DOE/OSTI--3411/4

THE OFFICE OF ENVIRONMENTAL MANAGEMENT TECHNICAL REPORTS

A Bibliography

May 1999

Prepared for
The Office of Science and Technology

Prepared by
Office of Scientific and Technical Information

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The Office of Environmental Management Technical Reports

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ABOUT THIS BIBLIOGRAPHY

The Office of Environmental Management's (EM) technical reports bibliography is an annual publication that contains information on scientific and technical reports sponsored by the Office of Environmental Management. This bibliography contains citations for reports published in Fiscal Year 1998 (October 1, 1997–September 30, 1998). EM's Office of Science and Technology sponsors this bibliography. Questions regarding the content of the publication should be addressed to Diana Krop, Communication Program Manager, at 301-903-7918 or **Diana.Krop@em.doe.gov**

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The Office of Environmental Management within the Department of Energy (DOE) is responsible for environmental restoration, waste management, technology development and facility transition and management. This Office was created in 1989 to consolidate responsibility within DOE for environmental management activities. EM develops DOE policies and plans related to environmental restoration and waste management and is working to foster open communication with the public.

The Office of Science and Technology (OST) was established to conduct an aggressive, national program of applied research, development, demonstration, testing, and evaluation for environmental cleanup solutions that are safe and more time- and cost-effective than those currently available. OST brings together experts from academia, the Federal government, and private industry to conduct a wide range of research and development. Through these unique partnerships, OST leverages resources to develop equipment and methods to render waste management technologies less expensive, safe, and commercially applicable around the globe. In doing so, OST seeks to achieve the twin goals of sustaining our environment and creating economic prosperity.

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How To Read A Citation

The principal data elements included in these citations are:

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16. **Drop note** or explanatory statement.
17. **Abstract.**
18. **Subject descriptors.** Listed only if no abstract or only a brief statement is included.

Sample Citations

Report

18494 (DOE/ER/40438–T1) **[Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report.** Haeberli, W. Phys. VI collaboration. Wisconsin Univ., Madison (USA). Dept. of Physics. [1989]. 12p. Sponsored by DOE Energy Research. DOE Contract FG02-88ER40438.

This paper briefly discusses the Wisconsin test facility for storage cells; results of target tests; the new UHV...

Report Analytic

18500 (INIS-SU—69, pp. 30-32) **Transition energies in Ne-like ions. Correlation effects.** Vainshtejn, L.A. AN SSSR, Moscow. Fizicheskij Inst. 1988. (In Russian). In *Experimental and theoretical physics. Collection.* Order Number DE89780060. Available from NTIS (US Sales Only), PC A03/MF A01; INIS.

Kratkie Soobshcheniya po Fizike.; no. 6.

SILVER IONS/energy-level transitions; XENON IONS/energy-level transitions; CORRELATIONS; D STATES; E STATES;...

54 (DOE/ER/60888-1-Vol.1, pp. 115-117) **Investigation of air pollution in house due to use of various fuels.** Luo, Dayu (Chengdu Sanitation (China)). Canada Mortgage and Housing Corp., Ottawa, ON (Canada). 1990. (CONF-900724-Vol.1: Indoor Air ’90: 5th international conference on indoor air quality and climate, Toronto (Canada), 29 Jul - 3 aug 1990). In Indoor air ’90: The fifth international conference on indoor air quality and climate. Volume 1: Final report. 786p. Order Number DE90017786. Source: NTIS.

Air pollution in houses caused by combustion of coal is more serious than that by combustion of natural gas and methane (primarily by SO_2 and NO_2). The gas concentration after cooking is higher than that before cooking, and it is higher in kitchen than in bedroom and outdoor. There were mutations in the extract from TSP in 30m^2 air in the bedroom, kitchen and outdoor, where coal and natural gas were used. The supernatant saliva activity of children whose family uses coal is significantly lower than that of pumping streams.

How To Use the Indexes

Two indexes are provided for approaching the content of *The Office of Environmental Management Technical Reports.* Descriptions of entries in these indexes follow.

Corporate Author Index

The corporation, organization, or institution responsible for the issuance of the document is listed in this index. The entries are arranged alphabetically and provide the title and citation number of the reference. For example, the listing for the "Report" sample citation would appear as shown at right.

Wisconsin Univ., Madison (USA). Dept. of Physics
[Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report, 15:18494 (R;US)

Wisconsin Univ., Madison (USA). Lab. of Genetics
Organization of the R chromosome region in maize: Final progress report, June 1, 1983–May 31, 1986, 15:18255 (R;US)

Personal Author Index

Each author's name listed on a document cited in this issue is indexed. An index entry provides title and citation number; for secondary and other names, a cross-reference is given to the primary author name where the full index entry is located.

Hadley, D.L., *See* Lee, A.D., 15:17651

Haeberli, W., [Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report, 15:18494 (R;US)

Environmental Management Technical Reports

ENVIRONMENTAL MANAGEMENT

1
(ANL–98/1)
Surveillance of Site A and Plot M report for 1997. Golchert, N.M. Argonne National Lab., IL (United States). May 1998. 106p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE98006038. Source: OSTI; NTIS; INIS; GPO Dep.

The results of the environmental surveillance program conducted at Site A/Plot M in the Palos Forest Preserve area for 1997 are presented. The surveillance program is the ongoing remedial action that resulted from the 1976–1978 radiological characterization of the site. That study determined that very low levels of hydrogen-3 (as tritiated water) had migrated from the burial ground and were present in two nearby hand-pumped picnic wells. The current program consists of sample collection and analysis of air, surface and subsurface water, and bottom sediment. The results of the analyses are used to: (1) monitor the migration pathway of water from the burial ground (Plot M) to the hand-pumped picnic wells, (2) establish if buried radionuclides other than hydrogen-3 have migrated, and (3) generally characterize the radiological environment of the area. Hydrogen-3 in the Red Gate Woods picnic wells was still detected this year, but the average and maximum concentrations were significantly less than found earlier. Tritiated water continues to be detected in a number of wells, boreholes, dolomite holes, and a surface stream. For many years it was the only radionuclide found to have migrated in measurable quantities. Analyses since 1984 have indicated the presence of low levels of strontium-90 in water from a number of boreholes next to Plot M. The available data does not allow a firm conclusion as to whether the presence of this nuclide represents recent migration or movement that may have occurred before Plot M was capped. The results of the surveillance program continue to indicate that the radioactivity remaining at Site A/Plot M does not endanger the health or safety of the public visiting the site, using the picnic area, or living in the vicinity.

2
(ANL–98/9)
A data base and a standard material for use in acceptance testing of low-activity waste products. Wolf, S.F.; Ebert, W.L.; Luo, J.S.; Strachan, D.M. Argonne National Lab., Chemical Technology Div., IL (United States). Apr 1998. 199p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE98007004. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have conducted replicate dissolution tests following the product consistency test (PCT) procedure to measure the mean and standard deviation of the solution concentrations of B, Na, and Si at various combinations of temperature, duration, and glass/water mass ratio. Tests were conducted with a glass formulated to be compositionally similar to low-activity waste products anticipated for Hanford to evaluate the adequacy of test methods that have been designated in privatization contracts for use in product acceptance. An important finding from this set of tests is that the solution concentrations generated in tests at 20 C will likely be too low to measure the dissolution rates of waste products reliably. Based on these results, the authors recommend that the acceptance test be conducted at 40 C. Tests at 40 C generated higher solution concentrations, were more easily conducted, and the measured rates were easily related to those at 20 C. Replicate measurements of other glass properties were made to evaluate the possible use of LRM-1 as a standard material. These include its composition, homogeneity, density, compressive strength, the Na leachability index with the ANSI/ANS 16.1 leach test, and if the glass is characteristically hazardous with the toxicity characteristic leach procedure. The values of these properties were within the acceptable limits identified for Hanford low-activity waste products. The reproducibility of replicate tests and analyses indicates that the glass would be a suitable standard material.

3
(ANL–98/10)
Formulation of a candidate glass for use as an acceptance test standard material. Ebert, W.L.; Strachan, D.M.; Wolf, S.F. Argonne National Lab., Chemical Technology Div., IL (United States). Apr 1998. 41p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE98007058. Source: OSTI; NTIS; INIS; GPO Dep.

In this report, the authors discuss the formulation of a glass that will be used in a laboratory testing program designed to measure the precision of test methods identified in the privatization contracts for the immobilization of Hanford low-activity wastes. Tests will be conducted with that glass to measure the reproducibility of tests and analyses that must be performed by glass producers as a part of the product acceptance procedure. Test results will be used to determine if the contractually required tests and analyses are adequate for evaluating the acceptability of likely immobilized low-activity waste (ILAW) products. They will also be used to evaluate if the glass designed for use in these tests can be used as an analytical standard test material for verifying results reported by vendors for tests withg ILAW products. The results of those tests and analyses will be presented in a separate report. The purpose of this report is to document the strategy used to formulate the glass to be used in the testing program. The low-activity waste reference glass LRM that will be used in the testing program was formulated to be compositionally similar to ILAW products to be made with wastes from Hanford. Since the ILAW product compositions have not been disclosed by the vendors participating in the Hanford privatization project, the composition of LRM was formulated based on simulated Hanford

waste stream and amounts of added glass forming chemicals typical for vitrified waste forms. The major components are 54 mass % SiO_2, 20 mass % Na_2O, 10 mass % Al_2O_3, 8 mass % B_2O_3, and 1.5 mass % K_2O. Small amounts of other chemicals not present in Hanford wastes were also included in the glass, since they may be included as chemical additives in ILAW products. This was done so that the use of LRM as a composition standard could be evaluated. Radionuclides were not included in LRM because a nonradioactive material was desired.

4

(ANL–98/17)

Ultrasonic viscometer and methods of measuring solids concentration. Sheen, S.H.; Chien, H.T. Argonne National Lab., Energy Technology Div., IL (United States). Jun 1998. 31p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE99001066. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the progress made in FY 1997 on the development of an on-line ultrasonic instrument for measuring fluid density, viscosity, and solids concentration in a slurry transport line. The instrument was developed to support the tank-waste transport effort undertaken by the US Department of Energy to treat low-level nuclear waste. A prototype instrument was built and performance-tested at Oak Ridge National Laboratory. Significant measurement biases were detected in both fluid density and viscosity data. The biases were mainly the result of process temperature variation, which changes the signals that propagate in transducer wedges. With proper temperature calibration, the instrument can achieve an accuracy of $\pm$1% and $\pm$3% when used to measure density and viscosity, respectively. Ultrasonic attenuation and speed-of-sound techniques are involved when the instrument is used to measure solids concentration. Test results show that the attenuation techniques give a better correlation with solids concentration and can be used to monitor solids concentrations up to 30% by weight for ka $<$1 (where k = ultrasonic wave number and a = particle diameter). Measurement problems and suggested remediations are discussed.

5

(ANL/CHM/CP–92698)

Chemistry, radiation, and interfaces in suspensions of nuclear waste simulants. Meisel, D.; Cook, A.; Camaioni, D.; Orlando, T. Argonne National Lab., IL (United States); Battelle Memorial Inst., Columbus, OH (United States). 1997. 10p. Sponsored by USDOE Office of Energy Research, Washington, DC (United States). DOE Contract W-31109-ENG-38 ; AC06-76RL01830. (CONF-970805–: 192. meeting of the Electrochemical Society and 48. annual meeting of the International Society of Electrochemistry, Paris (France), 31 Aug - 5 Sep 1997). Order Number DE97053261. Source: OSTI; NTIS; INIS; GPO Dep.

We focus in this report on three issues that are of central importance in the management of radioactive high-level liquid waste (HLLW). We show that the only reducing radical that lasts longer than a few ps in typical HLLW, and is capable of generating hydrogen, is NO_3^{2-}. We measured the lifetime of this species across the whole pH range ($3 \leq pH \leq 14$) and found it to be shorter than $\approx$15 μs, before is dissociates to give strongly oxidizing NO_2 radicals. We found that it reacts with many proton donors (H^+ phosphate, borate, NH_4^+, amines) in a reaction that is not merely an acid-base equilibrium reaction. Using high-level ab initio calculations we estimate its redox potential and pK_a. We have developed methodologies to study the degradation of organic additives to the HLLW (to CO_2 or carbonate) by NO_2. Relative rates of degradation of several complexants were determined using competition kinetics and ^{13}C NMR and proton NMR detection techniques. Direct absorption of the radiation (low-energy electrons as well as photons above the ionization threshold) in $NaNO_3$ single crystal at the solid/vacuum interface led to production of NO, O, and O- as the major products.

6

(ANL/CHM/CP–93218)

In-situ mineralization of actinides for groundwater cleanup: Laboratory demonstration with soil from the Fernald Environmental Management Project. Nash, K.L. (Argonne National Lab., IL (United States). Chemistry Div.); Jensen, M.P.; Schmidt, M.A. Argonne National Lab., IL (United States). [1997]. 17p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970962–: 214. American Chemical Society meeting, Las Vegas, NV (United States), 7-13 Sep 1997). Order Number DE98050529. Source: OSTI; NTIS; GPO Dep.

An attractive approach to decreasing the probability of actinide migration in the subsurface is to transform the ions into less mobile forms by remote treatment. The process described herein relies on a polyfunctional organophosphorus complexant to sequester the mobile metal ions by complexation/cation exchange in the near term. The cation exchanger is designed to subsequently decompose, transforming the actinides into insoluble phosphate mineral forms as the medium of stable long-term isolation. This material can be generated in situ in the subsurface thus eliminating the need for excavation to immobilize the actinide ions. Previous investigations have identified a suitable organophosphorus reagent and profiled its decomposition kinetics, verified the formation of phosphate mineral phases upon decomposition of the reagent, determined solubility limits for appropriate metal phosphates under groundwater conditions, and examined the cation exchange behavior of the calcium salt of the organophosphorus reagent. In this report, the focus is on a laboratory-scale demonstration of the concept using a soil sample from the Fernald Environmental Management Plant.

7

(ANL/CMT/CP–91771)

An AEM study of glass-palagonite interfaces formed in Hawaiian basalt glasses. Luo, J.S.; Ebert, W.L.; Dietz, N.L.; Bates, J.K. Argonne National Lab., IL (United States). [1997]. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970568–3: 99. annual meeting of the American Ceramic Society, Cincinnati, OH (United States), 4-7 May 1997). Order Number DE97053127. Source: OSTI; NTIS; INIS; GPO Dep.

Basalt glass has been used as a natural analogue of high-level waste glass because both types of glass have similar Si contents. Most important for identifying the dominant long-term corrosion process is the exact chemical nature of the glass-palagonite boundary. In this paper, the authors present the results of a detailed study of alteration interfaces formed in subaerially altered Hawaiian basalt glasses (400

to 700 years old) and analyzed with high resolution transmission electron microscopy (TEM) and nanometer-size energy dispersive x-ray spectrometric (EDS) probe. The study reveals a sharp contact between fresh glass and alteration products at nanometer scale. The alteration products, which were typically several nanometers in size, were found to be iron oxide hydroxide (goethite), aluminum hydroxide hydrate (scarbroite), and an Si-Fe-Al rich amorphous phase. The EDS line profile across the boundary showed a zone of 60–130 nm thickness that is depleted in alkali elements but exhibits no variation for silicon. These results point to a dominant dissolution-precipitation mechanism plus a limited ion-exchange process under subaerial conditions.

8
(ANL/CMT/CP–92648)
Short-term consistency testing vs. long-term behavior. Ebert, W.L.; Bakel, A.J.; Wolf, S.F.; Strachan, D.M. Argonne National Lab., IL (United States). 1997. 13p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970537–8: 18. annual DOE low-level radioactive waste management conference, Salt Lake City, UT (United States), 20-22 May 1997). Order Number DE97007068. Source: OSTI; NTIS; INIS; GPO Dep.

The authors conducted Product Consistency Tests (PCTs) with a surrogate low-activity waste (LAW) glass to (1) evaluate the possible use of various test conditions in a specification test for LAW waste forms, (2) measure the reproducibility of the test at low temperatures, and (3) determine if the rates calculated from 7-day PCTs bound the rates measured in PCT conducted for longer durations, which represent more advanced corrosion. The effects of temperature and pH on the dissolution rate in PCTs are much less than the effects observed in dilute solutions due to the buildup of dissolved glass components in the PCTs. The precision of replicate 7-day tests at 20 and 40°C was limited by the analytical uncertainty. The dissolution rates at all temperatures decreased with the test duration initially. However, the dissolution rates in tests at 70 and 90°C increased when certain alteration phases formed after about 100 and 500 days, respectively; the rates in some tests exceeded that measured in a 7-day PCT. While the 7-day PCT does not provide a bounding rate for this glass at 70 or 90°C, tests for longer durations are needed to determine if a 7-day test provides a bounding rate at lower temperatures.

9
(ANL/CMT/CP–92880)
Plutonium alteration phases from lanthanide borosilicate glass. Fortner, J.A.; Mertz, C.J.; Chamberlain, D.C.; Bates, J.K. Argonne National Lab., IL (United States). [1997]. 7p. Sponsored by USDOE Assistant Secretary for Human Resources and Administration, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970844–3: Plutonium futures: the science, Santa Fe, NM (United States), 25-27 Aug 1997). Order Number DE97008381. Source: OSTI; NTIS; INIS; GPO Dep.

A prototype lanthanide borosilicate (LaBS) glass containing 10 mass % plutonium was reacted with water vapor at 200 C for periods of 14 to 56 days. These tests, while not designed to replicate specific conditions that may be found in a potential geologic repository (e.g., Yucca Mountain), have been shown to accelerate alteration phase formation. The surfaces of the glass samples, along with alteration phases, were examined with a transmission electron microscope (TEM). Tests of 14 days produced macroscopic (∼ 20 { micro} m) crystallites of a plutonium-lanthanide silicate. An extensive alteration layer was found on the glass surface containing amorphous aluminosilicate layered with bands of a cryptocrystalline plutonium silicate. After 56 days of testing, additional alteration phases were formed, including a strontium lanthanide oxide phase. One of the options for disposal of surplus plutonium, particularly for impure residues that may be unfit for production of MOX fuel, is vitrification followed by geologic disposal. Since geologic disposal requires a passive system to isolate the radiotoxic elements from the biosphere, it is important to understand the possible corrosion mechanisms of the waste form.

10
(ANL/CMT/CP–92884)
Microscopic analysis of Pu-contaminated incinerator ash: Implications for immobilization. Buck, E.C. (Argonne National Lab., IL (United States). Chemical Technology Div.). Argonne National Lab., IL (United States). [1997]. 5p. Sponsored by USDOE Assistant Secretary for Human Resources and Administration, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970844–5: Plutonium futures: the science, Santa Fe, NM (United States), 25-27 Aug 1997). Order Number DE97008379. Source: OSTI; NTIS; INIS; GPO Dep.

In this paper, a nanometer-scale mineralogical study with analytical transmission electron microscopy (AEM) of plutonium-bearing incinerator ash from the Rocky Flats Environmental Technology Site (RFETS) in Colorado is described. The findings from this work may have implications for the present effort to immobilize plutonium waste. Around 70% of the plutonium ash in the DOE weapons complex is stored at RFETS. The ash was formed from the combustion of contaminated wastes generated from plutonium processing. The RFETS incinerator ash composition has been determined by Blum et al. The ash was formed at temperatures estimated to be between 200 C and 900 C and contains up to 14 wt% Pu. Ash is a generic term used to describe the by-product of combustion and owing to the variability in the inorganic components.

11
(ANL/CMT/CP–92918)
Pu and Gd chemistry of zirconolite polytypes in a titanate ceramic. Bakel, A.J. (Argonne National Lab., IL (United States). Chemical Technology Div.); Buck, E.C.; Ebbinghaus, B. Argonne National Lab., IL (United States). [1997]. 4p. Sponsored by USDOE Assistant Secretary for Human Resources and Administration, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970844–4: Plutonium futures: the science, Santa Fe, NM (United States), 25-27 Aug 1997). Order Number DE97008380. Source: OSTI; NTIS; INIS; GPO Dep.

Titanate-based ceramics are being developed as possible candidates for immobilizing excess plutonium from dismantled nuclear weapons. Evidence from testing of similar ceramics and natural analogues suggests that this material is very resistant to aqueous corrosion. The purpose of this work is to describe the phase(s) present in these ceramics. In particular the authors are interested in the disposition of important elements such as Pu and Gd (to be incorporated into the wasteform as a neutron absorber). In concert with data from corrosion tests, this characterization will allow one

to describe the release behaviors of important elements from this type of ceramic. This is particularly difficult and important due to the heterogeneous nature of the material.

12
(ANL/CMT/CP–94430)
Effect of alteration phase formation on the glass dissolution rate. Ebert, W.L. Argonne National Lab., IL (United States). 1997. 8p. Sponsored by USDOE Office of Civilian Radioactive Waste Management, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-9708128–: CEA-Valrho workshop on glass: scientific research toward high performance containment conference, Mejannes-le-Clap (France), 31 Aug - 7 Sep 1997). Order Number DE97054270. Source: OSTI; NTIS; INIS; GPO Dep.

The dissolution rates of many glasses have been observed to increase upon the formation of certain alteration phases. It is important to understand the mechanism by which alteration phases affect glass corrosion behavior and the glass dissolution rate to reliably predict whether or not similar effects will occur in a disposal environment and the impact of phase formation on the long-term performance of waste glass. While solid state transformation of a glass to thermodynamically more stable phases in kinetically prohibitive, contact by water provides an energetically favorable pathway for this transformation to occur by a dissolution-reprecipitation mechanism. The kinetics of the transformation depends on the dissolution kinetics of the glass and the precipitation kinetics of the alteration phases. The rates of these two processes are linked primarily through the solution activity of orthosilicic acid (and perhaps also that of an aluminum-bearing species).

13
(ANL/CTD/PP–86307)
Gas evolution during vitrification of sodium sulfate and silica. Ebert, W.L. (Argonne National Lab., IL (United States). Chemical Technology Div.); Bakel, A.J.; Rosine, S.D. Argonne National Lab., IL (United States). [1997]. 18p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE97008113. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the operation of an apparatus designed to identify species evolved during vitrification of hazardous waste materials and to measure the temperatures at which they are evolved. To demonstrate the utility of the apparatus for designing off-gas systems, the authors present the results of heating various sulfates alone and in the presence of silica. During vitrification, the decomposition behavior of some waste components will be affected by the chemical composition of the melt. For example, they found that when silica is present during heating, SO_x gases are evolved at lower temperatures than when pure sodium sulfate is heated. Such analyses will be important in the design of off-gas units for waste vitrification systems.

14
(ANL/D&D–97-1)
Decontamination and dismantlement of the JANUS Reactor at Argonne National Laboratory-East. Project final report. Fellhauer, C.R. (Argonne National Lab., IL (United States). Technology Development Div.); Clark, F.R.; Garlock, G.A. Argonne National Lab., IL (United States). Oct 1997. 111p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE98001522. Source: OSTI; NTIS; INIS; GPO Dep.

The decontamination and dismantlement of the JANUS Reactor at Argonne National Laboratory-East (ANL-E) was completed in October 1997. Descriptions and evaluations of the activities performed and analyses of the results obtained during the JANUS D and D Project are provided in this Final Report. The following information is included: objective of the JANUS D and D Project; history of the JANUS Reactor facility; description of the ANL-E site and the JANUS Reactor facility; overview of the D and D activities performed; description of the project planning and engineering; description of the D and D operations; summary of the final status of the JANUS Reactor facility based upon the final survey results; description of the health and safety aspects of the project, including personnel exposure and OSHA reporting; summary of the waste minimization techniques utilized and total waste generated by the project; and summary of the final cost and schedule for the JANUS D and D Project.

15
(ANL/D&D–98-1)
Decontamination and Decommissioning activities photobriefing book FY 1997. Argonne National Lab., IL (United States). Apr 1998. 90p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE98004979. Source: OSTI; NTIS; INIS; GPO Dep.

The Decontamination and Decommissioning (D and D) Program at Argonne National Laboratory-East (ANL-E) is dedicated to the safe and cost effective D&D of surplus nuclear facilities. There is currently a backlog of more than 7,000 contaminated US Department of Energy facilities nationwide. Added to this are 110 licensed commercial nuclear power reactors operated by utilities learning to cope with deregulation and an aging infrastructure that supports the commercial nuclear power industry, as well as medical and other uses of radioactive materials. With this volume it becomes easy to understand the importance of addressing the unique issues and objectives associated with the D&D of surplus nuclear facilities. This photobriefing book summarizes the decontamination and decommissioning projects and activities either completed or continuing at the ANL-E site during the year.

16
(ANL/DIS/PP–90117)
Analysis of disposition alternatives for radioactively contaminated scrap metal. Nieves, L.A.; Chen, S.Y.; Kohout, E.J.; Nabelssi, B.; Tilbrook, R.W.; Wilson, S.E. Argonne National Lab., IL (United States). [1997]. 17p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE97002663. Source: OSTI; NTIS; INIS; GPO Dep.

Millions of tonnes of slightly radioactive, scrap iron and steel, stainless steel, and copper are likely to become available as nuclear and other facilities and equipment are withdrawn from service. Disposition of this material is an international policy issue under consideration currently. The major alternatives for managing this material are to either develop a regulatory process for decontamination and recycling that will safeguard human health or to dispose of the

scrap and replace the metal stocks. To evaluate the alternatives, we estimate quantities of scrap arising from nuclear power plant decommissioning, evaluate potential price impacts of recycling on regional markets, and assess the health and environmental impacts of the management alternatives. We conclude that decontaminating and recycling the scrap is the superior alternative.

17
(ANL/EA/CP–90804)
A comparative review of accident studies from recent assessments of emergency planning zone boundaries. Mueller, C.J.; Kier, P.H.; Folga, S.M. Argonne National Lab., IL (United States). [1997]. 4p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-970419–5: 6. American Nuclear Society (ANS) topical meeting on emergency preparedness and response, San Francisco, CA (United States), 22-25 Apr 1997). Order Number DE97004692. Source: OSTI; NTIS; INIS; GPO Dep.

Hazards assessments and accompanying accident and human health and risk calculations are routinely done to establish Emergency Planning Zone (EPZ) boundaries for facilities managing hazardous and/or radioactive materials. This paper reviews the underlying US DOE guidance, assesses the degree of conformance to the guidance in recent hazards assessments performed to support selection of EPZ boundaries, and compares the consistency of the accident analysis approaches and underlying key assumptions. Recommendations are made on the basis of these reviews, as well as from knowledge of the approaches used in safety assessments performed in support of safety analysis reports (SARs) and environmental impact statements (EISs).

18
(ANL/EA/CP–90893)
Conceptual framework and technical basis for clearance of materials with residual radioactivity. Chen, S.Y. Argonne National Lab., IL (United States). [1997]. 4p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-970322–2: International conference on radiation dosimetry and safety, Taipei (Taiwan, Province of China), 31 Mar - 2 Apr 1997). Order Number DE97004695. Source: OSTI; NTIS; INIS; GPO Dep.

The primary impediment to the release of materials containing residual radioactivity from a controlled environment is the lack of a suitable framework within which release standards can be developed. Recently, the 'risk-based' approach has been proposed as an appropriate means of setting standards. The term 'clearance' has been introduced by the International Atomic Energy Commission as a regulatory process for releasing radioactive materials posing trivial risks. A 'trivial' risk level has been determined to be on the order of 10[sup -6] to 10[sup -7] annual risk to an exposed individual, and a population risk of no more than 0.1 annually. Under these strict constraints, exposure scenarios may account for processing, disposal, and product end-use of materials. This paper discusses these scenarios and also describes the technical basis for deriving release levels under the suggested risk (or dose) constraints.

19
(ANL/EA/CP–91190)
Legal precedents regarding use and defensibility of risk assessment in Federal transportation of SNF and HLW. Bentz, E.J. Jr. (E.J. Bentz and Associates, inc., Alexandria, VA (United States)); Bentz, C.B.; O'Hora, T.D.; Chen, S.Y. Argonne National Lab., IL (United States). [1997]. 13p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970335–43: Waste Management '97, Tucson, AZ (United States), 2-7 Mar 1997). Order Number DE97004677. Source: OSTI; NTIS; INIS; GPO Dep.

Risk assessment has become an increasingly important and essential tool in support of Federal decision-making regarding the handling, storage, disposal, and transportation of spent nuclear fuel (SNF) and high-level radioactive waste (HLW). This paper analyzes the current statutory and regulatory framework and related legal precedents with regard to SNF and HLW transportation. The authors identify key scientific and technical issues regarding the use and defensibility of risk assessment in Federal decision-making regarding anticipated shipments.

20
(ANL/EA/CP–91830)
Release process for non-real property containing residual radioactive material. Ranek, N.L. (Argonne National Lab., IL (United States)); Chen, S.Y.; Kamboj, S.; Hensley, J.; Burns, D.; Fleming, R.; Warren, S.; Wallo, A. Argonne National Lab., IL (United States). [1997]. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970360–1: Environmental restoration '97, Tucson, AZ (United States), 5-6 Mar 1997). Order Number DE97001995. Source: OSTI; NTIS; INIS; GPO Dep.

It is DOE's objective to operate its facilities and to conduct its activities so that radiation exposures to members of the public are maintained within acceptable limits and exposures to residual radioactive materials are controlled. To accomplish this, DOE has adopted Order DOE 5400.51 'Radiation Protection of the Public and the Environment', and will be promulgating IO CR Part 834 to codify and clarify the requirements of DOE 5400.5. Under both DOE 5400.5 and 10 CR Part 834, radioactively contaminated DOE property is prohibited from release unless specific actions have been completed prior to the release. This paper outlines a ten-step process that, if followed, will assist DOE Operations and contractor personnel in ensuring that the required actions established by Order DOE 5400.5 and 10 CR Part 834 have been appropriately completed prior to the release for reuse or recycle of non-real property (e.g., office furniture, computers, hand tools, machinery, vehicles and scrap metal). Following the process will assist in ensuring that radiological doses to the public from the released materials will meet applicable regulatory standards and be as low as reasonably achievable (ALARA).

21
(ANL/EA/CP–92219)
Consistency in accident analyses in DOE safety, environmental, and emergency planning documents. Mueller, C.; Kier, P.; Folga, S. Argonne National Lab., IL (United States). [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970661–10: 1997 safety analysis workshop, Oakland, CA (United States), 9-13 Jun 1997). Order Number DE97006978. Source: OSTI; NTIS; INIS; GPO Dep.

A consistency review of accident analyses in US Department of Energy (DOE) safety, environmental, and emergency planning documents is presented. The range of and key differences in driving assumptions used in accident definition and frequency assessment, radiological source term generation, and atmospheric transport and fate modeling across recent environmental impact statements (EISs) and emergency planning documents and the effects of these differences on results are summarized. Considerable variation in both the assumptions and the underlying level of conservatism is shown to exist. Recommendations are made for source term generation and assumed meteorological conditions to reduce inconsistencies without being overly prescriptive. Recommendations also are made to improve consistency in assessing the frequencies of various generic accident sequences traditionally analyzed in EIS and emergency planning documents. All recommendations are shown to be consistent with currently applicable DOE guidance.

22
(ANL/EA/CP–92259)
Nevada Risk Assessment/Management Program scientific peer review. Bentz, E.J. Jr. (E.J. Bentz and Associates, Inc., Alexandria, VA (United States)); Bentz, C.B.; O'Hora, T.D.; Chen, S.Y. Argonne National Lab., IL (United States). [1997]. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970322–3: International conference on radiation dosimetry and safety, Taipei (Taiwan, Province of China), 31 Mar - 2 Apr 1997). Order Number DE97004699. Source: OSTI; NTIS; INIS; GPO Dep.

The 1,350 square-mile Nevada Test Site and additional sites in Nevada served as the continental sites for US nuclear weapons testing from 1951 to 1992. The Nevada Risk Assessment/Management Program (NRAMP) is a currently on-going effort of the Harry Reid Center for Environmental Studies at the University of Nevada, Las Vegas (UNLV) and the firm of E. J. Bentz and Associates, Inc., in cooperation with the US Department of Energy (DOE) Environmental Management Program. Argonne National Laboratory is one of several public and private organizations supporting personnel appointed by the NRAMP to the NRAMP Scientific Peer Review Panel. The NRAMP is part of a national effort by the DOE to develop new sources of information and approaches to risk assessment, risk management, risk communication, and public outreach relevant to the ecological and human health effects of radioactive and hazardous materials management and site remediation activities. This paper describes the development, conduct, and current results of the scientific peer review process which supports the goals of the NRAMP.

23
(ANL/EA/CP–94676)
Environmental risk assessment. MacDonell, M.M. Argonne National Lab., IL (United States). [1997]. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9710136–: Eco-Informa '97, Munich (Germany), 6-9 Oct 1997). Order Number DE98050139. Source: OSTI; NTIS; GPO Dep.

This paper presents a current overview of the basic elements of environmental risk assessment within the basic four-step process of hazard identification, exposure assessment, toxicity assessment, and risk characterization. These general steps have been applied to assess both human and ecological risks from environmental exposures. Approaches used to identify hazards and exposures are being refined, including the use of optimized field sampling and more representative, rather than conservative,upper-bound estimates. In addition, toxicity data are being reviewed more rigorously as US and European harmonization initiatives gain strength, and the classification of chemicals has become more qualitative to more flexibly accommodate new dose-response information as it is developed. Finally, more emphasis is being placed on noncancer end points, and human and ecological risks are being weighed against each other more explicitly at the risk characterization phase. Recent advances in risk-based decision making reflect the increased transparency of the overall process, with more explicit incorporation of multiple trade-offs. The end result is a more comprehensive life-cycle evaluation of the risks associated with environmental exposures at contaminated sites.

24
(ANL/EAD/TM–78)
Review of processes for the release of DOE real and non-real property for reuse and recycle. Ranek, N.L.; Kamboj, S.; Hensley, J.; Chen, S.Y.; Blunt, D. Argonne National Lab., IL (United States). Nov 1997. 92p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE98001779. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the underlying historical and regulatory framework supporting the concept of authorizing release for restricted or unrestricted reuse or recycle of real and non-real U.S. Department of Energy (DOE) properties containing residual radioactive material. Basic radiation protection principles as recommended by the International Commission on Radiological Protection are reviewed, and international initiatives to investigate radiological clearance criteria are reported. Applicable requirements of the U.S. Nuclear Regulatory Commission, the Environmental Protection Agency, DOE, and the State of Washington are discussed. Several processes that have been developed for establishing cleanup and release criteria for real and non-real DOE property containing residual radioactive material are presented. Examples of DOE real property for which radiological cleanup criteria were established to support unrestricted release are provided. Properties discussed include Formerly Utilized Sites Remedial Action Project sites, Uranium Mill Tailings Remedial Action Project sites, the Shippingport decommissioning project, the south-middle and south-east vaults in the 317 area at Argonne National Laboratory, the Heavy Water Components Test Reactor at DOE's Savannah River Site, the Experimental Boiling Water Reactor at Argonne National Laboratory, and the Weldon Spring site. Some examples of non-real property for which DOE sites have established criteria to support unrestricted release are also furnished. 10 figs., 4 tabs.

25
(ANL/EAD/TM–82)
Evaluation of the area factor used in the RESRAD code for the estimation of airborne contaminant concentrations of finite area sources. Chang, Y.S.; Yu, C.; Wang, S.K. Argonne National Lab., Environmental Assessment Div., IL (United States). Jul 1998. 32p. Sponsored by USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States);USDOE Office of

Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE99000492. Source: OSTI; NTIS; INIS; GPO Dep.

The area factor is used in the RESRAD code to estimate the airborne contaminant concentrations for a finite area of contaminated soils. The area factor model used in RESRAD version 5.70 and earlier (referred to as the old area factor) was a simple, but conservative, mixing model that tended to overestimate the airborne concentrations of radionuclide contaminants. An improved and more realistic model for the area factor (referred to here as the new area factor) is described in this report. The new area factor model is designed to reflect site-specific soil characteristics and meteorological conditions. The site-specific parameters considered include the size of the source area, average particle diameter, and average wind speed. Other site-specific parameters (particle density, atmospheric stability, raindrop diameter, and annual precipitation rate) were assumed to be constant. The model uses the Gaussian plume model combined with contaminant removal processes, such as dry and wet deposition of particulates. Area factors estimated with the new model are compared with old area factors that were based on the simple mixing model. In addition, sensitivity analyses are conducted for parameters assumed to be constant. The new area factor model has been incorporated into RESRAD version 5.75 and later.

26

(ANL/ED/CP–92749)

Statistical signal processing and artificial intelligence applications in the nondestructive assay of U/Pu bearing materials. Aumeier, S.E.; Forsmann, J.H. Argonne National Lab., Idaho Falls, ID (United States). [1997]. 5p. Sponsored by USDOE Assistant Secretary for Nuclear Energy, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970844–6: Plutonium futures: the science, Santa Fe, NM (United States), 25-27 Aug 1997). Order Number DE97008378. Source: OSTI; NTIS; INIS; GPO Dep.

Over the years a number of techniques have been developed to determine the quantity and distribution of radiative isotopes contained in given assay samples through the measurement and analysis of penetrating characteristic radiations. An active technique of particular utility when assaying samples containing very small quantities of fissionable material or when high gamma ray backgrounds are encountered is the delayed neutron nondestructive assay (DN-NDA) technique. Typically, analysis of the delayed neutron signal involves relating the gross delayed neutron count observed following neutron irradiation of an assay sample to total fissionable material present via a linear calibration curve. In this way, the technique is capable of yielding the mass of a single dominant fissionable isotope or the total fissionable mass contained in a sample. Using this approach the only way to determine the mass of individual fissionable isotopes contained in a sample is to correlate total fissionable mass to individual isotopics via calculations or other means, yielding an indirect measure of isotopics. However, there is isotope specific information in the temporal delayed neutron signal due to differences in the delayed neutron precursor yields resulting from the fissioning of different isotopes. The authors present the results of an analysis to evaluate the feasibility of using Kalman filters and genetic algorithms to determine multiple specific fissionable isotopic masses contained in an assay sample from a cumulative delayed neutron signal measured following neutron irradiation of the sample.

27

(ANL/ED/CP–94173)

Deactivation of the EBR-II complex. Michelbacher, J.A. (and others); Earle, O.K.; Henslee, S.P. Argonne National Lab., IL (United States). 1997. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-971222–: Exchange 1997, Miami, FL (United States), 4 Dec 1997). Order Number DE97054217. Source: OSTI; NTIS; INIS; GPO Dep.

In January of 1994, the Department of Energy mandated the termination of the Integral Fast Reactor (IFR) Program, effective October 1, 1994. To comply with this decision, Argonne National Laboratory-West (ANL-W) prepared a plan providing detailed requirements to place the Experimental Breeder Reactor-II (EBR-II) in a radiologically and industrially safe condition, including removal of all irradiated fuel assemblies from the reactor plant, and removal and stabilization of the primary and secondary sodium, a liquid metal used to transfer heat within the reactor plant. The ultimate goal of the deactivation process is to place the EBR-II complex in a stable condition until a decontamination and decommissioning (D&D) plan can be prepared, thereby minimizing requirements for maintenance and surveillance and maximizing the amount of time for radioactive decay. The final closure state will be achieved in full compliance with federal, state and local environmental, safety, and health regulations and requirements. The decision to delay the development of a detailed D&D plan has necessitated this current action. The EBR-II is a pool-type reactor. The primary system contains approximately 87,000 gallons of sodium, while the secondary system has 13,000 gallons. In order to properly dispose of the sodium in compliance with the Resource Conservation and Recovery Act (RCRA), a facility has been built to react the sodium to a dry carbonate powder in a two stage process. Deactivation of a liquid metal fast breeder reactor (LMFBR) presents unique concerns. Residual amounts of sodium remaining in the primary and secondary systems must be either reacted or inerted to preclude future concerns with sodium-air reactions that generate explosive mixtures of hydrogen and leave corrosive compounds. Residual amounts of sodium on components will effectively “solder” components in place, making future operation or removal unfeasible.

28

(ANL/EMO/CP–92504)

Production-scale LLW and RMW solidification system operational testing at Argonne National Laboratory-East (ANL-E). Wescott, J. (Argonne National Lab., IL (United States)); Wagh, A.; Singh, D.; Nelson, R.; No, H. Argonne National Lab., IL (United States). [1997]. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970335–41: Waste Management ‘97, Tucson, AZ (United States), 2-7 Mar 1997). Order Number DE97004694. Source: OSTI; NTIS; INIS; GPO Dep.

Argonne National Laboratory-East (ANL-E) has begun production-scale testing of a low-level waste and radioactive mixed waste solidification system. This system will be used to treat low-level and mixed radioactive waste to meet land burial requirements. The system can use any of several

types of solidification media, including a chemically bonded phosphate ceramic developed by ANL-E scientists. The final waste product will consist of a solidified mass in a standard 208-liter drum. The system uses commercial equipment and incorporates several unique process control features to ensure proper treatment. This paper will discuss the waste types requiring treatment, the system configuration, and operation results for these waste streams.

29
(ANL/EMO/SUMM–93614)
The restoration of an Argonne National Laboratory foundry. Shearer, T.; Pancake, D.; Shelton, B. Argonne National Lab., IL (United States). 1997. 4p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-971125–12-Summ.: 1997 American Nuclear Society (ANS) winter meeting, Albuquerque, NM (United States), 16-20 Nov 1997). Order Number DE97053542. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Management Operations' Waste Management Department (WMD) at Argonne National Laboratory-East (ANL-E) undertook the restoration of an unused foundry with the goal of restoring the area for general use. The foundry was used in the fabrication of reactor components for ANL's research and development programs; many of the items fabricated in the facility were radioactive, thereby contaminating the foundry equipment. This paper very briefly describes the dismantling and decontamination of the facility. The major challenges associated with the safe removal of the foundry equipment included the sheer size of the equipment, a limited overhead crane capability (4.5 tonne), the minimization of radioactive and hazardous wastes, and the cost-effective completion of the project, the hazardous and radioactive wastes present, and limited process knowledge (the facility was unused for many years).

30
(ANL/EMO/SUMM–93615)
Argonne National Laboratory's photo-oxidation organic mixed waste treatment system - installation and startup testing. Shearer, T.L.; Nelson, R.A.; Torres, T.; Conner, C.; Wygmans, D. Argonne National Lab., IL (United States). 1997. 5p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-971125–11-Summ.: 1997 American Nuclear Society (ANS) winter meeting, Albuquerque, NM (United States), 16-20 Nov 1997). Order Number DE97053541. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the installation and startup testing of the Argonne National Laboratory (ANL-E) Photo-Oxidation Organic Mixed Waste Treatment System. This system will treat organic mixed (i.e., radioactive and hazardous) waste by oxidizing the organics to carbon dioxide and inorganic salts in an aqueous media. The residue will be treated in the existing radwaste evaporators. The system is installed in the Waste Management Facility at the ANL-E site in Argonne, Illinois. 1 fig.

31
(ANL/ESH-HP–98/02)
Characterization report for Building 301 Hot Cell Facility. Argonne National Lab., IL (United States). Jul 1998. [400p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE99000494. Source: OSTI; NTIS; INIS; GPO Dep.

During the period from October, 1997, through March, 1998, ANL-E Health Physics conducted a pre-D and D characterization of Building 301, referred to as the Hot Cell Facility. While primary emphasis was placed on radiological evaluation, the presence of non-nuclear hazardous and toxic material was also included in the scope of the characterization. This is one of the early buildings on the ANL-E site, and was heavily used in the 1950's and 1960's for various nuclear reaction and reactor design studies. Some degree of cleanup and contamination fixation was done in the 1970's, so that the building could be used with a minimum of risk of personnel contamination. Work records are largely nonexistent for the early history of the building, so that any assumptions about extent and type of contamination had to be kept very open in the survey planning process. The primary contaminant was found to be painted-over Cs-137 embedded in the concrete floors, although a variety of other nuclides consistent with the work said to have been performed were found in smaller quantities. Due to leaks and drips through the floor, a relatively modest amount of soil contamination was found in the service trench under the building, not penetrating deeply. Two contaminated, disconnected drain lines leaving the building could not be traced by site records, and remain a problem for remediation. The D and D Characterization Plan was fulfilled.

32
(ANL/ES/RP–93122)
Argonne National Laboratory puts alternative-fuel vehicles to the test. Argonne National Lab., IL (United States). [1997]. 4p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE97006977. Source: OSTI; NTIS; GPO Dep.

This paper describes the participation in the alternative-fueled vehicles (AFV) program at Argonne National Laboratory. Argonne maintains a fleet of 300 vehicles, including AFV's.

33
(ANL/ET/CP–92453)
Regulatory concerns for leakage testing of packagings with three O-ring closure seals. Oras, J.J. (Argonne National Lab., IL (United States)); Towell, R.H.; Wangler, M.E. Argonne National Lab., IL (United States). [1997]. 5p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970744–: 38. annual meeting of the Institute of Nuclear Materials management, Phoenix, AZ (United States), 20-24 Jul 1997). Order Number DE97053876. Source: OSTI; NTIS; INIS; GPO Dep.

The American National Standard for Radioactive Materials–Leakage Tests on Packages for Shipment (ANSI N14.5) provides guidance for leakage rate testing to show that a particular packaging complies with regulatory requirements and also provides guidance in determining appropriate acceptance criteria. Recent radioactive packagings designs have incorporated three O-ring closure seals, the middle O-ring being the containment seal. These designs have the potential for false positive results of leakage rate tests. The volume between the containment O-ring and the inner O-ring is used for the helium gas required for the leakage rate tests to reduce both the amount of helium used and

the time required to conduct the tests. A leak detector samples the evacuated volume between the outer O-ring and the containment O-ring. False positive results can be caused in two ways, a large leakage in the containment seal or leakage in the inner seal. This paper will describe the problem together with possible solutions/areas that need to be addressed in a Safety Analysis Report for Packagings before a particular packaging design can be certified for transport.

34

(ANL/ET/CP–93070)

Method of estimating the leakage of multiple barriers in a radioactive materials shipping package. Towell, R.H. (Eagle Research Group, Inc., Germantown, MD (United States)); Kapoor, A.; Moses, S.B.; Oras, J.J. Argonne National Lab., IL (United States). 1997. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970778–1: 1997 ASME pressure vessels and piping conference, Orlando, FL (United States), 27-31 Jul 1997). Order Number DE97007121. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents the results of a theoretical study of the performance of multiple leaky barriers in containing radioactive materials in a shipping package. The methods used are reasoned analysis and finite element modeling barriers. The finite element model is developed and evaluated with parameters set to bracket 6M configurations with three to six nested plastic jars, food-pack cans, and plastic bags inside Department of Transportation (DOT) Specification 2R inner containers with pipe thread closures. The results show that nested barriers reach the regulatory limit of $1x10^{-6}$ A_2/hr in 11 to 52 days, even though individually the barriers would exceed the regulatory limit by a factor of as much as 370 instantaneously. These times are within normal shipping times. The finite element model is conservative because it does not consider the deposition and sticking of the leaking radioactive material on the surfaces inside each boundary.

35

(ANL/ET/CP–93397)

Leakage testing of packagings with three-O-ring closure seals. Oras, J.J. (Argonne National Lab., IL (United States)); Towell, R.H.; Wangler, M.E. Argonne National Lab., IL (United States). Oct 1997. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98050328. Source: OSTI; NTIS; INIS; GPO Dep.

Both the American National Standard for Radioactive Materials–Leakage Tests on Packages for Shipment (ANSI N14.5) and the ISO 12807:1996 Safe Transport of Radioactive Materials–Leakage Testing on Packages provide guidance for leakage rate testing to show that a particular packaging complies with regulatory requirements; both also provide guidance for determining appropriate acceptance criteria. Recent radioactive packaging designs have incorporated three-O-ring closure seals, the middle O-ring being the containment seal. These designs have the potential for false positive results in leakage rate tests. The volume between the containment O-ring and the inner O-ring is used for the helium gas required for the leakage rate tests, in order to reduce both the amount of helium used and the time required to conduct the tests. A leak detector samples the evacuated volume between the outer O-ring and the containment O-ring. False positive results can have two causes: a large leakage in the containment seal or leakage in the inner seal. This paper describes the problem, together with possible solutions and areas that should be addressed in a Safety Analysis Report for Packaging (SARP) before a particular packaging design can be certified for transport. Ultimately, the SARP should provide justification that the requirements for leakage rate testing procedures, including the length of time needed to conduct the tests, will ensure that the containment closure seal is properly tested.

36

(ANL/ET/CP–93781)

Immobilization of fission products in phosphate ceramic waste forms. Singh, D.; Wagh, A. Argonne National Lab., IL (United States). 1997. 4p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-970148–: Efficient Separations and Processing (ESP) Crosscutting Program FY 1997 technical exchange meeting, Gaithersburg, MD (United States), 28-30 Jan 1997). Order Number DE97053710. Source: OSTI; NTIS; INIS; GPO Dep.

Argonne National Laboratory (ANL) is developing chemically bonded phosphate ceramics (CBPCs) to treat low-level mixed wastes, particularly those containing volatiles and pyrophorics that cannot be treated by conventional thermal processes. This work was begun under ANL's Laboratory Directed Research and Development funds, followed by further development with support from EM-50's Mixed Waste Focus Area.

37

(ANL/ET/CP–94482)

An ultrasonic instrument for measuring density and viscosity of tank waste. Sheen, S.H.; Chien, H.T.; Raptis, A.C. Argonne National Lab., IL (United States). 1997. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970962–: 214. American Chemical Society meeting, Las Vegas, NV (United States), 7-13 Sep 1997). Order Number DE98000286. Source: OSTI; NTIS; INIS; GPO Dep.

An estimated 381,000 m^3/1.1 x 10^9 Ci of radioactive waste are stored in high-level waste tanks at the Hanford Savannah River, Idaho Nuclear Engineering and Environmental Laboratory, and West Valley facilities. This nuclear waste has created one of the most complex waste management and cleanup problems that face the United States. Release of radioactive materials into the environment from underground waste tanks requires immediate cleanup and waste retrieval. Hydraulic mobilization with mixer pumps will be used to retrieve waste slurries and salt cakes from storage tanks. To ensure that transport lines in the hydraulic system will not become plugged, the physical properties of the slurries must be monitored. Characterization of a slurry flow requires reliable measurement of slurry density, mass flow, viscosity, and volume percent of solids. Such measurements are preferably made with on-line nonintrusive sensors that can provide continuous real-time monitoring. With the support of the U.S. Department of Energy (DOE) Office of Environmental Management (EM-50), Argonne National Laboratory (ANL) is developing an ultrasonic instrument for

in-line monitoring of physical properties of radioactive tank waste.

38
(ANL/ET/CP–94812)
Evaluation of gamma radiation shielding for nuclear waste shipping casks. Liu, Y.Y. (Argonne National Lab., IL (United States). Energy Technology Div.); Carlson, R.D.; Primeau, S.J.; Wangler, M.E. Argonne National Lab., IL (United States). May 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98050530. Source: OSTI; NTIS; INIS; GPO Dep.

A method has been developed for evaluating gamma radiation shielding of shipping casks that are used to transport nuclear waste with ill-defined radionuclide contents. The method is based on calculations that establish individual limits for a comprehensive list of radionuclides in the waste, assuming that each radionuclide is uniformly distributed in a volumetric source in the cask. For multiple radionuclide mixtures, a linear fraction rule is used to restrict the total amount of radionuclides such that the sum of the fractions does not exceed 1. As long as the radionuclide limits and the linear fraction rule are followed, it can be shown that the regulatory dose rate requirements for a cask will be satisfied under normal conditions of transport and in a hypothetical accident during which the shielding thickness of the cask has been reduced by 40%.

39
(ANL/RA/CP–92135)
VIM: Initial ENDF/B-VI experience. Blomquist, R.N. Argonne National Lab., IL (United States). 1997. 5p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970607–31: ARS '97: American Nuclear Society (ANS) international meeting on advanced reactors safety, Orlando, FL (United States), 1-5 Jun 1997). Order Number DE97007097. Source: OSTI; NTIS; INIS; GPO Dep.

The VIM Monte Carlo particle transport code uses detailed continuous-energy cross sections produced from ENDF/B data by a set of specialized codes developed or adapted for use at Argonne National Laboratory. ENDF/B-IV data were used until about 1979, and Version V data since then. These VIM libraries were extensively benchmarked against the MC^2-2 code and against ZPR and ZPPR criticals for fast spectrum calculations, as well as other fast and thermal experiments and calculations. Recently, the cross section processing codes have been upgraded to accommodate ENDF/B-VI files, and a small library has been tested. Several fundamental tasks comprise the construction of a faithful representation of ENDF data for VIM calculations: (1) The resolved resonance parameters are converted to Doppler-broadened continuous-energy cross sections with energy grids suitable for linear-linear interpolation. (2) The unresolved resonance parameter distributions are sampled to produce many (40-400) resonance ladders in each energy band. These are converted to Doppler-broadened continuous energy resonance cross sections that are then binned by cross section, accumulating ladders until statistical convergence, the result being probability tables of total cross sections and conditional mean scattering and fission cross sections. VIM samples these tables at run time, and File 3 back ground cross sections are added. (3) Anisotropic angular distribution data are converted to angular probability tables. All other ENDF data are unmodified, except for format.

40
(ANL/TD/CP–92637)
Systems engineering based planning for DOE D&D projects. Craig, K.A. (NES, Inc., Danbury, CT (United States)); Rose, R.W. Argonne National Lab., IL (United States). 1997. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970952–6: Decontamination, decommissioning and reutilization of commercial and government facilities, Knoxville, TN (United States), 7-12 Sep 1997). Order Number DE97053226. Source: OSTI; NTIS; INIS; GPO Dep.

A primary concern in any D&D project is the detailed process of utilizing a systems analysis approach to achieve efficient planning and implementation of D&D projects. This includes such items as project management and document preparation, in addition to the hands-on field work. There are detailed analyses which can be performed to accurately determine the risk and hazards of a site which will be a primary concern during D&D at a DOE Facility. Scheduling and cost estimates must also be performed to assist in the D&D planning process.

41
(ANL/TD/CP–92675)
Deployment of remote dismantlement systems at the CP-5 reactor. Black, D.B.; Ditch, R.W.; Henley, D.R.; Seifert, L.S. Argonne National Lab., IL (United States). 1997. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970952–5: Decontamination, decommissioning and reutilization of commercial and government facilities, Knoxville, TN (United States), 7-12 Sep 1997). Order Number DE97053225. Source: OSTI; NTIS; INIS; GPO Dep.

The Chicago Pile 5 (CP-5) Reactor Facility is currently undergoing decontamination and decommissioning (D&D) at the Argonne National Laboratory (ANL) Illinois site. CP-5 was the principal nuclear reactor used to produce neutrons for scientific research at Argonne from 1954 to 1979. The CP-5 reactor was a heavy-water moderated, enriched uranium-fueled reactor with a graphite reflector. The CP-5 D&D project includes the disassembly and removal of all radioactive components, equipment, and structures associated with the CP-5 facility. The Department of Energy's Robotics Technology Development Program along with the Federal Energy Technology Center, Morgantown Office, have provided teleoperated, remote systems for use in the dismantlement of the CP-5 reactor structure for tasks requiring remote dismantlement. These systems include the dual-arm work platform, the Rosie mobile D&D vehicle, the swing-reduced crane control system, and a remotely-operated crane control system. The dual-arm work platform is a robotic dismantlement system that includes a pair of Schilling Titan III hydraulic manipulators mounted on a special platform, a hydraulic power unit and an operator console. The Rosie mobile D&D work system developed by RedZone Robotics, Inc. is an electro-hydraulic omni-directional locomotor platform with a heavy manipulator

mounted on its deck. The Rosie vehicle moves about the floor around the CP-5 reactor block and is operated from a console in the control room. The swing-reduced crane control system has been installed on the CP-5 polar crane, and allows a load suspended from the crane hook to be moved while reducing the induced swing in the load. A remote control system and a rotating crane hook have also been added to the CP-5 polar crane. This paper discusses the status of these remote systems at CP-5 and the facility changes made to allow for their use in the dismantlement of the reactor structure internals. 4 refs., 3 figs.

42

(ANL/TD/CP–92727)

Large-scale demonstration of D&D technologies. Bhattacharyya, S.K. (and others); Black, D.B.; Rose, R.W. Argonne National Lab., IL (United States). 1997. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970531–8: 5. ASME/SFEN/JSME international conference on nuclear engineering: nuclear advances through global cooperation, Nice (France), 26-30 May 1997). Source: American Society of Mechanical Engineers, 345 E. 47th St., New York, NY 10017 (United States).

It is becoming increasingly evident that new technologies will need to be utilized for decontamination and decommissioning (D&D) activities in order to assure safe and cost effective operations. The magnitude of the international D&D problem is sufficiently large in anticipated cost (100's of billions of dollars) and in elapsed time (decades), that the utilization of new technologies should lead to substantial improvements in cost and safety performance. Adoption of new technologies in the generally highly contaminated D&D environments requires assurances that the technology will perform as advertised. Such assurances can be obtained from demonstrations of the technology in environments that are similar to the actual environments without being quite as contaminated and hazardous. The Large Scale Demonstration Project (LSDP) concept was designed to provide such a function. The first LSDP funded by the U.S. Department Of Energy's Environmental Management Office (EM) was on the Chicago Pile 5 (CP-5) Reactor at Argonne National Laboratory. The project, conducted by a Strategic Alliance for Environmental Restoration, has completed demonstrations of 10 D&D technologies and is in the process of comparing the performance to baseline technologies. At the conclusion of the project, a catalog of performance comparisons of these technologies will be developed that will be suitable for use by future D&D planners.

43

(ANL/TD/CP–92728)

D&D of a reactor, hot cells and gloveboxes - an integrated experience. Yule, T.J.; Fellhauer, C.R.; Rose, R.W.; Bhattacharyya, S.K. Argonne National Lab., IL (United States). 1997. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-970531–7: 5. ASME/SFEN/JSME international conference on nuclear engineering: nuclear advances through global cooperation, Nice (France), 26-30 May 1997). Source: American Society of Mechanical Engineers, 345 E. 47th St., New York, NY 10017 (United States).

Performing Decontamination and Decommissioning (D&D) operations at a multi-use laboratory containing small sites which run the gamut of nuclear facility types within the DOE Complex provides engaging challenges, as well as many unique opportunities. While the relatively small scale of the D&D work performed at Argonne National Laboratory (ANL-E) does not present the significant environmental, safety and health risks which might be encountered at large production sites, the types of issues are representative of the most significant problems. Being a small site with relatively low risks and an exceptional rapport with local stakeholders provides for the development and demonstration of technologies and methodologies which could be utilized at the larger sites.

44

(ANL/TD/CP–94598)

Incorporation of pollution prevention and waste minimization practices during the decommissioning of Building 310 at Argonne National Laboratory-East. Mezaraups, J. (Argonne National Lab., IL (United States)); Krstich, M.A.; Yerace, P.J.; Gresalfi, M.J. Argonne National Lab., IL (United States). Oct 1997. 5p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-971121–: X-Change '97, Miami, FL (United States), 30 Nov - 4 Dec 1997). Order Number DE98050099. Source: OSTI; NTIS; INIS; GPO Dep.

The decommissioning of radiologically contaminated buildings at Department of Energy (DOE) sites provides a major opportunity to include pollution prevention and waste minimization (P2/WMin) practices to minimize waste using authorized release opportunities, and recycle and reuse (R2) activities on a complex-wide basis. The "P2/WMin Users Guide for Decommissioning Projects" (a.k.a. Users Guide or Guide) will be used to incorporate P2/WMin practices into the decommissioning and dismantlement (D and D) of Building 310 retention tanks at Argonne National Laboratory-East (ANL-E). The Building 310 service floor retention-tank facility contains ten isolated retention tanks that served to store excess radioactive liquids generated during process operations. The building consists of three rooms containing three tanks each and a larger room containing one tank. Due to a concern that the deteriorating facility could expose personnel working in the vicinity to radioactive contamination, a decision was made to decommission the building. The Users Guide, a document prepared under the auspices of the Office of Pollution Prevention (EM-77), details a step-by-step approach for incorporating P2/WMin options into a project's documentation and subsequent decommissioning activities. It is a compilation of lessons learned and strategic P2/WMin initiatives from across the DOE complex. The benefits derived from using P2/WMin initiatives for the D and D of Building 310 include an accelerated decommissioning schedule, reduction in health risk, and the elimination of six release sites from the DOE EM-40 list. The benefits derived from implementation of P2/WMin initiatives into this project include cost savings, reduction in long-term liability, and deployment of technologies without impacting scope or schedule for the project.

45

(BHI–00139-Rev.3)

Environmental Restoration Disposal Facility Waste Acceptance Criteria. Dronen, V.R. Bechtel Hanford, Inc., Richland, WA (United States). Jun 1998. 36p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United

States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98057634. Source: OSTI; INIS; NTIS; GPO Dep.

The Hanford Site is operated by the U. S. Department of Energy (DOE) with a primary mission of environmental cleanup and restoration. The Environmental Restoration Disposal Facility (ERDF) is an integral part of the DOE environmental restoration effort at the Hanford Site. The purpose of this document is to establish the ERDF waste acceptance criteria for disposal of materials resulting from Hanford Site cleanup activities. Definition of and compliance with the requirements of this document will enable implementation of appropriate measures to protect human health and the environment, ensure the integrity of the ERDF liner system, facilitate efficient use of the available space in the ERDF, and comply with applicable environmental regulations and DOE orders. To serve this purpose, the document defines responsibilities, identifies the waste acceptance process, and provides the primary acceptance criteria and regulatory citations to guide ERDF users. The information contained in this document is not intended to repeat or summarize the contents of all applicable regulations.

46

(BHI–00217-Rev.2)

Bechtel Hanford, Inc., RCRA Permit Implementation Plan. Robinson, G.S. Bechtel Hanford, Inc., Richland, WA (United States). Oct 1997. 54p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE98051322. Source: OSTI; NTIS; INIS; GPO Dep.

A Resource Conservation and Recovery Act of 1976 (RCRA) Permit was issued to the U.S. Department of Energy and its contractors operating facilities at the Hanford Site. The permit took effect on September 28, 1994, allowing for the treatment, storage, and/or disposal of dangerous waste within the respective authorities of the U.S. Environmental Protection Agency and the Washington State Department of Ecology. The purpose of this document is to provide information clarifying permit conditions and guidance for implementing the Hanford Facility RCRA Permit.

47

(BHI–00288-Rev.3)

Unit-Specific Contingency Plan for the 183-H Solar Evaporation Basins. Edens, V.G. Bechtel Hanford, Inc., Richland, WA (United States). Apr 1998. 10p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98054478. Source: OSTI; INIS; NTIS; GPO Dep.

This document is a supplement to DOE/RL-93-75, 'Hanford Contingency Plan.' It provides the unit-specific information needed to fully comply with the Washington Administrative Code. General emergency and response information is contained in the Hanford Facility Contingency Plan and is not repeated in this supplement. The 183-H Solar Evaporation Basins were four concrete internal surfaces, which contained radiologically and hazardous contaminated waste. The 183-H Basin area is a final status treatment, storage, and disposal unit undergoing Resource Conservation and Recovery Act modified post- closure care.

48

(BHI–00301-Rev.1)

1301-N Liquid Waste Disposal Facility Supplemental Information to the Hanford Facility Contingency Plan. Edens, V.G. Bechtel Hanford, Inc., Richland, WA (United States). Apr 1998. 10p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98054488. Source: OSTI; NTIS; GPO Dep.

The 1301-N Liquid Waste Disposal Facility located at the 100-N Area of the Hanford Site was the primary liquid radioactive waste disposal system for the N Reactor. Use of the facility began at the time of reactor start-up in 1963 and was discontinued in September 1985. From 1963 until 1985, liquid wastes disposed of in the 1301-N Facility were generated in the 105-N Reactor and the 109-N Heat Exchanger buildings. Waste streams routed to 1301-N were reactor coolant system bleed off, spent fuel storage basin cooling water overflow, reactor periphery cooling systems bleed off, reactor primary coolant loop decontamination rinse solution, and building drains containing radioactive waste generated from reactor support facilities.Specific information on types of waste discharged to 1301-N are contained within the Part A, Form 3, Permit application of this unit. Currently, them are no waste streams entering 130 1 -N.

49

(BHI–00304-Rev.1)

1325-N Liquid Waste Disposal Facility Supplemental Information to the Hanford Facility Contingency Plan (DOE/RL-93-75). Edens, V.G. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1998. 10p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98054489. Source: OSTI; INIS; NTIS; GPO Dep.

The 1325-N Liquid Waste Disposal Facility located at the 100-N Area of the Hanford Site started receiving part of the N Reactor liquid radioactive effluent flow in 1983. In September 1985, the 1325-N Facility became the primary liquid waste disposal system for the N Reactor. The facility is located approximately 60 feet above and 2000 feet east of the shore of the Columbia River. Waste stream discharges were ceased in April 1991.Specific information on types of waste discharged to 1325-N are contained within the Part A, Form 3, Permit application of this unit.

50

(BHI–00351-Rev.1)

Chemical Hygiene Plan for Onsite Measurement and Sample Shipping Facility Activities. Price, W.H. Bechtel Hanford, Inc., Richland, WA (United States). Jan 1998. 118p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE98052279. Source: OSTI; NTIS; INIS; GPO Dep.

This chemical hygiene plan presents the requirements established to ensure the protection of employee health while performing work in mobile laboratories, the sample shipping facility, and at the onsite radiological counting facility. This document presents the measures to be taken to promote safe work practices and to minimize worker exposure to hazardous chemicals. Specific hazardous chemicals present

in the mobile laboratories, the sample shipping facility, and in the radiological counting facility are presented in Appendices A through G.

51
(BHI–00823-Rev.2)
Site-Specific Health and Safety Plan, 233-S Decontamination and Decommissioning. Hobbs, B.J. Bechtel Hanford, Inc., Richland, WA (United States). Jan 1998. 36p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE98052280. Source: OSTI; NTIS; INIS; GPO Dep.

The 233-S Facility operated from January 1952 until July 1967, at which time the building entered the U.S. Department of Energy's Surplus Facility Management Program as a retired facility. The facility has since undergone severe degradation due to exposure to extreme weather conditions. A freeze and thaw cycle occurred at the Hanford Site during February 1996, which caused cracking failure of portions of the building roof. This resulted in significant infiltration of water into the facility, which creates a pathway for potential release of radioactive material into the environment (air and/or ground). Additionally, the weather caused existing cracks in concrete structures of the building to lengthen, thereby increasing the potential for failed confinement of the building's radioactive material. Differential settlement has also occurred, causing portions of the facility to separate from the main building structure, increasing the potential for release of radioactive material to the environment. An expedited response is proposed to remove this threat and ensure protection of human health and the environment.

52
(BHI–00853-Rev.1)
Hazard Classification and Auditable Safety Analysis for the 1300-N Emergency Dump Basin. Kloster, G.L., Bechtel Hanford Inc. Bechtel Hanford, Inc., Richland, WA (United States). 22 Jul 1998. 21p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE98058266. Source: OSTI; NTIS; INIS; GPO Dep.

This document combines three analytical functions consisting of (1) the hazards baseline of the Emergency Dump Basin (EDB) for surveillance and maintenance, (2) the final hazard classification for the facility, and (3) and auditable safety analysis. This document also describes the potential hazards contained within the EDB at the N Reactor complex and the vulnerabilities of those hazards. The EDB segment is defined and confirmed its independence from other segments at the site by demonstrating that no potential adverse interactions exist between the segments. No EDB hazards vulnerabilities were identified that require reliance on either active, mitigative, or protective measures; adequate facility structural integrity exists to safely control the hazards.

53
(BHI–00858)
Environmental Restoration Project - Systems Engineering Management Plan. Anderson, T.D. Bechtel Hanford, Inc., Richland, WA (United States). Jun 1998. 13p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98057635. Source: OSTI; INIS; NTIS; GPO Dep.

This Environmental Restoration (ER) Project Systems Engineering Management Plan (SEMP) describes relevant Environmental Restoration Contractor (ERC) management processes and shows how they implement systems engineering. The objective of this SEMP is to explain and demonstrate how systems engineering is being approached and implemented in the ER Project. The application of systems engineering appropriate to the general nature and scope of the project is summarized in Section 2.0. The basic ER Project management approach is described in Section 3.0. The interrelation and integration of project practices and systems engineering are outlined in Section 4.0. Integration with sitewide systems engineering under the Project Hanford Management Contract is described in Section 5.0.

54
(BHI–00898)
Operations and Maintenance Manual for the Temporary Septic Holding Tank at the 100-C Remedial Action Support Facility. Palmquist, C.A. Bechtel Hanford, Inc., Richland, WA (United States). Dec 1997. 35p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98052486. Source: OSTI; INIS; NTIS; GPO Dep.

The purpose of this document is to provide detailed information regarding the operations and maintenance of the septic holding tank system at the 100-C Remedial Action Restroom Facility. Specific information provided in this document includes the type and frequency of required maintenance and failure response procedures.

55
(BHI–00920)
Operations and Maintenance Manual for the Temporary Septic Holding Tank at the 100-C Remedial Action Restroom Facility. Palmquist, C.A. Bechtel Hanford, Inc., Richland, WA (United States). Nov 1997. 25p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98052487. Source: OSTI; INIS; NTIS; GPO Dep.

The purpose of this document is to provide detailed information regarding the operations and maintenance of the septic holding tank system at the 100-C Remedial Action Restroom Facility. Specific information provided in this document includes the type and frequency of required maintenance and failure response procedures.

56
(BHI–00934-Rev.2)
Code of accounts. Management overview volume: Environmental restoration. Fox, M.B.; Birkholz, H.L. Bechtel Hanford, Inc., Richland, WA (United States). Oct 1997. 359p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE98051271. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this procedure is to provide the requirement for assigning cost collection codes and the structure of these codes for all costs incurred for the Environmental

Restoration Contract. The coding structure will be used in the budgeting and control of project costs.

57
(BHI–00968-Rev.1)
Final Hazard Classification and Auditable Safety Analysis for the N Basin Segment. Kloster, G.L. Bechtel Hanford, Inc., Richland, WA (United States). Aug 1998. 80p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE98058386. Source: OSTI; NTIS; INIS; GPO Dep.

The purposes of this report are to serve as the auditable safety analysis (ASA) for the N Basin Segment, during surveillance and maintenance preceding decontamination and decommissioning; to determine and document the final hazard classification (FHC) for the N Basin Segment. The result of the ASA evaluation are: based on hazard analyses and the evaluation of accidents, no activity could credibly result in an unacceptable exposure to an individual; controls are identified that serve to protect worker health and safety. The results of the FHC evaluation are: potential exposure is much below 10 rem (0.46 rem), and the FHC for the N Basin Segment is Radiological.

58
(BHI–00987-Rev.1-Vol.1)
The Necessary and Sufficient Closure Process Completion Report for Purex FacilitySurveillance and Maintenance. Gerald, J.W. Bechtel Hanford, Inc., Richland, WA (United States). Oct 1997. 45p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE98051324. Source: OSTI; NTIS; INIS; GPO Dep.

This document completes the U.S. Department of Energy Closure Process for Necessary and Sufficient Sets of Standards process for the Plutonium Uranium Extraction facility located at the Hanford Site in Washington State. This documentation is provided to support the Work Smart Standards set identified for the long-term surveillance and maintenance of PUREX. This report is organized into two volumes. Volume 1 contains the following sections: Section 1: Provides an introduction for the document Section 2: Provides a basis for initiating the N&S process Section 3: Defines the work and hazards to be addressed Section 4: Identifies the N&S set of standards and requirements Section 5: Provides the justification for adequacy of the work smart standards Section 6: Shows the criteria and qualifications of the teams Section 7: Describes the stakeholder participation and concerns Section 8: Provides a list of references used within the document.

59
(BHI–01010-Rev.1)
Survey Method for Radiological Surveys of 300-FF-1 Operable Unit Soils and Material. Brehm, D.M. Bechtel Hanford, Inc., Richland, WA (United States). Jun 1998. 28p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE98057684. Source: OSTI; NTIS; INIS; GPO Dep.

This technical basis is to be used to survey soils at the 300-FF-1 Operable Unit during remediation of the site. Its purpose is to provide a basis for the survey methods to be employed by radiological control technician (RCTs) to guide the excavation effort in accordance with the 300-FF-1 waste site Record of Decision (ROD). The ROD for the 300-FF-1 Operable Unit requires selective excavation, removal, and disposal of contaminated soil above 350 pCi/g total uranium activity. Soil above this level will be disposed of as radioactive waste. The remaining soil will remain onsite.

60
(BHI–01020)
Data Quality Objectives Report for the 115-B Gas Tunnel. Bauer, R.G. Bechtel Hanford, Inc., Richland, WA (United States). May 1998. 96p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98057476. Source: OSTI; INIS; NTIS; GPO Dep.

This workbook assisted the Data Quality Objectives Team in implementing the Data Quality Objectives Process through the use of a template which lists the important elements of the DQO. The completion of this workbook is a required element of the BHI-EE-01, Procedure 1.2, 'Data Quality Objectives.' The objective of this project is to define the sampling and analysis requirements for isolation and decontamination and decommissioning release of the 115- B Gas Tunnel. The 115-B Gas Tunnel is an underground concrete pipe tunnel that houses piping used to recirculate helium gas between the 105-B Reactor Building and the 115-B/C Gas Recirculation System.

61
(BHI–01022)
Sampling and Analysis Instruction for the 120-F-1 Glass Dump Site. Brown, T.M. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1998. 18p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98053048. Source: OSTI; INIS; NTIS; GPO Dep.

This sampling and analysis instruction has been prepared to clearly define the sampling and analysis activities to be performed to develop the basis for surveillance and maintenance of the 120-F-1 Glass Dumpsite. The purpose of this investigation is to augment historical information and obtain data to establish a technical basis for surveillance and maintenance at the site.

62
(BHI–01052)
Description of Work for a Vadose Zone Characterization Borehole at the 216-B-2-2 Ditch. Faurote, J.M.; Wittreich, C.D. Bechtel Hanford, Inc., Richland, WA (United States). Oct 1997. 70p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE98051318. Source: OSTI; NTIS; INIS; GPO Dep.

This Description of Work details the characterization activities related to a proposed borehole in the 200-BP-11 Operable Unit, and will serve as a guide for those performing the work. The 216-B-2-2 Ditch was selected for characterization based on the Waste Site Grouping Report for 200 Area Soil Investigations which identified this ditch as a representative site for the Gable Mountain Pond/B- Pond and Ditches Cooling Water Group. The scope of work includes drilling the proposed borehole, Well ID Number

B8079, to refine the conceptual model, assessing the nature and extent of subsurface contaminants, and supporting remedial action/closure decisions for the Gable Mountain Pond/B-Pond and Ditches Cooling Water Group.

63
(BHI–01054-Rev.2)
Technical Basis to Describe the Use of the Eberline E-600. Brehm, D.M. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1998. 17p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE98054477. Source: OSTI; NTIS; INIS; GPO Dep.

This technical basis document describes the parameters and conditions under which the Eberline E-600 rate meter and the associated detectors can be operated to quantify ionizing radiation and radiological contamination.

64
(BHI–01109)
Sampling and Analysis Plan for the 216-A-29 Ditch. Petersen, S.W. Bechtel Hanford, Inc., Richland, WA (United States). Jun 1998. 21p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98057636. Source: OSTI; INIS; NTIS; GPO Dep.

This sampling and analysis plan defines procedures to be used for collecting and handling samples to be obtained from the 216-A-29 Ditch, and identifies requirements for field and laboratory measurements. The sampling strategy describes here is derived from a Data Quality Objectives workshop conducted in January 1997 to support sampling to assure worker safety during construction and to assess the validity of a 1988 ditch sampling campaign and the effectiveness of subsequent stabilization. The purpose of the proposed sampling and analysis activities is to characterize soil contamination in the vicinity of a proposed road over the 216-A-29 Ditch.

65
(BHI–01128-Rev.1)
Site-Specific Waste Management Instruction - 100-DR-1 Group 2 Sites. Jackson, R.W. Bechtel Hanford, Inc., Richland, WA (United States). Jan 1998. 27p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98052485. Source: OSTI; INIS; NTIS; GPO Dep.

This site-specific waste management instruction (SSWMI) provides guidance for the management of wastes that may be generated during the excavation and remediation of the 100-DR-1 Group 2 sites. The management of waste generated as a result of these activities will be as directed in this SSWMI. This SSWMI will be revised to incorporate guidance for management of wastes encountered that are not addressed in this SSWMI.

66
(BHI–01130)
N Area Final Project Program Plan. Day, R.S.; Duncan, G.M; Trent, S.J. Bechtel Hanford, Inc., Richland, WA (United States). Jul 1998. 134p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE98057659. Source: OSTI; NTIS; INIS; GPO Dep.

The N Area Final Project Program Plan is issued for information and use by the U.S. Department of Energy (DOE), the Environmental Restoration Contractor (ERC) for the Hanford Site, and other parties that require workscope knowledge for the deactivation of N Reactor facilities and remediation of the 100-N Area. This revision to the program plan contains the updated critical path schedule to deactivate N Reactor and its supporting facilities, cleanout of the N Reactor Fuel Storage Basin (105-N Basin), and remediate the 100-N Area. This document reflects notable changes in the deactivation plan for N Reactor, including changes in deactivation status, the N Basin cleanout task, and 100-N Area remediation.

67
(BHI–01146)
Annular Kinetic Impactor Air Sampler. Moroney, J.D. Bechtel Hanford, Inc., Richland, WA (United States). Jan 1998. 5p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98052488. Source: OSTI; INIS; NTIS; GPO Dep.

This technical basis document describes and documents the parameters under which the Annular Kinetic Impactor can be operated to quantify alpha and beta airborne radioactivity concentrations.

68
(BHI–01151)
Final Hazard Classification and Auditable Safety Analysis for the 105-F Building Interim Safe Storage Project. Rodovsky, T.J.; Bond, S.L. Bechtel Hanford, Inc., Richland, WA (United States). Jul 1998. 172p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE98057563. Source: OSTI; NTIS; INIS; GPO Dep.

The auditable safety analysis (ASA) documents the authorization basis for the partial decommissioning and facility modifications to place the 105-F Building into interim safe storage (ISS). Placement into the ISS is consistent with the preferred alternative identified in the Record of Decision (58 FR). Modifications will reduce the potential for release and worker exposure to hazardous and radioactive materials, as well as lower surveillance and maintenance (S&M) costs. This analysis includes the following: A description of the activities to be performed in the course of the 105-F Building ISS Project. An assessment of the inventory of radioactive and other hazardous materials within the 105-F Building. Identification of the hazards associated with the activities of the 105-F Building ISS Project. Identification of internally and externally initiated accident scenarios with the potential to produce significant local or offsite consequences during the 105-F Building ISS Project. Bounding evaluation of the consequences of the potentially significant accident scenarios. Hazard classification based on the bounding consequence evaluation. Associated safety function and controls, including commitments. Radiological and other employee safety and health considerations.

69
(BHI–01154)
118-C-4 Horizontal Rod Cave Characterization Report. Encke, B.D.; Thoren, R.A. Fermi National Accelerator Lab., Batavia, IL (United States). Mar 1998. 81p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98053049. Source: OSTI; INIS; NTIS; GPO Dep.

This report addresses the characterization data collected from 118-C- 4 Horizontal Rod Cave in December 1996 and August 1997. The characterization activities evaluated the radiological status and identified hazardous materials locations. The scope of this report is limited to the 118-C-4 Facility Structure. Information in this report can be used to identify the waste streams, provide specific chemical and radiological data to aid in planning decontamination and decommissioning (D&D) activities, and allow proper disposal of the demolition debris, as required by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

70
(BHI–01158)
Cleanup Verification Package for the 107-D5 Trench. Corpuz, F.M.; Fancher, J.D.; Blumenkranz, D.B. Fermi National Accelerator Lab., Batavia, IL (United States). Mar 1998. 42p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98053050. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the results of remedial action objectives performed at the 107-D5 Sludge Trench, located at the 100-DR-1 Operable Unit in the 100 Area of the Hanford Site in southeastern Washington State. The 107-D5 Sludge Trench is also identified in the Hanford Waste Information Data System as Waste Site 100-D-4 (site code). The selected remedial action was (1) excavation of the site to the extent required to meet specified soil cleanup levels, (2) disposal of contaminated excavation materials at the Environmental Restoration and Disposal Facility at the 200 Area of the Hanford Site, and (3) backfilling the site with clean soil to adjacent grade elevations.

71
(BHI–01160)
ALARA Review for the Sediment Relocation and Removal from the 105-N Fuel Storage Basin. Demers, J.W. Fermi National Accelerator Lab., Batavia, IL (United States). Mar 1998. 17p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98053051. Source: OSTI; NTIS; INIS; GPO Dep.

This as low as reasonable achievable (ALARA) review revision provides a description of the engineering and administrative controls used to manage personnel exposure, control contamination levels, and airborne radioactivity concentrations during sediment relocation and removal in the 105-N Fuel Storage Basin. This document updates and supercedes the ALARA review of the sediment-related activities contained in 100-N Basin Stabilization Project As Low As Reasonably Achievable Plan (BHI 1995).

72
(BHI–01161)
Inspection, Monitoring, and Maintenance Plan for the 300 Area Process Trenches. Buckmaster, M.A. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1998. 7p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98057497. Source: OSTI; INIS; NTIS; GPO Dep.

This plan describes inspection, monitoring, and maintenance activities for the 300 Area Process Trenches (APT). The 300 APT is located within the 300-FF-1 Operable Unit of the U. S. Department of Energy's Hanford Site. The 300 APT was constructed and began operations in 1975 as the 316-S Process Trenches. The 300 APT received effluent discharges from the 300 Area process sewer system. The site was closed to liquid discharges of dangerous waste in 1994.

73
(BHI–01162)
111-B Metal Examination Facility Concrete Tank Interim Characterization Report. Encke, D.B.; Thoren, R.A. Bechtel Hanford, Inc., Richland, WA (United States). Jul 1998. 212p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE98057854. Source: OSTI; NTIS; INIS; GPO Dep.

This report addresses the characterization data collected from the 111-B Metal Examination Facility from December 1996 through November 1997. The characterization activities identified and evaluated the radiological and suspect hazardous materials within the tanks. The scope of this report is limited to the 111-B tank structure and concrete foundation surrounding the tanks. Radiological surveys were conducted to provide data on average levels and distribution of contamination and dose rates within the tanks. The dose rates were collected to estimate potential doses workers might receive during the D&D and remedial action activities. Dose rates can also be used to calculate total curie content in the tanks when used in conjunction with sample data. Large area wipes were obtained to determine if smearable radioactive contamination was present on equipment and facility surfaces. The radiological survey data are provided in Appendix A.

74
(BHI–01171)
Vadose Zone Clean Closure Report for the 300 Area Process Trenches. Lerch, J.A. Bechtel Hanford, Inc., Richland, WA (United States). May 1998. 43p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98057498. Source: OSTI; INIS; NTIS; GPO Dep.

This report documents the achievement of closure performance standards for the 300 Area Process Trenches (300 APT) located within the 300-FF-1 Operable Unit (OU). The report is intended to supplement the 300 Area Process Trenches Verification Package (BHI 1998C), which documents the achievement of the remedial action objectives specified in the 300-FF-1 Remedial Design Report/Remedial Action Work Plan (RDR/RAWP) (DOE-RL 1997). Upon

acceptance of this document by the Washington State Department of Ecology, a 60-day period will begin to certify closure of the the process trenches.

75
(BHI–01177)
Borehole Summary Report for the 216-B-2-2 Ditch. Rohay, V.J.; Weekes, D.C. Bechtel Hanford, Inc., Richland, WA (United States). Jun 1998. 117p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE98057564. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this borehole summary report is to provide the results of the drilling and sampling as a data package. The 216-B-2-2 Ditch borehole data will be evaluated with other existing data during remedial investigation/feasibility study (RI/FS) work plan development for the Gable Mountain Pond/B-Pond and Ditches Cooling Water Group (200-CW-1). Additional characterization needs for the ditch, as well as for the 200-CW-1 Waste Group in general, will be defined in an RI/FS work plan for the 200-CW-1 Waste Group planned for preparation in fiscal year 1999. After characterization activities have been completed for the waste group, the information (including the 216-B-2-2 borehole data) will be collectively evaluated and documented in a remedial investigation report.

76
(BHI–01178)
105-DR Large Sodium Fire Facility Supplemental Information to the Hanford Facility Contingency Plan (DOE/RL-93-75). Edens, V.G. Bechtel Hanford, Inc., Richland, WA (United States). May 1998. 11p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98057319. Source: OSTI; INIS; NTIS; GPO Dep.

This document is a unit-specific contingency plan for the 105-DR Large Sodium Fire Facility and is intended to be used as a supplement to DOE/RL-93-75, Hanford Facility Contingency Plan (DOE-RL 1993). This unit-specific plan is to be used to demonstrate compliance with the contingency plan requirements of Washington Administrative Code (WAC) 173-303 for certain Resource Conservation and Recovery Act of 1976 (RCRA) waste management units.The LSFF occupied the former ventilation supply fan room and was established to provide a means of investigating fire and safety aspects associated with large sodium or other metal alkali fires. The unit was used to conduct experiments for studying the behavior of molten alkali metals and alkali metal fires. This unit had also been used for the storage and treatment of alkali metal dangerous waste. Additionally, the Fusion Safety Support Studies programs sponsored intermediate-size safety reaction tests in the LSFF with lithium and lithium-lead compounds. The LSFF, which is a RCRA site, was partially clean closed in 1995 and is documented in 'Transfer of the 105-DR Large Sodium Fire Facility to Bechtel Hanford, Inc.' (BHI 1998). In summary, the 105-DR supply fan room (1720-DR) has been demolished, and a majority of the surrounding soils were clean-closed. The 117-DR Filter Building, 116-DR Exhaust Stack, 119- DR Sampling Building, and associated ducting/tunnels were not covered under this closure.

77
(BHI–01188)
105-DR Large Sodium Fire Facility Inspection Plan. Zoric, J.P. Bechtel Hanford, Inc., Richland, WA (United States). May 1998. 5p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98057499. Source: OSTI; INIS; NTIS; GPO Dep.

This document provides the inspection plan for the 105-DR Large Sodium Fire Facility (LSFF). The 105-DR LSFF is a partially closed Resource Conservation and Recovery Act (RCRA) facility. Included in this plan are the details concerning necessary surveillance and inspection for proper sign posting and other factors that may affect the integrity of the facility. A checklist shall be completed by personnel conducting the inspection.

78
(BHI–01196)
ALARA Review for the Decontamination, Deactivation and Housekeeping of the 233-S Viewing Room. Kornish, M.J. Bechtel Hanford, Inc., Richland, WA (United States). Jun 1998. 17p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE98057660. Source: OSTI; NTIS; INIS; GPO Dep.

A formal as low as reasonably achievable (ALARA) review is required by BHI-SH-02, Vol. 1, Safety and Health Procedures, Procedure 1.22, 'Planning Radiological Work', when radiological conditions exceed trigger level. The level of contamination inside the viewing room of the 233-S Facility meets this criterion. This ALARA review is for task instructions 1997-03-18-005-8.3.1, 'Instructions for Routine Entries and Minor Maintenance Work at 233-S,' and 8.3.2, 'Instructions for Deactivation, Decon, and Housekeeping in Viewing Room.' The radiological work permit (RWP) request broke the two task instructions into nine separate tasks. The nine tasks identified in the RWP request were used to estimate airborne concentrations and the total exposure.

79
(BHI–01201)
ALARA Review of the Activation/Repair of Fire Detectors in Zone Three at the 233-S Facility. Kornish, M.J. Bechtel Hanford, Inc., Richland, WA (United States). Jul 1998. 19p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE98058351. Source: OSTI; NTIS; INIS; GPO Dep.

A formal as low as reasonably achievable (ALARA) review is required by BHI-SH-02, Vol. 1, Procedure 1.22, 'Planning Radiological Work', when radiological conditions exceed trigger levels. The level of contamination inside the viewing room meets this criterion. This ALARA review is for task instruction 1997-03-18-005-8.3.3 (mini task instruction to a living work package), 'Instructions for D&D Support of Fire Detector Troubleshooting and Minor Maintenance Work at 233-S,' and DynCorp 2G-98-7207C, '233-S Reconnect Smoke Detectors Zone 3.' The Radiological Work Permit (RWP) request broke these two task instructions into four separate tasks. The four tasks identified in the RWP request were used to estimate airborne concentrations and the total exposure.

80
(BHI–01208)
ALARA Review for the 202-S Plutonium Loadout Hood Sampling. Winslow, R.C. Bechtel Hanford, Inc., Richland, WA (United States). Aug 1998. 16p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE98058385. Source: OSTI; NTIS; INIS; GPO Dep.

This as low as reasonably achievable (ALARA) review provides a description of the engineering and administrative controls used to manage personnel exposure, control contamination levels, and control airborne radioactivity concentrations while preparing for sampling of the 202-S Facility plutonium loadout hood under task instruction 19980325002, '202-S Plutonium Loadout Hood Sampling'. Preparation for sampling includes pre-job surveys of the area around the Plutonium Loadout Hood and decontamination as required to allow set up for sampling activities. The Reduction-Oxidation (REDOX) Facility separations process was implemented at the 202-S Canyon Building in January 1951 and was discontinued at the end of 1966. The REDOX process used several organic solvent extraction steps that allowed continuous separation of both plutonium and uranium from dissolved fuel rod solution. The plutonium loadout hood and the plutonium concentration system have been identified for potential removal and disposal.

81
(BJC/OR–6)
In-Process Analysis Program for the Isolock sampler at the Gunite and Associated Tanks, Oak Ridge National Laboratory, Oak Ridge, Tennessee. Bechtel Jacobs Co., Oak Ridge, TN (United States);Providence Group, Inc., Knoxville, TN (United States). May 1998. 18p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-98OR22700. Order Number DE98005153. Source: OSTI; NTIS; INIS; GPO Dep.

The In-Process Analysis Program documents the requirements for handling, transporting, and analyzing waste slurry samples gathered by the Bristol Isolock slurry sampler from the Gunite and Associated Tanks at Oak Ridge National Laboratory in Oak Ridge, Tennessee. Composite samples will be gathered during sludge retrieval operations, labeled, transported to the appropriate laboratory, and analyzed for physical and radiological characteristics. Analysis results will be used to support occupational exposure issues, basic process control management issues, and prediction of radionuclide flow.

82
(BJC/OR–15/R1)
Work plan for denaturing waste in the Old Hydrofracture Tanks at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States). Jun 1998. 16p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-98OR22700. Order Number DE98005705. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Management Program at Oak Ridge National Laboratory (ORNL) is managing a project to remove the contents of the Old Hydrofracture (OHF) Tanks, located in Melton Valley. CDM Federal is responsible for sluicing the sludge and supernate from the OHF Tanks and transferring the slurry into the Melton Valley Storage Tanks (MVSTs), ORNL's active liquid low-level waste system. Before the material can be sluiced to the MVSTs, it must meet the requirements of WM-LWS-WAC, Waste Acceptance Criteria for Liquid Low-Level Waste System, Process Waste Treatment Complex-Building 3544, and Process Waste Treatment Complex-Building 3608, which contains requirements for ratios of fissile to nonfissionable isotopes. Because the sludge and supernate contain uranium with increased ratios of U-233 and U-235 to U-238, depleted uranium must be added to the tanks to dilute the isotopic ratio of the contents before they can be sluiced. This work plan describes the denaturing activities, namely adding depleted uranyl nitrate solution, to be performed to ensure that the material meets requirements. Personnel from the ORNL Chemical Technology Division are responsible for the denaturing activity described in this work plan.

83
(BJC/OR–18)
Evaluation of the Molten Salt Reactor Experiment drain tanks for reuse in salt disposal, Oak Ridge National Laboratory, Oak Ridge, Tennessee. Bechtel Jacobs Co., Oak Ridge, TN (United States). May 1998. 73p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-98OR22700. Order Number DE98005245. Source: OSTI; NTIS; INIS; GPO Dep.

This report was prepared to identify the source documentation used to evaluate the drain tanks in the Molten Salt Reactor Experiment (MSRE) at Oak Ridge National Laboratory (ORNL). The evaluation considered the original quality of the tanks, their service history, and their intended use during the removal of fluoride salts. It also includes recommendations for a quality verification plan. The estimates of corrosion damage to the salt containing system at the MSRE are low enough to lend optimism that the system will be fit for its intended use, which is disposal of the salt by transferring it to transport containers. The expected corrosion to date is estimated between 10 and 50 mil, or 2 to 10% of the shell wall. The expected corrosion rate when the tanks are used to remove the salt at 110 F is estimated to be .025 to 0.1 mil per hour of exposure to HF and molten salt. To provide additional assurance that the estimates of corrosion damage are accurate, cost effective nondestructive examination (NDE) has been recommended. The NDE procedures are compared with industry standards and give a perspective for the extent of additional measures taken in the recommendation. A methodology for establishing the remaining life has been recommended, and work is progressing towards providing an engineering evaluation based upon thickness and design conditions for the future use of the tanks. These extra measures and the code based analysis will serve to define the risk of salt or radioactive gases leaking during processing and transfer of the salt as acceptable.

84
(BJC/OR–44)
Contingency plan for the Old Hydrofracture Facility Tanks Sluicing Project at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Bechtel Jacobs Co. LLC, Oak Ridge, TN (United States). Jun 1998. 30p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-98OR22700. Order Number DE98005706. Source: OSTI; NTIS; INIS; GPO Dep.

This revised contingency plan addresses potential scenarios involving the release of radioactively contaminated waste

from the Old Hydrofracture Facility Tanks Contents Removal project to the environment. The tanks are located at the Oak Ridge National Laboratory. The project involves sluicing the contents of the five underground tanks to mix the sludge and supernatant layers, and pumping the mixture to the Melton Valley Storage Tanks (MVST) for future processing. The sluicing system to be used for the project consists of a spray nozzle designated the "Borehole Miner," with an associated pump; in-tank submersible pumps to transfer tank contents from the sluice tanks to the recycle tank; high-pressure pumps providing slurry circulation and slurry transport to the MVST; piping; a ventilation system; a process water system; an instrumentation and control system centered around a programmable logic controller; a video monitoring system; and auxiliary equipment. The earlier version of this plan, which was developed during the preliminary design phase of the project, identified eight scenarios in which waste from the tanks might be released to the environment as a result of unanticipated equipment failure or an accident (e.g., vehicular accident). One of those scenarios, nuclear criticality, is no longer addressed by this plan because the tank waste will be isotopically diluted before sluicing begins. The other seven scenarios have been combined into three, and a fourth, Borehole Miner Failure, has been added as follows: (1) underground release from the tanks; (2) aboveground release or spill from the sluicing system, a tank riser, or the transfer pipeline; (3) release of unfiltered air through the ventilation system; and (4) Borehole Miner arm retraction failure. Methods for preventing, detecting, and responding to each release scenario are set out in the plan.

85
(BJC/OR–53)
Project management plan for Waste Area Grouping 5 Old Hydrofracture Facility tanks contents removal at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States);CDM Federal Programs Corp., Oak Ridge, TN (United States). Jun 1998. 23p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-98OR22700. Order Number DE98005707. Source: OSTI; NTIS; INIS; GPO Dep.

On January 1, 1992, the US Department of Energy (DOE), the US Environmental Protection Agency (EPA) Region IV, and the Tennessee Department of Environment and Conservation (TDEC) signed a Federal Facility Agreement (FFA) concerning the Oak Ridge Reservation. The FFA requires that inactive liquid low-level (radioactive) waste (LLLW) tanks at Oak Ridge National Laboratory (ORNL) be remediated in accordance with requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This revision is to update the schedule and designation of responsibilities for the Old Hydrofracture Facility (OHF) tanks contents removal project. The scope of this project is to transfer inventory from the five inactive LLLW tanks at the OHF into the active LLLW system.

86
(BJC/OR–55)
Guidance for treatment of variability and uncertainty in ecological risk assessments of contaminated sites. Bechtel Jacobs Co., Oak Ridge, TN (United States). Jun 1998. 49p. Sponsored by USDOE Office of Financial Management and Controller, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-98OR22700. Order Number DE98005806. Source: OSTI; NTIS; INIS; GPO Dep.

Uncertainty is a seemingly simple concept that has caused great confusion and conflict in the field of risk assessment. This report offers guidance for the analysis and presentation of variability and uncertainty in ecological risk assessments, an important issue in the remedial investigation and feasibility study processes. This report discusses concepts of probability in terms of variance and uncertainty, describes how these concepts differ in ecological risk assessment from human health risk assessment, and describes probabilistic aspects of specific ecological risk assessment techniques. The report ends with 17 points to consider in performing an uncertainty analysis for an ecological risk assessment of a contaminated site.

87
(BNL–64595)
Northeast Waste Management Enterprise (NEWME) 1996 annual/final report. Goland, A. (Brookhaven National Lab., Upton, NY (United States)); Kaplan, E.; Palmedo, P. Wortman, J. Brookhaven National Lab., Upton, NY (United States). [1997]. 130p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE98000148. Source: OSTI; NTIS; INIS; GPO Dep.

The Northeast Waste Management Enterprise was created in response to Dr. Clyde Frank's vision of a new partnership between research, industrial, and financial sectors, with the goal of speeding development and use (particularly at U.S. Department of Energy [DOE] facilities) of environmental remediation technologies. It was anticipated that this partnership would also strengthen the international competitiveness of the U.S. environmental industry. Brookhaven National Laboratory's (BNL) response to Dr. Frank was a proposal to create the Northeast Waste Management Alliance, later renamed the Northeast Waste Management Enterprise (NEWME). Recognizing the need to supplement its own technical expertise with acumen in business, financial management, and venture capital development, BNL joined forces with the Long Island Research Institute (LIRI). Since its inception at the end of FY 1993, NEWME has achieved several significant accomplishments in pursuing its original business and strategic plans. However, its successes have been constrained by a fundamental mismatch between the time scales required for technology commercialization, and the immediate need for available environmental technologies of those involved with ongoing environmental remediations at DOE facilities.

88
(BNL–64969)
Overview of environmental decision support software. Sullivan, T.M. (Brookhaven National Lab., Upton, NY (United States)); Moskowitz, P.D.; Gitten, M. Brookhaven National Lab., Upton, NY (United States). [1997]. 29p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9705216–: Toxicology in risk assessment conference, Bethesda, MD (United States), 14-16 May 1997). Order Number DE98001628. Source: OSTI; NTIS; GPO Dep.

Regulatory exposure limits form the basis for making decisions on the characterization, monitoring, and remediation of

environmental contamination. This paper discusses the development of Decision Support Software (DSS) tools developed to support decisions pertaining to environmental management. Decision support software packages are computer-based programs that facilitate the use of data, models, and structured decision processes in decision making. They incorporate the information into an integrated package that presents results in a format useful for making environmental decisions. Six major analysis functions of DSS tools have been identified: site characterization, plume characterization, risk assessment including regulatory compliance assessment, remedy selection, remedy design optimization, and cost/benefit analysis. Decision support software is relatively new and is now beginning to see application in the field. This paper discusses existing DSS and the strengths and limitations of some of the DSS packages. General limitations of decision support software are also discussed.

89
(BNL–65039)
Commercialization of the polyethylene macroencapsulation process. Lageraaen, P.R. (Brookhaven National Lab., Upton, NY (United States)); Kalb, P.D.; Hellstrom, G.W.; Vance, J.K. Brookhaven National Lab., Upton, NY (United States). Jan 1998. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-960804–: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE98003076. Source: OSTI; NTIS; INIS; GPO Dep.

With support from the US Department of Energy Office of Science and Technology (DOE OST) and assistance from Brookhaven National Laboratory (BNL), Envirocare of Utah, Inc. (Envirocare) is commercializing the polyethylene macroencapsulation process. Envirocare, currently the only commercially licensed mixed waste disposal facility in the US, will initially demonstrate the process by treating and disposing up to 227,000 kg (500,000 lbs) of radioactively contaminated lead. This waste, considered mixed due to both radioactive and hazardous constituents, is currently being stored at various sites throughout the DOE complex. Following this initial work for DOE, the process will be available for the treatment of other applicable wastes. Throughout commercialization of this process, BNL has provided Envirocare with technical support for engineering and permitting.

90
(CONF-9606392–Summ.)
The Keystone Center final technical report. Keystone Center, Keystone, CO (United States). 22 Jan 1998. [100p.] Sponsored by USDOE Office of Energy Research, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG03-96ER62220. (CONF-9606393–Summ.: Environmental Management Science Program (EMSP) workshop; Environmental management science program workshop; Environmental management science program workshop; Environmental management science program workshop, Savannah River, SC (Un Order Number DE98004409. Source: OSTI; NTIS; INIS; GPO Dep.

The Keystone Center began its work with the Environmental Management Science Program (EMSP) in May, 1996, when The Center agreed to design, organize, and facilitate stakeholder meetings at two DOE sites: Savannah River and Hanford. These meetings were held June 24–25, 1996 for the purpose of discussing the role of EMSP in constructing a site-specific basic research agenda that maps site cleanup needs to basic science areas. Summaries of the discussions from these meetings as well as lists of the stakeholders who were invited are included as Attachment 1. In August/September 1996, the Keystone Center was asked to convene two additional site meetings using funds that remained in their contract. These meetings were held in October 1996 at Oak Ridge and Idaho National Engineering Laboratory. Summaries from these meetings and participant lists are included as Attachment 2.

91
(CONF-970126–)
Proceedings for the nondestructive assay and nondestructive examination waste characterization conference. No. 5. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). 1997. 521p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. From 5. nondestructive assay/nondestructive examination waste characterization conference; Salt Lake City, UT (United States); 14-16 Jan 1997. Order Number DE97052960. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains paper presented at the 5th Nondestructive Assay and nondestructive Examination Waste Characterization conference. Topics included compliance, neutron NDA techniques, gamma NDA techniques, tomographic methods, and NDA modality and information combination techniques. Individual reports have been processed separately for the United States Department of Energy databases.

92
(CONF-970148–1)
Solvent extraction of radionuclides from aqueous tank waste. Moyer, B.A. (Oak Ridge National Lab., TN (United States). Chemical and Analytical Sciences Div.); Bonnesen, P.V.; Sachleben, R.A.; Leonard, R.A.; Lumetta, G.J. Oak Ridge National Lab., TN (United States). [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From Efficient Separations and Processing (ESP) Crosscutting Program FY 1997 technical exchange meeting; Gaithersburg, MD (United States); 28-30 Jan 1997. Order Number DE97001645. Source: OSTI; NTIS; INIS; GPO Dep.

This task aims toward the development of efficient solvent-extraction processes for the removal of the fission products ^{99}Tc, ^{90}Sr, and ^{137}Cs from alkaline tank wastes. Processes already developed or proposed entail direct treatment of the waste solution with the solvent and subsequent stripping of the extracted contaminants from the solvent into a dilute aqueous solution. Working processes to remove Tc(and SR) separately and Cs separately have been developed; the feasibility of a combined process is under investigation. Since Tc, Sr, and Cs will be vitrified together in the high-level fraction, however, a process that could separate Tc, Sr, and Cs simultaneously, as opposed to sequentially, potentially offers the greatest impact. A figure presents a simplified diagram of a proposed solvent-extraction cycle followed by three possible treatments for the stripping solution. Some degree

of recycle of the stripping solution (option a) is expected. Simple evaporation (option c) is possible prior to vitrification; this offers the greatest possible volume reduction with simple operation and no consumption of chemicals, but it is energy intensive. However, if the contaminants are concentrated (option b) by fixed-bed technology, the energy penalty of evaporation can be avoided and vitrification facilitated without any additional secondary waste being produced.

93
(CONF-970208–4)
Degradation of trichloroethylene (TCE) and polychlorinated biphenyls (PCBs) by Fe and Fe-Pd bimetals in the presence of surfactants and cosolvents. Gu, B. (Oak Ridge National Lab., TN (United States)); Liang, L.; West, O.R.; Cameron, P.; Davenport, D. Oak Ridge National Lab., TN (United States). [1997]. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From International containment technology conference and exhibition; St. Petersburg, FL (United States); 9-12 Feb 1997. Order Number DE97001366. Source: OSTI; NTIS; INIS; GPO Dep.

Surfactants and cosolvents are being used to enhance the removal of dense non-aqueous phase liquids (DNAPL) such as trichloroethylene (TCE) and polychlorinated biphenyls (PCBS) from contaminated soils. However, the waste surfactant solution containing TCE and PCBs must be treated before it can be disposed. This study evaluated the use of zero-valence iron and palladized iron fillings on the dechlorination of TCE and a PCB congener in a dihexylsulfosuccinate surfactant solution. Batch experimental results indicated that TCE can be rapidly degraded by palladized iron filings with a half-life of 27.4 min. PCB was degraded at a slower rate than TCE with a half-life ranging from 100 min to 500 min as the concentration of surfactant increased. In column flow-through experiments, both TCE and PCBs degrade at an enhanced rate with a half-life about 1.5 and 6 min because of an increased solid to solution ratio in the column than in the batch experiments. Results of this work suggest that Fe-Pd filings may be potentially applicable for ex-situ treatment of TCE and PCBs in the surfactant solutions that are generated during surfactant washing of the contaminated soils.

94
(CONF-970208–7)
A case study: using a multi-grout barrier to control ^{90}Sr release at ORNL. Long, J.D. (Lockheed Martin Energy Systems, Inc., Oak Ridge, TN (United States)); Huff, D.D.; Naudts, A.A. Oak Ridge National Lab., TN (United States). [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From International containment technology conference and exhibition; St. Petersburg, FL (United States); 9-12 Feb 1997. Order Number DE97003335. Source: OSTI; NTIS; INIS; GPO Dep.

During summer 1996, low-pressure permeation grouting was performed inside portions of four unlined, shallow waste disposal trenches at a radioactive waste burial ground that was opened in 1951 at the Oak Ridge National Laboratory (ORNL). The objective was to selectively control sources that release about 25 percent of all strontium 90 (90Sr) discharged from the ORNL complex. A unique grouting methodology was adapted to control interaction of wastes with natural runoff at this humid site. Driven sleeve pipes were injected 4 to 5 times with multiple formulae of type III portland cement- based grouts, ultra fine cement-based grouts, and acrylamide grouts. Multiple-hole grout injection was monitored continuously using real time monitoring equipment. Apparent Lugeon values were calculated during grouting operations and grout formulae were continually adjusted during injection to maximize permeation, durability, and economy. Over 500 cubic meters of combined grout types were emplaced. At the completion of production grouting, the effectiveness of grout spread and in situ hydraulic conductivity of the grouted mass were assessed. The average residual hydraulic conductivity measured in more than 20 check pipes was less than I x 10’ cm/sec. Hydrologic monitoring has been established to determine the overall effectiveness of the project for 9OSr control.

95
(CONF-970208–11)
Bear Creek Valley characterization area mixed wastes passive in situ treatment technology demonstration project - status report. Watson, D. (Oak Ridge National Lab., TN (United States)); Leavitt, M.; Moss, D. Oak Ridge National Lab., TN (United States). 1997. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From International containment technology conference and exhibition; St. Petersburg, FL (United States); 9-12 Feb 1997. Order Number DE97003184. Source: OSTI; NTIS; INIS; GPO Dep.

Historical waste disposal activities within the Bear Creek Valley (BCV) Characterization Area (CA), at the U.S. Department of Energy (DOE) Oak Ridge Y-12 plant, have contaminated groundwater and surface water above human health risk levels and impacted the ecology of Bear Creek. Contaminates include nitrate, radioisotopes, metals, volatile organic chemicals (VOCS), and common ions. This paper provides a status report on a technology demonstration project that is investigating the feasibility of using passive in situ treatment systems to remove these contaminants. Although this technology may be applicable to many locations at the Oak Ridge Y-12 Plant, the project focuses on collecting the information needed to take CERCLA removal actions in 1998 at the S-3 Disposal Ponds site. Phase 1 has been completed and included site characterization, laboratory screening of treatment media (sorbents; and iron), and limited field testing of biological treatment systems. Batch tests using different Y-12 Plant waters were conducted to evaluate the removal efficiencies of most of the media. Phase 1 results suggest that the most promising treatment media are Dowex 21 k resin, peat moss, zero-valent iron, and iron oxides. Phase 2 will include in-field column testing of these media to assess loading rates, and concerns with clogging, by-products, and long-term treatment efficiency and media stability. Continued testing of wetlands and algal mats (MATs) will be conducted to determine if they can be used for in-stream polishing of surface water. Hydraulic testing of a shallow trench and horizontal well will also be completed during Phase 2. 4 refs., 3 tabs.

96
(CONF-970208–Proc.)
International Containment Technology Conference: proceedings. USDOE, Washington, DC (United States). [1997]. 1140p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);Environmental

Protection Agency, Washington, DC (United States);Department of the Air Force, Washington, DC (United States);American Society of Civ From International containment technology conference and exhibition; St. Petersburg, FL (United States); 9-12 Feb 1997. Order Number DE98001967. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains the manuscripts of the papers and posters presented at the 1997 International Containment Technology Conference and Exhibition. These manuscripts represent a valuable compilation of information and data on the environmental challenges and technology-based solutions associated with containment technologies. The purpose of the conference was to promote the advancement of containment technologies by providing a forum from which participants from related disciplines could meet to exchange ideas and information on recent developments. Selected papers were indexed separately for inclusion in the Energy Science and Technology Database.

97

(CONF-970321–2)

Cesium removal flow studies using ion exchange. Lee, D.D. (and others); Walker, J.F. Jr.; Taylor, P.A. Oak Ridge National Lab., TN (United States); Westinghouse Hanford Co., Richland, WA (United States). 1997. 40p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464 ; AC06-87RL10930. From National spring meeting and petrochemical exposition of the American Institute of Chemical Engineers (AIChE) and 2. plant operations and design conference; Houston, TX (United States); 10-13 Mar 1997. Order Number DE97003333. Source: OSTI; NTIS; INIS; GPO Dep.

Cesium and strontium radionuclides are a small fraction of the mainly sodium and potassium salts in underground storage tank supernatant at US Department of Energy (DOE) sites at Hanford, Oak Ridge, Savannah River, and Idaho that DOE must remediate. Cesium-137 (^{137}Cs) is the primary gamma radiation source in the dissolved tank waste at these sites, and its removal from the supernatant can reduce the hazard and waste classification of the treated waste reducing the further treatment and disposal costs. Several cesium removal sorbents have been developed by private industry and the US DOE's Office of Science and Technology. Several of these removal technologies have been previously tested in small batch and column tests using simulated and a few actual supernatant under DOE's Environmental Management (EM) programs including the Tanks Focus Area (TFA) and the Efficient Separations and Processing (ESP) Cross-Cutting Program.

98

(CONF-970321–4)

Tank Focus Area pretreatment activities. McGinnis, C.P. (Oak Ridge National Lab., TN (United States)); Welch, T.D.; Manke, K.L. Oak Ridge National Lab., TN (United States); Pacific Northwest National Lab., Richland, WA (United States). [1997]. 20p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464 ; AC06-76RL01830. From National spring meeting and petrochemical exposition of the American Institute of Chemical Engineers (AIChE) and 2. plant operations and design conference; Houston, TX (United States); 10-13 Mar 1997. Order Number DE97004113. Source: OSTI; NTIS; INIS; GPO Dep.

Plans call for the high-level wastes to be retrieved from the tanks and immobilized in a stable waste form suitable for long-term isolation. Chemistry and chemical engineering operations are required to retrieve the wastes, to condition the wastes for subsequent steps, and to reduce the costs of the waste management enterprise. Pretreatment includes those processes between retrieval and immobilization, and includes preparation of suitable feed material for immobilization and separations to partition the waste into streams that yield lower life-cycle costs. Some of the technologies being developed by the Tank Focus Area (TFA) to process these wastes are described. These technologies fall roughly into three areas: (1) solid/liquid separation (SLS), (2) sludge pretreatment, and (3) supernate pretreatment.

99

(CONF-970335–15)

The mixed waste focus area mercury working group: an integrated approach for mercury treatment and disposal. Conley, T.B. (Oak Ridge National Lab., TN (United States)); Morris, M.I.; Holmes-Burns, H.; Petersell, J.; Schwendiman, L. Oak Ridge National Lab., TN (United States). [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From Waste Management '97; Tucson, AZ (United States); 2-7 Mar 1997. Order Number DE97003084. Source: OSTI; NTIS; INIS; GPO Dep.

In May 1996, the U.S. Department of Energy (DOE) Mixed Waste Focus Area (MWFA) initiated the Mercury Work Group (HgWG), which was established to address and resolve the issues associated with mercury- contaminated mixed wastes. Three of the first four technology deficiencies identified during the MWFA technical baseline development process were related to mercury amalgamation, stabilization, and separation/removal. The HgWG will assist the MWFA in soliciting, identifying, initiating, and managing all the efforts required to address these deficiencies. The focus of the HgWG is to better establish the mercury-related treatment needs at the DOE sites, refine the MWFA technical baseline as it relates to mercury treatment, and make recommendations to the MWFA on how to most effectively address these needs. The team will initially focus on the sites with the most mercury-contaminated mixed wastes, whose representatives comprise the HgWG. However, the group will also work with the sites with less inventory to maximize the effectiveness of these efforts in addressing the mercury- related needs throughout the entire complex.

100

(CONF-970344–1)

Seismic reflection processing for characterization of a hazardous waste site. Liu, Z.-M. (Oklahoma Univ., Norman, OK (United States). School of Geology and Geophysics); Doll, W.E. Oak Ridge National Lab., TN (United States). [1997]. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From SAGEEP '97: 10. annual symposium on the application of geophysics to environmental and engineering problems; Reno, NV (United States); 23-26 Mar 1997. Order Number DE97003087. Source: OSTI; NTIS; INIS; GPO Dep.

Seismic reflection data have been acquired by the Kansas Geological Survey near the Oak Ridge K-25 Plant on the Oak Ridge Reservation, Tennessee, to assist in the selection of ground water monitoring well locations. The data

were recorded in uncorrelated format to allow flexibility in enhancement of stacked images. During the summer of 1996, five of the thirteen seismic reflection lines acquired were processed. An unconventional correlation procedure, "Vibroseis Whitening" (VSW) (Coruh and Costain, 1983) has been applied to produce improved seismic sections. Refraction statics corrections, which remove the detrimental effect of an irregular weathered layer, have also been utilized to improve the seismic sections. The seismic data were stacked using the velocities obtained from a standard semblance velocity analysis tool. Locations and orientations of faults or fault zones can be interpreted from these stacked sections, and they are in agreement with the interpretations of the surface mapping in the area. This paper concludes that VSW and refraction statics can be important to near-surface swept source seismic data processing.

101
(CONF-970462–1)
RoboCon: A general purpose telerobotic control center. Draper, J.V. (Oak Ridge National Lab., TN (United States). Robotics and Process Systems Div.); Noakes, M.W.; Schempf, H.; Blair, L.M. Oak Ridge National Lab., TN (United States). [1997]. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From 7. American Nuclear Society topical meeting on robotics and remote handling; Savannah, GA (United States); 27 Apr - 1 May 1997. Order Number DE97001649. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes human factors issues involved in the design of RoboCon, a multi-purpose control center for use in US Department of Energy remote handling applications. RoboCon is intended to be a flexible, modular control center capable of supporting a wide variety of robotic devices.

102
(CONF-970462–3)
Dual Arm Work Package performance estimates and telerobot task network simulation. Draper, J.V. (Oak Ridge National Lab., TN (United States). Robotics and Process Systems Div.); Blair, L.M. Oak Ridge National Lab., TN (United States). [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From 7. American Nuclear Society topical meeting on robotics and remote handling; Savannah, GA (United States); 27 Apr - 1 May 1997. Order Number DE97001647. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the methodology and results of a network simulation study of the Dual Arm Work Package (DAWP), to be employed for dismantling the Argonne National Laboratory CP-5 reactor. The development of the simulation model was based upon the results of a task analysis for the same system. This study was performed by the Oak Ridge National Laboratory (ORNL), in the Robotics and Process Systems Division. Funding was provided the US Department of Energy's Office of Technology Development, Robotics Technology Development Program (RTDP). The RTDP is developing methods of computer simulation to estimate telerobotic system performance. Data were collected to provide point estimates to be used in a task network simulation model. Three skilled operators performed six repetitions of a pipe cutting task representative of typical teleoperation cutting operations.

103
(CONF-970464–5)
Strategies for redundancy resolution of dual-arm systems with passive elements for tank waste removal. Dubey, R. (Univ. of Tennessee, Knoxville, TN (United States). Dept. of Mechanical Engineering); Love, L.J. Oak Ridge National Lab., TN (United States). [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);Oak Ridge Inst. for Science and Education, TN (United States). DOE Contract AC05-96OR22464. From 7. American Nuclear Society topical meeting on robotics and remote systems; Augusta, GA (United States); 27 Apr - 1 May 1997. Order Number DE97002988. Source: OSTI; NTIS; INIS; GPO Dep.

The work described in this paper focuses on the coordination and control of two manipulators coupled by passive elements operating in a confined space. An example of one such system is the hardware used for the environmental response treatability study funded by the Department of Energy at Oak Ridge National Laboratory (ORNL). The motivation for this project is to establish the methodology necessary to extract large volumes of hazardous waste from underground storage facilities. The hardware used at ORNL consists of two long-reach manipulators. The first robot, the Modified Light Duty Utility Arm (MLDUA), is an 8-degree-of-freedom long-reach manipulator. The second arm, the Hose Management Arm (HMA), has two active degrees-of-freedom and provides hardware to break up and extract materials from the tank. Current strategies call for the MLDUA to grasp a combined sluicing end-effector attached, by a long flexible hose, to the HMA. The MLDUA will then move the combined system through the waste, extracting material. This paper describes many of the issues related to redundancy resolution and the coordinated control of these two robots. First, the authors provide a brief outline of the project and the existing hardware. This is followed by a description of existing redundancy resolution techniques and the impact redundancy has on the success of the project. Finally, preliminary simulation results show the effect cooperative control has on the level of forces generated between the dual-arm systems when coupled by an elastic exhaust hose. These results show a significant reduction in forces when both arms are active and have a combined manipulation strategy.

104
(CONF-970464–6)
Control of flexible robots with prismatic joints and hydraulic drives. Love, L.J. (Oak Ridge Inst. for Science and Education, TN (United States)); Kress, R.L.; Jansen, J.F. Oak Ridge National Lab., TN (United States). [1997]. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From 7. American Nuclear Society topical meeting on robotics and remote systems; Augusta, GA (United States); 27 Apr - 1 May 1997. Order Number DE97002980. Source: OSTI; NTIS; INIS; GPO Dep.

The design and control of long-reach, flexible manipulators has been an active research topic for over 20 years. Most of the research to date has focused on single link, fixed length, single plane of vibration test beds. In addition, actuation has been predominantly based upon electromagnetic motors. Ironically, these elements are rarely found in the existing industrial long-reach systems. One example is the Modified Light Duty Utility Arm (MLDUA) designed and

built by Spar Aerospace for Oak Ridge National Laboratory (ORNL). This arm operates in larger, underground waste storage tanks located at ORNL. The size and nature of the tanks require that the robot have a reach of approximately 15 ft and a payload capacity of 250 lb. In order to achieve these criteria, each joint is hydraulically actuated. Furthermore, the robot has a prismatic degree-of-freedom to ease deployment. When fully extended, the robot's first natural frequency is 1.76 Hz. Many of the projected tasks, coupled with the robot's flexibility, present an interesting problem. How will many of the existing flexure control algorithms perform on a hydraulic, long-reach manipulator with prismatic links? To minimize cost and risk of testing these algorithms on the MLDUA, the authors have designed a new test bed that contains many of the same elements. This manuscript described a new hydraulically actuated, long-reach manipulator with a flexible prismatic link at ORNL. Focus is directed toward both modeling and control of hydraulic actuators as well as flexible links that have variable natural frequencies.

105
(CONF-970464–7)
The Virtual Robotics Laboratory. Kress, R.L. (Oak Ridge National Lab., TN (United States)); Love, L.J. Oak Ridge National Lab., TN (United States). [1997]. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From 7. American Nuclear Society topical meeting on robotics and remote systems; Augusta, GA (United States); 27 Apr - 1 May 1997. Order Number DE97002986. Source: OSTI; NTIS; INIS; GPO Dep.

The growth of the Internet has provided a unique opportunity to expand research collaborations between industry, universities, and the national laboratories. The Virtual Robotics Laboratory (VRL) is an innovative program at Oak Ridge National Laboratory (ORNL) that is focusing on the issues related to collaborative research through controlled access of laboratory equipment using the World Wide Web. The VRL will provide different levels of access to selected ORNL laboratory equipment to outside universities, industrial researchers, and elementary and secondary education programs. In the past, the ORNL Robotics and Process Systems Division (RPSD) has developed state-of-the-art robotic systems for the Army, NASA, Department of Energy, Department of Defense, as well as many other clients. After proof of concept, many of these systems sit dormant in the laboratories. This is not out of completion of all possible research topics, but from completion of contracts and generation of new programs. In the past, a number of visiting professors have used this equipment for their own research. However, this requires that the professor, and possibly his students, spend extended periods at the laboratory facility. In addition, only a very exclusive group of faculty can gain access to the laboratory and hardware. The VRL is a tool that enables extended collaborative efforts without regard to geographic limitations.

106
(CONF-970464–8)
Adaptive controller for hyperthermia robot. Kress, R.L. Oak Ridge National Lab., TN (United States). [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From 7. American Nuclear Society topical meeting on robotics and remote systems; Augusta, GA (United States); 27 Apr - 1 May 1997. Order Number DE97002987. Source: OSTI; NTIS; GPO Dep.

This paper describes the development of an adaptive computer control routine for a robotically, deployed focused, ultrasonic hyperthermia cancer treatment system. The control algorithm developed herein uses physiological models of a tumor and the surrounding healthy tissue regions and transient temperature data to estimate the treatment region's blood perfusion. This estimate is used to vary the specific power profile of a scanned, focused ultrasonic transducer to achieve a temperature distribution as close as possible to an optimal temperature distribution. The controller is evaluated using simulations of diseased tissue and using limited experiments on a scanned, focused ultrasonic treatment system that employs a 5-Degree-of-Freedom (D.O.F.) robot to scan the treatment transducers over a simulated patient. Results of the simulations and experiments indicate that the adaptive control routine improves the temperature distribution over standard classical control algorithms if good (although not exact) knowledge of the treated region is available. Although developed with a scanned, focused ultrasonic robotic treatment system in mind, the control algorithm is applicable to any system with the capability to vary specific power as a function of volume and having an unknown distributed energy sink proportional to temperature elevation (e.g., other robotically deployed hyperthermia treatment methods using different heating modalities).

107
(CONF-970464–9)
Simulation tools for hazardous waste removal. Bills, K.C. (Oak Ridge National Lab., TN (United States)); Love, L.J. Oak Ridge National Lab., TN (United States). [1997]. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From 7. American Nuclear Society topical meeting on robotics and remote systems; Augusta, GA (United States); 27 Apr - 1 May 1997. Order Number DE97002979. Source: OSTI; NTIS; INIS; GPO Dep.

The primary mission of Oak Ridge National Laboratory (ORNL) during World War 2 was the processing of pure plutonium metal in support of the Manhattan Project. Byproducts of this process include radioactive cesium-137 and strontium-90. Between 1943 and 1951, the Gunite and Associated Tanks (GAAT) at ORNL were built to collect, neutralize, and storage these by-products. Currently, twelve gunite tanks and four stainless steel tanks are located on the ORNL complex. Characterization studies of these tanks in 1994 indicated that the structural integrity of some of the tanks is questionable. These risks provided the motivation for remediation and relocation of waste stored in the ORNL tanks. A number of factors complicate the remediation process. The material stored in these tanks ranges from liquid to sludge and solid and is composed of organic materials, heavy metals, and radionuclides. Furthermore, the tanks, which range from 12 to 50 ft in diameter, are located below ground and in the middle of the ORNL complex. The only access to these tanks is through one of three access ports that are either 12 or 24 in. in diameter. These characteristics provide a daunting challenge: how can material be safely removed from such a confined structure? This paper describes the existing strategy and hardware projected for use in the remediation process. This is followed by a description of an integrated hardware system model. This investigation has isolated a few key areas where further work may be needed.

108
(CONF-970464–10)
Hydraulic manipulator research at ORNL. Kress, R.L. (Oak Ridge National Lab., TN (United States)); Jansen, J.F.; Love, L.J. Oak Ridge National Lab., TN (United States). [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From 7. American Nuclear Society topical meeting on robotics and remote systems; Augusta, GA (United States); 27 Apr - 1 May 1997. Order Number DE97002981. Source: OSTI; NTIS; INIS; GPO Dep.

Recently, task requirements have dictated that manipulator payload capacity increase to accommodate greater payloads, greater manipulator length, and larger environmental interaction forces. General tasks such as waste storage tank cleanup and facility dismantlement and decommissioning require manipulator life capacities in the range of hundreds of pounds rather than tens of pounds. To meet the increased payload capacities demanded by present-day tasks, manipulator designers have turned once again to hydraulics as a means of actuation. In order to successfully design, build, and deploy a new hydraulic manipulator (or subsystem), sophisticated modeling, analysis, and control experiments are usually needed. Oak Ridge National Laboratory (ORNL) has a history of projects that incorporate hydraulics technology, including mobile robots, teleoperated manipulators, and full-scale construction equipment. In addition, to support the development and deployment of new hydraulic manipulators, ORNL has outfitted a significant experimental laboratory and has developed the software capability for research into hydraulic manipulators, hydraulic actuators, hydraulic systems, modeling of hydraulic systems, and hydraulic controls. The purpose of this article is to describe the past hydraulic manipulator developments and current hydraulic manipulator research capabilities at ORNL. Included are example experimental results from ORNL's flexible/prismatic test stand.

109
(CONF-970464–11)
An investigation of a passively controlled haptic interface. Davis, J.T. (Oak Ridge National Lab., TN (United States)); Book, W.J. Oak Ridge National Lab., TN (United States). [1997]. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC05-96OR22464. Grant IRI-9526322. From 7. American Nuclear Society topical meeting on robotics and remote systems; Augusta, GA (United States); 27 Apr - 1 May 1997. Order Number DE97002982. Source: OSTI; NTIS; INIS; GPO Dep.

Haptic interfaces enhance cooperation between humans and robotic manipulators by providing force and tactile feedback to the human user during the execution of arbitrary tasks. The use of active actuators in haptic displays presents a certain amount of risk since they are capable of providing unacceptable levels of energy to the systems upon which they operate. An alternative to providing numerous safeguards is to remove the sources of risk altogether. This research investigates the feasibility of trajectory control using passive devices, that is, devices that cannot add energy to the system. Passive actuators are capable only of removing energy from the system or transferring energy within the system. It is proposed that the utility of passive devices is greatly enhanced by the use of redundant actuators. In a passive system, once motion is provided to the system, presumably by a human user, passive devices may be able to modify this motion to achieve a desired resultant trajectory. A mechanically passive, 2-Degree-of-Freedom (D.O.F.) manipulator has been designed and built. It is equipped with four passive actuators: two electromagnetic brakes and two electromagnetic clutches. This paper gives a review of the literature on passive and robotics and describes the experimental test bed used in this research. Several control algorithms are investigated, resulting in the formulation of a passive control law.

110
(CONF-9705112–1)
In situ global method for measurement of oxygen demand and mass transfer. Klasson, K.T. (Oak Ridge National Lab., TN (United States). Chemical Technology Div.); Lundbaeck, K.M.O.; Clausen, E.C.; Gaddy, J.L. Oak Ridge National Lab., TN (United States). [1997]. 13p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From 19. symposium on biotechnology for fuels and chemicals; Colorado Springs, CO (United States); 4-8 May 1997. Order Number DE97005994. Source: OSTI; NTIS; GPO Dep.

Two aerobic microorganisms, Saccharomycopsis lipolytica and Brevibacterium lactofermentum, have been used in a study of mass transfer and oxygen uptake from a global perspective using a closed gas system. Oxygen concentrations in the gas and liquid were followed using oxygen electrodes, and the results allowed for easy calculation of in situ oxygen transport. The cell yields on oxygen for S. lipolytica and B. lactofermentum were 1.01 and 1.53 g/g respectively. The mass transfer coefficient was estimated as 10 h^{-1} at 500 rpm for both fermentations. The advantages with this method are noticeable since the use of model systems may be avoided, and the in situ measurements of oxygen demand assure reliable data for scale-up.

111
(CONF-9705140–1)
The use of carbonate lixiviants to remove uranium from uranium-contaminated soils. Francis, C.W. (Oak Ridge National Lab., TN (United States)); Lee, S.Y.; Wilson, J.H.; Timpson, M.E.; Elless, M.P. Oak Ridge National Lab., TN (United States). [1997]. 21p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From SIS '97: 7. international conference on separation of ionic solutes; Piestany Spa (Slovakia); 18-23 May 1997. Order Number DE97007765. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this research was to design an extraction media and procedure that would selectively remove uranium without adversely affecting the soils' physicochemical characteristics or generating secondary waste forms difficult to manage or dispose of. Investigations centered around determining the best lixivant and how the various factors such as pH, time, and temperature influenced extraction efficiency. Other factors investigated included the influence of attrition scrubbing, the effect of oxidants and reductants and the recycling of lixiviants. Experimental data obtained at the bench- and pilot-scale levels indicated 80 to 95% of the uranium could be removed from the uranium-contaminated soils by using a carbonate lixiviant. The best treatment was

three successive extractions with 0.25 M carbonate-bicarbonate (in presence of $KMnO_4$ as an oxidant) at 40 C followed with two water rinses.

112
(CONF-970675–1)
Admixture enhanced controlled low-strength material for direct underwater injection with minimal cross-contamination. Hepworth, H.K.; Davidson, J.S.; Hooyman, J.L. Oak Ridge National Lab., TN (United States). 1997. 16p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From American Society for Testing and Materials (ASTM) symposium on the design and application of CLSM (flowable fill); St. Louis, MO (United States); 19-20 Jun 1997. Order Number DE97004112. Source: OSTI; NTIS; INIS; GPO Dep.

Commercially available admixtures have been developed for placing traditional concrete products under water. This paper evaluates adapting anti-washout admixture (AWA) and high range water reducing admixture (HRWRA) products to enhance controlled low-strength materials (CLSMs) for underwater placement. A simple experimental scale model (based on dynamic and geometric similitude) of typical grout pump emplacement equipment has been developed to determine the percentage of cementing material washed out. The objective of this study was to identify proportions of admixtures and underwater CLSM emplacement procedures which would minimize the cross-contamination of the displaced water while maintaining the advantages of CLSM. Since the displaced water from radioactively contaminated systems must be subsequently treated prior to release to the environment, the amount of cross-contamination is important for cases in which cementing material could form hard sludges in a water treatment facility and contaminate the in-place CLSM stabilization medium.

113
(CONF-9706113–12)
Implications of electron attachment to highly-excited states in pulsed-power discharges. Pinnaduwage, L.A. (Oak Ridge National Lab., TN (United States)). Oak Ridge National Lab., TN (United States). 1997. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC05-96OR22464. NSF Contract ECS-9626217. From 11. IEEE international pulsed power conference; Baltimore, MD (United States); 29 Jun - 2 Jul 1997. Order Number DE97007788. Source: OSTI; NTIS; INIS; GPO Dep.

The author points out the possible implications of electron attachment to highly-excited states of molecules in two pulsed power technologies. One involves the pulsed H_2 discharges used for the generation of H ion beams for magnetic fusion energy and particle accelerators. The other is the power modulated plasma discharges used for material processing.

114
(CONF-970795–1)
Introduction to naturally occurring radioactive material. Egidi, P. Oak Ridge National Lab., Grand Junction, CO (United States). [1997]. 54p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From Health Physics Society annual meeting; San Antonio, TX (United States); 1 Jul 1997. Order Number DE97008455. Source: OSTI; NTIS; INIS; GPO Dep.

Naturally occurring radioactive material (NORM) is everywhere; we are exposed to it every day. It is found in our bodies, the food we eat, the places where we live and work, and in products we use. We are also bathed in a sea of natural radiation coming from the sun and deep space. Living systems have adapted to these levels of radiation and radioactivity. But some industrial practices involving natural resources concentrate these radionuclides to a degree that they may pose risk to humans and the environment if they are not controlled. Other activities, such as flying at high altitudes, expose us to elevated levels of NORM. This session will concentrate on diffuse sources of technologically-enhanced (TE) NORM, which are generally large-volume, low-activity waste streams produced by industries such as mineral mining, ore benefication, production of phosphate Fertilizers, water treatment and purification, and oil and gas production. The majority of radionuclides in TENORM are found in the uranium and thorium decay chains. Radium and its subsequent decay products (radon) are the principal radionuclides used in characterizing the redistribution of TENORM in the environment by human activity. We will briefly review other radionuclides occurring in nature (potassium and rubidium) that contribute primarily to background doses. TENORM is found in many waste streams; for example, scrap metal, sludges, slags, fluids, and is being discovered in industries traditionally not thought of as affected by radionuclide contamination. Not only the forms and volumes, but the levels of radioactivity in TENORM vary. Current discussions about the validity of the linear no dose threshold theory are central to the TENORM issue. TENORM is not regulated by the Atomic Energy Act or other Federal regulations. Control and regulation of TENORM is not consistent from industry to industry nor from state to state. (Abstract truncated)

115
(CONF-970926–2)
Nuclear criticality safety controls for uranium deposits during D and D at the Oak Ridge Gaseous Diffusion Plant. Haire, M.J. (Oak Ridge National Lab., TN (United States)); Jordan, W.C.; Jollay, L.J. III; Dahl, T.L. Oak Ridge National Lab., TN (United States). [1997]. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From American Nuclear Society (ANS) topical meeting on criticality safety challenges in the next decade; Chelan, WA (United States); 7-11 Sep 1997. Order Number DE97001039. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) Deputy Assistant Secretary of Energy for Environmental Management has issued a challenge to complete DOE environmental cleanup within a decade. The response for Oak Ridge facilities is in accordance with the DOE ten-year plan which calls for completion of $>$ 95% of environmental management work by the year 2006. This will result in a 99% risk reduction and in a significant savings in base line costs in waste management (legacy waste); remedial action (groundwater, soil, etc.); and decontamination and decommissioning (D and D). It is assumed that there will be long-term institutional control of cascade equipment, i.e., there will be no walk away from sites, and that there will be firm radioactivity release limits by 1999 for recycle metals. An integral part of these plants

is the removal of uranium deposits which pose nuclear criticality safety concerns in the shut down of the Oak Ridge Gaseous Diffusion Plant. DOE has initiated the Nuclear Criticality Stabilization Program to improve nuclear criticality safety by removing the larger uranium deposits from unfavorable geometry equipment. Nondestructive assay (NDA) measurements have identified the location of these deposits. The objective of the K-25 Site Nuclear Criticality Stabilization Program is to remove and place uranium deposits into safe geometry storage containers to meet the double contingency principle. Each step of the removal process results in safer conditions where multiple controls are present. Upon completion of the Program, nuclear criticality risks will be greatly reduced.

116
(CONF-970926–4)
Criticality safety considerations for MSRE fuel drain tank uranium aggregation. Hollenbach, D.F. (Oak Ridge National Lab., TN (United States). Computational Physics and Engineering Div.); Hopper, C.M. Oak Ridge National Lab., TN (United States). [1997]. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From American Nuclear Society (ANS) topical meeting on criticality safety challenges in the next decade; Chelan, WA (United States); 7-11 Sep 1997. Order Number DE97003663. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents the results of a preliminary criticality safety study of some potential effects of uranium reduction and aggregation in the Molten Salt Reactor Experiment (MSRE) fuel drain tanks (FDTs) during salt removal operations. Since the salt was transferred to the FDTs in 1969, radiological and chemical reactions have been converting the uranium and fluorine in the salt to UF_6 and free fluorine. Significant amounts of uranium (at least 3 kg) and fluorine have migrated out of the FDTs and into the off-gas system (OGS) and the auxiliary charcoal bed (ACB). The loss of uranium and fluorine from the salt changes the chemical properties of the salt sufficiently to possibly allow the reduction of the UF_4 in the salt to uranium metal as the salt is remelted prior to removal. It has been postulated that up to 9 kg of the maximum 19.4 kg of uranium in one FDT could be reduced to metal and concentrated. This study shows that criticality becomes a concern when more than 5 kg of uranium concentrates to over 8 wt% of the salt in a favorable geometry.

117
(CONF-970926–10)
Heterogeneous reactivity effects in medium- and high-enriched uranium metal-water systems. Lichtenwalter, J.J. Oak Ridge National Lab., TN (United States). 1997. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);Oak Ridge Inst. for Science and Education, TN (United States). DOE Contract AC05-96OR22464. From American Nuclear Society (ANS) topical meeting on criticality safety challenges in the next decade; Chelan, WA (United States); 7-11 Sep 1997. Order Number DE97006433. Source: INIS; OSTI; NTIS; INIS; GPO Dep.

The effect of heterogeneity on reactivity of low-, medium-, and high-enriched, water-moderated uranium metal systems has been examined for various hydrogen-to-fissile (H/X) ratios using the CSAS1X sequence in SCALE and MCNP. For the calculations, an infinite array of close-packed unit cells was modeled which consisted of centered uranium metal spheres surrounded by water. The enrichments used correspond to the average enrichments of fragmented fuel plates in three proposed waste shipments from Oak Ridge National Laboratory. The analysis performed to obtain peak reactivity for each enrichment as a function of particle size and H/X ratio led to the development of the topic discussed in this paper.

118
(CONF-970952–1)
Isotopes facilities deactivation project at Oak Ridge National Laboratory. Eversole, R.E. Oak Ridge National Lab., TN (United States). 1997. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From Decontamination, decommissioning and reutilization of commercial and government facilities; Knoxville, TN (United States); 7-12 Sep 1997. Order Number DE97005999. Source: OSTI; NTIS; INIS; GPO Dep.

The production and distribution of radioisotopes for medical, scientific, and industrial applications has been a major activity at Oak Ridge National Laboratory (ORNL) since the late 1940s. As the demand for many of these isotopes grew and their sale became profitable, the technology for the production of the isotopes was transferred to private industry, and thus, many of the production facilities at ORNL became underutilized. In 1989, the U.S. Department of Energy (DOE) instructed ORNL to identify and prepare various isotopes production facilities for safe shutdown. In response, ORNL identified 19 candidate facilities for shutdown and established the Isotopes Facilities Shutdown Program. In 1993, responsibility for the program was transitioned from the DOE Office of Nuclear Energy to the DOE Office of Environmental Management and Uranium Enrichment Operation's Office of Facility Transition and Management. The program was retitled the Isotopes Facilities Deactivation Project (IFDP), and implementation responsibility was transferred from ORNL to the Lockheed Martin Energy Systems, Inc. (LMES), Environmental Restoration (ER) Program.

119
(CONF-970952–3)
Measuring the accomplishments of public participation programs: Overview of a methodological study performed for DOE's Office of Environmental Management. Schweitzer, M.; Carnes, S.A.; Peelle, E.B.; Wolfe, A.K. Oak Ridge National Lab., TN (United States). 1997. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From Decontamination, decommissioning and reutilization of commercial and government facilities; Knoxville, TN (United States); 7-12 Sep 1997. Order Number DE97006333. Source: OSTI; NTIS; INIS; GPO Dep.

Recently, staff at Oak Ridge National Laboratory performed a study for the Office of Intergovernmental and Public Accountability within the U.S. Department of Energy's (DOE) Office of Environmental Management (EM), examining how to measure the success of public participation programs. While the study began with a thorough literature review, the primary emphasis of this research effort was on getting key stakeholders to help identify attributes of successful public participation in EM activities and to suggest how those attributes might be measured. Interviews were conducted at

nine DOE sites that provided substantial variety in terms of geographic location, types of environmental management activities undertaken, the current life-cycle stage of those EM efforts, and the public participation mechanisms utilized. Approximately 12 to 15 oral interviews were conducted at each site, and each respondent also was asked to complete a written survey. Those interviewed included: non-regulatory state and local government officials; project managers and public participation staff for DOE and its management and operations contractors; non-government groups concerned with environmental protection, public safety, and health issues; federal and state environmental regulators; business organizations; civic groups; and other interested parties. While this study examined only those public participation programs sponsored by DOE, the resulting findings also have applicability to the public involvement efforts sponsored by many other public and private sector organizations.

120
(CONF-970952–4)
The independent verification process in decommissioning, decontamination, and reutilization activities - description, benefits, and lessons learned. Egidi, P.V. Oak Ridge National Lab., TN (United States). 1997. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From Decontamination, decommissioning and reutilization of commercial and government facilities; Knoxville, TN (United States); 7-12 Sep 1997. Order Number DE97007500. Source: OSTI; NTIS; INIS; GPO Dep.

Oak Ridge National Laboratory Environmental Technology Section has been performing Independent Verification (IV) activities for U.S. DOE sites since 1986. DOE has successfully used IV in the Uranium Mill Tailings Remedial Action Program, Decontamination and Decommissioning projects, and Formerly Utilized Sites Remedial Action Projects/ Surplus Facilities Management Program. Projects that have undergone IV range from small residential properties to large, industrial sites. The IV process provides a third-party review conducted by an independent organization. The purpose is to verify accuracy and completeness of contractor field measurements and final documentation, evaluate the credibility of procedures, and independently assess post-cleanup conditions versus decommissioning project plans and release criteria. Document reviews of plans, dose models, procedures, and reports are some IV activities undertaken. Independent measurements are also collected during field visits to confirm the contractor's findings. Corrective actions for discrepancies are suggested if necessary. Finally, archival and reporting of the final site environmental conditions for project closeout and certification are completed. The IV contractor reports to DOE headquarters and acts as a quality assurance feedback mechanism. An IV also provides additional assurance that projects are planned, carried out, and documented properly. Decommissioning projects benefit from the IV process by: (1) cost and time savings from early identification of potential problems, (2) assurance that cleanup meets regulatory guidelines, and (3) technical reviews and consultation with experts in field instrumentation, sampling strategy, etc. Some lessons learned from the IV process include avoiding: (1) improper survey techniques, (2) reporting data in units not comparable with guideline values, (3) premature release of surfaces, (4) poor decommissioning project planning, (5) misapplication of release guidelines. 20 refs.

121
(CONF-970962–2)
Comparative testing of slurry monitors. Hylton, T.D. (Oak Ridge National Lab., TN (United States)); Bayne, C.K.; Anderson, M.S.; Van Essen, D.C. Oak Ridge National Lab., TN (United States). 1997. 5p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From 214. American Chemical Society meeting; Las Vegas, NV (United States); 7-13 Sep 1997. Order Number DE98000127. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) has millions of gallons of radioactive liquid and sludge wastes stored in underground tanks. These wastes must be retrieved, transferred to treatment facilities, and processed for disposal. Before removal from the storage tanks, the sludge and liquid wastes will typically be combined to create a mixture of suspended solids, generally referred to as a slurry; the slurry is then pumped from the tank to the treatment facilities by pipelines. Since the wastes are radioactive, it is critically important that the slurries are transported safely and successfully. The consequences of pipeline plugging are unacceptable from the perspectives of schedule, cost, and safety. The baseline method of ensuring that the transport properties of the slurries are correct is to sample the slurry in the tank and analyze the sample in the laboratory. This method has some problems. First, there is a delay between the time that the sample is taken and the time that the analytical results are reported. For some types of analysis, this delay could be from 24 to 48 hours. Second, although the tank is being mixed to keep tile solids in suspension during this period, there is no way to determine whether the contents of the tank are homogenous unless multiple samples are collected at various depths and locations. Therefore, an on-line system that monitors slurry transport properties in real time is needed to evaluate the slurry prior to and during transfer.

122
(CONF-970962–3)
Solids Control in Sludge Pretreatment. Beahm, E.C., Weber, C.F., Hunt, R.D., Dillow, T.A. Oak Ridge National Lab., TN (United States). 1997. 14p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. From 214. American Chemical Society meeting; Las Vegas, NV (United States); 7-13 Sep 1997. Order Number DE98000120. Source: OSTI; NTIS; INIS; GPO Dep.

Sludge pretreatment will likely involve washing, followed by caustic or acidic leaching and washing of sludge residues after leaching. The principal goal of pretreatment is to obtain a low-volume high-activity waste stream and a high-volume low-activity waste stream. Also, some waste constituents such as chromium and phosphate can be included in glass formulations only at very low concentrations; therefore, it is desirable to remove them from high-level waste streams. Two aspects of sludge treatment and subsequent separations should be well delineated and predictable: (1) the distribution of chemical species between aqueous solutions and solids and (2) potential problems due to chemical interactions that could result in process difficulties or safety concerns.Before any treatment technology is adopted, it must be demonstrated that the process can be carried out as planned. Three pretreatment methods were considered in

the Tri-Party (Washington State Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy) negotiations: (1) sludge washing with corrosion- inhibiting water, (2) Enhanced Sludge Washing, and (3)acidic dissolution with separations processes. Enhanced Sludge Washing is the baseline process. In Enhanced Sludge Washing, sludge is first washed with corrosion-inhibiting water; it is then leached with caustic (sodium hydroxide solution) and washed again with corrosion- inhibiting water. The initial concern is whether a pretreatment technique is effective in separating sludge components. This can be evaluated by bench-scale tests with sludge specimens from underground storage tanks. The results give data on the distribution of important species such as aluminum, phosphate, and radionuclides between wash and leach solutions and solid sludge residues.

123
(CONF-971032–1)
Performance of in situ chemical oxidation field demonstrations at DOE sites. Cline, S.R.; West, O.R.; Siegrist, R.L.; Holden, W.L. Oak Ridge National Lab., TN (United States). 1997. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. From In situ remediation of the geoenvironment conference; Minneapolis, MN (United States); 5-7 Oct 1997. Order Number DE97004725. Source: OSTI; NTIS; INIS; GPO Dep.

Researchers at the Oak Ridge National Laboratory (ORNL) have been investigating the use of in situ chemical oxidation to remediate organic contaminants (VOCs, SVOCs, and PCBs) in soils and groundwater at the laboratory and field scales. Field scale design parameters (e.g., oxidant loading rates and oxidant delivery techniques) are often dictated by site conditions (e.g., soil properties and initial contaminant concentrations). Chemical destruction of organic compounds can be accomplished using a variety of oxidants. Recent research has involved field scale in situ chemical oxidation demonstrations using H_2O_2 and $KMnO_4$ in conjunction with soil mixing as the oxidant delivery mechanism. A description of some of these fields activities and future field-scale work is presented here.

124
(CONF-971143–1)
Field technologies for the measurement of PCBs. Dindal, A.B. (Oak Ridge National Lab., TN (United States)); Bayne, C.K.; Jenkins, R.A.; Carden, D.M.; Billets, S. Oak Ridge National Lab., TN (United States). [1997]. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);Environmental Protection Agency, Washington, DC (United States). DOE Contract AC05-96OR22464. From 20. world energy engineering congress; Atlanta, GA (United States); 19 Nov 1997. Order Number DE97008485. Source: OSTI; NTIS; GPO Dep.

The collaborative effort between the US Environmental Protection Agency (EPA), US Department of Energy (DOE), and the Oak Ridge National Laboratory (ORNL) represents a viable team to administer, plan, execute, and report on demonstrations of commercially available field characterization and monitoring technologies. This effort is part of the EPA's Environmental Technology Verification (ETV) Program. One of the overriding goals of this effort is to develop regulatory-accepted and cost effective alternatives to conventional fixed laboratory analyses through the identification and evaluation of innovative, field technologies. A technology demonstration of polychlorinated biphenyl (PCB) field analytical techniques will occur during July 22 through 30, 1997. The demonstration will be conducted at a DOE site (ORNL) where there is a substantial repository of PCB-contaminated materials from multiple DOE sites. Technology developers with PCB monitoring instrumentation will be evaluated. These instruments will include field portable gas chromatographs with surface acoustic wave and electron capture detectors, and field analysis kits, such as immunoassay and ion specific electrode kits. These instruments are suitable for the quantification of PCBs in a variety of matrices. Soil and surface samples will be evaluated during the demonstration. The demonstration will focus on the current DOE-Oak Ridge analytical needs to support Toxic Substance and Control Act (TSCA) decisions, while allowing developers to showcase the features of their technologies.

125
(DOE/AL/58309–68)
Evaluation of the WIPP Project's compliance with the EPA radiation protection standards for disposal of transuranic waste. Neill, R.H. (Environmental Evaluation Group, Albuquerque, NM (United States)); Chaturvedi, L.; Rucker, D.F.; Silva, M.K.; Walker, B.A.; Channell, J.K.; Clemo, T.M. Environmental Evaluation Group, Albuquerque, NM (United States);Environmental Evaluation Group, Carlsbad, NM (United States). Mar 1998. 622p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-89AL58309 ; AC04-78AL10752. (EEG–68). Order Number DE98004586. Source: OSTI; NTIS; INIS; GPO Dep.

The US Environmental Protection Agency's (EPA) proposed rule to certify that the Waste Isolation Pilot Plant (WIPP) meets compliance with the long-term radiation protection standards for geologic repositories (40CFR191 Subparts B and C), is one of the most significant milestones to date for the WIPP project in particular, and for the nuclear waste issue in general. The Environmental Evaluation Group (EEG) has provided an independent technical oversight for the WIPP project since 1978, and is responsible for many improvements in the location, design, and testing of various aspects of the project, including participation in the development of the EPA standards since the early 1980s. The EEG reviewed the development of documentation for assessing the WIPP's compliance by the Sandia National Laboratories following the 1985 promulgation by EPA, and provided many written and verbal comments on various aspects of this effort, culminating in the overall review of the 1992 performance assessment. For the US Department of Energy's (DOE) compliance certification application (CCA), the EEG provided detailed comments on the draft CCA in March, 1996, and additional comments through unpublished letters in 1997 (included as Appendices 8.1 and 8.2 in this report). Since the October 30, 1997, publication of the EPA's proposed rule to certify WIPP, the EEG gave presentations on important issues to the EPA on December 10, 1997, and sent a December 31, 1997 letter with attachments to clarify those issues (Appendix 8.3). The EEG has raised a number of questions that may have an impact on compliance. In spite of the best efforts by the EEG, the EPA reaction to reviews and suggestions has been slow and apparently driven by legal considerations. This report discusses in detail the questions that have been raised about containment requirements. Also discussed are assurance requirements,

groundwater protection, individual protection, and an evaluation of EPA's responses to EEG's comments.

126
(DOE/AL/62350–89-Rev.2)
Long-term surveillance plan for the Green River, Utah disposal site. Revision 2. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jul 1998. [100p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE99000970. Source: OSTI; NTIS; INIS; GPO Dep.

The long-term surveillance plan (LTSP) for the Green River, Utah, Uranium Mill Tailings Remedial Action (UMTRA) Project disposal site describes the surveillance activities for the Green River disposal cell. The US Department of Energy (DOE) will carry out these activities to ensure that the disposal cell continues to function as designed. This final LTSP was prepared as a requirement for acceptance under the US Nuclear Regulatory Commission (NRC) general license for custody and long-term care of residual radioactive materials (RRM). This LTSP documents whether the land and interests are owned by the United States or an Indian tribe and details how the long-term care of the disposal site will be carried out.

127
(DOE/AL/62350–236-Rev.(5/98))
Long-term surveillance plan for the Burro Canyon disposal cell, Slick Rock, Colorado. Jacobs Engineering Group Inc., Albuquerque, NM (United States). May 1998. 40p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE99001098. Source: OSTI; NTIS; INIS; GPO Dep.

This long-term surveillance plan (LTSP) describes the US Department of Energy (DOE) long-term care program for the Uranium Mill Tailings Remedial Action (UMTRA) Project Burro Canyon disposal cell in San Miguel County, Colorado. The US Nuclear Regulatory Commission (NRC) developed regulations for the issuance of a general license for the custody and long-term care of UMTRA Project disposal sites in 10 CFR Part 40. The purpose of this general license is to ensure that the UMTRA Project disposal sites are cared for in a manner that protects the public health and safety and the environment. Before each disposal site is licensed, the NRC requires the DOE to submit a site-specific LTSP. The DOE prepared this LTSP to meet this requirement for the Burro Canyon disposal cell. The general license becomes effective when the NRC concurs with the DOE's determination that remedial action is complete at the Burro Canyon disposal cell and the NRC formally accepts this LTSP. Attachment 1 contains the concurrence letters from NRC. This LTSP describes the long-term surveillance program the DOE will implement to ensure that the Burro Canyon disposal cell performs as designed. The program is based on site inspections to identify threats to disposal cell integrity. Ground water monitoring will not be required at the Burro Canyon disposal cell because the ground water protection strategy is supplemental standards based on low yield from the uppermost aquifer.

128
(DOE/AL/62350–247-Pt.2)
Long-term surveillance plan for the Maybell, Colorado Disposal Site. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Dec 1997. 39p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE98005074. Source: OSTI; NTIS; INIS; GPO Dep.

This long-term surveillance plan (LTSP) describes the U.S. Department of Energy's (DOE) long-term care program for the Uranium Mill Tailings Remedial Action (UMTRA) Project Maybell disposal site in Moffat County, Colorado. The U.S. Nuclear Regulatory Commission (NRC) has developed regulations for the issuance of a general license for the custody and long-term care of UMTRA Project disposal sites in 10 CFR Part 40. The purpose of this general license is to ensure that the UMTRA Project disposal sites are cared for in a manner that protects the public health and safety and the environment. Before each disposal site is licensed, the NRC requires the DOE to submit a site-specific LTSP. The DOE prepared this LTSP to meet this requirement for the Maybell disposal site. The general license becomes effective when the NRC concurs with the DOE's determination that remedial action is complete for the Maybell site and the NRC formally accepts this LTSP. This document describes the long-term surveillance program the DOE will implement to ensure the Maybell disposal site performs as designed. The program is based on site inspections to identify threats to disposal cell integrity. The LTSP is based on the UMTRA Project long-term surveillance program guidance document and meets the requirements of 10 CFR §40.27(b) and 40 CFR §192.03.

129
(DOE/AL/62350–247-Pt.3)
1997 Monitoring report for the Gunnison, Colorado Wetlands Mitigation Plan. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Nov 1997. 62p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE98005075. Source: OSTI; NTIS; INIS; GPO Dep.

Under the Uranium Mill Tailings Remedial Action (UMTRA) Project, the U.S. Department of Energy (DOE) cleaned up uranium mill tailings and other surface contamination near the town of Gunnison, Colorado. Remedial action resulted in the elimination of 4.3 acres (ac) (1.7 hectares [ha]) of wetlands. This loss is mitigated by the enhancement of six spring-fed areas on Bureau of Land Management (BLM) land (mitigation sites). Approximately 254 ac (1 03.3 ha) were fenced at the six sites to exclude grazing livestock. Of the 254 ac (103.3 ha), 17.8 ac (7.2 ha) are riparian plant communities; the rest are sagebrush communities. Baseline grazed conditions of the riparian plant communities at the mitigation sites were measured prior to fencing. This report discusses results of the fourth year of a monitoring program implemented to document the response of vegetation and wildlife to the exclusion of livestock. Three criteria for determining success of the mitigation were established: plant height, vegetation density (bare ground), and vegetation diversity. By 1996, Prospector Spring, Upper Long's Gulch, and Camp Kettle met the criteria. The DOE requested transfer of these sites to BLM for long-term oversight. The 1997 evaluation of the three remaining sites, discussed in this report, showed two sites (Houston Gulch and Lower Long's Gulch) meet the criteria. The DOE will request the transfer of these two sites to the BLM for long-term oversight. The last remaining site, Sage Hen Spring, has met only two of the criteria (percent bare ground and plant height). The third

criterion, vegetation diversity, was not met. The vegetation appears to be changing from predominantly wet species to drier upland species, although the reason for this change is uncertain. It may be due to below-normal precipitation in recent years, diversion of water from the spring to the stock tank, or manipulation of the hydrology farther up gradient.

130
(DOE/AL/62350–249)
Remedial action plan for the inactive uranium processing site at Naturita, Colorado. Remedial action selection report: Attachment 2, geology report; Attachment 3, ground water hydrology report; Attachment 4, supplemental information. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Mar 1998. 516p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE98005077. Source: OSTI; NTIS; INIS; GPO Dep.

The uranium processing site near Naturita, Colorado, is one of 24 inactive uranium mill sites designated to be cleaned up by the U.S. Department of Energy (DOE) under the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), 42 USC § 7901 et seq. Part of the UMTRCA requires that the U.S. Nuclear Regulatory Commission (NRC) concur with the DOE's remedial action plan (RAP) and certify that the remedial action conducted at the site complies with the standards promulgated by the U.S. Environmental Protection Agency (EPA). This RAP serves two purposes. First, it describes the activities that are proposed by the DOE to accomplish remediation and long-term stabilization and control of the radioactive materials at the inactive uranium processing site near Naturita, Colorado. Second, this RAP, upon concurrence and execution by the DOE, the state of Colorado, and the NRC, becomes Appendix B of the cooperative agreement between the DOE and the state of Colorado.

131
(DOE/AL/62350–T17)
Addendum to the 1996 Gunnison Monitoring Report for the Gunnison, Colorado Wetlands Mitigation Plan. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Oct 1997. 28p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE98005076. Source: OSTI; NTIS; INIS; GPO Dep.

This document is an addendum to the 1996 Gunnison Monitoring Report for the Gunnison, Colorado, Wetlands Mitigation Report, dated July 1997. The purpose of this addendum is to: (1) modify how information on plant height and plant species criteria are presented; and (2) provide more detailed information regarding the evaluation of the bare ground criteria at the Camp Ketle site. The information in this addendum is provided at the request of the Bureau of Land Management to aid in future monitoring and evaluation of the wetland mitigation sites.

132
(DOE/AL/62350–T18)
Uranium Mill Tailings Remedial Action Project fiscal year 1997 annual report to stakeholders. Dept. of Energy, Office of Environmental Management, Washington, DC (United States). 31 Dec 1997. 38p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE99000968. Source: OSTI; NTIS; INIS; GPO Dep.

The fiscal year (FY) 1997 annual report is the 19th report on the status of the US Department of Energy's (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project. In 1978, Congress directed the DOE to assess and clean up contamination at 24 designated former uranium processing sites. The DOE is also responsible for cleaning up properties in the vicinity of the sites where wind and water erosion deposited tailings or people removed them from the site for use in construction or landscaping. Cleanup has been undertaken in cooperation with state governments and Indian tribes within whose boundaries the sites are located. It is being conducted in two phases: the surface project and the groundwater project. This report addresses specifics about the UMTRA surface project.

133
(DOE/AL/76406–T1)
Improved risk estimates for carbon tetrachloride. Project status report and technical progress report. Benson, J.M. (Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (United States). Lovelace Respiratory Research Inst.); Nikula, K.J.; Barr, E.B.; Springer, D.L.; Thrall, K.D. Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (United States). [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC04-96AL76406. Order Number DE97009333. Source: OSTI; NTIS; GPO Dep.

Carbon tetrachloride (CCl_4) has been used extensively within the Department of Energy (DOE) nuclear weapons facilities. High levels of CCl_4 at these facilities represent a potential health hazard for workers conducting cleanup operations and for surrounding communities. The overall purpose of these studies is to improve the scientific basis for assessing the health risk associated with human exposure to CCl_4. Specifically, the authors will determine the toxicokinetics of inhaled and ingested CCl_4 in F344/Crl rats. $B6C3F_1$ mice, and Syrian hamsters. They will also evaluate species differences in the metabolism of CCl_4 by rats, mice, hamsters, and man. Dose-response relationships will be determined in all these studies. This information will be used to improve the physiologically based pharmacokinetic (PBPK) model for CCl_4 originally developed by Paustenbach et al. (1988) and more recently revised by Thrall and Kenny (1996). The authors will also provide scientific evidence that CCl_4, like chloroform, is a hepatocarcinogen only when exposure results in cell damage, cell killing, and regenerative cell proliferation.

134
(DOE/CH/10639–T1)
Field evaluation of recycled plastic lumber (RPL) pallets. Final project report. Krishnaswamy, P. (Battelle, Columbus, OH (United States)); Miele, C.R.; Francini, R.B.; Yuracko, K.; Yerace, P. Battelle, Columbus, OH (United States). [1997]. 86p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG02-95CH10639. Order Number DE98000726. Source: OSTI; NTIS; GPO Dep.

One significant component of the waste stream, discarded plastic products and packaging, continues to be a growing portion of the municipal solid waste (MSW). There has been considerable work done in characterizing the quantity and

types of plastics in different waste streams, collection methods, separation, sorting as well as technologies for processing post-consumer mixed plastics. The focus in recent years has been the development of markets for recycled plastic products, which constitutes the second half of the material flow diagram cycle shown in Figure 1. One key product that holds significant promise for plastics recycling to be both technically feasible and economically viable is Recycled Plastic Lumber (RPL). The contents of this report forms the second phase of a two-phase pilot project on developing specifications and standards for a product fabricated from RPL. Such standards and specifications are needed to prepare procurement guidelines for state and federal agencies interested in purchasing products made from recycled materials. The first phase focused on establishing a procedure to evaluate RPL product,s such as pallets, in a laboratory setting while this phase focuses on field evaluation of RPL pallets in service. This effort is critical in the development of new markets for RPL products. A brief summary of the findings from Phase 1 of this effort is presented next.

135
(DOE/CH/10865–1)
Description of the U.S. Geological Survey's water-quality sampling and water-level monitoring program at the Hallam Nuclear Facility, June through September 1996. Geological Survey, Lincoln, NE (United States). [1997]. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AI02-96CH10865. Order Number DE97008069. Source: OSTI; NTIS; INIS; GPO Dep.

A water-quality and water-level program of the US Department of Energy (USDOE) in cooperation with the US Geological Survey (USGS) was re-established in June 1996 to develop six new USDOE observation wells, collect one set of water-quality samples from 17 of the 19 USDOE observation wells, and take monthly water-level measurements for a 3-month period in all 19 USDOE observation wells at the Hallam Nuclear Facility, Hallam, Nebraska. Thirteen of the observation wells were installed by HWS Consulting Group, Inc., in June 1993 and the remaining six were installed by Applied Research Associates in August 1995.

136
(DOE/CH/10898–T1)
Description of the U.S. Geological Survey's water-quality sampling and water-level monitoring program at the Hallam Nuclear Facility, August through September 1997. Geological Survey, Water Resources Div., Lincoln, NE (United States). 14 Nov 1997. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AI02-97CH10898. Order Number DE99000095. Source: OSTI; NTIS; INIS; GPO Dep.

A water-quality and water-level program between the US Department of Energy (USDOE) and the US Geological Survey (USGS) was re-established in August 1997 to (1) collect one set of water-quality samples from 17 of the 19 USDOE monitor wells, and (2) make five water-level measurements during a 2-month period from the 19 USDOE monitor wells at the Hallam Nuclear Facility, Hallam, Nebraska. Data from these wells are presented.

137
(DOE/EIS–0200-F-Vol.2)
Final waste management programmatic environmental impact statement for managing treatment, storage, and disposl of radioactive and hazardous waste. Volume II. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). [1997]. 769p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE97007519. Source: OSTI; NTIS; INIS; GPO Dep.

The Final Waste Management Programmatic Environmental Impact Statement (WM PEIS) examines the potential environmental and cost impacts of strategic management alternatives for managing five types of radioactive and hazardous wastes that have resulted and will continue to result from nuclear defense and research activities at a variety of sites around the United States. The five waste types are low-level mixed waste, low-level waste, transuranic waste, high-level waste, and hazardous waste. The WM PEIS provides information on the impacts of various siting alternatives which the Department of Energy (DOE) will use to decide at which sites to locate additional treatment, storage, and disposal capacity for each waste type.Volume II is an integral part of the Office of Environmental Management's (EM's) Waste Management Programmatic Environmental Impact Statement (WM PEIS), which portrays the impacts of EM's waste management activities at each of the 17 major DOE sites evaluated in the WM PEIS.

138
(DOE/EIS–0200-F-Vol.3)
Final waste management programmatic environmental impact statement for managing treatment, storage, and disposal of radioactive and hazardous waste. Volume III of V. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). [1997]. 650p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE97007520. Source: OSTI; NTIS; INIS; GPO Dep.

The Final Waste Management Programmatic Environmental Impact Statement (WM PEIS) examines the potential environmental and cost impacts of strategic management alternatives for managing five types of radioactive and hazardous wastes that have resulted and will continue to result from nuclear defense and research activities at a variety of sites around the United States. The five waste types are low-level mixed waste, low-level waste, transuranic waste, high-level waste, and hazardous waste. The WM PEIS provides information on the impacts of various siting alternatives which the Department of Energy (DOE) will use to decide at which sites to locate additional treatment, storage, and disposal capacity for each waste type.

139
(DOE/EIS–0200-F-Vol.4)
Final waste management programmatic environmental impact statement for managing treatment, storage, and disposal of radioactive and hazardous waste. Volume IV of V. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). [1997]. 514p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE97007521. Source: OSTI; NTIS; INIS; GPO Dep.

The Final Waste Management Programmatic Environmental Impact Statement (WM PEIS) examines the potential environmental and cost impacts of strategic management alternatives for managing five types of radioactive and hazardous wastes that have resulted and will continue to result

from nuclear defense and research activities at a variety of sites around the United States. The five waste types are low-level mixed waste, low-level waste, transuranic waste, high-level waste, and hazardous waste. The WM PEIS provides information on the impacts of various siting alternatives which the Department of Energy (DOE) will use to decide at which sites to locate additional treatment, storage, and disposal capacity for each waste type.Transportation is an integral component of the alternatives being considered for each type of radioactive waste in the U.S. Department of Energy (DOE) Waste Management Programmatic Environmental Impact Statement (WM PEIS). The types of radioactive waste considered in Part I are high-level waste (HLW), low-level waste (LLW), transuranic waste (TRUW), and low-level mixed waste (LLMW). For some alternatives, radioactive waste would be shipped among the DOE sites at various stages of the treatment, storage, and disposal (TSD) process. The magnitude of the transportation-related activities varies with each alternative, ranging from minimal transportation for decentralized approaches to significant transportation for some centralized approaches. The human health risks associated with transporting various waste materials were assessed to ensure a complete appraisal of the impacts of each PEIS alternative being considered.

140
(DOE/EIS–0200-F-Vol.5)
Final waste management programmatic environmental impact statement for managing treatment, storage, and disposal of radioactive and hazardous waste. Volume V of V. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). [1997]. 900p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE97007522. Source: OSTI; NTIS; INIS; GPO Dep.

The Final Waste Management Programmatic Environmental Impact Statement (WM PEIS) examines the potential environmental and cost impacts of strategic management alternatives for managing five types of radioactive and hazardous wastes that have resulted and will continue to result from nuclear energy research and the development, production, and testing of nuclear weapons at a variety of sites around the United States. The five waste types are low-level mixed waste, low-level waste, transuranic waste, high-level waste, and hazardous waste. The WM PEIS provides information on the impacts of various siting alternatives, which the Department of Energy (DOE) will use to decide at which sites to locate additional treatment, storage, and disposal capacity for each waste type. This information includes the cumulative impacts of combining future siting configurations for the five waste types and the collective impacts of other past, present, and reasonably foreseeable future activities. The selected waste management facilities being considered for these different waste types are treatment and disposal facilities for low-level mixed waste; treatment and disposal facilities for low-level waste; treatment and storage facilities for transuranic waste in the event that treatment is required before disposal; storage facilities for created (vitrified) high-level waste canisters; and treatment of nonwastewater hazardous waste by DOE and commercial vendors. In addition to the No Action Alternative, which includes only existing of approved waste management facilities, the alternatives for each of the waste-type configurations include Decentralized, Regionalized, and Centralized Alternatives for using existing and operating new waste management facilities. However, the siting, construction, and operations of any new facility at a selected site will not be decided until completion of a sitewide or project-specific environmental impact review.

141
(DOE/EIS–0290-D)
Advanced mixed waste treatment project draft environmental impact statement. USDOE Idaho Operations Office, Office of Environmental Management, Idaho Falls, ID (United States). Jul 1998. [400p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE Idaho Operations Office, Idaho Falls, ID (United States). Order Number DE98007360. Source: OSTI; NTIS; INIS; GPO Dep.

The AMWTP DEIS assesses the potential environmental impacts associated with four alternatives related to the construction and operation of a proposed waste treatment facility at the INEEL. Four alternatives were analyzed: The No Action Alternative, the Proposed Action, the Non-Thermal Treatment Alternative, and the Treatment and Storage Alternative. The proposed AMWTP facility would treat low-level mixed waste, alpha-contaminated low-level mixed waste, and transuranic waste in preparation for disposal. Transuranic waste would be disposed of at the Waste isolation Pilot Plant in New Mexico. Low-level mixed waste would be disposed of at an approval disposal facility depending on decisions to be based on DOE's Final Waste Management Programmatic Environmental Impact Statement. Evaluation of impacts on land use, socio-economics, cultural resources, aesthetic and scenic resources, geology, air resources, water resources, ecological resources, noise, traffic and transportation, occupational and public health and safety, INEEL services, and environmental justice were included in the assessment. The AMWTP DEIS identifies as the Preferred Alternative the Proposed Action, which is the construction and operation of the AMWTP facility.

142
(DOE/EM–0328)
Environmental management activities. USDOE Office of Environmental Management, Washington, DC (United States). 1997. 72p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE97006924. Source: OSTI; NTIS; INIS; GPO Dep.

The Office of Environmental Management (EM) has been delegated the responsibility for the Department of Energy's (DOE's) cleanup of the nuclear weapons complex. The nature and magnitude of the waste management and environmental remediation problem requires the identification of technologies and scientific expertise from domestic and foreign sources. Within the United States, operational DOE facilities, as well as the decontamination and decommissioning of inactive facilities, have produced significant amounts of radioactive, hazardous, and mixed wastes. In order to ensure worker safety and the protection of the public, DOE must: (1) assess, remediate, and monitor sites and facilities; (2) store, treat, and dispose of wastes from past and current operations; and (3) develop and implement innovative technologies for environmental restoration and waste management. The EM directive necessitates looking beyond domestic capabilities to technological solutions found outside US borders. Following the collapse of the Soviet regime, formerly restricted elite Soviet scientific expertise

became available to the West. EM has established a cooperative technology development program with Russian scientific institutes that meets domestic cleanup objectives by: (1) identifying and accessing Russian EM-related technologies, thereby leveraging investments and providing cost-savings; (2) improving access to technical information, scientific expertise, and technologies applicable to EM needs; and (3) increasing US private sector opportunities in Russian in EM-related areas.

143
(DOE/EM–0330)
Fiscal year 1996 progress in implementing Section 120 of the Comprehensive Environmental Response, Compensation, and Liability Act. Tenth annual report to Congress. USDOE, Washington, DC (United States). Dec 1997. 155p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98001810. Source: OSTI; NTIS; GPO Dep.

Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Public Law 96-510), commonly known as Superfund, in 1980. The Superfund Amendments and Reauthorization Act (SARA) (Public Law 99-499), which amended CERCLA in 1986, added Section 120 regarding the cleanup of contaminated sites at Federal facilities. Under Section 120(e)(5) of CERCLA, each department, agency, or instrumentality of the Federal government responsible for compliance with Section 120 must submit an annual report to Congress concerning its progress in implementing the requirements of Section 120. The report must include information on the progress in reaching Interagency Agreements (IAGs), conducting remedial investigation and feasibility studies (RI/FSs), and performing remedial actions. Federal agencies that own or operate facilities on the National Priorities List (NPL) are required to begin an RI/FS for these facilities within 6 months after being placed on the NPL. Remediation of these facilities is addressed in an IAG between the Federal agency, the US Environmental Protection Agency (EPA), and in some instances the state within which the facility is located.

144
(DOE/EM–0332)
1996 annual report on low-level radioactive waste management progress. Report to Congress. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Nov 1997. 31p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98001966. Source: OSTI; NTIS; INIS; GPO Dep.

This report is prepared in response to the Low-Level Radioactive Waste Policy Act (the Act), Public Law 96-573, 1980, as amended by the Low-Level Radioactive Waste Policy Amendments Act of 1985, Public Law 99-240. The report summarizes the activities during calendar year 1996 related to the establishment of new disposal facilities for commercially-generated low-level radioactive waste. The report emphasizes significant issues and events that have affected progress in developing new disposal facilities, and also includes an introduction that provides background information and perspective on US policy for low-level radioactive waste disposal.

145
(DOE/EM–0341)
Equity of commercial low-level radioactive waste disposal fees. Report to Congress. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Feb 1998. 18p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98004690. Source: OSTI; NTIS; INIS; GPO Dep.

In the Report accompanying the Fiscal Year 1997 Senate Energy and Water Development Appropriations Bill, the Senate Appropriations Committee directed the Department of Energy (DOE) to prepare a study of the costs of operating a low-level radioactive waste (LLW) disposal facility such as the one at Barnwell, South Carolina, and to determine whether LLW generators are paying equitable disposal fees. The disposal costs of four facilities are reviewed in this report, two operating facilities and two planned facilities. The operating facilities are located at Barnwell, South Carolina, and Richland, Washington. They are operated by Chem-Nuclear, LLC, (Chem-Nuclear), and US Ecology, Inc., (US Ecology), respectively. The planned facilities are expected to be built at Ward Valley, California, and Sierra Blanca, Texas. They will be operated by US Ecology and the State of Texas, respectively. This report found that disposal fees vary significantly among facilities for a variety of reasons. However, the information suggests that at each disposal facility, LLW generators pay equitable disposal fees.

146
(DOE/EM–0343)
ROTO PEEN Scalar and VAC-PAC® system. Dept. of Energy, Washington, DC (United States). Feb 1998. 36p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Source: OSTI (Free of Charge); INIS; DOE and DOE contractors free from OSTI (United States); public availability from Center for Environmental Management Information (United States), 1-800-736-3282.

The Pentek, Inc., milling technology, comprising the ROTO PEEN Scaler and the VAC-PAC® waste collection system, is a fully developed and commercialized technology used to remove hazardous coatings from concrete and steel floors, walls, ceilings, and structural components. This report describes a demonstration of the Pentek, Inc., milling system to remove the paint coating from 650 ft^2 of concrete flooring on the service floor of the Chicago Pile-5 (CP-5) Research Reactor. CP-5 is a heavy-water moderated and cooled, highly enriched, uranium-fueled thermal reactor designed to supply neutrons for research. The reactor had a thermal-power rating of 5 megawatts and was operated continuously for 25 years until its final shutdown in 1979. These 25 years of operation produced activation and contamination characteristics representative of other nuclear facilities within the Department of Energy (DOE) complex and the commercial nuclear sector. CP-5 contains many of the essential features of other DOE and commercial nuclear facilities and can be used safely as a demonstration facility for the evaluation of innovative technologies for the future D and D of much larger, more highly contaminated facilities.

147
(DOE/EM–0344)
Rotary peening with captive shot. Dept. of Energy, Washington, DC (United States). Feb 1998. 38p. Sponsored by

USDOE Office of Environmental Management, Washington, DC (United States). Source: OSTI (Free of Charge); INIS; DOE and DOE contractors free from OSTI (United States); public availability from Center for Environmental Management Information (United States), 1-800-736-3282.

Roto Peen with captive shot removes coatings and surface contamination from concrete floors. The objective of treating radioactively contaminated concrete floors during the Deactivation and Decommissioning (D and D) process is to reduce the surface contamination levels to meet regulatory criteria for unrestricted use. The US Department of Energy (DOE) Chicago Operations office and DOE's Federal Energy Technology Center (FETC) jointly sponsored a Large-Scale Demonstration Project (LSDP) at the Chicago Pile-5 Research Reactor (CP-5) at Argonne National Laboratory-East (ANL). The objective of the LSDP is to demonstrate potentially beneficial D and D technologies in comparison with current baseline technologies. As part of the LSDP, roto Peen with captive shot was demonstrated March 17–20, 1997, to treat a 20 x 25 ft area of radioactively contaminated concrete floor on the service level of the CP-5 building.

148
(DOE/EM–0345)
GammaCam™ radiation imaging system. Dept. of Energy, Washington, DC (United States). Feb 1998. 33p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Source: OSTI (Free of Charge); INIS; DOE and DOE contractors free from OSTI (United States); public availability from Center for Environmental Management (United States), 1-800-736-3282.

GammaCam™, a gamma-ray imaging system manufactured by AIL System, Inc., would benefit a site that needs to locate radiation sources. It is capable of producing a two-dimensional image of a radiation field superimposed on a black and white visual image. Because the system can be positioned outside the radiologically controlled area, the radiation exposure to personnel is significantly reduced and extensive shielding is not required. This report covers the following topics: technology description; performance; technology applicability and alternatives; cost; regulatory and policy issues; and lessons learned. The demonstration of GammaCam™ in December 1996 was part of the Large-Scale Demonstration Project (LSDP) whose objective is to select and demonstrate potentially beneficial technologies at the Argonne National Laboratory-East (ANL) Chicago Pile-5 Research Reactor (CP-5). The purpose of the LSDP is to demonstrate that by using innovative and improved decontamination and decommissioning (D and D) technologies from various sources, significant benefits can be achieved when compared to baseline D and D technologies.

149
(DOE/EM–0346)
Centrifugal shot blast system. Dept. of Energy, Washington, DC (United States). Feb 1998. 42p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Source: OSTI (Free of Charge); INIS; DOE and DOE contractors free from OSTI (United States); public availability from Center for Environmental Management Information (United States), 1-800-736-3282.

This report describes a demonstration of Concrete cleaning, Inc., modified centrifugal shot blast technology to remove the paint coating from concrete flooring. This demonstration is part of the Chicago Pile-5 (CP-5) Large-Scale Demonstration Project (LSDP) sponsored by the US Department of Energy (DOE), office of Science and Technology (OST), Deactivation and Decommissioning Focus Area (DDFA). The objective of the LSDP is to select and demonstrate potentially beneficial technologies at the Argonne National Laboratory-East (ANL) CP-5 Research Reactor. The purpose of the LSDP is to demonstrate that using innovative and improved decontamination and decommissioning (D and D) technologies from various sources can result in significant benefits, such as decreased cost and increased health and safety, as compared with baseline D and D technologies. Potential markets exist for the innovative centrifugal shot blast system at the following sites: Fernald Environmental Management Project, Los Alamos, Nevada, Oak Ridge Y-12 and K-25, Paducah, Portsmouth Gaseous Diffusion site, and the Savannah River Site. This information is based on a revision to the OST Linkage Tables dated August 4, 1997.

150
(DOE/EM–0347)
Surface Contamination Monitor and Survey Information Management System. Dept. of Energy, Washington, DC (United States). Feb 1998. 29p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Source: OSTI (Free of Charge); INIS; DOE and DOE contractors free from OSTI (United States); public availability from Center for Environmental Management Information (United States), 1-800-736-3282.

Shonka Research Associates, Inc.'s (SRA) Surface Contamination Monitor and Survey Information management System (SCM/SIMS) is designed to perform alpha and beta radiation surveys of floors and surfaces and document the measured data. The SRA-SCM/SIMS technology can be applied to routine operational surveys, characterization surveys, and free release and site closure surveys. Any large nuclear site can make use of this technology. This report describes a demonstration of the SRA-SCM/SIMS technology. This demonstration is part of the chicago Pile-5 (CP-5) Large-Scale Demonstration Project (LSDP) sponsored by the US Department of Energy (DOE), Office of Science and Technology (ST), Deactivation and Decommissioning Focus Area (DDFA). The objective of the LSDP is to select and demonstrate potentially beneficial technologies at the Argonne National Laboratory-East's (ANL) CP-5 Research Reactor Facility. The purpose of the LSDP is to demonstrate that by using innovative and improved deactivation and decommissioning (D and D) technologies from various sources, significant benefits can be achieved when compared to baseline D and D technologies.

151
(DOE/EM–0349)
Proceedings of a workshop on uses of depleted uranium in storage, transportation and repository facilities. Dept. of Energy Assistant Secretary for Environmental Management, Office of the Deputy Assistant Secretary for Science and Technology, Washington, DC (United States). [1997]. [200p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE Office of Civilian Radioactive Waste Management, Washington, DC (United States);USDOE Assistant Secretary for Nuclear Energy, Washington, DC (CONF-970793–PROC.: US Department of Energy workshop on uses of depleted

uranium in storage, transportation and repository facilities, Las Vegas, NV (United States), 15-17 Jul 1997). Order Number DE99000797. Source: OSTI; NTIS; INIS; GPO Dep.

A workshop on the potential uses of depleted uranium (DU) in the repository was organized to coordinate the planning of future activities. The attendees, the original workshop objective and the agenda are provided in Appendices A, B and C. After some opening remarks and discussions, the objectives of the workshop were revised to: (1) exchange information and views on the status of the Department of Energy (DOE) activities related to repository design and planning; (2) exchange information on DU management and planning; (3) identify potential uses of DU in the storage, transportation, and disposal of high-level waste and spent fuel; and (4) define the future activities that would be needed if potential uses were to be further evaluated and developed. This summary of the workshop is intended to be an integrated resource for planning of any future work related to DU use in the repository. The synopsis of the first day's presentations is provided in Appendix D. Copies of slides from each presenter are presented in Appendix E.

152
(DOE/EM–0350)
Integrated process analyses studies on mixed low level and transuranic wastes. Summary report. Dept. of Energy, Office of Science and Technology, Washington, DC (United States). Dec 1997. 107p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE99000888. Source: OSTI; NTIS; INIS; GPO Dep.

Options for integrated thermal and nonthermal treatment systems for mixed low-level waste (MLLW) are compared such as total life cycle cost (TLCC), cost sensitivities, risk, energy requirements, final waste volume, and aqueous and gaseous effluents. The comparisons were derived by requiring all conceptual systems to treat the same composition of waste with the same operating efficiency. Thus, results can be used as a general guideline for the selection of treatment and disposal concepts. However, specific applications of individual systems will require further analysis. The potential for cost saving options and the research and development opportunities are summarized.

153
(DOE/EM–0351)
Polyethylene macroencapsulation - mixed waste focus area. OST reference No. 30. USDOE Office of Science and Technology, Washington, DC (United States). Research and Technical Assessment Div. Feb 1998. 19p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Source: OSTI (Free of Charge); INIS; DOE and DOE contractors free from OSTI (United States); public availability from Center for Environmental Management Information (United States), 1-800-736-3282.

The lead waste inventory throughout the US Department of Energy (DOE) complex has been estimated between 17 million and 24 million kilograms. Decontamination of at least a portion of the lead is viable but at a substantial cost. Because of various problems with decontamination and its limited applicability and the lack of a treatment and disposal method, the current practice is indefinite storage, which is costly and often unacceptable to regulators. Macroencapsulation is an approved immobilization technology used to treat radioactively contaminated lead solids and mixed waste debris. (Mixed waste is waste materials containing both radioactive and hazardous components). DOE has funded development of a polyethylene extrusion macroencapsulation process at Brookhaven National Laboratory (BNL) that produces a durable, leach-resistant waste form. This innovative macroencapsulation technology uses commercially available single-crew extruders to melt, convey, and extrude molten polyethylene into a waste container in which mixed waste lead and debris are suspended or supported. After cooling to room temperature, the polyethylene forms a low-permeability barrier between the waste and the leaching media.

154
(DOE/EM–0352)
Cyanide destruction/immobilization of residual sludge - mixed waste focus area. Innovative Technology Summary Report. USDOE Office of Environmental Management, Washington, DC (United States). Feb 1998. 16p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Source: OSTI (Free of Charge); INIS; DOE and DOE contractors free from OSTI (United States); public availability from Center for Environmental Management Information (United States), 1-800-736-3282.

Innovative Technology Summary Reports are designed to provide potential users with the information they need to quickly determine if a technology would apply to a particular environmental management problem. They are also designed for readers who may recommend that a technology be considered by prospective users. Each report describes a technology, system, or process that has been developed and tested with funding from DOE's Office of Science and Technology (OST). A report presents the full range of problems that a technology, system, or process will address and its advantages to the DOE cleanup in terms of system performance, cost, and cleanup effectiveness. Most reports include comparisons to baseline technologies as well as other competing technologies. Information about commercial availability and technology readiness for implementation is also included. Innovative Technology Summary Reports are intended to provide summary information. References for more detailed information are provided in an appendix. Efforts have been made to provide key data describing the performance, cost, and regulatory acceptance of the technology. If this information was not available at the time of publication, the omission is noted.

155
(DOE/EM–0353)
FRHAM-TEX™ cool suit - OST reference No. 1854. Deactivation and decommissioning focus area. USDOE Office of Science and Technology, Washington, DC (United States). Office of Program Analysis. Feb 1998. 15p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Source: OSTI (Free of Charge); INIS; DOE and DOE contractors free from OSTI; public availability from Center for Environmental Management Information, 1-800-736-3282.

This paper describes a demonstration project for the FRHAM-TEX Cool Suit™ manufactured by FRHAM Safety Products. It is a one-piece, disposable, breathable, waterproof coverall designed to permit moisture generated by the wearer to be transmitted outside the suit. The performance of this suit was compared to a Tyvek® suit as a baseline.

The suit is proposed as safety ware for workers at decontamination and decommissioning projects.

156
(DOE/EM–0354)
NuFab™ anti-contamination suit - OST reference No. 1855. Deactivation and decommissioning focus area. USDOE Office of Science and Technology, Washington, DC (United States). Office of Program Analysis. Feb 1998. 15p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Source: OSTI (Free of Charge); INIS; DOE and DOE contractors free from OSTI; public availability from Center for Environmental Management Information, 1-800-736-3282.

Radiation workers at all US Department of Energy (DOE) sites require some form of protective clothing when performing radiological work. A large number of contaminated facilities at DOE site are currently or will eventually undergo some form of decontamination and decommissioning (D&D), requiring some type of protective clothing, often in multiple layers. Protective clothing that does not allow perspiration to escape causes heat stress, which lowers worker comfort and productivity. This report describes the NuFab™ anti-contamination. The suit is a one-piece, disposable, breathable, waterproof coverall with a single front zipper. Constructed of tri-laminated composite material using spunbonded polypropylene and microporous film layers, the suit is certified as incineratorable.

157
(DOE/EM–0355)
Pipe Crawler® internal piping characterization system - deactivation and decommissioning focus area. Innovative Technology Summary Report. USDOE Office of Environmental Management, Washington, DC (United States). Feb 1998. 36p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Source: OSTI (Free of Charge); INIS; DOE and DOE contractors free from OSTI (United States); public availability from Center for Environmental Management Information (United States), 1-800-736-3282.

Pipe Crawler® is a pipe surveying system for performing radiological characterization and/or free release surveys of piping systems. The technology employs a family of manually advanced, wheeled platforms, or crawlers, fitted with one or more arrays of thin Geiger Mueller (GM) detectors operated from an external power supply and data processing unit. Survey readings are taken in a step-wise fashion. A video camera and tape recording system are used for video surveys of pipe interiors prior to and during radiological surveys. Pipe Crawler® has potential advantages over the baseline and other technologies in areas of cost, durability, waste minimization, and intrusiveness. Advantages include potentially reduced cost, potential reuse of the pipe system, reduced waste volume, and the ability to manage pipes in place with minimal disturbance to facility operations. Advantages over competing technologies include potentially reduced costs and the ability to perform beta-gamma surveys that are capable of passing regulatory scrutiny for free release of piping systems.

158
(DOE/EM–0356)
In situ permeable flow sensor - OST reference No. 99. Subsurface contaminants focus area. USDOE Office of Science and Technology, Washington, DC (United States). Office of Program Analysis. Feb 1998. 19p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Source: OSTI (Free of Charge); INIS; DOE and DOE contractors free from OSTI; public availability from Center for Environmental Management Information, 1-800-736-3282.

This summary reports describes the In Situ Permeable Flow Sensor (ISPFS) developed to directly measure the direction and velocity of groundwater flow at a point in saturated soil sediments. The ISPFS provides information for locating, designing, and monitoring waste disposal sites, and for monitoring remediated waste sites. The design and performance are described and compared to alternative methods. Economic, regulatory, and policy issues are discussed. Applicability of the ISPFS to specific situations is also summarized. 8 refs., 7 figs., 3 tabs.

159
(DOE/EM–0357-Vol.1)
Report to Congress on the U.S. Department of Energy's Environmental Management Science Program: Research funded and its linkages to environmental cleanup problems. Volume 1 of 3 – Report and Appendix A. Department of Energy, Office of Environmental Management, Washington, DC (United States). Apr 1998. 153p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98005102. Source: OSTI; NTIS; INIS; GPO Dep.

This report is submitted in response to a Congressional request and is intended to communicate the nature, content, goals, and accomplishments of the Environmental Management Science Program (EMSP) to interested and affected parties in the Department and its contractors, at Federal agencies, in the scientific community, and in the general public. The EMSP was started in response to a request to mount an effort in longer term basic science research to seek new and innovative cleanup methods to replace current conventional approaches which are often costly and ineffective. Section 1, "Background of the Program," provides information on the evolution of the EMSP and how it is managed, and summarizes recent accomplishments. Section 2, "Research Award Selection Process," provides an overview of the ongoing needs identification process, solicitation development, and application review for scientific merit and programmatic relevance. Section 3, "Linkages to Environmental Cleanup Problems," provides an overview of the major interrelationships (linkages) among EMSP basic research awards, Environmental Management problem areas, and high cost projects. Section 4, "Capitalizing on Science Investments," discusses the steps the EMSP plans to use to facilitate the application of research results in Environmental Management strategies through effective communication and collaboration. Appendix A contains four program notices published by the EMSP inviting applications for grants.

160
(DOE/EM–0357-Vol.2)
Report to Congress on the U.S. Department of Energy's Environmental Management Science Program: Research funded and its linkages to environmental cleanup problems, and Environmental Management Science Program research award abstracts. Volume 2 of 3 – Appendix B. Department of Energy, Office of Environmental Management, Washington, DC (United States). Apr

1998. 448p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98005103. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy's Environmental Management Science Program (EMSP) serves as a catalyst for the application of scientific discoveries to the development and deployment of technologies that will lead to reduction of the costs and risks associated with cleaning up the nation's nuclear complex. Appendix B provides details about each of the 202 research awards funded by the EMSP. This information may prove useful to researchers who are attempting to address the Department's environmental management challenges in their work, program managers who are planning, integrating, and prioritizing Environmental Management projects, and stakeholders and regulators who are interested in the Department's environmental challenges. The research award information is organized by the state and institution in which the lead principal investigator is located. In many cases, the lead principal investigator is one of several investigators at a number of different institutions. In these cases, the lead investigator (major collaborator) at each of the additional institutions is listed. Each research award abstract is followed by a list of high cost projects that can potentially be impacted by the research results. High cost projects are Environmental Management projects that have total costs greater than $50 million from the year 2007 and beyond, based on the March 1998 Accelerating Cleanup: Paths to Closure Draft data, and have costs or quantities of material associated with an Environmental Management problem area. High cost projects which must remain active in the year 2007 and beyond to manage high risk are also identified. Descriptions of these potentially related high cost Environmental Management projects can be found in Appendix C. Additional projects in the same problem area as a research award can be located using the Index of High Cost Environmental Management Projects by Problem Area, at the end of Appendices B and C.

161
(DOE/EM–0357-Vol.3)
Report to Congress on the U.S. Department of Energy's Environmental Management Science Program: Research funded and its linkages to environmental cleanup problems, and high out-year cost environmental management project descriptions. Volume 3 of 3 – Appendix C. Department of Energy, Office of Environmental Management, Washington, DC (United States). Apr 1998. 314p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98005104. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy's Environmental Management Science Program (EMSP) serves as a catalyst for the application of scientific discoveries to the development and deployment of technologies that will lead to reduction of the costs and risks associated with cleaning up the nation's nuclear complex. Appendix C provides details about each of the Department's 82 high cost projects and lists the EMSP research awards with potential to impact each of these projects. The high cost projects listed are those having costs greater than $50 million in constant 1998 dollars from the year 2007 and beyond, based on the March 1998 Accelerating Cleanup: Paths to Closure Draft data, and having costs of quantities of material associated with an environmental management problem area. The high cost project information is grouped by operations office and organized by site and project code. Each operations office section begins with a list of research needs associated with that operations office. Potentially related research awards are listed by problem area in the Index of Research Awards by Environmental Management Problem Area, which can be found at the end of appendices B and C. For projects that address high risks to the public, workers, or the environment, refer also the Health/Ecology/Risk problem area awards. Research needs are programmatic or technical challenges that may benefit from knowledge gained through basic research.

162
(DOE/EM–0360)
Tanks focus area. Annual report. Frey, J. USDOE Office of Environmental Management, Washington, DC (United States). 1997. 26p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98005229. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy Office of Environmental Management is tasked with a major remediation project to treat and dispose of radioactive waste in hundreds of underground storage tanks. These tanks contain about 90,000,000 gallons of high-level and transuranic wastes. We have 68 known or assumed leaking tanks, that have allowed waste to migrate into the soil surrounding the tank. In some cases, the tank contents have reacted to form flammable gases, introducing additional safety risks. These tanks must be maintained in the safest possible condition until their eventual remediation to reduce the risk of waste migration and exposure to workers, the public, and the environment. Science and technology development for safer, more efficient, and cost-effective waste treatment methods will speed up progress toward the final remediation of these tanks. The DOE Office of Environmental Management established the Tanks Focus Area to serve as the DOE-EM's technology development program for radioactive waste tank remediation in partnership with the Offices of Waste Management and Environmental Restoration. The Tanks Focus Area is responsible for leading, coordinating, and facilitating science and technology development to support remediation at DOE's four major tank sites: the Hanford Site in Washington State, Idaho National Engineering and Environmental Laboratory in Idaho, Oak Ridge Reservation in Tennessee, and the Savannah River Site in South Carolina. The technical scope covers the major functions that comprise a complete tank remediation system: waste retrieval, waste pretreatment, waste immobilization, tank closure, and characterization of both the waste and tank. Safety is integrated across all the functions and is a key component of the Tanks Focus Area program.

163
(DOE/EM–0361)
Subsurface Contaminants Focus Area annual report 1997. USDOE Office of Environmental Management, Subsurface Contaminants Focus Area, Washington, DC (United States). [1997]. 21p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98005486. Source: OSTI; NTIS; INIS; GPO Dep.

In support of its vision for technological excellence, the Subsurface Contaminants Focus Area (SCFA) has identified three strategic goals. The three goals of the SCFA are: Contain and/or stabilize contamination sources that pose an

imminent threat to surface and ground waters; Delineate DNAPL contamination in the subsurface and remediate DNAPL-contaminated soils and ground water; and Remove a full range of metal and radionuclide contamination in soils and ground water. To meet the challenges of remediating subsurface contaminants in soils and ground water, SCFA funded more than 40 technologies in fiscal year 1997. These technologies are grouped according to the following product lines: Dense Nonaqueous-Phase Liquids; Metals and Radionuclides; Source Term Containment; and Source Term Remediation. This report briefly describes the SCFA 1997 technologies and showcases a few key technologies in each product line.

164
(DOE/EM–0362)
Accelerating cleanup: Paths to closure. Dept. of Energy, Office of Environmental Management, Washington, DC (United States). Jun 1998. [300p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98007081. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the status of Environmental Management's (EM's) cleanup program and a direction forward to complete achievement of the 2006 vision. Achieving the 2006 vision results in significant benefits related to accomplishing EM program objectives. As DOE sites accelerate cleanup activities, risks to public health, the environment, and worker safety and health are all reduced. Finding more efficient ways to conduct work can result in making compliance with applicable environmental requirements easier to achieve. Finally, as cleanup activities at sites are completed, the EM program can focus attention and resources on the small number of sites with more complex cleanup challenges. Chapter 1 describes the process by which this report has been developed and what it hopes to accomplish, its relationship to the EM decision-making process, and a general background of the EM mission and program. Chapter 2 describes how the site-by-site projections were constructed, and summarizes, for each of DOE's 11 Operations/Field Offices, the projected costs and schedules for completing the cleanup mission. Chapter 3 presents summaries of the detailed cleanup projections from three of the 11 Operations/Field Offices: Rocky Flats (Colorado), Richland (Washington), and Savannah River (South Carolina). The remaining eight Operations/Field Office summaries are in Appendix E. Chapter 4 reviews the cost drivers, budgetary constraints, and performance enhancements underlying the detailed analysis of the 353 projects that comprise EM's accelerated cleanup and closure effort. Chapter 5 describes a management system to support the EM program. Chapter 6 provides responses to the general comments received on the February draft of this document.

165
(DOE/EM–0365)
Annual report of waste generation and pollution prevention progress 1997. Dept. of Energy, Albuquerque Operations Office, NM (United States). Sep 1998. 144p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98006498. Source: OSTI; NTIS; INIS; GPO Dep.

This sixth Annual Report presents and analyzes DOE Complex-wide waste generation and pollution prevention activities at 36 reporting sites from 1993 through 1997. In May 1996, the Secretary of Energy established a 50 percent Complex-Wide Waste Reduction Goal (relative to the 1993 baseline) for routine operations radioactive and hazardous waste generation, to be achieved by December 31, 1999. Excluding sanitary waste, routine operations waste generation increased three percent from 1996 to 1997, and decreased 61 percent overall from 1993 to 1997. DOE has achieved its Complex-Wide Waste Reduction Goals for routine operations based upon a comparison of 1997 waste generation to the 1993 baseline. However, it is important to note that increases in low-level radioactive and low-level mixed waste generation could reverse this achievement. From 1996 to 1997, low-level radioactive waste generation increased 10 percent, and low-level mixed waste generation increased slightly. It is critical that DOE sites continue to reduce routine operations waste generation for all waste types, to ensure that DOE's Complex-Wide Waste Reduction Goals are achieved by December 31, 1999.

166
(DOE/EM–0368)
Innovative technology summary report: Houdini™ I and II remotely operated vehicle. Dept. of Energy, Office of Environmental Management, Washington, DC (United States). Jul 1998. 31p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98007484. Source: OSTI; NTIS; INIS; Public inquiries to Center for Environmental Management Information, 1-800-736-3282 (United States); DOE and DOE contractors receive free stock copies from OSTI while they last; GPO Dep.

The US Department of Energy (DOE) is responsible for cleaning up and closing 273 large, aging, underground tanks the department has used for storing approximately 1 million gal of high- and low-level radioactive and mixed waste. The waste's radioactivity precludes humans from working in the tanks. A remote-controlled retrieval method must be used. The Houdini robot addresses the need for vehicle-based, rugged, remote manipulation systems that can perform waste retrieval, characterization, and inspection tasks. Houdini-I was delivered to ORNL in September 1996, deployed in a cold test facility in November, and first deployed in the gunite tanks in June 1997. Since then, it has seen continuous (still on-going) service at ORNL, providing a critical role in the cleanup of two gunite tanks, W-3 and W-4, in the GAAT NTF. Houdini-I has proven rugged, capable of waste retrieval, and able to withstand high reaction force operations such as wall core sampling. It's even able to operate while hanging, which was the case when Houdini was used to cut and remove cables and steel pipes hanging below manways in Tank W-3. Based upon the lessons learned at ORNL, Houdini's design has been completely overhauled. A second generation system, Houdini-II, is now being built.

167
(DOE/EM–0371)
Innovative technology summary report: Transportable vitrification system. Dept. of Energy, Office of Environmental Management, Washington, DC (United States). Sep 1998. 44p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE99000452. Source: OSTI; NTIS; INIS; Public inquiries to Center for Environmental Management Information, 1-800-736-3282 (United States); DOE and DOE

contractors receive free stock copies from OSTI while they last; GPO Dep.

At the end of the cold war, many of the Department of Energy's (DOE's) major nuclear weapons facilities refocused their efforts on finding technically sound, economic, regulatory compliant, and stakeholder acceptable treatment solutions for the legacy of mixed wastes they had produced. In particular, an advanced stabilization process that could effectively treat the large volumes of settling pond and treatment sludges was needed. Based on this need, DOE and its contractors initiated in 1993 the EM-50 sponsored development effort required to produce a deployable mixed waste vitrification system. As a consequence, the Transportable Vitrification System (TVS) effort was undertaken with the primary requirement to develop and demonstrate the technology and associated facility to effectively vitrify, for compliant disposal, the applicable mixed waste sludges and solids across the various DOE complex sites. After 4 years of development testing with both crucible and pilot-scale melters, the TVS facility was constructed by Envitco, evaluated and demonstrated with surrogates, and then successfully transported to the ORNL ETTP site and demonstrated with actual mixed wastes in the fall of 1997. This paper describes the technology, its performance, the technology applicability and alternatives, cost, regulatory and policy issues, and lessons learned.

168
(DOE/EM–0372)
Innovative technology summary report: Confined sluicing end effector. Dept. of Energy, Office of Environmental Management, Washington, DC (United States). Sep 1998. 18p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98007489. Source: OSTI; NTIS; INIS; Public inquiries to Center for Environmental Management Information, 1-800-736-3282 (United States); DOE and DOE contractors receive free stock copies from OSTI while they last; GPO Dep.

A Confined Sluicing End-Effector (CSEE) was field tested during the summer of 1997 in Tank W-3, one of the Gunite and Associated Tanks (GAAT) at the Oak Ridge Reservation (ORR). It should be noted that the specific device used at the Oak Ridge Reservation demonstration was the Sludge Retrieval End-Effector (SREE), although in common usage it is referred to as the CSEE. Deployed by the Modified Light-Duty Utility Arm (MLDUA) and the Houdini remotely operated vehicle (ROV), the CSEE was used to mobilize and retrieve waste from the tank. After removing the waste, the CSEE was used to scarify the gunite walls of Tank W-3, removing approximately 0.1 in of material. The CSEE uses three rotating water-jets to direct a short-range pressurized jet of water to effectively mobilize the waste. Simultaneously, the water and dislodged tank waste, or scarified materials, are aspirated using a water-jet pump-driven conveyance system. The material is then pumped outside of the tank, where it can be stored for treatment. The technology, its performance, uses, cost, and regulatory issues are discussed.

169
(DOE/EM–0374)
Innovative technology summary report: Concrete grinder. Dept. of Energy, Office of Environmental Management, Washington, DC (United States). Sep 1998. 33p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98007485. Source: OSTI; NTIS; INIS; Public inquiries to Center for Environmental Management Information, 1-800-736-3282 (United States); DOE and DOE contractors receive free stock copies from OSTI while they last; GPO Dep.

The Flex concrete grinder is a lightweight, hand-held concrete and coating removal system used for decontaminating or stripping concrete surfaces. The US Department of Energy has successfully demonstrated it for decontaminating walls and floors for free release surveys prior to demolition work. The grinder is an electric-powered tool with a vacuum port for dust extraction and a diamond grinding wheel. The grinder is suitable for flat or slightly curved surfaces and results in a smooth surface, which makes release surveys more reliable. The grinder is lightweight and produces very little vibration, thus reducing worker fatigue. The grinder is more efficient than traditional baseline, tools at removing contamination from concrete surfaces (more than four times faster than hand-held pneumatic scabbling and scaling tools). Grinder consumables (i.e., replacement diamond grinding wheel) are more expensive than the replacement carbide parts for the scaler and scabbler. However, operating costs are outweighed by the lower purchase price of the grinder (50% of the price of the baseline scaler and 8% of the price of the baseline scabbler). Overall, the concrete grinder is an attractive alternative to traditional scabbling and scaling pneumatic tools. To this end, in July 1998, the outer rod room exposed walls of the Safe Storage Enclosure (SSE), an area measuring approximately 150 m^2, may be decontaminated with the hand-held grinder. This concrete grinder technology was demonstrated for the first time at the DOE's Hanford Site. Decontamination of a sample room walls was performed at the C Reactor to free release the walls prior to demolition. The demonstration was conducted by onsite D and D workers, who were instructed by the vendor prior to and during the demonstration.

170
(DOE/EM–0375)
Innovative technology summary report: High-speed clamshell pipe cutter. Dept. of Energy, Office of Environmental Management, Washington, DC (United States). Sep 1998. 28p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98007486. Source: OSTI; NTIS; INIS; Public inquiries to Center for Environmental Management Information, 1-800-736-3282 (United States); DOE and DOE contractors receive free stock copies form OSTI while they last; GPO Dep.

The Hanford Site C Reactor Technology Demonstration Group demonstrated the High-Speed Clamshell Pipe Cutter technology, developed and marketed by Tri Tool Inc. (Rancho Cordova, California). The models demonstrated are portable, split-frame pipe lathes that require minimal radial and axial clearances for severing and/or beveling in-line pipe with ranges of 25 cm to 41 cm and 46 cm to 61 cm nominal diameter. The radial clearance requirement from the walls, floors, or adjacent pipes is 18 cm. The lathes were supplied with carbide insert conversion kits for the cutting bits for the high-speed technique that was demonstrated. Given site-specific factors, this demonstration showed the cost of the improved technology to be approximately 30% higher than the traditional (baseline) technology

(oxyacetylene torch) cost of $14,400 for 10 cuts of contaminated 41-cm and 61-cm-diameter pipe at C Reactor. Actual cutting times were faster than the baseline technology; however, moving/staging the equipment took longer. Unlike the baseline torch, clamshell lathes do not involve applied heat, flames, or smoke and can be operated remotely, thereby helping personal exposures to be as low as reasonably achievable. The baseline technology was demonstrated at the C Reactor north and south water pipe tunnels August 19–22, 1997. The improved technology was demonstrated in the gas pipe tunnel December 15–19.

171
(DOE/EM–0376)
Innovative technology summary report: System for Tracking Remediation, Exposure, Activities and Materials. Dept. of Energy, Office of Environmental Management, Washington, DC (United States). Sep 1998. 29p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98007487. Source: OSTI; NTIS; INIS; Public inquiries to Center for Environmental Management Information, 1-800-736-3282 (United States); DOE and DOE contractors receive free stock copies from OSTI while they last; GPO Dep.

The System for Tracking Remediation, Exposure, Activities, and Materials (STREAM) technology is a multi-media database that consolidates project information into a single, easily-accessible place for day-to-day work performance and management tracking. Information inputs can range from procedures, reports, and references to waste generation logs and manifests to photographs and contaminant survey maps. Key features of the system are quick and easy information organization and retrieval, versatile information display options, and a variety of visual imaging methods. These elements enhance productivity and compliance and facilitate communications with project staff, clients, and regulators. Use of STREAM also gives visual access to contaminated areas, reducing the number of physical entries and promoting safety and as low as reasonably achievable (ALARA) principles. The STREAM system can be customized to focus on the information needs of a specific project, and provides a capability and work process improvement well beyond the usual collection of paperwork and independent databases. Especially when incorporated early in project planning and implemented to the fullest extent, it is a systematic and cost-effective tool for controlling and using project information. The STREAM system can support up to 50 different work stations. This report covers the period February through October 1997, when the STREAM software program, owned by Delphinus Engineering, was demonstrated at the Hanford Site's Reactor Interim Safe Storage (ISS) Project.

172
(DOE/EM–0377)
Innovative technology summary report: Sealed-seam sack suits. Dept. of Energy, Office of Environmental Management, Washington, DC (United States). Sep 1998. 25p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98007490. Source: OSTI; NTIS; INIS; Public inquiries to Center for Environmental Management Information, 1-800-736-3282 (United States); DOE and DOE contractors receive free stock copies from OSTI while they last; GPO Dep.

Sealed-seam sack suits are an improved/innovative safety and industrial hygiene technology designed to protect workers from dermal exposure to contamination. Most of these disposable, synthetic-fabric suits are more protective than cotton suits, and are also water-resistant and gas permeable. Some fabrics provide a filter to aerosols, which is important to protection against contamination, while allowing air to pass, increasing comfort level of workers. It is easier to detect body-moisture breakthrough with the disposable suits than with cotton, which is also important to protecting workers from contamination. These suits present a safe and cost-effective (6% to 17% less expensive than the baseline) alternative to traditional protective clothing. This report covers the period from October 1996 to August 1997. During that time, sealed-seam sack suits were demonstrated during daily activities under normal working conditions at the C Reactor and under environmentally controlled conditions at the Los Alamos National Laboratory (LANL).

173
(DOE/EM–98003908)
EM international activities: May 1998 highlights. Dept. of Energy, Office of Environmental Management, Washington, DC (United States). May 1998. 33p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98003908. Source: OSTI; NTIS; INIS; GPO Dep.

This publication is produced twice a year by the International Technology Systems Application staff. This issue is divided into the following sections: (1) Global Issues Facing Environmental Management; (2) Activities in Western Europe; (3) Activities in Central and Eastern Europe; (4) Activities in Russia; (5) Activities in Asia and the Pacific Rim; (6) Activities in South America; (7) Activities in North America; (8) Country studies; and (9) International Organizations. Some topics discussed are nuclear materials management, radioactive waste and hazardous waste management, and remedial action programs.

174
(DOE/EM–98006440)
United States-Russia: Environmental management activities, Summer 1998. Office of Science and Technology, International Program Office, Washington, DC (United States). Sum 1998. 80p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98006440. Source: OSTI; NTIS; INIS; GPO Dep.

A Joint Coordinating Committee for Environmental Restoration and Waste Management (JCCEM) was formed between the US and Russia. This report describes the areas of research being studied under JCCEM, namely: Efficient separations; Contaminant transport and site characterization; Mixed wastes; High level waste tank remediation; Transuranic stabilization; Decontamination and decommissioning; and Emergency response. Other sections describe: Administrative framework for cooperation; Scientist exchange; Future actions; Non-JCCEM DOE-Russian activities; and JCCEM publications.

175
(DOE/ER–433/V2)
Old hydrofracture facility tanks contents removal action operations plan at the Oak Ridge National Laboratory, Oak Ridge, Tennessee. Volume 2: Checklists and work

instructions. CDM Federal Programs Corp., Oak Ridge, TN (United States). May 1998. 194p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-98OR22700. Order Number DE98005139. Source: OSTI; NTIS; INIS; GPO Dep.

This is volume two of the ORNL old hydrofracture facility tanks contents removal action operations plan. This volume contains checklists and work instructions.

176
(DOE/EW/50625–T36)
Environmental hazards assessment program. Quarterly report (extended quarter), April 1997–September 1997. Medical Univ. of South Carolina, Charleston, SC (United States). 31 Oct 1997. 52p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG01-92EW50625. Order Number DE98000869. Source: OSTI; NTIS; GPO Dep.

On June 23, 1992, the United States Department of Energy (DOE) signed Assistance Instrument Number DE-FG01-92EW50625 with the Medical University of South Carolina (MUSC) to support the Environmental Hazards Assessment Program (EHAP). Dr. James B. Edwards, President of the Medical University of South Carolina, suggested, “Good health is not the result of good doctorin’ but the result of a healthy society in a healthy, economic, political and biological environment”. To further good health, it is appropriate that an educational institution such as MUSC utilize grant funds to help people from all walks of life understand better what truly does affect human health, what does not, and why. EHAP is an integrated, multidisciplinary program, employing a range of initiatives to identify, address and resolve environmental health risk issues.

177
(DOE/EW/50625–T37)
Environmental hazards assessment program (extended year). Annual report, July 1, 1996–September 30, 1997. Medical Univ. of South Carolina, Charleston, SC (United States). 31 Oct 1997. 80p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG01-92EW50625. Order Number DE98000870. Source: OSTI; NTIS; GPO Dep.

On June 23, 1992, the United States Department of Energy (DOE) signed Assistance Instrument Number DE-FG01-92EW50625 with the Medical University of South Carolina (MUSC) to support the Environmental Hazards Assessment Program (EHAP). Dr. James B. Edwards, President of the Medical University of South Carolina, suggested, “Good health is not the result of good doctorin’ but the result of a healthy society in a healthy, economic, political and biological environment.” To further good health, it is appropriate that an educational institution such as MUSC utilize grant funds to help people from all walks of life understand better what truly does affect human health, what does not, and why. The objectives of EHAP stated in the proposal to DOE are to: (1) develop a holistic, national basis for risk assessment, risk management, and risk communications that recognizes the direct impact of environmental hazards on the health and well-being of all; (2) develop a pool of talented scientists and experts in cleanup activities, especially in human health aspects; and (3) identify needs and develop programs addressing the critical shortage of well-educated, highly-skilled technical and scientific personnel to address the health-oriented aspects of environmental restoration and waste management.

178
(DOE/EW/50625–T38)
Environmental hazards assessment program. Summary report, June 23, 1992–September 30, 1997. Medical Univ. of South Carolina, Charleston, SC (United States). 31 Dec 1997. 78p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG01-92EW50625. Order Number DE98002537. Source: OSTI; NTIS; INIS; GPO Dep.

This summary report describes activities and reports for the grant period from June 1992 to September 1997. It reports progress against grant objectives and the Program Implementation Plan published during the first year of the grant program. The program consists of six major elements: (1) public and professional outreach, (2) clinical science, (3) biomedical research, (4) information systems, (5) education, and (6) community development. Research is focused on toxicological and epidemiological investigation into environmental problems that pose a direct risk to human health, and methods to translate basic research into risk assessment and preventive medicine applications for health care providers.

179
(DOE/EW/50625–T39)
Environmental Hazards Assessment Program summary report, June 23, 1992–September 30, 1997. Medical Univ. of South Carolina, Charleston, SC (United States). 31 Dec 1997. 76p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG01-92EW50625. Order Number DE98001832. Source: OSTI; NTIS; GPO Dep.

On June 23, 1992, the US Department of Energy (DOE) signed an agreement with the Medical University of South Carolina (MUSC) to support the Environmental Hazards Assessment Program (EHAP). The objectives of EHAP are to: (1) develop a holistic, national basis for risk assessment, risk management and risk communication that recognizes the direct impact of environmental hazards on the health and well-being of all; (2) develop a pool of talented scientists and experts in cleanup activities, especially in human health aspects and (3) identify needs and develop programs addressing the critical shortage of well-educated, highly-skilled technical and scientific personnel to address the health-oriented aspects of environmental restoration and waste management. In this report, the highlights listed describe a summary of the primary accomplishments made by the projects ongoing at the end of Year Five. It reports progress against the objectives and the Program Implementation Plan published at the end of the first year of the grant.

180
(DOE/EW/55094–26)
Investigation of waste glass pouring behavior over a knife edge. Ebadian, M.A. Florida International Univ., Miami, FL (United States). Jan 1998. 26p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG21-95EW55094. Order Number DE98059424. Source: OSTI; NTIS; INIS; GPO Dep.

The development of vitrification technology for converting radioactive waste into a glass solid began in the early

1960s. Some problems encountered in the vitrification process are still waiting for a solution. One of them is wicking. During pouring, the glass stream flows down the wall of the pour spout until it reaches an angled cut in the wall. At this point, the stream is supposed to break cleanly away from the wall of the pour spout and fall freely into the canister. However, the glass stream is often pulled toward the wall and does not always fall into the canister, a phenomenon known as wicking. Phase 1 involves the assembly, construction, and testing of a melter capable of supplying molten glass at operational flow rates over a break-off point knife edge. Phase 2 will evaluate the effects of glass and pour spout temperatures as well as glass flow rates on the glass flow behavior over the knife edge. Phase 3 will identify the effects on wicking resulting from varying the knife edge diameter and height as well as changing the back-cut angle of the knife edge. The following tasks were completed in FY97: Design the experimental system for glass melting and pouring; Acquire and assemble the melter system; and Perform initial research work.

181
(DOE/EW/55094–29)
Sensor for viscosity and shear strength measurement. Ebadian, M.A.; Dillion, J.; Moore, J.; Jones, K. Florida International Univ., Miami, FL (United States). Jan 1998. 92p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). DOE Contract FG21-95EW55094. Order Number DE98059427. Source: OSTI; NTIS; GPO Dep.

Measurement of the physical properties (viscosity and density) of waste slurries is critical in evaluating transport parameters to ensure turbulent flow through transport pipes. The environment for measurement and sensor exposure is extremely harsh; therefore, reliability and ruggedness are critical in the sensor design. Two different viscometer techniques are being investigated in this study, based on: magnetostrictive pulse generated acoustic waves; and an oscillating cylinder. Prototype sensors have been built and tested which are based on both techniques. A base capability instrumentation system has been designed, constructed, and tested which incorporates both of these sensors. It requires manual data acquisition and off-line calculation. A broad range of viscous media has been tested using this system. Extensive test results appear in this report. The concept for each technique has been validated by these test results. This base capability system will need to be refined further before it is appropriate for field tests. The mass of the oscillating system structure will need to be reduced. A robust acoustic probe assembly will need to be developed. In addition, in March 1997 it was made known for the first time that the requirement was for a deliverable automated viscosity instrumentation system. Since then such a system has been designed, and the hardware has been constructed so that the automated concept can be proved. The rest of the hardware, which interfaced to a computer, has also been constructed and tested as far as possible. However, for both techniques the computer software for automated data acquisition, calculation, and logging had not been completed before funding and time ran out.

182
(DOE/EW/55094–30)
Melting, solidification, remelting, and separation of glass and metal. Ebadian, M.A.; Xin, R.C.; Liu, Y.Z. Florida International Univ., Miami, FL (United States). Jan 1998. 36p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG21-95EW55094. Order Number DE98059428. Source: OSTI; NTIS; INIS; GPO Dep.

Several high-temperature vitrification technologies have been developed for the treatment of a wide range of mixed waste types in both the low-level waste and transuranic (TRU) mixed waste categories currently in storage at DOE sites throughout the nation. The products of these processes are an oxide slag phase and a reduced metal phase. The metal phase has the potential to be recycled within the DOE Complex. Enhanced slag/metal separation methods are needed to support these processes. This research project involves an experimental investigation of the melting, solidification, remelting, and separation of glass and metal and the development of an efficient separation technology. The ultimate goal of this project is to find an efficient way to separate the slag phase from the metal phase in the molten state. This two-year project commenced in October 1995 (FY96). In the first fiscal year, the following tasks were accomplished: (1) A literature review and an assessment of the baseline glass and metal separation technologies were performed. The results indicated that the baseline technology yields a high percentage of glass in the metal phase, requiring further separation. (2) The main melting and solidification system setup was established. A number of melting and solidification tests were conducted. (3) Temperature distribution, solidification patterns, and flow field in the molten metal pool were simulated numerically for the solidification processes of molten aluminum and iron steel. (4) Initial designs of the laboratory-scale DCS and CS technologies were also completed. The principal demonstration separation units were constructed. (5) An application for a patent for an innovative liquid-liquid separation technology was submitted and is pending.

183
(DOE/EW/55094–31)
Plant stress analysis technology deployment. Ebadian, M.A. Florida International Univ., Miami, FL (United States). Jan 1998. 14p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG21-95EW55094. Order Number DE98059429. Source: OSTI; NTIS; GPO Dep.

Monitoring vegetation is an active area of laser-induced fluorescence imaging (LIFI) research. The Hemispheric Center for Environmental Technology (HCET) at Florida International University (FIU) is assisting in the transfer of the LIFI technology to the agricultural private sector through a market survey. The market survey will help identify the key eco-agricultural issues of the nations that could benefit from the use of sensor technologies developed by the Office of Science and Technology (OST). The principal region of interest is the Western Hemisphere, particularly, the rapidly growing countries of Latin America and the Caribbean. The analysis of needs will assure that the focus of present and future research will center on economically important issues facing both hemispheres. The application of the technology will be useful to the agriculture industry for airborne crop analysis as well as in the detection and characterization of contaminated sites by monitoring vegetation. LIFI airborne and close-proximity systems will be evaluated as stand-alone technologies and additions to existing sensor

technologies that have been used to monitor crops in the field and in storage.

184
(DOE/EW/55094–32)
Assessment of strippable coatings for decontamination and decommissioning. Ebadian, M.A. Florida International Univ., Miami, FL (United States). Jan 1998. 39p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG21-95EW55094. Order Number DE98059430. Source: OSTI; INIS; NTIS; GPO Dep.

Strippable or temporary coatings were developed to assist in the decontamination of the Three Mile Island (TMI-2) reactor. These coatings have become a viable option during the decontamination and decommissioning (D and D) of both US Department of Energy (DOE) and commercial nuclear facilities to remove or fix loose contamination on both vertical and horizontal surfaces. A variety of strippable coatings are available to D and D professionals. However, these products exhibit a wide range of performance criteria and uses. The Hemispheric Center for Environmental Technology (HCET) at Florida International University (FIU) was commissioned to perform a 2-year investigation into strippable coatings. This investigation was divided into four parts: (1) identification of commercially available strippable coating products; (2) survey of D and D professionals to determine current uses of these coatings and performance criteria; (3) design and implementation of a non-radiological testing program to evaluate the physical properties of these coatings; and (4) design and implementation of a radiological testing program to determine decontamination factors and effects of exposure to ionizing radiation. Activities during fiscal year 1997 are described.

185
(DOE/EW/55094–33)
Microwave combustion and sintering without isostatic pressure. Ebadian, M.A. Florida International Univ., Miami, FL (United States). Jan 1998. 31p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG21-95EW55094. Order Number DE98059431. Source: OSTI; NTIS; INIS; GPO Dep.

In recent years interest has grown rapidly in the application of microwave energy to the processing of ceramics, composites, polymers, and other materials. Advances in the understanding of microwave/materials interactions will facilitate the production of new ceramic materials with superior mechanical properties. One application of particular interest is the use of microwave energy for the mobilization of uranium for subsequent redeposition. Phase III (FY98) will focus on the microwave assisted chemical vapor infiltration tests for mobilization and redeposition of radioactive species in the mixed sludge waste. Uranium hexachloride and uranium (IV) borohydride are volatile compounds for which the chemical vapor infiltration procedure might be developed for the separation of uranium. Microwave heating characterized by an inverse temperature profile within a preformed ceramic matrix will be utilized for CVI using a carrier gas. Matrix deposition is expected to commence from the inside of the sample where the highest temperature is present. The preform matrix materials, which include aluminosilicate based ceramics and silicon carbide based ceramics, are all amenable to extreme volume reduction, densification, and vitrification. Important parameters of microwave sintering such as frequency, power requirement, soaking temperature, and holding time will be investigated to optimize process conditions for the volatilization of uranyl species using a reactive carrier gas in a microwave chamber.

186
(DOE/EW/55094–35)
Large-bore pipe decontamination. Ebadian, M.A. Florida International Univ., Miami, FL (United States). Jan 1998. 49p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG21-95EW55094. Order Number DE98059433. Source: OSTI; NTIS; INIS; GPO Dep.

The decontamination and decommissioning (D and D) of 1200 buildings within the US Department of Energy-Office of Environmental Management (DOE-EM) Complex will require the disposition of miles of pipe. The disposition of large-bore pipe, in particular, presents difficulties in the area of decontamination and characterization. The pipe is potentially contaminated internally as well as externally. This situation requires a system capable of decontaminating and characterizing both the inside and outside of the pipe. Current decontamination and characterization systems are not designed for application to this geometry, making the direct disposal of piping systems necessary in many cases. The pipe often creates voids in the disposal cell, which requires the pipe to be cut in half or filled with a grout material. These methods are labor intensive and costly to perform on large volumes of pipe. Direct disposal does not take advantage of recycling, which could provide monetary dividends. To facilitate the decontamination and characterization of large-bore piping and thereby reduce the volume of piping required for disposal, a detailed analysis will be conducted to document the pipe remediation problem set; determine potential technologies to solve this remediation problem set; design and laboratory test potential decontamination and characterization technologies; fabricate a prototype system; provide a cost-benefit analysis of the proposed system; and transfer the technology to industry. This report summarizes the activities performed during fiscal year 1997 and describes the planned activities for fiscal year 1998. Accomplishments for FY97 include the development of the applicable and relevant and appropriate regulations, the screening of decontamination and characterization technologies, and the selection and initial design of the decontamination system.

187
(DOE/FT/34337–1)
The NGA-DOE grant to examine critical issues related to radioactive waste and materials disposition involving DOE facilities. Quarterly report, October 1–December 31, 1997. Beauchesne, A.M. National Governors' Association, Center for Best Practices, Washington, DC (United States). [1997]. 8p. Sponsored by USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG26-97FT34337. Order Number DE98054553. Source: OSTI; NTIS; GPO Dep.

Topics explored through this project include: decisions involving disposal of mixed, low-level, and transuranic (TRU) waste and disposition of nuclear materials; decisions involving DOE budget requests and their effect on environmental cleanup and compliance at DOE facilities; strategies to treat mixed, low-level, and transuranic (TRU) waste and their effect on individual sites in the complex; changes to the FFCA

site treatment plans as a result of proposals in the EM 2006 cleanup plans and contractor integration analysis; interstate waste and materials shipments; and reforms to existing RCRA and CERCLA regulations/guidance to address regulatory overlap and risks posed by DOE wastes. The work accomplished by the NGA project team during the past four months can be categorized as follows: maintained open communication with DOE on a variety of activities and issues within the DOE environmental management complex; and maintained communication with NGA Federal Facilities Compliance Task Force members regarding DOE efforts to formulate a configuration for mixed low-level waste and low-level treatment and disposal, DOE activities in the area of the Hazardous Waste Identification Rule, and DOE's proposed National Dialogue.

188
(DOE/ID–10631)
Plutonium stabilization and disposition focus area, FY 1999 and FY 2000 multi-year program plan. Lockheed Martin Idaho Technologies Co., Idaho Falls, ID (United States). Mar 1998. 52p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98054114. Source: OSTI; NTIS; INIS; GPO Dep.

Consistent with the Environmental Management's (EM's) plan titled, "Accelerating Cleanup: Paths to Closure", and ongoing efforts within the Executive Branch and Congress, this Multi-Year Program Plan (MYPP) for the Plutonium Focus Area was written to ensure that technical gap projects are effectively managed and measured. The Plutonium Focus Area (PFA) defines and manages technology development programs that contribute to the effective stabilization of nuclear materials and their subsequent safe storage and final disposition. The scope of PFA activities includes the complete spectrum of plutonium materials, special isotopes, and other fissile materials. The PFA enables solutions to site-specific and complex-wide technology issues associated with plutonium remediation, stabilization, and preparation for disposition. The report describes the current technical activities, namely: Plutonium stabilization (9 studies); Highly enriched uranium stabilization (2 studies); Russian collaboration program (2 studies); Packaging and storage technologies (6 studies); and PFA management work package/product line (3 studies). Budget information for FY 1999 and FY 2000 is provided.

189
(DOE/ID/13220–T9)
Magnetically controlled deposition of metals using gas plasma. Quarterly progress report, October–December 1996. Idaho Univ., Moscow, ID (United States). [1997]. 27p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG07-93ID13220. Order Number DE97003651. Source: OSTI; NTIS; GPO Dep.

Thin layers of secondary material are plated on substrates either by plating or spraying processes. Plating operations produce large amounts of hazardous liquid waste. Spraying, while one of the less waste intensive methods, produces "over spray" which is waste that is a result of uncontrolled nature of the spray stream. In many cases the over spray produces a hazardous waste. Spray coating is a mature process with many uses. Material can be deposited utilizing spraying technology in three basic ways: "Flame spraying", direct spraying of molten metals and/or plasma spraying. This project is directed at controlling the plasma spraying process and thereby minimizing the waste generated in that process. The proposed process will utilize a standard plasma spray gunsmith the addition of magnetic fields to focus and control the plasma. In order to keep development cost at a minimum, the project was organized in phases. The first and current phase involves developing an analytical model that will prove the concept and be used to design a prototype. Analyzing the process and using the analysis has the potential to generate significant hardware cost savings.

190
(DOE/ID/13220–T10)
Magnetically controlled deposition of metals using gas plasma. Quarterly progress report, January 1997–March 1997. Idaho Univ., Moscow, ID (United States). [1997]. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG07-93ID13220. Order Number DE97005978. Source: OSTI; NTIS; INIS; GPO Dep.

Thin layers of secondary material are plated on substrates either by plating or spraying processes. Plating operations produce large amounts of hazardous liquid waste. Spraying, while one of the less waste intensive methods, produces "over spray," or waste that is a result of uncontrolled nature of the spray stream. In many cases the over spray may produce a hazardous waste, requiring special processing. Spray coating is a mature process with many uses. Material can be deposited utilizing spraying technology in three basic ways: "Flame spraying", direct spraying of molten metals and/or plasma spraying. This project is directed at controlling the plasma spraying process and thereby minimizing the waste generated in that process. The proposed process will utilize a standard plasma spray gun with the addition of magnetic fields to focus and control the plasma. In order to keep development cost at a minimum, the project was organized in phases. The first and current phase involves developing an analytical model that will prove the concept and be used to design a prototype. Analyzing the process and using the analysis has the potential to generate significant hardware cost savings.

191
(DOE/ID/13220–T11)
Magnetically controlled deposition of metals using gas plasma. Quarterly progress report, April–June 1997. Idaho Univ., Moscow, ID (United States). Coll. of Engineering. [1997]. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG07-93ID13220. Order Number DE97007318. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of the grant is to develop a method of spraying materials on a substrate in a controlled manner to eliminate the waste inherent in present plating processes. The process under consideration is magnetically controlled plasma spraying. As noted in the last several quarterly reports, the project is no longer on schedule. Difficulties with modeling compressible flow caused a slip in the schedule. The field equations have been cast in a format that allows solution using Finite Element (FE) techniques. The development of the computer code that will allow evaluation of the proposed technique and design of an experiment to prove the proposed process is complete. Work last quarter was

centered on validating the magnetic field equation and developing the mesh for the final plasma torch flow problem. Results of a test problem used to validate the magnetic calculation were included with the second quarterly report in 1997. The effort this quarter focused on running the actual plasma spray model on the finite element code, and developing a stand alone code (SPRAY.for) that will be used to calculate the trajectory of the particles used for plating the substrate.

192
(DOE/ID/13220–T13)
Magnetically controlled deposition of metals using gas plasma. Final report. Idaho Univ., Moscow, ID (United States). Coll. of Engineering. 2 Apr 1998. 38p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG07-93ID13220. Order Number DE98005144. Source: OSTI; NTIS; GPO Dep.

This is the first phase of a project that has the objective to develop a method of spraying materials on a substrate in a controlled manner to eliminate the waste and hazardous material generation inherent in present plating processes. The project is considering plasma spraying of metal on a substrate using magneto-hydrodynamics to control the plasma/metal stream. The process being developed is considering the use of commercially available plasma torches to generate the plasma/metal stream. The plasma stream is collimated, and directed using magnetic forces to the extent required for precise control of the deposition material. The project will be completed in phases. Phase one of the project, the subject of this grant, is the development of an analytical model that can be used to determine the feasibility of the process and to design a laboratory scale demonstration unit. The contracted time is complete, and the research is still continuing. This report provides the results obtained to date. As the model and calculations are completed those results will also be provided. This report contains the results of the computer code that have been completed to date. Results from a ASMEE Benchmark problem, flow over a backward step with heat transfer, Couette flow with magnetic forces, free jet flow are presented along with several other check calculations that are representative of the cases that were calculated in the course of the development process. The final cases that define a velocity field in the exit of a plasma spray torch with and without a magnetic field are in process. A separate program (SPRAY) has been developed that can track the plating material to the substrate and describe the distribution of the material on the substrate. When the jet calculations are complete SPRAY will be used to compare the distribution of material on the substrate with and without the effect of the magnetic focus.

193
(DOE/ID/13223–T12)
Task 7: Die soldering during host site testing. Final report, January1–December 31, 1997. Goodwin, F.E. (International Lead Zinc Research Organization, Inc., Research Triangle Park, NC (United States)); Walkington, W.G. International Lead Zinc Research Organization, Research Triangle Park, NC (United States). 31 Jan 1998. 35p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98004395. Source: OSTI; NTIS; GPO Dep.

To provide industrial confirmation of laboratory results produced in Task 6 of this project, five industrial trials were organized with cooperative die casters in the USA. Components cast during these trials ranged from functional electronic heat sinks to decorative household plumbing components. Whereas laboratory work indicated that die temperature and draft angle were the most important process factors influencing solder accumulation, it was not possible to vary draft angle on the established production dies used for these trials. Substantial variations in die temperature were realized however and also die surface conditions were varied, confirming the influence of a secondary variable in the laboratory investigation. Substantial evidence from the trials indicated that die surface temperature is the most important factor for controlling solder build up. The surface roughness of the die casting die greatly influenced the number of castings that could be run before solder initially appeared. Development of careful thermal management techniques, now judged to be beyond the capabilities of most US die casters, will be necessary to control incidences of die soldering found in typical production. Thermal control will involve both control of the bulk die temperature through use of thermally controlled cooling lines, and also regulation of surface temperature by well controlled cooling lines, and also regulation of surface temperature by well controlled die spraying (lubrication) techniques. Further research, development and technology transfer to enhance thermal control capabilities of US die casters is recommended.

194
(DOE/ID/13450–T1)
Precision agriculture in the 21st Century: Geospatial and information technologies in crop management. Department of Agriculture, Washington, DC (United States). ©1997. 127p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);Department of Agriculture, Washington, DC (United States). DOE Contract AI07-96ID13450. Source: National Academy Press, 2101 Constitution Avenue, N.W., Lockbox 285, Washington, DC 20055, (United States); (800) 624-6242 or (202) 334-3313 (in the Washington metropolitan area).

Agricultural managers have for decades taken advantage of new technologies, including information technologies, that enabled better management decision making and improved economic efficiency of operations. The extent and rate of change now occurring in the development of information technologies have opened the way for significant change in crop production management and agricultural decision making. This vision is reflected in the concept of precision agriculture. Precision agriculture is a phrase that captures the imagination of many concerned with the production of food, feed, and fiber. The concepts embodied in precision agriculture offer the promise of increasing productivity while decreasing production costs and minimizing environmental impacts. Precision agriculture conjures up images of farmers overcoming the elements with computerized machinery that is precisely controlled via satellites and local sensors and using planning software that accurately predicts crop development. This image has been called the future of agriculture. Such high-tech images are engaging. Precision agriculture, however, is in early and rapidly changing phases of innovation. Techniques and practices not anticipated by the committee will likely become common in the future, and some techniques and practices thought to hold high promise

today may turn out to be less desirable than anticipated. This report defines precision agriculture as a management strategy that uses information technologies to bring data from multiple sources to bear on decisions associated with crop production. Precision agriculture has three components: capture of data at an appropriate scale and frequency, interpretation and analysis of that data, and implementation of a management response at an appropriate scale and time. The most significant impact of precision agriculture is likely to be on how management decisions address spatial and temporal variability in crop production systems.

195
(DOE/ID/13462–T2)
The greenhouse of the future: Using a sponsored competition in a capstone course. Bates, R.M.; Baumbauer, D. Montana State Univ., Bozeman, MT (United States). 18 Feb 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG07-96ID13462. Order Number DE98003238. Source: OSTI; NTIS; GPO Dep.

Educational objectives of capstone courses such as critical-thinking and problem-solving skills are among the most cited needs in curriculum revitalization efforts. Sponsored competitions present an important vehicle for achieving these educational objectives. Opportunities such as the Greenhouse of the Future Competition provide students a diverse range of critical experiences not easily simulated in traditional classroom settings. The objective of the competition was to provide an opportunity for US university students to conceptualize, design, integrate, fabricate, and demonstrate innovative greenhouse or controlled environment ideas. The students achieved a great sense of accomplishment and satisfaction by converting their ideas into proposals, developing proposals into experiments, tracking the data generated by the experiments and translating that data into a meaningful communication locally and to the scientific community at large. Most of these important learning experiences would have remained as components of the project even if the team had not advanced as the winning entry.

196
(DOE/ID/13505–T1)
Report for slot cutter proof-of-principle test, Buried Waste Containment System project. Revision 1. RAHCO International, Inc., Spokane, WA (United States). 21 May 1998. 80p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-97ID13505. Order Number DE98007207. Source: OSTI; NTIS; INIS; GPO Dep.

Several million cubic feet of hazardous and radioactive waste was buried in shallow pits and trenches within many US Department of Energy (US DOE) sites. The pits and trenches were constructed similarly to municipal landfills with both stacked and random dump waste forms such as barrels and boxes. Many of the hazardous materials in these waste sites are migrating into groundwater systems through plumes and leaching. On-site containment is one of the options being considered for prevention of waste migration. This report describes the results of a proof-of-principle test conducted to demonstrate technology for containing waste. This proof-of-principle test, conducted at the RAHCO International, Inc., facility in the summer of 1997, evaluated equipment techniques for cutting a horizontal slot beneath an existing waste site. The slot would theoretically be used by complementary equipment designed to place a cement barrier under the waste. The technology evaluated consisted of a slot cutting mechanism, muck handling system, thrust system, and instrumentation. Data were gathered and analyzed to evaluate the performance parameters.

197
(DOE/ID/13507–T1)
Greenhouse of the future. Final report. Cavin, B. III. Cal Poly Pomona Foundation, Pomona, CA (United States). 3 Jul 1998. 47p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG07-97ID13507. Order Number DE98007026. Source: OSTI; NTIS; GPO Dep.

This greenhouse of the future is located at the Center for Regenerative Studies (CRS) at Cal Poly Pomona. The building design was driven by desired environmental conditions. The primary objective was to keep the interior space warm during winter for the breeding of fish and other greenhouse activities, especially in the winter. To do this, a highly insulating envelope was needed. Straw bales provide excellent insulation with an R-value of approximately 50 and also help solve the environmental problems associated with this agricultural waste product. A summary of the construction progress, construction costs and operating costs are included.

198
(DOE/LLW–245)
The basics in transportation of low-level radioactive waste. Allred, W.E. Lockheed Martin Idaho Technologies Co., Idaho Falls, ID (United States). Jun 1998. 30p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98058449. Source: OSTI; NTIS; INIS; GPO Dep.

This bulletin gives a basic understanding about issues and safety standards that are built into the transportation system for radioactive material and waste in the US. An excellent safety record has been established for the transport of commercial low-level radioactive waste, or for that matter, all radioactive materials. This excellent safety record is primarily because of people adhering to strict regulations governing the transportation of radioactive materials. This bulletin discusses the regulatory framework as well as the regulations that set the standards for packaging, hazard communications (communicating the potential hazard to workers and the public), training, inspections, routing, and emergency response. The excellent safety record is discussed in the last section of the bulletin.

199
(DOE/LLW–246)
Life cycle costs for disposal and assured isolation of low-level radioactive waste in Connecticut. Chau, B.; Sutherland, A.A.; Baird, R.D. Rogers and Associates Engineering Corp., Salt Lake City, UT (United States). Mar 1998. 106p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98054115. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents life cycle costs for a low-level radioactive disposal facility and a comparable assured isolation facility. Cost projections were based on general plans

and assumptions, including volume projections and operating life, provided by the Connecticut Hazardous Waste Management Service, for a facility designed to meet the State's needs. Life cycle costs include the costs of preconstruction activities, construction, operations, closure, and post-closure institutional control. In order to provide a better basis for understanding the relative magnitude of near-term costs and future costs, the results of present value analysis of ut-year costs are provided.

200

(DOE/LLW–250a-Vol.1)

Licensing an assured isolation facility for low-level radioactive waste. Volume 1: Licensing strategy and issues. Silverman, D.J. (Morgan, Lewis and Bockius, Washington, DC (United States)); Bauser, M.A.; Baird, R.D. Morgan, Lewis and Bockius, Washington, DC (United States);Rogers and Associates Engineering Corp., Salt Lake City, UT (United States). Jul 1998. 29p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98058448. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a detailed set of proposed criteria and guidance for the preparation of a license application for an assured isolation facility (AIF). The report is intended to provide a detailed planning basis upon which a prospective applicant may begin pre-licensing discussions with the Nuclear Regulatory Commission and initiate development of a license application. The report may also be useful to the NRC or to state regulatory agencies that may be asked to review such an application. Volume 1 of this report provides background information, and describes the licensing approach and methodology. Volume 2 identifies specific information that is recommended for inclusion in a license application.

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(DOE/LLW–250b.Vol.2)

Licensing an assured isolation facility for low-level radioactive waste. Volume 2: Recommendations on the content and review of an application. Silverman, D.J. (Morgan, Lewis and Bockius, Washington, DC (United States)); Bauser, M.A.; Baird, R.D. Morgan, Lewis and Bockius, Washington, DC (United States);Rogers and Associates Engineering Corp., Salt Lake City, UT (United States). Jul 1998. [250p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98007459. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a detailed set of proposed criteria and guidance for the preparation of a license application for an assured isolation facility (AIF). The report is intended to provide a detailed planning basis upon which a prospective applicant may begin pre-licensing discussions with the Nuclear Regulatory Commission and initiate development of a license application. The report may also be useful to the NRC or to state regulatory agencies that may be asked to review such an application. Volume 1 of this report provides background information, and describes the licensing approach and methodology. Volume 2 identifies specific information that is recommended for inclusion in a license application.

202

(DOE/LLW–98052630)

LLW Forum meeting report, May 7–9, 1997. Norris, C.; Brown, H. (eds.); Lovinger, T.; Scheele, L.; Shaker, M.A. Afton Associates, Inc., Washington, DC (United States). [1997]. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9705249–: Low-level radioactive waste forum meeting, Chicago, IL (United States), 7-9 May 1997). Order Number DE98052630. Source: OSTI; NTIS; INIS; GPO Dep.

The Low-Level Radioactive Waste Forum met in Chicago, Illinois, on may 7–9, 1997. Twenty-three Forum Participants, Alternate Forum Participants, and meeting designees representing 20 compacts and states participated. A report on the meeting is given under the following subtitles: New developments in states and compacts; Upgrading an existing disposal facility; Revisions to DOE Order 5820 re DOE waste management; Conference of radiation control program directors: Recent and upcoming activities; National Conference of State Legislatures' (NCSL) low-level radioactive waste working group: Recent and upcoming activities; Executive session; LLW forum business session; Public involvement and risk communication: Success at West Valley, New York; DOE low-level waste management program; impact of the International Atomic Energy Agency's convention on waste; Panel discussion: The environmental justice concept–Past, present and future; New technologies for processing and disposal of LLRW; High-level and low-level radioactive waste: A dialogue on parallels and intersections; Draft agreement re uniform application of manifesting procedures; Regulatory issues focus; LLW forum October 1997 agenda planning; Resolutions; LLW forum regulatory issues discussion group meets; and Attendance.

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(DOE/LLW–98052631)

LLW Forum meeting report, October 20–22, 1997. Norris, C.; Brown, H. (eds.); Lovinger, T.; Scheele, L.; Shaker, M.A. Afton Associates, Inc., Washington, DC (United States). [1997]. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9710189–: Low-level radioactive waste forum meeting, Annapolis, MD (United States), 20-22 Oct 1997). Order Number DE98052631. Source: OSTI; NTIS; INIS; GPO Dep.

The Low-Level Radioactive Waste Forum met in Annapolis, Maryland, on October 20–22, 1997. Twenty-six Forum Participants, Alternate Forum Participants, and meeting designees representing 22 compacts and states participated. A report on the meeting is given under the following subtitles: New developments in states and compacts; Discussion with NRC Commissioner McGaffigan; Regulatory issues session; Executive session; LLW forum business session; DOE low-level waste management program; Transportation of radioactive waste; Environmental equity: Title VI; Congressional studies on Ward Valley Site; Implementation of DOE's strategy for waste management; Relicensing Envirocare; Draft agreement for uniform application of manifesting procedures; CRCPD report; Panel: Future of low-level radioactive waste management; Agenda planning: February 1998; Resolutions; and Attendance.

204
(DOE/LLW–98052641)
LLW Notes, Volume 12, Number 8. Norris, C.; Brown, H. (eds.); Gedden, R.; Lovinger, T.; Scheele, L.; Shaker, M.A. Afton Associates, Inc., Washington, DC (United States). Win 1997. 44p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052641. Source: OSTI; NTIS; INIS; GPO Dep.

Contents include articles entitled: Chem-Nuclear documents new plan for Barnwell; Nebraska releases technical analysis of LLRW facility; Southeast Compact suspends funding for NC facility development; NC governor and Southeast Compact differ on proposed MOU; Midwest Compact to return export fees; State legislators' group revises radioactive waste policy; Internal documents discuss administration's policy on Ward Valley; BLM issues EA for Ward Valley testing; California DHS, NRC criticize DOI's testing protocols; Army removes training mines from Ward Valley site; The 1997 gubernatorial elections and a look ahead to 1998; Court throws out case challenging Pennsylvania's siting law; DOE files notice of appeal in WCS suit; Central Compact moves to dismiss "Veto" authority suit; Congress exempts NAS from FACA; Judge sets schedule for Ward Valley case; Court won't order DOE to accept spent fuel by deadline; NRC chairman expresses concern re CERCLA reauthorization; Senators question EPA's guidance on remediation; EPA issues guidance, criticizes NRC decommissioning rule; Members of Congress clarify FUSRAP transfer; HLW legislation passes House by wide margin; Takings legislation passes House; Energy and water bill signed into law; and Senate confirms 5 of 6 DOE appointees.

205
(DOE/LLW–98052642)
LLW Notes, Volume 12, Number 9. Norris, C.; Brown, H. (eds.); Gedden, R.; Lovinger, T. Afton Associates, Inc., Washington, DC (United States). Dec 1997. 24p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052642. Source: OSTI; NTIS; INIS; GPO Dep.

Contents include articles entitled: Senators criticize DOE use of Envirocare and Molten Metal; Officials express concern re implications of WCS ruling; DOE files notice of appeal in WCS suit; WCS responds to critics re implications of ruling; Background: Prior correspondence between the Senators and DOE re Envirocare; Waste control specialists authorized to conduct additional operations at Texas site; Molten Metal files for bankruptcy protection; Envirocare of Texas receives first approval for hazardous waste permit; Envirocare of Utah applies to NRC for SNM license; NRDC alleges death threats and financial intimidation by Envirocare; DOE and NRC sign off on external regulation pilot program; and NRDC requests Inspector General probe re Envirocare.

206
(DOE/LLW–98056089)
LLW (Low-Level Waste) Notes, Volume 13, Number 1, February 1998. Afton Associates, Inc., Washington, DC (United States). Feb 1998. 44p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98056089. Source: OSTI; NTIS; INIS; GPO Dep.

LLW Notes is a newsletter distributed to Low-Level Radioactive Waste Forum Participants and other state and compact officials. The LLW Forum provides an opportunity for state and compact officials to share information with one another and to exchange views with officials of federal agencies and other interested parties. This issue focuses on the following topics: DOI approves Ward Valley permit application; Project evidentiary hearings begin in Texas; and Summary judgment motions in California breach of contract action.

207
(DOE/MC/29112–5399)
Intelligent mobile sensor system for drum inspection and monitoring: Topical report, October 1, 1993–April 22, 1995. Lockheed Martin Astronautics, Littleton, CO (United States). [1997]. 103p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC21-92MC29112. Order Number DE97002136. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of the Intelligent Mobile Sensor System (IMSS) project is to develop an operational system for monitoring and inspection activities for waste storage facility operations at several DOE sites. Specifically, the product of this effort is a robotic device with enhanced intelligence and maneuverability capable of conducting routine inspection of stored waste drums. The system has an integrated sensor suite for problem-drum detection, and is linked to a site database both for inspection planning and for data correlation, updating, and report generation. The system is capable of departing on an assigned mission, collecting required data, recording which portions of its mission had to be aborted or modified due to environmental constraints, and reporting back when the mission is complete. Successful identification of more than 96% of drum defects has been demonstrated in a high fidelity waste storage facility mockup. Identified anomalies included rust spots, rust streaks, areas of corrosion, dents, and tilted drums. All drums were positively identified and correlated with the site database. This development effort is separated into three phases of which phase two is now complete. The second phase demonstrated a prototype system appropriate for operational use in an actual storage facility. The prototype provides an integrated design that considers operational requirements, hardware costs, maintenance, safety, and robustness. The final phase will demonstrate commercial viability using the prototype vehicle in a pilot waste operations and inspection project. This report summarizes the design and evaluation of the new IMSS Phase 2 system and vehicle. Several parts of the IMSS Phase 1 Topical (Final) Report, which describes the requirements, design guidelines, and detailed design of the Phase 1 IMSS vehicle, are incorporated here, with modifications to reflect the changes in the design and the new elements added during the Phase 2 work.

208
(DOE/MC/29113–5599)
Interactive Computer-Enhanced Remote Viewing System (ICERVS): Final report, November 1994–September 1996. Mechanical Technology, Inc., Latham, NY (United States). [1997]. 241p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC21-92MC29113. Order Number DE97002246. Source: OSTI; NTIS; INIS; GPO Dep.

The Interactive Computer-Enhanced Remote Viewing System (ICERVS) is a software tool for complex three-dimensional (3-D) visualization and modeling. Its primary purpose is to facilitate the use of robotic and telerobotic systems in remote and/or hazardous environments, where spatial information is provided by 3-D mapping sensors. ICERVS provides a robust, interactive system for viewing sensor data in 3-D and combines this with interactive geometric modeling capabilities that allow an operator to construct CAD models to match the remote environment. Part I of this report traces the development of ICERVS through three evolutionary phases: (1) development of first-generation software to render orthogonal view displays and wireframe models; (2) expansion of this software to include interactive viewpoint control, surface-shaded graphics, material (scalar and nonscalar) property data, cut/slice planes, color and visibility mapping, and generalized object models; (3) demonstration of ICERVS as a tool for the remediation of underground storage tanks (USTs) and the dismantlement of contaminated processing facilities. Part II of this report details the software design of ICERVS, with particular emphasis on its object-oriented architecture and user interface.

209
(DOE/MC/29467–5670)
Decontamination systems information and research programs. Quarterly report, July 1–August 31, 1996. West Virginia Univ. Research Corp., Morgantown, WV (United States). [1997]. 519p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-92MC29467. Order Number DE97052831. Source: OSTI; NTIS; GPO Dep.

The US contains numerous hazardous waste sites. Many sites are on private land near operating units of various companies. An effort is being made to determine the conditions under which such sites can be remediated voluntarily. The objective of the project will be to first assess the interest and willingness of industry in the Kanawha River Valley, WV to participate in discussions that would lead toward voluntary cleanup activities. The second will be to implement the activities agreed upon by the interested parties. The project will first involve individual discussions with the industrial, government, and other organized groups in the area. These discussions will help determine the feasibility of organizing voluntary efforts. If the discussions indicate that conditions may be favorable for developing individual or group voluntary cleanup projects, a working group will be convened to establish the environmental goals of the project as well as the technical approach for achieving those goals. The projects for the 1996 WVU Cooperative Agreement are categorized into three task focus areas: Task 1.0 Contaminant Plume Containment and Remediation, Task 2.0 Cross Cutting Innovative Technologies, and Task 3.0 Small Business Support Program. Summaries of the accomplishments for the subtasks reporting under these categories during the third quarter, 1 July 96 through 30 September 96, are presented.

210
(DOE/MC/30164–97/C0816)
Progress of electro-hydraulic scabbling technology for concrete decontamination. Goldfarb, V.; Gannon, R. Textron, Inc., Wilmington, MA (United States). [1997]. 4p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC21-93MC30164. (CONF-9610231–14: Conference on industry partnerships to deploy environmental technology, Morgantown, WV (United States), 22-24 Oct 1996). Order Number DE97052256. Source: OSTI; NTIS; INIS; GPO Dep.

Concrete decontamination from organics, metals, and radionuclides requires removal of up to one inch of the surface layer. The Electro- Hydraulic Scabbling (EHS) technique has been developed within a 3- phase program. A prototype 8 kW EHS unit was designed and assembled in Phase II. This system was tested initially by scabbling non-contaminated concrete, and later at the DOE Fernald site where a concrete floor containing uranium was decontaminated. In the latter test, the unit operated without problems and reduced the counts per minute by more than 90%. Currently in Phase III, a larger 30 kW unit has been assembled and prepared for testing/demonstration.

211
(DOE/MC/30171–5710)
Recycle of contaminated scrap metal, comprehensive executive summary. Final report, September 30, 1993–March 31, 1996. Molten Metal Technology, Inc., Waltham, MA (United States). [1997]. 81p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC21-93MC30171. Order Number DE97005431. Source: OSTI; NTIS; GPO Dep.

R&D activities have demonstrated Catalytic Extraction Processing (CEP) to be a robust, one-step process that is relatively insensitive to wide variations in waste composition and is applicable to a broad spectrum of DOE wastes. The feed size and composition compatible with CEP have been increased in a short period of time, and additional R&D should lead to the ability to accept a drum (and larger?) size feed of completely uncharacterized waste. Experiments have validated the CPU (Catalytic Processing Unit). Two commercial facilities have been commissioned and are currently processing mixed low level wastes. Expansion of CEP to transuranic and high level wastes should be the next step in the development and deployment of CEP for recycle, reuse, and disposal of materials from DOE decontamination and decommissioning activities.

212
(DOE/MC/30172–97/C0803)
Characterization of pipes, drain lines, and ducts using the pipe explorer system. Cremer, C.D.; Kendrick, D.T.; Cramer, E. Science and Engineering Associates, Inc., Albuquerque, NM (United States). [1997]. 17p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC21-93MC30172. (CONF-9610231–3: Conference on industry partnerships to deploy environmental technology, Morgantown, WV (United States), 22-24 Oct 1996). Order Number DE97052243. Source: OSTI; NTIS; INIS; GPO Dep.

As DOE dismantles its nuclear processing facilities, site managers must employ the best means of disposing or remediating hundreds of miles of potentially contaminated piping and duct work. Their interiors are difficult to access, and in many cases even the exteriors are inaccessible. Without adequate characterization, it must be assumed that the piping is contaminated, and the disposal cost of buried drain lines can be on the order of $1,200/ft and is often unnecessary as residual contamination levels often are below free release criteria. This paper describes the program to

develop a solution to the problem of characterizing radioactive contamination in pipes. The technical approach and results of using the Pipe Explorer ™ system are presented. The heart of the system is SEA's pressurized inverting membrane adapted to transport radiation detectors and other tools into pipes. It offers many benefits over other pipe inspection approaches. It has video and beta/gamma detection capabilities, and the need for alpha detection has been addressed through the development of the Alpha Explorer™. These systems have been used during various stages of decontamination and decommissioning of DOE sites, including the ANL CP-5 reactor D&D. Future improvements and extensions of their capabilities are discussed.

213

(DOE/MC/30174–97/C0784)

Rapid surface sampling and archival record system (RSSAR). Barren, E. (and others); Bracco, A.; Dorn, S.B. General Electric Co., Schenectady, NY (United States). Corporate Research and Development Center. [1997]. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC21-93MC30174. (CONF-970113–3: Field analytical methods for hazardous wastes and toxic chemicals conference, Las Vegas, NV (United States), 29-31 Jan 1997). Order Number DE97051970. Source: OSTI; NTIS; INIS; GPO Dep.

Purpose is to develop a rapid surface (concrete, steel) contamination measurement system that will provide a "quick-look" indication of contamination areas, an archival record, and an automated analysis. A bulk sampling oven is also being developed. The sampling device consists of a sampling head, a quick look detector, and an archiving system (sorbent tube). The head thermally desorbs semivolatiles, such as PCBs, oils, etc., from concrete and steel surfaces; the volatilized materials are passed through a quick-look detector. Sensitivity of the detector can be attenuated for various contaminant levels. Volatilized materials are trapped in a tube filled with adsorbent. The tubes are housed in a magazine which also archives information about sampling conditions. Analysis of the tubes can be done at a later date. The concrete sampling head is fitted with a tungsten-halogen lamp; in laboratory experiments it has extracted model contaminants by heating the top 4mm of the surface to 250 C within 100-200 s. The steel sampling head has been tested on different types of steels and has extracted model contaminants within 30 s. A mathematical model of heat and mass transport in concrete has been developed. Rate of contaminant removal is at maximum when the moisture content is about 100 kg/m^3. The system will be useful during decontamination and decommissioning operations.

214

(DOE/MC/30174–5551)

Rapid Surface Sampling and Archival Record (RSSAR) System. Topical report, October 1, 1993–December 31, 1994. General Electric Co., Schenectady, NY (United States). Corporate Research and Development Center. [1997]. 146p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC21-93MC30174. Order Number DE97002208. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the results of Phase 1 efforts to develop a Rapid Surface Sampling and Archival Record (RSSAR) System for the detection of semivolatile organic contaminants on concrete, transite, and metal surfaces. The characterization of equipment and building surfaces for the presence of contaminants as part of building decontamination and decommissioning activities is an immensely large tacks of concern to both government and industry. Contaminated and clean materials must be clearly identified and segregated so that the clean materials can be recycled or reused, if possible, or disposed of more cheaply as nonhazardous waste. Characterization of building and equipment surfaces will be needed during initial investigations, during cleanup operations, and during the final confirmatory process, increasing the total number of samples well beyond that needed for initial characterization. This multiplicity of information places a premium on the ability to handle and track data as efficiently as possible. Aware of the shortcomings of traditional surface characterization technology, GE, with DOE support has undertaken a 12-month effort to complete Phase 1 of a proposed four-phase program to develop the RSSAR system. The objectives of this work are to provide instrumentation to cost-effectively sample concrete and steel surfaces, provide a quick-look indication for the presence or absence of contaminants, and collect samples for later, more detailed analysis in a readily accessible and addressable form. The Rapid Surface Sampling and Archival Record (RSSAR) System will be a modular instrument made up of several components: (1) sampling heads for concrete surfaces, steel surfaces, and bulk samples; (2) quick-look detectors for photoionization and ultraviolet; (3) multisample trapping module to trap and store vaporized contaminants in a manner suitable for subsequent detailed lab-based analyses.

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(DOE/MC/30175–5315)

Portable sensor for hazardous waste. Topical report, October 1, 1993–September 30, 1994. Physical Sciences, Inc., Andover, MA (United States). [1997]. 72p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC21-93MC30175. Order Number DE97002063. Source: OSTI; NTIS; INIS; GPO Dep.

The authors describe an innovative technique to detect hazardous materials at sub part-per-billion levels. The approach exploits active nitrogen energy-transfer (ANET) to excite atomic and molecular fluorescence characteristic of various hazardous species. ANET excitation is very state specific, generating simple spectra that are easily detected with instrumentation of modest resolution. Typical spectral features include 254 nm emission from Hg, 388 and 420 nm emission from CN when organics are sampled, and 278 nm emission from CCl when chlorinated organics are sampled. They also observe several broadbands between 450 and 540 nm where uranium compounds are added to the D-B discharge region. They attribute this spectrum to electronic transitions of uranium oxide, probably UO. Additionally, they have used ANET to detect a number of heavy metals such as Cr, Se, Cd, Pb, and Cu. Dielectric-barrier (D-B) discharge technology generates the active nitrogen. This approach affords atmospheric-pressure operation, fluorescence excitation in gaseous, particulate, and aqueous sample matrices, and is amenable to field operation because the discharge and associated electronics are compact and can be powered by 12V batteries. This report details the results of the first phase of a three and a half year program designed to develop a portable monitor for sensitive hazardous waste detection. The ultimate goal of the program is to develop the

concept to the prototype instrument level. In this first phase they have demonstrated the applicability of the ANET technology to a variety of hazardous species, and have determined detection sensitivity limits for Hg, Se, organics, and chlorinated organics to be at part-per-billion levels or below.

216
(DOE/MC/30359–1)
Commercialization plan laser-based decoating systems. Freiwald, J.; Freiwald, D.A. F2 Associates, Inc., Albuquerque, NM (United States). Jan 1998. 46p. Sponsored by USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AR21-94MC30359. Order Number DE98054524. Source: OSTI; NTIS; INIS; GPO Dep.

F2 Associates Inc. (F2) is a small, high-technology firm focused on developing and commercializing environmentally friendly laser ablation systems for industrial-rate removal of surface coatings from metals, concrete, and delicate substrates such as composites. F2 has a contract with the US Department of Energy Federal Energy Technology Center (FETC) to develop and test a laser-based technology for removing contaminated paint and other contaminants from concrete and metal surfaces. Task 4.1 in Phase 2 of the Statement of Work for this DOE contract requires that F2 "document its plans for commercializing and marketing the stationary laser ablation system. This document shall include a discussion of prospects for commercial customers and partners and may require periodic update to reflect changing strategy. This document shall be submitted to the DOE for review." This report is being prepared and submitted in fulfillment of that requirement. This report describes the laser-based technology for cleaning and coatings removal, the types of laser-based systems that have been developed by F2 based on this technology, and the various markets that are emerging for this technology. F2's commercialization and marketing plans are described, including how F2's organization is structured to meet the needs of technology commercialization, F2's strategy and marketing approach, and the necessary steps to receive certification for removing paint from aircraft and DOE certification for D and D applications. The future use of the equipment built for the DOE contract is also discussed.

217
(DOE/MC/31179–5309)
Environmental management technology leveraging initiative. Topical report, October 1994–September 1995. Global Environment and Technology Foundation, Annandale, VA (United States). [1997]. 36p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-94MC31179. Order Number DE97002049. Source: OSTI; NTIS; GPO Dep.

The deployment of innovative DOE-EM technologies could provide more cost-effective treatments than remediation technologies and methods currently in use. By building partnerships between the public and private sectors, the technological expertise of federal researchers and engineers and the commercial incentive of industrialists and other nongovernment interests can combine to help move these technologies "off the shelf' and toward use at contaminated sites. The GETE approach to achieving this end is: (1) to develop a process which identifies and assesses DOE-developed technologies from the perspective of commercial marketability; assists in bringing these technologies to the attention of the private sector; and aids, if necessary, in business planning and start-up activities, (2) to establish a state-of-the-art electronic communications system, the Global Network of Environment & Technology (GNET), to disseminate information on DOE-developed technologies, as well as information on capital and financing availability, regulatory matters, and commercialization objectives to potential business partners and others, and (3) to undertake public participation and outreach activities designed to address barrier reduction and public acceptance issues.

218
(DOE/MC/31185–5375)
Development of the integrated, in-situ remediation technology. Topical report for tasks No. 8 and No. 10 entitled: Laboratory and pilot scale experiments of Lasagna™ process, September 26, 1994–May 25, 1996. Ho, Sa V. (and others); Athmer, C.J.; Sheridan, P.W. Monsanto Co., St. Louis, MO (United States). [1997]. 71p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AR21-94MC31185. Order Number DE97002150. Source: OSTI; NTIS; INIS; GPO Dep.

Contamination in low permeability soils poses a significant technical challenge to in-situ remediation efforts. Poor accessibility to the contaminants and difficulty in delivery of treatment reagents have rendered existing in-situ treatments such as bioremediation, vapor extraction, pump and treat rather ineffective when applied to low permeability soils present at many contaminated sites. This technology is an integrated in-situ treatment in which established geotechnical methods are used to install degradation zones directly in the contaminated W and electro-osmosis is utilized to move the contaminants back and forth through those zones until the treatment is completed. This topical report summarizes the results of the lab and pilot sized Lasagna™ experiments conducted at Monsanto. Experiments were conducted with kaofinite and an actual Paducah soil in units ranging from bench-scale containing kg-quantity of soil to pilot-scale containing about half a ton of soil having various treatment zone configurations. The obtained data support the feasibility of scaling up this technology with respect to electrokinetic parameters as well as removal of organic contaminants. A mathematical model was developed that was successful in predicting the temperature rises in the soil. The information and experience gained from these experiments along with the modeling effort enabled us to successfully design and operate a larger field experiment at a DOE TCE-contaminated clay site.

219
(DOE/MC/31185–5388)
Development of an integrated, in-situ remediation technology. Topical report for task No. 6: lab-scale development of microbial degradation process, September 26, 1994–May 25, 1996. Odom, J.M. (DuPont Central Research & Development, Wilmington, DE (United States)). Monsanto Co., St. Louis, MO (United States). [1997]. 21p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AR21-94MC31185. Order Number DE97002130. Source: OSTI; NTIS; INIS; GPO Dep.

Contamination in low permeability soils poses a significant technical challenge to in situ remediation efforts. Poor accessibility to the contaminants and difficulty in delivery of treatment reagents have rendered existing in situ treatments such as bioremediation, vapor extraction, and pump and treat rather ineffective when applied to low permeability soils present at many contaminated sites. The technology is an integrated in situ treatment in which established geotechnical methods are used to install degradation zones directly in the contaminated soil, and electro-osmosis is utilized to move the contaminants back and forth through those zones until the treatment is completed. The present Topical Report for Task No. 6 summarizes the results of a study of the potential for stimulating microbial reductive dehalogenation as part of the integrated in situ treatment process at the field experiment test site at DOE's Gaseous Diffusion Plant in Paducah, Kentucky. A series of "microcosm bottle tests" were performed on samples of contaminated soil and groundwater taken from the Paducah site and spiked with trichloroethene (TCE). A number of bottles were set up, each spiked with a different carbon source in order to enhance the growth of different microbial subpopulations already present within the indigenous population in the soil. In addition, a series of bottle tests were completed with samples of the granular activated carbon (GAC) treatment zone material retrieved from the test site during the Paducah field experiment. In these tests, the GAC samples were used in place of the soil. Results of the soil-groundwater microcosms yielded a negative indication of the presence of dechlorinating bacteria at the site. However, charcoal (GAC) samples from one location in the test plot exhibited marked dechlorination with conversion of TCE to dichloroethene.

220
(DOE/MC/31185–5389)
Development of an integrated, in-situ remediation technology. Topical report for task No. 5: Cost analysis, September 26, 1994–May 25, 1996. Quinton, G. (and others); Schultz, D.; Landis, R. Monsanto Co., St. Louis, MO (United States). [1997]. 36p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AR21-94MC31185. Order Number DE97002134. Source: OSTI; NTIS; INIS; GPO Dep.

Contamination in low permeability soils poses a significant technical challenge to in situ remediation efforts. Poor accessibility to the contaminants and difficulty in delivering treatment reagents have rendered existing in situ treatments such as bioremediation, vapor extraction, pump and treat rather ineffective when applied to low permeability soils present at many contaminated sites. The Lasagna™ technology is an integrated in situ treatment in which established geotechnical methods are used to install degradation zones directly into the contaminated soil and electro-osmosis if utilized to move the contaminants back and forth through those zones until the treatment is completed. This topical report presents the results of an engineering evaluation and cost analysis of the vertically configured treatment process completed by the DuPont Company. The cost evaluation was prepared by developing a cost optimization model of the overall treatment process. This model considers various input parameters such as soil properties, depth of contamination, cost for emplacing electrodes and treatment zones, required purge water volume, time constraints to achieve cleanup, and cost of power. Several example cases were run using the cost model to provide representative cost ranges for applying the technology to clean up trichloroethene contamination in clay. These costs are estimated to range from $40 to $95 per cubic yard of soil for a 1-acre site, with cost depending on depth of contamination (cost range valid from 15 to 45 ft), method of electrode/treatment zone emplacement (cost range valid from 15 to 45 ft), method of electrode/treatment zone emplacement (cost range valid for Lasagna™ Phase I emplacement and optimized emplacement techniques), and time available to complete remediation (cost range valid for one- and three-year timeframe).

221
(DOE/MC/31185–5390)
Development of an integrated in-situ remediation technology. Topical report for task No. 12 and 13 entitled: Large scale field test of the Lasagna™ process, September 26, 1994–May 25, 1996. Athmer, C.J. (and others); Ho, Sa V.; Hughes, B.M. Monsanto Co., St. Louis, MO (United States). [1997]. 139p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AR21-94MC31185. Order Number DE97002156. Source: OSTI; NTIS; INIS; GPO Dep.

Contamination in low permeability soils poses a significant technical challenge to in-situ remediation efforts. Poor accessibility to the contaminants and difficulty in delivery of treatment reagents have rendered existing in-situ treatments such as bioremediation, vapor extraction, pump and treat rather ineffective when applied to low permeability soils present at many contaminated sites. This technology is an integrated in-situ treatment in which established geotechnical methods are used to instant degradation zones directly in the contaminated soil and electroosmosis is utilized to move the contaminants back and forth through those zones until the treatment is completed. This topical report summarizes the results of the field experiment conducted at the Paducah Gaseous Diffusion Plant in Paducah, KY. The test site covered 15 feet wide by 10 feet across and 15 feet deep with steel panels as electrodes and wickdrains containing granular activated carbon as treatment zone& The electrodes and treatment zones were installed utilizing innovative adaptation of existing emplacement technologies. The unit was operated for four months, flushing TCE by electroosmosis from the soil into the treatment zones where it was trapped by the activated carbon. The scale up from laboratory units to this field scale was very successful with respect to electrical parameters as weft as electroosmotic flow. Soil samples taken throughout the site before and after the test showed over 98% TCE removal, with most samples showing greater than 99% removal.

222
(DOE/MC/31185–5391)
Development of an integrated, in-situ remediation technology: Task 2–4, electrokinetic modeling. Topical report, September 26–May 25, 1996. Monsanto Co., St. Louis, MO (United States). [1997]. 54p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AR21-94MC31185. Order Number DE97002135. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the work conducted in Tasks 2-4, which together make up the Electrokinetic Modeling carried out in this project. The modeling was divided into three main sections: thermal analysis, chemical species transport, and

electrode geometry and soil heterogeneity issues. The thermal modeling consisted of development of the governing equations to incorporate Joule heating associated with electro-osmosis, heat conduction and convection, and temperature dependencies of electrical conductivity and electro-osmotic permeability. To model the transport of chemical species in the Lasagna™ process, a one-dimensional model was developed. This model is based on previous models, but includes additional mechanism to account for charge transfer in the double layer, pH buffering of the soil, and zeta potential dependency on pH and ionic strength. The results of this model and the corroboration by experimental measurement support some key assumptions made in the thermal model. An analysis was also conducted to compare the use of cylindrical electrodes to the plate geometry used in Phase I. In summary, cylindrical electrodes may be appropriate for anodes, because the do not intercept the flow. If used as cathodes, a planar treatment zone in their vicinity would probably be required. The cylindrical electrodes can operate at reasonable current densities without boiling water. Because the hottest region is at the electrode, cooling schemes could be used to operate at higher current densities. If iron anodes are used, they will have to be quite massive, and may not be economical compared to planar models. An example of soil heterogeneity was investigated when it was discovered that a steel pt was buried in the vicinity of the pilot test. There is some distortion of the field near the pit, but its effects on the test zone between the electrodes are minimal.

223

(DOE/MC/31185–5392)

Development of an integrated, in-situ remediation technology. Topical report for task No. 9. Part I. TCE degradation using nonbiological methods, September 26, 1994–May 25, 1996. Shapiro, A.P. (General Electric Research and Development, Schenectady, NY (United States)); Sivavec, T.M.; Baghel, S.S. Monsanto Co., St. Louis, MO (United States). [1997]. 35p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AR21-94MC31185. Order Number DE97002133. Source: OSTI; NTIS; INIS; GPO Dep.

Contamination in low-permeability soils poses a significant technical challenge for in situ remediation efforts. Poor accessibility to the contaminants and difficulty in delivery of treatment reagents have rendered existing in situ treatments such as bioremediation, vapor extraction, pump and treat rather ineffective when applied to low-permeability soils present at many contaminated sites. The technology is an integrated in situ treatment in which established geotechnical methods are used to install degradation zones directly in the contaminated soil and electro-osmosis is used to move the contaminants back and forth through those zones until the treatment is completed. The present Draft Topical Report for Task No. 9 summarizes laboratory investigations into TCE degradation using nonbiological methods. These studies were conducted by the General Electric Company. The report concentrates on zero valent iron as the reducing agent and presents data on TCE and daughter product degradation rates in batch experiments, column studies, and electroosmotic cells. It is shown that zero valent iron effectively degrades TCE in electroosmotic experiments. Daughter product degradation and gas generation are shown to be important factors in designing field scale treatment zones for the Lasagna™ process.

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(DOE/MC/31185–5393)

Development of an integrated, in-situ remediation technology. Draft topical report for task No. 9. Part II. Entitled: TCE degradation using non-biological methods, September 26, 1994–May 25, 1996. Orth, R.G.; McKenzie, D.E. Monsanto Co., St. Louis, MO (United States). [1997]. 24p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AR21-94MC31185. Order Number DE97002131. Source: OSTI; NTIS; INIS; GPO Dep.

Contamination in low permeability soils poses a significant technical challenge to in-situ remediation efforts. Poor accessibility to the contaminants and difficulty in delivery of treatment reagents have rendered existing in-situ treatments such as bioremediation, vapor extraction, pump and treat rather ineffective when applied to low permeability soils present at many contaminated sites. The technology is an integrated in-situ treatment in which established geotechnical methods are used to install degradation zones directly in the contaminated soil and electro-osmosis is utilized to move the contaminants back and forth through those zones until the treatment is completed. The use of zero valence iron for reductive dechlorination of aliphatic chlorinated hydrocarbons is currently under investigation by a number of research groups as a potential method of in-situ treatment of contaminated ground water. The reaction appears to involve the transfer of electrons to chloro-aliphatic compounds by the oxidation of zero valence iron to ferrous iron (Fe^{+2}). Our studies have indicated that this reaction is consistent with those of corrosion, and as such, can be influenced or increased by the presence of small amounts of metals (5% by weight) such as copper, tin, silver, gold and palladium coated on the iron surface. Incomplete coverage of the iron surface with a more electropositive metal results in an open galvanic cell, which increases the oxidation of iron and facilitates and increases the concurrent reduction of trichloroethylene and other chlorinated aliphatic compounds to the corresponding alkenes and alkanes. Our results show that plating more electropositive metals onto certain iron surfaces results in approximately a factor of ten increase in the dechlorination rate of small organochlorine compounds such as TCE.

225

(DOE/MC/31185–5495)

Development of an integrated in-situ remediation technology. Topical report for task No. 7 entitled: Development of degradation processes, September 26, 1994–May 25, 1996. Brackin, M.J. (and others); Heitkamp, M.A.; Ho, Sa V. Monsanto Co., St. Louis, MO (United States). [1997]. 53p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AR21-94MC31185. Order Number DE97002165. Source: OSTI; NTIS; INIS; GPO Dep.

Contamination in low permeability soils poses a significant technical challenge to in-situ remediation efforts. Poor accessibility to the contaminants and difficulty in delivery of treatment reagents have rendered existing in-situ treatments such as bioremediation, vapor extraction, pump and treat rather ineffective when applied to law permeability soils present at many contaminated sites. The Lasagna technology is an integrated in-situ treatment in which established geotechnical methods are used to install degradation zones

directly in the contaminated soil and electro-osmosis is utilized to move the contaminants back and forth through those zones until the treatment is completed. The general concept of the technology is to use electrokinetics to move contaminants from the soils into "treatment zones" where the contaminants can be removed from the water by either adsorption or degradation. The focus of technical task No. 7 was to optimize the conditions required for electro-osmotic movement of contaminants and microbial degradation in the treatment zones. This topical report summarizes the results of aerobic microbial research performed to evaluate the feasibility of incorporating the chemical-degrading organisms into biotreatment zones in laboratory-scale electro-osmosis units and to demonstrate the combination of electrokinetics and aerobic microbial degradation for the removal of contaminants from clay. Also included in this report are the results of investigating microbial movement during electro-osmosis and studies involving the optimization of the microbial support matrix in the biozone. The Stanford study was conducted in order to obtain a better understanding of rates of anaerobic reductive dehalogenation of TCE to ethylene and of factors affecting these rates in order to determine the potential for application of TCE biodegradation as part of the Lasagna technology.

226

(DOE/MC/31185–5496)

Development of an integrated in-situ remediation technology. Topical report for task No. 11 entitled: Evaluation of TCE contamination before and after the field experiment, September 26, 1994–May 25, 1996. Hughes, B.M. (and others); Athmer, C.J.; Sheridan, P.W. Monsanto Co., St. Louis, MO (United States). [1997]. 214p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AR21-94MC31185. Order Number DE97002166. Source: OSTI; NTIS; INIS; GPO Dep.

Contamination in low permeability soils poses a significant technical challenge to in-situ remediation efforts. Poor accessibility to the contaminants and difficulty in delivery of treatment reagents have rendered existing in-situ treatments such as bioremediation, vapor extraction, pump and treat rather ineffective when applied to low permeability soils present at many contaminated sites. The technology is an integrated in-situ treatment in which established geotechnical methods are used to install degradation zones directly in the contaminated soil and electro-osmosis is utilized to move the contaminants back and forth through those zones until the treatment is completed. The present Topical Report for Task No. 11 summarizes the results of TCE analysis in soil and carbon before and after conducting the field experiment. In addition, a discussion of the TCE material balance demonstrates that the Lasagna™ process is effective in moving TCE from the contaminated soil into carbon treatment zones in the field experiment at DOE's Gaseous Diffusion Plant in Paducah, Kentucky.

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(DOE/MC/31190–5547)

Base program interim phase test procedure - Coherent Laser Vision System (CLVS). Final report, September 27, 1994–January 30, 1997. Coleman Research Corp., Springfield, VA (United States). [1997]. 44p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AR21-94MC31190. Order Number DE97002207. Source: OSTI; NTIS; GPO Dep.

The purpose of the CLVS research project is to develop a prototype fiber-optic based Coherent Laser Vision System suitable for DOE's EM Robotics program. The system provides three-dimensional (3D) vision for monitoring situations in which it is necessary to update geometrics on the order of once per second. The CLVS project plan required implementation in two phases of the contract, a Base Contract and a continuance option. This is the Test Procedure and test/demonstration results presenting a proof-of-concept for a system providing three-dimensional (3D) vision with the performance capability required to update geometrics on the order of once per second.

228

(DOE/MC/31388–13-Pt.1)

Task 2 – Extraction and analysis of pollutant organics from contaminated solids using off-line supercritical fluid extraction (SFE) and on-line SFE-infrared spectroscopy. Semi-annual report, April 1–September 30, 1997. Hawthorne, S.B. Univ. of North Dakota, Energy and Environmental Research Center, Grand Forks, ND (United States). [1997]. 3p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE98054519. Source: OSTI; NTIS; GPO Dep.

The work for this task was canceled as of February 1997. At that time, Suprex Corporation, the commercial partner, was purchased by a competitor (ISCO of Lincoln, Nebraska). ISCO had no plans to continue the development of the interface which the EERC and Suprex were developing since ISCO had recently developed a similar product based on a window (rather than a fiber optic) interface. The EERC is currently waiting for approval from the US Department of Energy to close out this task.

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(DOE/MC/31388–13-Pt.3)

Task 8 – Management and reporting. Semi-annual report, April 1–September 30, 1997. Daly, D.J.; Erickson, T.A. Univ. of North Dakota, Energy and Environmental Research Center, Grand Forks, ND (United States). [1997]. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE98054521. Source: OSTI; NTIS; INIS; GPO Dep.

The task of addressing the environmental needs of nuclear defense complex sites under the US Department of Energy (DOE) Environmental Management (EM) Program requires the timely availability of appropriate cleanup technologies. Fostering the commercialization of these technologies is the mission of EM-50, the EM Program Office of Science and Technology. DOE's Federal Energy Technology Center (FETC) pursues activities integral to the EM-50 mission through its Cooperative Agreement with the EM Office of Science and Technology (EMCA). The primary objective of Task 8 is to ensure the effectiveness of the EMCA. This is accomplished through (1) the coordination of internal EMCA activities and coordination with the FETC contractor's representative, (2) the coordination and expansion of the EMCA, and (3) effective technical transfer.

230
(DOE/MC/31388–13-Pt.4)
Task 9 – Centrifugal membrane filtration. Semi-annual report, April 1–September 30, 1997. Stepan, D.J.; Grafsgaard, M.E. Univ. of North Dakota, Energy and Environmental Research Center, Grand Forks, ND (United States). [1997]. 19p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE98054522. Source: OSTI; NTIS; INIS; GPO Dep.

This project is designed to establish the utility of a novel centrifugal membrane filtration technology for the remediation of liquid mixed waste streams at US Department of Energy (DOE) facilities in support of the DOE Environmental Management (EM) program. The Energy and Environmental Research Center (EERC) has teamed with SpinTek Membrane Systems, Inc., a small business and owner of the novel centrifugal membrane filtration technology, to establish the applicability of the technology to DOE site remediation and the commercial viability of the technology for liquid mixed waste stream remediation. The technology is a uniquely configured process that makes use of ultrafiltration and centrifugal force to separate suspended and dissolved solids from liquid waste streams, producing a filtered water stream and a low-volume contaminated concentrate stream. This technology has the potential for effective and efficient waste volume minimization, the treatment of liquid tank wastes, the remediation of contaminated groundwater plumes, and the treatment of secondary liquid waste streams from other remediation processes, as well as the liquid waste stream generated during decontamination and decommissioning activities.

231
(DOE/MC/31388–13-Pt.5)
Task 10 – Technology development integration. Semi-annual report, April 1–September 30, 1997. Erickson, T.A.; Daly, D.J.; Jones, M.L. Univ. of North Dakota, Energy and Environmental Research Center, Grand Forks, ND (United States). [1997]. 20p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE98054537. Source: OSTI; NTIS; GPO Dep.

Task 10 activities by the Energy and Environmental Research Center (EERC) have focused on the identification and integration of new cleanup technologies for use in the US Department of Energy (DOE) Environmental Management Program to address environmental issues within the nuclear defense complex. Under Subtask 10A, activities focused on a review of technology needs compiled by the Site Technology Coordination Groups as part of an ongoing assessment of the relevance of the EM Cooperative Agreement Program activities to EM site needs. Work under this subtask was completed August 31. Work under Task 10B had as its goal assisting in the definition and development of specific models to demonstrate several approaches to be used by DOE to encourage the commercialization of environmental technologies. This activity included identification and analysis of economic and regulatory factors affecting feasibility of commercial development of two specific projects and two general models to serve as a mechanism for the transfer of federally supported or developed environmental technologies to the private sector or for rapid utilization in the federal government's efforts to clean up the weapons complex.

232
(DOE/MC/31388–13-Pt.6)
EM Task 12 – Laser cleaning of contaminated painted surfaces. Semi-annual report, April 1–September 30, 1997. Grisanti, A.A.; Jenson, R.R.; Allan, S.E. Univ. of North Dakota, Energy and Environmental Research Center, Grand Forks, ND (United States). [1997]. [75p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE98054538. Source: OSTI; NTIS; INIS; GPO Dep.

Surface decontamination of concrete and steel surfaces in nuclear facilities provides cost savings during decommissioning operations by allowing recycling or reuse of concrete and steel structures. Separation of radionuclides and other contamination from the concrete or steel substrates also allows reduction in volume of hazardous materials during the D and D (decontamination and decommissioning) process, resulting in further cost savings. Several techniques are available or under development for surface decontamination in nuclear facilities. Each technique has its merits; however, none of them is universally the best choice for all surface decontamination applications. Because of the multitude of factors which influence the environmental and economic aspects of selecting a surface decontamination technique, it is difficult to select the best method in a given situation; an objective basis for comparing techniques is needed. The objective of this project is to develop a software tool for use by personnel selecting a surface decontamination technique. The software will incorporate performance data for available surface decontamination techniques. The major activities in the project are broken down as follows: Task 1–Complete decision tree development; Task 2–Literature search for surface decontamination reports; Task 3–Compilation of database from literature data; Task 4–Sensitivity analysis and model design; Task 5–Design of model data structures; and Task 6–PC software design and coding. Work during this reporting period completed Tasks 1, 2, 3, 5, and 6. Task 4 activities resulted in a prototype of the model design; sensitivity analysis and model modifications are in progress at the time of this report. Task 4 will be complete prior to the end of December 1997. A working prototype of the software implementation of the surface decontamination model and technology database has been completed. (Abstract truncated)

233
(DOE/MC/31388–13-Pt.7)
EM Task 13 – Cone penetrometer for subsurface heavy metals detection. Semi-annual report, April 1–September 30, 1997. Grisanti, A.A.; Timpe, R.C.; Foster, H.J.; Eylands, K.E.; Crocker, C.R. Univ. of North Dakota, Energy and Environmental Research Center, Grand Forks, ND (United States). [1997]. [100p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE98054539. Source: OSTI; NTIS; GPO Dep.

Surface and subsurface contamination of soils by heavy metals, including Pb, Cr, Cu, Zn, and Cd has become an area of concern for many industrial and government organizations. Conventional sampling and analysis techniques for soil provide a high degree of sensitivity and selectivity for individual analytes. However, obtaining a representative

sampling and analysis from a particular site using conventional techniques is time-consuming and costly. Additionally, conventional methods are difficult to implement in the field for in situ and/or real-time applications. Therefore, there is a need for characterization and monitoring techniques for heavy metals in soils which allow cost-effective, rapid, in situ measurements. Laser induced breakdown spectroscopy (LIBS) has been used to successfully measure metals content in a variety of matrices including soil. Science and Engineering Associates (SEA) is developing a subsurface cone penetrometer (CPT) probe for heavy metal detection that employs LIBS. The LIBS/CPT unit is to be applied to in situ, real-time sampling and analysis of heavy metals in soil. The overall objectives of this project are to evaluate potential calibration techniques for the LIBS/CPT instrument and to provide a preliminary evaluation of the LIBS instrument calibration using samples obtained from the field.

234
(DOE/MC/31388–13-Pt.8)
EM14 – Bubbleless gas transfer technology for the in situ remediation of chlorinated hydrocarbons. Semi-annual report, April 1–September 30, 1997. Gallagher, J.R. Univ. of North Dakota, Energy and Environmental Research Center, Grand Forks, ND (United States). [1997]. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE98054533. Source: OSTI; NTIS; GPO Dep.

The primary objective of this project is to demonstrate the ability of hydrogen to supply reducing equivalents for the reductive dehalogenation of PCE. This objective will be accomplished by two types of activities. First, laboratory experiments will compare the kinetics of hydrogen-mediated dehalogenation with natural routes of loss (hydrolysis and natural attenuation). Secondly, bench-scale column experiments will be performed to demonstrate hydrogen-mediated reductive dehalogenation in aquifer sediments.

235
(DOE/MC/31388–13-Pt.9)
Task 15 – Remediation of organically contaminated soil using hot/liquid (subcritical) water. Semi-annual report, April 1–September 30, 1997. Hawthorne, S.B. Univ. of North Dakota, Energy and Environmental Research Center, Grand Forks, ND (United States). [1997]. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE98054534. Source: OSTI; NTIS; GPO Dep.

This activity involves a pilot-scale demonstration of the use of hot/liquid water for the removal of organic contaminants from soil at the pilot (20 to 40 kg) scale. Lab-scale studies are being performed to determine the optimum temperature, contact time, and flow rates for removal of the organic contaminants. Initial investigations into using carbon sorbents to clean the extractant water for recycle use and to concentrate the extracted contaminants in a small volume for disposal are also being performed. Liquid water is normally considered to be too polar a solvent to be effective for removal of organic contaminants from contaminated soils and sludges. However, the Energy and Environmental Research Center (EERC) has demonstrated that the polarity of liquid water can be changed from that of a very polar solvent at ambient conditions to that of an organic solvent (e.g., ethanol or acetonitrile) by simply raising the temperature. The EERC has exploited this unique property of liquid water to obtain highly selective extractions of polar (at lower temperatures) to nonpolar (at 200 to 250 C) organics from contaminated soils and sludges. Only moderate pressures (a maximum of about 45 atm at 250 C and lower pressures at lower temperatures) are required. With this procedure, all detectable hazardous organics were removed from the sludge, thus making the remaining material (about 99% of the original mass) a nonhazardous material. The present understanding of hot/liquid water extraction for the removal of hazardous organics from contaminated soils and sludges is being used to develop the engineering parameters needed to perform a pilot-scale demonstration of the remediation technology. Progress during the report period is summarized.

236
(DOE/MC/31388–5497)
Task 2: Extraction and analysis of pollutant organics from contaminated solids using off-line Supercritical Fluid Extraction (SFE) and on-line SFE-infrared spectroscopy. Semi-annual report, April 1, 1996–September 30, 1996. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. [1997]. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE97002176. Source: OSTI; NTIS; GPO Dep.

This activity will result in a commercialized version of a field-portable instrument for performing supercritical fluid extraction (SFE) with on-line Fourier transform infrared (FT-IR) detection. The Energy & Environmental Research Center (EERC) has developed an SFE field-portable method for quantitatively extracting organic pollutants (e.g., polycyclic aromatic hydrocarbons [PAHs], polychlorinated biphenyls [PCBs], total petroleum hydrocarbons [TPHs]) from soils and sludges under U.S. Environmental Protection Agency (EPA) funding. FT-IR is a detector that can yield quantitative and compound-class information for organic pollutants and is excellent for survey uses, since virtually all organic compound classes can be monitored. A laboratory prototype SFE-FT-IR instrument has been developed at the EERC and the University of North Dakota (UND) Department of Chemistry. The commercial instrument will be field-portable (requiring only generator electricity) and able to extract and measure organic pollutants from soils and sludges, identify the compound classes present, and provide quantitative or semiquantitative results at detection limits relevant to regulatory needs (e.g., parts per million). The SFE-FT-IR approach is particularly advantageous for very hazardous samples (e.g., determination of organics in solids contaminated with radioactive components), since SFE-FT-IR analysis generates no waste solvents. The instrument will also be configured to allow collection of “positive” extracts for analysis by other confirmatory (e.g., gas chromatography-mass spectroscopy [GC-MS]) methods.

237
(DOE/MC/31388–5498)
Task 3 - pyrolysis of plastic waste. Semi-annual report, April 1–September 30, 1996. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. [1997]. 17p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United

States). DOE Contract FC21-94MC31388. Order Number DE97002177. Source: OSTI; NTIS; GPO Dep.

This report briefly describes progress in the development of a thermal decomposition process for volume reduction of spent ion-exchange resin. During the reporting period, two series of tests were performed. The mixed waste plastics test investigated the effectiveness of the process in concentrating radionuclide surrogates in a solids residual while yielding a surrogate-free condensate product. Preliminary results indicated the occurrence of solids carryover. The ion-exchange resin tests resulted in a cesium concentration in the unfiltered condensate of about 4 to 20 micrograms/gram, indicating that fine particulate material was passing through the reactor cyclone. Future work includes the evaluation of an auger reactor in place of the fluidized bed reactor to address the problem of reactor carryover. 2 figs., 7 tabs.

238

(DOE/MC/31388–5499)

Task 8 - management and reporting. Semi-annual report April 1–September 30, 1996. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. [1997]. 16p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE97002178. Source: OSTI; NTIS; INIS; GPO Dep.

The task of restoring nuclear defense complex sites under the U.S. Department of Energy (DOE) Environmental Management (EM) program presents an unprecedented challenge to the environmental restoration community. Effective and efficient cleanup requires the timely development or modification of novel cleanup technologies applicable to radioactive wastes. Fostering the commercialization of these innovative technologies is the mission of EM-50, the EM Program Office of Science and Technology. DOE's Morgantown Energy Technology Center (METC) pursues activities integral to the EM-50 mission through its Cooperative Agreement with the EM Office of Science and Technology. The advancement of innovative technologies is often arrested at the "valley of death," the general term for barriers to demonstration and commercialization. Alternatively, commercialization and deployment are impacted by a lack of clear choices among competing technologies. The Energy & Environmental Research Center (EERC), a not-for-profit, contract-supported organization focused on research, development, demonstration, and commercialization (RDD&C) of energy and environmental technologies, is in the second year of a Cooperative Agreement with METC designed (1) to deliver EM technologies into the commercial marketplace through a unique combination of technical support, real-world demonstrations, and brokering; (2) to facilitate decisions regarding deployment and support for commercialization by providing comparative performance data through systems analysis; and (3) to support the integration and deployment of "winner" technologies at EM sites. These activities, along with program management, make up the four program areas of the METC-EERC EM Cooperative Agreement (EMCA): Technology Commercialization, Systems Engineering, Technology Integration, and Management and Reporting.

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(DOE/MC/31388–5500)

Task 9 - centrifugal membrane filtration. Semi-annual report April 1–September 30, 1996. Stepan, D.J.; Moe, T.A.; Collings, M.E. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. [1997]. 181p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE97002179. Source: OSTI; NTIS; INIS; GPO Dep.

This report assesses a centrifugal membrane filtration technology developed by SpinTek Membrane Systems, Inc. The technology uses supported microporous membranes rotating at high rpm, under pressure, to separate suspended and colloidal solids from liquid streams, yielding a solids-free permeate stream and a highly concentrated solids stream. The Tank Waste Focus Area was chosen for study. Membrane-screening tests were performed with the STC-X4 static test cell filtration unit, using five ceramic membranes with different pore size and composition. Based on permeate flux, a 0.25-μm TiO_2/Al_2O_3 membrane was selected for detailed performance evaluation using the centrifugal membrane filtration unit with a surrogate tank waste solution. The performance of the unit was evaluated with a statistical test design that determined the effect of temperature, pressure, membrane rotational speed, and solids loading on permeate flux. All four variables were found to be statistically significant, with the magnitude of the effect in the order of temperature, solids loading, rotor speed, and pressure. Temperature, rotor speed, and pressure had an increasing effect on flux with increasing value, while increases in solids loading showed a decrease in permeate flux. Significant interactions between rotor speed and solids loading and pressure and solids loading were also observed. The regression equation derived from test data had a correlation coefficient of 0.934, which represents a useful predictive capability for integrating the technology into DOE cleanup efforts. An extended test run performed on surrogate waste showed some deterioration in filtration performance, based on flux, apparently due to the buildup of solids near the inner portion of the membrane where relative membrane velocities were low. Continued testing of the system will focus on modifications to the shear pattern across the entire membrane surface to affect improved long-term performance.

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(DOE/MC/31388–5501)

Task 10 - technology development integration. Semi-annual report, April 1–September 30, 1996. Hendrikson, J.G.; Daly, D.J. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. [1997]. 230p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE97002180. Source: OSTI; NTIS; INIS; GPO Dep.

The Energy and Environmental Research Center (EERC), in conjunction with the Waste Policy Institute (WPI), will identify and integrate new technologies to meet site-specific environmental management (EM) requirements at contaminated sites appropriate to U.S. Department of Energy (DOE) interests. This paper briefly reports overall progress for three activities: technology management, project management, and technology integration. Work performed over the reporting period has focused on providing logistical and administrative support. In addition, six monthly WPI reports to the EERC are included as appendices. The WPI reports contained detailed information for progress in each activity.

241
(DOE/MC/31388–5502)
Task 11: Technology development integration. Semi-annual report, April 1, 1996–September 30, 1996. Musich, M.A. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. [1997]. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE97002181. Source: OSTI; NTIS; INIS; GPO Dep.

A review was conducted of three systems analysis (SA) studies performed by Lockheed Idaho Technologies Company (LITCO) on integrated thermal treatment systems (ITTSs) and integrated nonthermal treatment systems (INTSs) for the remediation of mixed low-level waste (MLLW) stored throughout the U.S. Department of Energy (DOE) weapons complex. The review was performed by an independent team led by the Energy & Environmental Research Center (EERC), including Science Applications International Corporation, the Waste Policy Institute (WPI), and Virginia Tech. The three studies reviewed were as follows: (1) Integrated Thermal Treatment System Study, Phase 1 - issued July 1994, (2) Integrated Thermal Treatment System Study, Phase 2 - issued February 1996, and (3) Integrated Nonthermal Treatment System Study - drafted March 1996. The three studies were commissioned by DOE to be SA studies of environmental management (EM) systems. The purpose of LITCO's engineering evaluation of the MLLW treatment system alternatives was to help DOE in the prioritization of research, development, and demonstration activities for remediation technologies. The review of these three studies was structured to further aid DOE in its current and future decision-making processes. The methodology in the studies was compared to a sound systems engineering (SE) approach to help DOE determine which tasks still need to be accomplished to complete a thorough design/review.

242
(DOE/MC/31388–5503)
Task 12: Laser cleaning of contaminated painted surfaces. Semi-annual report, April 1, 1996–September 30, 1996. Grisanti, A.A.; Hassett, D.J. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. [1997]. 22p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE97002182. Source: OSTI; NTIS; INIS; GPO Dep.

Paint contaminated with radionuclides and other hazardous materials is common in Department of Energy (DOE) facilities. Facility decommissioning and decontamination requires the removal of contaminated paint. Paint removal technologies include laser- and abrasive-based systems. F2 Associates are utilizing a pulsed-repetition CO_2 laser that produces a 2.5-cm x 2.5-cm beam which can be scanned across a 30- x 100-cm raster and, when placed on a robot, can be designed to clean any surface that the robot can be programmed to follow. Causing little or no damage to the substrate (concrete, steel, etc.), the laser ablates the material to be removed from a given surface. Ablated material is then pulled into a filtration and collection (VAC-PAC) system to prevent the hazardous substances from entering into the atmosphere. The VAC-PAC system deposits the ablated material into waste drums which may be removed from the system without compromising the integrity of the seal, allowing a new drum to be set up for collection without leakage of the ablated material into the atmosphere.

243
(DOE/MC/31388–5772)
Task 15 - Remediation of Organically Contaminated Soil Using Hot/Liquid (Subcritical) Water. Semiannual report, November 1, 1996– March 31,1997. Hawthorne, Steven B. North Dakota Univ., Grand Forks, ND (United States). 1997. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE97005470. Source: OSTI; NTIS; INIS; GPO Dep.

This activity will perform a pilot-scale demonstration of the use of hot/liquid water for the removal of organic contaminants from soil at the pilot (20 to 40 kg) scale. Lab-scale studies will be performed to determine the optimum temperature, contact time, and flow rates for removal of the organic contaminants. Initial investigations into using carbon sorbents to clean the extractant water for recycle use and to concentrate the extracted contaminants in a small volume for disposal will also be performed.

244
(DOE/MC/31388–5773)
Task 14 - Bubbleless Gas Transfer Technology for the In Situ Remediation of Chlorinated Hydrocarbons. Semiannual report, November 1, 1996–March 31, 1997. Gallagher, J.R. North Dakota Univ. Grand Forks Energy And Environmental Research Center (United States). 1997. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-94MC31388 ; FC21-93MC30098. Order Number DE97005471. Source: OSTI; NTIS; GPO Dep.

The primary objective of this project is to demonstrate the ability of hydrogen to supply reducing equivalents for the reductive dehalogenation of PCE. This objective will be accomplished by two types of activities. First, laboratory experiments will compare the kinetics of hydrogen-mediated dehalogenation with natural routes of loss (hydrolysis and natural attenuation). Secondly, bench-scale column experiments will be performed to demonstrate hydrogen-mediated reductive dehalogenation in aquifer sediments.

245
(DOE/MC/31388–5774)
Task 10 - Technology Development Integration. Semiannual report, November 1, 1996–March 31, 1997. Erickson, Thomas A.; Daly, Daniel J. Univ. of North Dakota Energy and Environmental Research Center, Grand Forks (United States). 1997. 59p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE97005472. Source: OSTI; NTIS; GPO Dep.

The Energy and Environmental Research Center (EERC) in conjunction with the Waste Policy Institute (WPI) will identify and integrate new technologies to meet site-specific environmental management (EM) requirements at contaminated sites appropriate to U.S. Department of Energy (DOE) interests. EM technologies offered by developers will be evaluated to determine their complementary contribution to new cleanup systems focused on particular characterization and remediation problems at specific EM sites. The technology clusters identified will provide EM cleanup capabilities

that are significantly faster, better, safer, and cheaper than systems that are currently available. Work will be performed under the DOE-EERC EM Cooperative Agreement (EMCA), which includes provisions to develop, demonstrate, and commercialize technologies that address environmental management needs of contaminated sites together with management activities which accelerate transfer of technologies. The effort began July 1, 1995.

246
(DOE/MC/31388–5775)
Task 9- Centrifugal Membrane Filtration. Semiannual report, November 1, 1996–March 31, 1997. Stephan, Daniel J.; Grafsgaard, Michael E. North Dakota Univ. Grand Forks Energy And Environmental Research Center (United States). 1997. 13p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE97005473. Source: OSTI; NTIS; GPO Dep.

The overall project consists of several integrated research phases related to the applicability, continued development, demonstration, and commercialization of the SpinTek centrifugal membrane filtration process. This phase of work is a continuation of the Phase 1 evaluation of the SpinTek centrifugal membrane filtration technology. During Phase 1 testing conducted at the EERC using the SpinTek ST-IIL unit operating on a surrogate tank waste, a solids cake developed on the membrane surface. Solids cake development was observed where linear membrane velocities were less than 17.5 feet per second and resulted in a reduction of unobstructed membrane surface area of up to 25%, reducing overall filtration performance. The primary goal of the Phase 2 research effort is to enhance filtration performance through the development and testing of alternative designs of the turbulence promoters to generate a shear force across the entire membrane surface that is sufficient to maintain a self-cleaning membrane capability and improve filtration efficiency and long term performance. Specific Phase 2 research activities include the following: System modifications to accommodate an 11-inch-diameter, two-disk rotating membrane assembly. Development and fabrication of alternative designs to the existing turbulence promoters. *Testing and evaluation of the existing and alternative turbulence promoters under selected operating conditions using a statistically designed test matrix Data reduction and analysis.

247
(DOE/MC/31388–5777)
Task 3 - Pyrolysis of Plastic Waste. Semiannual report, November 1, 1996–March 31, 1997. Ness, Robert O.; Aulich, Ted R. North Dakota Univ., Grand Forks, ND (United States). 1997. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE97005475. Source: OSTI; NTIS; INIS; GPO Dep.

Over the last 50 years, the U.S. Department of Energy (DOE) has produced a wide variety of radioactive wastes from activities associated with nuclear defense and nuclear power generation. These wastes include low-level radioactive solid wastes, mixed wastes, and transuranic (TRU) wastes. A portion of these wastes consists of high- organic-content materials, such as resins, plastics, and other polymers; synthetic and natural rubbers; cellulosic-based materials; and oils, organic solvents, and chlorinated organic solvents. Many of these wastes contain hazardous and/or pyrophoric materials in addition to radioactive species. Physical forms of the waste include ion-exchange resins used to remove radioactive elements from nuclear reactor cooling water, lab equipment and tools (e.g., measurement and containment vessels, hoses, wrappings, equipment coverings and components, and countertops), oil products (e.g., vacuum pump and lubrication oils), bags and other storage containers (for liquids, solids, and gases), solvents, gloves, lab coats and anti-contamination clothing, and other items. Major polymer and chemical groups found in high-organic-content radioactive wastes include polyvinyl chloride (PVC), low-density polyethylene (LDPE), polypropylene (PP), Teflon(TM), polystyrene (PS), nylon, latex, polyethylene terephthalate (PET), vinyl, high-density polyethylene (HDPE), polycarbonate, nitriles, Tygon(R), butyl, and Tyvec(R).

248
(DOE/MC/31388–5780)
Laser Cleaning of Contaminated Painted Surfaces. Semiannual report, November 1, 1996–March 31, 1997. Grisanti, Ames A.; Jensen, Robert R. North Dakota Univ. Grand Forks Energy And Environmental Research Center (United States). 1997. 23p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE97005478. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this project is to develop a software tool for use by personnel who must select a surface decontamination technique. The software will incorporate performance data for available surface decontamination techniques. The major activities in the project are broken down as follows: Task 1 - Complete decision tree development. Task 2 - Literature search for surface decontamination reports. Task 3 - Compilation of database from literature data. Task 4 - Sensitivity analysis and model design. Task 5 - Design of model data structures. Task 6 - PC software design and coding

249
(DOE/MC/31388–5781)
Cone Penetrometer for Subsurface Heavy Metals Detection. Semiannual report, November 1, 1996–March 31, 1997. Grisanti, Ames A.; Timpe, Ronald C.; Foster, H.J.; Eylands, Kurt E.; Crocker, Charlene R. North Dakota Univ. Grand Forks Energy And Environmental Research Center (United States). 1997. 26p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE97005479. Source: OSTI; NTIS; INIS; GPO Dep.

Surface and subsurface contamination of soils by heavy metals, including Pb, Cr, Cu, Zn, and Cd, has become an area of concern for many industrial and government organizations (1). Conventional sampling and analysis techniques for soil provide a high degree of sensitivity and selectivity for individual analytes. However, obtaining a representative sampling and analysis from a particular site using conventional techniques is time consuming and costly (2). Additionally, conventional methods are difficult to implement in the field for in situ and/or real-time applications. Therefore, there is a need for characterization and monitoring techniques for heavy metals in soils which allow cost-effective, rapid, in situ measurements. Laser-induced breakdown spectroscopy (LIBS) has been used to successfully measure metals content in a variety of matrices (3-15) including soil

(16,17). Under the Department of Energy (DOE) Federal Energy Technology Center (FETC) Industry Program, Science & Engineering Associates (SEA) is developing a subsurface cone penetrometer (CPT) probe for heavy metals detection that employs LIBS (18). The LIES-CPT unit is to be applied to in situ, real-time sampling and analysis of heavy metals in soil. As part of its contract with DOE FETC, SEA is scheduled to field test its LIBS-CPT system in September 1997.

250
(DOE/MC/32091–3)
Steam reforming of low-level mixed waste. Final report. ThermoChem, Inc., Baltimore, MD (United States). Jun 1998. [400p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AR21-95MC32091. Order Number DE98058965. Source: OSTI; NTIS; INIS; GPO Dep.

ThermoChem has successfully designed, fabricated and operated a nominal 90 pound per hour Process Development Unit (PDU) on various low-level mixed waste surrogates. The design, construction, and testing of the PDU as well as performance and economic projections for a 300-lb/hr demonstration and commercial system are described. The overall system offers an environmentally safe, non-incinerating, cost-effective, and publicly acceptable method of processing LLMW. The steam-reforming technology was ranked the No. 1 non-incineration technology for destruction of hazardous organic wastes in a study commissioned by the Mixed Waste Focus Area and published in April 1997. The ThermoChem steam-reforming system has been developed over the last 13 years culminating in this successful test campaign on LLMW surrogates. Six surrogates were successfully tested including a 750-hour test on material simulating a PCB- and Uranium-contaminated solid waste found at the Portsmouth Gaseous Diffusion Plant. The test results indicated essentially total (> 99.9999%) destruction of RCRA and TSCA hazardous halogenated organics, significant levels of volume reduction (> 400 to 1), and retention of radionuclides in the volume-reduced solids. Economic evaluations have shown the steam-reforming system to be very cost competitive with more conventional and other emerging technologies.

251
(DOE/MC/32110–5477)
Measurement of radionuclides using ion chromatography and flow-call scintillation counting with pulse shape discrimination: Topical report, September 15, 1996–October 3, 1996, Tasks 1.11, 1.12 and 1.13. South Carolina Universities Research and Education Foundation, Clemson, SC (United States). Strom Thurman Inst. [1997]. 5p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AR21-95MC32110. Order Number DE97002144. Source: OSTI; NTIS; INIS; GPO Dep.

Several flow-cell radiation detector systems are commercially available for quantification of aqueous radioactive solutions. These systems do not use the technique of pulse shape discrimination to identify the incident radiation and therefore are limited in environmental characterization application when coupled to an ion chromatography system. The advantages of the pulse shape discriminating flow-cell detector over the commercially available systems include: (1) lower minimum detectable activity for alpha radiation, (2) reduced radiological interferences that may exist between co-eluted alpha- and beta-emitting radionuclides, and (3) possible isotopic information from the ion chromatography system. For Tasks 1.1.1 and 1.1.2 of this project, several scintillation materials were investigated for pulse shape (alpha and beta) discrimination capabilities and the best candidate material was optimized. In addition, the following detector properties were also optimized: scintillator particle size, flow-cell tubing type, and electromagnetic as well as optical crosstalk between the photomultiplier tubes.

252
(DOE/MC/32260–1)
PTC-6 vacuum system: WallWalker™ and Blastrac® shot blast cleaning system. Operating Engineers National HAZMAT Program, Beaver, WV (United States). Feb 1998. [150p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-95MC32260. Order Number DE98058271. Source: OSTI; NTIS; INIS; GPO Dep.

The LTC Americas, Inc. wall decontamination technology consisted of two pneumatic hand-held tools: (1) a roto-peen scaler that used star cutters and (2) a 3-piston hammer with reciprocating bits. The hand-held tools were used in conjunction with the LTC PTC-6 vacuum system which captured dust and debris as the wall decontamination took place. Recommendations for improved worker safety and health during use of the PTC-6 vacuum system with hand-held tools include: (1) keeping all hoses and lines as orderly as possible in compliance with good housekeeping requirements; (2) ergonomic training to include techniques in lifting, bending, stooping, twisting, etc.; (3) use of a clamping system to hold hoses to the vacuum system; (4) a safety line on the air line connections; (5) use of a mechanical lifting system for waste drum removal; and (6) the use of ergonomically designed tools.

253
(DOE/MC/32260–3)
Pegasus International, Inc. coating removal systems. Operating Engineers National HAZMAT Program, Beaver, WV (United States). Feb 1998. [250p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). DOE Contract FC21-95MC32260. Order Number DE98058272. Source: OSTI; NTIS; GPO Dep.

The Pegasus Coating Removal System (PCRS) was demonstrated at Florida International University (FIU) where it was being evaluated for efficiency and cost. In conjunction with the FIU testing demonstration, a human factors assessment was conducted to assess the hazards and associated safety and health issues of concern for workers utilizing this technology. The PCRS is a chemical paste that is applied to the surface using a brush, roller, or airless sprayer. After the type of PCRS, thickness, and dwell time have been determined, a laminated backed material is placed on top of the chemical paste to slow down the drying process and to provide a mechanism to strip-off the chemical. After the dwell time is reached, the chemical substrate can be removed. Scrapers may be used to break-loose the layers as necessary or to break-loose the layers that are not removed when the laminated paper is picked up. Residue may also be cleaned off of the surface with a damp sponge with an agitating motion, absorbent sponges, or a vacuum, as needed.

The paint and removal agent is then placed in drums for disposal at a later time. During the assessment sampling was conducted for organic vapors and general observational techniques were conducted for ergonomics. Recommendations for improved worker safety and health during application and removal of the PCRS include: (1) work practices that reflect avoidance of exposure or reducing the risk of exposure; (2) assuring all PPE and equipment are compatible with the chemicals being used; (3) work practices that reduce the worker's need to walk on the slippery surface caused by the chemical or the use of special anti-slip soles; (4) careful control of overspray (if a spray application is used); and (5) the use of ergonomically designed long-handled tools to apply and remove the chemical (to alleviate some of the ergonomic concerns).

254
(DOE/MC/32260–4)
A robotic inspection experimental system (ARIES) and BOA. Operating Engineers National HAZMAT Program, Beaver, WV (United States). Feb 1998. [250p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FC21-95MC32260. Order Number DE98058273. Source: OSTI; NTIS; GPO Dep.

ARIES consists of a 6-wheeled K3A mobile platform, a compact subturret, a sonar imaging system, a laser-based light detection and ranging (lidar) navigation beacon system, and a camera positioning system. It has a sonar imaging system used in navigation and collision avoidance and an automatic docking/charging system. Drum-referencing algorithms and camera-positioning algorithms have been included in the primitive instruction set for the robot. The robot's navigation is based on Synchro-Drive, a patented design that utilizes concentric shafts to distribute drive and steering power to the six wheels simultaneously. ARIES uses a virtual path concept in which only a limited amount of information needs to be provided to the control computer in order to get the vehicle moving. The safety and health evaluation, during the human factors assessment, found several areas of concern including ergonomics, laser hazards, tripping hazards, fall-from-above and struck-by hazards, electrical hazards, and decontamination of the system. BOA is a self-propelled automated mini-enclosure, able to remove insulation from installed pipes, primarily of 4 inch nominal outside diameter. The system is designed for two operators: one oversees the abatement head operation from a distance of 10 or 15 feet using a pendant control and the other bags the debris at a cyclonic bagging station that is attached by a vacuum hose to the cutting head. Since the abatement head is its own enclosure, there may be no need for further enclosures to be built. The system wets and removes asbestos insulation automatically, cutting the debris into consistent chunks and moving the wave under a strong vacuum to a bagging machine. Prior to reaching the bagging operation, the material passes through a water separator which greatly reduces the weight of the debris and allows recirculation of water, after sufficient filtration. (Abstract truncated)

255
(DOE/NE/44139–83)
Integrated radwaste treatment system. Final report. Baker, M.N.; Houston, H.M. West Valley Nuclear Services Co., Inc., NY (United States). Oct 1997. 27p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC24-81NE44139. Order Number DE98002842. Source: OSTI; NTIS; INIS; GPO Dep.

In May 1988, the West Valley Demonstration Project (WVDP) began pretreating liquid high-level radioactive waste (HLW). This HLW was produced during spent nuclear fuel reprocessing operations that took place at the Western New York Nuclear Service Center from 1966 to 1972. Original reprocessing operations used plutonium/uranium extraction (PUREX) and thorium extraction (THOREX) processes to recover usable isotopes from spent nuclear fuel. The PUREX process produced a nitric acid-based waste stream, which was neutralized by adding sodium hydroxide to it. About two million liters of alkaline liquid HLW produced from PUREX neutralization were stored in an underground carbon steel tank identified as Tank 8D-2. The THOREX process, which was used to reprocess one core of mixed uranium-thorium fuel, resulted in about 31,000 liters of acidic waste. This acidic HLW was stored in an underground stainless steel tank identified as Tank 8D-4. Pretreatment of the HLW was carried out using the Integrated Radwaste Treatment System (IRTS), from May 1988 until May 1995. This system was designed to decontaminate the liquid HLW, remove salts from it, and encapsulate the resulting waste into a cement waste form that achieved US Nuclear Regulatory Commission (NRC) criteria for low-level waste (LLW) storage and disposal. A thorough discussion of IRTS operations, including all systems, subsystems, and components, is presented in US Department of Energy (DOE) Topical Report (DOE/NE/44139-68), Integrated Radwaste Treatment System Lessons Learned from 2 1/2 Years of Operation. This document also presents a detailed discussion of lessons learned during the first 2 1/2 years of IRTS operation. This report provides a general discussion of all phases of IRTS operation, and presents additional lessons learned during seven years of IRTS operation.

256
(DOE/NV/11508–29)
Numerical evaluation of monofil and subtle-layered evapotranspiration (ET) landfill caps. Wilson, G.V.; Henley, M.; Valceschini, R. Nevada Univ., Las Vegas, NV (United States). Water Resources Center. Jan 1998. 65p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE, Washington, DC (United States). DOE Contract AC08-95NV11508. (DRI–45159). Order Number DE98005553. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy/Nevada Operations Office (DOE/NV) has identified the need to design a low-level waste (LLW) closure cap for the arid conditions at the Nevada Test Site (NTS). As a result of concerns for subsidence impacting the cover, DOE/NV redesigned the LLW cover from one containing a 'hard' infiltration barrier that would likely fail, to a 'soft' (ET) cover that is sufficiently deep to accommodate the hydrologic problems of subsidence. An ET cover is one that does not contain hydrologic barrier layers but relies on soil-water retention and sufficient thickness to store water until evapotranspiration (ET) can remove the moisture. Subtle layering within an ET cap using the native soil could be environmentally beneficial and cost effective.

257
(DOE/NV/11508–34)
Hunter-gatherer adaptations and environmental change in the southern Great Basin: The evidence from Pahute

and Rainier mesas. Pippin, L.C. University and Community College System of Nevada, Desert Research Inst., Quaternary Sciences Center, Reno, NV (United States). Jun 1998. 159p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Civilian Radioactive Waste Management, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC08-95NV11508. Order Number DE98002976. Source: OSTI; NTIS; GPO Dep.

Technical report number 92.

This paper reviews the evidence for fluctuations in past environments in the southern Great Basin and examines how these changes may have affected the strategies followed by past hunter and gatherers in their utilization of the resources available on a highland in this region. The evidence used to reconstruct past environments for the region include botanical remains from packrat middens, pollen spectra from lake and spring deposits, faunal remains recovered from archaeological and geologic contexts, tree-ring indices from trees located in sensitive (tree-line) environments, and eolian, alluvial and fluvial sediments deposited in a variety of contexts. Interpretations of past hunter and gatherer adaptive strategies are based on a sample of 1,311 archaeological sites recorded during preconstruction surveys on Pahute and Rainier mesas in advance of the US Department of Energy's nuclear weapons testing program. Projectile point chronologies and available tree-ring, radiocarbon, thermoluminescence and obsidian hydration dates were used to assign these archaeological sites to specific periods of use.

258

(DOE/NV/11508–35)

Evaluation of groundwater flow and transport at the Shoal underground nuclear test: An interim report. Pohll, G.; Chapman, J.; Hassan, A.; Papelis, C.; Andricevic, R.; Shirley, C. University and Community College System of Nevada, Desert Research Inst., Las Vegas, NV (United States). Jul 1998. [325p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC08-95NV11508. Order Number DE98007140. Source: OSTI; NTIS; INIS; GPO Dep.

Desert Research Institute publication number 45162.

Since 1962, all United States nuclear tests have been conducted underground. A consequence of this testing has been the deposition of large amounts of radioactive materials in the subsurface, sometimes in direct contact with groundwater. The majority of this testing occurred on the Nevada Test Site, but a limited number of experiments were conducted in other locations. One of these is the subject of this report, the Project Shoal Area (PSA), located about 50 km southeast of Fallon, Nevada. The Shoal test consisted of a 12-kiloton-yield nuclear detonation which occurred on October 26, 1963. Project Shoal was part of studies to enhance seismic detection of underground nuclear tests, in particular, in active earthquake areas. Characterization of groundwater contamination at the Project Shoal Area is being conducted by the US Department of Energy (DOE) under the Federal Facility Agreement and Consent Order (FFACO) with the State of Nevada Department of Environmental Protection and the US Department of Defense (DOD). This order prescribes a Corrective Action Strategy (Appendix VI), which, as applied to underground nuclear tests, involves preparing a Corrective Action Investigation Plan (CAIP), Corrective Action Decision Document (CADD), Corrective Action Plan, and Closure Report. The scope of the CAIP is flow and transport modeling to establish contaminant boundaries that are protective of human health and the environment. This interim report describes the current status of the flow and transport modeling for the PSA.

259

(DOE/NV/11718–182)

Establishment of a facility for intrusive characterization of transuranic waste at the Nevada Test Site. Foster, B.D. (Bechtel Nevada Corp., Las Vegas, NV (United States)); Musick, R.G.; Pedalino, J.P.; Cowley, J.L.; Karney, C.C.; Kremer, J.L. Bechtel Nevada Inc., Las Vegas, NV (United States). Jan 1998. 16p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC08-96NV11718. (CONF-980307–: Waste management '98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98052961. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes design and construction, project management, and testing results associated with the Waste Examination Facility (WEF) recently constructed at the Nevada Test Site (NTS). The WEF and associated systems were designed, procured, and constructed on an extremely tight budget and within a fast track schedule. Part 1 of this paper focuses on design and construction activities, Part 2 discusses project management of WEF design and construction activities, and Part 3 describes the results of the transuranic (TRU) waste examination pilot project conducted at the WEF. In Part 1, the waste examination process is described within the context of Waste Isolation Pilot Plant (WIPP) characterization requirements. Design criteria are described from operational and radiological protection considerations. The WEF engineered systems are described. These systems include isolation barriers using a glove box and secondary containment structure, high efficiency particulate air (HEPA) filtration and ventilation systems, differential pressure monitoring systems, and fire protection systems. In Part 2, the project management techniques used for ensuring that stringent cost/schedule requirements were met are described. The critical attributes of these management systems are described with an emphasis on team work. In Part 3, the results of a pilot project directed at performing intrusive characterization (i.e., examination) of TRU waste at the WEF are described. Project activities included cold and hot operations. Cold operations included operator training, facility systems walk down, and operational procedures validation. Hot operations included working with plutonium contaminated TRU waste and consisted of waste container breaching, waste examination, waste segregation, data collection, and waste repackaging.

260

(DOE/NV/11718–196)

Remedial actions of nuclear safety shot sites: Double Tracks and Clean Slates. Sanchez, M. (Dept. of Energy, Las Vegas, NV (United States)); Shotton, M.; Lyons, C. Bechtel Nevada Inc., Las Vegas, NV (United States). Mar 1998. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC08-96NV11718. (CONF-980307–: Waste management '98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98052973. Source: OSTI; INIS; NTIS; GPO Dep.

Remedial actions of plutonium (Pu)-contaminated soils are in the preliminary stages of development at the Nevada Test Site (NTS). Interim clean-up actions were completed at the Double Tracks and Clean Slate 1 safety shot sites in 1996 and 1997, respectively. Soil at both sites, with a total transuranic activity greater than 20 picoCuries per gram (pCi/g), was excavated and shipped to the NTS for disposal. Characterization and assessment efforts were initiated at the Double Tracks site in 1995, and the clean-up of this site as an interim action was completed in 1996. Clean-up of this site consisted of taking site-specific data and applying rationale for dose and risk calculations in selecting parameter values for the interim corrective action level. The remediation process included excavating and stockpiling the contaminated soil and loading the soil into supersacks with approximately 1,513 cubic meters (53,500 cubic feet) being shipped to the NTS for disposal. In 1997, remediation began on the Clean Slate 1 site on which characterization had already been completed using a very similar approach; however, the site incorporated lessons learned, cost efficiencies, and significant improvements to the process. This paper focuses on those factors and the progress that has been made in cleaning up the sites. The application of a technically reasonable remediation method, as well as the cost factors that supported transport and disposal of the low-level waste in bulk are discussed.

261
(DOE/OR–01-1709&D1)
Removal action work plan for the YS-860 Firing Ranges, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States);ENTECH, Inc., Oak Ridge, TN (United States). Mar 1998. 28p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98004260. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy is conducting environmental restoration activities at the Y-12 Plant in Oak Ridge, Tennessee. As part of these efforts, a removal action is planned for the former YS-860 Firing Ranges as described in the Action Memorandum for the project. This removal action work plan (RmAWP) is focused on the former YS-860 Firing Ranges, located outside the primary fenceline at the eastern end of the plant. This RmAWP defines the technical approach, procedures, and requirements for the removal of lead-contaminated soil and site restoration of the former YS-860 Firing Ranges at the Y-12 Plant. This RmAWP describes excavation, verification/confirmatory sampling, and reporting requirements for the project. Lower tier plans associated with the RmAWP, which are submitted as separate stand-alone documents, include a field sampling and analysis plan, a health and safety plan, a quality assurance project plan, a waste management plan, a data management implementation plan, and a best management practices plan. A site evaluation of the YS-86O Firing Ranges conducted in 1996 by Lockheed Martin Energy Systems, Inc., determined that elevated lead levels were present in the Firing Ranges target berm soils. The results of this sampling event form the basis for the removal action recommendation as described in the Action Memorandum for this project. This RmAWP contains a brief history and description of the Former YS-860 Firing Ranges Project, along with the current project schedule and milestones. This RmAWP also provides an overview of the technical requirements of the project, including a summary of the approach for the removal activities. Finally, the RmAWP identifies the regulatory requirements and the appropriate removal action responses to address applicable or relevant and appropriate requirements to achieve the project goals of substantially reducing the risk to human health and the environment.

262
(DOE/OR–11-1729&D1)
Portsmouth annual environmental report for 1997. Bechtel Jacobs Co., Environmental Compliance Div., Piketon, OH (United States). Sep 1998. [250p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-98OR22700. Order Number DE99000914. Source: OSTI; NTIS; INIS; GPO Dep.

The Portsmouth plant is one of two US Department of Energy (DOE)-owned, contractor-managed uranium enrichment facilities in operation. As of July 1, 1993, responsibility for implementing environmental compliance at the facility was split between DOE, as site owner, and the US Enrichment Corporation (USEC), a government-owned corporation formed by the Energy Policy Act of 1992, to operate the nation's uranium enrichment business. The management contractor for DOE in 1997 was Lockheed Martin Energy Systems, which was responsible for environmental restoration, waste management, removal of highly enriched uranium, and operation of nonleased facilities at the Portsmouth Gaseous Diffusion Plant (DOE/PORTS). A new 5 1/2-year management and integration contract was awarded by DOE to Bechtel Jacobs Company LLC on December 18, 1997. Bechtel Jacobs Company officially assumed management responsibilities on April 1, 1998, when the Lockheed Martin Energy Systems contract expired. Lockheed Martin Utility Services provides management services for USEC. The Nuclear Regulatory Commission assumed direct oversight of USEC operations, formerly a DOE function, in March 1997.

263
(DOE/OR/21492–T8)
Developing biological and chemical methods for environmental monitoring of DOE waste disposal and storage facilities. Progress report, April 1, 1985–October 30, 1985. Oak Ridge Research Inst., TN (United States). [1997]. 168p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21492. Order Number DE98000012. Source: OSTI; NTIS; INIS; GPO Dep.

During the first year of this contract great efforts were made to develop methods for (1) characterizing bacteria from soil and sediment, (2) evaluating the ability of single and mixed soil bacterial isolates to, (a) bioconcentrate, (b) biodegrade and/or (c) precipitate inorganic and organic pollutants and (3) expanding current concepts for treating waste in aqueous (i.e. biological waste treatment system) and solid media (i.e. in situ soil (soil) treatment system). The development of the above methods are in the final stages of completion and we have as a result of these efforts isolated from soil (1) a mixed culture which precipitate toxic metals (i.e. mercury cadmium, lead etc.) and (2) single isolates which bioconcentrate a variety of toxic metals. Methods for screening soil bacterial isolates for their ability to concentrate, degrade and/or precipitate environmental pollutants have been developed. The development of those methods

will allow the staff at ORRI to quickly screen hundreds of samples in our attempt to isolate bacteria capable of degrading, concentrating and/or precipitating inorganics and organics in aqueous and solid waste. The results of these studies are summarized below.

264
(DOE/OR/21492–T9)
Removal of dissolved heavy metals and radionuclides by microbial spores. Revis, N.W. (and others); Hadden, C.T.; Edenborn, H. Oak Ridge Research Inst., TN (United States). [1997]. 14p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21492. Order Number DE98000856. Source: OSTI; NTIS; INIS; GPO Dep.

Microbial systems have been shown to remove specific heavy metals from contaminated aqueous waste to levels acceptable to EPA for environmental release. However, systems capable of removing a variety of heavy metals from aqueous waste to environmentally acceptable levels remain to be reported. The present studies were performed to determine the specificity of spores of the bacterium Bacillus megaterium for the adsorption of dissolved metals and radionuclides from aqueous waste. The spores effectively adsorbed eight heavy metals from a prepared metal mix and from a plating rinse waste to EPA acceptable levels for waste water. These results suggest that spores have multiple binding sites for the adsorption of heavy metals. Spores were also effective in adsorbing the radionuclides ^{85}strontium and ^{197}cesium. The presence of multiple sites in spores for the adsorption of heavy metals and radionuclides makes this biosorbent a good candidate for the treatment of aqueous wastes associated with the plating and nuclear industries. 17 refs., 4 tabs.

265
(DOE/OR/22207–1)
Ground-water flow and ground- and surface-water interaction at the Weldon Spring quarry, St. Charles County, Missouri. Imes, J.L.; Kleeschulte, M.J. Geological Survey, Rolla, MO (United States). 1997. 76p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AI05-94OR22207. (USGS-WRI–96-4279). Order Number DE98002779. Source: OSTI; NTIS; INIS; GPO Dep.

Ground-water-level measurements to support remedial actions were made in 37 piezometers and 19 monitoring wells during a 19-month period to assess the potential for ground-water flow from an abandoned quarry to the nearby St. Charles County well field, which withdraws water from the base of the alluvial aquifer. From 1957 to 1966, low-level radioactive waste products from the Weldon Spring chemical plant were placed in the quarry a few hundred feet north of the Missouri River alluvial plain. Uranium-based contaminants subsequently were detected in alluvial ground water south of the quarry. During all but flood conditions, lateral ground-water flow in the bedrock from the quarry, as interpreted from water-table maps, generally is southwest toward Little Femme Osage Creek or south into the alluvial aquifer. After entering the alluvial aquifer, the ground water flows southeast to east toward a ground-water depression presumably produced by pumping at the St. Charles County well field. The depression position varies depending on the Missouri River stage and probably the number and location of active wells in the St. Charles County well field.

266
(DOE/OR/22459–T1)
Development of an integrated in-situ remediation technology. Topical report for Task #3.2 entitled, "Modeling and iron dechlorination studies" (September 26, 1994–August 31, 1997). Shapiro, A.P. (General Electric Research and Development, Schenectady, NY (United States)); Sivavec, T.M.; Principe, J.M. Monsanto Co., St. Louis, MO (United States). Nov 1997. 72p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22459. Order Number DE98006103. Source: OSTI; NTIS; GPO Dep.

Contamination in low-permeability soils poses a significant technical challenge to in-situ remediation efforts. Poor accessibility to the contaminants and difficulty in delivery of treatment reagents have rendered existing in-situ treatments such as bioremediation, vapor extraction, and pump and treat rather ineffective when applied to low-permeability soils present at many contaminated sites. The technology is an integrated in-situ treatment in which established geotechnical methods are used to install degradation zones directly in the contaminated soil, and electro-osmosis is utilized to move the contaminants back and forth through those zones until the treatment is complete. The present Topical Report for Task #3.2 summarizes the modeling and dechlorination research conducted by General Electric Research and Development.

267
(DOE/OR/22459–T2)
Development of an integrated in-situ remediation technology. Draft topical report for Task #3.3 entitled, "Iron dechlorination studies" (September 26, 1994–August 31, 1997). Orth, R.; Dauda, T.; McKenzie, D.E. Monsanto Co., St. Louis, MO (United States). Nov 1997. 27p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22459. Order Number DE98006119. Source: OSTI; NTIS; GPO Dep.

Contamination in low-permeability soils poses a significant technical challenge to in-situ remediation efforts. Poor accessibility to the contaminants and difficulty in delivery of treatment reagents have rendered existing in-situ treatments such as bioremediation, vapor extraction, and pump and treat rather ineffective when applied to low permeability soils present at many contaminated sites. The technology is an integrated in-situ treatment in which established geotechnical methods are used to install degradation zones directly in the contaminated soil and electro-osmosis is utilized to move the contaminants back and forth through those zones until the treatment is completed. The present Topical Report for Task #3.3 summarizes the iron dechlorination research conducted by Monsanto Company.

268
(DOE/OR/22459–T3)
Development of an integrated in-situ remediation technology. Draft topical report for Task #7.2 entitled "Field scale test" (January 10, 1996–December 31, 1997). Athmer, C. (and others); Ho, S.V.; Hughes, B.M. Monsanto Co., St. Louis, MO (United States). Nov 1997. 53p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22459. Order Number DE98006120. Source: OSTI; NTIS; GPO Dep.

Contamination in low-permeability soils poses a significant technical challenge to in-situ remediation efforts. Poor accessibility to the contaminants and difficulty in delivery of treatment reagents have rendered existing in-situ treatments such as bioremediation, vapor extraction, and pump and treat rather ineffective when applied to low permeability soils present at many contaminated sites. The technology is an integrated in-situ treatment in which established geotechnical methods are used to install degradation zones directly in the contaminated soil and electro-osmosis is utilized to move the contaminants back and forth through those zones until the treatment is completed. The present Topical Report for Task #7.2 summarizes the Field Scale Test conducted by Monsanto Company, DuPont, and General Electric.

269
(DOE/OR/22520–T1)
Tennessee Department of Environment and Conservation Department of Energy Oversight Division - status report to the public. Tennessee Dept. of Environment and Conservation, Oak Ridge, TN (United States). Oct 1997. 64p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG05-96OR22520 ; FG05-96OR22521. Order Number DE98004455. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The Oak Ridge Reservation, encompassing about 35,500 acres in Oak Ridge, Tennessee, is one of the largest US Department of Energy (DOE) sites in the nation. The DOE missions here employ more than 11,000 individuals at three major facilities. The Manhattan Project and the Cold War left a legacy of hazardous and radioactive waste around the country at many sites, including Oak Ridge. The Cold War has now come to an end, and the mission for DOE's three Oak Ridge plants is changing. With this change, environmental restoration has become a focal point for the State, DOE and the community. Seeing the impacts DOE had on the region, the State of Tennessee asserted its authority over activities on the Oak Ridge Reservation. This authority included enforcement of regulations, monitoring of the environment and oversight of cleanup on the ORR. The State's role has been enhanced by two major agreements that govern the relationship between DOE and the State of Tennessee. This report outlines the State of Tennessee's DOE Oversight Division's efforts to monitor residual contamination and continuing releases to the air, water and land. It explains the complex issues surrounding DOE's storage, treatment and disposal of mixed and radioactive waste, and its handling of contaminated sites and buildings. The report also includes a list of further resources available to the interested reader.

270
(DOE/OSTI–3411/3)
The Office of Environmental Management technical reports: A bibliography. Dept. of Energy, Office of Scientific and Technical Information, Oak Ridge, TN (United States). Jul 1998. 260p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98005317. Source: OSTI; NTIS; GPO Dep.

The Office of Environmental Management's (EM) technical reports bibliography is an annual publication that contains information on scientific and technical reports sponsored by the Office of Environmental Management added to the Energy Science and Technology Database from July 1, 1995–that were published from October 1, 1996–September 30, 1997. This information is divided into the following categories: Miscellaneous, Focus Areas and Crosscutting Programs, Support Programs, Technology Integration and International Technology Exchange, are now included in the Miscellaneous category. The Office of Environmental Management within the Department of Energy (DOE) is responsible for environmental restoration, waste management, technology development and facility transition and management. Subjects include: subsurface contaminants; mixed waste characterization, treatment and disposal; radioactive tank waste remediation; plutonium; deactivation and decommissioning; robotics; characterization, monitoring, and sensor technology; and efficient separations. 880 refs.

271
(DOE/R2/08007–T1)
NICE-3. Technical progress report, March 1, 1995–October 31, 1995. New Jersey Public Utilities Board, Newark, NJ (United States). [1997]. 4p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG43-92R208007. Order Number DE98000954. Source: OSTI; NTIS; INIS; GPO Dep.

This is the final report on a project to demonstrate the application of ultrasonic cleaning technology to the task of tank cleaning. The major activities in this period were the presentation of three technology sharing seminars to describe the results achieved in this program.

272
(DOE/RL–91-50-Rev.2)
Environmental Monitoring Plan United States Department of Energy Richland Operations Office. Revision 2. Pacific Northwest National Lab., Richland, WA (United States); Fluor Daniel Hanford, Inc., Richland, WA (United States); Waste Management Federal Services of Hanford, Inc., Richland, WA (United States); Bechtel Hanford, Inc., Richland, WA (United States). 10 Nov 1997. [250p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98050554. Source: OSTI; NTIS; INIS; GPO Dep.

This Environmental Monitoring Plan was prepared for the US Department of Energy's (DOE's) Richland Operations Office (RL) to implement the requirements of DOE Order 5400.1. According to the Order, each DOE site, facility, or activity that uses, generates, releases, or manages significant pollutants or hazardous materials shall prepare a written environmental monitoring plan covering two major activities: (1) effluent monitoring and (2) environmental surveillance. The plan is to contain information discussing the rationale and design criteria for the monitoring programs, sampling locations and schedules, quality assurance requirements, program implementation procedures, analytical procedures, and reporting requirements. The plan's purpose is to assist DOE in the management of environmental activities at the Hanford Site and to help ensure that operations on the site are conducted in an environmentally safe and sound manner.

273
(DOE/RL–96-66)
RCRA corrective measure study for the 200-PO-1 operable unit. Bechtel Hanford, Inc., Richland, WA (United States). Dec 1997. 107p. Sponsored by USDOE Office of

Environmental Management, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE97051699. Source: OSTI; NTIS; INIS; GPO Dep.

This Resource Conservation and Recovery Act of 1976 (RCRA) corrective measures study (CMS) report supports the RCRA Facility Investigation process for the 200-PO-1 Groundwater Operable Unit in the 200 East Area of the Hanford Site, located in Richland, Washington. This CMS evaluates the need for interim actions and potential corrective measure that could be used should interim actions be necessary. An evaluation of final actions would be coordinated with evaluations of actions at the source operable unit. This CMS identifies, screens, and develops potential corrective measures alternatives for three major contaminant plumes associated with a single RCRA treatment, storage, or disposal unit and not with the remainder of the operable unit evaluated.

274

(DOE/RL–97-75)

Sampling and Analysis Plan for the REDOX Plutonium Loadout Hood. Encke, D.B. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1998. 49p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE98054159. Source: OSTI; NTIS; INIS; GPO Dep.

This sampling and analysis plan presents the rationale and strategy for the sampling and analysis activities proposed in support of decontaminating and removing the Plutonium Loadout Hood from the Reduction Oxidation (REDOX) process canyon building. The results of this investigation will be used to estimate the types of radiological and chemical contaminants and for initial waste designations for the component vessels, pipes, loadout hood frame and plexiglass, decontamination materials, and debris, as well as for development of future safety analysis documentation for eventual removal of the Plutonium Loadout Hood.

275

(DOE/RL–98-031)

300 Area Process Trenches Postclosure Plan. Badden, J.W. Bechtel Hanford, Inc., Richland, WA (United States). May 1998. 32p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98057348. Source: OSTI; INIS; NTIS; GPO Dep.

The 300 Area Process Trenches (300 APT) certified closure under a modified closure option and in compliance with Condition II.K.3 oft he Hartford Facility Dangerous Waste Permit (Penit) (Ecology 1994). Modified closure has been determined to be the appropriate closure option for this unit due to groundwater that remains contaminated from past operations at the 300 APT. Corrective actions required for dangerous waste constituents remaining in groundwater will occur pursuant to the 300 APT Resource Conservation and Recovery Act (RCRA) Final Status Facility Ground Water Monitoring Plan, the Hanford Site Wide Dangerous Waste Permit, and in conjunction with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial actions at the 300-FF-5 Groundwater Operable Unit (OU) pursuant to the Record of Decision (ROD) (EPA 1996). This postclosure plan identifies the modified closure actions required at the unit under postclosure care. It contains a description of the unit, past closure actions, and postclosure care requirements subject to compliance under the Permit (condition II.K.3).

276

(DOE/RL–98-035)

Surveillance and Maintenance Plan for the Plutonium Uranium Extraction (PUREX) Facility. Woods, P.J. Bechtel Hanford, Inc., Richland, WA (United States). May 1998. 81p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98057349. Source: OSTI; INIS; NTIS; GPO Dep.

This document provides a plan for implementing surveillance and maintenance (S&M) activities to ensure the Plutonium Uranium Extraction (PUREX) Facility is maintained in a safe, environmentally secure, and cost-effective manner until subsequent closure during the final disposition phase of decommissioning. This plan has been prepared in accordance with the guidelines provided in the U.S. Department of Energy (DOE), Office of Environmental Management (EM) Decommissioning Resource Manual (DOE/EM-0246) (DOE 1995), and Section 8.6 of TPA change form P-08-97-01 to the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) (Ecology, et al. 1996). Specific objectives of the S&M program are: Ensure adequate containment of remaining radioactive and hazardous material. Provide security control for access into the facility and physical safety to surveillance personnel. Maintain the facility in a manner that will minimize potential hazards to the public, the environment, and surveillance personnel. Provide a plan for the identification and compliance with applicable environmental, safety, health, safeguards, and security requirements.

277

(DOE/RL–98-043)

105-F and DR Phase 1 Sampling and Analysis Plan. Curry, L.R. Bechtel Hanford, Inc., Richland, WA (United States). Jun 1998. 122p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. DE-AC06-93RL-12367. Order Number DE98057512. Source: OSTI; INIS; NTIS; GPO Dep.

This SAP presents the rationale and strategy for characterization of specific rooms within the 105-F and 105-DR reactor buildings. Figures 1-1 and 1-2 identify the rooms that are the subject of this SAP. These rooms are to be decontaminated and demolished as an initial step (Phase 1) in the Interim Safe Storage process for these reactors. Section 1.0 presents the background and sites history for the reactor buildings and summarizes the data quality objective process, which provides the logical basis for this SAP. Preliminary surveys indicate that little radiochemical contamination is present. Section 2.0 presents the quality assurance project plan, which includes a project management structure, sampling methods and quality control, and oversight of the sampling process. Section 2.2.1 summarizes the sampling methods, reflecting the radiological and chemical sampling designs presented in Tables 1-17 and 1-18. Section 3.0 presents the Field Sampling Plan for Phase 1. The sampling design is broken into two stages. Stage 1 will verify the list of radioactive constituents of concern and generate the isotopic distribution. The objectives of Stage 2 are to estimate

the radionuclide inventories of room debris, quantify chemical contamination, and survey room contents for potential salvage or recycle. Table 3-1 presents the sampling activities to be performed in Stage 1. Tables 1-17 and 1-18 identify samples to be collected in Stage 2. Stage 2 will consist primarily of survey data collection, with fixed laboratory samples to be collected in areas showing visible stains. Quality control sampling requirements are presented in Table 3-2.

278
(DOE/RW–0006-Rev.13)
Integrated data base report–1996: US spent nuclear fuel and radioactive waste inventories, projections, and characteristics. Oak Ridge National Lab., TN (United States). Dec 1997. 263p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98003259. Source: OSTI; NTIS; INIS; GPO Dep.

The Integrated Data Base Program has compiled historic data on inventories and characteristics of both commercial and U.S. Department of Energy (DOE) spent nuclear fuel (SNF) and commercial and U.S. government-owned radioactive wastes. Inventories of most of these materials are reported as of the end of fiscal year (FY) 1996, which is September 30, 1996. Commercial SNF and commercial uranium mill tailings inventories are reported on an end-of-calendar year (CY) basis. All SNF and radioactive waste data reported are based on the most reliable information available from government sources, the open literature, technical reports, and direct contacts. The information forecasted is consistent with the latest DOE/Energy Information Administration (EIA) projections of U.S. commercial nuclear power growth and the expected DOE-related and private industrial and institutional activities. The radioactive materials considered, on a chapter-by-chapter basis, are SNF, high-level waste, transuranic waste, low-level waste, uranium mill tailings, DOE Environmental Restoration Program contaminated environmental media, naturally occurring and accelerator-produced radioactive material, and mixed (hazardous and radioactive) low-level waste. For most of these categories, current and projected inventories are given through FY 2030, and the radioactivity and thermal power are calculated based on reported or estimated isotopic compositions.

279
(DOE/SF/20686–T2)
Final annual site environmental report, calendar year 1997, for the Laboratory for Energy-Related Health Research (LEHR), University of California at Davis, California. Weiss Associates, Emeryville, CA (United States). Sep 1998. [200p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC03-96SF20686. Order Number DE99000732. Source: OSTI; NTIS; INIS; GPO Dep.

This Annual Site Environmental Report (ASER) describes DOE activities for the Environmental Restoration/Waste Management (ER/WM) Project at the Laboratory for Energy-Related Health Research (LEHR) site at UC Davis California. The report provides information about the Site and its environmental monitoring operation throughout calendar year 1997 for both radiological and non-radiological parameters. This report also describes activities conducted during 1997 in support of the Site environmental restoration efforts, and information about the impact of these activities on the public and the environment.

280
(DOE/SF/21375–T1)
Tribal Colleges Initiative project. Quarterly report, April 1–June 30, 1998. Crownpoint Inst. of Tech., NM (United States);Dine Coll., Tsaile, AZ (United States);Southwestern Indian Polytechnic Inst., Albuquerque, NM (United States). Jul 1998. 16p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG03-97SF21375. Order Number DE98007291. Source: OSTI; NTIS; GPO Dep.

The Tribal Colleges Initiative (TCI) grant is in the second year of funding from the US Department of Energy Environmental Management program. This quarterly report includes activities for the first three months (April 1–June 30, 1998) of the Year 2 funding period. The TCI program office requested each Tribal College to write a quarterly report of activities at their respective institutions. These reports are attached. These institutions are Southwestern Indian Polytechnic Institute (SIPI), Crownpoint Institute of Technology (CIT) and the Dine' College (DC, formerly Navajo Community College). The purpose of this program is to offer educational opportunities to Native Americans in the environmental field.

281
(DOE/SF/21375–T2)
Tribal Colleges Initiative project. Quarterly report, April 1–June 30, 1998. Southwestern Indian Polytechnic Inst., Albuquerque, NM (United States);Tribal College Initiative Program Office (United States);Crownpoint Inst. of Tech. (United States);Dine' Coll., Tsaile, AZ (United States). Jul 1998. [50p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG03-97SF21375. Order Number DE99000074. Source: OSTI; NTIS; GPO Dep.

The Tribal Colleges Initiative (TCI) grant is in the second year of funding from the US Department of Energy Environmental Management Program. The project period has been determined to be 7.5 months, April 1 to November 14, 1998 in order to align with the federal fiscal year. This quarterly report includes activities for the first three months (April 1–June 30, 1998) of the Year 2 funding period. The TCI Program office requested each Tribal College to write a quarterly report of activities at their respective institutions. These reported are attached. These institutions are Southwestern Indian Polytechnic Institute (SIPI), Crownpoint Institute of Technology (CIT) and the Dine' College (DC, formerly Navajo Community College).

282
(DOE/SNF/REP–011-Vol.1)
Preliminary design specification for Department of Energy standardized spent nuclear fuel canisters. Volume 1: Design specification. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). 19 Aug 1998. 27p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98058451. Source: OSTI; NTIS; INIS; GPO Dep.

This document (Volume 1) is the preliminary design specification for the canisters to be used during the handling,

storage, transportation, and repository disposal of Department of Energy (DOE) spent nuclear fuel (SNF). This document contains no procurement information, such as the number of canisters to be fabricated, explicit timeframes for deliverables, etc. A companion document (Volume 2) provides background information and design philosophy in order to help engineers better understand the established design requirements for these DOE SNF canisters.

283
(DOE/SNF/REP–011-Vol.2)
Preliminary design specification for Department of Energy standardized spent nuclear fuel canisters. Volume 2: Rationale document. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). 19 Aug 1998. 41p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98007434. Source: OSTI; NTIS; INIS; GPO Dep.

This document (Volume 2) is a companion document to a preliminary design specification for the design of canisters to be used during the handling, storage, transportation, and repository disposal of Department of Energy (DOE) spent nuclear fuel (SNF). This document contains no procurement information, such as the number of canisters to be fabricated, explicit timeframes for deliverables, etc. However, this rationale document does provide background information and design philosophy in order to help engineers better understand the established design criteria (contained in Volume 1 respectively) necessary to correctly design and fabricate these DOE SNF canisters.

284
(DOE/SNF/REP–014)
Deployment evaluation methodology for the electrometallurgical treatment of DOE-EM spent nuclear fuel. Dahl, C.A.; Adams, J.P.; Ramer, R.J. Dept. of Energy, Office of Spent Fuel Management and Special Projects, Washington, DC (United States). Jul 1998. 66p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98058450. Source: OSTI; NTIS; INIS; GPO Dep.

Part of the Department of Energy (DOE) spent nuclear fuel (SNF) inventory may require some type of treatment to meet acceptance criteria at various disposition sites. The current focus for much of this spent nuclear fuel is the electrometallurgical treatment process under development at Argonne National Laboratory. Potential flowsheets for this treatment process are presented. Deployment of the process for the treatment of the spent nuclear fuel requires evaluation to determine the spent nuclear fuel program need for treatment and compatibility of the spent nuclear fuel with the process. The evaluation of need includes considerations of cost, technical feasibility, process material disposition, and schedule to treat a proposed fuel. A siting evaluation methodology has been developed to account for these variables. A work breakdown structure is proposed to gather life-cycle cost information to allow evaluation of alternative siting strategies on a similar basis. The evaluation methodology, while created specifically for the electrometallurgical evaluation, has been written such that it could be applied to any potential treatment process that is a disposition option for spent nuclear fuel. Future work to complete the evaluation of the process for electrometallurgical treatment is discussed.

285
(DOE/SR/18445–T5)
Infrastructure support for a waste management institute. Final project report, September 12, 1994–September 11, 1997. North Carolina Agricultural and Technical State Univ., Greensboro, NC (United States). [1997]. 152p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract FG09-94SR18445. Order Number DE98001110. Source: OSTI; NTIS; GPO Dep.

North Carolina A and T State University has completed the development of an infrastructure for the interdisciplinary Waste Management Institute (WMI). The Interdisciplinary Waste Management Institute (WMI) was approved in June, 1994 by the General Administration of the University of North Carolina as an academic support unit with research and public service functions. The mission of the WMI is to enhance awareness and understanding of waste management issues and to provide instructional support including research and outreach. The goals of WMI are as follows: increase the number of minority professionals who will work in waste management fields; develop cooperative and exchange programs involving faculty, students, government, and industry; serve as institutional sponsor of public awareness workshops and lecture series; and support interdisciplinary research programs. The vision of the WMI is to provide continued state-of-the art environmental educational programs, research, and outreach.

286
(EEG–65)
Probability of failure of the waste hoist brake system at the Waste Isolation Pilot Plant (WIPP). Greenfield, M.A. (Univ. of California, Los Angeles, CA (United States)); Sargent, T.J. Environmental Evaluation Group, Albuquerque, NM (United States). Jan 1998. 30p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-89AL58309. Order Number DE98004011. Source: OSTI; NTIS; INIS; GPO Dep.

In its most recent report on the annual probability of failure of the waste hoist brake system at the Waste Isolation Pilot Plant (WIPP), the annual failure rate is calculated to be 1.3E(−7)(1/yr), rounded off from 1.32E(−7). A calculation by the Environmental Evaluation Group (EEG) produces a result that is about 4% higher, namely 1.37E(−7)(1/yr). The difference is due to a minor error in the US Department of Energy (DOE) calculations in the Westinghouse 1996 report. WIPP's hoist safety relies on a braking system consisting of a number of components including two crucial valves. The failure rate of the system needs to be recalculated periodically to accommodate new information on component failure, changes in maintenance and inspection schedules, occasional incidents such as a hoist traveling out-of-control, either up or down, and changes in the design of the brake system. This report examines DOE's last two reports on the redesigned waste hoist system. In its calculations, the DOE has accepted one EEG recommendation and is using more current information about the component failures rates, the Nonelectronic Parts Reliability Data (NPRD). However, the DOE calculations fail to include the data uncertainties which are described in detail in the NPRD reports. The US Nuclear Regulatory Commission recommended that a system evaluation include mean estimates of component failure rates and take into account the potential uncertainties that exist so that an estimate can be made on the confidence level to be

ascribed to the quantitative results. EEG has made this suggestion previously and the DOE has indicated why it does not accept the NRC recommendation. Hence, this EEG report illustrates the importance of including data uncertainty using a simple statistical example.

287
(EEG–71)
Mine stability evaluation of panel 1 during waste emplacement operations at WIPP. Maleki, H. (Maleki Technologies Inc., Spokane, WA (United States)). Environmental Evaluation Group, Albuquerque, NM (United States);Environmental Evaluation Group, Carlsbad, NM (United States). Jul 1998. [100p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-89AL58309. Order Number DE98007031. Source: OSTI; NTIS; INIS; GPO Dep.

The specific objectives of the work were defined by the Environmental Evaluation Group (EEG) as follows: (1) assess the stability of panel 1 during the proposed operation of waste emplacement; (2) estimate the amount of time before room closure would be expected to transfer rock loads to the waste packages. The work consisted of (1) an analysis of geotechnical data and a review of the Department of Energy's (DOE) plans for waste emplacement in panel 1, (2) an evaluation of ground conditions based on data analysis and observations of changes in ground conditions since the first evaluation in 1993 (USBM 1993), and (3) preparation of a report and presentation of the results to EEG staff. Excluded from this study are radiological safety issues and policies. The study is based on data provided by DOE and Westinghouse Electric Corporation (operator of the site) and conversations with DOE and Westinghouse personnel. MTI cannot independently verify the accuracy of the data within the scope of this study and recommends independent evaluations of data gathering, quality assurance procedures, and structural designs. The operator has the ultimate responsibility for structural designs and has expressed a strong commitment to ensuring worker safety.

288
(EML–590)
ISD97, a computer program to analyze data from a series of in situ measurements on a grid and identify potential localized areas of elevated activity. Reginatto, M.; Shebell, P.; Miller, K.M. Dept. of Energy, Environmental Measurements Lab., New York, NY (United States). Oct 1997. 82p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98007054. Source: OSTI; NTIS; INIS; GPO Dep.

A computer program, ISD97, was developed to analyze data from a series of in situ measurements on a grid and identify potential localized areas of elevated activity. The ISD97 code operates using a two-step process. A deconvolution of the data is carried out using the maximum entropy method, and a map of activity on the ground that fits the data within experimental error is generated. This maximum entropy map is then analyzed to determine the locations and magnitudes of potential areas of elevated activity that are consistent with the data. New deconvolutions are then carried out for each potential area of elevated activity identified by the code. Properties of the algorithm are demonstrated using data from actual field measurements.

289
(EML–592)
Preparation and validation of gross alpha/beta samples used in EML's quality assessment program. Scarpitta, S.C. Dept. of Energy, Environmental Measurements Lab., New York, NY (United States). Oct 1997. 29p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98007063. Source: OSTI; NTIS; INIS; GPO Dep.

A set of water and filter samples have been incorporated into the existing Environmental Measurements Laboratory's (EML) Quality Assessment Program (QAP) for gross alpha/beta determinations by participating DOE laboratories. The participating laboratories are evaluated by comparing their results with the EML value. The preferred EML method for measuring water and filter samples, described in this report, uses gas flow proportional counters with 2 in. detectors. Procedures for sample preparation, quality control and instrument calibration are presented. Liquid scintillation (LS) counting is an alternative technique that is suitable for quantifying both the alpha (^{241}Am, ^{230}Th and ^{238}Pu) and beta (^{90}Sr/^{90}Y) activity concentrations in the solutions used to prepare the QAP water and air filter samples. Three LS counting techniques (Cerenkov, dual dpm and full spectrum analysis) are compared. These techniques may be used to validate the activity concentrations of each component in the alpha/beta solution before the QAP samples are actually prepared.

290
(EML–593)
A portable battery-powered continuous airborne ^{222}Rn sampler. Scarpitta, S.; Kadnar, M. Dept. of Energy, Environmental Measurements Lab., New York, NY (United States). Apr 1998. 28p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98007064. Source: OSTI; NTIS; INIS; GPO Dep.

The Polyport, designed at the Environmental Measurements Laboratory (EML) for deployment in atmospheric balloons or remote areas, was laboratory and field tested to determine its effectiveness in collecting ^{222}Rn gas in dry and humid air. Twelve 6-cm long tubes containing 0.4 g of Carboxen™-564 a hydrophobic beaded carbon molecular sieve (BCMS) material efficiently adsorbs airborne ^{222}Rn under dynamic sampling conditions of 1–2 hr duration. The exposed sorbent is later weighed for water uptake, transferred and counted in a low background liquid scintillation (LS) counter that can detect alpha and beta emitting ^{222}Rn progeny with a maximum counting efficiency of 5 cpm per dpm. Each sorbent tube can be gamma counted if it contains sufficient adsorbed ^{214}Pb and ^{214}Bi activity. The variables tested were sampling flow rate, temperature, sampling time and relative humidity (RH).

291
(EML–594)
Semi-annual report of the Department of Energy, Office of Environmental Management, Quality Assessment Program. Greenlaw, P.D. Dept. of Energy, Environmental Measurements Laboratory, New York, NY (United States). Jan 1998. 324p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98007065. Source: OSTI; NTIS; INIS; GPO Dep.

This Quality Assessment Program (QAP) is designed to test the quality of the environmental measurements being reported to the Department of Energy by its contractors. Since 1976, real or synthetic environmental samples that have been prepared and thoroughly analyzed at the Environmental Measurements Laboratory (EML) have been distributed at first quarterly and then semi-annually to these contractors. Their results, which are returned to EML within 90 days, are compiled with EML's results and are reported back to the participating contractors 30 days later. A summary of the reported results is available to the participants 4 days after the reporting deadline via the Internet at www.eml.doe.gov. This report presents the results from the analysis of the 47th set of environmental quality assessment samples (QAP XLVII) that were received on or before December 1, 1997.

292
(EML–595)
MAXED, a computer code for the deconvolution of multisphere neutron spectrometer data using the maximum entropy method. Reginatto, M.; Goldhagen, P. Dept. of Energy, Environmental Measurements Lab., New York, NY (United States). Jun 1998. 37p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98007067. Source: OSTI; NTIS; INIS; GPO Dep.

The problem of analyzing data from a multisphere neutron spectrometer to infer the energy spectrum of the incident neutrons is discussed. The main features of the code MAXED, a computer program developed to apply the maximum entropy principle to the deconvolution (unfolding) of multisphere neutron spectrometer data, are described, and the use of the code is illustrated with an example. A user's guide for the code MAXED is included in an appendix. The code is available from the authors upon request.

293
(EML–596)
Semi-annual report of the Department of Energy, Office of Environmental Management, Quality Assessment Program. Greenlaw, P.D.; Minick, S.K. Dept. of Energy, Environmental Measurement Lab., New York, NY (United States). 1 Jul 1998. 327p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE99000898. Source: OSTI; NTIS; INIS; GPO Dep.

This Quality Assessment Program (QAP) is designed to test the quality of the environmental measurements being reported to the Department of Energy by its contractors. Since 1976, real or synthetic environmental samples that have been prepared and thoroughly analyzed at the Environmental Measurements Laboratory (EML) have been distributed at first quarterly and then semi-annually to these contractors. Their results, which are returned to EML within 90 days, are compiled with EML's results and are reported back to the participating contractors 30 days later. This report presents the results from the analysis of the 48th set of environmental quality assessment samples (QAP XLVIII) that were received on or before June 1, 1998.

294
(ESRF–025)
Landowner and permit-holder perceptions of wildlife damage around the Idaho National Engineering and Environmental Laboratory. A survey of INEEL neighbors about elk, mule deer, pronghorn antelope, and depredation. Roush, D.E. Jr. (Environmental Science and Research Foundation, Inc., Idaho Falls, ID (United States)); Beaver, D.E. Environmental Science and Research Foundation Inc., Idaho Falls, ID (United States). Jun 1998. 37p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13268. Order Number DE98005880. Source: OSTI; NTIS; GPO Dep.

Property-owners (N = 220) around the Idaho National Engineering and Environmental Laboratory (INEEL) in southeastern Idaho were surveyed about depredation, control methods and economic issues related to use of the area by elk (Cervus elaphus), mule deer (Odocoileus hemionus), and pronghorn antelope (Antilocapra americana). Depredation was defined as damage to privately-owned crops, forage, and fences and irrigation equipment by these animals. The focus on the three ungulate species was prompted by concerns that elk, which had recolonized the INEEL since 1984, were responsible for an inordinate amount of unprecedented damage to agricultural operations. As the INEEL is a US Department of Energy (DOE) reserve with little public hunting access, there have been calls for removal of elk from this land. This study's objective was to quantify the wildlife damage occurring on agricultural operations adjacent to the INEEL and to characterize the damage attributed to each big game species. Responses from 70.2% of the target population indicate an evenness of opinion, by which the authors mean that various opinions were represented equitably, toward these animals and wildlife damage Total estimated wildlife damage in 1996 was between $140,000 and $180,000 It was attributed foremost to elk, although pronghorn antelope were viewed nearly as damaging. Respondents placed high values in big game animals and wished to see them continue to inhabit these lands. For managing depredation, adjusting hunting seasons was preferred.

295
(ESRF–027)
Environmental Science and Research Foundation, Inc. annual technical report: Calendar year 1997. Reynolds, R.D.; Warren, R.W. (eds.). Environmental Science and Research Foundation, Inc., Idaho Falls, ID (United States). May 1998. 109p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13268. Order Number DE98003890. Source: OSTI; NTIS; INIS; GPO Dep.

This Annual Technical Report describes work conducted for the Department of Energy, Idaho Operations Office (DOE-ID), by the Environmental Science and Research Foundation (Foundation). The Foundation's mission to DOE-ID provides support in several key areas. The Foundation conducts an environmental monitoring and surveillance program over an area covering much of the upper Snake River Plain, and provides environmental education and support services related to Idaho National Engineering and Environmental Laboratory (INEEL) natural resource issues. Also, the Foundation, with its University Affiliates, conducts ecological and radioecological research on the Idaho National Environmental Research Park. This research benefits major DOE-ID programs including Waste Management, Environmental Restoration, Spent Nuclear Fuels, and Land Management Issues. Summaries are included of the individual research projects.

296
(FEMP–2535)
Presidential Rapid Commercialization Initiative for mixed waste solvent extraction. Honigford, L. (Fluor Daniel Fernald, Inc., Cincinnati, OH (United States). Fernald Environmental Management Project); Dilday, D.; Cook, D.; Sattler, J. Fluor Daniel Fernald, Inc., Cincinnati, OH (United States). [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-970335–32: Waste Management '97, Tucson, AZ (United States), 2-7 Mar 1997). Order Number DE97004117. Source: OSTI; NTIS; INIS; GPO Dep.

Recently, the Fernald Environmental Management Project (FEMP) has made some major steps in mixed waste treatment which have taken it closer to meeting final remediation goals. However, one major hurdle remains for the FEMP mixed waste treatment program, and that hurdle is tri-mixed waste. Tri-mixed is a term coined to describe low-level waste containing RCRA hazardous constituents along with polychlorinated biphenyls (PCB). The prescribed method for disposal of PCBs is incineration. In mixed waste treatment plans developed by the FEMP with public input, the FEMP committed to pursue non-thermal treatment methods and avoid the use of incineration. Through the SITE Program, the FEMP identified a non-thermal treatment technology which uses solvents to extract PCBs. The technology belongs to a small company called Terra-Kleen Response Group, Inc. A question arose as to how can this new and innovative technology be implemented by a small company at a Department of Energy (DOE) facility. The answer came in the form of the Rapid Commercialization Initiative (RCI) and the Mixed Waste Focus Area (MWFA). RCI is a program sponsored by the Department of commerce (DOC), DOE, Department of Defense (DOD), US EPA and various state agencies to aid companies to market new and innovative technologies.

297
(HLW-OVP–98-0037)
High Level Waste System Plan Revision 9. Davis, N.R.; Wells, M.N.; Choi, A.S.; Paul, P.; Wise, F.E. Westinghouse Savannah River Company, Aiken, SC (United States). Apr 1998. 100p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98058909. Source: OSTI; NTIS; INIS; GPO Dep.

Revision 9 of the High Level Waste System Plan documents the current operating strategy of the HLW System at SRS to receive, store, treat, and dispose of high-level waste.

298
(INEEL–95/0109-Rev.2)
Position for determining gas-phase volatile organic compound concentrations in transuranic waste containers. Revision 2. Connolly, M.J. (Lockheed Martin Idaho Technologies Co., Idaho Falls, ID (United States). Idaho National Engineering and Environmental Lab.); Liekhus, K.J.; Djordjevic, S.M.; Loehr, C.A.; Spangler, L.R. Lockheed Martin Idaho Technologies, Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Jun 1998. 79p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98057352. Source: OSTI; NTIS; INIS; GPO Dep.

In the conditional no-migration determination (NMD) for the test phase of the Waste Isolation Pilot Plant (WIPP), the US Environmental Protection Agency (EPA) imposed certain conditions on the US Department of Energy (DOE) regarding gas phase volatile organic compound (VOC) concentrations in the void space of transuranic (TRU) waste containers. Specifically, the EPA required the DOE to ensure that each waste container has no layer of confinement that contains flammable mixtures of gases or mixtures of gases that could become flammable when mixed with air. The EPA also required that sampling of the headspace of waste containers outside inner layers of confinement be representative of the entire void space of the container. The EPA stated that all layers of confinement in a container would have to be sampled until DOE can demonstrate to the EPA that sampling of all layers is either unnecessary or can be safely reduced. A test program was conducted at the Idaho National Engineering and Environmental Laboratory (INEEL) to demonstrate that the gas phase VOC concentration in the void space of each layer of confinement in vented drums can be estimated from measured drum headspace using a theoretical transport model and that sampling of each layer of confinement is unnecessary. This report summarizes the studies performed in the INEEL test program and extends them for the purpose of developing a methodology for determining gas phase VOC concentrations in both vented and unvented TRU waste containers. The methodology specifies conditions under which waste drum headspace gases can be said to be representative of drum gases as a whole and describes a method for predicting drum concentrations in situations where the headspace concentration is not representative. The methodology addresses the approach for determining the drum VOC gas content for two purposes: operational period drum handling and operational period no-migration calculations.

299
(INEEL/CON–97-00119)
Degradation of hazardous chemicals in liquid radioactive wastes from biomedical research using a mixed microbial population. Wolfram, J.H. (Lockheed Martin Idaho Technology Co., Idaho Falls, ID (United States). Idaho National Engineering and Environmental Lab.); Radtke, M.; Wey, J.E.; Rogers, R.D.; Rau, E.H. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Oct 1997. 29p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970857–: 4. biennial ASME mixed waste symposium, Baltimore, MD (United States), 17-21 Aug 1997). Order Number DE98050320. Source: OSTI; NTIS; INIS; GPO Dep.

As the costs associated with treatment of mixed wastes by conventional methods increase, new technologies will be investigated as alternatives. This study examines the potential of using a selected mixed population of microorganisms to treat hazardous chemical compounds in liquid low level radioactive wastes from biomedical research procedures. Microorganisms were isolated from various waste samples and enriched against compounds known to occur in the wastes. Individual isolates were tested for their ability to degrade methanol, ethanol, phenol, toluene, phthalates, acetonitrile, chloroform, and trichloroacetic acid. Following these tests, the organisms were combined in a media with a mixture of the different compounds. Three compounds: methanol,

acetonitrile, and pseudocumene, were combined at 500 microliter/liter each. Degradation of each compound was shown to occur (75% or greater) under batch conditions with the mixed population. Actual wastes were tested by adding an aliquot to the media, determining the biomass increase, and monitoring the disappearance of the compounds. The compounds in actual waste were degraded, but at different rates than the batch cultures that did not have waste added. The potential of using bioprocessing methods for treating mixed wastes from biomedical research is discussed.

300
(INEEL/CON–97-00284)
Applying programmatic risk assessment to nuclear materials stabilization R and D planning. Kenley, C.R. (Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)); Brown-van Hoozer, S.A. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1997]. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970803–: 7. international conference on creep and fracture of engineering materials and structure, Los Angeles, CA (United States), 3-14 Aug 1997). Order Number DE98050323. Source: OSTI; NTIS; INIS; GPO Dep.

A systems engineering approach to programmatic risk assessment, derived from the aerospace industry, was applied to various stabilization technologies to assess their relative maturity and availability for use in stabilizing nuclear materials. The assessment provided valuable information for trading off available technologies and identified the at-risk technologies that will require close tracking by the Department of Energy (DOE) to mitigate programmatic risks.

301
(INEEL/CON–97-00285)
Department of Energy environmental management complex-wide integration using systems engineering. Fairbourn, P. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1997]. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970803–: 7. international conference on creep and fracture of engineering materials and structure, Los Angeles, CA (United States), 3-14 Aug 1997). Order Number DE98050284. Source: OSTI; NTIS; INIS; GPO Dep.

A systems engineering approach was successfully used to recommend changes to environmental management activities across the DOE Complex. A team of technical experts and systems engineers developed alternatives that could save tax payers billions of dollars if the barriers are removed to allow complete implementation. The alternatives are technically-based and defensible, and are being worked through the stakeholder review process. The integration process and implementing project structure are both discussed.

302
(INEEL/CON–97-00286)
Development of the environmental management integrated baseline at the Idaho National Engineering Laboratory using systems engineering. Murphy, J.A.; Caliva, R.M.; Wixson, J.R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970803–: 7. international conference on creep and fracture of engineering materials and structure, Los Angeles, CA (United States), 3-14 Aug 1997). Order Number DE98050285. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho National Engineering Laboratory (INEL) is one of many Department of Energy (DOE) national laboratories that has been performing environmental cleanup and stabilization, which was accelerated upon the end of the cold war. In fact, the INEL currently receives two-thirds of its scope to perform these functions. However, the cleanup is a highly interactive system that creates an opportunity for systems engineering methodology to be employed. At the INEL, a group called EM (Environmental Management) Integration has been given this charter along with a small core of systems engineers. This paper discusses the progress to date of converting the INEL legacy system into one that uses the systems engineering discipline as the method to ensure that external requirements are met.

303
(INEEL/CON–97-00880)
Characterization of environmental samples using ion trap-secondary ion mass spectrometry. Groenewold, G.S.; Appelhans, A.D.; Ingram, J.C. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Feb 1998. 9p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-971163–: 1997 U.S. Army Edgewood Research, Development and Engineering Center scientific conference on chemical and biological defense research, Aberdeen Proving Ground, MD (United States), 18-21 Nov 1997). Order Number DE98052225. Source: OSTI; NTIS; GPO Dep.

The detection of chemical warfare agent residues on environmental surfaces is an important analytical activity because of the potential for proliferation of these weapons, and for environmental monitoring in areas where they are stored. Historically, one of the most widely used agents has been bis(2-chloroethyl) sulfide, also known as mustard gas and HD. It was initially used in combat in 1917; by the end of the First World War, more than 16% of all casualties were due to chemicals, in most cases mustard. Manufacture of mustard is continuing to this day; consequently, there are ongoing opportunities for exposure. 2-Chloroethyl ethyl sulfide (CEES) is used as a simulant for mustard (HD) in a study to develop secondary ion mass spectrometry (SIMS) for rapid, semi-quantitative detection of mustard on soil. Using SIMS with single stage mass spectrometry, a signature for CEES can be unequivocally observed only at the highest concentrations (0.1 monolayer and above). Selectivity and sensitivity are markedly improved employing multiple-stage mass spectrometry using an ion trap. $C_2H_5SC_2H_4^+$ from CEES eliminates C_2H_4 and H_2S, which are highly diagnostic. CEES was detected at 0.0012 monolayer on soil. A single analysis could be conducted in under 5 minutes.

304
(INEEL/CON–97-00895)
Development of a techno-economic model to optimization DOE spent nuclear fuel disposition. Ramer, R.J.; Plum, M.M.; Adams, J.P.; Dahl, C.A. Lockheed Martin Idaho Technologies Co., Idaho National Engineering Lab., Idaho

Falls, ID (United States). Nov 1997. 11p. Sponsored by US-DOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-980307–: Waste management '98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98050590. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the National Spent Nuclear Fuel (NSNF) Program conducted by Lockheed Martin Idaho Technology Co. (LMITCO) at the Idaho National Engineering and Environmental Laboratory (INEEL) is to evaluate what to do with the spent nuclear fuel (SNF) in the Department of Energy (DOE) complex. Final disposition of the SNF may require that the fuel be treated to minimize material concerns. The treatments may range from electrometallurgical treatment and chemical dissolution to engineering controls. Treatment options and treatment locations will depend on the fuel type and the current locations of the fuel. One of the first steps associated with selecting one or more sites for treating the SNF in the DOE complex is to determine the cost of each option. An economic analysis will assist in determining which fuel treatment alternative attains the optimum disposition of SNF at the lowest possible cost to the government and the public. For this study, a set of questions was developed for the electrometallurgical treatment process for fuels at several locations. The set of questions addresses all issues associated with the design, construction, and operation of a production facility. A matrix table was developed to determine questions applicable to various fuel treatment options. A work breakdown structure (WBS) was developed to identify a treatment process and costs from initial design to shipment of treatment products to final disposition. Costs will be applied to determine the life-cycle cost of each option. This technique can also be applied to other treatment techniques for treating spent nuclear fuel.

305

(INEEL/CON–97-00898)

High-level waste program integration within the DOE complex. Valentine, J.H. (Lockheed Martin Idaho Technologies Co., Idaho Falls, ID (United States). Idaho National Engineering and Environmental Lab.); Davis, N.R.; Malone, K.; Schaus, P.S. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Mar 1998. 14p. Sponsored by US-DOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-980307–: Waste management '98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98052245. Source: OSTI; NTIS; INIS; GPO Dep.

Eleven major Department of Energy (DOE) site contractors were chartered by the Assistant Secretary to use a systems engineering approach to develop and evaluate technically defensible cost savings opportunities across the complex. Known as the complex-wide Environmental Management Integration (EMI), this process evaluated all the major DOE waste streams including high level waste (HLW). Across the DOE complex, this waste stream has the highest life cycle cost and is scheduled to take until at least 2035 before all HLW is processed for disposal. Technical contract experts from the four DOE sites that manage high level waste participated in the integration analysis: Hanford, Savannah River Site (SRS), Idaho National Engineering and Environmental Laboratory (INEEL), and West Valley Demonstration Project (WVDP). In addition, subject matter experts from the Yucca Mountain Project and the Tanks Focus Area participated in the analysis. Also, departmental representatives from the US Department of Energy Headquarters (DOE-HQ) monitored the analysis and results. Workouts were held throughout the year to develop recommendations to achieve a complex-wide integrated program. From this effort, the HLW Environmental Management (EM) Team identified a set of programmatic and technical opportunities that could result in potential cost savings and avoidance in excess of $18 billion and an accelerated completion of the HLW mission by seven years. The cost savings, schedule improvements, and volume reduction are attributed to a multifaceted HLW treatment disposal strategy which involves waste pretreatment, standardized waste matrices, risk-based retrieval, early development and deployment of a shipping system for glass canisters, and reasonable, low cost tank closure.

306

(INEEL/CON–97-00930)

Integrated process analysis of treatment systems for mixed low level waste. Cooley, C.R. (Dept. of Energy, Washington, DC (United States)); Schwinkendorf, W.E.; Bechtold, T.E. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Oct 1997. 35p. Sponsored by US-DOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970857–: 4. biennial ASME mixed waste symposium, Baltimore, MD (United States), 17-21 Aug 1997). Order Number DE98050322. Source: OSTI; NTIS; INIS; GPO Dep.

Selection of technologies to be developed for treatment of DOE's mixed low level waste (MLLW) requires knowledge and understanding of the expected costs, schedules, risks, performance, and reliability of the total engineered systems that use these technologies. Thus, an integrated process analysis program was undertaken to identify the characteristics and needs of several thermal and nonthermal systems. For purposes of comparison, all systems were conceptually designed for a single facility processing the same amount of waste at the same rate. Thirty treatment systems were evaluated ranging from standard incineration to innovative thermal systems and innovative nonthermal chemical treatment. Treating 236 million pounds of waste in 20 years through a central treatment was found to be the least costly option with total life cycle cost ranging from $2.1 billion for a metal melting system to $3.9 billion for a nonthermal acid digestion system. Little cost difference exists among nonthermal systems or among thermal systems. Significant cost savings could be achieved by working towards maximum on line treatment time per year; vitrifying the final waste residue; decreasing front end characterization segregation and sizing requirements; using contaminated soil as the vitrifying agent; and delisting the final vitrified waste form from Resource Conservation and Recovery Act (RCRA) Land Disposal Restriction (LDR) requirements.

307

(INEEL/CON–97-00940)

Development of a comprehensive source term model for the Subsurface Disposal Area at the Idaho National Engineering and Environmental Laboratory. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Laboratory, Idaho Falls, ID (United States). [1997]. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE

Contract AC07-94ID13223. (CONF-980307–: Waste management ’98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98054117. Source: OSTI; NTIS; INIS; GPO Dep.

The first detailed comprehensive simulation study to evaluate fate and transport of wastes disposed in the Subsurface Disposal Area (SDA), at the Radioactive Waste Management Complex (RWMC), Idaho National Engineering and Environmental Laboratory (INEEL) has recently been conducted. One of the most crucial parts of this modeling was the source term or release model. The current study used information collected over the last five years defining contaminant specific information including: the amount disposed, the waste form (physical and chemical properties) and the type of container used for each contaminant disposed. This information was used to simulate the release of contaminants disposed in the shallow subsurface at the SDA. The DUST-MS model was used to simulate the release. Modifications were made to allow the yearly disposal information to be incorporated. The modeling includes unique container and release rate information for each of the 42 years of disposal. The results from this simulation effort are used for both a groundwater and a biotic uptake evaluation. As part of this modeling exercise, inadequacies in the available data relating to the release of contaminants have been identified. The results from this modeling study have been used to guide additional data collection activities at the SDA for purposes of increasing confidence in the appropriateness of model predictions.

308

(INEEL/CON–97-00953)

Pinhole corrosion of CH-TRU waste containers by volatile organic compounds. Zeek, D.P. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Mar 1998. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-980307–: Waste management ’98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98052756. Source: OSTI; NTIS; INIS; GPO Dep.

In the spring of 1996 at the Idaho National Engineering and Environmental Laboratory Radioactive Waste Management Complex, an epidemic of corroded CH-TRU waste drums was encountered. The observed corrosion was in the form of rusty brown streaks that emanated from pinholes in about the upper one-third of the 55 gal drums. Wet streaks were tested as highly acidic by litmus paper. The liquid that emanated from the pinholes was found to be hydrochloric (HCl) acid. An investigation concluded that the pinholes were localized pitting corrosion caused by HCl acid formed in the drum headspace from reactions involving chlorinated volatile organic compounds (VOCs) in the waste and the unlined steel of the internal drum wall. The pinholes occurred in the upper parts of the drums because this corresponds to the internal headspace region above the rigid liner. Affected drums had a few to hundreds of pinholes with no detectable release of radioactivity. This was due to the internal packaging of waste in heavy polyethylene and/or polyvinyl chloride waste bags inside a rigid high-density polyethylene liner. The corrective action taken was to overpack pinhole corrosion drums into polyethylene-lined 83-gal drums and to test hundreds of drums with drum filters, but without pinhole corrosion, for the presence of HCl acid in the headspace gas with colorimetric tubes fitted to the drum filters. These colorimetric tubes contain a substance that changes color in reaction to HCl acid when headspace gas is drawn by a hand pump. Only drums that had a significant probability for the presence of HCl acid in the headspace were segregated in storage to allow ready inspection and efficient handling, if needed. It is recommended that any facility involved in the long-term storage of waste or other contents, that include chlorinated VOCs in unlined steel containers, be wary for the possible development of pinhole corrosion.

309

(INEEL/CON–97-00964)

Incineration of DOE offsite mixed waste at the Idaho National Engineering and Environmental Laboratory. Harris, J.D. (Lockheed Martin Idaho Technologies Co., Idaho Falls, ID (United States)); Harvego, L.A.; Jacobs, A.M.; Willcox, M.V. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Jan 1998. 32p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-980307–: Waste management ’98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98052244. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Experimental Reduction Facility (WERF) incinerator at the Idaho National Engineering and Environmental Laboratory (INEEL) is one of three incinerators in the US Department of Energy (DOE) Complex capable of incinerating mixed low-level waste (MLLW). WERF has received MLLW from offsite generators and is scheduled to receive more. The State of Idaho supports receipt of offsite MLLW waste at the WERF incinerator within the requirements established in the (INEEL) Site Treatment Plan (STP). The incinerator is operating as a Resource Conservation and Recovery Act (RCRA) Interim Status Facility, with a RCRA Part B permit application currently being reviewed by the State of Idaho. Offsite MLLW received from other DOE facilities are currently being incinerated at WERF at no charge to the generator. Residues associated with the incineration of offsite MLLW waste that meet the Envirocare of Utah waste acceptance criteria are sent to that facility for treatment and/or disposal. WERF is contributing to the treatment and reduction of MLLW in the DOE Complex.

310

(INEEL/CON–97-00968)

Evaluation of engineered barriers at the Idaho National Engineering and Environmental Laboratory. Bhatt, R.N.; Porro, I. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Feb 1998. 13p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-980307–: Waste management ’98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98052224. Source: OSTI; NTIS; INIS; GPO Dep.

Subsurface Disposal (SDA) of the Radioactive Waste Management Complex serves as the low level waste burial ground at the Idaho National Engineering and Environmental Laboratory (INEEL). The low level wastes are buried in trenches, pits, and soil vaults in surficial sediments. A closure/post-closure plan must be written prior to closure of the SDA. The closure plan for the facility must include a design for an engineered barrier closure cover that will meet all applicable regulatory requirements. This paper describes the

approach being followed at the INEEL to choose an appropriate cover design for the SDA closure. Regulatory requirements and performance objectives potentially applicable to closure of the SDA were identified. Technical issues related to SDA closure were identified from a literature search of previous arid site engineered barrier studies and from previous SDA closure cover evaluations. Five engineered barrier conceptual design alternatives were identified: (1) a bio/capillary barrier cover, (2) a thin soil cover, (3) a thick soil cover, (4) a Resource Conservation and Recovery Act cover, and (5) a concrete sealed surface cover. Two of these designs were chosen for in situ hydraulic testing, rather than all five, in order to maximize the amount of information generated relative to projected project costs. Testing of these two cover designs provides data to quantify hydrologic model input parameters and for verification of site specific hydrologic models for long term closure cover performance evaluation and detailed analysis of closure cover alternatives. The specific objectives of the field tests are to determine the water balance for the two covers over several years and to determine cover soil physical and hydraulic properties.

311

(INEEL/CON–97-00993)

Cask crush pad analysis using detailed and simplified analysis methods. Uldrich, E.D.; Hawkes, B.D. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1997]. 5p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-980426–: American power conference, Chicago, IL (United States), 14-16 Apr 1998). Order Number DE98052578. Source: OSTI; NTIS; INIS; GPO Dep.

A crush pad has been designed and analyzed to absorb the kinetic energy of a hypothetically dropped spent nuclear fuel shipping cask into a 44-ft. deep cask unloading pool at the Fluorinel and Storage Facility (FAST). This facility, located at the Idaho Chemical Processing Plant (ICPP) at the Idaho national Engineering and Environmental Laboratory (INEEL), is a US Department of Energy site. The basis for this study is an analysis by Uldrich and Hawkes. The purpose of this analysis was to evaluate various hypothetical cask drop orientations to ensure that the crush pad design was adequate and the cask deceleration at impact was less than 100 g. It is demonstrated herein that a large spent fuel shipping cask, when dropped onto a foam crush pad, can be analyzed by either hand methods or by sophisticated dynamic finite element analysis using computer codes such as ABAQUS. Results from the two methods are compared to evaluate accuracy of the simplified hand analysis approach.

312

(INEEL/CON–97-01042)

Demonstration of the TRUEX process for the treatment of actual high activity tank waste at the INEEL using centrifugal contactors. Law, J.D.; Brewer, K.N.; Todd, T.A.; Olson, L.G. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970962–: 214. American Chemical Society meeting, Las Vegas, NV (United States), 7-13 Sep 1997). Order Number DE98050366. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho Chemical Processing Plant (ICPP), located at the Idaho National Engineering and Environmental Laboratory (INEEL), formerly reprocessed spent nuclear fuel to recover fissionable uranium. The radioactive raffinates from the solvent extraction uranium recovery processes were converted to granular solids (calcine) in a high temperature fluidized bed. A secondary liquid waste stream was generated during the course of reprocessing, primarily from equipment decontamination between campaigns and solvent wash activities. This acidic tank waste cannot be directly calcined due to the high sodium content and has historically been blended with reprocessing raffinates or non-radioactive aluminum nitrate prior to calcination. Fuel reprocessing activities are no longer being performed at the ICPP, thereby eliminating the option of waste blending to deplete the waste inventory. Currently, approximately 5.7 million liters of high-activity waste are temporarily stored at the ICPP in large underground stainless-steel tanks. The United States Environmental Protection Agency and the Idaho Department of Health and Welfare filed a Notice of Noncompliance in 1992 contending some of the underground waste storage tanks do not meet secondary containment. As part of a 1995 agreement between the State of Idaho, the Department of Energy, and the Department of Navy, the waste must be removed from the tanks by 2012. Treatment of the tank waste inventories by partitioning the radionuclides and immobilizing the resulting high-activity and low-activity waste streams is currently under evaluation. A recent peer review identified the most promising radionuclide separation technologies for evaluation. The Transuranic Extraction-(TRUEX) process was identified as a primary candidate for separation of the actinides from ICPP tank waste.

313

(INEEL/CON–97-01064)

Analysis of a hypothetical dropped spent nuclear fuel shipping cask impacting a floor mounted crush pad. Hawkes, B.D.; Uldrich, E.D. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Mar 1998. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-960708–: IMACS international conference on computational engineering in systems applications, Lille (France), 8-10 Jul 1996). Order Number DE98052574. Source: OSTI; NTIS; INIS; GPO Dep.

A crush pad has been designed and analyzed to absorb the kinetic energy of a hypothetically dropped spent nuclear fuel shipping cask into a 44-ft. deep cask unloading pool at the Idaho Chemical Processing Plant. The 110-ton Large Cell Cask was assumed to be accidentally dropped onto the parapet of the unloading pool, causing the cask to tumble through the pool water and impact the floor mounted crush pad with the cask's top corner. The crush pad contains rigid polyurethane foam, which was modeled in a separate computer analysis to simulate the manufacturer's testing of the foam and to determine the foam's stress and strain characteristics. This computer analysis verified that the foam was accurately represented in the analysis to follow. A detailed non-linear, dynamic finite element analysis was then performed on the crush pad and adjacent pool structure to assure that a drop of this massive cask does not result in unacceptable damage to the storage facility. Additionally, verification was made that the crush pad adequately protects the cask from severe impact loading. At impact, the

cask has significant vertical, horizontal and rotational velocities. The crush pad absorbs much of the energy of the cask through plastic deformation during primary and secondary impacts. After the primary impact with the crush pad, the cask still has sufficient energy to rebound and rotate until it impacts the pool wall. An assessment is made of the damage to the crush pad and pool wall and of the impact loading on the cask.

314
(INEEL/CON–97-01171)
Design and operational considerations of United States commercial near-surface low-level radioactive waste disposal facilities. Birk, S.M. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Oct 1997. 17p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9710133–: Korean Institute of Nuclear Safety Workshop, Taejon (Korea, Republic of), 19-24 Oct 1997). Order Number DE98050596. Source: OSTI; NTIS; INIS; GPO Dep.

In accordance with the Low-Level Radioactive Waste Policy Amendments Act of 1985, states are responsible for providing for disposal of commercially generated low-level radioactive waste (LLW) within their borders. LLW in the US is defined as all radioactive waste that is not classified as spent nuclear fuel, high-level radioactive waste, transuranic waste, or by-product material resulting from the extraction of uranium from ore. Commercial waste includes LLW generated by hospitals, universities, industry, pharmaceutical companies, and power utilities. LLW generated by the country's defense operations is the responsibility of the Federal government and its agency, the Department of Energy. The commercial LLRW disposal sites discussed in this report are located near: Sheffield, Illinois (closed); Maxey Flats, Kentucky (closed); Beatty, Nevada (closed); West Valley, New York (closed); Barnwell, South Carolina (operating); Richland, Washington (operating); Ward Valley, California, (proposed); Sierra Blanca, Texas (proposed); Wake County, North Carolina (proposed); and Boyd County, Nebraska (proposed). While some comparisons between the sites described in this report are appropriate, this must be done with caution. In addition to differences in climate and geology between sites, LLW facilities in the past were not designed and operated to today's standards. This report summarizes each site's design and operational considerations for near-surface disposal of low-level radioactive waste. The report includes: a description of waste characteristics; design and operational features; post closure measures and plans; cost and duration of site characterization, construction, and operation; recent related R and D activities for LLW treatment and disposal; and the status of the LLW system in the US.

315
(INEEL/CON–97-01172)
Security preparation for receipt of SNF from the FRR to the INEEL. Dahlquist, R.L. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). 9 Oct 1997. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9710102–: 1997 international meeting on reduced enrichment for research and test reactors, Jackson Hole, WY (United States), 5-10 Oct 1997). Order Number DE98050355. Source: OSTI; NTIS; INIS; GPO Dep.

This paper reports the key security related activities associated with the FRR shipment. Starting with transportation of the SNF in the country of origin to the final destination at the INEEL. Methodology for compliance will be addressed. The graded approach and a three step system will be explained. This paper will be used as part of the planning to support the FRR Project for returning the Asia and European SNF back to the US.

316
(INEEL/CON–97-01173)
Status of the TRIGA shipments to the INEEL from Europe. Mustin, T. (Dept. of Energy, Washington, DC (United States)); Stump, R.C.; Tyacke, M.J. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). 9 Oct 1997. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9710102–: 1997 international meeting on reduced enrichment for research and test reactors, Jackson Hole, WY (United States), 5-10 Oct 1997). Order Number DE98002873. Source: OSTI; NTIS; INIS; GPO Dep.

This paper reports the activities underway by the US Department of Energy (DOE) for returning Training, Research, Isotope, General Atomics (TRIGA) spent nuclear fuel (SNF) from foreign research reactors (FRR) in four European countries to the Idaho National Engineering and Environmental Laboratory (INEEL). Those countries are Germany, Italy, Romania, and Slovenia. This is part of the "Nuclear Weapons Nonproliferation Policy" of returning research reactor SNF containing uranium enriched in the US. This paper describes the results of a pre-assessment trip in September, 1997, to these countries, including: history of the reactors and research being performed; inventory of TRIGA SNF; fuel types (stainless steel, aluminum, or Incoloy) and enrichments; and each country's plans for returning their TRIGA SNF to the INEEL.

317
(INEEL/CON–97-01174)
Assessment results of the South Korea TRIGA SNF to be shipped to INEEL. Cole, C.M. (Lockheed Martin Idaho Technologies Co., Idaho Falls, ID (United States)); Dirk, W.J.; Cottam, R.E.; Paik, S.T. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). 9 Oct 1997. 15p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9710102–: 1997 international meeting on reduced enrichment for research and test reactors, Jackson Hole, WY (United States), 5-10 Oct 1997). Order Number DE98050356. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the Training, Research, Isotope, General Atomics (TRIGA) spent nuclear fuel (SNF) examination at the Seoul and the Taejon Research Reactor Facilities in South Korea. The examination was required before the SNF would be accepted for transportation and storage at the INEEL. The results of the aluminum and stainless steel clad TRIGA fuel examination have been summarized. A description of the examination team training, the examination work plan and examination equipment is also included. This paper also explains the technical basis for the examination and physical condition criteria used to determine what, if

any, additional packaging would be required for transportation and for the receipt and storage of the fuel at the INEEL. This paper delineates the preparation activities prior to the fuel examinations and includes (1) collecting spent fuel data; (2) preparatory work by the Korean Atomic Energy Research Institute (KAERI) for fuel examination: (3) preparation of a radionuclide report, Radionuclide Mass Inventory, Activity, Decay Heat, and Dose Rate Parametric Data for TRIGA Spent Nuclear Fuels needed to provide input data for transportation and fuel acceptance at the Idaho National Engineering and Environmental Laboratory (INEEL); (4) gathering FRR Facility data; and (5) coordination between the INEEL and KAERI. Included, are the unanticipated conditions encountered in the unloading of fuel from the dry storage casks in Taejon in preparation for examination, a description of the damaged condition of the fuel removed from the casks, and the apparent cause of the damages. Lessons learned from all the activities are also addressed. A brief description of the preparatory work for the shipment of the spent fuel from Korea to INEEL is included.

318
(INEEL/CON–97-01175)
Status of the TRIGA shipments to the INEEL from Asia. Tyacke, M. (Lockheed Martin Idaho Technology Co., Idaho Falls, ID (United States)); George, W.; Petrasek, A.; Stump, R.C.; Patterson, J. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). 9 Oct 1997. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9710102–: 1997 international meeting on reduced enrichment for research and test reactors, Jackson Hole, WY (United States), 5-10 Oct 1997). Order Number DE98050357. Source: OSTI; NTIS; INIS; GPO Dep.

This paper will report on preparations being made for returning Training, Research, Isotope, General Atomics (TRIGA) foreign research reactor (FRR) spent fuel from South Korea and Indonesia to the Idaho National Engineering and Environmental Laboratory (INEEL). The roles of US Department of Energy, INEEL, and NAC International in implementing a safe shipment are provided. Special preparations necessitated by making a shipment through a west coast port of the US to the INEEL will be explained. The institutional planning and actions needed to meet the unique political and operational environment for making a shipment from Asia to INEEL will be discussed. Facility preparation at both the INEEL and the FRRs is discussed. Cask analysis needed to properly characterize the various TRIGA configurations, compositions, and enrichments is discussed. Shipping preparations will include an explanation of the integrated team of spent fuel transportation specialists, and shipping resources needed to retrieve the fuel from foreign research reactor sites and deliver it to the INEEL.

319
(INEEL/CON–97-01176)
Assessment results of the Indonesian TRIGA SNF to be shipped to INEEL. Jefimoff, J. (Lockheed Martin Idaho Technologies Co., Idaho Falls, ID (United States)); Robb, A.K.; Wendt, K.M.; Syarip, I.; Alfa, T. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). 9 Oct 1997. 15p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9710102–: 1997 international meeting on reduced enrichment for research and test reactors, Jackson Hole, WY (United States), 5-10 Oct 1997). Order Number DE98050358. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the Training, Research, Isotope, General Atomics (TRIGA) spent nuclear fuel (SNF) examination performed by technical personnel from the Idaho National Engineering and Environmental Laboratory (INEEL) at the Bandung and Yogyakarta research reactor facilities in Indonesia. The examination was required before the SNF would be accepted for transportation to and storage at the INEEL. This paper delineates the Initial Preparations prior to the Indonesian foreign research reactor (FRR) fuel examination. The technical basis for the examination, the TRIGA SNF Acceptance Criteria, and the physical condition required for transportation, receipt and storage of the TRIGA SNF at the INEEL is explained. In addition to the initial preparations, preparation descriptions of the Work Plan For TRIGA Fuel Examination, the Underwater Examination Equipment used, and personnel Examination Team Training are included. Finally, the Fuel Examination and Results of the aluminum and stainless steel clad TRIGA fuel examination have been summarized. Lessons learned from all the activities completed to date is provided in an addendum. The initial preparations included: (1) coordination between the INEEL, FRR or Badan Tenaga Atom Nasional (BATAN), DOE-HQ, and the US State Department and Embassy; (2) incorporating Savannah River Site (SRS) FRR experience and lessons learned; (3) collecting both FRR facility and spent fuel data, and issuing a radionuclide report (Radionuclide Mass Inventory, Activity, Decay Heat, and Dose Rate Parametric Data for TRIGA Spent Nuclear Fuels) needed for transportation and fuel acceptance at the INEEL; and (4) preexamination work at the research reactor for the fuel examination.

320
(INEEL/CON–97-01181)
Performance assessment and licensing issues for United States commercial near-surface low-level radioactive waste disposal facilities. Birk, S.M. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Oct 1997. 18p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9710133–: Korean Institute of Nuclear Safety Workshop, Taejon (Korea, Republic of), 19-24 Oct 1997). Order Number DE98050597. Source: OSTI; NTIS; INIS; GPO Dep.

The final objective of performance assessment for a near-surface LLW disposal facility is to demonstrate that potential radiological impacts for each of the human exposure pathways will not violate applicable standards. This involves determining potential pathways and specific receptor locations for human exposure to radionuclides; developing appropriate scenarios for each of the institutional phases of a disposal facility; and maintaining quality assurance and control of all data, computer codes, and documentation. The results of a performance assessment should be used to demonstrate that the expected impacts are expected to be less than the applicable standards. The results should not be used to try to predict the actual impact. This is an important distinction that results from the uncertainties inherent in performance assessment calculations. The paper discusses performance objectives; performance assessment phases;

scenario selection; mathematical modeling and computer programs; final results of performance assessments submitted for license application; institutional control period; licensing issues; and related research and development activities.

321
(INEEL/CON–97-01187)
Developmental assessment of the SCDAP/RELAP5 code. Harvego, E.A. (and others); Slefken, L.J.; Coryell, E.W. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9705246–: 6. international conference on nuclear energy (ICONE-6), San Diego, CA (United States), 10-15 May 1997). Order Number DE98052571. Source: OSTI; NTIS; INIS; GPO Dep.

The development and assessment of the late-phase damage progression models in the current version (designated MOD3.2) of the SCDAP/RELAP5 code are described. The SCDAP/RELAP5 code is being developed at the Idaho National Engineering and Environmental Laboratory under the primary sponsorship of the US Nuclear Regulatory Commission (NRC) to provide best-estimate transient simulations of light water reactor coolant systems (RCS) during severe accident conditions. Recent modeling improvements made to the MOD3.2 version of the code include (1) molten pool formation and heat up, including the transient start-up of natural circulation heat transfer, (2) in-core molten pool thermal-mechanical crust failure, (3) the melting and relocation of upper plenum structures, and (4) improvements in the modeling of lower plenum debris behavior and the potential for failure of the lower head. Finally, to eliminate abrupt transitions between core damage states and provide more realistic predictions of late phase accident progression phenomena, a transition smoothing methodology was developed and implemented that results in the calculation of a gradual transition from an intact core geometry through the different core damage states leading to molten pool formation. A wide range of experiments and modeling tools were used to assess the capabilities of MOD3.2. The results of the SCDAP/RELAP5/MOD3.2 assessment indicate that modeling improvements have significantly enhanced the code capabilities and performance in several areas compared to the earlier code version. New models for transition smoothing between core damage states, and modeling improvements/additions for cladding oxide failure, molten pool behavior, and molten pool crust failure have significantly improved the code usability for a wide range of applications and have significantly improved the prediction of hydrogen production, molten pool melt mass and core melt relocation time.

322
(INEEL/CON–97-01225)
Mercury emissions control technologies for mixed waste thermal treatment. Chambers, A. (Lockheed Martin Idaho Technologies Co., Idaho Falls, ID (United States). Idaho National Engineering and Environmental Lab.); Knecht, M.; Soelberg, N.; Eaton, D.; Roberts, D.; Broderick, T. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). [1997]. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-980472–: 1998 international conference on incineration and thermal treatment technologies, Salt Lake City, UT (United States), 17-20 Apr 1998). Order Number DE98056074. Source: OSTI; NTIS; INIS; GPO Dep.

EPA has identified wet scrubbing at low mercury feedrates, as well as carbon adsorption via carbon injection into the offgas or via flow through fixed carbon beds, as control technologies that can be used to meet the proposed Maximum Achievable Control Technology (MACT) rule limit for mercury emissions from hazardous waste incinerators. DOE is currently funding demonstrations of gold amalgamation that may also control mercury to the desired levels. Performance data from a variety of sources was reviewed to determine ranges of achievable mercury control. Preliminary costs were estimated for using these technologies to control mercury emissions from mixed waste incineration. Mercury emissions control for mixed waste incineration may need to be more efficient than for incineration of other hazardous wastes because of higher mercury concentrations in some mixed waste streams. However, mercury control performance data for wet scrubbing and carbon adsorption is highly variable. More information is needed to demonstrate control efficiencies that are achievable under various design and operating conditions for wet scrubbing, carbon adsorption, and gold amalgamation technologies. Given certain assumptions made in this study, capital costs, operating costs, and lifecycle costs for carbon injection, carbon beds, and gold amalgamation generally vary for different assumed mercury feedrates and for different offgas flowrates. Assuming that these technologies can in fact provide the necessary mercury control performance, each of these technologies may be less costly than the others for certain mercury feedrates and the offgas flowrates.

323
(INEEL/CON–97-01241)
Volatilization of heavy metals and radionuclides from soil heated in an induction “cold” crucible melter. Aloy, A.S. (Khlopin Radium Inst., St. Petersburg (Russian Federation)); Belov, V.Z.; Trofimenko, A.S.; Dmitriev, S.A.; Stefanovsky, S.V.; Gombert, D.; Knecht, D.A. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). [1997]. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-980513–: International conference on incineration and thermal treatment technologies, Salt Lake City, UT (United States), 11-15 May 1998). Order Number DE98054118. Source: OSTI; NTIS; INIS; GPO Dep.

The behavior of heavy metals and radionuclides during high-temperature treatment is very important for the design and operational capabilities of the off-gas treatment system, as well as for a better understanding of the nature and forms of the secondary waste. In Russia, a process for high-temperature melting in an induction heated cold crucible system is being studied for vitrification of Low Level Waste (LLW) flyash and SYNROC production with simulated high level waste (HLW). This work was done as part of a Department of Energy (DOE) funded research project for thermal treatment of mixed low level waste (LLW). Soil spiked with heavy metals (Cd, Pb) and radionuclides (Cs-137, U-239, Pu-239) was used as a waste surrogate. The soil was melted in an experimental lab-scale system that consisted of

a high-frequency generator (1.76 MHz, 60 kW), a cold crucible melter (300 mm high and 90 mm in diameter), a shield box, and an off-gas system. The process temperature was 1,350–1,400 C. Graphite and silicon carbide were used as sacrificial conductive materials to start heating and initial melting of the soil batch. The off-gas system was designed in such a manner that after each experiment, it can be disconnected to collect and analyze all deposits to determine the mass balance. The off-gases were also sampled during an experiment to analyze for hydrogen, NO_x, carbon dioxide, carbon monoxide and chlorine formation. This paper describes distribution and mass balance of metals and radionuclides in various parts of the off-gas system. The leach rate of the solidified blocks identified by the PCT method is also reported.

324
(INEEL/CON–97-01271)
Corrosion Resistance of Various High Chromium Alloys in Simulated Chemical Processing Nuclear Plant Waste Solutions. Anderson, P.A. (Lockheed Martin Idaho Technologies Co., Idaho Falls, ID (United States)); Agarwal, D.C. Lockheed Martin Idaho Technologies Co., Idaho Falls, ID (United States). [1997]. 13p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-980316–: Corrosion '98, San Diego, CA (United States), 22-27 Mar 1998). Order Number DE98051454. Source: OSTI; NTIS; GPO Dep.

Prepared in cooperation with Krupp VDM.

High chromium nickel alloys were tested at the Idaho Chemical Processing Plant (ICPP) to determine their corrosion performance in the high temperature aggressive chemical environments of liquid waste evaporators used in the chemical reprocessing of irradiated nuclear fuels. The results of these tests, which included a variety of base metal alloys I weld filler material combinations, are presented and discussed.

325
(INEEL/CON–97-01313)
Spreadsheet application to classify radioactive material for shipment. Brown, A.N. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Dec 1997. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-980307–: Waste management '98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98051451. Source: OSTI; NTIS; INIS; GPO Dep.

A spreadsheet application has been developed at the Idaho National Engineering and Environmental Laboratory to aid the shipper when classifying nuclide mixtures of normal form, radioactive materials. The results generated by this spreadsheet are used to confirm the proper US Department of Transportation (DOT) classification when offering radioactive material packages for transport. The user must input to the spreadsheet the mass of the material being classified, the physical form (liquid or not), and the activity of each regulated nuclide. The spreadsheet uses these inputs to calculate two general values: (1) the specific activity of the material, and (2) a summation calculation of the nuclide content. The specific activity is used to determine if the material exceeds the DOT minimal threshold for a radioactive material (Yes or No). If the material is calculated to be radioactive, the specific activity is also used to determine if the material meets the activity requirement for one of the three Low Specific Activity designations (LSA-I, LSA-II, LSA-III, or Not LSA). Again, if the material is calculated to be radioactive, the summation calculation is then used to determine which activity category the material will meet (Limited Quantity, Type A, Type B, or Highway Route Controlled Quantity).

326
(INEEL/CON–97-01339)
Overview of the United States spent nuclear fuel program. Hurt, W.L. Lockheed Martin Idaho Technologies Co., National Spent Nuclear Fuel Program, Idaho Falls, ID (United States). Dec 1997. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-971225–: International Atomic Energy Agency (IAEA) meeting on procedures and techniques for the management of experimental and exotic fuels from research and test reactors, Vienna (Austria), 1-7 Dec 1997). Order Number DE98052633. Source: OSTI; NTIS; INIS; GPO Dep.

As a result of the end of the Cold War, the mission of the US Department of Energy (DOE) has shifted from an emphasis on nuclear weapons development and production to an emphasis on the safe management and disposal of excess nuclear materials including spent nuclear fuel from both production and research reactors. Within the US, there are two groups managing spent nuclear fuel. Commercial nuclear power plants are managing their spent nuclear fuel at the individual reactor sites until the planned repository is opened. All other spent nuclear fuel, including research reactors, university reactors, naval reactors, and legacy material from the Cold War is managed by DOE. DOE's mission is to safely and efficiently manage its spent nuclear fuel and prepare it for disposal. This mission involves correcting existing vulnerabilities in spent fuel storage; moving spent fuel from wet basins to dry storage; processing at-risk spent fuel; and preparing spent fuel in road-ready condition for repository disposal. Most of DOE's spent nuclear fuel is stored in underwater basins (wet storage). Many of these basins are outdated, and spent fuel is to be removed and transferred to more modern basins or to new dry storage facilities. In 1995, DOE completed a complex-wide environmental impact analysis that resulted in spent fuel being sent to one of three principal DOE sites for interim storage (up to 40 years) prior to shipment to a repository. This regionalization by fuel type will allow for economies of scale yet minimize unnecessary transportation. This paper discusses the national SNF program, ultimate disposition of SNF, and the technical challenges that have yet to be resolved, namely, release rate testing, non-destructive assay, alternative treatments, drying, and chemical reactivity.

327
(INEEL/CON–97-01359)
Predicting flammability of gas mixtures containing volatile organic compounds. Liekhus, K. (Lockheed Martin Idaho Technologies Co., Idaho Falls, ID (United States). Idaho National Engineering and Environmental Lab.); Zlochower, I.; Djordjevic, S.; Loehr, C. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). [1997]. 17p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract

AC07-94ID13223. (CONF-980972–: International symposium on hazards, prevention, and mitigation of industrial explosions, Schaumberg, IL (United States), 21-25 Sep 1998). Order Number DE98058489. Source: OSTI; NTIS; INIS; GPO Dep.

One requirement regarding the transportation of transuranic (TRU) radioactive waste containers currently limits the total concentration of potentially flammable volatile organic compounds (VOCs) and flammable gases in the headspace of the waste container. Typical VOCs observed in the drums include aromatic hydrocarbons, ketones, alcohols, cyclohexane, as well as chlorinated hydrocarbons (alkanes and alkenes). Flammable gases, such as hydrogen and methane, may be generated in the containers by radiation-induced decomposition (radiolysis) of water and hydrocarbon waste forms. An experimental program was initiated to identify an accurate means for predicting flammability for gas mixtures containing one or more of the following species: hydrogen, carbon tetrachloride, 1,2-dichloroethane, toluene, or 2-butanone. The lower flammability limits (LFL) of gas mixtures containing equimolar quantity for each species were determined in a 19-liter laboratory flammability chamber using a strong spark ignition source. The group factor contribution method was determined to be more accurate than the LeChatelier method for estimating the LFL for these gas mixtures.

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(INEEL/CON–97-01431)

Removal of strontium-90 from calcined wastes with the SREX process. Wood, D.J.; Mann, N.R.; Tillotson, R.; Tullock, P.A.; Todd, T.A. Lockheed Martin Idaho Technologies, Inc., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). [1997]. 5p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-980905–: SPECTRUM '98: nuclear and hazardous waste management international topical meeting, Denver, CO (United States), 13-18 Sep 1998). Order Number DE98056070. Source: OSTI; NTIS; INIS; GPO Dep.

Experiments have been performed to formulate chemical procedures for the processing of radioactive dissolved calcine wastes for the removal of ^{90}Sr with the SREX (Strontium Extraction) solvent. Batch contact solvent extraction experiments have been performed to yield a processing scheme which is highly efficient for the extraction of Sr, while remaining free from insoluble precipitate formation and third phase formation. The effect of various scrubbing and stripping techniques and elevated temperature have been evaluated. The results of the batch contact experimentation has formed the basis for a proposed processing flowsheet which is scheduled soon for demonstration in centrifugal contactors.

329

(INEEL/CON–97-01433)

Treatment of acidic INEEL waste using a countercurrent cobalt dicarbollide-based universal solvent extraction process. Todd, T.A. (Lockheed Martin Idaho Technologies, Inc., Idaho Falls, ID (United States). Idaho National Engineering and Environmental Lab.); Law, J.D.; Herbst, R.S.; Brewer, K.N.; Romanovskiy, V.N.; Esimantovskiy, V.M.; Smirnov, I.V.; Babain, V.A.; Zaitsev,.Lockheed Martin Idaho Technologies, Inc., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). [1997]. 5p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-980905–: SPECTRUM '98: nuclear and hazardous waste management international topical meeting, Denver, CO (United States), 13-18 Sep 1998). Order Number DE98056071. Source: OSTI; NTIS; INIS; GPO Dep.

A tertiary solvent containing chlorinated cobalt dicarbollide, diphenylcarbamoylmethylphosphine oxide and polyethylene glycol in different diluents was evaluated for the separation of cesium, strontium, actinides and rare earth elements from acidic liquid radioactive waste in countercurrent solvent extraction processes. This universal solvent extraction process has been demonstrated in 24-stage centrifugal contactor pilot plants, using simulated acidic tank waste, at the Khlopin Radium Institute (KRI), St. Petersburg, Russia, and at the Idaho National Engineering and Environmental Laboratory (INEEL). Demonstration of the universal extraction process with actual tank waste is scheduled at the INEEL in 1998.

330

(INEEL/CON–97-01434)

Developing a dependable approach for evaluating waste treatment data. Gering, K.L. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). [1997]. 16p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-980307–: Waste management '98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98058490. Source: OSTI; NTIS; INIS; GPO Dep.

Decision makers involved with hazardous waste treatment issues are faced with the challenge of making objective evaluations concerning treatment formulations. This work utilizes an effectiveness factor (denoted as η) as the basis for waste treatment evaluations, which was recently developed for application to mixed waste treatability studies involving solidification and stabilization at the Idaho National Engineering and Environmental Laboratory. The effectiveness factor incorporates an arbitrary treatment criterion Φ, which in practice could be the Toxicity Characteristic Leaching Procedure, Unconfined Compressive Strength, Leachability Index, or any other criterion used to judge treatment performance. Three values for Φ are utilized when assessing a given treatment formulation: before treatment, after treatment, and a reference value (typically a treatment standard). The expression for η also incorporates the waste loading as the prime experimental parameter, and accounts for the contribution that each hazard has upon the overall treatment performance. Also discussed are general guidelines for numerical boundaries and statistical interpretations of treatment data. Case studies are presented that demonstrate the usefulness of the effectiveness factor and related numerical methods, where the typical hazards encountered are toxic metals within mixed waste.

331

(INEEL/CON–98-00055)

An alternative test for verifying electronic balance linearity. Thomas, I.R. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Feb 1998. 16p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-980230–: 1998 measurement science conference

symposium, Pasadena, CA (United States), 5-6 Feb 1998). Order Number DE98052757. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents an alternative method for verifying electronic balance linearity and accuracy. This method is being developed for safeguards weighings (weighings for the control and accountability of nuclear material) at the Idaho National Engineering and Environmental Laboratory (INEEL). With regard to balance linearity and accuracy, DOE Order 5633.3B, Control and Accountability of Nuclear Materials, Paragraph 2, 4, e, (1), (a) Scales and Balances Program, states: "All scales and balances used for accountability purposes shall be maintained in good working condition, recalibrated according to an established schedule, and checked for accuracy and linearity on each day that the scale or balance is used for accountability purposes." Various tests have been proposed for testing accuracy and linearity. In the 1991 Measurement Science Conference, Dr. Walter E. Kupper presented a paper entitled: "Validation of High Accuracy Weighing Equipment." Dr. Kupper emphasized that tolerance checks for calibrated, state-of-the-art electronic equipment need not be complicated, and he presented four easy steps for verifying that a calibrated balance is operating correctly. These tests evaluate the standard deviation of successive weighings (of the same load), the off-center error, the calibration error, and the error due to nonlinearity. This method of balance validation is undoubtedly an authoritative means of ensuring balance operability, yet it could have two drawbacks: one, the test for linearity is not intuitively obvious, especially from a statistical viewpoint; and two, there is an absence of definitively defined testing limits. Hence, this paper describes an alternative means of verifying electronic balance linearity and accuracy that is being developed for safeguards measurements at the INEEL.

332
(INEEL/EXT–97-00609)
Development, calibration, and predictive results of a simulator for subsurface pathway fate and transport of aqueous- and gaseous-phase contaminants in the Subsurface Disposal Area at the Idaho National Engineering and Environmental Laboratory. Magnuson, S.O.; Sondrup, A.J. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Jul 1998. [250p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98058438. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the development, calibration, and predictive results of a simulation study of fate and transport of waste buried in the Subsurface Disposal Area (SDA) (which is hereafter referred to as the SDA simulation study). This report builds on incorporates a previous report that dealt only with the calibration of a flow model for simulation of water movement beneath the SDA (Magnuson and Sondrup 1996). The primary purpose of the SDA simulation study was to perform fate and transport calculations to support the IRA. A secondary purpose of the SDA simulation study was to be able to use the model to evaluate possible remediation strategies and their effects on flow and transport in the OU 7-13/14 feasibility study.

333
(INEEL/EXT–97-00654)
Alternative calcination development status report. Boardman, R.D. Lockheed Martin Idaho Technologies Co., Inc., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Dec 1997. [200p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98058432. Source: OSTI; NTIS; INIS; GPO Dep.

The Programmatic Spent Nuclear Fuel and (INEEL) Environmental Restoration and Waste Management Programs Environmental Impact Statement Record of Decision, dated June 1, 1995, specifies that high-level waste stored in the underground tanks at the ICPP continue to be calcined while other options to treat the waste are studied. Therefore, the High-Level Waste Program has funded a program to develop new flowsheets to increase the liquid waste processing rate. Simultaneously, a radionuclide separation process, as well as other options, are also being developed, which will be compared to the calcination treatment option. Two alternatives emerged as viable candidates; (1) elevated temperature calcination (also referred to as high temperature calcination), and (2) sugar-additive calcination. Both alternatives were determined to be viable through testing performed in a lab-scale calcination mockup. Subsequently, 10-cm Calciner Pilot Plant scoping tests were successfully completed for both flowsheets. The results were compared to the standard 500 C, high-ANN flow sheet (baseline flowsheet). The product and effluent streams were characterized to help elucidate the process chemistry and to investigate potential environmental permitting issues. Several supplementary tests were conducted to gain a better understanding of fine-particles generation, calcine hydration, scrub foaming, feed makeup procedures, sugar/organic elimination, and safety-related issues. Many of the experiments are only considered to be scoping tests, and follow-up experiments will be required to establish a more definitive understanding of the flowsheets. However, the combined results support the general conclusion that flowsheet improvements for the NWCF are technically viable.

334
(INEEL/EXT–97-00831)
Development of the SREX process for the treatment of ICPP liquid wastes. Wood, D.J.; Law, J.D.; Garn, T.G.; Tillotson, R.D.; Tullock, P.A.; Todd, T.A. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Dec 1997. 44p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052247. Source: OSTI; NTIS; INIS; GPO Dep.

The removal of ^{90}Sr from actual and simulated wastes at the Idaho Chemical Processing Plant (ICPP) at the Idaho National Engineering and Environmental Laboratory (INEEL) has been demonstrated with the SREX process. This solvent extraction process employs the extractant 4′,4′(5′) di-(t-butylcyclohexano)-18-crown-6 in 1-octanol or a mixture of tributyl phosphate and a hydrocarbon diluent called Isopar L®. Process flowsheets have been designed for testing in countercurrent experiments with centrifugal contractors. The flowsheets have been designed using batch contract solvent extraction methods. The extraction of Sr as well as other interfering ions has been studied. The effect of various parameters including nitric acid dependence, extractant concentration dependence, hydronium ion concentration, and interferent concentrations upon the extraction efficiency of the process has been evaluated. The radiolysis of the SREX

solvent has also been investigated as a function of absorbed gamma radiation. The extraction efficiency of the solvent has been shown to be only slightly dependent upon absorbed dose in the range 0–1,000 kGy. The decontamination of actual sodium-bearing waste and dissolved calcine solutions has been accomplished in batch contact flowsheets. Decontamination factors as high as 10E3 have been obtained with sequential batch contacts. Flowsheets have been developed to accomplish decontamination of the liquid wastes with respect to ^{90}Sr as well as the removal of Pb and Hg. Pb may be partitioned from the Sr fraction in a separate stripping procedure using ammonium citrate. This work has led to the formulation of countercurrent flowsheets which have been tested in centrifugal contractors with actual waste and reported in the document INEEL/EXT-97-00832.

335
(INEEL/EXT–97-00837)
TRUEX flowsheet testing for the removal of the actinides from dissolved ICPP zirconium calcine using centrifugal contactors. Herbst, R.S.; Law, J.D.; Brewer, K.N.; Todd, T.A. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Dec 1997. 26p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052249. Source: OSTI; NTIS; INIS; GPO Dep.

Solid calcine is one of the wastes under evaluation for TRU removal by the TRUEX process. The calcine must first be dissolved in nitric acid prior to the removal of TRUs and fission products. Zirconium type calcine (generated from zirconium fuel reprocessing raffinates) comprises the majority of the calcine currently stored at the ICPP. The zirconium calcines average 18.3 wt% ZrO_2 and are anticipated to be the most challenging to treat with regards to TRU removal because of the large zirconium content. This paper reports the results from a countercurrent flowsheet test performed with a dissolved calcine simulant in a 2-cm centrifugal contractor pilot plant. The simulant was spiked with radioactive ^{241}Am and ^{95}Zr to facilitate analysis and evaluate the behavior of the actinides. Flooding and precipitate formation were observed in the strip section during the flowsheet testing. It is postulated that the flooding occurred as a result of precipitate formation. The precipitate was determined to be $ZrPO_4$ and was likely formed due the excessive amount of Zr carried into the strip section with the organic phase. Roughly 65% of the Zr in the feed was extracted. Of the extracted Zr, 15.6% reported to the strip product and 15.1% ended up in the organic effluent, indicating the strip section was ineffective at re-extracting Zr. The poor strip section performance was probably due to the precipitation and concomitant flooding problems encountered in the test, resulting in the strip section never achieving steady state operating conditions. Despite the obvious problems encountered during the test, $>$ 99.18% of the americium was removed from the feed in the extraction section. This may be slightly lower than the anticipated 99.9% Am removal efficiency necessary to insure the $<$ 10 nCi/g TRU content in the LLW raffinate.

336
(INEEL/EXT–97-01032)
Buried waste containment system materials. Final Report. Weidner, J.R.; Shaw, P.G. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Oct 1997. 58p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98051444. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the results of a test program to validate the application of a latex-modified cement formulation for use with the Buried Waste Containment System (BWCS) process during a proof of principle (POP) demonstration. The test program included three objectives. One objective was to validate the barrier material mix formulation to be used with the BWCS equipment. A basic mix formula for initial trials was supplied by the cement and latex vendors. The suitability of the material for BWCS application was verified by laboratory testing at the Idaho National Engineering and Environmental Laboratory (INEEL). A second objective was to determine if the POP BWCS material emplacement process adversely affected the barrier material properties. This objective was met by measuring and comparing properties of material prepared in the INEEL Materials Testing Laboratory (MTL) with identical properties of material produced by the BWCS field tests. These measurements included hydraulic conductivity to determine if the material met the US Environmental Protection Agency (EPA) requirements for barriers used for hazardous waste sites, petrographic analysis to allow an assessment of barrier material separation and segregation during emplacement, and a set of mechanical property tests typical of concrete characterization. The third objective was to measure the hydraulic properties of barrier material containing a stop-start joint to determine if such a feature would meet the EPA requirements for hazardous waste site barriers.

337
(INEEL/EXT–97-01069)
An engineering and economic analysis: Inductively coupled plasma mobile treatment of hazardous waste. Detering, B.A.; McLlwain, M.E. Idaho National Engineering Lab., Idaho Falls, ID (United States). Oct 1997. 42p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98050425. Source: OSTI; NTIS; INIS; GPO Dep.

This analysis considers the engineering and economic viability of an rf-plasma, mobile treatment process for remediation of hazardous waste located at remote sites in Alaska. A simple engineering process flowsheet is used to define the elements associated with the process and to identify major pieces of equipment. The proposed flowsheet and equipment are used to estimate capital and operational costs for four separate processing cases. These cases explore various operational situations, including moving equipment to a remote site, transporting wastes to a base site, and varying operational periods. Some cases consider variations in fuel costs known to exist across Alaska. Operational costs, capital equipment costs, and revenues are used to calculate pro-forma income statements. These income statements are used to predict economic viability. Based on the economic viability, the analysis suggests that processing of hydrocarbon-contaminated soils is more profitable when performed at remote sites as compared to at a home base. Processing of poly-chloro-biphenyl (PCB)-contaminated oil at a stationary site is more profitable as compared to remote treatment due to the cost of transporting the equipment. Over the range of fuel prices considered, higher fuel costs increase the per unit treatment price by ten percent. Based on the results of this analysis, an rf-plasma based process appears to be economically viable for remote

treatment of hydrocarbon-contaminated soil, but less viable for treatment of PCB-contaminated oil.

338
(INEEL/EXT–97-01072)
Evaluation of emplacement sensors for detecting radiation and volatile organic compounds and for long-term monitoring access tubes for the BWCS. Lord, D.L.; Averill, R.H. Idaho National Engineering Lab., Idaho Falls, ID (United States). Oct 1997. 21p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98050621. Source: OSTI; NTIS; INIS; GPO Dep.

This document evaluates sensors for detecting contaminants in the excavated waste generated by the Buried Waste Containment System (BWCS). The Barrier Placement Machine (BPM) removes spoils from under a landfill or plume and places it on a conveyor belt on the left and right sides of the BPM. The spoils will travel down the conveyor belts past assay monitors and be deposited on top of the site being worked. The belts are 5 ft wide and transport approximately 15 ft3 /minute of spoils. This corresponds to a 10 ft per hour BPM advance rate. With a 2 in. spoils height the belt speed would be 3.6 in. per second. The spoils being removed are expected to be “clean” (no radiation or volatile organics above background levels). To ensure that the equipment is not digging through a contaminated area, assay equipment will monitor the spoils for mg radiation and volatile organic compounds (VOCs). The radiation monitors will check for gross radiation indication. Upon detection of radiation levels above a predetermined setpoint, further evaluation will be performed to determine the isotopes present and their quantity. This will require hand held monitors and a remote monitoring station. Simultaneously, VOC monitors will monitor for predetermined volatile/semi-volatile organic compounds. A Fourier-Transform Infrared Spectrometer (FTIR) monitor is recommended for this operation. Specific site requirements and regulations will determine setpoints and operation scenarios. If VOCs are detected, the data will be collected and recorded. A flat panel display will be mounted in the BPM operator’s cab showing the radio nuclide and VOC monitoring data. As the BPM advances, a 3-in. diameter PVC tube will be placed on the bottom of the barrier slot in front of the 12 to 16-in. containment barrier being emplaced.

339
(INEEL/EXT–97-01113)
Radioactive waste management complex low-level waste radiological composite analysis. McCarthy, J.M.; Becker, B.H.; Magnuson, S.O.; Keck, K.N.; Honeycutt, T.K. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). May 1998. 110p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98056049. Source: OSTI; NTIS; INIS; GPO Dep.

The composite analysis estimates the projected cumulative impacts to future members of the public from the disposal of low-level radioactive waste (LLW) at the Idaho National Engineering and Environmental Laboratory (INEEL) Radioactive Waste Management Complex (RWMC) and all other sources of radioactive contamination at the INEEL that could interact with the LLW disposal facility to affect the radiological dose. Based upon the composite analysis evaluation, waste buried in the Subsurface Disposal Area (SDA) at the RWMC is the only source at the INEEL that will significantly interact with the LLW facility. The source term used in the composite analysis consists of all historical SDA subsurface disposals of radionuclides as well as the authorized LLW subsurface disposal inventory and projected LLW subsurface disposal inventory. Exposure scenarios evaluated in the composite analysis include all the all-pathways and groundwater protection scenarios. The projected dose of 58 mrem/yr exceeds the composite analysis guidance dose constraint of 30 mrem/yr; therefore, an options analysis was conducted to determine the feasibility of reducing the projected annual dose. Three options for creating such a reduction were considered: (1) lowering infiltration of precipitation through the waste by providing a better cover, (2) maintaining control over the RWMC and portions of the INEEL indefinitely, and (3) extending the period of institutional control beyond the 100 years assumed in the composite analysis. Of the three options investigated, maintaining control over the RWMC and a small part of the present INEEL appears to be feasible and cost effective.

340
(INEEL/EXT–97-01138)
High performance APCS conceptual design and evaluation scoping study. Soelberg, N.; Liekhus, K.; Chambers, A.; Anderson, G. EG and G Idaho, Inc., Idaho Falls, ID (United States). Feb 1998. 147p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98054111. Source: OSTI; NTIS; INIS; GPO Dep.

This Air Pollution Control System (APCS) Conceptual Design and Evaluation study was conducted to evaluate a high-performance (APC) system for minimizing air emissions from mixed waste thermal treatment systems. Seven variations of high-performance APCS designs were conceptualized using several design objectives. One of the system designs was selected for detailed process simulation using ASPEN PLUS to determine material and energy balances and evaluate performance. Installed system capital costs were also estimated. Sensitivity studies were conducted to evaluate the incremental cost and benefit of added carbon adsorber beds for mercury control, specific catalytic reduction for NO_x control, and offgas retention tanks for holding the offgas until sample analysis is conducted to verify that the offgas meets emission limits. Results show that the high-performance dry-wet APCS can easily meet all expected emission limits except for possibly mercury. The capability to achieve high levels of mercury control (potentially necessary for thermally treating some DOE mixed streams) could not be validated using current performance data for mercury control technologies. The engineering approach and ASPEN PLUS modeling tool developed and used in this study identified APC equipment and system performance, size, cost, and other issues that are not yet resolved. These issues need to be addressed in feasibility studies and conceptual designs for new facilities or for determining how to modify existing facilities to meet expected emission limits. The ASPEN PLUS process simulation with current and refined input assumptions and calculations can be used to provide system performance information for decision-making, identifying best options, estimating costs, reducing the potential for emission violations, providing information needed for waste flow analysis, incorporating new

APCS technologies in existing designs, or performing facility design and permitting activities.

341
(INEEL/EXT–97-01142)
Low-level radioactive waste form qualification testing. Sohal, M.S.; Akers, D.W. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Jun 1998. 78p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98058441. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes activities that have already been completed as well as yet to be performed by the Idaho National Engineering and Environmental Laboratory (INEEL) to develop a plan to quantify the behavior of radioactive low-level waste forms. It briefly describes the status of various tasks, including DOE approval of the proposed work, several regulatory and environmental related documents, tests to qualify the waste form, preliminary schedule, and approximate cost. It is anticipated that INEEL and Brookhaven National Laboratory will perform the majority of the tests. For some tests, services of other testing organizations may be used. It should take approximately nine months to provide the final report on the results of tests on a waste form prepared for qualification. It is anticipated that the overall cost of the waste quantifying service is approximately $150,000. The following tests are planned: compression, thermal cycling, irradiation, biodegradation, leaching, immersion, free-standing liquid tests, and full-scale testing.

342
(INEEL/EXT–97-01145-Vol.1)
Waste disposal options report. Volume 1. Russell, N.E.; McDonald, T.G.; Banaee, J.; Barnes, C.M.; Fish, L.W.; Losinski, S.J.; Peterson, H.K.; Sterbentz, J.W.; Wenzel, D.R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Feb 1998. 53p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052238. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the potential options for the processing and disposal of mixed waste generated by reprocessing spent nuclear fuel at the Idaho Chemical Processing Plant. It compares the proposed waste-immobilization processes, quantifies and characterizes the resulting waste forms, identifies potential disposal sites and their primary acceptance criteria, and addresses disposal issues for hazardous waste.

343
(INEEL/EXT–97-01145-Vol.2)
Waste disposal options report. Volume 2. Russell, N.E.; McDonald, T.G.; Banaee, J.; Barnes, C.M.; Fish, L.W.; Losinski, S.J.; Peterson, H.K.; Sterbentz, J.W.; Wenzel, D.R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Feb 1998. [300p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98002911. Source: OSTI; NTIS; INIS; GPO Dep.

Includes INEEL/EXT–97-01147-Rev.1.

Volume 2 contains the following topical sections: estimates of feed and waste volumes, compositions, and properties; evaluation of radionuclide inventory for Zr calcine; evaluation of radionuclide inventory for Al calcine; determination of k_{eff} for high level waste canisters in various configurations; review of ceramic silicone foam for radioactive waste disposal; epoxides for low-level radioactive waste disposal; evaluation of several neutralization cases in processing calcine and sodium-bearing waste; background information for EFEs, dose rates, watts/canister, and PE-curies; waste disposal options assumptions; update of radiation field definition and thermal generation rates for calcine process packages of various geometries-HKP-26-97; and standard criteria of candidate repositories and environmental regulations for the treatment and disposal of ICPP radioactive mixed wastes.

344
(INEEL/EXT–97-01164)
Performance test results of noninvasive characterization of RCRA surrogate waste by prompt gamma neutron activation analysis. Gehrke, R.J.; Propp, W.A. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Nov 1997. 13p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98056053. Source: OSTI; NTIS; INIS; GPO Dep.

A performance evaluation to determine the feasibility of using prompt gamma neutron activation analysis (PGNAA) for noninvasive, quantitative assay of mixed waste containers was sponsored by DOE's Office of Technology Development (OTD), the Mixed Waste Focus Area (MWFA), and the Idaho National Engineering and Environmental Laboratory (INEEL). The evaluation was conducted using a surrogate waste, based on Portland cement, that was spiked with three RCRA metals, mercury, cadmium, and lead. The results indicate that PGNAA has potential as a process monitor. However, further development is required to improve its sensitivity to meet regulatory requirements for determination of these RCRA metals.

345
(INEEL/EXT–97-01204-Vol.1)
ICPP tank farm closure study. Volume 1. Spaulding, B.C. (and others); Gavalya, R.A.; Dahlmeir, M.M. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Feb 1998. [500p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052226. Source: OSTI; NTIS; INIS; GPO Dep.

The disposition of INEEL radioactive wastes is now under a Settlement Agreement between the DOE and the State of Idaho. The Settlement Agreement requires that existing liquid sodium bearing waste (SBW), and other liquid waste inventories be treated by December 31, 2012. This agreement also requires that all HLW, including calcined waste, be disposed or made road ready to ship from the INEEL by 2035. Sodium bearing waste (SBW) is produced from decontamination operations and HLW from reprocessing of SNF. SBW and HLW are radioactive and hazardous mixed waste; the radioactive constituents are regulated by DOE and the hazardous constituents are regulated by the Resource Conservation and Recovery Act (RCRA). Calcined waste, a dry granular material, is produced in the New Waste Calcining Facility (NWCF). Two primary waste tank storage locations exist at the ICPP: Tank Farm Facility (TFF)

and the Calcined Solids Storage Facility (CSSF). The TFF has the following underground storage tanks: four 18,400-gallon tanks (WM 100-102, WL 101); four 30,000-gallon tanks (WM 103-106); and eleven 300,000+ gallon tanks. This includes nine 300,000-gallon tanks (WM 182-190) and two 318,000 gallon tanks (WM 180-181). This study analyzes the closure and subsequent use of the eleven 300,000+ gallon tanks. The 18,400 and 30,000-gallon tanks were not included in the work scope and will be closed as a separate activity. This study was conducted to support the HLW Environmental Impact Statement (EIS) waste separations options and addresses closure of the 300,000-gallon liquid waste storage tanks and subsequent tank void uses. A figure provides a diagram estimating how the TFF could be used as part of the separations options. Other possible TFF uses are also discussed in this study.

346
(INEEL/EXT–97-01204-Vol.2)
ICPP tank farm closure study. Volume 2: Engineering design files. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Feb 1998. [500p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98002909. Source: OSTI; NTIS; INIS; GPO Dep.

Volume 2 contains the following topical sections: Tank farm heel flushing/pH adjustment; Grouting experiments for immobilization of tank farm heel; Savannah River high level waste tank 20 closure; Tank farm closure information; Clean closure of tank farm; Remediation issues; Remote demolition techniques; Decision concerning EIS for debris treatment facility; CERCLA/RCRA issues; Area of contamination determination; Containment building of debris treatment facility; Double containment issues; Characterization costs; Packaging and disposal options for the waste resulting from the total removal of the tank farm; Take-off calculations for the total removal of soils and structures at the tank farm; Vessel off-gas systems; Jet-grouted polymer and subsurface walls; Exposure calculations for total removal of tank farm; Recommended instrumentation during retrieval operations; High level waste tank concrete encasement evaluation; Recommended heavy equipment and sizing equipment for total removal activities; Tank buoyancy constraints; Grout and concrete formulas for tank heel solidification; Tank heel pH requirements; Tank cooling water; Evaluation of conservatism of vehicle loading on vaults; Typical vault dimensions and approximately tank and vault void volumes; Radiological concerns for temporary vessel off-gas system; Flushing calculations for tank heels; Grout lift depth analysis; Decontamination solution for waste transfer piping; Grout lift determination for filling tank and vault voids; sprung structure vendor data; Grout flow properties through a 2–4 inch pipe; Tank farm load limitations; NRC low level waste grout; Project data sheet calculations; Dose rates for tank farm closure tasks; Exposure and shielding calculations for grout lines; TFF radionuclide release rates; Documentation of the clean closure of a system with listed waste discharge; and Documentation of the ORNL method of radionuclide concentrations in tanks.

347
(INEEL/EXT–97-01204-Vol.3)
ICPP tank farm closure study. Volume 3: Cost estimates, planning schedules, yearly cost flowcharts, and life-cycle cost estimates. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Feb 1998. [500p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98002910. Source: OSTI; NTIS; INIS; GPO Dep.

This volume contains information on cost estimates, planning schedules, yearly cost flowcharts, and life-cycle costs for the six options described in Volume 1, Section 2: Option 1 – Total removal clean closure; No subsequent use; Option 2 – Risk-based clean closure; LLW fill; Option 3 – Risk-based clean closure; CERCLA fill; Option 4 – Close to RCRA landfill standards; LLW fill; Option 5 – Close to RCRA landfill standards; CERCLA fill; and Option 6 – Close to RCRA landfill standards; Clean fill. This volume is divided into two portions. The first portion contains the cost and planning schedule estimates while the second portion contains life-cycle costs and yearly cash flow information for each option.

348
(INEEL/EXT–97-01251)
DPC loading feasibility study report. Dafoe, R.E.; Lopez, D.A.; Williams, K.L. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Nov 1997. 341p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98051441. Source: OSTI; NTIS; INIS; GPO Dep.

Disposal of radioactive wastes now stored at the Idaho Chemical Processing Plant at the Idaho National Engineering and Environmental Laboratory is mandated under a “Settlement Agreement” between the Department of Energy and the State of Idaho. This study investigates the feasibility of using the Dry Transfer Cell facility to package waste into Dual Purpose Canisters for interim storage at the adjacent Dry Storage System comprised of an interim storage pad with NUHOMS® storage modules. The wastes would then be road-ready for eventual disposal in a permanent repository. The operating period for these activities is expected to be from 2015 to 2035.

349
(INEEL/EXT–97-01253)
Human health risk comparisons for environmental management baseline program and integration opportunities (discussion draft). Eide, S.A.; Jones, J.L.; Wierman, T.E. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Feb 1998. [150p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98058439. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the process and results of human health risk assessments of the US Department of Energy (DOE) complex-wide programs for high-level waste, transuranic waste, low-level waste, mixed low-level waste, and spent nuclear fuel. The DOE baseline programs and alternatives for these five material types were characterized by disposition maps (system flow diagrams) and supporting information in the May 1997 report A Contractor Report to the Department of Energy on Environmental Baseline Programs and Integration Opportunities (Discussion Draft). Risk analyses were performed using the Simplified Risk Model (SRM), developed to support DOE Environmental Management

(EM) integration studies. The SRM risk analyses consistently and comprehensively cover the entire programs for the five material types, from initial storage through final disposition. Risk results are presented at several levels: DOE complex-wide, material type program, individual DOE sites, and DOE site activities.

350
(INEEL/EXT–97-01273)
SWEPP PAN assay system uncertainty analysis: Active mode measurements of solidified aqueous sludge waste. Blackwood, L.G.; Harker, Y.D.; Meachum, T.R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Dec 1997. 35p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052237. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho National Engineering and Environmental Laboratory is being used as a temporary storage facility for transuranic waste generated by the US Nuclear Weapons program at the Rocky Flats Plant (RFP) in Golden, Colorado. Currently, there is a large effort in progress to prepare to ship this waste to the Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico. In order to meet the TRU Waste Characterization Quality Assurance Program Plan nondestructive assay compliance requirements and quality assurance objectives, it is necessary to determine the total uncertainty of the radioassay results produced by the Stored Waste Examination Pilot Plant (SWEPP) Passive Active Neutron (PAN) radioassay system. This paper is one of a series of reports quantifying the results of the uncertainty analysis of the PAN system measurements for specific waste types and measurement modes. In particular this report covers active mode measurements of weapons grade plutonium-contaminated aqueous sludge waste contained in 208 liter drums (item description codes 1, 2, 7, 800, 803, and 807). Results of the uncertainty analysis for PAN active mode measurements of aqueous sludge indicate that a bias correction multiplier of 1.55 should be applied to the PAN aqueous sludge measurements. With the bias correction, the uncertainty bounds on the expected bias are $0 \pm 27\%$. These bounds meet the Quality Assurance Program Plan requirements for radioassay systems.

351
(INEEL/EXT–97-01300)
FY-97 operations of the pilot-scale glass melter to vitrify simulated ICPP high activity sodium-bearing waste. Musick, C.A. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Nov 1997. 56p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98051445. Source: OSTI; NTIS; INIS; GPO Dep.

A 3.5 liter refractory-lined joule-heated glass melter was built to test the applicability of electric melting to vitrify simulated high activity waste (HAW). The HAW streams result from dissolution and separation of Idaho Chemical Processing Plant (ICPP) calcines and/or radioactive liquid waste. Pilot scale melter operations will establish selection criteria needed to evaluate the application of joule heating to immobilize ICPP high activity waste streams. The melter was fabricated with K-3 refractory walls and Inconel 690 electrodes. It is designed to be continuously operated at 1,150 C with a maximum glass output rate of 10 lbs/hr. The first set of tests were completed using surrogate HAW-sodium bearing waste (SBW). The melter operated for 57 hours and was shut down due to excessive melt temperatures resulting in low glass viscosity ($<$ 30 Poise). Due to the high melt temperature and low viscosity the molten glass breached the melt chamber. The melter has been dismantled and examined to identify required process improvement areas and successes of the first melter run. The melter has been redesigned and is currently being fabricated for the second run, which is scheduled to begin in December 1997.

352
(INEEL/EXT–97-01325)
Assessment of the RELAP5 multi-dimensional component model using data from LOFT test L2-5. Davis, C.B. Idaho National Engineering Lab., Idaho Falls, ID (United States). Jan 1998. 50p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052253. Source: OSTI; NTIS; INIS; GPO Dep.

The capability of the RELAP5-3D computer code to perform multi-dimensional analysis of a pressurized water reactor (PWR) was assessed using data from the LOFT L2-5 experiment. The LOFT facility was a 50 MW PWR that was designed to simulate the response of a commercial PWR during a loss-of-coolant accident. Test L2-5 simulated a 200% double-ended cold leg break with an immediate primary coolant pump trip. A three-dimensional model of the LOFT reactor vessel was developed. Calculations of the LOFT L2-5 experiment were performed using the RELAP5-3D Version BF02 computer code. The calculated thermal-hydraulic responses of the LOFT primary and secondary coolant systems were generally in reasonable agreement with the test. The calculated results were also generally as good as or better than those obtained previously with RELAP/MOD3.

353
(INEEL/EXT–97-01337)
Complex-Wide Waste Flow Analysis V1.0 verification and validation report. Hsu, K.M.; Lundeen, A.S.; Oswald, K.B.; Shropshire, D.E.; Robinson, J.M.; West, W.H. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). 21 Nov 1997. 228p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98051446. Source: OSTI; NTIS; INIS; GPO Dep.

The complex-wide waste flow analysis model (CWWFA) was developed to assist the Department of Energy (DOE) Environmental Management (EM) Office of Science and Technology (EM-50) to evaluate waste management scenarios with emphasis on identifying and prioritizing technology development opportunities to reduce waste flows and public risk. In addition, the model was intended to support the needs of the Complex-Wide Environmental Integration (EMI) team supporting the DOE's Accelerating Cleanup: 2006 Plan. CWWFA represents an integrated environmental modeling system that covers the life cycle of waste management activities including waste generation, interim process storage, retrieval, characterization and sorting, waste preparation and processing, packaging, final interim storage, transport, and disposal at a final repository. The CWWFA shows waste flows through actual site-specific and facility-specific conditions. The system requirements for CWWFA

are documented in the Technical Requirements Document (TRD). The TRD is intended to be a living document that will be modified over the course of the execution of CWWFA development. Thus, it is anticipated that CWWFA will continue to evolve as new requirements are identified (i.e., transportation, small sites, new streams, etc.). This report provides a documented basis for system verification of CWWFA requirements. System verification is accomplished through formal testing and evaluation to ensure that all performance requirements as specified in the TRD have been satisfied. A Requirement Verification Matrix (RVM) was used to map the technical requirements to the test procedures. The RVM is attached as Appendix A. Since February of 1997, substantial progress has been made toward development of the CWWFA to meet the system requirements. This system verification activity provides a baseline on system compliance to requirements and also an opportunity to reevaluate what requirements need to be satisfied in FY-98.

354
(INEEL/EXT–97-01389)
Vitrified waste option study report. Lopez, D.A.; Kimmitt, R.R. Idaho National Engineering Lab., Idaho Falls, ID (United States). Feb 1998. 451p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052230. Source: OSTI; NTIS; INIS; GPO Dep.

A “Settlement Agreement” between the Department of Energy and the State of Idaho mandates that all radioactive high-level waste (HLW) now stored at the Idaho Chemical Processing Plant (ICPP) will be treated so that it is ready to be moved out of Idaho for disposal by a target date of 2035. This report investigates vitrification treatment of all ICPP calcine, including the existing and future HLW calcine resulting from calcining liquid Sodium-Bearing Waste (SBW). Currently, the SBW is stored in the tank farm at the ICPP. Vitrification of these wastes is an acceptable treatment method for complying with the Settlement Agreement. This method involves vitrifying the calcined waste and casting the vitrified mass into stainless steel canisters that will be ready to be moved out of the Idaho for disposal by 2035. These canisters will be stored at the Idaho National Engineering and Environmental Laboratory (INEEL) until they are sent to a HLW national repository. The operating period for vitrification treatment will be from 2013 through 2032; all HLW will be treated and in storage by the end of 2032.

355
(INEEL/EXT–97-01392)
Hot isostatic press waste option study report. Russell, N.E.; Taylor, D.D. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Feb 1998. [400p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052233. Source: OSTI; NTIS; INIS; GPO Dep.

A Settlement Agreement between the Department of Energy and the State of Idaho mandates that all high-level radioactive waste now stored at the Idaho Chemical Processing Plant be treated so that it is ready to move out of Idaho for disposal by the target date of 2035. This study investigates the immobilization of all Idaho Chemical Processing Plant calcine, including calcined sodium bearing waste, via the process known as hot isostatic press, which produces compact solid waste forms by means of high temperature and pressure (1,050 C and 20,000 psi), as the treatment method for complying with the settlement agreement. The final waste product would be contained in stainless-steel canisters, the same type used at the Savannah River Site for vitrified waste, and stored at the Idaho National Engineering and Environmental Laboratory until a national geological repository becomes available for its disposal. The waste processing period is from 2013 through 2032, and disposal at the High Level Waste repository will probably begin sometime after 2065.

356
(INEEL/EXT–97-01393)
Interim storage study report. Rawlins, J.K. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Feb 1998. [400p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052240. Source: OSTI; NTIS; INIS; GPO Dep.

High-level radioactive waste (HLW) stored at the Idaho Chemical Processing Plant (ICPP) in the form of calcine and liquid and liquid sodium-bearing waste (SBW) will be processed to provide a stable waste form and prepare the waste to be transported to a permanent repository. Because a permanent repository will not be available when the waste is processed, the waste must be stored at ICPP in an Interim Storage Facility (ISF). This report documents consideration of an ISF for each of the waste processing options under consideration.

357
(INEEL/EXT–97-01396-Vol.1)
Calcined solids storage facility closure study. Dahlmeir, M.M. (and others); Tuott, L.C.; Spaulding, B.C. Idaho National Engineering Lab., Idaho Falls, ID (United States). Feb 1998. 310p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052234. Source: OSTI; NTIS; INIS; GPO Dep.

The disposal of radioactive wastes now stored at the Idaho National Engineering and Environmental Laboratory is currently mandated under a “Settlement Agreement” (or “Batt Agreement”) between the Department of Energy and the State of Idaho. Under this agreement, all high-level waste must be treated as necessary to meet the disposal criteria and disposed of or made road ready to ship from the INEEL by 2035. In order to comply with this agreement, all calcined waste produced in the New Waste Calcining Facility and stored in the Calcined Solids Facility must be treated and disposed of by 2035. Several treatment options for the calcined waste have been studied in support of the High-Level Waste Environmental Impact Statement. Two treatment methods studied, referred to as the TRU Waste Separations Options, involve the separation of the high-level waste (calcine) into TRU waste and low-level waste (Class A or Class C). Following treatment, the TRU waste would be sent to the Waste Isolation Pilot Plant (WIPP) for final storage. It has been proposed that the low-level waste be disposed of in the Tank Farm Facility and/or the Calcined Solids Storage Facility following Resource Conservation and Recovery Act closure. In order to use the seven Bin Sets making up the Calcined Solids Storage Facility as a low-level waste landfill, the facility must first be closed to Resource Conservation and Recovery Act (RCRA) standards. This study identifies and discusses two basic methods available to close the Calcined Solids Storage Facility under the

RCRA - Risk-Based Clean Closure and Closure to Landfill Standards. In addition to the closure methods, the regulatory requirements and issues associated with turning the Calcined Solids Storage Facility into an NRC low-level waste landfill or filling the bin voids with clean grout are discussed.

358
(INEEL/EXT–97-01396-Vol.2)
ICPP calcined solids storage facility closure study. Volume II: Cost estimates, planning schedules, yearly cost flowcharts, and life-cycle cost estimates. Idaho National Engineering Lab., Idaho Falls, ID (United States). Feb 1998. 339p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98002912. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains Volume II of the Closure Study for the Idaho Chemical Processing Plant Calcined Solids Storage Facility. This volume contains draft information on cost estimates, planning schedules, yearly cost flowcharts, and life-cycle costs for the four options described in Volume I: (1) Risk-Based Clean Closure; NRC Class C fill, (2) Risk-Based Clean Closure; Clean fill, (3) Closure to landfill Standards; NRC Class C fill, and (4) Closure to Landfill Standards; Clean fill.

359
(INEEL/EXT–97-01396-Vol.3)
ICPP calcined solids storage facility closure study. Volume III: Engineering design files. Idaho National Engineering Lab., Idaho Falls, ID (United States). Feb 1998. 481p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98002913. Source: OSTI; NTIS; INIS; GPO Dep.

Includes WINCO–1180 and INEL/EXT–97-00117.

The following information was calculated to support cost estimates and radiation exposure calculations for closure activities at the Calcined Solids Storage Facility (CSSF). Within the estimate, volumes were calculated to determine the required amount of grout to be used during closure activities. The remaining calcine on the bin walls, supports, piping, and floor was also calculated to approximate the remaining residual calcine volumes at different stages of the removal process. The estimates for remaining calcine and vault void volume are higher than what would actually be experienced in the field, but are necessary for bounding purposes. The residual calcine in the bins may be higher than was is experienced in the field as it was assumed that the entire bin volume is full of calcine before removal activities commence. The vault void volumes are higher as the vault roof beam volumes were neglected. The estimations that follow should be considered rough order of magnitude, due to the time constraints as dictated by the project's scope of work. Should more accurate numbers be required, a new analysis would be necessary.

360
(INEEL/EXT–97-01399)
Direct cementitious waste option study report. Dafoe, R.E.; Losinski, S.J. Idaho National Engineering Lab., Idaho Falls, ID (United States). Feb 1998. 500p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052242. Source: OSTI; NTIS; INIS; GPO Dep.

A settlement agreement between the Department of Energy (DOE) and the State of Idaho mandates that all high-level radioactive waste (HLW) now stored at the Idaho Chemical Processing Plant (ICPP) will be treated so that it is ready to be moved out of Idaho for disposal by a target data of 2035. This study investigates the direct grouting of all ICPP calcine (including the HLW dry calcine and those resulting from calcining sodium-bearing liquid waste currently residing in the ICPP storage tanks) as the treatment method to comply with the settlement agreement. This method involves grouting the calcined waste and casting the resulting hydroceramic grout into stainless steel canisters. These canisters will be stored at the Idaho National Engineering and Environmental Laboratory (INEEL) until they are sent to a national geologic repository. The operating period for grouting treatment will be from 2013 through 2032, and all the HLW will be treated and in interim storage by the end of 2032.

361
(INEEL/EXT–97-01400)
Cementitious waste option scoping study report. Lee, A.E.; Taylor, D.D. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Feb 1998. [400p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052239. Source: OSTI; NTIS; INIS; GPO Dep.

A Settlement Agreement between the Department of Energy (DOE) and the State of Idaho mandates that all high-level radioactive waste (HLW) now stored at the Idaho Chemical Processing Plant (ICPP) on the Idaho National Engineering and Environmental Laboratory (INEEL) will be treated so that it is ready to be moved out of Idaho for disposal by a target date of 2035. This study investigates the nonseparations Cementitious Waste Option (CWO) as a means to achieve this goal. Under this option all liquid sodium-bearing waste (SBW) and existing HLW calcine would be recalcined with sucrose, grouted, canisterized, and interim stored as a mixed-HLW for eventual preparation and shipment off-Site for disposal. The CWO waste would be transported to a Greater Confinement Disposal Facility (GCDF) located in the southwestern desert of the US on the Nevada Test Site (NTS). All transport preparation, shipment, and disposal facility activities are beyond the scope of this study. CWO waste processing, packaging, and interim storage would occur over a 5-year period between 2013 and 2017. Waste transport and disposal would occur during the same time period.

362
(INEEL/EXT–97-01414)
Evaluation of SAFT America, Inc. electrochemical capacitors. Wright, R.B.; Murphy, T.C. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Dec 1997. 70p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052255. Source: OSTI; NTIS; GPO Dep.

The electrochemical capacitor devices described in this report were deliverables from Lawrence Berkeley National Laboratory (LBNL), Contract No. 4606510 with SAFT America, Inc., as part of LBNL's exploratory research program. Dr. Kimio Kinoshita is the Program Manager at LBNL. The contract was in support of the US Department of Energy's (DOE) exploratory electrochemical energy storage program

which includes development projects for a wide variety of advanced high-energy/high-power energy storage systems for electric and hybrid vehicle programs. The DOE is currently developing various electrochemical capacitors as candidate power assist devices for the Partnership for a New Generation of Vehicles (PNGV) fast-response engine requirements. The LBNL contract with SAFT America, Inc., was intended to evaluate various activated carbon-based electrode formulations and develop an electrical model of the double-layer capacitor. The goal is to design and deliver prototypes meeting the DOE requirement of > 1,000 W/kg, 16 Wh/kg. Deliverables were sent to the INEEL EST laboratory for independent testing and evaluation. The following report describes performance testing on ten devices received September 2, 1996. Due to the initial performance of these early devices, life-cycle testing was not conducted. Additional devices, with improved performance, are expected to be tested. Future results will be reported in a follow-on report.

363

(INEEL/EXT–97-01461)

Fusion safety program annual report fiscal year 1997. Longhurst, G.R. (and others); Anderl, R.A.; Cadwallader, L.C. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jan 1998. 68p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052227. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the major activities of the Fusion Safety Program in FY 1997. The Idaho National Engineering and Environmental Laboratory (INEEL) is the designated lead laboratory, and Lockheed Martin Idaho Technologies Company is the prime contractor for this program. The Fusion Safety Program was initiated in FY 1979 to perform research and develop data needed to ensure safety in fusion facilities. Activities include experiments, analysis, code development and application, and other forms of research. These activities are conducted at the INEEL, different DOE laboratories, and other institutions. The technical areas covered in this report include chemical reactions and activation product release, tritium safety, risk assessment failure rate database development, and safety code development and application to fusion safety issues. Most of this work has been done in support of the International Thermonuclear Experimental Reactor (ITER) project. Work done for ITER this year has focused on developing the needed information for the Non-site Specific Safety Report (NSSR-2).

364

(INEEL/EXT–98-00004)

Demonstration of an optimized TRUEX flowsheet for partitioning of actinides from actual ICPP sodium-bearing waste using centrifugal contactors in a shielded cell facility. Law, J.D.; Brewer, K.N.; Herbst, R.S.; Todd, T.A.; Olson, L.G. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jan 1998. 30p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052248. Source: OSTI; NTIS; INIS; GPO Dep.

The TRUEX process is being evaluated at the Idaho Chemical Processing Plant (ICPP) for the separation of the actinides from acidic radioactive wastes stored at the ICPP. These efforts have culminated in recent demonstrations of the TRUEX process with actual tank waste. The first demonstration was performed in 1996 using 24 stages of 2-cm diameter centrifugal contactors and waste from tank WM-183. Based on the results of this flowsheet demonstration, the flowsheet was optimized and a second flowsheet demonstration was performed. This test also was performed using 2-cm diameter centrifugal contactors and waste from tank WM-183. However, the total number of contactor stages was reduced from 24 to 20. Also, the concentration of HEDPA in the strip solution was reduced from 0.04 M to 0.01 M in order to minimize the amount of phosphate in the HLW fraction, which would be immobilized into a glass waste form. This flowsheet demonstration was performed using centrifugal contactors installed in the shielded hot cell at the ICPP Remote Analytical Laboratory. The flowsheet tested consisted of six extraction stages, four scrub stages, six strip stages, two solvent was stages, and two acid rinse stages. An overall removal efficiency of 99.79% was obtained for the actinides. As a result, the activity of the actinides was reduced from 540 nCi/g in the feed to 0.90 nCi/g in the aqueous raffinate, which is well below the NRC Class A LLW requirement of 10 nCi/g for non-TRU waste. Removal efficiencies of 99.84%, 99.97%, 99.97%, 99.85%, and 99.76% were obtained for ^{241}Am, ^{238}Pu, ^{239}Pu, ^{235}U, and ^{238}U, respectively.

365

(INEEL/EXT–98-00062)

Mapping of contamination at Savannah River Site FBWU by INEEL trolley. Carpenter, M.V.; Gehrke, R.J.; Helmer, R.G.; Josten, N. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jan 1998. [50p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052241. Source: OSTI; NTIS; INIS; GPO Dep.

The Ford Building Waste Unit (FBWU) 643-11G is a Resource Conservation and Recovery Act/Comprehensive Environmental Response Compensation and Liability Act (RCRA/CERCLA) designated site at the Savannah River Site (SRS) in Aiken, South Carolina. Pre-Work Plan Characterization at the FBWU in May 1996 indicated that radiological contamination was present in surface and near surface soils and identified cesium-137, ^{137}Cs, the unit specific contaminant, as being primarily in the top 15 cm of soil. The Idaho National Engineering and Environmental Laboratory (INEEL) sent the dig-face trolley system to SRS where it demonstrated its capability over a 6.1-m (20 ft.) x 9.6-m (30 ft.) area to rapidly map the contamination on-line with its large area plastic scintillation detector. Also, an extended-range (10 keV to 3 MeV) Ge detector was used at selected locations to identify and quantify the ^{137}Cs contamination. The coordinate locations of each measurement acquired in either the scanning or fixed position mode was obtained with a survey system based on radial encoders. Topography measurements were also made during measurements to permit correction of field of view and activity concentrations for changes in the ground to detector distance.

366

(INEEL/EXT–98-00100)

Evaluation and testing of HUMASORB-CS™ for the removal of radionuclides from groundwater. Mann, N.R.; Todd, T.A.; Wood, D.J. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jan 1998. 29p. Sponsored

by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052236. Source: OSTI; NTIS; INIS; GPO Dep.

An independent experiment to demonstrate the combined removal of the radionuclides, ^{85}Sr and ^{137}Cs from groundwater has been conducted with the sorbent, HUMASORB-CS. Arctech, Inc. manufactures this humic acid-based sorbent material. This sorbent material is reported to have potential for remediation of contaminated groundwater present at DOE sites. The purpose of this work was to evaluate the removal efficiency and the capacity of the sorbent. Two ion-exchange columns were assembled at the Idaho Chemical Processing Plant (ICPP) to evaluate the sorbent technology. Initial ^{137}Cs breakthrough in both columns was observed after 22.0 and 30.2 bed volumes, respectively. Strontium-85 removal was slightly more efficient than ^{137}Cs removal. Initial ^{85}Sr breakthrough in both columns was observed after 29.4 and 22.7 bed volumes, respectively. Calcium, which is of concern, is the major constituent within the feed solution. Calcium is attributed to loading interference in addition to other alkaline and alkaline earth metals such as stable Sr, Mg, Na, K, and Ba. Interfering ions fill exchange sites that greatly reduce the sorbents efficiency to sorb targeted ions such as radioactive Cs and Sr. Despite high concentrations of Ca in the feed solution, Ca was not sorbed by HUMASORB-CS. Results indicate HUMASORB-CS does not sorb sodium or potassium. Sodium and potassium concentrations were consistently observed at 100% breakthrough throughout the test.

367

(INEEL/EXT–98-00101)

High level waste facilities – Continuing operation or orderly shutdown. Decker, L.A. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Apr 1998. 41p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98054113. Source: OSTI; NTIS; INIS; GPO Dep.

Two options for Environmental Impact Statement No action alternatives describe operation of the radioactive liquid waste facilities at the Idaho Chemical Processing Plant at the Idaho National Engineering and Environmental Laboratory. The first alternative describes continued operation of all facilities as planned and budgeted through 2020. Institutional control for 100 years would follow shutdown of operational facilities. Alternatively, the facilities would be shut down in an orderly fashion without completing planned activities. The facilities and associated operations are described. Remaining sodium bearing liquid waste will be converted to solid calcine in the New Waste Calcining Facility (NWCF) or will be left in the waste tanks. The calcine solids will be stored in the existing Calcine Solids Storage Facilities (CSSF). Regulatory and cost impacts are discussed.

368

(INEEL/EXT–98-00116)

Idaho Chemical Processing Plant low-activity waste grout stabilization development program FY-97 status report. Herbst, A.K.; Marshall, D.W.; McCray, J.A. Lockheed Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Feb 1998. 29p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052563. Source: OSTI; NTIS; INIS; GPO Dep.

The general purpose of the Grout Development Program is to solidify and stabilize the liquid low-activity wastes (LAW) generated at the Idaho Chemical Processing Plant (ICPP). It is anticipated that LAW will be produced from the following: (1) chemical separation of the tank farm high-activity sodium-bearing waste, (2) retrieval, dissolution, and chemical separation of the aluminum, zirconium, and sodium calcines, (3) facility decontamination processes, and (4) process equipment waste. Grout formulation studies for sodium-bearing LAW, including decontamination and process equipment waste, continued this fiscal year. A second task was to develop a grout formulation to solidify potential process residual heels in the tank farm vessels when the vessels are closed.

369

(INEEL/EXT–98-00157)

Legacy sample disposition project. Volume 2: Final report. Gurley, R.N.; Shifty, K.L. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Feb 1998. 77p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052565. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the legacy sample disposition project at the Idaho Engineering and Environmental Laboratory (INEEL), which assessed Site-wide facilities/areas to locate legacy samples and owner organizations and then characterized and dispositioned these samples. This project resulted from an Idaho Department of Environmental Quality inspection of selected areas of the INEEL in January 1996, which identified some samples at the Test Reactor Area and Idaho Chemical Processing Plant that had not been characterized and dispositioned according to Resource Conservation and Recovery Act (RCRA) requirements. The objective of the project was to manage legacy samples in accordance with all applicable environmental and safety requirements. A systems engineering approach was used throughout the project, which included collecting the legacy sample information and developing a system for amending and retrieving the information. All legacy samples were dispositioned by the end of 1997. Closure of the legacy sample issue was achieved through these actions.

370

(INEEL/EXT–98-00221)

Workshop proceedings: Developing the scientific basis for long-term land management of the Idaho National Engineering and Environmental Laboratory. Sperber, T.D. (Environmental Science and Research Foundation, Inc., Idaho Falls, ID (United States)); Reynolds, T.D. (eds.); Breckenridge, R.P. (ed.). Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Mar 1998. [150p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (ESRF–023; CONF-9709210–Summ.: Workshop on developing the scientific basis for long-term land management of the Idaho National Engineering and Environmental Laboratory, Idaho Falls, ID (United States),

9-10 Sep 1997). Order Number DE98052560. Source: OSTI; NTIS; INIS; GPO Dep.

Responses to a survey on the INEEL Comprehensive Facility and Land Use Plan (US DOE 1996a) indicated the need for additional discussion on environmental resources, disturbance, and land use issues on the Idaho National Engineering and Environmental Laboratory (INEEL). As a result, in September 1997, a workshop evaluated the existing scientific basis and determined future data needs for long-term land management on the INEEL. This INEEL Long-Term Land Management Workshop examined existing data on biotic, abiotic, and heritage resources and how these resources have been impacted by disturbance activities of the INEEL. Information gained from this workshop will help guide land and facility use decisions, identify data gaps, and focus future research efforts. This report summarizes background information on the INEEL and its long-term land use planning efforts, presentations and discussions at the workshop, and the existing data available at the INEEL. In this document, recommendations for future INEEL land use planning, research efforts, and future workshops are presented. The authors emphasize these are not policy statements, but comments and suggestions made by scientists and others participating in the workshop. Several appendices covering land use disturbance, legal drivers, land use assumptions and workshop participant comments, workshop participants and contributors, and the workshop agenda are also included.

371
(INEEL/EXT–98-00284)
National Low-Level Waste Management Program final summary report of key activities and accomplishments for fiscal year 1997. Rittenberg, R.B. Lockheed Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Mar 1998. 22p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98052579. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) has responsibilities under the Low-Level Radioactive Waste Policy Amendments Act of 1985 to assist states and compacts in their siting and licensing efforts for low-level radioactive waste disposal facilities. The National Low-Level Waste Management Program (NLLWMP) is the element of the DOE that performs the key support activities under the Act. The NLLWMP's activities are driven by the needs of the states and compacts as they prepare to manage their low-level waste under the Act. Other work is added during the fiscal year as necessary to accommodate new requests brought on by status changes in states' and compacts' siting and licensing efforts. This report summarizes the activities and accomplishments of the NLLWMP during FY 1997.

372
(INEEL/EXT–98-00301)
Waste generator services implementation plan. Mousseau, J.; Magleby, M.; Litus, M. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Apr 1998. 109p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98056054. Source: OSTI; NTIS; INIS; GPO Dep.

Recurring waste management noncompliance problems have spurred a fundamental site-wide process revision to characterize and disposition wastes at the Idaho National Engineering and Environmental Laboratory. The reengineered method, termed Waste Generator Services, will streamline the waste acceptance process and provide waste generators comprehensive waste management services through a single, accountable organization to manage and disposition wastes in a timely, cost-effective, and compliant manner. This report outlines the strategy for implementing Waste Generator Services across the INEEL. It documents the culmination of efforts worked by the LMITCO Environmental Management Compliance Reengineering project team since October 1997. These efforts have included defining problems associated with the INEEL waste management process; identifying commercial best management practices; completing a review of DOE Complex-wide waste management training requirements; and involving others through an Integrated Process Team approach to provide recommendations on process flow, funding/charging mechanisms, and WGS organization. The report defines the work that will be performed by Waste Generator Services, the organization and resources, the waste acceptance process flow, the funding approach, methods for measuring performance, and the implementation schedule and approach. Field deployment will occur first at the Idaho Chemical Processing Plant in June 1998. Beginning in Fiscal Year 1999, Waste Generator Services will be deployed at the other major INEEL facilities in a phased approach, with implementation completed by March 1999.

373
(INEEL/EXT–98-00303)
Corral Monitoring System assessment results. Filby, E.E.; Haskel, K.J. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Mar 1998. 60p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98054112. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the results of a functional and operational assessment of the Corral Monitoring Systems (CMS), which was designed to detect and document accountable items entering or leaving a monitored site. Its development was motivated by the possibility that multiple sites in the nuclear weapons states of the former Soviet Union might be opened to such monitoring under the provisions of the Strategic Arms Reduction Treaty. The assessment was performed at three levels. One level evaluated how well the planned approach addressed the target application, and which involved tracking sensitive items moving into and around a site being monitored as part of an international treaty or other agreement. The second level examined the overall design and development approach, while the third focused on individual subsystems within the total package. Unfortunately, the system was delivered as disassembled parts and pieces, with very poor documentation. Thus, the assessment was based on fragmentary operating data coupled with an analysis of what documents were provided with the system. The system design seemed to be a reasonable match to the requirements of the target application; however, important questions about site manning and top level administrative control were left unanswered. Four weaknesses in the overall design and development approach were detected: (1) poor configuration

control and management, (2) inadequate adherence to a well defined architectural standard, (3) no apparent provision for improving top level error tolerance, and (4) weaknesses in the object oriented programming approach. The individual subsystems were found to offer few features or capabilities that were new or unique, even at the conceptual level. The CMS might possibly have offered a unique combination of features, but this level of integration was never realized, and it had no unique capabilities that could be readily extracted for use in another system.

374
(INEEL/EXT–98-00339)
ICPP Tank Farm planning through 2012. Palmer, W.B.; Millet, C.B.; Staiger, M.D.; Ward, F.S. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). 1 Apr 1998. [75p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98056057. Source: OSTI; NTIS; INIS; GPO Dep.

Historically, liquid high-level waste (HLW) generated at the Idaho Chemical Processing Plant has been stored in the Tank Farm after which it is calcined with the calcine being stored in stainless steel bins. Following the curtailment of spent nuclear fuel reprocessing in 1992, the HLW treatment methods were re-evaluated to establish a path forward for producing a final waste form from the liquid sodium bearing wastes (SBW) and the HLW calcine. Projections for significant improvements in waste generation, waste blending and evaporation, and calcination were incorporated into the Tank Farm modeling. This optimized modeling shows that all of the SBW can be calcined by the end of 2012 as required by the Idaho Settlement Agreement. This Tank Farm plan discusses the use of each of the eleven HLW tanks and shows that two tanks can be emptied, allowing them to be Resource Conservation and Recovery Act closed by 2006. In addition, it describes the construction of each tank and vault, gives the chemical concentrations of the contents of each tank, based on historical input and some sampling, and discusses the regulatory drivers important to Tank Farm operation. It also discusses new waste generation, the computer model used for the Tank Farm planning, the operating schedule for each tank, and the schedule for when each tank will be empty and closed.

375
(INEEL/EXT–98-00446)
Idaho Nuclear Technology and Engineering Center (INTEC) (formerly ICPP) ash reutilization study. Langenwalter, T.; Pettet, M.; Ochoa, R.; Jensen, S. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). May 1998. [200p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98056082. Source: OSTI; NTIS; INIS; GPO Dep.

Since 1984, the coal-fired plant at the Idaho Nuclear Technology and Engineering Center (INTEC, formerly Idaho Chemical Processing Plant) has been generating fly ash at a rate of approximately 1,000 tons per year. This ash is hydrated and placed in an ash bury pit near the coal-fired plant. The existing ash bury pit will be full in less than 1 year at its present rate of use. A conceptual design to build a new ash bury pit was completed, and the new pit is estimated to cost $1.7 million. This report evaluates ash reutilization alternatives that propose to eliminate this waste stream and save the $1.7 million required to build a new pit. The alternatives include using ash for landfill day cover, concrete admixture, flowable fill, soil stabilization, waste remediation, and carbon recovery technology. Both physical and chemical testing, under the guidance of the American Society for Testing and Materials, have been performed on ash from the existing pit and from different steps within the facility's processes. The test results have been evaluated, compared to commercial ash, and are discussed as they relate to reutilization alternatives. This study recommends that the ash be used in flowable fill concrete for Deactivation and Demolition work at the Idaho National Engineering and Environmental Laboratory.

376
(INEEL/EXT–98-00666)
Parameter selection for Department of Energy spent nuclear fuel to be used in the Yucca Mountain Viability Assessment. Fillmore, D.L. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Jun 1998. 31p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98057353. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the chemical, physical, and radiological parameters that were chosen to represent the Department of Energy spent nuclear fuel in the Yucca Mountain Viability Assessment. It also contains the selected packaging requirements for the various fuel types and the criticality controls that were used. The data is reported for representative fuels in groups of fuels that were selected for the analysis. The justification for the selection of each parameter is given. The data reported was not generated under any Q.A. Program.

377
(INEEL/EXT–98-00702)
Preliminary design report for SCDAP/RELAP5 lower core plate model. Coryell, E.W. (Lockheed Martin Idaho Technologies Co., Idaho Falls, ID (United States). Idaho National Engineering and Environmental Lab.); Griffin, F.P. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Jul 1998. 47p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98058446. Source: OSTI; NTIS; INIS; GPO Dep.

The SCDAP/RELAP5 computer code is a best-estimate analysis tool for performing nuclear reactor severe accident simulations. Under primary sponsorship of the US Nuclear Regulatory Commission (NRC), Idaho National Engineering and Environmental Laboratory (INEEL) is responsible for overall maintenance of this code and for improvements for pressurized water reactor (PWR) applications. Since 1991, Oak Ridge National Laboratory (ORNL) has been improving SCDAP/RELAP5 for boiling water reactor (BWR) applications. The RELAP5 portion of the code performs the thermal-hydraulic calculations for both normal and severe accident conditions. The structures within the reactor vessel and coolant system can be represented with either RELAP5 heat structures or SCDAP/RELAP5 severe accident structures. The RELAP5 heat structures are limited to normal

operating conditions (i.e., no structural oxidation, melting, or relocation), while the SCDAP portion of the code is capable of representing structural degradation and core damage progression that can occur under severe accident conditions. DCDAP/RELAP5 currently assumes that molten material which leaves the core region falls into the lower vessel head without interaction with structural materials. The objective of this design report is to describe the modifications required for SCDAP/RELAP5 to treat the thermal response of the structures in the core plate region as molten material relocates downward from the core, through the core plate region, and into the lower plenum. This has been a joint task between INEEL and ORNL, with INEEL focusing on PWR-specific design, and ORNL focusing upon the BWR-specific aspects. Chapter 2 describes the structures in the core plate region that must be represented by the proposed model. Chapter 3 presents the available information about the damage progression that is anticipated to occur in the core plate region during a severe accident, including typical SCDAP/RELAP5 simulation results. (Abstract truncated)

378
(INEEL/EXT–98-00780)
An evaluation of the cost/benefits of concrete biodecontamination. Gorschboth, F.F.; Hamilton, M.A. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Aug 1998. 42p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98058435. Source: OSTI; NTIS; INIS; GPO Dep.

Two candidate technologies for decontamination of extensive areas of radioactively contaminated concrete, a biological technology and electro-hydraulic scabbling, that had been rated as highly useful in an earlier study were assessed more precisely. These technologies were compared to a base technology, scarification. The evaluation method was an adaptation of the Multi-Attribute Utility Technique (MAUT), a formal quantitative approach for analyzing decisions with regard to multiple objectives. The advantages of the biodecontamination technology were confirmed by this more precise quantitative analysis.

379
(INEL–96/00279)
Where has the public gone and will communications technology bring them back?. Hutterman, L.; Smith, R. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970335–54: Waste Management ‘97, Tucson, AZ (United States), 2-7 Mar 1997). Order Number DE97052129. Source: OSTI; NTIS; INIS; GPO Dep.

This paper addresses the decreasing number of persons interested and participating in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or “Superfund” process. It also looks at communications technology to bring people back into participation in the Superfund process. The material studied and the technologies evaluated involve the Environmental Restoration Program at the Idaho National Engineering and Environmental Laboratory. The conclusions are probably valid for most DOE Superfund activities. Where has the public gone? The public has taken an interest in issues that they perceive have greater impact on their quality of life and that have an adverse impact on the environment, such as the shipment and storage of spent nuclear fuel. Will communications technology bring them back? Technology can do many things: it can reduce cost; it can allow quicker access to and from the public; it can offer more information; and it can increase interest because of its novelty for short periods of time, but it will not, in and of its own, create public involvement.

380
(INEL–96/0280-Rev.2)
Acceptable knowledge document for INEEL stored transuranic waste – Rocky Flats Plant waste. Revision 2. WASTREN, Inc., Westminster, CO (United States). 23 Jan 1998. [300p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE98058388. Source: OSTI; NTIS; INIS; GPO Dep.

This document and supporting documentation provide a consistent, defensible, and auditable record of acceptable knowledge for waste generated at the Rocky Flats Plant which is currently in the accessible storage inventory at the Idaho National Engineering and Environmental Laboratory. The inventory consists of transuranic (TRU) waste generated from 1972 through 1989. Regulations authorize waste generators and treatment, storage, and disposal facilities to use acceptable knowledge in appropriate circumstances to make hazardous waste determinations. Acceptable knowledge includes information relating to plant history, process operations, and waste management, in addition to waste-specific data generated prior to the effective date of the RCRA regulations. This document is organized to provide the reader a comprehensive presentation of the TRU waste inventory ranging from descriptions of the historical plant operations that generated and managed the waste to specific information about the composition of each waste group. Section 2 lists the requirements that dictate and direct TRU waste characterization and authorize the use of the acceptable knowledge approach. In addition to defining the TRU waste inventory, Section 3 summarizes the historical operations, waste management, characterization, and certification activities associated with the inventory. Sections 5.0 through 26.0 describe the waste groups in the inventory including waste generation, waste packaging, and waste characterization. This document includes an expanded discussion for each waste group of potential radionuclide contaminants, in addition to other physical properties and interferences that could potentially impact radioassay systems.

381
(INEL–96/00343)
Results from five years of treatability studies using hydraulic binders to stabilize low-level mixed waste at the INEL. Gering, K.L.; Schwendiman, G.L. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 19p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970335–48: Waste Management ‘97, Tucson, AZ (United States), 2-7 Mar 1997). Order Number DE97052976. Source: OSTI; NTIS; INIS; GPO Dep.

This paper summarizes work involving bench-scale solidification of nonincinerable, land disposal restricted low-level mixed waste. Waste forms included liquids, sludges, and solids; treatment techniques included hydraulic systems (Portland cement with and without additives), proprietary

commercial formulations, and sulphur polymer cement. Solidification was performed to immobilize hazardous heavy metals (including mercury, lead, chromium, and cadmium), and volatile and semivolatile organic compounds. Pretreatment options for mixed wastes are discussed, using a decision tree based on the form of mixed waste and the type of hazardous constituents. Hundreds of small concrete monoliths were formed for a variety of waste types. The experimental parameters used for the hydraulic concrete systems include the ratio of waste to dry binder (Portland cement, proprietary materials, etc.), the total percentage of water in concrete, and the amount of concrete additives. The only parameter that was used for the sulfur polymer-based monoliths is ratio of waste to binder. Optimum concrete formulations or "recipes" for a given type of waste were derived through this study, as based on results from the Toxicity Characteristic Leaching Procedure analyses and a free liquids test. Overall results indicate that high waste loadings in the concrete can be achieved while the monolithic mass maintains excellent resistance to leaching of heavy metals. In our study the waste loadings in the concrete generally fell within the range of 0.5 to 2.0 kg mixed waste per kg dry binder. Likewise, the most favorable amount of water in concrete, which is highly dependent upon the concrete constituents, was determined to be generally within the range of 300 to 330 g/kg (30-33% by weight). The results of this bench-scale study will find applicability at facilities where mixed or hazardous waste solidification is a planned or ongoing activity. 19 refs., 1 fig., 5 tabs.

382

(INEL–96/00351)

Gamma-ray pulse height spectrum analysis on systems with multiple Ge detectors using a spectrum summing. Killian, E.W. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970126–15: 5. nondestructive assay/nondestructive examination waste characterization conference, Salt Lake City, UT (United States), 14-16 Jan 1997). Order Number DE97052138. Source: OSTI; NTIS; INIS; GPO Dep.

A technique has been developed at the Idaho National Engineering Laboratory to sum high resolution gamma-ray pulse spectra from systems with multiple Ge detectors. Lockheed Martin Idaho Technologies Company operates a multi-detector spectrometer configuration at the Stored Waste Examination Pilot Plant facility which is used to characterize the radio nuclide contents in waste drums destined for shipment to Waste Isolation Pilot Plant. This summing technique was developed to increase the sensitivity of the system, reduce the count times required to properly quantify the radionuclides and provide a more consistent methodology for combining data collected from multiple detectors. In spectrometer systems with multiple detectors looking at non homogenous waste forms it is often difficult to combine individual spectrum analysis results from each detector to obtain a meaningful result for the total waste container. This is particularly true when the counting statistics in each individual spectrum are poor. The spectrum summing technique adds the spectra collected by each detector into a single spectrum which has better counting statistics than each individual spectrum. A normal spectral analysis program can then be used to analyze the sum spectrum to obtain radio nuclide values which have smaller errors and do not have to be further manipulated to obtain results for the total waste container.

383

(INEL–96/00357)

Passive active neutron radioassay measurement uncertainty for combustible and glass waste matrices. Blackwood, L.G.; Harker, Y.D.; Meachum, T.R.; Yoon, Woo Y. Lockheed Martin Idaho Technologies Co., Idaho Falls, ID (United States). [1997]. 31p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970126–4: 5. nondestructive assay/nondestructive examination waste characterization conference, Salt Lake City, UT (United States), 14-16 Jan 1997). Order Number DE97051090. Source: OSTI; NTIS; INIS; GPO Dep.

Using a modified statistical sampling and verification approach, total uncertainty of INEL's Passive Active Neutron (PAN) radioassay system was evaluated for combustible and glass content codes. Waste structure and content of 100 randomly selected drums in each the waste categories were computer modeled based on review of real-time radiography video tapes. Specific quantities of Pu were added to the drum models according to an experimental design. These drum models were then submitted to the Monte Carlo Neutron Photon code processing and subsequent calculations to produce simulated PAN system measurements. The reported Pu masses from the simulation runs were compared with the corresponding input masses. Analysis of the measurement errors produced uncertainty estimates. This paper presents results of the uncertainty calculations and compares them to previous reported results obtained for graphite waste.

384

(INEL–96/00358)

Sampling and verification methods for the uncertainty analysis of NDA and NDE waste characterization systems. Blackwood, L.G. Lockheed Martin Idaho Technologies Co., Idaho Falls, ID (United States). [1997]. 20p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970126–3: 5. nondestructive assay/nondestructive examination waste characterization conference, Salt Lake City, UT (United States), 14-16 Jan 1997). Order Number DE97051091. Source: OSTI; NTIS; INIS; GPO Dep.

Use of nondestructive assay (NDA) and evaluation (NDE) systems in critical waste characterization requires a realistic assessment of the uncertainty in the measurements. The stated uncertainty must include potential effects of a variety of complicating external factors on the expected bias and precision. These factors include material heterogeneity (matrix effects), fluctuating background levels, and other variable operating conditions. Uncertainty figures from application of error propagation methods to data from controlled laboratory experiments using standard test materials can grossly underestimate the expected error. This paper reviews the standard error propagation method of uncertainty analysis, discusses some of its limitations, and presents an alternative approach based on sampling and verification. Examples of application of sampling and verification methods to measurement systems at INEL are described.

385
(INEL–96/00366)
SWEPP assay system software: An update. East, L.V. Lockheed Martin Idaho Technologies Co., Idaho Falls, ID (United States). [1997]. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970126–5: 5. nondestructive assay/nondestructive examination waste characterization conference, Salt Lake City, UT (United States), 14-16 Jan 1997). Order Number DE97051089. Source: OSTI; NTIS; INIS; GPO Dep.

The development of a new software package to control data acquisition and perform data analysis for a Passive/Active Neutron Assay system was reported at this conference in 1994. The software has undergone additional development including improvements to the user interface, additional data integrity checks and support for a shift register coincidence analyzer. An overview of this additional work is presented in this report.

386
(INEL/CON–97-00008)
The development of a new edition of the gamma-ray spectrum catalogues designed for presentation in electronic format. Heath, R.L. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 10p. Sponsored by USDOE Office of Energy Research, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970126–14: 5. nondestructive assay/nondestructive examination waste characterization conference, Salt Lake City, UT (United States), 14-16 Jan 1997). Order Number DE97052141. Source: OSTI; NTIS; INIS; GPO Dep.

New editions of the original Gamma-ray Spectrum Catalogues are being prepared for publication in electronic format. The objective of this program is to produce versions of the Catalogues in CD-ROM format and as an Internet resource. Additions to the original content of the Catalogues will include integrated decay scheme drawings, tables of related decay data, and updated text on the techniques of gamma-ray spectrometry. Related decay data from the Evaluated Nuclear Structure Data File (ENSDF) are then added, and all data converted to the Adobe Acrobat (PDF) format for CD-ROM production and availability on the Internet. At a later date the catalogues will be expanded to include spectra representing the response of large-volume Ge detectors, alpha-particle spectra, prompt neutron capture and inelastic scattering gamma-ray spectra, and gross fission product spectra characteristic of fuel cycle waste materials. Characterization of radioactivity in materials is a requirement in many phases of radioactive waste management. Movement, shipping, treatment, all activities which involve handling of mixed waste or TRU categories of waste at all DOE sites will require that measurements and assessment documentation utilize basic nuclear data which are tracable to internationally accepted standard values. This program will involve the identification of data needs unique to the development and application of specialized detector systems for radioactive waste characterization.

387
(INEL/CON–97-00085)
Field screening of soils contaminated with explosives using ion mobility spectrometry. Atkinson, D.A. (Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)); Crockett, A.B.; Jenkins, T.F. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1997]. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970113–5: Field analytical methods for hazardous wastes and toxic chemicals conference, Las Vegas, NV (United States), 29-31 Jan 1997). Order Number DE97052137. Source: OSTI; NTIS; GPO Dep.

This study involved the comparison of IMS screening with EPA's standard method for explosives, Method 8330. The US Army Corps of Engineers provided a large number of soil samples that had been collected from three locations at each of three explosive contaminated installations. The samples had been dried, ground, homogenized and analyzed in duplicate by Method 8330. Duplicate two gram aliquots of these samples were extracted with 10 mL of acetone by shaking for three minutes, allowed to settle, then analyzed by IMS for Method 8330 compounds. Half of the extracts from one location have also been analyzed in duplicate by IMS for TNT. Results from TNT contaminated soils look extremely promising. Correlation between IMS and EPA Method 8330 results was very high ($r = 0.99$). Based on these results, the intention is to further develop and evaluate IMS for simultaneously quantifying multiple analytes. IMS throughput and cost per sample makes it an attractive technique. The ultimate objective is to provide adequate validation data to EPA for inclusion of the method as a screening procedure in SW-846.

388
(INEL/CON–97-00102)
Public participation in a DOE national program: The mixed waste focus area's approach. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970335–49: Waste Management '97, Tucson, AZ (United States), 2-7 Mar 1997). Order Number DE97052936. Source: OSTI; NTIS; INIS; GPO Dep.

The authors describe the Mixed Waste Focus Area's approach to involving interested Tribal and public members in the mixed waste technology development process. Evidence is provided to support the thesis that the Focus Area's systems engineering process, which provides visible and documented requirements and decision criteria, facilitates effective Tribal and public participation. Also described is a status of Tribal and public involvement at three levels of Focus Area activities.

389
(INEL/CON–97-00103)
The proposed combustion standards and DOE thermal treatment systems. McFee, J. (IT Corp. (United States)); Hinman, M.B.; Eaton, D.; NcNeel, K. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1997]. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970335–: Waste Management '97, Tucson, AZ (United States), 2-7 Mar 1997). Order Number DE97053003. Source: OSTI; NTIS; INIS; GPO Dep.

Under the provisions of the Clean Air Act (CAA) concerning emission of hazardous air pollutants (HAPs), the Environmental Protection Agency (EPA) published the proposed Revised Standards for Hazardous Waste Combustors

on April 19, 1996 (EPA, 1996). These standards would apply to the existing Department of Energy (DOE) radioactive and mixed waste incinerators, and may be applied to several developing alternatives to incineration. The DOE has reviewed the basis for these regulations and prepared extensive comments to present concerns about the bases and implications of the standards. DOE is now discussing compliance options with the EPA for regulation of radioactive and mixed waste thermal treatment systems.

390
(INEL/CON–97-00104)
The Mixed Waste Focus Area: Status and accomplishments. Conner, J.E. (Dept. of Energy, Idaho Falls, ID (United States). Idaho Operations Office); Williams, R.E. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1997]. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970335–: Waste Management '97, Tucson, AZ (United States), 2-7 Mar 1997). Order Number DE97053004. Source: OSTI; NTIS; INIS; GPO Dep.

The Mixed Waste Focus Area began operations in February of 1995. Its mission is to provide acceptable technologies that enable implementation of mixed waste treatment systems developed in partnership with end-users, stakeholders, tribal governments, and regulators. The MWFA will develop, demonstrate, and deliver implementable technologies for treatment of mixed waste within the DOE complex. Treatment refers to all post waste-generation activities including sampling and analysis, characterization, storage, processing, packaging, transportation, and disposal. The MWFA's mission arises from the Resources Conservation and Recovery Act (RCRA) as amended by the Federal Facility Compliance Act. Each DOE site facility that generates or stores mixed waste prepared a plan, the Site Treatment Plan, for developing treatment capacities and treating that waste. Agreements for each site were concluded with state regulators, resulting in Consent Orders providing enforceable milestones for achieving treatment of the waste. The paper discusses the implementation of the program, its status, accomplishments and goals for FY1996, and plans for 1997.

391
(INEL/CON–97-00182)
Construction safety: Can management prevent all accidents or are workers responsible for their own actions?. Cotten, G.B.; Jenkins, S.L. Parsons Infrastructure and Technology Group, Inc., Idaho Falls, ID (United States). 1997. 5p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970952–: Decontamination, decommissioning and reutilization of commercial and government facilities, Knoxville, TN (United States), 7-12 Sep 1997). Order Number DE98050308. Source: OSTI; NTIS; INIS; GPO Dep.

The construction industry has struggled for many years with the answer to the question posed in the title: Can Management Prevent All Accidents or Are Workers Responsible for Their Own Actions? In the litigious society that we live, it has become more important to find someone "at fault" for an accident than it is to find out how we can prevent it from ever happening again. Most successful companies subscribe to the theme that "all accidents can be prevented." They institute training and qualification programs, safe performance incentives, and culture-change-driven directorates such as the Voluntary Protection Program (VPP); yet we still see construction accidents that result in lost time, and occasionally death, which is extremely costly in the shortsighted measure of money and, in real terms, impact to the worker's family. Workers need to be properly trained in safety and health protection before they are assigned to a job that may expose them to safety and health hazards. A management committed to improving worker safety and health will bring about significant results in terms of financial savings, improved employee morale, enhanced communities, and increased production. But how can this happen, you say? Reduction in injury and lost workdays are the rewards. A decline in reduction of injuries and lost workdays results in lower workers' compensation premiums and insurance rates. In 1991, United States workplace injuries and illnesses cost public and private sector employers an estimated $62 billion in workers' compensation expenditures.

392
(INEL/CON–97-00184)
Design and operation of the Rover vacuum system. Wagner, E.P. Jr. (LMITCO, Idaho Falls, ID (United States)); Griffith, D.L.; Rivera, J.M. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970952–: Decontamination, decommissioning and reutilization of commercial and government facilities, Knoxville, TN (United States), 7-12 Sep 1997). Order Number DE97053245. Source: OSTI; NTIS; INIS; GPO Dep.

The Rover process for recovering unused uranium from graphite fuels was operated during 1983 and 1984, and then shut down in 1984. The first steps of the process used fluidized alumina beds to burn away the graphite and produce a uranium bearing ash. The ash was then transferred to a different process cell for acid dissolution. At the time of shutdown, a significant, but unmeasureable, quantity of highly enriched uranium was left in the process vessels. Normal decontamination procedures could not be used due to plugged process lines and the exclusion of moderator materials (water or finely divided organic substances) for criticality safety. The presence of highly enriched uranium in poorly defined quantity and configuration led to concerns for criticality safety, nuclear materials accountability, and physical security. A project was established to eliminate these concerns by cleaning and/or removing the process vessels, piping, and cells and sending the recovered Uranium Bearing Material (UBM) to secure storage. A key element of this project was the design of a system for collecting and transporting dry solids to a location where they could be loaded into critically favorable storage cans.

393
(INEL/CON–97-00185)
A graded approach to safety analysis for Rover Processing Facility deactivation. Henrikson, D.J. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 4p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970952–: Decontamination, decommissioning and reutilization of commercial and government facilities, Knoxville, TN (United States), 7-12 Sep

1997). Order Number DE97053242. Source: OSTI; NTIS; INIS; GPO Dep.

The Rover Fuels Processing Facility operated in the early 1980's, recovering uranium from graphite fuels. In 1996 clean-out began of uranium bearing material remaining in the Rover cells where combustion processes had occurred. Success of the Rover Deactivation Project depends on the safe, timely, and cost-effective repackaging and removal of the uranium bearing material. Due to a number of issues which could not be resolved prior to clean-out, and consideration of cost and schedule objectives, a graded approach was taken to projected design and criticality safety analysis. The safety authorization basis was upgraded primarily by a specific Deactivation addendum, instead of being completely rewritten to current format and content standards. In place of having all design activities completed prior to the start of the Deactivation, the project design and accompanying safety documentation evolved as the project progressed. The Unreviewed Safety Question determination process was used to ensure that new project activities were within the safety envelope. This graded approach allowed operational flexibility while maintaining a critically safe work environment.

394

(INEL/CON–97-00260)

High resolution gamma spectroscopy well logging system. Giles, J.R.; Dooley, K.J. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 17p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970424–8: 4. international conference on methods and applications of radioanalytical chemistry, Kona, HI (United States), 6-11 Apr 1997). Order Number DE97052973. Source: OSTI; NTIS; INIS; GPO Dep.

A Gamma Spectroscopy Logging System (GSLS) has been developed to study sub-surface radionuclide contamination. The absolute counting efficiencies of the GSLS detectors were determined using cylindrical reference sources. More complex borehole geometries were modeled using commercially available shielding software and correction factors were developed based on relative gamma-ray fluence rates. Examination of varying porosity and moisture content showed that as porosity increases, and as the formation saturation ratio decreases, relative gamma-ray fluence rates increase linearly for all energies. Correction factors for iron and water cylindrical shields were found to agree well with correction factors determined during previous studies allowing for the development of correction factors for type-304 stainless steel and low-carbon steel casings. Regression analyses of correction factor data produced equations for determining correction factors applicable to spectral gamma-ray well logs acquired under non-standard borehole conditions.

395

(INEL/CON–97-00292)

Gravity gradiometry difference measurement as a tool for monitoring pumping and injection; forward modeling results. Creed, R. (Department of Energy, Idaho Falls, ID (United States)); Edwards, A. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 14p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9703120–: 32. annual symposium on engineering geology and geotechnical engineering, Boise, ID (United States), 26-28 Mar 1997). Order Number DE97053250. Source: OSTI; NTIS; INIS; GPO Dep.

Gravity gradiometry forward models have been developed at the Idaho National Engineering and Environmental laboratory (INEEL) that can characterize gravity gradient changes with the development of a cone of depression or injection mound in water table aquifers. Difference measurements at long time intervals reduce delayed drainage effects and eliminate the need for determining an initial density structure. Qualitative or semi-quantitative analysis of the gradient signal to determine changes in groundwater distribution with injection or pumping may be possible, particularly if the time varying nature of the signal is of interest. Gravity gradiometer instruments (such as the Gravity Gradient Survey System) have progressed to the point where the complete second order gravity gradient tensor can be measured with an instrument noise level of less than 1 Eotvos (0.1 microgals/meter). Modeling indicates direct gravity measurements for the injection mound perched aquifier case could produce similar signal to noise ratios. However gravity gradients provide 5 independent measurements and due to the common mode nature of the instruments are less susceptible to other effects (tide, latitude, elevation, etc.). The gradients also provide a sharper image of the edge of the anomaly. The systematic identification and removal of specific retention, rainfall and subsidence or uplift effects may be required to make gradiometry difference imaging practical for field use.

396

(INEL/CON–97-00331)

Clean-up criteria for remediation of contaminated soils. Nguyen, H.D. (Lockheed Martin Idaho Technologies Co., Idaho Falls, ID (United States). Idaho National Engineering and Environmental Lab.); Wilson, J.R.; Sato, Chikashi. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 14p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9704167–: 1997 conference on hazardous wastes and materials, Pocatello, ID (United States), 8-9 Apr 1997). Order Number DE97053006. Source: OSTI; NTIS; INIS; GPO Dep.

"How clean is clean?" is a question commonly raised in the remediation of contaminated soils. To help with the answer, criteria are proposed to serve as guidelines for remedial actions and to define a clean-up level such that the remaining contaminant residuals in the soil will not violate the Drinking Water Standards (DWS). The equations for computing those criteria are developed from the principle of conservation of mass and are functions of the maximum concentration level in the water (MCL) and the sorption coefficient. A multiplier, ranging from 10 to 1000, is also factored into the soil standard equation to reflect the effectiveness of various remediation techniques. Maximum allowable concentration in the soil (MSCL) is presented for several contaminants which are being regulated at the present time. Future modifications are recommended for better estimates of the MSCLs as additional transport mechanisms are incorporated to account for other potentially dominant effects.

397

(INEL/CON–97-00334)

Optimization of hydraulic cement admixture waste forms for sodium-bearing, high aluminum, and high zirconium wastes. Herbst, A.K. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 9p. Sponsored

by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970537–: 18. annual DOE low-level radioactive waste management conference, Salt Lake City, UT (United States), 20-22 May 1997). Order Number DE97053243. Source: OSTI; NTIS; INIS; GPO Dep.

A three-way blend of portland cement, blast furnace slag, and fly ash was successfully tested on simulated acidic high sodium, aluminum, and zirconium low-level wastes (LLW). Grout cubes were prepared at various waste loadings to maximize loading while meeting compressive strength and leach resistance requirements. For sodium LLW, a 21% waste loading achieves a volume reduction of 3.3 and a compressive strength of 2750 pounds per square inch while meeting leach, mix, and flow requirements. It was found that the sulfur in the slag reduces the chromium leach rate below regulatory limits. For aluminum LLW, a 10% waste loading achieves a volume reduction of 8.5 and a compressive strength of 4.50 pounds per square inch while meeting leach requirements. Likewise for zirconium LLW, a 21% waste loading achieves a volume reduction of 8.3 and a compressive strength of 3570 pounds per square inch.

398

(INEL/CON–97-00455)

The VirtualwindoW for nuclear applications. Anderson, M.O.; McKay, M.D.; Willis, W.D. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970464–: 7. American Nuclear Society topical meeting on robotics and remote systems, Augusta, GA (United States), 27 Apr - 1 May 1997). Order Number DE97053248. Source: OSTI; NTIS; INIS; GPO Dep.

Throughout the Department of Energy (DOE) complex there are numerous facilities which were constructed to research and develop nuclear materials during the cold war era. As a result, there are now many facilities such as reactors which require dismantlement and clean up. Technological advances over the past 10 years have significantly increased the state of computers, electronics and automated machinery. Because of this rapid growth, the technology of robotics has played a key role in clean up and remote operations. While robotic systems which perform hazardous tasks are being advanced, the human interface has not. Only within the past few years has the human/machine interface been addressed. A growing concern with the rapid advances in technology is that the robotic systems will become so complex that operators will be overwhelmed by the complexity and number of controls. Thus there is an on going effort within the remote and teleoperated robotic field to develop better man-machine interfaces. The Department of Energy's Idaho National Engineering Laboratory (INEL) has been researching methods to simplify this interface including telepresence techniques which are applicable to nuclear environments. Initial telepresence research conducted at the INEL developed a concept called the VirtualwindoW. This system minimizes the complexity of remote stereo viewing controls and provides the operator the 'feel' of viewing the environment in a natural setting. The VirtualwindoW has shown that the man-machine interface can be simplified while increasing operator performance. This paper deals with the continuing research and development of the VirtualwindoW system to provide a standard camera interface. An application of the VirtualwindoW in the dismantlement of the Chicago Pile-Five (CP-5) reactor at Argonne National Laboratory-East is discussed.

399

(INEL/CON–97-00507)

Thermal denitration and mineralization of waste constituents. Nenni, J.A.; Boardman, R.D. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 14p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970537–: 18. annual DOE low-level radioactive waste management conference, Salt Lake City, UT (United States), 20-22 May 1997). Order Number DE97053244. Source: OSTI; NTIS; INIS; GPO Dep.

In order to produce a quality grout from LLW using hydraulic cements, proper conditioning of the waste is essential for complete cement curing. Several technologies were investigated as options for conditions. Since the LLW is dilute, removal of all, or most, of the water will significantly reduce the final waste volume. Neutralization of the LLW is also desirable since acidic liquids to not allow cement to cure properly. The nitrate compounds are very soluble and easily leached from solid waste forms; therefore, denitration is desirable. Thermal and chemical denitration technologies have the advantages of water removal, neutralization, and denitration. The inclusion of additives during thermal treatment were investigated as a method of forming insoluable waste conditions.

400

(INEL/CON–97-00533)

Systems engineering identification and control of mixed waste technology development. Beitel, G.A. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1997]. 19p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970857–: 4. biennial ASME mixed waste symposium, Baltimore, MD (United States), 17-21 Aug 1997). Order Number DE97053252. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) established the Mixed Waste Characterization, Treatment, and Disposal Focus Area (MWFA) to develop technologies required to meet the Department's commitments for treatment of mixed low-level and transuranic wastes. Waste treatment includes all necessary steps from generation through disposal. Systems engineering was employed to reduce programmatic risk, that is, risk of failure to meet technical commitments within cost and schedule. Customer needs (technology deficiencies) are identified from Site Treatment Plans, Consent Orders, ten year plans, Site Technical Coordinating Groups, Stakeholders, and Site Visits. The Technical Baseline, a prioritized list of technology deficiencies, forms the basis for determining which technology development activities will be supported by the MWFA. Technology Development Requirements Documents are prepared for each technology selected for development. After technologies have been successfully developed and demonstrated, they are documented in a Technology Performance Report. The Technology Performance Reports are available to any of the customers or potential users of the technology, thus closing the loop between problem identification and product development. This systematic approach to technology development and its effectiveness after 3 years is discussed in this paper.

401
(INEL/CON–97-00644)
To retrieve or not to retrieve: These are the issues. Hyde, R.A.; Dahlmeir, M.M.; Nickelson, D.F.; Swanson, S.P. Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Oct 1997. 20p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-970857–: 4. biennial ASME mixed waste symposium, Baltimore, MD (United States), 17-21 Aug 1997). Order Number DE98050469. Source: OSTI; NTIS; INIS; GPO Dep.

There are many factors that must be evaluated when determining whether a buried mixed waste site should be retrieved and subsequently stored, treated, and/or disposed of or if some other action is more appropriate. The criteria developed for the evaluation of remedial actions at mixed waste sites under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulation EPA, provide an excellent methodology for deciding upon a preferred action even if the site is not under CERCLA regulation. Each topic for evaluation in the criteria is not mutually exclusive, and many tradeoffs must be reviewed. The criteria have been broken down into a number of categories: overall protection of human health and the environment; compliance with Applicable or Relevant and Appropriate Requirements (ARARs); long-term effectiveness and permanence; reduction of toxicity, mobility, and volume; short-term effectiveness; implementability; cost; state acceptance; and community acceptance. Once the data is gathered, a Hazards Analysis must be performed to understand the risks of the site to workers, the public, and the environment. The Hazard Analysis is critical in helping personnel understand the associated issues so that an effective evaluation can take place. The intent of this paper is not to focus on a particular site, but to provide information that is useful for many problem holders to better understand the issues associated with buried mixed waste retrieval. Ultimately, these issues affect the final decision of whether or not retrieval is a feasible alternative.

402
(INEL/CON–97-00705)
Actinide partitioning from actual Idaho chemical processing plant acidic tank waste using centrifugal contactors. Law, J.D.; Brewer, K.N.; Todd, T.A. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-971004–: GLOBAL '97: international conference on future nuclear systems, Yokohama (Japan), 5-10 Oct 1997). Order Number DE98050471. Source: OSTI; NTIS; INIS; GPO Dep.

The TRUEX process is being evaluated at the Idaho Chemical Processing Plant (ICPP) for the separation of the actinides from acidic radioactive wastes stored at the ICPP. These efforts have culminated in a recent demonstration of the TRUEX process with actual tank waste. This demonstration was performed using 24 stages of 2-cm diameter centrifugal contactors installed in a shielded hot cell at the ICPP Remote Analytical Laboratory. An overall removal efficiency of 99.97% was obtained for the actinides. As a result, the activity of the actinides was reduced from 457 nCi/g in the feed to 0.12 nCi/g in the aqueous raffinate, which is well below the U.S. NRC Class A LLW requirement of 10 nCi/g for non-TRU waste. Iron was partially extracted by the TRUEX solvent, resulting in 23% of the Fe exiting in the strip product. Mercury was also extracted by the TRUEX solvent (76%) and stripped from the solvent in the 0.25 M Na_2CO_3 wash section.

403
(INEL/CON–97-00706)
Demonstration of the SREX process for the removal of ^{90}Sr from actual highly radioactive solutions in centrifugal contactors. Law, J.D.; Wood, D.J.; Todd, T.A.; Olson, L.G. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-971004–: GLOBAL '97: international conference on future nuclear systems, Yokohama (Japan), 5-10 Oct 1997). Order Number DE98050470. Source: OSTI; NTIS; INIS; GPO Dep.

The SREX process is being evaluated at the Idaho Chemical Processing Plant (ICPP) for the separation of ^{90}Sr from acidic radioactive wastes stored at the ICPP. These efforts have culminated in a recent demonstration of the SREX process with actual tank waste. This demonstration was performed using 24 stages of 2-cm diameter centrifugal contactors installed in a shielded hot cell at the ICPP Remote Analytical Laboratory. An overall removal efficiency of 99.995% was obtained for ^{90}Sr. As a result, the activity of ^{90}Sr was reduced from 201 Ci/m^3 in the feed solution of 0.0089 Ci/m^3 in the aqueous raffinate, which is below the U.S. NRC Class A LLW limit of 0.04 Ci/m^3 for ^{90}Sr. Lead was extracted by the SREX solvent and successfully partitioned from the ^{90}Sr using an ammonium citrate strip solution. Additionally, 94% of the total alpha activity, 1.9% of the ^{241}Am, 99.94% of the ^{238}Pu, 99.97% of the ^{239}Pu, 36.4% of the K, 64% of the Ba, and $>$83% of the Zr were extracted by the SREX solvent. Cs, B, Cd, Ca, Cr, Fe, Mn, Ni, and Na were essentially inextractable. 10 refs., 2 figs., 3 tabs.

404
(INEL/CON–97-00707)
Tribal and stakeholder involvement in systems analysis. McClure, L. (Lockheed Martin Idaho Technologies Company, Idaho Falls, ID (United States)); Swartz, G.; Cooley, C. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-971004–: GLOBAL '97: international conference on future nuclear systems, Yokohama (Japan), 5-10 Oct 1997). Order Number DE98050310. Source: OSTI; NTIS; INIS; GPO Dep.

Beginning in early 1995, U.S. Department of Energy began an experiment to link tribal and stakeholder representatives into technology assessment activities related to an Integrated Nonthermal Treatment System (INTS) study. The INTS study moved outside the framework of after-the-fact public involvement by providing the opportunity for technical and non-technical stakeholders alike to work together in the early predecision stages of the criteria development and assessment of options for innovative mixed waste treatment. The stakeholders gained an appreciation of the intense level of effort required to complete such an analysis. The engineers and scientists conducting the systems analyses had the opportunity (some for the first time) to learn more about tribal and stakeholder issues and how they might apply to

the technical tasks related to technology assessment and selection.

405
(INEL/CON–97-00711)
System for decision analysis support on complex waste management issues. Shropshire, D.E. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1997. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-971040–: ICEM '97: 6. international conference on radioactive waste management and environmental remediation, Singapore (Singapore), 12-16 Oct 1997). Order Number DE98050311. Source: OSTI; NTIS; INIS; GPO Dep.

A software system called the Waste Flow Analysis has been developed and applied to complex environmental management processes for the United States Department of Energy (US DOE). The system can evaluate proposed methods of waste retrieval, treatment, storage, transportation, and disposal. Analysts can evaluate various scenarios to see the impacts to waste slows and schedules, costs, and health and safety risks. Decision analysis capabilities have been integrated into the system to help identify preferred alternatives based on a specific objectives may be to maximize the waste moved to final disposition during a given time period, minimize health risks, minimize costs, or combinations of objectives. The decision analysis capabilities can support evaluation of large and complex problems rapidly, and under conditions of variable uncertainty. The system is being used to evaluate environmental management strategies to safely disposition wastes in the next ten years and reduce the environmental legacy resulting from nuclear material production over the past forty years.

406
(INEL/CON–97-01062)
Integration of project management and systems engineering: Tools for a total-cycle environmental management system. Blacker, P.B.; Winston, R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1997]. 4p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9709185–: Project Management Institute '97, Chicago, IL (United States), 29 Sep 1997). Order Number DE98050367. Source: OSTI; NTIS; INIS; GPO Dep.

An expedited environmental management process has been developed at the Idaho National Engineering and Environmental Laboratory (INEEL). This process is one result of the Lockheed Martin commitment to the US Department of Energy to incorporate proven systems engineering practices with project management and program controls practices at the INEEL. Lockheed Martin uses a graded approach of its management, operations, and systems activities to tailor the level of control to the needs of the individual projects. The Lockheed Martin definition of systems engineering is: "Systems Engineering is a proven discipline that defines and manages program requirements, controls risk, ensures program efficiency, supports informed decision making, and verifies that products and services meet customer needs." This paper discusses: the need for an expedited environmental management process; how the system was developed; what the system is; what the system does; and an overview of key components of the process.

407
(IS–5128)
Performance testing of multi-metal continuous emissions monitors. Haas, W.J. (Ames Lab., IA (United States)); French, N.B.; Brown, C.H.; Burns, D.B.; Lemieux, P.M.; Ryan, J.V.; Priebe, S.J.; Waterland, L.R. Ames Lab., IA (United States). 17 Nov 1997. [70p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);Environmental Protection Agency, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE98004610. Source: OSTI; NTIS; GPO Dep.

Three prototype multi-metals continuous emissions monitors (CEMs) were tested in April 1996 at the Rotary Kiln Incinerator Simulator facility at the US Environmental Protection Agency (EPA) National Risk Management Research Laboratory, Research Triangle Park, North Carolina. The CEM instruments were: Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES); Laser Induced Breakdown Spectrometry-Atomic Emission Spectroscopy (LIBS); and Laser Spark Spectrometry, another LIBS instrument. The three CEMs were tested simultaneously during test periods in which low, medium, and high concentration levels of seven toxic metals – antimony, arsenic, beryllium, cadmium, chromium, lead, and mercury – were maintained under carefully controlled conditions. Two methods were used to introduce the test metals into the flue gas: (1) solution atomization, introducing metal-containing aerosol directly into the secondary combustion burner, and (2) injection of fly ash particulates. The testing addressed four measures of CEM performance: relative accuracy (RA), calibration drift, zero drift, and response time. These were accomplished by comparing the toxic metal analyte concentrations reported by the CEMs to the concentrations measured using the EPA reference method (RM) for the same analytes. Overall, the test results showed the prototype nature of the test CEMs and the clear need for further development. None of the CEMs tested consistently achieved RA values of 20% or less as required by the EPA draft performance specification. Instrument size reduction and automation will also likely need additional attention before multi-metal CEMs systems become commercially available for service as envisioned by regulators and citizens.

408
(IS–5128-App.-Vol.1)
Performance testing of multi-metal continuous emissions monitors. Appendix Volume 1. Haas, W.J. Jr. (Ames Lab., IA (United States)); French, N.B.; Brown, C.H.; Burns, D.B.; Lemieux, P.M.; Ryan, J.V.; Priebe, S.J. Ames Lab., IA (United States). 17 Nov 1997. [100p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);Environmental Protection Agency, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE98004611. Source: OSTI; NTIS; GPO Dep.

This report contains appendices to the study of three prototype multi-metal continuous emission monitors (CEMs). The appendices are: Final report of the Diagnostic Instrumentation and Analytical Laboratory (DIAL) CEM developer team; Final report of Navy/Thermo Jarrell Ash Corp. CEM developer team; Final report of Sandia National Laboratories CEM developer team; Developer team comments; and

Performance specification 10 – Specifications and test procedures for multi-metals continuous monitoring systems in stationary sources.

409
(IS–5128-App.-Vol.2)
Performance testing of multi-metal continuous emissions monitors. Appendix Volume 2. Haas, W.J. Jr. (Ames Lab., IA (United States)); French, N.B.; Brown, C.H.; Burns, D.B.; Lemieux, P.M.; Ryan, J.V.; Priebe, S.J. Ames Lab., IA (United States). 17 Nov 1997. [250p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);Environmental Protection Agency, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE98004612. Source: OSTI; NTIS; GPO Dep.

This report contains appendices to the study of three prototype multi-metals continuous emission monitors (CEMs). The appendices are: Diagnostic Instrumentation and Analytical Laboratory daily logbook pages and CEM data; Navy/Thermo Jarrell Ash Corp. daily logbook pages and CEM data; Sandia National Laboratories daily logbook pages and CEM data; Measurement data from Insitec particle counter, sizers, velocimeter.

410
(JIEE–97008398)
DOE-EM privatization and the 2006 Plan: Principles for procurement policies and risk management. Bjornstad, D.J.; Jones, D.W.; Duemmer, C.L. Joint Inst. for Energy and Environment, Knoxville, TN (United States). [1997]. 22p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE97008398. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy's Office of Environmental Remediation and Waste Management (EM) has recently set in place programs to restructure the strategic planning mechanism that will drive its clean-up schedule, The 2006 Plan, and to create a new set of business relationships with private contractors that will reduce costs–privatization. Taken together, the 2006 Plan and privatization will challenge EM to create new business practices to recast its risk management policies to support these initiatives while ensuring that its responsibilities toward the environment, human health, and worker safety (ES and H) are maintained. This paper argues that the 2006 Plan has transformed EM's traditional, bottoms-up approach based on technical dictates to a top-down approach based on management goals–a transformation from an engineering problem to an economic problem. The 2006 Plan evolved from EM's Ten-Year Plan, and seeks to convert the largely open-ended planning approach previously undertaken by EM to a plan bounded by time and dollars. The plan emphasizes making tradeoffs and choosing activities that deliver the most clean-up for the dollar. It also recognizes that each major player–stakeholders, DOE, OMB and Congress–has distinct interests that must be resolved if the process is to succeed. This, in turn, has created the need for a corresponding transformation in risk management practices from compliance-driven to benefit/cost-driven.

411
(K/WM–177)
Review of organic nitrile incineration at the Toxic Substances Control Act Incinerator. Lockheed Martin Energy Systems, Inc., Toxic Substances Control Act/Health Issues Team, Oak Ridge, TN (United States). Oct 1997. 30p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98003664. Source: OSTI; NTIS; INIS; GPO Dep.

Lockheed Martin Energy Systems, Inc. (LMES) operates the East Tennessee Technology Park (ETTP), formerly called the Oak Ridge K-25 Site, where uranium was enriched under contract with the US Department of Energy (DOE). Currently, ETTP missions include environmental management, waste management (WM), and the development of new technologies. As part of its WM mission, ETTP operates the TSCA (Toxic Substances Control Act) Incinerator (TSCAI) for treatment of hazardous waste and polychlorinated biphenyls (PCBs) contaminated with low-level radioactivity. Beginning in the autumn of 1995, employees from diverse ETTP buildings and departments reported experiencing headaches, fatigue, depression, muscle aches, sleeplessness, and muscle tremors. These symptoms were judged by a physician in the ETTP Health Services Department to be consistent with chronic exposures to hydrogen cyanide (HCN). The National Institute for Occupational Safety and Health (NIOSH) was called in to perform a health hazard evaluation to ascertain whether the employees' illnesses were in fact caused by occupational exposure to HCN. The NIOSH evaluation found no patterns for employees' reported symptoms with respect to work location or department. NIOSH also conducted a comprehensive air sampling study, which did not detect airborne cyanides at the ETTP. Employees, however, expressed concerns that the burning of nitrile-bearing wastes at the TSCAI might have produced HCN as a combustion product. Therefore, LMES and DOE established a multidisciplinary team (TSCAI Technical Review Team) to make a more detailed review of the possibility that combustion of nitrile-bearing wastes at the TSCAI might have either released nitriles or created HCN as a product of incomplete combustion (PIC).

412
(KY/EM–206)
Paducah site annual environmental for 1996. Belcher, G. (ed.). Paducah Gaseous Diffusion Plant, KY (United States). Dec 1997. 166p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98004010. Source: OSTI; NTIS; INIS; GPO Dep.

The Paducah Gaseous Diffusion Plant, located in McCracken County, Kentucky, has been producing enriched uranium since 1952. In July 1993, the US Department of Energy (DOE) leased the production areas of the site to the United States Enrichment Corporation (USEC). A subsidiary of Lockheed Martin Corporation, Lockheed Martin Utility Services, manages the leased facilities for USEC. The DOE maintains responsibility for the environmental restoration, waste management, and depleted uranium hexafluoride cylinder program activities at the plant through its management contractor, Lockheed Martin Energy Systems. The purpose of this document is to summarize calendar year 1996 environmental monitoring activities for DOE activities at the Paducah Site. The DOE requires all of its facilities to conduct and document such activities annually. This report does not include USEC environmental activities.

413
(LA–13329)
Measurement of surface emission flux rates for volatile organic compounds at Technical Area 54. Trujillo, V. (Los Alamos National Lab., NM (United States)); Morgenstern, M.; Krier, D.; Gilkeson, R. Los Alamos National Lab., NM (United States). Jun 1998. 84p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE98007277. Source: OSTI; NTIS; INIS; GPO Dep.

The survey described in this report was conducted to estimate the mass of volatile organic compounds venting to the atmosphere from active and inactive waste disposal sites at Technical Area 54. A large number of nonintrusive passive sample collection devices were placed on the ground surface for 72 hours to characterize an area of approximately 150 acres. Results provided an indication of the boundary location of the known volatile organic plume, plume constituents, and isolated high concentration areas. The data from this survey enhanced existing data from a limited number of monitor wells currently used for plume surveillance. Results indicate that the estimated mass emission to the atmosphere is orders of magnitude lower than what is considered a small flux rate at a spill site or a Resource Conservation and Recovery Act landfill and is far below the threshold limit established by the State of New Mexico as an air quality concern.

414
(LA–13350)
Old-field plant succession on the Pajarito Plateau. Foxx, T. (Los Alamos National Lab., NM (United States)); Mullen, M.; Salisbury, M.; Tierney, G. Los Alamos National Lab., NM (United States). Oct 1997. 109p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE98001722. Source: OSTI; NTIS; INIS; GPO Dep.

Eight fallow historic fields of the ponderosa pine and pinon-juniper cover types were surveyed to determine species composition and distribution. The purpose of the study was to understand plant succession on old fields as related to mechanically manipulated sites such as material disposal areas (MDAs). Additionally, the authors wanted a listing of species on disturbed lands of the Pajarito Plateau to aide in the reclamation planning of MDAs using native species. They also wanted to determine if any species could be used as an indicator of disturbance. The eight historic fields were all within Los Alamos County, New Mexico, and had been abandoned in 1943. Two sites were within the boundaries of Los Alamos National Laboratory and were studied both in 1982 and 1993. The study provides a description of each of the field sites, historic information about the homesteads from patent applications, a photographic record of some of the sites, and a listing of species found within each field. The study showed that there were 78 different plant species found on disturbed sites. Of these 78 species, 23 were found to be dominant on one or more of the MDAs or old fields. Although, the disturbance history of each site is imperfectly known, the study does provide an indication of successional processes within disturbed sites of the Pajarito Plateau. Additionally, it provides a listing of species that will invade disturbed sites, species that may be used in site reclamation.

415
(LA–13372-MS)
An analysis of background noise in selected canyons of Los Alamos County. Huchton, K.; Koch, S.W.; Robinson, R. Los Alamos National Lab., NM (United States). Oct 1997. 26p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE98000768. Source: OSTI; NTIS; GPO Dep.

The authors recorded background noise levels in six canyons within Los Alamos County in order to establish a baseline for future comparisons and to discover what noises animals are exposed to. Noise level measurements were taken within each canyon, beginning at an established starting point and at one-mile intervals up to four miles. The primary source of noise above 55 dBA was vehicular traffic. One clap of thunder provided the highest recorded noise level (76 dBA). In general, the level of noise, once away from highways and parking lots, was well below 60 dBA.

416
(LA–13374)
Correction to the MCNP™ perturbation feature for cross-section dependent tallies. Densmore, J.D.; McKinney, G.W.; Hendricks, J.S. Los Alamos National Lab., NM (United States). Oct 1997. 39p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE98001724. Source: OSTI; NTIS; INIS; GPO Dep.

The differential operator perturbation technique is a new feature of the Monte Carlo N-Particle Transport Code MCNP version 4B that will allow users to calculate the effects of cross-section data perturbations on tallies. The implementation of the differential operator perturbation technique in MCNP assumes that the tally is independent of any perturbed cross-section data, an assumption that may not be valid for some tallies. The authors provide derivations of both the first- and second-order corrected perturbations. In addition, the appropriate perturbation corrections are demonstrated so users may accurately calculate perturbation effects for any cross-section dependent tally. Finally, corrected perturbations from six example problems are compared to actual MCNP results.

417
(LA–13380-MS)
A Standard Analysis Method (SAM) for the automated analysis of polychlorinated biphenyls (PCBs) in soils using the chemical analysis automation (CAA) paradigm: Validation and performance. Rzeszutko, C. (Los Alamos National Lab., NM (United States)); Johnson, C.R.; Monagle, M.; Klatt, L.N. Los Alamos National Lab., NM (United States). Nov 1997. 15p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE98001727. Source: OSTI; NTIS; GPO Dep.

The Chemical Analysis Automation (CAA) program is developing a standardized modular automation strategy for chemical analysis. In this automation concept, analytical chemistry is performed with modular building blocks that correspond to individual elements of the steps in the analytical process. With a standardized set of behaviors and interactions, these blocks can be assembled in a plug-and-play manner into a complete analysis system. These building blocks, which are referred to as Standard laboratory

Modules (SLM), interface to a host control system that orchestrates the entire analytical process, from sample preparation through data interpretation. The integrated system is called a Standard Analysis Method (SAM). A SAM for the automated determination of polychlorinated biphenyls (PCBs) in soils, assembled in a mobile laboratory, is undergoing extensive testing and validation. The SAM consists of the following SLMs: a four-channel Soxhlet extractor, a high-volume concentration, a column clean-up, a gas chromatography, a PCB data-interpretation module, a robot, and a human-computer interface. The SAM is configured to meet the requirements specified in the US Environmental Protection Agency's (EPA) SW-846 methods 3541/3620A/8082 for the analysis of PCBs in soils. The PCB SAM will be described along with the developmental test plan. Performance data obtained during developmental testing will also be discussed.

418
(LA–13407-MS)
HEPA filter jointer. Hill, D.; Martinez, H.E. Los Alamos National Lab., NM (United States). Feb 1998. 38p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE98004420. Source: OSTI; NTIS; GPO Dep.

A HEPA filter jointer system was created to remove nitrate contaminated wood from the wooden frames of HEPA filters that are stored at the Rocky Flats Plant. A commercial jointer was chosen to remove the nitrated wood. The chips from the wood removal process are in the right form for caustic washing. The jointer was automated for safety and ease of operation. The HEPA filters are prepared for jointing by countersinking the nails with a modified air hammer. The equipment, computer program, and tests are described in this report.

419
(LA–13419-PR)
Laboratory and field studies related to radionuclide migration at the Nevada Test Site. Progress report, October 1, 1996–September 30, 1997. Thompson, J.L. (ed.). Los Alamos National Lab., NM (United States). Feb 1998. 38p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). Order Number DE98002777. Source: OSTI; NTIS; INIS; GPO Dep.

In this report the authors describe the work done at Los Alamos National Laboratory in FY 1997 for the Hydrologic Resources Management Program funded by the Nevada Operations Office of the US Department of Energy. A major part of their work is the study of the movement underground of radioactive material from nuclear tests at the Nevada Test Site. This year water samples from near the nuclear tests BULLION, BILBY, DALHART, CHESHIRE, and TYBO were analyzed for radionuclides. Data from the first four sites were consistent with expectations based on previous measurements; however, the water from TYBO contained unexpected amounts of plutonium. This plutonium was subsequently found to originate from the BENHAM test which was located 1.3 km distant. The low concentration of plutonium was associated with natural groundwater colloids and could be largely removed by filtration. The authors are attempting to identify the physical and chemical form of the plutonium and to assess the mechanism(s) of its movement over the observed distance. They report the successful testing of small diameter pumps in tandem to extract water form tubing too small to accommodate other means of pumping. And finally, they review this year's consultative and educational activities and list their publications.

420
(LA–13475)
Recovery of ^{241}Am/Be neutron sources, Wooster, Ohio. Tompkins, J.A.; Wannigman, D.; Hatler, V. Los Alamos National Lab., NM (United States). Jul 1998. [50p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE98007274. Source: OSTI; NTIS; INIS; GPO Dep.

In August 1997, the Nuclear Regulatory Commission (NRC) submitted to the US Department of Energy (DOE) a partial list of licensed radioactive sealed sources to be recovered under a pilot project initiating Radioactive Source Recovery Program (RSRP) operations. The first of the pilot project recoveries was scheduled for September 1997 at Eastern Well Surveys in Wooster, Ohio, a company with five unwanted sealed sources on the NRC list. The sources were neutron emitters, each containing ^{241}Am/Be with activities ranging from 2.49 to 3.0 Ci. A prior radiological survey had established that one of these sources, a Gulf Nuclear Model 71-1 containing 3 Ci of ^{241}Am, was contaminated with ^{241}Am and might be leaking. The other four sources were obsolete and could no longer be used by Eastern Well Surveys for their intended application in well-logging applications due to NRC decertification of these sources. All of the sources exceeded the limits established for Class C waste under 10 CFR 61.55 and, as a result, are the ultimate responsibility of the DOE under the provisions of PL 99-240. This report describes the cooperative effort between the DOE and NRC to recover the sources and transport them to Los Alamos National Laboratory (LANL) for deactivation under the RSRP. This operation alleviated any potential risk to the public health and safety from the site which might result from the leaking neutron sources or the potential mismanagement of unwanted sources. The on-site recovery occurred on September 23, 1997, and was performed by personnel from LANL and its contractor and was observed by staff from the Region III office of the NRC. All aspects of the recovery were successfully accomplished, and the sources were received at LANL on September 29, 1997. Experience gained during this operation will be used to formulate operational poilicies and procedures which will contribute to the eventual routine recovery operations of a full-scale RSRP.

421
(LA–13480-PR)
Radionuclide concentrations in honey bees from Area G at TA-54 during 1997. Progress report. Haarmann, T.K.; Fresquez, P.R. Los Alamos National Lab., NM (United States). Jul 1998. 31p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE98007278. Source: OSTI; NTIS; INIS; GPO Dep.

Honey bees were collected from two colonies located at Los Alamos National Laboratory's Area G, Technical Area 54, and from one control (background) colony located near Jamez Springs, NM. Samples were analyzed for the following: cesium (^{137}Cs), americium (^{241}Am), plutonium (^{238}Pu and ^{239,240}Pu), tritium (^{3}H), total uranium, and gross gamma

activity. Area G sample results from both colonies were higher than the upper (95%) level background concentration for ^{238}Pu and ^{3}H.

422
(LA-SUB–93-260)
241-SY-101 strain concentration factor development via nonlinear analysis. Volume 1 of 1. Los Alamos National Lab., NM (United States); Advent Engineering Services, Inc., San Ramon, CA (United States). [1997]. 133p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE97003572. Source: OSTI; NTIS; INIS; GPO Dep.

The 241-SY-101 waste storage tank at the Hanford-Site has been known to accumulate and release significant quantities of hydrogen gas. An analysis was performed to assess the tank's structural integrity when subjected to postulated hydrogen deflagration loads. The analysis addressed many nonlinearities and appealed to a strain-based failure criteria. The model used to predict the global response of the tank was not refined enough to confidently predict local peak strains. Strain concentration factors were applied at structural discontinuities that were based on steel-lined reinforced-concrete containment studies. The discontinuities included large penetrations, small penetrations, springline geometries, stud/liner connections, and the $\frac{1}{2}$ inch to 3/8 inch liner thickness transition. The only tank specific strain concentration factor applied in the evaluation was for the $\frac{1}{2}$ inch to 3/8 inch liner thickness change in the dome. Review of the tank drawings reveals the possibility that a 4 inches Sch. 40 pipe penetrates the dome thickness transition region. It is not obvious how to combine the strain concentration factors for a small penetration with that of a thickness transition to arrive at a composite strain concentration factor. It is the goal of this effort to make an approximate determination of the relative significance of the 4 inch penetration and the $\frac{1}{2}$ inch to 3/8 inch thickness transition in the 241-SY-101 dome geometry. This is accomplished by performing a parametric study with three general finite-element models. The first represents the thickness transition only, the second represents a 4 inch penetration only, and the third combines the thickness transition with a penetration model.

423
(LA-SUB–95-87)
Prediction of heat capacities of solid inorganic salts from group contributions. Mostafa, A.T.M.G. (New Mexico State Univ., Las Cruces, NM (United States). Dept. of Chemical Engineering); Eakman, J.M.; Yarbro, S.L. Los Alamos National Lab., NM (United States); New Mexico State Univ., Las Cruces, NM (United States). Dept. of Chemical Engineering. [1997]. 46p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE97002570. Source: OSTI; NTIS; GPO Dep.

A group contribution technique is proposed to predict the coefficients in the heat capacity correlation, $C_p = a + bT + c/T^2 + dT^2$, for solid inorganic salts. The results from this work are compared with fits to experimental data from the literature. It is shown to give good predictions for both simple and complex solid inorganic salts. Literature heat capacities for a large number (664) of solid inorganic salts covering a broad range of cations (129), anions (17) and ligands (2) have been used in regressions to obtain group contributions for the parameters in the heat capacity temperature function. A mean error of 3.18% is found when predicted values are compared with literature values for heat capacity at 298° K. Estimates of the error standard deviation from the regression for each additivity constant are also determined.

424
(LA-SUB–95-165)
Chemical gel barriers as low-cost alternative to containment and in situ cleanup of hazardous wastes to protect groundwater. Los Alamos National Lab., NM (United States). [1997]. 57p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE97002592. Source: OSTI; NTIS; INIS; GPO Dep.

Chemical gel barriers are being considered as a low-cost alternative for containment and in situ cleanup of hazardous wastes to protect groundwater. Most of the available gels in petroleum application are non-reactive and relative impermeable, providing a physical barriers for all fluids and contaminants. However, other potential systems can be envisioned. These systems could include gels that are chemically reactive and impermeable such that most phase are captured by the barriers but the contaminants could diffuse through the barriers. Another system that is chemically reactive and permeable could have potential applications in selectivity capturing contaminants while allowing water to pass through the barriers. This study focused on chemically reactive and permeable gel barriers. The gels used in experiment are DuPont LUDOX SM colloidal silica gel and Pfizer FLOPAAM 1330S hydrolyzed polyacrylamide (HPAM) gel.

425
(LA-SUB–98-37)
Treatability study Number PDC-1-O-T. Final report. Los Alamos National Lab., NM (United States);Perma-Fix Environmental Services, Gainesville, FL (United States). 22 Apr 1998. [50p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE99001032. Source: OSTI; NTIS; INIS; GPO Dep.

Los Alamos National Laboratory provided treatability study samples from four waste streams, designated Stream #1, Stream #3, Stream #6, and Stream #7. Stream #1 consisted of one 55-gallon drum of personal protective equipment (PPE), rags, and neutralizing agent (bicarbonate) generated during the cleanup of a sodium dichromate solution spill. Stream #3 was one 55-gallon drum of paper, rags, lab utensils, tools, and tape from the decontamination of a glovebox. The sample of Stream #6 was packaged in three 30-gallon drums and a 100 ft^3 wooden box. It consisted of plastic sheeting, PPE, and paper generated from the cleanup of mock explosive (barium nitrate) from depleted uranium parts. Stream #7 was scrap metal (copper, stainless and carbon steel joined with silver solder) from the disassembly of gas manifolds. The objective of the treatability study is to determine: (1) whether the Perma-Fix stabilization/solidification process can treat the waste sample to meet Land Disposal Restrictions and the Waste Acceptance Criteria for LANL Technical Area 54, Area G, and (2) optimum loading and resulting weight and volume of finished waste form. The stabilized waste was mixed into grout that had been poured into a lined drum. After each original container of waste was processed, the liner was closed and a new liner was placed in the same drum on top

of the previous closed liner. This allowed an overall reduction in waste volume but kept waste segregated to minimize the amount of rework in case analytical results indicated any batch did not meet treatment standards. Samples of treated waste from each waste stream were analyzed by Perma-Fix Analytical Services to get a preliminary approximation of TCLP metals. Splits of these samples were sent to American Environmental Network's mixed waste analytical lab in Cary, NC for confirmation analysis. (Abstract truncated)

426
(LA-UR–96-3983)
Real-time alpha emitter assay of large volumes. Kerr, P.L.; Koster, J.E.; Macy, K.; Cook, J. Los Alamos National Lab., NM (United States). [1997]. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-970335–7: Waste Management '97, Tucson, AZ (United States), 2-7 Mar 1997). Order Number DE97001674. Source: OSTI; NTIS; INIS; GPO Dep.

In this paper we discuss the design and behavior of a High Airflow Monitor (HAFM) based on Long-Range Alpha Detector (LRAD) technology [1]. The low air resistance construction of the HAFM enables the high airflow crucial for assay of rooms, vaults, or cargo vehicles. This is accomplished by orienting plates parallel to the airflow rather than perpendicular, as are the grids in other LRADS. As will be shown in this paper, the advantages of an LRAD-based volume monitor are its inexpensive simplicity, ruggedness, and its ability to detect contamination that is hidden from traditional alpha detection methods such as Geiger-Muller, gas cell, or solid-state detectors.

427
(LA-UR–96-4071)
Low-level radioactive waste disposal operations at Los Alamos National Laboratory. Stanford, A.R. Los Alamos National Lab., NM (United States). [1997]. 5p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-970335–19: Waste Management '97, Tucson, AZ (United States), 2-7 Mar 1997). Order Number DE97003125. Source: OSTI; NTIS; INIS; GPO Dep.

Los Alamos National Laboratory (LANL) generates Low-Level Radioactive Waste (LLW) from various activities: research and development, sampling and storage of TRU wastes, decommissioning and decontamination of facilities, and from LANL's major role in stockpile stewardship. The Laboratory has its own active LLW disposal facility located at Technical Area 54, Area G. This paper will identify the current operations of the facility and the issues pertaining to operating a disposal facility in today's compliance and cost-effective environment.

428
(LA-UR–96-4434)
Key regulatory drivers affecting shipments of mixed transuranic waste from Los Alamos National Laboratory to the Waste Isolation Pilot Plant. Schumann, P.B. (and others); Bacigalupa, G.A.; Kosiewicz, S.T.; Sinkule, B.J. Los Alamos National Lab., NM (United States). 1997. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-970335–16: Waste Management '97, Tucson, AZ (United States), 2-7 Mar 1997). Order Number DE97003132. Source: OSTI; NTIS; INIS; GPO Dep.

A number of key regulatory drivers affect the nature, scope, and timing of Los Alamos National Laboratory's (LANL's) plans for mixed transuranic (MTRU) waste shipments to the Waste Isolation Pilot Plant (WIPP), which are planned to commence as soon as possible following WIPP's currently anticipated November, 1997 opening date. This paper provides an overview of some of the key drivers at LANL, particularly emphasizing those associated with the hazardous waste component of LANL's MTRU waste (MTRU, like any mixed waste, contains both a radioactive and a hazardous waste component). The key drivers discussed here derive from the federal Resource Conservation and Recovery Act (RCRA) and its amendments, including the Federal Facility Compliance Act (FFCAU), and from the New Mexico Hazardous Waste Act (NMHWA). These statutory provisions are enforced through three major mechanisms: facility RCRA permits; the New Mexico Hazardous Waste Management Regulations, set forth in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1: and compliance orders issued to enforce these requirements. General requirements in all three categories will apply to MTRU waste management and characterization activities at both WIPP and LANL. In addition, LANL is subject to facility-specific requirements in its RCRA hazardous waste facility permit, permit conditions as currently proposed in RCRA Part B permit applications presently being reviewed by the New Mexico Environment Department (NNED), and facility-specific compliance orders related to MTRU waste management. Likewise, permitting and compliance-related requirements specific to WIPP indirectly affect LANL's characterization, packaging, record-keeping, and transportation requirements for MTRU waste. LANL must comply with this evolving set of regulatory requirements to begin shipments of MTRU waste to WIPP in a timely fashion.

429
(LA-UR–96-4722)
Los Alamos National Laboratory's Mobile Real Time Radiography System. Vigil, J.; Taggart, D.; Betts, S.; Mendez, J.; Rael, C.; Martinez, F. Los Alamos National Lab., NM (United States). [1997]. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-970126–1: 5. nondestructive assay/nondestructive examination waste characterization conference, Salt Lake City, UT (United States), 14-16 Jan 1997). Order Number DE97001667. Source: OSTI; NTIS; INIS; GPO Dep.

A 450-KeV Mobile Real Time Radiography (RTR) System was delivered to Los Alamos National Laboratory (LANL) in January 1996. It was purchased to inspect containers of radioactive waste produced at (LANL). Since its delivery it has been used to radiograph greater than 600 drums of radioactive waste at various LANL sites. It has the capability of inspecting waste containers of various sizes. It has three independent X-Ray acquisition formats. The primary system used is a 12 in. image intensifier, the second is a 36 in. linear diode array (LDA) and the last is an open system. It is fully self contained with on board generator, HVAC and a fire suppression system. It is on a 53 ft long X 8 ft. wide X 14 ft. high trailer that can be moved over any highway requiring only a easily obtainable overweight permit because it weighs approximately 38 tons. It was built to conform to

industry standards for a cabinet system which does not require an exclusion zone. The fact that this unit is mobile has allowed us to operate where the waste is stored, rather than having to move the waste to a fixed facility.

430
(LA-UR–96-4723)
Experience operating LANL's passive/active neutron (PAN) assay system. Taggart, D.P.; Betts, S.E.; Martinez, E.F.; Mendez, J.L.; Rael, C.D.; Vigil, J.J. Los Alamos National Lab., NM (United States). [1997]. 13p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-970126–2: 5. nondestructive assay/nondestructive examination waste characterization conference, Salt Lake City, UT (United States), 14-16 Jan 1997). Order Number DE97001668. Source: OSTI; NTIS; INIS; GPO Dep.

We present a summary of our operating experience with LANL's mobile PAN assay system, which was acquired from the Carlsbad Area Office in 1994, refurbished, calibrated, and fielded for the first time on LANL's TRU waste in the winter of 1996. It is functionally identical to other PAN systems throughout the DOE complex and its software is the same as at INEL. Since Jan. 1996, it has passed the first round of the Performance Demonstration Program and has been used to assay several hundred drums of LANL's TRU waste. Difficulties in assaying homogeneous wastes with high (α,n) neutron fluxes and experience in assaying debris waste in both active and passive PAN modes are reported on.

431
(LA-UR–96-4870)
Atmospheric transport in complex terrain at Los Alamos, Area G. Vold, E.L. Los Alamos National Lab., NM (United States). [1997]. 21p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE97004254. Source: OSTI; NTIS; GPO Dep.

This report documents the atmospheric dispersion used in the Area G Performance Assessment for off-site airborne dose calculations. Potential airborne contaminants from the mesa top disposal facility disperse in the complex terrain dominated by narrow mesas in parallel to narrow canyons. The dispersion is characterized by site-specific values of X/Q [$(Ci/m^3)/(Ci/s)$] at each of two designated receptor locations, a 'maximum off-site dose' location and a nearby population center (White Rock, NM). The values of X/Q in each of the sixteen wind sectors are first estimated with the CAP-88 computer code using 1992 annual meteorologic data from Area G and assuming an area source for release. This data captures the dominant wind direction on the mesa tops from the SSW. These dispersion parameters are assumed to apply to open, flat terrain and must be corrected for the complex mesa and canyon terrain terrain surrounding the Area G site. Additional meteorologic data has been collected over two years from six remote temporary meteorological stations operated on the mesas and in the canyons immediately around Area G. These data indicate that the wind flow in the canyons is exclusively bimodel, flowing up canyon during the day and down canyon at night. It is conservatively assumed that all ground level releases from Area G which blow out across an adjacent canyon become entrained in the canyon flow. This effectively combines the contaminant release for several sectors into a single canyon flow which is upstream during the day or downstream at night. This canyon channeling mechanism is implemented in the model by summing the wind sector dispersion factors over those sectors appropriate to the geometry for a release from Area G toward either adjacent canyon.

432
(LA-UR–96-4871)
A model for the effective diffusion of gas or the vapor phase in a fractured media unsaturated zone driven by periodic atmospheric pressure fluctuations. Vold, E.L. Los Alamos National Lab., NM (United States). [1997]. 40p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE97004255. Source: OSTI; NTIS; GPO Dep.

There is evidence for migration of tritiated water vapor through the tuff in the unsaturated zone from the buried disposal shafts located on a narrow mesa top at Area G, Los Alamos, NM. Field data are consistent with an effective in-situ vapor phase diffusion coefficient of 1.5×10^{-3} m^s/s, or a factor of 60 greater than the binary diffusion coefficient for water vapor in air. A model is derived to explain this observation of anomolously large diffusion, which relates an effective vapor or gas phase diffusion coefficient in the fractured porous media to the subsurface propagation of atmospheric pressure fluctuations (barometric pumping). The near surface (unattenuated) diffusion coefficient is independent of mode period under the simplified assumptions of a complete 'mixing mechanism' for the effective diffusion process. The unattenuated effective diffusion driven by this barometric pumping is proportional to an average media permeability times the sum of the square of pressure mode amplitudes, while the attenuation length is proportional to the squarer root of the product of permeability times mode period. There is evidence that the permeability needed to evaluate the pressure attenuation length is the in-situ value, approximately that of the matrix. The diffusion which results using Area G parameter values is negligible in the matrix but becomes large at the effective permeability of the fractured tuff matrix. The effective diffusion coefficient predicted by this model, due to pressure fluctuations and the observed fracture characteristics, is in good agreement with the observed in-situ diffusion coefficient for tritium field measurements. It is concluded that barometric pumping in combination with the enhanced permeability of the fractured media is a likely candidate to account for the observed in-field migration of vapor in the near surface unsaturated zone at Area G.

433
(LA-UR–97-210)
Visualizing data for environmental analysis. Benson, J. Los Alamos National Lab., NM (United States). [1997]. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-970493–1: American Society for Photogrammetry and Remote Sensing/American Congress on Surveying and Mapping (ASPRS/ACSM), Seattle, WA (United States), 10 Apr 1997). Order Number DE97004758. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Restoration Project at Los Alamos National Laboratory (LANL) has over 11,000 sampling locations in a 44 square mile area. The sample analyses contain raw analytical chemistry values for over 2,300 analytes and

compounds used to define and remediate contaminated areas at LANL. The data consist of 2.5 million records in an oracle database. Maps are often used to visualize the data. Problems arise when a client specifies a particular kind of map without fully understanding the limitations of the data or the map. The ability of maps to convey information is dependent on many factors, though all maps are data dependent. The quantity, spatial distribution, and numerical range of the data can limit use with certain kinds of maps. To address these issues and educate the clients, several types of statistical maps (e.g., choropleth, isarithm, and graduated symbol such as bubble and spike) used for environmental analysis were chosen to show the advantages, disadvantages, and data limitations of each. By examining both the complexity of the analytical data and the limitations of the map type, it is possible to consider how reality has been transformed through the map, and if that transformation accurately conveys the information present.

434
(LA-UR–97-1144)
CID-based ICP-AES instrumentation for continuous on-line analysis of aqueous industrial waste streams. Federici, C. (Los Alamos National Lab., NM (United States)); Doorn, S.; Villanueva, D.; Arrington, T. Los Alamos National Lab., NM (United States). 1997. 16p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-970503–36: 17. IEEE particle accelerator conference, Vancouver (Canada), 12-16 May 1997). Order Number DE97007474. Source: OSTI; NTIS; INIS; GPO Dep.

A CID detection based ICP-AES instrument has been incorporated into an on-line continuous process monitoring system for analysis of aqueous industrial waste streams. Total wavelength coverage afforded by the CID detection allows increased confidence in the analytical results through use of multiple wavelengths for analysis of each element. Total wavelength coverage also allows quick detection of interferences present in the varying waste stream that may cause false positives. Several internal standards have been evaluated to correct for expected variations in the waste stream matrix, and results have been incorporated in the analytical method. The system has been tested on a surrogate waste stream and results are compared to those obtained through conventional ICP-AES analysis of waste stream grab samples.

435
(LA-UR–97-1170)
New spectroscopic studies of plutonium (IV) nitrate complex formation in solution. Berg, J.M. (and others); Veirs, D.K.; Vaughn, R.B. Los Alamos National Lab., NM (United States). 1997. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-970424–7: 4. international conference on methods and applications of radioanalytical chemistry, Kona, HI (United States), 6-11 Apr 1997). Order Number DE97007579. Source: OSTI; NTIS; INIS; GPO Dep.

Spectrophotometric titrations of Pu(IV) with HNO_3 were conducted in a series of aqueous $HClO_4$ solutions ranging ionic strength from 2 to 19 mol/kg on the molality scale. The Pu f-f absorption spectra in the visible and near IR range were deconvoluted into spectra of $Pu^{4+}(aq)$, $Pu(NO_3)^{3+}$ and $Pu(NO_3)_2^{2+}$ complexes and their formation constants as functions of ionic strength. When corrected for the incomplete dissociation of nitric acid, these formation constants exhibit smooth increases with ionic strength from 5 to 19 mol/kg.

436
(LA-UR–97-1263)
A new waste minimization method for the determination of total nonhalogenated volatile organic compounds in TRU wastes. Sandoval, W. (and others); Quintana, B.D.; Ortega, L. Los Alamos National Lab., NM (United States). 1997. 13p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-970424–15: 4. international conference on methods and applications of radioanalytical chemistry, Kona, HI (United States), 6-11 Apr 1997). Order Number DE97007186. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the technical support CST-12 provides for a wide variety of defense and nondefense programs within Los Alamos National Laboratory (LANL) and the Department of Energy (DOE) complex, new waste minimization technique is under development for radiological volatile organic analysis (Hot VOA). Currently all HOT VOA must be run in a glovebox. Several types of sample contain TRU radiological waste in the form of particulates. By prefiltering the samples through a 1.2 micron syringe and counting the radioactivity, it has been found that many of the samples can be analyzed outside a glovebox. In the present investigation, the types of Hot VOA samples that can take advantage of this new technique, the volume and types of waste reduced and the experimental parameters will be discussed. Overall, the radioactive waste generated is minimized.

437
(LA-UR–97-1279)
New bifunctional anion-exchange resins for nuclear waste treatment: Part 2. Marsh, S.F. (Los Alamos National Lab., NM (United States)); Jarvinen, G.D.; Barr, M.E.; Bartsch, R.A. Los Alamos National Lab., NM (United States). [1997]. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-970424–6: 4. international conference on methods and applications of radioanalytical chemistry, Kona, HI (United States), 6-11 Apr 1997). Order Number DE97007417. Source: OSTI; NTIS; INIS; GPO Dep.

Additional bifunctional anion-exchange resins have been designed, synthesized and evaluated for their ability to take up Pu(IV) from nitric acid solutions. Bifunctionality is achieved by adding a second anion-exchange site to the pyridine nitrogen (also an anion-exchange site) of the base poly(4-vinylpyridine) resin. Previous work focused on the effect of varying the chemical properties of the added site along with the length of an alkylene spacer between the two sites. Here the authors examine four new 3- and 4-picolyl derivatives which maintain more rigidly defined geometries between the two nitrogen cationic sites. These materials, which have the two anion-exchange sites separated by three and four carbons, respectively, exhibit lower overall Pu(IV) distribution coefficients than the corresponding N-alkylenepyridium derivatives with more flexible spacers. Methylation of the second pyridium site results in a ca. 20% increase in the Pu(IV) distribution coefficients.

438
(LA-UR–97-2003)
Plutonium (IV) complexation by nitrate in acid solutions of ionic strengths from 2 to 19 molal. Berg, J.M. (Los Alamos National Lab., NM (United States). Nuclear Materials Technology Div.); Veirs, D.K.; Vaughn, R.B.; Cisneros, M.A.; Smith, C.A. Los Alamos National Lab., NM (United States). [1997]. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9706138–2: Workshop on long-lived radionuclide chemistry in nuclear waste treatment, Avignon (France), 18-20 Jun 1997). Order Number DE97008755. Source: OSTI; NTIS; INIS; GPO Dep.

Titrations of Pu(IV) with HNO_3 in a series of aqueous $HClO_4$ solutions ranging in ionic strength from 2 to 19 molal were followed using absorption spectrophotometry. The Pu 5f-5f spectra in the visible and near IR range change with complex formation. At each ionic strength, a series of spectra were obtained by varying nitrate concentration. Each series was deconvoluted into spectra f $Pu^{4+}(aq)$, $Pu(NO_3)^{3+}$ and $Pu(NO_3)_2^{2+}$ complexes, and simultaneously their formation constants were determined. When corrected for the incomplete dissociation of nitric acid, the ionic strength dependence of each formation constant can be described by two parameters, β^0 and $\Delta\varepsilon$ using the formulae of specific ion interaction theory. The difficulties with extending this analysis to higher nitrate coordination numbers are discussed.

439
(LA-UR–97-2414)
Speciation and surface interactions of actinides on aged ion-exchange resins. Morris, D.E. (and others); Buscher, C.T.; Donohoe, R.J. Los Alamos National Lab., NM (United States). 1997. 5p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-970844–: Plutonium futures: the science, Santa Fe, NM (United States), 25-27 Aug 1997). Order Number DE97008970. Source: OSTI; NTIS; INIS; GPO Dep.

The United States Department of Energy is presently faced with the stabilization and safe disposition of hundreds of metric tons of residue materials resulting from 50+ years of nuclear weapons production activities. These residues encompass a broad range of substrates and radionuclides and include both solid and liquid materials. Combustible residues constitute a significant fraction of the total residue inventory, and an important constituent within the combustible category is spent anion ion-exchange resins. These resins are typically utilized for the separation of plutonium from other radionuclides under strongly acidic nitric or hydrochloric acid solution conditions which favor the formation and partitioning of anionic Pu(IV) nitrato or chloride species. The spent resins are usually rinsed prior to storage as residues to reduce both acid and radionuclide concentrations, but significant radionuclide concentrations remain in these resins, and the long-term effects of concentrated acid and radiolysis on the resin integrity are relatively unexplored. Thus, new research is needed to assess the stability of these resin residues and address the need for further treatment to ensure stability prior to long-term disposal.

440
(LA-UR–97-2592)
Oxidation kinetics of plutonium in air: Consequences for environmental dispersal. Haschke, J.M.; Allen, T.H.; Martz, J.C. Los Alamos National Lab., NM (United States). 1997. 16p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-970907–: Actinides '97: international conference on actinides, Baden-Baden (Germany), 21-26 Sep 1997). Order Number DE97008884. Source: OSTI; NTIS; INIS; GPO Dep.

Kinetic studies show that plutonium corrosion in air is catalyzed by plutonium hydride on the metal surface and suggest that the process has caused storage containers to fail. The catalyzed reaction initiates at 25°C, indiscriminately consumes both O_2 and N_2, and transforms metal into a dispersible product at a 10^7-10^{10} faster rate (0.6 ± 0.1 g Pu/cm^2 min) than normal air oxidation. The catalyzed Pu+O_2 reaction advances into the metal at a linear rate of 2.9 m/h. Rate equations and particle size data, which are presented for catalyzed and atmospheric corrosion at temperatures up to 3500°C, provide a technical basis for more accurately assessing the dispersal hazard posed by plutonium metal.

441
(LA-UR–97-2741)
Performance of NDA techniques on a vitrified waste form. Hurd, J.R.; Veazey, G.W.; Prettyman, T.H.; Mercer, D.J.; Ricketts, T.E.; Nakaoka, R.K. Los Alamos National Lab., NM (United States). [1997]. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-970744–: 38. annual meeting of the Institute of Nuclear Materials management, Phoenix, AZ (United States), 20-24 Jul 1997). Order Number DE98001014. Source: OSTI; NTIS; INIS; GPO Dep.

Rocky Flats Environmental Technology Site (RFETS) is currently considering the use of vitrified transuranic (TRU)-waste forms for the final disposition of several waste materials. To date, however, little nondestructive assay (NDA) data have been acquired in the general NDA community to assist in this endeavor. This paper describes the efforts to determine constraints and operating parameters for using NDA instrumentation on vitrified waste. The present study was conducted on a sample composed of a plutonium-contaminated ash, similar to that found in the RFETS inventory, and a borosilicate-based glass. The vitrified waste item was fabricated at Los Alamos National Laboratory (LANL) using methods and equipment similar to those being proposed by RFETS to treat their ash material. The focus of this study centered on the segmented gamma scanner (SGS) with 1/2-inch collimation, a technique that is presently available at RFETS. The accuracy and precision of SGS technology was evaluated, with particular attention to bias issues involving matrix geometry, homogeneity, and attenuation. Tomographic gamma scanning was utilized in the determination of the waste form homogeneity. A thermal neutron technique was also investigated and comparisons made with the gamma results.

442
(LA-UR–97-2810)
Comparison of silver(II), cobalt(III), and cerium(IV) as electron transfer mediators in the MEO mixed waste treatment process. Smith, W.H.; Purdy, G.M.; McKee, S.D. Los Alamos National Lab., NM (United States). [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9709118–: I&EC symposium,

Pittsburgh, PA (United States), 15-17 Sep 1997). Order Number DE98000805. Source: OSTI; NTIS; INIS; GPO Dep.

Mediated electrochemical oxidation (MEO) has been developed as a method to treat mixed hazardous waste. The technology has for the most part been targeted toward wastes generated by the nuclear industry, consisting of a hazardous or non-hazardous organic material contaminated by a radioactive substance. The MEO process consists of the electrochemical generation of a powerful oxidizing agent, which serves as an electron transfer mediator to bring about the oxidation of the organic component. Numerous studies on a variety of organic substrates have demonstrated complete oxidation to carbon dioxide can be realized under the proper reaction conditions, with water serving as the source of oxygen. The radioactive component, usually an actinide element or heavy metal isotope, can then be recovered from the resulting organic free aqueous solution by standard methods such as ion exchange or solvent extraction. In addition to the variety of organic compounds tested, investigators have also looked at a number of process parameters including choice of mediator, temperature, concentration of mediator, current density, anode material, acid concentration, and cell separator material. From these studies it would appear that for a given organic substrate, the two most important process parameters are choice of mediator and temperature. The purpose of this work is to evaluate these two parameters for a given organic material, holding all other parameters constant. The organic material chosen for this study is the industry standard sulfonated styrene-divinyl benzene based cation exchange resin. This material is ubiquitous throughout the nuclear complex as a process residue, and is very resistant to chemical attack making it an ideal substrate to evaluate MEO capability. A high acid concentration is necessary to solubilize the mediator in its higher oxidation state, 6 M nitric acid was chosen since it is compatible with existing subsequent actinide element recovery processes.

443

(LA-UR–97-2934)

TRU waste transportation – The flammable gas generation problem. Connolly, M.J. (Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)); Kosiewicz, S.T. Los Alamos National Lab., NM (United States). [1997]. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-970857–: 4. biennial ASME mixed waste symposium, Baltimore, MD (United States), 17-21 Aug 1997). Order Number DE98000995. Source: OSTI; NTIS; INIS; GPO Dep.

The Nuclear Regulatory Commission (NRC) has imposed a flammable gas (i.e., hydrogen) concentration limit of 5% by volume on transuranic (TRU) waste containers to be shipped using the TRUPACT-II transporter. This concentration is the lower explosive limit (LEL) in air. This was done to minimize the potential for loss of containment during a hypothetical 60 day period. The amount of transuranic radionuclide that is permissible for shipment in TRU waste containers has been tabulated in the TRUPACT-II Safety Analysis Report for Packaging (SARP, 1) to conservatively prevent accumulation of hydrogen above this 5% limit. Based on the SARP limitations, approximately 35% of the TRU waste stored at the Idaho National Engineering and Environmental Lab (INEEL), Los Alamos National Lab (LANL), and Rocky Flats Environmental Technology Site (RFETS) cannot be shipped in the TRUPACT-II. An even larger percentage of the TRU waste drums at the Savannah River Site (SRS) cannot be shipped because of the much higher wattage loadings of TRU waste drums in that site's inventory. This paper presents an overview of an integrated, experimental program that has been initiated to increase the shippable portion of the Department of Energy (DOE) TRU waste inventory. In addition, the authors will estimate the anticipated expansion of the shippable portion of the inventory and associated cost savings. Such projection should provide the TRU waste generating sites a basis for developing their TRU waste workoff strategies within their Ten Year Plan budget horizons.

444

(LA-UR–97-2935)

Hazardous waste systems analysis at Los Alamos National Laboratory. Urioste, J. Los Alamos National Lab., NM (United States). [1997]. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-970854–: 13. pollution prevention conference, Atlanta, GA (United States), 26-28 Aug 1997). Order Number DE98000985. Source: OSTI; NTIS; INIS; GPO Dep.

Los Alamos National Laboratory produces routine and non-routine hazardous waste as a by-product of mission operations. Hazardous waste commonly generated at the Laboratory includes many types of laboratory research chemicals, solvents, acids, bases, carcinogens, compressed gases, metals, and other solid waste contaminated with hazardous waste. The Los Alamos National Laboratory Environmental Stewardship Office has established a Hazardous Waste Minimization Coordinator to specifically focus on routine and non-routine RCRA, TSCA, and other administratively controlled wastes. In this process, the Waste Minimization Coordinator has developed and implemented a systems approach to define waste streams, estimate waste management costs and develop plans to implement avoidance practices, and develop projects to reduce or eliminate the waste streams at the Laboratory. The paper describes this systems approach.

445

(LA-UR–97-2997)

Metal recycling experience at Los Alamos National Laboratory. Reuse, release, and recycle of metals from radiological control areas". Gogol, S. Los Alamos National Lab., NM (United States). [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-970854–: 13. pollution prevention conference, Atlanta, GA (United States), 26-28 Aug 1997). Order Number DE98000986. Source: OSTI; NTIS; INIS; GPO Dep.

Approximately 15% of the Low-Level Waste (LLW) produced at Los Alamos consists of scrap metal equipment and materials. The majority of this material is produced by decommissioning and the modification of existing facilities. To reduce this waste stream, Department of Energy Headquarters, EM-77 Office, sponsored the Reuse, Recycle, and Release of Metals from Radiological Control Areas High Return on Investment (ROI) Project to implement recycle, reuse, and release of scrap metal at the laboratory. The goal of this project was to develop cost effective alternatives to LLW disposal of scrap metal and to avoid the disposal of

2,400 m^3 of scrap metal. The ROI for this project was estimated at 948%. The ROI project was funded in March 1996 and is scheduled for completion by October 1997. At completion, a total of 2,400 m^3 of LLW avoidance will have been accomplished and a facility to continue recycling activities will be operational. This paper will present the approach used to develop effective alternatives for scrap metal at Los Alamos and then discuss the tasks identified in the approach in detail. Current scrap metal inventory, waste projections, alternatives to LLW disposal, regulatory guidance, and efforts to institutionalize the alternatives to LLW disposal will be discussed in detail.

446
(LA-UR–97-3188)
A successful waste stream analysis on a large construction project in a radiologically controlled facility. Kennicott, M. (n,p Energy, Inc. (United States)); Durrer, R.; Richardson, D.; Starke, T.P. Los Alamos National Lab., NM (United States). [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-970854–: 13. pollution prevention conference, Atlanta, GA (United States), 26-28 Aug 1997). Order Number DE98001340. Source: OSTI; NTIS; INIS; GPO Dep.

The Los Alamos National Laboratory (the Laboratory) Chemistry and Metallurgy Research (CMR) Facility, constructed in 1952, is currently under going a major, multi-year demolition and construction project. Many of the operations required under this project (i.e., design, demolition, decontamination, construction, and waste management) mimic the processes required of a large scale decontamination and decommissioning (D and D) job and are identical to the requirements of any of several upgrades projects anticipated for the laboratory and other Department of Energy (DOE) sites. For these reasons the CMR upgrades Project is seen as an ideal model facility–to test the application and measure the success of waste minimization techniques which could be implemented for any similar projects. The purpose of this paper will be to discuss the successful completion of a waste stream analysis. The analyses performed was to measure the potential impact of waste generation, in terms of volume and costs, for a reconfiguration option being considered to change the approach and execution of the original project.

447
(LA-UR–97-4023)
Automating the analytical laboratory via the Chemical Analysis Automation paradigm. Hollen, R.; Rzeszutko, C. Los Alamos National Lab., NM (United States). Oct 1997. 15p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9710163–: ISLAR ’97, Boston, MA (United States), 19-22 Oct 1997). Order Number DE98003082. Source: OSTI; NTIS; GPO Dep.

To address the need for standardization within the analytical chemistry laboratories of the nation, the Chemical Analysis Automation (CAA) program within the US Department of Energy, Office of Science and Technology’s Robotic Technology Development Program is developing laboratory sample analysis systems that will automate the environmental chemical laboratories. The current laboratory automation paradigm consists of islands-of-automation that do not integrate into a system architecture. Thus, today the chemist must perform most aspects of environmental analysis manually using instrumentation that generally cannot communicate with other devices in the laboratory. CAA is working towards a standardized and modular approach to laboratory automation based upon the Standard Analysis Method (SAM) architecture. Each SAM system automates a complete chemical method. The building block of a SAM is known as the Standard Laboratory Module (SLM). The SLM, either hardware or software, automates a subprotocol of an analysis method and can operate as a standalone or as a unit within a SAM. The CAA concept allows the chemist to easily assemble an automated analysis system, from sample extraction through data interpretation, using standardized SLMs without the worry of hardware or software incompatibility or the necessity of generating complicated control programs. A Task Sequence Controller (TSC) software program schedules and monitors the individual tasks to be performed by each SLM configured within a SAM. The chemist interfaces with the operation of the TSC through the Human Computer Interface (HCI), a logical, icon-driven graphical user interface. The CAA paradigm has successfully been applied in automating EPA SW-846 Methods 3541/3620/8081 for the analysis of PCBs in a soil matrix utilizing commercially available equipment in tandem with SLMs constructed by CAA.

448
(LA-UR–97-4024)
A standard analysis method (SAM) for the automated analysis of polychlorinated biphenyls (PCBs) in soils using the chemical analysis automation (CAA) paradigm: validation and performance. Rzeszutko, C. (Los Alamos National Lab., NM (United States)); Johnson, C.R.; Monagle, M.; Klatt, L.N. Los Alamos National Lab., NM (United States). Oct 1997. 18p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9710163–: ISLAR ’97, Boston, MA (United States), 19-22 Oct 1997). Order Number DE98003081. Source: OSTI; NTIS; INIS; GPO Dep.

The Chemical Analysis Automation (CAA) program is developing a standardized modular automation strategy for chemical analysis. In this automation concept, analytical chemistry is performed with modular building blocks that correspond to individual elements of the steps in the analytical process. With a standardized set of behaviors and interactions, these blocks can be assembled in a ’plug and play’ manner into a complete analysis system. These building blocks, which are referred to as Standard Laboratory Modules (SLM), interface to a host control system that orchestrates the entire analytical process, from sample preparation through data interpretation. The integrated system is called a Standard Analysis Method (SAME). A SAME for the automated determination of Polychlorinated Biphenyls (PCB) in soils, assembled in a mobile laboratory, is undergoing extensive testing and validation. The SAME consists of the following SLMs: a four channel Soxhlet extractor, a High Volume Concentrator, column clean up, a gas chromatograph, a PCB data interpretation module, a robot, and a human- computer interface. The SAME is configured to meet the requirements specified in U.S. Environmental Protection Agency’s (EPA) SW-846 Methods 3541/3620A/8082 for the analysis of pcbs in soils. The PCB SAME will be described along with the developmental test plan. Performance data obtained during developmental testing will also be discussed.

449
(LA-UR–97-4102)
Report on the GC-MBS method for correcting NaI spectra for transmission loss in hand-held instruments. Rawool-Sullivan, M. Los Alamos National Lab., NM (United States). 8 Oct 1997. 32p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE98003094. Source: OSTI; NTIS; INIS; GPO Dep.

The goals of this project were (1) to develop a capability to study the scattered components in the NaI spectra of attenuated sources and (2) to evaluate the effectiveness of the gross count material basis set (GC-MBS) method in quantifying transmission losses from the shapes of measured NaI spectra. These goals are related, as the GC-MBS method involves a linear log-spectrum decomposition into MBS component spectra, and scattered gamma rays represent a significant nonlinear interference. Eventually, the authors hope to understand the effect of the scattered components on the MBS decomposition and to develop ways to correct for inaccuracies. As of this writing the authors have not reached that long-term objective, so the two halves of this project are treated here as separate topics, with a separate section for each. They have substantially achieved both of the project goals and are collecting additional data for two publications at the upcoming IEEE conference in Albuquerque, NM–one paper about their work on scattering and another on the GC-MBS method. This project report will contain preliminary portions of those two papers.

450
(LA-UR–97-4439)
Effects on the long term storage container by thermal cycling alpha plutonium. Flamm, B.F.; Prenger, F.C.; Veirs, D.K.; Hill, D.D.; Isom, G.M. Los Alamos National Lab., NM (United States). Mar 1998. 21p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-971125–: 1997 American Nuclear Society (ANS) winter meeting, Albuquerque, NM (United States), 16-20 Nov 1997). Order Number DE98003351. Source: OSTI; NTIS; INIS; GPO Dep.

Experiments were conducted to determine the validity of the steady state temperature limit of 100 C established by the DOE-STD-3013-96 for storing alpha plutonium metal. Studies with an alpha plutonium ingot combined with strain gauge measurements indicate that the stainless steel storage container, yields very little (0.005 in.) to the expanding plutonium metal as it undergoes alpha beta phase transformation at temperatures above 112 C. Another experiment using an alpha plutonium rod for point loading of the container wall showed no measured deformation of the container. The results of strain measurements for alpha beta and beta alpha transformations for twenty five thermal cycles are reported. Finite element modeling using the measured data predicts that the compressive yield strength is 3,500 psi versus the literature value of 13,000 psi.

451
(LA-UR–97-4616)
Hazards associated with retrieval and storage of legacy waste at the Transuranic Waste Inspectable Storage Project. Pannell, M.A.; Grogin, P.W.; Langford, R.R. Los Alamos National Lab., NM (United States). Mar 1998. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-980307–: Waste management ’98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98002928. Source: OSTI; NTIS; INIS; GPO Dep.

Approximately 17,000 containers of solid transuranic and hazardous waste have been stored beneath earthen cover for nearly twenty years at Technical Area 4 of the Los Alamos National Laboratory. The mission of the Transuranic Waste Inspectable Storage Project (TWISP) is to retrieve, vent, and place these containers into an inspectable storage configuration in compliance with the Resource Conservation and Recovery Act, prior to final disposition at the Waste Isolation Pilot Plant. Significant hazards currently identified with TWISP activities include: (1) the pressurization of drums; (2) volatilization of organic compounds (VOCs) within the drums; and (3) the generation of elevated hydrogen levels by certain waste streams. Based on the retrieval of 15% of the waste containers, the following preliminary conclusions are presented to better protect personnel and the environment: (1) the likelihood of unvented drums becoming pressurized increases when environmental conditions change; (2) pressurized drums must be vented before they become bulging drums; (3) vented drums present the potential for VOC emissions and personnel exposure; (4) the vapor pressure and boiling points of waste stream constituents may be an indication of the likelihood of VOC emissions from stored hazardous waste containers; (5) large numbers of co-located vented drums may present the potential of increased hydrogen and VOC concentrations within unventilated storage domes; (6) monitoring and sampling vented drum storage domes is necessary to ensure that the levels of risk to drum handlers and inspection personnel are acceptable; (7) identifying, tagging, and segregating special case drums is necessary to prevent personnel overexposures and preclude environmental contamination; (8) applying rust inhibitor prolongs the useful life of waste containers stored under earthen cover; (9) acoustic drum pressure detection may be a viable tool in assessing elevated drum pressures.

452
(LA-UR–97-4632)
Systematic evaluation of options to avoid generation of noncertifiable transuranic (TRU) waste at Los Alamos National Laboratory. Boak, J.M.; Kosiewicz, S.T.; Triay, I.; Gruetzmacher, K.; Montoya, A. Los Alamos National Lab., NM (United States). Mar 1998. 13p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-980307–: Waste management ’98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98002933. Source: OSTI; NTIS; INIS; GPO Dep.

At present, $>35\%$ of the volume of newly generated transuranic (TRU) waste at Los Alamos National Laboratory is not certifiable for transport to the Waste Isolation Pilot Plant (WIPP). Noncertifiable waste would constitute 900–1,000 m^3 of the 2,600 m^3 of waste projected during the period of the Environmental Management (EM) Accelerated Cleanup: Focus on 2006 plan (DOE, 1997). Volume expansion of this waste to meet thermal limits would increase the shipped volume to $\sim$5,400 m^3. This paper presents the results of efforts to define which TRU waste streams are noncertifiable at Los Alamos, and to prioritize site-specific options to reduce the volume of certifiable waste over the period of the EM Accelerated Cleanup Plan. A team of Los

Alamos TRU waste generators and waste managers reviewed historic generation rates and thermal loads and current practices to estimate the projected volume and thermal load of TRU waste streams for Fiscal Years 1999–2006. These data defined four major problem TRU waste streams. Estimates were also made of the volume expansion that would be required to meet the permissible wattages for all waste. The four waste streams defined were: (1) ^{238}Pu-contaminated combustible waste from production of Radioactive Thermoelectric Generators (RTGs) with ^{238}Pu activity which exceeds allowable shipping limits by 10–100X. (2) ^{241}Am-contaminated cement waste from plutonium recovery processes (nitric and hydrochloric acid recovery) are estimated to exceed thermal limits by ∼3X. (3) ^{239}Pu-contaminated combustible waste, mainly organic waste materials contaminated with ^{239}Pu and ^{241}Am, is estimated to exceed thermal load requirements by a factor of ∼2X. (4) Oversized metal waste objects, (especially gloveboxes), cannot be shipped as is to WIPP because they will not fit in a standard waste box or drum.

453
(LA-UR–97-4976)
Quality management in environmental programs: Los Alamos National Laboratory's approach. Maassen, L.; Day, J.L. Los Alamos National Lab., NM (United States). Mar 1998. 5p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-980354–: National environmental and standards integration '98, Las Vegas, NV (United States), 3-6 Mar 1998). Order Number DE98004366. Source: OSTI; NTIS; INIS; GPO Dep.

Since its inception in 1943, Los Alamos National Laboratory's (LANL's) primary mission has been nuclear weapons research and development, which involved the use of hazardous and radioactive materials, some of which were disposed of onsite. LANL has established an extensive Environmental Restoration Project (Project) to investigate and remediate those hazardous and radioactive waste disposal sites. This paper describes LANL's identification and resolution of critical issues associated with the integration and management of quality in the Project.

454
(LA-UR–97-5185)
Synopsis of hydrologic data collected by waste management for characterization of unsaturated transport at Area G. Vold, E. Los Alamos National Lab., NM (United States). Mar 1998. 34p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE98004335. Source: OSTI; NTIS; INIS; GPO Dep.

Data which have been collected by Los Alamos National Laboratory waste management for the hydrologic characterization of the subsurface at the low level radioactive waste disposal facility, Area G, are reported and discussed briefly. The data includes Unsaturated Flow Apparatus measurements of the unsaturated conductivity in samples from borehole G-5. Analysis compares these values to the predictions from van Genuchten estimates, and the implications for transport and data matching are discussed, especially at the location of the Vapor Phase Notch (VPN). There, evaporation drives a significant vapor flux and the liquid flux cannot be measured accurately by the UFA device. Data also include hydrologic characterization of samples from borehole G-5, Area G surface soils, Los Alamos (Cerros de Rio) basalt, Tsankawi and Cerro-Toledo layers, the Vapor Phase Notch (VPN), and additional new samples from the uppermost tuff layer at Area G. Hydraulic properties from these sample groups can be used to supplement the existing data base. The data in this report can be used to improve the accuracy and reduce the uncertainty in future computational modeling of the unsaturated transport at Area G. This report supports the maintenance plan for the Area G Performance Assessment.

455
(LA-UR–97-5186)
Synopsis of moisture monitoring by neutron probe in the unsaturated zone at Area G. Vold, E. Los Alamos National Lab., NM (United States). 1997. 51p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE98004337. Source: OSTI; NTIS; INIS; GPO Dep.

Moisture profiles from neutron probe data provide valuable information in site characterization and to supplement ground water monitoring efforts. The neutron probe precision error (reproducibility) is found to be about 0.2 vol% under in situ field conditions where the slope in moisture content with depth is varying slowly. This error is about 2 times larger near moisture spikes (e.g., at the vapor phase notch), due to the sensitivity of the probe response to vertical position errors on the order of 0.5 inches. Calibrations were performed to correct the downhole probe response to the volumetric moisture content determined on core samples. Calibration is sensitive to borehole diameter and casing type, requiring 3 separate calibration relations for the boreholes surveyed here. Power law fits were used for calibration in this study to assure moisture content results greater than zero. Findings in the boreholes reported here confirm the broad features seen previously in moisture profiles at Area G, a near-surface region with large moisture variability, a very dry region at greater depths, and a moisture spike at the vapor phase notch (VPN). This feature is located near the interface between the vitrified and vitrified stratigraphic units and near the base of the mesa. This report describes the in-field calibration methods used for the neutron moisture probe measurements and summarizes preliminary results of the monitoring program in the in-situ monitoring network at Area G. Reported results include three main areas: calibration studies, profiles from each of the vertical boreholes at Area G, and time-dependent variations in a select subset of boreholes. Results are reported here for the vertical borehole network. Results from the horizontal borehole network will be described when available.

456
(LA-UR–97-5202)
Synopsis of recent moisture flux analyses relevant to the unsaturated zone at Area G. Vold, E. Los Alamos National Lab., NM (United States). Mar 1998. 56p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE98004332. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes selected recent analyses relevant to the assessment of the site performance for disposal facilities at Los Alamos (Area G) regarding unsaturated zone

transport of moisture in liquid and vapor phases and the surface water balance. Much of the analyses methods have been reported previously but in several separate and detailed reports. These do not always reflect the overview possible with hindsight. The present report is an attempt to integrate the author's previous results into a cohesive whole. Due to project time constraints, this report is incomplete in some area. This report first reviews the basis for the Darcy flux analyses and its inherent uncertainties, as detailed in previous reports. Results from the previous works are then reviewed and discussed and in some cases, elaborated in an attempt for clarification. New results of the Darcy Flux Analyses are presented and discussed for Area G mesa top locations, nearby canyon locations and a second mesa top location (TA46 west of Area G). Select evapotranspiration and precipitation data from TA6 are presented and discussed. The conclusions section draws a picture of the hydrology which unifies the study results reported here and in previous reports for the undisturbed and disturbed site locations.

457
(LA-UR–98-26)
New probability table treatment in MCNP for unresolved resonances. Carter, L.L. (Carter M.C. Analysis, Richland, WA (United States)); Little, R.C.; Hendricks, J.S.; MacFarlane, R.E. Los Alamos National Lab., NM (United States). Apr 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-980403–: Radiation protection and shielding topical meeting: technologies for the new century, Nashville, TN (United States), 19-23 Apr 1998). Order Number DE98005277. Source: OSTI; NTIS; INIS; GPO Dep.

An upgrade for MCNP has been implemented to sample the neutron cross sections in the unresolved resonance range using probability tables. These probability tables are generated with the cross section processor code NJOY, by using the evaluated statistical information about the resonances to calculate cumulative probability distribution functions for the microscopic total cross section. The elastic, fission, and radiative capture cross sections are also tabulated as the average values of each of these partials conditional upon the value of the total. This paper summarizes how the probability tables are utilized in this MCNP upgrade and compares this treatment with the approximate smooth treatment for some example problems.

458
(LA-UR–98-433)
Test plan for hydrogen getters project. Mroz, G. (Los Alamos National Lab., NM (United States)); Weinrach, J. Los Alamos National Lab., NM (United States);Benchmark Environmental Corp., Albuquerque, NM (United States). 1 Apr 1998. 17p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE98005930. Source: OSTI; NTIS; INIS; GPO Dep.

Hydrogen levels in many transuranic (TRU) waste drums are above the compliance threshold, therefore deeming the drums non-shippable to the Waste Isolation Pilot Plant (WIPP). Hydrogen getters (alkynes and dialkynes) are known to react irreversibly with hydrogen in the presence of certain catalysts. The primary purpose of this investigation is to ascertain the effectiveness of a hydrogen getter in an environment that contains gaseous compounds commonly found in the headspace of drums containing TRU waste. It is not known whether the volatile organic compounds (VOCs) commonly found in the headspace of TRU waste drums will inhibit (poison) the effectiveness of the hydrogen getter. The results of this study will be used to assess the feasibility of a hydrogen-getter system, which is capable of removing hydrogen from the payload containers or the Transuranic package Transporter-II (TRUPACT-II) inner containment vessel to increase the quantity of TRU waste that can be shipped to the WIPP.

459
(LA-UR–98-845)
Use of data fusion to optimize contaminant transport predictions. Eeckhout, E. van. Los Alamos National Lab., NM (United States). Oct 1997. 17p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE98006333. Source: OSTI; NTIS; INIS; GPO Dep.

The original data fusion workstation, as envisioned by Coleman Research Corp., was constructed under funding from DOE (EM-50) in the early 1990s. The intent was to demonstrate the viability of fusion and analysis of data from various types of sensors for waste site characterization, but primarily geophysical. This overall concept changed over time and evolved more towards hydrogeological (groundwater) data fusion after some initial geophysical fusion work focused at Coleman. This initial geophysical fusion platform was tested at Hanford and Fernald, and the later hydrogeological fusion work has been demonstrated at Pantex, Savannah River, the US Army Letterkenny Depot, a DoD Massachusetts site and a DoD California site. The hydrogeologic data fusion package has been spun off to a company named Fusion and Control Technology, Inc. This package is called the Hydrological Fusion And Control Tool (HydroFACT) and is being sold as a product that links with the software package, MS-VMS (MODFLOW-SURFACT Visual Modeling System), sold by HydroGeoLogic, Inc. MODFLOW is a USGS development, and is in the public domain. Since the government paid for the data fusion development at Coleman, the government and their contractors have access to the data fusion technology in this hydrogeologic package for certain computer platforms, but would probably have to hire FACT (Fusion and Control Technology, Inc.,) and/or HydroGeoLogic for some level of software and services. Further discussion in this report will concentrate on the hydrogeologic fusion module that is being sold as HydroFACT, which can be linked with MS-VMS.

460
(LA-UR–98-898)
Test plan for headspace gas sampling of remote-handled transuranic waste containers at Los Alamos National Laboratory. Field, L.R. (Los Alamos National Lab., NM (United States)); Villarreal, R. Los Alamos National Lab., NM (United States);Benchmark Environmental Corp., Albuquerque, NM (United States). 24 Feb 1998. 31p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE98006332. Source: OSTI; NTIS; INIS; GPO Dep.

Seventeen remote-handled (RH) transuranic (TRU) waste canisters currently are stored in vertical, underground shafts

at Technical Area (TA)-54, Area G, at Los Alamos National Laboratory (LANL). These 17 RH TRU waste canisters are destined to be shipped to the Waste Isolation Pilot Plant (WIPP) for permanent disposal in the geologic repository. As the RH TRU canister is likely to be the final payload container prior to placement into the 72-B cask and shipment to the WIPP, these waste canisters provide a unique opportunity to ascertain representative flammable gas concentrations in packaged RH-TRU waste. Hydrogen, which is produced by the radiolytic decomposition of hydrogenous constituents in the waste matrix, is the primary flammable gas of concern with RH TRU waste. The primary objectives of the experiment that is described by this test plan are to sample and analyze the waste canister headspace gases to determine the concentration of hydrogen in the headspace gas and to calculate the hydrogen gas generation rate for comparison to the applicable maximum allowable hydrogen generation rate (mole/sec) limits. It is a goal of this experiment to determine the headspace gas concentrations of other gases (e.g., oxygen, nitrogen, carbon dioxide, carbon monoxide, and volatile organic compounds (VOCs) with molecular weights less than 60 g/mole) that are produced by radiolysis or present when the waste was packaged. Additionally, the temperature, pressure, and flow rate of the headspace gas will be measured.

461
(LA-UR–98-1450)
Draft test plan for hydrogen getters project. Mroz, G. (Los Alamos National Lab., NM (United States)); Weinrach, J. Los Alamos National Lab., NM (United States);Benchmark Environmental Corp., Albuquerque, NM (United States). 1 Apr 1998. 18p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE99000861. Source: OSTI; NTIS; INIS; GPO Dep.

Hydrogen levels in many transuranic (TRU) waste drums are above the compliance threshold, therefore deeming the drums non-shippable to the Waste Isolation Pilot Plant (WIPP). Hydrogen getters (alkynes and dialkynes) are known to react irreversibly with hydrogen in the presence of certain catalysts. The primary purpose of this investigation is to ascertain the effectiveness of a hydrogen getter in an environment that contains gaseous compounds commonly found in the headspace of drums containing TRU waste. It is not known whether the volatile organic compounds (VOCs) commonly found in the headspace of TRU waste drums will inhibit (poison) the effectiveness of the hydrogen getter. The results of this study will be used to assess the feasibility of a hydrogen-getter system, which is capable of removing hydrogen from the payload containers or the Transuranic Package Transporter-II (TRUPACT-II) inner containment vessel to increase the quantity of TRU waste that can be shipped to the WIPP.

462
(LA-UR–98-1826)
Comparison of General Purpose Heat Source testing with the ANSI N43.6-1977 (R1989) sealed source standard. Grigsby, C.O. Los Alamos National Lab., NM (United States). 26 Mar 1998. [150p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE99001117. Source: OSTI; NTIS; INIS; GPO Dep.

This analysis provides a comparison of the testing of Radioisotope Thermoelectric Generators (RTGs) and RTG components with the testing requirements of ANSI N43.6-1977 (R1989) “Sealed Radioactive Sources, Categorization”. The purpose of this comparison is to demonstrate that the RTGs meet or exceed the requirements of the ANSI standard, and thus can be excluded from the radioactive inventory of the Chemistry and Metallurgy Research (CMR) building in Los Alamos per Attachment 1 of DOE STD 1027-92. The approach used in this analysis is as follows: (1) describe the ANSI sealed source classification methodology; (2) develop sealed source performance requirements for the RTG and/or RTG components based on criteria from the accident analysis for CMR; (3) compare the existing RTG or RTG component test data to the CMR requirements; and (4) determine the appropriate ANSI classification for the RTG and/or RTG components based on CMR performance requirements. The CMR requirements for treating RTGs as sealed sources are derived from the radiotoxicity of the isotope (^{238}P7) and amount (13 kg) of radioactive material contained in the RTG. The accident analysis for the CMR BIO identifies the bounding accidents as wing-wide fire, explosion and earthquake. These accident scenarios set the requirements for RTGs or RTG components stored within the CMR.

463
(LA-UR–98-2022)
Standard data report. 1997 annual report on waste generation and waste minimization progress. Wilburn, D. Los Alamos National Lab., NM (United States). 7 Apr 1998. 25p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE99000806. Source: OSTI; NTIS; INIS; GPO Dep.

The Laboratory’s central mission of Reducing the Global Nuclear Danger supports core competencies that enable the Laboratory to contribute to defense, civilian, and industrial needs. In turn, the intellectual challenges of civilian and industrial problems strengthen and help support the core competencies required for the national security mission. The ability to do great science underpins all of the applied work. There are five core competencies which support this mission: (1) Stockpile Stewardship ensures the US has safe, secure and reliable nuclear weapons; (2) Stockpile Management provides capabilities ranging from dismantling to remanufacturing of the enduring stockpile; (3) Nuclear Materials Management ensures the availability and safe disposition of plutonium, highly enriched uranium, and tritium; (4) Nonproliferation and Counterproliferation help to deter, detect, and respond to the proliferation of weapons of mass destruction; and (5) Environmental Stewardship provides for the remediation and reduction of wastes from the nuclear weapons complex. This report contains data on volumes of waste generated as part of routine and cleanup/stabilization activities of the lab.

464
(LA-UR–98-2130)
Gas generation matrix depletion quality assurance project plan. Los Alamos National Lab., NM (United States). 1 May 1998. 27p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE99000811. Source: OSTI; NTIS; INIS; GPO Dep.

The Los Alamos National Laboratory (LANL) is to provide the necessary expertise, experience, equipment and instrumentation, and management structure to: Conduct the matrix depletion experiments using simulated waste for quantifying matrix depletion effects; and Conduct experiments on 60 cylinders containing simulated TRU waste to determine the effects of matrix depletion on gas generation for transportation. All work for the Gas Generation Matrix Depletion (GGMD) experiment is performed according to the quality objectives established in the test plan and under this Quality Assurance Project Plan (QAPjP).

465
(LBL–38024)
Susceptibility of polysiloxane and colloidal silica to degradation by soil microorganisms. Lundy, D.Z. (Lawrence Berkeley National Lab., CA (United States). Earth Sciences Div.); Hunter-Cevera, J.C.; Moridis, G.J. Lawrence Berkeley National Lab., CA (United States). Nov 1997. 68p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE98051514. Source: OSTI; NTIS; GPO Dep.

This report is a description of the laboratory study undertaken to determine the biodegradability of Colloidal Silica (CS) and PolySiloXane (PSX), a new generation of barrier liquids employed by the Viscous Liquid Barrier (VLB) technology in the containment of subsurface contaminants. Susceptibility of either material to microbial degradation would suggest that the effectiveness of a barrier in the subsurface may deteriorate over time. Degradation may result from several different biological events. Organisms may consume the material as a carbon and/or energy source, organisms may chemically change the material as a detoxification mechanism, or organisms may erode the material by their physical penetration of the material during growth. To determine if degradation occurs, physical interactions between soil microbes and the barrier materials were analyzed, and the metabolic activity of individual organisms in the presence of CS and PSX was measured.

466
(LBNL–40939)
Literature search on the use of resins for treatment of radioactive wastes. AlMahamid, I.; Smith, B.M. Lawrence Berkeley National Lab., CA (United States). Oct 1997. 14p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE98052314. Source: OSTI; NTIS; INIS; GPO Dep.

Over 100 commercial providers with mixed-waste treatability capabilities exist in the US. The maturity level of these technologies varies from a bench scale to a pilot or a commercial scale. The techniques include deactivation, chemical oxidation, recovery of metals, stabilization, vitrification, incineration, biodegradation, and chemical extraction. This report focuses on the use of resins to remove actinides and heavy metals from aqueous waste streams. Only the literature that described resins with high removing efficiency are presented here. The majority of the literature reviewed are proceedings and national or international reports ordered through the Berkeley Lab Library. Some of the reports that the authors requested have not yet arrived. Only a few papers were found in the open literature (journals or magazines). Although this report does not include all existing references, it provides an accurate assessment of efficient resins to be considered for waste minimization procedures. 70 refs.

467
(LBNL–41192)
Environmental Management Science Program awards. Fiscal year 1997 annual progress report. Simmons, A. (ed.); Benner, W.H.; DePaolo, D.J.; Faybishenko, B.; Majer, E.L.; Pallavicini, M.; Russo, R.E.; Shultz, P.G.; Wan, J. Lawrence Berkeley National Lab.,Berkeley, CA (United States). Oct 1997. 61p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE98056098. Source: OSTI; NTIS; INIS; GPO Dep.

Lawrence Berkeley National Laboratory was awarded eight Environmental Management Science Program (EMSP) research grants in Fiscal Year 1996. This report summarizes the progress of each grant in addressing significant DOE site cleanup issues after completion of the first year of research. The technical progress made to date in each of the research projects is described in greater detail in individual progress reports. The focus of the research projects covers a diversity of areas relevant to site cleanup, including bioremediation, health effects, characterization, and mixed waste. Some of the projects cut across a number of focus areas. Three of the projects are directed toward characterization and monitoring at the Idaho National Engineering and Environmental Laboratory, as a test case for application to other sites.

468
(LBNL–41454)
What does a tensiometer measure in fractured rock?. Finsterle, S.; Faybishenko, B. Lawrence Berkeley National Lab., CA (United States). Feb 1998. 14p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9710205–: Characterization and measurement of the hydraulic properties of unsaturated porous media, Riverside, CA (United States), 22-24 Oct 1997). Order Number DE98052894. Source: OSTI; NTIS; GPO Dep.

Tensiometers are routinely used in both the laboratory and the field for measuring the capillary pressure in unsaturated porous media. The authors conducted a laboratory experiment on a fractured basalt core. They also examined the performance of a tensiometer in fractured porous media by means of numerical simulation, in which the tensiometer itself and its interaction with the formation were explicitly modeled. They conclude that the gauge pressure is primarily affected by the fracture rock component fracture or matrix that conducts water into or out of the ceramic cup of the tensiometer. Fracture flow is accurately monitored during imbibition events, whereas during drainage, the matrix capillary pressure is registered, leading to a strong hysteretic behavior in the pressure measurements.

469
(LBNL–41920)
Numerical modeling of field tests in unsaturated fractured basalt at the Box Canyon site. Doughty, C. Lawrence Berkeley National Lab., Earth Sciences Div., Berkeley, CA (United States). May 1998. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-980559–: TOUGH '98 workshop, Berkeley, CA

(United States), 4-6 May 1998). Order Number DE98058300. Source: OSTI; INIS; NTIS; GPO Dep.

A TOUGH2 model of a ponded infiltration test has been developed and used to predict the results of a field experiment conducted in the vadose zone of the fractured Snake River Plain basalts, at the Box Canyon site in southeastern idaho. The key question addressed is how fracture-pattern characteristics and connectivity affect the pattern of liquid infiltration. The numerical model, a two-dimensional vertical cross-section, uses half-meter discretization for the shallow field site, which extends about 20 m from the ground surface to an underlying perched water body. The model includes explicit but highly simplified representations of major fractures and other important hydrological features. It adequately reproduces the majority of the field observations, confirming the notion that infiltration is largely fracture-controlled.

470

(ORNL/CP–93287)

Laboratory stabilization/solidification of surrogate and actual mixed-waste sludge in glass and grout. Spence, R.D.; Gilliam, T.M.; Mattus, C.H.; Mattus, A.J. Oak Ridge National Lab., TN (United States). 3 Mar 1998. 31p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980318–: 1998 American Institute of Chemical Engineers (AIChE) spring meeting, New Orleans, LA (United States), 8-12 Mar 1998). Order Number DE98004885. Source: OSTI; NTIS; INIS; GPO Dep.

Grouting and vitrification are currently the most likely stabilization/solidification technologies for mixed wastes. Grouting has been used to stabilize and solidify hazardous and low-level waste for decades. Vitrification has long been developed as a high-level-waste alternative and has been under development recently as an alternative treatment technology for low-level mixed waste. Laboratory testing has been performed to develop grout and vitrification formulas for mixed-waste sludges currently stored in underground tanks at Oak Ridge National Laboratory (ORNL) and to compare these waste forms. Envelopes, or operating windows, for both grout and soda-lime-silica glass formulations for a surrogate sludge were developed. One formulation within each envelope was selected for testing the sensitivity of performance to variations ($\pm$10 wt%) in the waste form composition and variations in the surrogate sludge composition over the range previously characterized in the sludges. In addition, one sludge sample of an actual mixed-waste tank was obtained, a surrogate was developed for this sludge sample, and grout and glass samples were prepared and tested in the laboratory using both surrogate and the actual sludge. The sensitivity testing of a surrogate tank sludge in selected glass and grout formulations is discussed in this paper, along with the hot-cell testing of an actual tank sludge sample.

471

(ORNL/CP–94788)

Distribution of Fatty Acids and Triethanolamine in Synthetic Metalworking Fluid Aerosols Generated in the Laboratory and Field. Ilgner, R.H., Palausky, A., Jenkins, R.A. (Oak Ridge National Lab., TN (United States) Chemical and Analytical Sciences Div.). Oak Ridge National Lab., TN (United States). [1997]. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-9709112–: Conference on the industrial metalworking environment: assessment and control of metal removal fluids, Detroit, MI (United States), 15 Sep 1997). Order Number DE98000702. Source: OSTI; NTIS; INIS; GPO Dep.

[540 409900].

Metalworking fluid mists were generated in the laboratory with selected synthetic fluids by nebulization and with an air sparging apparatus. Short chain fatty acid species were determined in the vapor and particulate phase of the resulting aerosols using in-situ trimethyl silyl derivatization. Certain fatty acid species in sparger generated mists were found in the vapor phase in greater quantities relative to the particle phase, compared with the corresponding amounts determined in nebulized mists. With one metalworking fluid, the nonanoic acid vapor phase to particulate phase concentration ratio was over 14 fold higher with air sparged mists (1.0) than with the corresponding nebulized mists (0.07). The nonanoic acid vapor phase concentrations were 0.026 mg/m^3 and 0.002 mg/m^3 for sparged (bubbled) and nebulized mists respectively. This phenomenon was observed with mists generated from several selected synthetic metalworking fluids. This could suggest that in the work place environment, with a variety of mist generation mechanisms occurring simultaneously, significant vapor phase concentrations of certain species could exist in an environment where particulate levels are low. Vapor phase fatty acid levels could remain relatively high in an occupational setting even when mist levels are reduced with efficient air cleaning devices. Results from mist generation experiments performed in the laboratory, were compared with actual field data from a relatively clean metal machining operation. Anecdotal evidence of potential irritation by short chain fatty acids prompted a study of this industrial site. Numerous air scrubbing devices were utilized at this industrial site to reduce airborne particulates, which typically ranged from 0.05 to 0.4 mg/m^3. Comparisons were made of triethanolamine and short chain fatty acid concentrations in vapor and particulate phases measured in the laboratory and work place environment.

472

(ORNL/CP–94841)

Basic and Acidic Leaching of Sludge from Melton Valley Storage Tank W-25. Collins, J.L., Egan, B.Z., Beahm, E.C., Chase, C.W., Anderson, K.K. Oak Ridge National Lab., TN (United States). Oct 1997. 33p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-9710103–: 10. symposium on separation science and technology for energy applications, Gatlinburg, TN (United States), 20-24 Oct 1997). Order Number DE98000680. Source: OSTI; NTIS; INIS; GPO Dep.

[540 549000].

Bench-scale leaching tests were conducted with samples of tank waste sludge from the Melton Valley Storage Tank (MVST) Facility at Oak Ridge National Laboratory (ORNL) to evaluate separation technology processes for use in concentrating the radionuclides and reducing the volume of waste for final disposal. This paper discusses the hot cell apparatus, the characterization of the sludge, the leaching methodology, and the results obtained from a variety of basic and acidic leaching tests of samples of sludge at ambient temperature. Basic leaching tests were also conducted at 75 and 95 deg C. The major alpha-,gamma., and beta-emitting radionuclides in the centrifuged, wet sludge solids

were ^{137}Cs, ^{60}Co, ^{154}Eu, ^{241}Am, ^{244}Cm ^{90}Sr, Pu, U, and Th. The other major metals (in addition to the U and Th) and anions were Na, Ca, Al, K, Mg, NO_3^-,CO_3^{2-}, OH^-, and O^{2-} organic carbon content was 3.0 +/- 1.0%. The pH was 13. A surprising result was that about 93% of the ^{137}Cs in the centrifuged, wet sludge solids was bound in the solids and could not be solubilized by basic leaching at ambient temperature and 75 deg C. However, the solubility of the ^{137}Cs was enhanced by heating the sludge to 95 deg C. In one of the tests,about 42% of the ^{137}Cs was removed by leaching with 6.3 M NaOH at 95 deg C.Removing ^{137}Cs from the W-25 sludge with nitric acid was a slow process. About 13% of the ^{137}Cs was removed in 16 h with 3.0 M HNO_3. Only 22% of the ^{137}Cs was removed in 117 h usi 6.0 M HNO_3. Successive leaching of sludge solids with 0.5 M, 3.0 M, 3.0 M; and 6.0 M HNO_3 for a total mixing time of 558 h removed 84% of the ^{137}Cs. The use of caustic leaching prior to HNO_3 leaching, and the use of HF with HNO_3 in acidic leaching, increased the rate of ^{137}Cs dissolution. (Abstract truncated)

473
(ORNL/CP–94912)
Cesium removal from high-pH, high-salt wastwater using crystalline silicotitanate sorbent. Walker, J.F. Jr.; Taylor, P.A.; Lee, D.D. Oak Ridge National Lab., TN (United States). 1997. 23p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-9710103–: 10. symposium on separation science and technology for energy applications, Gatlinburg, TN (United States), 20-24 Oct 1997). Order Number DE98001055. Source: OSTI; NTIS; GPO Dep.

Treatment and disposal options for Department of Energy (DOE) underground storage tank waste at Hanford, Savannah River, and Oak Ridge National Laboratory (ORNL) are limited by high gamma radiation fields that are produced by high concentrations of cesium in the waste. Treatment methods are needed to remove the cesium from the liquid waste and thus concentrate the cesium into high-activity, remote-handled waste forms. The treated liquids could then be processed and disposed of by more cost-effective means with less radiation exposure to workers. A full-scale demonstration of one cesium removal technology is currently being conducted at ORNL. This demonstration utilizes a modular, mobile ion-exchange system and existing facilities for the off-gas system, secondary containment, and utilities. The ion-exchange material, crystalline silicotitanate (CST), was chosen on the basis of its effectiveness in laboratory tests. The CST, which was developed through a Cooperative Research and Development Agreement between DOE and private industry, has several advantages over current organic ion-exchange technologies. These advantages include (1) the ability to remove cesium in the presence of high concentrations of potassium, (2) a high affinity for cesium in both alkaline and acidic conditions, (3) physical stability over wide alkaline and acidic ranges, and (4) the elimination of large volumes of secondary waste required for regeneration of organic ion exchangers. Approximately 100,000 L of wastewater will be processed during the demonstration. The wastewater being processed has a high salt content, about 4 M $NaNO_3$, and a pH of 12 to 13. This paper discusses the results of the full-scale demonstration and compares these results with data from the laboratory tests.

474
(ORNL/CP–94960)
Magnetic-seeding filtration. Ying, T.Y. (Georgia Institute of Technology, Atlanta, GA (United States). School of Civil and Environmental Engineering); Chin, C.J.; Lu, S.C.; Yiacoumi, S. Oak Ridge National Lab., TN (United States). Oct 1997. 32p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-9710103–: 10. symposium on separation science and technology for energy applications, Gatlinburg, TN (United States), 20-24 Oct 1997). Order Number DE98001054. Source: OSTI; NTIS; INIS; GPO Dep.

Magnetic-seeding filtration consists of two steps: heterogeneous particle flocculation of magnetic and nonmagnetic particles in a stirred tank and high-gradient magnetic filtration (HGMF). The effects of various parameters affecting magnetic-seeding filtration (HGMF). The effects of various parameters affecting magnetic seeding filtration are theoretically and experimentally investigated. A trajectory model that includes hydrodynamic resistance, van der Waals, and electrostatic forces is developed to calculate the flocculation frequency in a turbulent-shear regime. Fractal dimension is introduced to simulate the open structure of aggregates. A magnetic-filtration model that consists of trajectory analysis, a particle build-up model, a breakthrough model, and a bivariate population-balance model is developed to predict the breakthrough curve of magnetic-seeding filtration. A good agreement between modeling results and experimental data is obtained. The results show that the model developed in this study can be used to predict the performance of magnetic-seeding filtration without using empirical coefficients or fitting parameters. 35 refs., 7 figs., 1 tab.

475
(ORNL/CP–94962)
Distillation under electric fields. Shah, V.M. (Univ. of Tennessee, Knoxville, TN (United States). Chemical Engineering Dept.); Blankenship, K.D.; Tsouris, C. Oak Ridge National Lab., TN (United States). 1997. 24p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-9710103–: 10. symposium on separation science and technology for energy applications, Gatlinburg, TN (United States), 20-24 Oct 1997). Order Number DE98001053. Source: OSTI; NTIS; GPO Dep.

Distillation Is the most common separation process used in the chemical and petroleum industry. Major limitations in the applicability and efficiency of distillation come from thermodynamic equilibria, that is, vapor-liquid equilibria (VLE), and heat and mass transfer rates. In this work, electric fields are used to manipulate the VLE of mixtures. VLE experiments are performed for various binary mixtures in the presence of electric fields on the order of a few kilovolts per centimeter. The results show that the VLE is changed by electric fields, with changes in the separation factor as high as 10% being observed. Batch distillation experiments are also carried out for binary mixtures of 2-propanol and water with and without an applied electric field. Results show enhanced distillation rates and separation efficiency in the presence of an electric field but decreased separation enhancement when the electric current is increased. The latter phenomenon is caused by the formation at the surface of the liquid mixture of microdroplets that are entrained by the vapor. These observations suggest that there should be an

electric field strength for each system for which the separation enhancement is maximum.

476
(ORNL/CP–95082)
Topographical mapping system for radiological and hazardous environments acceptance testing. Armstrong, G.A. (Oak Ridge National Lab., TN (United States)); Dochat, G.R. Oak Ridge National Lab., TN (United States). [1997]. 14p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464 ; AC05-84OR21400. (CONF-971086–: SPIE's intelligent systems and advanced manufacturing symposium: microrobotics and microsystem fabrication conference, Pittsburgh, PA (United States), 14-17 Oct 1997). Order Number DE98000800. Source: OSTI; NTIS; INIS; GPO Dep.

During the summer of 1996, the Topographical Mapping System (TMS) for hazardous and radiological environments and its accompanying three-dimensional (3-D) visualization tool, the Interactive Computer-Enhanced Remote-Viewing System (ICERVS), were delivered to Oak Ridge National Laboratory (ORNL). ORNL and Mechanical Technology, Inc., performed final acceptance testing of the TMS during the next eight months. The TMS was calibrated and characterized during this period. This paper covers the calibration, characterization, and acceptance testing of the TMS. Development of the TMS and ICERVS was initiated by the US Department of Energy (DOE) for the purpose of characterization and remediation of underground storage tanks (USTs) at DOE sites across the country. DOE required a 3-D, topographical mapping system suitable for use in hazardous and radiological environments. The intended application is the mapping of the interior of USTs as part of DOE's waste characterization and remediation efforts and to obtain baseline data on the content of the storage tank interiors as well as data on changes in the tank contents and levels brought about by waste remediation steps. Initially targeted for deployment at the Hanford Washington site, the TMS is designed to be a self-contained, compact, and reconfigurable system that is capable of providing rapid, variable-resolution mapping information in poorly characterized workspaces with a minimum of operator intervention.

477
(ORNL/CP–95423)
Advanced hydraulic fracturing methods to create in situ reactive barriers. Murdoch, L. (FRX Inc., Cincinnati, OH (United States)); Siegrist, B.; Meiggs, T. Oak Ridge National Lab., TN (United States). 1997. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-970208–: International containment technology conference and exhibition, St. Petersburg, FL (United States), 9-12 Feb 1997). Order Number DE98001942. Source: OSTI; NTIS; INIS; GPO Dep.

This article describes the use of hydraulic fracturing to increase permeability in geologic formations where in-situ remedial action of contaminant plumes will be performed. Several in-situ treatment strategies are discussed including the use of hydraulic fracturing to create in situ redox zones for treatment of organics and inorganics. Hydraulic fracturing methods offer a mechanism for the in-situ treatment of gently dipping layers of reactive compounds. Specialized methods using real-time monitoring and a high-energy jet during fracturing allow the form of the fracture to be influenced, such as creation of assymmetric fractures beneath potential sources (i.e. tanks, pits, buildings) that should not be penetrated by boring. Some examples of field applications of this technique such as creating fractures filled with zero-valent iron to reductively dechlorinate halogenated hydrocarbons, and the use of granular activated carbon to adsorb compounds are discussed.

478
(ORNL/CP–95593)
Real-time, automated characterization of surfaces for alpha and beta radiation. Egidi, P.V. (Oak Ridge National Lab., Grand Junction, CO (United States). Environmental Technology Section); Flynn, C.R.; Blair, M.S.; Selfridge, R.J. Oak Ridge National Lab., Grand Junction, CO (United States). [1997]. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-971222–: Exchange 1997, Miami, FL (United States), 4 Dec 1997). Order Number DE98001926. Source: OSTI; NTIS; INIS; GPO Dep.

A new data collection system, called ABACUS™, has been developed that automates and expedites the collection, conversion, and reporting of radiological survey data of surfaces. Field testing of the system by Oak Ridge National Laboratory/Environmental Technology Section is currently underway. Preliminary results are presented. The system detects, discriminates, and separately displays the results for alpha and beta contamination scans on floors and walls with a single pass. Fixed-position static counting is also possible for quantitative measuring. The system is currently configured with five 100 cm^2 dual-phosphor plastic scintillation detectors mounted in a lightweight aluminum fixture that holds the detectors in a fixed array. ABACUS™ can be configured with other detectors if desired. Ratemeter/scalars traditionally coupled to individual detectors have been replaced by a single unit that houses the power supply and discriminator circuit boards to support up to five detectors. The system is designed to be used by a single operator. Each detector's position and data are transmitted once per second and recorded on a nearby laptop computer. The data are converted to appropriate units, color-coded, and mapped to display graphically the findings for each detector in real-time. Reports can be generated immediately following the survey. Survey data can be exported in a variety of formats. Benefits of ABACUS™ are: (1) immediate feedback to decision makers using the observational approach to characterization or remediation, (2) thorough documentation of survey results, (3) increased statistical confidence in scans by recording counts every second, (4) reduced paperwork and elimination of transcription errors, and (5) time and cost savings for collection, conversion, mapping, evaluating, and reporting data over traditional methods.

479
(ORNL/CP–95756)
Technological and economic update on the nitrate to ammonia and ceramic process. Mattus, A.J. Oak Ridge National Lab., Chemistry Div., TN (United States). May 1998. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980905–: SPECTRUM '98: nuclear and hazardous waste management international topical meeting, Denver, CO (United States), 13-18 Sep

1998). Order Number DE98001903. Source: OSTI; NTIS; INIS; GPO Dep.

The Nitrate to Ammonia and Ceramic (NAC) process, which was developed several years ago at the Oak Ridge National Laboratory (ORNL), still remains relatively unknown. This is despite its simplicity in converting nitrate or nitrite to ammonia gas at high efficiency while forming a very useful hydrated alumina-based solid that binds most metals and nonmetals. Two recent Department of Energy (DOE)-contracted total life-cycle cost analyses, related to treating nitrate-based wastes at Hanford, Savannah River, and Oak Ridge, have shown that the NAC technology is only one-third to one-fourth the cost of vitrification, electroreduction, steam reforming, and plasma arc.

480

(ORNL/CP–96319)

Mixed Waste Focus Area Mercury Working Group: An integrated approach to mercury waste treatment and disposal. Conley, T.B.; Morris, M.I.; Osborne-Lee, I.W. Oak Ridge National Lab., TN (United States). Jan 1998. 15p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980307–: Waste management '98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98004116. Source: OSTI; INIS; NTIS; GPO Dep.

In May 1996, the US Department of Energy (DOE) Mixed Waste Focus Area (MWFA) initiated the Mercury Working Group (HgWG). The HgWG was established to address and resolve the issues associated with mercury contaminated mixed wastes. During the MWFA's initial technical baseline development process, three of the top four technology deficiencies identified were related to the need for amalgamation, stabilization, and separation removal technologies for the treatment of mercury and mercury contaminated mixed waste. The HgWG is assisting the MWFA in soliciting, identifying, initiating, and managing efforts to address these areas. The focus of the HgWG is to better establish the mercury related treatment technologies at the DOE sites, refine the MWFA technical baseline as it relates to mercury treatment, and make recommendations to the MWFA on how to most effectively address these needs. Based on the scope and magnitude of the mercury mixed waste problem, as defined by HgWG, solicitations and contract awards have been made to the private sector to demonstrate both the amalgamation and stabilization processes using actual mixed wastes. Development efforts are currently being funded that will address DOE's needs for separation removal processes. This paper discusses the technology selection process, development activities, and the accomplishments of the HgWG to date through these various activities.

481

(ORNL/CP–96394)

Removal of chlorinated and non-chlorinated alkanes in a trickle-bed biofilter. Klasson, K.T.; Davison, B.H.; Barton, J.W.; Jacobs, J.E. Oak Ridge National Lab., TN (United States). Jan 1998. 15p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980632–: 91. annual meeting and exhibition of the Air and Waste Management Association, San Diego, CA (United States), 14-19 Jun 1998). Order Number DE98004265. Source: OSTI; NTIS; GPO Dep.

Increasing restrictions in emissions from a variety of industrial settings demand low cost removal of dilute contaminants in air. Many of these contaminants such as volatile organic components (VOCs) and sulfur compounds are biodegradable and can be removed from air streams via biofiltration. The simplest form of biofiltration consists of compost-based systems. More advanced systems designed for unique contaminants are biofilters with bioactive structured packing operating in trickle-bed mode. These advanced systems rely on a microbial consortium capable of degrading the contaminants of concern and the consortium usually is isolated or enriched from a more complex microbial mixture. This paper describes the use of a trickle-bed reactor seeded with a microbial consortium enriched from a methanotrophic culture. The microbial consortium has been found to degrade chlorinated alkanes as the sole carbon source. Degradation rates of alkane mixtures are presented for the trickle-bed as well as results from batch cultures experiments designed to study degradation of various chlorinated and non-chlorinated VOCs.

482

(ORNL/CP–96463)

Development and testing of spheroidal inorganic sorbents. Collins, J.L.; Anderson, K.K. Oak Ridge National Lab., TN (United States). 29 Jan 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE Office of Energy Research, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980335–: Efficient separations and processing crosscutting program technical exchange meeting, Augusta, GA (United States), 17-19 Mar 1998). Order Number DE98004055. Source: OSTI; NTIS; INIS; GPO Dep.

The general objectives of this task are to develop, prepare, and test spheroidal inorganic ion exchangers made by the HMTA (hexamethylenetetramine) internal gelation process to remove radionuclides and heavy metals from waste streams occurring at the various DOE sites. Inorganic ion-exchange materials, such as sodium silicotitanate, sodium titanate, ammonium molybdeophosphate, phosphotungstic acid, hexacyanoferrates, titanium monohydrogen phosphate, hydrous titanium oxide, polyantimonic acid, magnesium oxide, etc. have high selectivities and efficiencies for separating and removing radionuclides (e.g., cesium, strontium, technetium, iodine, europium, cerium, ruthenium, and zirconium), actinides, and other elements (such as lead, mercury, silver, nickel, zinc, chromium, and fluoride) from aqueous waste streams. The development of cesium specific spherical sorbents for treatment of acidic, high-salt waste solutions was initiated in FY 1998. Acid-side treatment is important at INEEL and could become important if acidic sludge washing were to become a treatment option at Hanford, Savannah River, or Oak Ridge. Zirconium monohydrogen phosphates (ZrHP) embedded with ammonium molybdophosphate (AMP) was the cesium selective inorganic sorbent chosen for making microspheres. AMP is known to be a very effective sorbent for removing cesium from waste streams over a wide range of acidity and salinity, and it has very rapid loading kinetics. The cesium can also be eluted from AMP with ammonium salt solutions. AMP cannot be used as a sorbent at pHs above 7 because it decomposes. In the pH range of 1 to 7, ZrHP is also a very effective sorbent for removing Cs, Sr, Th, U(VI), Pu(IV), AM(III), Hg, and Pb from streams of lower ionic concentrations.

483
(ORNL/CP–96538)
Reprocessing of Shallow Seismic Reflection Data to Image Faults Near a Hazardous Waste Site on the Oak Ridge Reservation, Tennessee. Doll, W.E. Oak Ridge National Lab., TN (United States). 1997. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980336–: Symposium on application of geophysics to engineering and environmental problems, Chicago, IL (United States), 22-26 Mar 1998). Order Number DE98004121. Source: OSTI; NTIS; GPO Dep.

Shallow seismic reflection data from Bear Creek Valley on the Oak Ridge Reservation demonstrates that spectral balancing and tomographic refraction statics can be important processing tools for shallow seismic data. At this site, reprocessing of data which had previously yielded no usable CMP stacked sections was successful after application of these processing techniques.

484
(ORNL/CP–97018)
Fission product solvent extraction. Moyer, B.A. (and others); Bonnesen, P.V.; Sachleben, R.A. Oak Ridge National Lab., TN (United States);Argonne National Lab., IL (United States);Pacific Northwest National Lab., Richland, WA (United States);Lockheed Martin Idaho Technologies Co., Idaho National Engineering and Environmental Lab., Idaho Falls, ID (United States). Feb 1998. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464 ; W-31109-ENG-38 ; AC06-76RL01830 ; AC07-94ID13223. (CONF-980335–: Efficient separations and processing crosscutting program technical exchange meeting, Augusta, GA (United States), 17-19 Mar 1998). Order Number DE98003392. Source: OSTI; NTIS; INIS; GPO Dep.

Two main objectives concerning removal of fission products from high-level tank wastes will be accomplished in this project. The first objective entails the development of an acid-side Cs solvent-extraction (SX) process applicable to remediation of the sodium-bearing waste (SBW) and dissolved calcine waste (DCW) at INEEL. The second objective is to develop alkaline-side SX processes for the combined removal of Tc, Cs, and possibly Sr and for individual separation of Tc (alone or together with Sr) and Cs. These alkaline-side processes apply to tank wastes stored at Hanford, Savannah River, and Oak Ridge. This work exploits the useful properties of crown ethers and calixarenes and has shown that such compounds may be economically adapted to practical processing conditions. Potential benefits for both acid- and alkaline-side processing include order-of-magnitude concentration factors, high rejection of bulk sodium and potassium salts, and stripping with dilute (typically 10 mM) nitric acid. These benefits minimize the subsequent burden on the very expensive vitrification and storage of the high-activity waste. In the case of the SRTALK process for Tc extraction as pertechnetate anion from alkaline waste, such benefits have now been proven at the scale of a 12-stage flowsheet tested in 2-cm centrifugal contactors with a Hanford supernatant waste simulant. SRTALK employs a crown ether in a TBP-modified aliphatic kerosene diluent, is economically competitive with other applicable separation processes being considered, and has been successfully tested in batch extraction of actual Hanford double-shell slurry feed (DSSF).

485
(ORNL/CP–97092)
Completion of the Radioactive Materials Packaging Handbook. Shappert, L.B. Oak Ridge National Lab., TN (United States). Feb 1998. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980507–: PATRAM ’98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98004984. Source: OSTI; NTIS; INIS; GPO Dep.

The Radioactive Materials Packaging Handbook: Design, Operation and Maintenance, which will serve as a replacement for the Cask Designers Guide (Shappert, 1970), has now been completed and submitted to the Oak Ridge National Laboratory (ORNL) electronics publishing group for layout and printing; it is scheduled to be printed in late spring 1998. The Handbook, written by experts in their particular fields, is a compilation of technical chapters that address the design aspects of a package intended for transporting radioactive material in normal commerce; it was prepared under the direction of M. E. Wangler of the US Department of Energy (DOE) and is intended to provide a wealth of technical guidance that will give designers a better understanding of the regulatory approval process, preferences of regulators on specific aspects of package design, and the types of analyses that should be considered when designing a package to carry radioactive materials.

486
(ORNL/CP–97102)
Predictive mathematical modeling of trickling bed biofilters for elucidating mass transfer and kinetic effects. Barton, J.W.; Zhang, X.S.; Klasson, K.T.; Davison, B.H. Oak Ridge National Lab., TN (United States). Mar 1998. 23p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). (CONF-980632–: 91. annual meeting and exhibition of the Air and Waste Management Association, San Diego, CA (United States), 14-19 Jun 1998). Order Number DE98004893. Source: OSTI; NTIS; GPO Dep.

Mathematical models of varying complexity have been proposed in the open literature for describing uptake of volatile organics in trickling bed biofilters. Many simpler descriptions yield relatively accurate solutions, but are limited as predictive tools by numerous assumptions which decrease the utility of the model. Trickle bed operation on the boundary between mass transfer and kinetic limitation regimes serves as one example in which these models may be insufficient. One-dimensional models may also fail to consider important effects/relationships in multiple directions, limiting their usefulness. This paper discusses the use of a predictive, two-dimensional mathematical model to describe microbial uptake, diffusion through a biofilm, and mass transfer of VOCs from gas to liquid. The model is validated by experimental data collected from operating trickle-bed bioreactors designed for removing sparingly soluble gaseous contaminants. Axial and radial (biofilm) concentration profiles are presented, along with validation results. Operation in regimes in which both mass transfer and kinetic factors play significant roles are discussed, along with predictive modeling implications.

487
(ORNL/CP–97105)
Certification testing for the ES-2 shipping package. Feldman, M.R. (Lockheed Martin Energy Systems, Inc., Oak Ridge, TN (United States)); Byington, G.A.; Handy, K.D.; Shappert, L.B.; Handy, K.D.; Oaks, R.E. Jr.; Stumpfl, E. Oak Ridge National Lab., TN (United States). Feb 1998. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98004889. Source: OSTI; NTIS; INIS; GPO Dep.

The ES-2 is a multiconfiguration, Type B fissile material shipping package, designed by the Y-12 Nuclear Packaging Systems. It is unique in that a castable refractory material performs primary impact absorption and thermal insulation duties. This material, unlike the insulation often used in fissile material packages, such as Celotex and various foams, is fireproof at temperatures associated with Type B package testing (800 C). The ES-2 is designed to permit the use of three different containment vessels which can result in as many as six different configurations. Eight prototype units were manufactured and successfully tested to US Federal Regulatory Requirements.

488
(ORNL/CP–97136)
A simplified ALARA approach to demonstration of compliance with surface contaminated object regulatory requirements. Pope, R.B. (Oak Ridge National Lab., TN (United States)); Shappert, L.B.; Michelhaugh, R.D.; Boyle, R.W.; Cook, J.C. Oak Ridge National Lab., TN (United States). Feb 1998. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98004931. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Transportation (DOT) and the US Nuclear Regulatory Commission (NRC) have jointly prepared a comprehensive set of draft guidance for consignors and inspectors to use when applying the newly imposed regulatory requirements for low specific activity (LSA) material and surface contaminated objects (SCOs). The guidance is being developed to facilitate compliance with the new LSA material and SCO requirements, not to impose additional requirements. These new requirements represent, in some areas, significant departures from the manner in which packaging and transportation of these materials and objects were previously controlled. On occasion, it may be appropriate to use conservative approaches to demonstrate compliance with some of the requirements, ensuring that personnel are not exposed to radiation at unnecessary levels, so that exposures are kept as low as reasonably achievable (ALARA). In the draft guidance, one such approach would assist consignors preparing a shipment of a large number of SCOs in demonstrating compliance without unnecessarily exposing personnel. In applying this approach, users need to demonstrate that four conditions are met. These four conditions are used to categorize nonactivated, contaminated objects as SCO-2. It is expected that, by applying this approach, it will be possible to categorize a large number of small contaminated objects as SCO-2 without the need for detailed, quantitative measurements of fixed, accessible contamination, or of total (fixed and nonfixed) contamination on inaccessible surfaces. The method, which is based upon reasoned argument coupled with limited measurements and the application of a sum of fractions rule, is described and examples of its use are provided.

489
(ORNL/CP–97138)
Characterizing, for packaging and transport, large objects contaminated by radioactive material having a limited A_2 value. Pope, R.B. (Oak Ridge National Lab., TN (United States)); Shappert, L.B.; Michelhaugh, R.D.; Cash, J.M.; Best, R.E. Oak Ridge National Lab., TN (United States). Feb 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98004930. Source: OSTI; NTIS; INIS; GPO Dep.

The International Atomic Energy Agency (IAEA) Regulations for the safe packaging and transportation of radioactive materials follow a graded approach to the requirements for both packaging and controls during transport. The concept is that, the lower the risk posed to the people and the environment by the contents, (1) the less demanding are the packaging requirements and (2) the smaller in number are the controls imposed on the transport of the material. There are likely to be a great number of situations arising in coming years when large objects, contaminated with radioactive material having unlimited A_2 values will result from various decommissioning and decontamination (D and D) activities and will then require shipment from the D and D site to a disposal site. Such situations may arise relatively frequently during the cleanup of operations involving mining, milling, feedstock, and uranium enrichment processing facilities. Because these objects are contaminated with materials having an unlimited A_2 value they present a low radiological risk to worker and public safety and to the environment during transport. However, when these radioactive materials reside on the surfaces of equipment and other large objects, where the equipment and objects themselves are not radioactive, the radioactive materials appear as surface contamination and, if the contaminated object is categorized as a surface contaminated object, it would need to be packaged for shipment according to the requirements of the Regulations for SCO. Despite this categorization, alternatives may be available which will allow these contaminants, when considered by themselves for packaging and transport, to be categorized as either (1) a limited quantity of radioactive material to be shipped in an excepted package or (2) low specific activity (LSA) materials to be shipped in an IP-1 package or possibly even shipped unpackaged. These options are discussed in this paper.

490
(ORNL/CP–97154)
Transportation Routing Analysis Geographic Information System – TRAGIS, progress on improving a routing tool. Johnson, P.E. (Oak Ridge National Lab., TN (United States)); Lester, P.B. Oak Ridge National Lab., TN (United States). May 1998. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States).

DOE Contract AC05-96OR22464. (CONF-980507–: PATRAM ’98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98004927. Source: OSTI; NTIS; INIS; GPO Dep.

The Transportation Routing Analysis Geographic Information System (TRAGIS) model provides a useful tool to calculate and analyze transportation routes for radioactive materials within the continental US. This paper outlines some of the features available in this model.

491
(ORNL/CP–97224)
Global transportation cost modeling for long-range planning. Pope, R.B. (Oak Ridge National Lab., TN (United States)); Michelhaugh, R.D.; Singley, P.T.; Lester, P.B. Oak Ridge National Lab., TN (United States). Feb 1998. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980507–: PATRAM ’98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98004891. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) is preparing to perform significant remediation activities of the sites for which it is responsible. To accomplish this, it is preparing a corporate global plan focused on activities over the next decade. Significant in these planned activities is the transportation of the waste arising from the remediation. The costs of this transportation are expected to be large. To support the initial assessment of the plan, a cost estimating model was developed, peer-reviewed against other available packaging and transportation cost data, and applied to a significant number of shipping campaigns of radioactive waste. This cost estimating model, known as the Ten-year Plan Transportation Cost Model (TEPTRAM), can be used to model radioactive material shipments between DOE sites or from DOE sites to non-DOE destinations. The model considers the costs for (a) recovering and processing of the wastes, (b)packaging the wastes for transport, and (c) the carriage of the waste. It also provides a rough order of magnitude estimate of labor costs associated with preparing and undertaking the shipments. At the user’s direction, the model can also consider the cost of DOE’s interactions with its external stakeholders (e.g., state and local governments and tribal entities) and the cost associated with tracking and communicating with the shipments. By considering all of these sources of costs, it provides a mechanism for assessing and comparing the costs of various waste processing and shipping campaign alternatives to help guide decision-making. Recent analyses of specific planned shipments of transuranic (TRU) waste which consider alternative packaging options are described. These analyses show that options are available for significantly reducing total costs while still satisfying regulatory requirements.

492
(ORNL/CP–97226)
Guidance and methods for satisfying low specific activity material and surface contaminated object regulatory requirements. Pope, R.B. (Oak Ridge National Lab., TN (United States)); Shappert, L.B.; Michelhaugh, R.D.; Boyle, R.W.; Easton, E.P.; Cook, J.R. Oak Ridge National Lab., TN (United States). Feb 1998. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980507–: PATRAM ’98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98004929. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Transportation (DOT) and the US Nuclear Regulatory Commission (NRC) have prepared a comprehensive set of draft guidance for shippers and inspectors to use when applying the newly imposed regulatory requirements for low specific activity (LSA) material and surface contaminated objects (SCOs). These requirements represent significant departures in some areas from the manner in which these materials and objects were regulated by the earlier versions of the regulations. The proper interpretation and application of the regulatory criteria can require a fairly complex set of decisions be made. To assist those trying to apply these regulatory requirements, a detailed set of logic flow diagrams representing decisions related to multiple factors were prepared and included in the draft report for comment on Categorizing and Transporting Low Specific Activity Materials and Surface Contaminated Objects. These logic flow diagrams, as developed, are specific to the US regulations, but were readily adaptable to the IAEA regulations. The diagrams have been modified accordingly and tied directly to specific paragraphs in IAEA Safety Series No. 6. This paper provides the logic flow diagrams adapted to the IAEA regulations, and demonstrates how these diagrams can be used to assist consignors and inspectors in assessing compliance of shipments with the LSA material and SCO regulatory requirements.

493
(ORNL/CP–97228)
Recent experience in planning, packaging and preparing noncommercial spent fuel for shipment in the United States. Shappert, L.B. (Oak Ridge National Lab., TN (United States)); Parks, C.V.; Turner, D.W.; Aramayo, G.A. Oak Ridge National Lab., TN (United States). May 1998. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980507–: PATRAM ’98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98004928. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy-Headquarters (DOE-HQ) has issued a Record of Decision (ROD) which identified the plan to be followed in managing spent nuclear fuel (SNF) belonging to the Department. As a result, the aluminum-clad fuels stored at Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee, were directed to be shipped to the Savannah River Site (SRS) near Aiken, South Carolina. The BMI-1 cask was chosen to make the shipments of SNF from dry storage that had to be placed in canisters. However, the Certificate of Compliance (COC) for the BMI-1 cask limited the fissile material loading to 800 g of unirradiated fissile material for the cask configuration chosen. Because about half of the canisters were already filled and sealed with more fissile material than was permitted by the COC, approval to make these shipments in the BMI-1 was requested from the Nuclear Regulatory Commission (NRC). A safety analysis showed that the shipments could be made safely under the conditions identified. The waiver was granted in September 1997 and the three shipments were successfully completed in January 1998.

494
(ORNL/CP–97640)
Large-scale treatment of high-salt, high-pH wastewater for ^{137}Cs and ^{90}Sr removal, using crystalline silicotitanate resin. Taylor, P.A.; Walker, J.F.; Lee, D.D. Oak Ridge National Lab., TN (United States). Apr 1998. 17p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980905–: SPECTRUM '98: nuclear and hazardous waste management international topical meeting, Denver, CO (United States), 13-18 Sep 1998). Order Number DE98005728. Source: OSTI; NTIS; INIS; GPO Dep.

A full-scale demonstration of cesium removal technology has been conducted at Oak Ridge National Laboratory (ORNL). This demonstration utilized a modular, mobile ion-exchange system and existing facilities for the off-gas system, secondary containment, and utilities. The ion-exchange material, crystalline silicotitanate (CST), was selected on the basis of its effectiveness in laboratory tests. The CST, which was developed through a Cooperative Research and Development Agreement between DOE and private industry, is highly selective for removing cesium from solutions containing high concentrations of other contaminants, such as sodium and potassium. Approximately 116,000 liters of supernate was processed during the demonstration with ~ 1,142 Ci of ^{137}Cs removed from the supernate and loaded onto 266 liters of the CST sorbent. The supernate processed had a high salt content, about 4 M $NaNO_3$ and a pH of 12 to 13. The CST also loaded Ba, Pb, Sr, U and Zn. Analysis of the spent sorbent has shown that it is not hazardous under the Resource Conservation and Recovery Act (RCRA). The cesium breakthrough curves for the lab and full-scale columns agreed very well, suggesting that lab-scale tests can be used to predict the performance of larger systems. The cesium breakthrough curves for runs at different flowrates show that film diffusion is significant in controlling the mass transfer process. Operational factors that increase the effect of film diffusion include the small size and high porosity of the CST sorbent, and the relatively low liquid velocity through the sorbent.

495
(ORNL/CP–97827)
Grout and vitrification formula development for immobilization of hazardous radioactive tank sludges at ORNL. Gilliam, T.M.; Spence, R.D. Oak Ridge National Lab., TN (United States). [1997]. 16p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-970962–: 214. American Chemical Society meeting, Las Vegas, NV (United States), 7-13 Sep 1997). Order Number DE98003514. Source: OSTI; NTIS; INIS; GPO Dep.

Stabilization/solidification (S/S) has been identified as the preferred treatment option for hazardous radioactive sludges, and currently grouting and vitrification are considered the leading candidate S/S technologies. Consequently, a project was initiated at Oak Ridge National Laboratory (ORNL) to define composition envelopes, or operating windows, for acceptable grout and glass formulations containing Melton Valley Storage Tank (MVST) sludges. The resulting data are intended to be used as guidance for the eventual treatment of the MVST sludges by the government and/or private sector. Wastewater at ORNL is collected, evaporated, and stored in the MVSTs pending treatment for disposal. The waste separates into two phases: sludge and supernate. The sludges in the tank bottoms have been accumulating for several years and contain a high amount of radioactivity, with some classified as transuranic (TRU) sludges. The available total constituent analysis for the MVST sludge indicates that the Resource and Conservation Recovery Act (RCRA) metal concentrations are high enough to be potentially RCRA hazardous; therefore, these sludges have the potential to be designated as mixed TRU waste. S/S treatment must be performed to remove free liquids and reduce the leach rate of RCRA metals. This paper focuses on initial results for the development of the operating window for vitrification. However, sufficient data on grouting are presented to allow a comparison of the two options.

496
(ORNL/CP–98259)
Testing of low-temperature stabilization alternatives for salt containing mixed wastes – Approach and results to date. Maio, V. (Lockheed Martin Idaho Technologies Co., Idaho Falls, ID (United States)); Loomis, G.; Spence, R.D.; Smith, G.; Biyani, R.K.; Wagh, A. Oak Ridge National Lab., TN (United States). May 1998. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980905–: SPECTRUM '98: nuclear and hazardous waste management international topical meeting, Denver, CO (United States), 13-18 Sep 1998). Order Number DE98005732. Source: OSTI; NTIS; INIS; GPO Dep.

Through its annual process of identifying technology deficiencies associated with waste treatment, the Department of Energy's (DOE) Mixed Waste Focus Area (MWFA) determined that the former DOE weapons complex lacks efficient mixed waste stabilization technologies for salt containing wastes. These wastes were generated as sludge and solid effluents from various primary nuclear processes involving acids and metal finishing; and well over 10,000 cubic meters exist at 6 sites. In addition, future volumes of these problematic wastes will be produced as other mixed waste treatment methods such as incineration and melting are deployed. The current method used to stabilize salt waste for compliant disposal is grouting with Portland cement. This method is inefficient since the highly soluble and reactive chloride, nitrate, and sulfate salts interfere with the hydration and setting processes associated with grouting. The inefficiency results from having to use low waste loadings to ensure a durable and leach resistant final waste form. The following five alternatives were selected for MWFA development funding in FY97 and FY98: phosphate bonded ceramics; sol-gel process; polysiloxane; polyester resin; and enhanced concrete. Comparable evaluations were planned for the stabilization development efforts. Under these evaluations each technology stabilized the same type of salt waste surrogates. Final waste form performance data such as compressive strength, waste loading, and leachability could then be equally compared. Selected preliminary test results are provided in this paper.

497
(ORNL/CP–98272)
A life cycle analysis approach to D and D decision-making. Yuracko, K.L. (Oak Ridge National Lab., TN (United States)); Gresalfi, M.; Yerace, P.; Flora, J.; Krstich, M.; Gerrick, D. Oak Ridge National Lab., TN (United States).

May 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980905–: SPECTRUM '98: nuclear and hazardous waste management international topical meeting, Denver, CO (United States), 13-18 Sep 1998). Order Number DE98005729. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes a life cycle analysis (LCA) approach that makes decontamination and decommissioning (D and D) of US Department of Energy facilities more efficient and more responsive to the concerns of the society. With the considerable complexity of D and D projects and their attendant environmental and health consequences, projects can no longer be designed based on engineering and economic criteria alone. Using the LCA D and D approach, the evaluation of material disposition alternatives explicitly includes environmental impacts, health and safety impacts, socioeconomic impacts, and stakeholder attitudes – in addition to engineering and economic criteria. Multi-attribute decision analysis is used to take into consideration the uncertainties and value judgments that are an important part of all material disposition decisions. Use of the LCA D and D approach should lead to more appropriate selections of material disposition pathways and a decision-making process that is both understandable and defensible. The methodology and procedures of the LCA D and D approach are outlined and illustrated by an application of the approach at the Department of Energy's West Valley Demonstration Project. Specifically, LCA was used to aid decisions on disposition of soil and concrete from the Tank Pad D and D Project. A decision tree and the Pollution Prevention/Waste Minimization Users Guide for Environmental Restoration Projects were used to identify possible alternatives for disposition of the soil and concrete. Eight alternatives encompassing source reduction, segregation, treatment, and disposal were defined for disposition of the soil; two alternatives were identified for disposition of the concrete. Preliminary results suggest that segregation and treatment are advantageous in the disposition of both the soil and the concrete. This and other recent applications illustrate the strength and ease of application of the LCA D and D approach.

498

(ORNL/CP–98274)

U.S. Department of Energy National Center of Excellence for Metals Recycle. Adams, V. (Dept. of Energy, Oak Ridge, TN (United States)); Bennett, M.; Bishop, L. Oak Ridge National Lab., TN (United States). May 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980905–: SPECTRUM '98: nuclear and hazardous waste management international topical meeting, Denver, CO (United States), 13-18 Sep 1998). Order Number DE98005730. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) National Center of Excellence for Metals Recycle has recently been established. The vision of this new program is to develop a DOE culture that promotes pollution prevention by considering the recycle and reuse of metal as the first and primary disposition option and burial as a last option. The Center of Excellence takes the approach that unrestricted release of metal is the first priority because it is the most cost-effective disposition pathway. Where this is not appropriate, restricted release, beneficial reuse, and stockpile of ingots are considered. Current recycling activities include the sale of 40,000 tons of scrap metal from the East Tennessee Technology Park (formerly K-25 Plant) K-770 scrap yard, K-1064 surplus equipment and machinery, 7,000 PCB-contaminated drums, 12,000 tons of metal from the Y-l2 scrap yard, and 1,000 metal pallets. In addition, the Center of Excellence is developing a toolbox for project teams that will contain a number of specific tools to facilitate metals recycle. This Internet-based toolbox will include primers, computer programs, and case studies designed to help sites to perform life cycle analysis, perform ALARA (As Low As is Reasonably Achievable) analysis for radiation exposures, provide pollution prevention information and documentation, and produce independent government estimates. The use of these tools is described for two current activities: disposition of scrap metal in the Y-12 scrapyard, and disposition of PCB-contaminated drums.

499

(ORNL/CP–98275)

Process wastewater treatment with hydrogen-form CST and chabazite zeolite. DePaoli, S.M.; Bostick, D.T. Oak Ridge National Lab., TN (United States). May 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980905–: SPECTRUM '98: nuclear and hazardous waste management international topical meeting, Denver, CO (United States), 13-18 Sep 1998). Order Number DE98005731. Source: OSTI; INIS; NTIS; GPO Dep.

Ion-exchange materials have been investigated for the removal of radionuclides from near-neutral-pH wastewaters containing competing cations at concentrations greater than those of the targeted species. Natural chabazite zeolite was chosen as the baseline material for the removal of fission products, namely ^{90}Sr and ^{137}Cs, from wastewater and groundwater. The sorbent IONSIV® IE-911, a crystalline silicotitanate manufactured by UOP, was recently tested in this capacity and found to compare extremely well against the baseline material in removing ^{90}Sr and ^{137}Cs from process wastewater. This paper presents results of similar column tests performed using both materials, as well as results from batch experiments on actual wastewaters using IONSIV® IE-911.

500

(ORNL/CP–98301)

Separations/pretreatment considerations for Hanford privatization phase 2. Hunt, R.D.; McGinnis, C.P.; Welch, T.D. Oak Ridge National Lab., TN (United States). May 1998. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980905–: SPECTRUM '98: nuclear and hazardous waste management international topical meeting, Denver, CO (United States), 13-18 Sep 1998). Order Number DE98005746. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Focus Area is funded to develop, demonstrate, and deploy technologies that will assist in the treatment and closure of its nuclear waste tanks. Pretreatment technologies developed to support the privatization effort by the Department of Energy are reviewed. Advancements in evaporation, solid-liquid separation, sludge treatment, solids controls, sodium management, and radionuclide removal are considered.

501
(ORNL/CP–98302)
U.S. Department of Energy National Center of Excellence for Metals Recycle. Adams, V. (Dept. of Energy, Oak Ridge, TN (United States)); Bennett, M.; Bishop, L. Oak Ridge National Lab., TN (United States). Jun 1998. 13p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980654–: 14. DOE pollution prevention conference, Seattle, WA (United States), 2-4 Jun 1998). Order Number DE98005665. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) National Center of Excellence for Metals Recycle has recently been established. The vision of this new program is to develop a DOE culture that promotes pollution prevention by considering the recycle and reuse of metal as the first and primary disposition option and burial as a last option. The Center of Excellence takes the approach that unrestricted release of metal is the first priority because it is the most cost-effective disposition pathway. Where this is not appropriate, restricted release, beneficial reuse, and stockpile of ingots are considered. The Center has gotten off to a fast start. Current recycling activities include the sale of 40,000 tons of scrap metal from the East Tennessee Technology Park (formerly K-25 Plant) K-770 scrap yard, K-1064 surplus equipment and machinery, 7,000 PCB-contaminated drums, 12,000 tons of metal from the Y-12 scrap yard, and 1,000 metal pallets. In addition, the Center of Excellence is developing a toolbox for project teams that will contain a number of specific tools to facilitate metals recycle. This Internet-based toolbox will include primers, computer software, and case studies designed to help sites to perform life cycle analysis, perform ALARA (As Low As is Reasonably Achievable) analysis for radiation exposures, produce pollution prevention information and documentation, manage their materials inventory, produce independent government estimates, and implement sale/service contracts. The use of these tools is described for two current activities: disposition of scrap metal in the Y-12 scrap yard, and disposition of PCB-contaminated drums. Members of the Center look forward to working with all DOE sites, regulatory authorities, the private sector, and other stakeholders to achieve the metals recycle goals.

502
(ORNL/CP–98304)
Gunite and associated tanks remediation project recycling and waste minimization effort. Van Hoesen, S.D.; Saunders, A.D. Oak Ridge National Lab., TN (United States). May 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980654–: 14. DOE pollution prevention conference, Seattle, WA (United States), 2-4 Jun 1998). Order Number DE98005666. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy's Environmental Management Program at Oak Ridge National Laboratory has initiated clean up of legacy waste resulting from the Manhattan Project. The gunite and associated tanks project has taken an active pollution prevention role by successfully recycling eight tons of scrap metal, reusing contaminated soil in the Area of Contamination, using existing water (supernate) to aid in sludge transfer, and by minimizing and reusing personal protective equipment (PPE) and on-site equipment as much as possible. Total cost savings for Fiscal Year 1997 activities from these efforts are estimated at $4.2 million dollars.

503
(ORNL/CP–98309)
Large underground radioactive waste storage tanks successfully cleaned at Oak Ridge National Laboratory. Billingsley, K. (Solutions to Environmental Problems, Inc., Oak Ridge, TN (United States)); Burks, B.L.; Johnson, M.; Mims, C.; Powell, J.; Hoesen, D. van. Oak Ridge National Lab., TN (United States). May 1998. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE Office of Financial Management and Controller, Washington, DC (United States). DOE Contract AC05-98OR22700. (CONF-980905–: SPECTRUM '98: nuclear and hazardous waste management international topical meeting, Denver, CO (United States), 13-18 Sep 1998). Order Number DE98005748. Source: OSTI; NTIS; INIS; GPO Dep.

Waste retrieval operations were successfully completed in two large underground radioactive waste storage tanks in 1997. The US Department of Energy (DOE) and the Gunite Tanks Team worked cooperatively during two 10-week waste removal campaigns and removed approximately 58,300 gallons of waste from the tanks. About 100 gallons of a sludge and liquid heel remain in each of the 42,500 gallon tanks. These tanks are 25 ft. in diameter and 11 ft. deep, and are located in the North Tank Farm in the center of Oak Ridge National Laboratory. Less than 2% of the radioactive contaminants remain in the tanks, proving the effectiveness of the Radioactive Tank Cleaning System, and accomplishing the first field-scale cleaning of contaminated underground storage tanks with a robotic system in the DOE complex.

504
(ORNL/CP–98424)
Impact analysis of stainless steel spent fuel canisters. Aramayo, G.A. (Oak Ridge National Lab., TN (United States)); Turner, D.W. Oak Ridge National Lab., TN (United States). Apr 1998. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. (CONF-980708–: 1998 ASME/JSME joint pressure vessel and piping (PVP) conference, San Diego, CA (United States), 26-30 Jul 1998). Order Number DE98005771. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents the results of the numerical analysis performed to asses the structural integrity of spent nuclear fuel (SNF) stainless steel canisters when subjected to impact loads associated with free gravity drops from heights not exceeding 20 ft. The SNF canisters are to be used for the Shipment of radioactive material from the Oak Ridge National Laboratory (ORNL) Site to the Idaho National Engineering and Environmental Laboratory (INEEL) for storage. The Idaho chemical Processing Plant Fuel Receipt Criteria Questionnaire requires that the vertical drop accidents from two heights be analyze. These heights are those that are considered to be critical at the time of unloading the canisters from the shipping cask. The configurations analyzed include a maximum payload of 90 lbs dropping from heights of 20 and 3 ft. The nominal weight of the canister is 23.3 lbs. The analysis has been performed using finite element methods. Innovative analysis techniques are used to capture the effects of failure and separation of canister components.

The structural integrity is evaluated in terms of physical deformation and separation of the canister components that may result from failure of components at selected interfaces.

505
(ORNL/CP–98899)
Caustic leaching of high-level radioactive tank sludge: A critical literature review. McGinnis, C.P.; Welch, T.D.; Hunt, R.D. Oak Ridge National Lab., TN (United States). [1997]. [50p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-9710103–: 10. symposium on separation science and technology for energy applications, Gatlinburg, TN (United States), 20-24 Oct 1997). Order Number DE99000367. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) must treat and safely dispose of its radioactive tank contents, which can be separated into high-level waste (HLW) and low-level waste (LLW) fractions. Since the unit costs of treatment and disposal are much higher for HLW than for LLW, technologies to reduce the amount of HLW are being developed. A key process currently being studied to reduce the volume of HLW sludges is called enhanced sludge washing (ESW). This process removes, by water washes, soluble constituents such as sodium salts, and the washed sludge is then leached with 2–3 M NaOH at 60–100 C to remove nonradioactive metals such as aluminum. The remaining solids are considered to be HLW while the solutions are LLW after radionuclides such as ^{137}Cs have been removed. Results of bench-scale tests have shown that the ESW will probably remove the required amounts of inert constituents. While both experimental and theoretical results have shown that leaching efficiency increases as the time and temperature of the leach are increased, increases in the caustic concentration above 2–3 M will only marginally improve the leach factors. However, these tests were not designed to validate the assumption that the caustic used in the ESW process will generate only a small increase (10 Mkg) in the amount of LLW; instead, the test conditions were selected to maximize leaching in a short period and used more water and caustic than is planned during full-scale operations. Even though calculations indicate that the estimate for the amount of LLW generated by the ESW process appears to be reasonable, a detailed study of the amount of LLW from the ESW process is still required. If the LLW analysis indicates that sodium management is critical, then a more comprehensive evaluation of the clean salt process or caustic recycle would be needed. Finally, experimental and theoretical studies have clearly demonstrated the need for the control of solids formation during and after leaching.

506
(ORNL/ER–297/R2)
Inactive tanks remediation program strategy and plans for Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States); STEP, Inc., Oak Ridge, TN (United States). Nov 1997. 34p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98001276. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents plans and strategies for remediation of the liquid low-level waste (LLLW) tanks that have been removed from service (also known as inactive tanks) at Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee. These plans and strategies will be carried out by the Environmental Restoration Program's Inactive LLLW Tank Program at ORNL. The approach to remediation of each tank or tank farm must be adapted in response to the specific circumstances of individual tank sites. The approach will be tailored to accommodate feedback on lessons learned from previous tank remediation activities and will not be a rigid step-by-step approach that must be conducted identically for every tank system. However, the approach will follow a multistep decision process. The overall objective of the Inactive Tank Program is to remediate all LLLW tanks that have been removed from service to the extent practicable in accordance with the FFA requirements. The Inactive Tank Program will focus on the remediation of the tank residues and tank shell. This strategy is discussed in detail in this report.

507
(ORNL/ER–326/R1)
Environmental health and safety plan for the Molten Salt Reactor Experiment Remediation Project at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Burman, S.N.; Tiner, P.F.; Gosslee, R.C. Oak Ridge National Lab., TN (United States). Jan 1998. [200p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98003280. Source: OSTI; NTIS; INIS; GPO Dep.

The Lockheed Martin Energy Systems, Inc. (Energy Systems) policy is to provide a safe and healthful workplace for all employees and subcontractors. The accomplishment of this policy requires that operations at the Molten Salt Reactor Experiment (MSRE) facility at the Department of Energy (DOE) Oak Ridge National Laboratory (ORNL) are guided by an overall plan and consistent proactive approach to environmental protection and safety and health (S and H) issues. The policy and procedures in this plan apply to all MSRE operations. The provisions of this plan are to be carried out whenever activities are initiated at the MSRE that could be a threat to human health or the environment. This plan implements a policy and establishes criteria for the development of procedures for day-to-day operations to prevent or minimize any adverse impact to the environment and personnel safety and health and to meet standards that define acceptable management of hazardous and radioactive materials and wastes. The plan is written to utilize past experience and the best management practices to minimize hazards to human health or the environment from events such as fires, explosions, falls, mechanical hazards, or any unplanned release of hazardous or radioactive materials to the air.

508
(ORNL/ER–336/R1)
Quality assurance plan for the molten salt reactor experiment Remediation Project at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States). Feb 1998. 60p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98004146. Source: OSTI; NTIS; INIS; GPO Dep.

This Quality Assurance Plan (QAP) identifies and describes the systems utilized by Molten Salt Reactor Experiment (MSRE) Remediation Project personnel to implement the requirements and associated applicable guidance contained in the Quality Program Description, Y/QD-15 Rev. 2

(Martin Marietta Energy Systems, Inc., 1995) and Environmental Management and Enrichment Facilities Work Smart Standards. This QAP defines the quality assurance (QA) requirements applicable to all activities and operations in and directly pertinent to the MSRE Remediation Project. This QAP will be periodically reviewed, revised, and approved as necessary. This QAP identifies and describes the QA activities and procedures implemented by the various Oak Ridge National Laboratory support organizations and personnel to provide confidence that these activities meet the requirements of this project. Specific support organization (Division) quality requirements, including the degree of implementation of each, are contained in the appendixes of this plan.

509
(ORNL/ER–375/R1)
Project management plan for Waste Area Grouping 5 Old Hydrofracture Facility tanks contents removal at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States); CDM Federal Programs Corp., Oak Ridge, TN (United States). Feb 1998. 26p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98003100. Source: OSTI; NTIS; INIS; GPO Dep.

This revision (Rev. 1) updates the schedule and designation of responsibilities for the Old Hydrofracture Facility (OHF) tanks contents removal project. Ongoing and planned future activities include: cold testing of the sluicing and pumping system; readiness assessment; equipment relocation and assembly; isotopic dilution of fissile radionuclides; sluicing and transfer of the tanks contents; and preparation of the Removal Action Completion Report. The most significant change is that the sluicing and pumping system has been configured by and will be operated by CDM Federal Programs Corporation. In addition, a new technical lead and a new project analyst have been designated within Lockheed Martin Energy Systems, Inc. and Lockheed Martin Energy Research Corp. The schedule for tanks contents removal has been accelerated, with transfer of the final batch of tank slurry now scheduled for March 31, 1998 (instead of November 10, 1998). The OHF sluicing and pumping project is proceeding as a non-time-critical removal action under the Comprehensive Environmental Response, Compensation, and Liability Act. The purpose of the project is to remove the contents from five inactive underground storage tanks, designated T-1, T-2, T-3, T-4, and T-9. The tanks contain an estimated 52,700 gal of liquid and sludge, together comprising a radioactive inventory of approximately 30,000 Ci.

510
(ORNL/ER–404)
Technical safety requirments for the South Tank Farm Remediation Project, Oak Ridge National Laboratory, Oak Ridge, Tennessee. Platfoot, J.H. Oak Ridge National Lab., TN (United States). Feb 1998. 41p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98004147. Source: OSTI; NTIS; INIS; GPO Dep.

The South Tank Farm (STF) is a series of six, 170,000-gal underground, domed storage tanks that were placed into service in 1943. The tanks were constructed of a concrete mixture known as gunite. They were used as a portion of the Liquid LOW-LEVEL WASTE (LLLW) System for the collection, neutralization, storage, and transfer of the aqueous portion of the radioactive and/or hazardous chemical wastes produced as part of normal facility operations at Oak Ridge National Laboratory (ORNL). Although the last of the tanks was taken out of service in 1986, they have been shown by structural analysis to continue to be structurally sound. An attempt was made in 1983 to empty the tanks; however, removal of all the sludge from the tanks was not possible with the equipment and schedule available. Since removal of the liquid waste in 1983, liquid continues to accumulate within the tanks. The in-leakage is believed to be the result of groundwater dripping into the tanks around penetrations in the domes. The tanks are currently being maintained under a Surveillance and Maintenance Program, which includes activities such as level monitoring, vegetation control, High Efficiency Particulate Air filter leakage requirement testing/replacement, sign erection/repair, pump-out of excessive liquids, and instrument calibration/maintenance.

511
(ORNL/ER–404/R1)
Technical safety requirements for the South Tank Farm remediation project, Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States). May 1998. 53p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-98OR22700. Order Number DE98005542. Source: OSTI; NTIS; INIS; GPO Dep.

The South Tank Farm (STF) is a series of six, 170,000-gal underground, domed storage tanks that were placed into service in 1943. The tanks were constructed of a concrete mixture known as gunite. They were used as a portion of the liquid low-level waste (LLLW) system for the collection, neutralization, storage, and transfer of the aqueous portion of the radioactive and/or hazardous chemical wastes produced as part of normal facility operations at Oak Ridge National Laboratory (ORNL). Although the last of the tanks was taken out of service in 1986, they have been shown by structural analysis to continue to be structurally sound. An attempt was made in 1983 to empty the tanks; however, removal of all the sludge from the tanks was not possible with the equipment and schedule available. Since removal of the liquid waste in 1983, liquid continues to accumulate within the tanks. The in-leakage is believed to be the result of groundwater dripping into the tanks around penetrations in the domes. The tanks are currently being maintained under a Surveillance and Maintenance Program, which includes activities such as level monitoring, vegetation control, High Efficiency Particulate Air filter leakage requirement testing/replacement, sign erection/repair, pump-out of excessive liquids, and instrument calibration/maintenance. These tanks are to undergo remediation and clean-up using sludge removal techniques and equipment planned for use in other waste storage tanks throughout the US DOE complex. The technical safety requirements are those operational requirements that specify the operating limits and surveillance requirements, the basis thereof, safety boundaries, and the management or administrative controls necessary to ensure the safe operation of the STF remediation project.

512
(ORNL/ER–412/R1)
Sampling and analysis plan for the gunite and associated tanks interim remedial action, wall coring and scraping at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States).

Feb 1998. 21p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98003099. Source: OSTI; NTIS; INIS; GPO Dep.

This Sampling and Analysis Plan documents the procedures for collecting and analyzing wall core and wall scraping samples from the Gunite and Associated Tanks. These activities are being conducted to support the Comprehensive Environmental Response, Compensation, and Liability Act at the gunite and associated tanks interim remedial action at Oak Ridge National Laboratory in Oak Ridge, Tennessee. The sampling and analysis activities will be performed in concert with sludge retrieval and sluicing of the tanks. Wall scraping and/or wall core samples will be collected from each quadrant in each tank by using a scraping sampler and/or a coring drill deployed by the Houdini robot vehicle. Each sample will be labeled, transported to the Radioactive Materials Analytical Laboratory, and analyzed for physical and radiological characteristics, including total activity, gross alpha, gross beta, radioactive strontium and cesium, and other alpha- and gamma-emitting radionuclides. The data quality objectives process, based on US Environmental Protection Agency guidance, was applied to identify the objectives of this sampling and analysis. The results of the analysis will be used to (1) validate predictions of a strontium concrete diffusion model, (2) estimate the amount of radioactivity remaining in the tank shells, (3) provide information to correlate with measurements taken by the Gunite Tank Isotope Mapping Probe and the Characterization End Effector, and (4) estimate the performance of the wall cleaning system. This revision eliminates wall-scraping samples from all tanks, except Tank W-3. The Tank W-3 experience indicated that the wall scrapper does not collect sufficient material for analysis.

513

(ORNL/ER–421)

Dry well conductivity monitoring report for Tanks W-8, W-9, and W-10, Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States); Vista Research, Inc., Mountain View, CA (United States). Oct 1997. 22p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98000608. Source: OSTI; NTIS; INIS; GPO Dep.

A treatability study and waste removal program are being implemented for the Gunite ad Associated Tanks Operable Unit at Oak Ridge National Laboratory, Oak Ridge, Tennessee. This report documents the instrumentation and monitoring efforts to establish baseline conductivity conditions. The simulated liquid release (SLR) testing reported here demonstrates the effectiveness of the Conductivity-monitoring method (CMM) as a liquid-release detection method for consolidation Tanks W-8 and W-9 and Tank W-10 in the South Tank Farm (STF). The results show the remarkable sensitivity of the CMM to even very small simulated releases from the tank. The SLR testing for DW-8, DW-9 and DW-10 show that the dry well conductivity monitoring will be effective in detecting potential releases from the tanks during waste removal operations. The data in this report also make clear statements about the inferred integrity of the tanks, tank pads, and drain system: (1) the data substantiate earlier work and show that Tanks W-8, W-9, and W-10 are not leaking; (2) the data show that the pads under Tanks W-8, W-9, and W-10 are integral and connected to the dry wells; (3) the STF drain system appears to be functioning properly. This report presents these results and describes the release monitoring plan for the consolidation tanks and during waste removal operations at all of the tanks in the STF.

514

(ORNL/ER–423)

Cold test plan for the Old Hydrofracture Facility tank contents removal project, Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., Oak Ridge, TN 37831 (United States);CDM Federal Programs Corp., Oak Ridge, TN 37830 (United States). Nov 1997. [200p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98005212. Source: OSTI; NTIS; INIS; GPO Dep.

This Old Hydrofracture Facility (OHF) Tanks Contents Removal Project Cold Test Plan describes the activities to be conducted during the cold test of the OHF sluicing and pumping system at the Tank Technology Cold Test Facility (TTCTF). The TTCTF is located at the Robotics and Process Systems Complex at the Oak Ridge National Laboratory (ORNL). The cold test will demonstrate performance of the pumping and sluicing system, fine-tune operating instructions, and train the personnel in the actual work to be performed. After completion of the cold test a Technical Memorandum will be prepared documenting completion of the cold test, and the equipment will be relocated to the OHF site.

515

(ORNL/ER–425/V1)

In situ vitrification demonstration at Pit 1, Oak Ridge National Laboratory. Volume 1: Results of treatability study. Spalding, B.P. (Oak Ridge National Lab., TN (United States). Environmental Sciences Div.); Naney, M.T.; Cline, S.R.; Bogle, M.A.; Tixier, J.S. Oak Ridge National Lab., TN (United States). Dec 1997. 169p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98001954. Source: OSTI; NTIS; INIS; GPO Dep.

A treatability study was initiated in October 1993 to apply in situ vitrification (ISV) to at least two segments of Oak Ridge National Laboratory (ORNL) seepage Pit 1 by the end of fiscal year (FY) 1995. This treatability study was later extended to include all of Pit 1 and was performed to support a possible Interim Record of Decision or removal action for closure of one or more of the seepage pits and trenches beginning as early as FY 1997. This treatability study was carried out to establish the field-scale technical performance of ISV for (1) attaining the required depth, nominally 15 ft, to incorporate source contamination within and beneath the pits; (2) demonstrating field capability for the overlap of melt settings which will be necessary to achieve fused, melted segments of the source contamination; (3) demonstrating off-gas handling technology for accommodating and minimizing the volatilization of ^{137}Cs; (4) demonstrating adequate site characterization techniques to predict ISV melting kinetics, processing temperatures, and product durability; and (5) promoting public acceptance of ISV technology by demonstrating its safety, implementability, site impacts, and air emissions and by coordinating the treatability study

within the regulatory closure process. In April 1996 an expulsion of an estimated 10% of the 196 Mg (216 tons) melt body occurred resulting in significant damage to ISV equipment and, ultimately, led to an indefinite suspension of further ISV operations at Pit 1. This report summarizes the technical accomplishments and status of the project in fulfilling these objectives through September 1997.

516
(ORNL/ER–425/V2)
In situ vitrification demonstration at Pit 1, Oak Ridge National Laboratory. Volume 2: Site characterization report of the Pit 1 area. Spalding, B.P.; Bogle, M.A.; Cline, S.R.; Naney, M.T.; Gu, B. Oak Ridge National Lab., TN (United States). Dec 1997. [200p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98001955. Source: OSTI; NTIS; INIS; GPO Dep.

A treatability study was initiated in October 1993, initially encompassing the application of in situ vitrification (ISV) to at least two segments of Oak Ridge National Laboratory (ORNL) seepage Pit 1 by the end of fiscal year (FY) 1995. This treatability study was to have supported a possible Interim Record of Decision (IROD) or removal action for closure of one or more of the seepage pits and trenches as early as FY 1997. The Remedial Investigation/Feasibility Study for Waste Area Grouping (WAG) 7, which contains these seven seepage pits and trenches, will probably not begin until after the year 2000. This treatability study will establish the field-scale technical performance of ISV for (1) attaining the required depth, nominally 15 ft, to incorporate source contamination within and beneath the pits; (2) demonstrating field capability to overlap melt settings that are necessary to achieve fused, melted segments of the source contamination; (3) demonstrating off-gas handling technology for accommodating and minimizing the volatilization of ^{137}Cs; (4) demonstrating adequate site characterization techniques to predict ISV melting kinetics, processing temperatures, and product durability; and (5) promoting public acceptance of ISV technology by demonstrating its safety, implementability, site impacts, and air emissions and by coordinating the treatability study within the regulatory closure process. This report summarizes the site characterization information gathered through the end of September 1996 which supports the planning and assessment of ISV for Pit 1 (objective 4 above).

517
(ORNL/ER–428)
Completion report for the isolation and remediation of inactive liquid low-level radioactive waste tanks WC-5, WC-6, WC-8, WC-19, 3002-A, 7560, and 7562 at Oak Ridge National Laboratory Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States). Dec 1997. 15p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98001661. Source: OSTI; NTIS; INIS; GPO Dep.

The Federal Facility Agreement (FFA) between the U.S. Environmental Protection Agency (EPA), Tennessee Department of Environment and Conservation (TDEC), and U.S. Department of Energy (DOE) requires that all liquid low-level waste tanks at Oak Ridge National Laboratory removed from service, designated in the FFA as Category D, be remediated in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements. A human health risk screening assessment was conducted for inactive Tanks WC-5, WC-6, WC-8, WC-19, 3002-A, 7560, and 7562 as part of an evaluation to determine the method of remediation necessary to safely and permanently isolate and remediate the tanks. Risk screening assessment results indicated that the health risks associated with these tanks were within or below the EPA range of concern of 1×10^{-4} to 1×10^{-6}. On the basis of these results and with regulators concurrence, it was determined that either no action or in-place stabilization of the tanks would satisfy risk-based remediation goals. Therefore, decisions were made and approved by DOE to remediate these tanks in-place as maintenance actions rather than actions under the CERCLA process. Letters documenting these decisions were approved by DOE and subsequently submitted to TDEC and EPA, who concurred with the maintenance actions. Tanks WC-5, WC-6, WC-8, WC-19, 3002-A, 7560, and 7562 were isolated from associated piping, electrical systems, and instrumentation and were grouted in-place. Tank 7562 was originally isolated from associated piping and instrumentation and left in-place empty for future remedial consideration. Upon further consideration, the decision was made by DOE, with concurrence by the regulators, to complete the maintenance action of Tank 7562 by grouting it in-place in March 1997.

518
(ORNL/ER–429)
ALARA plan for the Old Hydrofracture Facility tanks contents removal project at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States);CDM Federal Programs Corp., Oak Ridge, TN (United States). Apr 1998. [100p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-98OR22700. Order Number DE98004692. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Old Hydrofracture Facility (OHF) Tanks Contents Removal Project is to remove the liquid low-level waste from the five underground storage tanks located at OHF and transfer the resulting slurry to the Melton Valley Storage Tanks facility for treatment and disposal. Among the technical objectives for the OHF Project, there is a specific provision to maintain personnel exposures as low as reasonably achievable (ALARA) during each activity of the project and to protect human health and the environment. The estimated doses and anticipated conditions for accomplishing this project are such that an ALARA Plan is necessary to facilitate formal radiological review of the campaign. This ALARA Plan describes the operational steps necessary for accomplishing the job together with the associated radiological impacts and planned controls. Individual and collective dose estimates are also provided for the various tasks. Any significant changes to this plan (i.e., planned exposures that are greater than 10% of original dose estimates) will require formal revision and concurrence from all parties listed on the approval page. Deviations from this plan (i.e., work outside the scope covered by this plan) also require the preparation of a task-specific ALARA Review that will be amended to this plan with concurrence from all parties listed on the approval page.

519
(ORNL/ER–429/A1)
ALARA plan for the Old Hydrofracture Facility tanks

contents removal project at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Amendment 1 for Appendix B: Install flex-pipe on tank riser spools. Oak Ridge National Lab., TN (United States);CDM Federal Programs Corp., Oak Ridge, TN (United States). 13 May 1998. 13p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-98OR22700. Order Number DE98005168. Source: OSTI; NTIS; INIS; GPO Dep.

This amendment to Appendix B contains the specific ALARA evaluations for installing flex-pipe on riser spools to accommodate ventilation duct connections to the north risers of each tank. The work will be a routine task that is part of the Equipment Installation and Mobilization phase of the project. The dose rates were estimated using the recent Radiological Surveillance Section radiological survey: SAAS-97-063S. Task B-6 has been added to the OHF Project ALARA review process to address a field decision to modify an approach to installing the tank ventilation system. The revised approach will incorporate 12-in. diameter, 36-in. long, stainless steel flex-pipe connected to each north riser spool to address the problem of pipe fitting multiple bends and turns expected with the 12-in. PVC duct. This improved approach will reduce the time necessary to install the duct system between the tanks and the ventilation skid. However, the task includes opening the 12-in. riser spool connections to replace the currently installed blind gaskets. Since a riser spool for each tank will be opened, there is a potential for significant personnel exposure and spread of contamination that will addressed through this ALARA review process.

520
(ORNL/ER–433/V1)
Old hydrofracture facility tanks contents removal action operations plan at the Oak Ridge National Laboratory, Oak Ridge, Tennessee. Volume 1: Text. Volume 2: Checklists and work instructions. CDM Federal Programs Corp., Oak Ridge, TN (United States). May 1998. 53p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-98OR22700. Order Number DE98005138. Source: OSTI; NTIS; INIS; GPO Dep.

This Operations Plan summarizes the operating activities for transferring contents of five low-level (radioactive) liquid waste storage tanks associated with the Old Hydrofracture Facility (OHF) to the Melton Valley Storage Tanks (MVST) for secure storage. The transfer will be accomplished through sluicing and pumping operations which are designed to pump the slurry in a closed circuit system using a sluicing nozzle to resuspend the sludge. Once resuspended, the slurry will be transferred to the MVST. The report documenting the material transfer will be prepared after transfer of the tank materials has been completed. The OBF tanks contain approximately 52,600 gal (199,000 L) of low-level radioactive waste consisting of both sludge and supernatant. This material is residual from the now-abandoned grout injection operations conducted from 1964 to 1980. Total curie content is approximately 30,000 Ci. A sluicing and pumping system has been specifically designed for the OHF tanks contents transfer operations. This system is remotely operated and incorporates a sluicing nozzle and arm (Borehole Miner) originally designed for use in the mining industry. The Borehole Miner is an in-tank device designed to deliver a high pressure jet spray via an extendable nozzle. In addition to removing the waste from the tanks, the use of this equipment will demonstrate applicability for additional underground storage tank cleaning throughout the U.S. Department of Energy complex. Additional components of the complete sluicing and pumping system consist of a high pressure pumping system for transfer to the MVST, a low pressure pumping system for transfer to the recycle tank, a ventilation system for providing negative pressure on tanks, and instrumentation and control systems for remote operation and monitoring.

521
(ORNL/ER–434)
Dismantlement and removal of Old Hydrofracture Facility bulk storage bins and water tank, Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States);Allied Technology Group, Inc., Oak Ridge, TN (United States). Mar 1998. 112p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98003426. Source: OSTI; NTIS; INIS; GPO Dep.

The Old Hydrofracture Facility (OHF), located at Oak Ridge National Laboratory (ORNL), was constructed in 1963 to allow experimentation and operations with an integrated solid storage, mixing, and grout injection facility. During its operation, OHF blended liquid low-level waste with grout and used a hydrofracture process to pump the waste into a deep low-permeable shale formation. Since the OHF Facility was taken out of service in 1980, the four bulk storage bins located adjacent to Building 7852 had deteriorated to the point that they were a serious safety hazard. The ORNL Surveillance and Maintenance Program requested and received permission from the US Department of Energy to dismantle the bins as a maintenance action and send the free-released metal to an approved scrap metal vendor. A 25,000-gal stainless steel water tank located at the OHF site was included in the scope. A fixed-price subcontract was signed with Allied Technology Group, Inc., to remove the four bulk storage bins and water tank to a staging area where certified Health Physics personnel could survey, segregate, package, and send the radiologically clean scrap metal to an approved scrap metal vendor. All radiologically contaminated metal and metal that could not be surveyed was packaged and staged for later disposal. Permissible personnel exposure limits were not exceeded, no injuries were incurred, and no health and safety violations occurred throughout the duration of the project. Upon completion of the dismantlement, the project had generated 53,660 lb of clean scrap metal (see Appendix D). This resulted in $3,410 of revenue generated and a cost avoidance of an estimated $100,000 in waste disposal fees.

522
(ORNL/ER–436)
Groundwater quality assessment report for Solid Waste Storage Area 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee – 1997. Oak Ridge National Lab., TN (United States). Feb 1998. 186p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98003432. Source: OSTI; NTIS; INIS; GPO Dep.

Solid Waste Storage Area (SWSA) 6, located at the US Department of Energy (DOE) Oak Ridge National Laboratory (ORNL) facility, is a shallow land burial site for low-level radioactive waste (LLW) and other waste types. Wastes were

disposed of in unlined trenches and auger holes from 1969 until May 1986, when it was determined that Resource Conservation and Recovery Act (RCRA) regulated wastes were being disposed of there. DOE closed SWSA 6 until changes in operating procedures prevented the disposal of RCRA wastes at SWSA 6. The site, which reopened for waste disposal activities in July 1986, is the only currently operating disposal area for low-level radioactive waste at ORNL. In addition to SWSA 6, it was determined that hazardous wastes were treated at the Explosives Detonation Trench (EDT). Explosives and shock-sensitive chemicals such as picric acid, phosphorus, and ammonium nitrate were detonated; debris from the explosions was backfilled into the trench.

523
(ORNL/ER–437)
GAAT dry well conductivity monitoring report, July 1997 through January 1998, Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States);Vista Research, Inc., Oak Ridge, TN (United States). 13 Mar 1998. 32p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98003406. Source: OSTI; NTIS; INIS; GPO Dep.

A waste removal program is being implemented for the Gunite and Associated Tanks (GAAT) Operable Unit at Oak Ridge National Laboratory (ORNL), Oak Ridge, Tennessee. The waste is being removed by means of remotely operated, in-tank, confined sluicing equipment. The waste removal operations in Tanks W-3 and W-4 in the North Tank Farm (NTF) have been completed and the equipment is being moved to the South Tank Farm (STF), where it will be used to remove the sludges from the six STF tanks (W-5, W-6, W-7, W-8, W-9, and W-10) beginning later this year. During sluicing operations the dry wells adjacent to each of the tanks are instrumented so that potential releases can be detected by means external to the tank. The method of detection is by monitoring the electrical conductivity of the water in the dry well associated with each tank. This report documents the dry well conductivity monitoring data for the period from July 1997 through January 1998. The dry wells monitored during this period include DW-3, DW-4, DW-8, DW-9, and DW-10. The conductivity of the water passing through Pump Station 1 (PS 1) was also monitored. The principal activities that occurred during this period were the sluicing of Tanks W-3 and W-4 in the NTF, transfer of tank liquids from the NTF to the STF, and the installation of new risers, tank dome leveling, and emplacement of stabilized base backfill in the STF. Presented in this report are the dry well conductivity, rainfall, tank level, and STF construction information that is relevant to the analysis and interpretation of the monitoring data for the reporting period. A thorough analysis of the monitoring results for the period indicates that no releases have occurred from the gunite tanks being monitored.

524
(ORNL/M–3788)
Active Sites Environmental Monitoring Program FY 1994 annual report. Morrissey, C.M.; Cunningham, G.R. Oak Ridge National Lab., TN (United States). Apr 1998. 71p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98058112. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division publication number 4336.

Chapter III of the US Department of Energy (DOE) Order 5820.2A (DOE 1988) specifies requirements for the management of facilities that were used for the disposal of radioactive solid low-level waste (LLW) on or after the date of the order (September 26, 1988). Activities in Solid Waste Storage Area (SWSA) 6 at Oak Ridge National Laboratory (ORNL) are governed by Chapter III. Chapter II of 5820.2A covers the transuranic (TRU) waste storage areas in SWSA 5 North at ORNL. Both chapters require environmental monitoring to provide early warning of leaks before such leaks pose a threat to human health or the environment. Chapter III also requires the monitoring of LLW disposal facilities so that their performance can be evaluated. In order to comply with this Order, the Environmental Sciences Division (ESD) at ORNL implements the Active Sites Environmental Monitoring Program (ASEMP) for the Radioactive Solid Waste Operations (RSWO) Department within the Waste Management and Remedial Action Division (WMRAD) at ORNL. The scope of the ASEMP includes all ORNL waste disposal sites that were active on or after the date of the Order and that are under the operational control of the RSWO Department of WMRAD. This report continues a series of annual and semiannual reports that present the results of ASEMP monitoring activities. This report details monitoring data for fiscal year (FY) 1994 and is divided into three major areas: SWSA 6, including the Interim Waste Management Facility (IWMF) and the Hillcut Disposal Test Facility (HDTF), the low-level Liquid-Waste Solidification Project (LWSP), and the TRU-waste storage areas in SWSA 5 N. This report presents a summary of the methodology used to gather data for each major area along with the results obtained during FY 1994. Tables of data collected are presented in Appendix A. Program-specific procedures used to collect the data are presented at the end of the report in Appendix B.

525
(ORNL/M–5507)
Active Sites Environmental Monitoring Program FY 1996 annual report. Morrissey, C.M.; Marshall, D.S.; Cunningham, G.R. Oak Ridge National Lab., TN (United States). Nov 1997. 85p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98003775. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Div. publication number 4611.

This report summarizes the activities of the Active Sites Environmental Monitoring Program (ASEMP) from October 1995 through September 1996. The Radioactive Solid Waste Operations Group (RSWOG) of the Waste Management and Remedial Action Division (WMRAD) and the Environmental Sciences Division (ESD) at Oak Ridge National Laboratory (ORNL) established ASEMP in 1989. The purpose of the program is to provide early detection and performance monitoring at active low-level waste (LLW) disposal sites in Solid Waste Storage Area (SWSA) 6 and transuranic (TRU) waste storage sites in SWSA 5 North as required by Chapters 2 and 3 of US Department of Energy Order 5820.2A.

526
(ORNL/M–6163)
Active sites environmental monitoring program FY 1997

annual report. Morrissey, C.M.; Marshall, D.S.; Cunningham, G.R. Oak Ridge National Lab., TN (United States). Mar 1998. 76p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98054810. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division publication number 4714.

This report summarizes the activities conducted by the Active Sites Environmental Monitoring Program (ASEMP) from October 1996 through September 1997. The purpose of the program is to provide early detection and performance monitoring at active low-level waste (LLW) disposal sites in Solid Waste Storage Area (SWSA) 6 and transuranic (TRU) waste storage sites in SWSA 5 North. This report continues a series of annual and semiannual reports that present the results of ASEMP monitoring activities. This report details monitoring results for fiscal year (FY) 1997 from SWSA 6, including the Interim Waste Management Facility (IWMF) and the Hillcut Disposal Test Facility (HDTF), and (2) TRU-waste storage areas in SWSA 5 N. This report presents a summary of the methodology used to gather data for each major area along with the FY 1997 results. Figures referenced in the text are found in Appendix A and data tables are presented in Appendix B.

527

(ORNL/M–6549)

Development of nuclear analysis capabilities for DOE waste management activities. Parks, C.V.; DeHart, M.D.; Broadhead, B.L.; Hopper, C.M.; Petrie, L.M. Oak Ridge National Lab., TN (United States). May 1998. 5p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98058119. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this project is to develop and demonstrate prototypic analysis capabilities that can be used by the nuclear safety analysis practitioners to: (1) demonstrate a more thorough understanding of the underlying physics phenomena that can lead to improved reliability and defensibility of safety evaluations; and (2) optimize operations related to the handling, storage, transportation, and disposal of fissile material and DOE spent fuel. To address these problems, the project will investigate the implementation of sensitivity and uncertainty methods within existing Monte Carlo codes used for criticality safety analyses, as well as within a new deterministic code that allows specification of arbitrary grids to accurately model the geometry details required in a criticality safety analysis. This capability can facilitate improved estimations of the required subcritical margin and potentially enable the use of a broader range of experiments in the validation process. The new arbitrary-grid radiation transport code will also enable detailed geometric modeling valuable for improved accuracy in application to a myriad of other problems related to waste characterization. Application to these problems will also be explored.

528

(ORNL/TM–13169)

Hot demonstration of proposed commercial cesium removal technology. Lee, D.D.; Travis, J.R.; Gibson, M.R. Oak Ridge National Lab., TN (United States). Dec 1997. 64p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE Assistant Secretary for Policy, Planning and Program Evaluation, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98003624. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the work done in support of the development of technology for the continuous removal and concentration of radioactive cesium in supernatant from Melton Valley Storage Tanks (MVSTs) at the ORNL site. The primary objective was to test candidate absorbers and ion exchangers under continuous-flow conditions using actual supernatant from the MVSTs. An experimental system contained in a hot-cell facility was constructed to test the materials in columns or modules using the same batch of supernatant to allow comparison on an equal basis. Resorcinol/formaldehyde (RF) resin was evaluated at three flow rates with 50% breakthrough ranges of 35 to 50 column volumes (CV) and also through a series of five loading/elution/regeneration cycles. The results reported here include the cesium loading breakthrough curves, elution curves (when applicable), and operational problems and observations for each material. The comparative evaluations should provide critical data for the selection of the sorbent for the ORNL Cesium Removal Demonstration project. These results will be used to help determine the design parameters for demonstration-scale systems. Such parameters include rates of cesium removal, quantity of resin or sorbent to be used, and elution and regeneration requirements, if applicable.

529

(ORNL/TM–13325)

Development of a path forward for special-case wastes at the Oak Ridge Reservation. Osborne-Lee, I.W. (Oak Ridge National Lab., TN (United States)); Lotts, A.L.; Robinette, R.J. Oak Ridge National Lab., TN (United States). 1 Oct 1997. 105p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98003611. Source: OSTI; NTIS; INIS; GPO Dep.

This report addresses the management of the inventory of existing and potential surplus equipment and materials at the Oak Ridge Reservation (ORR) that are candidates for various waste or surplus material categories, including special case waste (SCW). This inventory is called candidate equipment and materials (CEM). This report presents a logical method for disposition of this and future CEM, summarizes the inventory, and suggests preliminary dispositions for the CEM. Also, recommendations are offered for an improved CEM management strategy and actions in this and future years to implement that strategy.

530

(ORNL/TM–13351-Add.1)

Statistical description of liquid low-level waste system supernatant liquids at Oak Ridge National Laboratory, Oak Ridge, Tennessee. DeVore, J.R. (ed.); Bayne, C.K.; Walker, A.B. Oak Ridge National Lab., TN (United States). Oct 1997. 51p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98003650. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy has presented plans for processing transuranic low level liquid wastes located at ORNL. The Tennessee Department of Health and Environment has

mandated the beginning of processing of these wastes by the year 2002, looking towards permanent disposal at a site located off the reservation. In order to meet this schedule, the DOE will solicit bids from various private sector companies to construct a processing facility to be operated by the private sector on a contract basis. In support of the Request for Proposal (RFP) process to accomplish the private sector involvement, this report is being written to give potential vendors information about the wastes contained in the ORNL tank farm system. This addendum report consolidates all data that presently exist on the properties and composition of the waste supernatant liquids, and presents methods to calculate the error bounds of the data in the best technically defensible manner possible.

531
(ORNL/TM–13363)
Hot demonstration of proposed commercial cesium removal technology: Progress report. Lee, D.D.; Travis, J.R.; Gibson, M.R. Oak Ridge National Lab., TN (United States). Dec 1997. 88p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98054255. Source: OSTI; NTIS; INIS; GPO Dep.

Cesium, strontium, and technetium radionuclides constitute a small fraction of the primarily sodium and potassium salts present in supernatants that are being stored in tanks at Hanford, Oak Ridge, Savannah River, and Idaho and must be remediated. Nuclide removal technologies supplied by the US Department of Energy Office of Science and Technology's Efficient Separations and Processing (ESP) Cross-Cutting Program have been previously proposed and tested in small batch and column tests using both simulated and actual supernatants. These technologies must now be tested and the most appropriate ones selected using a flow system of a scale suitable to obtain engineering data that can be applied to the design of pilot-scale equipment. This report describes the operation of the experimental test unit that is located in Building 4501 (ORNL) and the results using the sorbent materials that were tested.

532
(ORNL/TM–13451)
Evaluation of operating characteristics for a chabazite zeolite system for treatment of process wastewater at Oak Ridge National Laboratory. Kent, T.E.; Perona, J.J.; Jennings, H.L.; Lucero, A.J.; Taylor, P.A. Oak Ridge National Lab., TN (United States). Feb 1998. 58p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98006010. Source: OSTI; NTIS; INIS; GPO Dep.

Laboratory and pilot-scale testing were performed for development and design of a chabazite zeolite ion-exchange system to replace existing treatment systems at the Process Waste Treatment Plant (PWTP) at Oak Ridge National Laboratory (ORNL). The process wastewater treatment systems at ORNL need upgrading to improve efficiency, reduce waste generation, and remove greater quantities of contaminants from the wastewater. Previous study indicated that replacement of the existing PWTP systems with an ion-exchange system using chabazite zeolite will satisfy these upgrade objectives. Pilot-scale testing of the zeolite system was performed using a commercially available ion-exchange system to evaluate physical operating characteristics and to validate smaller-scale column test results. Results of this test program indicate that (1) spent zeolite can be sluiced easily and completely from a commercially designed vessel, (2) clarification followed by granular anthracite prefilters is adequate pretreatment for the zeolite system, and (3) the length of the mass transfer zone was comparable with that obtained in smaller-scale column tests. Laboratory studies were performed to determine the loading capacity of the zeolite for selected heavy metals. These test results indicated fairly effective removal of silver, cadmium, copper, mercury, nickel, lead, and zinc from simple water solutions. Heavy-metals data collected during pilot-scale testing of actual wastewater indicated marginal removal of iron, copper, and zinc. Reduced effectiveness for other heavy metals during pilot testing can be attributed to the presence of interfering cations and the relatively short zeolite/wastewater contact time. Flocculating agents (polyelectrolytes) were tested for pretreatment of wastewater prior to the zeolite flow-through column system. Several commercially available polyelectrolytes were effective in flocculation and settling of suspended solids in process wastewater.

533
(ORNL/TM–13496)
Alternative methods to determine headwater benefits. Bao, Y.S.; Perlack, R.D.; Sale, M.J. Oak Ridge National Lab., TN (United States). 10 Nov 1997. 68p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98054232. Source: OSTI; NTIS; GPO Dep.

In 1992, the Federal Energy Regulatory Commission (FERC) began using a Flow Duration Analysis (FDA) methodology to assess headwater benefits in river basins where use of the Headwater Benefits Energy Gains (HWBEG) model may not result in significant improvements in modeling accuracy. The purpose of this study is to validate the accuracy and appropriateness of the FDA method for determining energy gains in less complex basins. This report presents the results of Oak Ridge National Laboratory's (ORNL's) validation of the FDA method. The validation is based on a comparison of energy gains using the FDA method with energy gains calculated using the MWBEG model. Comparisons of energy gains are made on a daily and monthly basis for a complex river basin (the Alabama River Basin) and a basin that is considered relatively simple hydrologically (the Stanislaus River Basin). In addition to validating the FDA method, ORNL was asked to suggest refinements and improvements to the FDA method. Refinements and improvements to the FDA method were carried out using the James River Basin as a test case.

534
(ORNL/TM–13497)
Evaluation of improved techniques for the removal of fission products from process wastewater and groundwater: FY 1997 status. Bostick, D.T.; DePaoli, S.M.; Guo, B. Oak Ridge National Lab., TN (United States). Feb 1998. 100p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98054245. Source: OSTI; NTIS; INIS; GPO Dep.

The primary goals of this effort in FY 1997 were to survey local end users of wastewater treatment technology and then to evaluate recently available treatment processes in light of user needs. Survey results indicate that local sites

are confronted with a limited, and shrinking, budget for treating aqueous waste streams. Therefore, a process will be selected primarily on the basis of sorbent costs, use of existing equipment, and disposal costs for spent processing materials. Current laboratory testing and economic studies have been directed toward addressing the technical issues specific to the removal of ^{90}Sr and ^{137}Cs from groundwater and process wastewater. This year's efforts have concentrated on evaluating the engineered form of crystalline silicotitanates (CSTs) for near neutral pH applications. Both powder and pellet forms of CST can be obtained through UOP; this task evaluated only the engineered form of the sorbent for wastewater remediation. Preliminary experimental efforts included measuring the average particle size, surface water content, total sodium content, ion exchange capacity, and equilibration mixing time. The as received material contains approximately 10% fines, which adhere to the CST pellet. The cesium and strontium ion-exchange capacities, based on multiple contacts with 50 ppm of the metal, are 0.8 meq/g and 1.1 meq/g, respectively. Batch tests indicated that an equilibrium mixing time of 100 h was required for cesium sorption. Group 2 cations (Sr, Ca, and Mg) required greater than 500 h. Particle diffusion coefficients were estimated for each of these cations from the batch studies.

535
(ORNL/TM–13501)
Out-of-tank evaporator demonstration. Final report. Lucero, A.J. (and others); Jennings, H.L.; VanEssen, D.C. Oak Ridge National Lab., TN (United States). Feb 1998. 58p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98052496. Source: OSTI; NTIS; INIS; GPO Dep.

The project reported here was conducted to demonstrate a skid-mounted, subatmospheric evaporator to concentrate liquid low-level waste (LLLW) stored in underground tanks at Oak Ridge National Laboratory (ORNL). This waste is similar to wastes stored at Hanford and Savannah River. A single-stage subatmospheric evaporator rated to produce 90 gallons of distillate per hour was procured from Delta Thermal, Inc., of Pensacola, Florida, and installed in an existing building. During the 8-day demonstration, 22,000 gal of LLLW was concentrated by 25% with the evaporator system. Decontamination factors achieved averaged 5×10^6 (i.e., the distillate contained five million times less Cesium 137 than the feed). Evaporator performance substantially exceeded design requirements and expectations based on bench-scale surrogate test data. Out-of tank evaporator demonstration operations successfully addressed the feasibility of hands-on maintenance. Demonstration activities indicate that: (1) skid-mounted, mobile equipment is a viable alternative for the treatment of ORNL LLLW, and (2) hands-on maintenance and decontamination for movement to another site is achievable. Cost analysis show that 10% of the demonstration costs will be immediately recovered by elimination of solidification and disposal costs. The entire cost of the demonstration can be recovered by processing the inventory of Melton Valley Storage Tank waste and/or sluice water prior to solidifications. An additional savings of approximately $200,000 per year can be obtained by processing newly generated waste through the system. The results indicate that this type of evaporator system should be considered for application across the DOE complex. 25 refs., 11 figs., 2 tabs.

536
(ORNL/TM–13503)
Cesium removal demonstration utilizing crystalline silicotitanate sorbent for processing Melton Valley Storage Tank supernate: Final report. Walker, J.F. Jr. (and others); Taylor, P.A.; Cummins, R.L. Oak Ridge National Lab., TN (United States). Mar 1998. [200p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98058130. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides details of the Cesium Removal Demonstration (CsRD), which was conducted at Oak Ridge National Laboratory (ORNL) on radioactive waste from the Melton Valley Storage Tanks. The CsRD was the first large-scale use of state-of-the-art sorbents being developed by private industry for the selective removal of cesium and other radionuclides from liquid wastes stored across the DOE complex. The crystalline silicotitanate sorbent used in the demonstration was chosen because of its effectiveness in laboratory tests using bench-scale columns. The demonstration showed that the cesium could be removed from the supernate and concentrated on a small-volume, solid waste form that would meet the waste acceptance criteria for the Nevada Test Site. During this project, the CsRD system processed $>$ 115,000 L (30,000 gal) of radioactive supernate with minimal operational problems. Sluicing, drying, and remote transportation of the sorbent, which could not be done on a bench scale, were successfully demonstrated. The system was then decontaminated to the extent that it could be contact maintained with the use of localized shielding only. By utilizing a modular, transportable design and placement within existing facilities, the system can be transferred to different sites for reuse. The initial unit has now been removed from the process building and is presently being reinstalled for use in baseline operations at ORNL.

537
(ORNL/TM–13506)
Passivation of fluorinated activated charcoal. Del Cul, G.D.; Trowbridge, L.D.; Simmons, D.W.; Williams, D.F.; Toth, L.M. Oak Ridge National Lab., TN (United States). Oct 1997. 66p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98051991. Source: OSTI; NTIS; INIS; GPO Dep.

The Molten Salt Reactor Experiment (MSRE), at the Oak Ridge National Laboratory has been shut down since 1969 when the fuel salt was drained from the core into two Hastelloy N tanks at the reactor site. In 1995, a multiyear project was launched to remediate the potentially hazardous conditions generated by the movement of fissile material and reactive gases from the storage tanks into the piping system and an auxiliary charcoal bed (ACB). The top 12 in. of the ACB is known by gamma scan and thermal analysis to contain about 2.6 kg U-233. According to the laboratory tests, a few feet of fluorinated charcoal are believed to extend beyond the uranium front. The remainder of the ACB should consist of unreacted charcoal. Fluorinated charcoal, when subjected to rapid heating, can decompose generating gaseous products. Under confined conditions, the sudden exothermic decomposition can produce high temperatures and pressures of near-explosive characteristics. Since it will be necessary to drill and tap the ACB to allow installation of piping and instrumentation for remediation and recovery activities, it is necessary to chemically convert the reactive

fluorinated charcoal into a more stable material. Ammonia can be administered to the ACB as a volatile denaturing agent that results in the conversion of the C_xF to carbon and ammonium fluoride, NH_4F. The charcoal laden with NH_4F can then be heated without risking any sudden decomposition. The only consequence of heating the treated material will be the volatilization of NH_4F as a mixture of NH_3 and HF, which would primarily recombine as NH_4F on surfaces below 200 C. The planned scheme for the ACB denaturing is to flow diluted ammonia gas in steps of increasing NH_3 concentration, 2% to 50%, followed by the injection of pure ammonia. This report summarizes the planned passivation treatment scheme to stabilize the ACB and remove the potential hazards. (Abstract truncated)

538
(ORNL/TM–13513)
Current and projected liquid low-level waste generation at ORNL. DePaoli, S.M.; Walker, A.B. Oak Ridge National Lab., TN (United States). Mar 1998. 34p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98054243. Source: OSTI; NTIS; INIS; GPO Dep.

Liquid low level waste (LLLW) is generated by various programs and projects throughout Oak Ridge National Laboratory (ORNL). This waste is collected via bottles, trucks, or underground collection tanks. It is then neutralized with sodium hydroxide, reduced in volume at the ORNL LLLW evaporator, and stored as concentrated LLLW in one of twelve storage tanks. Many other tanks (called inactive tanks), which contain historical liquids and sludges generated by past activities, will be remediated; the sludges and associated sluicing and scabbling liquids will then be transferred to the active system for treatment and storage. This report presents historical and projected data concerning the volume and the characterization of LLLW, both prior to and after evaporation. Storage space for projected waste generation is also discussed.

539
(ORNL/TM–13516)
R-matrix analysis of ^{235}U neutron transmission and cross sections in the energy range 0 to 2.25 keV. Leal, L.C.; Derrien, H.; Larson, N.M.; Wright, R.Q. Oak Ridge National Lab., TN (United States). Nov 1997. 117p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98007037. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes a new R-matrix analysis of ^{235}U cross section data in the energy range from 0 to 2,250 eV. The analysis was performed with the computer code SAMMY, that has recently been updated to permit, for the first time, inclusion of both differential and integral data within the analysis process. Fourteen differential data sets and six integral quantities were used in this evaluation: two measurements of fission plus capture, one of fission plus absorption, six of fission alone, two of transmission, and one of eta, plus standard values of thermal cross sections for fission, capture, and scattering, and of K1 and the Westcott g-factors for both fission and absorption. An excellent representation was obtained for the high-resolution transmission, fission, and capture cross-section data as well as for the integral quantities. The result is a single set of resonance parameters spanning the entire range up to 2,250 eV, a decided improvement over the present ENDF/VI evaluation, in which eleven discrete resonance parameter sets are required to cover that same energy range. This new evaluation is expected to greatly improve predictability of the criticality safety margins for nuclear systems in which ^{235}U is present.

540
(ORNL/TM–13526)
Programmatic and technical requirements for the FMDP fresh MOX fuel transport package. Ludwig, S.B. (and others); Michelhaugh, R.D.; Pope, R.B. Oak Ridge National Lab., TN (United States). Dec 1997. [100p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98007040. Source: OSTI; NTIS; INIS; GPO Dep.

This document is intended to guide the designers of the package to all pertinent regulatory and other design requirements to help ensure the safe and efficient transport of the weapons-grade (WG) fresh MOX fuel under the Fissile Materials Disposition Program. To accomplish the disposition mission using MOX fuel, the unirradiated MOX fuel must be transported from the MOX fabrication facility to one or more commercial reactors. Because the unirradiated fuel contains large quantities of plutonium and is not sufficient radioactive to create a self-protecting barrier to deter the material from theft, DOE intends to use its fleet of safe secure trailers (SSTs) to provide the necessary safeguards and security for the material in transit. In addition to these requirements, transport of radioactive materials must comply with regulations of the Department of Transportation and the Nuclear Regulatory Commission (NRC). In particular, NRC requires that the packages must meet strict performance requirements. The requirements for shipment of MOX fuel (i.e., radioactive fissile materials) specify that the package design is certified by NRC to ensure the materials contained in the packages are not released and remain subcritical after undergoing a series of hypothetical accident condition tests. Packages that pass these tests are certified by NRC as a Type B fissile (BF) package. This document specifies the programmatic and technical design requirements a package must satisfy to transport the fresh MOX fuel assemblies.

541
(ORNL/TM–13534)
X-231A demonstration of in-situ remediation of DNAPL compounds in low permeability media by soil fracturing with thermally enhanced mass recovery or reactive barrier destruction. Siegrist, R.L. (Oak Ridge National Lab., TN (United States)); Lowe, K.S.; Murdoch, L.D.; Slack, W.W.; Houk, T.C. Oak Ridge National Lab., TN (United States). Mar 1998. [300p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98058134. Source: OSTI; NTIS; INIS; GPO Dep.

The overall goal of the program of activities is to demonstrate robust and cost-effective technologies for in situ remediation of DNAPL compounds in low permeability media (LPM), including adaptations and enhancements of conventional technologies to achieve improved performance for DNAPLs in LPM. The technologies sought should be potential for application at simple, small sites (e.g., gasoline underground storage tanks) as well as at complex, larger sites (e.g., DOE land treatment units). The technologies involved in the X-231A demonstration at Portsmouth Gaseous

Diffusion Plant (PORTS) utilized subsurface manipulation of the LPM through soil fracturing with thermally enhanced mass recovery or horizontal barrier in place destruction. To enable field evaluation of these approaches, a set of four test cells was established at the X-231A land treatment unit at the DOE PORTS plant in August 1996 and a series of demonstration field activities occurred through December 1997. The principal objectives of the PORTS X-231A demonstration were to: determine and compare the operational features of hydraulic fractures as an enabling technology for steam and hot air enhanced soil vapor extraction and mass recovery, in situ interception and reductive destruction by zero valent iron, and in situ interception and oxidative destruction by potassium permanganate; determine the interaction of the delivered agents with the LPM matrix adjacent to the fracture and within the fractured zone and assess the beneficial modifications to the transport and/or reaction properties of the LPM deposit; and determine the remediation efficiency achieved by each of the technology strategies.

542
(ORNL/TM–13536)
Progress report and technology status development of an EG and G Berthold LB-150 alpha/beta particulate monitor for use on the East Tennessee Technology Park Toxic Substances Control Act Incinerator. Shor, J.T. (Oak Ridge National Lab., TN (United States). Chemical Technology Div.); Singh, S.P.N.; Gibson, L.V. Jr. Oak Ridge National Lab., Chemical Technology Div., TN (United States). Jun 1998. 57p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464 ; AC05-84OR21400. Order Number DE98058135. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this project was to modify and evaluate a commercially available EG and G Berthold LB-150 alpha-beta radionuclide particulate monitor for the high-temperature and moisture-saturation conditions of the East Tennessee Technology Park (formerly K-25 Site) Toxic Substances Control Act (TSCA) Incinerator stack. The monitor was originally outfitted for operation at gas temperatures of 150 F on the defunct Los Alamos National Laboratory (LANL) controlled air incinerator, and the objective was to widen its operating envelope. A laboratory apparatus was constructed that simulated the effects of water-saturated air at the TSCA Incinerator stack-gas temperatures, 183 F. An instrumented set of heat exchangers was constructed to then condition the gas so that the radionuclide monitor could be operated without condensation. Data were collected under the conditions of the elevated temperatures and humidities and are reported herein, and design considerations of the apparatus are provided. The heat exchangers and humidification equipment performed as designed, the Mylar film held, and the instrument suffered no ill effects. However, for reasons as yet undetermined, the sensitivity of the radionuclide detection diminishes as the gas temperature is elevated, whether the gas is humidified or not. The manufacturer has had no experience with (a) the operation of the monitor under these conditions and (b) any commercial market that might exist for an instrument that operates under these conditions. The monitor was not installed into the radiologically contaminated environment of the TSCA Incinerator stack pending resolution of this technical issue.

543
(ORNL/TM–13546)
Characterization of the C1 and C2 waste tanks located in the BVEST system at ORNL. Keller, J.M.; Giaquinto, J.M. Oak Ridge National Lab., TN (United States). Feb 1998. 88p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98006008. Source: OSTI; NTIS; INIS; GPO Dep.

There was a major effort to sample and analyze the Active Liquid Low-Level Waste (LLLW) tanks at ORNL which include the Melton Valley Storage Tanks (MVST) and the Bethel Valley Evaporator Service Tanks (BVEST). The characterization data summarized in this report was needed to address waste processing options, address concerns dealing with the performance assessment (PA) data for the Waste Isolation Pilot Plant (WIPP), evaluate the waste characteristics with respect to the waste acceptance criteria (WAC) for WIPP and Nevada Test Site (NTS), address criticality concerns, and meet DOT requirements for transporting the waste. This report discusses the analytical characterization data for the supernatant and sludge in the BVEST waste tanks C-1 and C-2. The isotopic data presented in this report supports the position that fissile isotopes of uranium (^{233}U and ^{235}U) and plutonium (^{239}Pu and ^{241}Pu) were denatured as required by the administrative controls stated in the ORNL LLLW waste acceptance criteria (WAC). In general, the sludge in tanks C1 and C2 was found to be hazardous based on RCRA characteristics and the transuranic alpha activity was well above the 100 nCi/g limit for TRU waste. Additional characteristics of the C1 and C2 sludge inventory relative to the WIPP WAC limits for fissile gram equivalent, plutonium equivalent activity, and thermal power from decay heat were estimated from the data in this report and found to be far below the upper boundary for any of the remote-handled transuranic waste (RH-TRU) requirements for disposal of the waste in WIPP.

544
(ORNL/TM–13557)
Temperature inversions in the vicinity of Oak Ridge, Tennessee, as characterized by tethersonde data. Blasing, T.J.; Wang, J.C.; Lombardi, D.A. Oak Ridge National Lab., Energy Div., TN (United States). Jan 1998. 30p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98007469. Source: OSTI; NTIS; INIS; GPO Dep.

Accidental releases of hazardous materials to the atmosphere may result from fires that create a buoyant plume which may rise several hundred meters above the ground. For such buoyant release cases, estimates of ground-level concentrations may be as much as a factor of 100 lower than similar, nonbuoyant releases. For the Oak Ridge Reservation, safety analyses often examine buoyant release accident scenarios and resulting downwind, ground-level consequence estimates. For these analyses, careful consideration of buoyant plume rise is important. Plume rise can be limited by a stable vertical atmospheric temperature profile, commonly called an inversion, where the air temperature increases with height. There is a concern that inversions may interact with the complex terrain on the Oak Ridge Reservation, particularly at the Y-12 Plant, which is located in a relatively shallow but narrow valley, to trap the plume and increase ground-level consequences. The purpose of this

paper is to review the available meteorological data that provide information on inversions in the Oak Ridge area.

545
(ORNL/TM–13566)
Homogeneous Reactor Experiment (HRE) Pond cryogenic barrier technology demonstration: Pre-barrier subsurface hydrology and contaminant transport investigation. Moline, G.R. Oak Ridge National Lab., TN (United States). Mar 1998. 57p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98058137. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division publication 4732.

The Homogeneous Reactor Experiment (HRE) Pond is the site of a former impoundment for radioactive wastes that has since been drained, filled with soil, and covered with an asphalt cap. The site is bordered to the east and south by a tributary that empties into Melton Branch Creek and that contains significant concentrations of radioactive contaminants, primarily ^{90}Sr. Because of the proximity of the tributary to the HRE disposal site and the probable flow of groundwater from the site to the tributary, it is hypothesized that the HRE Pond is a source of contamination to he creek. As a means for temporary containment of contaminants within the impoundment, a cryogenic barrier technology demonstration was initiated in FY96 with a background hydrologic investigation that continued through FY97. Cryogenic equipment installation was completed in FY97, and freezing was initiated in September of 1997. This report documents the results of a hydrologic and geologic investigation of the HRE Pond/cryogenic barrier site. The purpose of this investigation is to evaluate the hydrologic conditions within and around the impoundment in order to meet the following objectives: (1) to provide a pre-barrier subsurface hydrologic baseline for post-barrier performance assessment; (2) to confirm that the impoundment is hydraulically connected to the surrounding sediments; and (3) to determine the likely contaminant exit pathways from the impoundment. The methods of investigation included water level and temperature monitoring in a network of wells and standpipes in and surrounding the impoundment, a helium tracer test conducted under ambient flow conditions, and geologic logging during the drilling of boreholes for installation of cryogenic probes and temperature monitoring wells.

546
(ORNL/TM–13575)
Demonstration of Mixed Waste Debris Macroencapsulation Using Sulfur Polymer Cement. Mattus, C.H. Oak Ridge National Lab., TN (United States). Jul 1998. 53p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98058140. Source: OSTI; NTIS; INIS; GPO Dep.

This report covers work performed during FY 1997 as part of the Evaluation of Sulfur Polymer Cement Fast-Track System Project. The project is in support of the "Mercury Working Group/Mercury Treatment Demonstrations - Oak Ridge" and is described in technical task plan (TTP) OR-16MW-61. Macroencapsulation is the treatment technology required for debris by the U.S. Environmental Protection Agency Land Disposal Restrictions (LDR) under the Resource Conservation and Recovery Act. Based upon the results of previous work performed at Oak Ridge, the concept of using sulfur polymer cement (SPC) for this purpose was submitted to the Mixed Waste Focus Area (MWFA). Because of the promising properties of the material, the MWFA accepted this Quick Win project, which was to demonstrate the feasibility of macroencapsulation of actual mixed waste debris stored on the Oak Ridge Reservation. The waste acceptance criteria from Envirocare, Utah, were chosen as a standard for the determination of the final waste form produced. During this demonstration, it was shown that SPC was a good candidate for macroencapsulation of mixed waste debris, especially when the debris pieces were dry. The matrix was found to be quite easy to use and, once the optimum operating conditions were identified, very straightforward to replicate for batch treatment. The demonstration was able to render LDR compliant more than 400 kg of mixed wastes stored at the Oak Ridge National Laboratory.

547
(ORNL/TM–13577)
Strategies for the cost effective treatment of Oak Ridge legacy wastes. Compere, A.L.; Griffith, W.L.; Huxtable, W.P.; Wilson, D.F. Oak Ridge National Lab., TN (United States). Mar 1998. 24p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98058141. Source: OSTI; NTIS; INIS; GPO Dep.

Research and development treatment strategies for treatment or elimination of several Oak Ridge plant liquid, solid, and legacy wastes are detailed in this report. Treatment strategies for volumetrically contaminated nickel; enriched uranium-contaminated alkali metal fluorides; uranium-contaminated aluminum compressor blades; large, mercury-contaminated lithium isotope separations equipment; lithium process chlorine gas streams; high-concentration aluminum nitrate wastes, and high-volume, low-level nitrate wastes are discussed. Research needed to support engineering development of treatment processes is detailed.

548
(ORNL/TM–13578)
Demonstration of fluidic pulse jet mixing for a horizontal waste storage tank. Kent, T.E.; Taylor, S.A.; Moore, J.W.; Stellern, J.L.; Billingsley, K.M. Oak Ridge National Lab., TN (United States). Jan 1998. 87p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98052498. Source: OSTI; NTIS; INIS; GPO Dep.

A fluidic pulse jet mixing system, designed and fabricated by AEA Technology of the United Kingdom, was successfully demonstrated for mobilization and retrieval of remote handled transuranic (RH-TRU) sludge from a 50,000-gal horizontal waste storage tank at Oak Ridge National Laboratory (ORNL). The pulse jet system, consisting of seven modular equipment skids, was installed and commissioned in about 7 weeks and operated remotely for 52 days to remove about 88% of the sludge in the tank. The system used specially designed fluidic jet pumps and pulse vessels, along with existing submerged nozzles for mixing the settled sludges with existing supernate in the tank. The operation also used existing piping and progressive cavity pumps for retrieval and

transfer of the mixture. A total of 64,000 gal of liquid was required to transfer 6300 gal of sludge to the Melton Valley Storage Tanks (MVSTs) designated for consolidation of all ORNL RH-TRU sludges. Of the liquid used for the retrieval, 88% was existing or recycled tank supernate and only 7770 gal of additional process water was added to the system. Minimizing the addition of process water is extremely important at ORNL, where tank system storage capacity is limited. A simple manual sluicer was used periodically to wash down and aid the removal of localized sludge heels.

549
(ORNL/TM–13581)
Liquid and gaseous waste operations section. Annual operating report CY 1997. Maddox, J.J.; Scott, C.B. Oak Ridge National Lab., TN (United States). Mar 1998. 127p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98052497. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents information on the liquid and gaseous wastes operations section for calendar year 1997. Operating activities, upgrade activities, and maintenance activities are described.

550
(ORNL/TM–13582)
Multi-weight isotherm results for mercury removal in upper East Fork Popular Creek water. Bostick, D.A.; Klasson, K.T. Oak Ridge National Lab., TN (United States). Feb 1998. 24p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98052510. Source: OSTI; NTIS; INIS; GPO Dep.

Many sorbents have been developed for the removal of mercury and heavy metals from waters; however, the majority of data published to date do not address the removal of mercury to the target levels represented in this project. The application to which these sorbents are targeted for use is the removal of mercury from microgram-per-liter levels to low nanogram-per-liter levels. Sorbents with thiouronium, thiol, amine, sulfur, and proprietary functional groups were selected for these studies. The initial mercury content in the majority of the batch samples was significantly augmented so that the equilibrium concentration was similar to that found in the original stream sample for at least one sample. Mercury was successfully removed from actual water via adsorption onto Ionac SR-4 (by Sybron Chemicals, Inc.), Keyle:X (by SolmeteX), and Mersorb (by Nucon International, Inc.) resins to levels below the target goal of 12 ng/L. A thiol-based resin (Ionac SR-4) performed the best, indicating that over 200,000 volumes of water could be treated with one volume of resin. The cost of the resin is approximately $0.24 per 1000 gal of water.

551
(ORNL/TM–13587)
Comparative testing of slurry monitors. Hylton, T.D. (Oak Ridge National Lab., TN (United States)); Bayne, C.K.; Anderson, M.S.; Van Essen, D.C. Oak Ridge National Lab., TN (United States). May 1998. [200p.] Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98058144. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) has millions of gallons of radioactive liquid and sludge wastes that must be retrieved from underground storage tanks, transferred to treatment facilities, and processed to a final waste form. The wastes will be removed from the current storage tanks by mobilizing the sludge wastes and mixing them with the liquid wastes to create slurries. Each slurry would then be transferred by pipeline to the desired destination. To reduce the risk of plugging a pipeline, the transport properties (e.g., density, suspended solids concentration, viscosity, particle size range) of the slurry should be determined to be within acceptable limits prior to transfer. These properties should also be monitored and controlled within specified limits while the slurry transfer is in progress. The DOE issued a call for proposals for developing on-line instrumentation to measure the transport properties of slurries. In response to the call for proposals, several researchers submitted proposals and were funded to develop slurry monitoring instruments. These newly developed DOE instruments are currently in the prototype stage. Before the instruments were installed in a radioactive application, the DOE wanted to evaluate them under nonradioactive conditions to determine if they were accurate, reliable, and dependable. The goal of this project was to test the performance of the newly developed DOE instruments along with several commercially available instruments. The baseline method for comparison utilized the results from grab-sample analyses.

552
(ORNL/TM–13590)
Development testing of the chemical analysis automation polychlorinated biphenyl standard analysis method during surface soils sampling at the David Witherspoon 1630 site. Hunt, M.A. (and others); Klatt, L.N.; Thompson, D.H. Oak Ridge National Lab., TN (United States). Feb 1998. 63p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98052502. Source: OSTI; NTIS; INIS; GPO Dep.

The Chemical Analysis Automation (CAA) project is developing standardized, software-driven, site-deployable robotic laboratory systems with the objective of lowering the per-sample analysis cost, decreasing sample turnaround time, and minimizing human exposure to hazardous and radioactive materials associated with DOE remediation projects. The first integrated system developed by the CAA project is designed to determine polychlorinated biphenyls (PCB) content in soil matrices. A demonstration and development testing of this system was conducted in conjuction with surface soil characterization activities at the David Witherspoon 1630 Site in Knoxville, Tennessee. The PCB system consists of five hardware standard laboratory modules (SLMs), one software SLM, the task sequence controller (TSC), and the human-computer interface (HCI). Four of the hardware SLMs included a four-channel Soxhlet extractor, a high-volume concentrator, a column cleanup, and a gas chromatograph. These SLMs performed the sample preparation and measurement steps within the total analysis protocol. The fifth hardware module was a robot that transports samples between the SLMs and the required consumable supplies to the SLMs. The software SLM is an automated data interpretation module that receives raw data from the gas chromatograph SLM and analyzes the data to yield the analyte information. The TSC is a software system

that provides the scheduling, management of system resources, and the coordination of all SLM activities. The HCI is a graphical user interface that presents the automated laboratory to the analyst in terms of the analytical procedures and methods. Human control of the automated laboratory is accomplished via the HCI. Sample information required for processing by the automated laboratory is entered through the HCI. Information related to the sample and the system status is presented to the analyst via graphical icons.

553
(ORNL/TM–13593)
A field trial of novel bifunctional resins for removing pertechnetate (TcO_4^-) from contaminated groundwater. Gu, B. (Oak Ridge National Lab., TN (United States)); Liang, L.; Brown, G.M.; Bonnesen, P.V.; Moyer, B.A.; Alexandratos, S.D.; Ober, R. Oak Ridge National Lab., TN (United States). Mar 1998. 35p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98058145. Source: OSTI; NTIS; GPO Dep.

Environmental Sciences Division publication number 4757.

A field trial using a custom-designed bifunctional synthetic resin prepared at the University of Tennessee and designed to selectively remove pertechnetate (TcO_4^-) from groundwater was conducted in summer 1997 at the Northwest Plume Pump-and-Treat Facility at the US Department of Energy's Paducah Gaseous Diffusion Plant (PGDP) site. The bifunctional resin, RO-02-119, was a copolymer of vinylbenzylchloride and divinylbenzene that had been functionalized with trihexylamine and triethylamine. The experiment was a parallel test of the synthetic resin and a commercial resin, Purolite A-520E, to directly compare the performance of the two resins. Purolite resin is currently used by the treatment facility to remove Tc-99 from the contaminated groundwater containing ~1,000 pCi/L TcO_4^-. A total of ~692,000 bed volumes of groundwater was passed through the column containing the synthetic resin (RO-02-119) whereas only ~205,000 bed volumes of groundwater were passed through the Purolite resin column because of reduced hydraulic conductivity and clogging within the latter column. Despite less groundwater passing through the Purolite resin column, however, the breakthrough of TcO_4^- occurred earlier in the Purolite column than in the RO-02-119 column.

554
(ORNL/TM–13617)
Implementation of passive samplers for monitoring volatile organic compounds in ground water at the Kansas City Plant. Gardner, F.G. (Oak Ridge National Lab., Grand Junction, CO (United States)); Korte, N.E.; Wilson-Nichols, M.J.; Baker, J.L.; Ramm, S.G. Oak Ridge National Lab., Grand Junction, CO (United States). Jun 1998. 23p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE99000348. Source: OSTI; NTIS; INIS; GPO Dep.

Passive sampling for monitoring volatile organic compounds (VOCs) has been suggested as a possible replacement to the traditional bailer method used at the Department of Energy Kansas City Plant (KCP) for routine groundwater monitoring. To compare methods, groundwater samples were collected from 19 KCP wells with VOC concentrations ranging from non-detectable to > 100,000 { micro} g/L. Analysis of the data was conducted using means and medians of multiple measurements of TCE, 1,2-DCE, 1,1-DCE and VC. All 95% confidence intervals of these VOCs overlap, providing evidence that the two methods are similar. The study also suggests that elimination of purging and decontamination of sampling equipment reduces the labor required to sample by approximately 32%. Also, because the passive method generates no waste water, there are no associated disposal costs. The results suggest evidence to continue studies and efforts to replace traditional bailer methods with passive sampling at KCP based on cost and the similarity of the methods.

555
(ORNL/TM–13630)
North Tank Farm data report for the Gunite and Associated Tanks at Oak Ridge National Laboratory. Rule, V.A. (XL Associates, Inc., Oak Ridge, TN (United States)); Burks, B.L.; Hoesen, S.D. van. Oak Ridge National Lab., TN (United States);XL Associates, Inc., Oak Ridge, TN (United States). May 1998. [200p.] Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-98OR22700 ; AC05-96OR22464. Order Number DE98058150. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) Office of Science and Technology, in cooperation with the Oak Ridge Environmental Management Program, has developed and demonstrated the first full-scale remotely operated system for cleaning radioactive liquid and waste from large underground storage tanks. The remotely operated waste retrieval system developed and demonstrated at Oak Ridge National Laboratory (ORNL) is designed to accomplish both retrieval of bulk waste, including liquids, thick sludge, and scarified concrete, and final tank cleaning. This report provides a summary of the North Tank Farm (NTF) operations data and an assessment of the performance and efficiency of the waste retrieval system during NTF operations data and an assessment of the performance and efficiency of the waste retrieval system during NTF operations. The organization of this report is as follows: Section 1 provides an introduction to the report. Section 2 describes the NTF tank structures (W-3 and W-4 only) and the contents of the tanks. Section 3 outlines the objectives of the NTF testing and explains how these objectives were met. Section 4 provides a description of the various operating systems used in the NTF operations. Sections 5 and 6 present a summary of the data collected during NTF operations. Section 7 summarizes the maintenance activities performed and Section 8 summarizes the on-the-job training performed in the NTF. Section 9 summarizes the capital cost for the waste retrieval and characterization equipment and operating costs for performing the NTF work. Section 10 provides observations and lessons learned, and Section 11 provides a summary and conclusions.

556
(ORNL/TM–13645)
A retrospective study of the chemical analysis cost for the remediation of Lower East Fork Poplar Creek, Oak Ridge, Tennessee. Klatt, L.N. Oak Ridge National Lab., TN (United States). Jun 1998. 26p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE

Contract AC05-96OR22464. Order Number DE98058152. Source: OSTI; NTIS; INIS; GPO Dep.

A retrospective study of the remediation of Lower East Fork Poplar Creek (LEFPC) in Oak Ridge, Tennessee was completed. The study was conducted by reviewing the public Comprehensive Environmental Response, Compensation, and Liability Act record documents associated with the remediation of LEFPC and through discussions with the project staff involved or familiar with the project. The remediation took place in two phases. The first phase involved the excavation of about 5,560 yd^3 of soil at the National Oceanic and Atmospheric Administration (NOAA) locations in 1996. The second phase involved the excavation of 39,200 yd^3 at another NOAA location and at the Bruner location in 1997. For the entire project (remedial investigation through cleanup), a total of 7,708 samples (1 sample for each 5.8 yd^3 of soil remediated) were analyzed for mercury. The project obtained special regulatory approval to use two methods for the determination of mercury in soils that are not part of the Resource Conservation and Recovery Act SW-846 methods manual. The mercury analysis cost was $678,000, which represents 9.6% of the cleanup cost. During the cleanup phase of the project, an on-site laboratory was used. The estimated cost savings that the on-site laboratory provided fall into two categories: direct reduction of costs associated with chemical analysis and sample shipment totaling approximately $38,000, which represents a 5.3% savings relative to the estimated cost of using an off-site laboratory, and savings in the amount of $890,000 (12.5% of the $7.1 M cleanup cost), associated with expediting execution of the cleanup work by providing rapid (< 3 hours) sample result turnaround time. (Abstract truncated)

557

(ORNL/TM–13653)

Grout and glass performance in support of stabilization/ solidification of ORNL tank sludges. Spence, R.D.; Mattus, C.H.; Mattus, A.J. Oak Ridge National Lab., TN (United States). Sep 1998. 97p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE99000341. Source: OSTI; NTIS; INIS; GPO Dep.

Wastewater at Oak Ridge National Laboratory (ORNL) is collected, evaporated, and stored in the Melton Valley Storage Tanks (MVST) and Bethel Valley Evaporator Storage Tanks (BVEST) pending treatment for disposal. In addition, some sludges and supernatants also requiring treatment remain in two inactive tank systems: the gunite and associated tanks (GAAT) and the old hydrofracture (OHF) tank. The waste consists of two phases: sludge and supernatant. The sludges contain a high amount of radioactivity, and some are classified as TRU sludges. Some Resource Conservation and Recovery Act (RCRA) metal concentrations are high enough to be defined as RCRA hazardous; therefore, these sludges are presumed to be mixed TRU waste. Grouting and vitrification are currently two likely stabilization/ solidification alternatives for mixed wastes. Grouting has been used to stabilize/solidify hazardous and low-level radioactive waste for decades. Vitrification has been developed as a high-level radioactive alternative for decades and has been under development recently as an alternative disposal technology for mixed waste. The objective of this project is to define an envelope, or operating window, for grout and glass formulations for ORNL tank sludges. Formulations will be defined for the average composition of each of the major tank farms (BVEST/MVST, GAAT, and OHF) and for an overall average composition of all tank farms. This objective is to be accomplished using surrogates of the tank sludges with hot testing of actual tank sludges to check the efficacy of the surrogates.

558

(ORNL/TM–13654)

Process waste treatment system upgrades: Clarifier startup at the nonradiological wastewater treatment plant. Lucero, A.J.; McTaggart, D.R.; Van Essen, D.C.; Kent, T.E.; West, G.D.; Taylor, P.A. Oak Ridge National Lab., TN (United States). Jul 1998. 13p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98058153. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Management Operations Division at Oak Ridge National Laboratory recently modified the design of a reactor/clarifier at the Nonradiological Wastewater Treatment Plant, which is now referred to as the Process Waste Treatment Complex–Building 3608, to replace the sludge-blanket softener/clarifier at the Process Waste Treatment Plant, now referred to as the Process Waste Treatment Complex-Building 3544 (PWTC-3544). This work was conducted because periodic hydraulic overloads caused poor water-softening performance in the PWTC-3544 softener, which was detrimental to the performance and operating costs of downstream ion-exchange operations. Over a 2-month time frame, the modified reactor/clarifier was tested with nonradiological wastewater and then with radioactive wastewater to optimize softening performance. Based on performance to date, the new system has operated more effectively than the former one, with reduced employee radiological exposure, less downtime, lower costs, and improved effluent quality.

559

(ORNL/TM–13660)

Status report on solid control in leachates. Beahm, E.C. (Oak Ridge National Lab., TN (United States)); Weber, C.F.; Lee, D.D.; Dillow, T.A.; Hunt, R.D.; Keswa, C.M.; Osseo-Asare, K.; Spear, K.E. Oak Ridge National Lab., TN (United States). Jul 1998. 98p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE98058154. Source: OSTI; NTIS; INIS; GPO Dep.

Sludge pretreatment will involve some combination of washing and leaching with sodium hydroxide solutions to remove soluble salts and amphoteric material such as alumina. It is of paramount importance to prevent gelation and uncontrolled solid formation in tanks, transfer lines, and process equipment. An evaluation of results of washing and caustic leaching indicates that washing is more effective in dissolving sludge solids than subsequent sodium hydroxide treatment. Only aluminum and chromium were removed more effectively by caustic leaching than by water washing.

560

(ORNL/TM–13663)

Caustic leaching of high-level radioactive tank sludge: A critical literature review. McGinnis, C.P.; Welch, T.D.; Hunt, R.D. Oak Ridge National Lab., TN (United States). Aug 1998. 21p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE

Contract AC05-96OR22464. Order Number DE99000333. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) must treat and safely dispose of its radioactive tank contents, which can be separated into high-level waste (HLW) and low-level waste (LLW) fractions. Since the unit costs of treatment and disposal are much higher for HLW than for LLW, technologies to reduce the amount of HLW are being developed. A key process currently being studied to reduce the volume of HLW sludges is called enhanced sludge washing (ESW). This process removes, by water washes, soluble constituents such as sodium salts, and the washed sludge is then leached with 2–3 M NaOH at 60–100 C to remove nonradioactive metals such as aluminum. The remaining solids are considered to be HLW while the solutions are LLW after radionuclides such as ^{137}Cs have been removed. Results of bench-scale tests have shown that the ESW will probably remove the required amounts of inert constituents. While both experimental and theoretical results have shown that leaching efficiency increases as the time and temperature of the leach are increased, increases in the caustic concentration above 2–3 M will only marginally improve the leach factors. However, these tests were not designed to validate the assumption that the caustic used in the ESW process will generate only a small increase (10 Mkg) in the amount of LLW; instead the test conditions were selected to maximize leaching in a short period and used more water and caustic than is planned during full-scale operations. Even though calculations indicate that the estimate for the amount of LLW generated by the ESW process appears to be reasonable, a detailed study of the amount of LLW from the ESW process is still required. If the LLW analysis indicates that sodium management is critical, then a more comprehensive evaluation of the clean salt process or caustic recycle would be needed. Finally, experimental and theoretical studies have clearly demonstrated the need for the control of solids formation during and after leaching.

561

(ORNL/TM–13668)

HYDROBIOGEOCHEM: A coupled model of HYDROlogic transport and mixed BIOGEOCHEMical kinetic/ equilibrium reactions in saturated-unsaturated media. Yeh, G.T. (Pennsylvania State Univ., University Park, PA (United States). Dept. of Civil and Environmental Engineering); Salvage, K.M.; Gwo, J.P.; Zachara, J.M.; Szecsody, J.E. Oak Ridge National Lab., TN (United States). Jul 1998. [400p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE99000336. Source: OSTI; NTIS; GPO Dep.

Center for Computational Sciences publication number 0007.

The computer program HYDROBIOGEOCHEM is a coupled model of HYDROlogic transport and BIOGEOCHEMical kinetic and/or equilibrium reactions in saturated/unsaturated media. HYDROBIOGEOCHEM iteratively solves the two-dimensional transport equations and the ordinary differential and algebraic equations of mixed biogeochemical reactions. The transport equations are solved for all aqueous chemical components and kinetically controlled aqueous species. HYDROBIOGEOCHEM is designed for generic application to reactive transport problems affected by both microbiological and geochemical reactions in subsurface media. Input to the program includes the geometry of the system, the spatial distribution of finite elements and nodes, the properties of the media, the potential chemical and microbial reactions, and the initial and boundary conditions. Output includes the spatial distribution of chemical and microbial concentrations as a function of time and space, and the chemical speciation at user-specified nodes.

562

(PNNL–11218)

STOMP Subsurface Transport Over Multiple Phases: User's guide. White, M.D.; Oostrom, M. Pacific Northwest Lab., Richland, WA (United States). Oct 1997. 218p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98050087. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy, through the Office of Technology Development, has requested the demonstration of remediation technologies for the cleanup of volatile organic compounds and associated radionuclides within the soil and groundwater at arid sites. This demonstration program, called the VOC-Arid Soils Integrated Demonstration Program (Arid-ID), has been initially directed at a volume of unsaturated and saturated soil contaminated with carbon tetrachloride, on the Hanford Site near Richland, Washington. A principal subtask of the Arid-ID program involves the development of an integrated engineering simulator for evaluating the effectiveness and efficiency of various remediation technologies. The engineering simulator's intended users include scientists and engineers who are investigating soil physics phenomena associated with remediation technologies. Principal design goals for the engineer simulator include broad applicability, verified algorithms, quality assurance controls, and validated simulations against laboratory and field-scale experiments. An important goal for the simulator development subtask involves the ability to scale laboratory and field-scale experiments to full-scale remediation technologies, and to transfer acquired technology to other arid sites. The STOMP (Subsurface Transport Over Multiple Phases) simulator has been developed by the Pacific Northwest National Laboratory for modeling remediation technologies. Information on the use, application, and theoretical basis of the STOMP simulator theory and discussions on the governing equations, constitutive relations, and numerical solution algorithms for the STOMP simulator.

563

(PNNL–11495)

Chemical information on tank supernatants, Cs adsorption from tank liquids onto Hanford sediments, and field observations of Cs migration from past tank leaks. Serne, R.J.; Zachara, J.M.; Burke, D.S. Pacific Northwest Lab., Richland, WA (United States). Jan 1998. 96p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98051885. Source: OSTI; NTIS; INIS; GPO Dep.

Borehole gamma-logging profiles beneath the SX-Tank Farm suggest that contamination from Cs-137 extends to at least a depth of 40 m (130 ft), and may extend even deeper. What is presently not known is the pathway that Cs-137 has taken to reach these depths. In this report we provide an analysis of the chemistry of tank supernates with emphasis on the REDOX waste stream disposed in SX tanks, Cs

chemistry in aqueous solutions and adsorption properties onto minerals, available data on Cs adsorption onto Hanford sediments, and information on Cs migration from other Hanford tank leaks that have been studied. The data in this report was used to help guide the vadose zone transport analysis of the SX Tank Farm presented in a companion report. The goal of the vadose zone transport modelling is to attempt to explain the depth and extent of the Cs-137 plume under the SX Tank farm, specifically in the vicinity of the greatest leak, near the SX-109 Tank as inferred from the gamma logs (DOE 1996). In solution Cs is present as the monovalent cation and shows very little tendency to form aqueous complexes with inorganic or organic ligands. Cs is expected to adsorb primarily onto selective minerals that have unique adsorption sites. The small Cs^+ ion is accommodated on these frayed edge and interlayer sites. Adsorption within the interlayers often leads to collapse of the layers such that the Cs^+ ion is effectively trapped and not readily exchangeable by all other common cations. The degree of adsorption is thus only moderately dependent on the types and high concentrations of other cations in leaking tank liquors.

564
(PNNL–11557-5)
Hanford annual first quarter seismic report, fiscal year 1998: Seismicity on and near the Hanford Site, Pasco Basin, Washington. Hartshorn, D.C.; Reidel, S.P.; Rohay, A.C. Pacific Northwest National Lab., Richland, WA (United States). Feb 1998. 30p. Sponsored by USDOE Assistant Secretary for Management and Administration, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98052278. Source: OSTI; NTIS; GPO Dep.

Hanford Seismic Monitoring provides an uninterrupted collection of high-quality raw and processed seismic data from the Hanford Seismic Network (HSN) for the US Department of Energy and its contractors. The staff also locates and identifies sources of seismic activity and monitors changes in the historical pattern of seismic activity at the hanford Site. The data are compiled, archived, and published for use by the Hanford Site for waste management, Natural Phenomena Hazards assessments, and engineering design and construction. In addition, the seismic monitoring organization works with the Hanford Site Emergency Services Organization to provide assistance in the event of an earthquake on the Hanford Site. The HSN and the Eastern Washington Regional Network (EWRN) consist of 41 individual sensor sites and 15 radio relay sites maintained by the Hanford Seismic Monitoring staff. The operational rate for the first quarter of FY98 for stations in the HSN was 98.5%. The operational rate for the first quarter of FY98 for stations of the EWRN was 99.1%. For the first quarter of FY98, the acquisition computer triggered 184 times. Of these triggers 23 were local earthquakes: 7 in the Columbia River Basalt Group, and 16 in the crystalline basement. The geologic and tectonic environments where these earthquakes occurred are discussed in this report. The most significant earthquakes in this quarter were a series of six events which occurred in the Cold Creek depression (approximately 4 km SW of the 200 West Area), between November 6 and November 11, 1997. All events were deep ($>$ 15 km) and were located in the crystalline basement. The first event was the largest, having a magnitude of 3.49 M_c. Two events on November 9, 1997 had magnitudes of 2.81 and 2.95 M_c, respectively. The other events had magnitudes between 0.7 and 1.2 M_c.

565
(PNNL–11634)
Gas treatment of Cr(VI)-contaminated sediment samples from the North 60's pits of the chemical waste landfill. Thornton, E.C.; Amonette, J.E. Pacific Northwest Lab., Richland, WA (United States). Dec 1997. 67p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98051354. Source: OSTI; NTIS; INIS; GPO Dep.

Twenty sediment samples were collected at depths ranging from 5 to 100 ft (1.5 to 30 m) beneath a metal-contaminated plating-waste site and extensively characterized for Cr(VI) content and environmental availability. Three samples were selected for treatment with diluted gas mixtures with the objective of converting Cr(VI) to Cr(III), which is relatively nontoxic and immobile. These tests were designed to provide information needed to evaluate the potential application of gas injection as an in situ remediation technique. Gas treatment was performed in small columns (4.9-cm ID, 6.4- to 13.9-cm long) using 100 ppm (μL L^{-1}) H_2S or ethylene mixtures in N_2. Treatment progress during the tests involving H_2S was assessed by monitoring the breakthrough of H_2S. Evaluation of H_2S treatment efficacy included (1) water-leaching of treated and untreated columns for ten days, (2) repetitive extraction of treated and untreated subsamples by water, 0.01 M phosphate (pH 7) or 6 M HCl solutions, and (3) Cr K-edge X-ray absorption near-edge structure (XANES) spectroscopy of treated and untreated subsamples. Results of the water-leaching studies showed that the H_2S treatment decreased Cr(VI) levels in the column effluent by 90% to nearly 100%. Repetitive extractions by water and phosphate solutions echoed these results, and the extraction by HCl released only 35-40% as much Cr in the treated as in the untreated samples. Analysis by XANES spectroscopy showed that a substantial portion of the Cr in the samples remained as Cr(VI) after treatment, even though it was not available to the water and phosphate extracting solutions. These results suggest that this residual Cr(VI) is present in low solubility phases such as $PbCrO_4$ or sequestered in unreacted grain interiors under impermeable coatings formed during H_2S treatment. However, this fraction is essentially immobile and thus unavailable to the environment.

566
(PNNL–11670-Rev.1)
Organic tanks safety program, FY97 waste aging studies. Revision 1. Camaioni, D.M.; Samuels, W.D.; Linehan, J.C.; Sharma, A.K.; Hogan, M.O.; Lilga, M.A.; Clauss, S.A.; Wahl, K.L.; Campbell, J.A. Pacific Northwest National Lab., Richland, WA (United States). Feb 1998. 81p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98052136. Source: OSTI; NTIS; INIS; GPO Dep.

To model tank waste aging and interpret tank waste speciation results, the authors began measuring the reactivity of organic complexants and related compounds towards radiation-induced oxidation reactions. Because of the high efficiency of scavenging of the primary radicals of water radiolysis by nitrate and nitrite ion, the major radiolytically-generated radicals in these solutions, and in Hanford tank

wastes, are NO_2, NO and O^-. Prior to this effort, little quantitative information existed for the reactions of these radicals with organic compounds such as those that were used in Hanford processes. Therefore, modeling of actual waste aging, or even simulated waste aging, was not feasible without measuring reactivities and determining reaction paths. The authors have made the first rate measurements of complexant aging and determined some of their degradation products.

567
(PNNL–11677)
International waste management fact book. Amaya, J.P.; LaMarche, M.N.; Upton, J.F. Pacific Northwest Lab., Richland, WA (United States). Oct 1997. 266p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98052581. Source: OSTI; NTIS; INIS; GPO Dep.

Many countries around the world are faced with nuclear and environmental management problems similar to those being addressed by the US Department of Energy. The purpose of this Fact Book is to provide the latest information on US and international organizations, programs, activities and key personnel to promote mutual cooperation to solve these problems. Areas addressed include all aspects of closing the commercial and nuclear fuel cycle and managing the wastes and sites from defense-related, nuclear materials production programs.

568
(PNNL–11678-Rev.1)
Nuclear magnetic resonance measurement of ammonia diffusion in dense solid-liquid slurries. Revision 1. Bobroff, S. (Univ. of California, Davis, CA (United States). Dept. of Chemical Engineering); Phillips, R.J.; Shekarriz, A. Pacific Northwest National Lab., Richland, WA (United States). Jan 1998. 21p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98051732. Source: OSTI; NTIS; INIS; GPO Dep.

The flammability and toxicity of ammonia released from the nuclear waste tanks at Hanford have been the subject of several recent studies. These releases may occur episodically, such as the buoyant plume releases occurring in various double-shell tanks (DSTs); gradually through the surface of the waste; or from the partially saturated saltcakes in the single-shell tanks during salt-well pumping. The diffusion of ammonium ions in aqueous solutions was measured by nuclear magnetic resonance (NMR) using the pulsed field gradient (PFG) method. The ammonium ions were obtained from aqueous solutions of ammonium chloride, ammonium sulfate, ammonium bicarbonate, and ammonium hydroxide. The translational diffusion of the ammonium ions was determined by measuring the diffusion of nitrogen nuclei in solution. Results showed that the ammonium diffusion coefficient can be measured in aqueous solutions with concentrations as low as 20×10^{-3} M. Typical values measured for the diffusion coefficient of the ammonium ion are 2×10^{-5} cm^2/s ($\pm$10%), similar to the values found for pure water. Due to the effect of the solution pH upon the NMR relaxation parameters for ^{14}N, measurements are constrained to pH values below 8.5. However, ^{15}N labeled ammonia is less sensitive to the solution pH, extending the measurement range to pH of 9.5. The results show that the solution viscosity has a measurable impact on the diffusion coefficient. The diffusion coefficient is almost inversely proportional to the relative viscosity of the solution, irrespective of how the viscosity is increased. Further, a randomly-packed porous bed of 200 { micro} m PMMA resulted in a reduction of $\sim$ 30% in the diffusion coefficient as a result of hindered diffusion.

569
(PNNL–11702-Rev.1)
Chemical pathways for the formation of ammonia in Hanford wastes. Stock, L.M.; Pederson, L.R. Pacific Northwest National Lab., Richland, WA (United States). Dec 1997. 41p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98051752. Source: OSTI; NTIS; INIS; GPO Dep.

This report reviews chemical reactions leading to the formation of ammonia in Hanford wastes. The general features of the chemistry of the organic compounds in the Hanford wastes are briefly outlined. The radiolytic and thermal free radical reactions that are responsible for the initiation and propagation of the oxidative degradation reactions of the nitrogen-containing complexants, trisodium HEDTA and tetrasodium EDTA, are outlined. In addition, the roles played by three different ionic reaction pathways for the oxidation of the same compounds and their degradation products are described as a prelude to the discussion of the formation of ammonia. The reaction pathways postulated for its formation are based on tank observations, laboratory studies with simulated and actual wastes, and the review of the scientific literature. Ammonia derives from the reduction of nitrite ion (most important), from the conversion of organic nitrogen in the complexants and their degradation products, and from radiolytic reactions of nitrous oxide and nitrogen (least important).

570
(PNNL–11703)
Descriptive models for single-jet sluicing of sludge waste. Erian, F.F.; Mahoney, L.A.; Terrones, G. Pacific Northwest National Lab., Richland, WA (United States). Dec 1997. 36p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98051304. Source: OSTI; NTIS; INIS; GPO Dep.

Mobilization of sludge waste stored in underground storage tanks can be achieved safely and reliably by sluicing. In the project discussed in this report, the waste in Hanford single-shell Tank 241-C-106 will be mobilized by sluicing, retrieved by a slurry retrieval pump, and transferred via an 1800-ft slurry pipeline to Tank 241-AY-102. A sluicing strategy must be developed that ensures efficient use of the deployed configuration of the sluicing system: the nozzle(s) and the retrieval pump(s). Given a sluicing system configuration in a particular tank, it is desirable to prescribe the sequential locations at which the sludge will be mobilized and retrieved and the rate at which these mobilization and retrieval processes take place. In addition, it is necessary to know whether the retrieved waste slurry meets the requirements for cross-site slurry transport. Some of the physical phenomena that take place during mobilization and retrieval and certain aspects of the sluicing process are described in this report. First, a mathematical model gives (1) an idealized geometrical representation of where, within the confines of a storage tank containing a certain amount of

settled waste, sludge can be removed and mobilized; and (2) a quantitative measure of the amount of sludge that can be removed during a sluicing campaign. A model describing an idealized water jet issuing from a circular nozzle located at a given height above a flat surface is also presented in this report. This dynamic water-jet model provides the basis for improving the geometrical sluicing model presented next. In this model the authors assume that the water jet follows a straight trajectory toward a target point on a flat surface. However, the water jet does not follow a straight line in the actual tank, and using the true trajectory will allow a more accurate estimate of the amount of disturbed material. (Abstract truncated)

571
(PNNL–11706)
Waste behavior during horizontal extrusion: Effect of waste strength for bentonite and kaolin/ludox simulants and strength estimates for wastes from Hanford waste tanks 241-SY-103, AW-101, AN-103, and S-102. Gauglitz, P.A.; Aikin, J.T. Pacific Northwest Lab., Richland, WA (United States). Oct 1997. 79p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98050605. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site has 149 single-shell tanks (SSTs) and 28 double-shell tanks (DSTs) containing radioactive wastes that are complex mixes of radioactive and chemical products. Some of these wastes are known to generate mixtures of flammable gases, including hydrogen, nitrous oxide, and ammonia. Nineteen of these SSTs and six of the DSTs have been placed on the Flammable Gas Watch List because they are known or suspected, in all but one case, to retain these flammable gases. Because these gases are flammable, their retention and episodic release pose a number of safety concerns. Understanding the physical mechanisms and waste properties that contribute to the retention and release of these gases will help to resolve the Flammable Gas Safety Issue. The strength of the waste plays a central role in the mechanisms of both bubble retention and bubble release. While recent in-situ measurements from the ball rheometer have provided results for five of the DSTs, waste strength measurements are typically not available for any of the SSTs or for the DSTs that have not been characterized with the ball rheometer. The overall purpose of this study is to develop a method to obtain strength estimates for actual wastes from observations of the wastes' behavior during extrusion from core samplers. The first objective of the study was to quantify waste behavior during horizontal extrusion by documenting the extrusion behavior of simulants with known strengths; the second was to estimate the strength of actual waste based on these simulant standards. Results showed a reproducible extrusion behavior for bentonite clay and kaolin/Ludox® simulants over strengths ranging from 30 to 6,500 Pa. The extrusion behavior was documented with both video recordings and still images. Based on these visual standards, strength estimates were made for wastes from DSTs 241-SY-103, 241-AW-101, and 241-AN-103 and SST 241-S-102.

572
(PNNL–11714)
Mercury separation from concentrated potassium iodide/iodine leachate using Self-Assembled Mesoporous Mercaptan Support (SAMMS) technology. Mattigod, S.V. (and others); Feng, X.; Fryxell, G.E. Pacific Northwest Lab., Richland, WA (United States). Oct 1997. 31p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98050091. Source: OSTI; NTIS; INIS; GPO Dep.

A study was conducted to demonstrate the effectiveness of a novel adsorber, the Self-Assembled Mesoporous Mercaptan Support (SAMMS) material to remove mercury (Hg) from potassium iodide/iodine (KI/I_2) waste streams. This study included investigations of the SAMMS material's binding kinetics, loading capacity, and selectivity for Hg adsorption from surrogate and actual KI/I_2 waste solutions. The kinetics data showed that binding of Hg by the adsorber material occurs very rapidly, with 82% to 95% adsorption occurring within the first 5 min. No significant differences in the rate of adsorption were noted between pH values of 5 and 9 and at Hg concentrations of ~100 mg/1. Within the same range of pH values, an approximate four-fold increase in initial Hg concentration resulted in a two-fold increase in the rate of adsorption. In all cases studied, equilibrium adsorption occured within 4 h. The loading capacity experiments in KI/I_2 surrogate solutions indicated Hg adsorption densities between 26 to 270 mg/g. The loading density increased with increasing solid: solution ratio and decreasing iodide concentrations. Values of distribution coefficients ($1.3x10^5$ to $>2.6x10^8$ ml/g) indicated that material adsorbs Hg with very high specificity from KI/I_2 surrogate solutions. Reduction studies showed that compared to metallic iron (Fe), sodium dithionite can very rapidly reduce iodine as the triiodide species into the iodide form. Adsorption studies conducted with actual KI/I_2 leachates confirmed the highly specific Hg adsorption properties ($K_d>6x10^7$ to$>1x10^8$ ml//g) of the adsorber material. Following treatment, the Hg concentrations in actual leachates were below instrumental detection limits (i.e., < 0.00005 mg/l), indicating that the KI solutions can be recycled.

573
(PNNL–11738)
Organic analysis progress report FY 1997. Clauss, S.A.; Grant, K.E.; Hoopes, V.; Mong, G.M.; Steele, R.; Bellofatto, D.; Sharma, A. Pacific Northwest National Labs., Richland, WA (United States). Apr 1998. 130p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98052811. Source: OSTI; NTIS; INIS; GPO Dep.

The Organic Analysis and Methods Development Task is being conducted by Pacific Northwest National Laboratory (PNNL) as part of the Organic Tank Waste Safety Project. The objective of the task is to apply developed analytical methods to identify and/or quantify the amount of particular organic species in tank wastes. In addition, this task provides analytical support for the Gas Generation Studies Task, Waste Aging, and Solubility Studies. This report presents the results from analyses of tank waste samples archived at Pacific Northwest National Laboratory (PNNL) and received from the Project Hanford Management Contractor (PHMC), which included samples associated with both the Flammable Gas and Organic Tank Waste Safety Programs. The data are discussed in Section 2.0. In addition, the results of analytical support for analyzing (1) simulated wastes for Waste Aging, (2) tank waste samples for Gas Generation, and (3) simulated wastes associated with solubility studies discussed in Sections 3.0, 4.0, and 5.0, respectively. The latter part of FY 1997 was devoted to

documenting the analytical procedures, including derivation gas chromatography/mass spectrometry (GC/MS) and GC/FID for quantitation, ion-pair chromatography (IPC), IC, and the cation exchange procedure for reducing the radioactivity of samples. The documentation of analytical procedures is included here and discussed in Section 6.0 and Section 7.0 discusses other analytical procedures. The references are listed in Section 8.0 and future plans are discussed in Section 9.0. Appendix A is a preprint of a manuscript accepted for publication. Appendix B contains the cc mail messages and chain-of-custody forms for the samples received for analyses. Appendix C contains the test plan for analysis of tank waste samples.

574
(PNNL–11746)
Comparison of inorganic ion exchange materials for removing cesium, strontium, and transuranic elements from K-basin water. Brown, G.N.; Bontha, J.R.; Carson, K.J.; Elovich, R.J.; DesChane, J.R. Pacific Northwest Lab., Richland, WA (United States). Oct 1997. 54p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98050506. Source: OSTI; NTIS; INIS; GPO Dep.

TTP No. RL3-6-C3-42.

The work presented in this report was conducted by the Pacific Northwest National Laboratory (PNNL) under the Efficient Separations and Crosscutting Program (ESP), Office of Science and Technology, U.S. Department of Energy (DOE). The objective of this work was to investigate radionuclide uptake by several newly produced ion exchange materials under actual waste conditions, and to compare the performance of those materials with that of commercially available ion exchangers. The equilibrium uptake data presented in this report are useful for identifying potential materials that are capable of removing cesium and strontium from 105-KE Basin water. The data show the relative selectivities of the ion exchange materials under similar operating conditions. Additional flow studies are needed to predict material capacities and to develop complete ion exchange process flow sheets. The materials investigated in this study include commercially available ion exchangers such as IONSIV® IE-911 (manufactured by UOP), clinoptilolite (a naturally occurring zeolite), and materials produced on an experimental basis by AlliedSignal (biotites and nonatitanates), 3M (hexacyanoferrates), Selion Technologies, Inc. (hexacyanoferrates and titanates), and Texas A&M University (pharmacosiderites, biotites, and nonatitanates). In all, the performance of 14 ion exchange materials was evaluated at two solution-to-exchanger mass ratios (i.e., 10^4 and 10^5) using actual 105-KE Basin water. Evaluation consisted of determining cesium and strontium batch distribution coefficients, loading, and decontamination factors. Actual 105-KE Basin water was obtained from a sample collected during the sludge dissolution work conducted by PNNL in FY 1996. This sample was taken from the bottom of the basin and contained significantly higher concentrations of the radioactive constituents than do samples taken from the top of the basin.

575
(PNNL–11759)
Retained gas sampler extractor mixing and mass transfer rate study: Experimental and simulation results. Recknagle, K.P.; Bates, J.M.; Shekarriz, A. Pacific Northwest National Lab., Richland, WA (United States). Nov 1997. 28p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98051303. Source: OSTI; NTIS; INIS; GPO Dep.

Research staff at Pacific Northwest National Laboratory conducted experimental testing and computer simulations of the impeller-stirred Retained Gas Sampler (RGS) gas extractor system. This work was performed to verify experimentally the effectiveness of the extractor at mixing viscous fluids of both Newtonian and non-Newtonian rheology representative of Hanford single- and double-shell wastes, respectively. Developing the computational models and validating their results by comparing them with experimental results would enable simulations of the mixing process for a range of fluid properties and mixing speeds. Five tests were performed with a full-scale, optically transparent model extractor to provide the data needed to compare mixing times for fluid rheology, mixer rotational direction, and mixing speed variation. The computer model was developed and exercised to simulate the tests. The tests demonstrated that rotational direction of the pitched impeller blades was not as important as fluid rheology in determining mixing time. The Newtonian fluid required at least six hours to mix at the hot cell operating speed of 3 rpm, and the non-Newtonian fluid required at least 46 hours at 3 rpm to become significantly mixed. In the non-Newtonian fluid tests, stagnant regions within the fluid sometimes required days to be fully mixed. Higher-speed (30 rpm) testing showed that the laminar mixing time was correlated to mixing speed. The tests demonstrated that, using the RGS extractor and current procedures, complete mixing of the waste samples in the hot cell should not be expected. The computer simulation of Newtonian fluid mixing gave results comparable to the test while simulation of non-Newtonian fluid mixing would require further development. In light of the laboratory test results, detailed parametric analysis of the mixing process was not performed.

576
(PNNL–11771)
Crystalline silicotitanate gate review analysis. Schlahta, S.N. (and others); Carreon, R.; Gentilucci, J.A. Pacific Northwest Lab., Richland, WA (United States). Nov 1997. 19p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98051229. Source: OSTI; NTIS; INIS; GPO Dep.

Crystalline silicotitanate (CST) is an ion-exchange method for removing radioactive cesium from tank waste to allow the separation of the waste into high- and low-level fractions. The CST, originally developed Sandia National Laboratories personnel in association with Union Oil Products Corporation, has both a high affinity and selectivity for sorbing cesium-137 from highly alkaline or acidic solutions. For several years now, the U.S. Department of Energy has funded work to investigate applying CST to large-scale removal of cesium-137 from radioactive tank wastes. In January 1997, an expert panel sponsored by the Tanks Focus Area met to review the current state of the technology and to determine whether it was ready for routine use. The review also sought to identify any technical issues that must be resolved or additional CST development that must occur before full implementation by end-users. The CST Gate Review Group concluded that sufficient work has been done to close developmental work on CST and turn the remaining site-specific

tasks over to the users. This report documents the review group's findings, issues, concerns, and recommendations as well as responses from the Tanks Focus Area expert staff to specific pretreatment and immobilization issues.

577
(PNNL–11773)
Atmospheric dispersion of ammonia accidentally released from the 242-A Evaporator, Hanford Site, Richland, Washington. Daling, P.M.; Lavender, J.C. Pacific Northwest Lab., Richland, WA (United States). Nov 1997. 28p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98051168. Source: OSTI; NTIS; INIS; GPO Dep.

Two errors have been identified in the authorization basis for the 242-A Evaporator at the Hanford Site. These errors, which appear in the 242-A Evaporator/Crystallizer Final Safety Analysis Report analysis of ammonia gas concentrations accidentally released from the 242-A Evaporator, are: (1) the vessel ventilation system flow rate used in the previous calculations is a factor of ten higher than the actual flow rate, and (2) the previous calculations did not account for the ammonia source term reduction that would occur via condensation of ammonia vapors, which will remove a large fraction of the ammonia from the exhaust gas stream. The purpose of this document is to correct these errors and recalculate the maximum ground-level concentrations of ammonia released to the environment as a result of potential errors in blending Evaporator feed. The errors offset each other somewhat, so it is unlikely that the 242-A Evaporator has operated outside its current authorization basis. However, the errors must be corrected and the results incorporated into a revision of the 242-A Evaporator/Crystallizer Safety Analysis Report, WHC-SD-WM-SAR-023. An EPA-approved atmospheric dispersion model, SCREEN3, was used to recalculate the maximum ground-level concentrations of ammonia that would be released from the 242-A Evaporator as a result of a feed-blending error. The results of the re-analysis of the 242-A Evaporator's ammonia release scenario are as follows. The onsite receptor 100 m away from the release point (242-A vessel vent stack) is projected to be exposed to a maximum ground-level concentration of ammonia of 8.3 ppm. The maximally-exposed offsite receptor, located at the nearest Hanford Site boundary 16 km away from the 242-A vessel vent stack, will be exposed to a maximum ground-level concentration of 0.11 ppm ammonia.

578
(PNNL–11777)
Composition and quantities of retained gas measured in Hanford waste tanks 241-U-103, S-106, BY-101, and BY-109. Mahoney, L.A.; Antoniak, Z.I.; Bates, J.M. Pacific Northwest National Lab., Richland, WA (United States). Dec 1997. [200p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98051462. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides the results obtained for the single-shell tanks (SSTs) sampled with the Retained Gas Sampler (RGS) during 1997: Tanks 241-U-103, 241-S-106, 241-BY-101, and 241-BY-109. The RGS is a modified version of the core sampler used at Hanford. It is designed specifically to be used in concert with the gas extraction equipment in the hot cell to capture and extrude a gas-containing waste sample in a hermetically sealed system. The four tanks represent several different types of flammable gas SSTs. Tank U-103 is on the Flammable Gas Watch List (FGWL) and is one of the highest-priority group of SSTs that show evidence of significant gas retention. Tank S-106, though not a FGWL tank, has a uniquely high barometric pressure response and continuing rapid surface level rise, indicating a large and increasing volume of retained gas. Tanks BY-101 and BY-109 are not on the FGWL but were chosen to test the effect of recent salt-well pumping on gas retention. Section 2 of this report provides an overview of the process by which retained gases in the Hanford tanks are sampled and analyzed. A detailed description of the procedure used to reduce and analyze the data is provided in Section 3. Tank-by-tank results are covered in Section 4 (with the data presented in the order in which the tanks were sampled), and an RGS system performance overview is given in Section 5. Section 6 presents conclusions from these analyses and recommendations for further research. The cited references are listed in Section 7. Appendix A describes the procedures used to extract gas and ammonia from the samples, Appendix B contains detailed laboratory data from each of the tanks, and Appendix C gives field sampling data.

579
(PNNL–11787)
TEMPEST code modifications and testing for erosion-resisting sludge simulations. Onishi, Y.; Trent, D.S. Pacific Northwest National Lab., Richland, WA (United States). Jan 1998. 52p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98051733. Source: OSTI; NTIS; INIS; GPO Dep.

The TEMPEST computer code has been used to address many waste retrieval operational and safety questions regarding waste mobilization, mixing, and gas retention. Because the amount of sludge retrieved from the tank is directly related to the sludge yield strength and the shear stress acting upon it, it is important to incorporate the sludge yield strength into simulations of erosion-resisting tank waste retrieval operations. This report describes current efforts to modify the TEMPEST code to simulate pump jet mixing of erosion-resisting tank wastes and the models used to test for erosion of waste sludge with yield strength. Test results for solid deposition and diluent/slurry jet injection into sludge layers in simplified tank conditions show that the modified TEMPEST code has a basic ability to simulate both the mobility and immobility of the sludges with yield strength. Further testing, modification, calibration, and verification of the sludge mobilization/immobilization model are planned using erosion data as they apply to waste tank sludges.

580
(PNNL–11798)
Application of the risk-based strategy to the Hanford tank waste organic-nitrate safety issue. Hunter, V.L.; Colson, S.D.; Ferryman, T.; Gephart, R.E.; Heasler, P.; Scheele, R.D. Pacific Northwest National Lab., Richland, WA (United States). Dec 1997. [200p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98051681. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the results from application of the Risk-Based Decision Management Approach for Justifying

Characterization of Hanford Tank Waste to the organic-nitrate safety issue in Hanford single-shell tanks (SSTs). Existing chemical and physical models were used, taking advantage of the most current (mid-1997) sampling and analysis data. The purpose of this study is to make specific recommendations for planning characterization to help ensure the safety of each SST as it relates to the organic-nitrate safety issue. An additional objective is to demonstrate the viability of the Risk-Based Strategy for addressing Hanford tank waste safety issues.

581
(PNNL–11800)
Composite analysis for low-level waste disposal in the 200 area plateau of the Hanford Site. Kincaid, C.T. (and others); Bergeron, M.P.; Cole, C.R. Pacific Northwest Lab., Richland, WA (United States). Mar 1998. 579p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98052818. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the first iteration of the Composite Analysis for Low-Level Waste Disposal in the 200 Area Plateau of the Hanford Site (Composite Analysis) prepared in response to the U.S. Department of Energy Implementation Plan for the Defense Nuclear Facility Safety Board Recommendation 94-2. The Composite Analysis is a companion document to published analyses of four active or planned low-level waste disposal actions: the solid waste burial grounds in the 200 West Area, the solid waste burial grounds in the 200 East Area, the Environmental Restoration Disposal Facility, and the disposal facilities for immobilized low-activity waste. A single Composite Analysis was prepared for the Hanford Site considering only sources on the 200 Area Plateau. The performance objectives prescribed in U.S. Department of Energy guidance for the Composite Analysis were 100 mrem in a year and examination of a lower dose (30 mrem in a year) to ensure the "as low as reasonably achievable" concept is followed. The 100 mrem in a year limit was the maximum allowable all-pathways dose for 1000 years following Hanford Site closure, which is assumed to occur in 2050. These performance objectives apply to an accessible environment defined as the area between a buffer zone surrounding an exclusive waste management area on the 200 Area Plateau, and the Columbia River. Estimating doses to hypothetical future members of the public for the Composite Analysis was a multistep process involving the estimation or simulation of inventories; waste release to the environment; migration through the vadose zone, groundwater, and atmospheric pathways; and exposure and dose. Doses were estimated for scenarios based on agriculture, residential, industrial, and recreational land use. The radionuclides included in the vadose zone and groundwater pathway analyses of future releases were carbon-14, chlorine-36, selenium-79, technetium-99, iodine-129, and uranium isotopes.

582
(PNNL–11801)
Three-dimensional analysis of future groundwater flow conditions and contaminant plume transport in the Hanford Site unconfined aquifer system: FY 1996 and 1997 status report. Cole, C.R.; Wurstner, S.K.; Williams, M.D.; Thorne, P.D.; Bergeron, M.P. Pacific Northwest Lab., Richland, WA (United States). Dec 1997. 130p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98051992. Source: OSTI; NTIS; INIS; GPO Dep.

A three-dimensional numerical model of groundwater flow and transport, based on the Coupled Fluid Energy, and Solute Transport (CFEST) code, was developed for the Hanford Site to support the Hanford Groundwater Project (HGWP), managed by Pacific Northwest National Laboratory. The model was developed to increase the understanding and better forecast the migration of several contaminant plumes being monitored by the HGWP, and to support the Hanford Site Composite Analysis for low-level waste disposal in the 200-Area Plateau. Recent modeling efforts have focused on continued refinement of an initial version of the three-dimensional model developed in 1995 and its application to simulate future transport of selected contaminant plumes in the aquifer system. This version of the model was updated using a more current version of the CFEST code called CFEST96. Prior to conducting simulations of contaminant transport with the three-dimensional model, a previous steady-state, two-dimensional model of the unconfined aquifer system was recalibrated to 1979 water-table conditions with a statistical inverse method implemented in the CFEST-INV computer code. The results of the recalibration were used to refine the three-dimensional conceptual model and to calibrate it with a conceptualization that preserves the two-dimensional hydraulic properties and knowledge of the aquifer's three-dimensional properties for the same 1979 water-table conditions. The transient behavior of the three-dimensional flow model was also calibrated by adjusting model storage properties (specific yield) until transient water-table predictions approximated observed water-table elevations between 1979 and 1996.

583
(PNNL–11836-Rev.1)
Flammable gas issues in double-contained receiver tanks. Revision 1. Peurrung, L.M.; Mahoney, L.A.; Stewart, C.W.; Gauglitz, P.A.; Pederson, L.R.; Bryan, S.A.; Shepard, C.L. Pacific Northwest National Lab., Richland, WA (United States). Jun 1998. 170p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98054466. Source: OSTI; NTIS; INIS; GPO Dep.

Four double-contained receiver tanks (DCRTs) at Hanford will be used to store salt-well pumped liquids from tanks on the Flammable Gas Watch List. This document was created to serve as a technical basis or reference document for flammable gas issues in DCRTs. The document identifies, describes, evaluates, and attempts to quantify potential gas carryover and release mechanisms. It estimates several key parameters needed for these calculations, such as initial aqueous concentrations and ventilation rate, and evaluates the uncertainty in those estimates. It justifies the use of the Schumpe model for estimating vapor-liquid equilibrium constants. It identifies several potential waste compatibility issues (such as mixing and pH or temperature changes) that could lead to gas release and provides a basis for calculating their effects. It evaluates the potential for gas retention in precipitated solids within a DCRT and whether retention could lead to a buoyant displacement instability (rollover) event. It discusses rates of radiolytic, thermal, and corrosive hydrogen generation within the DCRT. It also describes in detail the accepted method of calculating the lower flammability limit (LFL) for mixtures of flammable gases.

584
(PNNL–11836-Rev.2)
Flammable gas issues in double-contained receiver tanks. Revision 2. Peurrung, L.M.; Mahoney, L.A.; Stewart, C.W.; Gauglitz, P.A.; Pederson, L.R.; Bryan, S.A.; Shepard, C.L. Pacific Northwest National Lab., Richland, WA (United States). Aug 1998. [150p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98058899. Source: OSTI; NTIS; INIS; GPO Dep.

Four double-contained receiver tanks (DCRTs) at Hanford will be used to store salt-well pumped liquids from tanks on the Flammable Gas Watch List. This document was created to serve as a reference document describing the current knowledge of flammable gas issues in DCRTs. The document identifies, describes, evaluates, and attempts to quantify potential gas carryover and release mechanisms. It estimates several key parameters needed for these calculations, such as initial aqueous concentrations and ventilation rate, and evaluates the uncertainty in those estimates. It justifies the use of the Schumpe model for estimating vapor-liquid equilibrium constants. It identifies several potential waste compatibility issues (such as mixing and pH or temperature changes) that could lead to gas release and provides a basis for calculating their effects. It evaluates the potential for gas retention in precipitated solids within a DCRT and whether retention could lead to a buoyant displacement instability (rollover) event. It discusses rates of radiolytic, thermal, and corrosive hydrogen generation within the DCRT. It also describes in detail the accepted method of calculating the lower flammability limit (LFL) for mixtures of flammable gases. The report incorporates these analyses into two models for calculating headspace flammability, one based on instantaneous equilibrium between dissolved gases and the headspace and one incorporating limited release rates based on mass-transfer considerations. Finally, it demonstrates the use of both models to estimate headspace flammable gas concentrations and minimum ventilation rates required to maintain concentrations below 25% of the LFL.

585
(PNNL–11852(Draft))
Risk based requirements for long term stewardship: A proof-of-principle analysis of an analytic method tested on selected Hanford locations. Jarvis, T.T. (and others); Andrews, W.B.; Buck, J.W. Pacific Northwest Lab., Richland, WA (United States). Mar 1998. 56p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. DE-AC06-76RLO 1830. Order Number DE98052629. Source: OSTI; NTIS; INIS; GPO Dep.

Since 1989, the Department of Energy's (DOE) Environmental Management (EM) Program has managed the environmental legacy of US nuclear weapons production, research and testing at 137 facilities in 31 states and one US territory. The EM program has conducted several studies on the public risks posed by contaminated sites at these facilities. In Risks and the Risk Debate [DOE, 1995a], the Department analyzed the risks at sites before, during, and after remediation work by the EM program. The results indicated that aside from a few urgent risks, most hazards present little inherent risk because physical and active site management controls limit both the releases of site contaminants, and public access to these hazards. Without these controls, these sites would pose greater risks to the public. Past risk reports, however, provided little information about post-cleanup risk, primarily because of uncertainty about future site uses and site characteristics at the end of planned cleanup activities. This is of concern because in many cases current cleanup technologies, and remedies, will last a shorter period of time than the waste itself and the resulting contamination will remain hazardous.

586
(PNNL–11887)
TWRS privatization phase 1 monitoring wells engineering study. Williams, B.A.; Newcomer, D.R. Pacific Northwest National Lab., Richland, WA (United States). Apr 1998. 70p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98053011. Source: OSTI; NTIS; INIS; GPO Dep.

This engineering study provides an evaluation of existing wells and boreholes (wells) within the proposed location for the Tank Waste Remediation System (TWRS) Privatization Phase 1 demonstration site. Phase 1 is part of the TWRS program that was established to manage, retrieve, treat, immobilize, and dispose of high-level waste stored in underground tanks at the Hanford Site. This evaluation is to determine which wells will remain active within the demonstration site based on regulatory, programmatic, or other beneficial use requirements. An initial evaluation of wells within the demonstration site was conducted in 1996. However, changes in construction plans and expansion of the demonstration site necessitated a reevaluation and reclassification of the wells that are within the expanded site. Impacted wells include many of those previously evaluated as well as additional wells identified in or near the expansion areas. Thirty-three wells exist within and immediately adjacent to the identified boundary of the proposed demonstration site. The wells identified for decommissioning will be abandoned according to the well decommissioning plan. Future well requirements within the site include replacement wells for those wells impacted by construction activities, replacements for Resource Conservation and Recovery Act of 1976 (RCRA) wells going dry, and a new characterization well installed to support a TWRS Phase 2 site assessment.

587
(PNNL–11890)
Baseline estimate of the retained gas volume in Tank 241-C-106. Stewart, C.W.; Chen, G. Pacific Northwest National Lab., Richland, WA (United States). Jun 1998. 34p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98054531. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of a study of the retained gas volume in Hanford Tank 241-C-106 (C-106) using the barometric pressure effect method. This estimate is required to establish the baseline conditions for sluicing the waste from C-106 into AY-102, scheduled to begin in the fall of 1998. The barometric pressure effect model is described, and the data reduction and detrending techniques are detailed. Based on the response of the waste level to the larger barometric pressure swings that occurred between October 27, 1997, and March 4, 1998, the best estimate and conservative (99% confidence) retained gas volumes in

C-106 are 24 scm (840 scf) and 50 scm (1,770 scf), respectively. This is equivalent to average void fractions of 0.025 and 0.053, respectively.

588
(PNNL–11900)
Interaction of Pu(IV,VI) hydroxides/oxides with metal hydroxides/oxides in alkaline media. Fedoseev, A.M. (Russian Academy of Sciences, Moscow (Russian Federation). Inst. of Physical Chemistry); Krot, N.N.; Budantseva, N.A.; Bessonov, A.A.; Nikonov, M.V.; Grigoriev, M.S.; Garnov, A.Y.; Perminov, V.P.; Astafurova, L.N. Pacific Northwest National Lab., Richland, WA (United States). Aug 1998. 58p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98058293. Source: OSTI; NTIS; INIS; GPO Dep.

The primary goal of this investigation was to obtain data on the possibility, extent, and characteristics of interaction of Pu(IV) and (VI) with hydroxides and oxides of d-elements and other metals [Al(III), LA(III), and U(VI)] in alkaline media. Such information is important in fundamental understanding of plutonium disposition and behavior in Hanford Site radioactive tank waste sludge. These results supply essential data for determining criticality safety and in understanding transuranic waste behavior in storage, retrieval, and treatment of Hanford Site tank waste.

589
(PNNL–11901)
Plutonium(IV) precipitates formed in alkaline media in the presence of various anions. Krot, N.N.; Shilov, V.P.; Yusov, A.B.; Tananaev, I.G.; Grigoriev, M.S.; Garnov, A.Yu.; Perminov, V.P.; Astafurova, L.N. Pacific Northwest National Lab., Richland, WA (United States). Sep 1998. [50p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98058986. Source: OSTI; NTIS; INIS; GPO Dep.

The tendency of Pu(IV) to hydrolyze and form true solutions, colloid solutions, or insoluble precipitates has been known since the Manhattan Project. Since then, specific studies have been performed to examine in detail the equilibria of Pu(IV) hydrolytic reactions in various media. Great attention also has been paid to the preparation, structure, and properties of Pu(IV) polymers or colloids. These compounds found an important application in sol-gel technology for the preparation of nuclear fuel materials. A most important result of these works was the conclusion that Pu(IV) hydroxide, after some aging, consists of very small PuO_2 crystallites and should therefore be considered to be Pu(IV) hydrous oxide. However, studies of the properties and behavior of solid Pu(IV) hydroxide in complex heterogeneous systems are rare. The primary goal of this investigation was to obtain data on the composition and properties of Pu(IV) hydrous oxide or other compounds formed in alkaline media under different conditions. Such information is important to understand Pu(IV) behavior and the forms of its existence in the Hanford Site alkaline tank waste sludge. This knowledge then may be applied in assessing plutonium criticality hazards in the storage, retrieval, and treatment of Hanford Site tank wastes as well as in understanding its contribution to the transuranic waste inventory (threshold at 100 nCi/g or about 5×10^{-6} M) of the separate solution and solid phases.

590
(PNNL–11903)
Groundwater monitoring plan for the Hanford Site 216-B-3 pond RCRA facility. Barnett, D.B.; Chou, C.J. Pacific Northwest National Lab., Richland, WA (United States). Jun 1998. [250p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98054558. Source: OSTI; NTIS; INIS; GPO Dep.

The 216-B-3 pond system was a series of ponds for disposal of liquid effluent from past Hanford production facilities. In operation since 1945, the B Pond system has been a RCRA facility since 1986, with Resource Conservation and Recovery Act (RCRA) interim-status groundwater monitoring in place since 1988. In 1994, discharges were diverted from the main pond, where the greatest potential for contamination was thought to reside, to the 3C expansion pond. In 1997, all discharges to the pond system were discontinued. In 1990, the B Pond system was elevated from detection groundwater monitoring to an assessment-level status because total organic halogens and total organic carbon were found to exceed critical means in two wells. Subsequent groundwater quality assessment failed to find any specific hazardous waste contaminant that could have accounted for the exceedances, which were largely isolated in occurrence. Thus, it was recommended that the facility be returned to detection-level monitoring.

591
(PNNL–11909-Rev.1)
Organic tanks safety program waste aging studies. Final report, Revision 1. Camaioni, D.M. (and others); Samuels, W.D.; Linehan, J.C. Pacific Northwest National Lab., Richland, WA (United States). Sep 1998. [150p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98059302. Source: OSTI; NTIS; INIS; GPO Dep.

Uranium and plutonium production at the Hanford Site produced large quantities of radioactive byproducts and contaminated process chemicals that are stored in underground tanks awaiting treatment and disposal. Having been made strongly alkaline and then subjected to successive water evaporation campaigns to increase storage capacity, the wastes now exist in the physical forms of saltcakes, metal oxide sludges, and aqueous brine solutions. Tanks that contain organic process chemicals mixed with nitrate/nitrite salt wastes might be at risk for fuel-nitrate combustion accidents. This project started in fiscal year 1993 to provide information on the chemical fate of stored organic wastes. While historical records had identified the organic compounds originally purchased and potentially present in wastes, aging experiments were needed to identify the probable degradation products and evaluate the current hazard. The determination of the rates and pathways of degradation have facilitated prediction of how the hazard changes with time and altered storage conditions. Also, the work with aged simulated waste contributed to the development of analytical methods for characterizing actual wastes. Finally, the results for simulants provide a baseline for comparing and interpreting tank characterization data.

592
(PNNL–11919)
Integrating pretreatment and retrieval: Results from the July 1997 Tanks Focus Area workshop. Pacific Northwest

National Lab., Richland, WA (United States). Jul 1998. 31p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98057776. Source: OSTI; NTIS; INIS; GPO Dep.

If scientists and researchers working to solve the tank waste challenges, technical program office managers at the tank sites, and others understand the connection between retrieval and pretreatment activities, more efficient processes and reduced costs can be achieved. To make this possible, researchers involved in retrieval and pretreatment activities met at the Conference Center in Richland, Washington, on July 16 and 17, 1997, to discuss the connections between these activities. The purpose of the workshop was to help participants (1) gain a better understanding of retrieval and pretreatment process needs and experiences; (2) gain practical knowledge of the applications, capabilities, and requirements of retrieval and pretreatment technologies being developed and deployed; and (3) focus on identifying and troubleshooting interface issues and problems. The end product of this meeting was to create a checklist of retrieval and pretreatment parameters to consider when developing new technologies or managing work at the sites in these areas. For convenience, the information is also organized by pretreatment parameter and retrieval-pretreatment parameter in Section 5.0.

593
(PNNL–11920)
Performance evaluation of rotating pump jet mixing of radioactive wastes in Hanford Tanks 241-AP-102 and -104. Onishi, Y.; Recknagle, K.P. Pacific Northwest National Lab., Richland, WA (United States). Jul 1998. [45p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98057836. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this study was to confirm the adequacy of a single mixer pump to fully mix the wastes that will be stored in Tanks 241-AP-102 and -104. These Hanford double-shell tanks (DSTs) will be used as staging tanks to receive low-activity wastes from other Hanford storage tanks and, in turn, will supply the wastes to private waste vitrification facilities for eventual solidification. The TEMPEST computer code was applied to Tanks AP-102 and -104 to simulate waste mixing generated by the 60-ft/s rotating jets and to determine the effectiveness of the single rotating pump to mix the waste. TEMPEST simulates flow and mass/heat transport and chemical reactions (equilibrium and kinetic reactions) coupled together. Section 2 describes the pump jet mixing conditions the authors evaluated, the modeling cases, and their parameters. Section 3 reports model applications and assessment results. The summary and conclusions are presented in Section 4, and cited references are listed in Section 5.

594
(PNNL–11923)
Sampling and analysis plan for the former Atomic Energy Commission bus lot property. Nielson, R.R. Pacific Northwest National Lab., Richland, WA (United States). Jul 1998. [100p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98059318. Source: OSTI; NTIS; INIS; GPO Dep.

This sampling and analysis plan (SAP) presents the rationale and strategy for the sampling and analysis activities proposed in support of an initial investigation of the former Atomic Energy Commission (AEC) bus lot property currently owned by Battelle Memorial Institute. The purpose of the proposed sampling and analysis activity is to investigate the potential for contamination above established action levels. The SAP will provide defensible data of sufficient quality and quantity to support recommendations of whether any further action within the study area is warranted. To assist in preparing sampling plans and reports, the Washington State Department of Ecology (Ecology) has published Guidance on Sampling and Data Analysis Methods. To specifically address sampling plans for petroleum-contaminated sites, Ecology has also published Guidance for Remediation of Petroleum Contaminated Sites. Both documents were used as guidance in preparing this plan. In 1992, a soil sample was taken within the current study area as part of a project to remove two underground storage tanks (USTs) at Battelle's Sixth Street Warehouse Petroleum Dispensing Station (Section 1.3). The results showed that the sample contained elevated levels of total petroleum hydrocarbons (TPH) in the heavy distillate range. This current study was initiated in part as a result of that discovery. The following topics are considered: the historical background of the site, current site conditions, previous investigations performed at the site, an evaluation based on the available data, and the contaminants of potential concern (COPC).

595
(PNNL–11925)
Waste tank ventilation rates measured with a tracer gas method. Huckaby, J.L.; Evans, J.C.; Sklarew, D.S.; Mitroshkov, A.V. Pacific Northwest National Lab., Richland, WA (United States). Aug 1998. [50p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98058853. Source: OSTI; NTIS; INIS; GPO Dep.

Passive ventilation with the atmosphere is used to prevent accumulation of waste gases and vapors in the headspaces of 132 of the 177 high-level radioactive waste Tanks at the Hanford Site in Southeastern Washington State. Measurements of the passive ventilation rates are needed for the resolution of two key safety issues associated with the rates of flammable gas production and accumulation and the rates at which organic salt-nitrate salt mixtures dry out. Direct measurement of passive ventilation rates using mass flow meters is not feasible because ventilation occurs va multiple pathways to the atmosphere (i.e., via the filtered breather riser and unsealed tank risers and pits), as well as via underground connections to other tanks, junction boxes, and inactive ventilation systems. The tracer gas method discussed in this report provides a direct measurement of the rate at which gases are removed by ventilation and an indirect measurement of the ventilation rate. The tracer gas behaves as a surrogate of the waste-generated gases, but it is only diminished via ventilation, whereas the waste gases are continuously released by the waste and may be subject to depletion mechanisms other than ventilation. The fiscal year 1998 tracer studies provide new evidence that significant exchange of air occurs between tanks via the underground cascade pipes. Most of the single-shell waste tanks are connected via 7.6-cm diameter cascade pipes to one or two adjacent tanks. Tracer gas studies of the Tank U-102/U-103 system indicated that the ventilation occurring via

the cascade line could be a significant fraction of the total ventilation. In this two-tank cascade, air evidently flowed from Tank U-103 to Tank U-102 for a time and then was observed to flow from Tank U-102 to Tank U-103.

596
(PNNL–11926)
Ventilation rates calculated from hydrogen release data in tanks equipped with standard hydrogen monitoring systems (SHMS). Sklarew, D.S.; Huckaby, J.L. Pacific Northwest National Lab., Richland, WA (United States). Sep 1998. 22p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98058987. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes a method for estimating the ventilation rates of the high-level radioactive waste tank headspaces at the Hanford Site in Southeastern Washington state. The method, using hydrogen concentration data, is applied to all passively ventilated and selected mechanically ventilated tanks equipped with Standard Hydrogen Monitoring Systems (SHMS) and covers the time period from when the SHMS were installed through July 12, 1998. Results of the analyses are tabulated and compared with results from tracer gas studies and similar analyses of SHMS data. The method relies on instances of above-normal hydrogen releases and assumes the rate at which hydrogen is released by the waste is otherwise approximately constant. It also assumes that hydrogen is uniformly distributed in the tank headspace, so that at any given time the concentration of hydrogen in the effluent is approximately equal to the average headspace concentration and that measured by the SHMS. In general, the greatest single source of error in the method is the determination of the baseline hydrogen concentration, which in this study has been estimated by visual inspection of plotted data. Uncertainties in the calculated ventilation rates due to inaccurate baseline measurements are examined by performing a sensitivity analysis with upper and lower bounding values for the baseline concentration (in addition to the best estimate). A table lists the tanks considered in this report and the range of estimated ventilation rates obtained for each tank. When multiple events of above-normal hydrogen releases were observed, the range of estimated ventilation rates is given. Resulting values and their variability are consistent with those determined using tracer gases.

597
(PNNL–11930)
Calculation of combustible waste fraction (CWF) estimates used in organics safety issue screening. Heasler, P.G.; Gao, F.; Toth, J.J. Pacific Northwest National Lab., Richland, WA (United States). Aug 1998. 492p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98058233. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes how in-tank measurements of moisture (H_2O) and total organic carbon (TOC) are used to calculate combustible waste fractions (CWF) for 138 of the 149 Hanford single shell tanks. The combustible waste fraction of a tank is defined as that proportion of waste that is capable of burning when exposed to an ignition source. These CWF estimates are used to screen tanks for the organics complexant safety issue. Tanks with a suitably low fraction of combustible waste are classified as safe. The calculations in this report determine the combustible waste fractions in tanks under two different moisture conditions: under current moisture conditions, and after complete dry out. The first fraction is called the wet combustible waste fraction (wet CWF) and the second is called the dry combustible waste fraction (dry CWF). These two fractions are used to screen tanks into three categories: if the wet CWF is too high (above 5%), the tank is categorized as unsafe; if the wet CWF is low but the dry CWF is too high (again, above 5%), the tank is categorized as conditionally safe; finally, if both the wet and dry CWF are low, the tank is categorized as safe. Section 2 describes the data that was required for these calculations. Sections 3 and 4 describe the statistical model and resulting fit for dry combustible waste fractions. Sections 5 and 6 present the statistical model used to estimate wet CWF and the resulting fit. Section 7 describes two tests that were performed on the dry combustible waste fraction ANOVA model to validate it. Finally, Section 8 presents concluding remarks. Two Appendices present results on a tank-by-tank basis.

598
(PNNL–11933)
Survey of radiological contaminants in the near-shore environment at the Hanford Site 100-N Area reactor. Van Verst, S.P. (Washington State Dept. of Health, Olympia, WA (United States)); Albin, C.L.; Patton, G.W.; Blanton, M.L.; Poston, T.M.; Cooper, A.T.; Antonio, E.J. Pacific Northwest National Lab., Richland, WA (United States). Sep 1998. [150p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98059301. Source: OSTI; NTIS; INIS; GPO Dep.

Past operations at the Hanford Site 100-N Area reactor resulted in the release of radiological contaminants to the soil column, local groundwater, and ultimately to the near-shore environment of the Columbia River. In September 1997, the Washington State Department of Health (WDOH) and the Hanford Site Surface Environmental Surveillance Project (SESP) initiated a special study of the near-shore vicinity at the Hanford Site's retired 100-N Area reactor. Environmental samples were collected and analyzed for radiological contaminants (^{3}H, ^{90}Sr, and gamma/emitters), with both the WDOH and SESP analyzing a portion of the samples. Samples of river water, sediment, riverbank springs, periphyton, milfoil, flying insects, clam shells, and reed canary grass were collected. External exposure rates were also measured for the near-shore environment in the vicinity of the 100-N Area. In addition, samples were collected at background locations above Vernita Bridge.

599
(PNNL–11935)
Dryout modeling in support of the organic tank safety project. Simmons, C.S. Pacific Northwest National Lab., Richland, WA (United States). Aug 1998. 57p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98058856. Source: OSTI; NTIS; INIS; GPO Dep.

This work was performed for the Organic Tank Safety Project to evaluate the moisture condition of the waste surface organic-nitrate bearing tanks that are classified as being conditionally safe because sufficient water is present. This report describes the predictive modeling procedure

used to predict the moisture content of waste in the future, after it has been subjected to dryout caused by water vapor loss through passive ventilation. This report describes a simplified procedure for modeling the drying out of tank waste. Dryout occurs as moisture evaporates from the waste into the headspace and then exits the tank through ventilation. The water vapor concentration within the waste of the headspace is determined by the vapor-liquid equilibrium, which depends on the waste's moisture content and temperature. This equilibrium has been measured experimentally for a variety of waste samples and is described by a curve called the water vapor partial pressure isotherm. This curve describes the lowering of the partial pressure of water vapor in equilibrium with the waste relative to pure water due to the waste's chemical composition and hygroscopic nature. Saltcake and sludge are described by two distinct calculations that emphasize the particular physical behavior or each. A simple, steady-state model is devised for each type to obtain the approximate drying behavior. The report shows the application of the model to Tanks AX-102, C-104, and U-105.

600
(PNNL–11945)
Organic tank safety project: Equilibrium moisture determination task, FY 1998 annual progress report. Scheele, R.D.; Bredt, P.R.; Sell, R.L. Pacific Northwest National Lab., Richland, WA (United States). Aug 1998. [100p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98058430. Source: OSTI; NTIS; INIS; GPO Dep.

During fiscal year 1998, PNNL investigated the effect of P_{H_2O} at or near maximum tank waste surface temperatures on the equilibrium water content of selected Hanford waste samples. These studies were performed to determine how dry organic-bearing wastes will become if exposed to environmental Hanford water partial pressures. The samples tested were obtained from Organic Watch List Tanks. At 26 C, the lowest temperature used, the water partial pressures ranged from 2 to 22 torr. At 41 C, the highest temperature used, the water partial pressures ranged from 3.5 to 48 torr. When the aliquots exposed to the lowest and highest water partial pressures reached their equilibrium or near-equilibrium water contents, they were exchanged to determine if hysteresis occurred. In some experiments, once equilibrated, aliquots not used in the hysteresis experiments were allowed to equilibrate at room temperature (23 C) until the hysteresis experiments ended; this provides a measure of the effect of temperature.

601
(PNNL–11955)
Organic speciation of AX-102, BX-104, C-104, C-201, and C-202 tank wastes. Campbell, J.A.; Sharma, A.K.; Clauss, S.A.; Mong, G.M.; Bellofatto, D.L. Pacific Northwest National Lab., Richland, WA (United States). Aug 1998. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98058970. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the work performed during FY 1998 by Pacific Northwest National Laboratory to identify organic components in Hanford waste tank samples to support resolution of the organic tank safety issue. The major focus during FY 1998 was the analysis of actual tank wastes under Hanford Analytical Services Quality Assurance (HASQARD) compliance. Samples from Tanks AX-102, C-104, BX-104, C-201, and C-202 were analyzed for organic constituents. Samples were analyzed using derivatization gas chromatography/flame ionization detection for chelators and chelator fragments, ion chromatography for low-molecular-weight organic acids, and ion-pair chromatography for chelators. The major components identified include low-molecular-weight acids (e.g., oxalic acid), chelators (e.g., EDTA) and chelator fragments.

602
(PNNL–11968)
Performance evaluation of the PITBULL™ pump for the removal of hazardous waste. Hatchell, B.K.; Combs, W.H.; Hymas, C.R.; Powell, M.R.; Rinker, M.W.; White, M. Pacific Northwest National Lab., TN (United States). Sep 1998. [75p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98059319. Source: OSTI; NTIS; INIS; GPO Dep.

One objective of the Waste Removal Project at the Department of Energy's Savannah River Site (SRS) is to explore methods to successfully remove waste heels that will remain in the high-level waste tanks after bulk waste removal has been completed. Tank closure is not possible unless this residue is removed. As much as 151,000 liters of residue can remain after a conventional waste removal campaign. The waste heels can be comprised of sludge, zeolite, and silica. The heels are generally hardened or compacted insoluble particulate with relatively rapid settling velocities. A PITBULL™ pump is being considered by SRS to retrieve sludge-type waste from Tank 19. Sections 1 through 4 of this report present the scope and objectives of the test program, describe the principles of operation of the PITBULL, and present the test approach, set-up, and instrumentation. Test results, including pumping rates with water and slurry, are provided in Section 5, along with considerations for remote operation. Conclusions and recommendations are provided in Section 6.

603
(PNNL–11970)
Monitoring bank erosion at the Locke Island Archaeological National Register District: Summary of 1996/1997 field activities. Nickens, P.R. (ed.); Bjornstad, B.N.; Nickens, P.R.; Cadoret, N.A.; Wright, M.K. Pacific Northwest National Lab., Richland, WA (United States). Aug 1998. [150p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98058488. Source: OSTI; NTIS; GPO Dep.

Locke Island is located in the Columbia River in south-central Washington. The US Department of Energy (DOE) owns Locke Island as part of its Hanford Site. In the 1960s and 1970s, as a result of intensive irrigation developments on the inland shoreline to the east of the island, the White Bluffs, which form the eastern boundary of the Columbia River channel in this area, began to show geological failures as excess irrigation water seeped out along the bluffs. One of the largest such failures, known as the Locke Island Landslide, is located just east of Locke Island. By the early 1980s, this landslide mass had moved westward into the river channel toward the island and was diverting the current

at the island's eastern perimeter. Erosion of the bank in the center of the island accelerated, threatening the cultural resources. By the early 1990s, the erosion had exposed cultural features and artifacts along the bank, leading to the beginning of intermittent monitoring of the cutbank. In 1994, DOE initiated more scheduled, systematic monitoring of island erosion to better understand the physical processes involved as well as mitigate ongoing loss of the archaeological record.

604
(PNNL–11981)
Mechanisms of gas retention and release: Experimental results for Hanford single-shell waste tanks 241-A-101, 241-S-106, and 241-U-103. Rassat, S.D.; Caley, S.M.; Bredt, P.R.; Gauglitz, P.A.; Rinehart, D.E.; Forbes, S.V. Pacific Northwest National Lab., Richland, WA (United States). Sep 1998. 65p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98058803. Source: OSTI; NTIS; INIS; GPO Dep.

The 177 underground waste storage tanks at the Hanford Site contain millions of gallons of radioactive waste resulting from the purification of nuclear materials and related processes. Through various mechanisms, flammable gas mixtures of hydrogen, ammonia, methane, and nitrous oxide are generated and retained in significant quantities within the waste in many (∼25) of these tanks. The potential for large releases of retained gas from these wastes creates a flammability hazard. It is a critical component of the effort to understand the flammability hazard and a primary goal of this laboratory investigation to establish an understanding of the mechanisms of gas retention and release in these wastes. The results of bubble retention experimental studies using waste samples from several waste tanks and a variety of waste types support resolution of the Flammable Gas Safety Issue. Gas bubble retention information gained in the pursuit of safe storage will, in turn, benefit future waste operations including salt-well pumping, waste transfers, and sluicing/retrieval.

605
(PNNL–11988)
Purification of alkaline solutions and wastes from actinides and technetium by coprecipitation with some carriers using the method of appearing reagents: Final Report. Peretrukhin, V.F. (Russian Academy of Sciences, Moscow (Russian Federation). Inst. of Physical Chemistry); Silin, V.I.; Kareta, A.V.; Gelis, A.V.; Shilov, V.P.; German, K.E.; Firsova, E.V.; Maslennikov, A.G.; Trushina, V.E. Pacific Northwest National Lab., Richland, WA (United States). Sep 1998. 55p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98059329. Source: OSTI; NTIS; INIS; GPO Dep.

The coprecipitation of transuranium elements (TRU) and technetium from alkaline solutions and from simulants of Hanford Site tank wastes has been studied in reducing and oxidizing conditions on uranium(IV,VI) hydroxocompounds, tetraalkylammonium perrhenate and perchlorate, and on hydroxides of Fe(III), Co(III), Mn(II), and Cr(III) using the method of appearing reagents (MAR). Coprecipitations in alkaline solution have been shown to give high decontamination factors (DF) at low content of carrier and in the presence of high salt concentrations. Uranium(IV) hydroxide in concentrations higher than 3×10^{-3} M coprecipitates Pu and Cm in any oxidation state from 0.2 to 4 M NaOH with DFs of 110 to 1000 and Np and Tc with DFs of 51 to 176. Technetium (VII) coprecipitates with (5 to 8) $\times 10^{-4}$ M tetrabutylammonium (TBA) perrhenate in 0.01 to 0.02 M TBA hydroxide from 0.5 to 1.5 M NaOH to give DFs of 150 to 200. Coprecipitations of Np and Pu with $Co(OH)_3$, $Fe(OH)_3$, $Cr(OH)_3$, and $Mn(OH)_2$ obtained by the MAR from precursors in the range from pH 10.5 to 0.4 M NaOH give DFs from 80 to 400.

606
(PNNL–11989)
Integrated monitoring plan for the Hanford groundwater monitoring project. Hartman, M.J.; Dresel, P.E.; McDonald, J.P.; Mercer, R.B.; Newcomer, D.R.; Thornton, E.C. Pacific Northwest National Lab., Richland, WA (United States). Sep 1998. [200p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98059078. Source: OSTI; NTIS; INIS; GPO Dep.

Groundwater is monitored in hundreds of wells at the Hanford Site to fulfill a variety of requirements. Separate monitoring plans are prepared for various requirements, but sampling is coordinated and data are shared among users to avoid duplication of effort. The US Department of Energy (DOE) manages these activities through the Hanford Groundwater Monitoring Project (groundwater project), which is the responsibility of Pacific Northwest National Laboratory. The groundwater project does not include all of the monitoring to assess performance of groundwater remediation or all monitoring associated with active facilities. This document is the first integrated monitoring plan for the groundwater project and contains: well and constituent lists for monitoring required by the Atomic Energy Act of 1954 and its implementing orders; other, established monitoring plans by reference; and a master well/constituent/frequency matrix for the entire Hanford Site.

607
(PNNL–11996)
Investigation of flammable gas and thermal safety issues for retrieval of waste from Tank 241-AN-105. Caley, S.M.; Stewart, C.W.; Antoniak, Z.I.; Cuta, J.M.; Mahoney, L.A.; Panisko, F.E. Pacific Northwest National Lab., Richland, WA (United States). Sep 1998. 50p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98059303. Source: OSTI; NTIS; INIS; GPO Dep.

The primary purpose of this report is to identify and resolve some of the flammable gas and thermal safety issues potentially associated with the retrieval of waste from Tank 241-AN-105 (AN-105), which is the first double-shell tank scheduled for waste retrieval at Hanford. The planned retrieval scenario includes the following steps in AN-105: (1) degas the tank using two submerged mixing pumps, (2) turn off the mixer pump(s) and allow any suspended solids to settle, (3) decant the supernatant to the intermediate feed staging tank(s) (IFSTs) (AP-102 and/or AP-104) using water/caustic dilution at the transfer pump inlet, (4) add the remaining dilution water/caustic to the slurry remaining in AN-105, (5) mix the tank with the mixer pump(s) until the soluble solids dissolve, (6) turn off the mixer pump(s) and let the insoluble solids settle, and (7) decant the new supernatant to the IFST(s), leaving the insoluble solids behind.

Three waste retrieval safety issues are addressed in this report. They are (1) the controlled degassing of AN-105 to ensure that the headspace remains <25% of the lower flammability limit (LFL), (2) an assessment of how dissolved gas (mainly ammonia) released during the transfer of the supernatant in AN-105 to the IFSTs and the water/caustic dilution of the remaining slurry in AN-105 will affect the flammability in these tanks; and (3) an assessment of the maximum waste temperatures that might occur in AN-105 during retrieval operations.

608
(PNNL–11999)
Demonstration of strontium removal from Hanford N-Area well water. Carlson, C.D.; DesChane, J.R.; Corneillie, T.M. Pacific Northwest National Lab., Richland, WA (United States). Sep 1998. 34p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98059362. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the Efficient Separations and Processing Crosscutting Program, the Pacific Northwest National Laboratory conducted this study to demonstrate the efficiency of several ion-exchange materials in removing strontium-90 from actual groundwater from the Hanford N-Springs Pump and Treat Demonstration Facility. The objective of this experiment was to determine the strontium-loading distribution coefficients (Kds) for some titanate ion-exchange materials, modified minerals, and organic ion-exchange resins. The equilibrium uptake data presented in this report are useful for identifying potential materials that are capable of removing strontium from N-area groundwaters. The data show the relative selectivities of the ion-exchange materials under similar operating conditions, and show that additional flow studies are needed to predict materials capacities and to develop complete ion-exchange process flow sheets. The materials investigated in this study include commercially available ion exchangers such as IONSIV IE-911 (manufactured by UOP) and SuperLig 644 (IBC Advanced Technologies, Inc.), and materials produced on an experimental basis by Allied Signal (nontitanates), Selion Inc. (titanates), and Pennsylvania State University (modified mica). In all, the performance of seven different ion-exchange materials was evaluated using actual N-Area groundwater. The evaluation consisted of the determining strontium batch distribution coefficients, loading, and decontamination factors. Tests were performed at two different solution-to-exchanger mass ratios (i.e., phase ratios) of 2000 and 4000 using actual N-Area groundwater samples from three different wells. Actual N-Area groundwater used in the present study was obtained from three monitoring wells in FY 1998. These samples were taken from wells with strontium-90 concentrations ranging from 0.25 to 3.9 pCi/L.

609
(PNNL–12001)
Low-pressure, single-point grout injection for tank heel sludge mixing and in-situ immobilization. Whyatt, G.A.; Hymas, C.R. Pacific Northwest National Lab., Richland, WA (United States). Sep 1998. 45p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98059321. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes tests conducted in an approximately 9-ft diameter test tank situated outside the 336 building in Hanford's 300 area. The tests were performed to measure the ability of jets of grout slurry to mobilize and mix simulated tank sludge. The technique is intended for in situ immobilization of tank waste heels. The current approach uses a single, rotated, larger-diameter nozzle driven at lower pressure. Due to the larger diameter, the potential for plugging is reduced and the effective radius around an injection point over which the jet is effective in mobilizing sludge from the tank bottom can be made larger. A total of three grout injection tests were conducted in a 9-ft diameter tank. In each case, a 2-in. layer of kaolin clay paste was placed on a dry tank floor to simulate a sludge heel. The clay was covered with 4 inches of water. The grout slurry, consisting of Portland cement, class F fly ash, and eater, was prepared and delivered by an offsite vendor. In the third test, the sludge in half of the tank was replaced by a layer of 20x50 mesh zeolite, and bentonite clay was added to the grout formulation. After injection, the grout was allowed to set and then the entire grout monolith was manually broken up and excavated using a jack hammer. Intact pieces of clay were visually apparent due to a sharp color contrast between the grout and clay. Remaining clay deposits were collected and weighed and suspended clay pieces within the monolith were photographed. The mobilization performance of the grout jets exceeded expectations.

610
(PNNL–12003)
Summary of uncertainty estimation results for Hanford tank chemical and radionuclide inventories. Ferryman, T.A. (and others); Amidan, B.G.; Chen, G. Pacific Northwest National Lab., Richland, WA (United States). Sep 1998. 198p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98059363. Source: OSTI; NTIS; INIS; GPO Dep.

The exact physical and chemical nature of 55 million gallons of radioactive waste held in 177 underground waste tanks at the Hanford Site is not known in sufficient detail to support safety, retrieval, and immobilization missions. The Hanford Engineering Analysis Best-Basis team has made point estimates of the inventories in each tank. The purpose of this study is to estimate probability distributions for each of the analytes and tanks for which the Hanford Best-Basis team has made point estimates. Uncertainty intervals can then be calculated for the Best-Basis inventories and should facilitate the cleanup missions. The methodology used to generate the results published in the Tank Characterization Database (TCD) and summarized in this paper is based on scientific principles, sound technical knowledge of the realities associated with the Hanford waste tanks, the chemical analysis of actual samples from the tanks, the Hanford Best-Basic research, and historical data records. The methodology builds on research conducted by Pacific Northwest National Laboratory (PNNL) over the last few years. Appendix A of this report summarizes the results of the study. The full set of results (in percentiles, 1–99) is available through the TCD, (http://twins.pnl.gov:8001).

611
(PNNL–12007)
Fabrication and testing of engineered forms of self-assembled monolayers on mesoporous silica (SAMMS) material. Mattigod, S.V. (Pacific Northwest National Lab., Richland, WA (United States)); Liu, J.; Fryxell, G.E.;

Baskaran, S.; Gong, M.; Nie, Z.; Feng, X.; Klasson, K.T. Pacific Northwest National Lab., Richland, WA (United States). Sep 1998. 27p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE98059366. Source: OSTI; NTIS; GPO Dep.

A number of engineered forms such as flexible extrudates, beads, and rods were fabricated using thiol-SAMMS (Self-Assembled Monolayers on Mesoporous Silica) and tested for their mercury adsorption capacities. The flexible extrudate form had a mercury adsorption capacity of 340 mg/g but was found to be structurally unstable. A structurally sound bead form of thiol-SAMMS was fabricated with 5, 10, 25, and 40% by weight clay binder (attapulgite) and successfully functionalized. A structurally stable but non-optimized rod form of thiol-SAMMS was also fabricated. Bench-scale processes were developed to silanize and functionalize mesoporous silica beads made with attapulgite clay binder. Contact angle measurements were conducted to assess the degree of surface coverage by functional groups on mesoporous silica materials.

612
(PNNL-SA–28461-Rev.1)
Proceedings of the efficient separations and processing crosscutting program 1997 technical exchange meeting. Gephart, J.M. (ed.). Science, Inc., Anaheim, CA (United States). [1997]. 211p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-970148–Rev.1: Efficient Separations and Processing (ESP) Crosscutting Program FY 1997 technical exchange meeting, Gaithersburg, MD (United States), 28-30 Jan 1997). Order Number DE97052111. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains summaries of technology development presented at the 1997 Efficient Separations and Processing Crosscutting Program (ESP-CP) Technical Exchange Meeting (TEM), held January 28-30, 1997, in Gaithersburg, Maryland. The ESP-CP is sponsored by the U.S. Department of Energy's Office of Environmental Management (DOE/EM), Office of Science and Technology. The ESP-CP TEM is held annually to: (1) Present current technology development activities funded by the ESP-CP. Developers of ESP-CP-funded technologies describe the problems and needs addressed by their technologies; the technical approach, accomplishments, and resolution of issues; the strategy and schedule for commercialization; and evolving potential applications. Representatives from DOE/EM's Focus Areas also present their technology needs. (2) Promote the exchange of technical information among those developing new separations technologies, those responsible for providing new separations technologies to meet DOE/EM needs, and those who need or will potentially make use of such technologies. (3) Familiarize the ESP-CP Technical Review Team with the FY 1997 program and solicit reviewers' views on the program as a whole. This meeting is not a program review of the individual tasks, but instead focuses on the technical aspects and implementation of ESP-CP-sponsored technology or data. This document also contains a list of ESP-CP-sponsored publications, presentations, and patents. Separate abstracts have been indexed into the energy database for contributions to this proceedings.

613
(RFP–5083)
Basis of Estimate Software Tool (BEST) - a practical solution to part of the cost and schedule integration puzzle. Murphy, L.; Bain, P. EG and G Rocky Flats, Inc., Golden, CO (United States). 1997. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC34-90RF62349. (CONF-970335–6: Waste Management '97, Tucson, AZ (United States), 2-7 Mar 1997). Order Number DE97002595. Source: OSTI; NTIS; INIS; GPO Dep.

The Basis of Estimate Software Tool (BEST) was developed at the Rocky Flats Environmental Technology Site (Rocky Flats) to bridge the gap that exists in conventional project control systems between scheduled activities, their allocated or assigned resources, and the set of assumptions (basis of estimate) that correlate resources and activities. Having a documented and auditable basis of estimate (BOE) is necessary for budget validation, work scope analysis, change control, and a number of related management control functions. The uniqueness of BEST is demonstrated by the manner in which it responds to the diverse needs of the heavily regulated environmental workplace - containing many features not found in conventional off-the-shelf software products. However, even companies dealing in relatively unregulated work places will find many attractive features in BEST. This product will be of particular interest to current Government contractors and contractors preparing proposals that may require subsequent validation. 2 figs.

614
(RFP–5098-Pt.2)
Safety Analysis and Risk Assessment Handbook, new guidance to the safety analyst. Peterson, V.L. (Rocky Flats Environmental Technology Site, Golden, CO (United States)). Rocky Flats Environmental Technology Site, Golden, CO (United States). [1997]. 5p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC34-90DP62349. (CONF-970661–11-Pt.2: 1997 safety analysis workshop, Oakland, CA (United States), 9-13 Jun 1997). Order Number DE97007029. Source: OSTI; NTIS; INIS; GPO Dep.

New guidance to the safety analyst has been developed at the Rocky Flats Environmental Technology Site (RFETS) in the form of the new Safety Analysis and Risk Assessment Handbook (SARAH). Although the older guidance (the Rocky Flats Risk Assessment Guide) continues to be used for updating the Final Safety Analysis Reports (FSARs) developed in the mid-1980s, this new guidance is used with all new authorization basis documents. With the RFETS mission change in the early 1990s came the need to establish new authorization basis documents for its facilities, whose missions had changed. The methodology and databases for performing the evaluations that support the new authorization basis documents needed to be standardized, to avoid the use of different approaches and/or databases for similar accidents in different facilities. This paper presents this new standardized approach, the SARAH.

615
(RFP–5108)
Workforce mobilization for D&D at the Rocky Flats Environmental Technology Site (RFETS). Coles, G.W. (Kaiser-Hill, Rocky Flats, CO (United States)); Easdon, R.C.; Bourgeois, T.G. EG and G Rocky Flats, Inc., Golden, CO

(United States). ©1997. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC34-90RF62349. (CONF-970335–2: Waste Management '97, Tucson, AZ (United States), 2-7 Mar 1997). Source: Kaiser-Hill Co., LLC, Golden, CO (United States).

The Rocky Flats Plant (RFP) was a nuclear production facility. Products from RFP included nuclear and non-nuclear parts used by other plants to assemble weapons. Operations at the plant generally included metal recovery, processing, machining, assembly, and the physical and administrative support functions associated with this type of production. Construction of the Site began in the early 1950's. The Site was an active production facility through the Cold War. After nuclear production operations ceased, the Site was renamed to become the Rocky Flats Environmental Technology Site (Site). Labor policies and precedence began to evolve from the time of initial construction. This paper reviews the labor situation at the plants at the commencement of D&D activities, the problems that were created by that environment, and the efforts made to adjust labor policies to aid effective implementation of D&D activities. Mobilization of the D&D workforce required specific planning for effective implementation. Work assignments for D&D activities had to receive approval prior to performing activities. Once established, the appropriate funding was secured to allow hiring, training and deployment of the workforce. An infrastructure was established to manage activities and control work on a day to day basis. The result of the Site effort in this area provided for an immediate positive impact to D&D activities.

616
(RFP–5117)
NRC regulation of DOE facilities. Buhl, A.R. (Kaiser-Hill, Golden, CO (United States)); Edgar, G.; Silverman, D.; Murley, T. Rocky Flats Environmental Technology Site, Golden, CO (United States). [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC34-90RF62349. Order Number DE97008351. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE), its contractors, and the Nuclear Regulatory Commission (NRC) are in for major changes if the DOE follows through on its intentions announced December 20, 1996. The DOE is seeking legislation to establish the NRC as the regulatory agency with jurisdiction over nuclear health, safety, and security at a wide range of DOE facilities. At this stage, it appears that as many as 200 (though not all) DOE facilities would be affected. On March 28, 1997, the NRC officially endorsed taking over the responsibility for regulatory oversight of DOE nuclear facilities as the DOE had proposed, contingent upon adequate funding, staffing resources, and a clear delineation of NRC authority. This article first contrasts the ways in which the NRC and the DOE carry out their basic regulatory functions. Next, it describes the NRC's current authority over DOE facilities and the status of the DOE's initiative to expand that authority. Then, it discusses the basic changes and impacts that can be expected in the regulation of DOE facilities. The article next describes key lessons learned from the recent transition of the GDPs from DOE oversight to NRC regulation and the major regulatory issues that arose in that transition. Finally, some general strategies are suggested for resolving issues likely to arise as the NRC assumes regulatory authority over DOE facilities.

617
(RFP–5137)
Natural succession impeded by smooth brome (Bromus inermis) and intermediate wheatgrass (Agropyron intermedium) in an abandoned agricultural field. Nelson, J.K. (PTI Environmental Services, Boulder, CO (United States)). EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant. [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC34-90DP62349. (CONF-971165–: 1997 international conference on ecological restoration and regional conservation strategies, Ft. Lauderdale, FL (United States), 12-15 Nov 1997). Order Number DE98000626. Source: OSTI; NTIS; GPO Dep.

In 1975, an abandoned agricultural field at Rocky Flats Environmental Technology Site (Site) that had been cultivated for more than 38 years, was seeded with smooth brome (Bromus inermis) and intermediate wheatgrass (Agropyron intermedium). Although these species are commonly planted in reclamation and roadside seed mixtures, few studies have documented their impact on the reestablishment of native plant communities. In 1994, species richness, cover, and biomass were sampled in the agricultural field and compared to the surrounding mixed-grass prairie at the Site. The agricultural field contained only 61 plant species (62% native), compared to 143 species (81% native) in the surrounding mixed-grass prairie. Community similarity based on species presence/absence was 0.47 (Sorensen coefficient of similarity). Basal vegetative cover was 11.2% in the agricultural field and 29.1% in the mixed-grass prairie. Smooth brome and intermediate wheatgrass accounted for 93% of the relative foliar cover and 96% of the biomass in the agricultural field. The aggressive nature of these two planted species has impeded the natural succession of the agricultural field to a more native prairie community. Studies of natural succession on abandoned fields and roads in northeastern Colorado have indicated that if left alone, fields would return to their native climax state in approximately 50 years and would be approaching their native state after 20–25 years. Based on the results of this study, this agricultural field may take more than 100 years to return to a native mixed-grass prairie state and it may never achieve a native state without human intervention.

618
(RFP–5153)
Status and use of the Rocky Flats Environmental Technology Site Pipe Overpack Container for TRU waste storage and shipments. Thorp, D.T. (Safe Sites of Colorado, L.L.C., Golden, CO (United States)); Geinitz, R.R.; Rivera, M.A. Rockwell International, Rocky Flats Plant, Golden, CO (United States). 3 Mar 1998. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC34-90RF62349. (CONF-980307–: Waste management '98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98002857. Source: OSTI; NTIS; INIS; GPO Dep.

The Pipe Overpack Container was designed to optimize shipments of high plutonium content transuranic waste from Rocky Flats Environmental Technology Site (RFETS) to Waste Isolation Pilot Plant (WIPP). The container was approved for use in the TRUPACT-II shipping container by the Nuclear Regulatory Commission in February 1997. The container optimizes shipments to WIPP by increasing the TRUPACT-II criticality limit from 325 fissile grams equivalent

(FGE) to 2,800 FGE and provides additional shielding for handling wastes with high americium-241 (Am-241) content. The container was subsequently evaluated and approved for storage of highly dispersible TRU wastes and residues at RFETS. Thermal evaluation of the container shows that the container will mitigate the impact of a worst case thermal event from reactive or potentially pyrophoric materials. These materials contain hazards postulated by the Defense Nuclear Facilities Safety Board for interim storage. Packaging these reactive or potentially pyrophoric residues in the container without stabilizing the materials is under consideration at RFETS. The design, testing, and evaluations used in the approvals, and the current status of the container usage, will be discussed.

619
(RFP–5154)
The use of filtered bags to increase waste payload capacity. Dustin, D.F. (Safe Sites of Colorado, Golden, CO (United States)); Thorp, D.T.; Rivera, M.A. Safe Sites of Colorado, Golden, CO (United States). 3 Mar 1998. 13p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC34-90RF62349. (CONF-980307–: Waste management '98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98002855. Source: OSTI; NTIS; INIS; GPO Dep.

For the past few years, the Department of Energy has favored the direct disposal of low plutonium content residue materials from Rocky Flats rather than engage in expensive and time consuming plutonium recovery operations. One impediment to direct disposal has been the wattage limit imposed by the Waste Isolation Pilot Plant on hydrogenous materials such as combustibles and sludges. The issue of concern is the radiolytic generation and accumulation of hydrogen and other explosive gases in waste containers. The wattage limits that existed through 1996 restricted the amount of plutonium bearing hydrogenous materials that could be packaged in a WIPP bound waste drum to only a fraction of the capacity of a drum. Typically, only about one kilogram of combustible residue could be packaged in a waste drum before the wattage limit was exceeded resulting in an excessively large number of drums to be procured, stored, shipped, and interred. The Rocky Flats Environmental Technology Site has initiated the use of filtered plastic bags (called bag-out bags) used to remove transuranic waste materials from glove box lines. The bags contain small, disk like HEPA filters which are effective in containing radioactively contaminated particulate material but allow for the diffusion of hydrogen gas. Used in conjunction with filtered 55 gallon drums, filtered bag-out bags were pursued as a means to increase the allowable wattage limits for selected residue materials. In February 1997, the Nuclear Regulatory Commission approved the use of filtered bag-out bags for transuranic waste materials destined for WIPP. The concomitant increase in wattage limits now allows for approximately four times the payload per waste drum for wattage limited materials.

620
(RFP–5155)
Cementation of residue ion exchange resins at Rocky Flats. Dustin, D.F.; Beckman, T.D.; Madore, C.M. Safe Sites of Colorado, Golden, CO (United States). 3 Mar 1998. 13p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC34-90RF62349. (CONF-980307–: Waste management '98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98002858. Source: OSTI; NTIS; INIS; GPO Dep.

Ion exchange resins have been used to purify nitric acid solutions of plutonium at Rocky Flats since the 1950s. Spent ion exchange resins were retained for eventual recovery of residual plutonium, typically by incineration followed by the aqueous extraction of plutonium from the resultant ash. The elimination of incineration as a recovery process in the late 1980s and the absence of a suitable alternative process for plutonium recovery from resins led to a situation where spent ion exchange resins were simply placed into temporary storage. This report describes the method that Rocky Flats is currently using to stabilize residue ion exchange resins. The objective of the resin stabilization program is: (1) to ensure their safety during interim storage at the site, and (2) to prepare them for ultimate shipment to the Waste Isolation Pilot Plant (WIPP) in New Mexico. Included in the discussion is a description of the safety concerns associated with ion exchange resins, alternatives considered for their stabilization, the selection of the preferred treatment method, the means of implementing the preferred option, and the progress to date.

621
(RFP–5158)
Progress in stabilization of plutonium and residues since DNFSB recommendation 94-1. Ball, J.M.; Dustin, D.F. Safe Sites of Colorado, Golden, CO (United States). 3 Mar 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC34-90RF62349. (CONF-980307–: Waste management '98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98002856. Source: OSTI; NTIS; INIS; GPO Dep.

There are approximately 100 metric tons of residues at the Rocky Flats Environmental Technology Site containing approximately 3 metric tons of plutonium. The residues are byproducts of past plutonium operations incinerator ash; pyrochemical salts; graphite; sand, slag, and crucible; and miscellaneous forms of combustibles, glass, metal, and sludges. In September 1993, a report was released (Reference 1) which identified concerns with the chemical stability of the residues and with the integrity of packaging. In May 1997, the Defense Nuclear Facility Safety Board published recommendation 94-1 citing a concern for the residue stability and requiring that the possibly unstable residues be processed within 3 years and all others within 5 years. A risk categorization scheme was developed which assigned a numerical risk to each residue type based on the probability and consequence of occurrence of failures associated with the hazards identified. The residues were ranked for priority of stabilization actions. Urgent concerns were resolved. All residue drums were vented to eliminate the potential for hydrogen and other explosive gas accumulation. Leaded rubber gloves and ion exchange resins were washed to eliminate the explosion potential. An aggressive characterization program was implemented to search for any additional safety or environmental concerns and to gain more definitive information concerning the choice of processes for stabilization and disposition of the residues. This paper provides background on the safety issues and summarizes recent characterization data. The residue processing and disposition plans, including schedule and cost,

are also summarized in the paper. Finally, the paper addresses initiatives undertaken by Safe Sites of Colorado to accelerate the residue program.

622
(RFP–5188)
Year 2000 compliance concerns with the ISA Thermoluminescent Dosimetry Data Processing (TL-DP) software system. Saviz, K. Safe Sites of Colorado, Rocky Flats Environmental Technology Site, Golden, CO (United States). 26 May 1998. 42p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC34-90DP62349. (CONF-980661–: 17. annual international Panasonic TLD users symposium, Santa Rosa, CA (United States), 8-12 Jun 1998). Order Number DE98005674. Source: OSTI; NTIS; INIS; GPO Dep.

The year 2000 is rapidly approaching, and there is a good chance that computer systems that utilize two digit year dates will experience problems in retrieval of date information. The ISA Thermoluminescent Dosimetry Data Processing (TL-DP) software and computer system has been reviewed for Year 2000 compliance issues.

623
(RFP–5189)
Panasonic dosimetry system performance testing and results at nuclear accident dose levels 500 rad to 10,000 rad. Klueber, M.R. Safe Sites of Colorado, Rocky Flats Environmental Technology Site, Golden, CO (United States). 6 Apr 1998. 10p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC34-90DP62349. (CONF-980661–: 17. annual international Panasonic TLD users symposium, Santa Rosa, CA (United States), 8-12 Jun 1998). Order Number DE98005675. Source: OSTI; NTIS; INIS; GPO Dep.

Panasonic thermoluminescent dosimeters (TLDs) are used as the photon dose assessment part of the personal nuclear accident dosimeter (PNAD) and may be used for the same purpose with the fixed nuclear accident dosimeter (FNAD). To demonstrate compliance with 10CFR835.1304 (and, its predecessor, DOE Order 5480.11), several sets of dosimeters were irradiated to photon doses above the upper limit of the DOELAP testing standard, DOE/EH-0026 and DOE/EH-0027. The upper range of the test was 10,000 rads, using both low energy (70 keV) and high energy (662 keV and 1,332 keV) sources. The testing indicated that the Panasonic TLD system is capable of meeting the requirements of 10CFR835.1304 and DOE Order 5480.11.

624
(SAND–96-2656C)
Implementation of chemical controls through a backfill system for the Waste Isolation Pilot Plant (WIPP). Bynum, R.V. (Science Applications International Corp., Albuquerque, NM (United States)); Stockman, C.; Wang, Yifeng; Peterson, A.; Krumhansl, J.; Nowak, J.; Chu, M.S.Y.; Cotton, J.; Patchet, S.J. Sandia National Labs., Albuquerque, NM (United States). [1997]. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-971040–2: ICEM '97: 6. international conference on radioactive waste management and environmental remediation, Singapore (Singapore), 12-16 Oct 1997). Order Number DE97007458. Source: OSTI; NTIS; INIS; GPO Dep.

A backfill system has been designed for the WIPP which will control the chemical environment of the post-closure repository to a domain where the actinide solubility is within its lowest region. The actinide solubility is highly dependent on the chemical species which constitute the fluid, the resulting pH of the fluid, and oxidation state of the actinide which is stable under the specific conditions. The implementation of magnesium oxide (MgO) as the backfill material not only controls the pH of the expected fluids but also effectively removes the carbonate from the system, which has a significant impact for actinide solubility. The selection process, emplacement system, design, and confirmatory experimental results are presented.

625
(SAND–96-2815C)
Studies of photoredox reactions on nanosize semiconductors. Wilcoxon, J.P. (Sandia National Labs., Albuquerque, NM (United States)); Parsapour, F.; Kelly, D.F. Sandia National Labs., Albuquerque, NM (United States). [1997]. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970578–1: 4. international conference on quantum confinement: nanoscale materials, devices and systems, Montreal (Canada), 4-9 May 1997). Order Number DE97001883. Source: OSTI; NTIS; GPO Dep.

Light induced electron transfer (ET) from nanosize semiconductors Of MoS_2 to organic electron acceptors such as 2,2'-bipyridine (bpy) and methyl substituted 4,4',5,5'-tetramethyl- 2,2'-bipyridine (tmb) was studied by static and time resolved photoluminescence spectroscopy. The kinetics of ET were varied by changing the nanocluster size (the band gap), the electron acceptor, and the polarity of the solvent. MoS_2 is an especially interesting semiconductor material as it is an indirect semiconductor in bulk form, and has a layered covalent bonding arrangement which is highly resistant to photocorrosion.

626
(SAND–96-2991C)
Condensed summary of the systems prioritization method as a decision-aiding approach for the Waste Isolation Pilot Plant. Boak, D.M. (and others); Prindle, N.H.; Lincoln, R. Sandia National Labs., Albuquerque, NM (United States). 1997. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970674–1: ESREL '97: international conference on safety and reliability, Lisbon (Portugal), 17-20 Jun 1997). Order Number DE97003821. Source: OSTI; NTIS; INIS; GPO Dep.

In March 1994, the US Department of Energy Carlsbad Area Office (DOE/CAO) implemented a performance based decision-aiding method to assist in programmatic prioritization within the Waste Isolation Pilot Plant (WIPP) project. The prioritization was with respect to 40 CFR Part 191.13(a) and 40 CFR part 268.6. U.S. Environmental Protection Agency (EPA) requirements for long-term isolation of radioactive and hazardous wastes. The Systems Prioritization Method (SPM), was designed by Sandia National Laboratories to: (1) identify programmatic options (activities), their costs and durations; (2) analyze combinations of activities in

terms of their predicted contribution to long-term performance of the WIPP disposal system; and (3) analyze cost, duration, and performance tradeoffs. SPM results were the basis for activities recommended to DOE/CAO in May 1995. SPM identified eight activities (less than 15% of the 58 proposed for consideration) predicted to be essential in addressing key regulatory issues. The SPM method proved useful for risk or performance-based prioritization in which options are interdependent and system behavior is nonlinear. 10 refs., 2 figs., 1 tab.

627
(SAND–97-0028C)
A new and superior ultrafine cementitious grout. Ahrens, E.H. Sandia National Labs., Albuquerque, NM (United States). 1997. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970747–1: Geo Logan conference '97, Logan, UT (United States), 16-18 Jul 1997). Order Number DE97004626. Source: OSTI; NTIS; INIS; GPO Dep.

Sealing fractures in nuclear waste repositories concerns all programs investigating deep burial as a means of disposal. Because the most likely mechanism for contaminant migration is by dissolution and movement through groundwater, sealing programs are seeking low-viscosity sealants that are chemically, mineralogically, and physically compatible with the host rock. This paper presents the results of collaborative work directed by Sandia National Laboratories (SNL) and supported by Whiteshell Laboratories, operated by Atomic Energy of Canada, Ltd. The work was undertaken in support of the Waste Isolation Pilot Plant (WIPP), an underground nuclear waste repository located in a salt formation east of Carlsbad, NM. This effort addresses the technology associated with long-term isolation of nuclear waste in a natural salt medium. The work presented is part of the WIPP plugging and sealing program, specifically the development and optimization of an ultrafine cementitious grout that can be injected to lower excessive, strain-induced hydraulic conductivity in the fractured rock termed the Disturbed Rock Zone (DRZ) surrounding underground excavations. Innovative equipment and procedures employed in the laboratory produced a usable cement-based grout; 90% of the particles were smaller than 8 microns and the average particle size was 4 microns. The process involved simultaneous wet pulverization and mixing. The grout was used for a successful in situ test underground at the WIPP. Injection of grout sealed microfractures as small as 6 microns (and in one rare instance, 3 microns) and lowered the gas transmissivity of the DRZ by up to three orders of magnitude. Following the WIPP test, additional work produced an improved version of the grout containing particles 90% smaller than 5 microns and averaging 2 microns. This grout will be produced in dry form, ready for the mixer.

628
(SAND–97-0099C)
The effects of heterogeneities on the performance of capillary barriers for waste isolation. Ho, C.K.; Webb, S.W. Sandia National Labs., Albuquerque, NM (United States). [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970208–2: International containment technology conference and exhibition, St. Petersburg, FL (United States), 9-12 Feb 1997). Order Number DE97002471. Source: OSTI; NTIS; INIS; GPO Dep.

The effects of heterogeneities on the performance of capillary barriers is investigated by simulating three systems comprised of a fine soil layer overlying a coarse gravel layer with homogeneous, layered heterogeneous, and random heterogeneous property fields. The amount of lateral diversion above the coarse layer under steady-state infiltration conditions is compared between the simulations. Results indicate that the performance of capillary barriers may be significantly influenced by the spatial variability of the properties. The layered heterogeneous system performed best as a result of horizontal features within the fine layer that acted as additional local capillary barriers that delayed breakthrough into the coarse layer. The random heterogeneous system performed worst because of channeled flow that produced localized regions of water breakthrough into the coarse layer. These results indicate that engineered capillary barriers may be improved through emplacement and packing methods that induce a layered system similar to the layered heterogeneous field simulated in this study.

629
(SAND–97-0111C)
Principles and objectives of containment verification and performance monitoring and technology selection. Reichhardt, D.K. (MSE Technology Applications, Inc., Butte, MT (United States)); Hart, A.T.; Betsill, J.D. Sandia National Labs., Albuquerque, NM (United States). [1997]. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970208–3: International containment technology conference and exhibition, St. Petersburg, FL (United States), 9-12 Feb 1997). Order Number DE97002472. Source: OSTI; NTIS; GPO Dep.

While a number of technologies or methods of subsurface imaging and monitoring exist, most require some adaptation to meet the site-specific objectives of a particular in-situ waste containment/stabilization verification and monitoring program. The selection of methods and their site-specific adaptation must be based on sound, scientific principles. Given this, specific information about the site and the objectives of the containment or remediation are required to design and implement an appropriate and effective verification and monitoring program. Site and technology information that must be considered and how it affects the selection and adaptation of monitoring technologies is presented. In general, this information includes the objectives of the containment or remediation, the verification and monitoring systems, and the physical properties of the site and the waste containment/stabilization system. The objectives of the containment or remediation and the verification and monitoring system must be defined to provide a goal for the technology developer's design. The physical properties of the site and the waste containment/stabilization system are required to ensure the proper technology is selected. A conceptual framework and examples are given to demonstrate the impacts of these aspects on technology selection.

630
(SAND–97-0147C)
Comparison of lumped-element and transmission-line models for thickness-shear-mode quartz resonator

sensors. Cernosek, R.W. (Sandia National Laboratories, Albuquerque, NM (United States)); Martin, S.J.; Hillman, A.R. Sandia National Labs., Albuquerque, NM (United States). 1997. 27p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9705139–1: 51. IEEE meeting of the frequency control symposium, Orlando, FL (United States), 28-30 May 1997). Order Number DE97007805. Source: OSTI; NTIS; GPO Dep.

Both a transmission-line model and its simpler variant, a lumped-element model, can be used to predict the responses of a thickness-shear-mode quartz resonator sensor. Relative deviations in the parameters computed by the two models (shifts in resonant frequency and motional resistance) do not exceed 3% for most practical sensor configurations operating at the fundamental resonance. If the ratio of the load surface mechanical impedance to the quartz shear characteristic impedance does not exceed 0.1, the lumped-element model always predicts responses within 1% of those for the transmission-line model.

631
(SAND–97-0173C)
Graphical programming of telerobotic tasks. Small, D.E. (Sandia National Labs., Albuquerque, NM (United States). Intelligent Systems and Robotics Center); McDonald, M.J. Sandia National Labs., Albuquerque, NM (United States). [1997]. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970462–6: 7. American Nuclear Society topical meeting on robotics and remote handling, Savannah, GA (United States), 27 Apr - 1 May 1997). Order Number DE97002539. Source: OSTI; NTIS; INIS; GPO Dep.

With a goal of producing faster, safer, and cheaper technologies for nuclear waste cleanup, Sandia is actively developing and extending intelligent systems technologies. Graphical Programming is a key technology for robotic waste cleanup that Sandia is developing for this goal. This paper describes Sancho, Sandia most advanced Graphical Programming supervisory software. Sancho, now operational on several robot systems, incorporates all of Sandia's recent advances in supervisory control. Sancho, developed to rapidly apply Graphical Programming on a diverse set of robot systems, uses a general set of tools to implement task and operational behavior. Sancho can be rapidly reconfigured for new tasks and operations without modifying the supervisory code. Other innovations include task-based interfaces, event-based sequencing, and sophisticated GUI design. These innovations have resulted in robot control programs and approaches that are easier and safer to use than teleoperation, off-line programming, or full automation.

632
(SAND–97-0281C)
Electrokinetic demonstration at Sandia National Laboratories: Use of transference numbers for site characterization and process evaluation. Lindgren, E.R. (Sandia National Labs, Environmental Restoration Technologies, Albuquerque, NM (United States)); Mattson, E.D. Sandia National Labs., Albuquerque, NM (United States). [1997]. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970335–14: Waste Management '97, Tucson, AZ (United States), 2-7 Mar 1997). Order Number DE97003005. Source: OSTI; NTIS; INIS; GPO Dep.

Electrokinetic remediation is generally an in situ method using direct current electric potentials to move ionic contaminants and/or water to collection electrodes. The method has been extensively studied for application in saturated clayey soils. Over the past few years, an electrokinetic extraction method specific for sandy, unsaturated soils has been developed and patented by Sandia National Laboratories. A RCRA RD&D permitted demonstration of this technology for the in situ removal of chromate contamination from unsaturated soils in a former chromic acid disposal pit was operated during the summer and fall of 1996. This large scale field test represents the first use of electrokinetics for the removal of heavy metal contamination from unsaturated soils in the United States and is part of the US EPA Superfund Innovative Technology Evaluation (SITE) Program. Guidelines for characterizing a site for electrokinetic remediation are lacking, especially for applications in unsaturated soil. The transference number of an ion is the fraction of the current carried by that ion in an electric field and represents the best measure of contaminant removal efficiency in most electrokinetic remediation processes. In this paper we compare the transference number of chromate initially present in the contaminated unsaturated soil, with the transference number in the electrokinetic process effluent to demonstrate the utility of evaluating this parameter.

633
(SAND–97-282C)
Cost comparisons of alternative landfill final covers. Dwyer, S.F. Sandia National Labs., Albuquerque, NM (United States). [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970208–5: International containment technology conference and exhibition, St. Petersburg, FL (United States), 9-12 Feb 1997). Order Number DE97003030. Source: OSTI; NTIS; GPO Dep.

A large-scale field demonstration comparing and contrasting final landfill cover designs has been constructed and is currently being monitored. Four alternative cover designs and two conventional designs (a RCRA Subtitle "D" Soil Cover and a RCRA Subtitle "C" Compacted Clay Cover) were constructed of uniform size, side-by-side. The demonstration is intended to evaluate the various cover designs based on their respective water balance performance, ease and reliability of construction, and cost. This paper provides an overview of the construction costs of each cover design.

634
(SAND–97-0283C)
The residuals analysis project: Evaluating disposal options for treated mixed low-level waste. Waters, R.D.; Gruebel, M.M.; Case, J.T.; Letourneau, M.J. Sandia National Labs., Albuquerque, NM (United States). [1997]. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970335–13: Waste Management '97, Tucson, AZ (United States), 2-7 Mar 1997). Order Number DE97003006. Source: OSTI; NTIS; INIS; GPO Dep.

For almost four years, the U.S. Department of Energy (DOE) through its Federal Facility Compliance Act Disposal Workgroup has been working with state regulators and governors' offices to develop an acceptable configuration for

disposal of its mixed low-level waste (MLLW). These interactions have resulted in screening the universe of potential disposal sites from 49 to 15 and conducting ”performance evaluations” for those fifteen sites to estimate their technical capabilities for disposal of MLLW. In the residuals analysis project, we estimated the volume of DOE’s MLLW that will require disposal after treatment and the concentrations of radionuclides in the treated waste. We then compared the radionuclide concentrations with the disposal limits determined in the performance evaluation project for each of the fifteen sites. The results are a scoping-level estimate of the required volumetric capacity for MLLW disposal and the identification of waste streams that may pose problems for disposal based on current treatment plans. The analysis provides technical information for continued discussions between the DOE and affected States about disposal of MLLW and systematic input to waste treatment developers on disposal issues.

635
(SAND–97-0337C)
In situ remediation of uranium contaminated groundwater. Dwyer, B.P.; Marozas, D.C. Sandia National Labs., Albuquerque, NM (United States). [1997]. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970208–8: International containment technology conference and exhibition, St. Petersburg, FL (United States), 9-12 Feb 1997). Order Number DE97003213. Source: OSTI; NTIS; INIS; GPO Dep.

In an effort to develop cost-efficient techniques for remediating uranium contaminated groundwater at DOE Uranium Mill Tailing Remedial Action (UMTRA) sites nationwide, Sandia National Laboratories (SNL) deployed a pilot scale research project at an UMTRA site in Durango, CO. Implementation included design, construction, and subsequent monitoring of an in situ passive reactive barrier to remove Uranium from the tailings pile effluent. A reactive subsurface barrier is produced by emplacing a reactant material (in this experiment various forms of metallic iron) in the flow path of the contaminated groundwater. Conceptually the iron media reduces and/or adsorbs uranium in situ to acceptable regulatory levels. In addition, other metals such as Se, Mo, and As have been removed by the reductive/adsorptive process. The primary objective of the experiment was to eliminate the need for surface treatment of tailing pile effluent. Experimental design, and laboratory and field results are discussed with regard to other potential contaminated groundwater treatment applications.

636
(SAND–97-0338C)
Development of a cement-polymer close-coupled subsurface barrier technology. Dwyer, B.P. (Sandia National Labs., Albuquerque, NM (United States)); Heiser, J.; Stewart, W.; Phillips, S. Sandia National Labs., Albuquerque, NM (United States). [1997]. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970208–9: International containment technology conference and exhibition, St. Petersburg, FL (United States), 9-12 Feb 1997). Order Number DE97003214. Source: OSTI; NTIS; INIS; GPO Dep.

The primary objective of this project was to further develop close-coupled barrier technology for the containment of subsurface waste or contaminant migration. A close-coupled barrier is produced by first installing a conventional cement grout curtain followed by a thin inner lining of a polymer grout. The resultant barrier is a cement polymer composite that has economic benefits derived from the cement and performance benefits from the durable and chemically resistant polymer layer. The technology has matured from a regulatory investigation of issues concerning barriers and barrier materials to a pilot-scale, multiple individual column injections at Sandia National Labs (SNL) to full scale demonstration. The feasibility of this barrier concept was successfully proven in a full scale ”cold site” demonstration at Hanford, WA. Consequently, a full scale deployment of the technology was conducted at an actual environmental restoration site at Brookhaven National Lab (BNL), Long Island, NY. This paper discusses the installation and performance of a technology deployment implemented at OU-1 an Environmental Restoration Site located at BNL.

637
(SAND–97-0360C)
United States of America activities relative to the International Atomic Energy Agency (IAEA) initiative: Records management for deep geologic repositories. Warner, P.J. Sandia National Labs., Albuquerque, NM (United States). 1997. 16p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970335–31: Waste Management ‘97, Tucson, AZ (United States), 2-7 Mar 1997). Order Number DE97004381. Source: OSTI; NTIS; INIS; GPO Dep.

The International Atomic Energy Agency (IAEA) has conducted consultant and advisory meetings to prepare a Technical Document which is intended to provide guidance to all IAEA Member States (otherwise known as countries) that are currently planning, designing, constructing or operating a deep or near surface geological repository for the storage and protection of vitrified high-level radioactive waste, spent fuel waste and TRU-waste (transuranic). Eleven countries of the international community are presently in various stages of siting, designing, or constructing deep geologic repositories. Member States of the IAEA have determined that the principle safety of such completed and operation sites must not rely solely on long term institutional arrangements for the retention of information. It is believed that repository siting, design, operation and postoperation information should be gathered, managed and retained in a manner that will provide information to future societies over a very long period of time. The radionuclide life is 10,000 years thus the retention of information must outlive current societies, languages, and be continually migrated to new technology to assure retrieval. This presentation will provide an overview of the status of consideration and implementation of these issues within the United States efforts relative to deep geologic repository projects.

638
(SAND–97-0383C)
Mixed low-level waste form evaluation. Pohl, P.I.; Cheng, Wu-Ching; Wheeler, T.; Waters, R.D. Sandia National Labs., Albuquerque, NM (United States). 1997. 14p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000.

(CONF-970335–29: Waste Management '97, Tucson, AZ (United States), 2-7 Mar 1997). Order Number DE97004383. Source: OSTI; NTIS; INIS; GPO Dep.

A scoping level evaluation of polyethylene encapsulation and vitreous waste forms for safe storage of mixed low-level waste was performed. Maximum permissible radionuclide concentrations were estimated for 15 indicator radionuclides disposed of at the Hanford and Savannah River sites with respect to protection of the groundwater and inadvertent intruder pathways. Nominal performance improvements of polyethylene and glass waste forms relative to grout are reported. These improvements in maximum permissible radionuclide concentrations depend strongly on the radionuclide of concern and pathway. Recommendations for future research include improving the current understanding of the performance of polymer waste forms, particularly macroencapsulation. To provide context to these estimates, the concentrations of radionuclides in treated DOE waste should be compared with the results of this study to determine required performance.

639

(SAND–97-0422C)

Implementation of a fully automated process purge-and-trap gas chromatograph at an environmental remediation site. Blair, D.S.; Morrison, D.J. Sandia National Labs., Albuquerque, NM (United States). 1997. 17p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970113–1: Field analytical methods for hazardous wastes and toxic chemicals conference, Las Vegas, NV (United States), 29-31 Jan 1997). Order Number DE97003183. Source: OSTI; NTIS; INIS; GPO Dep.

The AQUASCAN, a commercially available, fully automated purge-and-trap gas chromatograph from Sentex Systems Inc., was implemented and evaluated as an in-field, automated monitoring system of contaminated groundwater at an active DOE remediation site in Pinellas, FL. Though the AQUASCAN is designed as a stand alone process analytical unit, implementation at this site required additional hardware. The hardware included a sample dilution system and a method for delivering standard solution to the gas chromatograph for automated calibration. As a result of the evaluation the system was determined to be a reliable and accurate instrument. The AQUASCAN reported concentration values for methylene chloride, trichloroethylene, and toluene in the Pinellas ground water were within 20% of reference laboratory values.

640

(SAND–97-0480C)

3D electromagnetic inversion for environmental site characterization. Alumbaugh, D.L.; Newman, G.A. Sandia National Labs., Albuquerque, NM (United States). 1997. 11p. Sponsored by USDOE Office of Energy Research, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970344–2: SAGEEP '97: 10. annual symposium on the application of geophysics to environmental and engineering problems, Reno, NV (United States), 23-26 Mar 1997). Order Number DE97004207. Source: OSTI; NTIS; GPO Dep.

A 3-D non-linear electromagnetic inversion scheme has been developed to produce images of subsurface conductivity structure from electromagnetic geophysical data. The solution is obtained by successive linearized model updates where full forward modeling is employed at each iteration to compute model sensitivities and predicted data. Regularization is applied to the problem to provide stability. Because the inverse part of the problem requires the solution of 10's to 100's of thousands of unknowns, and because each inverse iteration requires many forward models to be computed, the code has been implemented on massively parallel computer platforms. The use of the inversion code to image environmental sites is demonstrated on a data set collected with the Apex Parametrics 'MaxMin I-8S' over a section of stacked barrels and metal filled boxes at the Idaho National Laboratory's 'Cold Test Pit'. The MaxMin is a loop-loop frequency domain system which operates from 440 Hz up to 56 kHz using various coil separations; for this survey coil separations of 15, 30 and 60 feet were employed. The out-of phase data are shown to be of very good quality while the in-phase are rather noisy due to slight mispositioning errors, which cause improper cancellation of the primary free space field in the receiver. Weighting the data appropriately by the estimated noise and applying the inversion scheme is demonstrated to better define the structure of the pit. In addition, comparisons are given for single coil separations and multiple separations to show the benefits of using multiple offset data.

641

(SAND–97-0485C)

Traceability and retrievability: Documentation, the bridge from science to compliance. Warner, P.J. (Sandia National Labs., Albuquerque, NM (United States). Nuclear Waste Management Programs Center). Sandia National Labs., Albuquerque, NM (United States). [1997]. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970648–2: Department of Energy (DOE) records management conference: illuminating our legacy, focusing our future, Las Vegas, NV (United States), 23-26 Jun 1997). Order Number DE97007131. Source: OSTI; NTIS; INIS; GPO Dep.

In this day of regulatory compliance, the fact that good science was practiced and documented is, in and of itself, not enough to assure a successful licensing or permitting result. A new level of documentation, that clearly walks a non-project reviewer through the traceability of all activities and decisions is required for successful acceptance of scientific results. Compliance reviewers (whether the Nuclear Regulatory Commission (NRC), Environmental Protection Agency (EPA), etc.) expect to verify the results of the scientific and program activities without the physical presence of the person or persons that conducted the activity. Traceability of activities and associated decisions through the retrieval of all associated records is a must. This presentation is based on lessons learned from the various quality assurance (QA) audits and program reviews of Sandia National Laboratories, Nuclear Waste Management Programs Center, scientific and programmatic documentation. The authors build a bridge from science to compliance from lessons learned. Here now is a somewhat fictional rendition of actual scientific testing and compliance support activities.

642

(SAND–97-0660C)

Metal sorption on kaolinite. Westrich, H.R. (Sandia National Labs., Albuquerque, NM (United States). Geochemistry Dept.); Brady, P.V.; Cygan, R.T.; Nagy, K.L.;

Anderson, H.L. Sandia National Labs., Albuquerque, NM (United States). [1997]. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970537–1: 18. annual DOE low-level radioactive waste management conference, Salt Lake City, UT (United States), 20-22 May 1997). Order Number DE97003785. Source: OSTI; NTIS; INIS; GPO Dep.

A key issue in performance assessment of low-level radioactive waste sites is predicting the transport and retardation of radionuclides through local soils under a variety of hydrologic and geochemical conditions. Improved transport codes should include a mechanistic model of radionuclide retardation. The authors have been investigating metal sorption (Cs^+, Sr^{2+}, and Ba^{2+}) on a simple clay mineral (kaolinite) to better understand the geochemical interactions of common soil minerals with contaminated groundwaters. These studies include detailed characterizations of kaolinite surfaces, experimental adsorption measurements, surface complexation modeling, and theoretical simulations of cation sorption. The aluminol edge (010) site has been identified as the most likely site for metal sorption on kaolinite in natural solutions. Relative metal binding strengths decrease from Ba^{2+} to Sr^{2+} to Cs^+, with some portion sorbed on both kaolinite edges and basal surfaces. Some Cs^+ also appears to be irreversibly sorbed on both sites. Molecular dynamics simulations suggest that Cs^+ is sorbed at aluminol (010) edge sites as an inner-sphere complex and weakly sorbed as an outer-sphere complex on (001) basal surfaces. These results provide the basis to understand and predict metal sorption onto kaolinite, and a framework to characterize sorption processes on more complex clay minerals.

643

(SAND–97-0709C)

Characterization of septic and drain system releases at Sandia National Laboratories, New Mexico. Sanders, M.R. (CDM Federal Programs Corp. (United States)); Galloway, R.B. Sandia National Labs., Albuquerque, NM (United States). [1997]. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-971030–1: 70. annual conference and exposition of the Water Environment Federation, Chicago, IL (United States), 18-22 Oct 1997). Order Number DE97004036. Source: OSTI; NTIS; INIS; GPO Dep.

Sandia National Laboratories/New Mexico (SNL/NM) is located in Albuquerque, New Mexico. The SNL/NM Environmental Restoration (ER) Project is tasked with performing the assessment and remediation of environmental releases resulting from the almost 50 years of engineering development and testing activities. Operable Unit 1295, Septic Tanks and Drainfields, includes inactive septic and drain systems at 23 separate ER sites that were listed as Solid Waste Management Units (SWMUs) in the SNL/NM Resource Conservation and Recovery Act (RCRA) Hazardous and Solid Waste Amendments (HSWA) Module Permit. These sites were identified, based on process histories and interviews with facility personnel, as the subset of all SNL/NM septic and drain systems that had the highest potential for releases of hazardous and radioactive wastes into the environment. An additional 101 septic and drain systems not currently classified as SWMUs also have been identified as needing future characterization.

644

(SAND–97-0776C)

Developing the Sandia National Laboratories transportation infrastructure for isotope products and wastes. Trennel, A.J. Sandia National Labs., Albuquerque, NM (United States). Nov 1997. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98001386. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) plans to establish a medical isotope project that would ensure a reliable domestic supply of molybdenum-99 (^{99}Mo) and related medical isotopes (Iodine-125, Iodine-131, and Xenon-133). The Department's plan for production will modify the Annular Core Research Reactor (ACRR) and associated hot cell facility at Sandia National Laboratories (SNL)/New Mexico and the Chemistry and Metallurgy Research facility at Los Alamos National Laboratory (LANL). Transportation activities associated with such production is discussed.

645

(SAND–97-0810C)

Rapid world modelling from a mobile platform. Barry, R.E. (Oak Ridge National Lab., TN (United States)); Jones, J.P.; Little, C.Q.; Wilson, C.W. Sandia National Labs., Albuquerque, NM (United States). 1997. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970469–13: 1997 international conference on robotics and automation, Albuquerque, NM (United States), 20-25 Apr 1997). Order Number DE97004633. Source: OSTI; NTIS; INIS; GPO Dep.

The ability to successfully use and interact with a computerized world model is dependent on the ability to create an accurate world model. The goal of this project was to develop a prototype system to remotely deploy sensors into a workspace, collect surface information, and rapidly build an accurate world model of that workspace. A key consideration was that the workspace areas are typically hazardous environments, where it is difficult or impossible for humans to enter. Therefore, the system needed to be fully remote, with no external connections. To accomplish this goal, an electric, mobile platform with battery power sufficient for both the platform and sensor electronics was procured and 3D range sensors were deployed on the platform to capture surface data within the workspace. A radio Ethernet connection was used to provide communications to the vehicle and all onboard electronics. Video from on-board cameras was also transmitted to the base station and used to teleoperate the vehicle. Range data generated by the on-board 3D sensors was transformed into surface maps, or models. Registering the sensor location to a consistent reference frame as the platform moved through the workspace allowed construction of a detailed 3D world model of the extended workspace.

646

(SAND–97-0850C)

Radioactive material package closures with the use of shape memory alloys. Koski, J.A.; Bronowski, D.R. Sandia National Labs., Albuquerque, NM (United States). Nov 1997. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract

AC04-94AL85000. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98000849. Source: OSTI; NTIS; INIS; GPO Dep.

When heated from room temperature to 165 C, some shape memory metal alloys such as titanium-nickel alloys have the ability to return to a previously defined shape or size with dimensional changes up to 7%. In contrast, the thermal expansion of most metals over this temperature range is about 0.1 to 0.2%. The dimension change of shape memory alloys, which occurs during a martensite to austenite phase transition, can generate stresses as high as 700 MPa (100 kspi). These properties can be used to create a closure for radioactive materials packages that provides for easy robotic or manual operations and results in reproducible, tamper-proof seals. This paper describes some proposed closure methods with shape memory alloys for radioactive material packages. Properties of the shape memory alloys are first summarized, then some possible alternative sealing methods discussed, and, finally, results from an initial proof-of-concept experiment described.

647
(SAND–97-0851C)
Gas generation phenomena in radioactive waste transportation packaging. Nigrey, P.J. Sandia National Labs., Albuquerque, NM (United States). Nov 1997. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98001246. Source: OSTI; NTIS; INIS; GPO Dep.

The interaction of radiation from radioactive materials with the waste matrix can lead to the deterioration of the waste form resulting in the possible formation of gaseous species. Depending on the type and characteristics of the radiation source, the generation of hydrogen may predominate. Since the interaction of alpha particles with the waste form results in significant energy transfer, other gases such as carbon oxides, methane, nitrogen oxides, oxygen, water, and helium are possible. The type of gases produced from the waste forms is determined by the mechanisms involved in the waste degradation. For transuranic wastes, the identified degradation mechanisms are reported to be caused by radiolysis, thermal decomposition or dewatering, chemical corrosion, and bacterial action. While all these mechanisms may be responsible for the buildup of gases during the storage of wastes, radiolysis and thermal decomposition appear to be the main contributors during waste transport operations. In this paper, the authors provide a review of applicable gas generation data resulting from the degradation of various waste forms under conditions typical for transport. The effects of radiolytic and thermal degradation mechanisms will be discussed in the context of transportation safety.

648
(SAND–97-0853C)
Design of an experiment to measure the fire exposure of radioactive materials packages aboard container cargo ships. Koski, J.A. Sandia National Labs., Albuquerque, NM (United States). Nov 1997. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98001124. Source: OSTI; NTIS; INIS; GPO Dep.

The test described in this paper is intended to measure the typical accident environment for a radioactive materials package in a fire aboard a container cargo ship. A stack of nine used standard cargo containers will be variously loaded with empty packages, simulated packages and combustible cargo and placed over a large hydrocarbon pool fire of one hour duration. Both internal and external fire container fire environments typical of on-deck stowage will be measured as well as the potential for container to container fire spread. With the use of the inverse heat conduction calculations, the local heat transfer to the simulated packages can be estimated from thermocouple data. Data recorded will also provide information on fire durations in each container, fire intensity and container to container fire spread characteristics.

649
(SAND–97-0854C)
Prediction of packaging seal life using thermoanalytical techniques. Nigrey, P.J. Sandia National Labs., Albuquerque, NM (United States). Nov 1997. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98001307. Source: OSTI; NTIS; INIS; GPO Dep.

In this study, Thermogravimetric Analysis (TGA) has been used to study silicone, Viton and Ethylene Propylene (EPDM) rubber. The studies have shown that TGA accurately predicts the relative order of thermo-oxidative stability of these three materials from the calculated activation energies. As expected, the greatest thermal stability was found in silicone rubber followed by Viton and EPDM rubber. The calculated lifetimes for these materials were in relatively close agreement with published values. The preliminary results also accurately reflect decreased thermal stability and lifetime for EPDM rubber exposed to radiation and chemicals. These results suggest TGA provides a rapid method to evaluate material stability.

650
(SAND–97-0861C)
Effects of simulant mixed waste on EPDM and butyl rubber. Nigrey, P.J.; Dickens, T.G. Sandia National Labs., Albuquerque, NM (United States). Nov 1997. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98001247. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have developed a Chemical Compatibility Testing Program for the evaluation of plastic packaging components which may be used in transporting mixed waste forms. In this program, they have screened 10 plastic materials in four liquid mixed waste simulants. These plastics were butadiene-acrylonitrile copolymer (Nitrile) rubber, cross-linked polyethylene, epichlorohydrin rubber, ethylene-propylene (EPDM) rubber, fluorocarbons (Viton and Kel-F™), polytetrafluoro-ethylene (Teflon), high-density polyethylene,

isobutylene-isoprene copolymer (Butyl) rubber, polypropylene, and styrene-butadiene (SBR) rubber. The selected simulant mixed wastes were (1) an aqueous alkaline mixture of sodium nitrate and sodium nitrite; (2) a chlorinated hydrocarbon mixture; (3) a simulant liquid scintillation fluid; and (4) a mixture of ketones. The screening testing protocol involved exposing the respective materials to approximately 3 kGy of gamma radiation followed by 14-day exposures to the waste simulants at 60 C. The rubber materials or elastomers were tested using Vapor Transport Rate measurements while the liner materials were tested using specific gravity as a metric. The authors have developed a chemical compatibility program for the evaluation of plastic packaging components which may be incorporated in packaging for transporting mixed waste forms. From the data analyses performed to date, they have identified the thermoplastic, polychlorotrifluoroethylene, as having the greatest chemical compatibility after having been exposed to gamma radiation followed by exposure to the Hanford Tank simulant mixed waste. The most striking observation from this study was the poor performance of polytetrafluoroethylene under these conditions. In the evaluation of the two elastomeric materials they have concluded that while both materials exhibit remarkable resistance to these environmental conditions, EPDM has a greater resistance to this corrosive simulant mixed waste.

651
(SAND–97-0865C)
SeaRAM: A DOE evaluation of maritime accident risk assessment data and methods. Sprung, J.L.; Ammerman, D.J.; Koski, J.A. Sandia National Labs., Albuquerque, NM (United States). Mar 1998. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM ’98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98004464. Source: OSTI; NTIS; INIS; GPO Dep.

The SeaRAM Program conducted for the US Department of Energy by Sandia National Laboratories has developed estimates of the frequencies of occurrence of ship fires and ship collisions, the fraction of all ship fires and ship collisions that might be sufficiently severe to challenge the integrity of a Type B spent fuel transportation cask, the magnitude of the radioactive source terms that might be released from a Type B spent fuel transportation cask due to loss of cask integrity, and the magnitude of the radiological consequences that might be caused by the radioactive release.

652
(SAND–97-0893C)
Calculation of population doses with RADTRAN for route segments that have an unpopulated near-field region. Kanipe, F.L.; Neuhauser, S.; Sprung, J.L. Sandia National Labs., Albuquerque, NM (United States). Mar 1998. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM ’98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98004426. Source: OSTI; NTIS; INIS; GPO Dep.

The RADTRAN code (Neuhauser and Kanipe, 1994) models the radiological consequences of the transportation of radioactive materials, both the exposures that will occur if the transport occurs without incident, and the exposures that may occur should the transport vehicle be involved in an accident while en route. Because accidents might occur at any point along a transportation route, RADTRAN divides the route into segments (links) and uses a uniform population density and constant meteorological conditions (wind speed and atmospheric stability) to represent the population and weather characteristics of each route segment. A way to perform RADTRAN calculations, that allows an unpopulated near-field region along a transportation link to be approximately modeled, is described, validated, and then illustratively applied to a coastal sailing route.

653
(SAND–97-0896C)
Experimental ship fire measurements with simulated radioactive cargo. Koski, J.A. (Sandia National Labs., Albuquerque, NM (United States)); Arviso, M.; Bobbe, J.G.; Wix, S.D.; Cole, J.K.; Hohnstreiter, G.F.; Beene, D.E. Jr.; Keane, M.P. Sandia National Labs., Albuquerque, NM (United States). Oct 1997. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM ’98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98000926. Source: OSTI; NTIS; INIS; GPO Dep.

Results from a series of eight test fires ranging in size from 2.2 to 18.8 MW conducted aboard the Coast Guard fire test ship Mayo Lykes at Mobile, Alabama are presented and discussed. Tests aboard the break bulk type cargo ship consisted of heptane spray fires simulating engine room and galley fires, wood crib fires simulating cargo hold fires, and pool fires staged for comparison to land based regulatory fire results. Primary instrumentation for the tests consisted of two pipe calorimeters that simulated a typical package shape for radioactive materials packages.

654
(SAND–97-0904C)
The electromagnetic integrated demonstration at the Idaho National Engineering Laboratory cold test pit. Pellerin, L. (Lawrence Berkeley National Lab., CA (United States)); Alumbaugh, D.L.; Pfeifer, M.C. Sandia National Labs., Albuquerque, NM (United States). 1997. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970344–3: SAGEEP ’97: 10. annual symposium on the application of geophysics to environmental and engineering problems, Reno, NV (United States), 23-26 Mar 1997). Order Number DE97004644. Source: OSTI; NTIS; INIS; GPO Dep.

The electromagnetic integrated demonstration (EMID) is a baseline study in electromagnetic (EM) exploration of the shallow subsurface (< 10 m). Eleven distinct EM systems, covering the geophysical spectrum, acquired data on a grid over the Idaho National Engineering Laboratory (INEL) Cold Test Pit (CTP). The systems are investigated and evaluated for the purpose of identifying and reviewing existing geophysical characterization instrumentation (commercial and experimental), integrating those technologies with multidimensional interpretational algorithms, and identifying gaps in shallow subsurface EM imaging technology. The EMID data, are valuable for testing and evaluating new interpretational software, and developing techniques for integrating multiple datasets. The experimental field techniques shows

how the acquisition of data in a variety of array configurations can considerably enhance interpretation. All data are available on the world wide web. Educators and students are encouraged to use the data for both classroom and graduate studies. The purpose of this paper is to explain why, where, how and what kind of data were collected. It is left to the reader to assess the value of a given system for their particular application. Information about the EMID is organized into two general categories: survey description and system evaluation.

655
(SAND–97-0905C)
Comparison of Ross' capillary barrier diversion formula with detailed numerical simulations. Webb, S.W. Sandia National Labs., Albuquerque, NM (United States). 1997. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970208–14: International containment technology conference and exhibition, St. Petersburg, FL (United States), 9-12 Feb 1997). Order Number DE97004637. Source: OSTI; NTIS; GPO Dep.

Ross developed an analytical relationship to calculate the diversion length of a tilted fine-over-coarse capillary barrier. Oldenburg and Pruess compared simulation results using upstream and harmonic weighting to the diversion length predicted by Ross formula with mixed results; the qualitative agreement is reasonable but the quantitative comparison is poor, especially for upstream weighting. The proximity of the water table to the fine-coarse interface at breakthrough is a possible reason for the poor agreement. In the present study, the Oldenburg and Pruess problem is extended to address the water table issue. When the water table is sufficiently far away from the interface at breakthrough, good qualitative and quantitative agreement is obtained using upstream weighting.

656
(SAND–97-0906C)
Prediction of tilted capillary barrier performance. Webb, S.W.; McCord, J.T.; Dwyer, S.F. Sandia National Labs., Albuquerque, NM (United States). 1997. 16p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970208–13: International containment technology conference and exhibition, St. Petersburg, FL (United States), 9-12 Feb 1997). Order Number DE97004651. Source: OSTI; NTIS; GPO Dep.

Capillary barriers, consisting of tilted fine-over-coarse layers under unsaturated conditions, have been suggested as landfill covers to divert water infiltration away from sensitive underground regions, especially for arid and semi-arid regions. The Hydrological Evaluation of Landfill Performance (HELP) computer code is an evaluation tool for landfill covers used by designers and regulators. HELP is a quasi-two-dimensional model that predicts moisture movement into and through the underground soil and waste layers. Processes modeled within HELP include precipitation, runoff, evapotranspiration, unsaturated vertical drainage, saturated lateral drainage, and leakage through liners. Unfortunately, multidimensional unsaturated flow phenomena that are necessary for evaluating tilted capillary barriers are not included in HELP. Differences between the predictions of the HELP and those from a multidimensional unsaturated flow code are presented to assess the two different approaches. Comparisons are presented for the landfill covers including capillary barrier configurations at the Alternative Landfill Cover Demonstration (ALCD) being conducted at Sandia.

657
(SAND–97-0908C)
Geothermal drilling technology update. Glowka, D.A. Sandia National Labs., Albuquerque, NM (United States). 1997. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970376–1: 15. US Department of Energy's geothermal program review, San Francisco, CA (United States), 24-26 Mar 1997). Order Number DE97004630. Source: OSTI; NTIS; GPO Dep.

Sandia National Laboratories conducts a comprehensive geothermal drilling research program for the US Department of Energy, Office of Geothermal Technologies. The program currently includes seven areas: lost circulation technology, hard-rock drill bit technology, high-temperature instrumentation, wireless data telemetry, slimhole drilling technology, Geothermal Drilling Organization (GDO) projects, and drilling systems studies. This paper describes the current status of the projects under way in each of these program areas.

658
(SAND–97-0916C)
Examples of technical innovations in rock property measurements prompted by the Waste Isolation Pilot Plant. Christian-Frear, T.L. Sandia National Labs., Albuquerque, NM (United States). 1997. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970684–3: 1997 national convention of Society of Women Engineers (SWE), Albuquerque, NM (United States), 24 Jun 1997). Order Number DE97007554. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is the U.S. Department of Energy's (DOE) planned repository for transuranic waste generated by defense programs. The WIPP repository 660 meters underground in bedded salt. Bedded salt was chosen for the repository because of salt's small moisture content, extremely low permeability, and its natural ability to flow or creep, effectively encapsulating the waste in the long-term. However, because of these unique characteristics, the ability to measure properties at in situ conditions are beyond the realm of most standard experimental equipment. Thus a suite of new experimental systems and techniques has been developed to measure properties in extremely "tight" (low permeability) rocks. Also, innovations in rock property measurements have been made for standard porous media through the research conducted to characterize the rocks above the repository. A number of the new systems and techniques developed through the WIPP are presented in this paper. Examples include permeameters, two-phase flow characterization equipment, techniques for evaluation of salt healing, and characterization of diffusive processes.

659
(SAND–97-1082C)
A testing program to evaluate the effects of simulant mixed wastes on plastic transportation packaging components. Nigrey, P.J. (Sandia National Labs., Albuquerque, NM (United States). Transportation Systems Dept.); Dickens, T.G.; Dickman, P.T. Sandia National Labs., Albuquerque,

NM (United States). [1997]. 18p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970857–1: 4. biennial ASME mixed waste symposium, Baltimore, MD (United States), 17-21 Aug 1997). Order Number DE97006866. Source: OSTI; NTIS; INIS; GPO Dep.

Based on regulatory requirements for Type A and B radioactive material packaging, a Testing Program was developed to evaluate the effects of mixed wastes on plastic materials which could be used as liners and seals in transportation containers. The plastics evaluated in this program were butadiene-acrylonitrile copolymer (Nitrile rubber), cross-linked polyethylene, epichlorohydrin, ethylene-propylene rubber (EPDM), fluorocarbons, high-density polyethylene (HDPE), butyl rubber, polypropylene, polytetrafluoroethylene, and styrene-butadiene rubber (SBR). These plastics were first screened in four simulant mixed wastes. The liner materials were screened using specific gravity measurements and seal materials by vapor transport rate (VTR) measurements. For the screening of liner materials, Kel-F, HDPE, and XLPE were found to offer the greatest resistance to the combination of radiation and chemicals. The tests also indicated that while all seal materials passed exposure to the aqueous simulant mixed waste, EPDM and SBR had the lowest VTRs. In the chlorinated hydrocarbon simulant mixed waste, only Viton passed the screening tests. In both the simulant scintillation fluid mixed waste and the ketone mixture waste, none of the seal materials met the screening criteria. Those materials which passed the screening tests were subjected to further comprehensive testing in each of the simulant wastes. The materials were exposed to four different radiation doses followed by exposure to a simulant mixed waste at three temperatures and four different exposure times (7, 14, 28, 180 days). Materials were tested by measuring specific gravity, dimensional, hardness, stress cracking, VTR, compression set, and tensile properties. The second phase of this Testing Program involving the comprehensive testing of plastic liner has been completed and for seal materials is currently in progress.

660

(SAND–97-1085C)

Computer-assisted comparison of analysis and test results in transportation experiments. Knight, R.D. (Gram, Inc., Albuquerque, NM (United States)); Ammerman, D.J.; Koski, J.A. Sandia National Labs., Albuquerque, NM (United States). 10 May 1998. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98004286. Source: OSTI; NTIS; INIS; GPO Dep.

As a part of its ongoing research efforts, Sandia National Laboratories' Transportation Surety Center investigates the integrity of various containment methods for hazardous materials transport, subject to anomalous structural and thermal events such as free-fall impacts, collisions, and fires in both open and confined areas. Since it is not possible to conduct field experiments for every set of possible conditions under which an actual transportation accident might occur, accurate modeling methods must be developed which will yield reliable simulations of the effects of accident events under various scenarios. This requires computer software which is capable of assimilating and processing data from experiments performed as benchmarks, as well as data obtained from numerical models that simulate the experiment. Software tools which can present all of these results in a meaningful and useful way to the analyst are a critical aspect of this process. The purpose of this work is to provide software resources on a long term basis, and to ensure that the data visualization capabilities of the Center keep pace with advancing technology. This will provide leverage for its modeling and analysis abilities in a rapidly evolving hardware/software environment.

661

(SAND–97-1248C)

Regulatory and extra-regulatory testing to demonstrate radioactive material packaging safety. Ammerman, D.J. Sandia National Labs., Albuquerque, NM (United States). 1997. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970537–5: 18. annual DOE low-level radioactive waste management conference, Salt Lake City, UT (United States), 20-22 May 1997). Order Number DE97007552. Source: OSTI; NTIS; INIS; GPO Dep.

Packages for the transportation of radioactive material must meet performance criteria to assure safety and environmental protection. The stringency of the performance criteria is based on the degree of hazard of the material being transported. Type B packages are used for transporting large quantities of radioisotopes (in terms of A_2 quantities). These packages have the most stringent performance criteria. Material with less than an A_2 quantity are transported in Type A packages. These packages have less stringent performance criteria. Transportation of LSA and SCO materials must be in "strong-tight" packages. The performance requirements for the latter packages are even less stringent. All of these package types provide a high level of safety for the material being transported. In this paper, regulatory tests that are used to demonstrate this safety will be described. The responses of various packages to these tests will be shown. In addition, the response of packages to extra-regulatory tests will be discussed. The results of these tests will be used to demonstrate the high level of safety provided to workers, the public, and the environment by packages used for the transportation of radioactive material.

662

(SAND–97-1309C)

Long-term brine migration through an engineered shaft seal system. Fryar, D.G. (INTERA Inc., Austin, TX (United States)); Beach, J.A.; Kelley, V.A.; Knowles, M.K. Sandia National Labs., Albuquerque, NM (United States). [1997]. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970665–2: American Society of Information Science conference, Scottsdale, AZ (United States), Jun 1997). Order Number DE97006891. Source: OSTI; NTIS; INIS; GPO Dep.

The shaft seal system for the Waste Isolation Pilot Plant (WIPP) must provide a barrier to the migration of fluids within the shafts to prevent the release of contaminants to the accessible environment. To investigate the performance of the shaft seal system, a set of fluid flow performance models was developed based upon the physical characteristics of the WIPP shaft seal system and the surrounding geologic media. This paper describes the results of a numerical model used to investigate the long-term potential for

brine migration through the shaft seal system. Modeling results demonstrate that the WIPP shaft seal system will effectively limit brine migration within the repository shafts.

663
(SAND–97-1310C)
A method of modeling time-dependent rock damage surrounding underground excavations in multiphase groundwater flow. Christian-Frear, T. (Sandia National Labs., Albuquerque, NM (United States). Geohydrology Dept.); Freeze, G. Sandia National Labs., Albuquerque, NM (United States). [1997]. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970663–3: 4. ASCE congress on computing in civil engineering, Philadelphia, PA (United States), 16-18 Jun 1997). Order Number DE97006890. Source: OSTI; NTIS; INIS; GPO Dep.

Underground excavations produce damaged zones surrounding the excavations which have disturbed hydrologic and geomechanical properties. Prediction of fluid flow in these zones must consider both the mechanical and fluid flow processes. Presented here is a methodology which utilizes a mechanical model to predict damage and disturbed rock zone (DRZ) development around the excavation and then uses the predictions to develop time-dependent DRZ porosity relationships. These relationships are then used to adjust the porosity of the DRZ in the fluid flow model based upon the time and distance from the edge of the excavation. The application of this methodology is presented using a site-specific example from the Waste Isolation Pilot Plant, a US Department of Energy facility in bedded salts being evaluated for demonstration of the safe underground disposal of transuranic waste from US defense-related activities.

664
(SAND–97-1311C)
Calculation of density and permeability of compacted crushed salt within an engineered shaft sealing system. Loken, M. (RE/SPEC Inc., Rapid City, SD (United States)); Statham, W. Sandia National Labs., Albuquerque, NM (United States). [1997]. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970663–4: 4. ASCE congress on computing in civil engineering, Philadelphia, PA (United States), 16-18 Jun 1997). Order Number DE97006889. Source: OSTI; NTIS; INIS; GPO Dep.

Crushed salt from the host Salado Formation is proposed as a sealing material in one component of a multicomponent seal system design for the shafts of the Waste Isolation Pilot Plant (WIPP), a mined geological repository for storage and disposal of transuranic radioactive wastes located near Carlsbad, New Mexico. The crushed salt will be compacted and placed at a density approaching 90% of the intact density of the host Salado salt. Creep closure of the shaft will further compact the crushed salt over time, thereby reducing the crushed-salt permeability from the initial state and creating an effective long-term seal. A structural model and a fluid flow model have been developed to provide an estimate of crushed-salt reconsolidation rate as a function of depth, time, and pore pressure. Model results are obtained in terms of crushed-salt permeability as a function of time and depth within the salt column. Model results indicate that average salt column permeability will be reduced to 3.3×10^{-20} m^2 in about 100 years, which provides for an acceptable long-term seal component.

665
(SAND–97-1336C)
Beyond pretty pictures: Quantifying porous media properties and transport processes using transmission and emission CT. Sandia National Labs., Albuquerque, NM (United States). [1997]. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970864–1: Applications of emerging technologies in hydrology, Minneapolis, MN (United States), 10-14 Aug 1997). Order Number DE97007140. Source: OSTI; NTIS; INIS; GPO Dep.

While gaining increasing interest, the use of Computerized Tomography (CT) in porous media studies has been limited by the availability of quantitative methods of analysis. Three methods are presented for the analysis of CT data and applied to images obtained from gamma transmission and gamma emission systems. The first utilizes measurement statistics and image histograms to provide exact estimates of multiple component volume contents. An improved thresholding technique in the second method allows an identification of individual voxel composition. The threshold utilizes error statistics to eliminate the arbitrary nature of current methods. Emission tomography images of solute transport are shown in the third procedure to provide in-situ measures of transport in fractured media. Application of each method is demonstrated on samples of the Culebra Dolomite of the Rustler Formation, New Mexico. Dolomite cores were collected by horizontal drilling at a depth of 218 m in the air intake shaft of the Waste Isolation Pilot Plant located near Carlsbad, New Mexico.

666
(SAND–97-1357C)
A comparison of regulatory impacts to real target impacts. Ammerman, D.J. Sandia National Labs., Albuquerque, NM (United States). May 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98003334. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this paper is to discuss the relative severity of regulatory impacts onto an essentially rigid target to impacts at higher velocities onto real targets. For impacts onto the essentially rigid target all of the kinetic energy of the package is absorbed by deformation of the package. For impacts onto real targets the kinetic energy is absorbed by deformation of the target as well as by deformation of the package. The amount of kinetic energy absorbed by the target does not increase the severity of the impact.

667
(SAND–97-1358C)
The effect of cargo on the crush loading of RAM transportation packages in ship collisions. Radloff, H.D.; Ammerman, D.J. Sandia National Labs., Albuquerque, NM (United States). Mar 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98003346. Source: OSTI; NTIS; INIS; GPO Dep.

Recent intercontinental radioactive material shipping campaigns have focused public and regulatory attention on the safety of transport of this material by ocean-going vessels. One major concern is the response of the vessel and onboard radioactive material (RAM) packages during a severe ship-to-ship collision. These collisions occur at velocities less than the velocity obtained in the Type B package regulatory impact event and the bow of the striking ship is less rigid than the unyielding target used in those tests (Ammerman and Daidola, 1996). This implies that ship impact is not a credible scenario for damaging the radioactive material packages during ship collisions. It is possible, however, for these collisions to generate significant amounts of crush force by the bow of the impacting ship overrunning the package. It is the aim of this paper to determine an upper bound on the magnitude of this crush force taking into account the strength of the radioactive material carrying vessel and any other cargo that may be stowed in the same hold as the radioactive material.

668
(SAND–97-1359C)
Development of a container for the transportation and storage of plutonium bearing materials. Ammerman, D. (Sandia National Labs., Albuquerque, NM (United States)); Geinitz, R.; Thorp, D.; Rivera, M. Sandia National Labs., Albuquerque, NM (United States). Mar 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98003335. Source: OSTI; NTIS; INIS; GPO Dep.

There is a large backlog of plutonium contaminated materials at the Rocky Flats Environmental Technology Site near Denver, Colorado, USA. The clean-up of this site requires this material to be packaged in such a way as to allow for efficient transportation to other sites or to a permanent geologic repository. Prior to off-site shipment of the material, it may be stored on-site for a period of time. For this reason, it is desirable to have a container capable of meeting the requirements for storage as well as the requirements for transportation. Most of the off-site transportation is envisioned to take place using the TRUPACT-II Type B package, with the Waste Isolation Pilot Plant (WIPP) as the destination. Prior to the development of this new container, the TRUPACT-II had a limit of 325 FGE (fissile gram equivalents) of plutonium due to criticality control concerns. Because of the relatively high plutonium content in the material to be transported, transporting 325 FGE per TRUPACT-II is uneconomical. Thus, the purpose of the new containers is to provide criticality control to increase the allowed TRUPACT-II payload and to provide a safe method for on-site storage prior to transport. This paper will describe the analysis and testing used to demonstrate that the Pipe Overpack Container provides safe on-site storage of plutonium bearing materials in unhardened buildings and provides criticality control during transportation within the TRUPACT-II. Analyses included worst-case criticality analyses, analyses of fork-lift time impacts, and analyses of roof structure collapse onto the container. Testing included dynamic crush tests, bare pipe impact tests, a 30-minute totally engulfing pool-fire test, and multiple package impact tests in end-on and side-on orientations.

669
(SAND–97-1365C)
Testing and analysis to determine the shell thickness required to prevent puncture. Ammerman, D.J.; Radloff, H.D.; Eifert, E.J. Sandia National Labs., Albuquerque, NM (United States). May 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98003333. Source: OSTI; NTIS; INIS; GPO Dep.

Type B radioactive material packages are required to withstand a hypothetical puncture accident of a free fall from a height of one meter onto a 15 cm diameter mild steel puncture probe. For many packages it is desirable to have this accident event not result in puncture or tearing of the outer shell of the package. The wall thickness necessary to prevent this has historically been determined by test or the use of empirical relations. This technique generally results in overly conservative designs, but the degree of conservatism is uncertain. The use of modem finite element codes to determine package response to puncture accidents can result in designs that are both safe and economical. The work reported in this paper is aimed at developing a method to analytically determine the wall thickness required to prevent puncture. For designers and regulators to have confidence in this analytical method, however, it must be benchmarked against test results. A series of tests has been conducted with differing shell thicknesses, shell materials of mild steel and stainless steel, and shell backing materials of lead, foam, and air. The results of these tests have been compared with pre-test analytical predictions of the response obtained from the nonlinear transient dynamic finite element program PRONTO-2D. From this comparison it can be seen that the finite element method can accurately predict the response of packages to puncture accidents. This implies that an analytical technique based on the finite element method can be used to design packages having known response and margin of safety against tearing of the outer shell. In addition, the analytical technique can accurately predict the deformed shape of the package following the test. This may be important for subsequent calculations, such as external dose and heat input during a thermal event.

670
(SAND–97-1459C)
Pollution prevention and waste minimization opportunity assessment in environmental restoration. Roybal, J.A.; Willison, C.P. Sandia National Labs., Albuquerque, NM (United States). [1997]. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970854–: 13. pollution prevention conference, Atlanta, GA (United States), 26-28 Aug 1997). Order Number DE98000212. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Restoration (ER) Project at Sandia National Laboratories implicitly subscribed to the philosophy of pollution prevention and waste minimization. As a result of a Department of Energy (DOE) offer, Pollution Prevention Opportunity Assessments (PPOA) were conducted at two ER sites and a decontamination and Demolition (D and D) site. The purpose of one of the PPOAs was to identify pollution prevention (P2) opportunities during environmental

remediation at the Classified Waste Landfill located at Sandia National Laboratories, New Mexico (SNL/NM). The remediation activities at this site are scheduled to begin in the fall of 1997. The PPOA included presentations by the team members, a tour of the site, and a brainstorming session to list the waste streams, identify P2 opportunities and rank them in order of priority. Twenty-five P2 opportunities were identified during the brainstorming session of which twenty-two opportunities were selected for further investigation. Those twenty-two opportunities are discussed in this paper. A cost benefit analysis was performed for each P2 opportunity based on the estimated waste volume, feasibility, and cost. Pollution Prevention by Design (P2D) was incorporated into the PPOA to introduce waste minimization techniques that can be used during the planning phase of restoration projects.

671
(SAND–97-1465C)
Studies of photoredox reactions on nanosize semiconductors. Wilcoxon, J.P. (Sandia National Labs., Albuquerque, NM (United States)); Parsapour, F.; Kelley, D.F. Sandia National Labs., Albuquerque, NM (United States). [1997]. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970517–9: 191. meeting of the Electrochemical Society, Inc., Montreal (Canada), 4-9 May 1997). Order Number DE97006874. Source: OSTI; NTIS; GPO Dep.

Light induced electron transfer (ET) from nanosize semiconductors of MoS_2 to organic electron acceptors such as 2,2′-bipyridine (bpy) and methyl substituted 4,4′,5,5′-tetramethyl-2,2′-bipyridine (tmb) was studied by static and time resolved photoluminescence spectroscopy. The kinetics of ET were varied by changing the nanocluster size (the band gap), the electron acceptor, and the polarity of the solvent. MoS_2 is an especially interesting semiconductor material as it is an indirect semiconductor in bulk form, and has a layered covalent bonding arrangement which is highly resistant to photocorrosion. Et occurs following photoexcitation of the direct band gap. Quantum confinement results in the smaller nanoclusters having higher conduction band energies, and therefore larger ET driving forces. The ET reaction energies may be varied by changing the electron acceptor, by varying the size of the MoS_2 nanocluster or by varying the polarity of the solvent. In addition, varying the polarity of the solvent affects the reorganization energy and the barrier to electron transfer. TMB is harder to reduce, and thus has a smaller ET driving force than bpy. The solvent polarity is varied by varying the composition of acetonitrile/benzene mixed solvents.

672
(SAND–97-1500C)
Low-level radioactive waste transportation safety history. McClure, J.D. (Sandia National Labs., Albuquerque, NM (United States). Transportation Systems Analysis Dept.). Sandia National Labs., Albuquerque, NM (United States). [1997]. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970537–10: 18. annual DOE low-level radioactive waste management conference, Salt Lake City, UT (United States), 20-22 May 1997). Order Number DE97006875. Source: OSTI; NTIS; INIS; GPO Dep.

The Radioactive Materials Incident Report (RMIR) database was developed fin 1981 at the Transportation Technology Center of Sandia National Laboratories to support its research and development activities for the US department of Energy (DOE). This database contains information about radioactive material (RAM) transportation incidents that have occurred in the US since 1971. These data were drawn from the US Department of Transportation's (DOT) Hazardous Materials Incident Report system, from Nuclear Regulatory Commission (NRC) files, and from various agencies including state radiological control offices. Support for the RMIR data base is funded by the US DOE National Transportation Program (NTP). Transportation events in RMIR are classified in one of the following ways: as a transportation accident, as a handling accident, or as a reported incident. This presentation will provide definitions for these classifications and give examples of each. The primary objective of this presentation is to provide information on nuclear materials transportation accident/incident events involving low-level waste (LLW) that have occurred in the US for the period 1971 through 1996. Among the areas to be examined are: transportation accidents by mode, package response during accidents, and an examination of accidents where release of contents has occurred. Where information is available, accident and incident history and package response for LLW packages in transportation accidents will be described.

673
(SAND–97-1645C)
Application of the RADTRAN 5 stop model. Neuhauser, K.S.; Kanipe, R.L.; Weiner, R.F. Sandia National Labs., Albuquerque, NM (United States). [1997]. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98004422. Source: OSTI; NTIS; INIS; GPO Dep.

A number of environmental impact analyses with the RADTRAN computer code have shown that dose to persons at stops is one of the largest components of incident-free dose during overland carriage of spent fuel and other radioactive materials (e.g., USDOE, 1994). The input data used in these analyses were taken from a 1983 study that reports actual observations of spent fuel shipments by truck. Early RADTRAN stop models, however, were insufficiently flexible to take advantage of the detailed information in the study. A more recent study of gasoline service stations that specialize in servicing large trucks, which are the most likely stop locations for shipments of Type B packages in the United States, has provided additional, detailed data on refueling/meal stops. The RADTRAN 5 computer code for transportation risk analysis allows exposures at stops to be more fully modeled than have previous releases of the code and is able to take advantage of detailed data. It is the intent of this paper first to compare results from RADTRAN and RADTRAN 5 for the old, low-resolution form of input data, and then to demonstrate what effect the new data and input format have on stop-dose estimates for an individual stop and for a hypothetical shipment route. Finally, these estimated public doses will be contrasted with doses calculated for a special population group – inspectors.

674
(SAND–97-2291C)
A risk-based decision-aiding tool for waste disposal. Weiner, R.F. (Sandia National Labs., Albuquerque, NM (United States)); Reiser, A.S.; Elcock, C.G.; Nevins, S. Sandia National Labs., Albuquerque, NM (United States). 1997. 15p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970857–2: 4. biennial ASME mixed waste symposium, Baltimore, MD (United States), 17-21 Aug 1997). Order Number DE98000040. Source: OSTI; NTIS; INIS; GPO Dep.

N-CART (the National Spent Nuclear Fuel Program Cost Analysis and Risk Tool) is being developed to aid in low-risk, cost-effective, timely management of radioactive waste and spent nuclear fuel, and can therefore be used in management of mixed waste. N-CART provides evaluation of multiple alternatives and presents the consequences of proposed waste management activities in a clear and concise format. N-CART's decision-aiding analyses include comparisons and sensitivity analyses of multiple alternatives and allows the user to perform quick turn-around "what if" studies to investigate various scenarios. Uncertainties in data (such as cost and schedule of various activities) are represented as distributions. N-CART centralizes documentation of the bases of program alternatives and program decisions, thereby supporting responses to stakeholders concerns. The initial N-CART design considers regulatory requirements, costs, and schedules for alternative courses of action. The final design will include risks (public health, occupational, economic, scheduling), economic benefits, and the impacts of secondary waste generation. An optimization tool is being incorporated that allows the user to specify the relative importance of cost, time risks, and other bases for decisions. The N-CART prototype can be used to compare the costs and schedules of disposal alternatives for mixed low-level radioactive waste (MLLW) and greater-than-Class-C (GTCC) waste, as well as spent nuclear fuel (SNF) and related scrap material.

675
(SAND–97-2390C)
Performance assessment in support of compliance certification application for the WIPP project. Jow, H.N. (Sandia National Labs., Albuquerque, NM (United States)); Anderson, D.R.; Marietta, M.; Helton, J.; Basabilvazo, G. Sandia National Labs., Albuquerque, NM (United States). Mar 1998. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-971040–: ICEM '97: 6. international conference on radioactive waste management and environmental remediation, Singapore (Singapore), 12-16 Oct 1997). Order Number DE98002839. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is being developed by the US Department of Energy for the geologic (deep underground) disposal of transuranic (TRU) waste. A Compliance Certification Application (CCA) of the WIPP (1) for such disposal was submitted to the US Environmental Protection Agency (EPA) in October, 1996, and is currently under review, with a decision anticipated in late 1997. An important component of the CCA is a performance assessment (PA) for the WIPP carried out by Sandia National Laboratories. The final outcome of the PA is a complementary cumulative distribution function (CCDF) for radionuclide releases from the WIPP to the accessible environment and an assessment of the confidence with which this CCDF can be estimated. This paper describes the computational process used to develop the CCDF. The results of uncertainty and sensitivity analysis are also presented.

676
(SAND–97-2592)
Electrokinetic demonstration at the unlined chromic acid pit. Lindgren, E.R. (Sandia National Labs., Albuquerque, NM (United States)); Hankins, M.G.; Mattson, E.D.; Duda, P.M. Sandia National Labs., Albuquerque, NM (United States). Jan 1998. 158p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE98004158. Source: OSTI; NTIS; INIS; GPO Dep.

Heavy-metal contaminated soils are a common problem at Department of Energy (DOE)-operated sites and privately owned facilities throughout the nation. One emerging technology which can remove heavy metals from soil in situ is electrokinetics. To conduct electrokinetic (EK) remediation, electrodes are implanted into the ground, and a direct current is imposed between the electrodes. Metal ions dissolved in the soil pore water migrate towards an electrode where they can be removed. The electrokinetic program at Sandia National Laboratories (SNL) has been focusing on electrokinetic remediation for unsaturated soils. A patent was awarded for an electrokinetic electrode system designed at SNL for applications to unsaturated soils. Current research described in this report details an electrokinetic remediation field demonstration of a chromium plume that resides in unsaturated soil beneath the SNL Chemical Waste Landfill (CWL). This report describes the processes, site investigation, operation and monitoring equipment, testing procedures, and extraction results of the electrokinetic demonstration. This demonstration successfully removed chromium contamination in the form of chromium(VI) from unsaturated soil at the field scale. After 2700 hours of operation, 600 grams of Cr(VI) was extracted from the soil beneath the SNL CWL in a series of thirteen tests. The contaminant was removed from soil which has moisture contents ranging from 2 to 12 weight percent. This demonstration was the first EK field trial to successfully remove contaminant ions from and soil at the field scale. Although the new patented electrode system was successful in removing an anionic contaminant (i.e., chromate) from unsaturated sandy soil, the electrode system was a prototype and has not been specifically engineered for commercialization. A redesign of the electrode system as indicated by the results of this research is suggested for future EK field trials.

677
(SAND–97-2707C)
A model for predicting damage dependent response of inelastic media with microstructure. Allen, D.H. (Texas A and M Univ., College Station, TX (United States). Aerospace Engineering Dept.); DeVries, K.L.; Hurtado, L.D. Sandia National Labs., Albuquerque, NM (United States). Dec 1997. 24p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980902–: 35. annual technical meeting of the Society of Engineering Science, Pullman, WA (United States), 27-30 Sep 1998). Order Number DE98001367. Source: OSTI; NTIS; GPO Dep.

This paper presents a model developed for predicting the mechanical response of inelastic media with heterogeneous microstructure. Particular emphasis is given to the development of microstructural damage along grains. The model is developed within the concepts of continuum mechanics, with special emphasis on the development of internal boundaries in the continuum by utilizing fracture mechanics-based cohesive zone models. In addition, the grains are assumed to be characterized by nonlinear viscoplastic material behavior. Implementation of the model to a finite element computational algorithm is also briefly described, and example solutions are obtained. Finally, homogenization procedures are discussed for obtaining macroscopic damage dependent mechanical constitutive equations that may then be utilized to construct a well-posed boundary value problem for the macroscopically homogenized damage dependent medium.

678
(SAND–97-2708C)
Science to compliance: The WIPP success story. Howarth, S.M.; Chu, M.S.; Shephard, L.E. Sandia National Labs., Albuquerque, NM (United States). 14 Nov 1997. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980516–: 1998 international high-level radioactive waste management conference, Las Vegas, NV (United States), 11-14 May 1998). Order Number DE98001311. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) in southeast New Mexico has been studied as a transuranic waste repository for the past 23 years. During this time, an extensive site characterization, design, construction, and experimental program was completed to provide in-depth understanding of the dominant processes that are most likely to influence the containment of radionuclides for 10,000 years. The success of the program, however, is defined by the regulator in the context of compliance with performance criteria, rather than by the in-depth technical understanding typical of most scientific programs. The WIPP project was successful in making a transformation from science to compliance by refocusing and redirecting programmatic efforts toward the singular goal of meeting regulatory compliance requirements while accelerating the submittal of the Compliance Certification Application (CCA) by two months from the April 1994 Disposal Decision Plan (DDP) date of December 1996, and by reducing projected characterization costs by more than 40%. This experience is unparalleled within the radioactive waste management community and has contributed to numerous lessons learned from which the entire community can benefit.

679
(SAND–97-2764C)
WIPP Compliance Certification Application calculations parameters. Part 1: Parameter development. Howarth, S.M. Sandia National Labs., Albuquerque, NM (United States). 14 Nov 1997. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980516–: 1998 international high-level radioactive waste management conference, Las Vegas, NV (United States), 11-14 May 1998). Order Number DE98001310. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) in southeast New Mexico has been studied as a transuranic waste repository for the past 23 years. During this time, an extensive site characterization, design, construction, and experimental program was completed, which provided in-depth understanding of the dominant processes that are most likely to influence the containment of radionuclides for 10,000 years. Nearly 1,500 parameters were developed using information gathered from this program; the parameters were input to numerical models for WIPP Compliance Certification Application (CCA) Performance Assessment (PA) calculations. The CCA probabilistic codes frequently require input values that define a statistical distribution for each parameter. Developing parameter distributions begins with the assignment of an appropriate distribution type, which is dependent on the type, magnitude, and volume of data or information available. The development of the parameter distribution values may require interpretation or statistical analysis of raw data, combining raw data with literature values, scaling of lab or field data to fit code grid mesh sizes, or other transformation. Parameter development and documentation of the development process were very complicated, especially for those parameters based on empirical data; they required the integration of information from Sandia National Laboratories (SNL) code sponsors, parameter task leaders (PTLs), performance assessment analysts (PAAs), and experimental principal investigators (PIs). This paper, Part 1 of two parts, contains a discussion of the parameter development process, roles and responsibilities, and lessons learned. Part 2 will discuss parameter documentation, traceability and retrievability, and lessons learned from related audits and reviews.

680
(SAND–97-2767C)
Truck transport of RAM: Risk effects of avoiding metropolitan areas. Mills, G.S.; Neuhauser, K.S. Sandia National Labs., Albuquerque, NM (United States). Nov 1997. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM ’98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98001125. Source: OSTI; NTIS; INIS; GPO Dep.

In the transport of radioactive material (RAM), e.g., spent nuclear fuel (SNF), stakeholders are generally most concerned about risks in high population density areas along transportation routes because of the perceived high consequences of potential accidents. The most significant portions of a transcontinental route and an alternative examined previously were evaluated again using population density data derived from US Census Block data. This method of characterizing population that adjoins route segments offers improved resolution of population density variations, especially in high population density areas along typical transport routes. Calculated incident free doses and accident dose risks for these routes, and the rural, suburban and urban segments are presented for comparison of their relative magnitudes. The results indicate that modification of this route to avoid major metropolitan areas through use of non-Interstate highways increases total risk yet does not eliminate a relatively small urban component of the accident dose risk. This conclusion is not altered by improved resolution of route segments adjoining high density populations.

681
(SAND–97-2768C)
Study of the components of evacuation times. Mills, G.S.; Neuhauser, K.S.; Smith, J.D. Sandia National Labs., Albuquerque, NM (United States). Nov 1997. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98001126. Source: OSTI; NTIS; INIS; GPO Dep.

The magnitudes of accident dose risks calculated by the RADTRAN code depend directly on the time span between an accidental release and evacuation of the affected area surrounding potential radionuclide releases. In a previous study of truck and rail transportation accidents, and other incidents requiring evacuations, a lognormal distribution of evacuation times (time span from decision to evacuate until complete) was developed, which provided a better model for this parameter than the practice of using a highly conservative value of 24 hours. However, the distribution did not account for time required for responders to arrive on the scene, to evaluate the hazards to surrounding population and to initiate an evacuation. Data from US Department of Transportation (DOT) accident statistics have been collected and their distribution functions determined. The separate distribution functions were combined into a single, comprehensive distribution which may be sampled to supply values of the RADTRAN input parameter, EVACUATION. A sample RADTRAN calculation illustrating the effect on risks of using the distribution versus the original (24 hour), conservative point-estimate are also presented.

682
(SAND–97-2769C)
Extension of ship accident analysis to multiple-package shipments. Mills, G.S.; Neuhauser, K.S. Sandia National Labs., Albuquerque, NM (United States). Nov 1997. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98001127. Source: OSTI; NTIS; INIS; GPO Dep.

Severe ship accidents and the probability of radioactive material release from spent reactor fuel casks were investigated previously. Other forms of RAM, e.g., plutonium oxide powder, may be shipped in large numbers of packagings rather than in one to a few casks. These smaller, more numerous packagings are typically placed in ISO containers for ease of handling, and several ISO containers may be placed in one of several holds of a cargo ship. In such cases, the size of a radioactive release resulting from a severe collision with another ship is determined not by the likelihood of compromising a single, robust package but by the probability that a certain fraction of 10's or 100's of individual packagings is compromised. The previous analysis involved a statistical estimation of the frequency of accidents which would result in damage to a cask located in one of seven cargo holds in a collision with another ship. The results were obtained in the form of probabilities (frequencies) of accidents of increasing severity and of release fractions for each level of severity. This paper describes an extension of the same general method in which the multiple packages are assumed to be compacted by an intruding ship's bow until there is no free space in the hold. At such a point, the remaining energy of the colliding ship is assumed to be dissipated by progressively crushing the RAM packagings and the probability of a particular fraction of package failures is estimated by adaptation of the statistical method used previously. The parameters of a common, well characterized packaging, the 6M with 2R inner containment vessel, were employed as an illustrative example of this analysis method. However, the method is readily applicable to other packagings for which crush strengths have been measured or can be estimated with satisfactory confidence.

683
(SAND–97-2777C)
Designing a database for performance assessment: Lessons learned from WIPP. Martell, M.A. (Sandia National Labs., Albuquerque, NM (United States)); Schenker, A. Sandia National Labs., Albuquerque, NM (United States). Dec 1997. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980516–: 1998 international high-level radioactive waste management conference, Las Vegas, NV (United States), 11-14 May 1998). Order Number DE98001679. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) Compliance Certification Application (CCA) Performance Assessment (PA) used a relational database that was originally designed only to supply the input parameters required for implementation of the PA codes. Reviewers used the database as a point of entry to audit quality assurance measures for control, traceability, and retrievability of input information used for analysis, and output/work products. During these audits it became apparent that modifications to the architecture and scope of the database would benefit the EPA regulator and other stakeholders when reviewing the recertification application. This paper contains a discussion of the WPP PA CCA database and lessons learned for designing a database.

684
(SAND–97-2797C)
"We crash, burn, and crush": A history of packaging at Sandia National Laboratories, 1978–1997. Mora, C.J.; McConnell, P. Sandia National Labs., Albuquerque, NM (United States). Nov 1997. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98000841. Source: OSTI; NTIS; INIS; GPO Dep.

Even prior to the beginning of the nuclear age, the packaging and transportation of nuclear materials was a prime national concern. Nuclear materials such as uranium and plutonium had to be transported safely (and secretly) to the Manhattan Engineer District Laboratory in Los Alamos, New Mexico. The subsequent post war use of nuclear power for the generation of electricity and accelerated weapons development programs resulted in radioactive waste byproducts, such as spent fuel and plutonium, that were stored on site at utilities and federal weapons sites. While projected repositories for long term storage of radioactive waste are being planned, both low and high level radioactive materials on occasion must be moved safely. Movement to interim storage and, for low level waste, repository sites, is accomplished by a combination of truck, rail, ship, and air. The US

Department of Energy (DOE) directs transportation activities including cask development technology for use in single or multimodal (a combination of land, water, and air) transport. In 1978, Sandia National Laboratories was selected as the lead contractor for basic transportation technology. This report is divided into the following topics: (1) early research and development (1936–1978); (2) radioactive material package test (1975–1977); (3) the SNL Transportation Technology Center; (4) TRUPACT-II; (5) beneficial uses of shipping system casks; (6) C-141B drop tests; (7) MIDAS; (8) MOSAIK; (9) SEARAM; (10) PATRAM; and (11) a chronology of transportation activities.

685
(SAND–97-2812C)
WIPP Compliance Certification Application calculations parameters. Part 2: Parameter documentation. Howarth, S.M. Sandia National Labs., Albuquerque, NM (United States). 14 Nov 1997. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980516–: 1998 international high-level radioactive waste management conference, Las Vegas, NV (United States), 11-14 May 1998). Order Number DE98001680. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) in southeast New Mexico has been studied as a transuranic waste repository for the past 23 years. During this time, an extensive site characterization, design, construction, and experimental program was completed, which provided in depth understanding of the dominant processes that are most likely to influence the containment of radionuclides for 10,000 years. Nearly 1,500 parameters were developed using information gathered from this program and were input to numerical models for WIPP Compliance Certification Application (CCA) Performance Assessment (PA) calculations. The CCA probability models require input parameters that are defined by a statistical distribution. Developing parameters begins with the assignment of an appropriate distribution type, which is dependent on the type, magnitude, and volume of data or information available. Parameter development may require interpretation or statistical analysis of raw data, combining raw data with literature values, scaling laboratory or field data to fit code grid mesh sizes, or other transformations. Documentation of parameter development is designed to answer two questions: What source information was used to develop this parameter? and Why was this particular data set/information used? Therefore, complete documentation requires integrating information from code sponsors, parameter task leaders, performance assessment analysts, and experimental principal investigators. This paper, Part 2 of 2 parts, contains a discussion of the WIPP CCA PA Parameter Tracking System, document traceability and retrievability, and lessons learned from related audits and reviews.

686
(SAND–97-2813C)
QA lessons learned for parameter control from the WIPP Project. Richards, R.R. Sandia National Labs., Albuquerque, NM (United States). Jan 1998. 4p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980516–: 1998 international high-level radioactive waste management conference, Las Vegas, NV (United States), 11-14 May 1998). Order Number DE98004101. Source: OSTI; INIS; NTIS; GPO Dep.

This paper provides a summary of lessons learned from experiences on the Waste Isolation Pilot Plant (WJPP) Project in implementation of quality assurance controls surrounding inputs for performance assessment analysis. Since the performance assessment (PA) process is inherent in compliance determination for any waste repository, these lessons-learned are intended to be useful to investigators, analysts, and Quality Assurance (QA) practitioners working on high level waste disposal projects. On the WIPP Project, PA analyses for regulatory-compliance determination utilized several inter-related computer programs (codes) that mathematically modeled phenomena such as radionuclide release, retardation, and transport. The input information for those codes are the parameters that are the subject of this paper. Parameters were maintained in a computer database, which was then queried electronically by the PA codes whenever input was needed as the analyses were run.

687
(SAND–97-2824C)
Anticipating Potential Waste Acceptance Criteria for Defense Spent Nuclear Fuel. Rechard, R.P. (Sandia National Labs., Albuquerque, NM (United States). Nuclear Waste Management Center); Lord, M.E.; Stockman, C.T.; McCurley, R.D. Sandia National Labs., Albuquerque, NM (United States). 1997. 17p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980307–: Waste management ’98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98001265. Source: OSTI; NTIS; INIS; GPO Dep.

The Office of Environmental Management of the U.S. Department of Energy is responsible for the safe management and disposal of DOE owned defense spent nuclear fuel and high level waste (DSNF/DHLW). A desirable option, direct disposal of the waste in the potential repository at Yucca Mountain, depends on the final waste acceptance criteria, which will be set by DOE’s Office of Civilian Radioactive Waste Management (OCRWM). However, evolving regulations make it difficult to determine what the final acceptance criteria will be. A method of anticipating waste acceptance criteria is to gain an understanding of the DOE owned waste types and their behavior in a disposal system through a performance assessment and contrast such behavior with characteristics of commercial spent fuel. Preliminary results from such an analysis indicate that releases of 99Tc and 237Np from commercial spent fuel exceed those of the DSNF/DHLW; thus, if commercial spent fuel can meet the waste acceptance criteria, then DSNF can also meet the criteria. In large part, these results are caused by the small percentage of total activity of the DSNF in the repository (1.5%) and regulatory mass (4%), and also because commercial fuel cladding was assumed to provide no protection.

688
(SAND–97-2832C)
Balancing compliance and cost when implementing a Quality Assurance program. Pickering, S.Y. Sandia National Labs., Albuquerque, NM (United States). Dec 1997. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980516–: 1998 international high-level radioactive waste management conference, Las

Vegas, NV (United States), 11-14 May 1998). Order Number DE98001681. Source: OSTI; NTIS; INIS; GPO Dep.

When implementing a Quality Assurance (QA) program, compliance and cost must be balanced. A QA program must be developed that hits the mark in terms of adequate control and documentation, but does not unnecessarily expand resources. As the Waste Isolation Pilot Plant (WIPP) has moved towards certification, Sandia National Laboratories has learned much about balancing compliance and costs. Some of these lessons are summarized here.

689

(SAND–97-2845C)

Reduction of Np(VI) and Pu(VI) by organic chelating agents. Reed, D.T. (Argonne National Lab., IL (United States)); Wygmans, D.G.; Aase, S.B.; Banaszak, J.E. Sandia National Labs., Albuquerque, NM (United States);Argonne National Lab., IL (United States). Jun 1998. 18p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000 ; W-31109-ENG-38. (CONF-971090–: 8. international conference on fusion reactor materials (ICFRM), Sendai (Japan), 26-31 Oct 1997). Order Number DE98005702. Source: OSTI; NTIS; INIS; GPO Dep.

The reduction of NpO_2^{2+} and PuO_2^{2+} by oxalate, citrate, and ethylenediaminetetraacetic acid (EDTA) was investigated in low ionic strength media and brines. This was done to help establish the stability of the An(VI) oxidation state depended on the pH nd relative strength of the various oxidation state-specific complexes. At low ionic strength and pH 6, NpO_2^{2+} was rapidly reduced to form NpO_2^{+} organic complexes. At longer times, Np(IV) organic complexes were observed in the presence of citrate. PuO_2^{2+} was predominantly reduced to Pu^{4+}, resulting in the formation of organic complexes or polymeric/hydrolytic precipitates. The relative rates of reduction to the An(V) complex were EDTA > citrate > oxalate. Subsequent reduction to An(IV) complexes, however, occurred in the following order: citrate > EDTA > oxalate because of the stability of the An(VI)-EDTA complex. The presence of organic complexants led to the rapid reduction of NpO_2^{2+} and PuO_2^{2+} in G-Seep brine at pHs 5 and 7. At pHs 8 and 10 in ERDA-6 brine, carbonate and hydrolytic complexes predominated and slowed down or prevented the reduction of An(VI) by the organics present.

690

(SAND–97-2850C)

An overview of performance assessment for the Waste Isolation Pilot Plant. Jow, Hong-Nian (Sandia National Labs., Albuquerque, NM (United States)); Anderson, D.R.; Marietta, M. Sandia National Labs., Albuquerque, NM (United States). 1997. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970335–: Waste Management '97, Tucson, AZ (United States), 2-7 Mar 1997). Order Number DE98001484. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents an overview of the methodology used in the recent performance assessment (PA) to support the U.S. Department of Energy (DOE) Carlsbad Area Office's (CAO's) Waste Isolation Pilot Plant (WIPP) Compliance Certification Application (CCA). The results of this recently completed WIPP PA will be presented. Major release modes contributing to the total radionuclide release to the accessible environment will be discussed. Comparison of the mean complementary cumulative distribution function (CCDF) curve against the Environmental Protection Agency (EPA) radionuclide release limits will be presented.

691

(SAND–97-2851C)

Critical scientific issues in the demonstration of WIPP compliance with EPA repository standards. Weart, W.D.; Chu, M.S.Y. Sandia National Labs., Albuquerque, NM (United States). 1997. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970335–: Waste Management '97, Tucson, AZ (United States), 2-7 Mar 1997). Order Number DE98001485. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy submitted a Compliance Certification Application for the Waste Isolation Pilot Plant to the Environmental Protection Agency (EPA) in October, 1996. A critical part of this application was a Performance Assessment which predicts the cumulative radioactive release to the accessible environment over a time period of 10,000 years. Comparison of this predicted release to the EPA standard shows a comfortable margin of compliance. The scientific understanding that was critical to developing this assessment spans a broad range of geotechnical disciplines, and required a thorough understanding of the site's geology and hydrology. Evaluation of the geologic processes which are active in the site region establishes that there will be no natural breach of site integrity for millions of years, far longer than the 10,000 year regulatory period. Inadvertent human intrusion is, therefore, the only credible scenario to lead to potential radioactive release to the accessible environment. To substantiate this conclusion and to quantify these potential releases from human intrusion, it has been necessary to develop an understanding of the following processes: (1) salt creep and shaft seal efficacy; (2) gas generation from organic decomposition of waste materials and anoxic corrosion of metals in the waste and waste packages; (3) solubilities for actinides in brine; (4) fluid flow in Salado formation rocks, and (5) hydrologic transport of actinides in the overlying dolomite aquifers. Other issues which had to be evaluated to allow definition of breach scenarios were brine reservoir occurrences and their associated reservoir parameters, consequences of mining over the repository, and drilling for natural resources in the vicinity of the repository. Results of all these studies will be briefly summarized in this paper.

692

(SAND–97-2909C)

Radioactive material (RAM) transportation accident and incident experience in the U.S.A. (1971–1997). McClure, J.D. (Sandia National Labs., Albuquerque, NM (United States). Transportation Systems Analysis Dept.); Yoshimura, H.R.; Fagan, H.F.; Thomas, T. Sandia National Labs., Albuquerque, NM (United States). Nov 1997. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98001309. Source: OSTI; NTIS; INIS; GPO Dep.

The Radioactive Materials Incident Report (RMIR) database was developed in 1981 at the Transportation Technology Center of Sandia National Laboratories to support its research and development activities for the US Department of Energy (DOE). This database contains information about radioactive materials transportation incidents that have occurred in the US since 1971. These data were drawn from the US Department of Transportation's (DOT) Hazardous Materials Incident Report system, from Nuclear Regulatory Commission (NRC) files, and from various agencies including state radiological control offices. Support for the RMIR data base is funded by the National Transportation Program (EM-70) of the US Department of Energy. Transportation events in RMIR are classified in one of the following ways: as a transportation accident, as a handling accident, or as a reported incident. This presentation will provide definitions for these classifications and give examples of each. The primary objective of this presentation is to provide information on nuclear materials transportation accident incident events in the US for the period 1971–1997. Among the areas to be examined are: transportation accidents by mode, package response during accidents and an examination of accidents where release of contents has occurred.

693
(SAND–97-2999C)
PASS: a component of Desk Top PA for the WIPP. Crawford, M.B. (Galson Sciences Ltd., Oakham (United Kingdom)); Wilmot, R.D.; Galson, D.A.; Swift, P.N.; Fewell, M.E. Sandia National Labs., Albuquerque, NM (United States). Jan 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970426–: International high-level radioactive waste management conference, Las Vegas, NV (United States), 29 Apr - 2 May 1997). Order Number DE98003085. Source: OSTI; NTIS; INIS; GPO Dep.

There is a growing recognition internationally of the need to demonstrate comprehensiveness in order to build confidence in performance assessments (PAs) for radioactive waste disposal projects. This has resulted in a number of methodologies being developed to formalize the process of defining and documenting the decision basis that underlies a PA. Such methodologies include process influence diagrams and the rock engineering system (RES) matrix. However, these methodologies focus mainly on the conceptualization of the disposal system and do not provide a ready framework to document the decisions behind the model development and parameterization of the PA system. The Performance Assessment Support System (PASS) is a flexible electronic tool designed to increase the transparency and traceability of decision making in the entire PA process. An application of PASS has been developed for the Waste Isolation Pilot Plant (WIPP) where it forms an important component of Desk Top PA, a PC-based PA computational environment under development at Sandia National Laboratories to document, plan, and support management decisions and to assess performance for the WIPP recertification process. This desk-top PA environment is also aimed at providing scientifically-based decision support for assessing the performance of nuclear and hazardous waste management and environmental clean-up systems.

694
(SAND–97-3097C)
A Modular Approach to Redundant Robot Control. Anderson, R.J. Sandia National Labs., Albuquerque, NM (United States). Dec 1997. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-970469–: 1997 international conference on robotics and automation, Albuquerque, NM (United States), 20-25 Apr 1997). Order Number DE98001676. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes a modular approach for computing redundant robot kinematics. First some conventional redundant control methods are presented and shown to be 'passive control laws', i.e. they can be represented by a network consisting of passive elements. These networks are then put into modular form by applying scattering operator techniques. Additional subnetwork modules can then be added to further shape the motion. Modules for obstacle detection, joint limit avoidance, proximity sensing, and for imposing nonlinear velocity constraints are presented. The resulting redundant robot control system is modular, flexible and robust.

695
(SAND–98-0001C)
Hydraulic Characterization Activities in Support of the Shaft-Seals Fluid-Flow Modeling Integration into the WIPP EPA Compliance Certification Application. Knowles, M.K. (Sandia National Labs., Albuquerque, NM (United States)); Hurtado, L.D.; Dale, Tim. Sandia National Labs., Albuquerque, NM (United States). [Dec 1997]. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-971224–: Field Testing and Associated Modeling (FTAM) of potential high-level nuclear waste geologic disposal sites, Berkeley, CA (United States), 15-16 Dec 1997). Order Number DE98003014. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is a planned geologic repository for permanent disposal of transuranic waste generated by the U.S. Department of Energy. Disposal regions consist of panels and drifts mined from the bedded salt of the Salado Formation at a depth of approximately 650 m below the surface. This lithology is part of the 225 million year old Delaware Basin, and is geographically located in southeastern New Mexico. Four shafts service the facility needs for air intake, exhaust, waste handling, and salt handling. As the science advisor for the project, Sandia National Laboratories developed the WIPP shaft sealing system design. This design is a fundamental component of the application process for facility licensing, and has been found acceptable by stakeholders and regulatory agencies. The seal system design is founded on results obtained from laboratory and field experiments, numerical modeling, and engineering judgment. This paper describes a field test program to characterize the fluid flow properties in the WIPP shafts at representative seal locations. This work was conducted by Duke Engineering and Services under contract to Sandia National Laboratories in support of the seal system design.

696
(SAND–98-0030)
Planning and scheduling for agile manufacturers: The Pantex Process Model. Kjeldgaard, E.A. (Sandia National

Labs., Albuquerque, NM (United States). Transportation Systems Analysis Dept.); Jones, D.A.; List, G.F.; Tumquist, M.A. Sandia National Labs., Albuquerque, NM (United States). Feb 1998. 44p. Sponsored by USDOE Office of Financial Management and Controller, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE98003409. Source: OSTI; NTIS; GPO Dep.

Effective use of resources that are shared among multiple products or processes is critical for agile manufacturing. This paper describes the development and implementation of a computerized model to support production planning in a complex manufacturing system at the Pantex Plant, a US Department of Energy facility. The model integrates two different production processes (nuclear weapon disposal and stockpile evaluation) that use common facilities and personnel at the plant. The two production processes are characteristic of flow-shop and job shop operations. The model reflects the interactions of scheduling constraints, material flow constraints, and the availability of required technicians and facilities. Operational results show significant productivity increases from use of the model.

697
(SAND–98-0049)
Analysis of hydraulic tests of the Culebra and Magenta Dolomites and Dewey Lake Redbeds conducted at the Waste Isolation Pilot Plant Site. Beauheim, R.L. (Sandia National Labs., Albuquerque, NM (United States). Geohydrology Dept.); Ruskauff, G.J. Sandia National Labs., Albuquerque, NM (United States). Sep 1998. 243p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE99000491. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents interpretations of hydraulic tests conducted at 15 well locations in the vicinity of the Waste Isolation Pilot Plant (WIPP) in southeastern New Mexico between 1980 and 1996. The WIPP is a US Department of Energy (DOE) facility to demonstrate safe disposal of transuranic wastes arising form the nation's defense programs. The WIPP repository lies within bedded halite of the Salado Formation, 2,155 ft below ground surface. The tests reported herein were, with two exceptions, conducted in the Culebra Dolomite member of the Rustler Formation, which overlies the Salado Formation. The remaining tests were conducted in the Magenta Member of the Rustler and in the overlying formation, the Dewey Lake Redbeds. This report completes the documentation of hydraulic-test interpretations used as input to the WIPP Compliance Certification Application (US DOE, 1996).

698
(SAND–98-0059C)
Modeling fires in adjacent ship compartments with computational fluid dynamics. Wix, S.D.; Cole, J.K.; Koski, J.A. Sandia National Labs., Albuquerque, NM (United States). 10 May 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980507–: PATRAM '98: 12. international conference on packaging and transportation of radioactive material, Paris (France), 10-15 May 1998). Order Number DE98004285. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents an analysis of the thermal effects on radioactive (RAM) transportation packages with a fire in an adjacent compartment. An assumption for this analysis is that the adjacent hold fire is some sort of engine room fire. Computational fluid dynamics (CFD) analysis tools were used to perform the analysis in order to include convective heat transfer effects. The analysis results were compared to experimental data gathered in a series of tests on tile US Coast Guard ship Mayo Lykes located at Mobile, Alabama.

699
(SAND–98-0072)
Milestones for disposal of radioactive waste at the Waste Isolation Pilot Plant (WIPP) in the United States. Rechard, R.P. Sandia National Labs., Albuquerque, NM (United States). Apr 1998. 41p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE98004732. Source: OSTI; NTIS; INIS; GPO Dep.

Since its identification as a potential deep geologic repository in about 1973, the regulatory assessment process for the Waste Isolation Pilot Plant (WIPP) in New Mexico has developed over the past 25 years. National policy issues, negotiated agreements, and court settlements over the first half of the project had a strong influence on the amount and type of scientific data collected. Assessments and studies before the mid 1980s were undertaken primarily (1) to satisfy needs for environmental impact statements, (2) to develop general understanding of selected natural phenomena associated with nuclear waste disposal, or (3) to satisfy negotiated agreements with the State of New Mexico. In the last third of the project, federal compliance policy and actual regulations were sketched out, but continued to evolve until 1996. During this eight-year period, four preliminary performance assessments, one compliance performance assessment, and one verification performance assessment were performed.

700
(SAND–98-0163)
An effective waste management process for segregation and disposal of legacy mixed waste at Sandia National Laboratories/New Mexico. Hallman, A.K. (Sandia National Labs., Albuquerque, NM (United States)); Meyer, D.; Rellergert, C.A.; Schriner, J.A. Sandia National Labs., Albuquerque, NM (United States). Apr 1998. 25p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE98004702. Source: OSTI; NTIS; INIS; GPO Dep.

Sandia National Laboratories/New Mexico (SNL/NM) is a research and development facility that generates many highly diverse, low-volume mixed waste streams. Under the Federal Facility Compliance Act, SNL/NM must treat its mixed waste in storage to meet the Land Disposal Restrictions treatment standards. Since 1989, approximately 70 cubic meters (2,500 cubic feet) of heterogeneous, poorly characterized and inventoried mixed waste was placed in storage that could not be treated as specified in the SNL/NM Site Treatment Plan. A process was created to sort the legacy waste into sixteen well-defined, properly characterized, and accurately inventoried mixed waste streams (Treatability Groups) and two low-level waste streams ready

for treatment or disposal. From June 1995 through September 1996, the entire volume of this stored mixed waste was sorted and inventoried. This process was planned to meet the technical requirements of the sorting operation and to identify and address the hazards this operation presented. The operations were routinely adapted to safely and efficiently handle a variety of waste matrices, hazards, and radiological conditions. This flexibility was accomplished through administrative and physical controls integrated into the sorting operations. Many Department of Energy facilities are currently facing the prospect of sorting, characterizing, and treating a large inventory of mixed waste. The process described in this report is a proven method for preparing a diverse, heterogeneous mixed waste volume into segregated, characterized, inventoried, and documented waste streams ready for treatment or disposal.

701
(SAND–98-0163C)
An Effective Waste Management Process for Segregation and Disposal of Legacy Mixed Waste at Sandia National Laboratories/New Mexico. Hallman, Anne K. (Sandia National Labs., Albuquerque, NM (United States)); Meyer, Dann; Rellergert, Carla A.; Schriner, Joseph A. Sandia National Labs., Albuquerque, NM (United States). [Jan 1998]. 19p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980307–: Waste management '98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98002722. Source: OSTI; NTIS; INIS; GPO Dep.

Sandia National Laboratories/New Mexico (SNL/NM) is a research and development facility that generates many highly diverse, low-volume mixed waste streams. Under the Federal Facility Compliance Act, SNL/NM must treat its mixed waste in storage to meet the Land Disposal Restrictions treatment standards. Since 1989, approximately 70 cubic meters (2500 cubic feet) of heterogeneous, poorly characterized and inventoried mixed waste was placed in storage that could not be treated as specified in the SNL/NM Site Treatment Plan. A process was created to sort the legacy waste into sixteen well- defined, properly characterized, and precisely inventoried mixed waste streams (Treatability Groups) and two low-level waste streams ready for treatment or disposal. From June 1995 through September 1996, the entire volume of this stored mixed waste was sorted and inventoried through this process. This process was planned to meet the technical requirements of the sorting operation and to identify and address the hazards this operation presented. The operations were routinely adapted to safely and efficiently handle a variety of waste matrices, hazards, and radiological conditions. This flexibility was accomplished through administrative and physical controls integrated into the sorting operations. Many Department of Energy facilities are currently facing the prospect of sorting, characterizing, and treating a large inventory of mixed waste. The process described in this paper is a proven method for preparing a diverse, heterogeneous mixed waste volume into segregated, characterized, inventoried, and documented waste streams ready for treatment or disposal.

702
(SAND–98-0178C)
Physical and mechanical properties of degraded waste surrogate material. Hansen, F.D. (Sandia National Labs., Carlsbad, NM (United States)); Mellegard, K.D. Sandia National Labs., Albuquerque, NM (United States). Mar 1998. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980620–: 3. North American Rock Mechanics Society conference, Cancun (Mexico), 3-5 Jun 1998). Order Number DE98004221. Source: OSTI; NTIS; INIS; GPO Dep.

This paper discusses rock mechanics testing of surrogate materials to provide failure criteria for compacted, degraded nuclear waste. This daunting proposition was approached by first assembling all known parameters such as the initial waste inventory and rock mechanics response of the underground setting after the waste is stored. Conservative assumptions allowing for extensive degradation processes helped quantify the lowest possible strength conditions of the future state of the waste. In the larger conceptual setting, computations involve degraded waste behavior in transient pressure gradients as gas exits the waste horizon into a wellbore. Therefore, a defensible evaluation of tensile strength is paramount for successful analyses and intentionally provided maximal failed volumes. The very conservative approach assumes rampant degradation to define waste surrogate composition. Specimens prepared from derivative degradation product were consolidated into simple geometries for rock mechanics testing. Tensile strength thus derived helped convince a skeptical peer review panel that drilling into the Waste Isolation Pilot Plant (WIPP) would not likely expel appreciable solids via the drill string.

703
(SAND–98-0179C)
Constitutive behavior of reconsolidating crushed salt. Callahan, G.D. (RE/SPEC, Inc., Rapid City, SD (United States)); Mellegard, K.D.; Hansen, F.D. Sandia National Labs., Albuquerque, NM (United States). Feb 1998. 15p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980620–: 3. North American Rock Mechanics Society conference, Cancun (Mexico), 3-5 Jun 1998). Order Number DE98004224. Source: OSTI; NTIS; INIS; GPO Dep.

The constitutive model used to describe deformation of crushed salt is presented in this paper. Two mechanisms–dislocation creep and grain boundary diffusional pressure solutioning–are combined to form the basis for the constitutive model governing deformation of crushed salt. The constitutive model is generalized to represent three-dimensional states of stress. Recently completed creep consolidation tests are combined with an existing database that includes hydrostatic consolidation and shear consolidation tests conducted on Waste Isolation Pilot Plant (WIPP) and southeastern New Mexico salt to determine material parameters for the constitutive model. Nonlinear least-squares model fitting to data from shear consolidation tests and a combination of shear and hydrostatic tests produces two sets of material parameter values for the model. Changes in material parameter values from test group to test group indicate the empirical nature of the model but show significant improvement over earlier work. To demonstrate the predictive capability of the model, each parameter value set was used to predict each of the tests in the database. Based on fitting statistics and ability of the model to predict test data, the model appears to capture the creep consolidation behavior of crushed salt quite well.

704
(SAND–98-0180/1)
Guidebook for performance assessment parameters used in the Waste Isolation Pilot Plant compliance certification application. Volume 1: Main report. Howarth, S.M. (Sandia National Labs., Albuquerque, NM (United States)); Martell, M.A.; Weiner, R.; Lattier, C. Sandia National Labs., Albuquerque, NM (United States). Jun 1998. 76p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE98005942. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) Compliance Certification Application (CCA) Performance Assessment (PA) Parameter Database and its ties to supporting information evolved over the course of two years. When the CCA was submitted to the Environmental Protection Agency (EPA) in October 1996, information such as identification of parameter value or distribution source was documented using processes established by Sandia National Laboratories WIPP Quality Assurance Procedures. Reviewers later requested additional supporting documentation, links to supporting information, and/or clarification for many parameters. This guidebook is designed to document a pathway through the complex parameter process and help delineate flow paths to supporting information for all WIPP CCA parameters. In addition, this report is an aid for understanding how model parameters used in the WIPP CCA were developed and qualified. To trace the source information for a particular parameter, a dual-route system was established. The first route uses information from the Parameter Records Package as it existed when the CCA calculations were run. The second route leads from the EPA Parameter Database to additional supporting information.

705
(SAND–98-0180/2)
Guidebook for performance assessment parameters used in the Waste Isolation Pilot Plant compliance certification application. Volume 2: Appendices. Howarth, S.M. (Sandia National Labs., Albuquerque, NM (United States)); Martell, M.A.; Weiner, R.; Lattier, C. Sandia National Labs., Albuquerque, NM (United States). Jun 1998. [600p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE98005943. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) Compliance Certification Application (CCA) Performance Assessment (PA) Parameter Database and its ties to supporting information evolved over the course of two years. When the CCA was submitted to the Environmental Protection Agency (EPA) in October 1996, information such as identification of parameter value or distribution source was documented using processes established by Sandia National Laboratories WIPP Quality Assurance Procedures. Reviewers later requested additional supporting documentation, links to supporting information, and/or clarification for many parameters. This guidebook is designed to document a pathway through the complex parameter process and help delineate flow paths to supporting information for all WIPP CCA parameters. In addition, this report is an aid for understanding how model parameters used in the WIPP CCA were developed and qualified. To trace the source information for a particular parameter, a dual-route system was established. The first route uses information from the Parameter Records package as it existed when the CCA calculations were run. The second route leads from the EPA Parameter Database to additional supporting information.

706
(SAND–98-0386C)
Representation of spatial variability for modelling of flow and transport processes in the Culebra Dolomite at the WIPP site. Meigs, L.C.; Beauheim, R.L. Sandia National Labs., Albuquerque, NM (United States). 1997. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9706229–: GEOTRAP workshop, Paris (France), 9-11 Jun 1997). Order Number DE98003377. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is a proposed repository for transuranic wastes constructed in bedded Permian-acre halite deposits in southeastern New Mexico, USA. Site-characterization studies at the WIPP site identified groundwater flow in the Culebra Dolomite Member of the Rustler Formation as the most likely Geologic pathway for radio nuclide transport to the accessible environment in the event of a breach of the WIPP repository through inadvertent human intrusion. The Culebra is a 7-m-thick, variably fractured dolomite with massive and layers. Detailed studies at all scales demonstrated that the Culebra is a heterogeneous medium. Heterogeneity in Culebra properties was incorporated into numerical simulations used for data interpretation and PA calculations in different ways, depending on the amount of data available, the certainty with which the effects of a given approach could be evaluated, and the purpose of the study. When abundant, spatially distributed data were available, the heterogeneity was explicitly included. For example, a stochastic approach was used to generate numerous, equally likely, heterogeneous transmissivity fields conditioned on head and transmissivity data. In other cases, constant parameter values were applied over the model domain. These constant values were selected and applied in two different ways. In simple cases where a conservative bounding value could be identified that would not lead to unrealistically conservative results, that value was used for all calculations. In more complex cases, parameter distributions were developed and single values of the parameters were sampled from the distributions and applied across the entire model domain for each of the PA Monte Carlo simulations. We are currently working to refine our understanding of the multiple rates of diffusion attributable to small-scale spatial variability.

707
(SAND–98-0411C)
Experimental determination of the relationship between permeability and microfracture-induced damage in bedded salt. Pfeifle, T.W. (RE/SPEC Inc., Rapid City, SD (United States)); Brodsky, N.S.; Munson, D.E. Sandia National Labs., Albuquerque, NM (United States). Mar 1998. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980670–: 12. international conference on computational methods in water resources, Heraklion (Greece), 15-19 Jun 1998). Order Number DE98004242. Source: OSTI; NTIS; INIS; GPO Dep.

The development of deep underground structures (e.g., shafts, mines, storage and disposal caverns) significantly

alters the stress state in the rock near the structure or opening. The effect of such an opening is to concentrate the far-field stress near the free surface. For soft rock such as salt, the concentrating effect of the opening induces deviatoric stresses in the salt that may be large enough to initiate microcracks which then propagate with time. The volume of rock susceptible to damage by microfracturing is often referred to as the disturbed rock zone and, by its nature, is expected to exhibit high permeability relative to that of the native, far-field rock. This paper presents laboratory data that characterize microfracture-induced damage and the effect this damage has on permeability for bedded salt from the Waste Isolation Pilot Plant located in southeastern New Mexico. Damage is induced in the salt through a series of tertiary creep experiments and quantified in terms of dilatant volumetric strain. The permeability of damaged specimens is then measured using nitrogen gas as the permeant. The range in damage investigated included dilatant volumetric strains from less than 0.03 percent to nearly 4.0 percent. Permeability values corresponding to these damage levels ranged from 1×10^{-18} m^2 to 1×10^{-12} m^2. Two simple models were fitted to the data for use in predicting permeability from dilatant volumetric strain.

708
(SAND–98-0417C)
Permeability of natural rock salt from the Waste Isolation Pilot Plant (WIPP) during damage evolution and healing. Pfeifle, T.W. (RE/SPEC Inc., Rapid City, SD (United States)); Hurtado, L.D. Sandia National Labs., Albuquerque, NM (United States). Jun 1998. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980620–: 3. North American Rock Mechanics Society conference, Cancun (Mexico), 3-5 Jun 1998). Order Number DE98002815. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy has developed the Waste Isolation Pilot Plant (WIPP) in the bedded salt of southeastern New Mexico to demonstrate the safe disposal of radioactive transuranic wastes. Four vertical shafts provide access to the underground workings located at a depth of about 660 meters. These shafts connect the underground facility to the surface and potentially provide communication between lithologic units, so they will be sealed to limit both the release of hazardous waste from and fluid flow into the repository. The seal design must consider the potential for fluid flow through a disturbed rock zone (DRZ) that develops in the salt near the shafts. The DRZ, which forms initially during excavation and then evolves with time, is expected to have higher permeability than the native salt. The closure of the shaft openings (i.e., through salt creep) will compress the seals, thereby inducing a compressive back-stress on the DRZ. This back-stress is expected to arrest the evolution of the DRZ, and with time will promote healing of damage. This paper presents laboratory data from tertiary creep and hydrostatic compression tests designed to characterize damage evolution and healing in WIPP salt. Healing is quantified in terms of permanent reduction in permeability, and the data are used to estimate healing times based on considerations of first-order kinetics.

709
(SAND–98-0450)
Evaluation of the capabilities of the Hanford Reservation and Envirocare of Utah for disposal of potentially problematic mixed low-level waste streams. Waters, R.D.; Pohl, P.I.; Cheng, W.C.; Gruebel, M.M.; Wheeler, T.A.; Langkopf, B.S. Sandia National Labs., Albuquerque, NM (United States). Mar 1998. 60p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE98004402. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy's (DOE) Mixed Waste Focus Area is developing a program to address and resolve issues associated with final waste form performance in treating and disposing of DOE's mixed low-level waste (MLLW) inventory. A key issue for the program is identifying MLLW streams that may be problematic for disposal. Previous reports have quantified and qualified the capabilities of fifteen DOE sites for MLLW disposal and provided volume and radionuclide concentration estimates for treated MLLW based on the DOE inventory. Scoping-level analyses indicated that 101 waste streams identified in this report (approximately 6,250 m^3 of the estimated total treated MLLW) had radionuclide concentrations that may make their disposal problematic. The radionuclide concentrations of these waste streams were compared with the waste acceptance criteria (WAC) for a DOE disposal facility at Hanford and for Envirocare's commercial disposal facility for MLLW in Utah. Of the treated MLLW volume identified as potentially problematic, about 100 m^3 exceeds the WAC for disposal at Hanford, and about 4,500 m^3 exceeds the WAC for disposal at Envirocare. Approximately 7% of DOE's total MLLW inventory has not been sufficiently characterized to identify a treatment process for the waste and was not included in the analysis. In addition, of the total treated MLLW volume, about 30% was associated with waste streams that did not have radionuclide concentration data and could not be included in the determination of potentially problematic waste streams.

710
(SAND–98-0457C)
Integration of US Department of Energy contractor installations for the purpose of optimizing treatment, storage, and disposal of low-level radioactive waste (LLW). Lucas, M.; Gnoose, J.; Coony, M.; Martin, E.; Piscitella, R. Sandia National Labs., Albuquerque, NM (United States). Feb 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980307–: Waste management '98, Tucson, AZ (United States), 1-5 Mar 1998). Order Number DE98004133. Source: OSTI; INIS; NTIS; GPO Dep.

The US Department of Energy (DOE) manages a multibillion dollar environmental management (EM) program. In June 1996, the Assistant Secretary of Energy for EM issued a memorandum with guidance and a vision for a ten year planning process for the EM Program. The purpose of this process, which became known as the Accelerated Cleanup: Focus on 2006, is to make step changes within the DOE complex regarding the approach for making meaningful environmental cleanup progress. To augment the process, Assistant Secretary requested the site contractors to engage in an effort to identify and evaluate integration alternatives for EM waste stream treatment, storage, and disposal (TSD) that would parallel the 2006 Plan. In October 1996, ten DOE contractor installations began the task of identifying alternative opportunities for low level radioactive waste (LLW). Cost

effective, efficient solutions were necessary to meet all requirements associated with storing, characterizing, treating, packaging, transporting, and disposing of LLW while protecting the workers' health and safety, and minimizing impacts to the environment. To develop these solutions, a systems engineering approach was used to establish the baseline requirements, to develop alternatives, and to evaluate the alternatives. Key assumptions were that unique disposal capabilities exist within the DOE that must be maintained; private sector disposal capability for some LLW may not continue to exist into the foreseeable future; and decisions made by the LLW Team must be made on a system or complex wide basis to fully realize the potential cost and schedule benefits. This integration effort promoted more accurate waste volume estimates and forecasts; enhanced recognition of existing treatment, storage, and disposal capabilities and capacities; and improved identification of cost savings across the complex.

711
(SAND–98-0466C)
Micromechanics and homogenization techniques for analyzing the continuum damage of rock salt. DeVries, K.L. (RE/SPEC Inc., Rapid City, SD (United States)); Allen, D.H.; Hurtado, L.D. Sandia National Labs., Albuquerque, NM (United States). Mar 1998. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980620–: 3. North American Rock Mechanics Society conference, Cancun (Mexico), 3-5 Jun 1998). Order Number DE98004243. Source: OSTI; NTIS; GPO Dep.

This paper presents a model for evaluating microcrack development and dilatant behavior of crystalline rocks. The model is developed within the concepts of continuum mechanics, with special emphasis on the development of internal boundaries in the continuum by utilizing fracture mechanics based cohesive zone models. The model is capable of describing the evolution from initial debonding through complete separation and subsequent void growth of an interface. An example problem of a rock salt specimen subjected to a high deviatoric load and low confinement is presented that predicts preferential opening of fractures oriented parallel with the maximum compressive stress axis.

712
(SAND–98-0468C)
Assessing seal performance and parameter sensitivity with a full-shaft model. Reeves, M. (Duke Engineering and Services, Austin, TX (United States)); Fryar, D.G.; Statham, W.H.; Knowles, M.K. Sandia National Labs., Albuquerque, NM (United States). May 1998. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980559–: TOUGH '98 workshop, Berkeley, CA (United States), 4-6 May 1998). Order Number DE98005536. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is a planned geologic repository for permanent disposal of transuranic waste generated by US government defense programs. Located near Carlsbad in southeastern New Mexico, the facility's disposal regions are mined from the bedded salt of the Salado Formation at a depth of approximately 652 m. Four shafts service the operational needs of the facility for air intake, exhaust, waste handling and salt handling. These shafts range in diameter from 3.5 to 6.1 m and extend from the ground surface to the repository. During repository closure, following an operational life of approximately 50 years, these shafts will be sealed in accordance with an acceptable design. Under contract to the US Department of Energy (DOE), the Repository Isolation Systems Department (RISD) of Sandia National Laboratories has developed a design for the WIPP shaft sealing system. This design has been reviewed by the US Environmental Protection Agency (EPA) as part of the 1996 WIPP Compliance Certification Application (CCA). An effective shaft sealing system for the WIPP will limit liquid and gas flows, and permanently prevent the migration of radiological or other hazardous constituents through the sealed shafts from repository to accessible environment. Because of these performance objectives, a significant effort has been directed toward evaluation of the seal design. Whereas RISD (1996) provides a comprehensive discussion, this paper focuses on only one aspect of the evaluation effort, namely a full shaft, fluid flow model.

713
(SAND–98-0476C)
Integration and evaluation of a position sensor with continuous read-out for use with the Environmental Measurement-While-Drilling Gamma Ray Spectrometer system. Normann, R.A.; Lockwood, G.J.; Williams, C.V.; Selph, M.M. Sandia National Labs., Albuquerque, NM (United States). Feb 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980418–: North American no-dig '98, Albuquerque, NM (United States), 5-8 Apr 1998). Order Number DE98004136. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Measurement-While-Drilling-Gamma Ray Spectrometer (EMWD-GRS) system represents an innovative blend of new and existing technology that provides real-time environmental and drill bit data during drilling operations. The EMWD-GRS technology was demonstrated at Savannah River Site (SRS) F-Area Retention Basin. The EMWD-GRS technology demonstration consisted of continuously monitoring for gamma-radiation-producing contamination while drilling two horizontal boreholes below the backfilled waste retention basin. These boreholes passed near previously sampled locations where concentrations of contaminant levels of cesium had been measured. Contaminant levels continuously recorded by the EMWD-GRS system during drilling were compared to contaminant levels previously determined through quantitative laboratory analysis of soil samples. The results show general agreement between the soil sampling and EMWD-GRS techniques for Cs-137. The EMWD-GRS system has been improved by the integration of an orientation sensor package for position sensing (PS) (EMWD-GRS/PS). This added feature gives the capability of calculating position, which is tied directly to EMWD-GRS sensor data obtained while drilling. The EMWD-GRS/PS system is described and the results of the field tests are presented.

714
(SAND–98-0529C)
Waste reduction by separation of contaminated soils during environmental restoration. Roybal, J.A. (Sandia National Labs., Albuquerque, NM (United States)); Conway, R.; Galloway, B.; Vinsant, E.; Slavin, P.; Guerin, D. Sandia National Labs., Albuquerque, NM (United States). Jun 1998.

14p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980654–: 14. DOE pollution prevention conference, Seattle, WA (United States), 2-4 Jun 1998). Order Number DE98005532. Source: OSTI; NTIS; INIS; GPO Dep.

During cleanup of contaminated sites, Sandia National Laboratories, New Mexico (SNL/NM) frequently encounters soils with low-level radioactive contamination. The contamination is not uniformly distributed, but occurs within areas of clean soil. Because it is difficult to characterize heterogeneously contaminated soils in detail and to excavate such soils precisely using heavy equipment, it is common for large quantities of uncontaminated soil to be removed during excavation of contaminated sites. This practice results in the commingling and disposal of clean and contaminated material as low-level waste (LLW), or possibly low-level mixed waste (LLMW). Until recently, volume reduction of radioactively contaminated soil depended on manual screening and analysis of samples, which is a costly and impractical approach and does not uphold As Low As Reasonably Achievable (ALARA) principles. To reduce the amount of LLW and LLMW generated during the excavation process, SNL/NM is evaluating two alternative technologies. The first of these, the Segmented Gate System (SGS), is an automated system that located and removes gamma-ray emitting radionuclides from a host matrix (soil, sand, dry sludge). The matrix materials is transported by a conveyor to an analyzer/separation system, which segregates the clean and contaminated material based on radionuclide activity level. The SGS was used to process radioactively contaminated soil from the excavation of the Radioactive Waste Landfill. The second technology, Large Area Gamma Spectroscopy (LAGS), utilizes a gamma spec analyzer suspended over a slab upon which soil is spread out to a uniform depth. A counting period of approximately 30 minutes is used to obtain a full-spectrum analysis for the isotopes of interest. The LAGS is being tested on the soil that is being excavated from the Classified Waste Landfill.

715

(SAND–98-1171/1)

Data and methods for the assessment of the risks associated with the maritime transport of radioactive materials: Results of the SeaRAM program studies. Volume 1 – Main report. Sprung, J.L. (and others); Bespalko, S.J.; Kanipe, F.L. Sandia National Labs., Albuquerque, NM (United States). May 1998. 180p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (TTC–1525/1). Order Number DE98005813. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes ship accident event trees, ship collision and ship fire frequencies, representative ships and shipping practices, a model of ship penetration depths during ship collisions, a ship fire spread model, cask to environment release fractions during ship collisions and fires, and illustrative consequence calculations.

716

(SAND–98-1171/2)

Data and methods for the assessment of the risks associated with the maritime transport of radioactive materials: Results of the SeaRAM program studies. Volume 2 – Appendices. Sprung, J.L. (and others); Bespalko, S.J.; Kanipe, F.L. Sandia National Labs., Albuquerque, NM (United States). May 1998. 319p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (TTC–1525/2). Order Number DE98005814. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes ship accident event trees, ship collision and ship fire frequencies, representative ships and shipping practices, a model of ship penetration depths during ship collisions, a ship fire spread model, cask to environment release fractions during ship collisions and fires, and illustrative consequence calculations. This report contains the following appendices: Appendix 1 – Representative Ships and Shipping Practices; Appendix 2 – Input Data for Minorsky Calculations; Appendix 3 – Port Ship Speed Distribution; and Appendix 4 – Cask-to-Environment Release Fractions.

717

(SAND–98-1192C)

Testing, expanding and implementing pollution prevention tools for environmental restoration and decontamination and decommissioning. Roybal, J.A. (Sandia National Lab., Albuquerque, NM (United States)); McInroy, D.; Watson, J.; Mizner, J. Sandia National Labs., Albuquerque, NM (United States). Jun 1998. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980654–: 14. DOE pollution prevention conference, Seattle, WA (United States), 2-4 Jun 1998). Order Number DE98005530. Source: OSTI; NTIS; INIS; GPO Dep.

Pollution Prevention (P2) programs and projects within the DOE Environmental Restoration (ER) and Decontamination and Decommissioning (D and D) Programs have been independently developed and implemented at various sites. As a result, unique, innovative solutions used at one site may not be known to other sites, and other sites may continue to duplicate efforts to develop and implement similar solutions. Several DOE Program offices have funded the development of tools to assist ER/D and D P2 projects. To realize the full value of these tools, they need to be evaluated and publicized to field sites. To address these needs and concerns, Sandia National Laboratory (SNL/NM), Los Alamos National Laboratory (LANL), and the Oak Ridge Field Office (DOE-OR) have teamed to pilot test DOE training and tracking tools; transfer common P2 analyses between sites, and evaluate and expand P2 tools and methodologies. The project is supported by FY 98 DOE Pollution Prevention Complex-Wide Project Funds. This paper presents the preliminary results for each of the following project modules: Training, Waste Tracking Pilot, Information Exchange, Evaluate P2 Tools for ER/D and D, Field Test of P2 Tools; and DOE Information Exchange.

718

(SAND–98-1193C)

Sandia bicycle commuters group – pollution prevention at Sandia National Laboratories, New Mexico. Wrons, R. Sandia National Labs., Albuquerque, NM (United States). Jun 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980654–: 14. DOE pollution prevention conference, Seattle, WA (United States), 2-4 Jun 1998). Order Number DE98005531. Source: OSTI; NTIS; GPO Dep.

The Sandia Bicycle Commuters Group (SBCG) formed three years ago for the purpose of addressing issues that impact the bicycle commuting option. The meeting that launched the SBCG was scheduled in conjunction with National Bike-to-Work day in May 1995. Results from a survey handed out at the meeting solidly confirmed the issues and that an advocacy group was needed. The purpose statement for the Group headlines its web site and brochure: "Existing to assist and educate the SNL workforce bicyclist on issues regarding Kirtland Air Force Base (KAFB) access, safety and bicycle-supporting facilities, in order to promote bicycling as an effective and enjoyable means of commuting." The SNL Pollution Prevention (P2) Team's challenge to the SNL workforce is to "prevent pollution, conserve natural resources, and save money". In the first winter of its existence, the SBCG sponsored a winter commute contest in conjunction with the City's Clean Air Campaign (CAC). The intent of the CAC is to promote alternative (to the single-occupant vehicle) commuting during the Winter Pollution Advisory Period (October 1–February 28), when the City runs the greatest risk of exceeding federal pollution limits.

719
(SAND–98-1200C)
Importance of energy efficiency in the design of the Process and Environmental Technology Laboratory (PETL) at Sandia National Laboratories, New Mexico (NM). Wrons, R. Sandia National Labs., Albuquerque, NM (United States). Jun 1998. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-980654–: 14. DOE pollution prevention conference, Seattle, WA (United States), 2-4 Jun 1998). Order Number DE98005533. Source: OSTI; NTIS; GPO Dep.

As part of the design of the Process and Environmental Technology Laboratory (PETL) in FY97, an energy conservation report (ECR) was completed. The original energy baseline for the building, established in Title 1 design, was 595,000 BTU/sq. ft./yr, site energy use. Following the input of several reviewers and the incorporation of the various recommendations into the Title 2 design, the projected energy consumption was reduced to 341,000 BTU/sq. ft./yr. Of this reduction, it is estimated that about 150,000 BTU/sq. ft./yr resulted from inclusion of more energy efficient options into the design. The remaining reductions resulted from better accounting of energy consumption between Title 1 ECR and the final ECR. The energy efficient features selected by the outcome of the ECR were: (1) Energy Recovery system, with evaporative cooling assist, for the Exhaust/Make-up Air System; (2) Chilled Water Thermal Storage system; (3) Premium efficiency motors for large, year-round applications; (4) Variable frequency drives for all air handling fan motors; (4) Premium efficiency multiple boiler system; and (5) Lighting control system. The annual energy cost savings due to these measures will be about $165,000. The estimated annual energy savings are two million kWhrs electric, and 168,000 therms natural gas, the total of which is equivalent to 23,000 million BTUs per year. Put into the perspective of a typical office/light lab at SNL/NM, the annual energy savings is equal the consumption of a 125,000 square foot building. The reduced air emissions are approximately 2,500 tons annually.

720
(SAND–98-1358C)
Field analytical technology verification: The ETV Site Characterization Program. Einfeld, W. (Sandia National Labs., Albuquerque, NM (United States)); Jenkins, R.A.; Dindal, A.B. Sandia National Labs., Albuquerque, NM (United States). Jun 1998. 15p. Sponsored by Environmental Protection Agency, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-980632–: 91. annual meeting and exhibition of the Air and Waste Management Association, San Diego, CA (United States), 14-19 Jun 1998). Order Number DE98005924. Source: OSTI; NTIS; GPO Dep.

Innovative field characterization and monitoring technologies are often slow to be adopted by the environmental engineering/consulting community because of concerns that their performance has not been proven by an independent testing body, and/or they have not received the EPA's blessing on a regional or national level. The purpose of the EPA Environmental Technology Verification (ETV) Site Characterization Pilot, a joint effort between EPA and DOE, is to accelerate the acceptance of technologies that reduce the cost and increase the speed of environmental clean-up and monitoring. Technology verifications that have been completed or are underway include: in situ technologies for the characterization of sub-surface hydrocarbon plumes, field-portable GC/MS systems, field-portable X-ray fluorescence analyzers, soil sampling technologies, field-portable PCB analyzers, analyzers for VOC analysis at the wellhead, and decision support software systems to aid site sample collection and contaminant plume definition. The verification process follows a somewhat generic pathway. A user-community need is identified, the vendor community is canvassed, and relevant, interested companies are selected. A demonstration plan is prepared by the verification organization and circulated to participants prior to the field activities. Field trials are normally held at two geologically or environmentally different sites and typically require one week at each site. Samples (soil, soil gas, water, surface wipe etc.) provided to the vendor at the demonstration include site-specific samples and standards or performance evaluation samples. Sample splits are sent to a pre-selected laboratory for analysis using a reference method. Laboratory data are used for comparison with field technology results during the data analysis phase of the demonstration.

721
(SAND–98-1719)
Development of the SEAtrace™ barrier verification and validation technology. Final report. Dunn, S.D. (Science and Engineering Associates, Santa Fe, NM (United States)); Lowry, W.; Walsh, R.; Rao, D.V.; Williams, C. Sandia National Labs., Albuquerque, NM (United States). Aug 1998. 129p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE99000462. Source: OSTI; NTIS; INIS; GPO Dep.

In-situ barrier emplacement techniques and materials for the containment of high-risk contaminants in soils are currently being developed by the Department of Energy (DOE). Because of their relatively high cost, the barriers are intended to be used in cases where the risk is too great to remove the contaminants, the contaminants are too difficult

to remove with current technologies, or the potential movement of the contaminants to the water table is so high that immediate action needs to be taken to reduce health risks. Assessing the integrity of the barrier once it is emplaced, and during its anticipated life, is a very difficult but necessary requirement. Science and Engineering Associates, Inc., (SEA) and Sandia National Laboratories (SNL) have developed a quantitative subsurface barrier assessment system using gaseous tracers in support of the Subsurface Contaminants Focus Area barrier technology program. Called SEAtrace™, this system integrates an autonomous, multi-point soil vapor sampling and analysis system with a global optimization modeling methodology to locate and size barrier breaches in real time. The methodology for the global optimization code was completed and a prototype code written using simplifying assumptions. Preliminary modeling work to validate the code assumptions were performed using the T2VOC numerical code. A multi-point field sampling system was built to take soil gas samples and analyze for tracer gas concentration. The tracer concentration histories were used in the global optimization code to locate and size barrier breaches. SEAtrace™ was consistently able to detect and locate leaks, even under very adverse conditions. The system was able to locate the leak to within 0.75 m of the actual value, and was able to determine the size of the leak to within 0.15 m.

722

(SAND–98-1720)

Project report: Tritiated oil repackaging highlighting the ISMS process. Historical radioactive and mixed waste disposal request validation and waste disposal project. Schriner, J.A. (Automated Solutions of Albuquerque, Inc., NM (United States)). Sandia National Labs., Albuquerque, NM (United States);Automated Solutions of Albuquerque, Inc., NM (United States). Aug 1998. 16p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE98006274. Source: OSTI; NTIS; INIS; GPO Dep.

The Integrated Safety Management System (ISMS) was established to define a framework for the essential functions of managing work safely. There are five Safety Management Functions in the model of the ISMS process: (1) work planning, (2) hazards analysis, (3) hazards control, (4) work performance, and (5) feedback and improve. Recent activities at the Radioactive and Mixed Waste Management Facility underscored the importance and effectiveness of integrating the ISMS process to safely manage high-hazard work with a minimum of personnel in a timely and efficient manner. This report describes how project personnel followed the framework of the ISMS process to successfully repackage tritium-contaminated oils. The main objective was to open the boxes without allowing the gaseous tritium oxide, which had built up inside the boxes, to release into the sorting room. The boxes would be vented out the building stack until tritium concentration levels were acceptable. The carboys would be repackaged into 30-gallon drums and caulked shut. Sealing the drums would decrease the tritium off-gassing into the RMWMF.

723

(UCRL-ID–129837)

Destruction of 2,2',3 - trichlorobiphenyl in aqueous solution by hydrous pyrolysis/oxidation (HPO). Leif, R.N.; Knauss, K.G.; Mew, D.A.; Aines, R.D. Lawrence Livermore National Lab., CA (United States). 25 Nov 1997. 21p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE98058335. Source: OSTI; NTIS; INIS; GPO Dep.

Aqueous, low-temperature oxidation rates for the polychlorinated biphenyl (PCB) congener 2,2',3-trichlorobiphenyl have been measured in aqueous phosphate-buffered solutions using Dickson-type reaction vessels. Concentrations of the target compounds were determined by gas chromatography and compound identification was verified by gas chromatography - mass spectrometry. The reaction temperatures ranged from 131 °C to 165°C and the activation energy for the destruction of 2,2',3-trichlorobiphenyl was estimated to be 134 kJ/mole. In a low concentration experiment (approximately 500 ng/g starting concentration), 2,2',3-trichlorobiphenyl concentration reached non-detect in two days at 135°C. In a much higher concentration experiment (approximately 24,000 mg/g initial loading), nearly 40% of the initial 2,2',3-trichlorobiphenyl concentration, or about 10,000 ng/g was destroyed at 161°C in 18 days. The 2,2', 3-trichlorobiphenyl concentration of 24,000 ng/g measured at 131°C represents a greater than 100 fold increase in the aqueous solubility compared to the value of 200 ng/g at 20°C reported by Mackay et al. During the experiments the reacted portion of the 2,2', 3-trichlorobiphenyl was completely mineralized, as indicated by a stoichiometric production of inorganic carbon and chloride ion, and no intermediates amenable to gas chromatography were observed during the HPO experiments. These preliminary experiments indicate that hydrous pyrolysis/oxidation (HPO) may be a useful alternative method for remediating soil and groundwater contaminated with PCBs.

724

(UCRL-JC–130449)

Alternate airborne release fraction determination for hazardous waste management storage repository hazard categorization at the Lawrence Livermore National Laboratory. Brumburgh, G.P. Lawrence Livermore National Lab., CA (United States). 1 May 1998. 13p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-980616–: Conference on integrating safety analysis into safety management, Park City, UT (United States), 15-19 Jun 1998). Order Number DE98054783. Source: OSTI; NTIS; INIS; GPO Dep.

Hazardous Waste Management (HWM) facilities are used in the handling and processing of solid and liquid radioactive, hazardous, mixed, and medical wastes generated at Lawrence Livermore National Laboratory (LLNL). Waste may be treated or stored in one of the HWM facility units prior to shipment off site for treatment or disposal. Planned facilities such as the Decontamination and Waste Treatment Facility (DWTF) and the Building 280 Container Storage Unit are expected to handle similar waste streams. A hazard classification was preformed in each facility safety analysis report (SAR) according to the DOE Standard 1027-92 'Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports.' The general methodology practiced by HWM to determine alternate airborne release fractions (ARFs) in those SARs was based upon a beyond evaluation basis earthquake accident scenario characterized by the release

of the largest amount of respirable, airborne radioactive material. The alternate ARF was calculated using a three-factor formula consisting of the fraction of failed waste containers, fraction of material released from failed waste containers,and the fraction of material entrained to the environment. Recently, in deliberation with DOE-Oakland representatives, HWM decided to modify this methodology. In place of the current detailed analysis, a more straightforward process was proposed based upon material form, credible accident environments, and empirical data. This paper will discuss the methodology and derivation of ARFs specific to HWM treatment and storage facilities that are alternative to those presented in DOE-STD-1027-92.

725
(UCRL-JC–131027)
Isotope hydrology of catchment basins: lithogenic and cosmogenic isotopic systems. Nimz, G. J., LLNL. Lawrence Livermore National Lab., CA (United States). 1 Jun 1998. 48p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-980736–: Environmental management science program workshop, Chicago, IL (United States), 27-30 Jul 1998). Order Number DE98058641. Source: OSTI; NTIS; GPO Dep.

A variety of physical processes affect solute concentrations within catchment waters. The isotopic compositions of the solutes can indicate which processes have determined the observed concentrations. These processes together constitute the physical history of the water. Many solutes in natural waters are derived from the interaction between the water and the rock and/or soil within the system - these are termed 'lithogenic' solutes. The isotopic compositions of these solutes provide information regarding rock-water interactions. Many other solutes have their isotopic compositions determined both within and outside of the catchment - i.e., in addition to being derived from catchment rock and soil, they are solutes that are also transported into the catchment. Important members of this group include solutes that have isotopic compositions produced by atomic particle interactions with other nuclides. The source of the atomic particles can be cosmic radiation (producing 'cosmogenic' nuclides in the atmosphere and land surface), anthropogenic nuclear reactions (producing 'thermonuclear' nuclides), or radioactive and fission decay of naturally-occurring elements, principally ^{238}U (producing 'in-situ' lithogenic nuclides in the deep subsurface). Current language usage often combines all of the atomic particle-produced nuclides under the heading 'cosmogenic nuclides', and for simplicity we will often follow that usage here, although always indicating which variety is being discussed. This paper addresses the processes that affect the lithogenic and cosmogenic solute concentrations in catchment waters, and how the isotopic compositions of the solutes can be used in integrative ways to identify these processes, thereby revealing the physical history of the water within a catchment system. The concept of a 'system' is important in catchment hydrology. (Abstract truncated)

726
(USGS–97-4025)
Estimated ground-water discharge by evapotranspiration, Ash Meadows Area, Nye County, Nevada, 1994. Nichols, W.D.; Laczniak, R.J.; DeMeo, G.A.; Rapp, T.R. Geological Survey, Carson City, NV (United States). 1997. 20p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AI08-91NV11040. Order Number DE97005308. Source: OSTI; NTIS; U.S. Geological Survey, Branch of Information Services, Box 25286, Denver, CO 80225-0286 (United States); GPO Dep.

Ground water discharges from the regional ground-water flow system that underlies the eastern part of the Nevada Test Site through numerous springs and seeps in the Ash Meadows National Wildlife Refuge in southern Nevada. The total spring discharge was estimated to be about 17,000 acre-feet per year by earlier studies. Previous studies estimated that about 10,500 acre-feet of this discharge was lost to evapotranspiration. The present study was undertaken to develop a more rigorous approach to estimating ground-water discharge in the Ash Meadows area. Part of the study involves detailed field investigation of evapotranspiration. Data collection began in early 1994. The results of the first year of study provide a basis for making preliminary estimates of ground-water discharge by evapotranspiration. An estimated 13,100 acre-feet of ground water was evapotranspired from about 6,800 acres of marsh and salt-grass. Additional 3,500 acre-feet may have been transpired from the open water and from about 1,460 acres of other areas of Ash Meadows in which field studies have not yet been made.

727
(USGS/OFR–97-476)
Geophysical interpretations west of and within the northwestern part of the Nevada Test Site. Grauch, V.J.; Sawyer, D.A.; Fridrich, C.J.; Hudson, M.R. Geological Survey, Denver, CO (United States). 1997. 57p. Sponsored by Geological Survey, Reston, VA (United States);Department of the Interior, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AI08-96NV11967. Order Number DE98003404. Source: OSTI; NTIS; INIS; GPO Dep.

This report focuses on interpretation of gravity and new magnetic data west of the Nevada Test Site (NTS) and within the northwestern part of NTS. The interpretations integrate the gravity and magnetic data with other geophysical, geological, and rock property data to put constraints on tectonic and magmatic features not exposed at the surface. West of NTS, where drill hole information is absent, these geophysical data provide the best available information on the subsurface. Interpreted subsurface features include calderas, intrusions, basalt flows and volcanoes, Tertiary basins, structurally high pre-Tertiary rocks, and fault zones. New features revealed by this study include (1) a north-south buried tectonic fault east of Oasis Mountain, which the authors call the Hogback fault; (2) an east striking fault or accommodation zone along the south side of Oasis Valley basin, which they call the Hot Springs fault; (3) a NNE striking structural zone coinciding with the western margins of the caldera complexes; (4) regional magnetic highs that probably represent a thick sequence of Tertiary volcanic rocks; and (5) two probable buried calderas that may be related to the tuffs of Tolicha Peak and of Sleeping Butte, respectively.

728
(WSRC-MS–96-0323)
Remote telerobotic replacement for master-slave manipulator. Heckendorn, F.M. (Westinghouse Savannah River Company, Aiken, SC (United States)); Iverson, D.C.; LaValle, D.R. Westinghouse Savannah River Co., Aiken, SC

(United States). 1997. 14p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-970464–15: 7. American Nuclear Society topical meeting on robotics and remote systems, Augusta, GA (United States), 27 Apr - 1 May 1997). Order Number DE97004962. Source: OSTI; NTIS; INIS; GPO Dep.

A remotely replaceable telerobotic manipulator (TRM) has been developed and deployed at the Defense Waste Processing Facility (DWPF) in support of its radioactive operation. The TRM replaces a Master-Slave Manipulator (MSM). The TRM is in use for both routine and recovery operations for the radioactive waste vitrification melter, the primary production device within the DWPF. The arm was designed for deployment and operation using an existing MSM penetration. This replacement of an existing MSM with a high power robotic device demonstrates the capability to perform similar replacement in other operating facilities. The MSM's were originally deployed in the DWPF to perform routine light capacity tasks. During the testing phase of the DWPF, prior to its radioactive startup in 5/96, the need to remove glass deposits that can form at the melter discharge during filling of glass containment canisters was identified. The combination of high radiation and contamination in the DWPF melter cell during radioactive operation eliminated personnel entry as a recovery option. Therefore remote cleaning methods had to be devised. The MSM's had neither the reach nor the strength required for this task. It became apparent that a robust manipulator arm would be required for recovery from these potential melter discharge pluggage events. The existing wall penetrations, used for the MSM's, could not be altered for seismic and radiological reasons. The new manipulator was required to be of considerable reach, due to existing physical layout, and strength, due to the glass removal requirement. Additionally, the device would have to compatible with high radiation and remote crane installation. The physical size of the manipulator and the weight of components must be consistent with the existing facilities. It was recognized early-on that a manipulator of sufficient strength to recover from a pluggage event would require robotic functions to constrain undesirable motions.

729

(WSRC-MS–96-0333)

The application of metal cutting technologies in tasks performed in radioactive environments. Fogle, R.F.; Younkins, R.M. Westinghouse Savannah River Co., Aiken, SC (United States). [1997]. 11p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9704105–1: 7. Americal Nuclear Society (ANS) topical meeting on robotics and remote systems, Agusta, GA (United States), 27 Apr - 1 May 1997). Order Number DE97060070. Source: OSTI; NTIS; INIS; GPO Dep.

The design and use of equipment to perform work in radioactive environments is uniquely challenging. Some tasks require that the equipment be operated by a person wearing a plastic suit or full face respirator and donning several pairs of rubber gloves. Other applications may require that the equipment be remotely controlled. Other important, design considerations include material compatibility, mixed waste issues, tolerance to ionizing radiation, size constraints and weight capacities. As always, there is the "We need it ASAP" design criteria. This paper describes four applications where different types of metal cutting technologies were used to successfully perform tasks in radioactive environments. The technologies include a plasma cutting torch, a grinder with an abrasive disk, a hydraulic shear, and a high pressure abrasive water jet cutter.

730

(WSRC-MS–96-0524)

Cross flow filtration of aqueous radioactive tank wastes. McCabe, D.J. (Westinghouse Savannah River Co., Aiken, SC (United States)); Reynolds, B.A.; Todd, T.A.; Wilson, J.H. Oak Ridge National Lab., TN (United States). [1997]. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-96OR22464. (CONF-970321–1: National spring meeting and petrochemical exposition of the American Institute of Chemical Engineers (AIChE) and 2. plant operations and design conference, Houston, TX (United States), 10-13 Mar 1997). Order Number DE97003104. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Focus Area (TFA) of the Department of Energy (DOE) Office of Science and Technology addresses remediation of radioactive waste currently stored in underground tanks. Baseline technologies for treatment of tank waste can be categorized into three types of solid liquid separation: (a) removal of radioactive species that have been absorbed or precipitated, (b) pretreatment, and (c) volume reduction of sludge and wash water. Solids formed from precipitation or absorption of radioactive ions require separation from the liquid phase to permit treatment of the liquid as Low Level Waste. This basic process is used for decontamination of tank waste at the Savannah River Site (SRS). Ion exchange of radioactive ions has been proposed for other tank wastes, requiring removal of insoluble solids to prevent bed fouling and downstream contamination. Additionally, volume reduction of washed sludge solids would reduce the tank space required for interim storage of High Level Wastes. The scope of this multi-site task is to evaluate the solid/liquid separations needed to permit treatment of tank wastes to accomplish these goals. Testing has emphasized cross now filtration with metal filters to pretreat tank wastes, due to tolerance of radiation and caustic.

731

(WSRC-MS–96-0670)

Coupon corrosion monitoring of a high level waste tank. Mickalonis, J.I. Westinghouse Savannah River Co., Aiken, SC (United States). [1997]. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-970332–2: Corrosion 97. 52. annual corrosion conference of the National Association of Corrosion Engineers: economics and performance - bridging the gap and NACExpo, New Orleans, LA (United States), 9-14 Mar 1997). Order Number DE97060048. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactive nuclear waste, which was generated during the production of nuclear fuel, is safely stored in contained underground tanks and is being processed for long-term storage. A coupon corrosion rig (CCR) for monitoring was designed and used in a preliminary trial on a tank containing diluted low-level radioactive waste. Welded and standard flat coupons were exposed for ten months. The coupons were exposed in both the liquid waste and the air space above the waste. The evaluation consisted of visual examination and weight loss and pit depth measurements. Corrosion degradation was not significant for coupons in the waste.

The corrosion in the air space was characterized by variable-depth degradation under adherent corrosion products. The coupon areas exposed at the air-waste interface had pits; the deepest measuring 6 mils. These results are consistent with those from previous laboratory coupon tests in simulated waste

732
(WSRC-MS–96-0743)
Automation in a material processing/storage facility. Peterson, K.; Gordon, J. Westinghouse Savannah River Co., Aiken, SC (United States). 1997. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-970464–16: 7. American Nuclear Society topical meeting on robotics and remote systems, Augusta, GA (United States), 27 Apr - 1 May 1997). Order Number DE97004957. Source: OSTI; NTIS; INIS; GPO Dep.

The Savannah River Site (SRS) is currently developing a new facility, the Actinide Packaging and Storage Facility (APSF), to process and store legacy materials from the United States nuclear stockpile. A variety of materials, with a variety of properties, packaging and handling/storage requirements, will be processed and stored at the facility. Since these materials are hazardous and radioactive, automation will be used to minimize worker exposure. Other benefits derived from automation of the facility include increased throughput capacity and enhanced security. The diversity of materials and packaging geometries to be handled poses challenges to the automation of facility processes. In addition, the nature of the materials to be processed underscores the need for safety, reliability and serviceability. The application of automation in this facility must, therefore, be accomplished in a rational and disciplined manner to satisfy the strict operational requirements of the facility. Among the functions to be automated are the transport of containers between process and storage areas via an Automatic Guided Vehicle (AGV), and various processes in the Shipping Package Unpackaging (SPU) area, the Accountability Measurements (AM) area, the Special Isotope Storage (SIS) vault and the Special Nuclear Materials (SNM) vault. Other areas of the facility are also being automated, but are outside the scope of this paper.

733
(WSRC-MS–97-0023)
Hydrological methods preferentially recover cesium from nuclear waste salt cake. Brooke, J.N.; Hamm, L.L. Westinghouse Savannah River Co., Aiken, SC (United States). 1997. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. (CONF-970607–17: ARS '97: American Nuclear Society (ANS) international meeting on advanced reactors safety, Orlando, FL (United States), 1-5 Jun 1997). Order Number DE97004879. Source: OSTI; NTIS; INIS; GPO Dep.

The Savannah River Site is treating high level radioactive waste in the form of insoluble solids (sludge), crystallized salt (salt cake), and salt solutions. High costs and operational concerns have prompted DOE to look for ways to improve the salt cake treatment process. A numerical model was developed to evaluate the feasibility of pump and treat technology for extracting cesium from salt cake. A modified version of the VAM3DCG code was used to first establish a steady-state flow field, then to simulate 30 days of operation. Simulation results suggest that efficient cesium extraction can be obtained with low displacement volumes. The actual extraction process will probably be less impressive because of nonuniform properties. 2 refs., 2 figs.

734
(WSRC-MS–97-00041)
Glass formulation development and testing for the vitrification of cesium-loaded crystalline silicotitanate (CST). Andrews, M.K. Westinghouse Savannah River Co., Aiken, SC (United States). 1997. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-970677–: 90. annual meeting and exhibition of the Air and Waste Management Association, Toronto (Canada), 8-13 Jun 1997). Order Number DE98003418. Source: OSTI; NTIS; INIS; GPO Dep.

Crystalline Silicotitanate (CST) is an inorganic ion exchange medium that was designed to sorb Cs-137, Sr-90 and several other radionuclides. CST exhibits high selectivity for the ion exchange of cesium from highly alkaline solutions containing large quantities of sodium. Through the Tanks Focus Area (TFA), Oak Ridge National Laboratory (ORNL) was funded to demonstrate the effectiveness of CST as an ion exchange material using supernate from the Melton Valley Storage Tanks (MVST). After processing the supernate through columns containing CST, the CST will be sluiced into drums and dewatered. Some of the CST will be shipped to the Savannah River Technology Center (SRTC) to demonstrate vitrification of the cesium-loaded CST in the shielded cells facility of SRTC. Vitrification is considered to be the Best Demonstrated Available Technology for immobilization of high-level waste and is currently being investigated for the treatment of low-level/mixed wastes. Vitrification of cesium-loaded CST offers a number of benefits. Vitrification: (1) is less expensive than many of the technologies available; (2) offers a large volume reduction; (3) produces a waste form that is very durable; (4) is an established technology; (5) can be used for a wide variety of waste streams; and (6) produces a waste form that is resistant to radiation damage. Prior to a full-scale demonstration, a glass formulation that will produce a glass that is both processable and durable must be developed. Crucible studies using unloaded CST and reagent grade glass-forming chemicals (or frit) were performed. Initially, scoping studies were performed to determine the chemicals necessary to form a glass. A screening experiment was then performed to determine the quantity of chemicals required. Finally, tests were conducted to determine the waste loading to be used during processing in the melter.

735
(WSRC-MS–97-0048)
Counter current decantation washing of HLW sludge. Brooke, J.N.; Peterson, R.A. Westinghouse Savannah River Co., Aiken, SC (United States). 1997. 15p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. (CONF-970321–7: National spring meeting and petrochemical exposition of the American Institute of Chemical Engineers (AIChE) and 2. plant operations and design conference, Houston, TX (United States), 10-13 Mar 1997). Order Number DE97004881. Source: OSTI; NTIS; INIS; GPO Dep.

The Savannah River Site (SRS) has 51 High Level Waste (HLW) tanks with typical dimensions 25.9 meters (85 feet) diameter and 10 meters (33 feet) high. Nearly 114 million liters (30 M gallons) of HLW waste is stored in these tanks in the form of insoluble solids called sludge, crystallized salt called salt cake, and salt solutions. This waste is being converted to waste forms stable for long term storage. In one of the processes, soluble salts are washed from HLW sludge in preparation for vitrification. At present, sludge is batch washed in a waste tank with one or no reuse of the wash water. Sodium hydroxide and sodium nitrite are added to the wash water for tank corrosion protection; the large volumes of spent wash water are recycled to the evaporator system; additional salt cake is produced; and sodium carbonate is formed in the washed sludge during storage by reaction with CO_2 from the air. High costs and operational concerns with the current washing process prompts DOE and WSRC to seek an improved washing method. A new method should take full advantage of the physical/chemical properties of sludge, experience from other technical disciplines, processing rate requirements, inherent process safety, and use of proven processes and equipment. Counter current solids washing is a common process in the minerals processing and chemical industries. Washing circuits can be designed using thickeners, filters or centrifuges. Realizing the special needs of nuclear work and the low processing rates required, a Counter Current Decantation (CCD) circuit is proposed using small thickeners and fluidic pumps.

736
(WSRC-MS–97-00050)
Compliance with the Nevada Test Site's waste acceptance criteria for vitrified cesium-loaded crystalline silicotitanate (CST). Harbour, J.R.; Andrews, M.K. Westinghouse Savannah River Co., Aiken, SC (United States). 1997. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-970677–: 90. annual meeting and exhibition of the Air and Waste Management Association, Toronto (Canada), 8-13 Jun 1997). Order Number DE98003419. Source: OSTI; NTIS; INIS; GPO Dep.

Oak Ridge National Laboratory (ORNL) and Savannah River Technology Center (SRTC) are involved in a joint project for immobilization of radionuclides from the Melton Valley Storage Tanks (MVST) at Oak Ridge (OR). The supernate from Tank W-29 of the MVST will be treated by passage through a crystalline silicotitanate (CST) ion exchange medium. The CST was designed to sorb cesium, the primary radio nuclide (Cs-137) in the supernate of MVST's. A smaller amount of strontium (Sr-90) will also be sorbed. This demonstration will be performed by ORNL. One column volume of cesium-loaded CST (~10 gallons or 38 liters) will then be shipped to SRTC where it will be mixed with glass formers and fed as an aqueous slurry to a joule-heated melter within the SRTC Shielded Cells. A borosilicate glass formulation which will incorporate the CST has been developed as part oft SRTC's role in this project. The molten glass (~1150°C) will be poured into 500 ml stainless steel beakers which in turn will be placed in 30 gallon drums for disposal. An import&f part of this project is to demonstrate that the glass waste form produced will meet the Waste Acceptance Criteria (WAC) for disposal at the Nevada Test Site (NTS). If vitrification of the cesium-loaded CST is implemented as the immobilization method for all of the MVST supernate, then it is essential to demonstrate that the waste can be disposed of at an acceptable disposal facility. NTS accepts low-level radioactive waste as long as it is not TRU and not hazardous. This paper documents the efforts in the development stage of this work to integrate the requirements of NTS into the formulation and processing efforts. This work is funded by the Tank Focus Area with additional funding for ORNL provided by EM-30 at OR.

737
(WSRC-MS–97-0214)
Joint EPA/DOE demonstration program for total mercury continuous emissions monitors. Burns, D.B. (Westinghouse Savannah River Company, Aiken, SC (United States). Savannah River Technology Center); Rauenzahn, H.S.; Stevens, F.M. Westinghouse Savannah River Co., Aiken, SC (United States). 1997. 16p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. (CONF-970677–13: 90. annual meeting and exhibition of the Air and Waste Management Association, Toronto (Canada), 8-13 Jun 1997). Order Number DE97060158. Source: OSTI; NTIS; INIS; GPO Dep.

Continuous emissions monitoring of mercury from hazardous waste thermal treatment processes is desired for verification of emission compliance, process control, and public safety perception. Continuous real-time monitoring of mercury would permit actual measurement of mercury emissions and permit measurement of real-time (actual) mercury emissions and allow accurate (realistic) human risk assessment from hazardous thermal treatment facility operation. The U.S. Environmental Protection Agency (EPA) has proposed regulations that require the use of total mercury continuous emissions monitors (CEMs) on incinerators, boilers, and industrial furnaces that burn hazardous waste. These proposed regulations also include draft performance specifications for mercury CEMs. This paper describes an ongoing joint EPA/DOE program to identify and demonstrate commercially available mercury CEMs that can meet the proposed EPA performance specification and includes initial instrument test results obtained. The complete demonstration consists of a six month performance test of several commercially available total mercury CEMs at a commercial cement kiln that co-fires hazardous waste. During the performance test, several indicators of CEM performance will be evaluated (as required in the proposed performance specification), including; zero and calibration drift, relative accuracy through comparison to EPA manual Reference Methods, calibration error through testing with calibration standards, and specific interference tests. The results of this extensive test program will be used to either confirm availability of mercury CEMs that meet the requirements in the proposed EPA performance specification, provide the necessary data for revision of the proposed mercury CEM performance specification, or reveal the need for further instrument development prior to deployment.

738
(WSRC-MS–97-0217)
Air pollution control system testing at the DOE offgas components test facility. Burns, D.B.; Speed, D.; VanPelt, W.; Burns, H.H. Westinghouse Savannah River Co., Aiken, SC (United States). 1997. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. (CONF-970562–4: International conference on incineration and thermal

treatment technologies, Oakland, CA (United States), 12-16 May 1997). Order Number DE97060159. Source: OSTI; NTIS; INIS; GPO Dep.

In 1997, the Department of Energy (DOE) Savannah River Site (SRS) plans to begin operation of the Consolidated Incineration Facility (CIF) to treat solid and liquid RCRA hazardous and mixed wastes. The Savannah River Technology Center (SRTC) leads an extensive technical support program designed to obtain incinerator and air pollution control equipment performance data to support facility start-up and operation. A key component of this technical support program includes the Offgas Components Test Facility (OCTF), a pilot-scale offgas system test bed. The primary goal for this test facility is to demonstrate and evaluate the performance of the planned CIF Air Pollution Control System (APCS). To accomplish this task, the OCTF has been equipped with a 1/10 scale CIF offgas system equipment components and instrumentation. In addition, the OCTF design maximizes the flexibility of APCS operation and facility instrumentation and sampling capabilities permit accurate characterization of all process streams throughout the facility. This allows APCS equipment performance to be evaluated in an integrated system under a wide range of possible operating conditions. This paper summarizes the use of this DOE test facility to successfully demonstrate APCS operability and maintainability, evaluate and optimize equipment and instrument performance, and provide direct CIF start-up support. These types of facilities are needed to permit resolution of technical issues associated with design and operation of systems that treat and dispose combustible hazardous, mixed, and low-level radioactive waste throughout and DOE complex.

739

(WSRC-MS–97-0220)

Investigation of water accumulation in an offgas test facility HEPA housing. Speed, D.L.; Burns, D.B.; Van Pelt, W.B.; Burns, H.H. Westinghouse Savannah River Co., Aiken, SC (United States). 1997. 14p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. (CONF-970562–4: International conference on incineration and thermal treatment technologies, Oakland, CA (United States), 12-16 May 1997). Order Number DE97060161. Source: OSTI; NTIS; INIS; GPO Dep.

The Consolidated Incineration Facility, at the Department of Energy's Savannah River Site, is designed to treat solid and liquid RCRA hazardous and mixed wastes generated by site operations and clean-up activities. During CIF's pretrial burn campaigns in 1995, an appreciable amount of water was recovered from the HEPA housings. Questions were immediately raised as to the source of the water, and the degree of wetness of the filters during operation. There are two primary issues involved: Water could reduce the life expectancy and performance of the HEPA filters, housing, and associated ducting, and wet HEPAs also present radiological concerns for personnel during filter change-out. A similar phenomenon was noted at the Offgas Components Test Facility (OCTF), a 1/10 scale pilot of CIF's air pollution control system. Tests at OCTF indicated the water's most likely origin to be vapor condensing out from the flue gas stream due to excessive air in-leakage at housing door seals, ducting flanges, and actual holes in the ducting. The rate of accumulation bears no statistical correlation to such process parameters as steam flow, reheater outlet temperature and offgas velocity in the duct. Test results also indicated that the HEPA filter media is moistened by the initial process flow while the facility is being brought on line. However, even when the HEPA filters were manually drenched prior to startup, they became completely dry within four hours of the time steam was introduced to the reheater. Finally, no demonstrable relationship was found between the degree of filter media wetness and filter dP.

740

(WSRC-MS–97-0404)

Chemical inventory control program for mixed and hazardous waste facilities at SRS. Ades, M.J.; Vincent, A.M. III. Westinghouse Savannah River Co., Aiken, SC (United States). 1997. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. (CONF-970661–4: 1997 safety analysis workshop, Oakland, CA (United States), 9-13 Jun 1997). Order Number DE97060187. Source: INIS; OSTI; NTIS; INIS; GPO Dep.

Mixed Waste (MW) and Hazardous Waste (HW) are being stored at the Savannah River Site (SRS) pending onsite and/or offsite treatment and disposal. The inventory control for these wastes has recently been brought under Technical Safety Requirements (TSR) in accordance with DOE Order 5480.22. With the TSRs was the question of the degree of rigor with which the inventory is to be tracked, considering that the variety of chemicals present, or that could be present, numbers in the hundreds. This paper describes the graded approach program to track Solid Waste (SW) inventories relative to TSRs. The approach uses a ratio of the maximum anticipated chemical inventory to the permissible inventory in accordance with Emergency Response Planning Guideline (ERPG) limits for on- and off-site receptors. A specific threshold ratio can then be determined. The chemicals above this threshold ratio are to be included in the chemical inventory control program. The chemicals that fall below the threshold ratio are managed in accordance with existing practice per State and RCRA hazardous materials requirements. Additionally, the facilities are managed in accordance with process safety management principles, specifically using process hazards analyses, which provides safety assurance for even the small quantities that may be excluded from the formal inventory control program. The method yields a practical approach to chemical inventory control, while maintaining appropriate chemical safety margins. The resulting number of specific chemicals that require inclusion in a rigorous inventory control program is greatly reduced by about 80%, thereby resulting in significant reduction in chemical data management while preserving appropriate safety margins.

741

(WSRC-MS–97-0574)

Feed Acceptance for the Defense Waste Processing Facility at the Savannah River Site. Jacobs, R.A. (Westinghouse Savannah River Company, AIKEN, SC (United States)); Elder, H.H. Westinghouse Savannah River Co., Aiken, SC (United States). Mar 1998. 28.p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-980318–: 1998 American Institute of Chemical Engineers (AIChE) spring meeting, New Orleans, LA (United States), 8-12 Mar 1998). Order Number DE98051763. Source: OSTI; NTIS; INIS; GPO Dep.

The DWPF at the Department of Energy's (DOE) Savannah River Site (SRS) began radioactive operations in December of 1995. The High Level Waste Tank Farm at SRS contains approximately thirty three million gallons of salt, supernate, and insoluble sludge wastes accumulated during more than three decades of weapons manufacture. In the DWPF, the radioactive components from this waste will ultimately be processed into a stable, borosilicate glass for long-term storage in a geological repository.The feeds to the DWPF are pretreated in a number of steps. Insoluble sludges, primarily aluminum, iron and other transition metals, are combined from several tanks, treated by caustic dissolution of aluminum and washed to remove soluble salts; these materials are removed to increase waste loading in the glass produced by the DWPF.The water soluble radioactive species in the salt and supernate, primarily cesium and actinides, are precipitated by sodium tetraphenylborate (NaTPB) or adsorbed onto sodium titanate. The resulting solids are also washed to remove excessive soluble salts before feeding to the DWPF. The soluble species removed by washing are disposed of as low level radioactive waste in a concrete form known as Saltstone. The presentation includes a brief overview of the High Level Waste system, pretreatment, and disposition of the various streams.The washed tetraphenylborate precipitates of cesium and potassium are hydrolyzed by copper catalyzed formic acid hydrolysis in the Salt Processing Cell (SPC) to yield soluble formates, boric acid, benzene and minor organic byproducts.The benzene and most of the organic byproducts are then steam stripped. The resulting aqueous hydrolysis product, including the still insoluble actinides adsorbed onto sodium titanate, is combined in the Chemical Processing Cell (CPC) with the insoluble sludge which has been treated with nitric acid and formic acid to remove mercury and to adjust the glass redox. (Abstract truncated)

742

(WSRC-MS–97-0576)

Fractured rock aquifer tests in the Western Siberian Basin, Ozyorsk, Russia. Nichols, R.L. (and others); Looney, B.B.; Eddy-Dilek, C.A. Westinghouse Savannah River Co., Aiken, SC (United States). 1997. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);Russian Atomic Energy Commission, Moscow (Russian Federation). DOE Contract AC09-96SR18500. (CONF-971198–: 1997 American Institute of Hydrology annual meeting, Tampa, FL (United States), 16-19 Nov 1997). Order Number DE97054318. Source: OSTI; NTIS; INIS; GPO Dep.

A series of multi-zone pumping tests was conducted in a contaminated fractured rock aquifer in the Western Siberian Basin, Ozyorsk, Russia. The tests were conducted adjacent to the Mishelyak River floodplain in fractured Paleozoic porphyrites, tufts, tuff breccia, and lava typical of the Ural mountain complex. Geophysical logs, borehole photography, core samples, and results from previous borehole contamination studies were used to identify the zones to be tested. A network of three uncased wells was tested using a system of inflatable packers, pressure transducers and data loggers. Seven zones were isolated and monitored in two of the uncased wells. A straddle packer assembly was used to isolate individual zones within the pumping well. Eight constant rate pumping tests were conducted. Results of the testing indicate that shallow groundwater migrates primarily in two intervals that are separated by an interval with low lateral conductivity. The water bearing intervals have moderate to high specific capacities (1.3 and 30 L/min/m). Several processes are responsible for fracturing present in the lower interval. The network of compound fractures produced a complex array of fracture intersections yielding a fractured media with hydraulic behavior similar to porous media. Models used for the analysis of pumping tests in porous media provide a good estimation of the hydraulic response of the lower interval to pumping. Future work will include more complex analysis of the data to determine hydraulic conductivity ellipses.

743

(WSRC-MS–97-00758)

Effect of nitrite concentration on pit depth in carbon steel exposed to simulated radioactive waste. Zapp, P.E. Westinghouse Savannah River Co., Aiken, SC (United States). 21 Oct 1997. 13p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. (CONF-980316–: Corrosion '98, San Diego, CA (United States), 22-27 Mar 1998). Order Number DE98051096. Source: OSTI; NTIS; INIS; GPO Dep.

The growth of pits in carbon steel exposed to dilute (0.055 M nitrate-bearing) alkaline salt solutions that simulate radioactive waste was investigated in coupon immersion tests. Most coupons were tested in the as-received condition, with the remainder having been heat treated to produce an oxide film. Nitrite, which is an established pitting inhibitor in these solutions, was present in concentrations from 0 to 0.031 M to 0.16 M; the last concentration is known to prevent pitting initiation in the test solution at the 50 degrees C test temperature. The depths of the deepest pits on coupons of particular exposure conditions were measure microscopically and were analyzed as simple, type 1 extreme value statistical distributions, to predict the deepest expected pit in a radioactive waste tank subject to the test conditions. While the growth rate of pits could not be established from these tests, the absolute value of the deepest pits predicted is of the order of 100 mils after 448 days of exposure. The data indicate that even nitrite concentrations insufficient to prevent pitting have a beneficial effect on limiting the growth of deepest pits.

744

(WSRC-MS–97-00790)

ICP-MS nebulizer performance for analysis of SRS high salt simulated radioactive waste tank solutions (#3053). Jones, V.D. Westinghouse Savannah River Co., Aiken, SC (United States). [1997]. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. (CONF-980317–: 2. ASTM symposium on applications of ICP-MS to radionuclide determinations, New Orleans, LA (United States), 2-7 Mar 1998). Order Number DE98050691. Source: OSTI; NTIS; INIS; GPO Dep.

High Level Radioactive Waste Tanks at the Savannah River Site are high in salt content. The cross-flow nebulizer provided the most stable signal for all salt matrices with the smallest signal loss/suppression due to this matrix. The DIN exhibited a serious lack of tolerance for TDS; possibly due to physical de-tuning of the nebulizer efficiency.

745
(WSRC-MS–98-00013)
ITP Waste Tank Positive Pressure Inerting System. Blanchard, A. (Westinghouse Savannah River Company, AIKEN, SC (United States)); Thomas, J.K. Westinghouse Savannah River Company, Aiken, SC (United States);Westinghouse Savannah River Co., Aiken, SC (United States). Jun 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. (CONF-980616–: Conference on integrating safety analysis into safety management, Park City, UT (United States), 15-19 Jun 1998). Order Number DE98054752. Source: OSTI; INIS; NTIS; GPO Dep.

This paper provides an overview of the methods used to perform the first two evaluations along with the most relevant results.

746
(WSRC-MS–98-00018)
A Simple Method for Estimating Forced Convection Mass Transfer in a Waste Tank. Kalinich, D.A. (Westinghouse Savannah River Company, AIKEN, SC (United States)); Paddleford, D.F. Westinghouse Savannah River Company, Aiken, SC (United States);Westinghouse Savannah River Co., Aiken, SC (United States). Jun 1998. 1p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. (CONF-980616–: Conference on integrating safety analysis into safety management, Park City, UT (United States), 15-19 Jun 1998). Order Number DE98054744. Source: OSTI; INIS; NTIS; GPO Dep.

Prevention of flammable vapor concentrations in a waste tank can be accomplished by forced ventilation of the tank vapor space.

747
(WSRC-MS–98-00022)
Preliminary Disposal Analysis for Selected Accelerator Production of Tritium Waste Streams. Ades, M.J. (Westinghouse Savannah River Company, AIKEN, SC (United States)); England, J.L. Westinghouse Savannah River Co., Aiken, SC (United States). Jun 1998. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-980606–: Annual meeting of the American Nuclear Society, Nashville, TN (United States), 7-12 Jun 1998). Order Number DE98051721. Source: OSTI; NTIS; INIS; GPO Dep.

A preliminary analysis was performed for two selected Accelerator Production of Tritium (APT) generated mixed and low-level waste streams to determine if one mixed low-level waste (MLLW) stream that includes the Mixed Waste Lead (MWL) can be disposed of at the Nevada Test Site (NTS) and at the Hanford Site and if one low-level radioactive waste (LLW) stream, that includes the Tungsten waste stream (TWS) generated by the Tungsten Neutron Source modules and used in the Target/Blanket cavity vessel, can be disposed of in the LLW Vaults at the Savannah River Plant (SRP). The preliminary disposal analysis that the radionuclide concentrations of the two selected APT waste streams are not in full compliance with the Waste Acceptance Criteria (WAC) and the Performance Assessment (PA) radionuclide limits of the disposal sites considered.

748
(WSRC-MS–98-00023)
Accelerator Production of Tritium Waste Characterization and Certification Challenges. Ades, M.J. (Westinghouse Savannah River Company, AIKEN, SC (United States)); England, J.L.; Nowacki, P.L.; Hane, R.; Tempel, K.L.; Pitcher, E.; Cohen, H.S. Westinghouse Savannah River Co., Aiken, SC (United States). Jun 1998. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-980606–: Annual meeting of the American Nuclear Society, Nashville, TN (United States), 7-12 Jun 1998). Order Number DE98051722. Source: OSTI; NTIS; INIS; GPO Dep.

This paper summaries the processes and methods APT used for the identification and classification of the waste streams, the characterization and certification of the waste streams, and waste minimization.

749
(WSRC-MS–98-00039)
Cross-Flow Filtration of Department of Energy Hanford Waste Streams Using Sintered Metal Mott and Graver Filters at the Savannah River Technology Center. Walker, B.W. (Westinghouse Savannah River Company, AIKEN, SC (United States)); McCabe, D.J. Westinghouse Savannah River Co., Aiken, SC (United States). May 1998. 8p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. (CONF-980543–: 11. annual technical conference of the American Filtration and Separations Society, St. Louis, MO (United States), 4-7 May 1998). Order Number DE98052363. Source: OSTI; NTIS; INIS; GPO Dep.

Treatment processes have been proposed that will utilize cross-flow filtration to filter supernate and concentrated sludge waste streams at a Department of Energy plant in Hanford, Washington. Two waste processing applications have been identified as candidates for this technology. The first of the Hanford applications involves filtration of the decanted supernate from sludge leaching and washing operations. This process requires the concentration and removal of dilute fines from the bulk of the supernate. The second application involves filtration to wash and concentrate the sludge during out-of-tank processing of a relatively concentrated solids feed stream.

750
(WSRC-MS–98-00107)
On-Board Hydrogen Storage for a City Transit Bus. Heung, L.K. (Westinghouse Savannah River Company, AIKEN, SC (United States)). Westinghouse Savannah River Co., Aiken, SC (United States). Mar 1998. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. (CONF-980350–: 9. annual U.S. hydrogen meeting, Vienna, VA (United States), 3-5 Mar 1998). Order Number DE98051917. Source: OSTI; NTIS; GPO Dep.

An electric bus was modified to use hydrogen fuel for demonstration in the city of Augusta, Georgia, USA. The hydrogen fuel is stored in a solid form using an on-board metal hydride storage system. The storage system performs better than expected.

751
(WSRC-MS–98-00112)
Advanced Separations at SRS. Thompson, M.C. (Westinghouse Savannah River Company, AIKEN, SC (United States)). Westinghouse Savannah River Co., Aiken, SC (United States). Mar 1998. 3p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. (CONF-980335–: Efficient separations and processing crosscutting program technical exchange meeting, Augusta, GA (United States), 17-19 Mar 1998). Order Number DE98052367. Source: OSTI; NTIS; INIS; GPO Dep.

The Savannah River Site (SRS) has many waste streams which are contaminated with radionuclides and/or hazardous materials which must be treated to remove the radioactivity (Cs, Sr, tritium, actinides) and hazardous components (polychlorinated biphenyls, cyanide, metal ions). This task provides test beds for ESP-developed separations materials and technologies using actual SRS waste streams. The work includes different SRS waste streams; high level waste solutions presently stored in underground tanks onsite, water recycled from the waste vitrification plant, and reactor basin water in excess facilities.

752
(WSRC-MS–98-00316)
Implementation of ISO140001 at the Savannah River Site. Marra, S.L. (Westinghouse Savannah River Company, AIKEN, SC (United States)); Reeves, R.D. Westinghouse Savannah River Co., Aiken, SC (United States). 20 Apr 1998. 8 p.p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. DE-AC09-96SR18500. Order Number DE98052902. Source: OSTI; INIS; NTIS; GPO Dep.

The Department of Energy's Savannah River Site (SRS) in Aiken, SC recently received ISO14001 certification. ISO14001 is an internationally recognized standard that delineates the elements of an effective environmental management system (EMS) and enhances environmental stewardship. SRS preparations for ISO14001 certification involved a comparison of existing programs to the requirements of the standard. Gaps in the program were identified and work initiated to fill those gaps. Primarily, these deficiencies were related to documentation of the SRS EMS and employee training. Certification was granted after an extensive review by a team of independent auditors. The review included personnel interviews, documentation reviews, and work practice observations. An overview of the preparation process as well as the independent review will be presented.

753
(WSRC-OS–97-00006)
Groundwater Flow Model for the R-Reactor Area Final Report. Harris, M.K. (Westinghouse Savannah River Company, AIKEN, SC (United States)). Westinghouse Savannah River Company, Aiken, SC (United States);Westinghouse Savannah River Co., Aiken, SC (United States). Nov 1997. 200p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98052998. Source: OSTI; NTIS; INIS; GPO Dep.

A detailed numerical groundwater flow model has been developed for the R-Area of the Savannah River Site in Aiken, South Carolina. The three-dimensional, finite-element groundwater modeling code Flow and Contaminant Transport (FACT) has been used for this study.

754
(WSRC-RP–97-25)
Report on bioventing of petroleum contaminated soils at 108-3C: Active extraction and passive injection (barometric pumping) of a gaseous nutrient. Kastner, J.R. (and others); Lombard, K.; Radway, J. Westinghouse Savannah River Co., Aiken, SC (United States). [1997]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE97060080. Source: OSTI; NTIS; INIS; GPO Dep.

A bioventing system was constructed with horizontal extraction wells and vertical injection wells in an area which had previously been excavated and then backfilled. Initial in-situ respiration rates (air addition only) suggest that hydrocarbon degradation may be nutrient limited. The rate of TPH degradation was maximum (0.8-1.2 mg/kg/day) between 10-15 ft (bgs), but dropped to essentially zero 30 ft (bgs) within the contaminated zone (even though previous analysis at this depth indicated a TPH concentration of 3800 ppm). Analysis of the soil at 17 ft showed that NO_3 and PO_4 were below detection limits (0.5 ppm), indicating that nutrient limitation may be occurring. Nitrate levels were highest at 10 ft (bgs), correlating with the highest respiration rates. However, phosphate levels were at/or below detection levels throughout tile site (indicating possible PO_4 limitation). Viable cells increased from 3×10^6 cfu/g at 3 ft (bgs) to 1×10^7 cfu/g at 10 ft (bgs) and remained relatively constant down to 17 ft. Cell numbers in the control area were significantly lower than in the contaminated zone (4.5×10^3). Gas phase nutrients (triethlyphosphate and nitrous oxide) will be injected to see if the hydrocarbon degradation rate can be increased.

755
(WSRC-RP–97-177-Rev.1-Final)
Removal site evaluation report L-area rubble pile (131-3L) gas cylinder disposal facility (131-2L). Palmer, E.R. (Westinghouse Savannah River Company, AIKEN, SC (United States)); Mason, J.T. Westinghouse Savannah River Co., Aiken, SC (United States). Oct 1997. 101p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98051299. Source: OSTI; NTIS; INIS; GPO Dep.

This Removal Site Evaluation Report (RSER) is prepared in accordance with Sections 300.410 and 300.415 of the National Contingency Plan and Section XIV of the Savannah River Site (SRS) Federal Facility Agreement (FFA). The purpose of this investigation is to report information concerning conditions at the L-Area Rubble Pile (LRP) (131-3L) and the L-Area Gas Cylinder Disposal Facility (LGCDF) (131- 2L) sufficient to assess the threat posed to human health and the environment. This investigation also assesses the need for additional Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) actions. The scope of this investigation included a review of files, limited sampling efforts, and visits to the area. An investigation of the LRP (1131-3L) indicates the presence of semi volatile organic compounds (SVOCs), volatile organic compounds (VOCs), metals, and asbestos. Potential contaminants in the waste piles could migrate into the secondary media (soils and groundwater), and the presence of some of the contaminants in the piles poses an exposure threat to site works.

The Department of Energy (DOE), United States Environmental Protection Agency (EPA) and South Carolina Department of Health and Environmental Control (SCDHEC) discussed the need for a removal action at the Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation (RFI/RI) work plan scoping meetings on the waste unit, and agreed that the presence of the waste piles limits the access to secondary media for sampling, and the removal of the piles would support future characterization of the waste unit. In addition, the DOE, EPA, and SCDHEC agreed that the proposed removal action for the LRP (131-3L) would be documented in the RFI/RI work plan. The LGCDF (131-2L) consists of a backfilled pit containing approximately 28 gas cylinders. (Abstract truncated)

756
(WSRC-RP–97-236)
Rheology of Savannah River site tank 42 HLW radioactive sludge. Ha, B.C. Westinghouse Savannah River Co., Aiken, SC (United States). 5 Nov 1997. 14p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98051871. Source: OSTI; NTIS; INIS; GPO Dep.

Knowledge of the rheology of the radioactive sludge slurries at the Savannah River Site is necessary in order to ensure that they can be retrieved from waste tanks and processed for final disposal. At Savannah River Site, Tank 42 sludge represents on of the first HLW radioactive sludges to be vitrified in the Defense Waste Processing Facility. The rheological properties of unwashed Tank 42 sludge slurries at various solids concentrations were measured remotely in the Shielded Cells at the Savannah River Technology Center using a modified Haake Rotovisco viscometer.

757
(WSRC-RP–97-00937)
Analysis of cascade impactor and EPA method 29 data from the americium/curium pilot melter system. Zamecnik, J.R. Westinghouse Savannah River Co., Aiken, SC (United States). Nov 1997. 41p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98051509. Source: OSTI; NTIS; INIS; GPO Dep.

The offgas system of the Am/Cm pilot melter at TNX was characterized by measuring the particulate evolution using a cascade impactor and EPA Method 29. This sampling work was performed by John Harden of the Clemson Environmental Technologies Laboratory, under SCUREF Task SC0056. Elemental analyses were performed by the SRTC Mobile Laboratory.Operation of the Am/Cm melter with B2000 frit has resulted in deposition of PbO and boron compounds in the offgas system that has contributed to pluggage of the High Efficiency Mist Eliminator (HEME). Sampling of the offgas system was performed to quantify the amount of particulate in the offgas system under several sets of conditions. Particulate concentration and particle size distribution were measured just downstream of the melter pressure control air addition port and at the HEME inlet. At both locations, the particulate was measured with and without steam to the film cooler while the melter was idled at about 1450 degrees Celsius. Additional determinations were made at the melter location during feeding and during idling at 1150 degrees Celsius rather than 1450 degrees Celsius (both with no steam to the film cooler). Deposition of particulates upstream of the melter sample point may have, and most likely did occur in each run, so the particulate concentrations measured do no necessarily reflect the total particulate emission at the melt surface. However, the data may be used in a relative sense to judge the system performance.

758
(WSRC-RP–98-00032)
Characterization Plan and Dissolution Tests for Tank 16H Samples. Davis, P.L.; Hay, M.S. Westinghouse Savannah River Co., Aiken, SC (United States). 9 Feb 1998. 5p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98052149. Source: OSTI; NTIS; INIS; GPO Dep.

In support of the closure of Tank 16H, a sample of the solids residue on the bottom of the tank interior and three samples from the tank annulus will be sent to SRTC for analysis. The results of the analysis of the samples from the tank interior and the annulus will define the source term inventory used for fate and transport modeling. In addition, the samples from the tank annulus will be used for dissolution tests to evaluate the effectiveness of various cleaning alternatives.

759
(WSRC-RP–98-00034)
Characterization of Samples from the Effluent Treatment Facility Evaporator Waste Concentrate Tank. Wilmarth, W.R. (Westinghouse Savannah River Company, AIKEN, SC (United States)). Westinghouse Savannah River Co., Aiken, SC (United States). 31 Jan 1998. 10p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE98052688. Source: OSTI; NTIS; INIS; GPO Dep.

During October 1997, the ETF Evaporator Waste Concentrate Tank No. 2 was discovered to contain a significant accumulation of solid deposits. SRTC performed destructive and nondestructive examination of solid samples from the tank. The results of these tests indicate that the solids contain mixtures of sodium oxalate (65 percent), the sulfide enclathrated sodium aluminosilicate (30 percent), and iron oxide (5 percent).

760
(WSRC-RP–98-00311)
Porflow Capabilities, Usage, History, and Testing. Collard, L.B. (Westinghouse Savannah River Company, AIKEN, SC (United States)). Westinghouse Savannah River Company, Aiken, SC (United States);Westinghouse Savannah River Co., Aiken, SC (United States). May 1998. 14p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98057406. Source: OSTI; INIS; NTIS; GPO Dep.

To support closure of the Savannah River Site High Level Waste tanks, the PORFLOW computer program is being applied to predict long term movement of residual contaminants from the tanks. The PORFLOW program has greater capabilities than simpler programs that have been used previously, and PORFLOW results have been accepted by state and federal regulators throughout the United States. This document briefly discusses the PORFLOW capabilities and presents lists of reports showing PORFLOW's usage history and testing.

761
(WSRC-TR–96-0294-Rev.1)
Commercial Light Water Reactor -Tritium Extraction Facility Process Waste Assessment (Project S-6091). Hsu, R.H. (Westinghouse Savannah River Co., Aiken, SC (United States)); Delley, A.O.; Alexander, G.J.; Clark, E.A.; Holder, J.S.; Lutz, R.N.; Malstrom, R.A.; Nobles, B.R.; Carson, S.D.; Peterson, P.K. Westinghouse Savannah River Co., Aiken, SC (United States). 30 Nov 1997. 126p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE98051912. Source: OSTI; NTIS; INIS; GPO Dep.

The Savannah River Site (SRS) has been tasked by the Department of Energy (DOE) to design and construct a Tritium Extraction Facility (TEF) to process irradiated tritium producing burnable absorber rods (TPBARs) from a Commercial Light Water Reactor (CLWR). The plan is for the CLWR-TEF to provide tritium to the SRS Replacement Tritium Facility (RTF) in Building 233-H in support of DOE requirements. The CLWR-TEF is being designed to provide 3 kg of new tritium per year, from TPBARS and other sources of tritium (Ref. 1-4).The CLWR TPBAR concept is being developed by Pacific Northwest National Laboratory (PNNL). The TPBAR assemblies will be irradiated in a Commercial Utility light water nuclear reactor and transported to the SRS for tritium extraction and processing at the CLWR-TEF. A Conceptual Design Report for the CLWR-TEF Project was issued in July 1997 (Ref. 4).The scope of this Process Waste Assessment (PWA) will be limited to CLWR-TEF processing of CLWR irradiated TPBARs. Although the CLWR- TEF will also be designed to extract APT tritium-containing materials, they will be excluded at this time to facilitate timely development of this PWA. As with any process, CLWR-TEF waste stream characteristics will depend on process feedstock and contaminant sources. If irradiated APT tritium-containing materials are to be processed in the CLWR-TEF, this PWA should be revised to reflect the introduction of this contaminant source term.

762
(WSRC-TR–97-0285)
Tetraphenylborate Solids Stability Tests. Walker, D.D. (Westinghouse Savannah River Company, AIKEN, SC (United States)); Edwards, T.B. Westinghouse Savannah River Company, Aiken, SC (United States). 19 Dec 1997. 44p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98058908. Source: OSTI; NTIS; INIS; GPO Dep.

Tetraphenylborate solids provide a potentially large source of benzene in the slurries produced in the In-Tank Precipitation process. The stability of the solids is an important consideration in the safety analysis of the process and we desire an understanding of the factors that influence the rate of conversion of the solids to benzene.

763
(WSRC-TR–97-00323)
Savannah River Site environmental report for 1997 summary. Arnett, M. Westinghouse Savannah River Co., Savannah River Site, Aiken, SC (United States). [1997]. 26p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE99001338. Source: OSTI; NTIS; INIS; GPO Dep.

The Savannah River Site (SRS) publishes an environmental report each year to provide environmental monitoring and surveillance results to the US Department of Energy (DOE), the public, Congress, state and federal regulators, universities, local governments, the news media, and environmental and civic groups. The Savannah River Site Environmental Report for 1997 (WSRC-TR-97-00322) contains detailed information on site operations, environmental monitoring and surveillance programs, environmental compliance activities, and special projects for calendar year 1997. The purpose of this document is to give a brief overview of the site and its activities, to summarize the site environmental report and the impact of 1997 SRS operations on the environment and the public, and to provide a brief explanation of radiation and dose.

764
(WSRC-TR–97-00323-Summ.)
Savannah River Site Environmental Report for 1997 Summary. Arnett, M. (Westinghouse Savannah River Company, AIKEN, SC (United States)). Westinghouse Savannah River Company, Aiken, SC (United States). 16 Jun 1998. 26p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98058240. Source: OSTI; NTIS; INIS; GPO Dep.

The Savannah River Site (SRS) publishes an environmental report each year to provide environmental monitoring and surveillance results to the U. S. Department of Energy (DOE), the public, Congress, state and federal regulators, universities, local governments, the news media, and environmental and civic groups. The Savannah River Site Environmental Report for 1997 (WSRC-TR-97-00322) contains detailed information on site operations, environmental monitoring and surveillance programs, environmental compliance activities, and special projects for the calendar year 1997. The purpose of this documents is to give a brief overview of the site and its activities, to summarize the site environmental report and the impact of 1997 SRS operations on the environment and the public, and to provide a brief explanation of radiation and dose.The data used to compile the annual environmental report and this summary can be found in Savannah River Site Environmental Data for 1997 (WSRC-TR-97-00324).

765
(WSRC-TR–97-00350)
Sampling plan to support HLW tank 16. Rodwell, P.O.; Martin, B. Westinghouse Savannah River Co., Aiken, SC (United States). 30 Oct 1997. 4p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98051776. Source: OSTI; NTIS; INIS; GPO Dep.

Plans are to remove the residual waste from the annulus of High-Level Waste Tank 16, located in the H-Area Tank Farm, in 1998. The interior of the tank is virtually clean. In the late 1970's, the waste was removed from the interior of the tank by several campaigns of waste removal with slurry pumps, spray washing, and oxalic acid cleaning. The annulus of the tank at one time had several thousand gallons of waste salt, which had leaked from the tank interior. Some of this salt was removed by adding water to the annulus and circulating, but much of the salt remains in the annulus. In

order to confirm the source term used for fate and transport modeling, samples of the tank interior and annulus will be obtained and analyzed. If the results of the analyses indicate that the data used for the initial modeling is bounding then no changes will be made to the model. However, if the results indicate that the source term is higher than that assumed in the initial modeling, thus not bounding, additional modeling will be performed. The purpose of this Plan is to outline the approach to sampling the annulus and interior of Tank 16 as a prerequisite to salt removal in the annulus and closure of the entire tank system. The sampling and analysis of this tank system must be robust to reasonably ensure the actual tank residual is within the bounds of analysis error.

766
(WSRC-TR–97-00368)
Tritium Facilities Modernization and Consolidation Project Process Waste Assessment (Project S-7726). Hsu, R.H. (Westinghouse Savannah River Company, AIKEN, SC (United States)); Oji, L.N. Westinghouse Savannah River Co., Aiken, SC (United States). 14 Nov 1997. 98p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE98052037. Source: OSTI; NTIS; INIS; GPO Dep.

Under the Tritium Facility Modernization & Consolidation (TFM&C) Project (S-7726) at the Savannah River Site (SS), all tritium processing operations in Building 232-H, with the exception of extraction and obsolete/abandoned systems, will be reestablished in Building 233-H. These operations include hydrogen isotopic separation, loading and unloading of tritium shipping and storage containers, tritium recovery from zeolite beds, and stripping of nitrogen flush gas to remove tritium prior to stack discharge. The scope of the TFM&C Project also provides for a new replacement R&D tritium test manifold in 233-H, upgrading of the 233- H Purge Stripper and 233-H/234-H building HVAC, a new 234-H motor control center equipment building and relocating 232-H Materials Test Facility metallurgical laboratories (met labs), flow tester and life storage program environment chambers to 234-H.

767
(WSRC-TR–97-00372)
Resolving Radiological Waste Classification and Release Issues Using Material Process Information and Simple Measurements and Models. Hochel, R.C. (Westinghouse Savannah River Company, AIKEN, SC (United States)). Westinghouse Savannah River Company, Aiken, SC (United States);Westinghouse Savannah River Co., Aiken, SC (United States). Nov 1997. 18p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98054746. Source: OSTI; NTIS; INIS; GPO Dep.

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768
(WSRC-TR–97-00389)
Sodium Aluminosilicate Formation in Tank 43H Simulants. Wilmarth, W.R. (Westinghouse Savannah River Company, AIKEN, SC (United States)); Walker, D.D.; Fink, S.D. Westinghouse Savannah River Company, Aiken, SC (United States);Westinghouse Savannah River Co., Aiken, SC (United States). Nov 1997. 21 p.p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE98054481. Source: OSTI; NTIS; INIS; GPO Dep.

This work studied the formation of a sodium aluminosilicate, $Na_8Al_6Si_6O_{24}(NO_3)_{2?4}H_2O$, at 40° 110° C in simulated waste solutions with varied amounts of silicon and aluminum. The data agree well with literature solubility data for sodalite, the analogous chloride salt. The following conclusions result from this work: (1) The study shows, by calculation and experiments, that evaporation of the September 1997 Tank 43H inventory will only form minor quantities of the aluminosilicate. (2) The data indicate that the rate of formation of the nitrate enclathrated sodalite solid at these temperatures falls within the residence time (<; 4 h) of liquid in the evaporator. (3) The silicon in entrained Frit 200 transferred to the evaporator with the Tank 43H salt solution will quantitatively convert to the sodium aluminosilicate. One kilogram of Frit 200 produces 2.1 kg of the sodium aluminosilicate.

769
(WSRC-TR–97-00394)
ESP's Tank 42 washwater transfer to the 241-F/H tank farms. Aponte, C.I. (Westinghouse Savannah River Company, Aiken, SC (United States)); Lee, E.D. Westinghouse Savannah River Co., Aiken, SC (United States). Dec 1997. 29p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98051771. Source: OSTI; NTIS; INIS; GPO Dep.

As a result of the separation of the High-Level Liquid Waste Department into three separate organizations (formerly there were two) (Concentration, Storage, and Transfer (CST), Waste Pre-Treatment (WPT) and Waste Disposition (WD)) process interface controls were required. One of these controls is implementing the Waste the waste between CST and WPT. At present, CST's Waste Acceptance Criteria is undergoing revision and WPT has not prepared the required Waste Compliance Plan (WCP). The Waste Pre-Treatment organization is making preparations for transferring spent washwater in Tank 42 to Tank 43 and/or Tank 22. The washwater transfer is expected to complete the washing steps for preparing ESP batch 1B sludge. This report is intended to perform the function of a Waste Compliance Plan for the proposed transfer. Previously, transfers between the Tank Farm and ITP/ESP were controlled by requirements outlined in the Tank Farm's Technical Standards and ITP/ESP's Process Requirements. Additionally, these controls are implemented primarily in operating procedure 241-FH-7TSQ and ITP Operations Manual SW16.1-SOP-WTS-1 which will be completed prior to performing the waste transfers.

770
(WSRC-TR–97-0398)
Technology Status Report of the Applicability of Solid-Liquid Separation Methods to Radioactive Tank Wastes. McCabe, D.J. (Westinghouse Savannah River Company, AIKEN, SC (United States)). Westinghouse Savannah River Co., Aiken, SC (United States). 22 Dec 1997. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98052362. Source: OSTI; NTIS; INIS; GPO Dep.

Solid-Liquid separation of highly radioactive underground storage tank wastes has been examined, and cross-flow filtration has been shown to be viable.

771
(WSRC-TR–98-00006)
Sanitary Landfill Groundwater Monitoring Report. Fourth Quarter 1997 and 1997 Summary. Chase, J. (Westinghouse Savannah River Company, AIKEN, SC (United States)). Westinghouse Savannah River Co., Aiken, SC (United States). Feb 1998. 400p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98052690. Source: OSTI; NTIS; GPO Dep.

A maximum of forty-eight wells of the LFW series monitor groundwater quality in the Steed Pond Aquifer (Water Table) beneath the Sanitary Landfill at the Savannah River Site (SRS). These wells are sampled quarterly to comply with the South Carolina Department of Health and Environmental Control Domestic Water Permit DWP-087A and as part of the SRS Groundwater Monitoring Program. Chloroethene (vinyl chloride) and trichloroethylene were the most widespread constituents exceeding standards during 1997. Lead (total recoverable), 1,4-dichlorobenzene, mercury, benzene, dichloromethane (methylene chloride), a common laboratory contaminant, tetrachloroethylene, 1,2-dichloroethane, gross alpha, tritium, and 1.2-dichloropropane also exceeded standards in one or more wells. The groundwater flow direction in the Steed Pond Aquifer (Water Table) beneath the Sanitary Landfill was to the southeast (universal transverse Mercator coordinates). The flow rate in this unit was approximately 139 ft/year during first quarter 1997 and 132 ft/year during fourth quarter.

772
(WSRC-TR–98-00011)
Glass Formulation Development for the Vitrification of Oak Ridge Tank Waste. Andrews, M.K. (Westinghouse Savannah River Company, AIKEN, SC (United States)); Workman, P.J.; Harbour, J.R.; Edwards, T.B. Westinghouse Savannah River Co., Aiken, SC (United States). Jul 1998. 6p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-980712–: 18. international congress on glass, San Francisco, CA (United States), 5-10 Jul 1998). Order Number DE98051873. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactive waste from four different Oak Ridge tank farms will be immobilized. The sludges in these tanks contain transuranic radionuclides and RCRA metals at levels which will make the final waste from both TRU and mixed. The final waste form in the immobilization of these sludges may be glass because of its ability to accept a wide variety of components into its network structure. The results of these tests indicate that sufficient waste loadings can be obtained in the glass to significantly reduce the waste volume. This paper will present the results of the glass formulation efforts.

773
(WSRC-TR–98-00047)
Trial Burn Activities for a Mixed Waste Incinerator. Birk, M.B. (Westinghouse Savannah River Company, AIKEN, SC (United States)). Westinghouse Savannah River Co., Aiken, SC (United States). May 1998. 10p. Sponsored by USDOE, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. (CONF-980513–: International conference on incineration and thermal treatment technologies, Salt Lake City, UT (United States), 11-15 May 1998). Order Number DE98052550. Source: OSTI; NTIS; GPO Dep.

The Consolidated Incineration Facility (CIF) is located on the Savannah River Site (SRS), owned by the U. S. Department of Energy and managed by BNFL, Inc. for the Westinghouse Savannah River Company. SRS received permits from the South Carolina Department of Health and Environmental Control (SCDHEC) and the U. S. Environmental Protection Agency (EPA), Region IV to construct and operate the CIF, a hazardous, radioactive mixed waste incinerator. This paper presents the results of the trial burn conducted on the CIF in April 1997 which is the initial demonstration of compliance with the permits. The incinerator is currently operating under approved post-trial burn conditions while the trial burn results are being evaluated. A final operating permit is expected the fall of 1998.

774
(WSRC-TR–98-00070,Rev.0)
Radioactive Testing Results in Support of the In-Tank Precipitation Facility. Hobbs, D.T. (Westinghouse Savannah River Company, AIKEN, SC (United States)); Barnes, M.J.; Peterson, R.A.; Crawford, C.L. Westinghouse Savannah River Company, Aiken, SC (United States);Westinghouse Savannah River Co., Aiken, SC (United States). Apr 1998. 68p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98054395. Source: OSTI; NTIS; INIS; GPO Dep.

A series of twelve tests examined benzene generation rates with radioactive materials simulating the planned Batches 2 through 4 that complete Cycle 1 for the In-Tank Precipitation (ITP) facility.

775
(WSRC-TR–98-0083)
Annual Radioactive Waste Tank Inspection Program - 1997. McNatt, F.G. (Westinghouse Savannah River Company, AIKEN, SC (United States)). Westinghouse Savannah River Company, Aiken, SC (United States);Westinghouse Savannah River Co., Aiken, SC (United States). May 1998. 91 p.p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98054393. Source: OSTI; INIS; NTIS; GPO Dep.

Aqueous radioactive wastes from Savannah River Site (SRS) separations processes are contained in large underground carbon steel tanks. Inspections made during 1997 to evaluate these vessels, and evaluations based on data

accrued by inspections performed since the tanks were constructed are the subject of this report.

776
(WSRC-TR–98-00099)
Excess Sodium Tetraphenylborate and Intermediates Decomposition Studies. Barnes, M.J. (Westinghouse Savannah River Company, AIKEN, SC (United States)); Peterson , R.A. Westinghouse Savannah River Company, Aiken, SC (United States);Westinghouse Savannah River Co., Aiken, SC (United States). Apr 1998. 42p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98053169. Source: OSTI; INIS; NTIS; GPO Dep.

The stability of excess amounts of sodium tetraphenylborate (NaTPB) in the In-Tank Precipitation (ITP) facility depends on a number of variables. Concentration of palladium, initial benzene, and sodium ion as well as temperature provide the best opportunities for controlling the decomposition rate. This study examined the influence of these four variables on the reactivity of palladium-catalyzed sodium tetraphenylborate decomposition. Also, single effects tests investigated the reactivity of simulants with continuous stirring and nitrogen ventilation, with very high benzene concentrations, under washed sodium concentrations, with very high palladium concentrations, and with minimal quantities of excess NaTPB. These tests showed the following.The testing demonstrates that current facility configuration does not provide assured safety of operations relative to the hazards of benzene (in particular to maintain the tank headspace below 60 percent of the lower flammability limit (lfl) for benzene generation rates of greater than 7 mg/(L.h)) from possible accelerated reaction of excess NaTPB. Current maximal operating temperatures of 40 degrees C and the lack of protection against palladium entering Tank 48H provide insufficient protection against the onset of the reaction. Similarly, control of the amount of excess NaTPB, purification of the organic, or limiting the benzene content of the slurry (via stirring) and ionic strength of the waste mixture prove inadequate to assure safe operation.

777
(WSRC-TR–98-00101)
Application of Epoxy Based Coating Instacote on Waste Tank Tops. Pike, J.A. (Westinghouse Savannah River Company, AIKEN, SC (United States)). Westinghouse Savannah River Company, Aiken, SC (United States);Westinghouse Savannah River Co., Aiken, SC (United States). 18 Mar 1998. 7p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98052911. Source: OSTI; NTIS; INIS; GPO Dep.

This evaluation examines the compatibility of coating Instacote with existing High-Level Waste facilities and safety practices. No significant incompatibilities are identified. The following actions need to be completed as indicated when applying Instacote on waste tank tops:(1) Prior to application in ITP facilities, the final product should be tested for chemical resistance to sodium tetraphenylborate solutions or sodium titanate slurries.(2) Any waste contaminated with Part A or B that can not be removed by the vendor such as for radiological contamination, HLW must hold the waste until HLW completes a formal assessment of the waste, disposal criteria, and impact.(3) Prior to the start of any application of the coating, each riser needs to be evaluated for masking and masking applied if needed.(4) At the conclusion of an application actual total weight of material applied to a waste tank needs to documented and sent to the tank top loading files for reference purposes.(5) Verify that the final product contains less than 250 ppm chloride.

778
(WSRC-TR–98-00129)
The Solubility of Phenylborate Compounds in Benzene. Eibling, R.E. (Westinghouse Savannah River Company, AIKEN, SC (United States)). Westinghouse Savannah River Company, Aiken, SC (United States);Westinghouse Savannah River Co., Aiken, SC (United States). Apr 1998. 9p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98057627. Source: OSTI; INIS; NTIS; GPO Dep.

The original goal of this scoping study was to determine if the solubility of sodium and potassium tetraphenylborates in benzene was sufficiently large to justify designing and performing kinetic studies on a benzene-phase catalytic reaction.

779
(WSRC-TR–98-00171-Rev.1)
Analysis of Steam Heating of a Two-Layer TBP/N-Paraffin/Nitric Acid Mixtures. Laurinat, J.E. (Westinghouse Savannah River Company, AIKEN, SC (United States)); Hassan, N.M.; Rudisill, T.S.; Askew, N.M. Westinghouse Savannah River Company, Aiken, SC (United States). 22 Jul 1998. 105p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98058037. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents an analysis of steam heating of a two-layer tri-n-butyl phosphate (TBP)/n-paraffin-nitric acid mixture.The purpose of this study is to determine if the degree of mixing provided by the steam jet or by bubbles generated by the TBP/nitric acid reaction is sufficient to prevent a runaway reaction.

780
(WSRC-TR–98-00186)
Summary of Tests to Determine Effectiveness of Gelatin Strike on SS&C Dissolver Solutions. Murray, A.M. (Westinghouse Savannah River Company, AIKEN, SC (United States)); Karraker, D.G. Westinghouse Savannah River Company, Aiken, SC (United States);Westinghouse Savannah River Co., Aiken, SC (United States). May 1998. 13p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98054751. Source: OSTI; INIS; NTIS; GPO Dep.

The solutions from the dissolution of sand, slag, and crucible (SS&C) material are sufficiently different from previous solutions processed via the F-Canyon Purex process that the effectiveness of individual process steps needed to be ascertained. In this study, the effectiveness of gelatin strike was tested under a variety of conditions. Specifically, several concentrations of silica, fluoride, nitric acid (HNO_3), boric acid (H_3BO_3), and aluminium nitrate nonahydrate (ANN) were studied. The disengagement times of surrogate and plant SS&C dissolver solutions from plant solvent also

were measured. The results of the tests indicate that gelatin strike does not coagulate the silica at the low concentration of silica (~30 ppm) expected in the SS&C dissolver solutions because the silicon is complexed with fluoride ions (e.g., SiF_6^{-2}). The silicon fluoride complex is expected to remain with the aqueous phase during solvent extraction. The disengagement times of the dissolver solutions from the plant solvent were not affected by the presence of low concentrations of silica and no third phase formation was observed in the disengagement phase with the low silica concentrations. Tests of surrogate SS&C dissolver solutions with higher concentration of silica (less than 150 ppm) did show that gelatin strike followed by centrifugation resulted in good phase disengagement of the surrogate SS&C dissolver solution from the plant dissolver solution. At the higher silica concentrations, there is not sufficient fluoride to complex with the silica, and the silica must be entrained by the gelatin and removed from the dissolver solution prior to solvent extraction.

781
(WSRC-TR–98-00188)
Solubility Limits of Dibutyl Phosphoric Acid in Uranium Solutions at SRS. Thompson, M.C. (Westinghouse Savannah River Company, AIKEN, SC (United States)); Pierce, R.A.; Ray, R.J. Westinghouse Savannah River Company, Aiken, SC (United States);Westinghouse Savannah River Co., Aiken, SC (United States). Jun 1998. 13p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98054753. Source: OSTI; INIS; NTIS; GPO Dep.

The Savannah River Site has enriched uranium (EU) solution which has been stored for almost 10 years since being purified in the second uranium cycle of the H area solvent extraction process. The concentrations in solution are ~6 g/L U and about 0.1 M nitric acid. Residual tributylphosphate in the solutions has slowly hydrolyzed to form dibutyl phosphoric acid (HDBP) at concentrations averaging 50 mg/L. Uranium is known to form compounds with DBP which have limited solubility. The potential to form uranium-DBP solids raises a nuclear criticality safety issue. SRTC tests have shown that U-DBP solids will precipitate at concentrations potentially attainable during storage of enriched uranium solutions. Evaporation of the existing EUS solution without additional acidification could result in the precipitation of U-DBP solids if DBP concentration in the resulting solution exceeds 110 ppm at ambient temperature. The same potential exists for evaporation of unwashed 1CU solutions. The most important variables of interest for present plant operations are HNO_3 and DBP concentrations. Temperature is also an important variable controlling precipitation. The data obtained in these tests can be used to set operating and safety limits for the plant. It is recommended that the data for 0 degrees C with 0.5 M HNO_3 be used for setting the limits. The limit would be 80 mg/L which is 3 standard deviations below the average of 86 observed in the tests. The data shows that super-saturation can occur when the DBP concentration is as much as 50 percent above the solubility limit. However, super-saturation cannot be relied on for maintaining nuclear criticality safety. The analytical method for determining DBP concentration in U solutions was improved so that analyses for a solution are accurate to within 10 percent. However, the overall uncertainty of results for periodic samples of the existing EUS solutions was only reduced slightly. (Abstract truncated)

782
(WSRC-TR–98-00202)
Commercial Light Water Reactor Irradiated Hardware Waste Stream. Adamson, D.J. (Westinghouse Savannah River Company, AIKEN, SC (United States)). Westinghouse Savannah River Company, Aiken, SC (United States). Jun 1998. 15p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98058683. Source: OSTI; NTIS; INIS; GPO Dep.

The Commercial Light Water Reactor (CLWR) Production of Tritium is one of two options being investigated by the DOE for producing tritium, an essential element of our nation's nuclear stockpile.

783
(WSRC-TR–98-00223)
High Level Waste Evaporator Analysis Results. Wilmarth, W.R. (Westinghouse Savannah River Company, AIKEN, SC (United States)). Westinghouse Savannah River Company, Aiken, SC (United States). 16 Jun 1998. 24p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC09-96SR18500. Order Number DE98058320. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses analyses of samples from the F- and H-Area Evaporator Feed and Concentrate Tanks for the period January of 1994 through January of 1997. Analyses include measurements of density, Cs-137 radioactivity, and concentration of actinide elements.. Statistical analysis of the data also includes previous samples dating as early as 1991. This data helps understand the behavior of fissile actinides in the evaporator system.

784
(Y/ER–293)
Experimental bypass of Lake Reality, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Oak Ridge Y-12 Plant, TN (United States). Oct 1997. 17p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98000607. Source: OSTI; NTIS; INIS; GPO Dep.

Studies conducted by the Y-12 Reduction of Mercury in Plant Effluent (RMPE) Program and Y-12 Biological Monitoring and Abatement Program (BMAP) in 1995 and 1996 (Y/ER-251, Y/ER-277) identified concerns regarding Lake Reality's effect on the transport and transformation of mercury in East Fork Poplar Creek (EFPC). The pond appeared to have two potentially adverse effects on mercury transport. First, it acted as a biochemical reactor, converting inorganic mercury in inflowing water to methylmercury, a more toxic substance with extremely high bioaccumulation potential in aquatic environments. Second, the pond appeared to trap mercury associated with suspended particulates during periods of stormflow, and slowly released that mercury via the export of resuspended particles during periods of baseflow. The net effect was to raise the day-to-day exposure of aquatic life to mercury in the stream downstream from the pond, and add to the calculated mercury loading of the stream under baseflow conditions. Scientific investigations thus indicated that diversion of the flow of EFPC around Lake Reality had the potential to reduce time-averaged concentrations of methylmercury and total mercury in the creek below its discharge, but that such diversion might also interfere with possible beneficial effects of the retention pond.

Therefore, an experimental bypass of the pond was undertaken in late 1996 to evaluate the consequences of such an action before embarking on a more permanent change.

785
(Y/ER–301)
Bear Creek Valley Floodplain Hot Spot Removal Action Project Plan, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Oak Ridge Y-12 Plant, TN (United States). Jan 1998. 17p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE98001771. Source: OSTI; NTIS; INIS; GPO Dep.

The Bear Creek Valley Floodplain Hot Spot Removal Action Project Plan, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee (Y/ER-301) was prepared (1) to safely, cost-effectively, and efficiently evaluate the environmental impact of solid material in the two debris areas in the context of industrial land uses (as defined in the Bear Creek Valley Feasibility Study) to support the Engineering Evaluation/Cost Assessment and (2) to evaluate, define, and implement the actions to mitigate these impacts. This work was performed under Work Breakdown Structure 1.x.01.20.01.08.

786
(Y/ER–305)
Phase 2 confirmatory sampling data report, Lower East Fork Poplar Creek, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Oak Ridge Y-12 Plant, TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Jan 1998. [300p.] Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE98003282. Source: OSTI; NTIS; INIS; GPO Dep.

A Remedial Investigation of East Fork Poplar Creek (EFPC) concluded that mercury is the principal contaminant of concern in the EFPC floodplain. The highest concentrations of mercury were found to be in a visually distinct black layer of soil that typically lies 15 to 30 cm (6 to 12 in.) below the surface. Mercury contamination was found to be situated in distinct areas along the floodplain, and generally at depths $>$ 20 cm (8 in.) below the surface. In accordance with Comprehensive, Environmental Response, Compensation, and Liability Act (CERCLA), a feasibility study was prepared to assess alternatives for remediation, and a proposed plan was issued to the public in which a preferred alternative was identified. In response to public input, the plan was modified and US Department of Energy (DOE) issued a Record of Decision in 1995 committing to excavating all soil in the EFPC floodplain exceeding a concentration of 400 parts per million (ppm) of mercury. The Lower East Fork Poplar Creek (LEFPC) remedial action (RA) focuses on the stretch of EFPC flowing from Lake Reality at the Y-12 Plant, through the city of Oak Ridge, to Poplar Creek on the Oak Ridge Reservation (ORR) and its associated floodplain. Specific areas were identified that required remediation at the National Oceanographic and Atmospheric Administration (NOAA) Site along Illinois Avenue and at the Bruner Site along the Oak Ridge Turnpike. The RA was conducted in two separate phases. Phase 2, conducted from February to October 1997, completed the remediation efforts at the NOAA facility and fully remediated the Bruner Site. During both phases, data were collected to show that the remedial efforts performed at the NOAA and Bruner sites were successful in implementing the Record of Decision and had no adverse impact on the creek water quality or the city of Oak Ridge publicly owned treatment works.

787
(Y/ER–306)
Work plan for mercury treatability study in upper east fork Popular Creek at DOE's Y-12 Site in support of the Reduction of Mercury in Plant Effluent program (RMPE). Oak Ridge Y-12 Plant, TN (United States). Feb 1998. 14p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE98004069. Source: OSTI; NTIS; INIS; GPO Dep.

Over the past ten years the Department of Energy Y-12 Site's Reduction of Mercury in Plant Effluents (RMPE) project has carried out an aggressive investigative program of identifying sources of mercury which are influencing the levels of mercury in Upper East Fork Popular Creek (UEFPC) and exiting the site at Station 17. The driver for these activities has been and continues to be the site's National Pollution Discharge Elimination Permit (NPDES). This permit establishes certain remedial actions, the schedule for these actions and requires that the mercury in the creek be equal to or less than 5 grams per day by December 31, 1998 and the concentration in the creek be equal to or less than 0.12 μ grams per liter on the last day of the permit, April 27, 2000.

788
(Y/ER–308)
Work plan for support to Upper East Fork Poplar Creek east end VOC plumes well installation project at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Oak Ridge Y-12 Plant, TN (United States);Science Applications International Corp., Oak Ridge, TN (United States). Mar 1998. 32p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98004691. Source: OSTI; NTIS; INIS; GPO Dep.

Under the Resource Conservation and Recovery Act of 1976 guidelines and requirements from the Tennessee Department of Environment and Conservation (TDEC), the Y-12 Plant initiated investigation and monitoring of various sites within its boundaries in the mid-1980s. The entire Oak Ridge Reservation (ORR) was placed on the National Priorities List of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) sites in November 1989. Following CERCLA guidelines, sites within the ORR require a remedial investigation (RI) to define the nature and extent of contamination, evaluate the risks to public health and the environment, and determine the goals for a feasibility study (FS) or an engineering evaluation/cost analysis (EE/CA) of potential remedial actions. Data from monitoring wells at the east end of the Y-12 Plant have identified an area of groundwater contamination dominated by the volatile organic compound (VOC) carbon tetrachloride; other VOCs include chloroform, tetrachloroethene, and trichloroethene.

789
(Y/ER–310)
Field sampling and analysis plan for the removal action at the former YS-860 Firing Ranges, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Lockheed Martin Energy Systems, Inc., Oak Ridge, TN (United States);ENTECH,

Inc., Oak Ridge, TN (United States). Mar 1998. 28p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98004548. Source: OSTI; NTIS; INIS; GPO Dep.

The former YS-860 Firing Ranges are located at the eastern end of the Oak Ridge Y-12 Plant outside the primary facility fence line and west of Scarboro Road within the Upper East Fork Poplar Creek watershed in Oak Ridge, Tennessee. A decision has been made by the US Department of Energy to conduct a removal action of lead-contaminated soils at this site as part of early source actions within the Upper East Fork Poplar Creek watershed. This non-time critical removal action of bullets and lead-contaminated soil from the YS-860 Firing Ranges is being conducted as a Comprehensive Environmental Response, Compensation, and Liability Act of 1980 action. These actions are consistent with the Oak Ridge Reservation Environmental Restoration Program. The removal action will focus on the excavation of bullets and lead-contaminated soil from the shooting range berms, transportation of the material to a permitted treatment facility for disposal, demolition and land filling of a concrete trench and asphalt pathways at the site, and grading and revegetating of the entire site. This report is the field sampling and analysis plan for the removal action at the former YS-860 Firing Ranges. The field sampling and analysis plan addresses environmental sampling for lead after the removal of lead-contaminated soil from the target berm area. The objective of this sampling plan is to obtain sufficient analytical data to confirm that the removal action excavation has successfully reduced lead levels in soil to below the action level of 1,400 micrograms/g.

790
(Y/ER–311)
Data management implementation plan for the removal action at the former YS-860 Firing Ranges, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Lockheed Martin Energy Systems, Inc., Oak Ridge, TN (United States);ENTECH, Inc., Oak Ridge, TN (United States). Mar 1998. 36p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98004550. Source: OSTI; NTIS; INIS; GPO Dep.

The former YS-860 Firing Ranges are located outside the primary facility fenceline at the Y-12 Plant within the Upper East Fork Poplar Creek watershed. The lead-contaminated soils at this site will be removed as part of early source actions of the Oak Ridge Reservation Environmental Restoration Program. The removal action will focus on the excavation of bullets and lead-contaminated soil from the shooting range berms, transportation of the material to a certified treatment and/or disposal facility, demolition and landfilling of a concrete trench and asphalt pathways, and grading and revegetating of the entire site. The primary purpose of environmental data management is to provide a system for generating and maintaining technically defensible data. To meet current regulatory requirements for the Environmental Restoration Program, complete documentation of the information flow must be established. This necessitates that each step in the data management process (collection, management, storage, and analysis) be adequately planned and documented. This document will serve to identify data management procedures, expected data types and flow, and roles and responsibilities for all data management activities associated with the YS-860 Firing Ranges removal action.

791
(Y/ER–313)
Health and safety plan for the removal action at the former YS-860 Firing Ranges, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Lockheed Martin Energy Systems, Inc., Oak Ridge, TN (United States);ENTECH, Inc., Oak Ridge, TN (United States). 24 Mar 1998. 42p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98004549. Source: OSTI; NTIS; INIS; GPO Dep.

This health and safety plan sets forth the requirements and procedures to protect the personnel involved in the removal action project at the former YS-860 Firing Ranges. This project will be conducted in a manner that ensures the protection of the safety and health of workers, the public, and the environment. The purpose of this removal action is to address lead-contaminated soil and reduce a potential risk to human health and the environment. This site is an operable unit within the Upper East Fork Poplar Creek watershed. The removal action will contribute to early source actions within the watershed. The project will accomplish this through the removal of lead-contaminated soil in the target areas of the two small arms firing ranges. The primary hazards include temperature extremes, equipment operation, noise, potential lead exposure, uneven and slippery working surfaces, and insects.

792
(Y/ER–314)
Quality assurance project plan for the removal action at the former YS-860 Firing Ranges, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Lockheed Martin Energy Systems, Inc., Oak Ridge, TN (United States);ENTECH, Inc., Oak Ridge, TN (United States). Mar 1998. 31p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98004547. Source: OSTI; INIS; NTIS; GPO Dep.

This quality assurance project plan defines project organization and roles of responsibility, sampling and field procedures, sample documentation and chain-of-custody protocols, equipment calibration, analytical procedures, data reduction and validation, and internal quality control procedures for the former YS-860 Firing Ranges removal action at the Oak Ridge Y-12 Plant. The ENTECH Team will maintain the highest standards to ensure strict compliance with this plan. Implementation of this plan will include consideration of the technical, as well as administrative, aspects of activities affecting quality. Plan implementation is based on the premise that quality controls selected for each element of work are consistent with the risk, importance, and health and safety considerations of performing the work. The purpose of this removal action is to address lead-contaminated soil and reduce a potential risk to human health and the environment. This site is an operable unit within the Upper East Fork Poplar Creek watershed. The removal action will contribute to early source actions within the watershed. The project will accomplish this through the removal of lead-contaminated soil in the target areas of two small arms firing ranges. This plan covers the removal action at the former

YS-86O Firing Ranges. These actions involve the excavation of lead-contaminated soils, the removal of the concrete trench and macadam (asphalt) paths, verification sampling, grading, and revegetation.

793
(Y/ER–315)
Waste management plan for the removal action at the former YS-860 Firing Ranges, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Lockheed Martin Energy Systems, Inc., Oak Ridge, TN (United States);ENTECH, Inc., Oak Ridge, TN (United States). Mar 1998. 24p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98004546. Source: OSTI; INIS; NTIS; GPO Dep.

This waste management plan defines the procedures for control and management of waste generated as a result of the removal action of the YS-86O Firing Ranges site at the Oak Ridge Y-12 Plant. This document includes plan objectives; remediation activities; key personnel; waste generation activities; and waste treatment, storage, transportation, and disposal. Methods of control and characterization of waste generated as a result of remediation activities will be within the guidelines and procedures outlined herein. ENTECH personnel will make every effort when conducting remediation and decontamination activities to minimize the amount of generated waste.

794
(Y/ER–316)
Reduction of mercury in plant effluents data management implementation plan, FY 1998, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Fischer, K.N.; Forsberg, V.M. Lockheed Martin Energy Systems, Inc., Oak Ridge, TN (United States). 26 Mar 1998. 110p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States);USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE98004552. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Data Management Implementation Plan (DMIP) is to document the requirements and responsibilities for managing, using, and archiving data used for the Reduction of Mercury in Plant Effluents (RMPE) project. The DMIP was created for the RMPE project in accordance with the guidance given in Environmental Data Management Implementation Handbook for the Environmental Restoration Program (ES/ER/TM- 88/R 1) and in “Developing, implementing, and Maintaining Data Management Implementation Plans” (EMEF/ER-P2216, Rev. 0). This document reflects the state of the RMPE project and the types of environmental monitoring planned as they existed through March 16, 1998. The scope of this document is the management of the RMPE project’s environmental information, which includes electronic or hard copy records describing environmental processes or conditions. The RMPE program was established as a best management practice to address sources in the Y-12 Plant that contribute mercury to plant effluents being discharged to Upper East Fork Poplar Creek. The strategy is multifaceted: reroute clean water through clean conduits; clean, reline, and/or replace mercury-contaminated water conduits; eliminate or reduce accumulations of mercury in tanks and sumps; isolate inaccessible mercury from contact with water; and install treatment capability for streams where the source(s) cannot be eliminated or mitigated to acceptable levels. The RMPE project database consists of data from surface water monitoring and sediment sampling at locations of interest within the Y-12 Plant. This DMIP describes the types and sources of RMPE data, other data systems relevant to the RMPE project, the different data management interactions and flow of information involved in processing RMPE data, and the systems used in data management.

795
(Y/ER–318)
Bear Creek Valley Floodplain hot spot removal early action characterization field data summary report, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Oak Ridge Y-12 Plant, TN (United States);ENTECH, Inc., Oak Ridge, TN (United States). Apr 1998. 393p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-98OR22700. Order Number DE98004590. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the field and laboratory efforts as a result of the Bear Creek Floodplain Hot Spot Removal Project Early Action. The purpose of this project was to collect data necessary to assess contaminant levels in the Bear Creek Valley Floodplain and evaluate the risk posed by the sites. This report provides information on the background of the site, characterization of site and field activities, results of field and laboratory data collected, extent and distribution of contamination, and an assessment of the future risk posed by the site.

796
(Y/ER–319)
Postremediation monitoring program baseline assessment report, Lower East Fork Poplar Creek, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Greeley, M.S. Jr. (Oak Ridge National Lab., TN (United States)); Ashwood, T.L.; Kszos, L.A.; Peterson, M.J.; Rash, C.D.; Southworth, G.R.; Phipps, T.L. Oak Ridge Y-12 Plant, TN (United States). Apr 1998. 38p. Sponsored by USDOE Office of Financial Management and Controller, Washington, DC (United States);USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-98OR22700. Order Number DE98004587. Source: OSTI; NTIS; INIS; GPO Dep.

Lower East Fork Poplar Creek (LEFPC) and its floodplain are contaminated with mercury (Hg) from ongoing and historical releases from the US Department of Energy (DOE) Oak Ridge Y-12 Plant. A remedial investigation and feasibility study of LEFPC resulted in the signing of a Record of Decision (ROD) in August 1995. In response to the ROD, soil contaminated with mercury above 400 mg/kg was removed from two sites in LEFPC and the floodplain during a recently completed remedial action (RA). The Postremediation Monitoring Program (PMP) outlined in the LEFPC Monitoring Plan was envisioned to occur in two phases: (1) a baseline assessment prior to remediation and (2) postremediation monitoring. The current report summarizes the results of the baseline assessment of soil, water, biota, and groundwater usage in LEFPC and its floodplain conducted in 1995 and 1996 by personnel of the Oak Ridge National Laboratory Biological Monitoring and Abatement Program (BMAP). This report also includes some 1997 data from contaminated sites that did not undergo remediation during the RA (i.e., sites where mercury is greater than 200 mg/kg

but less than 400 mg/kg). The baseline assessment described in this document is distinct and separate from both the remedial investigation/feasibility study the confirmatory sampling conducted by SAIC during the RA. The purpose of the current assessment was to provide preremediation baseline data for the LEFPC PMP outlined in the LEFPC Monitoring Plan, using common approaches and techniques, as specified in that plan.

797
(Y/ER/MS–11-Rev.1)
Best management practices and work plan for installation of and monitoring at temporary weirs and flumes at NT-3, NT-4, and NT-5 Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. Oak Ridge Y-12 Plant, TN (United States). Feb 1998. 12p. Sponsored by USDOE Office of Environmental Management, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE98004148. Source: OSTI; NTIS; INIS; GPO Dep.

This Best Management Practices (BMP) and Work Plan has been developed in order to maintain compliance with applicable regulatory requirements by documenting the practices that are required during the installation and maintenance of temporary weirs and flumes at the NT-3, NT-4, and NT-5 tributaries, subsequent collection of water discharge data, and removal of the weirs and flumes. The practices included in this BMP comply with the Clean Water Act and the intent of Sect. 70-8-104(b) of the Tennessee Code Annotated: Tennessee Wildlife Resources Commission Proclamation 94-16 to prevent the destruction of the habitat of state-listed wildlife species that are designated as “in need of management.”

Corporate Author Index

This index lists the corporate authors responsible for issuing the documents in this publication which are identified primarily by report number. The corporate names are entered in standardized forms as defined in ETDE/PUB–3 (Rev.1), *International Energy: Research Organizations 1988–1992.* Each entry under a corporate name includes the document title and citation number. Three items of information may appear in parentheses: (1) an abbreviation to identify the document type, such as a report; (2) the country of publication, indicated by International Organization for Standardization (ISO) country code; and (3) the language of the document if non-English (R;CA;In French). Author affiliations are not listed in this index.

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Mechanical Technology, Inc., Latham, NY (United States)
Interactive Computer-Enhanced Remote Viewing System (ICERVS): Final report, November 1994–September 1996, 98:208 (R;US)

Medical Univ. of South Carolina, Charleston, SC (United States)
Environmental hazards assessment program. Quarterly report (extended quarter), April 1997–September 1997, 98:176 (R;US)
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Molten Metal Technology, Inc., Waltham, MA (United States)
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New Jersey Public Utilities Board, Newark, NJ (United States)
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Southwestern Indian Polytechnic Inst., Albuquerque, NM (United States)
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STEP, Inc., Oak Ridge, TN (United States)
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Tribal College Initiative Program Office (United States)
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Univ. of North Dakota Energy and Environmental Research Center, Grand Forks (United States)
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EM Task 12 – Laser cleaning of contaminated painted surfaces. Semi-annual report, April 1–September 30, 1997, 98:232 (R;US)
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USDOE Idaho Operations Office, Office of Environmental Management, Idaho Falls, ID (United States)
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USDOE Office of Environmental Management, Subsurface Contaminants Focus Area, Washington, DC (United States)
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USDOE Office of Environmental Management, Washington, DC (United States)
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