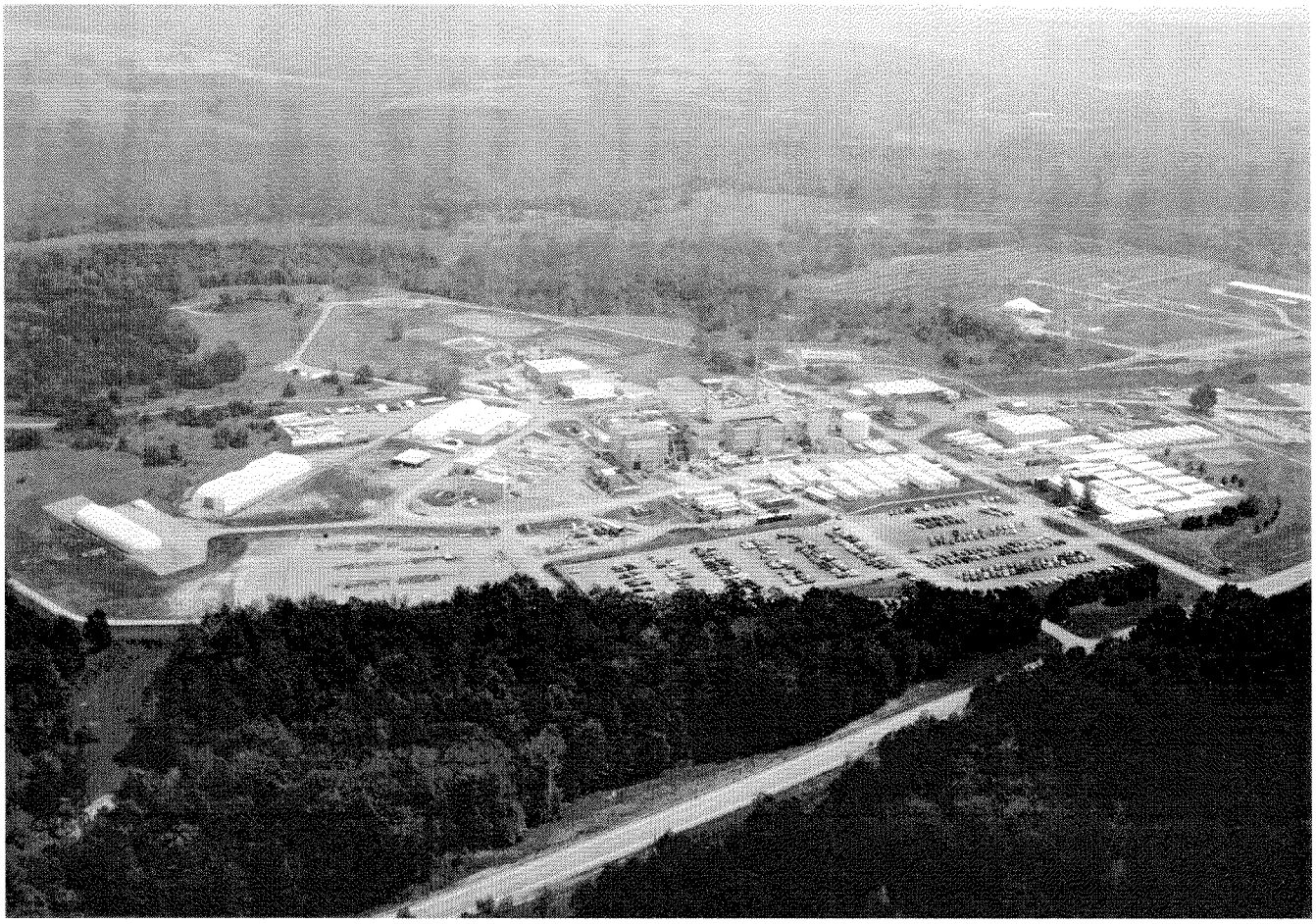

The West Valley Demonstration Project

EXECUTIVE SUMMARY

The West Valley Demonstration Project (WVDP) monitors the environment on and around its facilities to fulfill federal and state requirements. The results of this program show that during the course of activities at the WVDP, public health, safety, and the environment are being protected.

This annual report summarizes the environmental monitoring data collected during 1993. On-site and off-site radiological and nonradiological monitoring in 1993 confirm that site activities, with only one exception, were conducted well within state and federal regulatory limits. (A description of regulatory issues is found in the *Environmental Compliance Summary: Calendar Year 1993*.) The exception, which involved a single pH value at the sanitary and utility wastewater outfall, resulted in no significant effects upon public health or the environment.

The West Valley Demonstration Project is operated under contract to the U.S. Department of Energy by the West Valley Nuclear Services Company, Inc. (WVNS), a subsidiary of Westinghouse Electric Corporation.

The purpose of the West Valley Demonstration Project is to solidify the high-level radioactive waste left at the site from the original nuclear fuel reprocessing activities, develop suitable containers for holding and transporting the solidified waste, arrange transport of the solidified waste to a federal repository, dispose of any Project low-level and transuranic waste resulting from the solidification of high-level waste, and decontaminate and decommission the Project facilities.

The high-level waste was contained in underground storage tanks and had settled into two layers — liquid supernatant and a precipitate sludge. The integrated radwaste treatment system (IRTS), operating through 1990, stripped radioactivity from the liquid supernatant, allowing the major portion of the liquid to be treated as low-level waste. The resulting low-level treated liquid waste was solidified in drums of a special cement mixture and stored on-site in an engineered aboveground vault.

The next step in the process, washing the remaining sludge with water to remove soluble constituents, has continued through 1993. (See *Chapter 1, Environmental Monitoring Program Information*, for a more detailed description.) Approximately 192,600 gallons of water used to wash the sludge were processed, and more than 3,600 drums of cemented low-level waste were

produced and stored on-site in 1993. The final step will be vitrification of the remaining high-level waste residues, currently scheduled to start in 1996.

Compliance

The West Valley Demonstration Project operates under Department of Energy (DOE) guidelines for radiation protection of the public and the environment. Limits on radioactivity concentrations and exposures to radiation are specified in DOE Orders. The Project did not exceed or approach any of the limits on radioactivity or radiation doses in 1993, including the emission standards promulgated by the U.S. Environmental Protection Agency (EPA) and incorporated in DOE Orders.

Nonradiological plant effluents are regulated by the New York State Department of Environmental Conservation (NYSDEC) and the EPA. Surface effluent water quality, regulated by NYSDEC, is tested for pH, biochemical oxygen demand, and other chemical constituents under a State Pollutant Discharge Elimination System (SPDES) permit, which identifies discharge water quality limits.

One SPDES permit limit was exceeded in 1993, at outfall 007, after an automatic control valve shut off the flow from the outfall because of an elevated pH in the upstream fluid. About 150 gallons of water above a pH of 9.0, trapped in the valved piping, was released when normal flow was resumed. Appropriate actions were taken to notify NYSDEC in accordance with permit requirements and to modify the piping to prevent a recurrence. This deviation resulted in no significant effect on the environment.

Effects of Project activities upon site groundwaters are regulated by NYSDEC and the EPA. Groundwater sampling and analyses confirm that on-site groundwater quality has been and continues to be affected both radiologically and nonradiologically by past facility operations. Evaluation of well sampling results for 1993 has started to clearly define some of these effects. Although radiological and nonradiological constituents are being detected in localized, on-site groundwaters, these do not affect public health or the off-site environment.

In 1993 the WVDP continued the actions that were required by a RCRA 3008 (h) Administrative Order on Consent agreed to by the EPA, NYSDEC, the DOE, and the New York State Energy Research and Development Authority (NYSERDA) in 1992. This agreement specifies the measures that must be taken to determine information about hazardous wastes or constituents that may have the potential for release to the environment from identified solid waste management units.

The WVDP continued to operate under the 1993 Federal and State Facility Compliance Agreement (FSFCA) that addresses radioactive mixed waste management issues. (See the *Environmental Compliance Summary*.)

Effluent and Environmental Monitoring Program

In 1993 the WVDP environmental monitoring program measured and evaluated radiological and nonradiological site effluents and related on-site and off-site samples. Air and surface water samples were collected to monitor the two major pathways by which radioactive material could migrate off-site.

Testing of animal, soil, and vegetation samples from the area surrounding the Project provided data to calculate the risk of exposure to radioactivity through eating, drinking, or breathing the air. Control (background) samples were also taken to compare with on- or near-site samples.

Air Pathway Monitoring

Airborne particulate radioactivity was sampled continuously at six WNYNSC perimeter locations and four remote locations during 1993. In mid-1993 one perimeter and three remote samplers were added to run in parallel with existing equipment, but in locations with more open space. Comparisons between parallel samplers will show if there are any sampling differences due to nearby trees or buildings. (See *Chapter 2, Environmental Monitoring*.) Sample filters were collected weekly; samples were analyzed weekly for gross alpha and gross beta radioactivity and quarterly for other isotopes. Airborne gross radioactivity around the site boundary was, in all cases, indistinguishable from background concentrations measured at the remote locations.

Direct monitoring of airborne effluents at the main plant stack and other permitted release points showed all discharges to be well below DOE and EPA effluent limitations.

Surface Water Pathway Monitoring

Automatic samplers collected surface water at six locations along site drainage channels. Samples were analyzed for gross alpha, gross beta, and gamma activity, and for tritium and strontium-90. Analyses for carbon-14, iodine-129, uranium and plutonium isotopes, and americium-241 are also program requirements at several collection points.

As a result of past site activities and continuing releases of treated liquids, gross radioactivity concentrations remained slightly higher in Buttermilk Creek below the West Valley Project site than at the upstream background sample point. However, yearly average concentrations in water below the Project site in Cattaraugus Creek during 1993 were indistinguishable from background concentrations measured in Buttermilk Creek upstream of the Project facilities. All Cattaraugus Creek concentrations observed were well below regulatory limits. Concentrations of cesium-137 and other gamma emitters, strontium-90 and other beta emitters, uranium and plutonium isotopes, and tritium were below DOE guidelines at all sampling locations, including Frank's Creek downstream of the Project at the inner site security fence, which is more than 3 miles upstream of Cattaraugus Creek.

The low-level liquid waste treatment facility (LLWTF) contributes most of the activity released from the site in liquid discharges. The 1993 annual average liquid effluent concentrations of radionuclides were below DOE release guidelines at the point of discharge.

Food Pathway Monitoring

Radioactivity that could pass through the food chain was measured by sampling milk, beef, hay, corn, apples, beans, fish, and venison. Marginally detectable differences in strontium-90 between two sets of near-site and background beef or milk samples were found, and potential doses were calculated to be 0.05% of the DOE limit. There also was a detectable difference in hay samples, but these samples were from a location different than the milk or beef samples.

Direct Environmental Radiation Monitoring

Direct environmental radiation was measured continuously during each calendar quarter in 1993 using thermoluminescent dosimeters (TLDs) placed at forty-one locations around the WNYNSC perimeter, along the site access road, at points around the Project site, and at various background locations. No real differences could be found between exposure rates measured at background stations and those at the WNYNSC perimeter locations. TLD measurements also were taken inside the restricted area boundary and reflect low-level radiation from nearby radioactive waste handling and storage facilities.

Nonradiological Monitoring

Nonradiological discharges from the site are regulated by NYSDEC; however, no special monitoring and reporting of nonradiological airborne effluents is required.

Nonradiological liquid discharges to an on-site stream from three permitted release points (outfalls) are monitored as required by the State Pollutant Discharge Elimination System permit. Project effluents are monitored for biochemical oxygen demand, suspended solids, ammonia, iron, pH, oil and grease, and other water quality indicators. Although there was one brief pH excursion in 1993, as noted above, monitoring indicated that nonradiological liquid discharges had no observed effect on the off-site environment.

Groundwater Monitoring

The WVDP is directly underlain by layers of unconsolidated sediments ranging from coarse gravels to fine clays. Permeabilities of these sediments are largely a function of grain sizes, with higher permeabilities reflected in coarser sediments. The targets of groundwater monitoring are those units with relatively higher groundwater velocities that are thus potential pathways for contaminant migration.

The 1993 monitoring well network included both on-site wells for surveillance of solid waste management units and off-site wells to monitor drinking water. The 1993 on-site groundwater monitoring network included 108 groundwater monitoring locations. (See Fig. 3-3 in *Chapter 3, Groundwater Monitoring*.)

The wells provided upgradient and downgradient monitoring of the low-level liquid waste treatment facility (LLWTF) lagoons, the high-level waste tank complex, the Nuclear Regulatory Commission (NRC)-licensed disposal area (NDA), and other solid waste management units. Wells in the groundwater monitoring network were each sampled six times during 1993. The range of analyses performed was determined by technical regulatory guidelines and site-specific characterization needs.

Monitoring well data is grouped by hydrogeologic unit. Data from groundwater monitoring of the sand and gravel unit around the LLWTF lagoons indicate that radionuclides from past plant operations have affected groundwater quality. Compared to background, both tritium and gross beta concentrations in groundwater surrounding the lagoon system are elevated; however, the level of tritium contamination has declined steadily since 1982, as indicated by measurements at the french drain outfall WNSP008. Gross beta activity, which previously had increased, leveled off or declined in 1993 at the sand and gravel LLWTF monitoring points WNSP008 and WNW8605. Gross beta activity continued to increase in sand and gravel monitoring wells WNW8604 and WNW0104 in 1993. Gross beta activity at well WNW0111 continued to be elevated in 1993.

Monitoring data from around the high-level waste tanks do not suggest any effect of the stored high-level radioactive waste on the groundwater. However, significant radiological differences between upgradient and downgradient wells do indicate that previous site activities have affected groundwater in this area. Most notable are elevated levels of gross beta in sand and gravel wells WNW0408, WNW0501, and WNW0502, which are downgradient of the main process plant facilities.

One of the streams originating in a swampy area on the Project premises was found in late 1993 to have increasing gross beta radioactivity. Upon investigation, a small groundwater seep was discovered that appeared to be a major contributor of strontium-90 to this drainage path. A plan is being developed to characterize the source of this

seep, its effect on surface water quality, and to provide mitigative action, if necessary.

Other measured parameters such as pH and conductivity have shown significant differences between upgradient and downgradient hydrogeologic unit locations. Downgradient sand and gravel well WNW0103 continued to demonstrate high sodium and hydroxide ion levels in 1993 samples. This well is located in the vicinity of a spill of sodium hydroxide solution that occurred because of a transfer pipe failure in 1984. Downgradient till-sand well WNW0202 also shows an elevated pH. This higher pH is of unknown origin.

Tributyl phosphate was detected in well WNW8605 in 1993. Radioactive contaminants have historically been present in this well. The detection of tributyl phosphate probably indicates migration of contaminants related to wastes generated by the NFS solvent extraction process.

Detectable concentrations of 1,1-dichloroethane at well WNW8612 continued to be found in 1993. Marginal detections of 1,1,1-trichloroethane at WNGSEEP and 1,1-dichloroethane at WNW8609 continued into 1993, maintaining downward trends observed at both locations since 1992. Difluoromethane was detected at wells WNW8612 and WNW0803 during the latter half of 1992 and in diminishing concentrations during 1993.

Groundwater monitoring around the NDA indicates no discernible effects on the deeper unweathered Lavery till deposits in the area, as indicated primarily by measurements for tritium. However, one shallow well (well WNW1107A in the weathered Lavery till) in the vicinity of the New York State-licensed disposal area (SDA), for which NYSERDA is responsible, has shown elevated tritium levels. Other SDA and NDA wells in the shallow hydrogeologic units have shown detectable tritium. Elevated tritium has not been observed in the monitoring wells in the deeper Kent recessional sequence.

Ongoing environmental characterization and facility investigations are being used to assess the groundwater in greater detail.

A control and remediation effort within the NDA included installation in 1990 of a gravel-backfilled interceptor trench downgradient of known tributyl phosphate- and n-dodecane-contaminated soils. As in previous years, no solvent was found in the water collected from this interceptor trench in 1993.

In addition to the on-site monitoring, the potential effect of Project activities on off-site groundwater is monitored by annual sampling of designated private drinking water wells. Monitoring of these wells continues to demonstrate that the site has had no effect on residential drinking water supplies in the vicinity.

Radiological Dose Assessment

Potential radiation doses to the public from airborne and liquid effluent releases of radioactivity from the site during 1993 were estimated using computer models.

The EPA-approved computer program CAP88-PC was used to calculate potential radiation doses from airborne effluents. A conservative total release value for each effluent point was used to prepare the annual National Emission Standards for Hazardous Air Pollutants (NESHAP) emission report to the EPA. Using these values, the highest annual effective dose equivalent (EDE) to a nearby resident was estimated to be 2.0E-04 mrem, which is 0.002% of the 10 mrem EPA standard. The collective dose to all persons within an 80-kilometer (50-mi) radius was estimated to be 2.7E-03 person-rem effective dose equivalent. A more realistic calculation of effluent release values was used in this site environmental report (*Chapter 4, Radiological Dose Assessment*), resulting in a maximum EDE of

1.6E-04 mrem to a nearby resident and a collective dose of 1.9E-03 person-rem to the population from the permitted stacks.

The highest individual calculated EDE for liquid effluents was 3.3E-02 mrem (3.3E-04 mSv), with an annual EDE to the population within 80 kilometers (50 mi) estimated to be 6.8E-02 person-rem (6.8E-04 person-Sv).

The total calculated dose estimates from 1993 Project effluents result in a maximum EDE to an individual of 3.3E-02 mrem (3.3E-04 mSv), which is 0.03% of the 100 mrem DOE limit. Overall, the annual EDE from air and liquid discharges to people within an 80-kilometer (50-mi) radius of the site was calculated to be 7.0E-02 person-rem (7.0E-04 person-Sv).

Concentrations of radionuclides in locally produced foods are at marginally detectable levels above or are statistically indistinguishable from background concentrations.

The potential calculated doses presented above should be considered in relation to an average dose of 300 mrem per year to a U.S. resident from natural background radiation. The dose assessment described in *Chapter 4, Radiological Dose Assessment*, predicts an insignificant effect on the public's health as a result of radiological releases from the WVDP.

Quality Assurance

The environmental monitoring quality assurance (QA) program includes provisions for evaluating and controlling data generated from both on-site and off-site measurements. Both on-site and off-site laboratories and their internal quality assurance programs are routinely reviewed by site personnel. In addition, commercial laboratories must satisfactorily perform blind analyses of standard or duplicate samples submitted by the WVDP Environmental Laboratory.

WVDP monitoring activities are subject to quality control checks from the time of sample collection through sample analysis and data reduction. Each analytical test of the samples analyzed in the on-site environmental laboratory is reviewed in detail. Specific quality checks include external review of sampling procedures, accurate calibrations using primary standard materials, participation in formal laboratory crosscheck programs (for example, with the EPA and the DOE), and appraisals by independent organizations that include the New York State Department of Health (NYSDOH), the U.S. Nuclear Regulatory Commission (NRC), the DOE, and Westinghouse Electric Corporation.

Environmental sample sharing and co-location of measurement points with NYSDOH and the NRC continued in 1993, ensuring that selected samples and locations were routinely measured by two or more independent organizations.

Participation in crosscheck programs, coupled with other internal quality control procedures and external laboratory checks, verified the quality of data gathered in 1993. General program adequacy and specific issues of quality assurance were audited by the WVNS quality assurance department in 1993. Quarterly self-assessments, conducted by an independent team of environmental monitoring staff, identified areas needing improvement and tracked the actions taken. (See *Chapter 5, Quality Assurance.*)

The major auditing activities in 1993 were a visit by a NYSDEC groundwater evaluation team in June and an NRC review team in November. Overall, the environmental monitoring program was found to be of high quality. (See the *Environmental Compliance Summary: Calendar Year 1993* for a more complete discussion.)