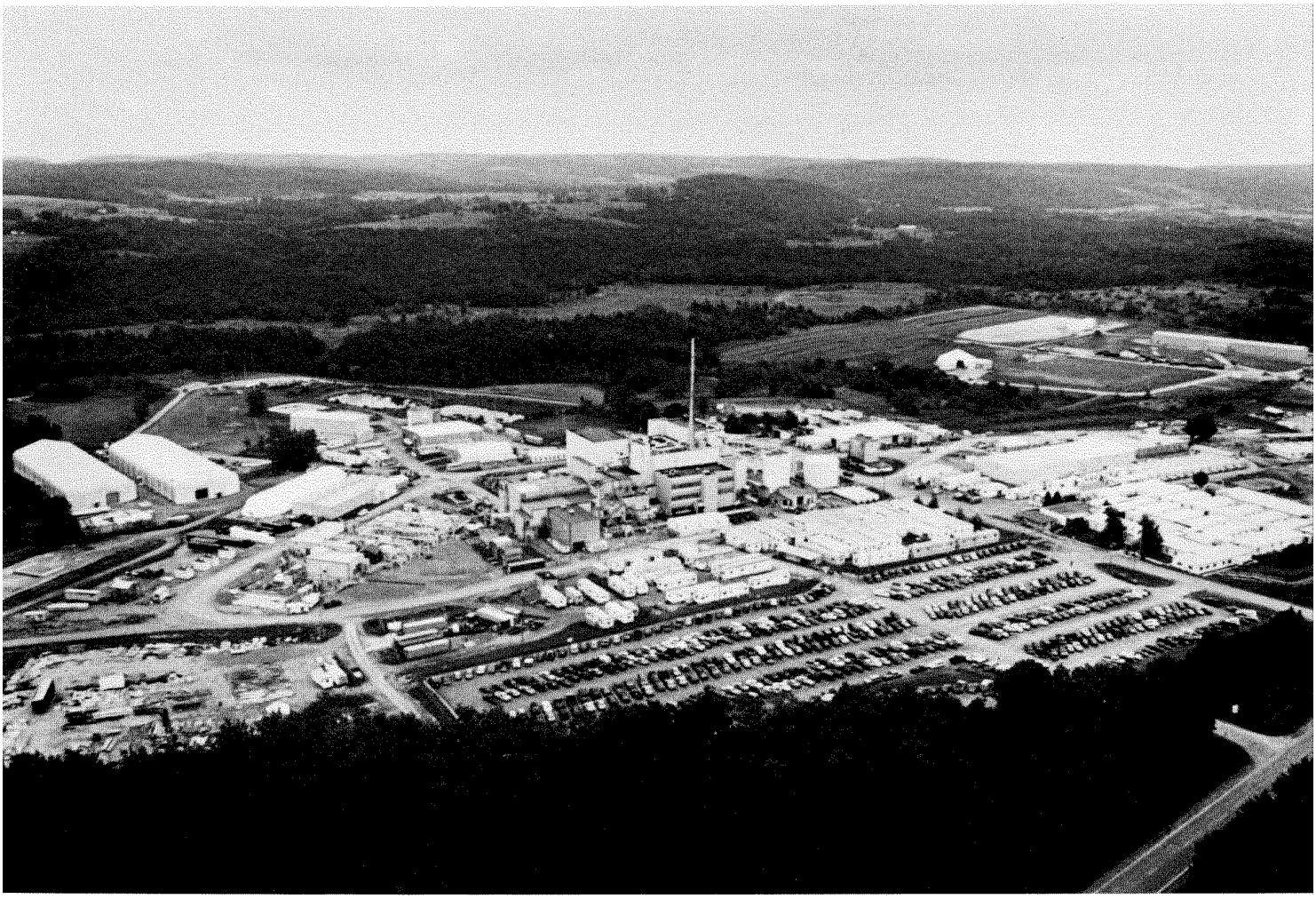

The West Valley Demonstration Project

EXECUTIVE SUMMARY

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

This annual report summarizes the environmental monitoring data collected during calendar year 1994. On-site and off-site radiological monitoring in 1994 confirmed that site activities were conducted well within state and federal regulatory limits. (A description of regulatory issues is found in the *Environmental Compliance Summary: Calendar Year 1994.*) Although nonradiological monitoring carried out in 1994 identified several exceedances of the site's water effluent permit, none of these resulted in adverse effects upon public health or the environment.

The monitoring activities described in this report support the primary Project mission to solidify the high-level radioactive waste left at the site from the original nuclear fuel reprocessing activities.

An important step toward final solidification of the high-level waste, initiated in late 1994 and completed in January 1995, was to combine two of the high-level waste streams in one underground storage tank. The final step, vitrification of the high-level waste residues, currently is scheduled to start in 1996. More site information is detailed in *Chapter 1, Environmental Monitoring Program Information.*

Compliance

The WVDP operates under U.S. Department of Energy (DOE) requirements 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 1994, 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 (BOD), and other chemical constituents under a State Pol-

lutant Discharge Elimination System (SPDES) permit, which identifies discharge water quality limits.

The site's SPDES permit limits were exceeded several times in 1994. In April and September the BOD limit was exceeded at outfall 001 as a result of the growth of algae in lagoon 3. In November, also at outfall 001, the level of total suspended solids slightly exceeded its permit limit due to the wind resuspending sediments in lagoon 3. Methods being examined to help reduce solids and BOD discharges include filtration and addition of hydrogen peroxide. Samples of discharges from outfall 001 in May showed pH values both above and below the permitted range. New pH monitoring equipment at outfall 001 has been installed to assist the site in meeting the more stringent pH limits received from NYSDEC in 1994 when the Project's SPDES permit was renewed. BOD exceedances at the wastewater treatment plant outfall (007) in April have been addressed through enhanced preventive maintenance of the site cafeteria grease trap and equipment in the wastewater treatment plant.

In all cases, appropriate actions were taken to notify NYSDEC in accordance with permit requirements and to keep the agency apprised of ongoing efforts to prevent recurrence. None of these exceedances resulted in notices of violation being issued by NYSDEC. In no case did any exceedance result in any significant effect on public health or the environment. (See the *Environmental Compliance Summary: Calendar Year 1994* for a more detailed description.)

Groundwater quality is 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 1994 continues to define some of these effects. Although radiological and nonradiological constituents are being detected in localized, on-site surface and groundwaters, these do not affect public health or the off-site environment.

In 1994 the WVDP continued the actions that were required by a RCRA 3008 (h) Administrative Order on Consent. This agreement, made in 1992 between the EPA, NYSDEC, the DOE, and the New York State Energy Research and Development Authority (NYSERDA), specifies the measures that must be taken to provide information about hazardous wastes or constituents that may have the potential for release to the environment from identified solid waste management units (SWMUs). As required by the Consent Order, a RCRA Facility Investigation (RFI) Work Plan (West Valley Nuclear Services Co., Inc. December 1993) was developed to be used in gathering this information. In 1994 all field work associated with this work plan was completed.

The WVDP continued to operate under and comply with a 1994 Federal and State Facility Compliance Agreement that addresses radioactive mixed waste management issues. A draft site treatment plan also related to mixed waste management was developed and submitted to NYSDEC in 1994, as required by the Federal Facility Compliance Act. (See the *Environmental Compliance Summary*.)

Waste minimization and pollution prevention initiatives continued to be aggressively pursued in 1994. Compared to 1993 waste-generation rates, the generation of low-level radioactive waste was reduced by 29% and radioactive mixed waste by 62%.

Preparation of the draft environmental impact statement for Project completion by the DOE and closure or long-term management of facilities at the Western New York Nuclear Service Center (WNYNSC) by NYSERDA continued in 1994. Six alternatives for closure have been developed and are being evaluated.

Effluent and Environmental Monitoring Program

In 1994 radiological and nonradiological site effluents and related on-site and off-site samples were measured and evaluated. 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 1994. (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 1994 were indistinguishable from background concentrations measured in Buttermilk Creek upstream of the Project facilities. All Cattaraugus Creek concentrations observed were well below DOE regulatory guidelines (derived concentration guides [DCGs]). Concentrations of cesium-137 and other gamma emitters, strontium-90 and other beta emitters, tritium, and uranium and plutonium isotopes were below DOE DCGs at all surface water sampling locations, including Frank's Creek downstream of the Project at the inner site security fence, which is more than 4.8 kilometers (3 mi) 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 1994 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. With the exception of strontium-90 from bottom-feeding fish from above the Springville dam, no statistically significant differences in radionuclide concentrations between background (control) samples and near-site samples were measured in any of these media. (See *Chapter 4, Radiological Dose Assessment.*)

Direct Environmental Radiation Monitoring

Direct environmental radiation was measured continuously during each calendar quarter in 1994 using thermoluminescent dosimeters (TLDs) placed at forty-three 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.

Small Mammal Study

In 1994 a special study was conducted to determine the significance of uncontrolled small mammal activity on-site as a mechanism for the transport of radioactivity. The study suggests that potential contaminant transport by small mammals is localized in restricted facility areas. Transport was not observed in radioactive waste management or disposal areas.

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 SPDES permit. Project effluents are monitored for BOD, suspended solids, ammonia, iron, pH, oil and grease, and other water quality indicators. Although the SPDES permit limits were exceeded several times in 1994, as noted above, monitoring and observation downstream indicated that nonradiological liquid discharges had no observed effects 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 saturated units with relatively higher groundwater velocities that are thus potential pathways for contaminant migration.

The 1994 monitoring well network included both on-site wells for surveillance of SWMUs and off-site wells to monitor drinking water. The 1994 on-site groundwater monitoring network included ninety-one Project-related groundwater monitoring locations. (See Fig. 3-3 in *Chapter 3, Groundwater Monitoring.*) Although an additional twenty-one wells located around the New York State-licensed disposal area (SDA) are monitored separately by NYSERDA, data from those wells are also included in this report. (See *Appendix F.*)

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 SWMUs. Wells in the groundwater monitoring network were each sampled four times during 1994. The range of analyses performed was determined by technical regulatory guidelines and site-specific characterization needs.

Monitoring well data are 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 had increased previously, leveled off or declined in 1994 at the sand and gravel LLWTF monitoring points WNSP008 and 8605. Gross beta activity at well 111 continued to be elevated in 1994. (See **Groundwater Monitoring Results** in *Chapter 3, Groundwater Monitoring*.)

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 408, 501, and 502, which are downgradient of the main process plant facilities. Gross beta activity in 1994 at well 408 reached an historic high.

In all, there are nine wells on-site that exhibit elevated gross beta levels above a concentration of 1E-06 μCi/mL. This concentration corresponds to the Department of Energy DCG for an annual average strontium-90 surface discharge and is presented for comparison only. Strontium-90 has been identified as the primary contributor to gross beta activity in groundwater on-site and therefore is used as the limiting beta-emitting isotope. See *Appendix B*, Table B-1.

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 examination, a small seasonal groundwater seep was discovered that appeared to be a major contributor of strontium-90 to this drainage path. An investigation was initiated to characterize the source of this seep, its effect on surface water quality, and to provide information for mitigative action, if deemed necessary. Groundwater and soil beneath and downgradient of the process building were sampled between July 14, 1994 and October 19, 1994. During this investigation groundwater was collected from eighty locations, and soil samples were collected from four locations. The groundwater and soil samples were collected with the Geoprobe®, a mobile, van-mounted sampling system designed to sample groundwater and/or soil at two-foot depth intervals.

Preliminary groundwater sampling results indicate that a narrow, elliptically shaped plume of elevated gross beta activity, extending northeastward from the south end of the process building to the construction and demolition debris landfill, is present in groundwater from the sand and gravel unit. The plume is approximately 300 feet in width and 800 feet in length. The highest gross beta activities in groundwater and soil were measured at two locations near the south end of the process building, reaching a maximum concentration of 3.6E-03 μCi/mL and 2.4E-02 μCi/g, respectively. Isotopic characterization of the groundwater and soil suggests that strontium-90 and its daughter product, yttrium-90, contribute most of the gross beta activity in groundwater and soil beneath and downgradient of the process building. At this time the primary source of contamination appears to be an area in the southwest corner of the process building associated with acid recovery operations conducted by the previous site operator, Nuclear Fuel Services, Inc. (NFS), prior to any WVDP activities. A final report describing the principal findings of the investigation, including potential sources, is scheduled to be completed in May 1995.

In the meantime, steps are being taken to remove strontium-90 from the groundwater flow path, if it should become necessary. A mobile ion-exchange treatment system for surface water was permitted by NYSDEC in 1994. In addition, preparations are under way to mitigate strontium-90 movement near the leading edge of the plume.

Elsewhere, other measured parameters such as pH and conductivity have shown significant differences between upgradient and downgradient hydrogeologic unit locations. Downgradient sand

and gravel well 103 continued to demonstrate high pH, sodium, and hydroxide ion levels in 1994 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 202 also shows an elevated pH. Recent data suggest that high pH in this well is an artifact of well construction rather than historical waste management unit releases or spills.

Organic contaminants were identified in groundwater in the vicinity of three super solid waste management units (SSWMUs). Tributyl phosphate, detected in the vicinity of the low-level waste treatment facility (SSWMU #1), is probably related to the migration of wastes generated by the NFS solvent extraction process. Radioactive contaminants have historically been present in the same area. Three chlorinated organic compounds were detected in the vicinity of the construction and demolition debris landfill (SSWMU #8) and near the high-level waste storage and processing area (SSWMU #4). Refer to **Results of Sampling for Groundwater Quality Parameters** in *Chapter 3, Groundwater Monitoring*, for a more detailed explanation.

Tritium has been detected in wells in the near-surface weathered Lavery till in the vicinity of the SDA and the NDA. Elevated tritium has not been observed in the monitoring wells in the deeper Kent recessional sequence, supporting the expectation that this geologic unit acts as a barrier.

Ongoing environmental characterization and RCRA facility investigations are being used to assess the groundwater in greater detail. (See *Chapter 3, Groundwater Monitoring.*)

A control and remediation effort within the NDA included installation in 1990 of a gravel-backfilled interceptor trench downgradient of soils known to be contaminated by tributyl phosphate and n-dodecane. As in previous years, no solvent was found in the water collected from this interceptor trench in 1994.

In addition to 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. In addition, on-site groundwaters flowing to the surface with above-background levels of radioactivity are quickly diluted by natural stream flow so that levels of radioactivity, as seen in Cattaraugus Creek at the first point of public access, continue to be at or below background levels.

Radiological Dose Assessment

Potential radiation doses to the public from airborne and liquid effluent releases of radioactivity from the site during 1994 were estimated using computer models.

The EPA-approved computer program CAP88-PC was used to calculate potential radiation doses from airborne discharges from the permanent stacks. These potential doses are measured in millirems or millisieverts and express a combination of organ and tissue doses into a single "effective" whole body dose. (See **Units of Measure** in *Chapter 4, Radiological Dose Assessment.*) The highest annual effective dose equivalent (EDE) to a nearby resident was estimated to be 3.2E-04 mrem (3.2E-06 mSv), which is 0.003% of the 10 mrem EPA standard. The collective dose to all persons within an 80-kilometer (50-mi) radius was estimated to be 3.7E-03 person-rem (3.7E-05 person-Sv) effective dose equivalent.

The highest individual calculated EDE for liquid effluents was 2.2E-02 mrem (2.2E-04 mSv), with an annual EDE to the population within 80 kilometers (50 mi) estimated to be 8.1E-02 person-rem (8.1E-04 person-Sv).

The total calculated dose estimates from 1994 Project effluents result in a maximum EDE to an

individual of 2.3E-02 mrem (2.3E-04 mSv), which is 0.02% 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 8.4E-02 person-rem (8.4E-04 person-Sv). More detailed explanations of these dose calculations are found in *Chapter 4, Radiological Dose Assessment*, **Dose Assessment Methodology**.

With the exception of strontium-90 in bottom-feeding fish taken from Cattaraugus Creek above the dam, concentrations of radionuclides in locally produced foods are statistically indistinguishable from background concentrations. The measured concentration corresponds to an EDE of 0.04 mrem/yr above background if 21 kilograms (46 lbs) of fish were eaten in 1994.

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 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 assessments by independent organizations that include the New York State Department of Health (NYSDOH), the NRC, the DOE, and Westinghouse Electric Corporation.

Environmental sample sharing and co-location of measurement points with NYSDOH and the NRC continued in 1994, 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 1994. General program adequacy and specific issues of quality assurance were audited by the WVNS quality assurance department in 1994. Four 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.*)

Project Assessment Activities

A number of important external assessment activities were carried out at the WVDP in 1994. The U.S. Department of Transportation and the New York State Department of Transportation jointly inspected the WVDP in July and October 1994 for compliance with hazardous waste shipping regulations. The July inspection identified one finding pertaining to the requirement for the site to have a continuously monitored telephone number that can be called in the event of a transportation emergency. The finding was addressed immediately, and the October inspection did not identify any findings.

The most significant external environmental overview activity in 1994 was a comprehensive Environmental, Safety, Health and Quality Assurance functional appraisal carried out by the DOE Idaho Operations office. This appraisal, along with routine inspections by NYSDEC, the EPA, and the Cattaraugus County Health Department, confirmed the high quality of the environmental monitoring program at the WVDP and the Project's commitment to environmental compliance.