



*The West Valley Demonstration Project*

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# EXECUTIVE SUMMARY

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## Project Description

The West Valley Demonstration Project (WVDP), the site of a U.S. Department of Energy (DOE) environmental cleanup activity operated by West Valley Nuclear Services Co. (WVNS), is in the process of stabilizing liquid high-level radioactive waste that remained at the site after commercial nuclear fuel reprocessing had been discontinued. The Project is located in Western New York State, about 30 miles south of Buffalo, within the New York State-owned Western New York Nuclear Service Center (WNYNSC). The WVDP is currently focusing on several goals that will lead to eventual site closure: removing and vitrifying the high-level residuals (heels) remaining in the high-level waste tanks, shipping low-level waste, preparing for the shipment of spent nuclear fuel, and cleaning up facilities not currently used.

## Compliance

Management at the WVDP continued to provide strong support for environmental compliance in 1999. DOE Orders and applicable state and federal statutes and regulations are integrated into the Project's compliance program. Highlights of the 1999 compliance program were as follows:

- All State Pollutant Discharge Elimination System (SPDES) permit limits were met in 1999.
- No notices of violation or inspection findings from any environmental regulatory agencies were received by the WVDP in 1999.
- Inspections of hazardous waste activities by the New York State Department of Environmental Conservation (NYSDEC) verified Project compliance with the applicable state and federal regulations.
- The Project continued to monitor specific waste management areas at the site in order to comply with the Resource Conservation and Recovery Act (RCRA) §3008(h) Administrative Order on Consent.
- The Project also met the requirements of the Emergency Planning and Community Right-to-Know Act (EPCRA) by identifying information about hazardous materials used at the Project and making this information available to the local community.

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*A reader opinion survey has been inserted in this report. If it is missing, please contact the Communications Department at (716) 942-4610. Additional Project information is available on the Internet at <http://www.wvdp.com>.*

- The SPDES permit currently identifies four permitted liquid outfalls at the Project. A draft SPDES permit to monitor eleven of thirty identified storm water outfalls was issued for public comment in June 1997, and a final permit is expected to be issued to the WVDP in 2000.
- Among other pollution-prevention accomplishments, waste minimization goals for 1999 were exceeded in all of the waste categories set in the one-year goals statement. The WVDP continues to exceed expectations for the five-year waste-minimization goals.
- In accordance with the Site Treatment Plan developed under the Federal Facility Compliance Act, all calendar year 1999 milestones for the characterization, treatment, and disposition of radioactive mixed waste at the WVDP were completed.
- There were no unplanned off-site releases of radiological material in 1999.

## Environmental Monitoring Program

Throughout the first three years of vitrification, specific, sustained attention was given to environmental monitoring and assessment of effluents from changing site operations. In 1999 Project environmental scientists continued to sample and measure effluent air and water, groundwater, surface streams, soil, sediment, vegetation, meat, milk, and game animals, and to record environmental radiation measurements. More than 10,000 samples were collected in order to assess the effect of site activities on public health, safety, and the environment.

The Project's environmental monitoring network is continually being evaluated and updated to ensure that all the locations and sample types that would be sensitive to process-related changes are monitored. Samples are tested for

radioactivity and/or nonradioactive substances using approved laboratory procedures. Both the laboratory test results and direct measurement data are reviewed at several stages for quality and for comparison with similar data.

Environmental data are entered in a controlled database and are automatically compared to upper and lower acceptance values. Data points falling outside these values are brought to the attention of WVDP scientists for further investigation. WVDP scientists assess all data points and evaluate trends at each location.

**Surface Water Monitoring.** The largest single source of radioactivity released to surface waters from the Project is the discharge from the low-level waste treatment facility through the lagoon 3 release outfall. The treated effluent water flows into Erdman Brook, which joins Frank's Creek just before exiting the Project's fenced area. Four treated batches totaling approximately 7.7 million gallons were released over a combined twenty-five day period in 1999. In 1998, 11.5 million gallons were released.

The combined average concentration of all radionuclides in liquid releases from lagoon 3 in 1999 was approximately 32% of the DOE derived concentration guide (DCG), which is used to evaluate liquid process discharges. (See Chapter 1, p.1-5, for an explanation of DCGs.) The average radioactivity concentrations from 1995 to 1999 were 43%, 35%, 22%, 23%, and 32% of the DCG, respectively. The major dose contributors to the total combined liquid effluent in 1999 were cesium-137 and strontium-90. Higher concentrations of cesium-137 and strontium-90 in facility effluents may be a factor contributing to the increase, compared to 1998, in the percent of the DCG released in 1999.

Surface water is continually sampled on the Project premises by four automatic samplers: Timed composite samples are collected at

Frank's Creek where it exits the Project, at two other on-site points where water flows off-site, and at a surface drainage point near the former radioactive waste disposal areas. Samples also are collected periodically at nine other points of drainage from facility areas. The data from these samples are used to determine the type, amount, and probable origin of both radiological and nonradiological contaminants.

As in 1998, the most notable source of gross beta and strontium-90 radioactivity in surface water in 1999 was from groundwater migrating through the subsurface of the north plateau and emerging as seepage to join the surface water drainage from the north plateau into Frank's Creek and then off-site. (See Fig.A-2 in Appendix A [p.A-4].)

This drainage point has been carefully monitored since the contaminated seep was identified in 1993. A groundwater recovery and treatment system currently is being used to reduce the migration of strontium-90 to surface water on the north plateau. The strontium-90, which originates from pre-Project operations, was about 1.8 times the DCG for liquid discharges in 1999. The 1998 strontium-90 concentration at this point was about 1.4 times the DCG. The increase in the 1999 strontium-90 concentration at the northeast swamp drainage is not unexpected and is thought to be linked to a combination of groundwater moving beyond the influence of the currently operating recovery system and unusually low precipitation in 1999.

The WVDP is evaluating a pilot-scale permeable treatment wall for treating contaminated groundwater on the north plateau. A subsurface trench filled with ion-exchange media, installed in the eastern lobe of the plume, removes contaminants from the groundwater as it flows through the trench. (See Chapter 3, p.3-16 for additional discussion of this technology.)

Nonradiological contaminants, measured at three outfalls and calculated at one monitoring point, were below the New York SPDES permit limits.

**Soil and Stream Sediments.** Surface soil is collected annually near the ten air sampler locations in order to track long-term deposition. Sediments from off-site creeks are collected annually from three downstream and two upstream locations. Three on-site drainage areas are also sampled annually in order to track waterborne movement of contaminants.

Surface soil samples in 1999 showed little change from previous years. Except for one area that historically has shown average cesium-137 concentrations above background values, the concentrations of radionuclides normally present in soil from both worldwide fallout and from Project air emissions are no different at near-site locations than at background locations.

Because of pre-Project releases from nuclear fuel reprocessing activities, the concentrations of cesium-137 in downstream creek sediments have been historically above concentrations in the upstream sediments. However, in 1998 sediment samples at one downstream location showed a marked decrease in cesium-137, compared to historical values, after an unusually high June 1998 flood. The 1999 samples showed a continued level of cesium-137 that is lower than historical values. The fourteen-year graph (Fig. 2-4 [p.2-12]) indicates no upward trends at either upstream or downstream points.

**Groundwater Monitoring.** Groundwater samples were collected as scheduled from sixty-nine on-site locations in 1999. Computerized screening of 1999 data speeded identification and evaluation of changes. Monitoring activities in 1999 included gathering more detailed information about the north plateau strontium-90 contamination. The 1999 groundwater pro-

gram confirmed that strontium-90 is still the major contributor to elevated gross beta contamination in the plume on the north plateau. The concentrations of other isotopes were below the DCG levels generally applied to surface water.

In addition to collecting samples from wells, groundwater was routinely collected from seeps on the bank above Frank's Creek along the northeastern edge of the north plateau. Results of radiological analyses indicate that gross beta activity from the north plateau plume has not migrated to these seepage areas. Site groundwater also is tested for a number of nonradiological contaminants: In 1999 there were no statistically remarkable changes in the levels measured.

As in previous years, near-site residential water-supply wells sampled during 1999 were within the historical range of values measured at the background well.

**Air Monitoring.** WVDP airborne radiological emissions in 1999 included emissions from six routinely operated permitted exhaust points and four exhausts excluded from permitting because of their low emission potential. As anticipated, radioactive releases from the Project in 1999 were far below the most restrictive limits that ensure public health and safety. Operating the vitrification process at a reduced capacity resulted in radiological air releases that were less than those noted in the last few months of 1998.

The dose from 1999 air emissions was about 0.11% of the EPA radionuclide emissions standard of 10 millirem (mrem) per year effective dose equivalent to the maximally exposed off-site individual. In 1998 the dose from these emissions was about 0.34%.

Although several fission products contribute to the radioactivity, the most significant continued to be airborne iodine-129, a long-lived ra-

dionuclide that exists in gaseous form at the high temperatures of the vitrification process and that is not fully removed during treatment of the air effluent. The 1999 levels of gaseous iodine-129 emissions were lower than 1998 levels. Approximately 99% of the 1999 calculated dose to the public is attributable to iodine-129 emissions from the vitrification process.

Six air samplers on the perimeter of the WYNSC and four in more distant locations continuously collect samples of air at the average human breathing height. The samples are tested for radioactivity carried by airborne particles. At two of the ten locations samples also are collected for analysis for tritium and iodine-129.

Gross radioactivity (airborne particulate) in 1999 air samples from around the perimeter was within the historical range of radioactivity measured at remote background locations or nearby communities. Gross radioactivity at the nearest perimeter sampler remained the same in 1999 as in 1998. Concentrations in samples from three on-site ambient air samplers located near waste storage facilities operated during 1999 also were far below any applicable limits.

Nitrogen oxides, nonradiological byproducts of the vitrification process, are monitored as part of the emission-control process. No opacity or permit limits were exceeded in 1999. Although there are a number of permitted air-emissions sources at the Project, none release a sufficient quantity of nonradiological material to warrant continuous monitoring as a condition of a regulatory permit.

**Vegetation, Meat, and Milk.** Test results from near-site samples of beans, apples, corn, hay, beef, and milk were consistent with results noted in previous years. With the exception of strontium-90 that was detectable at slightly above background values in corn from a location near the WVDP, no site-related effects were noted.

**Game Animals.** Fifty fish specimens from Cattaraugus Creek were collected in 1999 for testing. Ten of these were from below the Springville dam, including species that migrate up from Lake Erie. Two semiannual sample sets of ten fish each were collected downstream of Buttermilk Creek, which receives Project liquid effluents, and two sets were collected upstream. These samples represent sportfishing species and bottom-feeding indicator species. Testing for gamma-emitting isotopes and strontium-90 showed no significant difference between average concentrations in upstream (background) fish and downstream fish.

Three samples of whitetail deer venison from a near-site (WNYNSC) herd were tested for gamma-emitting isotopes and strontium-90. Control deer samples from locations more than thirty miles away from the site also were collected in 1999. Low levels of radioactivity from cesium-137, strontium-90, and naturally occurring potassium-40 were detectable in both control and near-site deer samples. Although results vary from year to year, data from the last nine years show no statistical differences between radionuclide concentrations in near-site and control venison samples.

In 1999, the sixth year of public access to portions of the WNYNSC for deer hunting, seventy-two deer were taken by hunters during the hunting season.

## Program Quality

The WVDP environmental monitoring program is designed to produce high quality, reliable results. To maintain this standard, each scientist must give continuous attention to the details of sample handling, following approved collection and analysis procedures and data review. Formal self-assessments were performed, and the environmental laboratory also continued the practice of analyzing radiological cross-check samples sent from a national laboratory.

Of 120 radiological analyses performed at both the on-site Project laboratory and off-site commercial service laboratories, 119 (99%) were within the control limits. The samples tested on-site at the Project environmental laboratory (twenty-five samples) were all within acceptable limits. Nonradiological check samples were not evaluated in 1999 because of a hiatus in the EPA crosscheck program.

Although no formal external audits of the environmental monitoring program were conducted in 1999, test results from the crosscheck program, self-assessments, and comparisons of co-located sample measurements taken by independent agencies such as the New York State Department of Health (NYSDOH) and NYSDEC indicate that high quality standards are being met. The WVNS Environmental Affairs and the Quality Assurance departments periodically conducted and documented reviews of program activities in 1999.

## Notable 1999 Events

The WVDP's integrated safety management system was verified by the DOE in 1998, and in 1999 a self-assessment of the program confirmed its function as an important aspect of the WVDP's safety culture.

In 1999 the WVDP was recommended for STAR status, the highest safety award given within the DOE. This award, received in early 2000, has been granted to only five other DOE sites in recognition of superior health and safety performance by contractor management and employees.

Computer hardware and software were assessed for year-2000 compliance. No problems were noted at the millenium date change.

## Dose Assessment

There were no events affecting public health and safety or the environment as-

sociated with Project operations in 1999. The small amounts of radioactive materials that were released were assessed and doses were calculated using approved computer modeling codes. These evaluations included calculations of doses received from the consumption of game animals and locally grown food. Airborne doses were calculated using CAP88-PC, an EPA-approved computer code. The result was a maximum dose to an off-site individual of 0.011 millirem (mrem). The limit is 10 mrem. Doses from the liquid pathway to the maximally exposed person were estimated to be 0.0283 mrem from Project effluents (excluding north plateau drainage). The north plateau drainage contribution to the total liquid dose was estimated to be an additional 0.0282 mrem. The predicted dose from all pathways was less than 0.07 mrem, or 0.07% of the 100-mrem DOE limit.

## **Conclusion**

**T**he West Valley Demonstration Project conducts extensive monitoring of on-site facilities and the surrounding environment. This program fulfills federal and state requirements to assess the effect of Project activities on public health and safety and the environment. In addition to demonstrating compliance with environmental regulations and directives, evaluation of data collected in 1999 continued to indicate that Project activities pose no threat to public health or safety or the environment.