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# EXECUTIVE SUMMARY

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## Purpose of This Report

This annual environmental monitoring report for the West Valley Demonstration Project (WVDP or Project) is published to inform those with interest about environmental conditions at the WVDP. In accordance with U.S. Department of Energy (DOE) Order 231.1, Environment, Safety, and Health Reporting, the report summarizes calendar year (CY) 2002 environmental monitoring data so as to describe the performance of the WVDP's environmental management system, confirm compliance with standards and regulations, and highlight important programs.

## Project Description

In 2002, the West Valley Demonstration Project, the site of a DOE environmental cleanup activity operated by West Valley Nuclear Services Co. (WVNSCO), was in the final stages of stabilizing high-level radioactive waste (HLW) that remained at the site after commercial nuclear fuel reprocessing had been discontinued in the early 1970s. 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 be-

ing conducted in cooperation with the New York State Energy Research and Development Authority (NYSERDA).

Ongoing work activities at the WVDP during 2002 included:

- completing HLW solidification and melter shutdown
- shipping low-level radioactive waste off-site for disposal
- constructing a facility where large high-activity components can be safely packaged for disposal
- packaging and removing spent materials from the vitrification facility
- preparing environmental impact statements for future activities

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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) 942-4555. Additional Project information is available on the internet at <http://www.wv.doe.gov>.*

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- removing as much of the waste left behind in waste tanks 8D-1 and 8D-2 as was reasonably possible
- removing storage racks, canisters, and debris from the fuel receiving and storage pool, decontaminating pool walls, and beginning shipment of debris for disposal
- ongoing decontamination in the general purpose cell and the process mechanical cell (also referred to as the head end cells)
- planning for cleanup of waste in the plutonium purification cell (south) and extraction cell number 2 in the main plant
- ongoing characterization of facilities such as the waste tank farm and process cells
- monitoring the environment and managing contaminated areas within the Project facility premises
- flushing and rinsing HLW solidification facilities.
- The WVDP continued to successfully monitor specific waste management areas at the site in order to comply with the Resource Conservation and Recovery Act §3008(h) Administrative Order on Consent.
- The Project also met the requirements of the Emergency Planning and Community Right-to-Know Act by collecting information about hazardous materials used at the Project and making this information available to the local community.
- The New York State Pollutant Discharge Elimination System (SPDES) permit currently identifies five permitted liquid outfalls (for example, a pipe where treated water flows into a stream) at the Project. A SPDES permit application was submitted to NYSDEC in 2000 to cover process changes and storm water runoff. A permit modification for process changes was received in 2002; the modifications for storm water runoff are expected in 2003.
- In fulfilling the requirements of the Site Treatment Plan developed under the Federal Facility Compliance Act, all important events in calendar year 2002 for the characterization, treatment, and disposition of mixed waste at the WVDP were completed.

## **Compliance**

Management at the WVDP continued to provide strong support for environmental compliance in 2002. DOE Orders and applicable state and federal statutes and regulations are integrated into the Project's compliance program. Highlights of the 2002 compliance program were:

- No notices of violation or inspection findings from any environmental regulatory agencies were received by the WVDP in 2002.
- Inspections by the New York State Department of Environmental Conservation (NYSDEC) and the local department of health verified Project compliance with the applicable environmental and health regulations.
- Among other pollution-prevention accomplishments, waste minimization goals for 2002 were met or exceeded in three of five specified waste categories. Although low-level radioactive waste generation did not decline by the targeted 70% reduction set in the one-year goals statement, generation was reduced by 69%. Sanitary waste generation was reduced by 68%, whereas the goal was 70%.

## Environmental Monitoring Program

Throughout the six years of vitrification, specific and continued attention was given to environmental monitoring and assessment of effluents (for example, water or air released from a facility and entering the environment) from changing site operations. In 2002, Project environmental scientists continued to sample and monitor effluent air and water, groundwater, surface streams, soil, sediment, vegetation, meat, milk, and game animals, and to record environmental radiation measurements. More than 13,000 samples were collected in 2002 in order to assess the effect of site activities on public health, safety, and the environment.

The Project's environmental monitoring network is 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 are compared with historical data from the same locations, with background data, and with data from similar locations.

The environmental data are entered into a controlled database and are automatically matched against high and low values in a normal range. Data points above or below these values are brought to the attention of WVDP scientists for further investigation. WVDP scientists periodically assess all data points and decide the importance of trends at each location.

Doses to the public are calculated using approved computer modeling codes. Dose calculations predict the impacts of air and water releases and the potential effects from consumption of game animals and locally grown food.

**Surface Water Monitoring.** Surface water is routinely 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. Individual on-site samples also are collected periodically by hand 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.

*Radiological Releases.* The largest single, treated effluent source of radioactivity released to surface waters from the WVDP is the discharge from the low-level waste treatment facility through the lagoon 3 outfall. The treated effluent water flows into Erdman Brook, which joins Frank's Creek just before exiting the Project's fenced area. Seven treated batches totaling approximately 13.7 million gallons (52.0 million liters) were released periodically over the course of forty-one days in 2002. In 2001, 8.42 million gallons (31.9 million liters) were released. The difference can be attributed to an increase in water from facility cleanup processes, as well as more precipitation in 2002 than in 2001.

The combined average concentration of all radionuclides in liquid releases from lagoon 3 in 2002 was approximately 34% of the DOE derived concentration guide (DCG), which is used to evaluate liquid process discharges. The average radioactivity concentrations from 1998 through 2001 were 23%, 32%, 34%, and 33% of the DCGs, respectively. The major dose contributors in the total combined liquid effluent in 2002 were strontium-90, cesium-137, and (to a lesser extent) uranium-232.

Seepage of contaminated groundwater from the north plateau was another source of strontium-90

radioactivity in surface water. Drainage from the north plateau eventually flows into Frank's Creek. This drainage point, sample location WNSWAMP, has been carefully monitored since the contaminated seep, which originates from pre-Project operations, was identified in 1993. A groundwater recovery and treatment system is currently being used to reduce the migration of strontium-90 to surface water on the north plateau. The average strontium-90 concentration at WNSWAMP decreased in 2002 from the concentration in 2001. The decrease in the strontium-90 concentrations at this northeast swamp drainage is thought to be linked to increased groundwater dilution due to more precipitation in 2002. Nonetheless, because of increased total flow, the total quantity of radioactivity released, and the associated dose to an off-site individual from this radioactivity, were higher than in 2001. Even so, the dose in 2002 was still far below 1% of the applicable limit.

In 2002 the WVDP evaluated a permeable treatment wall that was installed in 1999 to treat strontium-90-contaminated groundwater. The evaluation concluded that complex hydrogeologic conditions and disturbances from the installation are influencing groundwater flow into and around the treatment wall.

*Dose Assessment.* The dose to the maximally exposed off-site individual from the liquid pathway in 2002 was estimated to be 0.057 millirem (mrem)– 0.026 mrem attributable to Project effluents from lagoon 3 and an additional 0.031 mrem from the north plateau drainage. In international units, these values would be 0.00057 millisieverts (mSv), 0.00026 mSv, and 0.00031 mSv, respectively.

*Nonradiological Releases.* Nonradiological contaminants, measured at three outfalls and calculated at one monitoring point, were below the WVDP 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. Soil and sediment from three on-site drainage channels is also sampled annually in order to track waterborne movement of contaminants.

Surface soil samples in 2002 showed little change from previous years. Except for one area that historically has shown average cesium-137 concentrations higher than background values, the concentrations of radioactive atoms normally present in soil from both worldwide fallout and from Project air emissions at near-site locations are indistinguishable from background concentrations found in the region away from the WVDP.

Because of pre-Project releases from nuclear fuel reprocessing activities, the concentrations of cesium-137 in downstream creek sediments have been historically higher than concentrations in the upstream sediments. Results from 2002 were consistent with historical results. Monitoring results for cesium-137 in sediments over seventeen years show no upward trends at either upstream or downstream points.

**Groundwater Monitoring.** Groundwater samples were collected as scheduled from sixty-five on-site locations in 2002. Computerized screening of the groundwater data accelerated identification and evaluation of changes. More monitoring wells had been installed in 2001 to provide additional subsurface and groundwater information in the area of the north plateau strontium-90 plume. Monitoring activities in 2002 included gathering more detailed information about the north plateau strontium-90 contamination. The 2002 groundwater program continued to indicate that strontium-90 is still the major contributor to elevated gross beta values (from indicator measure-

ments) in the underground contamination area plume on the north plateau. The concentrations of other isotopes were below the DCG levels usually 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 constituents. In 2002 there were no statistically remarkable changes in the concentrations measured.

Calendar year 2002 sample results from near-site residential water-supply wells were indistinguishable from results at background wells.

**Air Monitoring.** The WVDP airborne radiological monitoring program in 2002 included emissions from six routinely operated permitted exhaust points and four exhausts excluded from permitting because of their low emission potential.

Six air samplers on the perimeter of the WNYNSC and four in more distant locations continuously collect samples of air at the average human breathing height. These samples are tested for radioactivity carried by airborne particles. Samples also are collected for measurement of tritium and iodine-129 at two of the ten locations – the Rock Springs Road sampler near the site and the Great Valley background sampler.

*Radiological Releases.* As anticipated, radioactive releases from the Project in 2002 were far below the most restrictive limits that ensure public health and safety. Operating the vitrification process at a reduced capacity, and melter shutdown at

the end of 2002, resulted in radiological air releases that were less in 2002 than those noted in 2001.

Although several fission products contribute to airborne radiological releases, the most significant continues to be iodine-129, a long-lived radionuclide that exists in gaseous form at the high temperatures of the vitrification process. Iodine-129 is not fully removed during treatment of the air effluent. The CY 2002 levels of gaseous iodine-129 emissions were lower than 2001 levels.

Gross radioactivity in air samples (airborne particulate) from around the site's perimeter was within the historical range of radioactivity measured at remote background locations or nearby communities. Concentrations in samples from three on-site outdoor air samplers and two portable samplers located near waste storage facilities operated during 2002 also were far below any applicable limits.

*Dose Assessment.* The dose from air emissions in calendar year 2002 was about 0.04% of the U.S. Environmental Protection Agency (EPA) radionuclide emissions standard of 10 millirem (mrem) per year effective dose equivalent to the maximally exposed off-site individual. (In 2000 the dose from these emissions was about 0.08% and in 2001 the dose was about 0.05%.) Approximately 98% of the total 2002 calculated airborne dose to the maximally exposed off-site individual from main plant stack emissions was from iodine-129 emissions.

*Nonradiological Releases.* Nitrogen oxides, nonradiological by-products of the vitrification process, were monitored in 2002 as part of the emission-control process. The WVDP monitored nitrogen oxides and sulfur dioxide emissions as a condition of the New York State Facility Air permit. The monitoring demonstrated that emissions were well below the 99-ton cap for each. No opac-

ity (visual smoke density) or permit limits were exceeded in 2002. When melter operations came to an end, the vitrification process source of nitrogen oxides and sulfur dioxides was permanently shut down.

**Vegetation, Beef, and Milk.** Test results from near-site samples of beans, apples, corn, hay, beef, and milk in 2002 were consistent with results noted in previous years. When near-site samples were compared with background samples, minimal or no site-related effects were noted for hay, beef, or milk. Near-site beans, apples, and corn had strontium-90 levels above background levels in 2002. (These results were not unusual when compared with historical results from the same locations.) If these foods had been consumed in normal quantities by the same person in one year, that individual would have received 0.10 mrem (0.0010 mSv), the equivalent of about three hours of background radiation. No upward trends were determined.

**Game Animals.** Test results for fish taken from Cattaraugus Creek in 2002, both upstream and downstream of the point where the Creek receives effluents from the WVDP, were what would be expected compared to historical results. When values for downstream fish were compared with those from upstream fish, elevated strontium-90 concentrations were noted below the site and elevated cesium-137 concentrations were noted below the Springville dam. The estimated individual dose attributed to these differences is 0.02 mrem (0.0002 mSv) in 2002, also within the range of historical results.

Radionuclide results for venison from near-site whitetail deer in 2002 were statistically indistinguishable from results for venison taken from background locations more than thirty miles from the site. Although results vary from year to year, data from the last eleven years show no statistical

differences between near-site and control venison samples. Public access to the WNYNSC for deer hunting was resumed in 2002 after having been curtailed in 2001 due to security restrictions.

## **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 and evaluation. Formal self-assessments were performed, and the WVDP Environmental Laboratory also continued the practice of analyzing radiological crosscheck samples sent from a national laboratory. Approximately 97% of radiological and nonradiological crosscheck analyses performed at both the on-site WVDP laboratory and the off-site commercial service laboratories were within acceptance limits.

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 and NYSDEC indicate that high quality standards are being met.

The WVNSCO Environmental Affairs and Quality Assurance Departments also periodically conducted and documented reviews of program activities in 2002. Off-site laboratories addressed data deficiencies under approved quality assurance programs.

## **Safety and Environmental Management**

In 2002 the WVDP continued to demonstrate its commitment to an all-inclusive approach to safety through implementation of its Integrated Safety

Management System (ISMS). As a key component of the ISMS, the sitewide work review group reviewed work plans, identified environmental safety and health concerns, and specified practices to ensure that work was performed safely. The Environmental Management System, or EMS, an integral part of the WVDP ISMS, was coordinated with other safety management and work planning processes through the integrated environmental, health, and safety management program.

## Notable 2002 Events

On June 10, 1998, the WVDP marked completion of the Project's production phase (Phase I) of high-level waste processing, during which 210 canisters were filled with vitrified waste. Phase II, vitrifying the high-level waste residuals, began in 1998 and continued through September 2002. The vitrification process was shut down on September 5, 2002.

In 1999 WVNSCO was recommended for STAR status, the highest safety award given within the DOE. This award, received in early 2000, was granted in recognition of superior health and safety performance by contractor management and employees. In 2001 DOE reconfirmed this award by bestowing the Star of Excellence on WVNSCO for an outstanding safety record. In early 2003 the WVDP was informed that, as a result of a 2002 evaluation, the STAR status was reconfirmed.

The WVDP also was recognized as a top environmental leader in 2000 and was accepted into the EPA's National Environmental Performance track. The WVDP was awarded charter member status as one of the first group of applicants.

To qualify for the award, the WVDP had to demonstrate that it voluntarily has adopted and imple-

mented an environmental management system, has attained previous specific environmental achievements, has made a commitment to achieve four future goals, and has a sustained record of environmental compliance.

The WVDP is one of the first DOE sites to hold both the EPA's highest award for environmental achievement and the DOE's STAR award for excellence in safety and health.

## Conclusion

The 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 WVDP activities on public health and safety and the environment. In 2002 the maximum predicted dose to a member of the public from the Project via all pathways was 0.06 mrem (0.0006 mSv), or 0.06% of the 100-mrem DOE limit. In comparison, the typical dose to a member of the public from natural background sources is 295 mrem per year.

The dose to the population within a 50-mile (80-kilometer) radius of the WVDP from DOE activities was 0.24 person-rem. This same population would have received approximately 453,000 person-rem from natural background radiation in 2002.

In addition to demonstrating compliance with environmental regulations and directives, evaluation of data collected in 2002 continued to indicate that WVDP activities pose no threat to public health or safety, or to the environment.

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