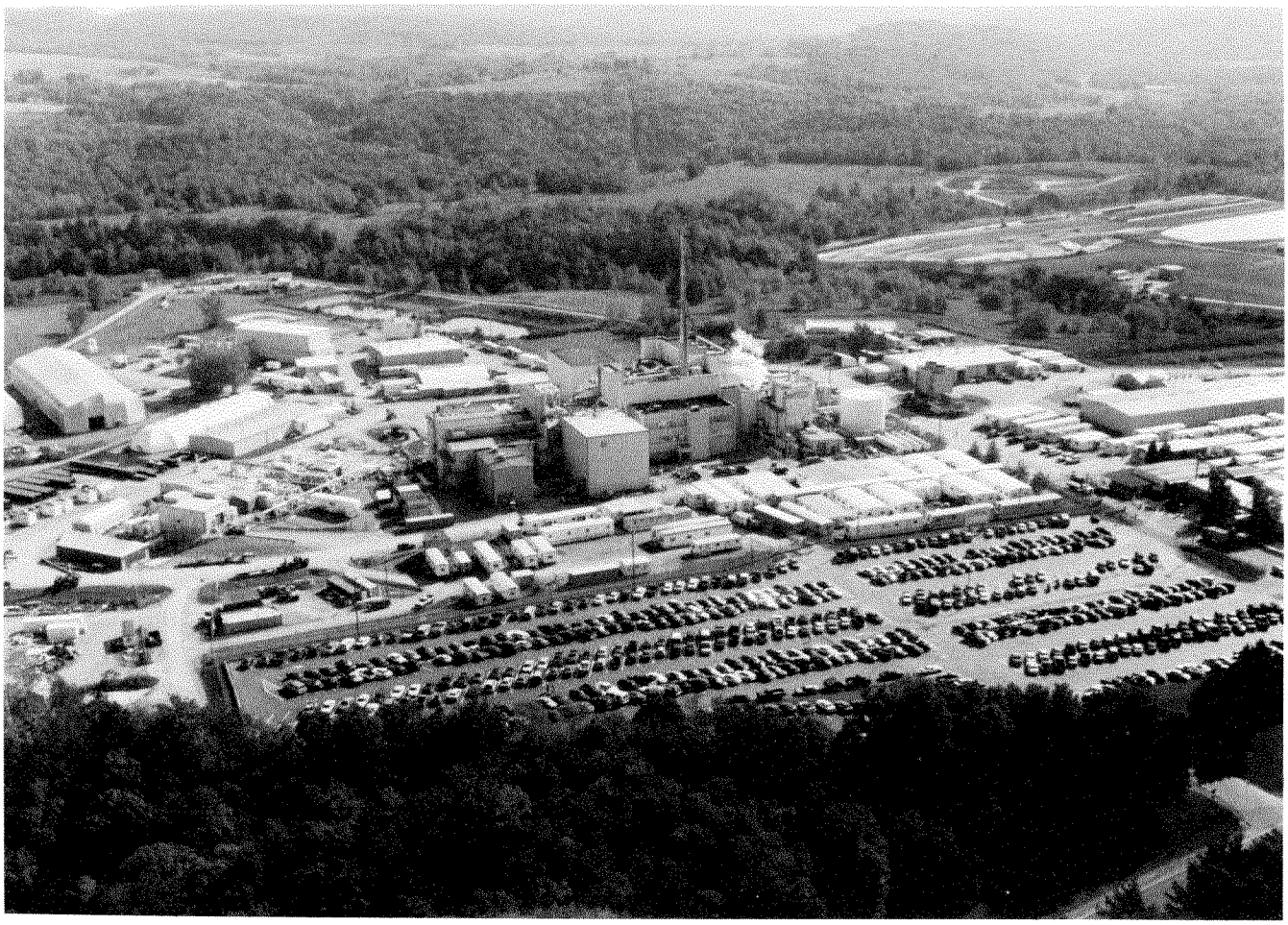

The West Valley Demonstration Project

EXECUTIVE SUMMARY

The West Valley Demonstration Project (the WVDP or Project) 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 1995. On-site and off-site monitoring in 1995 confirmed that site activities were conducted well within state and federal regulatory radiological limits. (A description of regulatory issues is found in the *Environmental Compliance Summary: Calendar Year 1995* [p. xliii].) Although nonradiological monitoring carried out in 1995 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.

During 1995 the major steps toward solidification of the high-level waste included combining two of the high-level waste streams in one underground storage tank and producing the first test canister of nonradioactive glass in the newly constructed vitrification facility. The final step, vitrification of the high-level waste residues, is currently scheduled to start in June 1996. More information is detailed in *Chapter 1, Environmental Monitoring Program Information* (pp. 1-6 through 1-8). A reader opinion survey questionnaire has been inserted in this report. If it is missing, please contact Community Relations at (716) 942-4610.

Compliance

The WVDP operates under U.S. Department of Energy (DOE) requirements for protection of the public and the environment from radiation. Limits on radioactivity concentrations and exposures to radiation are specified in DOE Orders. The Project did not approach any of the limits on radiation doses in 1995, 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-5), and other chemical constituents under a State Pollutant Discharge Elimination System (SPDES) permit, which identifies discharge water quality limits.

Although the site's SPDES permit limits were exceeded six times in 1995, none of the exceedances resulted in notices of violation being issued by NYSDEC. In no case did any exceedance result in any adverse effect on public health or the environment. (See the *Environmental Compliance Summary: Calendar Year 1995* [p. liii] 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 1995 continues to better define 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 1995 the WVDP continued the actions that were required by a Resource Conservation and Recovery Act (RCRA) 3008(h) Administrative Order on Consent. This agreement, entered into 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 be potentially released 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. In 1995 two draft SWMU assessments and seven draft RFI reports were submitted to the EPA and NYSDEC. The current focus of the RFI program is on finalizing these seven reports and drafting the two RFI reports that remain to be completed.

The WVDP continued to operate under and comply with a Federal and State Facility Compliance Agreement (FSFCA) 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 (FFCAct). In March 1995 the WVDP submitted a proposed site treatment plan as the next required step.

In April 1995 the EPA removed the WVDP from the Federal Agency Hazardous Waste Compliance docket based on the determination (re: 60 CFR 18474) that the site of the WVDP is not federally owned. This action effectively resulted in the WVDP not being further considered at this time for placement on the National Priority List. (See the *Environmental Compliance Summary: Calendar Year 1995* [p. l].)

Waste minimization and pollution prevention initiatives continued to be aggressively pursued in 1995. The WVDP exceeded its 1995 waste-reduction goals: specifically, the generation of low-level radioactive waste was reduced by 55% and the generation of radioactive mixed waste by 80%. Hazardous waste generation was reduced by 37%.

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 1995. Five alternatives are being evaluated for this statement, which is scheduled for public review and comment in 1996.

Effluent and Environmental Monitoring Program

In 1995 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 additional data to calculate the risk of exposure to radioactivity through eating, drinking, or breathing. 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 1995. (See *Chapter 2, Environmental Monitoring* [p. 2-14].) Sample filters were collected weekly; samples were analyzed weekly for gross alpha and gross beta radioactivity and quarterly for other specific nuclides. 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 radionuclides, 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 downstream of 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 1995 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 radionuclides were below DOE DCGs at all off-site surface water sampling locations as well as at 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. (See *Chapter 2, Environmental Monitoring* [p. 2-7].)

The treated effluent from the low-level liquid waste treatment facility (LLWTF) contributes most of the activity released from the site in controlled liquid discharges. The 1995 annual average liquid effluent concentrations of radionuclides were below DOE release guidelines at the point of discharge.

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.

Sampling results indicated 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 within the sand and gravel unit. The plume is approximately 300 feet wide and 800 feet long. The highest gross beta activities in groundwater and soil were measured at two locations near the south end of the process building. 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 is located near 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 and mitigative alternatives, was completed and submitted to NYSDEC in April 1995 in compliance with schedule provisions of the WVDP's SPDES permit. In November 1995, in an effort to mitigate the movement of strontium-90 contamination in site groundwater, the WVDP installed and began operating a groundwater pump-and-treat system. Recovered well water, after pretreatment, is directed either to the site's low-level waste treatment facility for additional treatment, or it is discharged to the environment through the monitored lagoon system. In 1995 approximately 935,000 liters (247,000 gal) were processed in this manner. The pump-and-treat system is currently being evaluated, along with other technologies, to determine if there are more effective methods for treating the groundwater. (See **Special Monitoring** in *Chapter 2* [p. 2-30] and **Interim Mitigative Measures Near the Leading Edge of the Gross Beta Plume on the North Plateau** in *Chapter 3, Groundwater Monitoring* [p. 3-24].)

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 two exceptions, no statistically significant differences in radionuclide concentrations between historical background (control) samples and near-site samples were measured in these media in 1995. However, these values still are within the historical range of background concentrations for other biological media. (See *Chapter 2*, **Radioactivity in the Food Chain** [p. 2-21] and *Chapter 4*, **Environmental Media Concentrations** [p. 4-9].)

Direct Environmental Radiation Monitoring

Direct environmental radiation was measured continuously during each calendar quarter in 1995 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.

Nonradiological Monitoring

Nonradiological discharges from the site are regulated by NYSDEC; however, no special monitoring and reporting of nonradiological airborne effluents was required in 1995.

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 biochemical oxygen demand, suspended solids, ammonia, iron, pH, oil and grease, and other water quality indicators. Although the SPDES permit limits were exceeded several times in 1995, as noted above, monitoring and observation downstream indicated that nonradiological liquid discharges had no observed effects on the off-site environment.

The WVDP continued to work with NYSDEC to complete storm water permitting requirements of the Clean Water Act by monitoring eleven outfalls in 1995. The storm water samples were analyzed for parameters identified in the current SPDES permit. The WVDP will submit a new storm water discharge permit application in 1996 that updates an original application filed in 1992.

Groundwater Monitoring

The WVDP is underlain by layers of unconsolidated sediments ranging from coarse gravels to fine clays. The ability of water to move through the sediments is largely related to the size of the soil particles in the sediments. The larger the soil particles, the easier it is for water to move through the sediments, making them more permeable to water. Groundwater monitoring focuses on the water-bearing layers of sediment with relatively higher permeabilities and groundwater velocities, which are thus potential pathways for contaminant migration.

The 1995 monitoring well network included both on-site wells for surveillance of SWMUs and off-site wells to monitor drinking water. The 1995 on-site groundwater monitoring network included ninety-one Project-related groundwater monitoring locations at the beginning of year. In May 1995 a report was issued that summarized a thorough review of the WVDP groundwater monitoring program. The review was conducted to evaluate and ensure that parameters of site-wide or SWMU-specific importance were being monitored and to eliminate redundancies in the program. A revised collection schedule was implemented for the third quarter of 1995, streamlining the program to fifty-six monitoring locations. Before implementation, NYSDEC approval was obtained under the condition that the program would continue to evolve to meet the needs of the 3008(h) Administrative Order on Consent.

Wells in the groundwater monitoring network provided upgradient and downgradient monitoring of the low-level liquid waste treatment facility lagoons, the high-level waste tank complex, the Nuclear Regulatory Commission (NRC)-licensed disposal area (NDA), and other SWMUs. Under the revised program for 1995 each well was sampled four times. The range of analyses performed was determined by technical regulatory guidelines and site-specific characterization needs. 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* [pp. F-1 through F-11].)

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.

Groundwater 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 1995 at well 408 remained consistent with historical highs reached in 1994.

In all, there are eight wells on-site that exhibit elevated gross beta levels above a concentration of 1E-06 μCi/mL. This concentration corresponds to the DOE 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 radionuclide.

At other groundwater monitoring points, 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 1995 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.

Organic contaminants were identified in groundwater in the vicinity of three super solid waste management units (SSWMUs). Tributyl phosphate, detected at very low levels in the vicinity of the low-level waste treatment facility (SSWMU #1), is probably related to the use of this chemical in the NFS solvent extraction process. Radioactive contaminants have historically been present in the same area. Three chlorinated organic compounds have previously been detected at very low levels in the vicinity of the construction and demolition debris landfill (SSWMU #8) and near the high-level waste tank farm.

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 the unweathered Lavery till would act as a barrier.

Ongoing environmental characterization and RCRA 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 soils known to be contaminated by tributyl phosphate and n-dodecane. As in previous years, no n-dodecane/tributyl phosphate was found.

In summary, the volume of on-site groundwaters having above-background levels of radioactivity that do flow to the surface is small in comparison to the natural stream flow with which it mixes. Consequently, levels of radioactivity, as seen in Cattaraugus Creek at the first point of public access, continue to be at or below background levels.

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.

Radiological Dose Assessment

Potential radiation doses to the public from airborne and liquid effluent releases of radioactivity from the site during 1995 were estimated using computer models.

The EPA-approved computer program CAP88-PC (U.S. Environmental Protection Agency March 1992) was used to calculate potential radiation doses from airborne discharges from the permanent stacks. These potential doses are measured in millirems (mrem) or millisieverts (mSv) and express a combination of organ and tissue doses into a single "effective" whole body dose. (See **Units of Measurement** in *Chapter 4, Radiological Dose Assessment* [p. 4-2].) The highest annual effective

dose equivalent (EDE) to a nearby resident was estimated to be 4.3E-04 mrem (4.3E-06 mSv), which is less than 0.005% of the 10 mrem EPA standard. The annual collective dose to all persons within an 80-kilometer (50-mi) radius was estimated to be 8.6E-03 person-rem (8.6E-05 person-Sv) effective dose equivalent.

The highest individual calculated EDE for liquid effluents was 2.8E-02 mrem (2.8E-04 mSv), with an annual EDE to the population within 80 kilometers (50 mi) estimated to be 9.4E-02 person-rem (9.4E-04 person-Sv).

The total calculated dose estimates from 1995 Project effluents result in a maximum EDE to an individual of 2.8E-02 mrem (2.8E-04 mSv), which is less than 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 1.0E-01 person-rem (1.0E-03 person-Sv). More detailed explanations of these dose calculations are found in *Chapter 4, Radiological Dose Assessment*, **Dose Assessment Methodology** (p. 4-4).

Statistical evaluations of biological media are made to determine if results should be used in dose assessments. Strontium-90 in a single on-site apple sample and annualized averages of strontium-90 in downstream fish showed levels above background. However, these values still are within the historical range of background concentrations for other biological media. (See *Chapter 4, Radiological Dose Assessment* [pp. 4-4 through 4-9].)

The potential calculated doses presented above should be considered in relation to the 100 mrem annual DOE limit for dose to an individual. From another perspective, a typical U.S. resident receives an average dose of about 300 mrem per year from natural background radiation. The dose assessment described in *Chapter 4, Radiological Dose Assessment* (pp. 4-4 through 4-9), predicts an insignificant effect on the public's health as a result of radiological releases from the WVDP.

The radionuclides present at the WVDP site are residues from the reprocessing of commercial nuclear fuel during the 1960s and early 1970s. A very small fraction of these radionuclides is released off-site annually through ventilation systems and liquid discharges and makes a negligible contribution to the radiation dose to the surrounding population through a variety of exposure pathways.

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 1995, 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 1995. General program adequacy and specific issues of quality assurance were audited by the WVNS quality assurance department in 1995. Two concurrent self-assessments, conducted by a select team of environmental monitoring staff, identified areas needing improvement and tracked the actions taken. (See *Chapter 5, Quality Assurance* [p. 5-6].)

Project Assessment Activities

A number of important assessment activities were conducted at the WVDP in 1995 by external agencies. These included a routine annual inspection by NYSDEC for compliance with the Clean Air Act and Clean Water Act; inspections by the EPA and NYSDEC for compliance with RCRA; and an annual inspection of the WVDP drinking water supply system by the Cattaraugus County Health Department. None of these assessments resulted in any findings of noncompliance.

External overview activities in 1995 included an operational readiness review conducted by the DOE Office of Environmental Management and a monitoring visit by the NRC, which has helped to prepare the WVDP for radioactive operation of the vitrification facility. In addition to conducting employee interviews and field observations, the DOE team reviewed the results of WVDP internal assessment activities. The findings of the DOE assessment are currently being evaluated and corrective actions are being planned and carried out. None of the findings were directed at the environmental program.

The independent monitoring visit by the NRC in June 1995 examined all aspects of the WVDP's vitrification-related effluent monitoring program, the adequacy of quality assurance and quality control programs, and internal vitrification-readiness documentation. The NRC monitoring assessment report concluded that the WVDP has established viable programs for protecting public health and safety.

Overall, internal and external assessment activities carried out in 1995 continued to confirm the high quality of the environmental monitoring program at the WVDP and the Project's commitment to environmental compliance.