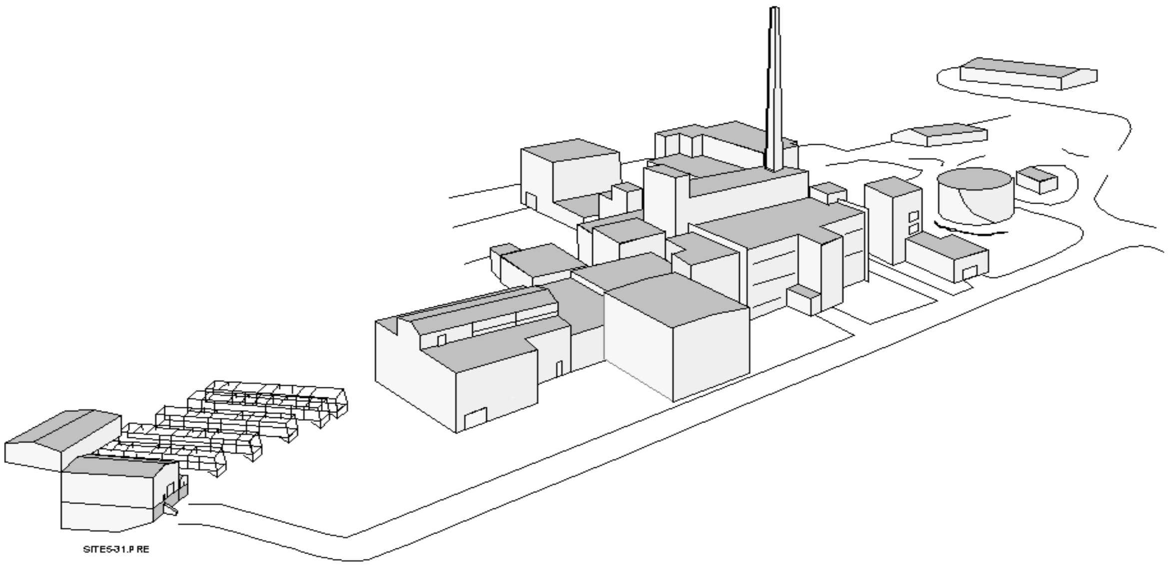
WEST VALLEY DEMONSTRATION PROJECT
ANNUAL SITE ENVIRONMENTAL REPORT
CALENDAR YEAR 2009



WEST VALLEY ENVIRONMENTAL SERVICES LLC
AND
URS CORPORATION

Department of Energy VPP

National Environmental Performance Track
U.S. Environmental Protection Agency

Prepared by: West Valley Environmental Services LLC and URS Corporation
Prepared for: U.S. Department of Energy DOE-WVDP

Under: Contract DE-AC30-07CC30000

September 2010
10282 Rock Springs Road
West Valley, New York 14171-9799

Department of Energy
West Valley Demonstration Project
10282 Rock Springs Road
West Valley, NY 14171-9799

To the Reader:

This report, prepared by the U.S. Department of Energy (DOE) West Valley Demonstration Project (WVDP), summarizes the environmental protection program at the WVDP for calendar year 2009.

Monitoring and surveillance of the WVDP facilities are conducted to verify that public health and safety and the environment are protected. The quality assurance requirements applied to the environmental monitoring program by the DOE ensure the validity and accuracy of the monitoring data.

At the WVDP, radiological air emissions are controlled and permitted by the U.S. Environmental Protection Agency (EPA) under National Emission Standards for Hazardous Air Pollutants, Subpart H, regulations. Nonradiological liquid effluent discharges are controlled and permitted through the New York State Pollutant Discharge Elimination System.

Air, surface water, groundwater, storm water, soil, sediment, and biological samples are collected and analyzed for radiological and nonradiological constituents. The resulting data are evaluated to assess effects of activities at the WVDP on the nearby public and the environment.

The calculated dose to the hypothetical maximally exposed off-site individual from airborne radiological emissions in 2009 was much less than one-tenth of one percent of the EPA limit. The dose from combined airborne and waterborne radiological releases in 2009 to the same individual was less than one-tenth of one percent of the DOE limit, verifying that the dose received by off-site residents continues to be minimal.

West Valley Environmental Services continued to operate the WVDP in a safe manner during 2009, achieving a cumulative 2.1 million work hours without a lost-time work accident or illness, while accomplishing complex decontamination and waste management activities. In 2009, deactivation and decontamination of equipment and facilities in the main plant process building (MPPB) continued, with fuel reprocessing equipment, residual tanks, vessels, and piping removed from several locations in the MPPB. Preparations began to isolate the four underground tanks formerly used to manage high-level radioactive waste, and to design a system to keep the tanks and vaults dry. On the north plateau, preparations to install an in-ground permeable treatment wall to intercept and treat the strontium-90 groundwater plume continued.

If you have any questions or comments about the information in this report, please contact the WVDP Communications Department at (716) 942-4555 or complete and return the enclosed survey.

Sincerely,

Bryan C. Bower, Director
West Valley Demonstration Project

SUMMARY OF CHANGES TO THE 2009 WVDP ANNUAL SITE ENVIRONMENTAL REPORT

FROM THE 2008 ANNUAL SITE ENVIRONMENTAL REPORT

This West Valley Demonstration Project (WVDP) Annual Site Environmental Report (ASER), prepared by the U.S. Department of Energy West Valley Demonstration Project office (DOE-WVDP), summarizes the environmental protection program at the WVDP for calendar year (CY) 2009. Monitoring and surveillance of the facilities used by the DOE are conducted to verify protection of public health and safety and the environment. This report is a key component of DOE's effort to keep the public informed of environmental conditions at the WVDP. The quality assurance protocols applied to the environmental monitoring program by the DOE ensure the validity and accuracy of the monitoring data.

In addition to demonstrating compliance with environmental regulations and directives, evaluation of data collected in 2009 continued to indicate that WVDP activities pose no threat to public health or safety, or to the environment.

SPECIAL ISSUES IN CY 2009

- Safety continued to be a priority in 2009. WVDP employees achieved 2.1 million safe work hours since the last lost-time work injury, with more than one year without a recordable injury.

- The WVDP was awarded funding under the American Recovery and Reinvestment Act (ARRA) to accelerate cleanup projects at the site. The ARRA funding afforded hiring of additional skilled workers to complete the new work to be performed in conjunction with cleanup work already underway. A decision in 2010 by the DOE to transfer a portion of the awarded ARRA funding to other DOE sites resulted in the need to halt or delay some of the work scopes originally identified under the ARRA at the WVDP.

- Deactivation and decontamination of equipment in the Main Plant Process Building (MPPB) continued in 2009. Residual equipment, tanks, vessels, and piping were removed from several locations in the MPPB. Much of the work focused on the product purification cell, the acid recovery cell, and extraction cell number 3.

- Stored radioactive waste continued to be processed and shipped off site for disposal.

- Preparations began to isolate the four underground tanks formerly used to manage high-level radioactive waste and to prevent ground and surface water infiltration to the tanks and surrounding vaults. Excavation around the tank and vault vent lines began in late 2009, while design of a tank and vault drying system continued. (The drying system is planned to be installed in 2010.)

- Special studies were begun to evaluate the ability of different types of natural zeolite to remove strontium-90 from groundwater. The studies, sponsored by the DOE and performed under the direction of the State University of New York at Buffalo, will support the design of an in-ground permeable treatment wall (PTW) at the WVDP. (The PTW is scheduled to be installed in a trench along the leading edge of the strontium-90 groundwater plume in 2010.)

- Public review of the Revised Draft Environmental Impact Statement (EIS) for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center continued through September 8, 2009. The final EIS was issued in January 2010. In April 2010, the DOE issued a Record of Decision, selecting the phased decisionmaking alternative for the WVDP.

Changes in content for the 2009 ASER are summarized below.

REVISIONS

- The Environmental Compliance Summary was updated to reflect 2009 compliance status and ongoing National Environmental Policy Act activities at the WVDP.

- Data and text were updated throughout to reflect results from the CY 2009 environmental monitoring program. Data tables, graphs, maps, supplemental information sections, and references were updated.

- Dose from natural background radiation was updated from 295 to 310 millirem per year (National Council on Radiation Protection and Measurements, Report No. 160, 2009). This report summarized the most recent estimates of average exposure of the U.S. population to both natural and man-made sources of ionizing radiation.

- Tables and figures applicable to locations at which sampling or monitoring has been discontinued or at which no sampling was done in 2009 have been deleted. (For example, no soil samples were collected so the appendix presenting soil data has been deleted [i.e., "Appendix F" from the 2008 report].)

- Consistent with previous years' ASERs, and consistent with the "Guidance for the Preparation of the DOE ASERs," noteworthy events or accomplishments that occurred in CY 2010 (up to the time of public distribution) have been included in this 2009 ASER.

West Valley Demonstration Project

Annual Site Environmental Report

for

Calendar Year 2009

Prepared for the U.S. Department of Energy

West Valley Demonstration Project Office

under contract DE-AC30-07CC30000

September 2010

West Valley Environmental Services LLC and URS Corporation

10282 Rock Springs Road

West Valley, New York 14171-9799

Disclaimer

This report was prepared by West Valley Environmental Services LLC (WVES) under contract number DE-AC30-07CC30000 with the United States of America, represented by the Department of Energy. Neither the United States Government nor WVES nor any of their contractors, subcontractors, or employees makes any warranty, expressed or implied, or assumes any legal liability or responsibility for any apparatus, product, or process disclosed, or represents that its use would not infringe on privately owned rights. References herein to any specific commercial product, process or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or WVES. This report contains a summary of major or significant activities occurring at the West Valley Demonstration Project (WVDP) only and is not a full disclosure of all details associated with WVDP-related activities. The views and opinions of authors expressed in this report may not specifically state or reflect those of the United States Government or any agency thereof.

Preface

Environmental monitoring at the West Valley Demonstration Project (WVDP) is conducted by West Valley Environmental Services LLC, under contract to the United States Department of Energy. The data collected provide a historical record of radionuclide and radiation levels and chemical data from natural and man-made sources in the survey area. The data also document the chemical and radiological quality of the groundwater on and around the WVDP and of the air and water released by the WVDP. Meteorological data are also presented.

It is the policy at the WVDP to conduct all activities, including design, construction, testing, start-up, commissioning, operation, maintenance, and decontamination and decommissioning, in a manner that is appropriate to the nature, scale, and environmental effects of these activities. The WVDP management is committed to full compliance with applicable federal, New York State, and local laws and regulations for the protection of the environment, to continual improvement, to the prevention and/or minimization of pollution, and to public outreach, including stakeholder involvement.

This report represents a single, comprehensive source of on-site and off-site data collected during 2009. The environmental monitoring program and results are discussed in the body of this report. Additional monitoring information is presented in the appendices. Appendix A contains maps of on-site and off-site sampling locations and a summary of the site environmental monitoring schedule. Appendices B through H can be found in electronic format on the compact disk (as indicated by the CD *icon) located inside the back cover. Appendices B through G contain summaries of data obtained during 2009 and are intended for those readers interested in more detail than is provided in the main body of the report. Appendix H contains a copy of the West Valley Demonstration Project Act.*

A reader opinion survey has been inserted in this report. Requests for additional copies of the 2009 Annual Site Environmental Report and questions regarding the report should be referred to WVDP Communications, 10282 Rock Springs Road, West Valley, New York 14171 (telephone: 716-942-4555). Additional Project information, including WVDP site environmental reports, is available on the internet at http://www.wv.doe.gov.

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EXECUTIVE SUMMARY

Purpose of This Report

The Annual Site Environmental Report for the West Valley Demonstration Project (WVDP or Project) is published to provide information about environmental conditions at the WVDP to members of the public living near the site, to the United States (U.S.) Department of Energy (DOE) Headquarters (HQ), and to other interested stakeholders. In accordance with DOE Order 231.1A, "Environment, Safety, and Health Reporting," this report summarizes calendar year (CY) 2009 environmental monitoring data so as to describe the performance of the WVDP's environmental management system (EMS), confirm compliance with standards and regulations, and highlight important programs. Activities at the WVDP are being conducted in cooperation with the New York State Energy Research and Development Authority (NYSERDA).

Major Site Programs

The WVDP is located on the site of a former commercial nuclear fuel reprocessing plant, which was shut down in 1976. In 1980, Public Law 96-368 (the WVDP Act) was passed, which authorized the DOE to demonstrate a method for solidifying approximately 600,000 gallons (2.3 million liters) of liquid high-level radioactive waste (HLW) that remained at the West Valley site. HLW vitrification began in 1996 and was completed in September 2002. Activities for decontaminating and dismantling the facilities and for managing and disposing of wastes were then initiated and continued through CY 2009. The major activities that occurred in 2009 are described below.

National Environmental Policy Act Activities. In 2008, a revised draft Environmental Impact Statement (DEIS) evaluating a range of alternatives for decommissioning and/or long-term stewardship for the WVDP and the Western New York Nuclear Service Center (WNYNSC) was made available by the DOE for public review. It proposed a preferred alternative that was to be implemented in two phases. Phase 1 included decommissioning a number of facilities on the north plateau (including the Main Plant Process Building [MPPB], the lagoon system, and the contaminated soils beneath and around them). During Phase 1, additional scientific studies would be conducted, with the goal of reducing the uncertainties associated with the decisions to be made in Phase 2. Phase 1 activities were to be completed within 30 years, but this was changed to 10 years in response to stakeholder concerns. Phase 2 decisions regarding other WVDP facilities (e.g., the waste tank farm, the Nuclear Regulatory Commission (NRC)-licensed disposal area [NDA], and the HLW canisters) would be deferred for no more than 10 years. NYSERDA would manage the state-licensed disposal area. During 2009, public review comments on the EIS were received and incorporated, and the Final EIS (FEIS) was issued in January 2010. In January 2010, NYSERDA issued a New York State Quality Review Act notice of completion for the FEIS, and the FEIS was accepted by NYSERDA on January 27, 2010. In April 2010, the DOE issued a Record of Decision selecting the phased decisionmaking alternative for the site.

In December 2008, the Phase 1 Decommissioning Plan (DP) for the WVDP was submitted to the NRC. In 2009, the DP was revised twice to include newly acquired environmental data and to address NRC requests for additional information. In February 2010, the NRC issued a Technical Evaluation Report for the DP concluding that the DP was consistent with the preferred alternative in the FEIS. A Phase 1 Characterization Sampling and Analysis Plan and a Phase 1 Final Status Survey Plan for completion of Phase 1 activities are currently being reviewed by the NRC.

Safety Emphasis. During CY 2009, the WVDP work force performed their work safely in a high-risk environment of nuclear waste cleanup, and achieved 2.1 million safe work hours since the last lost-time work injury; more than one year without a recordable injury. This safety performance record earned West Valley Environmental Services LLC (WVES) the rank of number one prime contractor (of 16) in DOE's Office of Environmental Management. In addition, WVES underwent a comprehensive DOE-HQ voluntary protection program (VPP) review and was granted full VPP Star status.

Main Plant Process Building. Only a few areas of the five-story MPPB still contain original reprocessing equipment from operations during the 1960s. Work in 2009 focused on removing equipment and piping from these remaining cells, further decontaminating surfaces, and preparing the structure for future demolition.

Waste Tank Farm Isolation and Tank and Vault Drying System. In 2009, work focused on preparing for the isolation of four underground waste storage tanks to minimize the possibility of ground and surface water entering the tanks and surrounding vaults. Eliminating water infiltration and drying the tanks is being done to prevent tank corrosion thus minimizing the potential for release of contamination into the surrounding soils. Excavation around the underground tank and vault ventilation lines began in late 2009. Design of a tank and vault drying system is nearing completion, and this system is scheduled to be installed in 2010.

North Plateau Groundwater Plume Mitigation. Near-term strategies for managing and mitigating the approximately 15-acre strontium-90 plume are currently being developed by the DOE. Characterization was completed to delineate the underground plume, to find a suitable material to capture and retain the contamination, and to test the capability of a trenching machine to dig a trench and simultaneously backfill the trench with the selected zeolite retention media. During 2009, 39 additional soil borings were completed along the proposed approximately 800-foot-long full-scale permeable treatment wall (PTW). A 30% conceptual design for the identified mitigation strategy (i.e., PTW) was developed in 2009 with final design targeted for 2010. The PTW is scheduled to be installed in the fall of 2010.

American Recovery and Reinvestment Act (ARRA). In 2009, the WVDP was awarded funding under the ARRA to accelerate the progress of site cleanup. Additional skilled workers were hired, enabling new cleanup projects to be initiated and work already underway to be accelerated. Projects included acceleration of deactivation and decontamination work in the MPPB, mitigating the strontium-90 groundwater plume, accelerating radioactive waste processing and packaging, and isolating utilities and removing conduit as part of preparing buildings for demolition. In 2010, a portion of the funding was redirected to other DOE sites, delaying some of the planned work.

DOE and NYSERDA Consent Decree. On October 27, 2009, the DOE and NYSERDA released a consent decree announcing how costs will be allocated between the DOE and NYSERDA for the WVDP and the WNYNSC. This consent decree will resolve litigation that was initiated in 2006 by NYSERDA, the state of New York, and the New York State Department of Environmental Conservation (NYSDEC).

Environmental Management System

The WVDP EMS satisfies the requirements of DOE Order 450.1A, "Environmental Protection Program," and is a key part of the WVDP Integrated Safety Management System. In 2009, WVDP employees continued to demonstrate their commitment to an all-inclusive approach to safety, coordinating the EMS with other safety management and work planning processes through the integrated environmental, health, and safety management program.

Compliance. Management at the WVDP continued to provide strong support for environmental compliance in 2009. Requirements and guidance from applicable state and federal statutes, executive orders, DOE orders, and standards are integrated into the Project's compliance program. In CY 2009:

- No notices of violation or inspection findings from any environmental regulatory agencies were received.
- Inspections by NYSDEC and the Cattaraugus County Department of Health verified Project compliance with the applicable environmental and health regulations.
- WVDP waste management areas were inspected by NYSDEC and the Environmental Protection Agency (EPA) to ensure compliance with the Resource Conservation and Recovery Act §3008(h) Administrative Order on Consent. No findings were noted.
- Project representatives met 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 appropriate emergency response organizations.
- No exceedances to the EPA's National Emission Standards for Hazardous Air Pollutants (NESHAP) dose standard were noted in 2009.
- One State Pollutant Discharge Elimination System (SPDES) permit limit exceedance was noted, in January 2009. The calculated daily maximum net effluent permit limit for total iron (0.30 mg/L) for the

sum of the outfalls was exceeded (0.73 mg/L). Site personnel are currently working with NYSDEC on a permit renewal that will include updated iron compliance limits.

- In February, 2010, DOE-WVDP notified NYSDEC that the approved usage limit for a specific laundry detergent had been exceeded at the WVDP throughout CY 2009. Usage of the detergent was immediately restricted, and toxicity testing was undertaken and results submitted to NYSDEC. Results of the tests indicated that the quantity of detergent used would not have been detrimental to water quality in Erdman Brook. Negotiations are ongoing with NYSDEC for approval of an increased limit for this detergent. The requested increase was filed in December 2009 together with a SPDES permit update.

Environmental Monitoring – Performance Indicators. As part of the WVDP EMS, environmental monitoring was continued on and near the site to detect and evaluate changes in the environment resulting from Project (or pre-Project) activities and to assess the effect of any such changes on the environment or human population. Within the environmental monitoring program, airborne and waterborne effluents were sampled and environmental surveillance of the site and nearby areas was conducted.

- Radiological Releases

  In 2009, the WVDP maintained six NESHAP permits for release of radiological airborne emissions. The primary controlled air emission point at the WVDP is the MPPB ventilation stack.

  Waterborne releases were from two primary sources. In 2009, treated process water was released in seven batches from lagoon 3, totaling approximately 12.3 million gallons (46.7 million liters). The other primary source was from a well-characterized drainage channel on the WVDP's north plateau that is contaminated with strontium-90 from pre-WVDP operations. Radiological concentrations and flow from the north plateau drainage channel were closely monitored.

- Estimated Dose

  In 2009, the estimated dose to a maximally exposed off-site individual (MEOSI) from airborne emissions at the WVDP was 0.0013 millirem (mrem) (0.000013 millisievert [mSv]), about 0.013% of the 10-mrem NESHAP standard. Estimated dose from waterborne sources in 2009 was about 0.074 mrem (0.00074 mSv), with 0.013 mrem (0.00013 mSv) attributable to liquid effluent releases and 0.061 mrem (0.00061 mSv) attributable to the north plateau drainage.

  Total estimated dose to the MEOSI from both airborne and waterborne sources in 2009 was 0.076 mrem (0.00076 mSv), about 0.076% of the annual 100-mrem DOE standard. In comparison, the average dose to a member of the public from natural background sources is 310 mrem per year.

  Estimated dose to the population from both air and water within a 50-mile (80-kilometer) radius of the WVDP from DOE activities in 2009 was 0.38 person-rem (0.0038 person-Sv). This same population would have received approximately 522,000 person-rem from natural background radiation in 2009.

- Dose to Biota

  An evaluation of dose to biota for CY 2009 concluded that populations of aquatic and terrestrial biota (both plants and animals) were not exposed to doses in excess of the existing DOE dose standard for native aquatic animal organisms (1 rad/day) nor the recommended thresholds for terrestrial animals (0.1 rad/day) and plants (1 rad/day).

- Nonradiological Releases

  Nonradiological releases from Project wastewater and storm water monitoring points were measured under the site's SPDES permit. As discussed earlier, during January 2009, the daily calculated maximum permit limit of 0.30 mg/L for total iron for the sum of outfalls was exceeded. Site personnel are currently working with NYSDEC on a permit renewal that will include updated iron compliance limits.

Key Initiatives – Environmental Performance Objectives

DOE Order 450.1A required establishment of goals to integrate sustainable environmental stewardship into a site's operations as a cost effective business practice. The goals are intended to prevent pollution, reduce environmental hazards, protect public health and the environment, avoid pollution control and waste disposal costs, and improve operational capability. Even though the EPA discontinued the National Performance Track program in 2009, WVES continued its commitment to achieve the goals identified in the Performance Track program by incorporating them into the updated EMS objectives and targets identified under DOE Order 450.1A. The former goals and the accomplishments achieved by the end of CY 2009 were to reduce the following from the CY 2006 baseline (2007 through 2009):

- the amount of liquid nitrogen used in the waste tank farm by 10%: liquid nitrogen usage was reduced by 100% from 2007 through 2009;
- the amount of resins used for the treatment of radiologically contaminated wastewater generated by plant operations by 10%: resin usage was reduced by 57.3% in CY 2009;
- the amount of sulfur oxide (SO_x) air emissions from non-transportation purposes by 10%: SO_x emissions were 7.1% above the baseline. Due to damage that occurred during a site power outage, the permanent ventilation system generator ran continuously for 524 hours; and
- the total non-transportation energy usage by 5%: total energy usage was reduced by 60.1% in CY 2009.

Other site-specific environmental stewardship goals and targets were established under this program using a graded approach that takes into consideration that all buildings and infrastructure will be demolished in the coming years.

Waste Minimization/Pollution Prevention. In 2009, the WVDP's long-term waste minimization and pollution prevention program accomplished the following:

- Recycled more than 147 tons (133 metric tons) of materials;
- Reduced expenditures by approximately $60,000 by purchasing used office furniture for renovation of an office complex.
- Transferred more than $1,640,000 worth of excess materials for reuse or resale; and
- Purchased more than $357,000 of environmentally preferable products.

The Nuclear Regulatory Commission-Licensed Disposal Area. The interim measure work was completed in December 2008 to stabilize the inactive landfill by preventing infiltration from precipitation and groundwater. A trench was excavated along two sides of the NDA and backfilled with a bentonite and clay mixture to form a low-permeability subsurface barrier to infiltration. The entire landfill was then resurfaced and covered with geomembrane. Early indications from 2009 data suggest that water levels in wells located in areas covered by the geomembrane have started to decline. The total volume of water pumped from the NDA trench in 2009 was only 15% of the previous three-year average.

Quality Assurance (QA). In 2009, implementation of a QA program for activities supporting the environmental monitoring and groundwater monitoring programs continued at the WVDP. As part of this ongoing effort, on-site and subcontract laboratories that analyze WVDP environmental samples participated in independent radiological and nonradiological constituent performance evaluation studies. In these studies, test environmental samples with concentrations known by the testing agency, but unknown by the laboratory, were analyzed. Of 306 performance evaluation analyses conducted by or for the WVDP, 99.7% fell within acceptance limits.

Several inspections, audits, and assessments of components of the environmental monitoring program were conducted in 2009. Although actions were recommended to improve the program, nothing was found that would compromise the data quality in this report or the environmental monitoring program in general.

Conclusion

In addition to demonstrating compliance with environmental regulations and directives, evaluation of data collected in 2009 continued to indicate that WVDP activities pose no threat to public health or safety, or to the environment.

INTRODUCTION

Site Location

The West Valley Demonstration Project (WVDP or Project) is located in western New York State, about 30 miles (50 kilometers [km]) south of Buffalo, New York (Fig. INT-1). The WVDP facilities occupy a security-fenced area of about 152 acres (61 hectares [ha]) within the 3,338-acre (1,351 ha) Western New York Nuclear Service Center (WNYNSC) located primarily in the town of Ashford in northern Cattaraugus County. In 2009, the Department of Energy released approximately 15.5 acres of the WVDP (on the north side of the New York state-licensed disposal area [SDA]) back to the New York State Energy Research and Development Authority (NYSERDA) as an SDA buffer area for conducting ongoing erosion monitoring, control, and maintenance activities associated with the SDA.

General Environmental Setting

Climate. Although extremes of 98.6°F (37°C) and -43.6°F (-42°C) have been recorded in western New York, the climate is moderate, with an average annual temperature (1971–2000) of 48°F (8.9°C). Precipitation is markedly influenced by Lake Erie to the west and, to a lesser extent, by Lake Ontario to the north. Regional winds are generally from the west and south at about 9 miles per hour (4 meters/second).

Ecology. The WNYNSC lies within the northern deciduous forest biome, and the diversity of its vegetation is typical of the region. Equally divided between forest and open land, the site provides a habitat especially attractive to white-tailed deer and various indigenous migratory birds, reptiles, and small mammals. No species on the federal endangered species list are known to reside on the WNYNSC.

Geology and Hydrology. The Project lies on New York State's Allegheny Plateau at an average elevation of about 1,300 feet (400 meters) above mean sea level. The underlying geology includes a sequence of glacial sediments above shale bedrock. The Project is drained by three small streams (Franks Creek, Quarry Creek, and Erdman Brook) and is divided by a stream valley (Erdman Brook) into two general areas: the north plateau and the south plateau.

Franks Creek, which receives drainage from Erdman Brook and Quarry Creek, flows into Buttermilk Creek, which enters Cattaraugus Creek and leaves the WNYNSC. (See Figs. A-1 and A-5.) Cattaraugus Creek ultimately drains into Lake Erie, to the northwest.

Relevant Demographics

Although several roads and a railway approach or pass through the WNYNSC, the public is prohibited from accessing the WNYNSC. A limited public deer hunting program managed by the NYSERDA is conducted on a year-to-year basis in designated areas on the WNYNSC. No public access is allowed on the WVDP Project premises.

Land near the WNYNSC is used primarily for agriculture and arboriculture. Downstream of the WNYNSC, Cattaraugus Creek is used locally for swimming, canoeing, and fishing. Although some water is taken from the creek to irrigate nearby golf course greens and tree farms, no public drinking water is drawn from the creek before it flows into Lake Erie. Water from Lake Erie is used as a public drinking water supply.

The communities of West Valley, Riceville, Ashford Hollow, and the village of Springville are located within approximately 5 miles (8 km) of the Project. The nearby population, approximately 9,200 residents within 6.2 miles (10 km) of the Project, relies largely on an agricultural economy. No major industries are located within this area. The WVDP is one of the largest employers in Cattaraugus County.

Historic Timeline of the WNYNSC and the WVDP

The following summary, presented in Table INT-1, depicts a historic timeline for the WNYNSC and the WVDP beginning with the establishment of the WNYNSC as a commercial nuclear fuel reprocessing facility, to the creation of the WVDP, to the current Project mission. The summary includes significant legal directives, major activities and accomplishments.

FIGURE INT-1
Location of the Western New York Nuclear Service Center

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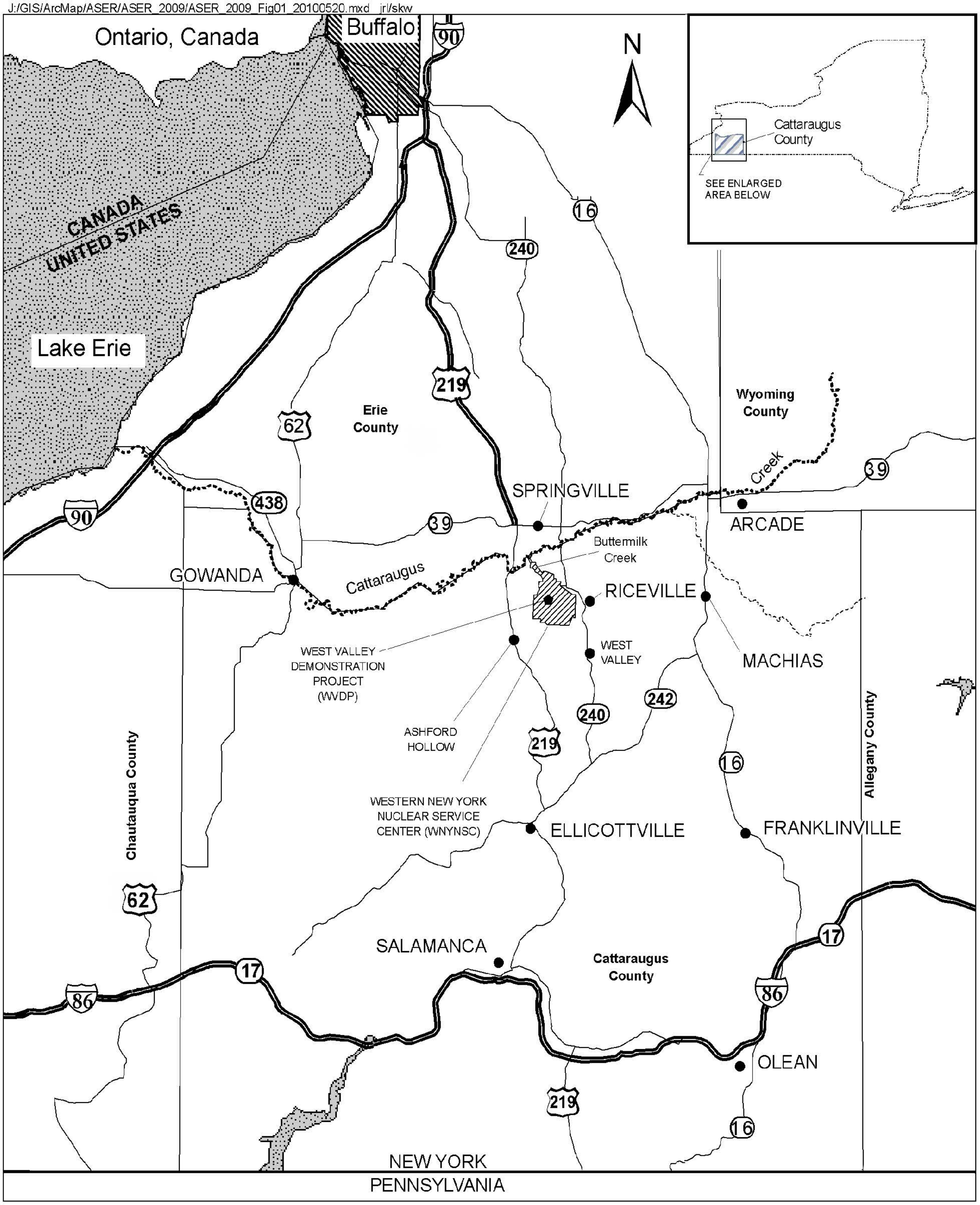


TABLE INT-1
Historic Timeline of the WNYNSC and the WVDP

Year	*Activity*
1954	The Federal Atomic Energy Act promoted commercialization of reprocessing spent nuclear fuel.
1959	New York State (NYS) established the Office of Atomic Development (OAD) to coordinate the atomic industry.
1961	The NYS OAD acquired 3,345 acres (1,354 hectares) of land in Cattaraugus County, Town of Ashford (near West Valley), in western New York and established the Western New York Nuclear Service Center (WNYNSC).
1962	Davison Chemical Company established Nuclear Fuels Services, Inc. (NFS) as a nuclear fuel reprocessing company, and reached an agreement with NYS to lease the WNYNSC (also referred to as "the Center").
1966	NFS constructed and operated the commercial nuclear fuel reprocessing facility at the WNYNSC from 1966 to 1972. NFS processed 640 metric tons of spent reactor fuel at the facility, generating 660,000 gallons (2.5 million liters) of highly radioactive liquid waste. NFS operated a 5-acre landfill, the "U.S. Nuclear Regulatory Commission (NRC)-licensed disposal area (NDA)" for disposal of waste generated from the reprocessing operations. In addition, a 15-acre commercial disposal area, the "state-licensed disposal area (SDA)" regulated by NYS agencies, under delegation of authority from the NRC, accepted low-level radioactive waste (LLW) from operations at the Center and from off-site facilities from 1963 until 1975.
1972	In 1972, while the plant was closed for modifications, more rigorous regulatory requirements were imposed upon fuel reprocessing facilities. NFS determined the costs to meet regulatory requirements of spent nuclear fuel reprocessing were not economically feasible. NFS notified the New York State Energy Research and Development Authority (NYSERDA) in 1976 that they would discontinue reprocessing and would not renew the lease that would expire at the end of 1980.
1975	Water infiltrated into the SDA trenches and waste burial operations ceased. Between 1975 and 1981, NFS pumped, treated, and released liquids to the adjacent stream. Redesigning the covers reduced, but did not eliminate, water accumulation in the trenches.
1980	Before discontinuing fuel reprocessing operations, NFS had accepted 750 spent fuel assemblies which remained in storage in the on-site fuel receiving and storage (FRS) area. In 1980, 625 of those assemblies were returned to the utilities that owned them.
1980	The United States (U.S.) Congress passed Public Law 96-368, the West Valley Demonstration Project Act (WVDP Act), requiring the U.S. Department of Energy (DOE) to be responsible for solidifying the liquid high-level waste (HLW) stored in underground tanks, disposing of the waste that would be created by solidification, and decontaminating and decommissioning the facilities used during the process. Per the WVDP Act, the DOE entered into a Cooperative Agreement with NYSERDA that established the framework for cooperative implementation of the WVDP Act. Under the agreement, the DOE has exclusive use and possession of a portion of the Center known as the Project Premises (approximately 167 acres). A supplement to the Cooperative Agreement (1981 amendment) between the two agencies set forth special provisions for the preparation of a joint Environmental Impact Statement (EIS).
1981	The DOE and the NRC entered into a Memorandum of Understanding that established specific agency responsibilities and arrangements for informal review and consultation by the NRC. Because NYSERDA holds the license and title to the West Valley site, the NRC put the technical specifications of the license (CSF-1) in abeyance to allow the DOE to carry out the responsibilities of the WVDP Act.
1982	West Valley Nuclear Services (WVNS), a Westinghouse subsidiary, was chosen by the DOE to be the management and operating contractor. WVNS commenced operations at the WVDP on February 28, 1982.
1983	In 1983, NYSERDA assumed management responsibility for the SDA and focused efforts to minimize infiltration of water into the trenches. In the 1990s, installation of a geomembrane cover over the entire SDA and an underground barrier wall were successful in eliminating increases in trench water levels.
1983	The DOE selected the vitrification (VIT) process as the preferred method for solidifying the HLW into glass.
1984	Nonradioactive testing of a full-scale VIT system was conducted from 1984–1989.
1984	NFS entered into an agreement with the DOE in which the DOE assumed ownership of the remaining 125 fuel assemblies in the FRS pool and the responsibility for their removal.

TABLE INT-1 *(continued)*
Historic Timeline of the WNYNSC and the WVDP

Year	*Activity*
1986	A large volume of radioactive, non-high-level waste would result from WVDP activities. Disposal of most of this waste was evaluated in an Environmental Assessment (DOE/EA-0295, April 1986), and a finding of no significant impact was issued. Consistent with a settlement agreement, the DOE temporarily stored the waste on site until disposal alternatives are determined under subsequent EISs. The NYS Department of Environmental Conservation (NYSDEC) was authorized by the U.S. Environmental Protection Agency (EPA) to administer the Resource Conservation and Recovery Act (RCRA) hazardous waste program.
1987	A decision to potentially dispose of LLW at the Project led to a legal disagreement between the DOE and the Coalition on West Valley Nuclear Wastes and the Radioactive Waste Campaign. It was resolved by a Stipulation of Compromise which states that LLW disposal at the site and the potential effects of erosion at the site must be included in a comprehensive EIS.
1988	In December 1988, the DOE and NYSERDA issued a Notice of Intent in the Federal Register to prepare an EIS in accordance with Section 102(2)(C) of the National Environmental Policy Act and Section 8-0109 of the New York State Environmental Quality Review Act (SEQRA).
1988	To prepare for VIT, the integrated radwaste treatment system was constructed to process the liquid supernatant from the underground HLW tanks by removing most of the radioactivity in the supernatant, concentrating the liquid, and blending it with cement. The HLW sludge layer was then washed to remove soluble salts. The water containing the salts was also stabilized into cement. About 20,000 drums of cement-stabilized LLW were stored in the aboveground drum cell. The process was completed in 1995.
1990	Organic solvent waste was observed in a groundwater monitoring well immediately downgradient of the NDA in 1983. Following characterization of the area, an interceptor trench bordering the northeast and northwest boundaries of the NDA and a liquid pretreatment system (LPS) were built in 1990–1991. The trench was designed to collect liquid that might migrate from the NDA and the LPS was designed to recover free organic product (if any) from the recovered liquid. To date, no organic product has been detected in the interceptor trench water; therefore, the water has been pumped and treated through the LLW treatment system. In 1990, New York State was granted the authority to regulate the hazardous waste constituents of radioactive mixed waste. Subsequently, a Title 6 New York State Official Compilation of Codes, Rules, and Regulations (6 NYCRR) RCRA Part 373-3 (Part A) Permit Application for the WVDP was filed with NYSDEC for storage and treatment of hazardous and mixed wastes.
1992	In 1992, the DOE and NYSERDA entered into a RCRA §3008(h) Administrative Order on Consent (Consent Order) with NYSDEC and the EPA. The Consent Order pertained to management of hazardous waste and/or hazardous constituents from solid waste management units at the WVDP. It also required the DOE and NYSERDA to perform a RCRA Facility Investigation at the WNYNSC to determine if there had been a release or if there was a potential for a release of RCRA hazardous constituents.
1993	In 1993, gross beta activity in excess of 1.0E-06 µCi/mL (the applicable DOE Derived Concentration Guide for strontium-90) was detected in surface water on the north plateau, in the vicinity of sampling location WNSWAMP. The gross beta radioactivity was determined to be strontium-90.
1994	Extensive subsurface investigations delineated the extent of the strontium-90 plume and determined that the plume originated beneath the southwest corner of the main plant process building (MPPB) during NFS operations and migrated toward the northeast quadrant of the north plateau. A second lobe of contamination was attributed to the area of former lagoon 1, which was backfilled in 1984.
1995	In 1995, a groundwater recovery system consisting of three wells was installed on the north plateau to extract and treat the strontium-90-contaminated groundwater to minimize plume advancement. In 1999, a pilot-scale permeable treatment wall (PTW) was constructed to test this passive in-situ remediation technology.
1995	The vitrification building shielding was installed in 1991, the slurry-fed ceramic melter was assembled in 1993, and the remaining major components were installed and tested by the end of 1994. In 1995, the vitrification facility was completed, fully tested, and "cold operations" began.
1996	The DOE and NYSERDA issued a draft environmental impact statement (DEIS) for Completion of the WVDP and Closure or Long-Term Management of the WNYNSC. After issuance of the DEIS, the Citizen Task Force was convened to provide additional stakeholder input regarding the WVDP/WNYNSC closure process.

TABLE INT-1 *(continued)*
Historic Timeline of the WNYNSC and the WVDP

Year	*Activity*
1996	Vitrification operations began in 1996 and continued into 2002, producing a total of 275 10-foot-tall stainless-steel canisters of hardened radioactive glass containing more than 12.2 million cesium/strontium curies. The glass melter was shut down in September 2002.
1996	NYSDEC and the DOE entered into an Order on Consent negotiated under the Federal Facilities Compliance Act for handling, storage, and treatment of mixed wastes at the WVDP.
1996	The Seneca Nation of Indians Cooperative Agreement was signed in 1996 to foster government-to-government relationships between the Seneca Nation and the U.S. government, as represented by the DOE.
1999	Vitrification expended materials processing was initiated to begin processing unserviceable equipment from the VIT facility. This success helped in developing a remote-handled waste facility (RHWF) to process large-scale, highly contaminated equipment excessed during decontamination and decommissioning activities.
2000	Restructuring of the work force began. Construction of the RHWF began.
2001	The 125 spent fuel assemblies that remained in storage at the WVDP since 1975 were prepared for transport to the Idaho National Engineering and Environmental Laboratory (INEEL). Two significantly contaminated areas in the MPPB, the process mechanical cell and the general purpose cell, were decontaminated.
2001	The DOE published formal notice in the Federal Register (66 FR 16447) to split the EIS process into (1) the WVDP Waste Management EIS, and (2) the Decommissioning and/or Long-Term Stewardship EIS at the WVDP and the WNYNSC.
2002	The NRC issued "Decommissioning Criteria for the West Valley Demonstration Project (M-32) at the West Valley Site; Final Policy Statement" (67 FR 5003).
2003	The remaining 125 spent fuel assemblies were shipped to INEEL, allowing for decontamination of the FRS to begin.
2004	The RHWF became operational. Major decontamination efforts continued and more than 104,000 cubic feet of LLW were safely shipped for off-site disposal. Footprint reduction began as 20 office trailers were removed. The 6 NYCRR RCRA Part 373-2 Permit Application (i.e., Part B) was submitted to NYSDEC.
2005	In June 2005, the DOE published its final decision on the "WVDP Waste Management Environmental Impact Statement (68 FR 26587)." The DOE implemented the preferred alternative for the management of WVDP LLW and mixed LLW. The decision on transuranic waste was deferred, and the HLW canisters will remain in on-site storage until they can be shipped to a repository.
2005	In November 2005, the WVDP was downgraded to a Category 3 nuclear facility, marking the first time in the site's history that it has been designated the least of the three DOE nuclear facility designations. The categorization is based on amounts, types, and configuration of the nuclear materials stored and their potential risks. Site footprint reduction activities escalated and more than 300,000 cubic feet of LLW were shipped off site for disposal.
2006	An Environmental Assessment (DOE/EA-1552) evaluating the proposed decontamination, demolition, and removal of 36 facilities was issued. Eleven of the 36 structures were removed by the end of 2006, and about 400,000 cubic feet of various waste types were shipped off site for disposal.
2006	The DOE-WVDP office initiated a collaborative, consensus-based team process, referred to as the "Core Team," that involved NYSERDA, the EPA, the New York State Department of Health, the NRC, and NYSDEC. This team brought individuals with decision-making authority together to resolve challenging issues surrounding the WVDP EIS process and to make recommendations to move the Project toward an "Interim End-State" prior to issuance of the "Final EIS for the Decommissioning and/or Long-Term Stewardship at the WVDP and the WNYNSC."
2007	Demolition and removal of four more structures identified under the DOE/EA-1552 was completed. On June 29, 2007, the DOE awarded West Valley Environmental Services LLC a four-year contract (Contract DE-AC30-07CC30000) to conduct the next phase of cleanup operations at the WVDP. The remaining drums of cemented LLW in the Drum Cell were packaged and shipped to the Nevada Test Site for disposal.

TABLE INT-1 *(concluded)*
Historic Timeline of the WNYNSC and the WVDP

Year	*Activity*
2007–2008	An interim measure to minimize water infiltration into the NDA was initiated in 2007 with site surveys and soil borings. In 2008, a trench was excavated along two sides of the NDA. The trench was backfilled with bentonite and clay to form the slurry wall - a low-permeability subsurface barrier to infiltration. The entire landfill was covered with a geomembrane cover.
2008	Additional subsurface soil and groundwater samples were collected in the summer and fall of 2008 to enhance the characterization of chemical and radiological constituents in soil and groundwater within the contaminated groundwater plume beneath and downgradient of the MPPB.
2008	The revised DEIS for Decommissioning and/or Long-Term Stewardship at the WVDP and WNYNSC was issued in December 2008 for public review, which continued through September 8, 2009. At the same time, the Proposed Phase 1 Decommissioning Plan for the WVDP was prepared and submitted to the NRC.
2009	Extensive characterization was completed to delineate the leading edge of the subsurface strontium-90 groundwater plume and to find a suitable material to capture and retain the contamination. An approximately 800-foot-long PTW near the leading edge of the plume is scheduled to be installed in 2010.
2010	In January 2010, the DOE and NYSERDA issued the Final EIS (FEIS) for the WVDP and the WNYNSC (DOE/EIS-0226). The phased decisionmaking alternative was selected as the preferred alternative for the site. The phase 2 decision was deferred for no more than 10 years. A SEQRA notice of completion for the FEIS and acceptance of the FEIS by NYSERDA was issued on January 27, 2010. On April 14, 2010, the DOE issued the Record of Decision for the FEIS, selecting the phased decisionmaking alternative.

ENVIRONMENTAL COMPLIANCE SUMMARY

Compliance Program

The United States (U.S.) Department of Energy (DOE) is currently focusing on several goals at the West Valley Demonstration Project (WVDP or Project) to support completion of the requirements identified in the WVDP Act (Public Law 96-368).

Activities at the WVDP are regulated by various federal and state public, worker, and environmental protection laws. These laws are administered primarily by the U.S. Environmental Protection Agency (EPA), the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, the New York State Department of Environmental Conservation (NYSDEC), and the New York State Department of Health (NYSDOH) through programs and regulatory requirements for permitting, reporting, inspecting, self-monitoring, and auditing.

The EPA, NYSDEC, and DOE have established standards for effluents that are intended to protect human health, safety, and the environment. The DOE applies to the EPA for permits to release limited amounts of radiological constituents to the air and applies to NYSDEC for permits to release limited amounts of nonradiological constituents to the air and water, in concentrations determined to be safe for humans and the environment. In general, the permits describe release points, specify management and reporting requirements, list discharge limits on those pollutants likely to be present, and define the sampling and analysis regimen. Releases of radiological constituents in water are subject to the requirements in DOE Orders 450.1A (Environmental Protection Program) and 5400.5 (Radiation Protection of the Public and the Environment). A summary of permits is found in Table ECS-3. (See the compliance tables at the end of this chapter.)

Compliance Status

Table ECS-1 describes the WVDP's compliance status with applicable environmental statutes, DOE directives, executive orders, and state laws and regulations applicable to the Project activities.

TABLE ECS-1
Compliance Status Summary for the WVDP in Calendar Year (CY) 2009

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
42 United States Code (USC) §2011 et seq.	The **Atomic Energy Act (AEA)** of 1954 was enacted to assure the proper management of source, special nuclear, and by-product materials. The AEA and the statutes that amended it delegate the control of nuclear energy primarily to the Department of Energy (DOE), the Nuclear Regulatory Commission (NRC), and the Environmental Protection Agency (EPA).	See discussions of the West Valley Demonstration Project (WVDP) Act and of DOE Orders 435.1, 450.1A, and 5400.5.
Public Law 96-368	The **WVDP Act** of 1980 authorized the DOE to carry out a high-level liquid nuclear waste demonstration project at the Western New York Nuclear Service Center (WNYNSC [the Center]) in West Valley, New York.	The DOE is focusing on goals that will lead to completion of responsibilities listed in the WVDP Act.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2009

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
Cooperative Agreement between the DOE and the New York State Energy Research and Development Authority (NYSERDA)	The **Cooperative Agreement Between the DOE and NYSERDA on the WNYNSC** established a cooperative framework for implementation of the Project, effective October 1980, as amended in September 1981.	The agreement arranged lease of the Project premises to the DOE in order to carry out responsibilities under the WVDP Act. The supplemental agreement defined special provisions for the preparation of a joint Environmental Impact Statement (EIS). A Notice of Public Availability of the Final EIS was published in the Federal Register (FR) on January 29, 2010.
WVDP Memorandum of Understanding (MOU) between the DOE and the NRC	The 1981 MOU, mandated by the WVDP Act, established procedures for review and consultation by the NRC with respect to activities conducted at the WNYNSC by the DOE under the WVDP Act. The agreement encompassed development, design, construction, operation, and decontamination and decommissioning activities associated with the Project as described in the WVDP Act. Under the WVDP Act, and to satisfy committments made to the NRC, the DOE was required to prepare a decommissioning plan for the Project and submit it to the NRC for review.	The NRC was authorized through the WVDP Act to prescribe decommissioning criteria for the WVDP. In 2002, the NRC issued "Decommissioning Criteria for the WVDP (M-32) at the West Valley Site; Final Policy Statement" (67 FR 5003). The NRC's role under the Act is to provide informal review and consultation. The "Phase 1 Decommissioning Plan for the West Valley Demonstration Project" was prepared by the DOE persuant to its statutory obligations for decontamination and decommissioning of the WVDP under the WVDP Act. This plan was submitted to the NRC in December 2008 and updated in March 2009 and again in December 2009.
DOE Order 231.1A	DOE Order 231.1A, **Environment, Safety, and Health Reporting,** was issued to ensure timely collection, reporting, analysis, and dissemination of information on environment, safety, and health issues as required by law or regulations or as needed to ensure that the DOE and National Nuclear Security Administration are kept fully updated about events that could adversely affect the health and safety of the public or the workers, the environment, the intended purpose of DOE facilities, or the DOE's credibility.	This WVDP Annual Site Environmental Report (ASER) is prepared and submitted annually to DOE Headquarters, regulatory agencies, and interested stakeholders in compliance with DOE Order 231.1A.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2009

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
DOE Order 5400.5	DOE Order 5400.5, **Radiation Protection of the Public and the Environment**, established standards for DOE operations and DOE contractors to ensure that (1) operations are conducted to limit radiation exposure to members of the public pursuant to limits established in the Order, (2) potential exposures to members of the public are as low as reasonably achievable, (3) routine and nonroutine releases are monitored and dose to the public is addressed, and (4) the environment is protected from radioactive contamination to the extent practicable.	This ASER summarizes radiological estimates of dose to the public and the environment, and compares these values with release and dose standards established by this Order. In 2009, estimated doses from airborne and waterborne releases to the maximally exposed off-site individual (MEOSI) were 0.076% of the 100-millirem (mrem) standard, and about 0.024**%** of natural background radiation. Refer to Chapter 3, "Dose Assessment," for further discussion.
DOE Order 435.1	DOE Order 435.1, **Radioactive Waste Management**, was issued in 1999 to ensure that all DOE radioactive waste is managed in a manner that is protective of worker and public health and safety and the environment, and complies with applicable state, federal and local laws and regulations. Under the Order, sites that manage radioactive waste are required to develop, document, implement, and maintain a site-wide radioactive waste management program which includes actions to minimize radioactive waste generation.	The WVDP maintains program documentation separately for each waste type. Management of high-level waste was conducted in accordance with the "WVDP Waste Acceptance Manual;" Transuranic (TRU) waste was managed in accordance with the "TRU Waste Management Program Plan;" low-level waste (LLW) was managed as summarized in the "LLW Management Program Plan;" and the radioactive component of mixed LLW was managed as summarized in the "Site Treatment Plan (STP) Fiscal Year 2009 Update."
DOE Order 450.1A	DOE Order 450.1A, **Environmental Protection Program,** June 4, 2008 replaced DOE Order 450.1. The Order required implementing an environmental management system (EMS) to conduct work at DOE sites to protect air, water, land, and other natural and cultural resources impacted by DOE operations. The DOE is required to conduct environmental effluent and surveillance monitoring to support the WVDP's integrated safety management system (ISMS), to ensure early identification of, and appropriate response to, potential adverse environmental impacts associated with operations. Sites must have a formal third party audit of the EMS, identified findings must be tracked to completion, and a "Declaration of Full Implementation" must be submitted to DOE-Headquarters every three years.	Since 1999, an EMS has been implemented via policies and procedures that provide an integrated site safety management program to accomplish work through proactive management, environmental stewardship, and integrating appropriate technologies across all Project functions. The EMS is an important part of the ISMS at the WVDP. A formal third party audit of the WVDP EMS was conducted on May 18–20, 2009 by a qualified party outside the control of the WVDP EMS. On June 11, 2009, consistent with the requirements of DOE Order 450.1A, WVES submitted to the DOE a declaration that the WVDP EMS is fully implemented. Refer to Chapter 1, "Environmental Management System," for further discussion.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2009

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
Title 10 Code of Federal Regulations (10 CFR) Part 830, Subpart A	10 CFR Part 830, **Nuclear Safety Management**, Subpart A, **Quality Assurance Requirements** provides the quality assurance (QA) program policies and requirements applicable to activities at the WVDP.	A QA program that provides a consistent system for collecting, assessing, and documenting data pertaining to radionuclides in the environment is implemented at the WVDP.
42 USC §4321 et seq.	The **National Environmental Policy Act (NEPA)**, of 1969 and as amended in 1970, established a national policy to ensure that protection of the environment is included in federal planning and decision-making. The President's Council on Environmental Quality established a screening system of analyses and documentation that requires each proposed action to be categorized according to the extent of its potential environmental impact.	The DOE-WVDP has prepared various documents which describe potential environmental effects associated with proposed site activities. The level of documentation depends upon whether the action constitutes a major federal action significantly affecting the quality of the human environment within the meaning of NEPA. Draft documents are then issued for public comment, as appropriate. Based on the analyses presented, and considering regulatory agency and public input, the DOE determines the preferred alternative and issues a record of decision regarding the action. Refer to text later in this chapter for further discussion of NEPA activities.
Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York (6 NYCRR) Part 617 New York State (NYS) Environmental Conservation Law (ECL)	The NY **State Environmental Quality Review Act (SEQRA) of** January 1, 1996, enacted in September 1976 and as amended on June 26, 2000, requires adequate environmental review and assessment of whether a proposed action has the potential to have a significant environmental impact, prior to a decision regarding the action. Where a project involves both NYS and federal approvals, it is preferred to coordinate the SEQRA and NEPA processes.	The SEQRA process is an action-forcing statute that requires state agencies to incorporate environmental considerations directly into their decision-making, and where necessary, to modify that action to mitigate adverse environmental effects. Although the NEPA federal procedural statute requires documentation of the decisionmaking process, it does not require that environmental considerations be elevated above other factors. Coordinated efforts were made at the WVDP to effectively utilize information from the federal EIS process to make the required SEQRA Findings Statement.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2009

Citation	***Environmental Statute, DOE Directive, Executive Order, Agreement***	***WVDP Compliance Status***
42 USC §6901 et seq., and NYS ECL	The **Resource Conservation and Recovery Act (RCRA)** of 1976 and the **NYS Solid Waste Disposal Act** (NYS ECL Article 27 [Title 9]) govern the generation, storage, handling, and disposal of hazardous wastes and closure of systems that handle these wastes. RCRA was enacted to ensure that hazardous wastes are managed in a way that protects human health, safety, and the environment.	Generation, storage, handling, treatment, and disposal of hazardous waste, and closure of systems that handle hazardous waste at the WVDP, are conducted in accordance with the RCRA Part A Interim Status Permit Application. The New York State Department of Environmental Conservation (NYSDEC) performed a hazardous waste compliance inspection of the WVDP facilities on March 24, 2009 and reported no violations of NYS hazardous waste regulations. The EPA also performed a RCRA facility inspection on November 17, 2009, and reported no negative findings. A detailed discussion of RCRA activities is presented later in this chapter.
Amendment to 42 USC §6961	The **Federal Facilities Compliance Act (FFCA)** of 1992 (an amendment to RCRA) requires DOE facilities to prepare an STP for treating mixed waste inventories to meet land disposal restrictions and to update the plan (i.e., annually) to account for changes in mixed waste inventories, capacities, and treatment technologies. The DOE entered into a Consent Order with NYSDEC for the WVDP in 1996.	The WVDP STP fiscal year (FY) 2009, revised in February 2010, consists of two volumes, the background volume and the plan volume. The FFCA requires completing milestones identified in the plan volume. The FY 2009 plan identified three proposed milestones for waste streams managed under the WVDP STP, all of which were completed by September 30, 2009.
Docket No. II RCRA 3008(h) 92-0202	The DOE and NYSERDA entered into the **RCRA §3008(h) Administrative Order on Consent** (the Consent Order) with the EPA and NYSDEC in March 1992. The Consent Order pertains to management of RCRA corrective actions in association with hazardous waste and/or hazardous constituents from solid waste management units at the WNYNSC. The EPA is the lead agency.	Written procedures and site activities are compliant with the Consent Order. In accordance with the Consent Order, the DOE submits quarterly reports to the EPA and NYSDEC that summarize all RCRA §3008(h) activities and progress conducted at the WVDP for the representative quarter. A detailed discussion of CY 2009 activities is presented later in this chapter.
RCRA 3016 Statute	The **RCRA 3016 Statute** applies to all Federal hazardous waste facilities currently owned or operated by the government. It requires that facility hazardous waste information be submitted to the EPA and authorized states.	WVDP facility hazardous waste activities are reported biennially to the EPA and NYSDEC. This report was submitted on December 28, 2009.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2009

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
NYS Navigation Law and NYS ECL	**NYS ECL** Article 17 (Titles 10 and 17), 6 NYCRR 612-614 and Parts 595-599, and 6 NYCRR Subpart 360-14 regulate design, operation, inspection, maintenance, and closure of aboveground and underground bulk petroleum and chemical bulk storage (CBS) tanks. They also regulate spill reporting and cleanup. Under terms of a 1996 agreement, amended in 2005, the DOE is not required to report a spill of petroleum product onto an impervious surface if the spill is less than 5 gallons and is cleaned up within two hours of discovery.	The last CBS tank at the WVDP was closed under these regulations in 2006. There remain nine registered petroleum bulk storage tanks (eight aboveground and one underground) that are periodically inspected and maintained. Spills are reported and cleaned up in accordance with written policies and procedures. There were two spills of petroleum product of approximately one quart each during the first and fourth quarters of CY 2009. These quantities did not require immediate notification to NYSDEC, and were reported in quarterly reports.
Executive Order (E.O.) 13423	E.O. 13423, **Strengthening Federal Environmental, Energy, and Transportation Management**, issued in January 2007, replaced several executive orders known as the Greening the Government Executive Orders (including E.O. 13101 and E.O. 13148). The Order did not rescind any of the requirements found in the earlier orders, but updated previous goals and their baselines and added new initiatives. The Order set goals in areas of energy efficiency, renewable energy, acquisition, toxics reduction, recycling, sustainable buildings, electronics stewardship, and water conservation.	Waste minimization, pollution prevention, recycling, and affirmative procurement objectives are achieved in accordance with the WVDP "Waste Minimization Pollution Prevention Awareness Plan." The "WVDP FY 2009 EO 13423 RCRA/EO Affirmative Procurement Report and the Annual Report on Pollution Prevention Progress" was submitted to the DOE website on November 24, 2009. (See Tables ECS-6 and ECS-7.)
42 USC §7401 et seq.; 40 CFR 61, Subpart H; and 6 NYCRR Chapter 3, Air Resources	The **Clean Air Act** of 1970 and the **NYS ECL** regulate the release of air pollutants through permits and air quality limits. Emissions of radionuclides are regulated by the EPA via the **National Emission Standards for Hazardous Air Pollutants (NESHAP)** regulations. Nonradiological emissions are permitted under 6 NYCRR Part 201-4 (Minor Facility Registrations).	During CY 2009, the DOE maintained six NESHAP permits for radiological emissions and one Air Facility Registration Certificate for nonradiological emissions at the WVDP. An annual NESHAP Report summarizing radiological emissions and estimating dose is submitted to the EPA. Estimated dose from radiological air emissions to the MEOSI in 2009 was 0.013**%** of the 10-mrem Subpart H standard. Refer to Chapter 3, "Dose Assessment," for discussion. In July 2009, the DOE received interim approval from EPA Region 2 to establish a program to use ambient environmental measurements pursuant to 40 CFR 61.93(b)(5) to demonstrate compliance with 40 CFR Subpart H. Refer to the "Environmental Issues" section at the end of this chapter for a discussion. In CY 2009, two utility steam boilers were responsible for nonradiological emissions of nitrogen and sulfur oxides at 1.6% of the 49.5-ton capping limit for maintaining the registration certificate. (See Table ECS-8.)

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2009

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
33 USC §1251 et seq. and NYS ECL	The **Federal Water Pollution Control Act** of 1977 (**Clean Water Act [CWA]**) and **NYS ECL** (Article 17 [Title 8]) seek to improve surface water quality by establishing standards and a system of permits. Wastewater and storm water discharges are regulated by NYSDEC through the State Pollutant Discharge Elimination System (SPDES) permit. Discharges of fill material are regulated through permits issued by the U.S. Army Corps of Engineers (USACE) and water quality certifications issued by NYSDEC.	Monthly SPDES Discharge Monitoring Reports are submitted to NYSDEC. SPDES-permitted storm water monitoring was successfully completed during 2009 by sampling the eight drainage basins during qualifying storm events. During the month of January 2009, the daily maximum net effluent permit limit of 0.30 mg/L for total iron for the sum of the outfalls was exceeded. Site personnel are currently working with NYSDEC on a permit renewal that will include updated iron discharge monitoring and compliance limits. Refer to "SPDES Permit" later in this chapter for further discussion.
E.O. 11990	E.O. 11990, **Protection of Wetlands**, directed federal agencies to avoid, where possible, impacts (e.g., destruction, modification, or new construction) that would adversely effect wetlands wherever there is a practical alternative. Activities in wetlands are regulated by the USACE and NYSDEC permits. The wetlands on the WVDP are subject to regulation under Section 404 of the CWA and NYS ECL Articles 24 and 36.	Wetlands are periodically identified and delineated on the WVDP. In 2006, the USACE confirmed that 34.09 acres of wetlands, subject to federal jurisdiction, exist within and adjacent to the WVDP. A wetland complex of 17.3 acres is subject to NYSDEC jurisdiction. A re-delineation identified an additional wetland of 0.09 acres, adjacent to the live-fire range (LFR), that is hydrologically connected to the NYSDEC jurisdictional wetlands.
42 USC §9601 et seq.	The **Comprehensive Environmental Response, Compensation, and Liability Act** of 1980 **(CERCLA**, including the **Superfund Amendments and Reauthorization Act** of 1986 **[SARA]**) provided the regulatory framework for remediation of releases of hazardous substances and remediation of inactive hazardous waste disposal sites.	Based on the results of a Preliminary Assessment Report prepared for the DOE, it was determined that the WVDP did not qualify for listing on the national priorities list. Therefore, no further investigation pursuant to CERCLA was warranted. However, if a hazardous substance spill exceeds a reportable quantity, CERCLA reporting requirements may be triggered.
42 USC §11001 et seq.	The **Emergency Planning and Community Right-to-Know Act (EPCRA)** of 1986 (also known as SARA Title III) was designed to create a working partnership between industry, business, state and local government, and emergency response representatives to help local communities protect public health, safety, and the environment from chemical hazards.	Chemical inventories for the WVDP are reported quarterly under EPCRA as appropriate. There were no releases of hazardous substances in 2009 that triggered release notifications under EPCRA. A new 13,000 gallon liquid nitrogen tank was installed in 2009 to support the nitrocision effort. Sodium hydroxide is no longer stored above the threshold planning quantity. Refer to Tables ECS-9 and ECS-10.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2009

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
42 USC §300f et seq.	The **Safe Drinking Water Act** of 1974 requires that each federal agency operating or maintaining a public water system must comply with all federal, state, and local requirements regarding safe drinking water. Compliance in New York State is verified by oversight of the New York State Department of Health (NYSDOH), through NYS Public Health law, and the Cattaraugus County Health Department (CCHD).	The WVDP operates a non-transient, non-community public drinking water system serving a population of less than 500. All CY 2009 results from analyses of drinking water were reported within limits to the CCHD. The CCHD performed an inspection of the treatment and distribution system on March 17, 2009, during which backflow prevention device testing documentation was verified. No concerns were identified.
10 CFR 851	10 CFR 851 **"Worker Safety and Health Program"** of 2006 requires DOE contractors to provide their workers with a safe and healthful workplace. To accomplish this objective, the rule established program requirements specific to management responsibilities, worker rights, hazard identification and prevention, safety health standards, required training, recordkeeping, and reporting.	WVES personnel revise procedures and programs to maintain requirements to comply with 10 CFR 851. Any proposed modification, addition, or deletion that may invalidate a portion of the worker health and safety program at the WVDP must be approved by DOE-WVDP.
15 USC §2601 et seq., and 12 NYCRR Part 56	The **Toxic Substances Control Act** of 1976 regulates the manufacture, processing, and distribution of chemicals, including asbestos-containing material (ACM) and polychlorinated biphenyls (PCBs). Effective September 2006, the New York State Department of Labor (NYSDOL) significantly revised the asbestos regulations, cited in 12 NYCRR Part 56. As a result, operating procedures were revised, special training for asbestos workers was conducted, and the WVDP applied for and was granted site-specific variances.	During 2009, all ACM activities were managed in accordance with the site "Asbestos Management Plan" and activities were completed by personnel certified by NYSDOL. On March 22, 2010, the NYSDOL conducted an unnanounced inspection of asbestos-handling activities at the WVDP. No violations, observations, or findings were identified. Refer to Table ECS-5 for a summary of asbestos waste management activities. Management of PCBs was done in accordance with the WVDP "PCB and PCB-Contaminated Material Management Plan." The WVDP operators maintain an annual document log that details PCB use and changes in storage or disposal status.
7 USC §136 et seq.	The **Federal Insecticide, Fungicide, and Rodenticide Act** of 1996 and **NYS ECL** provided for EPA and NYSDEC control of pesticide distribution, sale, and use.	Chemical pesticides are applied at the WVDP only after alternative methods are evaluated by trained and NYSDEC-certified professionals and determined to be unfeasible. In 2009, approximately 250 pounds (lbs) of a NYSDEC-registered biocide was added to the cooling water system to minimize the potential for system damage due to algal buildup and the potential for worker exposure to waterborne pathogens, such as Legionella. In addition, 90 lbs of a germicidal detergent was used to clean respirators. Refer to "SPDES Permit" discussion later in this chapter.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2009

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
NYS ECL, Article 15, Title 5, et seq.	**NYS ECL**, Article 15, Title 5, **Protection of Water** regulates the safety of dams and other surface water impounding structures, including construction, inspection, operation, maintenance, and modification of these structures. Revised dam safety regulations became effective on August 19, 2009. The dams maintained by the WVDP, on the WNYNSC property, are classified as Class A - low-hazard dams.	Two surface water impounding dam structures are located on the WNYNSC: NYS Atomic Development Dam #1 (DEC Dam ID #019-3149) and NYS Atomic Development Dam #2 (DEC Dam ID #019-3150). Inspections and maintenance are routinely performed. Repairs or construction activities related to the dams may require permits from NYSDEC. Refer to "Safety Inspections of the WNYNSC Dams" discussion later in this chapter.
NYS ECL Article 15, Title 33, et seq.	**NYS ECL,** Article 15, Title 33 **Water Withdrawal Reporting** requires that any person who withdraws or is operating any system or method of withdrawal that has a capacity to withdraw more than 100,000 gallons of groundwater or surface water per day shall file an annual report with NYSDEC. The recently passed legislation was enacted in order to gain more complete information for managing the state's water resources.	WVES operates a non-transient, non-community public water supply system for drinking water and operational purposes at the WVDP. In compliance with the newly enacted legislation, the 2009 WVDP Water Withdrawal Annual Report was submitted to NYSDEC on January 28, 2010.
NYS Public Health Law	**Public Health Law**, Article 5 (Laboratories), Section 502 (Environmental Laboratories, Examinations, and Certificates of Approval)	The WVDP Environmental Laboratory (the URS Corporation Laboratory) is certified by NYSDOH for certain radiological and nonradiological constituents in potable and nonpotable water, as well as for asbestos in solids.
49 CFR Part 172, and 6 NYCRR Part 364.9	6 NYCRR Part 364.9 regulates handling and storage of potentially infectious regulated medical waste. 49 CFR Part 172, Subpart H regulates transportation safety and disposal of regulated medical waste at a licensed facility.	The on-site health services office is registered with NYS as a "Small Quantity Generator" of regulated medical waste. Medical services generate potentially infectious medical wastes that are securely stored in approved biohazard containers and are handled and controlled by authorized personnel.
16 USC §703 et seq., and 6 NYCRR Part 175	The **Migratory Bird Treaty Act** of 1918 implemented various treaties and conventions between the U.S. and foreign countries for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful. (See also 6 NYCRR Part 175, **Special Licenses and Permits - Definitions and Uniform Procedures.)**	The DOE maintains, and complies with, a NYSDEC Division of Fish and Wildlife Bird Depredation License and a U.S. Fish and Wildlife Bird Depredation Permit for the WVDP. (See Table ECS-12.)

TABLE ECS-1 *(concluded)*
Compliance Status Summary for the WVDP in CY 2009

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
16 USC §1531 et seq., and 6 NYCRR Part 182	The **Endangered Species Act** of 1973 provided for the conservation of endangered and threatened species of fish, wildlife, and plants. (See also 6 NYCRR Part 182, **Endangered and Threatened Species of Fish and Wildlife; Species of Special Concern**.)	Several ecological surveys of the WNYNSC premises have been conducted. Except for "occasional transient individuals," no plant or animal species protected under the Endangered Species Act are known to reside at the Center.
16 USC §470	The **National Historic Preservation Act** of 1966 established a program for the preservation of historic properties throughout the nation.	Surveys have been conducted of the WNYNSC for historic and archaeological sites. Surveys revealed American Indian and historic homestead artifacts, consistent with the area.
E.O. 11988	E.O. 11988, **Floodplain Management**, was issued to avoid adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.	No activities were performed during 2009 at the WVDP that would develop or be adversely impacted by the 100-year floodplain within the premises.
Stipulation Pursuant to NYS ECL Section 17-0303, and Section 176 of the Navigation Law	In accordance with **Stipulation No. R9-4756-99-03**, dated March 1999, the DOE agreed to install a soil bioventing system to remediate petroleum contaminated soils in the warehouse underground tank site (NYSDEC Spill number 9708617). The remediation plan was to construct a bioventing system, operate it for two calendar years, assess performance, and report to NYSDEC.	The system stimulated natural in-situ biodegradation of petroleum hydrocarbons in the soil by providing abundant oxygen to existing microorganisms. After reviewing soil and water sampling, analyses, and evaluations, NYSDEC determined that no further remediation was required. A determination regarding the potential need for future actions will be made consistent with Phase 2 decisionmaking under the NEPA process.
6 NYCRR 360	**NYS ECL Solid Waste Management Facility Regulations** define requirements for closure of nonradioactive solid waste disposal facilities in a manner that protects the environment.	In 1986, an engineering closure plan was submitted to and approved by NYSDEC for the construction and demolition debris landfill (CDDL). The closure was performed in accordance with landfill closure regulatory requirements specified in the approved closure plan. The plan also requires post-closure perpetual maintenance and annual reporting in this ASER. The CDDL cover was inspected in April 2009 for integrity and bare areas and the culverts were inspected for erosion and silting. All areas were found to be in good condition.

2009 Accomplishments and Highlights at the WVDP

West Valley Environmental Services LLC (WVES) operated the WVDP in a safe manner that continued to be protective of the public, its workers, and the environment throughout 2009. The projects were carried out in accordance with applicable permits and licenses. The following accomplishments contributed to major progress in support of completion of the requirements identified in the WVDP Act.

Safety Emphasis. During calendar year (CY) 2009, the WVDP workforce performed their work safely in a high-risk environment of nuclear waste cleanup, and achieved 2.1 million safe work hours since the last lost-time work injury, with more than one year without a recordable injury. This safety performance earned WVES the rank of being the number one prime contractor (of 16) in DOE's Office of Environmental Management. Hazardous work, combined with changing conditions and challenging schedules, create the potential for worker injury, but attention to detail, strong technical know-how, and commitment to safety demonstrate the site-wide safety culture at the WVDP.

In November 2009, WVES underwent a rigorous DOE-HQ voluntary protection program (VPP) accreditation review and was awarded unconditional VPP Star status.

Main Plant Process Building (MPPB). Only a few areas of the five-story MPPB still contain original reprocessing equipment from operations during the 1960s. Work is focusing on removing equipment and piping from the remaining cells and further decontamination to prepare the structure for future demolition.

The MPPB was not designed for hands-on maintenance, with limited access to the upper floors and many cells. In 2009, the north side of the product purification cell was cleared and decontaminated for use as a material-handling chute, allowing access to previously inaccessible MPPB areas. In the acid recovery cell, work began in 2008 and was completed in 2009 with removal of the remaining vessels and over 5,500 linear feet of contaminated piping. Extraction cell-3 (XC-3) was also emptied and work completed in 2009. XC-3 was originally cleared in the 1980s and reused during the vitrification era of the Project. Due to the weight of the tanks and limited access, nearly all of the 12 tanks and associated piping were removed by crane through the MPPB roof. From the Hot Acid Cell, two large tanks were removed through an opening cut into an exterior MPPB wall.

Waste Tank Farm Isolation and Tank and Vault Drying System. In 2009, work was focused on preparing for the isolation of four underground former high-level waste (HLW) tanks and minimizing ground and surface water from entering the tanks and surrounding vaults. Eliminating water infiltration and drying the tanks is being done to prevent tank corrosion thus minimizing the potential release of contamination into the surrounding soils. Excavation around the underground tank and vault ventilation lines began in late 2009, while design was nearing completion. A tank and vault drying system is scheduled to be installed in 2010.

North Plateau Groundwater Plume Mitigation. The plan to mitigate the approximately 15-acre radioactively contaminated groundwater plume at the WVDP was developed in 2009. Characterization was completed to delineate the underground plume, find a suitable material to capture and retain the contamination, and to test the capability of a trenching machine to dig a trench and simultaneously backfill with treatment media. An approximately 800-foot-long permeable treatment wall (PTW) near the leading edge of the plume is scheduled to be installed in 2010.

Special studies were begun in 2009 to evaluate the ability of different types of zeolite to remove strontium-90 from groundwater. These studies, sponsored by the DOE and performed under the direction of the State University of New York at Buffalo, are being performed to support the design of a full-scale PTW at the WVDP. See discussion in Chapter 1 under "Collaborative Study for Treatment of Strontium-90 in Groundwater."

American Recovery and Reinvestment Act (ARRA). In 2009, the WVDP was awarded funding under the ARRA to accelerate cleanup projects at the site. The funding afforded hiring of additional skilled workers to complete the new work, to be performed in conjunction with important cleanup work already underway. 2009 ARRA accomplishments included:

- Accelerating decontamination of the MPPB, including isolating and removing hazardous and asbestos-containing materials from steam lines and light fixtures; initiating utility isolation and conduit removal; and completing decontamination of the process mechanical cell crane and the power manipulator and crane room.
- Designing a system to solidify higher-activity liquids remaining in the MPPB. Work involved sam-

pling and analyzing the liquids to be stabilized; placing a subcontract for the laboratory development of a stabilization recipe; and technically reviewing quotes for a dry ingredient supply system.

- Designing a system to dry the underground radioactive waste tanks and vaults. Installation of the temporary ventilation line is 80% complete. The system is undergoing a final design review.

- Preparing a design for a system to mitigate the strontium-90-contaminated groundwater plume. A trencher test demonstration was conducted for installation of the PTW in the north plateau.

- Accelerating stored radioactive waste processing and packaging. Facility upgrades were completed to support contact-handled transuranic waste processing.

- Isolating the utilities was begun in the 01-14 building.

A decision in 2010 by the DOE to transfer a portion of the awarded ARRA funding to other DOE sites resulted in the need to halt or delay some of the work scopes originally identified under the ARRA at the WVDP.

National Environmental Policy Act (NEPA)

NEPA requires the DOE to consider the overall environmental effects of its proposed actions. Draft documents are prepared that describe potential environmental effects associated with proposed Project activities. The level of evaluation and documentation depends upon whether the action constitutes a major federal action significantly affecting the quality of the human environment within the meaning of NEPA. The categories of documentation include categorical exclusions (CXs), environmental assessments (EAs) and environmental impact statements (EISs).

CXs document actions that, by their nature, will not have a significant effect on the environment. EAs are used to evaluate the extent to which a proposed action, not categorically excluded, will affect the environment.

Based on the analyses presented in an EA and considering regulatory agency, stakeholder, and public comment, the DOE may determine that the proposed action is not a major federal action significantly affecting the quality of the human environment within the meaning of NEPA. As a result, the DOE may issue a notice indicating the finding of no significant impact and therefore would not be required to prepare an EIS.

If a proposed action has the potential for significant environmental effects, an EIS would be prepared that describes proposed alternatives to an action and explains the effects of each. Based on the analyses presented, and considering regulatory agency and public input, the DOE will determine the preferred alternative and issue a record of decision (ROD) regarding the action.

Since the Project began, a number of proposed site activities have warranted environmental impact evaluations. The WVDP NEPA history is summarized in Table ECS-2. Decisions resulting from the final EISs and associated RODs and EAs facilitate ongoing waste management and remediation activities at the Project.

Final Environmental Impact Statement (FEIS) Issued. In December 2008, the DOE issued a notice of public availability in the Federal Register for the "Revised Draft EIS for Decommissioning and/or Long-Term Stewardship at the WVDP and the WNYNSC" (DOE/EIS-0226-D). The DOE and the New York State Energy Research and Development Authority (NYSERDA) were the lead agencies on this EIS, and the EPA, Nuclear Regulatory Commission (NRC), and NYSDEC were cooperating agencies. NYSDOH was an involved agency under the New York State Environmental Quality Review Act (SEQRA). The draft was distributed for a six-month public review process, plus a three-month extension.

In January 2010, the DOE and NYSERDA issued the FEIS for Decommissioning and/or Long-Term Stewardship at the WVDP and the WNYNSC (DOE/EIS-0226). The phased decisionmaking alternative was selected as the preferred alternative at the site. In Phase 1, the DOE will decommission the MPPB, the vitrification facility, remote-handled waste facility, the lagoon areas, and the contaminated soils under and around these facilities, including the source of the contaminated groundwater plume. No decommissioning actions would be taken on the underground high-level waste tanks or the NRC-licensed disposal area (NDA), and the HLW canisters will be safely stored on site. NYSERDA would manage the State-licensed disposal area (SDA).

While decommissioning activities are underway in Phase 1, the DOE and NYSERDA will undertake a number of studies to help determine the best technical approach to complete decommissioning of the remaining facilities. Phase 1 is expected to take up to 10 years, during which time the DOE will manage the site's remaining facilities in a safe manner. The Phase 2 decision will be made within 10 years.

TABLE ECS-2
National Environmental Policy Act (NEPA) Documents Affecting DOE Activities at the WVDP

Year	*Action*	*Outcome*
1982	The final Environmental Impact Statement (EIS) and associated Record of Decision (ROD) were issued outlining the actions the United States Department of Energy (DOE) proposed for solidification of the liquid high-level waste (HLW) contained in the underground tanks (DOE-EIS-0081).	The first phase of the West Valley Demonstration Project (WVDP) Act, completed in September 2002, removed the HLW from the tanks and immobilized it into borosilicate glass through vitrification. The glass canisters remain on site in storage.
1988	The DOE and the New York State Energy Research and Development Authority (NYSERDA) published a Notice of Intent (NOI) to prepare the EIS for Completion of the WVDP and Closure or Long-Term Management of the Facilities at the Western New York Nuclear Service Center (WNYNSC).	The draft EIS was issued in 1996.
1996	The DOE and NYSERDA issued the "Draft EIS for the Completion of the WVDP and Closure or Long-Term Management of the Facilities at the WNYNSC" (DOE/EIS-0226-D).	The draft EIS was issued without a preferred alternative for a six-month review and comment period. After issuance of the draft EIS, and despite long negotiations, the DOE and NYSERDA were unable to reach an agreement on the future course of action for closure at the Center (see Government Accounting Office, 2001).
1997	Following issuance of the draft 1996 EIS, NYSERDA and the DOE formed a stakeholder advisory group (the West Valley Citizen Task Force [CTF]) to provide additional input to the public comment process required by NEPA.	The CTF mission is to provide stakeholder input to decision-making for development of a closure option for the WVDP and the WNYNSC.
1997	The DOE Headquarters issued the "Final Waste Management Programmatic EIS," (WM PEIS [DOE/EIS-0200F]) to evaluate nationwide management and siting alternatives for treatment, storage, and disposal of five types of radioactive and hazardous waste.	The EIS was issued with the intent to issue a separate ROD for each type of waste generated, stored, or buried over the next 20 years at 54 sites in the DOE complex.
1999	The DOE issued a ROD for nationwide management of HLW,Vol. 64, Federal Register (FR), p. 46661 (64 FR 46661)	The ROD specified that WVDP-vitrified HLW will remain in storage on site until it is accepted at a geologic repository.
2000	The DOE issued a ROD for nationwide management of low-level waste (LLW) and mixed LLW (65 FR 10061).	The Hanford site in Washington State and the Nevada Test Site were designated as national DOE disposal sites for LLW and mixed LLW.
2001	The DOE published an NOI (66 FR 16447) formally announcing its rescoping plan and preparation of the waste management EIS for the WVDP.	The rescoping plan split the scope of the 1996 WVDP Draft EIS into two phases: (1) near-term waste management decisionmaking and (2) final decommissioning and/or long-term stewardship decisionmaking.
2003	The DOE issued a notice of availability of the "WVDP Draft Waste Management EIS" (68 FR 26587).	The draft EIS presented alternatives for near-term management of WVDP LLW, mixed LLW, transuranic (TRU) waste, and HLW.

TABLE ECS-2 *(concluded)*
National Environmental Policy Act (NEPA) Documents Affecting DOE Activities at the WVDP

Year	*Action*	*Outcome*
2003	The DOE, in cooperation with NYSERDA, issued an NOI (68 FR 12044) to issue an EIS for "Decontamination and/or Long-Term Stewardship at the WVDP and the WNYNSC."	As a result of comments during the scoping process and the complexity of issues relating to long-term agency responsibility, this EIS was delayed (DOE-EIS-0226-R).
2005	The DOE issued a ROD, based on alternative A, for the "WVDP Waste Management EIS (WVDP WM EIS-0337)" (70 FR 35073).	As a result, the HLW canisters remain in storage on site until transfer to a geologic repository, the decision on TRU waste would be deferred until certification is obtained from the Waste Isolation Pilot Plant in Carlsbad, New Mexico, and LLW and mixed LLW would be shipped off site according to the ROD for nationwide management of LLW and mixed LLW.
2005	On August 26, 2005, the Coalition on West Valley Nuclear Wastes (the Coalition [a citizens group]) filed a complaint in the U.S. District Court, Western District of New York, against the DOE regarding the NEPA process at the WVDP. The Coalition contended that the DOE's rescoping plan to split the 1996 draft WVDP EIS violated NEPA and the Stipulation of Compromise. The Coalition also sought a declaration that the DOE is not empowered to reclassify waste at the WVDP using the "waste incidental to reprocessing " determination.	On September, 28, 2007, the U.S. District Court, Western District of New York ruled to dismiss the complaint in its entirety. Refer to Case 1:05-cv-00614-JTC, Document 41, filed September 28, 2007 for the ruling.
2006	An Environmental Assessment (EA) (DOE/EA-1552) evaluated the proposed decontamination, demolition, and removal of select facilities at the site. A finding of no significant impact (FONSI) was issued.	The EA, with the associated FONSI, cleared the way for removal of 36 facilities that are (or in the next four years will be) no longer required to support activities at the WVDP.
2007	DOE issued an NOI to prepare an EIS for the disposal of Greater-Than-Class-C LLW (72 FR 40135).	Nine scoping meetings were held and the scoping comment period ended in September 2007. The Draft EIS has not been issued.
2008	The DOE issued a notice of availability for the Revised Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center (DOE/EIS-0226-D [Revised]) (73 FR 74160).	The draft EIS evaluated the range of reasonable alternatives for decommissioning and/or long-term stewardship of the facilities at the Center. This EIS is a revised draft of the 1996 Cleanup and Closure Draft EIS. The draft EIS was distributed December 5, 2008, for a six-month public review period, which was extended through September 8, 2009.
2010	In January 2010, the DOE issued the Final EIS for Decommissioning and/or Long-Term Stewardship at the WVDP and WNYNSC (DOE/EIS-0226 [Revised]). On April 14, 2010, the DOE issued the ROD for the FEIS, selecting the phased decisionmaking alternative.	The preferred alternative, Phased Decisionmaking, calls for removal of the MPPB and the lagoons, remediation of the source of the north plateau plume contamination, and will allow for collection and analysis of data and information to make a more informed Phase 2 decision. The Phase 2 decision would be made within 10 years through issuance of a subsequent ROD by the DOE.

A SEQRA notice of completion for the FEIS and acceptance of the FEIS by NYSERDA was issued on January 29, 2010, as required in accordance with Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York (6 NYCRR) Part 617.12(b).

On April 14, 2010, the DOE issued the ROD for the FEIS, selecting the phased decisionmaking alternative.

Phase 1 Decommissioning Plan for the West Valley Demonstration Project. On December 5, 2008, the DOE issued the proposed "Phase 1 Decommissioning Plan for the West Valley Demonstration Project, West Valley, NY" (73 Federal Register 74162). In December 2008, the DOE transmitted the "Phase 1 Decommissioning Plan (DP) for the West Valley Demonstration Project" (Rev. 0) to the NRC for review. The plan was prepared pursuant to statutory obligations required under the WVDP Act and to satisfy commitments made to the NRC in 1981 under the DOE/NRC memorandum of understanding, and again in 2003. The plan addressed Phase 1 of the two phases of the proposed WVDP decommissioning approach based on the preferred alternative in the EIS for the WVDP and the WNYNSC.

On March 16, 2009, the DOE submitted revision 1 of the DP, which incorporated additional information, to the NRC. On March 20, 2009, the NRC determined that the document was sufficiently complete to warrant a technical review. On May 15, 2009, the NRC transmitted a request for additional information pertaining to the Phase 1 DP.

On December 18, 2009, the DOE submitted the revised Phase 1 DP (revision 2) after incorporating changes in response to the NRC's request.

On September 16, 2009, the NRC held an open house at West Valley, New York to provide interested members of the public with the status of NRC's review of the Phase 1 DP. Representatives of the NRC review team provided information on different aspects of its review. This meeting format provided an opportunity for one-on-one interaction between members of the public and the NRC review team. Topical areas included: DP review status, alternative conceptual model uncertainty, radiological dose assessment, hydraulic barrier evaluation, radiological surveys and sampling, as-low-as-reasonably-achievable evaluations, and NRC monitoring activities.

On February 25, 2010, the NRC transmitted to DOE-WVDP a Technical Evaluation Report for the Phase 1 DP, concluding that the Phase 1 DP was consistent with the preferred alternative in the EIS. The NRC also determined that there is reasonable assurance that the proposed actions will meet the decommissioning criteria.

Phase 1 Characterization Sampling and Analysis Plan (CSAP) and the Phase 1 Final Status Survey Plan (FSSP). The CSAP provides details about environmental data collection that will take place to support the decommissioning activities described in the Phase 1 DP. The DP provided the foundation for CSAP activities in that it: (1) defined the portions of the WVDP within the Phase 1 DP scope; (2) identified the radionuclides of interest; (3) developed cleanup guidelines for soils that meet unrestricted release criteria; and (4) described events required to meet the Phase 1 DP objectives. The CSAP and FSSP are supporting documents that provide additional detail to implement the Phase 1 DP, support Phase 1 DP activities, and support Phase 2 decisionmaking.

The CSAP data collection objectives are divided into four main categories:

- pre-design data collection to support appropriate Phase 1 designs;
- remedial action support to guide phase 1 activities while underway;
- post-remediation status documentation; and
- support Phase 2 decisionmaking.

Within these categories, specific goals have been defined to evaluate the radionuclides of interest for each waste management area (WMA), establish background data sets if necessary, and to determine the extent of surface contamination above the derived concentration guideline levels (DCGLs).

The FSSP provides protocols for demonstrating that specific portions of the WVDP project premises meet the DCGLs developed by the Phase 1 DP. The FSSP applies to soils exposed as part of the WMA 1 and WMA 2 deep excavations, and potentially to surface soils outside those excavations where subsurface contamination is not present. The CSAP and the FSSP have very prescriptive requirements regarding sampling and analysis of soils. The CSAP was written so that data collection to support characterization can potentially be used for final status survey purposes. The data will be needed to verify achievement of Phase 1 DP goals.

These plans are currently undergoing NRC review.

Resource Conservation and Recovery Act (RCRA)

RCRA and its implementing regulations govern the life cycle of hazardous waste from "cradle-to-grave" and mandate that generators take responsibility for ensuring the proper treatment, storage, and ultimate disposal of their wastes.

The EPA is responsible for issuing guidelines and regulations for the proper management of solid and hazardous waste (including mixed [radioactive and hazardous] waste). In New York, the EPA has delegated the authority to issue permits and enforce these regulations to NYSDEC. In addition, the U.S. Department of Transportation (U.S. DOT) is responsible for issuing guidelines and regulations for labeling, packaging, and spill reporting for hazardous and mixed wastes while in transit.

Hazardous Waste Permitting. A hazardous waste permit is required for facilities that treat or store large quantities of hazardous waste for more than 90 days or dispose of hazardous waste at the facility. In 1984, the DOE notified the EPA of hazardous waste activities at the WVDP and identified the DOE as a generator of hazardous waste.

RCRA Part A Permit Application. In 1990, to comply with 6 NYCRR Part 373-3, a RCRA Part A (i.e., Interim Status) Permit Application for the WVDP was filed with NYSDEC for storage and treatment of hazardous and mixed wastes. The WVDP has operated under interim status ever since. Facility operations are limited to those described in the RCRA Part A Permit Application and must comply with the interim status regulations; therefore, it must be revised prior to changes to the Project's waste management operations. Revisions to the RCRA Part A Permit Application were submitted to NYSDEC on February 3, 2010 and are currently under NYSDEC review.

In accordance with the RCRA Part A Permit Application, the DOE prepared closure plans for the hazardous waste management units at the WVDP. The closure plans were transmitted to NYSDEC in anticipation of closure activities, and are revised as appropriate to address NYSDEC comments or changes in activities. To perform clean closure of a RCRA unit, NYSDEC must approve the closure plan and must be notified of the closure schedule. Waste is removed, and impacted areas are decontaminated. If identified in the closure plan, clean closure confirmatory sampling and analysis are performed, and data are evaluated and presented to NYSDEC in a closure certification report. Since 2006, two units (the interim waste storage facility and the lag storage building) have been clean-closed under interim status. A third unit, the lag storage area #1 (a unit that was not used for the management of hazardous waste), was also demolished and removed from the RCRA Part A Permit Application.

During 2009, two revised closure plans were submitted to NYSDEC: (1) the RCRA Hazardous Waste Closure Plan for the Fuel Receiving and Storage Area High-Integrity Container Storage Area (submitted on January 21, 2009), and (2) the RCRA Hazardous Waste Closure Plan for the Hazardous Waste Storage Lockers (submitted on September 23, 2009). These closure plans are being revised based on NYSDEC's review comments.

6 NYCRR Part 373-2 Permit Application. In 2003, NYSDEC made an official request for the submittal of a 6 NYCRR Part 373-2 Permit Application (i.e., Part B) for the WVDP. The complete 6 NYCRR Part 373-2 Permit Application was transmitted to NYSDEC in December 2004. This application included RCRA closure plans for all interim status units that continued to be managed in accordance with the 6 NYCRR Part 373-3 Permit Application. The permit application remains in review with NYSDEC.

On April 16, 2009, NYSDEC made an official request for submittal of a revised 6 NYCRR Part 373-2 Permit Application for the WVDP. To streamline the permit application, process information will be excluded for any operating hazardous waste management unit in which no waste will be stored after May 1, 2012. The revised permit application is being prepared for submittal to NYSDEC in late 2010.

RCRA §3008(h) Administrative Order on Consent. Section §3008(h) of RCRA authorizes the EPA to issue an order requiring corrective action to protect human health or the environment if there has been a release of hazardous waste or hazardous constituents to the environment from a solid waste management unit (SWMU). The DOE and NYSERDA entered into a RCRA §3008(h) Administrative Order on Consent (the Consent Order) with NYSDEC and the EPA in March 1992.

- RCRA Facility Investigation (RFI)

  The Consent Order required NYSERDA and the DOE's WVDP office to conduct RFIs (unit-specific environmental investigations) at SWMUs to determine if there had been a release or if there were a potential for release of RCRA-regulated hazardous constituents from SWMUs.

Because many SWMUs are contiguous, or so close together as to make their separate monitoring impractical, many SWMUs have been grouped into larger units, referred to as super SWMUs (SSWMUs). This terminology is unique to the WVDP, and is not an official regulatory term. Descriptions of the SSWMUs, and the individual constituent SWMUs, are presented in Table ECS-4. Figures A-7 and A-8 in Appendix A show the locations of the WVDP SSWMUs. The final RFI reports were submitted in 1997, completing the investigative activities associated with the Consent Order. No corrective actions were required at that time as a result of the RFIs.

Groundwater monitoring, as recommended in the RFI reports and approved by the EPA and NYSDEC, continued during 2009 in compliance with the requirements of the Consent Order. The groundwater monitoring results and the groundwater program at the WVDP are discussed in Chapter 4 "Groundwater Protection Program."

- Current Conditions Report

Pursuant to a request from NYSDEC, a report entitled "West Valley Demonstration Project Solid Waste Management Unit Assessment and Current Conditions Report" was submitted in November 2004. This report summarized the historic activities at individual SWMUs through the RFI activities and provided environmental monitoring data and information on site activities performed since the completion of the RFI reports.

This document is being revised to incorporate changes in the operational status of each SWMU and to provide updated environmental monitoring data. This document will support and be incorporated with the revised 6 NYCRR Part 373-2 Permit Application.

- Corrective Measures Study (CMS)

In 2004, NYSDEC requested Corrective Measures Studies to be performed on six specific SWMUs at the WVDP. The six SWMUs were:

- NDA Burial Area (SWMU #2);
- NDA Interceptor Trench (SWMU #23);
- Demineralizer Sludge Ponds (SWMU #5);
- Lagoon 1 (SWMU #3);
- Construction Demolition and Debris Landfill (SWMU #1); and
- The Low-Level Waste Treatment Facility (SWMUs #17, #17a, and #17b).

The CMS Work Plan was approved by NYSDEC and the draft reports are being revised to be consistent with the FEIS and the ROD. The revised documents will support and be incorporated with the 6 NYCRR Part 373-2 Permit Application.

- Interim Measures (IM)

NDA Cap - The NDA, identified as SSWMU #9, is regulated under the Consent Order. Per the "CMS Work Plan for Select SWMUs" and in response to Core Team comments on the work plan, the DOE evaluated engineering controls to improve the integrity of the NDA cap. Pursuant to Section VI, paragraph 7 of the Consent Order, the DOE implemented an IM to ensure a minimum four-foot-thick earthen cap, minimize the potential release of impacted groundwater from the NDA, and minimize water infiltration into the NDA until the final disposition of the NDA is determined and can be implemented.

Soil boring tests were completed in late 2007. In 2008, a 950-foot-long trench was excavated along two sides of the disposal area. The trench was backfilled with a bentonite and clay mixture that formed a low-permeability barrier (slurry wall) against lateral groundwater infiltration. The second part of the two-phase project involved resurfacing the entire five-acre landfill with added soils, re-grading, compacting, and applying an impermeable geomembrane cover. The IM falls within the scope and intent of the CX for small-scale, short-term cleanup actions, described in 10 Code of Federal Regulations §1021, Subpart D, Appendix B, B6.1.

On March 9, 2009, the DOE submitted to NYSDEC the final IM construction report for the NDA cap and groundwater barrier IM. The final report included a written summary of all construction activities, as-built drawings, data, quality control records, and other associated records pertaining to the project in accordance with the IM work plan.

- Quarterly Reporting to the EPA and NYSDEC

In accordance with the Consent Order, the DOE transmits a quarterly progress report to the EPA and NYSDEC that summarizes all Consent Order activities conducted at the WVDP for the previous quarter. The summary includes progress and accomplishments, contacts with local community interest groups and regulatory agencies, changes to personnel, projected future work activities, and an inventory of mixed waste that was generated from decontamination activities during the reporting period.

Hazardous Waste Management. Under RCRA, hazardous wastes at the WVDP are managed in accordance with 6 NYCRR Parts 370–374 and 376. Hazardous and mixed waste activities are reported to NYSDEC in the WVDP's Annual Hazardous Waste Report, which specifies the quantities of waste generated, treated, and/or disposed of, and identifies the treatment, storage, and disposal facilities used. The Annual Hazardous Waste Report for 2009 was submitted to NYSDEC in February 2010.

Additional reports are submitted each year to document hazardous waste reduction efforts. Pursuant to Article 27, Section 0908 of New York State Environmental Conservation Law, an annual update of the WVDP's Hazardous Waste Reduction Plan must be submitted to NYSDEC. The updates are submitted in two forms which differ slightly in scope. The plan is updated biennially to reflect changes in the types and amounts of hazardous wastes generated at the WVDP. The biennial update to the Hazardous Waste Reduction Plan for CY 2008 was submitted to NYSDEC on June 24, 2009. Every other year, the Annual Status Report, essentially an abbreviated version of the biennial update, is submitted. The CY 2009 Annual Status Report for the Hazardous Waste Reduction Plan was submitted to NYSDEC on June 28, 2010.

Mixed Waste Management. Mixed wastes are managed according to the "Site Treatment Plan," prepared by the DOE under requirements of the Federal Facilities Compliance Act, an amendment to RCRA. The plan describes the development of treatment capabilities and technologies for treating mixed waste. The fiscal year (FY) 2009 update brought the waste stream inventory and treatment information current to the end of FY 2009. There were three proposed milestones, and all were completed by the end of September 2009. If acceptable treatment or handling options were not available for a specific waste stream, an alternate schedule was prepared. During 2009, 11,235 pounds (5,096 kilograms) of mixed waste was shipped off site for disposal. (See Table ECS-5.)

A Treatability Study Report is required to be submitted to NYSDEC in accordance with requirements of 6 NYCRR Part 371.1, when there is a change in a mixed waste stream treatment technology. During 2009, a treatability study was initiated to "stabilize and solidify radioactive mixed waste liquids generated as a result of decontamination/acid flushing of the liquid waste treatment system." The first step was taking a sample of the mixed waste from the storage tanks for characterization purposes. The treatability study report was submitted to NYSDEC on February 16, 2010. Based on the results of the characterization data, a treatability plan will be conceptualized and a treatment recipe will be developed during 2010. This study supports future plans to solidify high-activity wastes from on-site stored liquids, followed by solidification.

Nonhazardous, Regulated Waste Management. Nonradioactive, nonhazardous material was shipped off site to solid waste management facilities in 2009. Certain components of this waste (lead-acid batteries and spent lamps [universal wastes]) were reclaimed or recycled at off-site, authorized reclamation and recycling facilities. Digested sludge from the site sanitary and industrial wastewater treatment facility was shipped to the Buffalo Sewer Authority for disposal. Sanitary treated wastewater was routinely sampled and discharged to Erdman Brook in compliance with the WVDP's SPDES permit. Quantities of nonhazardous wastes handled in 2009 are summarized in Table ECS-5 and recycled materials are summarized in ECS-6.

Waste Minimization and Pollution Prevention. WVES submits an annual pollution prevention report to the DOE summarizing recycling and waste generation information. See Table ECS-6, "Pollution Prevention Progress for FY 2009;" Table ECS-7, "Affirmative Procurement Accomplishments for FY 2009;" and Chapter 1, "Environmental Management System." Reports are submitted to the DOE to document hazardous waste reduction efforts, as discussed previously in the "Hazardous Waste Management" section. In 2009, a decontamination technology was designed and engineered for use in CY 2010, which would result in a reduction in the volume of the waste generated. Nitrocision is a nitrogen-based abrasive blasting system that will be used for radiological decontamination purposes. Solid nitrogen abrasive sublimates directly from solid to gas, resulting in no additional waste.

Construction and Demolition Debris (CDDL) Activities. The CDDL was closed in 1986 under a NYSDEC-approved closure plan for a nonradioactive solid waste disposal facility. Over time, the north plateau strontium-90 plume has migrated from the MPPB into the CDDL area and beyond. Characterization activities were performed during 2008 and 2009 to develop a plan to mitigate migration of the groundwater plume. Some of these activities were performed within and along the southern edge of the CDDL. Activities included Geoprobe soil sampling and installing microwells within the disposal facility itself. In accordance with the closure plan, NYSDEC was notified of these activities. In 2010, a full-scale PTW is scheduled for installation, south of the CDDL. Construction of the PTW will not impact the CDDL. See "Strontium-90 Plume Characterization and Remediation Activities in 2009" in Chapter 4.

SPDES Permit

SPDES Exceedance. One SPDES permit limit exceedance occurred in 2009. The calculated daily maximum net effluent permit limit for total iron (0.30 milligrams/liter [mg/L]) for the sum of the outfalls was exceeded when a value of 0.73 mg/L was recorded in January. Site personnel are currently working with NYSDEC on a permit renewal that will include updated iron discharge monitoring and compliance limits.

SPDES Noncompliance Event. On February 18, 2010, the DOE notified NYSDEC that a SPDES permit noncompliance event had occurred at the WVDP for CY 2009. (See Table ECS-11.) The event was filed because the approved usage limit of N-45 laundry detergent was exceeded. A water treatment chemical (WTC) usage form for N-45 laundry detergent was approved by NYSDEC on August 17, 2008 for a dosage of 0.23 pounds (lbs) per day average, and 0.26 lbs/day maximum. The submittal of the CY 2009 annual WTC usage for N-45 was identified as 649 lbs. This exceeded the NYSDEC-approved dosage. Immediate actions were taken that included NYSDEC notification and implementation of immediate restrictions on the use of N-45 detergent. Subsequent contacts were made to discuss future actions. It was agreed that the WVDP would perform whole effluent toxicity (WET) testing on the outfall 001 discharge. Negotiations have been ongoing with NYSDEC representatives since 2008 for approval of an increased dosage of N-45 laundry detergent.

The WET testing was performed during the February 2010 lagoon discharge, and results were reported to NYSDEC. The WET testing results were positive in that both test species (*Ceriodaphnia dubia* [water flea] and the *Pimephales promelas* [fathead minnow]) showed a 100% survival rate when exposed to the WVDP's effluent from outfall 001. Results demonstrated that the dosage of laundry detergent requested in the SPDES permit update submitted to NYSDEC in December 2008 would not be detrimental to water quality of lagoon 3 effluent, as discharged to Erdman Brook.

Baltimore and Pittsburgh (B&P) Railroad Spur. The B&P Railroad was involved in an ongoing off-site rail line repair project south of the WNYNSC, from the WVDP rail spur to Ashford Junction. In early August 2009, dying vegetation was observed along the WNYNSC railway and the rail spur that serves the WVDP. An investigation revealed that neither WVES nor any of its contractors used herbicide for work on the railroad tracks. WVES contacted B&P personnel who acknowledged that its contractors had sprayed herbicide along the railroad tracks north of Fox Valley Road, extending to just before the old schoolhouse roadway which crosses the tracks along the WVDP rail spur. The application of the herbicide was likely inadvertent because the B&P contractors did not realize they were on the WNYNSC property.

The DOE notified NYSDEC of the herbicide application and discussed the potential ramification to the storm water program. The SPDES permit requires mapping the locations of the herbicide application and sampling the affected outfalls. NYSDEC determined that sampling was not required.

Process Sewer Integrity Evaluation. In 2003, camera-accessible process sewer lines were inspected by video. A breach was identified in a laundry tributary line that allowed laundry wastewater to discharge to subsurface soil. The breached line was taken out of service, and laundry wastewater was redirected through an alternate pipeline to the low-level waste treatment facility (LLW2). This breach was identified as SWMU #45, under the Consent Order, and the DOE provided written notification to NYSDEC and the EPA on October 30, 2003. Following an investigation in 2004, a New York State-licensed professional engineer (PE) performed an integrity evaluation of the process sewer system and prepared a final report that identified actions to be implemented. The recommendations of the PE were completed in accordance with recommended intervals. The final recommendation was to clean and re-inspect process lines, accessible main service lines, and operational cleanout risers every five years.

The five-year video re-inspection was performed by the PE on August 19, September 21, September 24, and October 14, 2009. A report was prepared to compare the 2004 and the 2009 video inspection films, and to ascertain the integrity of the process wastewater conveyance lines. The 2009 video surveys showed that the lines were in overall sound condition. After each line was inspected, areas of interest were determined. None of the areas were determined to be of concern, as long as the pipes are kept clear of obstruction and are not allowed to surcharge. It was recommended by the PE that the lines should be reinspected on a five-year cycle, and that the lines be further cleaned of sediment and debris before future video surveys.

Environmental Issues

Unplanned Releases. No unplanned releases of pollutants or hazardous substances, radiological or nonradiological, from the WVDP occurred in 2009.

EPA Interim Approval to Use Environmental Measurements for National Emission Standards for Hazardous Air Pollutants (NESHAP) Compliance. Radiological NESHAP compliance at the WVDP is currently demonstrated by (1) measuring (and/or estimating) radiological emissions in air released from the site during the calendar year of interest and (2) using EPA-approved computer models to estimate the dose to the maximally exposed off-site individual. This method is referred to as the "measure and model" approach, and is most suitable for point sources of air emissions such as stacks or ducts. Resulting dose estimates for the WVDP have always been far below the 10-millirem/year compliance standard. (See Chapter 3 for a discussion of dose assessment methodology.)

NESHAP regulations in Title 40 Code of Federal Regulations Part 61, Subpart H allow (with prior EPA approval) for use of an alternate method of demonstrating compliance by measuring environmental concentrations of airborne radionuclides at critical receptor locations. As WVDP facilities continue to be closed, the relative importance of diffuse (nonpoint) sources to dose estimates will increase as the number of point sources suitable for emission measurements decrease. Therefore, the measure-and-model approach for demonstrating compliance will become less representative of total WVDP emissions, and the alternative approach of environmental air sampling will become the more appropriate method.

In June 2007, the DOE submitted a plan and a request to the EPA for approval to use environmental air measurements for demonstrating NESHAP compliance at the WVDP. In February 2009, the DOE submitted to the EPA a request for approval to proceed with demolition of the MPPB (after shutting down the MPPB ventilation system) and submitted an updated plan for implementing a program of environmental measurements to document NESHAP compliance. The plan included a one-year period of using both the "measure and model" and the environmental measurement approaches to confirm compliance. On July 9, 2009, the EPA granted interim conditional approval for 24 months, subject to incorporating EPA changes to the proposed program. At present, implementation of the proposed ambient air monitoring network has been deferred due to resource constraints.

Safety Inspections of the WNYNSC Dams. During August 8 through 10, 2009, a severe rainstorm event caused flood damage to areas of the reservoirs and spillways of the two dams located on the WNYNSC property. These dams are maintained by WVES because they provide water for drinking and operational purposes for the WVDP. The flooding resulted in immediate minor maintenance being performed, such as removing vegetation from the spillways and dam faces; removing debris from the lakes; and cleaning out the canal connecting the lakes. On August 10, 2009, NYSDEC was notified, via e-mail and photos, of the damage to the dams and emergency spillway. These dams are classified as Class A Low-Hazard dams, meaning that if they failed, there may be damage to isolated buildings, town and/or county roads, and/or other potential damage. The flood damage was reviewed with a NYSDEC dam safety engineer who provided suggestions for repair, monitoring, and maintenance. On September 24, 2009, NYSDEC performed an on-site visual inspection to observe the damage caused by the rain event, and to perform a compliance inspection of the Class A Low-Hazard dams.

On August 27, 2009, WVES retained the services of a professional engineer from Hartman Engineering to evaluate the resultant storm damage to the reservoirs. Based on the engineering observations, the dams and spillways were determined to not be vulnerable to sudden catastrophic failure.

An interim inspection plan was developed that has been implemented, as recommended by NYSDEC. The inspection program provides for weekly evaluation of the dams and the spillway to observe if there are any changes to the dams, and also after each significant storm event (greater than one inch of rain in 24 hours). DOE will develop a plan to repair the eroded and damaged areas of the dams and spillways. Required permits will be obtained and NYSDEC will be provided the opportunity to review the repair plans as part of the Dam Safety Permit before repair or construction begins.

Lagoon 3 Embankment Inspections. The lagoon 3 embankment was constructed in the 1960s to manage waters from operation of the low-level wastewater treatment facility (LLWTF, now the LLW2). In 1991, surface erosion and surface soil movement were observed. A stability evaluation, conducted by Empire Soils Investigation, Inc., concluded that overall global or deep-seated stability of the slope was adequate and that the observed soil movement was shallow. Five test borings were installed (piezometers and inclinometers) to provide continued monitoring. During 1998, one inclinometer became unreadable and observations included surface movement in the slope, settlement, new tension cracks, and stair movement/distortion. In 2005, the West Valley Nuclear Services Company retained a New York State-licensed Professional Engineer (PE) from Empire GEO-Services, Inc. to perform a slope stability analysis which generally agreed with the original (1991) stability evaluation.

Slope stability analysis demonstrates that numerous factors determine the overall stability of the slope, the major factors being: soils strength parameters, elevation of the groundwater, and the steepness of the slope. The most likely mode of slope movement at the site consists of shallow surface failures resulting from the upper portion of the indigenous soils becoming saturated from rainfall and surface waters.

The groundwater and surface water depths and elevations are compared to pre-determined “trigger elevation levels” in an effort to maintain a calculated minimum safety factor. These triggers, if exceeded, would require the lagoon to be held at less than 60% capacity.

In March 2008, a trigger elevation level was exceeded for one sample location. It was determined that surface slope movement resulted in a break of the piezometer. Lagoon 3 has since been held to 60% operating capacity.

During 2009, several actions were implemented to make improvements to the Lagoon 3 slope monitoring, inspection, and reporting. Two piezometers (B-1 and B-2), used to measure water level changes, were either repaired and redeveloped, or replaced. Inclinometer B3 was excavated and a new casing was installed. One inclinometer (B4), previously damaged beyond repair, is no longer useable or repairable. The Lagoon 3 roadway was regraded to divert storm water runoff from the southeast slope of the Lagoon 3 embankment to ensure that the runoff flows to the northeast and discharges through an existing ditch. A set of 11 settlement and displacement monitoring points were installed on the north face of the Lagoon 3 embankment. In addition, semiannual photographs of the slope toe at Erdman Brook will be taken to document visual conditions of the slope. Reports will be prepared quarterly and submitted to WVES Environmental Affairs and Engineering departments. These reports include summaries of information recorded on the inspection forms, field measurements, observations, and photographs.

Erdman Brook Erosion Mitigation Project. The August 2009 storm event worsened stream erosion within Erdman Brook adjacent to the SDA. The extent of damage prompted NYSERDA to install new erosion controls in Erdman Brook. The work involved realigning the stream channel farther away from the toe of the north slope of the SDA and armoring the channel with stone to dissipate the energy of the flowing stream. Work was completed in October 2009. In 2010, NYSERDA is planning to continue stream stabilization efforts on Erdman Brook to mitigate the effects of a knickpoint downstream from the recently completed work.

Leachate Removal Project. In November 2009, NYSERDA safely and successfully removed more than 8,000 gallons of leachate from a storage tank located adjacent to the SDA. The liquid was pumped from trench 14 in 1991 and was stored in a large tank inside a building near the perimeter of the SDA. The project involved pumping the liquid into DOT-approved containers and shipment to a treatment facility in Tennessee. In 2010, NYSERDA plans to remove the large tank and miscellaneous solid waste from inside the building. The waste will be shipped to Utah for disposal.

The DOE and NYSERDA Consent Decree. On October 27, 2009, the DOE and NYSERDA released a consent decree announcing how costs will be allocated between the DOE and NYSERDA for the WVDP and the WNYNSC. This consent decree will resolve litigation that was initiated in 2006 by NYSERDA, the state of New York, and NYSDEC.

Project Assessment Activities in 2009

Throughout CY 2009, assessments were conducted through the Integrated Assessment Program (IAP) at the WVDP. This program effectively complies with applicable DOE directives, regulations, standards, and integrated safety management system requirements. The IAP applies to all disciplines including, but not limited to, safety and health, operations, maintenance, environmental protection, quality, decontamination and decommissioning, HLW activities, emergency management, business processes, and management. Inspections, reviews, and oversight activities are routinely conducted to evaluate performance, reduce risk, and identify improvement opportunities.

The local DOE Project office and other agencies with responsibilities for the WVDP also independently reviewed various aspects of the environmental and waste management programs. At the conclusion of the reporting period, there were no outstanding issues that had not been satisfactorily addressed. Overall results reflected continuing, well-managed environmental programs at the WVDP. Refer to Chapter 1, Environmental Management System.

TABLE ECS-3
WVDP Environmental Permits

Permit Name and Number	*Agency/Permit Type*	*Description*	*2009 Changes*	*Status*
West Valley Demonstration Project (WVDP) Resource Conservation and Recovery Act (RCRA) Part A Permit Application (United States [U.S.] Environmental Protection Agency [EPA] ID #NYD980779540)	New York State Department of Environmental Conservation (NYSDEC)/ Hazardous Waste	Provides interim status under RCRA for treatment and storage of hazardous waste.	The U.S. Department of Energy (DOE) is currently operating under the June 2001 NYSDEC-approved RCRA Part A Permit Application. Revisions to the RCRA Part A Permit Application were submitted to NYSDEC for review on February 3, 2010. NYSDEC approval is pending.	A Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York (6 NYCRR) Part 373-2 (i.e., Part B) Permit Application was submitted to NYSDEC on December 23, 2004. In April 2009, NYSDEC requested the submittal of a revised 6 NYCRR Part 373-2 Permit Application.
Air Facility Registration Certificate (9-0422-00005/00099)	NYSDEC/Air Emissions	Certificate caps nitrogen oxide and sulfur oxide emissions from 2 boilers.	None	No expiration date.
Slurry-fed ceramic melter (modification to WVDP-687-01) process building ventilation	EPA/National Emission Standards for Hazardous Air Pollutants (NESHAP)	Slurry-fed ceramic melter radionuclide emissions — main plant stack modified February 18, 1997.	None	Permit approved February 18, 1997. No expiration date.
Vitrification Facility Heating, Ventilation, and Air-Conditioning (HVAC) System (no permit number)	EPA/NESHAP	Vitrification facility HVAC system for radionuclide emissions	None	Permit approved February 18, 1997. No expiration date.
01-14 Building Ventilation System (WVDP-187-01)	EPA/NESHAP	Liquid waste treatment system ventilation of radionuclide emissions in the 01-14 building.	None	Issued October 5, 1987. Modified May 25, 1989. No expiration date.
Contact Size-Reduction Facility (WVDP-287-01)	EPA/NESHAP	Contact size-reduction and decontamination facility radionuclide emissions	None	Issued October 5, 1987. No expiration date.
Supernatant Treatment System/Permanent Ventilation System (WVDP-387-01)	EPA/NESHAP	Supernatant treatment system ventilation for radionuclide emissions	None	Modified January 1, 1997. No expiration date.

Note: Permit and license expiration dates are current as of September 2010.

TABLE ECS-3 *(continued)*
WVDP Environmental Permits

Permit Name and Number	*Agency/Permit Type*	*Description*	*2009 Changes*	*Status*
Outdoor Ventilated Enclosures (WVDP-587-01)	EPA/NESHAP	Fifteen portable ventilation units (PVUs) for removal of radionuclides.	Since 2007 EPA approval to expand usage of PVUs from 10 to 15, the DOE tracks usage on the basis of annual cumulative estimated dose.	Issued December 22, 1987. Permit modification issued on December 10, 2007. No expiration date.
State Pollutant Discharge Elimination System (SPDES) (NY0000973)	NYSDEC/Water	Monitors discharges to surface waters from various on-site sources.	An amended permit went into effect on September 1, 2006. A revised application for SPDES permit modifications was submitted to NYSDEC in December 2008.	Although the current permit expired on February 1, 2009, NYSDEC notified the DOE that the current permit will remain in effect after the expiration date under the provisions of the State Administrative Procedure Act.
New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) Certification to URS Corporation, Lab ID #10474 EPA Lab Code NY01259	NYSDOH/ELAP certification	Certification of the Environmental Laboratory for the analysis of potable and nonpotable water samples for specific radiological and nonradiological constituents and for asbestos in friable material.	Certification was transferred from West Valley Nuclear Services Company to URS Corporation in April 2006. The certificate was revised to remove total suspended solids from the permit. The change became effective in February 2009.	Certification renewed on April 1, 2010. Certification expires April 1, 2011.
Buffalo Pollutant Discharge Elimination System (10-06-TR096)	Buffalo Sewer Authority/ sanitary sewage sludge disposal	Permit issued to hauler of waste from the wastewater treatment facility.	Hauler renewed permit in June 2010.	Permit expires June 30, 2011.
Chemical Bulk Storage (CBS) (#9-000158)	NYSDEC/ regulated CBS tanks	Registration of bulk storage tanks used for listed hazardous chemicals.	Currently no tanks at the WVDP are regulated under 6 NYCRR Parts 595–599.	If regulated CBS tanks are needed in the future, a permit application will be submitted under the existing CBS Registration.
Public Water System ID #NY0417557	Cattaraugus County Health Department	The WVDP is a non-transient non-community public drinking water system.	None	No expiration date.

Note: Permit and license expiration dates are current as of September 2010.

TABLE ECS-3 *(concluded)*
WVDP Environmental Permits

Permit Name and Number	*Agency/Permit Type*	*Description*	*2009 Changes*	*Status*
Petroleum Bulk Storage (#9-008885)	NYSDEC/ petroleum bulk storage tank registration	Registration of bulk storage tanks used for petroleum.	Diesel fuel tank FO-D-11 was permanently closed and removed from the license.	License expires September 2, 2011.
Asbestos-Handling License WVES #33657	New York State Department of Labor/asbestos-handling and sampling activities	West Valley Environmental Services, LLC (WVES) maintains the asbestos-handling license and specific variances for asbestos handling and monitoring.	License was renewed in September 2009	License expires on September 30, 2010; each variance has a unique expiration date.
NYS Atomic Development Dam #1 (ID #019-3149) NYS Atomic Development Dam #2 (ID #019-3150)	NYSDEC Division of Water, Bureau of Flood Protection and Dam Safety	WVES maintains two Class A Low-Hazard dams on the Western New York Nuclear Services Center property that supply water for drinking and operational purposes at the WVDP.	NYSDEC inspected the dams in 2009 following a major storm rain-event. Repair or construction activities related to the dams may require permits from NYSDEC.	No expiration date.
Bird Depredation License (32)	NYSDEC/ Division of Fish and Wildlife	State license for the removal of nests of migratory birds.	License was renewed on October 1, 2009.	License expires on September 30, 2010.
Bird Depredation Permit (MB747595-0)	U.S. Fish and Wildlife Service	Federal permit for the limited taking of migratory birds and active bird nests.	Permit was renewed on October 1, 2009.	Permit expires September 30, 2010.

Note: Permit and license expiration dates are current as of September 2010.

TABLE ECS-4
Solid Waste Management Units (SWMUs) at the WVDP

WVDP RCRA SSWMUs and Constituent SWMUs Identified in the RFI		
SSWMU	***SWMU #***	***Constituent SWMUs***
Super SWMU (SSWMU) #1 – Low-Level Waste Treatment Facilities (LLWTF)	3, 4, 17, 17a, and 17b	Former Lagoon 1 LLWTF and LLWTF Lagoons 2, 3, 4, and 5 Neutralization pit and interceptors
SSWMU #2 – Miscellaneous Small Units	5, 6, 7, and 10	Demineralizer sludge ponds and solvent dike Effluent mixing basin Waste paper incinerator
SSWMU #3 – Liquid Waste Treatment System (LWTS)	18, 18a Sealed Room, and 22	LWTS Cement solidification system Sealed rooms associated with the LWTS in the main plant process building (MPPB)
SSWMU #4 – High-Level Waste (HLW) Storage and Processing Area	12/12a, 13, 19, and 20	HLW tank farm, Vitrification test facility waste storage areas Supernatant treatment system, HLW vitrification facility
SSWMU #5 – Maintenance Shop Leach Field	8	Maintenance shop leach field
SSWMU #6 – Low-Level Waste Storage Area	9/9a, 15, 16/16a, and 38	Lag storage area (LSA) #1 and #2 hardstands Lag storage building, lag storage extension and lag storage addition LSA #3 and #4, and the drum supercompactor.
SSWMU #7 – Chemical Process Cell (CPC) Waste Storage Area	14	CPC waste storage area
SSWMU #8 – Construction and Demolition Debris Landfill (CDDL)	1	CDDL
SSWMU #9 – Nuclear Regulatory Commission-Licensed Disposal Area (NDA)	2, 11/11a, 23, 31, and 39	NDA and NDA trench soil containment area, Kerosene tanks and NDA container storage area Interceptor trench project and staging area for NDA
SSWMU #10 – Integrated Radwaste Treatment System (IRTS)	21	IRTS drum cell
SSWMU #11 – New York State-Licensed Disposal Area (SDA)	NA	The SDA is a closed radioactive waste landfill that is contiguous with the Project premises and is owned and managed by the New York State Energy Research and Development Authority (NYSERDA). For more information, see their website at www.nyserda.org.
SSWMU #12 – Hazardous Waste Storage Lockers	24	Hazardous waste storage lockers 1 to 4

Note: The WVDP RCRA SWMUs and SSWMUs are discussed under “RCRA §3008(h) Administrative Order on Consent.”

TABLE ECS-4 *(concluded)*
Solid Waste Management Units (SWMUs) at the WVDP

WVDP RCRA Individual SWMUs Not Associated with an SSWMU		
Individual SWMUs	25	Inactive scrap metal landfill adjacent to bulk storage warehouse (NYSERDA SWMU)
	26	Subcontractor maintenance area
	27	Fire brigade training area
	28	Vitrification hardstand
	29	Industrial waste storage area
	30	Cold hardstand area near the CDDL
	32	Old sewage treatment facility
	33	Existing sewage treatment facility
	34	Temporary storage locations for well purge water
	35	Construction and demolition area
	36	Old school house septic system
	37	Contact size-reduction facility
	40	Satellite Accumulation Areas and 90-day storage areas
	41	Designated roadways
	42	Product storage area
	43	Warehouse extension staging area
	44	Fuel receiving and storage area; high-intensity container and SUREPAK™ staging area
	45	Breach in laundry wastewater line
	46	Vitrification vault and empty container hardstand
	47	Remote-handled waste facility
	----	Non-LWTS sealed rooms in the MPPB

Note: The WVDP RCRA SWMUs and SSWMUs are discussed under "RCRA §3008(h) Administrative Order on Consent."

TABLE ECS-5
Summary of Waste Management Activities at the WVDP in Calendar Year (CY) 2009

Waste Description/ Facility	Type of Project Generating Waste	Quantity in 2009	Discussion
Low-level waste (LLW)	Waste disposition and shipping	64,321 cubic feet (ft^3) (1,821 cubic meters [m^3])	LLW shipped for disposal during CY 2009
Transuranic waste (TRU)	Waste processing	12,786 ft^3 (362 m^3)	TRU waste processed during CY 2009
Mixed LLW and Mixed TRU LLW	Waste management according to the Site Treatment Plan	11,235 pounds (lbs) (5,096 kilograms [kg])	Waste packaged and shipped during CY 2009
Hazardous Waste	Waste management according to the Resource Conservation Recovery Act Part A Permit	402 lbs (182 kg)	Waste packaged and shipped during CY 2009
Radiological wastewater from the low-level liquid waste treatment facility (LLW2 [WNSP001])	New York State Department of Environmental Conservation regulates point-source liquid effluent discharges of treated process wastewater through the State Pollutant Discharge Elimination System (SPDES) Permit for the WVDP.	About 12,300,000 gallons (46,700,000 liters)	During CY 2009, seven batches of wastewater were processed through the LLW2. The SPDES daily maximum net effluent permit limit for iron was exceeded in January 2009.
Treated sewage and industrial wastewaters (WNSP007)	Wastewater processing, discharge	4,830,000 gallons (18,300,000 liters)	The wastewater treatment facility (WWTF) treated sanitary wastewater that was discharged through outfall WNSP007 in CY 2009.
North plateau groundwater recovery system (NPGRS)	Pump and treat strontium-90 (Sr-90) contaminated groundwater	3,570,000 gallons (13,500,000 liters)	The NPGRS operated to recover groundwater from an area near the leading edge of the Sr-90 plume on the north plateau. Water was treated by ion exchange to remove Sr-90, then transferred to the LLW2 (CY 2009).
Nuclear Regulatory Commission - Licensed Disposal Area groundwater interceptor trench	Interceptor trench (WNNDATR) and groundwater pre-treatment	79,400 gallons (301,000 liters)	Groundwater was pumped and transferred to the LLW2. No n-dodecane or tributyl phosphate were encountered in CY 2009. No pre-treatment was necessary.
Sanitary and industrial	Cleanup-stabilization	294 tons (267 metric tons)	Cleanup stabilization waste disposed as trash during fiscal year 2009.
Digested sanitary sludge	Waste shipping and disposal	275,000 gallons (1,040,000 liters)	Digested sludge from the WWTF was shipped in CY 2009 to the Buffalo Sewer Authority for disposal during CY 2009.
Asbestos	Asbestos management and abatement	931 linear feet pipe insulation; 75 square feet asbestos-containing tar coating	Pipe insulation removed from steam piping in the main plant process building (MPPB), and tar coating removed from a ventilation duct in the MPPB during CY 2009.

Note: Certain waste totals are tallied by FY while others are tallied by CY.

TABLE ECS-6
Pollution Prevention Progress for Fiscal Year (FY) 2009

Recycled Materials	*2009 Quantity (tons/metric tons)*
Office and mixed paper	25.8 tons (23.4 metric tons)
Corrugated cardboard	0.07 tons (0.06 metric tons)
Iron	13.1 tons (11.8 metric tons)
Aluminum	0.90 tons (0.81 metric)
Aluminum cans	0.04 tons (0.04 metric tons)
Engine oils	0.61 tons (0.55 metric tons)
Toner cartridges	0.65 tons (0.59 metric tons)
Batteries	9.5 tons (8.62 metric tons)
Concrete	94.6 tons (85.9 metric tons)
Fluorescent bulbs	0.02 tons (0.02 metric tons)
Plastic	0.15 tons (0.13 metric tons)
Styrofoam	0.010 tons (0.009 metric tons)
Wood pallets	2.06 tons (1.87 metric tons)
Electronics reuse and recycling campaign	5.91 tons (5.36 metric tons)
Other Accomplishments - Transfer or Sale of Excess Material	
Approximately $822,000 worth of excess material (based upon estimated and/or actual acquisition costs) has been reused in FY 2009 by transferring to other Department of Energy (DOE) facilities, Federal and State agencies, various DOE-sponsored programs, donation programs, auctions, and sales.	
Transfers - $300,793	estimated and/or actual acquisition cost
Donations - $32,464	actual acquisition cost
Energy-related laboratory equipment grants - $78,143	estimated and/or actual acquisition cost
Computers for learning - $373,400	actual acquisition cost
Ebay - $36,527	estimated assuming revenues of at least 10% acquisition cost
Negotiated sales - $450	estimated acquisition cost

TABLE ECS-7
Affirmative Procurement Accomplishments for FY 2009

Environmentally Preferable Products	***Amount Purchased***
Binders	$2,749
Bristols (file folders, card stock, tags)	$914
Office furniture	$167,897
Office recycling containers	$856
Paperboard and packaging products	$752
Plastic envelopes	$2,913
Plastic trash bags	$105,346
Printer ribbons	$691
Re-refined lubricating oil	$146
Sanitary tissue products	$31,716
Solid plastic binders	$684
Toner cartridges	$4,542
Uncoated printing papers	$35,936
Bio-Based Products	***Amount Purchased***
Bath and spa cleaners	$913
Graffiti and grease removers	$504
Hand cleaners and sanitizers	$259
Laundry products	$396
Greases	$10
Penetrating lubricant	$10
Other	
Used office furniture was purchased for the renovation of an office complex.	Avoided purchasing new furniture that would have contained virgin materials, saving approximately $60,000.

TABLE ECS-8
WVDP 2009 Air Quality Noncompliance Episodes

Permit Type	Facility	Parameter	Date(s) Exceeded	Description/ Solutions
EPA NESHAP	All	All	None	None
NYSDEC Air	All	All	None	None

TABLE ECS-9
Status of EPCRA (SARA Title III) Reporting at the WVDP in 2009

EPCRA Section	Description of Reporting	Submission to EPA
EPCRA 302–303	Planning Notification	Not Required
EPCRA 304	Extremely Hazardous Substance Release Notification	Not Required
EPCRA 311	Material Safety Data Sheet	Not Required
EPCRA 312	Hazardous Chemical Inventory	Required
EPCRA 313	Toxic Release Inventory Reporting	Not Required

TABLE ECS-10
Reportable Chemicals Above EPCRA 312 Threshold Planning Quantities (TPQ) Stored at the WVDP in 2009

Chemicals Stored at the WVDP in 2009 Above TPQ		
Diesel fuel #2	Ion-exchange media	Sulfuric acid
Gasoline	Lead-acid batteries	Liquid nitrogen
Oils - various grades		

TABLE ECS-11
WVDP 2009 NPDES/SPDES[a] Permit Noncompliance Episodes

Permit Type	Outfall(s)	Parameter	No. of Permit Exceptions [b]	No. of Samples Taken	No. of Compliant Samples	Percent Compliant Samples
SPDES	All	Iron	1	1,742	1,741	99.9%

[a] Radionuclides are not regulated under the site's SPDES permit. However, special requirements in the permit specify that the concentration of radionuclides in the discharge is subject to requirements of DOE Order 5400.5.

[b] In January 2009, the daily maximum net effluent permit limit of 0.30 mg/L for iron for the sum of the outfalls was exceeded.

TABLE ECS-12
WVDP Migratory Bird Nest Depredation Episodes in 2009

Permit/License Type	*Parameter*	*Permit/License Limit*	*Total Removed in 2009*
U.S. Fish and Wildlife - Bird Depredation Permit	Removal of Active Barn Swallow Nests	20	3
U.S. Fish and Wildlife - Bird Depredation Permit	Removal of Active American Robin Nests	15	1
U.S. Fish and Wildlife - Bird Depredation Permit	Removal of Active Eastern Phoebe Nests	5	0
U.S. Fish and Wildlife - Bird Depredation Permit	Removal of Active Canada Goose Nests	5	1
NYSDEC - Bird Depredation License	Removal of Inactive Migratory Bird Nests	Not limited	0

ENVIRONMENTAL MANAGEMENT SYSTEM

Integrated Safety Management System (ISMS) Implementation

In accordance with the United States (U.S.) Department of Energy (DOE) Policy 450.4, "Safety Management System Policy," a plan to integrate environmental, safety, and health (ES&H) management programs at the West Valley Demonstration Project (WVDP or Project) was developed and initiated in 1998. Implementation of an ISMS at the WVDP was verified by the DOE in November 1998. Environmental subject matter experts routinely participate in a site-wide work review group to review work plans, identify ES&H concerns, and specify practices that ensure work is performed safely. For the purposes of this policy, the term "safety" includes environmental, radiological, industrial/chemical, and nuclear safety and health and encompasses the public, workers, and the environment.

Environmental Management System (EMS)

During the development of the ISMS, the EMS was identified as an integral part of the ISMS. The WVDP EMS satisfies the requirements of DOE Order 450.1A, "Environmental Protection Program," which incorporates the requirements of Executive Order (E.O.) 13423, "Strengthening Federal Environmental, Energy, and Transportation Management." The four key requirements of an EMS are:

- An EMS is to reflect the EMS elements and framework found in International Organization for Standardization (ISO) 14001:2004, "Environmental Management Systems," and serve as the primary management approach for addressing the environmental aspects of agency operations and activities, including energy and transportation functions.

- An EMS shall include specified compliance management elements, including an environmental compliance audit program that identifies compliance needs and possible root causes of non-compliance.

- An EMS shall include site-specific goals and targets that contribute to the achievement of DOE sustainable environmental stewardship goals and energy transportation goals.

- Each EMS must have a formal audit by a qualified party outside the control or scope of the EMS before declaring initial implementation of the EMS, and every three years thereafter.

In compliance with the fourth requirement, an independent third-party audit of the EMS was conducted in May 2009. As a result of this audit, on June 11, 2009, West Valley Environmental Services LLC (WVES) submitted a declaration to the DOE-WVDP that the EMS at the WVDP is fully implemented, consistent with the requirements of DOE Order 450.1A. (Refer to "Independent Third-Party Audit of the EMS" later in this chapter.)

The elements of the WVDP EMS are summarized in Table 1-1. The elements for which activities or achievements were accomplished in CY 2009 are presented in the sections that follow.

The WVDP is in the closure portion of its life cycle, therefore there are challenges in meeting the recommended sustainability practices in E.O. 13423. The goals and objectives of E.O. 13423 have been evaluated using a graded approach that takes into consideration that all buildings and infrastructure will be demolished in the coming years. Another challenge was to ensure that subcontractors perform work in accordance with the site's EMS. This was accomplished by detailed review of subcontractor work documents by Environmental Affairs personnel. Yet another challenge has been to ensure the subcontractor "way of thinking" about environmental safety culture was consistent with the site's EMS. This has been accomplished through enhanced communication of safety expectations, hazard recognition, and assignment of a safety department member as a subcontractor point of contact.

The Project's EMS provides the basic policy and direction for work at the WVDP through procedures that support proactive management, environmental stewardship, and the integration of appropriate technologies throughout all aspects of work. The environmental

TABLE 1-1
Elements of the Environmental Management System (EMS) - WVDP Implementation

Environmental Policy	
It is the policy at the West Valley Demonstration Project (WVDP) to conduct all activities, including design, construction, testing, startup, commissioning, operation, maintenance, and decontamination and decommissioning in a manner appropriate to the nature, scale, and environmental impacts of these activities. West Valley Environmental Services LLC (WVES) is committed to full compliance with applicable federal and New York State laws and regulations for the protection of the environment, continual improvement, the prevention and/or minimization of pollution, and public outreach, including stakeholder involvement. The policy establishes the WVDP EMS, which provides the framework for environmental protection at the WVDP.	
Planning	
Environmental Aspects	When operations are identified to have an environmental aspect, the WVDP's EMS approach is to minimize or eliminate any adverse potential impact. WVDP employees evaluate operations, identify the aspects of operations that can impact the environment, and determine those impacts that are significant. The base environmental aspects that have been determined to have the potential to affect the environment are: • Waste generation, management, and decontamination activities; • Radiological and/or chemical atmospheric emissions and liquid effluent discharges; • Energy usage and materials consumed and/or recycled; • Natural resource preservation, restoration, and impact; and • Accidental releases, spills, prevention, and mitigation.
Legal and Other Requirements	WVES has implemented an environmental regulatory review and assessment process to deliver WVDP-level requirements and guidance to all staff. New or revised requirements (e.g., new regulations) are analyzed to determine their applicability to the WVDP and to identify whether actions are required to achieve compliance. This may involve developing or revising WVDP documents or operating procedures, implementing administrative controls, providing training, installing engineered controls, or increasing monitoring.
Objectives and Targets	The Department of Energy (DOE) Order 450.1A requires that goals be established to integrate sustainable environmental stewardship into the site's operations as a cost-effective business practice. Goals are intended to prevent pollution, reduce environmental hazards, protect the public and the environment, avoid pollution control and waste disposal costs, and improve operational capability. The order establishes five performance-based sustainable environmental stewardship goals. These goals are discussed in Table 1-2.
	Energy, Renewable Energy and Transportation Management. WVES has defined the site's energy, sustainable buildings and fleet management program in an Executable Plan which the DOE has approved. DOE Order 430.2B, "Departmental Energy, Renewable Energy and Transportation Management" (February 2008), establishes leadership goals that are to be achieved by each DOE site. These objectives and target goals are presented in Table 1-2.
	National Environmental Performance Track (P-Track). The U.S. Environmental Protection Agency has recognized the WVDP as a P-Track program charter member since 2000. Although the program was discontinued in early 2009, the focus of the P-Track was to ensure that the EMS has sufficient programs in place to perform effectively and to identify and address opportunities to improve environmental performance. The remaining four P-Track goals were carried through to 2009, and are presented in the EMS Objectives and Targets listed in Table 1-2 as goal 1, goals 2.1 and 2.2, and goal 6.1.
Environmental Management Program	A key element to successful implementation of an EMS, the environmental management program describes aspects of environmental policy implementation applicable to that organization, and may be subdivided to address specific elements of the organization's operations. WVES accomplishes this through policies and procedures, project schedules, milestone tracking, and commitment tracking.

TABLE 1-1 *(continued)*
Elements of the Environmental Management System (EMS) - WVDP Implementation

Implementation and Operation	
Structure and Responsibility	Site procedures define roles and responsibilities, and management provides resources essential to the implementation and control of the EMS. Specific WVES management representatives have the defined role, responsibility and authority for ensuring that EMS requirements are established, implemented and maintained in accordance with the policy, and for reporting on the performance to staff management. This reporting and review provide the basis for improvement of the EMS.
Training, Awareness, and Competence	Employees are informed of the importance of conformance with the environmental policy and with implementing EMS procedures; the significant environmental impacts, actual or potential, of their work activities; the environmental benefits of improved personal performance; their roles and responsibilities in achieving conformance with the environmental policy and EMS procedures (including emergency preparedness); and the potential consequences of departure from specified operating procedures.
Communication	WVES provides for internal communication between the various levels and functions of the company and for receiving, documenting, and responding to relevant communication from external interested parties. Key external parties include the regulatory agencies and local emergency responders. Communications with the local stakeholders include monthly meetings with the Citizen Task Force and quarterly meetings with the general public. Project information, including this entire Annual Site Environmental Report (ASER), is available on the internet at http://www.wv.doe.gov.
EMS Documentation	Comprehensive, up-to-date environmental policies are written to describe the core elements of the EMS and their interaction, and to reference related implementing documentation.
Document Control	EMS documentation is maintained via controls that require the documents to be available at locations where operations essential to the effective functioning of the EMS are performed; provide for periodic review and revision; require that obsolete documents be promptly removed from all points of issue and points of use; and, require that any obsolete documents retained for legal use and/or record preservation purposes be suitably identified. Records pertaining to the EMS are classified, inventoried, indexed, retained, and disposed in accordance with established procedures.
Operational Control	WVES shall identify those operations and activities that are associated with the identified significant environmental aspects in line with the EMS policy, as well as resultant objectives and targets. Procedures for these operations must provide specific conditions and criteria that must be satisfied to ensure compliance and ensure meeting the objectives and targets.
Emergency Preparedness and Response	An emergency preparedness and response program with specialized staff provides timely response to emergency situations, and the prevention and mitigation of the environmental impacts that may be associated with them. Emergency preparedness and response procedures are reviewed and revised routinely and after the occurrence of accidents or emergency situations, when appropriate.

TABLE 1-1 *(concluded)*
Elements of the Environmental Management System (EMS) - WVDP Implementation

Checking and Corrective Action	
Monitoring and Measurement	Liquid effluent and air-emission monitoring helps ensure the effectiveness of controls, adherence to regulatory requirements, and timely identification and implementation of corrective measures. A comprehensive, sitewide environmental monitoring program is in place at the WVDP. Results are reported to regulatory agencies and summarized in this ASER. In addition, monitoring data are assessed for adverse trends to determine site performance, impacts from site conditions, and the need for preventative or corrective measures.
Evaluation of Compliance	WVES has established, implemented, and maintained a procedure for periodically evaluating compliance with applicable legal requirements.
Nonconformance and Corrective and Preventive Actions	WVES has defined responsibilities and authorities for handling and investigating nonconformances, taking action to mitigate any associated impacts, and for initiating and completing corrective and preventative actions.
Records	Environmental records are identified, maintained, and dispositioned in accordance with regulatory requirements for record maintenance. These include training records and the results of audits and other reviews.
EMS Audit (Assessments)	EMS assessments are done to determine whether or not the EMS conforms to the requirements of the policy; that the EMS has been properly implemented and maintained; and to provide information on the results of the assessment to management. They are based on the environmental importance of the site activities and consider the results of previous reviews.
Management Review	
Senior management reviews site environmental performance to ensure the continuing suitability, adequacy and effectiveness of the EMS. The review must address opportunities for improvement, the need for changes to the EMS, including environmental policy and environmental objectives and targets.	
EMS Validation	
The WVDP EMS is considered to be fully implemented because: 1 - it has been the subject of a formal audit by a qualified party outside the control or scope of this EMS; 2 - the findings of the above audit have been addressed by the Environmental Safety, Health and Quality (ESH&Q) manager and the Department of Energy office at the WVDP (DOE-WVDP) director; 3 - the ESH&Q manager and the DOE-WVDP director have declared conformance of the EMS to the requirements of DOE Order 450.1A. These steps must be completed at least every three years for the EMS to remain fully implemented.	

monitoring program is an important component of the EMS and accomplishment of its mission.

Environmental Policy

Activities at the WVDP during 2009 were conducted in full compliance with applicable environmental statutes, DOE directives, executive orders, and state laws and regulations. Refer to Table ECS-1, "Compliance Status Summary for the WVDP in CY 2009," for details.

Environmental Aspects

The environmental aspects of site activities that have been identified at the WVDP are presented in Table 1-1. Activities that have regulatory implications or those that could have significant environmental impacts are identified as significant aspects. Site activities related to hazardous and radiological waste management, pollution prevention, air and water emissions, energy and materials use, and recycling are all presented in the “Environmental Compliance Summary” (Tables ECS-8 through ECS-11).

Current work scope at the project encompasses waste disposition, decontamination, deactivation, disposition of facilities, and infrastructure reduction; therefore, site activities are related to decommissioning and demolition. For each facility or structure that is under consideration for demolition, the base environmental aspects have been identified. These aspects are addressed during work planning with the assistance of hazard control specialists. In addition, before a building may be demolished, a “Demolition Readiness Checklist” that captures many of these environmental aspects must be completed.

Legal and Other Requirements

Requirements contained in DOE orders and directives are incorporated into the WVDP Interim End-State Contract with WVES as specific terms and conditions. WVES Regulatory Affairs conducts environmental regulatory reviews to identify, evaluate, and document changes to applicable environmental regulations. Items that have an effect upon compliance activities at the WVDP are communicated to Environmental Affairs and other Project personnel.

Objectives and Targets

DOE Order 450.1A requires that goals be established to integrate sustainable environmental stewardship into the site’s operations as a cost-effective business practice. Goals are intended to prevent pollution, reduce environmental hazards, protect the public and the environment, reduce waste disposal costs, and improve operational capability. The Order also established five performance-based sustainable environmental stewardship goals that are to be achieved at each DOE site.

The WVDP’s "Waste Minimization and Pollution Prevention Awareness Plan” established the strategic framework for integrating waste minimization and pollution prevention into waste generation and reduction activities, the procurement of recycled products, the reuse of existing products, and the use of methods that conserve energy. The program is a comprehensive and continual effort to prevent or minimize pollution, with the overall goals of reducing health and safety risks, and protecting the environment. The WVDP objectives and targets that were established to meet the goals are presented in Table 1-2. Also refer to the Environmental Compliance Summary Table ECS-6, "Pollution Prevention Progress for Fiscal Year (FY) 2009," and Table ECS-7, "Affirmative Procurement Accomplishments for Fiscal Year 2009."

Environmental Management Program

An environmental management program is a key element to the successful implementation of an EMS. At the WVDP, the program is implemented by the “WVDP Environmental Management System” policy. The policy describes how the objectives and targets are achieved and clearly defines responsibilities, timeframes, and provides for modifications to ensure that environmental management will apply to new developments and new or modified activities. This is accomplished through policies and procedures, as well as through project schedules, milestone tracking, and commitment tracking.

Training, Awareness, and Competence

Human performance/behavior-based safety (HP/BBS) training is conducted across the site. Project personnel are trained to HP/BBS concepts and practices, and HP/BBS observer technique training is provided for safety department and safety observers. Self-assessment activities are also stressed as a mechanism for evaluating, improving, and maintaining worker safety. WVES operated the WVDP throughout 2009 in a safe manner that was protective of its workers, the public, and the environment.

TABLE 1-2
WVDP EMS Objectives and Targets

Goal	*Objective*	*Target*	*Target Date*	*Status*
Goal 1	**Reduce or eliminate the generation and/or toxicity of waste and other pollutants at the source through pollution prevention**			
1.1	Reduce the amount of resins used for the treatment of radiologically contaminated wastewater generated by main plant operations.	Reduction of 10% from calendar year (CY) 2006 baseline Baseline - 54,996 pounds (lbs) Goal - 49,495 lbs	12/31/09	Former U.S. Environmental Protection Agency (EPA) National Environmental Performance Track (P-Track) goal. CY 2009 - 23,504 lbs 57.3% below baseline Goal met
Goal 2	**Reduce or eliminate the acquisition, use, and release of toxic and hazardous chemicals and materials**			
2.1	Reduce the amount of liquid nitrogen used for drying the interior of the former high level waste tanks.	Reduction of 10% from CY 2006 baseline Baseline - 783,835 lbs Goal - 705,452 lbs	12/31/09	Former P-Track goal CY 2009 - 0 lbs Goal met
2.2	Reduce the amount of sulfur oxide air emissions from non-transportation purposes	Reduction of 10% from CY 2006 baseline. Baseline - 0.28 tons Goal - 0.25 tons	12/31/09	Former P-Track goal CY 2009 - 0.30 tons; 7.1% above baseline; goal not met. Due to damage that occurred during a site power outage, the permanent ventilation system generator ran continuously for 524 hours.
Goal 3	**Maximize the Acquisition and use of environmentally preferable products in the conduct of operations**			
3.1	Update procurement software to track purchases of EPA-designated items and biobased products.	Complete software update.	7/30/09	Completed 7/16/2009.
3.2	Maximize the purchase of biobased products.	Update purchasing database with biobased items.	7/30/09	Completed 4/30/2009.
3.3	Maximize the purchase of EPA-designated items and biobased products	Provide training to procurement personnel on the resources available to assist in locating alternative items that meet EPA designated items and biobased product requirements.	3/31/10	Training briefing completed on 3/11/2010.
Goal 4	**Reduce or eliminate the environmental impacts of electronics assets**			
4.1	Maximize the purchase of electronic procurement environmental assessment tool (EPEAT) registered personal computers, laptops, and monitors.	Provide training to information technology and procurement personnel on EPEAT products.	6/30/09	Completed 6/18/09
4.2	Enable Energy Star® features on electronic equipment	Instruct all employees to shut down all non-essential electronic equipment at the end of their work shift, and to utilize energy management features of their PCs.	3/31/09	Complete - all employee communication was distributed on 3/2/2009.

TABLE 1-2 *(continued)*
WVDP EMS Objectives and Targets

Goal	*Objective*	*Target*	*Target Date*	*Status*
4.3	Participate in the electronics reuse and recycling challenge (ERRC)	Register on the ERRC website when program is launched for fiscal year (FY) 2009.	4/30/09	Completed 4/1/2009. Recycled 11,822 lbs of excess electronic equipment in FY 2009. This represents an increase of 8,556 lbs from the FY 2008 total.
Goal 5	**Reduce degradation and depletion of environmental resources through post-consumer material recycling**			
5.1	Recycle excavated asphalt removed to support installation of modular office units.	Recycle 100% of asphalt removed from the parking lot.	12/31/09	Recycled 130 tons. Goal met.
5.2	Reuse of electrical components removed in decontamination and decommissioning projects.	Reuse electrical components to assemble portable electric distribution panels.	8/31/09	Complete - 2 panels assembled. More are planned in the future.
5.3	Purchase used office furniture for use in office trailers.	To the extent feasible, furnish new office trailers with previously used furniture.	11/15/09	Complete - Purchased $30,000 of used office furniture, with cost avoidance of $60,000.
Goal 6	**Energy efficiency**			
6.1	Reduce the total non-transportation energy use	Reduction of 5% from CY 2006 baseline. Baseline - 123,011 million british thermal Units (MMBtus)	12/31/09	Former P-Track goal CY 2009 - 49,060 MMBtus; 60.1% below baseline. Goal met.
6.2	Update the Department of Energy (DOE) Order 430.2B Executable Plan for CY 2009.	Update the Executable Plan and issue to the DOE	12/31/09	Complete - issued to the DOE on 12/22/09
6.3	Obtain DOE approval for the DOE 430.2B Executable Plan.	Obtain DOE approval for the WVDP 430.2B Executable Plan	2/8/09	Complete - Obtained DOE approval on 2/9/09
6.4	Secure Renewable Energy Credits (RECs)	Obtain 5 to 10% in RECs	6/30/09	Complete - obtained RECs equal to 10% total used at the WVDP.
6.5	Reduce energy requirements of air compressors	Replace the functions of older with a new compressor with variable frequency drives.	2/28/09	Installation completed in March 2010.
6.6	Reduce energy requirements of Vit exhaust fan	Replace drives with variable frequency drives.	10/15/09	Complete
6.7	Reduce energy requirements to cool the Site air compressors	Eliminate site cooling tower and replace with glycol cooling system and one air cooled compressor. Anticipate 75% reduction in energy.	11/2/09	Complete

TABLE 1-2 *(concluded)*
WVDP EMS Objectives and Targets

Goal	*Objective*	*Target*	*Target Date*	*Status*
6.8	Reduce energy requirements of laundry	Replace existing laundry facility with a modular laundry facility with high-efficiency washer; use 70% less water; and install an on-demand water heater.	On hold	Plans to move the laundry are currently on hold. Replacement with a high-efficiency washer is being evaluated.
6.9	Reduce energy requirements of office space	Office space will be relocated to modular units from the main plant process building (MPPB) and administration building. Will allow inefficient boiler systems to be converted to low-pressure steam.	4/30/10	Planning complete. 47 units installed; 155 personnel moved into 40 units. Seven units are used for material and equipment.
6.10	Reduce energy requirements of laboratory facility	Laboratory space will be relocated to modular units.	On hold	Plans to move the laboratory are currently on hold.
6.11	Reduce energy requirements of MPPB compressed air system	Eliminate use of compressed air to sparge lagoons	7/31/10	Installation is 100% complete. Blowers have been relocated and final testing is in process.
Goal 7	**Other**			
7.1	Provide EMS overview training to new hire American Reinvestment Recovery Act (ARRA) employees	Prepare and present a PowerPoint training presentation on the WVES EMS program and expectations of WVES employees	1/31/10	Complete 1/11/10 68 ARRA new hires trained

During CY 2009, the WVDP workforce performed their work safely in a high-risk environment of nuclear waste cleanup, and achieved 2.1 million safe work hours since the last lost-time work injury, with more than one year without a recordable injury. This safety performance has earned WVES the rank of being the number one prime contractor (of 16) in the DOE's Office of Environmental Management.

In 2009, the WVDP was awarded funding under the American Recovery and Reinvestment Act (ARRA) to accelerate cleanup projects at the site. In all, 68 new hires received up to 12 weeks of training and were introduced to the WVDP strong safety culture. All were given a training presentation on the WVES EMS program and expectations of employees. The training department developed a systematic approach to assessing individual qualifications and tailoring training requirements to the individuals. The new hires brought a wealth of field expertise, including hazardous materials, welding, asbestos-handling certifications, and heavy equipment operation.

Voluntary Protection Program (VPP) STAR Status. Since May 2000, West Valley Nuclear Services Company (WVNSCO) had been recognized by DOE Headquarters (DOE-HQ) for its excellent worker safety and health programs. In 2007, WVES assumed operations under the WVDP interim end-state contract. In 2008, the decision was made to retire the WVNSCO STAR on the basis that WVES was a new company, therefore ineligible for recertification under the original WVNSCO STAR. WVES subsequently submitted an application for recertification. In November 2009, a team of safety assessors from DOE-HQ performed an extensive review of WVES' application and recommended VPP STAR status. In January 2010, WVES was awarded membership and presented the DOE VPP STAR status for its safety performance.

10 Code of Federal Regulations (CFR) 851, "Worker Safety and Health Program." 10 CFR 851 became effective in February 2007, with full implementation at the WVDP by May, 2007. The law superseded DOE Order 440.1A, "Worker Protection Management for DOE Federal and Contractor Employees," which directed compliance with specific Occupaton Safety and Health (OSHA) requirements.

Similar to OSHA, the rule established the framework for an effective worker safety and health program to provide DOE contractor workers with a safe and healthful workplace in which workplace hazards are abated, controlled or otherwise mitigated in a manner that provides reasonable assurance that workers are adequately protected from identified hazards.

The "WVDP Worker Safety and Health Plan" describes how the WVDP complies with 10 CFR 851. The plan was reviewed in 2090 and no modifications were necessary.

Any person working at the WVDP who has a personal photo badge allowing unescorted access to administrative areas of the site receives general employee training that covers health and safety, emergency response, and environmental compliance issues. All visitors to the WVDP receive a site-specific briefing on safety and emergency procedures.

Hazardous waste operations and emergency response regulations require that employees at treatment, storage, and disposal facilities receive training appropriate to their job function and responsibilities. The WVDP environmental, health, and safety training matrix identifies the specific training requirements for such employees.

Training programs include, but are not limited to:

- 24-hour/40-hour hazardous waste operations;
- emergency spill-response training;
- decontamination techniques;
- waste minimization and pollution prevention;
- the WVDP environmental management program;
- radiation hazards and warnings;
- dosimetry and respiratory protection;
- medical emergency response training; and
- electrical safety and fire protection.

Training programs have evolved into a comprehensive curriculum of knowledge and skills necessary to maintain the health and safety of employees and ensure the continued compliance of the WVDP with applicable regulations and requirements.

Safety-Trained Supervisor (STS) Program. Since November 2003, WVNSCO/WVES has maintained an STS certification program whereby employees complete an extensive program to become safety-certified. Certification and renewal requirements include at least 30 hours of safety-related training and successful completion of a certification exam. Standards, established by the Council on Certification of Health, Environmental, and Safety Technologists, ensure that certified individuals have a broad understanding of industrial safety. The benefits at the site include increased safety awareness among employees, an improved site safety culture, and increased confidence when dealing with safety and health matters during the planning and field phases of work. Currently there are 66 certified WVES safety-trained supervisors at the WVDP who undergo renewal requalification once every three years to maintain the STS status.

Operational Control

U.S. Nuclear Regulatory Commision-Licensed Disposal Area (NDA) Interceptor Trench and Pretreatment System. Radioactively contaminated n-dodecane, in combination with tributyl phosphate (TBP), was discovered in groundwater at the northern boundary of the NDA in 1983, shortly after the DOE assumed control of the WVDP. To mitigate subsurface migration of this radioactive organic mixture, an interceptor trench and liquid pre-treatment system (LPS) were installed.

As in previous years, no n-dodecane/TBP contamination was detected in the trench water; therefore, no water was treated by the LPS in 2009. Approximately 79,400 gallons (301,000 liters) of radiologically contaminated water were pumped and transferred from the interceptor trench to the low-level waste treatment facility (LLW2) during CY 2009. Refer to the “Environmental Compliance Summary” for a discussion of the interim measure to construct a cap over the NDA and discussion of the installation of the slurry wall upgradient of the NDA. Refer also to Chapter 4, “Groundwater Protection Program,” under "Groundwater Sampling Observations on the South Plateau: Weathered Lavery Till and the NDA" for a discussion of results of surface and groundwater monitoring in the vicinity of the NDA.

Collaborative Study for Treatment of Strontium-90 in Groundwater. In 2009, special studies were begun to evaluate the ability of different types of zeolite to remove strontium-90 from groundwater. Zeolite is a natural mineral with a porous structure that can trap positively charged ions, such as strontium. These studies were performed to support the design of a full-scale permeable treatment wall (PTW) at the

WVDP. The PTW will be constructed of zeolite and will be designed to remove strontium-90 as groundwater flows through it.

As a collaborative effort sponsored by the DOE, the State University of New York at Buffalo's (UB's) Department of Civil, Structural, and Environmental Engineering performed various tests to evaluate zeolite's ability to remove strontium under a variety of conditions, and to provide the basis for the design of the full-scale PTW. This work benefited from input and review by a number of different groups, including: the DOE, The U.S. Army Corps of Engineers, WVES, UB, Geomatrix, and URS. Hands-on work at UB was performed by graduate students in the National Science Foundation-funded Integrated Graduate Education and Research Training program in Ecosystem Restoration through the Interdisciplinary Exchange program.

In addition to the work performed at the UB campus, zeolite studies were undertaken in the WVDP's Environmental Laboratory. These studies, also performed under the direction of UB, were designed to test the ability of zeolite to remove radioactive strontium-90 from WVDP groundwater. As part of this long-term study, water from the North Plateau Groundwater Recovery System (i.e., water containing strontium-90) is being passed continuously through vertical columns of zeolite at a very low flow-rate. Measurements are being taken to assess the effectiveness of the different types of zeolite in removing the contamination. Due to the radioactive contamination in the groundwater, this type of work would have been very difficult to perform at UB. However, the work is being readily accomplished at the WVDP with the support of DOE, WVES, and Environmental Laboratory personnel and facilities.

Results of this work may help further refine the understanding of the way strontium is adsorbed and released from zeolite materials at the WVDP and may have direct application to subsurface remediation projects at other sites.

Emergency Preparedness and Response

The emergency response organization (ERO) activates the emergency operations center (EOC) and the technical support center (TSC) in accordance with site emergency response procedures in the event of health, safety, or environmental emergencies. The ERO refresher training was updated in 2009 and on May 5, a classroom training session was held, along with a tabletop drill. Seven new members of the ERO were trained for positions in the EOC and the TSC.

Emergency management overview training was completed for five groups of new employees (approximately 68) that were hired under ARRA funding. These new hires also participated in 12 drills during 2009, which included several radiation drills, operations drills, and tabletop exercises.

On October 22, 2009, a mass casualty/communications drill was held on the back shift for the West Valley Volunteer Hose Company and the Bertrand Chaffee Hospital. Prior to this drill, emergency management training, security, and radiation safety training was provided to the off-site responders.

Emergency management training for subcontract employees at the Ashford Office Complex was provided in 2009, and an evacuation drill was held on July 30, 2009.

A site-integrated exercise was conducted on June 23, 2010. The exercise included on-site response teams, as well as one off-site response organization (the West Valley Volunteer Hose Company, Inc.).

Environmental Monitoring and Measurement

As the Western New York Nuclear Service Center is no longer an active nuclear fuel reprocessing facility, the environmental monitoring program at the WVDP focuses on measuring radioactivity and chemical constituents associated with the aged residual by-products of former Nuclear Fuel Services Inc. operations, the Project's former high-level radioactive waste (HLW) treatment operations, and the current operations for management of HLW, transuranic waste, and low-level radioactive waste (LLW).

Exposure to radioactivity from site activities could occur primarily through the air, water, and food pathways. All three potential pathways are monitored at the WVDP, but air and surface water pathways are the two primary means by which radioactive material could move off site.

The on-site and off-site monitoring program at the WVDP includes measuring the concentration of alpha and beta radioactivity, conventionally referred to as "gross alpha" and "gross beta," in air and water effluents. Measuring the total alpha and beta radioactivity from key locations produces a comprehensive picture of on-site and off-site levels of radioactivity from all sources. Frequent updating and tracking of the gross radioactivity in effluents is required to maintain acceptable operations.

More-detailed measurements are also made for specific radionuclides. The radionuclides monitored at the Project are those that might produce relatively higher doses or that are most abundant in air and water effluents. Because man-made sources of radiation at the Project have been decaying for more than 35 years, the monitoring program does not routinely include short-lived radionuclides, that is, isotopes with a half-life of less than two years, which would be present at less than 1/100,000 of the original radioactivity levels.

The WVDP monitoring program includes sanitary wastewater discharges and storm water for nonradiological water quality and chemical constituents. See Appendix A for the schedule of sample locations and analytical requirements and Chapter 2 for a discussion of nonradiological program information.

Environmental Management of Wastewater. Water containing radioactive material from site process operations is collected in the site's interceptors, then transferred to the LLW2 and treated. The LLW2 includes the LLW treatment building and associated holding lagoons.

Lagoon 3 water is held, sampled, and analyzed before its release through a New York State Pollutant Discharge Elimination System (SPDES)-permitted outfall. (The SPDES permit is identified in Table ECS-3.) In 2009, about 12.3 million gallons (46.7 million liters) of water were discharged through outfall 001, the lagoon 3 weir. Table 1-3 summarizes the estimated releases of radioactivity in the 2009 discharge waters, as compared to the previous 10-year average. (Also, see Table 2-1 in Chapter 2.) Note that releases of tritium activity through outfall 001 were below the 10-year average, however, releases of gross alpha and beta activity were higher. (See "Predicted Dose From Waterborne Releases" in Chapter 3.)

Effective operation of the site wastewater treatment facilities is indicated by compliance with the applicable discharge limits regulated by the SPDES permit. Approximately 60 chemical and water quality constituents are monitored regularly. The analytical results are reported to the New York State Department of Environmental Conservation (NYSDEC) via monthly Discharge Monitoring Reports, required under the SPDES program. There was one SPDES daily maximum net effluent permit limit exception for chemical constituents during 2009, a calculated daily maximum permit limit for total iron concentration of 0.73 mg/L. Historical limit exceptions are discussed in previous Annual Site Environmental Reports (ASERs). Although the goal of the LLW2 and sanitary and utility wastewater treatment facility operations is to maintain effluent water quality consistently within the permit requirements, if SPDES permit limit exceptions occur, the exceptions are evaluated to determine their cause and to identify corrective measures. (See "SPDES Permit" discussion in the Environmental Compliance Summary.)

- North Plateau Groundwater Recovery System (NPGRS)

  The NPGRS operated throughout 2009, recovering groundwater from an area within the eastern lobe of the strontium-90 plume on the north plateau. Approximately 3.6 million gallons (14.0 million liters) were recovered during 2009. For a more-detailed discussion of the plume and the NPGRS, see "Strontium-90 Plume Characterization and Remediation Activities in 2009" in Chapter 4.

TABLE 1-3
2009 Radioactivity Releases Versus 10-Year Averages[a]

Radionuclide	*10-Year Average Curies*	*2009 Curies*	*% of 10-Year Average*
Aqueous Discharge LLW2			
Tritium	0.10	0.042	42%
Gross Alpha and Beta	0.0161	0.019	120%
Airborne Discharge ANSTACK			
Gaseous			
Tritium	0.012	0.0019	15%
Iodine-129	0.00043	0.000021	4.9%
Particulate			
Gross Alpha and Beta	0.00019	0.000040	21%

[a] All numbers were rounded to two significant digits after calculations were complete. Percentages based on the above total curie values may not exactly match those in the table.

Environmental Management of Airborne Emissions. During operations, ventilated air from the various WVDP facilities is continuously sampled for radioactivity in gases and particulate matter. Ventilated air is monitored and an alarm is activated if particulate matter radioactivity increases above preset levels. Samples are analyzed in the laboratory for the specific radionuclides that are present in the radioactive materials being handled in the facilities. (See "Radiological Air Emissions" in Chapter 2.)

Ventilation air through facilities undergoing radioactive material cleanup passes through high-efficiency filters before being released to the atmosphere. The filters are generally more effective for particulate matter than for gaseous radioactivity. For this reason, facility air treatment tends to remove a lesser percentage of gaseous radioactivity (e.g., tritium and iodine-129) than radioactivity associated with particulate matter (e.g., strontium-90 and cesium-137). However, gaseous radionuclide emissions still remain so far below the most restrictive regulatory limits for public safety that additional treatment technologies beyond those already provided are not necessary.

Table 1-3 shows the gaseous and particulate matter radioactivity emissions from the main plant process building (location ANSTACK) in 2009 compared to averages from the previous 10-year period. These 2009 values are low in comparison with the 10-year averages that include years when the vitrification system was operating.

Environmental Performance Measures

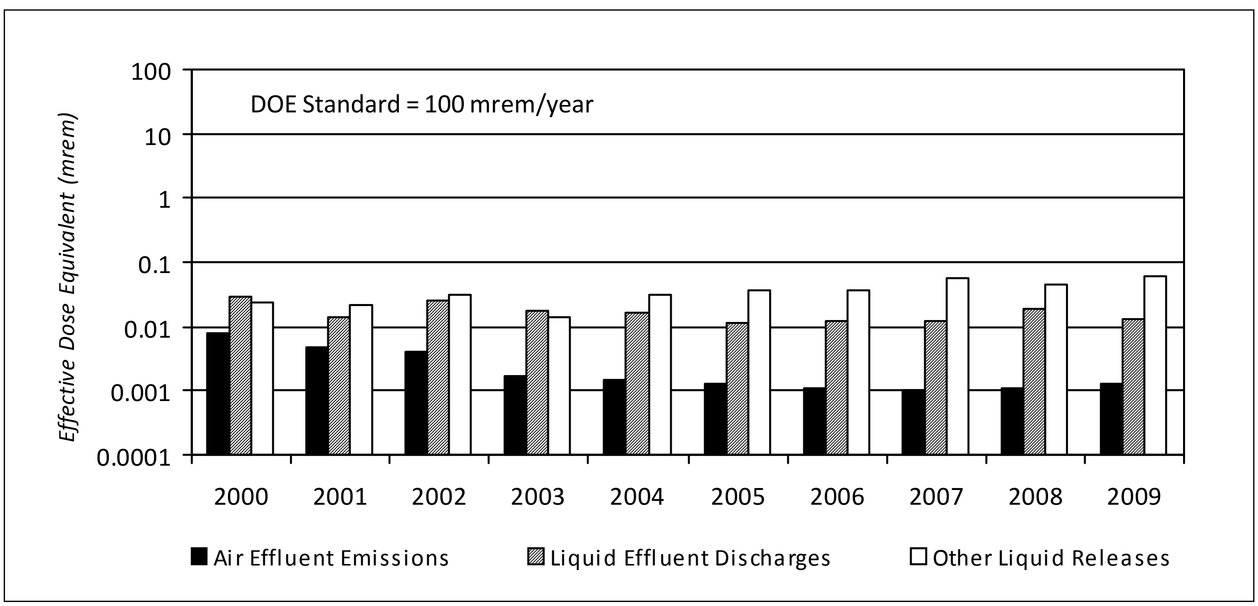
Performance measures can be used to evaluate effectiveness, quality, timeliness, safety, or other areas that reflect achievements related to organization or process goals, and can be used as tools to identify the need to institute changes.

Dose Assessment. As an overall assessment of Project activities and the effectiveness of the as-low-as-reasonably-achievable policy, the low potential radiological dose to the maximally exposed off-site individual is an indicator of well-managed radiological operations.

The relative dose equivalents for radiological air emissions, liquid effluent discharges, and other liquid releases (including swamp drainage) from 2000 through 2009 are graphed on Figure 1-1. Note that, when summed, the total is well below the DOE standard of 100 millirem (mrem) per year. The consistently low effluent results indicate that radiological activities at the site are well-controlled. (See also Table 3-2 in Chapter 3, "Dose Assessment.")

Groundwater Monitoring. The groundwater program is implemented at the WVDP according to DOE Order 450.1A and Resource Conservation and Recovery Act

FIGURE 1-1
Annual Effective Dose Equivalent to the Maximally Exposed Off-Site Individual



§3008(h) Administrative Order on Consent requirements, as approved by NYSDEC and the U.S. Environmental Protection Agency (EPA). Monitoring continued during 2009. Refer to Chapter 4, "Groundwater Protection Program," for details.

Environmental Management of Radiation Exposure. Environmental radiation is measured with thermoluminescent dosimeters (TLDs) at on-site and off-site locations. (See Figures A-10 through A-12.) Although exposure rates at most on-site locations in 2009 were elevated with respect to background, results from perimeter TLDs that would be more representative of exposure to the public were statistically indistinguishable from background results. (See "Environmental Radiation" in Chapter 2.)

Quality Assurance (QA) Program

The QA program at the WVDP provides for and documents consistency, precision, and accuracy in collecting and analyzing environmental samples and in interpreting and reporting environmental monitoring data. Under contract with the DOE, WVES implements the QA program at the WVDP. Subcontractor laboratories providing analytical services for the environmental monitoring program are contractually required to maintain a QA program consistent with WVES requirements.

10 CFR Part 830, Subpart A, "Quality Assurance Requirements," Section 830.122, "Quality Assurance Criteria," and DOE Order 414.1C, "Quality Assurance" (DOE, 2005), document the QA program policies and requirements applicable to activities at the WVDP. The WVDP QA program serves to implement the DOE Order 450.1A requirement to provide "assurance that analytical work for environmental and effluent monitoring supports data quality objectives, using a documented approach for collecting, assessing, and reporting environmental data." The integrated QA program also incorporates the requirements from the consensus standard "Quality Assurance Program Requirements for Nuclear Facilities" (American Society of Mechanical Engineers NQA-1, 1989). Controlled documents specific to the WVDP are used to implement the integrated QA program.

General areas addressed by the QA program include the following:

Responsibility. Responsibilities for overseeing, managing, and conducting an activity must be clearly defined. Personnel who verify that an activity has been completed correctly must be independent of those who performed it. Managers of programs, projects, and tasks at the WVDP are responsible for ensuring that QA requirements applicable to activities under their cognizance are implemented.

Planning. Work activities must be planned beforehand, the plan followed, and activities documented. Purchases of quality-affecting equipment or items must be planned, specified precisely, and verified for correctness upon receipt.

Training. Anyone performing an activity in support of the WVDP environmental monitoring program must be trained in the appropriate procedures and qualified accordingly before carrying out the activity.

Control of Design, Procedures, Items, and Documents. Any activity, equipment, or construction must be clearly described or defined and tested. Changes in the design must be tested and documented. Procedures must clearly state how activities will be conducted. Procedures are reviewed periodically, updated when necessary, and are controlled so that only approved and current procedures are used.

Equipment or particular items affecting the quality of environmental data must be identified, inspected, calibrated, and tested before use. Calibration status must be clearly indicated. Items that do not conform to requirements must be identified as nonconforming and segregated so as to prevent inadvertent use.

Corrective Action. Conditions adverse to quality must be promptly identified, a corrective action planned, responsibility assigned, and the problem remedied.

Documentation. Records of all activities must be kept to verify what was done and by whom. Records must be clearly traceable to an item or activity. Records such as field data sheets, chain-of-custody forms, requests for analysis, sample shipping documents, sample logs, data packages, training records, and weather measurements, in addition to other records in both paper and electronic form, are maintained as documentation for the environmental monitoring program.

Quality Control (QC)

The QC practices, an integral part of the WVDP QA program, are used to ensure that samples are collected and analyzed in a consistent and repeatable manner. QC methods are applied both in the field and in the laboratory.

Field QC. Procedures are defined for collecting each type of sample, such as surface water, groundwater, soil, and air. Trained Environmental Laboratory (ELAB) field personnel collect the samples. Field sampling locations are clearly marked to ensure that routine samples are collected in the same location each time. Collection equipment that remains in the field is routinely inspected, calibrated, and maintained, and automated sampling stations are kept locked to prevent tampering. Samples are collected into certified pre-cleaned containers of an appropriate material and capacity. Containers are labeled with information about the sample, such as date and time of collection, sample collection personnel, and special field conditions. Collection information is documented and kept as part of the sample record.

Chain-of-custody documentation is maintained to trace sample possession from time of collection through analysis. Samples are stored in a locked, secure location before analysis or shipping. Samples sent off site for analysis are accompanied by an additional chain-of-custody form. Subcontract laboratories are required by contract to maintain internal chain-of-custody records and to store the samples under secure conditions.

Special field QC samples are collected and analyzed to assess the sampling process. Duplicate field samples are used to assess sample homogeneity and sampling precision. Field and trip blanks (laboratory-deionized water in sample containers) are used to detect contamination potentially introduced during sampling or shipping. Environmental background samples (samples of air, water, vegetation, venison, and milk taken from locations remote from the WVDP) are collected and analyzed to provide baseline information for comparison with on-site or near-site samples so that site influences can be evaluated.

Laboratory QC. In 2009, samples were collected by personnel from the URS ELAB. On-site analyses were performed at the ELAB or the Wastewater Treatment Facility Laboratory. Off-site analyses were performed by GEL Laboratories LLC (GEL, in Charleston, South Carolina), TestAmerica Laboratories, Inc. (TestAmerica, formerly Severn Trent Laboratories, in Buffalo, New York), and AREVA NP Inc. (AREVA, in Westborough, Massachusetts). As samples were collected, shipped, and analyzed, chain-of-custody documentation was maintained to track sample possession from time of collection through analysis and data reporting. All laboratories are required to maintain relevant certifications, to participate in applicable crosscheck programs, and to maintain a level of QC as defined in their contracts.

To analyze environmental samples originating from the state of New York, both on-site and subcontract analytical laboratories are required to maintain the relevant New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certification.

Laboratory QC practices specific to each analytical method are described in approved references or procedures. QC practices include proper training of analysts, maintaining and calibrating measuring equipment and instrumentation, and routinely processing laboratory QC samples such as standards and spikes (to assess method accuracy), duplicates and replicates (to assess precision), and blanks (to assess the possibility of contamination). Standard reference materials (materials with known quantities or concentrations of constituents of interest) traceable to the National Institute of Standards and Technology are used to calibrate counting and test instruments and to monitor their performance.

Crosschecks. Crosscheck samples (performance evaluation samples) contain a concentration of a constituent of interest known to the agency conducting the crosscheck, but unknown to the participating laboratory. Crosscheck programs provide an additional means of testing accuracy of environmental measurements. Subcontract laboratories are required to perform satisfactorily on crosschecks, defined as having at least 80% of reported results falling within control limits. Crosscheck results that fall outside of control limits are addressed by formal corrective actions to determine any conditions that could adversely affect sample data and to ensure that actual sample results are reliable.

The WVDP participates in formal crosscheck programs for both radiological and nonradiological analyses.

- Radiological Crosschecks

  Organizations performing radiological analyses as part of effluent or environmental monitoring are encouraged by the DOE to participate in formal crosscheck programs to test the quality of environmental measurements being reported to the DOE by its contractors. Crosscheck samples for radiological constituents are analyzed on site by the ELAB and off site by GEL. In 2009, the WVDP participated in the DOE Radiological Environmental Sciences Laboratory Mixed Analyte Performance Evaluation Program (MAPEP). Results are listed in Appendix G.

- Nonradiological Crosschecks

  As a SPDES Permittee, the WVDP is required to participate in the EPA Discharge Monitoring Report - QA performance evaluation studies for the National Pollutant Discharge Elimination System. Samples from this program are analyzed both on site and by subcontract laboratories. In addition, subcontract laboratories performing nonradiological analyses of samples that contain radiological contamination participate in the DOE MAPEP program. This mixed analyte program provides performance evaluation samples for both radiological and nonradiological constituents.

  In 2009, nonradiological crosschecks were analyzed by the WVDP Wastewater Treatment Facility Laboratory, the ELAB, GEL, and TestAmerica. Results are summarized in Appendix G.

Results for 2009 from all laboratories that analyzed samples from the WVDP monitoring program are summarized in Table 1-4. As presented, 99.7% of the crosschecks performed in 2009 were acceptable.

TABLE 1-4
Summary of Crosschecks Completed in 2009

Type	*Number Reported*	*Number Within Acceptance Limits*	*Percent Within Limits*
Radiological	92	91	98.9%
Non-radiological	214	214	100.0%
All types	306	305	99.7%

Data Management

The Environmental Laboratory Information Management System (LIMS) is a database system used at the WVDP for establishing sample identification number, maintaining the sample data log, tracking samples, managing field and analytical data, and recording status and results of data validation. The LIMS is used as a controlled-source database for generating reports and statistical evaluations of data sets to support environmental surveillance activities. Subcontract laboratories are requested to provide data in electronic format for direct entry into the LIMS by WVDP personnel.

All software packages used to generate data are verified and validated before use. All analytical data produced in the ELAB at the bench level are reviewed and signed off by a qualified person other than the one who performed the analysis. A similar in-house review is contractually required from subcontractor laboratories.

Data Verification and Validation

Data validation is the process by which analytical data from both on-site and off-site laboratories are reviewed to verify proper documentation of sample processing and data reporting, and to determine the quality and usability of the data. A graded approach is applied that, based upon data quality objectives, dictates the rigor of review of the documentation associated with sample collection and/or sample analysis. In the WVDP environmental program, each data point is validated per approved standard procedures before it is assigned approval status and made ready for data assessment.

Data Assessment and Reporting

Validated analytical data, field information, and historical project data are integrated and evaluated to determine whether the constituents of interest are actually present and, if so, at what concentrations. Data problems identified at this level are investigated and appropriately resolved.

Data from the environmental monitoring program are then evaluated to assess the effect, if any, of the site operations and activities on the environment and the public. Data from each sampling location are compared with historical results from the same location, with comparable background measurements, and (if applicable) with regulatory limits or guidance standards. Standard statistical methods are used to evaluate the data.

Before each technical report is issued, the final document is comprehensively reviewed by one or more persons who are knowledgeable in the technical aspects of the work.

EMS Audits and Other Audits and Assessments

Assessments and surveillances are an important part of the improvement of the safety program at WVES. WVES uses an Integrated Assessment Council, made up of representatives from different departments, to develop an annual Integrated Assessment Schedule-based on past performance and the risk and hazards of upcoming work. Internal assessments, audits, and self-assessments are performed throughout the year to continuously improve safety programs. Issues discovered through the Integrated Assessment Program are tracked in a centralized database, statused weekly with senior management, and trended via a quarterly performance analysis program.

In addition to WVES oversight and self-assessment, numerous other reviews are conducted by DOE, regulatory agencies, and URS. A DOE Conduct of Operations (ConOps) Assessment was conducted by both internal and external DOE personnel in March 2009. Assessment results indicated a well-established and mature ConOps program with no programmatic concerns. WVES continues to self-identify, monitor, and track improvements to the ConOps program by regularly scheduled quarterly ConOps assessments conducted by supervisors and managers, as well as routine field and procedural walkdowns by operators.

Audits and assessments are conducted to verify compliance with, and effectiveness of, all aspects of the QA program, and to verify programmatic and functional compliance with site procedures, applicable local, state, and federal environmental regulations, and applicable DOE Directives. The WVDP environmental monitoring program is audited by external agencies and evaluated using internal self-assessments and audits.

Terminology. An audit or assessment provides for objective and independent review of site functions to determine if they are operating within regulatory, programmatic, and procedural parameters. The focus and/or topics of an audit or assessment are selected from specific criteria taken from the protocol, procedure, or regulation against which the function is to be evaluated.

During an audit or assessment, a "finding" is a noncompliance with a program element or a requirement of a specification, procedure, or commitment. Findings that may be considered immediately dangerous or involve any direct violation of a regulation, WVDP policy or procedure, DOE Order, or conduct of operations requirement must be brought to the immediate attention of the cognizant site manager. Such conditions require corrective action and are to be fixed immediately and documented within the assessment. An "observation" is a condition that, if left uncorrected, could lead to a "finding." It may indicate the potential for violating regulations or requirements or an opportunity to improve an existing compliant condition or procedure. Such conditions also require corrective action. If a finding or an observation cannot be fixed before the issuance of the assessment report, an Issue Report (IR) is initiated to document the condition that needs to be addressed, the required corrective action, and the timeline for completing the corrective action. IRs are tracked to closure in the WVDP open items tracking system. A "recommended action" may be identified to improve a program. "Good practices" (noteworthy practices) are identified when actions are above and beyond those required by procedural compliance.

Follow-up of 2008 DOE Audit of WVES Environmental Programs. DOE audited WVES Environmental Programs from November 17–24, 2008. Findings and observations reported from this audit in the areas of Environmental Management and Waste Management were described in the 2008 ASER. On February 5, 2009, WVES submitted a response to the DOE listing corrective actions that had been completed and others that were being tracked to completion in the open items tracking system.

Independent Third-Party Audit of the EMS. As required by E.O. 13423 (January 2007) and DOE Order 450.1A (June 2008), an EMS at a DOE site must be formally audited by a qualified party outside the control or scope of the EMS before declaring initial implementation of the EMS, and every three years thereafter. A formal third-party audit of the WVES EMS was conducted on May 18–20, 2009 by representatives of Washington Regulatory and Environmental Services (WRES), a qualified party outside the control of the WVDP EMS. While no nonconformances were identified, two observations were noted. Corrective actions required that additional detail be provided in the WVES Environmental Management System procedure. The revised procedure was issued on June 10, 2009, completing corrective actions.

During the audit, WRES also identified several "best practices" related to the WVDP EMS and its application:

- excellent integration of environmental planning with project and work planning;
- establishment of a "Green Team" to facilitate improvements in environmental sustainability;
- maintaining a robust system of environmental and safety self-checks;

- using indoctrination checklists for new or transferred employees; and
- well-executed practices and programs for external communications.

On June 11, 2009, consistent with the requirements of DOE Order 450.1A, WVES submitted to the DOE a declaration that the WVDP EMS is fully implemented.

ISMS and QA Program Assessment. During 2009, WVES conducted an annual effectiveness review (self-assessment) of the ISMS and the QA program. On August 31, 2009, WVES submitted to DOE documentation of the annual ISMS and QA effectiveness review and annual declaration. The review included the EMS. WVES concluded that the ISMS at the WVDP remains well documented, is effectively functioning, and is sufficiently staffed.

DOE Voluntary Protection Program Review. In the second quarter of 2009, an annual review of the VPP program was conducted in preparation for recertification. In the fall, after an extensive on-site assessment of implementation of the five tenets of VPP, WVES was recommended to continue in the VPP as a Star of Excellence site. Brad Davy (Director, Office of Worker Safety and Health Assistance, Office of Health and Safety) said, "Workers interviewed by the Team were clearly willing to raise safety issues, report injuries if they occurred, and stop work when necessary to address safety questions or concerns. The Team determined that the safety culture at the WVDP is strong and that WVES meets the requirements of all five tenets of DOE-VPP." The review team had no findings or concerns but offered several opportunities for improvement.

In January 2010, WVES was awarded membership and presented the VPP STAR status for its safety performance.

U.S. Army Corps of Engineers (USACE) Compliance Audit of the WVDP Environmental Monitoring Program. Between June and September 2009 (on-site July 14–16, 2009), the USACE conducted an audit of the Environmental Monitoring Program Integration and Reduction Strategy (EMIRS), which was prepared in 2007 to streamline the sampling and analytical program at the WVDP. Program revisions based on the EMIRS were implemented in January 2008. As part of the audit, the USACE also evaluated compliance with procedures and records maintenance. A formal report was issued in September 2009. Although several recommendations were made, the USACE found that the WVDP Environmental Monitoring Program was in compliance with applicable regulations, orders, and guidance.

WVES QA Department Audit of TestAmerica-Buffalo. On July 13–14, 2009, the WVES QA Department conducted an audit of TestAmerica, the laboratory in Amherst, New York, that analyzes nonradiological environmental samples for the WVDP environmental monitoring program. The audit focused on specific NQA-1-1989 elements as they apply to a laboratory setting, the laboratory's quality assurance program, and the requirements of technical contracts. One finding, four observations, and three commendable practices were identified. Several recommendations to improve daily operations were also made by the audit team. It was the consensus of the audit team that TestAmerica Implements an effective QA program that is, for the most part, adequately administered.

The one finding pertained to a supplier nonconformance report (SNR) issued to TestAmerica in April 2009. When following up on the response to the SNR, it was found that, although TestAmerica uses a Data Quality Resolution (DQR) program, the conclusion and/or corrective actions pertaining to the SNR were not linked back to the DQR form. Therefore, documentations of the nonconformance, corrective action(s), resolutions, and conclusions were not brought together.

The SNR was closed based upon subsequent tracking and resolution of the above finding and closure of the audit. Corrective actions have been proposed by TestAmerica, and WVES QA is following up with TestAmerica's new Quality Assurance Manager.

WVES QA Department Audit of the Off-Site Bioassay Program. On November 16–17, 2009, the WVES QA Department conducted an audit of GEL, the off-site laboratory that analyzes radiobioassay samples for the WVDP. The audit was focused on GEL's Quality Assurance and Technical Programs, as well as compliance requirements to perform analyses, as outlined in the WVES contract. In addition, the audit served to verify corrective actions that addressed issues identified in the previous years' audit, performed in November 2008.

The audit team concluded that GEL exhibits a mature, well-defined, and effective program. No findings were noted, and two minor observations were made. No response from GEL was required, and the audit was closed.

WVES QA Audit of the WVDP Environmental Laboratory. An external QA audit of the ELAB was conducted by WVES QA on December 2–3, 2009. The audit focused on specific NQA-1-1989 elements, as well as National Environmental Laboratory Accreditation Conference and ELAP requirements. Specific areas audited included:

- Management assessment of quality program effectiveness;
- Software control;
- Instructions, procedures, and drawings;
- Environmental data collection planning;
- Inspection, test, and operating status;
- Nonconformance control and related activities;
- Corrective action;
- ELAP applicable focus areas
- Compliance to resolutions from previous audits; and
- General safety practices.

No findings, three observations, and one noteworthy practice were identified. The audit team concluded that the ELAB effectively implements a mature and well-administered program. No formal response to the observations was requested, and the audit was closed.

NYSDOH ELAP Assessment of the WVDP Environmental Laboratory. An assessment of the WVDP ELAB against requirements of ELAP was conducted by NYSDOH on June 2–3, 2009. In a letter from NYSDOH on July 2, 2009, three deficiencies were noted: (1) not conducting formal reviews for vulnerabilities in data integrity; (2) not including in-depth training of staff with regard to data integrity; and (3) not submitting "blind" asbestos QC samples (i.e., samples for which the analyst is unaware of the QC status). Corrective actions were taken to address each of the deficiencies and a response letter was submitted to NYSDOH on July 28, 2009. On August 27, 2009, NYSDOH communicated that the corrective action responses were satisfactory.

Self-Assessments. Self-assessments (or program assessments) were conducted of the following topics in CY 2009, with no findings, observations, or suggested corrective actions noted:

- Compliance with conditions of the New York State Air Facility Registration Certificate for operation of two boilers;
- Compliance with potable water requirements associated with monthly reporting (Safe Drinking Water Act);
- Compliance with requirements for asbestos removal;
- Compliance with requirements of the polychlorinated biphenyls (PCB) and PCB-contaminated Material Management Plan; and
- Environmental Safety, Health, and Quality (ESH&Q) implementation of DOE Order 226.1A, "Implementation of Department of Energy Oversight Policy."

Environmental Surveillances. Several surveillances of issues that potentially could impact environmental health or safety were conducted in 2009.

On November 12, 2009, a walkdown of the NDA cap was performed by personnel from the Environmental Affairs, QA, and Site Operations Engineering, and Engineering Departments. The purpose of the walkdown was to assist in identifying modifications to site inspection and sampling procedures for the NDA cap, and to identify items that may require immediate action. Some recommendations included: placing barriers to prevent routine traffic from entering the cap area and to prevent snow plows from sending stone onto the cap; identifying corrective actions that could prevent collection of water near or on the cap; removing vegetation from the cap; removing excess sandbags and stone from the cap; removing leaves and debris in drain grates in the catch basin; and routinely inspecting the grates for debris. Action items were referred to Operations for follow-up.

On December 8, 2009, a walkdown of site facilities was conducted to assess general facility housekeeping and to identify impacts to storm water quality, waste management concerns (i.e., spills or releases), or other issues that could affect the environment, health, or safety. No findings were noted, however four observations were identified: (1) labels on ice melt containers did not always reflect contents; (2) cardboard waste was not always disposed of in containers designated for cardboard and paper; (3) an acetylene tank was stored outside; and (4) a spill of some petroleum-based material was observed on the roadway between the tank farm and the test and storage building locker rooms. Corrective actions were recommended (i.e., contacting Site Operations to verify exactly what product is being used for ice melt, moving the "cardboard only" dumpster to a location near the main gatehouse, moving the acetylene cylinder to an area protected from the weather, and writing a spill report for the petroleum material on the roadway [completed by Environmental Affairs before the walkdown report was issued on December 10, 2009]).

In 2009, a surveillance of storm water sampling was conducted. No findings or observations were identified, and no corrective actions were required.

Lessons Learned. Lessons learned data from audits, appraisals, and self-assessments are shared internally and externally through the WVDP lessons learned program. The WVDP maintains this system to promote the recurrence of desirable events and to minimize the recurrence of undesirable events.

Summary. Although areas for improvement were identified in the course of audits and assessments, nothing was found that would compromise the quality of the data in this report or the environmental monitoring program in general.

Changes in the 2009 Environmental Monitoring Program

The milk sampling point at a farm 3.0 km southeast of the site (BFMWIDR), was dropped from the program because the dairy herd was sold. This sampling point was replaced with sampling point BFMFLDMN, a dairy farm 5.1 km southeast of the site.

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ENVIRONMENTAL MONITORING

Monitoring Program

The goal of the West Valley Demonstration Project (WVDP or Project) environmental monitoring program is to ensure that public health and safety and the environment continue to be protected with respect to releases from site activities. To achieve this goal, possible exposure pathways are monitored.

The primary focus of the monitoring program is on surface water and air pathways, as these are the principal means by which potential contaminants are transported off site. Samples are collected from water, air, and other environmental media and measured for radiological and nonradiological constituents. A description of and schedule for the sampling program at each location and discussion of the environmental monitoring program drivers and rationale are presented in Appendix A, as well as maps showing the 2009 sampling locations. In accordance with United States (U.S.) Department of Energy (DOE) Order 450.1A, the monitoring program includes both effluent monitoring and environmental surveillance.

Effluent Monitoring. Liquid effluents and air emissions are monitored by collecting samples at locations on site where radioactivity or chemical pollutants are (or might be) released. Release points include discharge outfalls, storm water outfalls, site drainage points, and plant ventilation stacks. At some points, direct measurements (e.g., of radioactivity or flow rates) are also taken. The WVDP maintains required permits and/or certificates from regulatory agencies applicable to releases to air and water, as listed in Table ECS-3.

Environmental Surveillance. Surface water, drinking water, air, sediment, soil, venison, fish, and milk are collected at locations where the highest concentrations of transported contaminants might be expected. Samples are also collected at remote locations to provide background data for comparison with data from on-site and near-site samples. Direct radiation is monitored on site, at the site perimeter, and at a remote background location.

Data Evaluation. Data are assessed to determine whether the constituents of interest are present and, if so, at what concentrations. Data from each sampling location are compared with regulatory or guidance limits (if applicable) to determine if any limits have been exceeded. Guidance levels for radiological constituents in air and water are listed in Table UI-4 in the "Useful Information" section of this report. Regulatory limits for nonradiological constituents in discharges to surface water, additional water quality standards, and potable water standards are listed in Appendix B-1.

Data from near-site locations are compared with background concentrations using standard statistical methods as a means of assessing possible site impacts to the environment. Results from each location are also compared with historical data from that location to determine if any trends, such as increasing concentrations of a constituent, are occurring. If indicated, follow-up actions are evaluated and implemented as warranted.

Effluent Monitoring

Liquid Effluents. The Project is drained by several small streams. Franks Creek enters from the south and receives drainage from the south plateau. As it flows northward, Franks Creek is joined by Erdman Brook, which receives effluent from the low-level waste treatment facility (LLW2). After leaving the Project at the site security fence, Franks Creek receives drainage from the north and northeast swamp areas on the north plateau and from Quarry Creek. Franks Creek then flows into Buttermilk Creek, which, after flowing northward through the Western New York Nuclear Service Center (WNYNSC), enters Cattaraugus Creek and leaves the WNYNSC. (See maps on Figs. A-2 and A-5.)

- Radiological Releases

  Two locations, the lagoon 3 weir at outfall 001 (WNSP001 on Fig. A-2) and a natural drainage from the northeast swamp (monitoring point WNSWAMP on Fig. A-2), are the primary sources of radionuclide releases to surface waters. (Note that two other liquid release points, the sewage treatment outfall [point WNSP007] and another drainage point on the north plateau [the north swamp, point WNSW74A] are also evaluated each year. Releases from these points are minor and are not included in this discussion. However, they are addressed in Chapter 3, Dose Assessment.)

The discharge through the lagoon 3 weir at outfall 001 into Erdman Brook is the primary controlled point source of liquid release from the Project. Seven batch releases totaling about 12.3 million gallons (gal) (46.7 million liters [L]) were discharged from WNSP001 in 2009. Drainage from the northeast swamp in calendar year (CY) 2009 was estimated to be approximately 39.7 million gal (150 million L). Estimates of curies released from these two sources in 2009 and average radionuclide concentrations are summarized in Tables 2-1 and 2-2.

DOE Order 5400.5 defines derived concentration guides (DCGs) as radionuclide concentrations that, under conditions of continuous exposure for one year by one exposure mode, would result in an effective dose

TABLE 2-1
Total Radioactivity Discharged at Lagoon 3 (WNSP001) in 2009 and Comparison of Concentrations with DOE DCGs

Isotope [a]	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *(Becquerels)*	*Average Concentration (µCi/mL)*	*DCG* [d] *(µCi/mL)*	*Ratio of Concentration to DCG*
Gross Alpha	1.17±0.09E-03	4.32±0.33E+07	2.50±0.19E-08	NA[e]	NA
Gross Beta	1.83±0.03E-02	6.75±0.10E+08	3.91±0.06E-07	NA[e]	NA
H-3	4.24±0.09E-02	1.57±0.03E+09	9.08±0.19E-07	2E-03	0.0005
C-14	9.15±5.34E-04	3.39±1.97E+07	1.96±1.14E-08	7E-05	0.0003
K-40	1.55±9.49E-04	0.57±3.51E+07	0.33±2.03E-08	NA[f]	NA
Co-60	0.21±3.39E-05	0.08±1.26E+06	0.44±7.26E-10	5E-06	<0.0001
Sr-90	8.35±0.08E-03	3.09±0.03E+08	1.79±0.02E-07	1E-06	0.179
Tc-99	6.40±0.44E-04	2.37±0.16E+07	1.37±0.09E-08	1E-04	0.0001
I-129	4.75±1.61E-05	1.76±0.60E+06	1.02±0.34E-09	5E-07	0.002
Cs-137	2.44±0.10E-03	9.02±0.36E+07	5.22±0.21E-08	3E-06	0.0189
U-232[g]	2.94±0.12E-04	1.09±0.04E+07	6.29±0.25E-09	1E-07	0.0629
U-233/234[g]	1.91±0.10E-04	7.05±0.36E+06	4.08±0.21E-09	5E-07	0.0081
U-235/236[g]	9.47±2.33E-06	3.50±0.86E+05	2.03±0.50E-10	5E-07[h]	0.0004
U-238[g]	1.55±0.09E-04	5.72±0.32E+06	3.31±0.19E-09	6E-07	0.0055
Pu-238	4.62±1.37E-06	1.71±0.51E+05	9.89±2.94E-11	4E-08	0.0025
Pu-239/240	5.03±1.40E-06	1.86±0.52E+05	1.08±0.30E-10	3E-08	0.0036
Am-241	6.81±1.56E-06	2.52±0.58E+05	1.46±0.33E-10	3E-08	0.0049
Sum of Ratios					**0.29**

Note: Radiological measurements are expressed as a result term plus or minus (±) an uncertainty term. Result terms may be positive or negative. If the uncertainty term is larger than the result, the radionuclide was not detected. For more detail, see the "Data Reporting" discussion in the "Useful Information" section.

NA - Not applicable

[a] Half-lives are listed in Table UI-4.

[b] Total volume released: 4.67E+10 milliliters (mL) (1.23E+07 gal)

[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq): 1 Bq = 2.7E-11 Ci: 1 microcurie (µCi) = 1E-06 Ci:

[d] DCGs are listed for reference only. DCGs are applicable at the point at which water is available for ingestion by the public (i.e., at the site boundary) but not to release point concentrations, as might be inferred from their inclusion in this table.

[e] DOE DCGs do not exist for indicator parameters gross alpha and beta.

[f] The DCG is not applied to potassium-40 (K-40) activity because of its natural origin.

[g] Total uranium (grams [g]) = 4.39±0.06E+02; average uranium concentration (micrograms [µg]/mL) = 9.40±0.13E-03

[h] The DCG for U-236 is used for this comparison.

TABLE 2-2
Total Radioactivity Released at Northeast Swamp (WNSWAMP) in 2009 and Comparison of Concentrations with DOE DCGs

Isotope [a]	*N*	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *(Becquerels)*	*Average Concentration (µCi/mL)*	*DCG* [d] *(µCi/mL)*	*Ratio of Concentration to DCG*
Gross Alpha	26	4.42±1.95E-04	1.64±0.72E+07	2.94±1.30E-09	NA[e]	NA
Gross Beta	26	7.97±0.07E-01	2.95±0.03E+10	5.31±0.05E-06	NA[e]	NA
H-3	26	6.15±2.43E-03	2.27±0.90E+08	4.09±1.62E-08	2E-03	<0.0001
C-14	2	-0.89±2.78E-03	-0.33±1.03E+08	-0.59±1.85E-08	7E-05	<0.0003
Sr-90	12	4.00±0.01E-01	1.48±.0.01E+07	2.67±0.01E-06	1E-06	2.67
I-129	2	-1.59±8.54E-05	-0.59±3.16E+06	-1.06±5.69E-10	5E-07	<0.0011
Cs-137	12	7.69±9.46E-05	2.84±3.50E+06	5.12±6.30E-10	3E-06	<0.0002
U-232[f]	2	-0.64±7.31E-06	-0.24±2.71E+05	-0.43±4.87E-11	1E-07	<0.0005
U-233/234[f]	2	2.32±1.34E-05	8.58±4.94E+05	1.54±0.89E-10	5E-07	0.0003
U-235/236[f]	2	2.35±6.16E-06	0.87±2.28E+05	1.56±4.10E-11	5E-07[g]	<0.0001
U-238[f]	2	1.40±1.04E-05	5.18±3.83E+05	9.32±6.90E-11	6E-07	0.0002
Pu-238	2	0.70±3.23E-06	0.26±1.19E+05	0.47±2.15E-11	4E-08	<0.0005
Pu-239/240	2	-0.39±3.16E-06	-0.14±1.17E+05	-0.26±2.11E-11	3E-08	<0.0007
Am-241	2	1.51±3.76E-06	0.56±1.39E+05	1.01±2.50E-11	3E-08	<0.0008
Sum of Ratios						**2.67**

Note: Radiological measurements are expressed as a result term plus or minus (±) an uncertainty term. Result terms may be positive or negative. If the uncertainty term is larger than the result, the radionuclide was not detected. For more detail, see the “Data Reporting” discussion in the “Useful Information” section.

Note: The average pH at this location was 7.64 standard units.

NA - Not applicable

[a] Half-lives are listed in Table UI-4.

[b] Total volume released: 1.50E+11 mL (3.97E+07 gal)

[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq): 1 Bq = 2.7E-11 Ci

[d] DCGs are listed for reference only. DCGs are applicable at the point at which water is available for ingestion by the public (i.e., at the site boundary) but not to release point concentrations, as might be inferred from their inclusion in this table.

[e] DOE DCGs do not exist for indicator parameters gross alpha and beta.

[f] Total uranium (g) = 3.13±0.45E+01; average uranium concentration (µg/mL) = 2.08±0.30E-04

[g] The DCG for U-236 is used for this comparison.

equivalent of 100 millirem (1 millisievert). These DCGs are applicable only at locations where members of the public could be exposed to effluents containing contaminants. DCGs for radionuclides measured at the WVDP are listed in Table UI-4. Note that DCGs are not used for dose assessment. Methods for estimating dose from the liquid pathway are discussed in Chapter 3.

To evaluate each of the releases with respect to the DCGs, each annual average radionuclide concentration was divided by its respective DCG and the ratios from all nuclides were summed. As a DOE policy, the sum of the ratios (also called the “sum of fractions”) should not exceed 1.0. That is, the sum of percentages should not exceed 100%. Tables 2-1 and 2-2 list the sum of ratios for each release point.

The sum of ratios for the release from WNSP001 in 2009 was approximately 0.29, below the 1.0 criterion. However, the sum of ratios from WNSWAMP was 2.67, above the DOE Order 5400.5 criterion. As in past years, the elevated sum of ratios was almost entirely attributable to strontium-90.

Drainage at this point largely consists of emergent groundwater. Elevated gross beta concentrations were first noted at this location in 1993. Subsequent investigations delineated a plume of strontium-90 contaminated groundwater on the north plateau.

Annualized average strontium-90 concentrations, which first exceeded the strontium-90 DCG (1E-06 µCi/mL) in 1995, again exceeded the DCG in 2009. (See Fig. 4-6 in Chapter 4, “Groundwater Protection Program.”) Ongoing activities to characterize and remediate the strontium-90 groundwater plume are discussed in Chapter 4.

Even though waters with elevated strontium-90 concentrations drain from WNSWAMP into Franks Creek, then into Buttermilk Creek, and ultimately into Cattaraugus Creek, concentrations of strontium-90 and gross beta in water collected from Cattaraugus Creek downstream of the WVDP at the first point of public access continue to show little or no difference from background concentrations. (See Table B-5A in Appendix B-5.)

State Pollutant Discharge Elimination System (SPDES) Permit-Required Monitoring. Liquid discharges from the WVDP are regulated for nonradiological constituents under a SPDES permit, as identified in Table ECS-3. The permit identifies compliance points from which liquid effluents are released to Erdman Brook (Fig. A-2), identifies 20 storm water outfalls (Figs. A-3 and A-4) and specifies the sampling and analytical requirements for each. One additional storm water location is being added to the permit. This additional storm water runoff location, tentatively designated as location WNSO43, was identified in 2006 near a wetland near the Live-Fire Range on the WNYNSC and was characterized in 2007.

The conditions and requirements of the SPDES permit are summarized in Appendix B-1. The permit identifies 25 outfalls and compliance points with monitoring requirements and discharge limits. The monitored outfalls include:

- outfall 001 (monitoring point WNSP001), discharge from the LLW2
- outfall 007 (monitoring point WNSP007), discharge from the sanitary and industrial wastewater treatment facility
- outfall 008 (monitoring point WNSP008), a groundwater french drain near the LLW2 storage lagoons (closed in May 2001 but still on the permit)
- outfall 116 (pseudo-monitoring point WNSP116), a location in Franks Creek that represents the confluence of outfalls WNSP001, WNSP007, and WNSP008, as well as storm water runoff, groundwater seepage, and augmentation water. Samples from upstream sources are used to calculate total dissolved solids (TDS) at this location and to demonstrate compliance with the SPDES permit limit for this parameter. (Outfall 116 is referred to as a “pseudo-monitoring” point on the SPDES permit.)
- outfall 01B (monitoring point WNSP01B), an internal monitoring point for the liquid waste treatment system (LWTS) evaporator effluent, monitored for flow and total mercury. No effluent was processed or released from this outfall in 2009.
- 20 storm water discharge outfalls that also receive flows from other minor sources, such as fire hydrant testing and groundwater seepage, being monitored on a rotational basis. The objectives of SPDES permit requirements for monitoring storm water runoff are to determine (1) the levels of water quality and specific chemicals in storm water discharges from specified locations on the WVDP, (2) the amount of rainfall, (3) duration of the storm event, and (4) the resulting flow at the outfalls. The 20 storm water outfalls at the WVDP are grouped into eight representative drainage basins that could potentially be influenced by industrial or construction activity runoff. One representative outfall from each of the eight outfall groups listed in Appendix A must be sampled on a semiannual basis.

The SPDES permit specifies the following conditions for a qualifying storm water event eligible for monitoring: (1) a period of 72 hours between the monitored event and the previous measurable event of 0.1 inches of precipitation; (2) a total rainfall of more than 0.1 inch; and (3) resultant storm discharge at the outfall.

Appendix B-2 presents process effluent data with SPDES permit limits provided for comparison. Appendix B-3 presents storm water runoff monitoring data for outfalls designated in the WVDP SPDES permit.

All samples were collected and analyzed in accordance with the permit in CY 2009, and only one SPDES effluent limit was exceeded. In January 2009, a total iron value of 0.73 milligrams (mg)/L was calculated for the sum of outfalls, exceeding the daily maximum net effluent permit limit of 0.30 mg/L. Site personnel are currently working with the New York State Department of Environmental Conservation (NYSDEC) on a permit renewal that will include changes to compliance limits.

Radiological Air Emissions. Federal law allows air containing small amounts of radioactivity to be released from plant ventilation stacks during normal operations. The releases must meet dose criteria specified in the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations to ensure that public health and safety and the environment are protected. At the WVDP, radiological releases are measured and/or estimated from six permitted emission points (see Table ECS-3), five non-permitted points, and three diffuse sources (wastewater storage lagoons, stored waste containers, and demolition activities). Sampling locations for air emissions are shown in Appendix A on Figure A-6. Releases are evaluated and reported to the U.S. Environmental Protection Agency (EPA) in the annual NESHAP report.

Measured radionuclide concentrations in air are also compared with DOE DCGs. Unlike NESHAP dose criteria, the DOE DCGs are expressed in units of microcuries per milliliter (µCi/mL) and can be directly compared with measurements from the monitoring program. Although the DOE DCGs are applicable only where the public may breathe air containing radionuclides, the DCGs are used at the WVDP as a tool for evaluating airborne emissions at the point of release. DCGs for radionuclides of interest at the WVDP are found in Table UI-4 in the “Useful Information” section at the end of this report. When only gross alpha and beta measurements are available, activity is assumed to come from americium-241 and strontium-90, respectively, because the DCGs for these radionuclides are the most limiting for major particulate emissions at the WVDP. No DCGs were exceeded by airborne emissions in 2009. Locations with results statistically greater than background values are summarized in Table 2-4.

Ventilation and Emission Systems. The exhaust from each EPA-permitted ventilation system is continuously filtered and the permanent systems are monitored as air is released to the atmosphere. Because radionuclide concentrations in air emissions are quite low, a large volume of air must be sampled to measure the quantities of radionuclides released from the facility. Emissions are sampled for radioactivity in both particulate forms (e.g., strontium-90 and americium-241) and gaseous forms (e.g., tritium and iodine-129). The total release of each radionuclide varies from year to year in response to changing site activities. For instance, releases of iodine-129 dropped sharply after vitrification was completed in 2002. Over the years, the annual calculated dose from air emissions at the WVDP has remained a small fraction of the NESHAP standard. (See “Predicted Dose From Airborne Emissions” in Chapter 3.)

- The Main Plant Ventilation Stack

  The primary controlled air emission point at the WVDP is the main plant process building (MPPB) ventilation stack, monitoring location code ANSTACK, which vents to the atmosphere at a height of 208 feet (ft) (63.4 meters [m]). This stack has historically released ventilation exhaust from several facilities, including the liquid waste treatment system, the analytical laboratories, and off-gas from the former vitrification system. In 2009, the MPPB stack continued to release ventilation exhaust from a variety of facility spaces.

  Total curies released from the main stack in 2009 are listed in Table 2-3, together with annual averages, maxima, and a comparison of average isotopic concentrations with the applicable DCGs. The sum of ratios for radiological concentrations from ANSTACK was 0.052, far below the DOE guideline of 1.0. Airborne concentrations from the stack to the site boundary were further reduced by dispersion. Historical results from air samples taken near the site boundary have confirmed that WVDP operations have had no discernible effect on off-site air quality. (See “Ambient Air,” later in this chapter.)

- Other On-Site Air Sampling Systems

  Sampling systems similar to those of the MPPB are used to monitor airborne effluents from the former vitrification heating, ventilation, and air-conditioning system (ANVITSK), the 01-14 building ventilation stack (ANCSSTK), the contact size-reduction facility ventilation stack (ANCSRFK), the supernatant treatment system ventilation stack (ANSTSTK), the container sorting and packaging facility ventilation stack (ANCSPFK), and the remote-handled waste facility (ANRHWFK) (Fig. A-6).

  Permitted portable outdoor ventilation enclosures (OVEs) are used to provide the ventilation necessary for the safety of personnel working with radioactive materials in areas outside permanently ventilated facilities or in areas where permanent ventilation must be augmented. Air samples from OVEs are collected continuously while emission points are discharging, and data from these portable ventilation units are included in annual evaluations of airborne emissions.

TABLE 2-3
Total Radioactivity Released at Main Plant Stack (ANSTACK) in 2009 and Comparison of Concentrations with DOE DCGs

Isotope [a]	*N*	*Total Activity Released* [b] *(Ci)*	*Average Concentration (µCi/mL)*	*Maximum Concentration (µCi/mL)*	*DCG* [c] *(µCi/mL)*	*Ratio of Concentration to DCG*
Gross Alpha	26	8.20±0.72E-07	1.11±0.10E-15	6.95E-15	--	--
Gross Beta	26	3.87±0.04E-05	5.22±0.06E-14	7.42E-13	--	--
H-3	26	1.94±0.05E-03	2.61±0.07E-12	7.84E-12	1E-07	<0.0001
Co-60	2	0.83±4.50E-08	1.12±6.06E-17	<9.86E-17	8E-11	<0.0001
Sr-90	2	1.09±0.04E-05	1.47±0.05E-14	2.36E-14	9E-12	0.0016
I-129	2	2.12±0.14E-05	2.86±0.19E-14	2.82E-14	7E-11	0.0004
Cs-137	2	1.12±0.04E-05	1.51±0.05E-14	2.22E-14	4E-10	<0.0001
Eu-154	2	-1.04±1.07E-07	-1.40±1.44E-16	<2.24E-16	5E-11	<0.0001
U-232 [d]	2	3.59±7.32E-09	4.84±9.87E-18	<1.61E-17	2E-14	<0.0005
U-233/234 [d]	2	2.53±0.88E-08	3.42±1.18E-17	3.87E-17	9E-14	0.0004
U-235/236 [d]	2	3.05±3.07E-09	4.11±4.14E-18	<5.48E-18	1E-13	<0.0001
U-238 [d]	2	1.92±0.74E-08	2.59±1.00E-17	2.91E-17	1E-13	0.0003
Pu-238	2	1.12±0.24E-07	1.51±0.33E-16	2.05E-16	3E-14	0.0050
Pu-239/240	2	2.04±0.33E-07	2.75±0.45E-16	3.48E-16	2E-14	0.0138
Am-241	2	4.41±0.51E-07	5.95±0.69E-16	8.55E-16	2E-14	0.0298
Sum of Ratios						**0.052**

N - Number of samples
-- - DCGs are not specified for gross alpha and beta concentrations.
[a] Half-lives are listed in Table UI-4.
[b] Total volume released at 50,000 cubic feet per minute = 7.42E+14 mL/year.
[c] DCGs are listed for reference only. DCGs are applicable at the point at which air could be inhaled by the public (i.e., at the site boundary) but not to release point concentrations, as might be inferred from their inclusion in this table.
[d] Total uranium (g) = 4.11±0.11E-02; average = 5.54±0.15E-11 µg/mL

Appendix C presents total radioactivity released for specific radionuclides at each of the on-site air sampling locations, with the exception of ANCSRFK, which did not operate in 2009 because no activities have been taking place in the facility since 2005, and the ventilation has been turned off.

No results exceeding the DOE DCGs were noted at any of the air emission sampling locations. Most results showed no detectable radioactivity.

- Nonradiological Air Emissions

Nonradiological air emissions at the WVDP are regulated under an air facility registration certificate that caps nitrogen and sulfur oxide emissions (NO_x and SO_x, respectively) from the facility at 49.5 tons per year. (See Table ECS-3.) The certificate applies to two site utility steam boilers, which are the primary sources of nitrogen and sulfur oxides at the site. Based on natural gas usage, the boilers are estimated to have released about 0.80 tons of NO_x and 0 tons of SO_2 in 2009, for a total of 0.80 tons, 1.62% of the capping limit.

Other units with the potential to emit, such as generators listed in the certificate, are exempted with the understanding that each unit operates less than 500 hours per year. In response to a power failure at the WVDP on December 9, 2009, the permanant ventilation system (PVS) generator was put into operation to provide power. The generator had run about 74 hours in 2009 before the outage and ran about 524 more during the outage, for a total of 598 hours during CY 2009, exceeding the certificate limit. This fact was communicated to NYSDEC, together with an estimate of nitrogen and sulfur oxide emissions from the PVS generator, about 1.53 tons of NO_x and 0.00187 tons of SO_2. Although total emissions from this generator (about 1.53 tons) are exempt from the certificate, they would have comprised about 3.1% of the limit. Combined emissions from the boilers and the PVS generator in CY 2009 would be about 2.33 tons of NO_x and SO_2, about 4.7% of the 49.5-ton cap.

Environmental Surveillance

Surface Water. On-site surface water drainage is routinely sampled at several points on the north and south plateaus, as shown in Appendix A, Figure A-2. Monitoring points are sited at locations where releases from possible source areas on the south and north plateaus could be detected. Appendices B-4[CD] through B-6[CD] present data for site surface drainage, subsurface drainage, contained water, ambient surface water, and potable (drinking) water monitoring locations. Off-site sampling locations are shown on Fig. A-5. Results are presented in Appendix B-5[CD]. Also provided for side-by-side comparison with these data are reference values, where available, including background ambient water monitoring data and/or pertinent ambient water quality standards, guidelines, or maximum contaminant levels (MCLs).

Radiological and nonradiological results from surface water samples were compared with applicable water quality standards and guidelines. Radiological results from on-site and downstream locations on Franks and Buttermilk Creeks were also compared with results from the background location on Buttermilk Creek (WFBCBKG), upstream of the WVDP. (Nonradiological results were compared with historical background values from WFBCBKG, because sampling for chemical constituents was discontinued in 2008.) Results from Cattaraugus Creek near Felton Bridge (sampling point WFFELBR), were compared with historical results from the Cattaraugus Creek background at Bigelow Bridge (former sampling point WFBIGBR). Locations with results exceeding applicable limits and those with results statistically greater than background values are summarized in Table 2-4.

- South Plateau

  Two inactive underground radioactive waste disposal areas (the Nuclear Regulatory Commission-licensed disposal area [NDA] and the New York State-licensed disposal area [SDA], under the control of the New York State Energy Research and Development Authority) lie on the south plateau. These disposal sites are possible sources of contaminants to surface water. Areas of the south plateau are being used to store radioactive vessels removed from site facilities and to temporarily store and stage containers of radioactive waste before they are shipped. Also located on the south plateau is the drum cell, a building formerly used to store drums of processed low-level radioactive waste. The drum cell has been empty since 2007, when the waste drums were shipped off site.

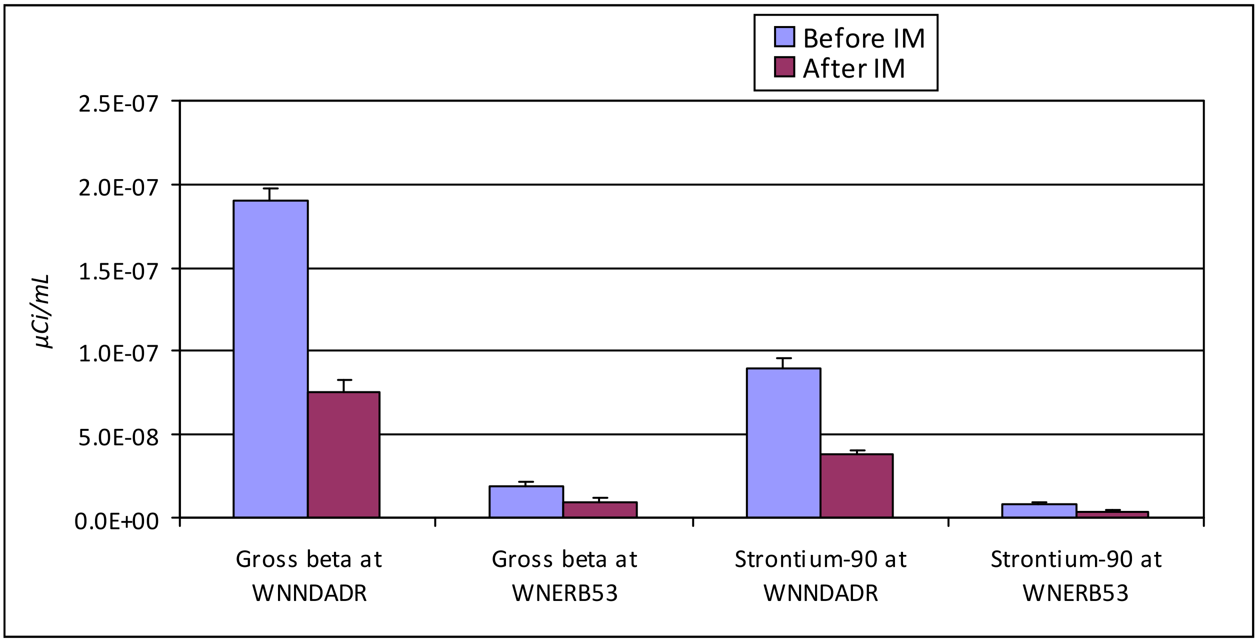
Surface water drainage downstream of the NDA is monitored at location WNNDADR, immediately north of the NDA, and further downstream at location WNERB53 on Erdman Brook. Some drainage from the western and northwestern portions of the SDA is also captured at WNNDADR and WNERB53. Although no radionuclide concentrations are greater than (or even approach) DOE DCGs, gross beta and strontium-90 concentrations have routinely exceeded background concentrations at both WNNDADR and WNERB53, as have tritium concentrations at WNNDADR. Residual soil contamination from past waste burial activities is thought to be the source.

As part of an interim measure (IM) to limit infiltration of groundwater, surface water, and precipitation into the NDA, a geomembrane cap and a slurry wall were constructed at the burial area. The IM was completed in December 2008. (See Chapter 4, "Interim Measures" under the discussion of "Groundwater Sampling Observations on the South Plateau: Weathered Lavery Till and the NDA" for more detail.)

Figure 2-1 is a plot of average gross beta and strontium-90 concentrations in surface water at WNNDADR and WNERB53 before and after completion of the IM. In CY 2009, average concentrations were significantly lower than historical concentrations (approximately 50% lower), suggesting that the IM has been effective in reducing infiltration of water through areas that affect surface water drainage at these points. As shown in Table 2-4, strontium-90 concentrations at WNERB53 were not significantly greater than background in 2009.

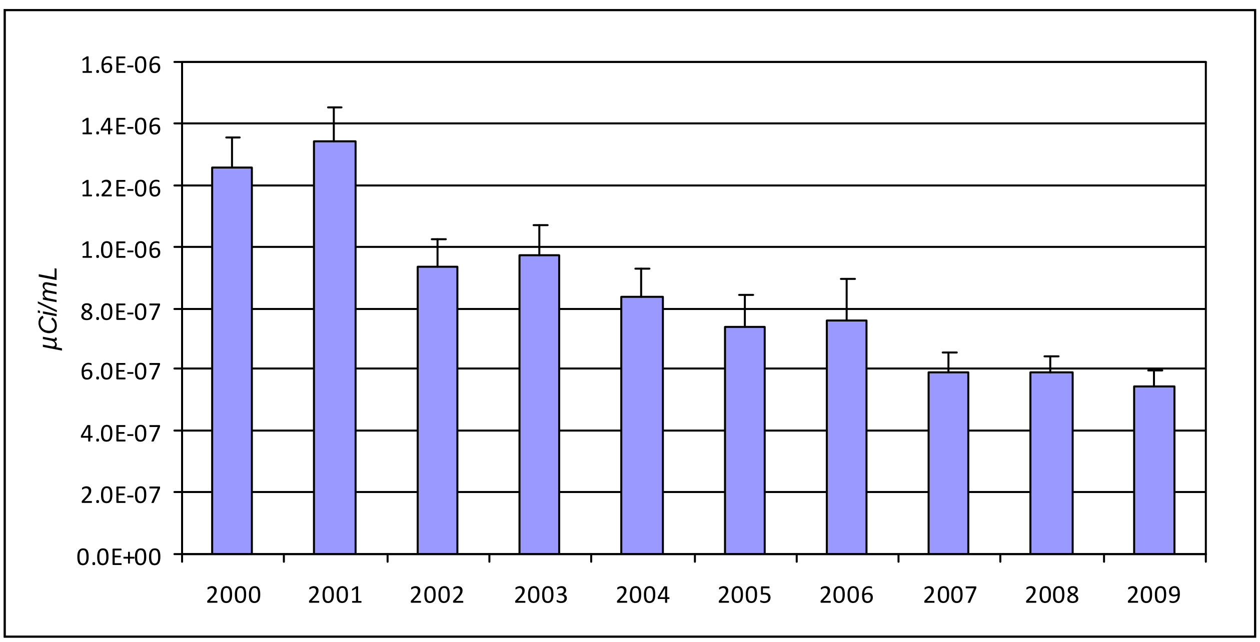
Although tritium concentrations at WNNDADR in CY 2009 remained above background, concentrations continued to trend downward, as noted in previous Annual Site Environmental Reports

FIGURE 2-1
Average Gross Beta and Strontium-90 Concentrations in Surface Water on the South Plateau at WNNDADR and WNERB53 Before and After the NDA Interim Measure (IM) was Installed



Note: The upper limit of the uncertainty term is indicated with each point. Average gross beta and strontium-90 background concentrations in Buttermilk Creek (WFBCBKG) in CY 2009 were 1.72±1.49E-09 and -3.90±6.59E-10 µCi/mL, respectively.

FIGURE 2-2
Average Concentration of Tritium in Surface Water at WNNDADR: 2000–2009



Note: The upper limit of the uncertainty term is indicated with each point. Average background value in CY 2009 was <4.46 E-08 µCi/mL.

TABLE 2-4
2009 Comparison of Environmental Monitoring Results With Applicable Limits and Backgrounds

Sample Type	*Number of Sampling Locations*	*Locations with Results Greater than Applicable Limits or Screening Levels [a] (Constituent)*	*Number of Locations with Results Greater Than Background*	*Locations with Results Statistically Greater than Background (Constituent)*
Air (1 background location)				
On-site air emission points	7	0	4	**ANSTACK** (H-3, Sr-90, I-129, Cs-137, Pu-238, Pu-239/240, Am-241); **ANSTSTK** (I-129); **ANCSPFK** (I-129); **ANVITSK** (I-129)
Surface water (2 background locations, one on Buttermilk Creek and one [historical] on Cattaraugus Creek)				
On-site controlled effluents	2	0	2	**WNSP001** (Gross alpha, Gross beta, H-3, Sr-90, Tc-99, I-129, Cs-137, U-232, U-233/234, U-235/236, U-238, Pu-238, Pu-239/240, Am-241, bromide, SO_4, NO_3-N, total B, total Hg, total dissolved solids [TDS]); **WNSP007** (Gross beta, NO_2-N, oil and grease)
On-site surface water	7	**WNSWAMP** (Sr-90)	6	**WNSP006** (Gross beta, Sr-90, U-232, U-233/234, U-238, TDS); **WNSP005** (Gross beta, Sr-90); **WNSWAMP** (Gross beta, H-3, Sr-90); **WNSW74A** (Gross beta, Sr-90); **WNNDADR** (Gross beta, H-3, Sr-90); **WNERB53** (Gross beta, Sr-90)
Off-site surface water	2	**WFBCTCB**[b] (total Fe[c], dissolved Hg[c])	1	**WFBCTCB** (Gross beta, Sr-90, total suspended solids, dissolved Cu, total Co, total Fe, total Ti)
Drinking water (1 background location)				
On-site drinking water	1	0	0	None
Soil (1 background location)				
Off-site soil	5	NS	NS	NS
Sediment (2 background locations, one on Buttermilk Creek and one [historical] on Cattaraugus Creek)				
On-site sediment/soil	3	NS	NS	NS
Off-site sediment	3	NS	NS	NS
Biologicals (3 background deer; 1 background per matrix for remainder)				
Fish	2	NA	NS	NS
Milk	1	NA	0	None
Deer	3	NA	0	None
Vegetables/fruits	3	NA	NS	NS
Environmental dosimetry (1 background)				
On-site, near facilities	8	NA	3	**DNTLDs #24, 38, 40**
Perimeter	17	NA	0	None

NA - No applicable regulatory, guidance, or screening limits are available.
NS - Not sampled in 2009.
[a] Applicable regulatory, guidance, or screening limits are listed in Table UI-4 (radionuclides in air and water) and Appendix B-1 (water).
[b] New York State Class C water quality standards were applied at WFBCTCB.
[c] Measurements at background location WFBCBKG have routinely exceeded the water quality standards.

(ASERs) and as shown in Figure 2-2. Because the half-life of tritium is slightly longer than 12 years, decreasing tritium concentrations may be partially attributable to radioactive decay.

North of the SDA, Franks Creek is sampled to monitor drainage downstream of the drum cell and the eastern and southern borders of the SDA (point WNFRC67, on Fig. A-2). In 2009, radionuclide concentrations at this point were indistinguishable from background.

- North Plateau

  Besides the effluent and drainage locations discussed earlier in the liquid effluents section, an additional location on the north plateau is sampled to monitor drainage and groundwater seepage on the east side of the MPPB (point WNSP005). As was noted at the northeast swamp location (WNSWAMP), gross beta and strontium-90 concentrations also exceeded background at locations WNSW74A and WNSP005. One more point, WNSP006, is sampled from Franks Creek at the security fence. WNSP006 is downgradient of the Lagoon 3 outfall (point WNSP001). In 2009, background concentrations of gross beta, strontium-90, uranium-232, uranium-233/234, uranium-238, and total dissolved solids were exceeded at WNSP006.

  On the north plateau, possible sources of contamination that could affect surface water include the high-level waste tanks, process buildings, the lagoon system associated with the LLW2, and facilities for handling and storing wastes.

- Off-Site Surface Water

  Surface water samples are collected at three off-site locations, one upstream background location and one downstream location on Buttermilk Creek and one downstream location on Cattaraugus Creek.

  – Buttermilk Creek receives surface drainage from the WNYNSC. The background monitoring point is located upstream of the WVDP at Fox Valley Road (WFBCBKG) and the downstream point is located at Thomas Corners Bridge (WFBCTCB), just before Buttermilk Creek enters Cattaraugus Creek.

  – Background samples were collected from Cattaraugus Creek at Bigelow Bridge before the point where Buttermilk Creek flows into Cattaraugus Creek. Data from this location from 1991 through 2007 have been used to establish an upstream background. Sampling was discontinued in 2008. Downstream of that point, samples are collected at Felton Bridge (WFFELBR), the first point of public access below the WVDP.

Applicable guidance levels were exceeded at two (of 11) on-site and off-site surface water monitoring locations affected by the WVDP in 2009.

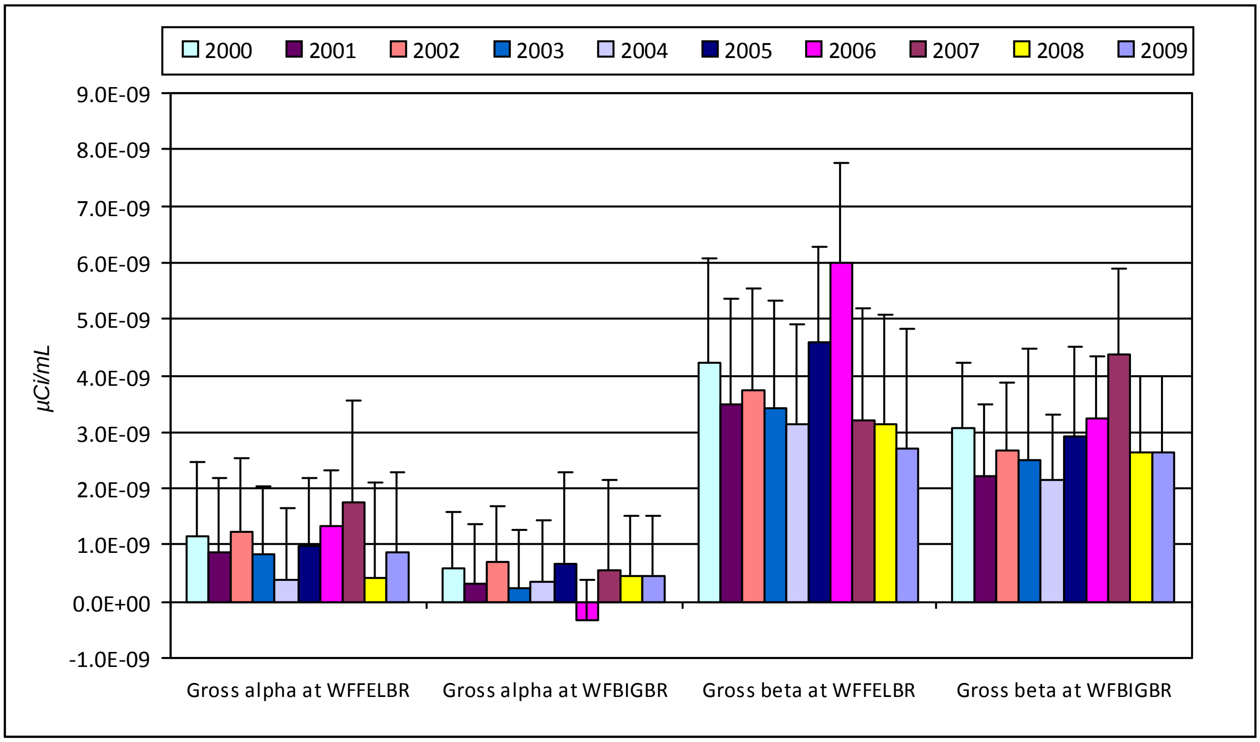
The New York State Class C and D water quality limit for total iron, 0.3 milligrams per liter (mg/L), was exceeded at location WFBCTCB, with a maximum concentration of 16.5 mg/L. However, the limit was also exceeded at background location WFBCBKG in eight of the 10 years of measurement before sampling for metals was discontinued in 2008. Background results ranged from a low of 0.16 mg/L to a high of 7.4 mg/L. These fluctuating elevated levels of iron are thought to reflect natural variability of stream conditions, not related to activities at the WVDP. The Class C water quality limit for dissolved mercury (0.0007 µg/L) was exceeded at point WFBCTCB, with a maximum concentration of 0.00113 µg/L. As seen with iron, the Class C limit for mercury was also exceeded at background location WFBCBKG, which ranged from 0.0005 to 0.0062 µg/L, reflecting natural variability.

A DOE DCG was exceeded at the northeast swamp (WNSWAMP), where the average strontium-90 concentration was 2.33E-06 µCi/mL. (The strontium-90 DCG is 1E-06 µCi/mL.)

Consistent with historical data, concentrations of radiological constituents above background values, usually gross beta and strontium-90, were noted at several on-site surface water monitoring locations. However, results from samples taken downstream at the first point of public access were statistically indistinguishable from background or, as with gross beta concentrations, only slightly higher than background, indicating little Project influence downstream.

See Figure 2-3 for a plot comparing average gross alpha and gross beta concentrations in Cattaraugus Creek at WFFELBR with those at historical background point WFBIGBR over the last 10 years. Although relative concentrations vary from year to year, in general, downstream results are only slightly higher than background. The highest average gross beta result at WFFELBR over the last 10 years (5.99E-09 µCi/mL in 2006) was only about 0.6% of the DOE DCG for stron-

FIGURE 2-3
Ten-Year Average Gross Alpha and Gross Beta Concentrations in Cattaraugus Creek Downstream of the WVDP at Felton Bridge (WFFELBR) and Upstream at Background Location Bigelow Bridge (WFBIGBR)



Note: All tritium averages were non-detects, so tritium was not included in this plot. The upper limit of the uncertainty term for the result is indicated with each point. Sampling at WFBIGBR was discontinued after 2007, so the 10-year averages for 1998–2007 were plotted for both 2008 and 2009.

tium-90 (1E-06 µCi/mL). The average result in 2009 (2.72E-09 µCi/mL) was about 0.3% of the DOE DCG.

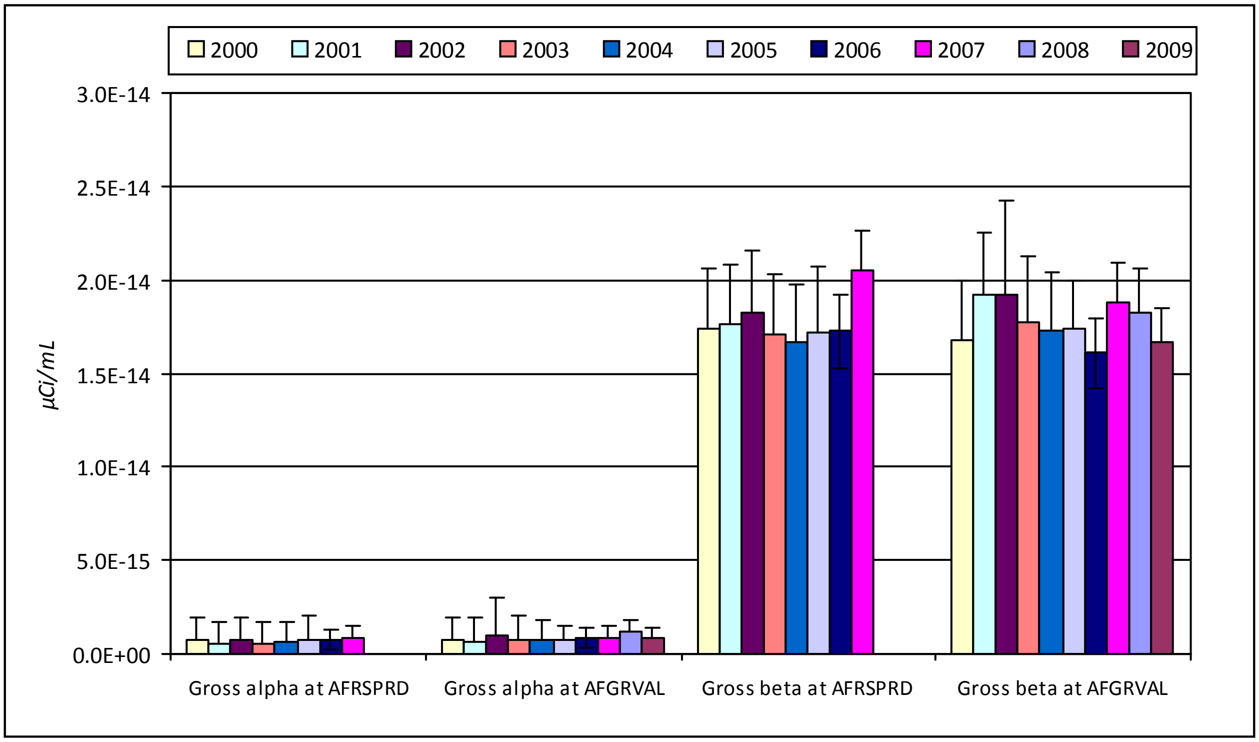
Drinking Water. Project drinking water (potable water) and utility water is drawn from two on-site surface water reservoirs. This water is sampled at select locations for both radiological and nonradiological constituents. It is monitored at the distribution entry point (WNDNKUR) and at other site tap water locations to verify compliance with EPA and New York State Department of Health (NYSDOH) regulations. Results from 2009 indicated that no radiological contaminants were found in on-site drinking water and that the Project's drinking water continued to remain below the MCLs and drinking water standards of the EPA, NYSDOH, and the Cattaraugus County Health Department. The results are presented in Appendix B-6[CD].

Ambient Air. In 2009, samples for radionuclides in air were collected at one background location at Great Valley (AFGRVAL), 18 miles (29 kilometers [km]) south of the site. (See Figure A-12.) This location is considered representative of regional air with no potential to be affected by radiological releases from the WVDP.

Until 2008, ambient air was routinely sampled at near-site locations and at locations in nearby communities. Figure 2-4 plots gross alpha and gross beta concentrations in air for a 10-year period from the nearest historical downwind sampling point (AFRSPRD) and concentrations from AFGRVAL. (No samples were collected at AFRSPRD in 2008 or 2009.) Although variability is noted from year to year, results from near-site point AFRSPRD have been statistically the same as those from the AFGRVAL background. Results from other historical near-site and community samples have also been statistically indistinguishable from background, suggesting no evidence of adverse site influence on the quality of ambient air.

Sediment and Soil. Airborne particulates may be deposited onto soil by wind or precipitation. Particulate matter in streams can adsorb radiological constituents in liquid effluents and settle on the bottom of the

FIGURE 2-4
Ten-Year Average Gross Alpha and Gross Beta Concentrations at Near-Site Ambient Air Sampler AFRSPRD as Compared with Concentrations at Background Air Sampler AFGRVAL, Located 18 Miles (29 km) from the WVDP



Note: The upper limit of the uncertainty term is plotted with each result. No samples were collected at AFRSPRD in 2008 or 2009.

stream as sediment. Soils and sediment may subsequently be eroded or resuspended, especially during periods of high winds or high stream flow. The resuspended particles may provide a pathway for radiological constituents to reach humans either directly via exposure or indirectly through the food pathway. As part of the monitoring program, on-site sediment/soil samples are collected at three locations on the north plateau where drainage has the potential to be contaminated (SNSP006, SNSWAMP, and SNSW74A on Fig. A-2). Off-site sediment samples are collected at one background location on Buttermilk Creek and at two downstream locations, one on Buttermilk and one on Cattaraugus Creek (SFBCSED, SFTCSED, and SFCCSED, respectively, on Fig. A-5). Soil samples are collected at one background and three former near-site air sampling locations (Figs. A-5 and A-12). All samples are analyzed for radiological constituents. In 2008, frequency of sampling for sediments and soils was dropped to every five years. In accordance with this schedule, no samples were collected in 2008 or 2009 and the next sampling will be done in 2012.

Food. Food samples are collected from locations near the site (Fig. A-9) and from remote locations (Fig. A-12). Milk and deer are collected annually. Other food items are collected every five years. Fish and deer are collected during periods when they would normally be taken by sportsmen. Corn, apples, and beans are collected at the time of harvest. Edible portions are analyzed for radionuclides. 2009 data are presented in Appendix E[CD].

In 2009, milk and deer were collected. Fish, apples, beans, and corn were last collected in 2007 and will next be collected in 2012. Data have consistently demonstrated that the Project has little or no effect on local food sources. Dose calculations based on results from food sources have consistently confirmed low dose estimates modeled on the basis of results from air and water monitoring. (See Chapter 3, "Dose Assessment.")

Environmental Radiation. Thermoluminescent dosimeters (TLDs) are placed on site at waste management units, at the site security fence, around the WNYNSC perimeter and the access road, and at a background location remote from the site. These dosimeters directly measure radiation in the environment.

Consistent with historical data, results from TLDs located near on-site facilities on the north plateau in 2009 were generally higher than background results, as shown in Table 2-4. These locations are well within the WNYNSC boundary and are not accessible by the public. On the south plateau, on-site TLD results remained at background levels.

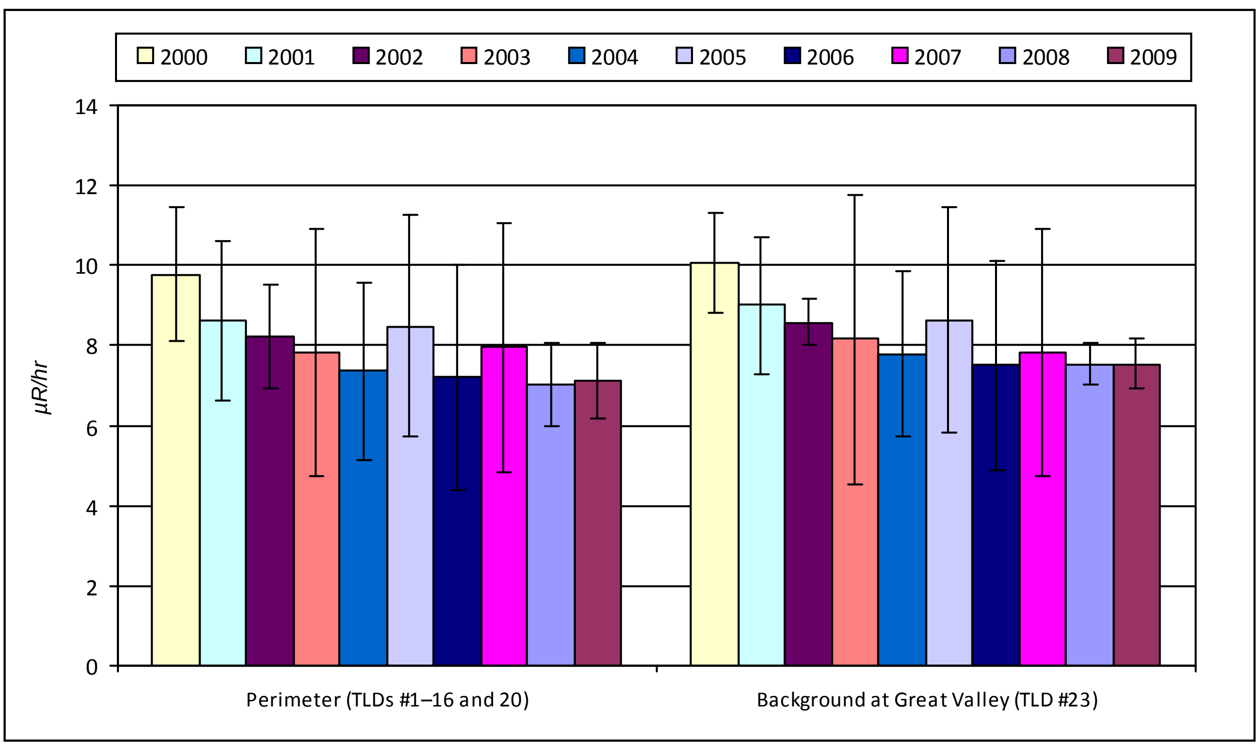
Results at perimeter locations were statistically the same as results from the background TLDs, indicating no measurable dose from Project activities at these locations. Figure 2-5 presents a graph of annual average exposure rates (in microroentgen per hour [µR/hr]) over the last 10 years at background and perimeter locations. As shown, results at perimeter locations are comparable to background. In addition, no discernible trends over time are evident. Historical measurements at community locations (discontinued in 2008) also showed no difference from background.

Meteorological Monitoring. Meteorological monitoring at the WVDP provides representative and verifiable data that characterize the local climatology. These data are used to assess potential effects of routine and nonroutine releases of airborne radioactivity and to provide input to dispersion models used to calculate dose to off-site residents. The on-site 197-ft (60-m) meteorological tower (Figure A-1) continuously monitors wind speed, wind direction, and temperature at both the 197-ft (60-m) and 33-ft (10-m) elevations. Precipitation is monitored near the Environmental Laboratory.

Barometric pressure is measured with instrumentation located in the Environmental Laboratory. The meteorological tower supplies data to the primary digital and analog data acquisition systems located within the Environmental Laboratory. The systems are provided with either uninterruptible or standby power backup in the event of site power failures. In 2009, the data recovery rate (the time valid data were logged versus the total elapsed time) was 96.1%.

Documentation, such as meteorological system calibration records, site log books, and analog strip charts, is stored in protected archives. "Wind roses"

FIGURE 2-5
Ten-Year Trends of Environmental Radiation Levels at Perimeter and Background TLDs



Note: The upper and lower limits of the uncertainty term are plotted with each result.

showing the predominant direction of the wind as measured at the meteorological tower (60-m and 10-m elevations) are shown in Figure 2-6. As shown, wind measurements at the 60-m elevation are predominantly from the west-northwest or south-southeast. Those measured at the 10-m elevation are predominantly from the northwest or the south-southeast, apparently influenced by the orientation of the topography around the site. As expected, wind speeds measured at the 10-m elevation were the lowest, while those from the 60-m elevation were the highest.

Because dispersive capabilities of the atmosphere are dependent upon wind speed, wind direction, and atmospheric stability (which includes a function of the difference in temperature between two elevations), these parameters are closely monitored and are available to the emergency response organization at the WVDP. If a release to the air occurred, meteorological data would be used to predict the direction in which the plume would move.

August Storm Event and Total Precipitation in 2009. A severe storm event began on August 8 and continued through August 10, 2009. On Sunday, August 9, 2009, the thunderstorm caused widespread power outages, disabling the meteorological system from 3:30 p.m. until 6:45 a.m. the following morning. The meteorological system recorded 0.88 inches on August 8, and 1.27 inches of rain on August 9 before losing power. It recorded 0.92 inches on August 10 after the system was restored. Therefore, no measurement data were available for the more than 15 hours that the system was off. An attempt was made to estimate the rainfall that may have occurred over this period, during which, to quote the National Weather Service, the storm produced "some of the highest short-term rainfall totals ever recorded in western New York" resulting in "one of the most significant flash flood events to hit the region in memory."

In the past, nearby community meteorological stations in West Valley and Springville have been used as sources of comparable data when on-site data were unavailable. However, these stations had also been disabled by the storm. According to the National Weather Service, a Cooperative Weather Observer in Perrysburg (between Gowanda and Silver Creek, approximately 20 miles west of the site) measured 5.98 inches of rainfall between 10:30 p.m. and midnight on August 9. Radar-derived estimates by the National Weather Service between 9:04 p.m. on August 9 and 12:04 a.m. on August 10 indicated as much as five to six inches of rain over the area (http://wwwerh.noaa.gov/buf/svrwx/web_090810_Flashflood/indexflood.html). Given the Perrysburg data and the track of the storm, an estimated 3.5 inches of rainfall has been added to the officially measured 7.88 inches of precipitation in August, for a total of 11.38 inches.

Including the estimated rainfall for the August storm event, precipitation in 2009 totaled approximately 44.9 inches (113.9 centimers [cm]), about 14.4% higher than the 10-year annual average (39.2 inches [99.5 cm]). (See Table 2-5.) If only official measurement data are considered, a total of 41.4 inches were recorded in 2009, which is about 5.5% greater than the 10-year average.

The computer program used to estimate air dose for the annual NESHAP report and this ASER requires that an estimate of total annual rainfall be included in the calculation. For dose calculations in CY 2009, a total of 113.9 cm of precipitation was used for the WVDP.

TABLE 2-5
WVDP 2009 Monthly Precipitation Totals Compared With 10-Year Monthly Averages

Month	*Monthly Total (inches)*	*Ten-Year Monthly Average (1999 through 2008)*
January	2.48	3.13
February	2.31	2.19
March	4.02	2.67
April	3.02	3.03
May	2.56	2.96
June	4.30	2.98
July	3.61	4.19
August[a]	11.38	3.58
September	1.94	3.68
October	3.17	3.24
November	2.06	3.85
December	4.00	3.68
Total (inches)	44.9	39.2
(Centimeters)	113.9	99.5

[a] Meteorological system equipment was disabled during an electrical outage August 9–10, 2009, during a severe thunderstorm. An estimated 3.5 inches of rainfall was added to the 7.88 inches measured by the meteorological system in August 2009.

As reported on the DOE website for the WVDP, with regard to flooding produced by the storm, the heavy rainfall and power outages had minimal effect on the WVDP. However, water levels at the two reservoirs that supply clean water for the site were high during and immediatley following the storm event. The reservoirs and dams are located southeast of the Project premises and are not near any waste storage or disposal area or any facilities that house radioactive materials. No unplanned or unauthorized releases of radiological contaminants associated with the WVDP occurred during or after the storm. Inspections following the storm identified erosion to the reservoirs' dams and spillway; repairs are planned. Until repairs are completed, the WVDP has increased inspection requirements.

Special Monitoring

Monitoring may be conducted outside the scope of the routine environmental monitoring program to address topics of environmental interest, or as part of investigations or characterizations. No special monitoring efforts were conducted in CY 2009.

Monitoring Program Changes

The near-site annual milk sampling location, BFMWIDR, was discontinued in 2009 when the dairy herd was sold. Annual milk sampling is now done at a new location, BFMFLDMN, also southeast of the WVDP.

Summary

As in the past, although concentrations of certain radiological and nonradiological constituents from samples collected within the security fence exceeded comparison limits or background concentrations, few results from near-site or downstream locations accessible to the public did.

Monitoring results from CY 2009 continued to demonstrate minimal or no adverse effects of the WVDP on the surrounding environment and confirmed the effectiveness of radiological control measures practiced at the WVDP.

FIGURE 2-6
Wind Frequency and Speed from the Meteorological Tower (10-m and 60-m Elevations)
January 1–December 31, 2009

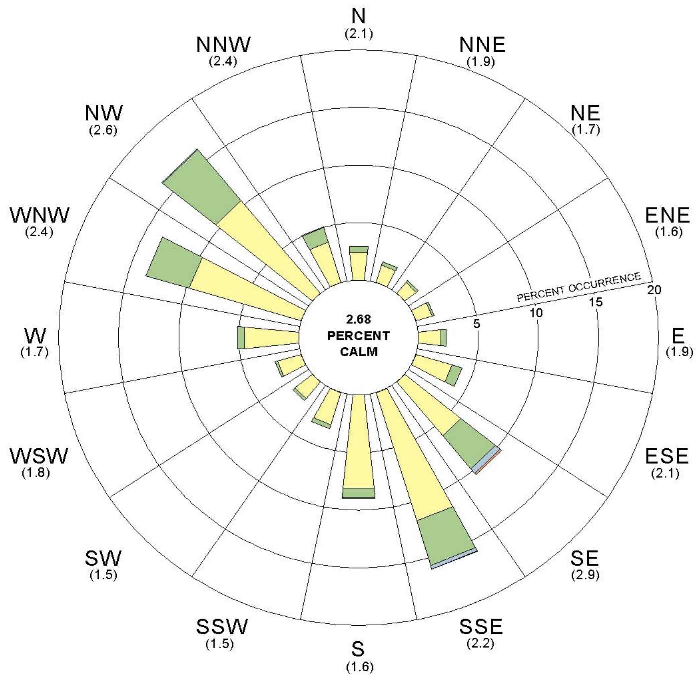
Key:

Numbers indicate sector mean wind speed.

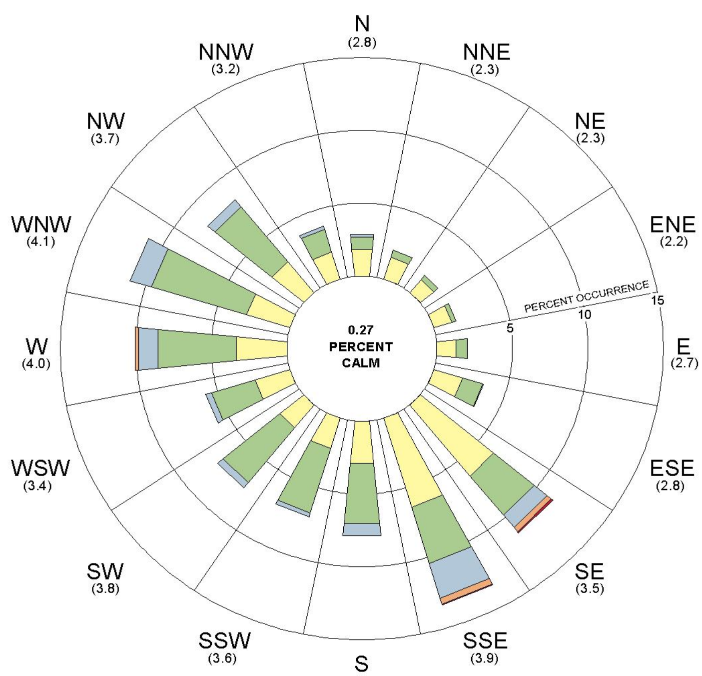
Sectors are directions from which the wind is blowing.

Wind Speed Range (m/sec)

- 0.5–3.0
- 3.0–6.0
- 6.0–9.0
- 9.0–12.0
- >12.0



Meteorological Tower (10-m)



Meteorological Tower (60-m)

DOSE ASSESSMENT

Sources of Radiation at the West Valley Demonstration Project (WVDP)

Members of the public are routinely exposed to natural and man-made sources of ionizing radiation. An individual living in the United States (U.S.) is estimated to receive an average annual effective dose equivalent (EDE) of about 620 millirem (mrem) (6.2 millisieverts [mSv]) (National Council on Radiation Protection [NCRP] and Measurements Report 160, 2009). NCRP Report No. 160, an update of NCRP Report No. 93 (1987), noted that the average member of the U.S. population was exposed to significantly more radiation from medical procedures as had been observed in earlier estimates. (See the "Useful Information" Section at the end of this report for discussions of ionizing radiation. See the inset on p. 3-3 for discussions of "Radiation Dose" and "Units of Dose Measurement.")

Half of the radiation dose to a member of the public, about 310 mrem/year, is from natural background sources of cosmic and terrestrial origin (Fig. 3-1). The other half, also about 310 mrem/year, is from man-made sources, including: diagnostic and therapeutic x-rays, tomography, and fluroscopy; nuclear medicine; consumer products such as cigarettes and smoke detectors; fallout from nuclear weapons tests; industrial, research, and educational applications; and effluents from nuclear facilities.

Radioactive materials at the WVDP are residues from the commercial reprocessing of nuclear fuel by a former site operator in the 1960s and early 1970s. Each year, very small quantities of the radioactive materials remaining at the WVDP are released to the environment. Emissions and effluents are strictly controlled so that release quantities are kept as low as reasonably achievable (ALARA).

Exposure Pathways

An exposure pathway consists of a route for contamination to be transported by an environmental medium from a source to a receptor. Table 3-1 summarizes the potential exposure pathways to the local off-site population and describes the rationale

FIGURE 3-1
Comparison of Doses From Natural and Man-Made Sources to the Dose From 2009 WVDP Effluents

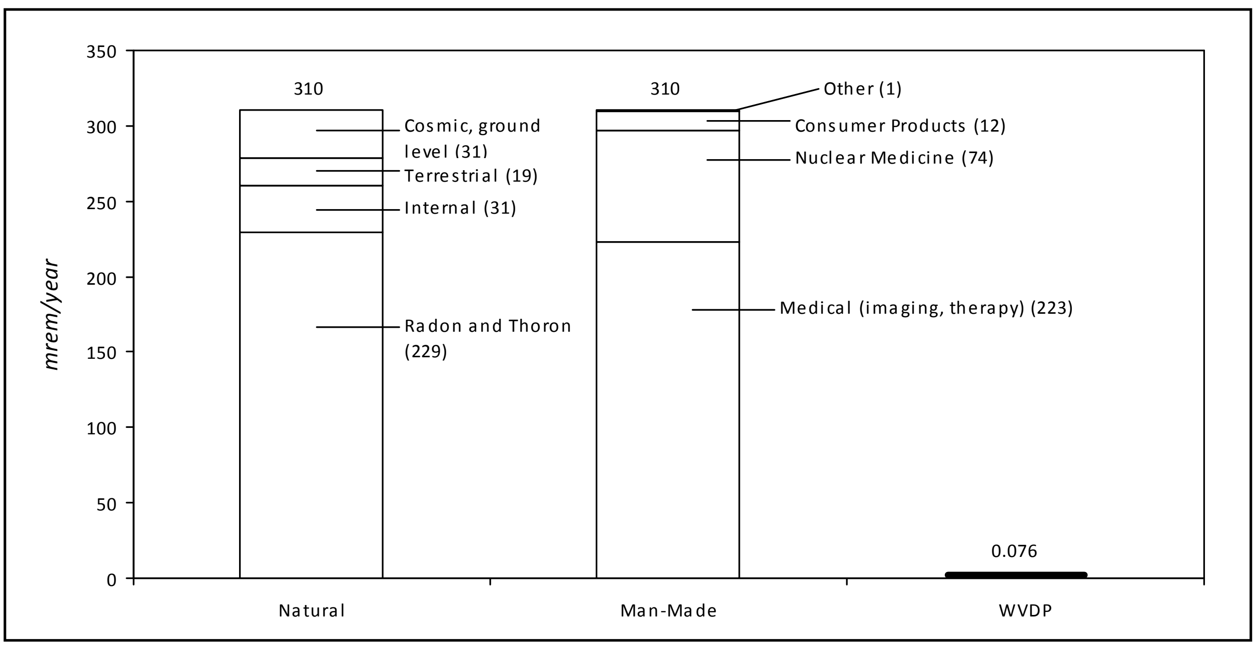


TABLE 3-1
Potential Exposure Pathways from the WVDP to the Local Off-Site Population

Exposure Pathway and Transporting Medium	*Reason for Including/Excluding*
Inhalation of gases and particulates in air (included)	Off-site transport of contaminants from stacks, vents, diffuse sources, or resuspended particulates from soil or water.
Ingestion of vegetables, cultivated crops, venison, milk, and fish (included)	Local agricultural products irrigated with potentially contaminated surface or groundwater; airborne deposition on leaves and uptake of deposited contaminants; venison and milk from animals that have inhaled or ingested contaminants; fish that have been exposed to or ingested contaminants in surface water and sediment.
Ingestion of surface and groundwater (excluded)	No documented use of local surface water or downgradient groundwater wells as drinking water by local residents.
External exposure to radiation from particulates and gases directly from air or surface water or indirectly from surface deposition (included)	Transport of air particulates and gases to off-site receptors; transport of contaminants in surface water and direct exposure when swimming, wading, boating, or fishing.

for including or excluding each pathway when calculating dose from the WVDP.

Potential exposure pathways that are considered include: inhalation of gases and particulates, ingestion of locally grown food products and game, and exposure to external penetrating radiation emitted from contaminated materials. Drinking water is not considered a pathway from the WVDP because surveys have determined that no public water supplies are drawn from downstream Cattaraugus Creek before Lake Erie or from groundwater in aquifers potentially affected by the WVDP.

Land Use Survey

Periodic surveys of local residents provide information about family size, sources of food, and gardening practices. Updated population data from the calendar year (CY) 2000 census was incorporated into WVDP analyses in 2003. Population around the WVDP by sector and distance is presented in Figure A-13. Information from the most recent land use survey, conducted in early 2002, was used to update the locations of the residences nearest to the site. In 2008, a field verification was conducted to confirm the location of the nearest residence in each sector. The Canadian population within a 50-mile (80-kilometer [km]) radius of the site (Statistics Canada, 2001) is included in dose calculations. Population information is required when using computer models for annual dose assessments. An estimated 1.68 million people live within 50 miles of the site.

Dose Assessment Methodology

Dose to the public is evaluated using a two-part method consistent with the requirements of the U.S. Department of Energy (DOE) Order 5400.5. First, measurements (and/or estimates) of radionuclide concentrations in liquid and air released from the Project are assembled from the calendar year of interest. The U.S. Environmental Protection Agency (EPA)- and DOE-approved models are then used to estimate the EDE to the maximally exposed off-site individual (MEOSI) and the collective EDE to the population within a 50-mile (80-km) radius. (See the inset on “Radiation Dose” and “Units of Dose Measurement.”)

Second, measurements of radioactivity in food from locations near the WVDP boundaries are taken to corroborate the results from the modeled dose calculations. Samples of vegetables, fruit, milk, venison, and fish from the vicinity of the WVDP are collected and analyzed for radiological constituents. (Biological sampling locations are shown on Figures A-9 and A-12.) Results are compared with similar measurements from samples collected at background locations far from the WVDP. If any near-site results are higher than background results, dose calculations are performed. These results are used as an independent confirmation of (not added to) the computer-modeled dose estimates (Table 3-2) because the models already take into account contributions from all environmental pathways.

Radiation Dose

The energy released from a radionuclide is eventually deposited in matter encountered along the path of the radiation. The radiation energy absorbed by a unit mass of material is referred to as the absorbed dose. The absorbing material can be either inanimate matter or living tissue.

Alpha particles leave a dense track of ionization as they travel through tissue and thus deliver the most dose per unit path-length. However, alpha particles are not penetrating and must be taken into the body by inhalation or ingestion to cause harm. Beta and gamma radiation can penetrate the protective dead skin layer of the body from the outside, resulting in exposure of the internal organs to radiation.

Because beta and gamma radiations deposit much less energy in tissue per unit path-length relative to alpha radiation, they produce fewer biological effects for the same absorbed dose. To allow for the different biological effects of different kinds of radiation, the absorbed dose is multiplied by a quality factor to yield a unit called the dose equivalent. A radiation dose expressed as a dose equivalent, rather than as an absorbed dose, permits the risks from different types of radiation exposure to be compared with each other (e.g., exposure to alpha radiation compared with exposure to gamma radiation). For this reason, regulatory agencies limit the dose to individuals in terms of total dose equivalent.

Units of Dose Measurement

The unit for dose equivalent in common use in the U.S. is the rem. The international unit of dose equivalent is the sievert (Sv), which is equal to 100 rem. The millirem (mrem) and millisievert (mSv), used more frequently to report the low dose equivalents encountered in environmental exposures, are equal to one-thousandth of a rem or sievert, respectively. Other radioactivity unit conversions are found in the "Useful Information" section at the back of this report.

The effective dose equivalent (EDE), also expressed in units of rem or sievert, provides a means of combining unequal organ and tissue doses into a single "effective" whole body dose that represents a comparable risk probability. The probability that a given dose will result in the induction of a fatal cancer is referred to as the risk associated with that dose. The EDE is calculated by multiplying the organ dose equivalent by the organ-weighting factors developed by the International Commission on Radiological Protection (ICRP) in Publications 26 (1977) and 30 (1979). The weighting factor is a ratio of the risk from a specific organ or tissue dose to the total risk resulting from an equal whole body dose. All organ-weighted dose equivalents are then summed to obtain the EDE.

The dose from internally deposited radionuclides calculated for a fifty-year period following intake is called the fifty-year committed effective dose equivalent (CEDE). The CEDE sums the dose to an individual over fifty years to account for the biological retention of radionuclides in the body. The total EDE for one year of exposure to radioactivity is calculated by adding the CEDE to the dose equivalent from external, penetrating radiation received during the year. Unless otherwise specified, all doses discussed here are total EDE values, which include the CEDE for internal emitters.

A collective population dose is expressed in units of person-rem or person-sievert because the individual doses are summed over the entire potentially exposed population. The average individual dose can therefore be estimated by dividing the collective dose by the population.

Measurement of Radionuclide Concentrations in Liquid and Air Releases. Because it is difficult to distinguish by direct measurement the small amount of radioactivity originating from the Project or from naturally occurring radiation in the environment, computer codes are used to model the environmental dispersion of radionuclides that originate from on-site monitored ventilation stacks and liquid discharge points.

Actual data from air and water release-monitoring samples are collected, together with annual weather measurements and the most recent demographic information for use in dose calculations. (See Appendices A, B, and C for details of the sampling program and for summaries of results in 2009.)

Dose to the Public

Each year an estimate is made of the potential radiological dose to the public that is attributable to operations and effluents from the WVDP during that calendar year. Estimates are calculated to confirm that no individual could have received a dose that exceeded the limits for protection of the public, as established by the DOE or the EPA.

Figure 3-1 shows the estimated maximum individual dose from the WVDP in CY 2009 as compared with the average annual dose a U.S. resident receives from man-made and natural background sources. As presented, estimated dose from the WVDP would have contributed a very small amount (0.076 mrem [0.00076 mSv]) of the total annual man-made radiation dose to the MEOSI. This is much less than the average dose received from consumer products and is insignificant compared with average dose from natural sources.

Estimated dose from the Project to an off-site resident is also far below the federal standard of 100 mrem allowed from any DOE site operation in a calendar year, confirming that efforts at the WVDP to minimize radiological releases are consistent with the ALARA philosophy of radiation protection.

Predicted Dose From Airborne Emissions

Airborne emissions of radionuclides are regulated by the EPA under the Clean Air Act and its implementing regulations. DOE facilities are subject to Title 40 of the Code of Federal Regulations (CFR) 61, Subpart H, National Emission Standards for Hazardous Air Pollutants (NESHAP). Subpart H contains the national emission standards for radionuclides other than radon from DOE facilities. The applicable standard is a maximum of 10 mrem (0.1 mSv) EDE to any member of the public in any year.

Releases of airborne radioactive materials in 2009 from stacks and diffuse sources on the WVDP were modeled using the EPA-approved CAP88-PC computer code (Parks, June 1997). This air dispersion code estimates EDEs for the ingestion, inhalation, air immersion, and ground surface pathways. (See "CAP88-PC Computer Code" in the "Useful Information" section.)

Site-specific data for CY 2009 (radionuclide releases in curies per year) were used as input to the CAP88-PC code, as were wind data collected from the on-site meteorological tower during 2009 and information from the most recent local population survey. The output from the CAP88-PC code was then used to determine the total EDE from air emissions to the MEOSI and the collective EDE to the population within a 50-mile (80 km) radius of the WVDP. Results are presented in Table 3-2. Although radon is specifically excluded from the NESHAP regulation, an estimate of dose from radon at the WVDP is also included in Table 3-2 for comparison purposes. (For a detailed discussion of radon in air emissions from the WVDP, see the inset on "Radon-220.")

Maximum Dose (Airborne) to an Off-Site Individual. Total curies released to the atmosphere from point sources at the WVDP are summarized in Table 3-3. Based on the nonradon airborne radioactivity released from all site sources during 2009 (i.e., permitted stacks, stacks that do not require permits, and nonpoint sources), it was estimated that a person living in the vicinity of the WVDP could have received a total EDE of 0.0013 mrem (0.000013 mSv) from airborne releases. The computer model estimated that this MEOSI, who was assumed to eat only locally produced foods, was located 1.2 mile (1.9 km) north-northwest of the site.

The dose from airborne sources is equal to about 2 minutes of natural background radiation received by an average member of the U.S. population, and is well below the 10-mrem (0.1 mSv) NESHAP limit established by the EPA and mandated by DOE Order 5400.5.

Iodine-129, a long-lived radionuclide, has routinely been found in main stack emissions. During the vitrification of high-level waste, iodine-129 releases increased because gaseous iodine was not as efficiently removed by the vitrification process off-gas treatment system as were most other radionuclides. As more high-level radioactive waste was removed from the tanks and converted into glass, less waste was available to emit iodine-129 and the total emitted decreased. In 2009, iodine-129 concentrations remained at (or below) pre-vitrification levels. Even so, in 2009, iodine-129 continued to account for the largest proportion of dose to an off-site individual from airborne point source emissions. A comparison of the proportions of dose from various nuclides is presented in Figure 3-2. As shown in this figure, about 91% of the estimated airborne dose from point sources in 2009 was from iodine-129.

Collective Population Dose (Airborne). About 1.68 million people were estimated to reside in the U.S. and Canada within 50 miles (80 km) of the WVDP. (See Figure A-13.) This population received an estimated 0.0076 person-rem (0.000076 person-Sv) total EDE from radioactive nonradon airborne emissions released from WVDP point and diffuse sources during 2009. The resulting average EDE per individual was 0.0000045 mrem (0.000000045 mSv).

Predicted Dose From Waterborne Releases

Currently there are no EPA standards establishing limits on the radiation dose to members of the public from liquid effluents, except as applied in 40 CFR Parts 141 and 143, Drinking Water Guidelines (EPA, 1984a; 1984b). Corollary limits for community water supplies are set by the New York State Department of Health (NYSDOH) in the New York State Sanitary Code (Title 10 of the Official Compilation of Codes, Rules, and Regulations of the State of New York 5-1.52). As indicated in Table 3-1, the only local private residential wells are located upgradient of the WVDP and therefore do not represent a potential source of exposure to radioactivity from Project activities. Cattaraugus Creek is not used as a drinking water supply; therefore, a comparison of estimated doses from this source with the 4-mrem/year (0.04-mSv/year) EPA and NYSDOH drink-

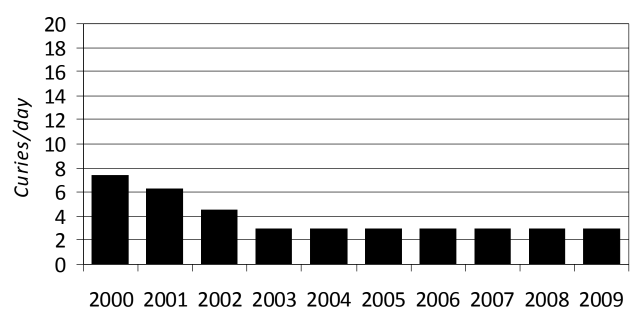
Radon-220

Radon-220, also known as thoron, is a naturally occurring gaseous decay product of thorium-232 present in the airborne emissions from the WVDP main plant. Radon-220 is also associated with the thorium reduction extraction (THOREX) process-related thorium-232 and uranium-232 in the high-level waste.

As reported in Chapter 2 of the 1996 WVDP Site Environmental Report (WVNSCO and Dames & Moore, June 1997), thoron levels were observed to increase during startup of the 1996 high-level waste vitrification process. An estimate of the thoron released during each waste concentration cycle was developed and used to determine a theoretical annual release. During the vitrification phase, an average of about 12 curies per day were assumed to have been released. In 2009, with the vitrification process completed, the average thoron release is conservatively estimated to be about three curies per day.

Although large numbers of curies were released relative to other radionuclides, the calculated dose from thoron is quite small because of its short decay half-life and other characteristics. The NESHAP rule specifically excludes thoron from air emission dose calculations, so a dose estimate using CAP88-PC was calculated separately. The theoretical dose to the MEOSI located 1.2 mi (1.9 km) north-northwest of the site in 2009 would have been 0.012 mrem (0.00012 mSv), and the collective dose to the population within a 50-mile (80-km) radius would have been 0.38 person-rem (0.0038 person-Sv). (See Table 3-2.) These theoretical doses are within the same range as historical doses from the man-made radionuclides found in WVDP effluents.

With vitrification completed, thoron releases have decreased to pre-vitrification levels. The figure presented here provides a relative indication of recent trends in the estimated annual thoron releases.



Estimated Radon-220 Releases From the WVDP

TABLE 3-2
Summary of Annual Effective Dose Equivalents to an Individual and Population From WVDP Releases in 2009

Exposure Pathways	*Annual Effective Dose Equivalent*	
	Maximally Exposed Off-Site Individual [a] *mrem (mSv)*	*Collective Effective Dose Equivalent* [b] *person-rem (person-Sv)*
Airborne Releases[c]	**1.3E-03 (1.3E-05)**	**7.6E-03 (7.6E-05)**
% EPA standard (10 mrem)	0.013%	NA
Waterborne Releases[d]	**7.4E-02 (7.4E-04)**	**3.8E-01 (3.8E-03)**
Effluents only	1.3E-02 (1.3E-04)	1.5E-02 (1.5E-04)
North plateau drainage	6.1E-02 (6.1E-04)	3.6E-01 (3.6E-03)
Total From All Pathways	**7.6E-02 (7.6E-04)**	**3.8E-01 (3.8E-03)**
% DOE standard (100 mrem) - air and water combined	0.076%	NA
% of natural background (310 mrem; 522,000 person-rem) - received from air and water combined	0.024%	0.000074%
Estimated Airborne Radon-220[e]	**1.2E-02 (1.2E-04)**[f]	**3.8E-01 (3.8E-03)**[f]

Note: Summed values may not exactly match totals due to rounding.
NA - Not applicable. Numerical regulatory standards are not set for the collective EDE to the population.

[a] The maximum exposure to air discharges is estimated to occur at a residence 1.2 miles (1.9 km) north-northwest of the main plant process building (MPPB).

[b] A population of 1.68 million is estimated to reside in the U.S. and Canada within 50 miles (80 km) of the site.

[c] Releases are from atmospheric nonradon point and diffuse sources. Calculations use CAP88-PC to estimate individual and population doses. EPA and DOE limits for individual airborne dose are the same.

[d] Estimates are calculated using the methodology described in the WVDP Manual for Radiological Assessment of Environmental Releases at the WVDP (WVES, 2010).

[e] Estimated airborne releases are based on indicator measurements and process knowledge. Dose estimates are calculated using CAP88-PC for the MPPB stack.

[f] The estimated dose from radon-220 is specifically excluded by rule from NESHAP totals.

ing water limits is not truly appropriate (although values are well below the drinking water limits). Population dose estimates are based on the presumption that radionuclides are even further diluted in Lake Erie before reaching any municipal water supplies.

Because the Project's liquid effluents eventually reach Cattaraugus Creek, the most important waterborne exposure pathway is the consumption of fish from the creek by local sportsmen and residents. Exposure to external radiation from contamination at the shoreline or in the water is also considered in the model for estimating radiation dose.

The computer codes GENII version 1.485 (Pacific Northwest Laboratory, 1988), which implements the models in the U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide 1.109 (NRC, 1977), and LADTAP II (Simpson and McGill, 1980) were used to calculate site-specific unit dose factors (UDFs) for routine waterborne releases and dispersion of these effluents. The UDFs derived from those codes are tabulated in the "WVDP Manual for Radiological Assessment of Environmental Releases at the WVDP" (WVES, 2010).

Seven batches of liquid effluents were released from lagoon 3 (point WNSP001) during 2009. Measurements of the radioactivity discharged in these effluents were combined with the UDFs to calculate the EDE to the MEOSI and the collective EDE to the population living within a 50-mile (80-km) radius of the WVDP.

In addition to measurements from WNSP001, radioactivity measurements from sewage treatment facil-

TABLE 3-3
WVDP Radiological Dose and Release Summary

WVDP Radiological Dose Reporting Table CY 2009							
Dose to the Maximally Exposed Individual		% of DOE 100-mrem Limit	Estimated Population Dose		Population Within 50 Miles[a] (2000 census)	Estimated Natural Radiation Population Dose
0.076 mrem	0.00076 (mSv)	0.076	0.38 person-rem	0.0038 (person-Sv)	1,684,000	522,000 person-rem

WVDP Radiological Atmospheric Emissions[b] CY 2009 in Curies and Becquerels (Bq)										
Tritium	Kr-85	Noble Gases ($T_{1/2}$<40 dy)	Short-Lived Fission and Activation Products ($T_{1/2}$<3 hr)	Fission and Activation Products ($T_{1/2}$>3 hr)	Total Radioiodine	Total Radiostrontium	Total Uranium[c]	Total Plutonium	Total Other Actinides	Other (Rn-220)
1.85E-03 (6.83E+07)	NA	NA	NA	1.14E-05 (4.22E+05)	2.83E-05 (1.05E+06)	1.09E-05 (4.04E+05)	1.02E-07 (3.77E+03)	3.16E-07 (1.17E+04)	4.45E-07 (1.64E+04)	1.10E+03 (4.05E+13)

WVDP Liquid Effluent Releases[d] of Radionuclide Material - CY 2009 in Curies and Becquerels (Bq)						
Tritium	Fission and Activation Products ($T_{1/2}$>3 hr)	Total Radioiodine	Total Radiostrontium	Total Uranium[e]	Total Plutonium	Total Other Actinides
4.67E-02 (1.73E+09)	6.25E-03 (2.31E+08)	9.03E-05 (3.34E+06)	4.09E-01 (1.51E+10)	6.94E-04 (2.57E+07)	9.63E-06 (3.56E+05)	1.26E-05 (4.65E+05)

Note: There are no known significant discharges of radioactive constituents from the site other than those reported in this table.

NA - Not applicable

[a] Total population includes the U.S. population from the 2000 census plus the Canadian population residing within a 50-mile (80-km) radius (Statistics Canada, 2001).

[b] Air releases are from point sources only.

[c] Total uranium (grams) = 1.01E-01

[d] Water releases are from both controlled liquid effluent releases and from well-characterized site drainages.

[e] Total uranium (grams) = 4.70E+02

FIGURE 3-2
Air Emissions From Point Sources: Dose Percent by Radionuclide in CY 2009

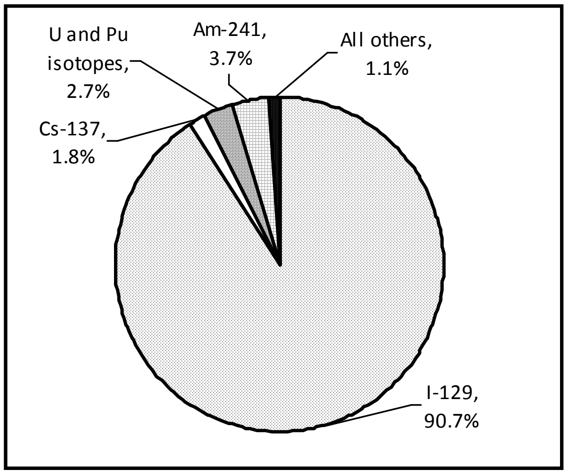


FIGURE 3-3
Water Effluents: Dose Percent by Radionuclide in CY 2009

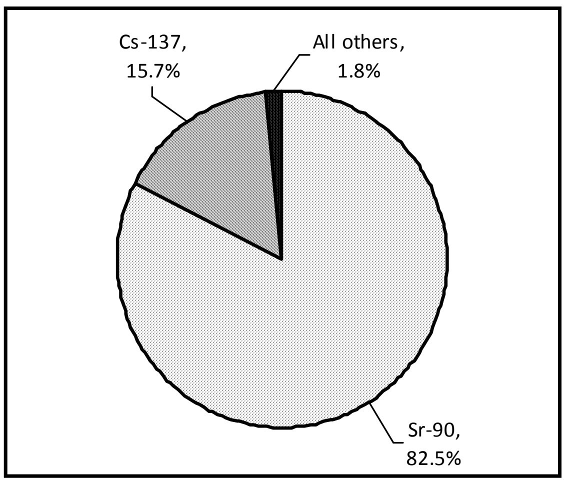
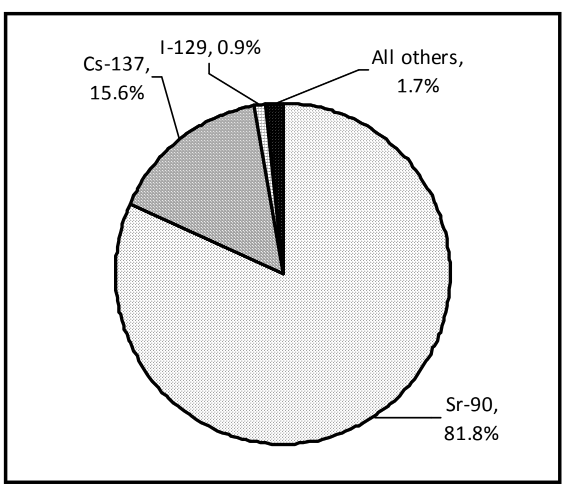


FIGURE 3-4
All Sources: Dose Percent by Radionuclide in CY 2009



ity effluents (WNSP007) were included in the EDE calculations. The french drain at WNSP008, a third release point that is listed in the State Pollutant Discharge Elimination System permit for the WVDP, has been sealed off since 2001 and was therefore not considered a source of discharge in 2009.

Besides the two controlled release points at WNSP001 and WNSP007, water from two natural drainage channels on the north plateau originating on the Project premises contain measurable concentrations of radioactivity: the northeast swamp (WNSWAMP) and north swamp (WNSW74A). Although releases from WNSWAMP and WNSW74A are not considered "controlled" releases, they are well characterized and are routinely sampled and monitored. Results from these monitoring points are included in the EDE calculations for the MEOSI and the collective population. See Figure 3-3 for a comparison of estimated doses attributable to specific waterborne radionuclides. As presented, strontium-90 and cesium-137 account for almost all of the estimated waterborne dose, at 82.5% and 15.7%, respectively.

There were no unplanned releases of waterborne radioactivity to the off-site environment in 2009.

Maximum Dose (Waterborne) to an Off-Site Individual. Based on the radioactivity in liquid effluents discharged from the WVDP (lagoon 3 and the sewage treatment plant) during 2009, an off-site individual could have received a maximum EDE of 0.013. mrem (0.00013 mSv). (See Table 3-2.) About 85% of this dose was from cesium-137. The maximum off-site individual EDE due to drainage from the north plateau was 0.061 mrem (0.00061 mSv). About 98% of the north plateau dose was attributable to strontium-90, largely from the WNSWAMP drainage point.

The combined EDE to the maximally exposed individual from liquid effluents and drainage was 0.074 mrem (0.00074 mSv). This annual dose is very small in comparison to the 310-mrem (3.10 mSv) dose that is received by an average member of the U.S. population from natural background radiation.

Collective Population Dose (Waterborne). As a result of radioactivity released in liquid effluents from the WVDP during 2009, the population living within 50 miles (80 km) of the site received an estimated collective EDE of 0.015 person-rem (0.00015 person-Sv). The collective dose to the population from the effluents plus the north plateau drainage was 0.38 person-rem (0.0038 person-Sv). The resulting average EDE per individual is 0.00022 mrem (0.0000022 mSv). This dose is an inconsequential addition to the dose that an average person receives in one year from natural background radiation.

Predicted Dose From All Pathways

The potential dose to the public from both airborne and liquid effluents released from the Project in 2009 is the sum of the individual dose contributions. (See Table 3-2 and Figure 3-4.) The calculated maximum EDE from all pathways to a nearby resident was 0.076 mrem (0.00076 mSv). This dose is 0.076% of the 100-mrem (1-mSv) annual limit in DOE Order 5400.5. As in past years, CY 2009 results continued to demonstrate WVDP compliance with applicable radiation standards for protection of the public and the environment. As presented on Figure 3-4, the largest proportion of estimated EDE to an off-site individual in 2009 was from strontium-90 via the waterborne pathway.

In CY 2009, the total collective EDE to the population within 50 miles (80 km) of the site was 0.38 person-rem (0.0038 person-Sv), with an average EDE of 0.00023 mrem (0.0000023 mSv) per individual.

Figure 3-5 shows the calculated annual dose to the hypothetical maximally exposed individual over the last 10 years. The estimated doses for 2009 were slightly higher than those in 2008. As shown by this figure, the largest portion is due to waterborne contributions.

Figure 3-6 shows the collective dose to the population over the last 10 years. The radioactivity in the human pathway represented by these data confirms the continued inconsequential addition to the natural background radiation dose that individuals and the population around the WVDP receive from Project activities.

Calculated Dose From Food. In 2009, all radionuclide concentrations in near-site food samples (deer and milk) were statistically indistinguishable from average concentrations in background samples collected over the most recent 10-year period. Because dose estimates are based on radionuclide concentrations statistically higher than background, no dose estimate from food was calculated for 2009.

Historical measurements have consistently shown that concentrations of radioactivity in near-site food samples are small, usually near the analytical detection limits and similar to background concentrations. Estimated doses in preceding years have

FIGURE 3-5
Effective Dose Equivalent From Liquid and Airborne Effluents to a Maximally Exposed Individual Residing Near the WVDP

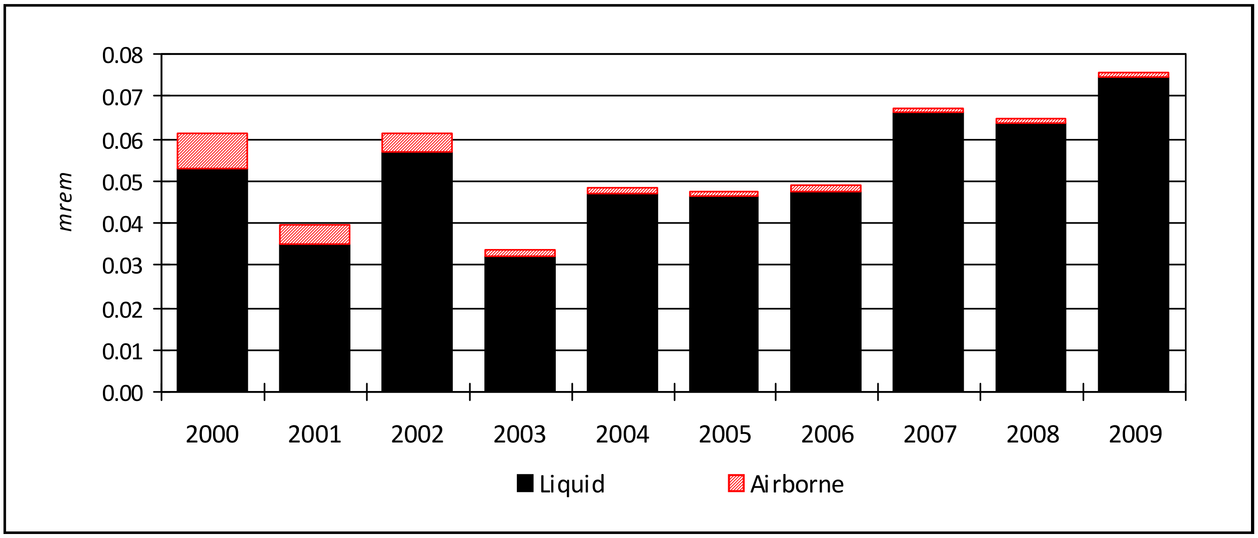
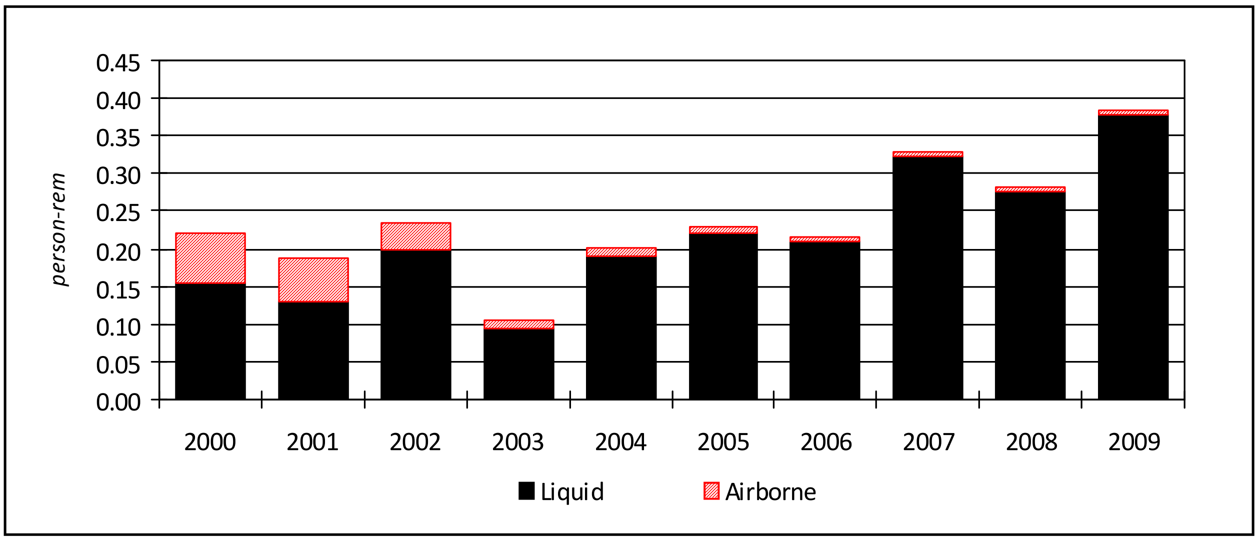


FIGURE 3-6
Collective Effective Dose Equivalent From Liquid and Airborne Effluents to the Population Residing Within 50 Miles (80 km) of the WVDP



Note: See the text box on p. 3-3 under "Units of Dose Measurement" for a discussion of mrem and person-rem.

confirmed the low modeled dose estimates based on air and water effluents (see Table 3-2 and Figure 3-5), providing additional assurance that operations at the WVDP are not adversely affecting the public.

Risk Assessment

Estimates of cancer risk from ionizing radiation have been presented by the National Council on Radiation Protection and Measurements (NCRP) (1987) and the National Research Council's Committee on Biological Effects of Ionizing Radiation (1990).

The NCRP estimates that the probability of fatal cancer occurring is between one and five per 10,000 people who are each exposed to one rem (i.e., a risk coefficient of between 0.0001 and 0.0005). DOE guidance has, in the past, recommended using a risk coefficient of 0.0005 (ICRP, 1991) to estimate risk to a MEOSI. Recent DOE guidance recommends using the even more conservative risk coefficient of 0.0006 provided by the Interagency Steering Committee on Radiation Standards (January 2003). The estimated risk to the hypothetical individual residing near the WVDP from airborne and waterborne releases in 2009 was about 5 per 100 million (a risk of 0.00000005). This risk is well below the range of 0.000001 to 0.00001 per year considered by the ICRP to be a reasonable risk for any member of the public (ICRP Report Number 26, 1977).

Release of Materials Containing Residual Radioactivity

The DOE ensures protection of the public and the environment through the implementation of the standards and requirements set forth in DOE Order 5400.5. In addition to discharges to the environment, the release of property containing residual radioactive materials is considered a potential contributor to the dose received by the public.

In 2000, the Secretary of Energy placed a moratorium on the release of volumetrically contaminated metals, and suspended the unrestricted release of metals from radiological areas of DOE facilities for recycling. The moratorium and suspension currently remain in effect.

A graded approach is utilized by the WVDP for the release of equipment and materials to the public for unrestricted use. This approach considers the use of the material, the potential for internal contamination, the location the material was used, and process knowledge of the item(s) to be released. In accordance with WVDP radiological controls manuals and procedures, these criteria are assessed and documented, and the material(s) may be radiologically surveyed to verify the survey results are within the contamination limits presented in DOE Order 5400.5, Figure IV-1. Records of released property are maintained.

Presently there are no approved criteria for releasing WVDP material to the public that may have been contaminated in depth or volume; therefore, no unrestricted release of scrap metal or other material of this type has occurred. Compliance with the Secretary of Energy's suspension of unrestricted release of scrap metal for recycle continues at the WVDP.

The Secretary does encourage efforts to promote reuse and recycling of excess property for use within the DOE complex. These transfers occur only when property is transferred to individuals authorized to use such material.

Dose to Biota

Radionuclides from both natural and man-made sources may be found in environmental media such as water, sediments, and soils. In the past, it has been assumed that if radiological controls are sufficient to protect humans, other living things are also likely to be sufficiently protected. This assumption is no longer considered adequate, because populations of plants and animals residing in or near these media or taking food or water from these media may be exposed to a greater extent than are humans. For this reason, the DOE prepared a technical standard that provides methods and guidance to be used to evaluate doses of ionizing radiation to populations of aquatic animals, riparian animals (i.e., those that live along banks of streams or rivers), terrestrial plants, and terrestrial animals.

Methods in this technical standard, "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota" (DOE-STD-1153-2002, July 2002), were used in 2009 to evaluate radiation doses to aquatic and terrestrial biota within the confines of the Western New York Nuclear Service Center (WNYNSC), which includes the WVDP. Doses were assessed for compliance with the limit in DOE Order 5400.5 for native aquatic animal organisms (1 rad/day) and for compliance with the thresholds for terrestrial plants (also 1 rad/day) and for terrestrial animals (0.1 rad/day), as proposed in DOE-STD-1153-2002. Note that the absorbed dose unit (rad) is used for biota instead of the units used for indicating human risk (rem).

RESRAD-BIOTA for Windows® (November 2009), a calculation tool provided by the DOE for implementing the technical standard, was used to compare existing radionuclide concentration data from environmental sampling with biota concentration guide (BCG) screening values and to estimate upper bounding doses to biota. Data were taken from surface water samples obtained in 2009 and sediments over the most recent five years of sediment sampling (2003–2007). Soil data from the most recent 10 years (1995–2004) for which special on-site surface soil sampling was conducted and the most recent 10 years of routine on-site surface soil sampling (1998–2007) were used. Differing time periods were used because radionuclide concentrations change more rapidly over time in surface waters than in sediments and soils, as reflected in their sampling frequencies (monthly or quarterly for water, every five years for sediment and surface soil).

Concentration data for radionuclides in each medium were entered into the RESRAD-BIOTA Code. The value for each radionuclide was automatically divided by its corresponding BCG to calculate a partial fraction for each nuclide in each medium. Partial fractions for each medium were added to produce a sum of fractions.

Exposures from the aquatic pathway may be assumed to be less than the aquatic dose limit from DOE Order 5400.5 if the sum of fractions for the water medium plus that for the sediment medium is less than 1.0. Similarly, exposures from the terrestrial pathway may be assumed to be less than the proposed dose limits for both terrestrial plants and animals if the sum of fractions for the water medium plus that for the soil medium is less than 1.0.

It was found that the isotopes with the highest sums of fractions – the radionuclides that contributed the largest component of both aquatic and terrestrial dose to biota – were strontium-90 and cesium-137. Per guidance in DOE-STD-1153-2002, the populations of organisms most sensitive to strontium-90 and cesium-137 in this evaluation – that is, those most likely to be adversely affected via the aquatic and terrestrial pathways – were determined to be populations of riparian animals (such as the raccoon [aquatic dose]) and terrestrial animals (such as the deer mouse [terrestrial dose]). Populations of both animals are found on the WNYNSC.

In accordance with the graded approach described in DOE-STD-1153-2002, a general screening was first conducted using the maximum radionuclide concentrations from surface waters, sediments, and soils. Maximum radionuclide concentrations exceeded applicable BCG limits for both aquatic and terrestrial evaluations.

As recommended in DOE-STD-1153-2002, a site-specific screening was then done using estimates of average radionuclide concentrations derived from measurements in site-wide surface waters, sediments, and soils. Results are summarized in Table 3-4.

At the site-specific screening level, the sums of fractions for the aquatic and terrestrial evaluations were 0.21 and 0.27, respectively. The sum of fractions for each assessment was less than 1.0, indicating that applicable BCGs were met for both the aquatic and terrestrial evaluations.

Upper bounding doses associated with the aquatic system evaluation were 0.0048 rad/day to an aquatic animal and 0.021 rad/day to a riparian animal, far below the 1 rad/day standard from DOE Order 5400.5 for dose to a native aquatic animal. Upper bounding doses associated with the terrestrial system evaluation were 0.027 rad/day to a terrestrial animal and 0.0025 rad/day to a terrestrial plant, again well below the guidance thresholds (0.1 and 1 rad/day, respectively).

It was therefore concluded that populations of aquatic and terrestrial biota (both plants and animals) on the WNYNSC are not being exposed to doses in excess of the existing DOE dose standard for native aquatic animals (DOE, February 1990) and the international standards for terrestrial organisms (International Atomic Energy Agency [IAEA], 1992).

Summary

Tables 3-2, 3-3, and 3-4 summarize radiological dose and release information for CY 2009.

Predictive computer modeling of airborne and waterborne releases resulted in estimated hypothetical doses to the maximally exposed individual that were orders of magnitude below all applicable EPA standards and DOE Orders that place limitations on the release of radioactive materials and dose to individual members of the public. The collective population dose was also assessed and found to be orders of magnitude below the natural background radia-

TABLE 3-4
2009 Evaluation of Dose to Aquatic and Terrestrial Biota

AQUATIC SYSTEM EVALUATION							
Nuclide	*Water BCG [a] (pCi/L)*	*Mean Water Value (pCi/L)*	*Ratio*	*Sediment BCG [a] (pCi/g)*	*Mean Sediment Value (pCi/g)*	*Ratio*	*Water and Sediment Sum of Fractions*
Cesium-137	42.7	2.41	5.65E-02	3,130	5.74	1.84E-03	0.058
Strontium-90	279	42.1	1.51E-01	583	1.22	2.09E-03	0.15
All Others	NA	NA	5.00E-04	NA	NA	5.10E-04	0.0010
Sum of Fractions			2.08E-01			4.44E-03	**0.21**
Estimated upper bounding dose to an aquatic animal = 0.0048 rad/day; to a riparian animal = 0.021 rad/day.							

TERRESTRIAL SYSTEM EVALUATION							
Nuclide	*Water BCG [a] (pCi/L)*	*Mean Water Value (pCi/L)*	*Ratio*	*Soil BCG [a] (pCi/g)*	*Mean Soil Value (pCi/g)*	*Ratio*	*Water and Soil Sum of Fractions*
Cesium-137	599,000	2.41	4.02E-06	20.8	4.64	2.23E-01	0.22
Strontium-90	54,500	42.1	7.72E-04	22.5	1.01	4.49E-02	0.046
All Others	NA	NA	1.98E-06	NA	NA	1.10E-03	0.0011
Sum of Fractions			7.78E-04			2.69E-01	**0.27**
Estimated upper bounding dose to a terrestrial plant = 0.0025 rad/day; to a terrestrial animal = 0.027 rad/day.							

NA - Not applicable

[a] The biota concentration guides (BCGs) are calculated values. Except for the sums of fractions and dose estimates, which are rounded to two significant digits, all values are expressed to three significant digits.

tion dose. Additionally, estimates indicated that populations of biota at the WVDP are exposed at a fraction of the DOE and IAEA guidelines for dose to biota.

Based on the overall dose assessment, the WVDP was found to be in compliance with applicable effluent radiological guidelines and standards during CY 2009.

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GROUNDWATER PROTECTION PROGRAM

Groundwater Monitoring Program

Groundwater monitoring at the West Valley Demonstration Project (WVDP or Project) complies with all applicable state and federal regulations and meets the requirements of United States (U.S.) Department of Energy (DOE) Order 450.1A and the Resource Conservation and Recovery Act (RCRA) §3008(h) Administrative Order on Consent (Consent Order).

Environmental Surveillance. The WVDP Environmental Management System (EMS) requires environmental monitoring to detect and evaluate changes in the environment resulting from Project (or pre-Project) activities and to assess the effect of any such changes on the public and the environment due to groundwater contamination. In addition, the WVDP must include in their EMS, as applicable, the implementation of a site-wide approach for groundwater protection. The "WVDP Groundwater Protection Management Program Plan" documents the Project's approach to the protection of groundwater from on-site activities.

The primary focus of the groundwater monitoring program (GMP), as summarized in the WVDP "Groundwater Monitoring Plan," is to identify, delineate, and monitor the groundwater migration pathways that could transport contaminants off site and to support mitigative actions and long-term monitoring. The groundwater well network at the WVDP was designed to monitor the multiple subsurface geologic units that could provide routes of migration for contaminants. For a description of these geologic units see "Geology and Hydrogeology" later in this chapter.

Regulatory Compliance: RCRA §3008(h) Consent Order. Routine monitoring of certain analytes is required at specified monitoring locations per the recommendations set forth in the RCRA Facility Investigation (RFI) reports and as required by the Consent Order.

Groundwater from the site is not used for drinking or operational purposes, nor is effluent discharged directly to groundwater. The majority of the site groundwater eventually flows to Cattaraugus Creek and then to Lake Erie. Surveys have determined that no public water supplies are drawn from Cattaraugus Creek downstream of the WVDP. Upgradient of the site, groundwater is used as a public and private drinking water supply by local residents.

Highlights of the history of groundwater monitoring on the site and the evolution of the GMP are summarized in Table 4-1.

Geology and Hydrogeology

The Western New York Nuclear Service Center is situated upon a layered sequence of glacial-age sediments that fill a steep-sided bedrock valley composed of interbedded shales and siltstones (Rickard, 1975). Erdman Brook bisects the WVDP into the north and south plateaus. The main plant process building (MPPB), waste tanks, and lagoons are located on the north plateau. The drum cell, the U.S. Nuclear Regulatory Commission (NRC)-Licensed Disposal Area (NDA), and the New York State-Licensed Disposal Area (SDA) are located on the south plateau.

The glacial sediments overlying the bedrock consist of a sequence of three glacial tills of Lavery, Kent, and possibly Olean age. The tills are separated by stratified fluvio-lacustrine deposits (silty or silty/sandy lakebed sediments). On the Project's north plateau, the Lavery till is overlain by a localized coarse-grained alluvial-fluvial deposit (sandy/silty/gravelly streambed sediments). See Figure 4-1 for cross-sectional view of the subsurface and Table 4-2 for the descriptions and the geographic distribution of these units.

The sediments above the Kent till – the Kent recessional sequence, the weathered and unweathered Lavery till, the intra-Lavery till-sand, and the alluvial sand and gravel – are generally regarded as containing all of the potential routes for contaminant migration from the Project via groundwater. The Kent till has a relatively low permeability and does not provide a pathway for contaminant movement from the WVDP; therefore, it is not discussed here.

Routine Groundwater Monitoring Program

Monitoring Well Network. The WVDP groundwater monitoring network is an essential component of the Environmental Protection Program implemented under DOE Order 450.1A. Groundwater is routinely monitored across the WVDP north and south plateaus and in the six hydrogeologic units described in Table 4-2. In calendar year (CY) 2009, groundwater samples were collected from a total of 66 on-site groundwater monitoring locations (see Figs. A-7 and A-8). The on-site locations included 60 monitoring wells and well points, five groundwater seepage points, and one trench sump. Many of the wells were installed to monitor one or more solid waste management units (SWMUs) on the WVDP in accordance with the Consent Order. Table 4-3 lists the wells in the network, the super solid waste management units (SSWMUs), the geologic units, and the analytes measured in CY 2009. Table 4-4 defines the analyte groups. (See "RCRA §3008(h) Administrative Order on Consent" in the "Environmental Compliance Summary.")

The frequency of monitoring and the constituents measured under the GMP are a function of regulatory requirements historical site activities, current operating practices, and evaluations of groundwater data.

Tables 4-5 and 4-6 provide an overview of groundwater monitoring performed during CY 2009 organized by geographic area and monitoring purpose.

Groundwater Elevation Monitoring. Water level measurements are taken at the monitoring network wells in conjunction with the quarterly analytical sampling. (See Figs. A-7 and A-8 in Appendix A.) Groundwater elevation data are used to produce maps that delineate groundwater flow directions and gradients. Long-term trend graphs are used to illustrate variations in groundwater elevations over time, such as seasonal fluctuations or changes resulting from the installation of water diversions, such as caps, trenches, or slurry walls.

Groundwater elevation mapping is particularly important in areas where knowledge of groundwater flow direction is critical for monitoring groundwater that is or may become impacted by contaminant migration. Mapping of groundwater elevations across the north plateau sand and gravel (S&G) unit aids in the analysis of the strontium-90 plume migration and direction. (See "Groundwater Sampling Observations on the South Plateau: Sand and Gravel Unit.") Surface water elevations are also measured on the north plateau where the water table in the S&G intersects the ground surface, resulting in standing water. These measurements supplement groundwater elevations measured at nearby monitoring wells to provide data in areas where groundwater discharges to surface water.

At the NDA on the south plateau, groundwater elevation mapping of the weathered Lavery till (WLT) helps evaluate the effectiveness of the slurry wall and geomembrane cover that were installed in 2008 to divert groundwater and surface water away from the burial area. (See "Groundwater Sampling Observations on the South Plateau: Weathered Lavery Till and the NDA.")

Groundwater Trigger Level Evaluation. A computerized data-screening program uses "trigger levels" – preset conservative values for chemical and radiological concentrations and groundwater elevation measurements – to promptly identify anomalies in monitoring results that may require further investigation. The trigger levels are statistically derived from historical results or are based on regulatory criteria or detection limits.

Analytical results exceeding the trigger levels may be the result of normal seasonal fluctuations, laboratory analytical problems, or changes in groundwater quality. Response actions are defined when concentrations exceed trigger levels. Each quarter, trigger level exceptions, defined as a current measurement above or below an upper or lower target, are compiled, evaluated, and summarized with recommended response actions.

Groundwater Screening Levels (GSLs). In 2009, GSLs were developed as a tool to identify the presence of chemical and radiological constituents in groundwater above levels of concern (e.g., regulatory limits, guidance limits, background). Methods used to develop the GSLs for radiological constituents, metals, and organics in groundwater are discussed in detail in Appendix D. Analytical results for 2009 are compared with applicable GSLs, discussed in the text, and summarized by hydrogeologic unit in Table 4-10.

Groundwater Sampling Observations on the North Plateau: Sand and Gravel Unit

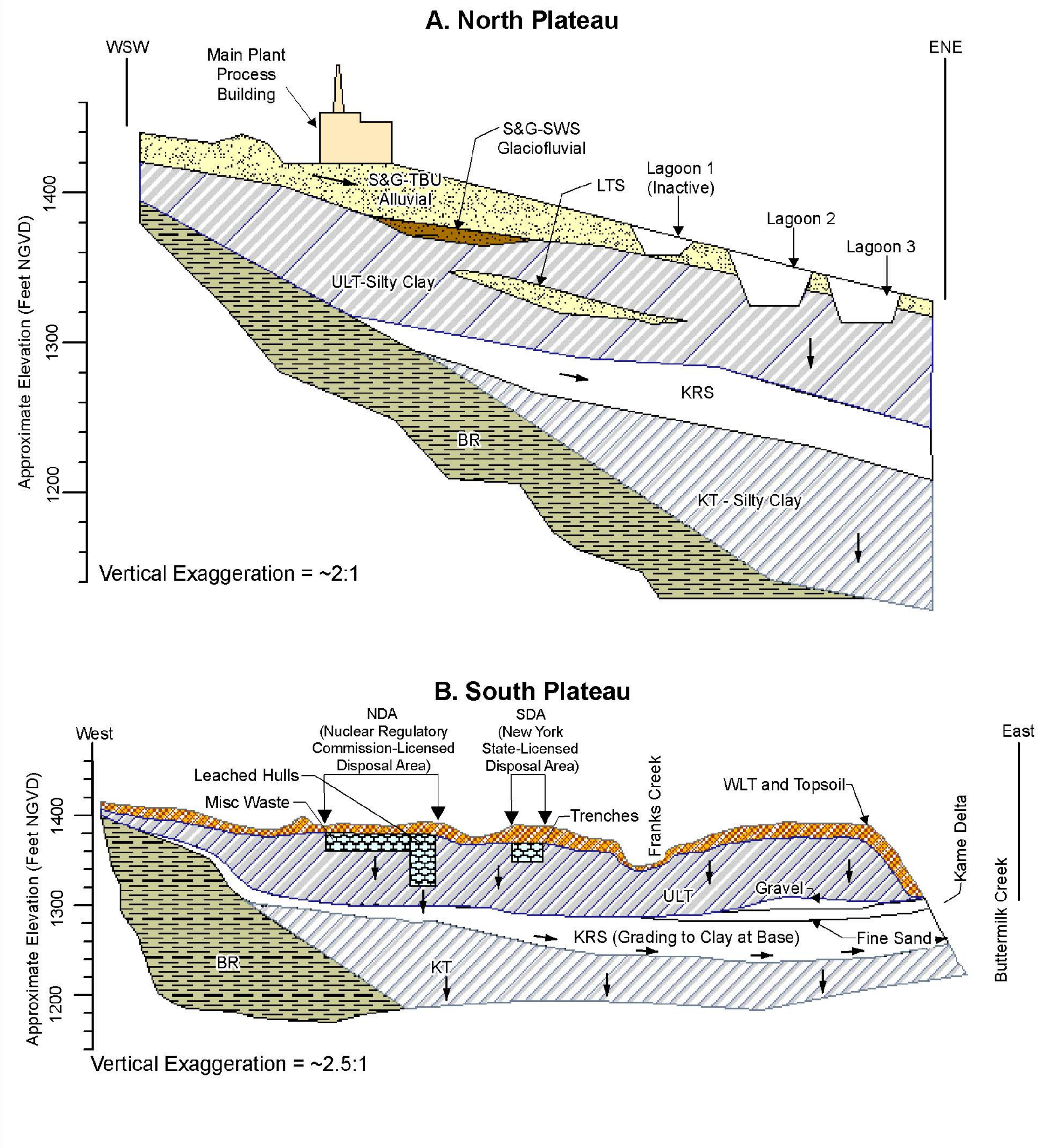
Gross Beta and the Strontium-90 Plume. On the north plateau, elevated gross beta activity is predominantly confined to the S&G unit, the shallowest hydrogeologic unit. (See the highlights for 1993 and 1994 in Table 4-1.) The routine GMP network in the S&G unit on the north plateau includes 32 monitoring wells, three well points, and five groundwater seepage locations.

TABLE 4-1
Highlights of Groundwater Monitoring History at the WVDP and the WNYNSC

Year	*Highlight*
1961–1980	From the time the Western New York Nuclear Service Center (WNYNSC) was established in 1961, to passage of the West Valley Demonstration Project (WVDP) Act in 1980, groundwater at the WVDP was periodically sampled by Nuclear Fuel Services (NFS), the New York Geological Society, and the United States Geological Survey (USGS) during construction of the main plant process building (MPPB), for spill investigations, and for post-NFS research studies.
1982	Groundwater monitoring at the WVDP began in 1982 under the Department of Energy (DOE) site subcontractor (West Valley Nuclear Services) and continued to expand through 1992.
1984	By 1984, 40 wells provided groundwater monitoring coverage near the MPPB and the U.S. Nuclear Regulatory Commission (NRC)-Licensed Disposal Area (NDA).
1986	Additional wells were installed to expand radiological and nonradiological sampling to supplement the existing groundwater monitoring network to more effectively monitor specifically identified waste management areas.
1990–1991	Ninety-six wells were installed upgradient and downgradient of the WVDP SWMUs for the DOE and RCRA monitoring programs. (The total included wells at the New York State-licensed disposal area.)
1993	Elevated gross beta activity was discovered in groundwater from the sand and gravel (S&G) unit on the north plateau. Subsequent investigation delineated a plume of strontium-90-contaminated groundwater originating near the MPPB and extended toward the northeast.
1993–1994	A RCRA Facility Investigation (RFI) expanded characterization program was conducted to assess potential releases of hazardous constituents from on-site SWMUs. Results from the RFI influenced decisionmaking for the groundwater monitoring program (GMP).
1994	A Geoprobe® investigation of groundwater and soil beneath and downgradient of the MPPB was performed to characterize the elevated gross beta activity in the S&G unit. The presumed source was found to be near the southwest corner of the MPPB. The primary isotopes responsible for the beta activity were strontium-90 and its daughter product yttrium-90.
1995	The GMP was evaluated and the number of sampling locations reduced. Analytical constituents were tailored to each sampling point for a more focused and cost-effective program. The north plateau groundwater recovery system (NPGRS) was installed near the leading edge of the main lobe of the strontium-90 plume to minimize migration. The NPGRS consisted of three extraction wells that recovered groundwater for treatment by ion exchange.
1996	Several groundwater seeps on the northeast edge of the north plateau were added to the monitoring program, and sample collection at the French drain outfall northeast of Lagoon 3 was discontinued.
1997	A Geoprobe® soil and groundwater sampling program was conducted to delineate the leading edge of the strontium-90 plume.
1998	In response to recommendations from a 1997 external review of WVDP actions regarding the north plateau, another Geoprobe® soil and groundwater sampling program was carried out to further characterize the core area of the plume. The new radiological data were compared to the 1994 data.
1999	A pilot-scale permeable treatment wall (PTW) was installed in the eastern lobe of the plume to test this passive in-situ remediation technology. Well points were installed near the PTW.
2000–2001	Additional wells and well points were installed across the leading edge of the strontium-90 plume to better monitor the plume's movement and assess the effectiveness of the pilot PTW.
2003	After construction of the remote-handled waste facility, four new wells were installed to monitor groundwater upgradient and downgradient of the new facility.
2005	Number of analytes or sampling frequencies were reduced at 14 groundwater monitoring locations.
2007	The GMP was again evaluated, considering current site conditions, activities, and environmental exposure pathways. The analytes and sampling frequencies at 20 monitoring points were reduced and sampling at four wells was discontinued. Off-site drinking water sampling was also discontinued after an evaluation of historical data had confirmed that site operations had no impact on off-site upgradient groundwater.
2008	On the south plateau, two replacement wells were installed near the NDA during installation of a slurry wall and geomembrane cover at the NDA. On the north plateau, three subsurface investigations were performed upgradient, within, and downgradient of the strontium-90 plume.
2010	Thirty-nine soil borings were drilled to delineate the depth of a proposed approximately 800-foot-long PTW that will be installed along the leading edges of the strontium-90 plume in 2010.

FIGURE 4-1
Geologic Cross Sections of the North and South Plateaus at the WVDP

J:/GIS/ArcMap/ASER/ASER_2009/ASER_2009_Fig4-1_20100520.mxd FJC/skw



Legend

S&G-TBU	Sand and Gravel - Thick-Bedded Unit	KT	Kent Till
S&G-SWS	Sand and Gravel - Slackwater Sequence	BR	Shale Bedrock
LTS	Lavery Till Sand	⟶	Conceptual Groundwater Flow Direction
WLT	Weathered Lavery Till	ENE	East-Northeast
ULT	Unweathered Lavery Till	WSW	West-Southwest
KRS	Kent Recessional Sequence	*(NGVD - National Geodetic Vertical Datum)*	

TABLE 4-2
Summary of Hydrogeology at the WVDP

Geologic Unit	*Description*	*Groundwater Flow Characteristics*	*Hydraulic Conductivity* [a]	*Location*
Sand and Gravel; Thick-Bedded Unit (S&G-TBU)	Silty sand and gravel layer composed of younger Holocene alluvial deposits	Flow is generally northeast across the plateau toward Franks Creek, with groundwater near the northwestern and southeastern margins flowing radially outward toward Quarry Creek and Erdman Brook.	9.0 feet (ft)/day) (3.2E-03 centimeters [cm]/second [sec])	North plateau
Sand and Gravel; Slackwater Sequence (S&G-SWS)	Interbedded silty sand and gravel layers composed of Pleistocene-age glaciofluvial deposits partially separated from the sand and gravel thick-bedded unit by a discontinuous silty clay interval	Flow is to the northeast along gravel layers toward Franks Creek.	21 ft/day (7.4E-03 cm/sec)	Underlies a portion of the north plateau
Weathered Lavery Till (WLT)	Upper zone of the Lavery till which has been exposed at the ground surface; weathered and fractured to a depth of 3–16 ft (0.9–4.9 meters[m]); brown in color due to oxidation; contains numerous desiccation cracks and root tubes	Flow has both horizontal and vertical components allowing groundwater to move laterally across the south plateau before moving downward into the unweathered lavery till or discharging to nearby incised stream channels.	0.07 ft/day (2.4E-05 cm/sec); the highest conductivities are associated with dense fracture zones found within the upper 7 ft (2 m) of the unit	South plateau
Unweathered Lavery Till (ULT)	Olive gray silty clay with intermittent lenses of silt and sand; ranges up to 130 ft (40 m) in thickness	Flow is vertically downward at a relatively slow rate; unit is considered an aquitard.	0.002 ft/day (7.8E-07 cm/sec)	Underlies both the north and south plateaus
Lavery Till Sand (LTS)	Thin, sandy unit of limited areal extent and variable thickness within the Lavery till.	Flow is to the east-southeast toward Erdman Brook.	0.2 ft/day (8.6E-05 cm/sec)	Primarily beneath the southeastern portion of the north plateau
Kent Recessional Sequence (KRS)	Interbedded clay and silty clay layers locally overlain by coarser-grained sands and gravels; pinches out near the east side of Rock Springs Road	Flow is to the northeast; recharge from the overlying till and from bedrock to the southwest; discharges into Buttermilk Creek.	0.012 ft/day (4.3E-06 cm/sec)	Underlies most of the Project, except areas adjacent to Rock Springs Road

Note: Hydrologic conditions of the site are more fully described in “Environmental Information Document, Volume III: Hydrology, Part 4” (West Valley Nuclear Services Co. [WVNSCO], March 1996) and in the “RCRA Facility Investigation Report (RFI) Vol. 1: Introduction and General Site Overview” (WVNSCO and Dames & Moore, July 1997).

[a] Hydraulic conductivities represent an average of testing results from 1991 through 2009.

TABLE 4-3
WVDP Groundwater Monitoring Network Sorted by Geologic Unit

Well ID	SSWMU	Gradient Position	Analytical Parameters (See Table 4-3)	Well ID	SSWMU	Gradient Position	Analytical Parameters (See Table 4-4)
Sand and Gravel Wells							
103[a]	1, 3	D	I, RI, V	801[a]	8, 6	U, D	I, RI, S, V
104	1	C	I, RI	802	8	D	I, RI, V
105	1	C	I, RI	803[a]	8	D	I, RI, SV, V
106	1	D	I, RI	804[a]	8	D	I, RI, V
111[a]	1	D	I, RI, M, SV, V	1302[b]	NA	U	I, RI, M,
116[a]	1, 8	C, U	I, RI, V	1304[b]	NA	D	I, RI, M, R
205	2, 3	D	I, RI	8603	8	U	I, RI
301[a]	3	B	I, RI	8604	1	C	I, RI
302	3	U	I, RI	8605[a]	1, 2	D	I, RI, M, SV, V
401[a]	4, 3	B	I, RI, R	8607[a]	6, 4	U, D	I, RI, V
402	4	B	I, RI	8609[a]	3, 4, 6	D, D, U	I, RI, S, V
403	4	U	I, RI	8612[a]	8	D	I, RI, SV, V
406[a]	4, 6	D, U	I, RI, R, V	WP-A[c]	NA	NA	I, RI
408[a]	4, 3	D	I, RI, R, V	WP-C[c]	NA	NA	I, RI
501[a]	5	U	I, RI, S, V	WP-H[c]	NA	NA	I, RI
502[a]	5	D	I, RI, S, SM, V	SP04[d]	NA	D	RI
602A	6	D	I, RI	SP06[d]	NA	D	RI
604	6	D	I, RI	SP11[d]	NA	D	RI
605	6	D	I, RI	SP12[a,d]	NA	D	I, RI, V
706[a]	7	B	I, RI, M	GSEEP[a,d]	NA	D	I, RI, V
Lavery Till Sand Wells							
204[a]	2, 3	D	I, RI	206	2	C	I, RI
Weathered Lavery Till Wells							
906[a]	9	D	I, RI	NDATR[a]	9	D	I, RI, M, R, SV, V
908[a]	9	D	I, RI[e]	1005[a]	9, 10	C, U	I, RI
908R[a]	9	B	I, RI	1006[a]	9, 10	C, D	I, RI
909[a]	9	D	I, RI, M, R, SV, V	1008C[a]	9, 10	U	I, RI
Unweathered Lavery Till Wells							
107	1	D	I, RI	704	7	D	I, RI
108	1	D	I, RI	707	7	C	I, RI
110[a]	1	D	I, RI, V	910R[a]	9	D	I, RI
405	4	B	I, RI, M	1301[b]	NA	U	I, RI
409	4	D	I, RI	1303[b]	NA	D	I, RI, M
Kent Recessional Sequence Wells							
901[a]	4	B	I, RI	1008B	10	U	I, RI
902[a]	9	U	I, RI	8610[a]	9	D	I, RI
903[a]	9	D	I, RI	8611[a]	9	D	I, RI

Gradient Positions: B (background); C (crossgradient); D (downgradient); U (upgradient)

[a] Monitoring for certain parameters is required by the RCRA §3008(h) Consent Order.
[b] Monitor upgradient and downgradient of the remote-handled waste facility.
[c] Monitor north and east of the main plant process building.
[d] Monitor groundwater eminating from seeps along the edge of the north plateau.
[e] Monitoring of analytical parameters was discontinued after September 2009.

TABLE 4-4
WVDP Groundwater Sampling and Analysis Agenda

Analyte Group	*Description of Parameters*
Contamination Indicator Parameters (I)	pH, specific conductance (field measurements)
Radiological Indicator Parameters (RI)	Gross alpha, gross beta, tritium
Volatile Organic Compounds (V)	Title 6 of the New York State Official Compilation of Codes, Rules, and Regulations (6 NYCRR) Part 373-2 Appendix 33 Volatile Organic Compounds (VOCs)
Semivolatile Organic Compounds (SV)	6 NYCRR Part 373-2 Appendix 33 Semivolatile Organic Compounds (SVOCs) and tributyl phosphate (TBP)
Groundwater metals (M)	6 NYCRR Part 373-2 Appendix 33 Metals
Special Monitoring Parameters for early warning wells (SM)	Aluminum, iron, manganese
Radioisotopic Analyses: alpha-, beta-, and gamma-emitters (R)	Carbon-14, strontium-90, technetium-99, iodine-129, cesium-137, radium-226, radium-228, uranium-232, uranium-233/234, uranium-235/236, uranium-238, total uranium.
Strontium-90 (S)	Strontium-90

TABLE 4-5
WVDP 2009 Groundwater Monitoring Overview by Geographic Area

Number of…	*Total WVDP*	*North Plateau*	*South Plateau*
Monitoring Points Sampled - Analytical	66	51	15
Monitoring Points - Water Elevations Only	73	35	38
Monitoring Events	4	4	4
Analyses	928	740	188
Results	5,768	4,332	1,436
Percent of Nondetectable Results	80%	78%	85%
Water Elevation Measurements	692	312	380

TABLE 4-6
WVDP 2009 Groundwater Monitoring Overview by Purpose

Number of…	*Total*	*Regulatory/ Waste Management*	*Environmental Surveillance*
Monitoring Points Sampled - Analytical	66	34	32
Monitoring Points - Water Elevations Only	73	0	73
Monitoring Events	4	4	4
Analyses	928	609	319
Results	5,768	4,900	868
Percent of Nondetectable Results	–	85%	52%
Water Elevation Measurements	692	412	280

At the WVDP, DOE derived concentration guides (DCGs) are sometimes used as a reference for evaluating liquid radionuclide effluents. Because there is no DCG for gross beta in liquid effluents, the strontium-90 DCG (1E-06 microcuries per milliliter [µCi/mL]) is used as a conservative basis for comparison where beta-emitting radionuclides are detected in groundwater. The strontium-90 DCG is the most restrictive for beta emitters at the WVDP. For the purpose of the following discussions, the strontium-90 DCG is used interchangeably for comparison with either gross beta or strontium-90. (See the "Useful Information" section at the end of this report for a discussion of the DOE DCGs, and Table UI-4 for a list of the DCGs for radionuclides of interest at the WVDP.)

Figure 4-2 shows the outline of the plume, as defined by the strontium-90 DCG (1E-06 µCi/mL), at three time intervals spanning 16 years – 1994, 2002, and 2009. As shown on Figure 4-2, although the western boundary of the plume has remained relatively constant since 1994, over time the plume has migrated to the northeast and east, consistent with the direction of groundwater flow in the S&G unit. The leading edge is now characterized as having three small lobes (western, central, and eastern). The lobes are a result of the heterogeneous nature of sediment within the S&G unit (i.e., the uneven distribution of coarse and fine sediments) which creates preferential pathways for groundwater migration.

Historical monitoring has established that strontium-90 is the predominant radioisotope contributing to the gross beta activity measured in the north plateau groundwater plume; therefore, monitoring wells are routinely sampled for gross beta concentrations, supported by periodic collection of samples at select wells for strontium-90 analysis. Gross beta concentration trends over the last 10 years at monitoring wells located within the plume are shown on Figures 4-3 through 4-5. These data are plotted on a log scale; therefore, an increase from one gridline to the next represents a 10-fold increase in concentration. The log scale was used so that data from background locations (with concentrations in the 1E-09 µCi/mL range) and data from the central plume (with concentrations in the 1E-04 µCi/mL range, 100,000 times higher than background) could be plotted on the same graphs.

Figure 4-3 illustrates the gross beta concentrations of wells within the central portion of the plume, where the highest concentrations were found. The location of the wells, their positions within the strontium-90 plume, and the gross beta concentrations in December 2009 are shown on Figure 4-2. The highest gross beta concentrations (i.e., greater than 1E-04 µCi/mL) were found in wells 408, 501, and 502, immediately downgradient of the MPPB. Well 408, located closest to the MPPB, contained the highest gross beta concentrations of any routinely monitored GMP well (see Table 4-7). The 2009 gross beta concentrations in these wells were consistent with those reported in 2008.

The strontium-90 plume is widening somewhat on its eastern side but has remained unchanged on the western side. The gross beta concentrations in well 104, near the plume's eastern edge, are less than those in well 502, in the center of the plume. Gross beta concentrations remained stable at well 8609, near the western edge of the plume, about two orders of magnitude lower than the concentrations directly downgradient of the MPPB. Well 8609 is located cross-gradient to the predominant flowpath of the plume.

The leading edge of the plume has bypassed the downgradient GMP wells (801, 8603, and 105). The leading edge of the plume was delineated in March 2009 after a plume characterization program, during which more than 70 geoprobe locations were sampled. Figure 4-4 illustrates gross beta concentrations in the GMP wells located downgradient of the MPPB, where the plume begins to split into three lobes. Gross beta concentrations at wells 105, 8603, and 8604 were consistent with concentrations measured in 2008, slightly lower than the concentrations nearer to the MPPB. Well 801, located in the western lobe of the plume's leading edge, exhibited gross beta concentrations near 1E-05 µCi/mL. Concentrations at wells 106 and 116 have increased over the last 10 years, illustrating the migration of the plume's leading edge.

Monitoring Near Former Lagoon 1. South of the plume, elevated gross beta concentrations have also been observed in groundwater downgradient of former lagoon 1, which was backfilled in 1984. (See Figure 4-2.) Gross beta concentrations in wells 8605 and 111 are consistently above the strontium-90 DCG and are remaining stable from year to year, as shown in the 10-year trend graph on Figure 4-5. The source of the gross beta activity is assumed to be radiologically contaminated material in the backfill and remaining sediment of former lagoon 1.

Monitoring at the Northeast Swamp Drainage. The western and central lobes of the plume are partially intercepted by a drainage ditch flowing west-to-east across the plume's leading edge (see Figure 4-2 and

FIGURE 4-2
North Plateau Gross Beta Plume: 1994, 2002, and 2009

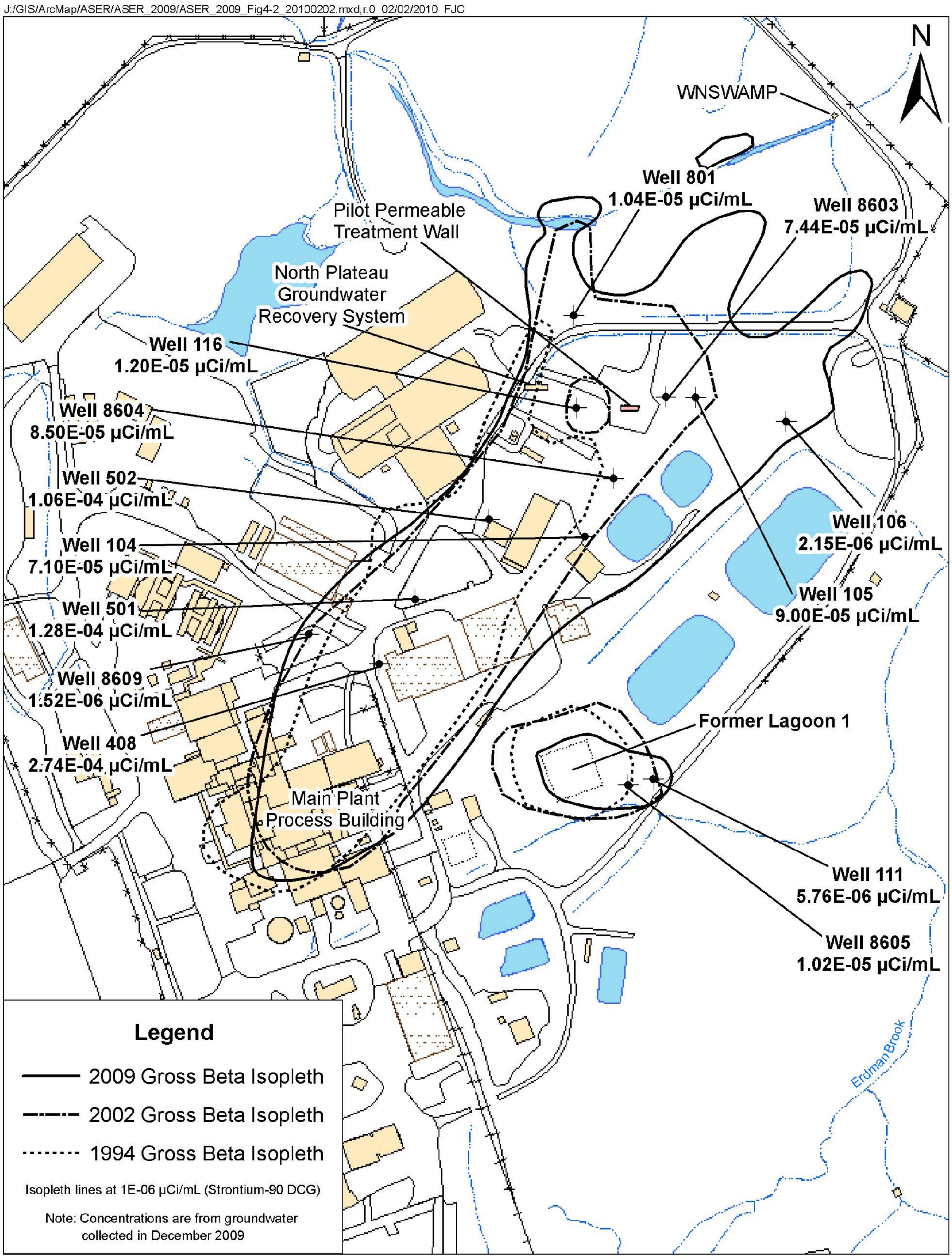


TABLE 4-7
Maximum Concentrations of Radiological Constituents in WVDP Wells During 2009[a]

Radionuclide	Regulatory/Waste Management		Environmental Surveillance	
	Well ID	Maximun Concentration (µCi/mL)	Well ID	Maximun Concentration (µCi/mL)
Gross Beta	Well 408	3.42E-04	Well 105	9.30E-05
Strontium-90	Well 408	1.87E-04	Well 1304	NA
Tritium	WNNDATR	1.82E-06	WP-C	3.45E-05

[a] Includes samples from routinely monitored wells collected from January 2009 to the end of December 2009.
NA - Strontium-90 is no longer analyzed for at the environmental surveillance groundwater wells.

Figure A-2 in Appendix A). Flow rate in this ditch is measured biweekly and surface water is sampled for radiological constituents at the WNSWAMP sampling location. As shown in the 10-year trend plot on Figure 4-6, annual average strontium-90 concentrations in the drainage ditch have been above the strontium-90 DCG for nine of the last 10 years. Although gross beta and strontium-90 concentrations at WNSWAMP vary with season, the average annual strontium-90 concentration measured in samples from the ditch decreased in 2009, the second consecutive annual decrease from the historical highest concentration that was measured in 2007. However, the decrease in the average annual concentration for 2009, when coupled with historical high flow volume at WNSWAMP, resulted in a historical high total curie discharge, accounting for an annual estimated dose of 6.1E-02 millirem. See "Maximum Dose (Waterborne) to an Off-Site Individual" in Chapter 3.

The main source of the strontium-90 activity is believed to be groundwater from the north plateau plume seeping into the ditch upstream of WNSWAMP. An estimated 39.7 million gallons (gal) (150 million liters [L]) of water flowed through this monitoring point in 2009. (For additional discussion of monitoring results at WNSWAMP, see "Effluent Monitoring" in Chapter 2 and "Predicted Dose From Waterborne Releases" in Chapter 3.)

Monitoring of surface water downstream of the WVDP at the first point of public access, Felton Bridge on Cattaraugus Creek (location WFFELBR), continued to show that strontium-90 concentrations in 2009 were indistinguishable from historical concentrations from the Cattaraugus Creek background location at Bigelow Bridge (WFBIGBR).

Monitoring at North Plateau Seeps. Groundwater is also monitored along the northeast edge of the north plateau, where it seeps from the steep banks of the stream channels incised by Erdman Brook and Franks Creek. (See Figs. A-2 and A-7 in Appendix A.) Ten-year trends of gross beta concentrations at five seep monitoring points are shown on Figure 4-7. Annual averages on Figure 4-7 were plotted against surface water backgrounds because water from seepage points may include surface water, and measured concentrations are often lower than groundwater background values.

For the last 10 years, gross beta concentrations at seepage points SP12, SP06, and GSEEP have remained stable, with values near to (or slightly above) background concentrations. However, concentrations at point SP11, downstream of surface water sampling point WNSWAMP, have been steadily increasing since 1999. In 2007, concentrations at point SP04 also began increasing, and by 2009 had exceeded the concentrations at SP11. Maximum concentrations at the two seepage points in 2009 were 1.43E-07 µCi/mL (SP11) and 2.7E-07 µCi/mL (SP04). Elevated concentrations at SP11 are thought to be largely attributable to re-infiltration of plume water surfacing upgradient of WNSWAMP and SP11. Elevated gross beta concentrations at SP04 are believed to be from groundwater discharging to the surface from the S&G unit.

North Plateau Groundwater Recovery System (NPGRS). In 1995, the NPGRS was installed to minimize the advance of the strontium-90 plume. (See Fig. 4-2.) The NPGRS consists of three wells that extract contaminated groundwater, which is then treated by ion exchange to remove strontium-90. Treated water is transferred to the lagoon system and is ultimately discharged to Erdman Brook via the New York State Pollutant Discharge Elimination System (SPDES)-permitted outfall 001.

TABLE 4-8
2009 Maximum Concentrations (µCi/mL) of Radionuclides[a] in Groundwater at the WVDP Compared With WVDP Groundwater Screening Levels

Well	*Tc-99*	*I-129*	*Ra-226*	*Ra-228*	*U-233/234*	*U-238*
GSL[b]	*5.02E-09*	*9.61E-10*	*1.33E-09*	*2.16E-09*	*6.24E-10*	*4.97E-10*
Sand and Gravel						
401[c]	--	--	6.19±3.03E-10	--	1.17±0.92E-10	1.29±0.92E-10
406	--	5.00±4.28E-10	3.38±2.22E-10	--	--	7.58±6.06E-11
408	**1.84±0.26E-08**	--	4.04±2.57E-10	1.01±0.41E-09	5.53±2.18E-10	4.55±1.97E-10
1304	--	--	2.48±1.94E-10	--	1.76±0.99E-10	--
Weathered Lavery Till						
909	--	**9.50±1.86E-09**	6.20±3.25E-10	9.86±6.51E-10	4.52±1.61E-10	3.60±1.42E-10
NDATR	**7.94±1.77E-09**	**2.16±0.26E-08**	3.81±2.03E-10	8.91±4.50E-10	**1.98±0.39E-09**	**1.38±0.33E-09**

Note: Bolding indicates that the radionuclide exceeds the GSL.
[a] Results for tritium and strontium-90, discussed earlier, are not included in this summary. Routine monitoring locations with no positive detections of radionuclides are not listed; the dash (--) indicates that the radionuclide was not positively identified at this location.
[b] GSLs for radiological constituents are set equal to the larger of the background concentrations or NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Class GA groundwater quality standards (see Table D-1A).
[c] Background well

The NPGRS operated throughout 2009, processing about 3.6 million gal (14 million L) of water. The system has extracted and processed approximately 56.5 million gal (214 million L) since November 1995.

North Plateau Groundwater Quality Early Warning Monitoring. Early-warning monitoring of groundwater directly upgradient of the NPGRS is performed because the monitoring results can be used to identify metals concentrations in groundwater that may affect compliance with the SPDES-permitted effluent limits. Metals results from well 502 in CY 2009 were below concentrations likely to affect SPDES permit compliance.

Pilot-Scale PTW. A pilot-scale permeable treatment wall (PTW) was constructed in 1999 within the eastern lobe of the strontium-90 plume to test this passive, in-situ remediation technology. The pilot PTW is a 7-foot by 30-foot by 25-foot-deep trench that was backfilled with clinoptilolite, a medium selected for its ability to adsorb strontium-90 ions from groundwater. Strontium-90 concentrations are lower in groundwater from wells within the PTW, indicating that strontium-90 is being removed from the water that passes through the wall. However, recent strontium-90 concentrations increased in three of the wells within the PTW to levels that suggest reduction in treatment capacity in that area.

The limited size of the pilot PTW and complex local geology affect the performance of the pilot wall, and the wall itself may be affecting the pattern of natural groundwater flow in a localized portion of the eastern lobe of the plume. In the 11 years since the pilot PTW was installed, the plume has continued to migrate past the pilot PTW, as it was not designed to treat the entire plume. Nevertheless, the data collected during the wall's operation have shown that the PTW technology is an effective remediation method for strontium-90-contaminated groundwater, and has helped in making the decision to implement this technology as a full-scale strontium-90 plume remediation strategy.

Strontium-90 Plume Activities in 2009

Near-Term and Long-Term Plume Management Activities. Preparation for installation of a full-scale PTW along the leading edge of the plume began in 2009. This PTW is being designed to reduce downgradient migration of the plume in the near-term. Alternatives for long-term management of the plume are being developed by the DOE. The proposed long-term strategies include excavation of subsurface soils in the source area under the MPPB.

The 2008 Geoprobe® investigation characterized soils and groundwater in the downgradient area of the strontium-90 plume to obtain data for use in designing the full-scale PTW. The field work included sampling of soils and groundwater and installing temporary microwells along the leading edge of the strontium-90 plume. During 2010, an additional 39 soil borings were completed along the approximately 800-foot alignment of the PTW to define the thickness of the S&G subunits and the depth to the unweathered Lavery till (ULT). The PTW will be installed through the S&G unit and keyed into the low-permeability ULT. Preliminary boring results indicated that depth to the ULT varied from 11 to more than 25 feet. Installation is scheduled for the fall of 2010.

Metals Sampling at Select Wells Within the North Plateau Plume. In 2005, 2007, and 2008, select groundwater wells were sampled to evaluate metals concentrations within the strontium-90 plume area associated with sources from the MPPB. In 2008, a Geoprobe® investigation was performed to collect additional soil and groundwater data to further evaluate metals contamination. Using newly established groundwater background metals concentrations and the TOGS 1.1.1 class GA groundwater standards, a set of site-specific GSLs were established. (Refer to Appendix D for a description of the methodology by which GSLs were established.)

During 2009, select wells were sampled for metals according to the GMP. Data are presented in Appendix D. These results were also compared with the established WVDP GSLs. Nickel and chromium were detected at concentrations above the GSLs in wells 706, 502, and 405, which are constructed of stainless steel. Elevated concentrations were attributed to corrosion of the well screens. (For additional detail, refer to "Investigation of Chromium and Nickel in the S&G Unit and Evaluation of Corrosion in Groundwater Monitoring Wells" in previous ASERs.)

Groundwater from well 1303, downgradient of the remote-handled waste facility, contained arsenic at 33 µg/L (compared with the GSL of 25 µg/L), chromium at 55 µg/L (compared with the GSL of 52.3 µg/L), and vanadium at 72 µg/L (compared with the GSL of 69.6 µg/L). These values are consistent with historical concentrations from this location.

Installation of standard-construction replacement wells for well points WP20D and WP20S was accomplished in early CY 2010, and two new wells were installed further downgradient of the MPPB, south of the fuel receiving and storage (FRS) building. The newly constructed wells will supplement downgradient surveillance and provide more-representative analytical results for groundwater in that area.

Tritium. On the north plateau, elevated tritium concentrations have historically been observed near the lag storage area, the lag storage hardstand, and adjacent to and downgradient of the lagoon system. Tritium concentrations sitewide have been consistently decreasing. Residual tritium activity is attributed to former operations as part of nuclear fuel reprocessing. No new source of tritium is suspected. As shown in Table 4-7, the maximum tritium concentration measured in groundwater from the north plateau in 2009, 3.45E-05 µCi/mL, was at well point WP-C, downgradient of the MPPB (see Figure A-7). This concentration was two orders of magnitude below the DOE DCG for tritium of 2.0E-03 µCi/mL.

Tritium concentrations in groundwater at the WVDP have been steadily decreasing, because tritium has a relatively short half-life, about 12.3 years. Dilu-

TABLE 4-9
Summary of Maximum Concentrations of Organic Constituents in Select WVDP Groundwater Wells in 2009

Constituent	*Regulatory/Waste Management Monitoring Program*		*New York State Groundwater Effluent Limitations [a] Class GA (µg/L)*
	Well with the Highest Concentration	*Maximum Concentration (µg/L)*	
1,2-Dichloroethylene (total)	8612	19	5.0
1,1-Dichloroethane	8612	5.9	5.0
Tributyl phosphate	8605	196	NA

NA - Not applicable.
[a] Source: 6 NYCRR Part 703, Division of Water TOGS 1.1.1, NYS Groundwater Effluent Limitations (Class GA).

TABLE 4-10
Groundwater Monitoring Wells, Well Points, Seeps, and the NDA Trench With 2009 Concentrations Exceeding Groundwater Screening Levels

Geologic Unit	*Total # of Sampling Locations*	*# of Locations with Results Greater Than GSLs*	*Locations with Results Greater than GSLs [a] (Constituent)*	*# of Locations with Results Greater Than Background*	*Locations with Results Statistically Greater than Background (Constituent)*
North Plateau					
Sand and Gravel Unit	40	21	**SP04** (H-3) **GSEEP** (H-3) **104** (Gross beta, H-3) **105** (Gross beta, H-3) **106** (Gross beta, H-3) **111** (Gross beta) **116** (Gross beta) **408** (Gross beta, Sr-90) **501** (Gross beta, Sr-90) **502** (Gross beta, Sr-90, chromium, nickel) **602A** (H-3) **706** (Chromium, nickel) **801** (Gross beta, Sr-90) **8603** (Gross beta, H-3) **8604** (Gross beta, H-3) **8605** (Gross beta, tributyl phosphate) **8609** (Gross beta, H-3, Sr-90) **8612** (H-3, 1,2-Dichloroethylene total, 1,1-Dichloroethane) **WP-A** (H-3) **WP-C** (H-3) **WP-H** (Gross beta, H-3)	29	**SP04** (Gross beta, H-3) **GSEEP** (Gross beta, H-3) **SP11** (Gross beta) **SP12** (Gross beta) **103** (Gross beta) **104** (Gross beta, H-3) **105** (Gross beta, H-3) **106** (Gross beta, H-3) **111** (Gross alpha, gross beta) **116** (Gross beta) **408** (Gross alpha, gross beta, Sr-90) **501** (Gross beta, Sr-90) **502** (Gross beta, Sr-90, barium, chromium, copper, nickel) **602A** (Gross beta, H-3) **605** (Gross beta) **706** (Chromium, nickel) **801** (Gross beta, Sr-90) **802** (Gross beta) **803** (Gross beta) **804** (Gross beta) **8603** (Gross beta, H-3) **8604** (Gross beta, H-3) **8605** (Gross beta, tributyl phosphate) **8607** (Gross beta) **8609** (Gross beta, H-3, Sr-90) **8612** (H-3, 1,2-Dichloroethylene [total], 1,1-Dichloroethane) **WP-A** (H-3) **WP-C** (Gross beta, H-3) **WP-H** (Gross beta, H-3)
Lavery Till	2	0	None	0	None
Unweathered Lavery Till	9	3	**110** (H-3) **405** (Chromium, nickel) **1303** (Arsenic, chromium, vanadium)	4	**107** (Gross beta) **110** (H-3) **405** (Chromium, nickel) **1303** (Arsenic, barium, beryllium, chromium, nickel, vanadium, zinc)

[a] The site-specific groundwater screening levels (GSLs) for radiological constituents were set to equal the larger of the WVDP background concentrations or NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards as discussed on page D-1 and presented in Table D-1A. The GSLs for metals were set to equal the larger of the background concentration or NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards as presented in Table D-1B. Organic constituents were compared directly with NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards.

TABLE 4-10 *(concluded)*
Groundwater Monitoring Wells, Well Points, Seeps, and the NDA Trench with 2009 Concentrations Exceeding Groundwater Screening Levels

Geologic Unit	*Total # of Sampling Locations*	*# of Locations with Results Greater Than GSLs*	*Locations with Results Greater than GSLs [a] (Constituent)*	*# of Locations with Results Greater Than Background*	*Locations with Results Statistically Greater than Background (Constituent)*
South Plateau					
Weathered Lavery Till	8	2	**NDATR** (Gross beta, H-3, Sr-90, Tc-99, I-129, U-233/234) **909** (H-3, Sr-90, I-129)	4	**NDATR** (Gross beta, H-3, Sr-90, Tc-99, I-129, Cs-137, Ra-226, U-233/234) **908** (Gross alpha, gross beta) **909** (Gross beta, H-3, Sr-90, I-129) **1006** (Gross alpha)
Unweathered Lavery Till	1	1	**910R** (Gross alpha)	1	**910R** (Gross alpha)
Kent Recessional	6	0	None	0	None

[a] The site-specific groundwater screening levels (GSLs) for radiological constituents were set to equal the larger of the WVDP background concentrations or NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards as discussed on page D-1 and presented in Table D-1A. The GSLs for metals were set to equal the larger of the background concentration or NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards as presented in Table D-1B. Organic constituents were compared directly with NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards.

tion from surface water infiltration and groundwater recharge is also contributing to the decrease, as is evaporation. Current tritium concentrations in groundwater from most monitoring locations on the north plateau are close to or within the range of background values. Monitoring locations where tritium exceeded GSLs and background concentrations are listed in Table 4-10.

Radioisotopic Sampling Results. In addition to being analyzed for gross alpha, gross beta, tritium, and strontium-90, samples from four groundwater wells in the S&G unit in the north plateau (401, 406, 408, and 1304) were analyzed for specific radionuclides (see Table 4-3); carbon-14, technetium-99, iodine-129, cesium-137, radium-226, radium-228, uranium-232, uranium-233/234, uranium-235/236, and uranium-238. (Note that radium-226, radium-228, uranium-234, and uranium-238 occur naturally in the environment.)

The maximum concentration of each radionuclide at each location measured to date is presented in Table 4-8. Well 401 serves as a background well. No carbon-14, cesium-137, uranium-232, or uranium-235/236 were detected in 2009, so these radionuclides are not included in Table 4-8.

At well 408, concentrations of technetium-99, the only radionuclide in Table 4-8 currently exceeding the GSL in the S&G unit, have decreased over the last 10 years. Although other radionuclides are measurable within groundwater samples collected from the S&G unit, their concentrations were very close to detection limits. Comparisons of all north plateau wells with GSLs and background values are summarized in Table 4-10.

Results for Volatile and Semivolatile Organic Compounds (VOCs and SVOCs). In accordance with the Consent Order, select wells within the S&G unit are monitored for VOCs and SVOCs because concentrations exceeding TOGS 1.1.1, Groundwater Effluent Limitations (Class GA), were found during the RFI. Currently, the only S&G monitoring location with consistent positive detections of VOCs is well 8612, located northeast and downgradient of the closed construction and demolition debris landfill (CDDL) at the northeast edge of the north plateau. (See Table 4-9 and Figure A-7 in Appendix A.) Figure 4-8 illustrates the concentration ranges of four detected VOCs at well 8612. Only two VOCs continue to be detected slightly above the TOGS 1.1.1 class GA groundwater effluent limitations; however, their concentrations are steadily decreasing and currently are not significantly above detection limits. The VOCs in well 8612 are presumed to be from wastes buried in the CDDL.

Downgradient of former lagoon 1, in 2009 the SVOC tributyl phosphate (TBP), which has been detected in this area since routine monitoring began, was again detected in groundwater from well 8605. However, the concentration was significantly lower than the historic high of 700 micrograms per liter (µg/L) in December 1996. TBP has also been detected in well 111, near well 8605, but at concentrations close to the quantitation limit of 10 µg/L. (See Fig. 4-9.) TBP in this area is believed to be from residual contamination from liquid waste management activities in the former lagoon 1 area during nuclear fuel reprocessing. No TOGS 1.1.1 screening criterion has been established for TBP.

A summary of maximum concentrations of organic compounds detected in WVDP groundwater wells for TBP and the VOCs that exceeded TOGS 1.1.1 criteria in 2009 is provided in Table 4-9.

Groundwater Sampling Observations on the South Plateau: Weathered Lavery Till and the NDA

Interim Measures (IM). In 1990, a trench system was constructed through the WLT along the northeast and northwest sides of the NDA to intercept and collect groundwater that was potentially contaminated with a mixture of radioactive n-dodecane and TBP. Sampling location NDATR is a sump at the lowest point of the interceptor trench. Groundwater is collected at NDATR and is transferred to the low-level waste treatment facility for processing. (See also "Interim Measures [IM]" under "NRC NDA Cap" in the Environmental Compliance Summary and "NDA Interceptor Trench and Pretreatment System" in Chapter 1.) Monitoring results in 2009 detected no TBP in groundwater from the NDA interceptor trench. Groundwater elevations are monitored quarterly in and around the trench to ensure that an inward gradient is maintained, thereby minimizing outward migration of contaminated groundwater.

A second IM to improve the integrity of the earthen cap and to limit infiltration of groundwater, surface water, and precipitation into the NDA was completed in December 2008. This included the installation of a geosynthetic cap over the NDA, a low-permeability subsurface groundwater cutoff wall (slurry wall) upgradient of the NDA, and surface water drainage diversions. In addition, 21 piezometers were installed to monitor groundwater elevation differences both upgradient and downgradient of the slurry wall. Early indications from 2009 water level data suggest that water levels in wells located in areas covered by the geomembrane have started to decline. Water levels in piezometers along the upgradient side of the slurry wall have increased slightly in some areas due to groundwater mounding but generally continue to follow seasonal trends. The volume pumped from the NDA trench in 2009 was much lower than that pumped in previous years. The total volume (79,000 gallons) was only 15% of the previous three-year average (535,000 gallons). (See Fig. 4-11.) The reduction in volume extracted from the NDA since the cap and barrier wall were installed is a strong indication that the IM is effectively reducing flow through the NDA.

Refer to Environmental Compliance Summary "Interim Measures" under "RCRA §3008(h) Order on Consent" for further discussion of the NDA IM.

NDA Monitoring. Gross beta and tritium concentrations in groundwater from NDATR and from WLT well 909, downgradient of NDATR (Fig. A-8 in Appendix A), continued to be elevated with respect to concentrations in background monitoring locations on the south plateau. Residual activity from historical site operations in the NDA is the presumed source of this gross beta activity. Similar to the north plateau, strontium-90 is the predominant contributing radioisotope to the measured gross beta concentrations. Gross beta concentrations at NDATR have increased with time, with even steeper increases observed from 2005 through the middle of 2009. The most recent increases are believed to be attributable to less dilution of trench contents because groundwater and surface water infiltration into the NDA has been reduced. Recent gross beta concentrations at well 909 are not increasing.

Tritium concentrations at NDATR continued to decrease, but remained the highest of any WVDP regulatory/waste management groundwater monitoring location on the site (1.82E-06 µCi/mL [2009 maximum]) (see Table 4-7). However the maximum tritium concentration remained well below the DOE DCG for tritium, 2.0E-03 µCi/mL.

Samples for the analysis of radionuclides are collected routinely from NDATR and well 909. During 2009, positive detections of iodine-129, radium-226, radium-228, uranium-233/234, and uranium-238 were reported at both monitoring locations, and technetium-99 was also detected at NDATR. The concentration of iodine-129 increased during 2009, as did the technetium-99 concentration. As previously noted, however, only technetium-99, iodine-129, uranium-233/234, and uranium-238 exceeded the GSLs. As with gross beta, increases are thought to be because of less dilution. Comparisons of all south plateau monitoring points with GSLs and background values are summarized in Table 4-10.

Radionuclide concentrations in groundwater downgradient of the NDA are presumed to be associated with former waste burial operations.

Summary

Evaluation of groundwater results from 2009, as discussed in the previous sections and summarized in Table 4-10, continued to show that the most widespread area of groundwater contamination at the WVDP is the strontium-90 plume in the sand and gravel unit on the north plateau. Other localized areas of contamination have been observed downgradient of the former lagoon 1, also on the north plateau, and downgradient of the NDA on the south plateau. Near-term measures to reduce water moving through the NDA included the installation of a slurry wall and geomembrane cover in 2008. The primary near-term activity to reduce migration of the strontium-90 plume on the north plateau is the planned installation of a permeable treatment wall across the leading edge of the plume in 2010. Note that Phase 1 of the Final Environmental Impact Statement preferred alternative selected by the DOE in the Record of Decision (April 2010), as discussed in the "Environmental Compliance Summary," includes removing the MPPB, removing the lagoons, and remediating the source of the north plateau plume.

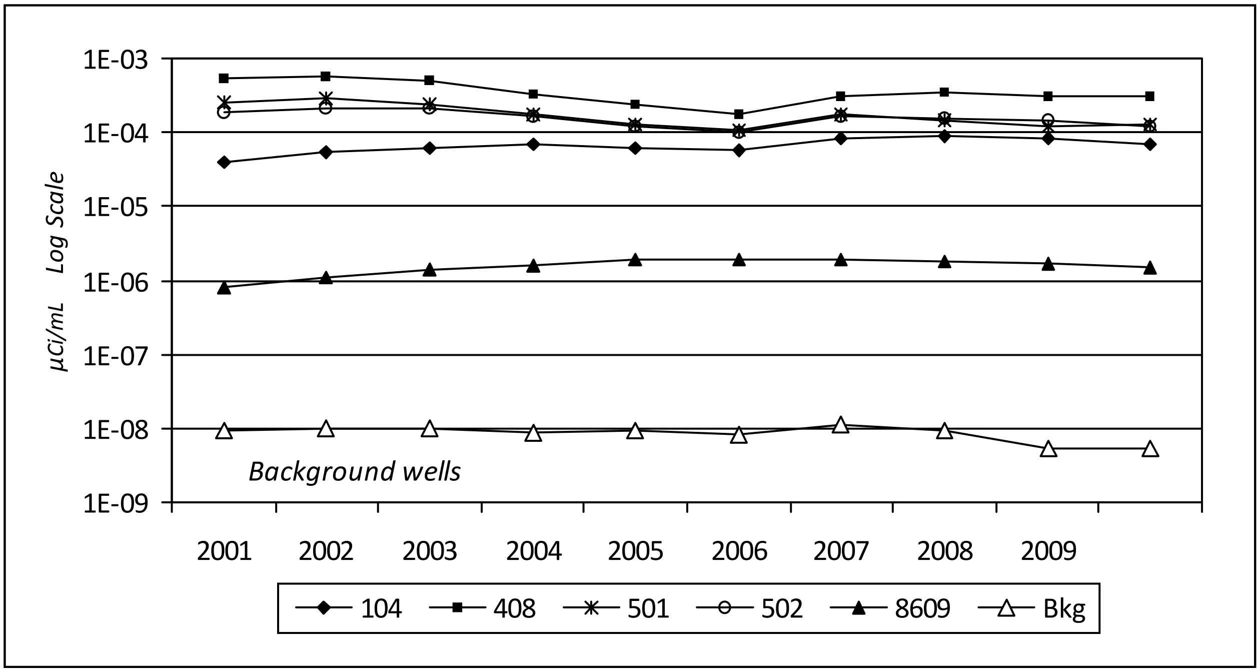
Additional Monitoring and Investigations

Groundwater Monitoring Downgradient of the Waste Tank Farm (WTF). The high-level radioactive waste in the underground tanks has been solidified through the vitrification process and the tanks containing residual waste remain in place. In 2005, DOE evaluated the current and historical groundwater conditions in the vicinity of the WTF. Throughout waste processing activities, groundwater controls were in place to (1) reduce the upward hydrostatic pressure on the tanks, and (2) to maintain an inward hydraulic gradient toward the tanks, thereby inhibiting any leaks from the tanks. The natural inward hydraulic gradient is influenced by periodically pumping a dewatering well (DWW), located outside the vault, that controls the hydrostatic pressure near the tanks.

Radioactivity in groundwater near the WTF is routinely monitored and evaluated. Elevated gross beta concentrations from well 8607 have been observed since 1994, with the maximum concentration measured in 2005. Gross beta activity has also been observed in the DWW and the tank 8D-2 pan. Radionuclide samples from these locations were collected in 2007 to determine the source(s) of the gross beta activity. After evaluating the radiological results, it was concluded that the gross beta activity in well 8607 was most likely attributed to residual contamination from historical events in and around the WTF (i.e., minor leaks from condensate lines or the WTF underdrain) and was not believed to have originated from the tanks themselves. Monitoring of specific radionuclides at these sampling points was discontinued in favor of continued gross beta monitoring, because gross beta results provide an adequate indicator of radioactivity concentrations. During 2009, gross beta concentrations at well 8607 continued to decrease from the 2005 maximum.

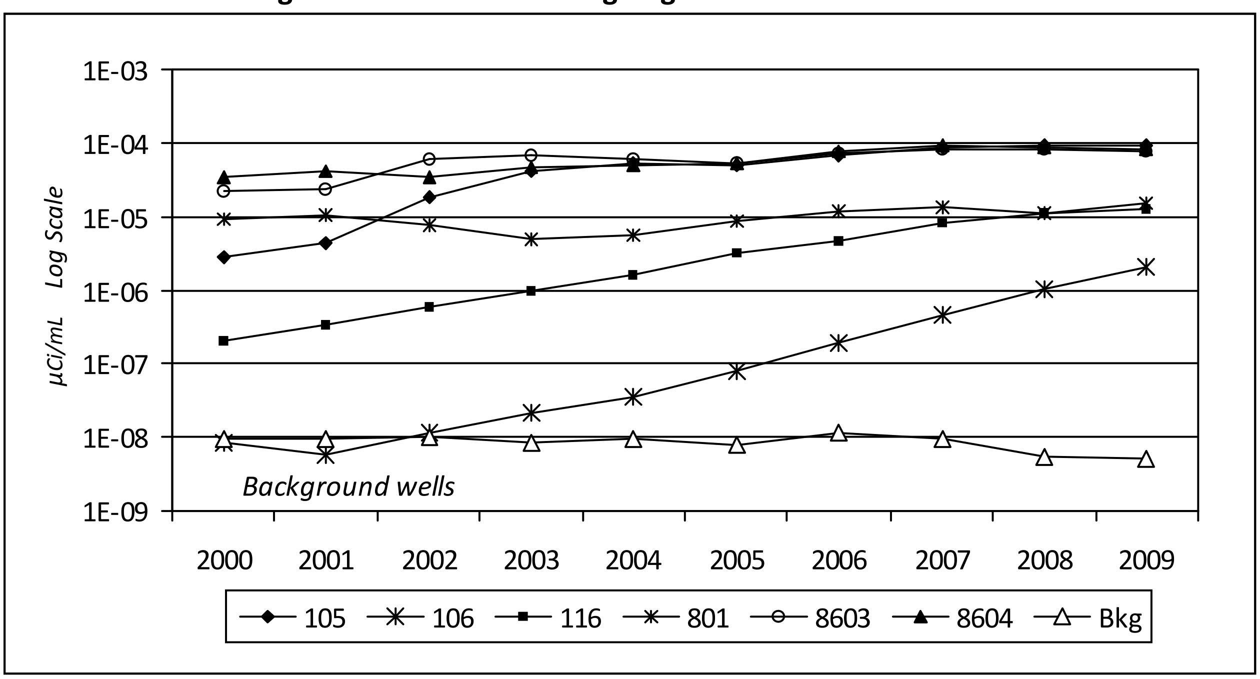
FRS Pool Water Infiltration. During mid-2005, water was found trickling into the empty FRS pool during a quarterly inspection. The water had accumulated to approximately four to six inches. The water is directed by a slope in the floor to a deeper stainless-steel-lined cask unloading pool (CUP). Analytical data for the FRS CUP water indicated that groundwater seepage was the source of the water. During periods of high precipitation or snow melt, slight seepage entered along the south wall. Elevated cesium-137 concentrations were observed in water samples collected from the water that infiltrated into the FRS pool since it was drained. The cesium-137 is believed to be from residuals that adhered to the FRS pool walls when the pool was full. Groundwater seepage into the pool is thought to have dissolved some of the cesium. Because the water does not pose operational or safety concerns, it has been left in the CUP under routine monitoring. Currently, the water level in the CUP is measured daily by facility operators.

FIGURE 4-3
Average Annual Gross Beta Concentrations
at Monitoring Wells Centrally Located Within the North Plateau Sr-90 Plume



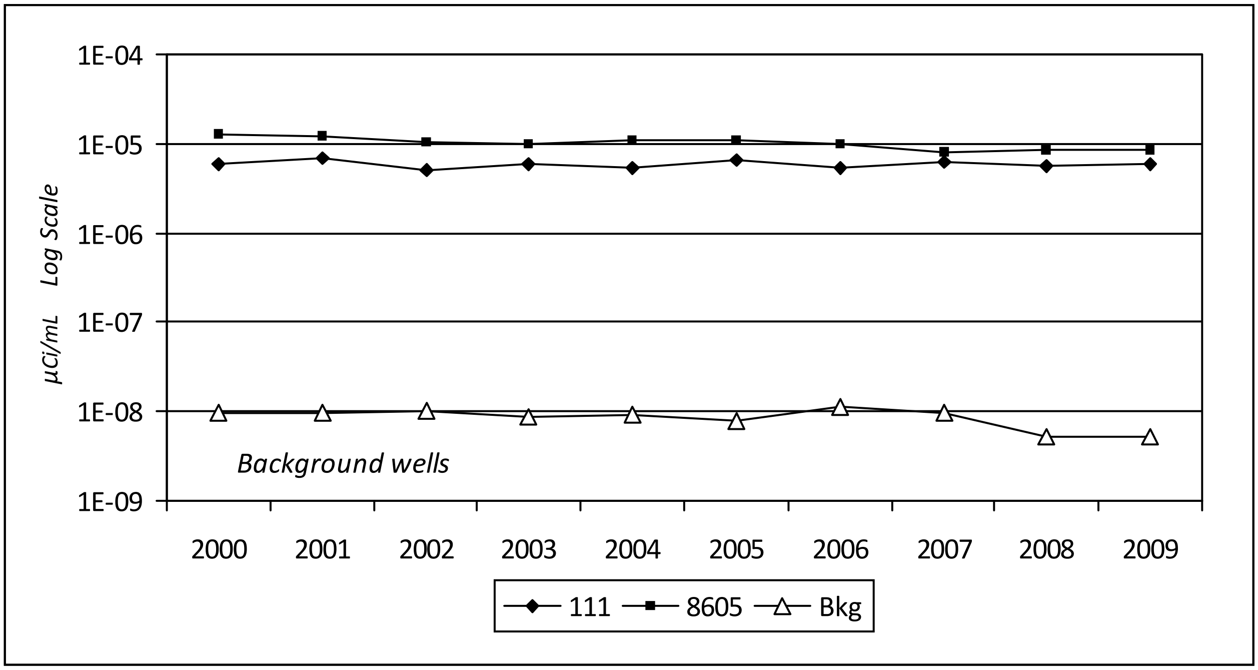
Note: Background wells 301, 401, and 706 are averaged for this comparison.

FIGURE 4-4
Average Annual Gross Beta Concentrations
at Monitoring Wells Near the Leading Edge of the North Plateau Sr-90 Plume



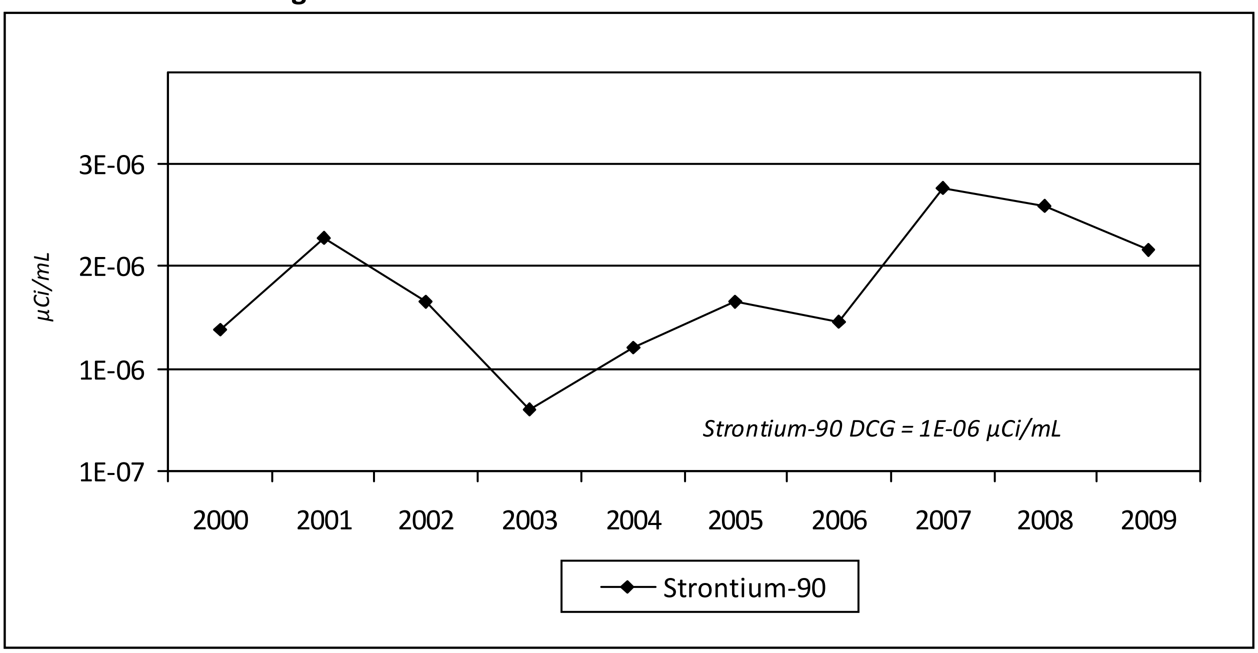
Note: Background wells 301, 401, and 706 are averaged for this comparison.

FIGURE 4-5
Average Annual Gross Beta Concentrations at Monitoring Wells Near Former Lagoon 1



Note: Background wells 301, 401, and 706 are averaged for this comparison.

FIGURE 4-6
Average Annual Strontium-90 Concentrations at WNSWAMP



Note: DCGs are used as an evaluation tool for results from on-site locations as part of the routine environmental monitoring program. However, DOE DCGs are applicable only at locations accessible to members of the public. The WNSWAMP location is not accessible to the public.

FIGURE 4-7
Average Annual Gross Beta Concentrations at Seeps From the Northeast Edge of the North Plateau

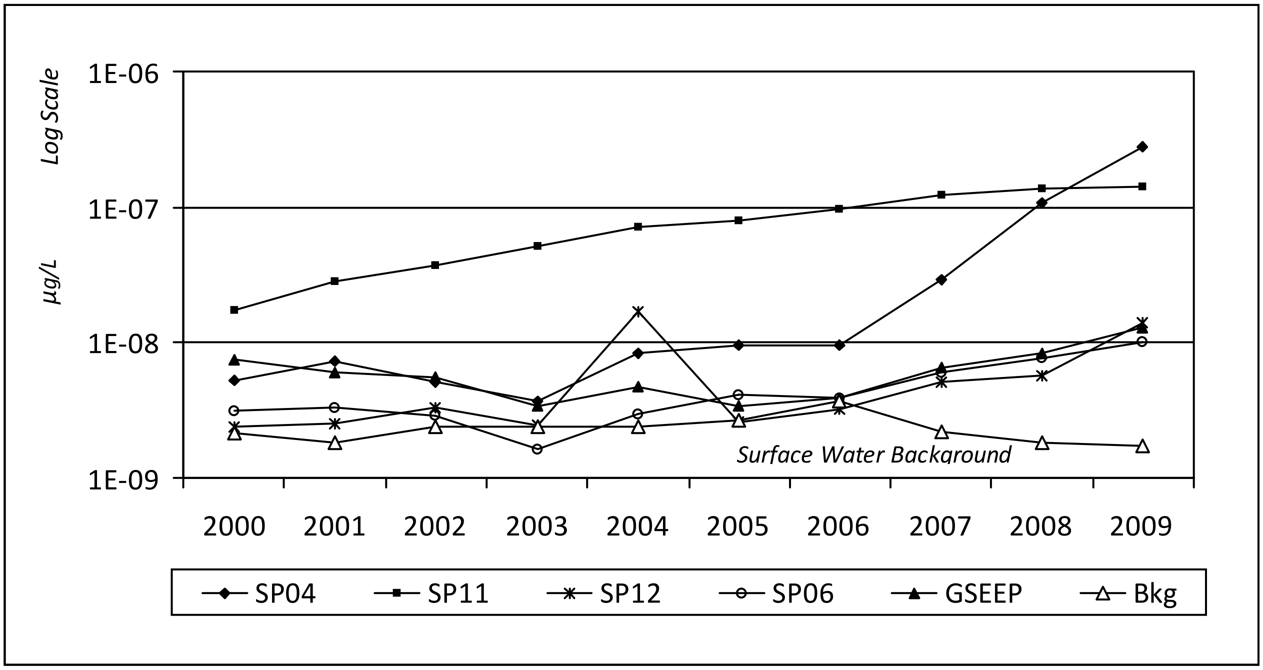


FIGURE 4-8
Concentrations of 1,2-DCE-t, 1,1,1-TCA, 1,1-DCA, and DCDFMeth at Well 8612 in the Sand and Gravel Unit

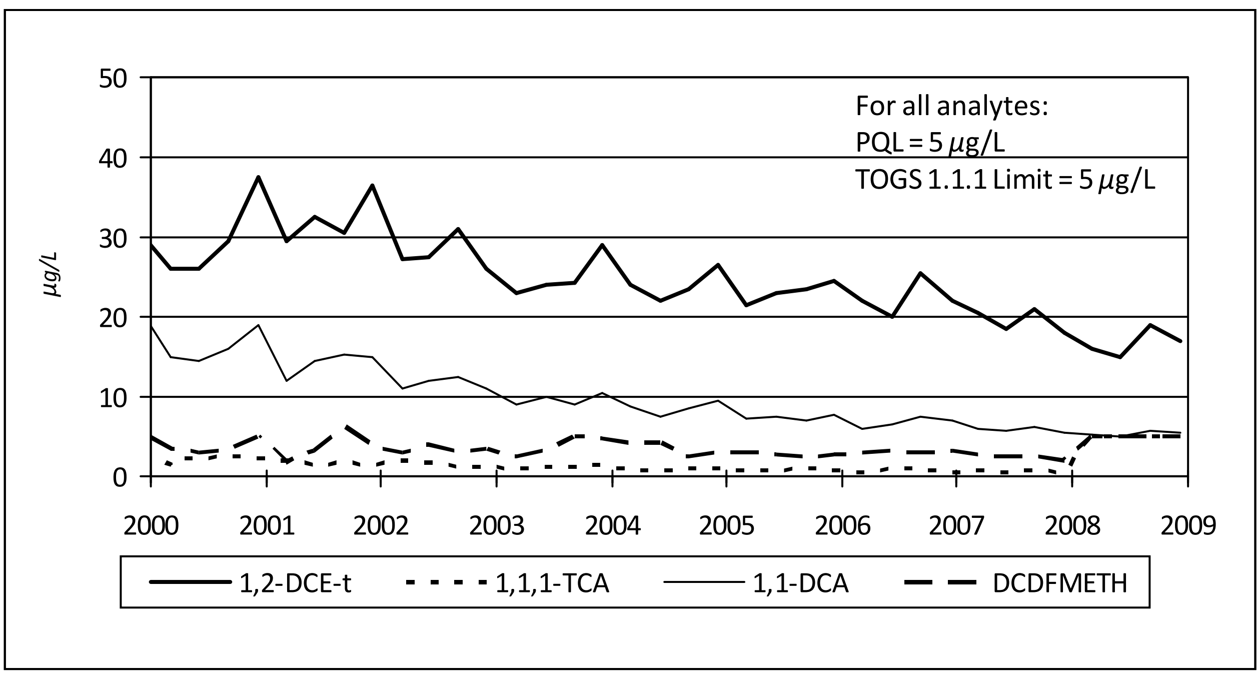


FIGURE 4-9
Concentrations of Tributyl Phosphate at Monitoring Wells Near Former Lagoon 1 in the Sand and Gravel Unit

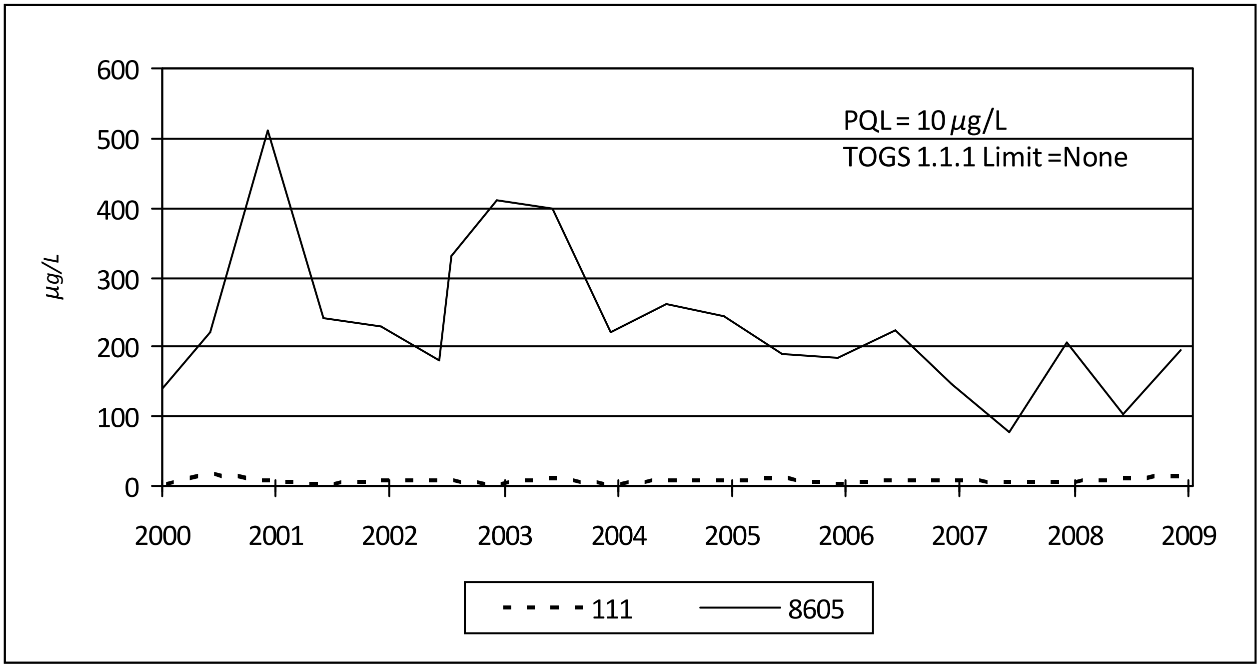
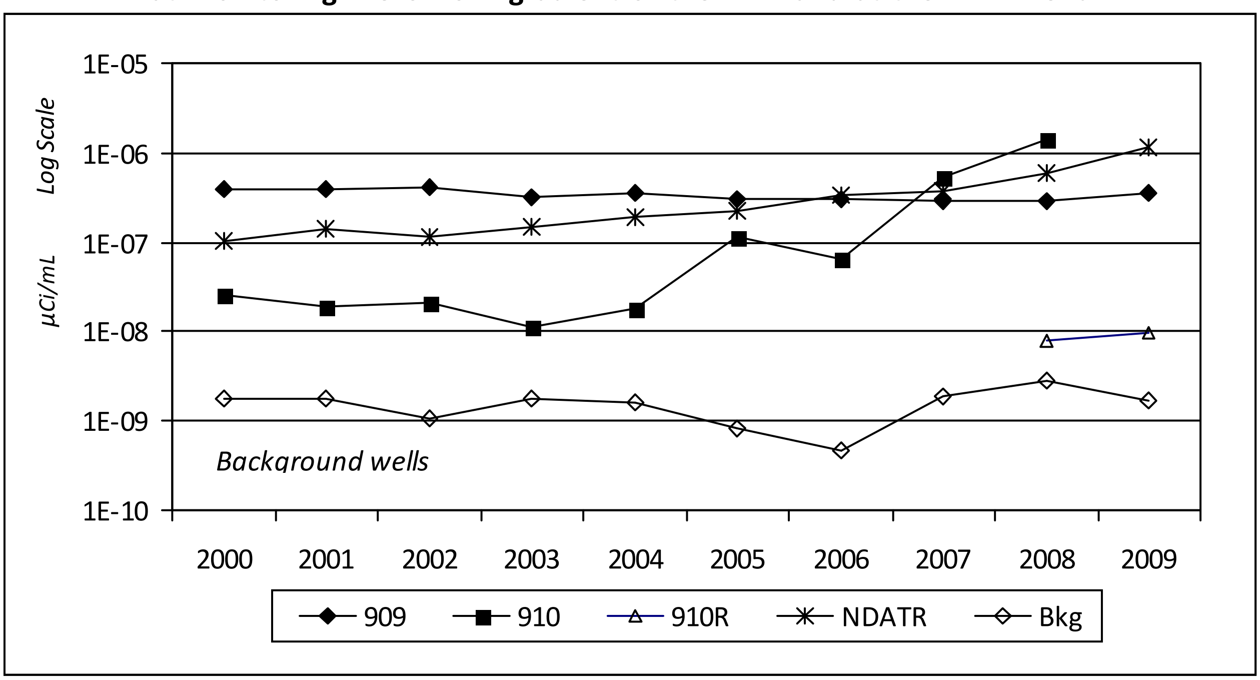
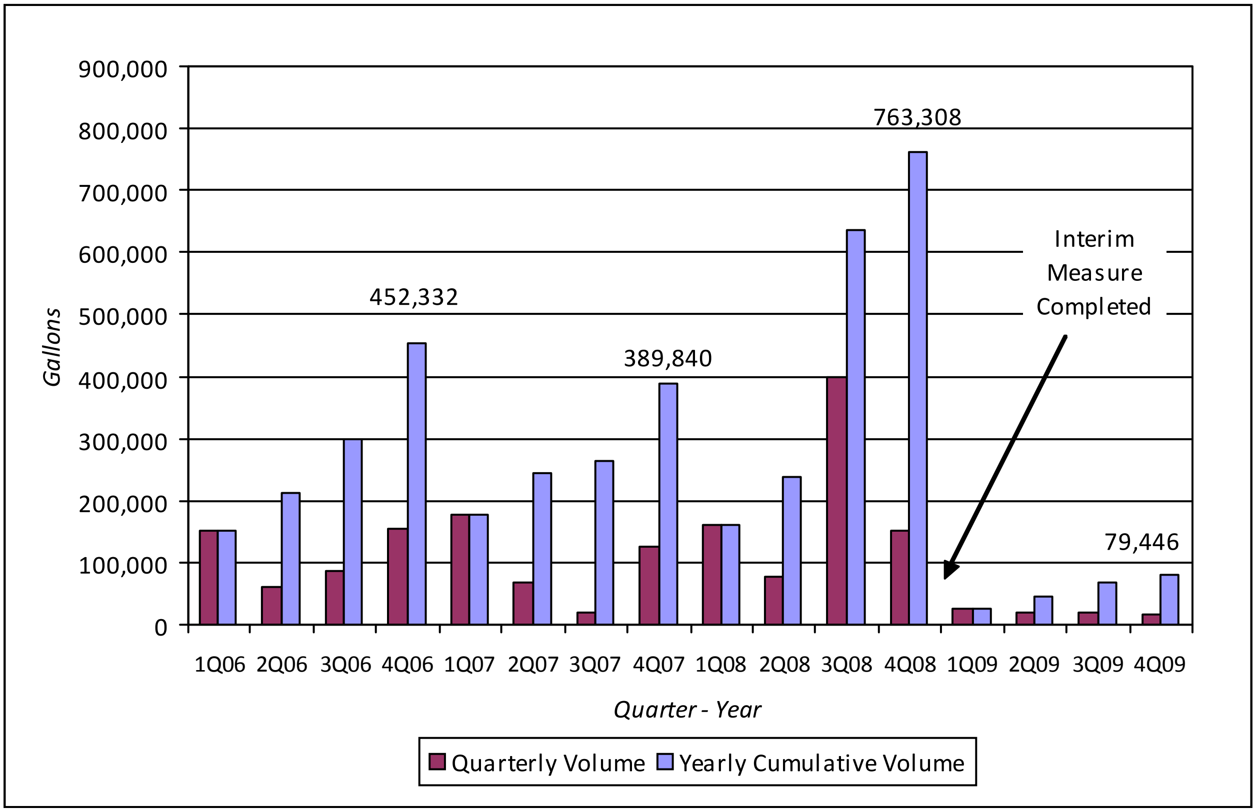


FIGURE 4-10
Average Annual Gross Beta Concentrations at Monitoring Wells Downgradient of the NDA and at the NDA Trench



Note: Background well for the south plateau is 1008C. Well 910 became damaged in 2007 and was decommissioned in 2008 when well 910R was installed.

FIGURE 4-11
Volume of Water Pumped From the NDA Interceptor Trench



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APPENDIX A

2009 Environmental Monitoring Program

Environmental Monitoring Program Drivers and Sampling Rationale

The following schedule represents the West Valley Demonstration Project (WVDP) routine environmental monitoring program for 2009. This schedule met or exceeded the requirements of the United States (U.S.) Department of Energy (DOE) Order 450.1A, "Environmental Protection Program," DOE Order 5400.5, "Radiation Protection of the Public and the Environment," and DOE/EH-0173T, "Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance." Specific methods and monitoring program elements were based on DOE/EP-0096, "A Guide for Effluent Radiological Measurements at DOE Installations," and DOE/EP-0023, "A Guide for Environmental Radiological Surveillance at U.S. Department of Energy Installations." Additional monitoring was mandated by air and water discharge permits (under the National Emission Standards for Hazardous Air Pollutants [NESHAP] regulations in 40 Code of Federal Regulations (CFR) 61, Subpart H, and the New York State Pollutant Discharge Elimination System [SPDES], respectively). Specific groundwater monitoring is required by the Resource Conservation and Recovery Act (RCRA) §3008(h) Administrative Order on Consent.

Permits, agreements, and/or programs may require formal reports of monitoring results. Radiological air emissions from the WVDP are reported annually in the NESHAP report to the U.S. Environmental Protection Agency. Nonradiological releases in water effluent and storm water drainage points covered under SPDES permit are reported monthly to the New York State Department of Environmental Conservation (NYSDEC) in a Discharge Monitoring Report (DMR). Groundwater monitoring results are reported quarterly to NYSDEC. Annual results from the monitoring program as a whole are evaluated and discussed in this Annual Site Environmental Report (ASER), which is prepared as directed in DOE Order 231.1A, "Environment, Safety, and Health Reporting," and associated guidance.

Table A-1 summarizes programmatic drivers and guidance applicable to each environmental medium measured or sampled as part of the WVDP Environmental Monitoring Program.

Sampling Schedule

Sampling locations are assigned a specific identifier, the location code, which is used to schedule sampling, track samples, and trace analytical results. This appendix details the sampling schedule conducted at each location in 2009. Changes since the last ASER are summarized on page A-17. Routine sampling locations are shown on Figs. A-2 through A-12. Table headings in the schedule are as follows:

- **Sample Location Code.** This code describes the physical location where the sample is collected. The code consists of seven or eight characters: The first character identifies the sample medium as **A**ir, **W**ater, **S**oil/sediment, **B**iological, or **D**irect measurement. The second character specifies o**N**-site or o**F**f-site. The remaining characters describe the specific location (e.g., **AFGRVAL** is **A**ir o**F**f-site at **GR**eat **VAL**ley). Distances noted at sampling locations are as measured in a straight line from the ventilation stack of the main plant process building on site. Groundwater and storm water sampling points (e.g., WNW0408, WNNDATR, WNSO04) are often abbreviated in figures or data tables (i.e., "408," "NDATR," "S04").

- **Sampling Type/Medium.** Describes the collection method and the physical characteristics of the medium or sample.

- **Collection Frequency/Total Annual Samples.** Indicates how often the samples are collected or retrieved and the total number of each type of sample processed in one year.

- **Measurements/Analyses.** Notes the type of measurement taken from the sampling medium and/or the constituents of interest, and (in some instances) the type of analysis conducted.

TABLE A-1
WVDP Environmental Program Drivers and Sampling Rationale

Programmatic Drivers	*Sampling Rationale*
On-Site Air Emissions (Appendix A, p. A-7)	
40 CFR 61, Subpart H (radiological air emissions); DOE Order 450.1A	DOE/EH-0173T, Chapter 3.0 (air effluent monitoring); DOE/EP-0096, Section 3.3 (criteria for effluent measurements)
Ambient Air (Appendix A, p. A-14 [off-site])	
DOE Order 450.1A	DOE/EH-0173T, Section 5.7.4 (environmental surveillance, air sampling locations); DOE/EP-0023, Section 4.2.3 (air sampling locations and measurement techniques)
On-Site Liquid Effluents and Storm Water (Appendix A, pp. A-8 through A-11)	
New York State SPDES Permit No. NY 0000973 (nonradiological; specified points only), DOE Order 450.1A and DOE Order 5400.5 (radiological)	DOE/EH-0173T, Section 2.3.3 (sampling locations for effluent monitoring); New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certification for nonpotable water
Surface Water (Appendix A, pp. A-11 [on-site] and A-14 and A-15 [off-site])	
DOE Order 450.1A	DOE/EH-0173T, Section 5.10.1 (environmental surveillance water sampling locations and methods); NYSDOH ELAP certification for nonpotable water
Potable (Drinking) Water (Appendix A, pp. A-12 [on-site])	
DOE Order 450.1A	DOE/EH-0173T, Section 5.10 (basis and guidance for environmental surveillance, water); NYSDOH ELAP certification for nonpotable water
On-Site Groundwater (Appendix A, pp. A-12 and A-13)	
RCRA §3008(h) Order on Consent (nonradiological); DOE Order 450.1A	DOE/EH-0173T, Section 5.10 (basis for environmental surveillance, water); NYSDOH ELAP certification for nonpotable water
Soil and Sediment (Appendix A, pp. A-13 and A-14 [on-site and off-site])	
DOE Order 450.1A	DOE EH-0173T, Sections 5.9 (environmental surveillance soil sampling locations and methods) and 5.12 (sediment sampling locations and methods)
Biological (Appendix A, pp. A-15 and A-16 [off-site])	
DOE Order 450.1A	DOE/EH-0173T, Sections 5.8 (environmental surveillance, terrestrial foodstuffs) and 5.11 (aquatic foodstuffs)
Direct Radiation (Appendix A, p. A-16 [on-site and off-site])	
DOE Order 450.1A	DOE/EH-0173T, Section 5.5 (environmental surveillance external radiation measurement locations and frequency); DOE/EP-0023, Section 4.6 (external radiation)

Index of Environmental Monitoring Program Sample Points

[a] Not detailed on map.

Index of Environmental Monitoring Program Sample Points *(continued)*

Liquid Effluent, On-Site Water, and Storm Water Outfalls (Figs. A-2 through A-4) ***(concluded)*** **Page**

Index of Environmental Monitoring Program Sample Points *(continued)*

Index of Environmental Monitoring Program Sample Points *(concluded)*

Off-Site Biological (Figs. A-9 and A-12 [pp. A-26 and A-29])

Direct Measurement Dosimetry (Figs. A-10 through A-12 [pp. A-27 through A-29])

[a] Near-site and background produce samples (corn, apples, and beans) are identified specifically as follows: corn = **BFVNEAC** and **BFVCTRC**; apples = **BFVNEAAF** and **BFVCTRA**; beans = **BFVNEAB** and **BFVCTRB**.

Sample Location Code	*Sampling Type/ Medium*	*Collection Frequency/ Total Annual Samples*	*Measurements/Analyses*
On-Site Air Emissions			
ANSTACK[a] Main plant process building ventilation exhaust stack **ANSTSTK**[a] Supernatant treatment system ventilation exhaust **ANCSSTK**[a] 01-14 building ventilation exhaust **ANCSRFK**[a] Contact size-reduction facility exhaust **ANCSPFK**[a] Container sorting and packaging facility exhaust **ANVITSK**[a] Vitrification heating, ventilation, and air conditioning exhaust **ANRHWFK**[a] Remote-handled waste facility exhaust	Continuous off-line air particulate monitors	Continuous measurement of fixed filter; replaced biweekly; held as backup	Real-time alpha and beta monitoring
	Continuous off-line air particulate filters	Biweekly; 26 each location	Gross alpha/beta, gamma isotopic[b] upon collection, flow
	Composite of biweekly particulate filters	Semiannually; 2 each location	Sr-90, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241, gamma isotopic, flow
	Continuous off-line desiccant columns for collection of water vapor	Biweekly; 26 each at ANSTACK and ANSTSTK only	H-3, flow
	Continuous off-line charcoal cartridges	Cartridges collected biweekly and composited into 2 semiannual samples at each location	I-129
OVEs/PVUs[a] Outdoor ventilated enclosures/portable ventilation units	Continuous off-line air particulate filter	Collected as required by project	Gross alpha/beta, gamma isotopic[b] upon collection, flow
	Composite of filters	Semiannually; 2 each location	Sr-90, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241, gamma isotopic, flow

[a] Required by 40 CFR 61, Subpart H. Results reported in the Annual NESHAP Report and evaluated in this ASER.
[b] Gamma isotopic analysis done only if gross alpha/beta activity rises significantly.

Sample Location Code	***Sampling Type/ Medium***	***Collection Frequency/ Total Annual Samples***	***Measurements/Analyses***
On-Site Liquid Effluents			
WNSP001[a] Lagoon 3 discharge weir	Grab liquid	Daily during discharge. Lagoon 3 is discharged 4 to 8 times per year, averaging 6 to 7 days per discharge; 24–56 per year	Daily flow, hold for flow-weighted composite
	Grab liquid	Twice during discharge; 8–16 per year	Gross alpha/beta, H-3, Sr-90, gamma isotopic
	Flow-weighted composite of daily samples for each discharge	4 to 8 per year	Gross alpha/beta, H-3, C-14, Sr-90, Tc-99, I-129, gamma isotopic, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241
	24-hour composite liquid	Twice during discharge; 8–16 per year	BOD_5, TSS, SO_4, NO_3-N,NO_2-N, NH_3, total Fe and Hg (method 1631)
	Grab liquid	Twice during discharge; 8–16 per year	Settleable solids, TDS, oil & grease, total recoverable Se
	24-hour composite liquid	Once during discharge; 4–8 per year	Total Al, dissolved As, dissolved sulfide
	Grab liquid	Once during discharge; 4–8 per year	pH, total recoverable V, Co
	24-hour composite liquid	Quarterly; 4 per year	Bromide and total B, total recoverable Pb
	24-hour composite liquid	Semiannually; 2 per year	Total Ti, Mn, dissolved Cu, total recoverable Cu, Cr, Ni, and Zn
	24-hour composite liquid	Annually; 1 per year	Total recoverable Cd, total Ba and Sb
	Grab liquid	Semiannually; 2 per year	Heptachlor, cyanide amenable to chlorination, surfactant (as LAS)
	Grab liquid	Annually; 1 per year	Chloroform, dichlorodifluoromethane, trichlorofluoromethane, 3,3-dichlorobenzidine, tributyl phosphate, hexachlorobenzene, alpha-BHC, xylene, 2-butanone, total recoverable Cr^{+6}
WNSP01B[a] Internal process monitoring point	Continuous; recorded monthly	NA	Elapsed flow time
	Composite liquid	Twice per month when operating; 0–24 per year	Total Hg
WNSP116[a] Pseudo-monitoring point outfall 116	Calculated	Twice per lagoon discharge; 8–16 per year	TDS

NA - Not applicable

[a] Required by SPDES Permit #NY0000973. Results reported in the SPDES DMR and evaluated in this ASER.

Sample Location Code	***Sampling Type/ Medium***	***Collection Frequency/ Total Annual Samples***	***Measurements/Analyses***
On-Site Liquid Effluents			
WNSP007[a] Sanitary waste discharge	24-hour composite liquid	1 per month; 12 per year	Gross alpha/beta, H-3
	Composite of monthly samples	Annually; 1 per year	Sr-90, gamma isotopic
	24-hour composite liquid	3 per month; 36 per year	TSS, NH_3, NO_2-N, BOD_5, total Fe, flow
	Grab liquid	3 per month; 36 per year	Oil & grease
	Grab liquid	Weekly; 52 per year	pH, settleable solids, total residual chlorine
	Grab liquid	Annually; 1 per year	Chloroform
	Grab liquid	3 per monthly; 36 per year	Flow, flow time
WNURRAW[a] Utility room raw water	Composite liquid	Weekly; 52 per year	Total Fe
	Grab liquid	Three per lagoon discharge; before start, near start, and near end; 12–24 per year	TDS
	Grab liquid	Monthly; 12 per year	TOC, alkalinity
WNSP006 Franks Creek at the security fence	Timed continuous composite liquid	Weekly during lagoon discharge, otherwise biweekly; 26–34 per year	Gross alpha/beta, H-3
	Composite of weekly and biweekly samples	Monthly; 12 per year	Sr-90 and gamma isotopic
	Composite of weekly and biweekly samples	Quarterly; 4 per year	C-14, Tc-99, I-129, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241
	Grab liquid	Three per lagoon discharge: before start; near start; and after end, 12–24 per year	TDS
WNSP008[a] French drain (Capped off in 2001; routinely checked to verify no discharge)	Grab liquid	Monthly; 12 per year if discharging	Gross alpha/beta, H-3
	Grab liquid	Three per month if discharging; 36 per year	Conductivity, pH, BOD_5, total Fe, total recoverable Cd and Pb, flow
	Grab liquid	Annually; 1 per year if discharging	Total As, Cr, Ag, and Zn
Storm Water Outfalls			
<u>Group 1</u>[a] **WNSO02 (S02)** **WNSO04 (S04)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, Cd, Cr, Se, V, Cr^{+6}, TKN, ammonia (as NH_3), NO_3-N, NO_2-N, total nitrogen (as N)
	Flow-weighted composite liquid	Semiannually; 2 per year	Maximum flow, total flow, plus all of the above constituents except for pH and oil & grease

[a] Required by SPDES Permit #NY0000973. Results reported in the SPDES DMR and evaluated in this ASER.

Sample Location Code	***Sampling Type/ Medium***	***Collection Frequency/ Total Annual Samples***	***Measurements/Analyses***
Storm Water Outfalls			
Group 2[a] **WNSO06 (S06)** **WNSO33 (S33)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, surfactant (as LAS)
	Flow-weighted composite liquid	Semiannually; 2 per year	Maximum flow, total flow, plus all of the above constituents except for pH and oil & grease
Group 3[a] **WNSO09 (S09)** **WNSO12 (S12)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, TKN, ammonia (as NH_3), NO_3-N, NO_2-N, alpha-BHC, total nitrogen (as N)
	Flow-weighted composite liquid	Semiannually; 2 per year	Maximum flow, total flow, plus all of the above constituents except for pH and oil & grease
Group 4[a] **WNSO34 (S34)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, surfactant (as LAS)
	Flow-weighted composite liquid	Semiannually; 2 per year	Maximum flow, total flow, plus all of the above constituents except for pH and oil & grease
Group 5[a] **WNSO14 (S14)** **WNSO17 (S17)** **WNSO28 (S28)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, V, TKN, ammonia (as NH_3), NO_3-N, NO_2-N, surfactant (as LAS), sulfide, settleable solids, total nitrogen (as N)
	Flow-weighted composite liquid	Semiannually; 2 per year	Maximum flow, total flow, plus all of the above constituents except for pH and oil & grease
Group 6[a] **WNSO36 (S36)** **WNSO37 (S37)** **WNSO38 (S38)** **WNSO39 (S39)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, V, TKN, ammonia (as NH_3), NO_3-N, NO_2-N, surfactant (as LAS), sulfide, settleable solids, total nitrogen (as N)
WNSO40 (S40) **WNSO41 (S41)** **WNSO42 (S42)**	Flow-weighted composite liquid	Semiannually; 2 per year	Maximum flow, total flow, plus all of the above constituents except for pH and oil & grease
Group 7[a] **WNSO20 (S20)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, TKN, ammonia (as NH_3), NO_3-N, NO_2-N, surfactant (as LAS), sulfide, total nitrogen (as N)
	Flow-weighted composite liquid	Semiannually; 2 per year	Maximum flow, total flow, plus all of the above constituents except for pH and oil & grease

[a] Required by SPDES Permit #NY0000973. Results reported in the SPDES DMR and evaluated in this ASER.

Sample Location Code	***Sampling Type/ Medium***	***Collection Frequency/ Total Annual Samples***	***Measurements/Analyses***
Storm Water Outfalls			
Group 8[a] **WNSO27 (S27)** **WNSO35 (S35)**	First flush grab liquid	Semiannually; 2 per year	pH, oil & grease, BOD_5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, TKN, ammonia (as NH_3), NO_3-N, NO_2-N, surfactant (as LAS), total nitrogen (as N)
	Flow-weighted composite liquid	Semiannually; 2 per year	Maximum flow, total flow, plus all of the above constituents except for pH and oil & grease
WNSWR01[a] Site rain gauge	Field measurement of precipitation	1 each storm water event	pH
On-Site Surface Water			
WNSWAMP Northeast swamp drainage **WNSW74A** North swamp drainage	Timed continuous composite liquid	Biweekly; 26 per year	Gross alpha/beta, H-3, pH, flow (at WNSWAMP only)
	Composite of biweekly samples	Monthly; 12 per year	Sr-90 and gamma isotopic
	Composite of biweekly samples	Semiannually; 2 per year	C-14, I-129, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241
WNSP005 Facility yard drainage	Grab liquid	Quarterly; 4 per year	Gross alpha/beta, H-3, pH
	Composite of quarterly samples	Semiannually; 2 per year	Sr-90 and gamma isotopic
WNFRC67 Franks Creek east of the SDA	Grab liquid	Quarterly; 4 per year (collected at same time as **WNNDADR**)	Gross alpha/beta, H-3, pH
	Composite of quarterly samples	Semiannually; 2 per year	Sr-90 and gamma isotopic
WNERB53 Erdman Brook north of disposal areas	Grab liquid	Quarterly; 4 per year (collected at same time as **WNNDADR**)	Gross alpha/beta, H-3, pH
	Composite of quarterly samples	Semiannually; 2 per year	Sr-90 and gamma isotopic
WNNDADR Drainage between NDA and SDA	Timed continuous composite liquid	Biweekly; 26 per year	Hold for composite
	Composite of biweekly samples	Monthly; 12 per year	Gross alpha/beta, H-3, gamma isotopic
	Composite of biweekly samples	Semiannually; 2 per year	Sr-90 and I-129

[a] Required by SPDES Permit #NY0000973. Results reported in the SPDES DMR and evaluated in this ASER.

Sample Location Code	Sampling Type/ Medium	Collection Frequency/ Total Annual Samples	Measurements/Analyses
On-Site Potable (Drinking) Water			
WNDNKUR Utility room (entry point [EP-02]) potable water storage	Grab liquid[a]	Annually; 1 per year	As, Ba, Be, Cd, Cr, Hg, Ni, Sb, Se, Tl, cyanide, fluoride
WNDNKMP Main plant drinking water	Grab liquid	Annually; 1 per year	Gross alpha/beta, H-3
WNDNKEL Environmental Laboratory drinking water	Grab liquid[a]	Annually; 1 per year	Total haloacetic acids, total trihalomethanes
On-Site Groundwater			
Low-level waste treatment facility: SSWMU #1 (wells 103, 104, 105, 106, 107, 108, 110, 111, 116, 8604, 8605) **Miscellaneous small units:** SSWMU #2 (wells 204, 205, 206) **Liquid waste treatment system:** SSWMU #3 (wells 301, 302) **High-level waste storage and processing tank:** SSWMU #4 (wells 401, 402, 403, 405, 406, 408, 409) **Maintenance shop leach field:** SSWMU #5 (wells 501, 502) **Low-level waste storage area:** SSWMU #6 (wells 602A, 604, 605, 8607, 8609) **Chemical process cell waste storage area:** SSWMU #7 (wells 704, 706, 707) **Construction and demolition debris landfill:** SSWMU #8 (wells 801, 802, 803, 804, 8603, 8612) **NRC-licensed disposal area (NDA):** SSWMU #9 (wells 901, 902, 903, 906, 908, 908R, 909, 910, 910R, 8610, 8611, trench NDATR)	Grab liquid Direct field measurement	Quarterly during the fiscal year (generally[b]); 4 per year Twice each sampling event; 8 per year for wells sampled quarterly	Gross alpha/beta, H-3. VOCs, SVOCs, or metals at select locations. Refer to Chapter 4 Tables 4-3 and 4-4. Conductivity, pH

[a] A sample for NO_3 (as N) is collected by the Cattaraugus County Health Department (CCHD). Pb and Cu are sampled at this site based upon CCHD guidance.

[b] Sampling frequency and analyses vary from point to point.

Sample Location Code	*Sampling Type/ Medium*	*Collection Frequency/ Total Annual Samples*	*Measurements/Analyses*
On-Site Groundwater			
IRTS drum cell: SSWMU #10 (wells 1005, 1006, 1007, 1008B, 1008C)	Grab liquid	Quarterly during the fiscal year (generally[a]); 4 per year	Gross alpha/beta, H-3. VOCs, SVOCs, or metals at select locations, refer to Chapter 4 Tables 4-3 and 4-4.
Remote-handled waste facility (not in a SSWMU): (wells 1301, 1302, 1303, 1304)	Direct field measurement	Twice each sampling event; 8 per year for wells sampled quarterly	Conductivity, pH
North plateau seeps (not in a SSWMU): (points GSEEP, SP04, SP06, SP11, SP12)	Grab liquid	Semiannually (quarterly at GSEEP); 2 (or 4) per year	Gross alpha/beta, H-3 (also VOCs at GSEEP and SP12)
	Direct field measurement of sampled water	Semiannually at SP12 (quarterly at GSEEP); 2 (or 4) per year	pH, conductivity
Miscellaneous monitoring locations (not in a SSWMU): Well points WP-A, WP-C, WP-H	Grab liquid	Annually (quarterly at NB1S); 1 (or 4) per year	Gross alpha/beta, H-3
	Direct field measurement of sampled water	Annually (quarterly at NB1S); 1 (or 4) per year	pH, conductivity
Surface water elevation points: (SE007, SE008, SE009, SE011)	Direct field measurement	Quarterly; 4 per year at each location	Water level
State-licensed disposal area (SDA) (SSWMU #11)	Groundwater wells in SSWMU #11 are sampled by NYSERDA under a separate program. For information, see the NYSERDA website at www.nyserda.org.		
On-Site Soil/Sediment			
SN on-site soil series; **SNSW74A** (near WNSW74A), **SNSWAMP** (near WNSWAMP), and **SNSP006** (near WNSP006)	Surface plug composite soil/sediment	1 each location every five years (last sampled in 2007)	Gross alpha/beta, gamma isotopic, Sr-90, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241
Off-Site Soil			
SF off-site soil series (collected at air sampling location[s]); **SFFXVRD, SFRT240, SFRSPRD, SFGRVAL**	Surface plug composite soil	1 each location every five years (last sampled in 2007)	Gross alpha/beta, Sr-90, gamma isotopic, Pu-238, Pu-239/240, Am-241. At nearest site (**SFRSPRD**) and background (**SFGRVAL**), also U-232, U-233/234, U-235/236, U-238, and total U

[a] Sampling frequency and analyses vary from point to point.

Sample Location Code	***Sampling Type/ Medium***	***Collection Frequency/ Total Annual Samples***	***Measurements/Analyses***
Off-Site Sediment			
SFCCSED Cattaraugus Creek at Felton Bridge **SFSDSED** Cattaraugus Creek at Springville Dam **SFTCSED** Buttermilk Creek at Thomas Corners Road **SFBCSED** Buttermilk Creek at Fox Valley Road (background)	Grab stream sediment	1 each location every five years (last sampled in 2007)	Gross alpha/beta, gamma isotopic, Sr-90, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241
Off-Site Air			
AFGRVAL 29 km south at Great Valley (background)	Continuous air particulate filter	Biweekly; 26 per year	Gross alpha/beta, flow
	Composite of biweekly filters	Semiannually; 2 per year	Sr-90, gamma isotopic, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241, flow
	Continuous charcoal cartridge	Monthly; 12 per year	Held for composite
	Composite of monthly charcoal cartridges	Semiannually; 2 per year	I-129
Off-Site Surface Water			
WFBCBKG Buttermilk Creek near Fox Valley (background)	Timed continuous composite liquid	Biweekly; 26 per year	Hold for composite
	Composite of biweekly samples	Monthly; 12 per year	Gross alpha/beta, H-3
	Composite of biweekly samples	Semiannually; 2 per year	C-14, Sr-90, Tc-99, I-129, U-232, U-233/234, U-235/236, U-238, total U, Pu-238, Pu-239/240, Am-241, gamma isotopic
WFFELBR Cattaraugus Creek at Felton Bridge (downstream of confluence with Buttermilk Creek); nearest point of public access to waters receiving WVDP effluents	Timed continuous composite liquid	Weekly during lagoon 3 discharge, otherwise biweekly; 26–34 per year	Gross alpha/beta, H-3, pH, flow
	Flow-weighted composite of weekly and biweekly samples	Monthly; 12 per year	Gross alpha/beta, H-3, Sr-90, and gamma isotopic

Sample Location Code	***Sampling Type/ Medium***	***Collection Frequency/ Total Annual Samples***	***Measurements/Analyses***
Off-Site Surface Water			
WFBCTCB Buttermilk Creek at Thomas Corners Road, downstream of WVDP and upstream of confluence with Cattaraugus Creek	Timed continuous composite liquid	Biweekly; 26 per year	Hold for composite
	Composite of biweekly samples	Monthly; 12 per year	Gross alpha/beta, H-3
	Composite of biweekly samples	Semiannually; 2 per year	Sr-90, gamma isotopic
	Grab liquid	Monthly; 12 per year	Hardness (Ca and Mg)
	Grab liquid	Semiannually; 2 per year[a]	Temperature (field), pH (field), dissolved oxygen (field), TOX, oil & grease
	24-hour timed continuous composite	Semiannually; 2 per year[a]	TSS, TDS, NPOC, NH_3 (as N), NO_3 (as N), NO_2 (as N), bromide, fluoride, sulfate, total sulfide, surfactant (as LAS), alpha-BHC, B, Ba, Co, Fe, Na, Mn, Sb, Ti, Tl, V, dissolved Al, As, Cd, Cr, Cu, Hg (method 1631), Ni, Pb, Se, Zn
Off-Site Biological			
BFMFLDMN Dairy farm 5.1 km southeast of WVDP	Grab milk sample	Annual; 1 per year	Sr-90, I-129, gamma isotopic
BFMCTLS Control location 22 km south (background) **BFMBLSY** Dairy farm 5.5 km west-northwest **BFMSCHT** Dairy farm 4.9 km south	Grab milk sample	1 each location every five years (last sampled in 2007)	Sr-90, I-129, gamma isotopic
BFDNEAR Deer in the vicinity of the WVDP **BFDCTRL** Control deer 16 km or more from the WVDP	Individual collection of venison samples, usually from deer killed in collisions with vehicles	Six deer collected annually during hunting season (3 near-site, 3 background)	Gamma isotopic and Sr-90 in edible portions of meat, % moisture, H-3 in free moisture
BFVNEAR Apples, beans, and corn from locations near the WVDP **BFVCTRL** Control apples, beans, and corn from locations far from the WVDP	Grab biological	1 every five years at time of harvest (last sampled in 2007)	Gamma isotopic and Sr-90 in edible portions, % moisture, H-3 in free moisture

[a] Samples are collected when points WNSP001 and WNSP007 are discharging.

Sample Location Code	***Sampling Type/ Medium***	***Collection Frequency/ Total Annual Samples***	***Measurements/Analyses***
Off-Site Biological			
BFFCATC Fish from Cattaraugus Creek downstream of its confluence with Buttermilk Creek **BFFCATD** Fish from Cattaraugus Creek downstream of the Springville Dam **BFFCTRL** Control fish sample from nearby stream not affected by WVDP (7 km or more upstream of site effluent point); background	Individual collection of fish	Once every 5 years; 10 fish from each location (last sampled in 2007)	Gamma isotopic and Sr-90 in edible portions, % moisture
Off-Site Direct Radiation			
DFTLD Series: Off-site environmental thermoluminescent dosimeters (TLDs): **#1 through #16**, at each of 16 compass sectors at nearest accessible perimeter point **#20:** 1,500 m northwest (downwind receptor) **#23:** 29 km south, Great Valley (background)	Integrating TLD	Semiannually; 2 per year at each location	Gamma radiation exposure
On-Site Direct Radiation			
DNTLD Series: On-site TLDs **#33**: Corner of the SDA **#24, #28**: Security fence around the WVDP **#35, #36, #38, #40**: Near operational areas on-site **#43**: SDA west perimeter fence	Integrating TLD	Semiannually; 2 per year at each location	Gamma radiation exposure

Summary of Monitoring Program Changes in 2009

Location Code	Description of Changes
BFMWIDR **BFMFLDMN**	The BFMWIDR near-site milk sampling point, 3.0 km southeast of the site, was dropped from the program in 2009 because the dairy herd was sold. This sampling point was replaced with point BFMFLDMN, 5.1 km southeast of the site.

FIGURE A-1
West Valley Demonstration Project Base Map

J:/GIS/ArcMap/ASER/ASER_2008/ASER_2008_FigA01_r0.mxd 4/13/2009 jrl/skw

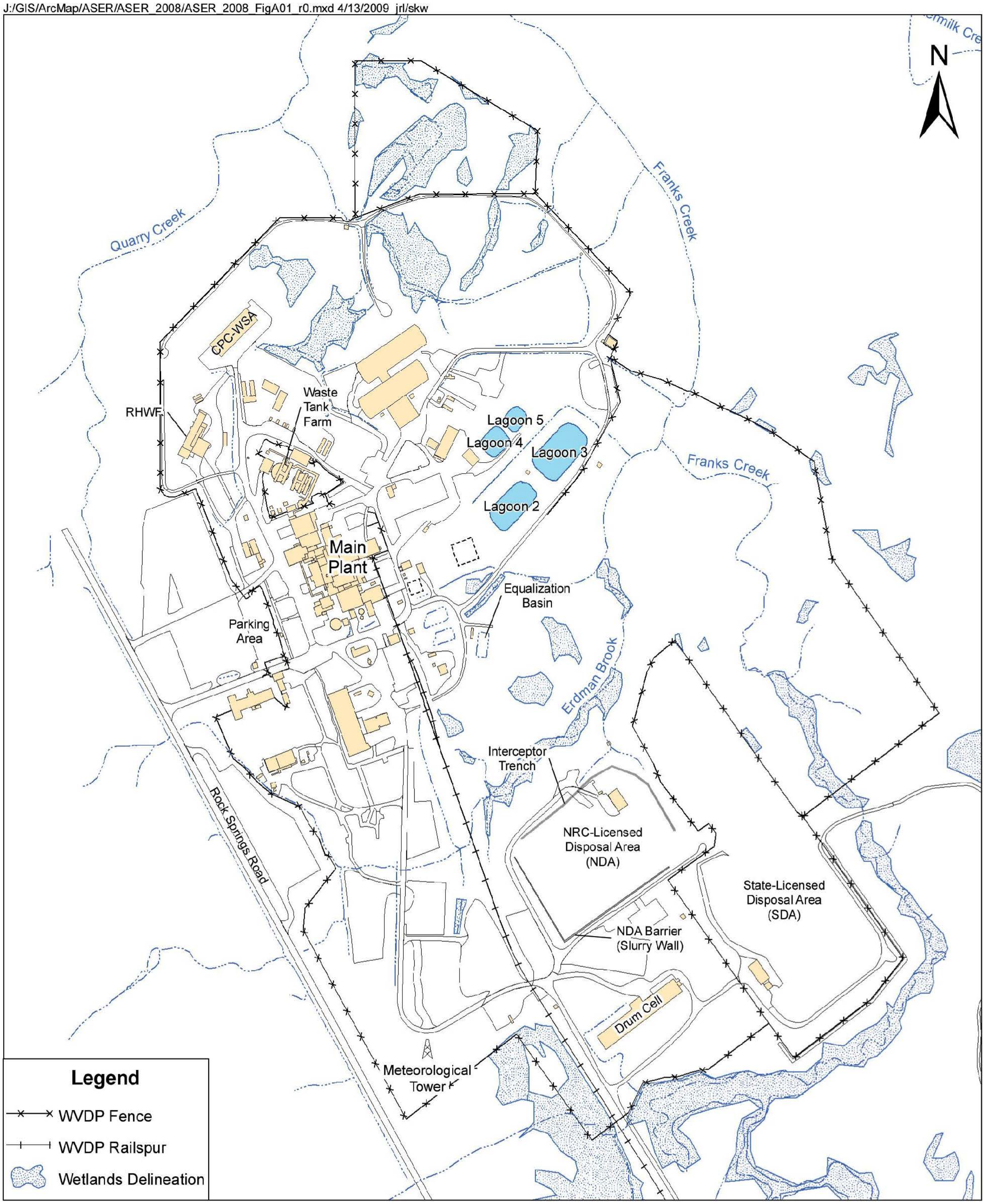

FIGURE A-2
On-Site Surface Water, Drinking Water, and Soil/Sediment Sampling Locations

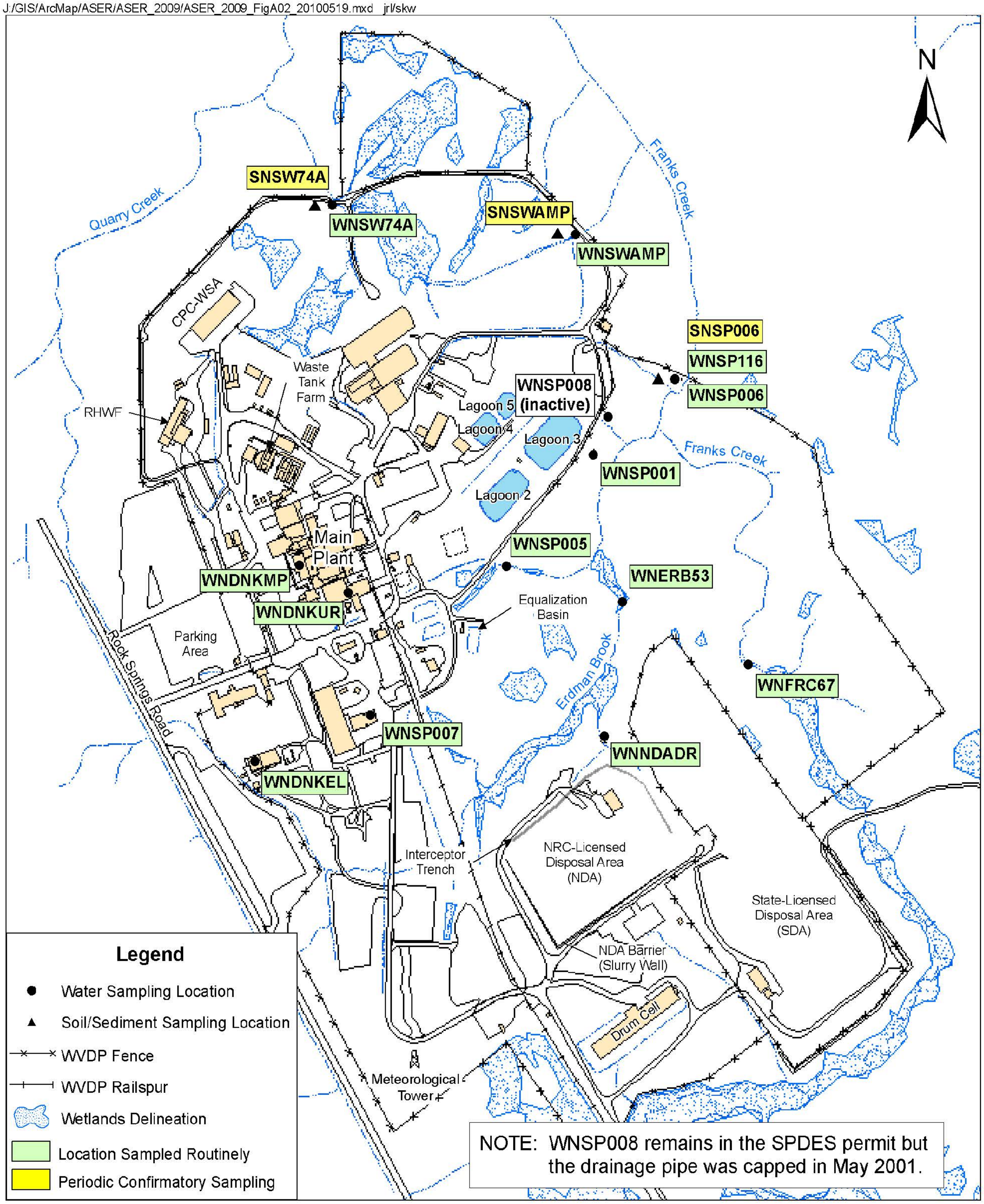

FIGURE A-3
On-Site Storm Water Outfalls

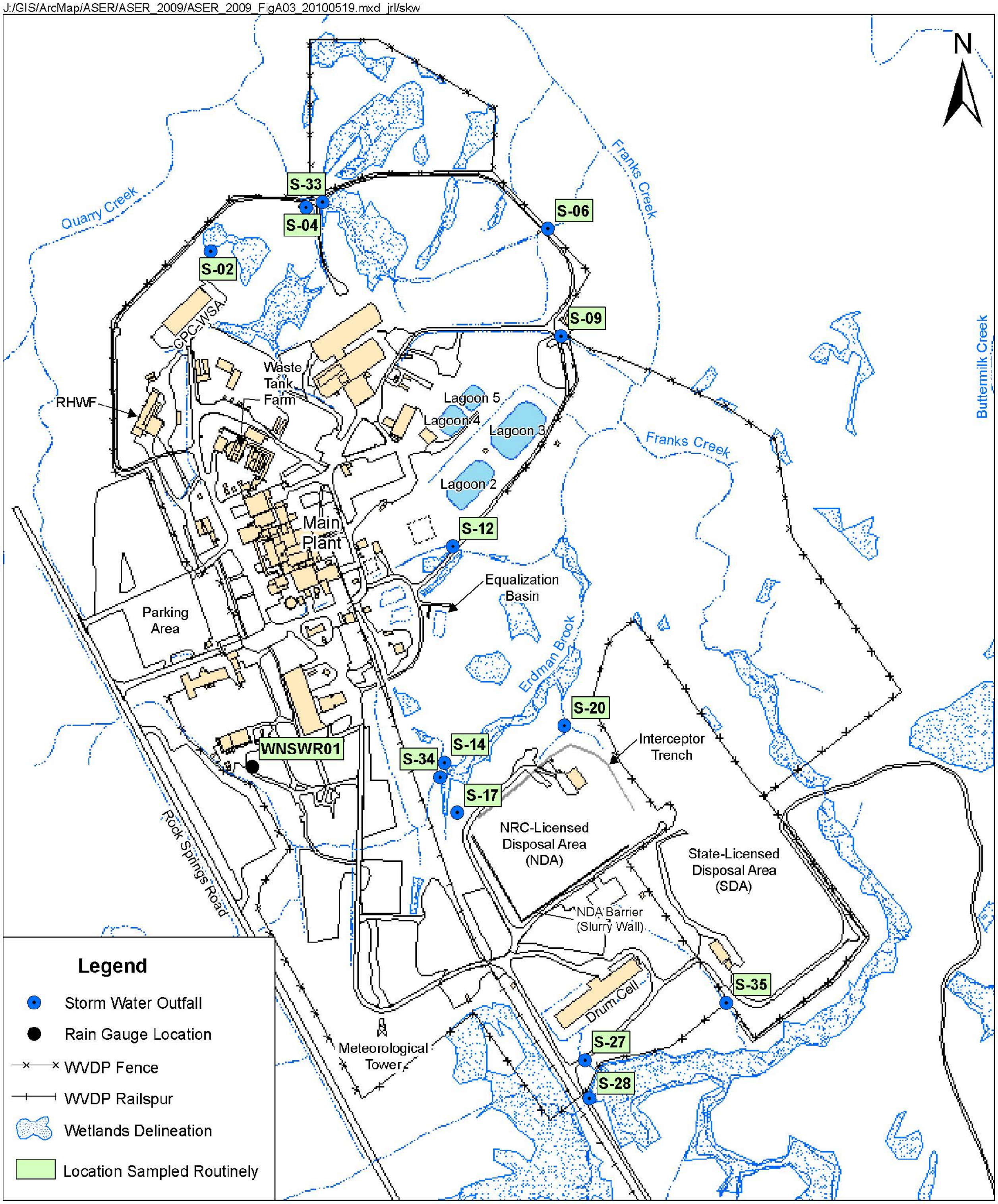

FIGURE A-4
Rail Spur Storm Water Outfalls

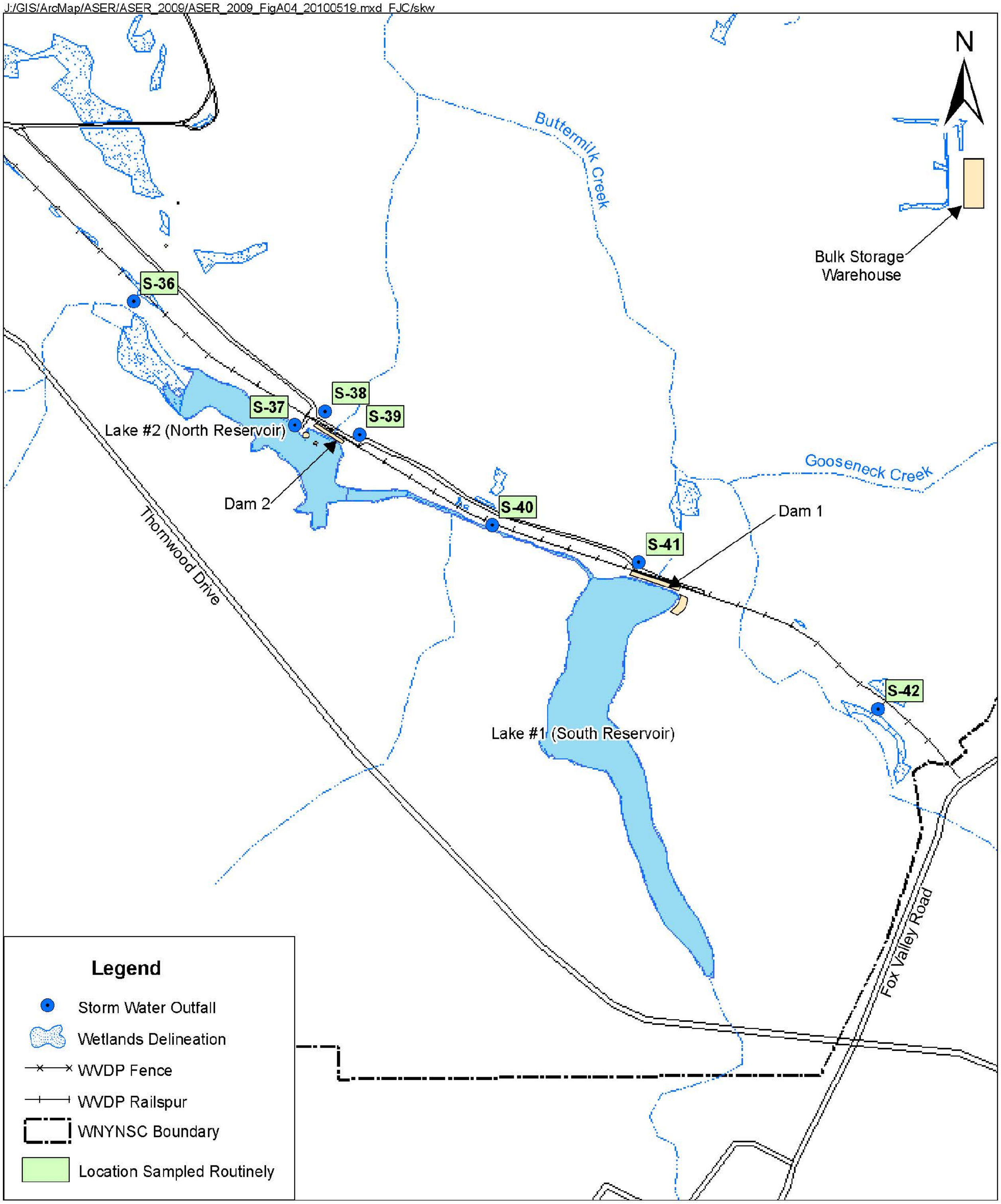

FIGURE A-5
Off-Site Surface Water and Soil/Sediment Sampling Locations

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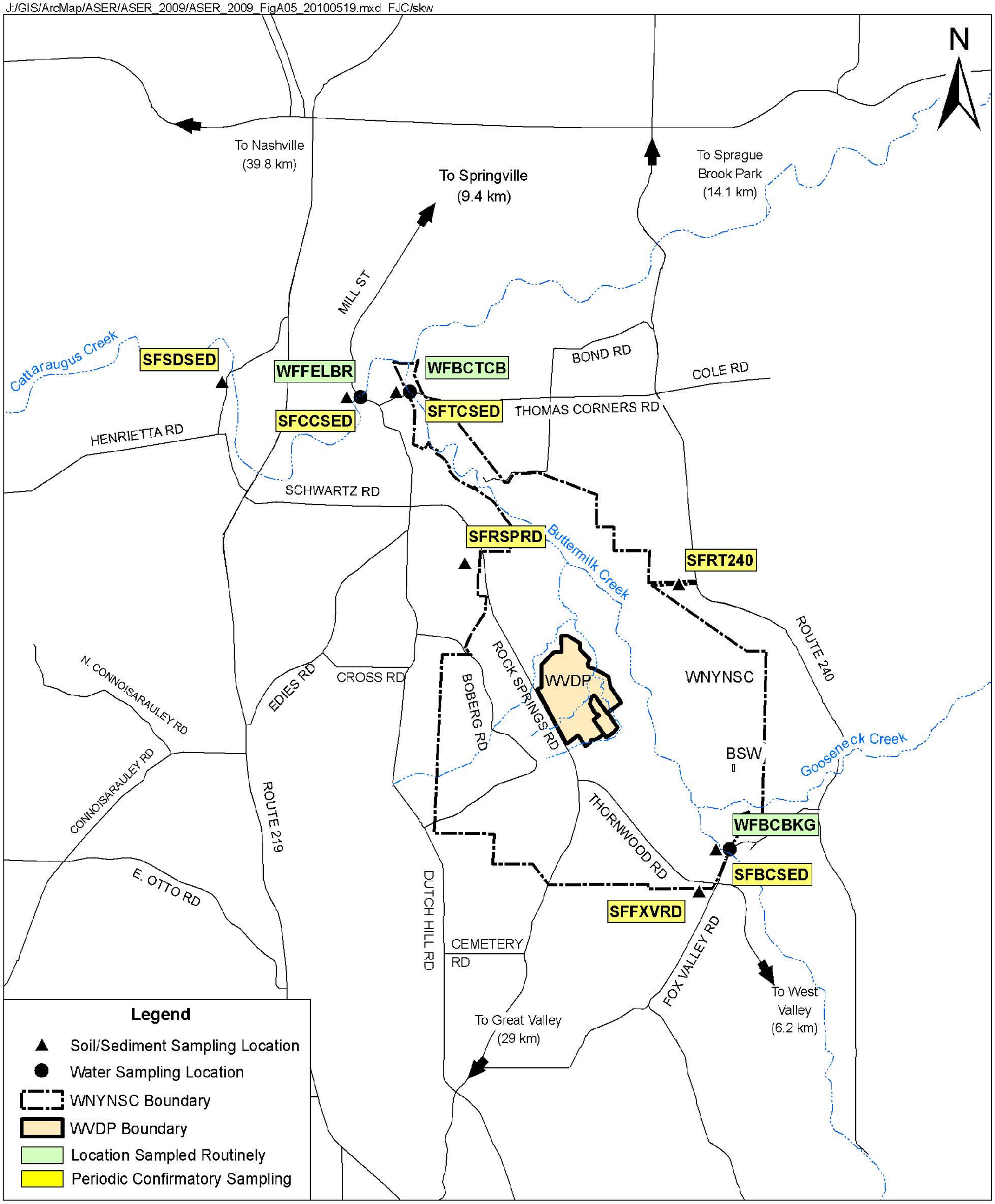

FIGURE A-6
On-Site Air Monitoring and Sampling Locations

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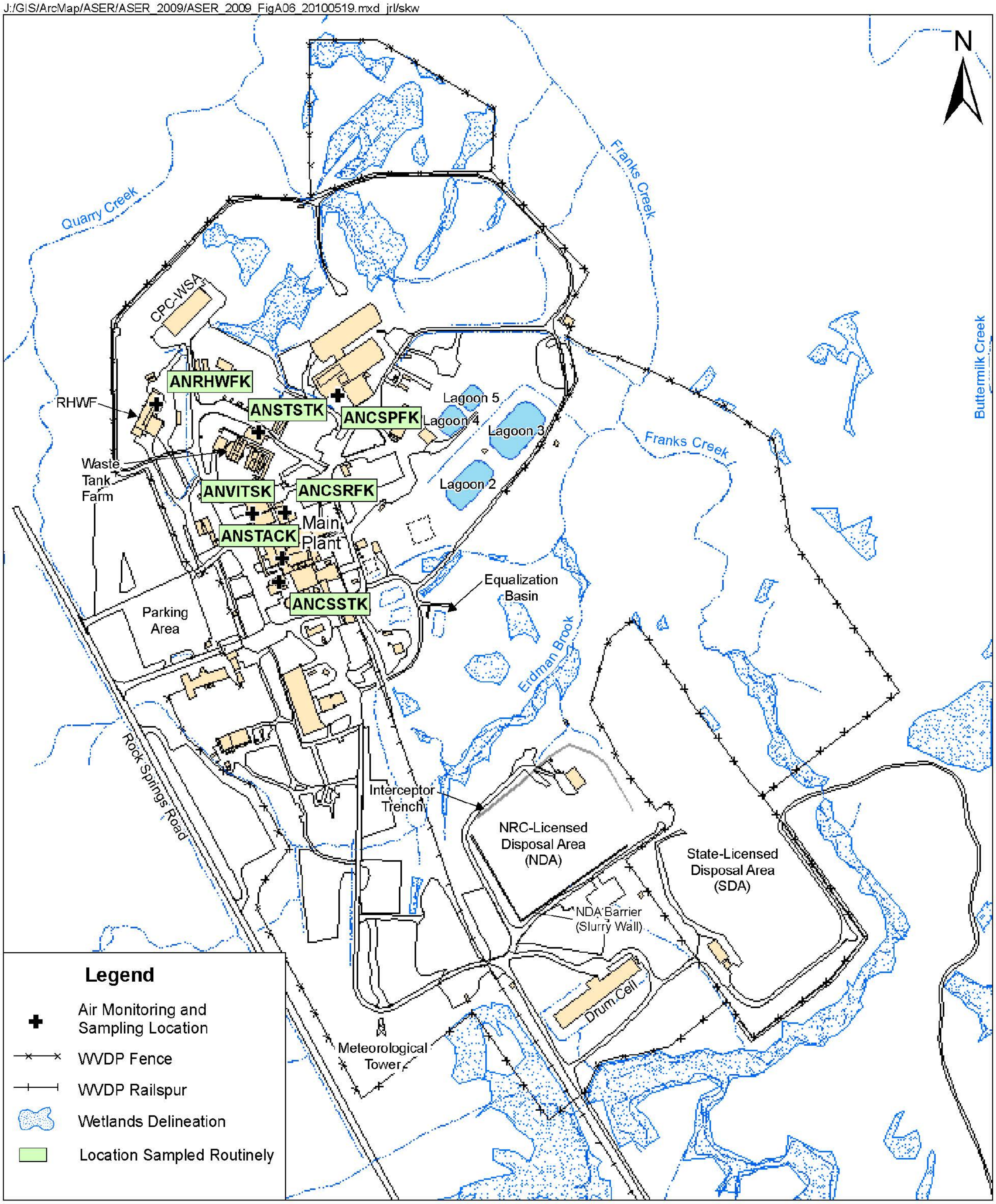

FIGURE A-7
North Plateau Groundwater Monitoring Network
(Includes Wells Used for Water-Level Measurements)

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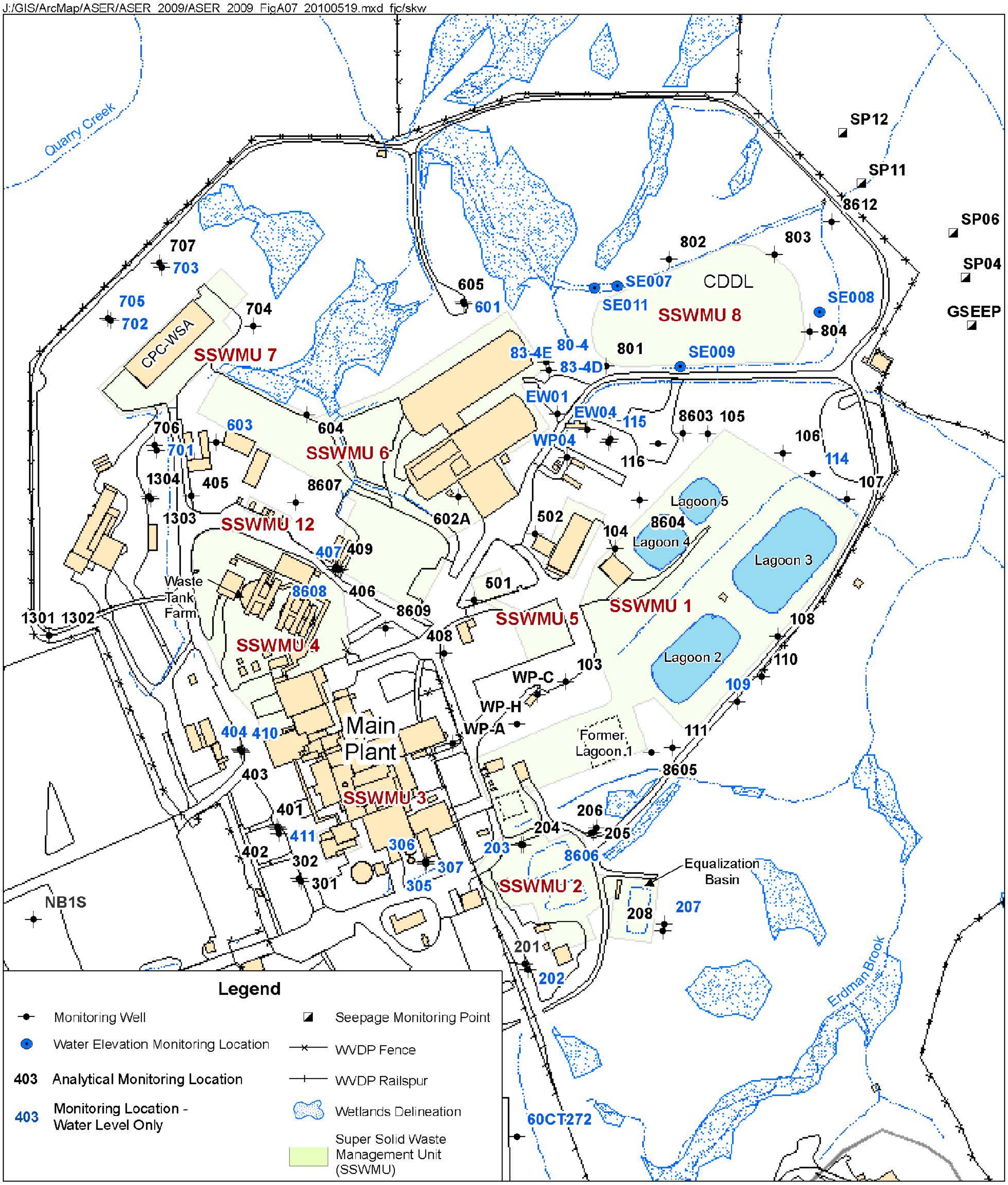

FIGURE A-8
South Plateau Groundwater Monitoring Network (Includes Wells Used for Water-Level Measurements)

J:/GIS/ArcMap/ASER/ASER_2009/ASER_2009_FigA08_20100519.mxd FJC/skw

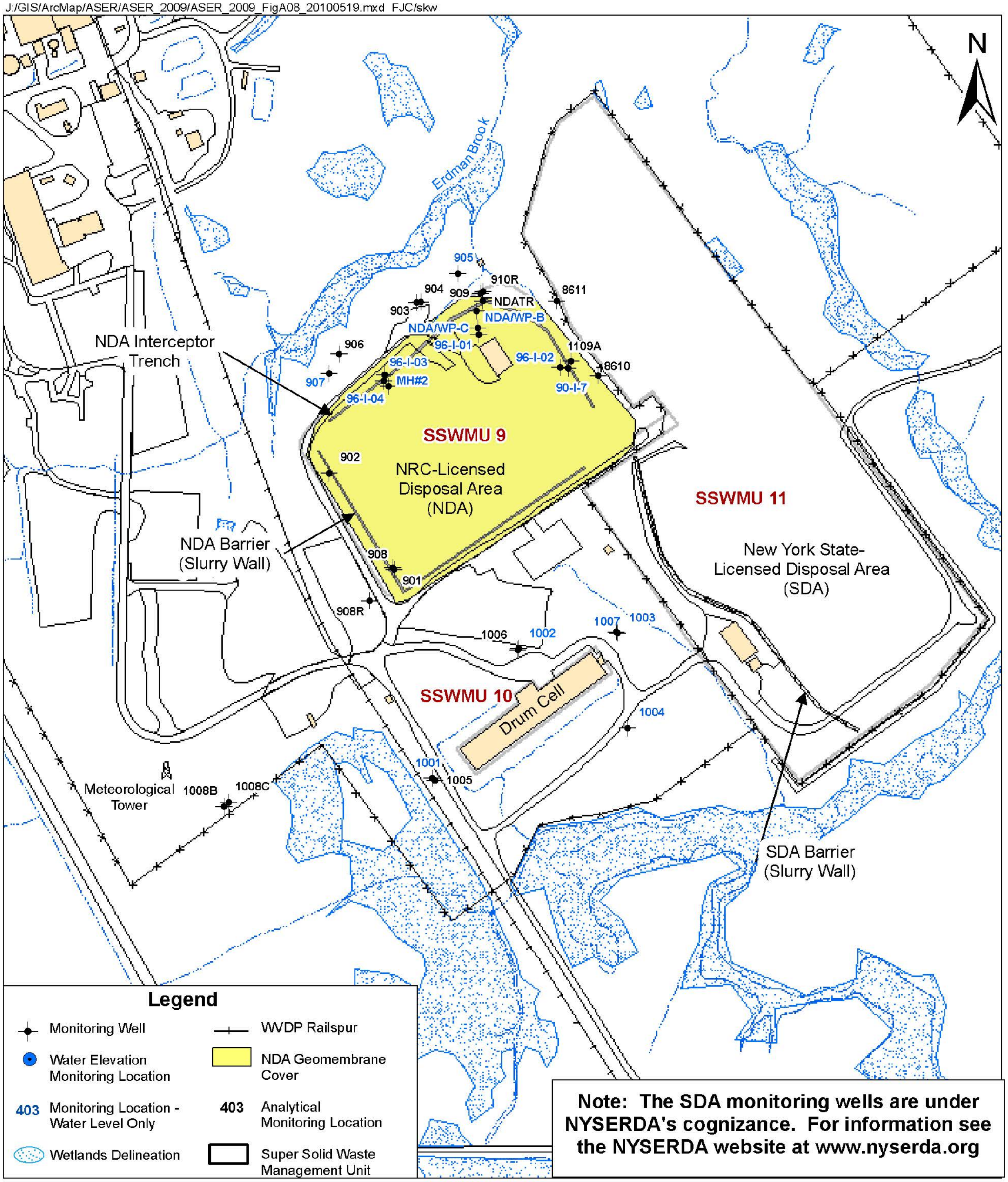

FIGURE A-9
Biological Sampling Locations

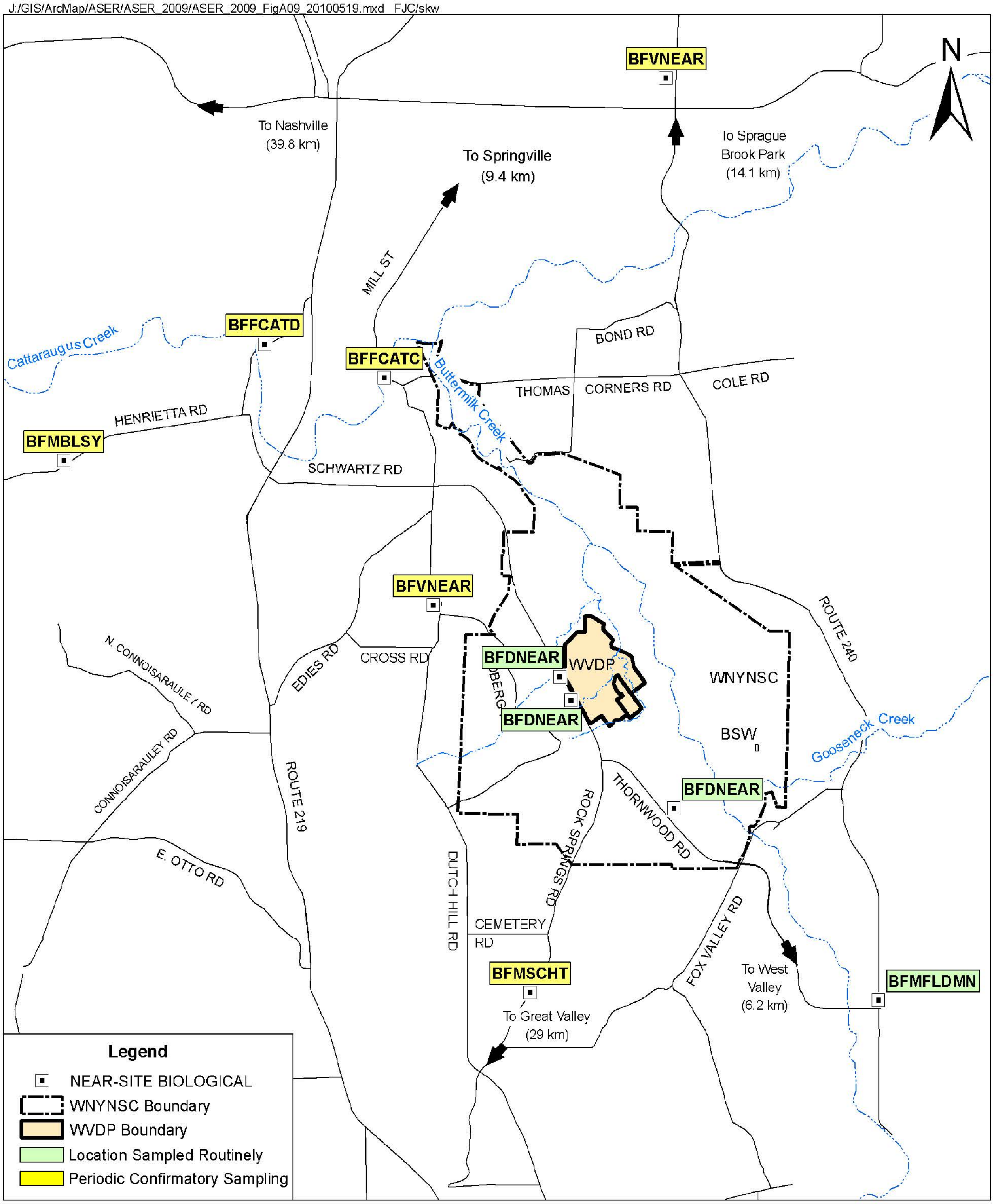

FIGURE A-10
Location of On-Site Thermoluminescent Dosimeters (TLDs)

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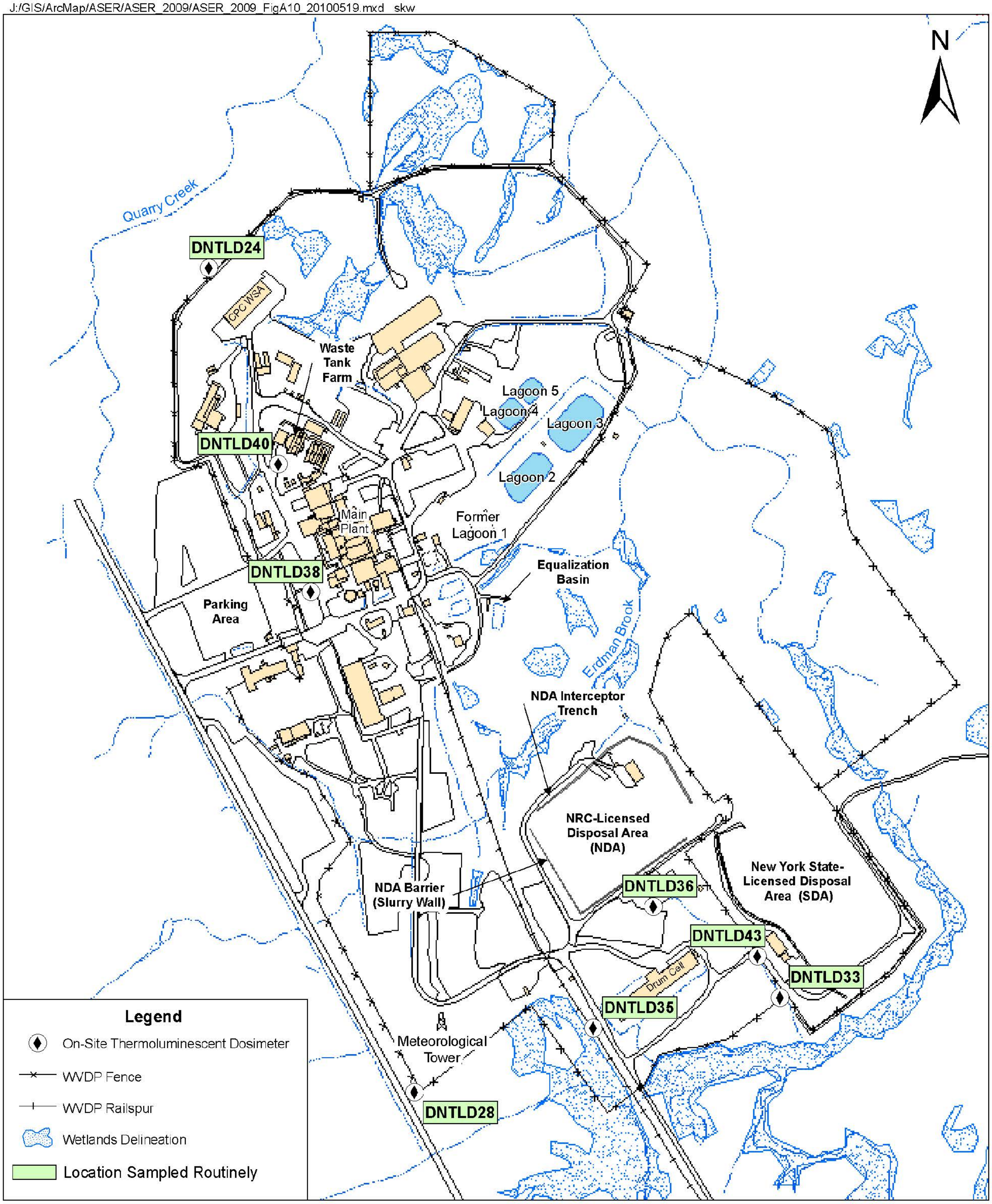

FIGURE A-11
Location of Off-Site Thermoluminescent Dosimeters (TLDs)

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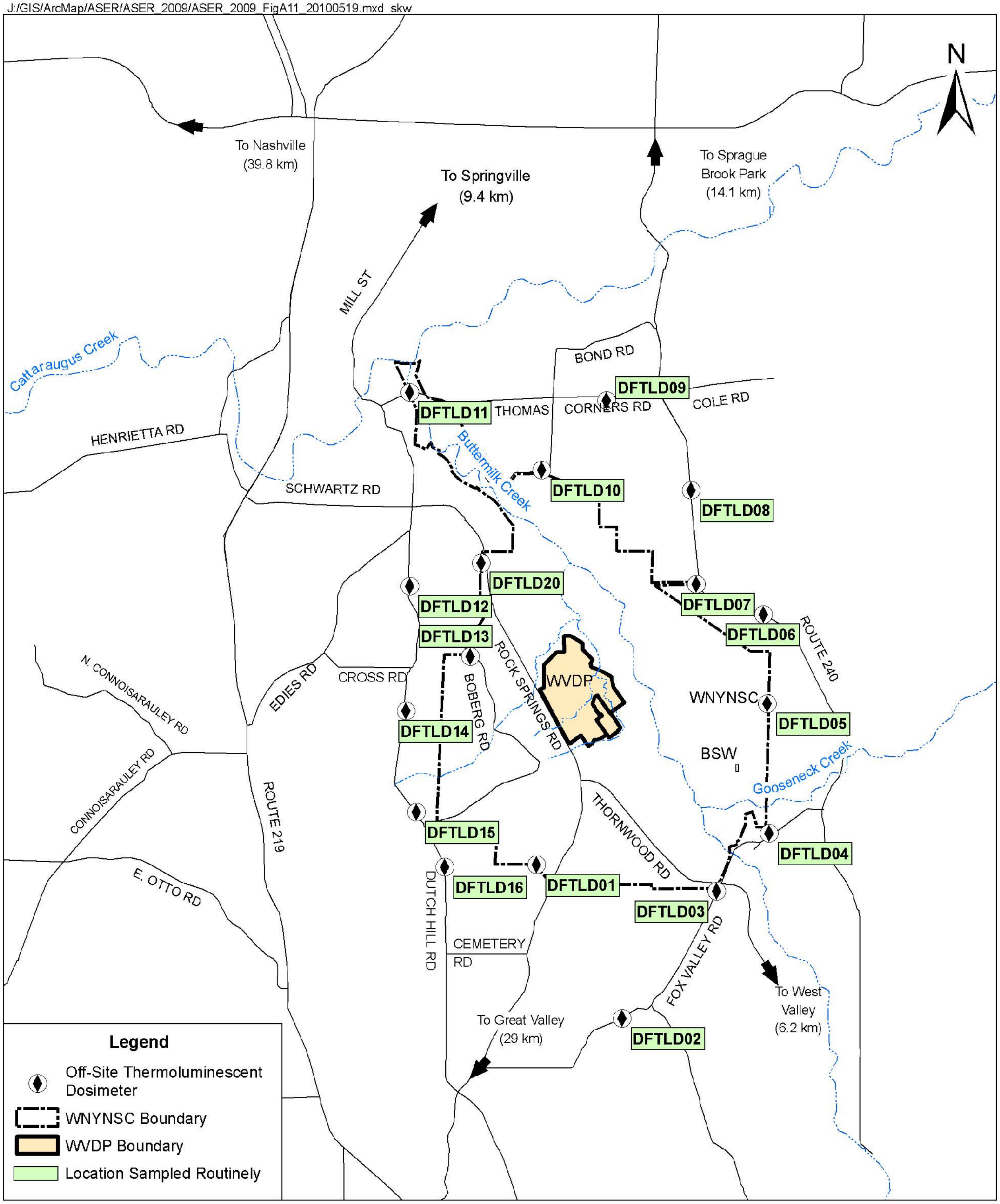


FIGURE A-12
Environmental Sampling Locations More Than 5 Kilometers From the WVDP

J:/GIS/ArcMap/ASER/ASER_2009/ASER_2009_FigA12_20100519.mxd skw

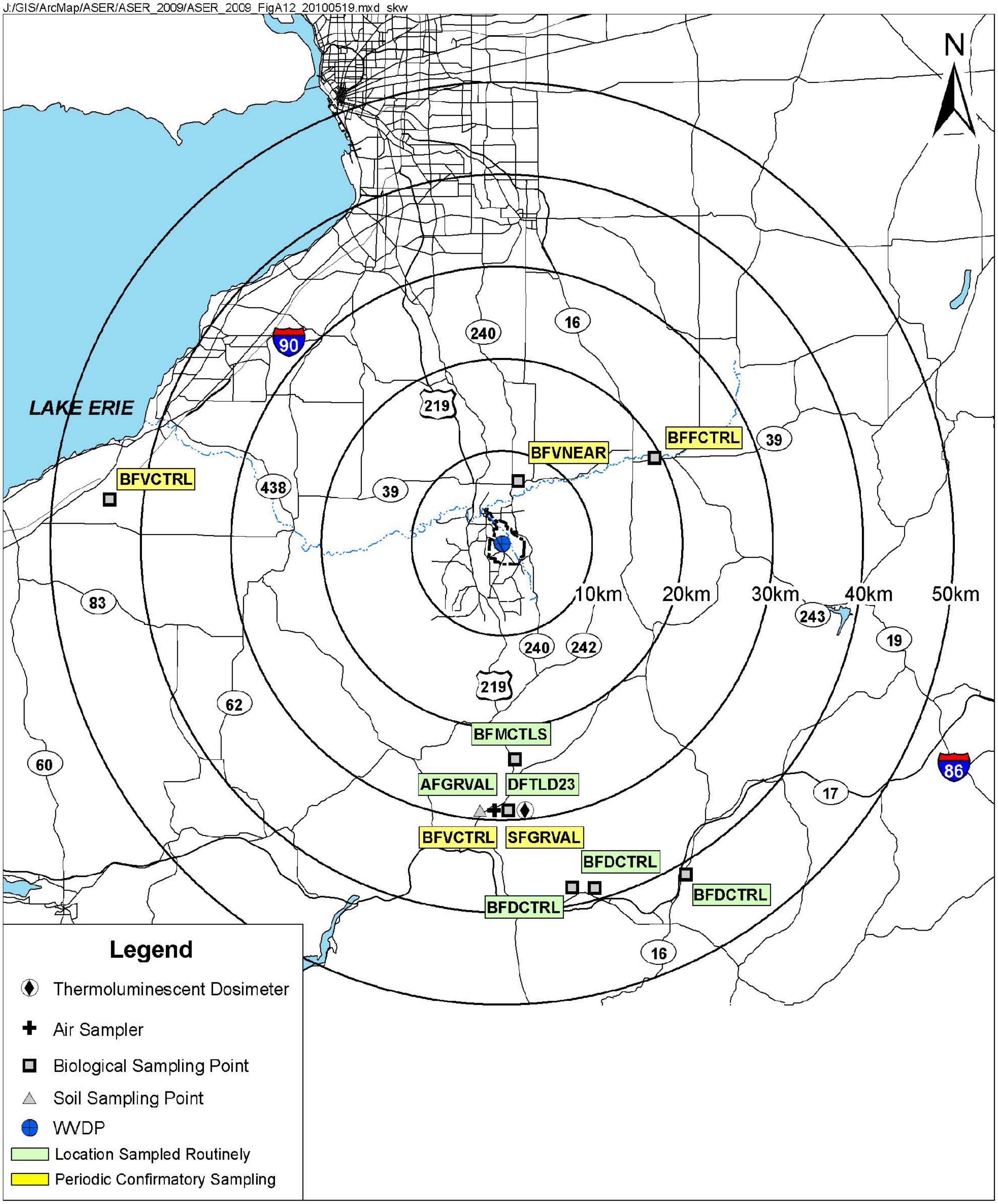
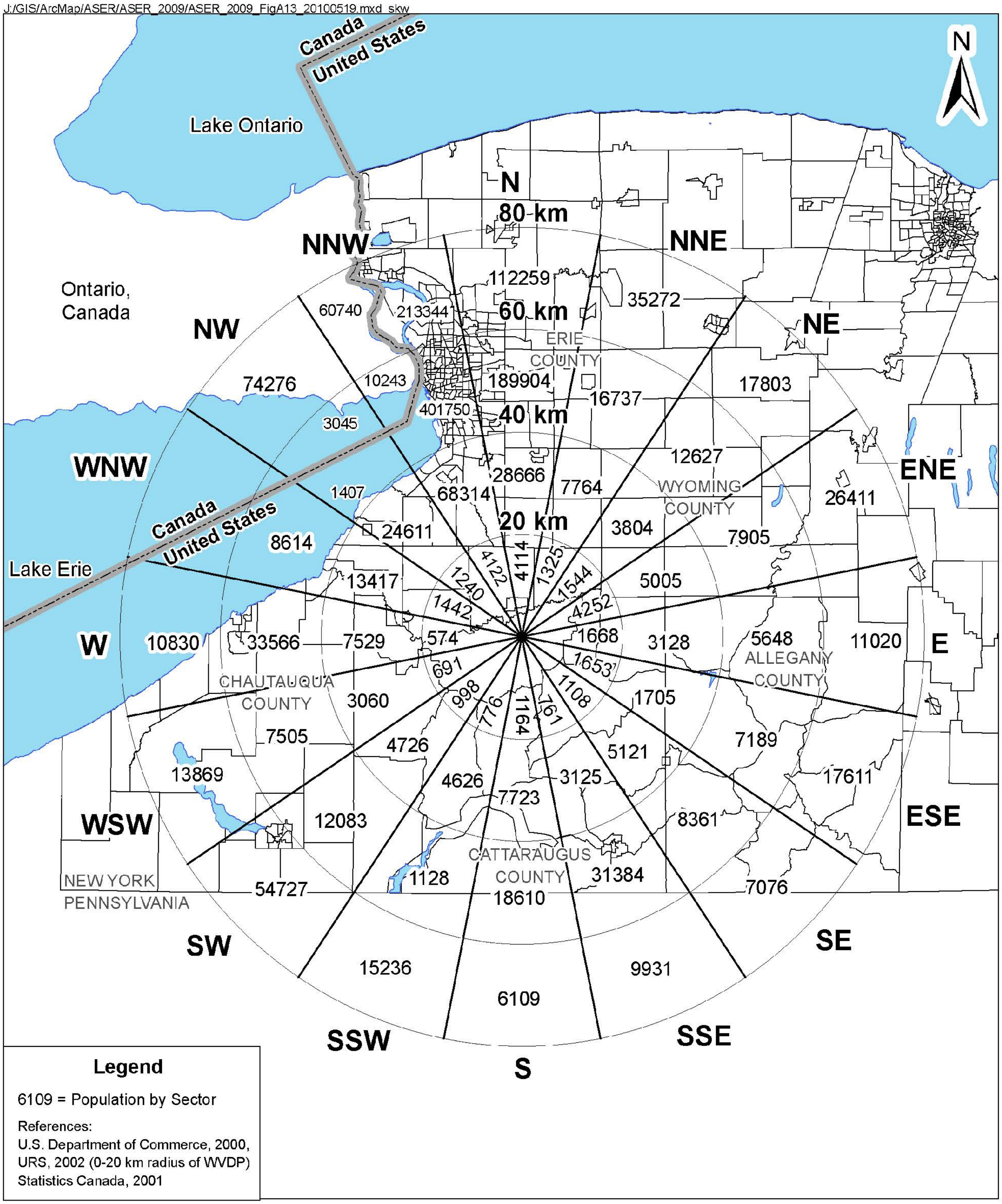


FIGURE A-13
Population by Sector Within 80 Kilometers of the WVDP (2002 Estimate)



USEFUL INFORMATION

This section provides background information that may be useful to the reader in understanding and interpreting the results presented in this Annual Site Environmental Report (ASER). First, it presents brief summaries of concepts pertaining to radiation and radioactivity, including:

- radioactive decay;
- types of ionizing radiation;
- measurement of radioactivity;
- measurement of dose;
- background radiation; and
- potential health effects of radiation.

It describes how data are presented in the ASER, and presents tables of unit prefixes, units of measure, and conversion factors. It discusses limits applicable to air emissions and water effluents, and describes (and presents a table of) the dose-based United States (U.S.) Department of Energy (DOE) derived concentration guides (DCGs). It includes a discussion of CAP88-PC, the computer code used to evaluate compliance with the air dose standard. It also presents discussions of 1) water quality classifications, standards, and limits for ambient water; 2) potable water standards; 3) soil and sediment guidelines; and 4) evaluation of monitoring data with respect to limits.

Radiation and Radioactivity

Radioactivity is a property of atoms with unstable nuclei. The unstable nuclei spontaneously decay by emitting radiation in the form of energy (such as gamma rays) or particles (such as alpha and beta particles) (see inset on following page). If the emitted energy or particle has enough energy to break a chemical bond or to knock an electron loose from another atom, a charged particle (an "ion") may be created. This radiation is known as "ionizing radiation."

As used in this ASER, the term "radiation" refers only to ionizing radiation and does not include nonionizing forms of radiation such as visible light, radio waves, microwaves, infrared light, or ultraviolet light.

Radioactive Decay

An atom is the smallest particle of an element. It cannot be broken down by chemical means. An atom consists of a central core (the *nucleus*), composed of positively charged particles (*protons*) and particles with no charge (*neutrons*), surrounded by negatively charged particles (*electrons*) that revolve in orbits in the region surrounding the nucleus. The protons and neutrons are much more massive than the electrons, therefore most of an atom's mass is in the nucleus.

An element is defined by the number of protons in its nucleus, its atomic number. For example, the atomic number of hydrogen is one (one proton), the atomic number of strontium is 38 (38 protons), and the atomic number of cesium is 55 (55 protons).

The mass number of an atom, its *atomic weight*, is equal to the total number of protons and neutrons in its nucleus. For example, although an atom of hydrogen will always have one proton in its nucleus, the number of neutrons may vary. Hydrogen atoms with zero, one, or two neutrons will have atomic weights of one, two, or three, respectively. These atoms are known as *isotopes* (or *nuclides*) of the element hydrogen. Elements may have many isotopes. For instance, the elements strontium and cesium have more than 30 isotopes each.

Isotopes may be stable or unstable. An atom from an unstable isotope will spontaneously change to another atom. The process by which this change occurs, that is, the spontaneous emission from the nucleus of alpha or beta particles, often accompanied by gamma radiation, is known as *radioactive decay*. Depending upon the type of radioactive decay,

Note: Much of the background information in this section was taken from The Handbook of Health Physics and Radiological Health (Shleien, 1998), from the Environmental Protection Agency website (www.epa.gov/radiation/understand), and from The Health Physics Society website (http://hps.org/publicinformation).

Some Types of Ionizing Radiation

Alpha Particles. An alpha particle is a positively charged particle consisting of two protons and two neutrons. Compared to beta particles, alpha particles are relatively large and heavy and do not travel very far when ejected by a decaying nucleus. Therefore, alpha radiation is easily stopped by a few centimeters of air or a thin layer of material, such as paper or skin. However, if radioactive material is ingested or inhaled, the alpha particles released inside the body can damage soft internal tissues because their energy can be absorbed by tissue cells in the immediate vicinity of the decay. An example of an alpha-emitting radionuclide is the uranium isotope with an atomic weight of 232 (uranium-232). Uranium-232 was in the high-level waste (HLW) mixture at the West Valley Demonstration Project (WVDP) as a result of a thorium-based nuclear fuel reprocessing campaign conducted by Nuclear Fuel Services, Inc. Uranium-232 has been detected in liquid waste streams.

Beta Particles. A beta particle is an electron emitted during the breakdown of a neutron in a radioactive nucleus. Compared to alpha particles, beta particles are smaller, have less of a charge, travel at a higher speed (close to the speed of light), and can be stopped by wood or a thin sheet of aluminum. If released inside the body, beta particles do much less damage than an equal number of alpha particles because beta particles deposit energy in tissue cells over a larger volume than alpha particles. Strontium-90, a fission product found in the liquids associated with the HLW, is an example of a beta-emitting radionuclide.

Gamma Rays. Gamma rays are high-energy "packets" of electromagnetic radiation, called photons, that are emitted from the nucleus. Gamma rays are similar to x-rays, but are generally more energetic. If an alpha or beta particle released by a decaying nucleus does not carry off all the energy generated by the nuclear disintegration, the excess energy may be emitted as gamma rays. If the released energy is high, a very penetrating gamma ray is produced that can be effectively reduced only by shielding consisting of several inches of a dense material, such as lead, or of water or concrete several feet thick. Although large amounts of gamma radiation are dangerous, gamma rays are also used in lifesaving medical procedures. An example of a gamma-emitting radionuclide is barium-137m, a short-lived daughter product of cesium-137. Both barium-137m and its precursor, cesium-137, are major constituents of the West Valley Demonstration Project HLW.

an atom may be transformed to another isotope of the same element or, if the number of protons in the nucleus has changed, to an isotope of another element.

Isotopes (nuclides) that undergo radioactive decay are called *radioactive* and are known as *radioisotopes* or *radionuclides*. Radionuclides are customarily referred to by their atomic weights. For instance, the radionuclides of hydrogen, strontium, and cesium measured at the WVDP are hydrogen-3 (also known as tritium), strontium-90, and cesium-137. For some radionuclides, such as cesium-137, a short-lived intermediate is formed that decays by gamma emission. This intermediate radionuclide may be designated by the letter "m" (for metastable) following the atomic weight. For cesium-137, the intermediate radionuclide is barium-137m, with a half-life of less than three minutes.

The process of radioactive decay will continue until only a stable, nonradioactive isotope remains. Depending on the radionuclide, this process can take anywhere from less than a second to billions of years. The time required for half of the radioactivity to decay is called the radionuclide's *half-life*. Each radionuclide has a unique half-life. The half-life of hydrogen-3 is slightly more than 12 years, both strontium-90 and cesium-137 have half-lives of approximately 30 years, and plutonium-239 has a half-life of more than 24,000 years.

Knowledge of radionuclide half-lives is often used to estimate past and future inventories of radioactive material. For example, a 1.0 millicurie source of cesium-137 in 2006 would have measured 2.0 millicuries in 1976 and will be 0.5 millicuries in 2036. For a list of half-lives of radionuclides applicable to the WVDP, see Table UI-4.

Measurement of Radioactivity

As they decay, radionuclides emit one or more types of radiation at characteristic energies that can be measured and used to identify the radionuclide. Detection instruments measure the quantity of radiation emitted over a specified time. From this measurement, the number of decay events (nuclear transformations) over a fixed time can be calculated.

Radioactivity is measured in units of curies (Ci) or becquerels (Bq). One Ci (based on the rate of decay of one gram of radium-226) is defined as the "quantity of any radionuclide that undergoes an average transformation rate of 37 billion transformations per second." In the International System of Units (SI), one Bq is equal to one transformation per second. In this ASER, radioactivity is customarily expressed in units of Ci followed by the equivalent SI unit in parentheses, as follows: 1 Ci (3.7E+10 Bq).

In this report, measurements of radioactivity in a defined volume of an environmental media, such as air or water, are presented in units of concentration. Since levels of radioactivity in the environment are typically very low, concentrations may be expressed in microcuries per milliliter, with SI units (becquerels per liter) in parentheses, as follows: 1.00E-06 µCi/mL (3.7E+01 Bq/L). (One microcurie is equal to one millionth of a curie.)

Measurement of Dose

The amount of energy absorbed by a material that receives radiation is measured in rads. A rad is 100 ergs of radiation energy absorbed per gram of material. (An erg is the approximate amount of energy necessary to lift a mosquito one-sixteenth of an inch.) "Dose" is a means of expressing the amount of energy absorbed, taking into account the effects of different kinds of radiation.

Alpha, beta, and gamma radiation affect the body to different degrees. Each type of radiation is given a quality factor that indicates the extent of human cell damage it can cause compared with equal amounts of other ionizing radiation energy. Alpha particles cause 20 times as much damage to internal tissues as x-rays, so alpha radiation has a quality factor of 20, compared to gamma rays, x-rays, or beta particles, each of which have a quality factor of one.

The unit of dose measurement to humans is the *rem*. The number of rem is equal to the number of rads multiplied by the quality factor for each type of radiation. In the SI system, dose is expressed in sieverts. One sievert (Sv) equals 100 rem. One rem equals 1,000 millirem (mrem), the unit used to express standards for dose to man from air and water sources, as applicable to this ASER. This ASER expresses dose in standard units, followed by equivalent SI units in parentheses, as follows: 1 mrem (0.01 mSv).

Background Radiation

Background radiation is always present, and everyone is constantly exposed to low levels of such radiation from both naturally occurring and man-made sources. In the United States the average total annual exposure to low-level background radiation is estimated to be about 620 mrem or 6.2 millisieverts (mSv). About one-half of this radiation, approximately 310 mrem (3.1 mSv), comes from natural sources. The other half (about 310 mrem [3.1 mSv]) comes from medical procedures, consumer products, and other man-made sources (National Council on Radiation Protection and Measurements Report Number 160, 2009). (See Figure 3-1 in Chapter 3.)

Background radiation includes cosmic rays; the decay of natural elements, such as potassium, uranium, thorium, and radon; and radiation from sources such as chemical fertilizers, smoke detectors, and cigarettes. Actual doses vary depending on such factors as geographic location, building ventilation, and personal health and habits.

Potential Health Effects of Radiation

The three primary pathways by which people may be exposed to radiation are (1) direct exposure, (2) inhalation, and (3) ingestion. Exposure from radiation may be from a source outside the body (external exposure) or from radioactive particles that have been taken in by breathing or eating and have become lodged inside the body (internal exposure). Radionuclides that are taken in are not distributed in the same way throughout the body. Radionuclides of strontium, plutonium, and americium concentrate in the skeleton, while radioisotopes of iodine concentrate in the thyroid. Radionuclides such as hydrogen-3 (tritium), carbon-14, or cesium-137, however, will be distributed uniformly throughout the body.

Living tissue in the human body can be damaged by ionizing radiation. The severity of the damage depends upon several factors, among them the amount of exposure (low or high), the duration of the exposure (long-term [*chronic*] or short-term [*acute*]), the type of radiation (alpha, beta, and gamma radiations of various energies), and the sensitivity of the human (or organ) receiving the radiation. The human body has mechanisms that repair damage from exposure to radiation; however, repair processes are not always successful.

Biological effects of exposure to radiation may be either somatic or genetic. *Somatic* effects are limited to the exposed individual. For example, a sufficiently high exposure could cause clouding of the lens of the eye or a decrease in the number of white blood cells. *Genetic* effects may show up in future generations. Radiation could damage chromosomes, causing them to break or join incorrectly with other chromosomes. Radiation-produced genetic defects and mutations in the offspring of an exposed parent, while not positively identified in humans, have been observed in some animal studies.

Assessing the biological damage from low-level radiation is difficult because other factors can cause the same symptoms as radiation exposure. Moreover, the body is able to repair damage caused by low-level radiation. Epidemiological studies have not demonstrated adverse health effects in individuals exposed to small doses (less than 10 rem) over a period of years. (For comparison, note that average natural background radiation in the United States is about 0.31 rem/year, and estimated annual dose from activities at the WVDP in 2009 was calculated to be about 0.000076 rem/year [0.076 mrem/year].)

The effect most often associated with exposure to relatively high levels of radiation appears to be an increased risk of cancer. However, scientists have not been able to demonstrate with certainty that exposure to low-level radiation causes an increase in injurious biological effects, nor have they been able to determine if there is a level of radiation exposure below which there are no adverse biological effects.

Data Reporting

In the text of this ASER, radiological units (e.g., rem, rad, curie) are presented first, followed by the International System of Units (SI) equivalent in parentheses. Nonradiological measurements are presented in English units, followed by the metric unit equivalent in parentheses. See Tables UI-1, UI-2, and UI-3 for a summary of unit prefixes, units of measurement, and basic conversion factors used in this ASER.

Where results are very large or very small, scientific notation is used. Numbers greater than 10 are expressed with a positive exponent. To convert the number to its decimal form, the decimal point must be moved to the right by the number of places equal to the exponent. For example, 1.0E+06 would be expressed as 1,000,000 (one million). Numbers smaller than 1 are expressed with a negative exponent. For example, 1.0E-06 would be expressed as 0.000001 (one millionth).

TABLE UI-1
Unit Prefixes Used in This ASER

Multiplication factor			
Scientific notation	**Decimal form**	**Prefix**	**Symbol**
1.0E+06	1000000	mega	M
1.0E+03	1000	kilo	k
1.0E-02	0.01	centi	c
1.0E-03	0.001	milli	m
1.0E-06	0.000001	micro	µ
1.0E-09	0.000000001	nano	n
1.0E-12	0.000000000001	pico	p

Radiological data are reported as a result plus or minus (±) an associated uncertainty, customarily the 95% confidence interval. The uncertainty is in part due to the random nature of radioactive decay. Generally, the relative uncertainty in a measurement increases as the amount of radioactivity being sampled decreases. For this reason, low-level environmental analyses for radioactivity are especially prone to significant uncertainty in comparison with the result. Radiological data are presented in the following manner:

Example: 1.04 ± 0.54 E-09

Where:
- 1.04 = the result
- ± 0.54 = plus or minus the associated uncertainty
- E-09 = times 10 raised to the power -09

Sources of uncertainty may include random components (e.g., radiological counting statistics) or systematic components (e.g., sample collection and handling, measurement sensitivity, or bias). Radiological data in this report include both a result and uncertainty term. The uncertainty term represents only the uncertainty associated with the analytical measurement which for environmental samples is largely due to the random nature of radioactive decay. When such radiological data are used in calculations, such as estimating the total curies released from an air or water effluent point, the other param-

TABLE UI-2
Units of Measure Used in This ASER

Type	Measurement	Symbol	Type	Measurement	Symbol
Length	meter	m	**Dose**	rad (absorbed dose)	rad
	centimeter	cm		rem (dose equivalent)	rem
	kilometer	km		millirem	mrem
	inch	in		sievert	Sv
	foot	ft		millisievert	mSv
	mile	mi		gray	Gy
Volume	gallon	gal	**Exposure**	roentgen	R
	liter	L		milliroentgen	mR
	milliliter	mL		microroentgen	µR
	cubic meter	m^3	**Concentration**	parts per million	ppm
	cubic feet	ft^3		parts per billion	ppb
Area	acre	ac		parts per trillion	ppt
	hectare	ha		milligrams per L (ppm)	mg/L
	square meter	m^2		micrograms per L (ppb)	µg/L
	square foot	ft^2		nanograms per L (ppt)	ng/L
Temperature	degrees Fahrenheit	^oF		milligrams per kg (ppm)	mg/kg
	degrees Celsius	^oC		micrograms per g (ppm)	µg/g
Mass	gram	g		micrograms per mL (ppm)	µg/mL
	kilogram	kg		milliliters per mL	mL/L
	milligram	mg		microcuries per mL	µCi/mL
	microgram	µg		picocuries per L	pCi/L
	nanogram	ng		microcuries per g	µCi/g
	pound	lb		becquerels per L	Bq/L
	tonne (metric ton)	t		nephelometric turbidity units	NTU
	ton, short	T		standard units (pH)	SU
Radoactivity	curie	Ci	**Flow rate**	gallons per day	gpd
	millicurie	mCi		million gallons per day	mgd
	microcurie	µCi		cubic feet per minute	cfm
	nanocurie	nCi		liters per minute	lpm
	picocurie	pCi		meters per second	m/sec
	becquerel	Bq			

TABLE UI-3
Conversion Factors Used in This ASER

To convert from	to	Multiply by
miles	kilometers	1.609344
feet	meters	0.3048
inches	centimeters	2.54
acres	hectares	0.4046873
pounds	kilograms	0.45359237
gallons	liters	3.785412
curies	becquerels	3.7E+10
rad	gray	0.01
rem	sievert	0.01

Note: To convert from the units in column two to the units in column one, divide by the conversion factor.

eter used in the calculation (e.g., air volumes, water volumes), typically do not have an associated uncertainty value available. As such, the uncertainties in this report for such calculated values only reflect the uncertainty associated with the radiological results used in the calculation. The actual (total propagated) uncertainty of such values would be larger if other components of uncertainty were available and included in these estimates.

Radiological results are calculated using both sample counts and background counts. If the background count is greater than the sample count, a negative result term will be reported. The constituent is considered to be detected if the result is larger than the associated uncertainty (i.e., a "positive" detection). Nonradiological data are not reported with an associated uncertainty.

In general, the detection limit is the minimum amount of a constituent that can be detected, or distinguished from background, by an instrument or a measurement technique. If a result is preceded by the symbol "<" (i.e., <5 ppm), the constituent was not measurable below the detection limit (in this example, 5 ppm).

The number of significant digits reported depends on the precision of the measurement technique. Integer counts are reported without rounding. Calculated values are customarily reported to three significant figures. Dose estimates are usually reported to two significant figures. All calculations are completed before values are rounded.

Limits Applicable to Environmental Media

Dose Standards. The two dose standards against which releases at the WVDP are assessed are those established by the U.S. Environmental Protection Agency (EPA) for air emissions and that established by the DOE regarding all exposure modes from DOE activities.

Radiological air emissions other than radon from DOE facilities are regulated by the EPA under the National Emission Standards for Hazardous Air Pollut-

CAP88-PC Computer Code

The WVDP ASER summarizes the airborne radioactivity released (see Appendix C) and the effect from those releases (Chapter 3). The computer code Clean Air Act Assessment Package-1988 for personal computers (CAP88-PC), Version 2.0, approved in October 1999, is used to perform radiation dose and risk calculations from WVDP airborne releases.

Version 3.0 of CAP88-PC (Trinity Engineering Associates, Inc., March 2006, with updates in November 2006, and March, October, and December of 2007) was approved by the EPA for use in February 2006 to demonstrate compliance with the 10-mrem/year NESHAP standard. Version 3.0 incorporates updated scientific methods to calculate radiation dose and risk. Version 3.0 also considers age and gender factors not considered in Version 2.0. Both versions use weighting factors that consider the sensitivity of various human organs to radiation. The models also calculate how long radioactive material will remain in a particular organ or system. Together, these factors are used to calculate dose and risk. Version 2.0 uses seven different organs and Version 3.0 uses 23. The risk of getting cancer from radiation exposure is calculated for 15 sites in Version 3.0 versus 10 in Version 2.0.

Upon initial and follow-up evaluation of code releases through December 2007, issues were encountered in running this new software code. At this juncture, the EPA accepts the use of any of the three approved versions of CAP88 for compliance purposes. After final evaluation (post-revision) at the WVDP, this updated (Version 3.0) code, or an appropriate approved alternative, will be used in the future at the WVDP, as recommended in the Federal Register notice.

The net effect is that dose and risk estimates summarized in the ASER from using CAP88-PC Version 2.0 and Version 3.0 are slightly different, even if the radioactivity released from WVDP and meteorology both remain constant. However, test calculations with both versions have resulted in estimated doses far below the compliance limit.

ants (NESHAP) regulation (40 Code of Federal Regulation [CFR] 61, Subpart H), which establishes a standard of 10 mrem/year effective dose equivalent to any member of the public. See “CAP88-PC Computer Code” in inset.

DOE Order 5400.5 sets the DOE primary standard of 100 mrem/year effective dose equivalent to members of the public considering all exposure modes from DOE activities. (Currently there are no EPA standards establishing limits on the radiation dose to members of the public from liquid effluents.)

Note that the EPA establishes a drinking water limit of 4-mrem/year (0.04-mSv/year) (40 CFR Parts 141 and 143, Drinking Water Guidelines). Corollary limits for community water supplies are set by the New York State Department of Health (NYSDOH) in the New York State Sanitary Code (Title 10 of the Official Compilation of Codes, Rules, and Regulations of the State of New York [NYCRR] 5-152). These limits are not applicable at the WVDP because no drinking water sources within the Cattaraugus Creek drainage basin are affected by the WVDP.

Derived Concentration Guides (DCGs). A DCG is defined as the concentration of a radionuclide in air or water that, under conditions of continuous exposure by one exposure mode (i.e., ingestion of water, immersion in air, or inhalation) for one year, would result in an effective dose equivalent of 100 mrem (1 mSv) to a "reference man" (DOE Order 5400.5). DCGs are applicable only at locations where members of the public could be exposed to air or water containing contaminants. DCGs for radionuclides measured at the WVDP are listed in Table UI-4. At the WVDP, DCGs are used as a screening tool for evaluating liquid effluents and airborne emissions. (DCGs are not used to estimate dose.)

State Pollutant Discharge Elimination System (SPDES) Permit Requirements. The site's SPDES permit defines points where sampling must be conducted, sampling frequency, the type of samples to be collected, constituents for which samples must be analyzed, and the limits applicable to these constituents. Results are reported monthly to the New York State Department of Environmental Conservation in a Discharge Monitoring Report. Requirements of the current permit are summarized in Appendix B-1.

Water Quality Classifications, Standards, and Limits for Ambient Water. The objective of the Clean Water Act of 1972 (CWA) is to restore and maintain the integrity of the nation's waters and ensure that, wherever attainable, waters be made useful for fishing and swimming. To achieve this goal, New York State is delegated with authority under Sections 118, 303, and 510 of the CWA to (1) classify and designate the best uses for receiving waters, such as streams and rivers, within its jurisdiction, and (2) establish and assign water quality standards — goals for achieving the designated best uses for these classified waters.

In addition to achieving CWA goals for fishing and swimming, New York has further classified its jurisdictional waters and established ambient water standards, guidelines, and maximum contaminant levels (MCLs) to achieve objectives under the Safe Drinking Water Act for drinking water. These standards serve as the basis for periodic evaluation of the integrity of the receiving waters and identification of needed controls.

The definitions for best usage classification of New York's jurisdictional waters and the water quality standard goals for these classifications are provided in 6 NYCRR Parts 701–704. Mapping of the Cattaraugus Creek drainage basin and assignment of best usage designations and classification to each receiving water segment within this drainage basin are described in 6 NYCRR Part 838.

According to these regulations, Franks Creek, Quarry Creek, and segments of Buttermilk Creek under the influence of water effluents from the WVDP are identified as Class "C" receiving waters with a minimum designated best usage for fishing with conditions suitable for fish propagation and survival.

Cattaraugus Creek, in the immediate downstream vicinity of the Western New York Nuclear Service Center (WNYNSC), is identified as a Class "B" receiving water with best designated usages for swimming and fishing. All fresh (nonsaline) groundwaters within New York are assigned a "GA" classification with a designated best usage as a potable water supply source.

Refer to Appendix B for a summary of the water quality standards, guidelines, and MCLs assigned to these water classifications for those constituents that are included in the WVDP environmental monitoring program for ambient water.

Potable Water Standards. Standards for drinking water are established by the EPA and by NYSDOH. These standards are expressed as MCLs or maximum contaminant level goals. See Appendix B-1 for a summary of these levels.

Soil and Sediment Concentration Guidelines. Contaminants in soil are potential sources for contamination of groundwater, surface water, ambient air, and plants and animals. No routine soil or sediment samples were collected in 2009, therefore, no soil or sediment data were available for comparison with applicable guidelines (e.g., from the Nuclear Regulatory Commission [NRC], the EPA, and NYSDEC). Therefore, the guideline levels that were presented in the 2008 ASER have not been included in the 2009 ASER. The routine soil and sediment sampling is next scheduled for 2012.

Evaluation of Monitoring Data with Respect to Limits

Monitoring data for this report were evaluated against the limits presented in Table UI-4, and Appendices B and D. Those locations with results exceeding the limits are listed in Chapter 2, Table 2-4, and in Chapter 4, Table 4-10.

TABLE UI-4
U.S. Department of Energy Derived Concentration Guides (DCGs)[a] for Inhaled Air or Ingested Water (µCi/mL)

Radionuclide	Half-life (years)[b]	DCG in Air	DCG in Water
Gross Alpha (as Am-241)[c]	NA	2E-14	3E-08
Gross Beta (as Sr-90)[c]	NA	9E-12	1E-06
Tritium (H-3)	1.23E+01	1E-07	2E-03
Carbon-14 (C-14)	5.70E+03	6E-09	7E-05
Potassium-40 (K-40)	1.25E+09	9E-10	7E-06
Cobalt-60 (Co-60)	5.27E+00	8E-11	5E-06
Strontium-90 (Sr-90)	2.89E+01	9E-12	1E-06
Technetium-99 (Tc-99)	2.11E+05	2E-09	1E-04
Iodine-129 (I-129)	1.57E+07	7E-11	5E-07
Cesium-137 (Cs-137)	3.00E+01	4E-10	3E-06
Europium-154 (Eu-154)	8.59E+00	5E-11	2E-05
Uranium-232 (U-232)	6.89E+01	2E-14	1E-07
Uranium-233 (U-233)	1.59E+05	9E-14	5E-07
Uranium-234 (U-234)	2.46E+05	9E-14	5E-07
Uranium-235 (U-235)	7.04E+08	1E-13	6E-07
Uranium-236 (U-236)	2.34E+07	1E-13	5E-07
Uranium-238 (U-238)	4.47E+09	1E-13	6E-07
Plutonium-238 (Pu-238)	8.77E+01	3E-14	4E-08
Plutonium-239 (Pu-239)	2.41E+04	2E-14	3E-08
Plutonium-240 (Pu-240)	6.56E+03	2E-14	3E-08
Americium-241 (Am-241)	4.32E+02	2E-14	3E-08

[a] DCGs are established in DOE Order 5400.5 and are defined as the concentration of a radionuclide that, under conditions of continuous exposure for one year by one exposure mode, would result in an effective dose equivalent of 100 mrem (1 mSv).

[b] Nuclear Wallet Cards. April 2005. National Nuclear Data Center. Brookhaven National Laboratory. Upton, New York.

[c] Because there are no DCGs for gross alpha and gross beta concentrations, the DCGs for the most restrictive alpha and beta emitters at the WVDP (americium-241 and strontium-90, respectively) are used as a conservative basis for comparison at locations for which there are no radionuclide-specific data, in which case a more appropriate DCG may be applied.

GLOSSARY

A

accuracy - The degree of agreement between a measurement and its true value. The accuracy of a data set is assessed by evaluating results from standards or sample spikes containing known quantities of an analyte.

action plan - An action plan addresses assessment findings and root causes that have been identified in an audit or an assessment report. It is intended to define specific actions that the responsible group will undertake to remedy deficiencies. The plan includes a timetable and resource requirements for implementation of the planned activities.

aquifer - A water-bearing unit of permeable rock or soil that will yield water in usable quantities via wells. Confined aquifers are bounded above and below by less permeable layers. Groundwater in a confined aquifer may be under a pressure greater than the atmospheric pressure. Unconfined aquifers are bounded below by less permeable material, but are not bounded above. The pressure on the groundwater at the surface of an unconfined aquifer is equal to that of the atmosphere.

aquitard - A low-permeability geologic unit that can store groundwater and can transmit groundwater at a very slow rate.

as low as reasonably achievable (ALARA) - An approach to radiation protection that advocates controlling or managing exposures (both individual and collective) to the work force and the general public and releases of radioactive material to the environment as low as social, technical, economic, practical, and public policy considerations permit. As used in United States Department of Energy (DOE) Order 5400.5, ALARA is not a dose limit but, rather, a process that has as its objective the attainment of dose levels as far below the applicable limits of the Order as practicable.

B

background radiation - Natural and man-made radiation such as: cosmic radiation, radiation from naturally radioactive elements, and radiation from commercial sources and medical procedures.

becquerel (Bq) - A unit of radioactivity equal to one nuclear transformation per second.

C

categorical exclusion (CX) - A proposed action that the DOE has determined does not individually or cumulatively have a significant effect on the human environment. See 10 Code of Federal Regulations (CFR) 1021.410.

Class A, B, and C low-level waste - Waste classifications from the Nuclear Regulatory Commission's 10 CFR Part 61 rule. Maximum concentration limits are set for specific isotopes. Class A waste disposal is minimally restricted with respect to the form of the waste. Class B waste must meet more rigorous requirements to ensure physical stability after disposal. Higher radionuclide concentration limits are set for Class C waste (the most radioactive), which also must meet physical stability requirements. Moreover, special measures must be taken at the disposal facility to protect against inadvertent intrusion.

compliance findings - Conditions that may not satisfy applicable environmental or safety and health regulations, DOE Orders and memoranda, enforcement actions, agreements with regulatory agencies, or permit conditions.

confidence interval - The range of values within which some parameter may be expected to lie with a stated degree of confidence. For example, a value of 10 with an uncertainty of 5 calculated at the 95% confidence level (10±5) indicates there is a 95% probability that the true value of that parameter lies between 5 and 15.

consistency - The condition of showing steady conformity to practices. In the environmental monitoring program, approved procedures are in place so that data collection activities are carried out in a uniform manner to minimize variability.

Core Team - The "core team approach" is a formalized, consensus-based process in which those individuals with decision-making authority, including the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and State remedial project managers, work together to reach agreement on key remediation decisions (DOE/EH-413-9911, October 1999). In August 2006, the DOE-West Valley Demonstration Project (DOE-WVDP) requested that the New York State Department of Health (NYSDOH), the U.S. Nuclear Regulatory Commission (NRC), the EPA (region 2), the New York State Department of Environmental Conservation (NYSDEC), and the New York State Energy Research and Development Authority (NYSERDA) participate in a collaborative process (i.e., Core Team) to resolve technical issues associated with the "Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center" (DEIS). The WVDP Core Team has been participating in this process since then.

cosmic radiation - High-energy subatomic particles from outer space that bombard the earth's atmosphere. Cosmic radiation is part of natural background radiation.

curie (Ci) - A unit of radioactivity equal to 37 billion (3.7×10^{10}) nuclear transformations per second.

D

data set - A group of data (e.g., factual information such as measurements or statistics) used as a basis for reasoning, discussion, or calculation.

decay (radioactive) - Disintegration of the nucleus of an unstable nuclide by spontaneous emission of charged particles and/or photons or by spontaneous fission.

derived concentration guide (DCG) - The concentration of a radionuclide in air and water that, under conditions of continuous human exposure for one year by one exposure mode (i.e., ingestion of water, inhalation, or immersion in a gaseous cloud), would result in an effective dose equivalent of 100 mrem (1 mSv). See Table UI-4 in the "Useful Information" section of this report.

detection limit or level (DL) - This term may also be expressed as "method detection limit" (MDL). The smallest amount of a substance that can be distinguished in a sample by a given measurement procedure at a given confidence level. (See *lower limit of detection*.)

dispersion (airborne) - The process whereby particulates or gases are spread and diluted in air as they move away from a source.

dispersion (groundwater) - The process whereby solutes are spread or mixed as they are transported by groundwater as it moves through the subsurface.

dosimeter - A portable device for measuring the total accumulated exposure to ionizing radiation.

downgradient - The direction of water flow from a reference point to a selected point of interest at a lower elevation than the reference point. (See *gradient.*)

E

effective dose - (See *effective dose equivalent* under *radiation dose*.)

effluent - Any treated or untreated air emission or liquid discharge to the environment.

effluent monitoring - Sampling or measuring specific liquid or gaseous effluent streams for the presence of pollutants to determine compliance with applicable standards, permit requirements, and administrative controls.

environmental assessment (EA) - An evaluation that provides sufficient evidence and analysis for determining whether an environmental impact statement is required or a finding of no significant impact should be issued. See 10 CFR 1021.

environmental impact statement (EIS) - A detailed statement that includes the environmental impact of the proposed action, any adverse environmental effects that cannot be avoided should the proposal be implemented, and alternatives to the proposed action. Detailed information may be found in Section 10 CFR 1021.

environmental management system (EMS) - The systematic application of business management practices to environmental issues, including defining the organizational structure, planning for activities, identifying responsibilities, and defining practices, procedures, processes, and resources.

environmental monitoring - The collection and analysis of samples or the direct measurement of environmental media. Environmental monitoring consists of two major activities: effluent monitoring and environmental surveillance.

environmental surveillance - The collection and analysis of samples or the direct measurement of air, water, soil, foodstuff, and biota in the environs of a facility of interest to determine compliance with applicable standards and to detect trends and environmental pollutant transport.

exposure - The subjection of a target (usually living tissue) to radiation.

F

fallout - The settling to earth of radioactive materials mixed into the earth's atmosphere.

finding - A DOE compliance term. A finding is a statement of fact concerning a condition in the Environmental, Safety, and Health program that was investigated during an appraisal. Findings include best management practice findings, compliance findings, and noteworthy practices. A finding may be a simple statement of proficiency or a description of deficiency (i.e., a variance from procedures or criteria). (See also *self-assessment*.)

fission - The act or process of splitting into parts. A nuclear reaction in which an atomic nucleus splits into fragments (i.e., fission products, usually fragments of comparable mass) with the evolution of approximately 100 million to several hundred million electron volts of energy.

G

gamma isotopic (also *gamma scan*) - An analytical method by which the quantity of several gamma ray-emitting radioactive isotopes may be determined simultaneously. Typical nuclear fuel cycle isotopes determined by this method include, but are not limited to, cobalt-60, zirconium-95, ruthenium-106, silver-110m, antimony-125, cesium-134, cesium-137, and europium-154. Naturally occurring isotopes for which samples may be analyzed are beryllium-7, potassium-40, radium-224, and radium-226.

gradient - Change in value of one variable with respect to another variable, such as a vertical change over a horizontal distance.

groundwater - Subsurface water in the pore spaces and fractures of soil and bedrock units.

H

half-life - The time in which half the atoms of a radionuclide disintegrate into another nuclear form. The half-life may vary from a fraction of a second to billions of years.

hazardous waste - A waste or combination of wastes that because of quantity, concentration, or physical, chemical, or infectious characteristics may: a) cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

high-level waste (HLW) - The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and solid waste derived from the liquid, that contains a combination of transuranic waste and fission products in concentrations sufficient to require permanent isolation. (See also *transuranic waste*.)

hydraulic conductivity - The ratio of flow velocity to driving force for viscous flow under saturated conditions of a specified liquid in a porous medium; the ratio describing the rate at which water can move through a permeable medium.

I

integrated safety management system (ISMS) - The ISMS describes the programs, policies, and procedures used by West Valley Environmental Services LLC (WVES) and the DOE to ensure that WVES establishes a safe workplace for the employees, the public, and the environment. The guiding principles of ISMS are line management responsibility for safety; clear roles and responsibilities; competence commensurate with responsibilities; balanced priorities; identification of safety standards and requirements; hazard controls; and operations authorization.

interim status - The status of any currently existing facility that becomes subject to the requirement to have a Resource Conservation and Recovery Act (RCRA) permit because of a new statutory or regulatory amendment to RCRA.

ion - An atom or group of atoms with an electric charge.

ion exchange - The reversible exchange of ions contained in solution with other ions that are part of the ion-exchange material.

isotope - Different forms of the same chemical element that are distinguished by having the same number of protons but a different number of neutrons in the nucleus. An element can have many isotopes. For example, the three isotopes of hydrogen are protium, deuterium, and tritium, with one, two, and three neutrons in the nucleus, respectively.

K

knickpoint - A term in geomorphology to describe a location in a river or channel where there is a sharp change in channel slope resulting from differential rates of erosion.

L

land disposal restrictions (LDR) - Regulations promulgated by the United States Environmental Protection Agency (EPA) (and by the New York State Department of Environmental Conservation [NYSDEC] in New York State) governing the land disposal of hazardous wastes. The wastes must be treated using the best demonstrated available technology or must meet certain treatment standards before being disposed.

lower limit of detection (LLD) - The lowest limit of a given parameter that an instrument is capable of detecting. A measurement of analytical sensitivity.

low-level waste (LLW) - Radioactive waste not classified as high-level waste, transuranic waste, spent fuel, or uranium mill tailings. (See *Class A, B, and C low-level waste*.)

M

maximally exposed individual (MEI) - On-site (occupational) or off-site (nonoccupational) person that receives the highest dose from a release scenario.

maximally exposed off-site individual (MEOSI) - Member of the general public receiving the highest dose from the effluent release.

mean - The average value of a series of measurements.

metric ton - (See *ton, metric*.)

millirem (mrem) - A unit of radiation dose equivalent that is equal to one one-thousandth of a rem. An individual member of the public can receive up to 100 mrem per year according to DOE standards. This limit does not include the roughly 310 mrem, on average, that people in the U.S. receive annually from natural background radiation.

minimum detectable concentration (MDC) or **method detection limit (MDL) -** Depending on the sample medium, the smallest amount or concentration of a radioactive or nonradioactive analyte that can be reliably detected using a specific analytical method. Calculations of the minimum detectable concentrations are based on the lower limit of detection.

mixed waste (MW) - A waste that is both radioactive and RCRA hazardous.

N

n-Dodecane/tributyl phosphate - An organic solution composed of 30% tributyl phosphate (TBP) dissolved in n-dodecane used to first separate the uranium and plutonium from the fission products in dissolved nuclear fuel and then to separate the uranium from the plutonium.

neutron - An electrically neutral subatomic particle in the baryon family with a mass 1,839 times that of an electron, stable when bound in an atomic nucleus, and having a mean lifetime of approximately 16.6 minutes as a free particle.

notice of violation (NOV) - Generally, an official notification from a regulatory agency of noncompliance with permit requirements. (An example would be a letter of notice from a regional water engineer in response to an instance of significant noncompliance with a State Pollutant Discharge Elimination System [SPDES] permit.)

nucleus - The positively-charged central region of an atom, made up of protons and neutrons and containing almost all of the mass of the atom.

O

outfall - The discharge end of a drain or pipe that carries wastewater or other liquid effluents into a ditch, pond, or river.

P

parameter - Any of a set of physical properties whose values determine the characteristics or behavior of something (e.g., temperature, pressure, density of air). In relation to environmental monitoring, a monitoring parameter is a constituent of interest. Statistically, the term "parameter" is a calculated quantity, such as a mean or variance, that describes a statistical population.

particulates - Solid particles and liquid droplets small enough to become airborne.

person-rem - The sum of the individual radiation dose equivalents received by members of a certain group or population. It may be calculated by multiplying the average dose per person by the number of persons exposed. For example, a thousand people each exposed to one millirem would have a collective dose of one person-rem.

plume - The distribution of a pollutant in air or water after being released from a source.

practical quantitation limits (PQLs) - The PQL is the minimum concentration of an analyte that can be measured within specified limits of precision during routine laboratory operations (New York State Department of Environmental Conservation, 1991).

precision - The degree of reproducibility of a measurement under a given set of conditions. Precision in a data set is assessed by evaluating results from duplicate field or analytical samples.

proton - A stable, positively-charged subatomic particle in the baryon family with a mass 1,836 times that of an electron.

pseudo-monitoring point - A theoretical monitoring location rather than an actual physical location; a calculation based on analytical test results of samples obtained from other associated, tributary, monitored locations. (Point 116 at the WVDP is classified as a "pseudo" monitoring point because samples are not physically collected at that location. Rather, using analytical results from samples collected from "real" upstream outfall locations, compliance with the total dissolved solids limit in the WVDP's SPDES permit is calculated for this theoretical point.)

Q

quality factor (QF) - The extent of tissue damage caused by different types of radiation of the same energy. The greater the damage, the higher the quality factor. More specifically, the factor by which absorbed doses are multiplied to obtain a quantity that indicates the degree of biological damage produced by ionizing radiation. See *radiation dose*.) The factor is dependent upon radiation type (alpha, beta, gamma, or x-ray) and exposure (internal or external).

R

rad - Radiation absorbed dose. One hundred ergs of energy absorbed per gram of solid material.

radiation - The process of emitting energy in the form of rays or particles that are thrown off by disintegrating atoms. The rays or particles emitted may consist of alpha, beta, or gamma radiation.

***alpha radiation* -** The least penetrating type of radiation. Alpha radiation (similar to a helium nucleus) can be stopped by a sheet of paper or the outer dead layer of skin.

***beta radiation* -** Electrons emitted from a nucleus during fission and nuclear decay. Beta radiation can be stopped by an inch of wood or a thin sheet of aluminum.

***gamma radiation* -** A form of electromagnetic, high-energy radiation emitted from a nucleus. Gamma rays are essentially the same as x-rays and require heavy shielding such as lead, concrete, or steel to be effectively attenuated.

***internal radiation* -** Radiation originating from a source within the body as a result of the inhalation, ingestion, or implantation of natural or man-made radionuclides in body tissues.

radiation dose:

***absorbed dose* -** The amount of energy absorbed per unit mass in any kind of matter from any kind of ionizing radiation. Absorbed dose is measured in rads or grays.

collective dose equivalent - The sum of the dose equivalents for all the individuals comprising a defined population. The per capita dose equivalent is the quotient of the collective dose equivalent divided by the population. The unit of collective dose equivalent is person-rem or person-sievert.

collective effective dose equivalent - The sum of the effective dose equivalents for the individuals comprising a defined population. Units of measurement are person-rem or person-sievert. The per capita effective dose equivalent is obtained by dividing the collective dose equivalent by the population. Units of measurement are rem or sievert.

committed dose equivalent - A measure of internal radiation. The predicted total dose equivalent to a tissue or organ over a fifty-year period after a known intake of a radionuclide into the body. It does not include contributions from sources of external penetrating radiation. Committed dose equivalent is measured in rem or sievert.

committed effective dose equivalent - The sum of the committed dose equivalents to various tissues in the body, each multiplied by the appropriate weighting factor. Committed effective dose equivalent is measured in rem or sievert.

total effective dose equivalent - The summation of the products of the dose equivalent received by specified tissues of the body and the appropriate weighting factors. It includes the dose from radiation sources internal and/or external to the body. The effective dose equivalent is expressed in units of rem or seivert.

radioactivity - A property possessed by some elements (such as uranium) whereby alpha, beta, or gamma rays are spontaneously emitted.

radioisotope - A radioactive isotope of a specified element. Carbon-14 is a radioisotope of carbon. Tritium is a radioisotope of hydrogen. (See *isotope*.)

radionuclide - A radioactive nuclide. Radionuclides are variations (isotopes) of elements. They have the same number of protons and electrons but different numbers of neutrons, resulting in different atomic masses. There are hundreds of known nuclides, both man-made and naturally occurring.

reference man - A hypothetical aggregation of human physical and physiological characteristics arrived at by international consensus. These characteristics may be used by researchers and public health workers to standardize results of experiments and to relate biological insult to a common base.

rem - An acronym for Roentgen Equivalent Man. A unit of radiation exposure that indicates the potential effect of radiation on human cells.

remote-handled waste - At the WVDP, waste that has an external surface dose rate that exceeds 100 millirem per hour or a high level of alpha and/or beta surface contamination and, therefore, must be handled in such a manner that it does not come into physical contact with workers.

roentgen - A unit of exposure to ionizing radiation. It is that quantity of gamma or x-rays required to produce ions carrying one electrostatic unit of electrical charge in one cubic centimeter of dry air under standard conditions. The unit is named after Wilhelm Roentgen, German scientist who discovered x-rays in 1895.

S

self-assessment - Appraisals of work at the WVDP by individuals, groups, or organizations responsible for overseeing and/or performing the work. Self-assessments are intended to provide an internal review of performance to determine that specific functional areas are in programmatic and site-specific compliance with applicable DOE directives, WVDP procedures, and regulations.

finding - A direct and significant violation of applicable DOE, regulatory, or other procedural or programmatic requirements. A finding requires documented corrective action.

observation - A condition that, while not a direct and significant violation of applicable DOE, regulatory, or other procedural or programmatic requirements, could result in a finding if not corrected. An observation requires documented corrective action.

good practice - A statement of proficiency or confirmed excellence worthy of documenting.

sievert - A unit of dose equivalent from the International System of Units (Systeme Internationale). Equal to one joule per kilogram.

solid waste management unit (swmu) - Any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at a facility at which solid wastes have been routinely and systematically released or created. (See also *super solid waste management unit*.)

spent fuel - Nuclear fuel that has been used in a nuclear reactor; this fuel contains uranium, activation products, fission products, and plutonium.

spill - A spill or release is defined as "any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or otherwise disposing of substances from the ordinary containers employed in the normal course of storage, transfer, processing, or use," outside of the intended procedural action.

stakeholder - A person or group that has an investment, share, or interest in something. At the WVDP stakeholders include Project management, scientists, other employees, politicians, regulatory agencies, local and national interest groups, and members of the general public.

standard deviation - An indication of the dispersion of a set of results around their average.

super solid waste management unit (SSWMU) - Individual solid waste management units that have been grouped and ranked into larger units – super solid waste management units – because some individual units are contiguous or so close together as to make monitoring of separate units impractical. This terminology is unique to the WVDP, and is not an official regulatory term. (See also *solid waste management unit*.)

surface water - Water that is exposed to the atmospheric conditions of temperature, pressure, and chemical composition at the surface of the earth.

surveillance - The act of monitoring or observing a process or activity to verify conformance with specified requirements.

T

thermoluminescent dosimeter (TLD) - A device that luminesces upon heating after being exposed to radiation. The amount of light emitted is proportional to the amount of radiation to which the luminescent material has been exposed.

ton, metric (also *tonne*) **-** A unit of mass equal to 1,000 kilograms. (See also Table UI-2, "Units of Measure Used in This ASER.")

ton (*short ton*) **-** A unit of weight equal to 2,000 pounds or 907.1847 kilograms. (See also Table UI-2, "Units of Measure Used in This ASER.)

transuranic (TRU) waste - Waste containing transuranic elements, that is, those elements with an atomic number greater than 92, including neptunium, plutonium, americium, and curium.

U

universal wastes - Wastes subject to special management provisions that are intended to ease the management burden and facilitate recycling of such materials. Four types of waste are currently covered under the universal waste regulations: hazardous waste batteries, hazardous waste pesticides that are either recalled or collected in waste pesticide collection programs, hazardous waste thermostats, and hazardous waste lamps.

upgradient - Referring to the flow of water or air, "upgradient" is analogous to upstream. Upgradient is a point that is "before" an area of study and that is used as a baseline for comparison with downstream or downgradient data. (See *gradient* and *downgradient*.)

V

vitrification - A waste treatment process that encapsulates or immobilizes radioactive wastes in a glassy matrix to prevent them from reacting in disposal sites. Vitrification involves adding chemicals, glass formers, and waste to a heated vessel and melting the mixture into a glass that is then poured into a canister.

W

watershed - The area contained within a drainage divide above a specified point on a stream or river.

water table - The upper surface in a body of groundwater; the surface in an unconfined aquifer or confining bed at which the pore water pressure is equal to atmospheric pressure.

well point - A small-diameter well that is hammer-driven rather than placed into a pre-drilled borehole.

X

x-ray - Penetrating electromagnetic radiations having wave lengths shorter than those of visible light. They are usually produced by bombarding a metallic target with fast electrons in a high vacuum. In nuclear reactions it is customary to refer to photons originating in the nucleus as gamma rays and those originating in the extranuclear part of the atom as x-rays. These rays are sometimes called Roentgen rays after their discoverer, W.C. Roentgen.

ACRONYMS AND ABBREVIATIONS

A

ACM - Asbestos-Containing Material
AEA - Atomic Energy Act
ALARA - As Low As Reasonably Achievable
alpha-BHC - alpha-hexachlorocyclohexane
ANSI - American National Standards Institute
ARRA - American Recovery and Reinvestment Act
ASER - Annual Site Environmental Report
ASME - American Society of Mechanical Engineers
ASQ - American Society for Quality
AWQS - Ambient Water Quality Standard

B

B&P - Baltimore and Pittsburgh Railroad
BAT - Best Available Technology
BCG - Biota Concentration Guide
BEIR - Biological Effects of Ionizing Radiation
BOD_5 - Biochemical Oxygen Demand (5-day)
Bq - Becquerel
BR - Shale Bedrock
BSW - Bulk Storage Warehouse
BTU - British Thermal Unit

C

CAA - Clean Air Act
CBS - Chemical Bulk Storage
CCHD - Cattaraugus County Health Department
CCZ - Criticality Control Zone
CD - Compact Disk
CDDL - Construction and Demolition Debris Landfill
CEDE - Committed Effective Dose Equivalent
CEMP - Code of Environmental Management Principles (for Federal Agencies)
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
CFR - Code of Federal Regulations
Ci - Curie
CMS - Corrective Measures Study
ConOps - Conduct of Operations
CPC - Chemical Process Cell
CPC-WSA - Chemical Process Cell Waste Storage Area
CSAP - Characterization Sampling and Analysis Plan
CSPF - Container Sorting and Packaging Facility
CSRF - Contact Size-Reduction Facility
CSS - Cement Solidification System
CTF - (West Valley) Citizen Task Force
CUP - Cask Unloading Pool
CWA - Clean Water Act
CX - Categorical Exclusion
CY - Calendar Year

D

D&D - Decontamination and Decommissioning
DCDFMeth - Dichlorodifluoromethane
DEIS - Draft Environmental Impact Statement
DCG - Derived Concentration Guide
DCGL - Derived Concentration Guideline Level
DL - Detection Limit or Detection Level
DMR - Discharge Monitoring Report
DOE - (U.S.) Department of Energy
DOE-EM - Department of Energy, Office of Environmental Management
DOE-HQ - Department of Energy, Headquarters Office
DOE-WVDP - Department of Energy, West Valley Demonstration Project (title as of June 2006)
DOT - (U.S.) Department of Transportation
DP - Decommissioning Plan
DWW - Dewatering Well

E

E.O. - Executive Order
EA - Environmental Assessment
ECL - (New York State) Environmental Conservation Law
EDE - Effective Dose Equivalent
EHS - Extremely Hazardous Substance
EIS - Environmental Impact Statement
ELAB - (WVDP) Environmental Laboratory
ELAP - (New York State Department of Health) Environmental Laboratory Approval Program
EMIRS - Environmental Monitoring Integration and Reduction Strategy
EMS - Environmental Management System
EOC - Emergency Operations Center

Note: For abbreviations of units of measure, see Table UI-2 ("Units of Measure Used in This ASER") in the "Useful Information" section.

EPA - (U.S.) Environmental Protection Agency
EPCRA - Emergency Planning and Community Right-to-Know Act
EPEAT - Electronic Procurement Environmental Assessment Tool
ERO - Emergency Response Organization
ERRC - Electronics Reuse and Recycling Challenge
ES&H - Environmental, Safety, and Health
ESH&Q - Environmental, Safety, Health, and Quality

F

FEIS - Final Environmental Impact Statement
FFCA - Federal Facilities Compliance Act
FIFRA - Federal Insecticide, Fungicide, and Rodenticide Act
FONSI - Finding of No Significant Impact
FR - Federal Register
FRS - Fuel Receiving and Storage
FSS - Final Status Survey
FSSP - Final Status Survey Plan
FY - Fiscal Year

G

GEL - GEL Laboratories LLC
GMP - Groundwater Monitoring Plan; Groundwater Monitoring Program
gpm - gallons per minute
GSL - (Site-Specific) Groundwater Screening Levels

H

HEPA - High-Efficiency Particulate Air (filter)
HLW - High-Level (radioactive) Waste
HP/BBS - Human Performance/Behavior-Based Safety
HPIC - High-Pressure Ion Chamber
HTO - Hydrogen Tritium Oxide
HVAC - Heating, Ventilation, and Air Conditioning

I

IAEA - International Atomic Energy Agency
IAP - Integrated Assessment Program
ICRP - International Commission on Radiological Protection
IM - Interim Measure
INEEL - Idaho National Engineering and Environmental Laboratory (historical)
INL - Idaho National Laboratory
IR - Issue Report
IRTS - Integrated Radwaste Treatment System
ISCORS - Interagency Steering Committee on Radiation Standards
ISMS - Integrated Safety Management System
ISO - International Organization for Standardization
IWSF - Interim Waste Storage Facility

K

KRS - Kent Recessional Sequence
KT - Kent Till

L

LAS - Linear Alkylate Sulfonate
LDR - Land Disposal Restriction
LFR - Live-Fire Range
LIMS - Laboratory Information Management System
LLD - Lower Limit of Detection
LLW - Low-Level (radioactive) Waste
LLW2 - Low-Level (liquid) Waste Treatment Facility
LLWTF - Low-Level Waste Treatment Facility (historical)
LPS - Liquid Pretreatment System
LSA - Lag (Low-Level Radioactive Waste) Storage Area
LSA #1 - Lag Storage Addition #1
LSA #2 - Lag Storage Hardstand #2
LSB - Lag Storage Building
LTR - License Termination Rule
LTS - Lavery Till Sand
LWTS - Liquid Waste Treatment System

M

MAPEP - Mixed Analyte Performance Evaluation Program
MCL - Maximum Contaminant Level
MCLG - Maximum Contaminant Level Goal
MDC - Minimum Detectable Concentration
MDL - Method Detection Limit (also Minimum Detection Level)
MEI - Maximally Exposed Individual
MEOSI - Maximally Exposed Off-Site Individual
MGD - Million Gallons per Day
MMBTU - One million BTUs (a thousand thousand BTUs), also expressed as MBTU
MOU - Memorandum of Understanding
MPPB - Main Plant Process Building
MSDS - Material Safety Data Sheet
MW - (Radioactive and Hazardous) Mixed Waste

Note: For abbreviations of units of measure, see Table UI-2 ("Units of Measure Used in This ASER") in the "Useful Information" section.

N

NCRP - National Council on Radiation Protection and Measurements
NDA - Nuclear Regulatory Commission (NRC)-Licensed Disposal Area
NELAC - National Environmental Laboratory Accreditation Conference
NEPA - National Environmental Policy Act
NESHAP - National Emission Standards for Hazardous Air Pollutants
NFS - Nuclear Fuel Services, Inc.
NGVD - National Geodetic Vertical Datum
NH_3 - Ammonia
NIST - National Institute of Standards and Technology
NOAA - National Oceanic and Atmospheric Administration
NOI - Notice of Intent
NOV - Notice of Violation
NO_x - Nitrogen Oxides
NPDES - National Pollutant Discharge Elimination System
NPGRS - North Plateau Groundwater Recovery System
NPOC - Nonpurgeable Organic Carbon
NRC - (U.S.) Nuclear Regulatory Commission
NTS - Nevada Test Site
NTU - Nephelometric Turbidity Unit
NYCRR - New York Official Compilation of Codes, Rules, and Regulations
NYS - New York State
NYSDEC - New York State Department of Environmental Conservation
NYSDOH - New York State Department of Health
NYSDOH ELAP - (NYSDOH) Environmental Laboratory Approval Program
NYSDOL - New York State Department of Labor
NYSERDA - New York State Energy Research and Development Authority
NYSGS - New York State Geological Survey

O

OAD - Office of Atomic Development
OSHA - Occupational Safety and Health Administration
OVE - Outdoor Ventilated Enclosure

P

P-track - (EPA) National Performance Track Program
PC - Personal Computer
PCB - Polychlorinated Biphenyl
PE - Professional Engineer
POC - Principal Organic Contaminant
PNL - Pacific Northwest Laboratory
PQL - Practical Quantitation Limit
PTW - Permeable Treatment Wall
PUREX - Plutonium Uranium Reduction Extraction
PVC - Polyvinyl Chloride
PVS - Permanent Ventilation System
PVU - Portable Ventilation Unit

Q

QA - Quality Assurance
QAP - Quality Assessment Program (also Quality Assurance Program)
QC - Quality Control
QF - Quality Factor

R

RAI - Request for Additional Information
RCRA - Resource Conservation and Recovery Act
REC - Renewable Energy Credits
REM - Roentgen Equivalent Man
RFI - RCRA Facility Investigation
RHWF - Remote-Handled Waste Facility
RMW - Regulated Medical Waste
ROD - Record of Decision

S

S&G - Sand and Gravel Unit
S&G-SWS - Sand and Gravel - Slack Water Sequence
S&G-TBU - Sand and Gravel - Thick-Bedded Unit
SAR - Safety Analysis Report
SARA - Superfund Amendments and Reauthorization Act
SD - Standard Deviation
SDA - (New York) State-Licensed Disposal Area
SDWA - Safe Drinking Water Act
SEQRA - (New York) State Environmental Quality Review Act
SI - Systeme Internationale (International System of Units)
SMS - Safety Management System
SNR - Supplier Nonconformance Report
SO_x - Sulfur Oxides
SPCC - Spill Prevention, Control, and Countermeasures (Plan)

Note: For abbreviations of units of measure, see Table UI-2 ("Units of Measure Used in This ASER") in the "Useful Information" section.

SPDES - (New York) State Pollutant Discharge Elimination System
SRM - Standard Reference Material
SSWMU - Super Solid Waste Management Unit
STP - Site Treatment Plan
STS - Supernatant Treatment System
SU - Standard Unit
SWPPP - Storm Water Pollution Prevention Plan
SVOC - Semivolatile Organic Compound
SWMU - Solid Waste Management Unit

T

TAGM - Technical and Administrative Guidance Memorandum
TBP - Tributyl Phosphate
TCE - Trichloroethylene
TDS - Total Dissolved Solids
TEDE - Total Effective Dose Equivalent
THOREX - Thorium Reduction Extraction
TKN - Total Kjeldahl Nitrogen
TLD - Thermoluminescent Dosimeter
TOC - Total Organic Carbon
TOGS - Technical and Operational Guidance Series
TOX - Total Organic Halides
TRI - Toxic Release Inventory
TRIEX - Triennial Emergency Exercise
TRU - Transuranic
TSC - Technical Support Center
TSCA - Toxic Substances Control Act
TSDF - Treatment, Storage, and Disposal Facility
TSS - Total Suspended Solids

U

U.S. - United States
UB - State University of New York at Buffalo
UDF - Unit Dose Factor
ULT - Unweathered Lavery Till
USACE - U.S. Army Corps of Engineers
URS - URS - Washington Division
USC - United States Code
USGS - United States Geological Survey

V

VIT - Vitrification
VOC - Volatile Organic Compound
VPP - (U.S. DOE) Voluntary Protection Program

W

WET - Whole Effluent Toxicity
WLT - Weathered Lavery Till
WMA - Waste Management Area
WMIN/P2 - Waste Minimization/Pollution Prevention
WNYNSC - Western New York Nuclear Service Center
WRES - Washington Regulatory and Environmental Services
WTC - Water Treatment Chemical
WTF - Waste Tank Farm
WVDP - West Valley Demonstration Project
WVES - West Valley Environmental Services LLC
WVNS - West Valley Nuclear Services (historical)
WVNSCO - West Valley Nuclear Services Company (historical)
WWTF - Wastewater Treatment Facility

X

XC-3 - Extraction Cell 3

Note: For abbreviations of units of measure, see Table UI-2 ("Units of Measure Used in This ASER") in the "Useful Information" section.

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APPENDIX B-1

Summary of Water Limits, Guidelines, and Standards

TABLE B-1A
West Valley Demonstration Project State Pollutant Discharge Elimination System (SPDES) Sampling Program

Outfall	Parameter	Daily Maximum Limit[a]	Sample Frequency
001 (Process and Storm Wastewater)	Flow	Monitor	2/discharge
	Aluminum, total	14.0 mg/L	1/discharge
	Ammonia (NH_3)	Monitor	2/discharge
	Arsenic, dissolved	0.15 mg/L	1/discharge
	Biochemical oxygen demand - 5-day (BOD_5)	10.0 mg/L	2/discharge
	Iron, total	Monitor	2/discharge
	Zinc, total recoverable	0.48 mg/L	2/year
	Solids, total suspended	45 mg/L	2/discharge
	Cyanide, amenable to chlorination	0.022 mg/L	2/year
	Settleable solids	0.3 mL/L	2/discharge
	pH (range)	6.5–8.5 SU	1/discharge
	Oil and grease	15.0 mg/L	2/discharge
	Sulfate (as S)	Monitor	2/discharge
	Sulfide, dissolved	0.4 mg/L	1/discharge
	Manganese, total	2.0 mg/L	2/year
	Nitrate (as N)	Monitor	2/discharge
	Nitrite (as N)	0.1 mg/L	2/discharge
	Chromium, total recoverable	0.3 mg/L	2/year
	Chromium, hexavalent, total recoverable	0.011 mg/L	1/year
	Cadmium, total recoverable	0.002 mg/L	1/year
	Copper, total recoverable	0.030 mg/L	2/year
	Copper, dissolved	Monitor	2/year
	Lead, total recoverable	0.006 mg/L	4/year
	Nickel, total recoverable	0.14 mg/L	2/year
	Dichlorodifluoromethane	0.01 mg/L	1/year
	Trichlorofluoromethane	0.01 mg/L	1/year
	3,3-dichlorobenzidine	0.01 mg/L	1/year
	Tributyl phosphate	32 mg/L	1/year
	Vanadium, total recoverable	0.014 mg/L	1/discharge
	Cobalt, total recoverable	0.005 mg/L	1/discharge
	Selenium, total recoverable	0.004 mg/L	2/discharge
	Hexachlorobenzene	0.02 mg/L	1/year
	Alpha-hexachlorocyclohexane (Alpha - BHC)	0.00001 mg/L	1/year
	Heptachlor	0.00001 mg/L	2/year
	Surfactants (as linear alkylate sulfonate [LAS])	0.4 mg/L	2/year
	Xylene	0.05 mg/L	1/year
	2-butanone	0.5 mg/L	1/year
	Total dissolved solids	Monitor	2/discharge
	Mercury, total	200 ng/L	2/discharge

[a] Daily average limitations are also identified in the permit but require only monitoring for all parameters except total aluminum (daily average limit - 7.0 mg/L); total suspended solids (daily average limit - 30 mg/L); BOD_5 for the sum of outfalls 001, 007, and 008 (daily average limit - 5.0 mg/L); and ammonia for the sum of outfalls 001 and 007 (daily average limit - 1.49 mg/L).

TABLE B-1A *(concluded)*
West Valley Demonstration Project State Pollutant Discharge Elimination System (SPDES) Sampling Program

Outfall	Parameter	Daily Maximum Limit[a]	Sample Frequency
01B (Internal Process Monitoring Point)	Flow	Monitor	weekly
	Mercury, total	10.0 µg/L	2/month
007 (Sanitary and Utility Wastewater)	Flow	Monitor	3/month
	Ammonia (as NH_3)	Monitor	3/month
	BOD5	10.0 mg/L	3/month
	Iron, total	Monitor	3/month
	Solids, total suspended	45 mg/L	3/month
	Solids, settleable	0.3 mL/L	weekly
	pH (range)	6.5–8.5 SU	weekly
	Nitrite (as N)	0.1 mg/L	3/month
	Oil and grease	15.0 mg/L	3/month
	Chlorine, total residual	0.1 mg/L	weekly
Sum of Outfalls 001, 007, and 008	Iron, total	0.30 mg/L	3/month
	BOD_5	Monitor	3/month
Sum of Outfalls 001 and 007	Ammonia (as NH_3)	2.1 mg/L	3/month
Pseudo-monitoring point (116)	Solids, total dissolved	500 mg/L	2/discharge

Outfall	Parameter	Action Level	Sample Frequency
001 (Process and Storm Wastewater)	Barium	0.5 mg/L	annual
	Antimony	1.0 mg/L	annual
	Chloroform	0.3 mg/L	annual
	Titanium	0.65 mg/L	semiannual
	Bromide	5.0 mg/L	quarterly
	Boron	2.0 mg/L	quarterly
007 (Sanitary and Utility Wastewater)	Chloroform	0.20 mg/L	annual

Note: Limits for point 008 (French Drain) are not listed because the point has been closed off since 2001.

[a] Daily average limitations are also identified in the permit but require only monitoring for all parameters except total aluminum (daily average limit - 7.0 mg/L); total suspended solids (daily average limit - 30 mg/L); BOD_5 for the sum of outfalls 001, 007, and 008 (daily average limit - 5.0 mg/L); and ammonia for the sum of outfalls 001 and 007 (daily average limit - 1.49 mg/L).

TABLE B-1B
New York State Water Quality Standards and Guidelines[a]

Parameter	*Units*	*Class A*	*Class B*	*Class C*	*Class D*	*Class GA*
Gross Alpha[b]	pCi/L (µCi/mL)	15 (1.5E-08)	--	--	--	15 (1.5E-08)
Gross Beta[c]	pCi/L (µCi/mL)	1,000 (1E-06)	--	--	--	1,000 (1E-06)
Tritium (H-3)	pCi/L (µCi/mL)	20,000 (2E-05)	--	--	--	--
Strontium-90	pCi/L (µCi/mL)	8 (8E-09)	--	--	--	--
Alpha BHC	mg/L	0.000002	0.000002	0.000002	0.000002	0.00001
Aluminum, Dissolved	mg/L	0.10	0.10	0.10	--	--
Aluminum, Total	mg/L	--	--	--	--	--
Ammonia, Total as N	mg/L	0.09–2.1	0.09–2.1	0.09–2.1	0.67–29	2.0
Antimony, Total	mg/L	0.003	--	--	--	0.003
Arsenic, Dissolved	mg/L	0.050	0.150	0.150	0.340	--
Arsenic, Total	mg/L	0.050	--	--	--	0.025
Barium, Total	mg/L	1.00	--	--	--	1.00
Beryllium, Total	mg/L	0.003	[d]	[d]	--	0.003
Boron, Total	mg/L	10.0	10.0	10.0	--	1.00
Bromide	mg/L	2.00	--	--	--	2.00
Cadmium, Dissolved[e]	mg/L	--	--	--	--	--
Cadmium, Total	mg/L	0.005	--	--	--	0.005
Calcium, Total	mg/L	--	--	--	--	--
Chloride	mg/L	250	--	--	--	250
Chromium, Dissolved[e]	mg/L	--	--	--	--	--
Chromium, Total	mg/L	0.05	--	--	--	0.05
Cobalt, Total[f]	mg/L	0.005	0.005	0.005	0.110	--
Conductivity	µmhos/cm@25°C	--	--	--	--	--
Copper, Dissolved[e]	mg/L	--	--	--	--	--
Copper, Total	mg/L	0.20	--	--	--	0.20
Cyanide	mg/L	0.0052	0.0052	0.0052	0.22	0.200
Dissolved Oxygen (minimum)	mg/L	4.0	4.0	4.0	3.0	--
Fluoride[e]	mg/L	--	--	--	--	1.5
Hardness	mg/L	--	--	--	--	--
Iron and Manganese (sum)	mg/L	--	--	--	--	0.500
Iron, Total	mg/L	0.30	0.30	0.30	0.30	0.30

-- No applicable guideline or reference standard available

Note: All water quality and metals standards are presented in mg/L (ppm) to provide consistency in comparisons.

[a] Source: 6 NYCRR Parts 701–704; The most stringent applicable pathway (e.g., wildlife, aquatic, human health) values are reported.

[b] Gross alpha standard includes radium-226, but excludes radon and uranium; however WVDP results include these isotopes.

[c] Gross beta standard excludes strontium-90 and alpha emitters, however WVDP results include these isotopes.

[d] Beryllium standard for classes “B” and “C” are based on stream hardness values.

[e] Standards for these constituents vary according to stream location hardness values.

[f] Standards for cobalt, thallium, and vanadium are applicable to the acid-soluble fraction.

[g] Applies to the sum of those organic substances which have individual human health water source standards listed at 0.100 mg/L or less in 6 NYCRR Part 703.5

[h] pH shall not be lower than 6.5 or the pH of natural groundwater, whichever is lower, nor shall pH be greater than 8.5 or the pH of the natural groundwater, whichever is greater.

TABLE B-1B *(concluded)*
New York State Water Quality Standards and Guidelines[a]

Parameter	Units	Class A	Class B	Class C	Class D	Class GA
Lead, Dissolved[e]	mg/L	--	--	--	--	--
Lead, Total	mg/L	0.050	--	--	--	0.025
Magnesium, Total	mg/L	35.0	--	--	--	35.0
Manganese, Total	mg/L	0.30	--	--	--	0.30
Mercury, Dissolved	mg/L	0.0000007	0.0000007	0.0000007	0.0000007	--
Mercury, Total	mg/L	0.0007	--	--	--	0.0007
Nickel, Dissolved[e]	mg/L	--	--	--	--	--
Nickel, Total	mg/L	0.10	--	--	--	0.10
Nitrate-N	mg/L	10.0	--	--	--	10.0
Nitrate + Nitrite	mg/L	10.0	10.0	10.0	10.0	10.0
Nitrite-N	mg/L	0.10	0.10	0.10	--	1.00
NPOC[g]	mg/L	0.10	--	--	--	--
Oil & Grease	mg/L	--	--	--	--	--
pH	SU	6.5–8.5[h]	6.5–8.5[h]	6.5–8.5[h]	6.0–9.5	6.5–8.5[h]
Potassium, Total	mg/L	--	--	--	--	--
Selenium, Dissolved	mg/L	0.0046	0.0046	0.0046	--	--
Selenium, Total	mg/L	0.01	--	--	--	0.01
Silver, Total	mg/L	0.05	--	--	--	0.05
Sodium, Total	mg/L	--	--	--	--	20.0
Solids, Total Dissolved	mg/L	500	500	500	--	500
Solids, Total Suspended	mg/L	--	--	--	--	--
Sulfate	mg/L	250	--	--	--	250
Sulfide (undissociated form)	mg/L	0.002	0.002	0.002	--	0.050 (as HS)
Surfactants (as LAS)	mg/L	0.04	0.04	0.04	--	--
Thallium, Total[f]	mg/L	0.0005	0.008	0.008	0.020	0.0005
Titanium, Total	mg/L	--	--	--	--	--
TOX (total organic halides)[g]	mg/L	0.10	--	--	--	--
Vanadium, Total[f]	mg/L	0.014	0.014	0.014	0.190	--
Zinc, Dissolved[e]	mg/L	--	--	--	--	--
Zinc, Total	mg/L	2.00	--	--	--	2.00

-- No applicable guideline or reference standard available

Note: All water quality and metals standards are presented in mg/L (ppm) to provide consistency in comparisons.

[a] Source: 6 NYCRR Parts 701–704; The most stringent applicable pathway (e.g., wildlife, aquatic, human health) values are reported.

[b] Gross alpha standard includes radium-226, but excludes radon and uranium; however WVDP results include these isotopes.

[c] Gross beta standard excludes strontium-90 and alpha emitters, however WVDP results include these isotopes.

[d] Beryllium standards for classes “B” and “C” are based on stream hardness values.

[e] Standards for these constituents vary according to stream location hardness values.

[f] Standards for cobalt, thallium, and vanadium are applicable to the acid-soluble fraction.

[g] Applies to the sum of those organic substances which have individual human health water source standards listed at 0.100 mg/L or less in 6 NYCRR Part 703.5

[h] pH shall not be lower than 6.5 or the pH of natural groundwater, whichever is lower, nor shall pH be greater than 8.5 or the pH of the natural groundwater, whichever is greater.

TABLE B-1C
New York State Department of Health (NYSDOH)/U.S. Environmental Protection Agency (EPA) Potable Water MCLs, MCLGs, and Raw Water Standards

Parameter	*Units*	*NYSDOH or EPA MCL* [a]	*EPA MCLG* [b]	*NYSDOH Raw Water Standards* [c]
Gross Alpha	pCi/L (µCi/mL)	15 (1.5E-08)[d]	0	--
Gross Beta	pCi/L (µCi/mL)	50 (5E-08)[e]	0	1,000 (1E-06)
Tritium (H-3)	pCi/L (µCi/mL)	20,000 (2E-05)	--	--
Strontium-90	pCi/L (µCi/mL)	8 (8E-09)	--	10 (1E-08)
Antimony, Total	mg/L	0.006	0.006	--
Arsenic, Total	mg/L	0.05	--	0.05
Barium, Total	mg/L	2.00	2.00	1.0
Beryllium, Total	mg/L	0.004	0.004	--
Cadmium, Total	mg/L	0.005	0.005	0.01
Chromium, Total	mg/L	0.10	0.10	--
Conductivity	µmhos/cm@25°C	--	--	--
Copper, Total	mg/L	1.3	1.3	<0.2
Cyanide	mg/L	0.2	0.2	<0.1
E. Coli	NA	one positive sample	0	--
Fluoride	mg/L	2.2	--	<1.5
Free Residual Chlorine	mg/L	0.02 (min) 4.0 (max)	--	--
Haloacetic Acids-Five (5)	mg/L	0.060	--	--
Iron, Total	mg/L	0.3	--	--
Lead, Total	mg/L	0.015	0	0.05
Mercury, Total	mg/L	0.002	0.002	0.005
Nickel, Total	mg/L	--	--	--
Nitrate-N	mg/L	10	10	--
pH	SU	--	--	6.5–8.5
POC (Principle Organic Contaminant)	mg/L	--	0.0005	--
Selenium, Total	mg/L	0.05	0.05	0.01
Solids, Total Dissolved	mg/L	--	--	500
Thallium, Total	mg/L	0.002	0.0005	--
Total Coliform	NA	2 or more positive samples	0	--
Total Trihalomethanes	mg/L	0.080	--	--
Turbidity	NTU	1 (max)	--	--

-- No applicable guideline or reference standard available
Note: All water quality and metals standards are presented in mg/L (ppm) to provide consistency in comparisons.
NA - Not applicable

[a] MCL - Listed is NYSDOH or EPA Maximum Contaminant Level. Sources: 40 CFR 141 and/or 5 NYCRR 5-1.52, whichever is more stringent.
[b] MCLG - Maximum Contaminant Level Goal (non-enforceable) as listed in 40 CFR Part 141
[c] Source: 10 NYCRR Part 170.4
[d] Alpha guideline includes radium-226, but excludes uranium; however, WVDP results include these isotopes.
[e] Average annual concentration assumed to produce a total body organ dose of 4 mrem/year

TABLE B-1D
U.S. Department of Energy Derived Concentration Guides (DCGs)[a] in Ingested Water

Radionuclide	Units	Concentration in Ingested Water
Gross Alpha (as Am-241)[b]	µCi/mL	3E-08
Gross Beta (as Sr-90)[b]	µCi/mL	1E-06
Tritium (H-3)	µCi/mL	2E-03
Carbon-14 (C-14)	µCi/mL	7E-05
Potassium-40 (K-40)	µCi/mL	7E-06
Cobalt-60 (Co-60)	µCi/mL	5E-06
Strontium-90 (Sr-90)	µCi/mL	1E-06
Technetium-99 (Tc-99)	µCi/mL	1E-04
Iodine-129 (I-129)	µCi/mL	5E-07
Cesium-137 (Cs-137)	µCi/mL	3E-06
Europium-154 (Eu-154)	µCi/mL	2E-05
Uranium-232 (U-232)	µCi/mL	1E-07
Uranium-233 (U-233)	µCi/mL	5E-07
Uranium-234 (U-234)	µCi/mL	5E-07
Uranium-235 (U-235)	µCi/mL	6E-07
Uranium-236 (U-236)	µCi/mL	5E-07
Uranium-238 (U-238)	µCi/mL	6E-07
Plutonium-238 (Pu-238)	µCi/mL	4E-08
Plutonium-239 (Pu-239)	µCi/mL	3E-08
Plutonium-240 (Pu-240)	µCi/mL	3E-08
Americium-241 (Am-241)	µCi/mL	3E-08

[a] DCG: Derived Concentration Guide. DCGs are established in DOE Order 5400.5 and are defined as the concentration of a radionuclide that, under conditions of continuous exposure for one year by one exposure mode, would result in an effective dose equivalent of 100 mrem (1 mSv).

[b] Because there are no DCGs for gross alpha and gross beta concentrations, the DCGs for the most restrictive alpha and beta emitters at the WVDP, americium-241 and strontium-90 (3E-08 and 1E-06 µCi/mL, respectively) are used as a conservative basis for comparison at locations for which there are no radionuclide-specific data, in which case a more appropriate DCG may be applied.

APPENDIX B-2

Process Effluent Data

TABLE B-2A
Comparison of 2009 Lagoon 3 (WNSP001) Liquid Effluent Radioactivity Concentrations With U.S. Department of Energy Guidelines

Isotope [a]	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *(Becquerels)*	*Average Concentration (µCi/mL)*	*DCG* [d] *(µCi/mL)*	*Ratio of Concentration to DCG*
Gross Alpha	1.17±0.09E-03	4.32±0.33E+07	2.50±0.19E-08	NA[e]	NA
Gross Beta	1.83±0.03E-02	6.75±0.10E+08	3.91±0.06E-07	NA[e]	NA
H-3	4.24±0.09E-02	1.57±0.03E+09	9.08±0.19E-07	2E-03	0.0005
C-14	9.15±5.34E-04	3.39±1.97E+07	1.96±1.14E-08	7E-05	0.0003
K-40	1.55±9.49E-04	0.57±3.51E+07	0.33±2.03E-08	NA[f]	NA
Co-60	0.21±3.39E-05	0.08±1.26E+06	0.44±7.26E-10	5E-06	<0.0001
Sr-90	8.35±0.08E-03	3.09±0.03E+08	1.79±0.02E-07	1E-06	0.179
Tc-99	6.40±0.44E-04	2.37±0.16E+07	1.37±0.09E-08	1E-04	0.0001
I-129	4.75±1.61E-05	1.76±0.60E+06	1.02±0.34E-09	5E-07	0.002
Cs-137	2.44±0.10E-03	9.02±0.36E+07	5.22±0.21E-08	3E-06	0.0189
U-232[g]	2.94±0.12E-04	1.09±0.04E+07	6.29±0.25E-09	1E-07	0.0629
U-233/234[g]	1.91±0.10E-04	7.05±0.36E+06	4.08±0.21E-09	5E-07	0.0081
U-235/236[g]	9.47±2.33E-06	3.50±0.86E+05	2.03±0.50E-10	5E-07[h]	0.0004
U-238[g]	1.55±0.09E-04	5.72±0.32E+06	3.31±0.19E-09	6E-07	0.0055
Pu-238	4.62±1.37E-06	1.71±0.51E+05	9.89±2.94E-11	4E-08	0.0025
Pu-239/240	5.03±1.40E-06	1.86±0.52E+05	1.08±0.30E-10	3E-08	0.0036
Am-241	6.81±1.56E-06	2.52±0.58E+05	1.46±0.33E-10	3E-08	0.0049
Sum of Ratios					**0.29**

NA - Not applicable

[a] Half-lives are listed in Table UI-4.

[b] Total volume released: 4.67E+10 mL (1.23E+07 gal)

[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq); 1Bq = 2.7E-11 Ci

[d] DOE-derived concentration guides (DCGs) are listed for reference only. DCGs are applicable at the point at which water is available for ingestion by the public (i.e., at the site boundary), but not to release point concentrations, as might be inferred from their inclusion in this table.

[e] DOE DCGs do not exist for indicator parameters gross alpha and gross beta.

[f] The DCG is not applied to potassium-40 (K-40) activity because of its natural origin.

[g] Total U (g) = 4.39±0.06E+02; Average U (µg/mL) = 9.40±0.13E-03

[h] DCG for U-236 is used for this comparison.

TABLE B-2B
2009 SPDES Results for Outfall 001 (WNSP001): Water Quality

Permit Limit	***Ammonia (as NH_3) (mg/L)*** ***Monitor***		***BOD $_5$ day (mg/L)*** ***10.0 mg/L daily maximum***		***Discharge Rate (MGD)*** ***Monitor***		***Nitrate (as N) (mg/L)*** ***Monitor***	
Month	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
January	0.090	0.12	<2.0	<2.0	0.263	0.293	0.70	0.73
February	0.085	0.096	<2.0	<2.0	0.249	0.254	1.5	1.5
March [a]	--	--	--	--	--	--	--	--
April	0.099	0.10	<2.0	<2.0	0.243	0.255	1.3	1.4
May	<0.009	<0.009	<2.0	<2.0	0.232	0.266	0.83	0.87
June	0.063	0.099	<2.3	2.6	0.158	0.171	<0.011	<0.011
July [a]	--	--	--	--	--	--	--	--
August	0.026	0.029	4.6	5.8	0.216	0.249	<0.011	<0.011
September [a]	--	--	--	--	--	--	--	--
October	0.029	0.031	5.8	6.2	0.249	0.260	<0.011	<0.011
November [a]	--	--	--	--	--	--	--	--
December [a]	--	--	--	--	--	--	--	--

Permit Limit	***Nitrite (as N) (mg/L)*** ***0.1 mg/L daily maximum***		***Oil & Grease (mg/L)*** ***15.0 mg/L daily maximum***		***pH (standard units)*** ***6.5 to 8.5***		***Solids, Settleable (mL/L)*** ***0.3 mL/L daily maximum***	
Month	**Avg**	**Max**	**Avg**	**Max**	**Min**	**Max**	**Avg**	**Max**
January	<0.02	<0.02	<2.2	<2.2	7.2	7.2	<0.2	0.2
February	<0.02	<0.02	<2.2	<2.2	6.9	6.9	<0.1	<0.1
March [a]	--	--	--	--	--	--	--	--
April	<0.02	0.02	<2.2	<2.2	7.1	7.1	<0.1	<0.1
May	0.02	0.02	<2.2	<2.2	7.7	7.7	<0.1	<0.1
June	<0.02	<0.02	<2.2	<2.2	7.4	7.4	<0.1	<0.1
July [a]	--	--	--	--	--	--	--	--
August	<0.02	<0.02	<2.5	2.7	7.7	7.7	<0.1	<0.1
September [a]	--	--	--	--	--	--	--	--
October	<0.02	<0.02	<2.2	<2.2	7.8	7.8	<0.1	<0.1
November [a]	--	--	--	--	--	--	--	--
December [a]	--	--	--	--	--	--	--	--

MGD - Million gallons per day
[a] No discharge this month

TABLE B-2B *(concluded)*
2009 SPDES Results for Outfall 001 (WNSP001): Water Quality

Permit Limit	***Solids, Total Dissolved (mg/L)*** ***Monitor***		***Solids, Total Suspended (mg/L)*** ***45 mg/L daily maximum; 30 mg/L daily average***		***Sulfate (as S) (mg/L)*** ***Monitor***		***Sulfide (as S) Dissolved (mg/L)*** ***0.4 mg/L daily maximum***	
Month	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
January	827	836	<4.0	<4.0	59	61	<0.02	<0.02
February	833	839	<4.0	<4.0	41	43	<0.02	<0.02
March [a]	--	--	--	--	--	--	--	--
April	771	793	<14.4	24.8	39	40	<0.02	<0.02
May	852	871	<4.0	<4.0	46	48	<0.02	<0.02
June	953	963	<4.0	<4.0	60	61	<0.02	<0.02
July [a]	--	--	--	--	--	--	--	--
August	887	944	17	24	66	76	<0.02	<0.02
September [a]	--	--	--	--	--	--	--	--
October	862	868	6.2	7.2	64	65	<0.02	<0.02
November [a]	--	--	--	--	--	--	--	--
December [a]	--	--	--	--	--	--	--	--

[a] No discharge this month

TABLE B-2C
2009 SPDES Results for Outfall 001 (WNSP001): Metals

Permit Limit	Aluminum Total (mg/L) 14.0 mg/L daily maximum; 7.0 mg/L daily average		Arsenic Dissolved (mg/L) 0.15 mg/L daily maximum		Cobalt Total Recoverable (mg/L) 0.005 mg/L daily maximum		Iron Total (mg/L) Monitor	
Month	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
January	2.29	2.29	0.0014	0.0014	<0.001	<0.001	1.24	1.43
February	0.526	0.526	0.0013	0.0013	<0.001	<0.001	0.400	0.445
March [a]	--	--	--	--	--	--	--	--
April	3.48	3.48	0.0014	0.0014	0.002	0.002	1.51	1.96
May	0.380	0.380	0.0015	0.0015	<0.001	<0.001	0.326	0.362
June	0.230	0.230	0.0023	0.0023	<0.0005	<0.0005	0.297	0.323
July [a]	--	--	--	--	--	--	--	--
August	0.248	0.248	0.0025	0.0025	<0.0005	<0.0005	1.7	2.8
September [a]	--	--	--	--	--	--	--	--
October	0.213	0.213	0.0026	0.0026	0.0006	0.0006	0.359	0.371
November [a]	--	--	--	--	--	--	--	--
December [a]	--	--	--	--	--	--	--	--

Permit Limit	Mercury, Total (per EPA Method 1631) (ng/L) 200 ng/L daily maximum		Selenium Total Recoverable (mg/L) 0.004 mg/L daily maximum		Vanadium Total Recoverable (mg/L) 0.014 mg/L daily maximum	
Month	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
January	4.18	4.79	<0.0004	<0.0004	0.0048	0.0048
February	4.13	4.22	<0.0004	<0.0004	<0.00098	<0.00098
March [a]	--	--	--	--	--	--
April	3.74	4.30	<0.0004	<0.0004	0.0052	0.0052
May	2.72	2.86	<0.0004	<0.0004	<0.001	<0.001
June	3.25	3.70	<0.0004	<0.0004	<0.0005	<0.0005
July [a]	--	--	--	--	--	--
August	6.81	7.39	<0.0004	<0.0004	<0.0011	<0.0011
September [a]	--	--	--	--	--	--
October	5.32	5.52	<0.0004	<0.0004	0.0011	0.0011
November [a]	--	--	--	--	--	--
December [a]	--	--	--	--	--	--

[a] No discharge this month

TABLE B-2D
2009 SPDES Results for Outfall 007 (WNSP007): Water Quality and Iron

Permit Limit	*Ammonia (as NH_3) (mg/L) Monitor*		*BOD_5 (mg/L) 10.0 mg/L daily maximum*		*Chlorine Total Residual (mg/L) 0.1 mg/L daily maximum*		*Discharge Rate (MGD) Monitor*		*Iron Total (mg/L) Monitor*	
Month	***Avg***	***Max***	***Avg***	***Max***	***Avg***	***Max***	***Avg***	***Max***	***Avg***	***Max***
January	<0.014	0.0216	<2.0	<2.0	0.02	0.03	0.021	0.051	0.166	0.188
February	<0.012	0.015	<2.2	2.4	0.03	0.06	0.012	0.025	0.226	0.278
March	0.024	0.033	<2.0	<2.0	0.02	0.05	0.016	0.036	0.179	0.256
April	<0.023	0.046	<2.5	3.1	0.03	0.05	0.017	0.032	0.0965	0.141
May	0.051	0.073	<2.3	2.9	0.02	0.02	0.011	0.024	0.0810	0.0993
June	0.029	0.049	<2.0	<2.0	0.03	0.07	0.012	0.020	0.0379	0.0449
July	<0.022	0.043	<2.0	<2.0	0.02	0.04	0.012	0.022	0.054	0.064
August	0.036	0.047	<2.0	<2.0	0.02	0.03	0.012	0.022	<0.0348	0.0459
September	0.032	0.043	<2.2	2.6	0.01	0.01	0.010	0.018	0.069	0.111
October	<0.023	0.030	<2.0	<2.0	0.03	0.04	0.011	0.027	0.106	0.181
November	0.024	0.040	<2.6	3.1	0.02	0.04	0.011	0.018	0.081	0.150
December	0.023	0.041	<2.0	2.1	0.01	0.01	0.014	0.024	0.126	0.298

Permit Limit	*Nitrite (as N) (mg/L) 0.1 mg/L daily maximum*		*Oil & Grease (mg/L) 15.0 mg/L daily maximum*		*pH (standard units) 6.5 to 8.5*		*Solids Settleable (mL/L) 0.3 mL/L daily maximum*		*Solids Total Suspended (mg/L) 45 mg/L daily maximum;*	
Month	***Avg***	***Max***	***Avg***	***Max***	***Min***	***Max***	***Avg***	***Max***	***Avg***	***Max***
January	<0.02	<0.02	<2.5	3.0	7.4	7.8	<0.1	<0.1	<4.0	<4.0
February	<0.02	<0.02	<3.1	3.9	7.7	7.8	<0.1	<0.1	<4.0	<4.0
March	<0.02	<0.02	<2.2	<2.2	7.3	7.7	<0.1	<0.1	<4.0	<4.0
April	<0.02	<0.02	<3.2	5.2	6.9	8.0	<0.1	<0.1	<4.0	<4.0
May	<0.02	<0.02	<2.8	4.0	7.7	8.1	<0.1	<0.1	<4.0	<4.0
June	<0.02	<0.02	<2.2	<2.2	7.7	8.1	<0.1	<0.1	<4.0	<4.0
July	<0.02	<0.02	<2.2	<2.2	7.4	8.1	<0.1	<0.1	<4.0	<4.0
August	<0.04	0.08	<2.2	<2.2	7.5	8.0	<0.1	<0.1	<4.0	<4.0
September	<0.02	<0.02	<2.2	<2.2	7.1	8.2	<0.1	<0.1	<4.0	<4.0
October	<0.02	<0.02	<2.2	<2.2	7.0	8.0	<0.1	<0.1	<4.0	<4.0
November	<0.02	<0.02	<3.1	4.9	7.8	8.1	<0.1	<0.1	<4.0	<4.0
December	<0.02	<0.02	<2.3	<2.3	7.8	8.1	<0.1	<0.1	<4.0	<4.0

TABLE B-2E
2009 SPDES Results for Sums of Outfalls 001, 007, 008, and 116: Water Quality

2009 Results for Sums of Outfalls 001, 007, and 008

Permit Limit	***Ammonia*[a] *(as NH_3) Flow-Weighted***		***BOD_5 Flow-Weighted***		***Iron Total Net Effluent Limitation***	
	1.49 mg/L daily average	***2.1 mg/L daily maximum***	***5.0 mg/L daily average***		***0.30 mg/L daily maximum***	
Month	***Avg***	***Max***	***Avg***	***Max***	***Avg***	***Max***
January	<0.060	0.109	<2.0	<2.0	0.73[b]	0.73[b]
February	<0.060	0.093	<2.0	<2.0	0.10	0.10
March	0.024	0.033	<2.0	<2.0	0.00	0.00
April	<0.067	0.099	<2.4	3.1	0.06	0.06
May	<0.031	0.073	<2.3	2.9	0.00	0.00
June	0.056	0.094	<2.2	<2.5	0.00	0.00
July	<0.022	0.043	<2.0	<2.0	0.00	0.00
August	0.033	0.047	<3.6	<5.5	0.00	0.00
September	0.032	0.043	<2.2	2.6	0.00	0.00
October	<0.029	0.0030	<4.3	<5.9	0.00	0.00
November	0.024	0.040	<2.6	3.1	0.00	0.00
December	0.023	0.041	<2.0	2.1	0.00	0.00

2009 Results for Outfall 116

Permit Limit	***Total Dissolved Solids (mg/L) 500 mg/L daily maximum***	
Month	***Avg***	***Max***
January	319	332
February	346	356
March[c]	--	--
April	276	288
May	350	362
June	336	344
July[c]	--	--
August	238	315
September[b]	--	--
October	318	381
November	--	--
December[c]	--	--

[a] Sum of Outfalls 001 and 007 only
[b] In January 2009, the daily maximum permit limit of 0.30 mg/L for iron for the sum of the outfalls was exceeded.
[c] No discharge this month

TABLE B-2F
2009 Annual, Semiannual, and Quarterly SPDES Results for Outfall 001: Metals, Organics, and Water Quality

Permit Limit Parameters	*Permit Limit*	*Monitoring Frequency*	*Reporting Date*	*Maximum Measured (mg/L)*
2-Butanone	0.5 mg/L daily maximum	Annual	January 2010	<0.004
3,3-Dichlorobenzidine	0.01 mg/L daily maximum	Annual	January 2010	<0.0008
Alpha-BHC	0.00001 mg/L daily maximum	Annual	January 2010	<0.000005
Cadmium, Total Recoverable	0.002 mg/L daily maximum	Annual	January 2010	<0.0003
Chromium VI, Total Recoverable	0.011 mg/L daily maximum	Annual	April 2009	<0.006
Chromium, Total Recoverable	0.3 mg/L daily maximum	Semiannual	July 2009 January 2010	<0.0009 0.003
Copper, Dissolved	Monitor	Semiannual	July 2009 January 2010	0.0042 <0.0013
Copper, Total Recoverable	0.030 mg/L daily maximum	Semiannual	July 2009 January 2010	0.0052 0.0051
Cyanide, Amenable to chlorination	0.022 mg/L daily maximum	Semiannual	July 2009 January 2010	<0.0030 <0.0030
Dichlorodifluoromethane	0.01 mg/L daily maximum	Annual	January 2010	<0.001
Heptachlor	0.00001 mg/L daily maximum	Semiannual	July 2009 January 2010	<0.000006 <0.000005
Hexachlorobenzene	0.02 mg/L daily maximum	Annual	January 2010	<0.0003
Lead, Total Recoverable	0.006 mg/L daily maximum	Quarterly	April 2009 July 2009 October 2009 January 2010	0.002 0.0005 0.0005 0.0004
Manganese, Total	2.0 mg/L daily maximum	Semiannual	July 2009 January 2010	0.051 0.097
Nickel, Total Recoverable	0.14 mg/L daily maximum	Semiannual	July 2009 January 2010	0.0019 0.0036
Surfactant as LAS	0.4 mg/L daily minimum	Semiannual	July 2009 January 2010	<0.01 <0.01
Tributyl phosphate	32 mg/L daily maximum	Annual	January 2010	<0.0008
Trichlorofluoromethane	0.01 mg/L daily maximum	Annual	January 2010	<0.0008
Xylene	0.05 mg/L daily maximum	Annual	January 2010	<0.002
Zinc, Total Recoverable	0.48 mg/L daily maximum	Semiannual	July 2009 January 2010	0.010 0.0076

TABLE B-2G
2009 SPDES Action Level Requirement Monitoring Results for Outfalls 001, 007, and 008: Metals, Organics, and Water Quality

Outfall	*Action Level Parameters*	*Action Level*	*Monitoring Frequency*	*Reporting Date*	*Maximum Measured (mg/L)*
001	**Antimony, Total**	1.0 mg/L daily maximum	Annual	January 2010	<0.0055
	Barium, Total	0.5 mg/L daily maximum	Annual	January 2010	0.02
	Boron, Total	2.0 mg/L daily maximum	Quarterly	April 2009 July 2009 October 2009 January 2010	0.037 0.031 0.051 0.040
	Bromide, Total	5.0 mg/L daily maximum	Quarterly	April 2009 July 2009 October 2009 January 2010	<0.073 <0.073 0.53 1.1
	Chloroform	0.3 mg/L daily maximum	Annual	January 2010	<0.0005
	Titanium, Total	0.65 mg/L daily maximum	Semiannual	July 2009 January 2010	0.014 0.0036 -
007	**Chloroform**	0.20 mg/L daily maximum	Annual	January 2010	0.012
008	**Arsenic, Total**	0.17 mg/L daily maximum	Annual	[a]	--
	Chromium, Total	0.13 mg/L daily maximum	Annual	[a]	--
	Silver, Total	0.008 mg/L daily maximum	Annual	[a]	--
	Zinc, Total	0.1 mg/L daily maximum	Annual	[a]	--

[a] No discharge at this outfall, drainage pipe was capped in May 2001.

TABLE B-2H
2009 SPDES Results for Outfall 01B (WNSP01B): Water Quality

Internal process monitoring point did not operate during 2009

TABLE B-2I
2009 SPDES Results for Outfall 008 (WNSP008): Water Quality

No discharge; Drainage pipe was capped in May 2001

TABLE B-2J
2009 Radioactivity Results for Sewage Treatment Outfall (WNSP007)

Isotope [a]	*N*	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *Becquerels*	*Average Concentration (µCi/mL)*	*DCG (µCi/mL)*	*Ratio of Concentration to DCG*
Gross Alpha	12	0.30±1.18E-05	1.10±4.38E+05	1.63±6.48E-10	NA[d]	NA
Gross Beta	12	2.02±0.17E-04	7.48±0.62E+06	1.11±0.09E-08	NA[d]	NA
Tritium	12	-3.82±2.57E-04	-1.41±0.95E+07	-2.09±1.40E-08	2E-03	<0.0001
Sr-90	1	-1.05±1.49E-05	-3.87±5.50E+05	-5.73±8.14E-10	1E-06	<0.0006
Cs-137	1	0.92±3.41E-05	0.34±1.26E+06	0.50±1.87E-09	3E-06	<0.0007
Sum of Ratios						**<0.0014**

N - Number of samples
NA - Not applicable
[a] Half-lives are listed in Table UI-4.
[b] Total volume released; 4.83E+06 gal (1.83E+10 mL)
[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq); 1 Bq = 2.7E-11 Ci
[d] DOE derived concentration guides (DCGs) do not exist for indicator parameters gross alpha and beta.

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APPENDIX B-3

SPDES-Permitted Storm Water Outfall Discharge Data

Note: Two sets of data are presented for each group: one from samples collected between January and June; the other from samples collected between July and December.

TABLE B-3A
2009 Storm Water Discharge Monitoring Data for Outfall Group 1

Storm Water Outfall S04

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			3/18/09	*3/18/09*
Aluminum, Total	mg/L	3	5.7 / 5.5	9.0
Ammonia (as NH_3)	mg/L	3	0.011 / 0.032	0.18
BOD_5	mg/L	3	<2.0 / <2.0	<2.0
Cadmium, Total Recoverable	mg/L	3	<0.0005 / <0.0005	<0.0001
Chromium, Total Recoverable	mg/L	3	0.0065 / 0.0076	0.0096
Chromium, Hexavalent, Total Recoverable	mg/L	3	<0.012 / <0.012	<0.030
Copper, Total Recoverable	mg/L	3	0.013 / 0.013	0.012
Iron, Total	mg/L	3	6.8 / 6.6	11.0
Lead, Total Recoverable	mg/L	3	0.0046 / 0.0046	0.0075
Nitrogen, Nitrate (as N)	mg/L	3	0.53 / 0.56	0.39
Nitrogen, Nitrite (as N)	mg/L	3	<0.020 / <0.020	<0.020
Nitrogen, Total (as N)	mg/L	3	<1.1 / <0.78	<0.75
Nitrogen, Total Kjeldahl	mg/L	3	0.52 / 0.20	0.34
Oil & Grease[a]	mg/L	2	3.3 / 3.7	NR
pH	SU	1	7.8	NR
Phosphorous, Total	mg/L	3	0.11 / 0.12	0.10
Selenium, Total Recoverable	mg/L	3	<0.0022 / <0.0022	<0.00044
Solids, Total Dissolved	mg/L	3	840 / 870	350
Solids, Total Suspended	mg/L	3	130 / 120	140
Vanadium, Total Recoverable	mg/L	3	0.0086 / 0.011	0.013
Zinc, Total Recoverable	mg/L	3	0.067 / 0.071	0.069
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.85	
Rainfall During Sampling Event	inches	--	0.62	
Total Flow During Sampling Event	gallons	--	673,000	
Maximum Flow Rate During Sampling Event	gpm	--	7,980	

Note: The first flush grab samples were sampled and analyzed in duplicate.
gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3A *(concluded)*
2009 Storm Water Discharge Monitoring Data for Outfall Group 1

Storm Water Outfall S04

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			7/21/09	*7/21/09*
Aluminum, Total	mg/L	2	1.9	1.8
Ammonia (as NH_3)	mg/L	2	0.045	0.039
BOD_5	mg/L	2	4.1	3.5
Cadmium, Total Recoverable	mg/L	2	<0.00002	0.00003
Chromium, Total Recoverable	mg/L	2	0.0018	0.0021
Chromium, Hexavalent, Total Recoverable	mg/L	2	<0.006	<0.006
Copper, Total Recoverable	mg/L	2	0.0051	0.0044
Iron, Total	mg/L	2	2.3	2.6
Lead, Total Recoverable	mg/L	2	0.002	0.0022
Nitrogen, Nitrate (as N)	mg/L	2	0.62	0.54
Nitrogen, Nitrite (as N)	mg/L	2	0.020	0.020
Nitrogen, Total (as N)	mg/L	2	1.4	1.3
Nitrogen, Total Kjeldahl	mg/L	2	0.74	0.76
Oil & Grease[a]	mg/L	1	<2.2	NR
pH	SU	1	6.7	NR
Phosphorous, Total	mg/L	2	0.046	0.059
Selenium, Total Recoverable	mg/L	2	<0.0004	<0.0004
Solids, Total Dissolved	mg/L	2	253	228
Solids, Total Suspended	mg/L	2	42	48
Vanadium, Total Recoverable	mg/L	2	0.0031	0.0036
Zinc, Total Recoverable	mg/L	2	0.039	0.042
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.1	
Rainfall During Sampling Event	inches	--	0.21	
Total Flow During Sampling Event	gallons	--	214,000	
Maximum Flow Rate During Sampling Event	gpm	--	3,100	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3B
2009 Storm Water Discharge Monitoring Data for Outfall Group 2

Storm Water Outfall S06

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			4/28/09	*4/28/09*
Aluminum, Total	mg/L	2	<0.068	<0.068
BOD_5	mg/L	2	2.8	2.0
Copper, Total Recoverable	mg/L	2	0.00089	0.0010
Iron, Total	mg/L	2	0.031	0.041
Lead, Total Recoverable	mg/L	2	<0.0005	<0.0005
Oil & Grease[a]	mg/L	1	2.0	NR
pH	SU	1	8.1	NR
Phosphorous, Total	mg/L	2	0.065	0.077
Solids, Total Dissolved	mg/L	2	698	724
Solids, Total Suspended	mg/L	2	1.6	<2.3
Surfactant (as LAS)	mg/L	2	0.048	0.048
Zinc, Total Recoverable	mg/L	2	0.0074	0.0084
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.33	
Rainfall During Sampling Event	inches	--	0.28	
Total Flow During Sampling Event	gallons	--	11,000	
Maximum Flow Rate During Sampling Event	gpm	--	89	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3B *(concluded)*
2009 Storm Water Discharge Monitoring Data for Outfall Group 2

Storm Water Outfall S33

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			7/21/09	*7/21/09*
Aluminum, Total	mg/L	3	0.90 / 1.9	0.42
BOD_5	mg/L	3	9.4 / 6.5	3.6
Copper, Total Recoverable	mg/L	3	0.0030 / 0.0043	0.0018
Iron, Total	mg/L	3	92 / 175	15
Lead, Total Recoverable	mg/L	3	0.0021 / 0.0039	0.0006
Oil & Grease[a]	mg/L	1	<2.2 / <2.2	NR
pH	SU	1	7.0	NR
Phosphorous, Total	mg/L	3	1.4 / 2.0	0.45
Solids, Total Dissolved	mg/L	3	348 / 397	356
Solids, Total Suspended	mg/L	3	586 / 586	50
Surfactant (as LAS)	mg/L	3	0.039 / <0.013	<0.013
Zinc, Total Recoverable	mg/L	3	0.018 / 0.028	<0.013
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.1	
Rainfall During Sampling Event	inches	--	0.21	
Total Flow During Sampling Event	gallons	--	133,000	
Maximum Flow Rate During Sampling Event	gpm	--	1,100	

Note: The first flush grab samples were sampled and analyzed in duplicate.
gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3C
2009 Storm Water Discharge Monitoring Data for Outfall Group 3

Storm Water Outfall S09

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			3/18/09	*3/18/09*
Alpha-BHC	mg/L	2	<0.000005	<0.000005
Aluminum, Total	mg/L	2	6.4	7.5
Ammonia (as NH_3)	mg/L	2	0.42	0.20
BOD_5	mg/L	2	3.2	2.6
Copper, Total Recoverable	mg/L	2	0.0090	0.0086
Iron, Total	mg/L	2	7.2	8.8
Lead, Total Recoverable	mg/L	2	0.024	0.014
Nitrogen, Nitrate (as N)	mg/L	2	0.61	0.57
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<2.0	<1.4
Nitrogen, Total Kjeldahl	mg/L	2	1.4	0.79
Oil & Grease[a]	mg/L	1	<2.2	NR
pH	SU	1	8.3	NR
Phosphorous, Total	mg/L	2	0.22	0.15
Solids, Total Dissolved	mg/L	2	290	210
Solids, Total Suspended	mg/L	2	200	160
Zinc, Total Recoverable	mg/L	2	0.040	0.042
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.85	
Rainfall During Sampling Event	inches	--	0.76	
Total Flow During Sampling Event	gallons	--	20,300	
Maximum Flow Rate During Sampling Event	gpm	--	158	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3C *(concluded)*
2009 Storm Water Discharge Monitoring Data for Outfall Group 3

Storm Water Outfall S12

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			7/21/09	*7/21/09*
Alpha-BHC	mg/L	2	<0.0000049	<0.0000046
Aluminum, Total	mg/L	2	12	1.7
Ammonia (as NH_3)	mg/L	2	0.054	0.024
BOD_5	mg/L	2	5.7	<2.0
Copper, Total Recoverable	mg/L	2	0.025	0.0045
Iron, Total	mg/L	2	17	1.8
Lead, Total Recoverable	mg/L	2	0.014	0.0015
Nitrogen, Nitrate (as N)	mg/L	2	0.58	0.38
Nitrogen, Nitrite (as N)	mg/L	2	0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	1.3	<0.68
Nitrogen, Total Kjeldahl	mg/L	2	0.74	0.28
Oil & Grease[a]	mg/L	1	6.3	NR
pH	SU	1	7.5	NR
Phosphorous, Total	mg/L	2	0.18	0.018
Solids, Total Dissolved	mg/L	2	257	335
Solids, Total Suspended	mg/L	2	110	22
Zinc, Total Recoverable	mg/L	2	0.17	0.027
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.1	
Rainfall During Sampling Event	inches	--	0.21	
Total Flow During Sampling Event	gallons	--	14,000	
Maximum Flow Rate During Sampling Event	gpm	--	220	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3D
2009 Storm Water Discharge Monitoring Data for Outfall Group 4

Storm Water Outfall S34

Analyte	***Units***	***N***	***First Flush Grab***	***Flow-weighted Composite***
			3/18/09	***3/18/09***
Aluminum, Total	mg/L	2	7.2	17
BOD_5	mg/L	2	<2.0	2.2
Copper, Total Recoverable	mg/L	2	0.0068	0.015
Iron, Total	mg/L	2	9.0	24
Lead, Total Recoverable	mg/L	2	0.0051	0.014
Oil & Grease[a]	mg/L	1	3.7	NR
pH	SU	1	7.9	NR
Phosphorous, Total	mg/L	2	0.10	0.25
Solids, Total Dissolved	mg/L	2	280	310
Solids, Total Suspended	mg/L	2	220	370
Surfactant (as LAS)	mg/L	2	<0.013	<0.052
Zinc, Total Recoverable	mg/L	2	0.085	0.160
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.85	
Rainfall During Sampling Event	inches	--	0.59	
Total Flow During Sampling Event	gallons	--	2,300,000	
Maximum Flow Rate During Sampling Event	gpm	--	23,000	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3D *(concluded)*
2009 Storm Water Discharge Monitoring Data for Outfall Group 4

Storm Water Outfall S34

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			8/18/09	*8/18/09*
Aluminum, Total	mg/L	2	1.7	6.3
BOD_5	mg/L	2	5.2	4.1
Copper, Total Recoverable	mg/L	2	0.011	0.0071
Iron, Total	mg/L	2	2.4	7.1
Lead, Total Recoverable	mg/L	2	0.0091	0.0058
Oil & Grease[a]	mg/L	1	<2.2	NR
pH	SU	1	8.2	NR
Phosphorous, Total	mg/L	2	0.35	0.091
Solids, Total Dissolved	mg/L	2	161	176
Solids, Total Suspended	mg/L	2	986	175
Surfactant (as LAS)	mg/L	2	<0.013	<0.013
Zinc, Total Recoverable	mg/L	2	0.17	0.078
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.7	
Rainfall During Sampling Event	inches	--	0.60	
Total Flow During Sampling Event	gallons	--	3,900,000	
Maximum Flow Rate During Sampling Event	gpm	--	35,000	

Note: The first flush grab samples were sampled and analyzed in duplicate.
gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3E
2009 Storm Water Discharge Monitoring Data for Outfall Group 5

Storm Water Outfall S17

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			3/18/09	*3/18/09*
Aluminum, Total	mg/L	2	24	44
Ammonia (as NH_3)	mg/L	2	0.14	0.33
BOD_5	mg/L	2	2.6	3.1
Copper. Total Recoverable	mg/L	2	0.020	0.042
Iron, Total	mg/L	2	31	63
Lead, Total Recoverable	mg/L	2	0.019	0.034
Nitrogen, Nitrate (as N)	mg/L	2	0.44	0.74
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<0.91	<1.3
Nitrogen, Total Kjeldahl	mg/L	2	0.45	0.58
Oil & Grease[a]	mg/L	1	2.4	NR
pH	SU	1	8.1	NR
Phosphorous, Total	mg/L	2	0.43	0.88
Solids, Settleable	ml/L	2	3.5	0.5
Solids, Total Dissolved	mg/L	2	310	330
Solids, Total Suspended	mg/L	2	870	1300
Sulfide	mg/L	2	<0.04	<0.22
Surfactant (as LAS)	mg/L	2	<0.013	<0.52
Vanadium, Total Recoverable	mg/L	2	<0.039	0.073
Zinc, Total Recoverable	mg/L	2	0.094	0.17
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.85	
Rainfall During Sampling Event	inches	--	0.67	
Total Flow During Sampling Event	gallons	--	45,000	
Maximum Flow Rate During Sampling Event	gpm	--	506	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3E *(concluded)*
2009 Storm Water Discharge Monitoring Data for Outfall Group 5

Storm Water Outfall S28

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			8/18/09	*8/18/09*
Aluminum, Total	mg/L	2	9.6	6.2
Ammonia (as NH_3)	mg/L	2	0.017	<0.009
BOD_5	mg/L	2	3.8	4.4
Copper. Total Recoverable	mg/L	2	0.011	0.0062
Iron, Total	mg/L	2	14	8.7
Lead, Total Recoverable	mg/L	2	0.0083	0.0046
Nitrogen, Nitrate (as N)	mg/L	2	0.29	0.093
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<2.0	<0.85
Nitrogen, Total Kjeldahl	mg/L	2	1.7	0.74
Oil & Grease[a]	mg/L	1	<2.2	NR
pH	SU	1	7.0	NR
Phosphorous, Total	mg/L	2	0.18	0.074
Solids, Settleable	ml/L	2	<0.1	<0.1
Solids, Total Dissolved	mg/L	2	198	218
Solids, Total Suspended	mg/L	2	346	147
Sulfide	mg/L	2	<0.022	<0.022
Surfactant (as LAS)	mg/L	2	<0.013	<0.013
Vanadium, Total Recoverable	mg/L	2	0.0082	0.0082
Zinc, Total Recoverable	mg/L	2	0.043	0.029
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.7	
Rainfall During Sampling Event	inches	--	0.60	
Total Flow During Sampling Event	gallons	--	27,000	
Maximum Flow Rate During Sampling Event	gpm	--	330	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3F
2009 Storm Water Discharge Monitoring Data for Outfall Group 6

Storm Water Outfall S38

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			3/26/09	*3/26/09*
Aluminum, Total	mg/L	2	0.30	2.4
Ammonia (as NH_3)	mg/L	2	<0.009	0.041
BOD_5	mg/L	2	<2.0	<2.0
Copper, Total Recoverable	mg/L	2	0.0013	0.0026
Iron, Total	mg/L	2	0.25	1.4
Lead, Total Recoverable	mg/L	2	0.0002	0.0009
Nitrogen, Nitrate (as N)	mg/L	2	<0.011	0.117
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<0.49	<0.72
Nitrogen, Total Kjeldahl	mg/L	2	0.46	0.58
Oil & Grease[a]	mg/L	1	3.8	NR
pH	SU	1	7.9	NR
Phosphorous, Total	mg/L	2	<0.005	<0.005
Solids, Settleable	ml/L	2	<0.1	<0.1
Solids, Total Dissolved	mg/L	2	95	163
Solids, Total Suspended	mg/L	2	<4.0	11.2
Sulfide	mg/L	2	<0.022	<0.022
Surfactant (as LAS)	mg/L	2	<0.013	0.046
Vanadium, Total Recoverable	mg/L	2	<0.001	0.0041
Zinc, Total Recoverable	mg/L	2	0.010	0.011
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.82	
Rainfall During Sampling Event	inches	--	0.28	
Total Flow During Sampling Event	gallons	--	38,000	
Maximum Flow Rate During Sampling Event	gpm	--	286	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3F *(concluded)*
2009 Storm Water Discharge Monitoring Data for Outfall Group 6

Storm Water Outfall S39

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			8/18/09	*8/18/09*
Aluminum, Total	mg/L	2	14	3
Ammonia (as NH_3)	mg/L	2	0.033	0.034
BOD_5	mg/L	2	2.8	2.4
Copper, Total Recoverable	mg/L	2	0.011	0.0036
Iron, Total	mg/L	2	16	2.9
Lead, Total Recoverable	mg/L	2	0.0055	0.0013
Nitrogen, Nitrate (as N)	mg/L	2	0.11	0.036
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<1.3	<1.6
Nitrogen, Total Kjeldahl	mg/L	2	1.2	1.5
Oil & Grease[a]	mg/L	1	<2.2	NR
pH	SU	1	8.0	NR
Phosphorous, Total	mg/L	2	0.35	0.072
Solids, Settleable	ml/L	2	<0.1	<0.1
Solids, Total Dissolved	mg/L	2	201	94
Solids, Total Suspended	mg/L	2	246	59
Sulfide	mg/L	2	<0.022	<0.022
Surfactant (as LAS)	mg/L	2	<0.013	<0.013
Vanadium, Total Recoverable	mg/L	2	0.017	0.0076
Zinc, Total Recoverable	mg/L	2	0.051	0.025
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.7	
Rainfall During Sampling Event	inches	--	0.60	
Total Flow During Sampling Event	gallons	--	69,000	
Maximum Flow Rate During Sampling Event	gpm	--	710	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3G
2009 Storm Water Discharge Monitoring Data for Outfall Group 7

Storm Water Outfall S20

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			3/18/09	*3/18/09*
Aluminum, Total	mg/L	2	8.1	5.0
Ammonia (as NH_3)	mg/L	2	1.2	0.99
BOD_5	mg/L	2	11	3.8
Copper, Total Recoverable	mg/L	2	0.008	0.0045
Iron, Total	mg/L	2	12	6.1
Lead, Total Recoverable	mg/L	2	0.0068	0.0033
Nitrogen, Nitrate (as N)	mg/L	2	1.4	0.63
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<3.9	<1.7
Nitrogen, Total Kjeldahl	mg/L	2	2.5	1.0
Oil & Grease[a]	mg/L	1	<2.2	NR
pH	SU	1	7.6	NR
Phosphorous, Total	mg/L	2	0.29	0.12
Solids, Total Dissolved	mg/L	2	160	56
Solids, Total Suspended	mg/L	2	1,100	37
Sulfide	mg/L	2	<0.044	<0.022
Surfactant (as LAS)	mg/L	2	<0.013	<0.013
Zinc, Total Recoverable	mg/L	2	0.062	0.027
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.85	
Total Rainfall During Sampling Event	inches	--	0.57	
Total Flow During SamplingEvent	gallons	--	129,000	
Maximum Flow Rate During Sampling Event	gpm	--	790	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3G *(concluded)*
2009 Storm Water Discharge Monitoring Data for Outfall Group 7

Storm Water Outfall S20

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			8/18/09	*8/18/09*
Aluminum, Total	mg/L	2	1.3	2.6
Ammonia (as NH_3)	mg/L	2	0.043	0.059
BOD_5	mg/L	2	7.0	<2.0
Copper, Total Recoverable	mg/L	2	0.0043	0.002
Iron, Total	mg/L	2	2.8	2.2
Lead, Total Recoverable	mg/L	2	0.0011	0.0011
Nitrogen, Nitrate (as N)	mg/L	2	1.6	0.27
Nitrogen, Nitrite (as N)	mg/L	2	0.10	<0.020
Nitrogen, Total (as N)	mg/L	2	4.0	<1.3
Nitrogen, Total Kjeldahl	mg/L	2	2.3	0.96
Oil & Grease[a]	mg/L	1	<2.2	NR
pH	SU	1	7.6	NR
Phosphorous, Total	mg/L	2	0.083	0.059
Solids, Total Dissolved	mg/L	2	153	63
Solids, Total Suspended	mg/L	2	50	29
Sulfide	mg/L	2	<0.022	<0.022
Surfactant (as LAS)	mg/L	2	0.029	0.019
Zinc, Total Recoverable	mg/L	2	0.020	0.0114
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.7	
Total Rainfall During Sampling Event	inches	--	0.60	
Total Flow During SamplingEvent	gallons	--	118,000	
Maximum Flow Rate During Sampling Event	gpm	--	990	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3H
2009 Storm Water Discharge Monitoring Data for Outfall Group 8

Storm Water Outfall S27

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			3/26/09	*3/26/09*
Aluminum, Total	mg/L	2	6.1	9.4
Ammonia (as NH_3)	mg/L	2	<0.009	<0.009
BOD_5	mg/L	2	8.5	3.2
Copper, Total Recoverable	mg/L	2	0.0056	0.011
Iron, Total	mg/L	2	4.8	8.7
Lead, Total Recoverable	mg/L	2	0.0031	0.006
Nitrogen, Nitrate (as N)	mg/L	2	0.054	0.093
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<2.1	<0.44
Nitrogen, Total Kjeldahl	mg/L	2	2.0	0.33
Oil & Grease[a]	mg/L	1	<2.2	NR
pH	SU	1	7.7	NR
Phosphorous, Total	mg/L	2	0.093	0.087
Solids, Total Dissolved	mg/L	2	222	368
Solids, Total Suspended	mg/L	2	66	169
Surfactant (as LAS)	mg/L	2	0.014	<0.013
Zinc, Total Recoverable	mg/L	2	0.022	0.035
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.82	
Rainfall During Sampling Event	inches	--	0.28	
Total Flow During Sampling Event	gallons	--	2,800	
Maximum Flow Rate During Sampling Event	gpm	--	23.3	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

TABLE B-3H *(concluded)*
2009 Storm Water Discharge Monitoring Data for Outfall Group 8

Storm Water Outfall S35

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			7/21/09	*7/21/09*
Aluminum, Total	mg/L	2	12	3.7
Ammonia (as NH_3)	mg/L	2	0.075	0.014
BOD_5	mg/L	2	5.2	<2.0
Copper, Total Recoverable	mg/L	2	0.015	0.0039
Iron, Total	mg/L	2	14	2.7
Lead, Total Recoverable	mg/L	2	0.070	0.0053
Nitrogen, Nitrate (as N)	mg/L	2	1.0	0.3
Nitrogen, Nitrite (as N)	mg/L	2	0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	2.1	<1.2
Nitrogen, Total Kjeldahl	mg/L	2	1.0	0.90
Oil & Grease[a]	mg/L	1	<2.2	NR
pH	SU	1	7.5	NR
Phosphorous, Total	mg/L	2	0.097	0.082
Solids, Total Dissolved	mg/L	2	555	426
Solids, Total Suspended	mg/L	2	688	50
Surfactant (as LAS)	mg/L	2	<0.013	0.023
Zinc, Total Recoverable	mg/L	2	0.14	0.026
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.1	
Rainfall During Sampling Event	inches	--	0.21	
Total Flow During Sampling Event	gallons	--	7,000	
Maximum Flow Rate During Sampling Event	gpm	--	56	

gpm - gallons per minute
N - Number of samples
NR - Not required by permit
[a] The SPDES permit specifies that oil and grease concentrations shall not exceed 15 mg/L.

APPENDIX B-4

Site Surface Drainage, Subsurface Drainage, and Contained Water Data

TABLE B-4A
2009 Radioactivity and pH in Surface Water at Facility Yard Drainage (WNSP005)

Analyte	*Units*	*N*	*WNSP005 Concentrations*			*Guideline [a] or Standard [b]*
			Minimum	*Average*	*Maximum*	
Gross Alpha	µCi/mL	4	<8.37E-10	0.03±3.23E-09	<6.14E-09	3E-08[c]
Gross Beta	µCi/mL	4	7.17E-08	1.74±0.10E-07	2.58E-07	1E-06[d]
Tritium	µCi/mL	4	<3.36E-08	-1.00±4.09E-08	<4.70E-08	2E-03
Sr-90	µCi/mL	2	3.69E-08	8.54±0.35E-08	1.34E-07	1E-06
Cs-137	µCi/mL	2	<1.87E-09	-0.04±1.90E-09	<1.93E-09	3E-06
pH	SU	4	7.62	7.73	7.93	6.0–9.5

N - Number of samples

[a] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results.

[b] New York State Water Quality Standards for Class "D" as a comparative reference for nonradiological results

[c] Alpha as Am-241

[d] Beta as Sr-90

TABLE B-4B
2009 Radioactivity in Surface Water at French Drain (WNSP008)

No Discharge; Drainage pipe was capped in May 2001

TABLE B-4C
2009 Radioactivity in Surface Water at the North Swamp (WNSW74A)

Isotope [a]	N	Discharge Activity [b] (Ci)	Radioactivity [c] (Becquerels)	Average Concentration (µCi/mL)	DCG (µCi/mL)	Ratio of Concentration to DCG
Gross Alpha	26	3.36±4.54E-05	1.24±1.68E+06	7.17±9.69E-10	NA[d]	NA
Gross Beta	26	7.11±0.47E-04	2.63±0.17E+07	1.52±0.10E-08	NA[d]	NA
Tritium	26	-1.46±0.63E-03	-5.41±2.31E+07	-3.12±1.33-08	2E-03	<0.0001
C-14	2	-0.10±1.05E-03	-0.36±3.89E+07	-0.21±2.24E-08	7E-05	<0.0003
Sr-90	12	2.87±0.15E-04	1.06±0.05E+05	6.12±0.31E-09	1E-06	0.0061
I-129	2	1.97±2.48E-05	7.29±9.16E+05	4.21±5.29E-10	5E-07	<0.0011
Cs-137	12	2.45±2.72E-05	0.91±1.01E+06	5.24±5.82E-10	3E-06	<0.0002
U-232[e]	2	-0.62±1.61E-06	-2.30±5.97E+04	-1.33±3.44E-11	1E-07	<0.0003
U-233/234[e]	2	1.27±1.90E-06	4.70±7.04E+04	2.71±4.06E-11	5E-07	<0.0001
U-235/236[e]	2	0.91±1.21E-06	3.38±4.48E+04	1.95±2.59E-11	5E-07[f]	<0.0001
U-238[e]	2	4.46±2.66E-06	1.65±0.99E+04	9.53±5.69E-11	6E-07	0.0002
Pu-238	2	0.00±6.68E-07	0.00±2.47E+04	0.00±1.43E-11	4E-08	<0.0004
Pu-239/240	2	-3.23±7.40E-07	-1.20±2.74E+04	-0.69±1.58E-11	3E-08	<0.0005
Am-241	2	-0.15±9.65E-07	-0.05±3.57E+04	-0.03±2.06E-11	3E-08	<0.0007
Sum of Ratios						**<0.0099**

Note: The average pH at this location was 7.32 SU.
N - Number of samples
NA - Not applicable
[a] Half-lives are listed in Table UI-4.
[b] Total estimated volume released: 4.68E+10 mL (1.23E+07 gal)
[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq); 1 Bq= 2.7E-11 Ci
[d] DOE-derived concentration guides (DCGs) do not exist for indicator parameters gross alpha and gross beta.
[e] Total Uranium (g) = -0.94±5.58E-01; Average Total Uranium (µg/mL) = -0.20±1.19E-05
[f] DCG for U-236 is used for this comparison.

TABLE B-4D
2009 Radioactivity in Surface Water at the Northeast Swamp (WNSWAMP)

Isotope [a]	*N*	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *(Becquerels)*	*Average Concentration (µCi/mL)*	*DCG* [d] *(µCi/mL)*	*Ratio of Concentration to DCG*
Gross Alpha	26	4.42±1.95E-04	1.64±0.72E+07	2.94±1.30E-09	NA[e]	NA
Gross Beta	26	7.97±0.07E-01	2.95±0.03E+10	5.31±0.05E-06	NA[e]	NA
H-3	26	6.15±2.43E-03	2.27±0.90E+08	4.09±1.62E-08	2E-03	<0.0001
C-14	2	-0.89±2.78E-03	-0.33±1.03E+08	-0.59±1.85E-08	7E-05	<0.0003
Sr-90	12	4.00±0.01E-01	1.48±.0.01E+07	2.67±0.01E-06	1E-06	2.67
I-129	2	-1.59±8.54E-05	-0.59±3.16E+06	-1.06±5.69E-10	5E-07	<0.0011
Cs-137	12	7.69±9.46E-05	2.84±3.50E+06	5.12±6.30E-10	3E-06	<0.0002
U-232[f]	2	-0.64±7.31E-06	-0.24±2.71E+05	-0.43±4.87E-11	1E-07	<0.0005
U-233/234[f]	2	2.32±1.34E-05	8.58±4.94E+05	1.54±0.89E-10	5E-07	0.0003
U-235/236[f]	2	2.35±6.16E-06	0.87±2.28E+05	1.56±4.10E-11	5E-07[g]	<0.0001
U-238[f]	2	1.40±1.04E-05	5.18±3.83E+05	9.32±6.90E-11	6E-07	0.0002
Pu-238	2	0.70±3.23E-06	0.26±1.19E+05	0.47±2.15E-11	4E-08	<0.0005
Pu-239/240	2	-0.39±3.16E-06	-0.14±1.17E+05	-0.26±2.11E-11	3E-08	<0.0007
Am-241	2	1.51±3.76E-06	0.56±1.39E+05	1.01±2.50E-11	3E-08	<0.0008
Sum of Ratios						**2.67**

Note: The average pH at this location was 7.44 SU.
NA - Not applicable
[a] Half-lives are listed in Table UI-4.
[b] Total volume released: 1.50E+11 mL (3.97E+07 gal)
[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq); 1 Bq = 2.7E-11 Ci
[d] DCGs are listed for reference only. DCGs are applicable at the point at which water is available for ingestion by the public (i.e., at the site boundary), but not to release point concentrations, as might be inferred from their inclusion in this table.
[e] DOE DCGs do not exist for indicator parameters gross alpha and gross beta.
[f] Total Uranium (g) = 3.13±0.45E+01; Average Total Uranium (µg/mL) = 2.08±0.30E-04
[g] DCG for U-236 is used for this comparison.

TABLE B-4E
2009 Radioactivity in Surface Water at Drainage Between the NDA and the SDA (WNNDADR)

Analyte	*Units*	*N*	*WNNDADR Concentrations*		
			Minimum	*Average*	*Maximum*
Gross Alpha	µCi/mL	12	<8.98E-10	0.68±1.41E-09	1.24E-09
Gross Beta	µCi/mL	12	3.42E-08	7.58±0.64E-08	1.18E-07
Tritium	µCi/mL	12	3.59E-07	5.46±0.53E-07	6.43E-07
Sr-90	µCi/mL	2	3.19E-08	3.85±0.23E-08	4.51E-08
I-129	µCi/mL	2	<7.46E-10	-0.02±7.96E-10	<8.43E-10
Cs-137	µCi/mL	12	<1.32E-09	0.40±1.83E-09	<2.12E-09

N - Number of samples

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APPENDIX B-5

Ambient Surface Water Data

TABLE B-5A
2009 Radioactivity and pH in Surface Water Downstream of the WVDP in Cattaraugus Creek at Felton Bridge (WFFELBR)

Analyte	Units	N	WFFELBR Concentrations		N	Reference Values	
			Average	Maximum		WFBIGBR Background Range	Guideline[a] or Standard[b]
Gross Alpha	µCi/mL	12	0.94±1.25E-09[c]	3.74E-09[c]	98	<3.59E-10–4.62E-09	3E-08[d]
Gross Beta	µCi/mL	12	2.77±1.98E-09[c]	4.48E-09[c]	98	<9.03E-10–1.37E-08	1E-06[e]
Tritium	µCi/mL	12	-3.60±4.37E-08[c]	5.35E-08[c]	98	<4.46E-08–2.65E-07	2E-03
Sr-90	µCi/mL	12	2.28±7.43E-10	8.37E-10	98	<3.57E-10–1.10E-08	1E-06
Cs-137	µCi/mL	12	0.41±1.61E-09	1.37E-09	98	<1.34E-09–5.29E-09	3E-06
pH	SU	36	7.95	8.38	98	5.80–8.34	6.5–8.5

Note: Historical background data are from Bigelow Bridge, on Cattaraugus Creek upstream of WFFELBR. Sampling at WFBIGBR was discontinued in 2008. Range was calculated from the most recent 10 years of sampling, 1998–2007.

N - Number of samples

[a] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results in the absence of water quality standards.

[b] New York State Water Quality Standards, Class "B" as a comparative reference for nonradiological results

[c] Values represent composite concentrations weighted to monthly stream flow.

[d] Alpha as Am-241

[e] Beta as Sr-90

TABLE B-5B
2009 Water Quality of Surface Water Downstream of the WVDP in Buttermilk Creek at Thomas Corners Bridge (WFBCTCB)

RADIOACTIVITY CONCENTRATIONS

Analyte	Units	N	WFBCTCB Concentrations		N	Reference Values	
			Average	Maximum		WFBCBKG[a] Background Range	Guideline[b]
Gross Alpha	µCi/mL	12	1.08±0.95E-09	2.77E-09	12	3.47E-10–1.44E-09	3E-08[c]
Gross Beta	µCi/mL	12	6.47±1.81E-09	7.96E-09	12	<1.56E-09–2.89E-09	1E-06[d]
Tritium	µCi/mL	12	-1.73±4.70E-08	<4.90E-08	12	<3.38E-08–5.67E-08	2E-03
Sr-90	µCi/mL	2	1.90±0.76E-09	2.47E-09	2	<5.70E-10–<7.38E-10	1E-06
Cs-137	µCi/mL	2	0.44±1.96E-09	<1.96E-09	2	<1.82E-09–1.96E-09	3E-06

N - Number of samples

[a] Background location

[b] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results in the absence of water quality standards.

[c] Alpha as Am-241

[d] Beta as Sr-90

TABLE B-5B *(continued)*
2009 Water Quality of Surface Water Downstream of the WVDP in Buttermilk Creek at Thomas Corners Bridge (WFBCTCB)

CHEMICAL CONSTITUENTS

Analyte	*Units*	*N*	*WFBCTCB Concentration*		*Standard* [a]
			Average	*Maximum*	
Alpha-BHC	µg/L	2	<0.009	<0.009	0.002
Aluminum, Dissolved	mg/L	2	<0.100	<0.100	0.10
Ammonia-N	mg/L	2	<0.03	0.03	0.09–2.1
Antimony, Total	mg/L	2	<0.004	<0.005	--
Arsenic, Dissolved	mg/L	2	<0.005	<0.005	0.150
Barium, Total	mg/L	2	0.1	0.13	--
Boron, Total	mg/L	2	0.03	0.03	10.0
Bromide	mg/L	2	<0.50	<0.50	--
Cadmium, Dissolved	mg/L	2	<0.001	<0.001	0.003[b]
Calcium, Total	mg/L	12	37.8	54.5	--
Chloride	mg/L	2	16	20	--
Chromium, Dissolved	mg/L	2	<0.01	<0.01	0.116[b]
Cobalt, Total	mg/L	2	<0.006	0.008	0.005[c]
Copper, Dissolved	mg/L	2	<0.006	0.006	0.014[b]
Dissolved, Oxygen	mg/L	2	11	11.7	4.0 (min)
Fluoride	mg/L	2	<0.15	<0.20	3.47[b]
Hardness	mg/L	12	120	172	--
Iron, Total	mg/L	2	8.94	16.5	0.30
Lead, Dissolved	mg/L	2	<0.0005	<0.0005	0.007[b]
Magnesium, Total	mg/L	12	6.27	8.78	--
Manganese, Total	mg/L	2	0.15	0.26	--
Mercury, Dissolved, Method 1631	µg/L	2	0.000932	0.00113	0.0007
Nickel, Dissolved	mg/L	2	<0.04	<0.04	0.082[b]
Nitrate-N	mg/L	2	0.17	0.24	--
Nitrite-N	mg/L	2	<0.05	<0.05	0.10
NPOC	mg/L	2	3.6	4.8	--

N - Number of samples
-- No reference standard available for this analyte
[a] New York State Water Quality Standards, Class "C" as a comparative reference for nonradiological results
[b] Calculated from maximum measurement of hardness of surface water stream at WFBCTCB
[c] Standards for cobalt, thallium, and vanadium are applicable to the acid-soluble fraction.

TABLE B-5B *(concluded)*
2009 Water Quality of Surface Water Downstream of the WVDP in Buttermilk Creek at Thomas Corners Bridge (WFBCTCB)

CHEMICAL CONSTITUENTS *(concluded)*

Analyte	*Units*	*N*	*WFBCTCB Concentration*		*Standard* [a]
			Average	*Maximum*	
Oil & Grease	mg/L	2	<5	<5	--
pH	SU	2	7.92	7.97	6.5–8.5
Selenium, Dissolved	mg/L	2	<0.001	<0.001	0.0046
Sodium, Total	mg/L	2	12	14.1	--
Solids, Total Dissolved	mg/L	2	167	188	500
Solids, Total Suspended	mg/L	2	<270	532	--
Sulfate	mg/L	2	20.8	21.7	--
Sulfide (as S)	mg/L	2	<0.04	<0.04	0.002
Surfactant	mg/L	2	<0.02	<0.02	0.04
Thallium, Total	mg/L	2	<0.008	<0.008	0.008[c]
Titanium, Total	mg/L	2	<0.0892	0.121	--
TOX	mg/L	2	<0.01	0.01	--
Vanadium, Total	mg/L	2	<0.0156	0.0211	0.014[c]
Zinc, Dissolved	mg/L	2	<0.02	<0.02	0.131[b]

N - Number of samples

-- No reference standard available for this analyte

[a] New York State Water Quality Standards, Class "C" as a comparative reference for nonradiological results

[b] Calculated from maximum measurement of hardness of surface water stream at WFBCTCB

[c] Standards for cobalt, thallium, and vanadium are applicable to the acid-soluble fraction.

TABLE B-5C
2009 Radioactivity in Surface Water Downstream of the WVDP at Franks Creek (WNSP006)

Analyte	Units	N	WNSP006 Concentrations		N	Reference Values	
			Average	Maximum		WFBCBKG [a] Background Range	Guideline [b]
Gross Alpha	µCi/mL	34	1.20±1.54E-09	5.23E-09	12	3.47E-10–1.44E-09	3E-08[c]
Gross Beta	µCi/mL	34	4.48±0.41E-08	1.15E-07	12	<1.56E-09–2.89E-09	1E-06[d]
Tritium	µCi/mL	34	3.80±4.66E-08	2.56E-07	12	<3.38E-08–5.67E-08	2E-03
C-14	µCi/mL	4	0.85±2.93E-08	2.48E-08	2	<2.40E-08–<3.84E-08	7E-05
Sr-90	µCi/mL	12	1.99±0.17E-08	3.69E-08	2	<5.70E-10–<7.38E-10	1E-06
Tc-99	µCi/mL	4	1.05±2.02E-09	<2.21E-09	2	<1.88E-09–<2.14E-09	1E-04
I-129	µCi/mL	4	-1.68±9.31E-10	<1.39E-09	2	<7.89E-10–<1.17E-09	5E-07
Cs-137	µCi/mL	12	1.75±2.23E-09	4.63E-09	2	<1.82E-09–1.96E-09	3E-06
U-232	µCi/mL	4	2.25±1.47E-10	3.58E-10	2	<3.73E-11–<7.49E-11	1E-07
U-233/234	µCi/mL	4	2.12±1.30E-10	3.66E-10	2	<6.05E-11–1.86E-10	5E-07
U-235/236	µCi/mL	4	3.85±6.01E-11	5.52E-11	2	<4.84E-11–<5.65E-11	5E-07[e]
U-238	µCi/mL	4	2.08±1.27E-10	2.96E-10	2	<8.47E-11–1.32E-10	6E-07
Total U	µg/mL	4	5.34±0.21E-04	6.26E-04	2	<3.00E-05–3.74E-04	--
Pu-238	µCi/mL	4	1.54±2.98E-11	4.99E-11	2	<1.77E-11–<2.91E-11	4E-08
Pu-239/240	µCi/mL	4	-0.45±2.22E-11	<2.85E-11	2	<2.95E-11–<3.43E-11	3E-08
Am-241	µCi/mL	4	1.05±3.18E-11	<3.82E-11	2	<2.93E-11–<5.42E-11	3E-08

N - Number of samples
-- No guideline or standard available for these analytes
[a] Background location
[b] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results.
[c] Alpha as Am-241
[d] Beta as Sr-90
[e] DCG for U-236 is used for this comparison.

TABLE B-5D
2009 Radioactivity and pH in Surface Water at Erdman Brook (WNERB53)

Analyte	Units	N	WNERB53 Concentrations		N	Reference Values	
			Average	Maximum		WFBCBKG [a] Background Range	Guideline[b] or Standard[c]
Gross Alpha	µCi/mL	4	0.10±1.34E-09	<2.11E-09	12	3.47E-10–1.44E-09	3E-08[d]
Gross Beta	µCi/mL	4	9.69±2.47E-09	1.32E-08	12	<1.56E-09–2.89E-09	1E-06[e]
Tritium	µCi/mL	4	-2.47±4.42E-08	<4.76E-08	12	<3.38E-08–5.67E-08	2E-03
Sr-90	µCi/mL	2	3.62±0.93E-09	3.77E-09	2	<5.70E-10–<7.38E-10	1E-06
Cs-137	µCi/mL	2	1.09±1.88E-09	<1.92E-09	2	<1.82E-09–1.96E-09	3E-06
pH	SU	4	7.89	7.93	293	6.4–8.7	6.0–9.5

N - Number of samples
[a] Background data are from Buttermilk Creek, upstream of the WVDP. Sampling for nonradiological data was discontinued at this location in 2008. The pH range was calculated from the most recent 10 years of sampling, 1998–2007.
[b] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results.
[c] New York State Water Quality Standards, Class “D” for surface waters as a standard for nonradiological results
[d] Alpha as Am-241
[e] Beta as Sr-90

TABLE B-5E
2009 Radioactivity and pH in Surface Water at Franks Creek East of the SDA (WNFRC67)

Analyte	Units	N	WNFRC67 Concentrations			N	Reference Values	
			Average	Maximum			WFBCBKG [a] Background Range	Guideline[b] or Standard[c]
Gross Alpha	µCi/mL	4	5.53±8.48E-10	1.12E-09		12	3.47E-10–1.44E-09	3E-08[d]
Gross Beta	µCi/mL	4	1.09±1.32E-09	1.85E-09		12	<1.56E-09–2.89E-09	1E-06[e]
Tritium	µCi/mL	4	-2.48±4.02E-08	<4.81E-08		12	<3.38E-08–5.67E-08	2E-03
Sr-90	µCi/mL	2	-0.91±6.25E-10	<7.40E-10		2	<5.70E-10–<7.38E-10	1E-06
Cs-137	µCi/mL	2	1.18±1.92E-09	<2.00E-09		2	<1.82E-09–1.96E-09	3E-06
pH	SU	4	7.76	7.80		293	6.4–8.7	6.0–9.5

N - Number of samples

[a] Background data are from Buttermilk Creek, upstream of the WVDP. Sampling for nonradiological data was discontinued at this location in 2008. The pH range was calculated from the most recent 10 years of sampling, 1998–2007.

[b] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results.

[c] New York State Water Quality Standards for Class “C” surface waters as a standard for nonradiological results

[d] Alpha as Am-241

[e] Beta as Sr-90

TABLE B-5F
Radioactivity and pH in Surface Water at Fox Valley Road Buttermilk Creek Background (WFBCBKG)

Analyte	Units	N	WFBCBKG [a] Concentrations			Reference Values Guideline [b] or Standard [c]
			Average	Maximum		
Gross Alpha	µCi/mL	12	4.69±8.84E-10	1.44E-09		3E-08[d]
Gross Beta	µCi/mL	12	1.72±1.49E-09	2.89E-09		1E-06[e]
Tritium	µCi/mL	12	-1.79±4.46E-08	5.67E-08		2E-03
C-14	µCi/mL	2	0.44±3.20E-08	<3.84E-08		7E-05
Sr-90	µCi/mL	2	-3.90±6.59E-10	<7.38E-10		1E-06
Tc-99	µCi/mL	2	0.53±2.01E-09	<2.14E-09		1E-04
I-129	µCi/mL	2	4.00±9.98E-10	<1.17E-09		5E-07
Cs-137	µCi/mL	2	1.51±1.87E-09	1.96E-09		3E-06
U-232	µCi/mL	2	0.72±5.92E-11	<7.49E-11		1E-07
U-233/234	µCi/mL	2	1.08±1.06E-10	1.86E-10		5E-07
U-235/236	µCi/mL	2	3.28±5.26E-11	<5.65E-11		5E-07
U-238	µCi/mL	2	1.05±1.00E-10	1.32E-10		6E-07
Pu-238	µCi/mL	2	-0.37±2.41E-11	<2.91E-11		4E-08
Pu-239/240	µCi/mL	2	1.50±3.20E-11	<3.43E-11		3E-08
Am-241	µCi/mL	2	1.53±4.36E-11	<5.42E-11		3E-08
pH	SU	293	Range: 6.42–8.67			6.5–8.5

N - Number of samples

[a] Radiological data are from samples collected in CY 2008. Sampling for nonradiological constituents was discontinued in 2008. The pH values represent measurements from the most recent 10 years of sampling, 1998–2007.

[b] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results.

[c] The New York State Water Quality Standard for Class “C” is provided as a comparative reference for pH.

[d] Alpha as Am-241

[e] Beta as Sr-90

TABLE B-5G
Radioactivity and pH in Surface Water at Bigelow Bridge
Cattaraugus Creek Background (WFBIGBR)

Analyte	*Units*	*N*	*WFBIGBR [a] Concentrations*		*Reference Values Guideline [b] or Standard [c]*
			Average	*Maximum*	
Gross Alpha	µCi/mL	98	0.45±1.05E-09	4.62E-09	3E-08[d]
Gross Beta	µCi/mL	98	2.64±1.35E-09	1.37E-08	1E-06[e]
Tritium	µCi/mL	98	0.71±7.79E-08	2.65E-07	2E-03
Sr-90	µCi/mL	98	1.27±1.46E-09	1.10E-08	1E-06
Cs-137	µCi/mL	98	0.59±3.27E-09	5.29E-09	3E-06
pH	SU	98	Range: 5.80–8.34		6.5–8.5

N - Number of samples

[a] Sampling was discontinued in 2008. Data represent measurements from the most recent 10 years of sampling, 1998–2007.

[b] DOE ingestion-based DCGs for 100 mrem/yr dose limit are provided as a guideline for radiological results.

[c] The New York State Water Quality Standard for Class “B” is provided as a comparative reference for pH.

[d] Alpha as Am-241

[e] Beta as Sr-90

APPENDIX B-6

Potable Water (Drinking Water) Data

TABLE B-6A
2009 Radioactivity and Water Quality Results in Potable Water at the WVDP

Analyte	*Units*	*N*	*WNDNKMP*	*WNDNKEL*	*Standard* [a]
Gross Alpha	µCi/mL	1	2.07±6.64E-10	NA	1.5E-08
Gross Beta	µCi/mL	1	1.76±0.93E-09	NA	5E-08
Tritium	µCi/mL	1	-4.20±4.69E-08	NA	2E-05
Cryptosporidium	IFA Pos Organism/1 L [b]	1	NA	<0.1	Absent
Giardia	IFA Pos Organism/1 L [b]	1	NA	<0.1	Absent
Heterotrophic bacteria	48ºCFU/1 L [c]	1	NA	<2	Absent
Haloacetic Acids-Five (5)	mg/L	1	NA	0.033	0.06
Total Trihalomethanes	mg/L	1	NA	0.054	0.08

N - Number of samples
NA - Not applicable, constituent not analyzed
[a] New York State Department of Health MCLs for drinking water used as a comparative reference
[b] IFA - Immunofluorescence Antibody positive organisims per liter.
[c] CFU - colony-forming unit; a measure of viable bacterial cells per liter.

TABLE B-6B
2009 Water Quality Results in Utility Room Potable Water (Entry Point 002)

Analyte	Units	N	Utility Room Concentrations		Standard or Guideline [a]
			Minimum	Maximum	
Antimony, Total	mg/L	1	NA	<0.0004	0.006
Arsenic, Total	mg/L	1	NA	<0.001	0.05
Barium, Total	mg/L	1	NA	<0.20	2.00
Beryllium, Total	mg/L	1	NA	<0.0003	0.004
Cadmium, Total	mg/L	1	NA	<0.001	0.005
Chromium, Total	mg/L	1	NA	<0.007	0.10
Cyanide, Total	mg/L	1	NA	<0.010	0.2
Fluoride	mg/L	1	NA	<0.25	2.2
Free Residual Chlorine	mg/L	1,095	0.50	2.03	0.2–4.0
Iron, Total	mg/L	1	NA	<0.050	0.3
Manganese, Total	mg/L	1	NA	<0.010	--
Mercury, Total	mg/L	1	NA	<0.0002	0.002
Nickel, Total	mg/L	1	NA	<0.005	--
TOC	mg/L	6	<1	2.2	--
Selenium, Total	mg/L	1	NA	<0.002	0.05
Thallium, Total	mg/L	1	NA	<0.0003	0.0005
Turbidity	NTU	2,190	0.1	0.9	1.0[b]
Zinc, Total	mg/L	1	NA	<0.010	--

Note: Chemical constituent sampling is required by, and reported to, the Cattaraugus County Department of Health.
N - Number of samples
NA - Not applicable, constituents sampled annually
NTU - Nephelometric Turbidity Unit
TOC - Total organic carbon
-- No guideline or standard available for these analytes
[a] New York State Department of Health MCLs for drinking water or EPA MCLGs, whichever is more stringent.
[b] A treatment standard of 0.3 NTU applies to the 95th percentile on a monthly basis.

TABLE B-6C
2009 Water Quality Results in Utility Room Raw (Untreated) Water (WNURRAW)

Analyte	Units	N	Untreated Raw Water Concentrations		
			Minimum	Average	Maximum
Alkalinity	mg/L	9	38.8	58.5	108
Cryptosporidium	IFA Pos Organism/1 L	1	NA	NA	0.2
Giardia	IFA Pos Organism/1 L	1	NA	NA	0.6
Iron, Total	mg/L	70	0.18	2.4	10.3
Solids, Total Dissolved	mg/L	21	80	121	211
TOC	mg/L	9	<1	2.6	4.3

Note: Chemical constituent sampling is required by, and reported to, the Cattaraugus County Department of Health.
N - Number of samples
NA - Not applicable, constituents sampled annually

TABLE B-6D
2009 Biological and Chlorine Results From Various Site Tap Water Locations
(Analyzed by Cattaraugus County Health Department)

Analyte	*Units*	*N*	*Various Site Tap Water Locations Results*	*Standard* [a]
E. coli	NA	12	Negative	one positive sample
Free Residual Chlorine	mg/L	12	Range: 0.03–0.96	4.0 (max)
Total Coliform	NA	12	Negative	two or more positive samples

N - Number of samples
NA - Not applicable
[a] New York State Department of Health MCLs for drinking water or EPA MCLGs, whichever is more stringent

TABLE B-6E
2009 Nitrate Results From the Utility Room Raw Tap Water
(Analyzed by Cattaraugus County Health Department)

Analyte	*Units*	*N*	*Date Collected*	*Annual Concentration*	*Standard* [a]
Nitrate-N	mg/L	1	3/4/09	<1.0	10

N - Number of samples
[a] New York State Department of Health MCLs for drinking water or EPA MCLGs, whichever is more stringent

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APPENDIX C

Summary of Air Monitoring Data

TABLE C-1
2009 Effluent Airborne Radioactivity at Main Stack (ANSTACK)

Isotope [a]	*N*	*Total Activity Released* [b] *(Ci)*	*Average Concentration (µCi/mL)*	*Maximum Concentration (µCi/mL)*	*DCG* [c] *(µCi/mL)*	*Ratio of Concentration to DCG*
Gross Alpha	26	8.20±0.72E-07	1.11±0.10E-15	6.95E-15	--	--
Gross Beta	26	3.87±0.04E-05	5.22±0.06E-14	7.42E-13	--	--
H-3	26	1.94±0.05E-03	2.61±0.07E-12	7.84E-12	1E-07	<0.0001
Co-60	2	0.83±4.50E-08	1.12±6.06E-17	<9.86E-17	8E-11	<0.0001
Sr-90	2	1.09±0.04E-05	1.47±0.05E-14	2.36E-14	9E-12	0.0016
I-129	2	2.12±0.14E-05	2.86±0.19E-14	2.82E-14	7E-11	0.0004
Cs-137	2	1.12±0.04E-05	1.51±0.05E-14	2.22E-14	4E-10	<0.0001
Eu-154	2	-1.04±1.07E-07	-1.40±1.44E-16	<2.24E-16	5E-11	<0.0001
U-232 [d]	2	3.59±7.32E-09	4.84±9.87E-18	<1.61E-17	2E-14	<0.0005
U-233/234 [d]	2	2.53±0.88E-08	3.42±1.18E-17	3.87E-17	9E-14	0.0004
U-235/236 [d]	2	3.05±3.07E-09	4.11±4.14E-18	<5.48E-18	1E-13	<0.0001
U-238 [d]	2	1.92±0.74E-08	2.59±1.00E-17	2.91E-17	1E-13	0.0003
Pu-238	2	1.12±0.24E-07	1.51±0.33E-16	2.05E-16	3E-14	0.0050
Pu-239/240	2	2.04±0.33E-07	2.75±0.45E-16	3.48E-16	2E-14	0.0138
Am-241	2	4.41±0.51E-07	5.95±0.69E-16	8.55E-16	2E-14	0.0298
Sum of Ratios						**0.052**

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Half-lives are listed in Table UI-4.
[b] Total volume released at 50,000 cfm = 7.42E+14 mL/year
[c] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.
[d] Total Uranium: 4.11±0.11E-02 g; average = 5.54E±0.15E-11 µg/mL

TABLE C-2
2009 Effluent Airborne Radioactivity at Vitrification System HVAC (ANVITSK)

Isotope	N	Total Activity Released (Ci)	Average Concentration (µCi/mL)	Maximum Concentration (µCi/mL)	DCG [a] (µCi/mL)
Gross Alpha	26	0.52±1.26E-08	1.39±3.38E-17	<2.66E-16	--
Gross Beta	26	2.90±3.87E-08	0.78±1.04E-16	7.38E-16	--
Co-60	2	1.64±2.08E-08	4.42±5.62E-17	<9.11E-17	8E-11
Sr-90	2	1.49±2.11E-08	4.02±5.68E-17	9.81E-17	9E-12
I-129	2	3.99±0.81E-07	1.07±0.22E-15	2.06E-15	7E-11
Cs-137	2	2.20±1.59E-08	5.94±4.27E-17	1.17E-16	4E-10
Eu-154	2	0.67±5.13E-08	0.18±1.38E-16	<2.17E-16	5E-11
U-232[b]	2	-0.34±1.51E-09	-0.93±4.08E-18	<5.86E-18	2E-14
U-233/234[b]	2	7.40±2.33E-09	1.99±0.63E-17	2.34E-17	9E-14
U-235/236[b]	2	7.43±9.66E-10	2.00±2.60E-18	5.10E-18	1E-13
U-238[b]	2	8.38±2.53E-09	2.26±0.68E-17	2.27E-17	1E-13
Pu-238	2	-0.23±1.79E-09	-0.61±4.81E-18	<7.16E-18	3E-14
Pu-239/240	2	0.23±1.67E-09	0.61±4.51E-18	<7.16E-18	2E-14
Am-241	2	1.90±2.80E-09	5.13±7.55E-18	<1.28E-17	2E-14

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.
[b] Total Uranium: 2.30±0.08E-02 g; average = 6.19±0.21E-11 µg/mL

TABLE C-3
2009 Effluent Airborne Radioactivity at 01-14 Building (ANCSSTK)

Isotope	N	Total Activity Released (Ci)	Average Concentration (µCi/mL)	Maximum Concentration (µCi/mL)	DCG [a] (µCi/mL)
Gross Alpha	26	-0.53±4.96E-09	-0.37±3.45E-17	<3.36E-16	--
Gross Beta	26	-0.49±1.60E-08	-0.34±1.11E-16	6.53E-16	--
Co-60	2	-1.14±7.13E-09	-0.79±4.95E-17	<7.93E-17	8E-11
Sr-90	2	2.61±8.51E-09	1.81±5.91E-17	<9.58E-17	9E-12
I-129	2	6.61±4.56E-08	4.59±3.17E-16	8.81E-16	7E-11
Cs-137	2	5.57±5.94E-09	3.87±4.12E-17	<6.57E-17	4E-10
Eu-154	2	-0.71±2.14E-08	-0.49±1.49E-16	<2.38E-16	5E-11
U-232[b]	2	0.38±1.00E-09	2.67±6.97E-18	<1.16E-17	2E-14
U-233/234[b]	2	2.90±1.28E-09	2.01±0.89E-17	2.55E-17	9E-14
U-235/236[b]	2	5.62±5.50E-10	3.90±3.82E-18	7.67E-18	1E-13
U-238[b]	2	3.71±1.22E-09	2.58±0.85E-17	2.64E-17	1E-13
Pu-238	2	0.00±9.35E-10	0.00±6.49E-18	<9.58E-18	3E-14
Pu-239/240	2	0.00±9.35E-10	0.00±6.49E-18	<9.58E-18	2E-14
Am-241	2	3.34±8.66E-10	2.32±6.02E-18	<9.32E-18	2E-14

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.
[b] Total Uranium: 9.88±0.33E-03 g; average = 6.86±0.11E-11 µg/mL

TABLE C-4
2009 Effluent Airborne Radioactivity at Contact Size-Reduction Facility (ANCSRFK)

Ventilation Off; System Did Not Operate During CY 2009

TABLE C-5
2009 Effluent Airborne Radioactivity at Supernatant Treatment System (ANSTSTK)

Isotope	*N*	*Total Activity Released (Ci)*	*Average Concentration (µCi/mL)*	*Maximum Concentration (µCi/mL)*	*DCG [a] (µCi/mL)*
Gross Alpha	26	2.24±2.91E-09	3.35±4.35E-17	2.94E-16	--
Gross Beta	26	1.70±8.68E-09	0.25±1.30E-16	6.56E-16	--
H-3	26	-6.34±4.95E-06	-9.47±7.39E-14	6.80E-13	1E-07
Co-60	2	1.32±4.19E-09	1.97±6.25E-17	<8.58E-17	8E-11
Sr-90	2	1.95±4.61E-09	2.90±6.89E-17	<9.16E-17	9E-12
I-129	2	6.50±0.32E-06	9.70±0.47E-14	1.10E-13	7E-11
Cs-137	2	4.71±3.81E-09	7.03±5.69E-17	7.88E-17	4E-10
Eu-154	2	-0.26±1.02E-08	-0.38±1.52E-16	<1.93E-16	5E-11
U-232 [b]	2	1.35±2.87E-10	2.02±4.29E-18	<5.42E-18	2E-14
U-233/234 [b]	2	1.87±0.67E-09	2.79±0.99E-17	3.44E-17	9E-14
U-235/236 [b]	2	2.94±2.36E-10	4.39±3.52E-18	4.94E-18	1E-13
U-238 [b]	2	2.30±0.71E-09	3.43±1.06E-17	3.70E-17	1E-13
Pu-238	2	0.00±3.72E-10	0.00±5.56E-18	<7.11E-18	3E-14
Pu-239/240	2	-0.30±3.77E-10	-0.45±5.63E-18	<7.11E-18	2E-14
Am-241	2	5.45±5.89E-10	8.14±8.79E-18	<1.08E-17	2E-14

N - Number of samples

-- DCGs are not specified for gross alpha and beta activity.

[a] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.

[b] Total Uranium: 5.22±0.16E-03 g; average = 7.80±0.24E-11 µg/mL

TABLE C-6
2009 Effluent Airborne Radioactivity at Container Sorting and Packaging Facility (ANCSPFK)

Isotope	N	Total Activity Released (Ci)	Average Concentration (µCi/mL)	Maximum Concentration (µCi/mL)	DCG [a] (µCi/mL)
Gross Alpha	25[b]	1.45±6.30E-10	0.90±3.90E-17	2.19E-16	--
Gross Beta	25[b]	-4.44±0.20E-08	-2.75±0.12E-15	7.13E-16	--
Co-60	2	0.85±9.48E-10	0.53±5.88E-17	<9.23E-17	8E-11
Sr-90	2	0.98±1.03E-09	6.10±6.41E-17	1.15E-16	9E-12
I-129	2	9.76±0.57E-08	6.05±0.36E-15	9.51E-15	7E-11
Cs-137	2	1.32±6.48E-10	0.82±4.02E-17	<6.28E-17	4E-10
Eu-154	2	0.80±1.78E-09	0.50±1.10E-16	<1.61E-16	5E-11
U-232[c]	2	-2.00±8.42E-11	-1.24±5.22E-18	<9.30E-18	2E-14
U-233/234[c]	2	3.52±1.42E-10	2.18±0.88E-17	2.75E-17	9E-14
U-235/236[c]	2	5.54±6.40E-11	3.43±3.97E-18	5.52E-18	1E-13
U-238[c]	2	3.38±1.36E-10	2.09±0.84E-17	2.20E-17	1E-13
Pu-238	2	0.00±1.10E-10	0.00±6.81E-18	<1.08E-17	3E-14
Pu-239/240	2	0.00±1.10E-10	0.00±6.79E-18	<1.08E-17	2E-14
Am-241	2	0.38±1.05E-10	2.36±6.50E-18	<9.72E-18	2E-14

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.
[b] Total Uranium: 1.19±0.04E-03 g; average = 7.37±0.23E-11 µg/mL

TABLE C-7
2009 Effluent Airborne Radioactivity at Outdoor Ventilation Enclosures/Portable Ventilation Units (OVEs/PVUs)

Isotope	N	Total Activity Released (Ci)	Average Concentration (µCi/mL)	Maximum Concentration (µCi/mL)	DCG [a] (µCi/mL)
Gross Alpha	79	1.98±2.49E-09	2.63±3.31E-17	5.62E-15	--
Gross Beta	79	-2.85±6.99E-09	-3.79±9.28E-17	2.61E-14	--
Co-60	2	0.17±1.63E-09	0.22±2.17E-17	<5.16E-17	8E-11
Sr-90	2	1.20±2.01E-09	1.59±2.67E-17	<5.29E-17	9E-12
Cs-137	2	-1.76±1.67E-09	2.33±2.22E-17	<5.38E-17	4E-10
Eu-154	2	-1.16±4.38E-09	1.54±5.82E-17	<1.34E-16	5E-11
U-232[b]	2	2.38±1.96E-10	3.16±2.60E-18	3.76E-18	2E-14
U-233/234[b]	2	2.30±0.41E-09	3.05±0.55E-17	2.80E-17	9E-14
U-235/236[b]	2	2.26±1.34E-10	3.01±1.77E-18	3.16E-18	1E-13
U-238[b]	2	2.54±0.42E-09	3.37±0.55E-17	3.77E-17	1E-13
Pu-238	2	0.58±1.66E-10	0.77±2.20E-18	<4.73E-18	3E-14
Pu-239/240	2	0.00±1.66E-10	0.00±2.20E-18	<4.73E-18	2E-14
Am-241	2	0.76±1.76E-10	1.02±2.34E-18	<4.64E-18	2E-14

N - Number of samples
-- DCGs are not specified for gross alpha and beta activity.
[a] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.
[b] Total Uranium: 6.48±0.18E-03 g; average = 8.62±0.23E-11 µg/mL

TABLE C-8
2009 Effluent Airborne Radioactivity at Remote-Handled Waste Facility (ANRHWFK)

Isotope	*N*	*Total Activity Released (Ci)*	*Average Concentration (µCi/mL)*	*Maximum Concentration (µCi/mL)*	*DCG[a] (µCi/mL)*
Gross Alpha	26	-2.25±6.85E-09	-1.93±5.88E-17	2.39E-16	--
Gross Beta	26	-0.41±2.22E-08	-0.35±1.91E-16	9.28E-16	--
Co-60	2	3.77±9.02E-09	3.24±7.74E-17	<7.27E-17	8E-11
Sr-90	2	0.16±1.08E-08	1.40±9.27E-17	<9.91E-17	9E-12
I-129	2	6.93±4.33E-08	5.94±3.71E-16	1.17E-15	7E-11
Cs-137	2	0.30±8.19E-09	0.26±7.01E-17	<6.35E-17	4E-10
Eu-154	2	-0.62±2.54E-08	-0.54±2.18E-16	<2.09E-16	5E-11
U-232[b]	2	0.22±1.15E-09	1.92±9.89E-18	<9.40E-18	2E-14
U-233/234[b]	2	5.14±1.79E-09	4.41±1.53E-17	2.94E-17	9E-14
U-235/236[b]	2	7.41±6.50E-10	6.35±5.58E-18	6.51E-18	1E-13
U-238[b]	2	6.80±1.96E-09	5.83±1.68E-17	4.05E-17	1E-13
Pu-238	2	0.00±1.13E-09	0.00±9.70E-18	<9.91E-18	3E-14
Pu-239/240	2	0.33±1.13E-09	2.83±9.70E-18	<9.91E-18	2E-14
Am-241	2	0.52±1.14E-09	4.46±9.76E-18	<9.62E-18	2E-14

N - Number of samples

-- DCGs are not specified for gross alpha and beta activity.

[a] Derived concentration guides (DCGs) are listed for reference only. They are applicable to average concentrations at the site boundary but not to stack concentrations, as might be inferred from their inclusion in this table.

[b] Total Uranium: 1.38±0.04E-02 g; average = 1.18±0.04E-10 µg/mL

TABLE C-9
2009 Ambient Airborne Radioactivity at Background Great Valley Location (AFGRVAL)

Isotope	*N*	*AFGRVAL µCi/mL*	
		Average	*Maximum*
Gross Alpha	26	8.91±5.09E-16	1.52E-15
Gross Beta	26	1.67±0.18E-14	2.83E-14
K-40	2	0.26±1.43E-15	<1.47E-15
Co-60	2	0.43±1.47E-16	<1.69E-16
Sr-90	2	0.41±1.10E-16	<1.30E-16
I-129	2	0.41±1.10E-16	<1.25E-16
Cs-137	2	3.49±9.32E-17	<1.00E-16
Eu-154	2	0.19±3.43E-16	<4.08E-16
U-232[a]	2	-4.88±7.23E-18	<8.41E-18
U-233/234[a]	2	2.87±1.46E-17	2.99E-17
U-235/236[a]	2	4.73±5.36E-18	6.11E-18
U-238[a]	2	2.72±1.33E-17	3.00E-17
Pu-238	2	2.23±9.58E-18	<1.04E-17
Pu-239/240	2	2.23±9.58E-18	<1.04E-17
Am-241	2	0.60±9.01E-18	<9.92E-18

N - Number of samples

[a] Total Uranium: AFGRVAL average = 7.24±0.37E-11 µg/mL

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APPENDIX D-1

Summary of Groundwater Screening Levels and Practical Quantitation Limits

Groundwater Sampling Methodology

Groundwater samples are collected from monitoring wells using either dedicated Teflon® well bailers or bladder pumps. Bailers are used in low-yield wells; bladder pumps are used in wells with good water-yielding characteristics. This sampling equipment is dedicated to an individual well to reduce the likelihood of sample contamination from external materials or cross contamination.

To ensure that only representative groundwater is sampled, three well volumes are removed (purged) from the well before the actual samples are collected. In low-yield wells, pumping or bailing to dryness provides sufficient purging. Conductivity and pH are measured before and after sampling to confirm the geochemical stability of the groundwater during sampling.

The bailer, a tube with a check valve at the bottom, is lowered slowly into the well to minimize agitation of the water column. The bailer containing the groundwater is then withdrawn from the well and emptied into a sample container. Bladder pumps use compressed air to gently squeeze a Teflon® bladder that prevents air contact with the groundwater as it is pumped into a sample container with a minimum of agitation and mixing. A check valve ensures that the water flows in only one direction.

Groundwater samples are cooled and preserved, with chemicals if required, to minimize chemical and/or biological changes after sample collection. A strict chain-of-custody protocol is followed for all samples collected by the WVDP.

Groundwater Screening Levels (GSLs) for Radiological Constituents: Background values for radiological constituents in groundwater were derived using data from background wells 301, 401, 706, and 1302, in the sand and gravel unit on the north plateau for samples collected from 1991 through September 2009. The 95% upper confidence limit (UCL) was applied in a similar statistical calculation for each radiological constituent. The site-specific GSLs for radiological constituents were set to the larger of the background level or the TOGS 1.1.1 Class GA groundwater quality standard for each radiological constituent. The NYSDEC TOGS standards are only established for gross alpha and gross beta concentrations, consequently most of the screening values for radiological constituents are set to equal the site background values. The GSLs for radiological constituents are listed in Table D-1A.

The site monitoring well radiological concentrations presented in the data tables in Appendix D-2 are compared with these GSLs. Bolding indicates that the measured concentration exceeded the GSL.

GSLs for Metals: The calculated WVDP GSLs for metals were established in WVDP-494, *North Plateau Plume Area Characterization Report*. The GSLs for metals were selected as the greater of the NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards or background concentrations in groundwater as documented in Appendix E of WVDP-494. The groundwater background concentrations were derived from a statistical calculation of the mean plus two standard deviations for metals data collected from four background wells (301, 401, 706, and 1302). Elevated levels of chromium and nickel were identified in site wells constructed with stainless steel (which includes 301, 401, and 706), as presented to NYSDEC in a report entitled *Final Report: Evaluation of the Pilot Program to Investigate Chromium & Nickel Concentrations in Groundwater in the Sand & Gravel Unit* (WVNSCO, 1998). The findings of this report were subsequently accepted by NYSDEC in their memorandum dated September 15, 1998. Consequently, the majority of the chromium and nickel results from these stainless-steel wells were omitted from the dataset used to establish background, relying primarily on the results from polyvinyl chloride (PVC) well 1302 for these two constituents. The groundwater screening values for metals are listed in Table D-1B.

The site monitoring well metals concentrations presented in the data tables in Appendix D-2 are compared with these GSLs. Bolding indicates that the measured concentration exceeded the GSL.

TABLE D-1A
Groundwater Screening Levels for Radiological Constituents

Radiological Constituent	*Range of Observed Concentrations From Background Monitoring Wells 301, 401, 706, and 1302 (µCi/mL)*	*WVDP 95% UCL Background Groundwater Concentration [a] (µCi/mL)*	*NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards [b] (µCi/mL)*	*WVDP GSLs [c] (µCi/mL)*
Gross alpha	< 7.78E-10 – 1.55E-08	7.61E-09	1.50E-08	1.50E-08
Gross beta	< 2.15E-09 – 2.35E-08	1.56E-08	1.00E-06	1.00E-06
Tritium	< 3.17E-08 – 2.63E-07	1.78E-07	NE	1.78E-07
Carbon-14	< 1.36E-11 – 5.02E-08	2.82E-08	NE	2.82E-08
Cesium-137	5.79E-10 – 1.90E-08	1.03E-08	NE	1.03E-08
Iodine-129	< 2.85E-10 – 1.58E-09	9.61E-10	NE	9.61E-10
Potassium-40	< 5.00E-08 – 3.56E-07	1.99E-07	NE	1.99E-07
Radium-226	< 1.10E-10 – 2.99E-09	1.33E-09	NE	1.33E-09
Radium-228	< 2.23E-10 – 3.20E-09	2.16E-09	NE	2.16E-09
Strontium-90	< 2.41E-10 – 6.40E-09	5.90E-09	NE	5.90E-09
Technetium-99	< 8.21E-10 – 8.61E-09	5.02E-09	NE	5.02E-09
Total Uranium	< 1.27E-06 – 3.46E-03	1.34E-03	NE	1.34E-03
Uranium-232	< 1.71E-11 – 3.78E-10	1.38E-10	NE	1.38E-10
Uranium-233/234	< 3.85E-11 – 1.53E-09	6.24E-10	NE	6.24E-10
Uranium-235/236	< 1.80E-11 – 1.39E-10	8.07E-11	NE	8.07E-11
Uranium-238	< 1.32E-11 – 1.26E-09	4.97E-10	NE	4.97E-10

NE - No NYSDEC TOGS 1.1.1 groundwater quality standard has been established for this analyte.

[a] The data used for the calculation of background values were taken from background wells 301, 401, 706, and 1302 in the sand and gravel unit on the north plateau for samples collected from 1991 through September 2009. The background concentration was set to the upper limit of the 95% confidence interval.

[b] NYSDEC TOGS 1.1.1 (June 1998/2004 addendum) Class GA groundwater quality standards and guidance values.

[c] The GSLs for radiological constituents were set equal to the larger of the background concentrations or the NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards.

TABLE D-1B
Groundwater Screening Levels for Metals

Analyte [a]	*Range of Observed Concentrations From Background Monitoring Wells 301, 401, 706, and 1302 (µg/L)*	*Background Groundwater Concentration* [b] *(µg/L)*	*NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards (µg/L)*	*WVDP Groundwater Screening Levels (GSLs)* [c] *(µg/L)*
Antimony, total	0.5 – 19.7	15.1	3	15.1
Arsenic, total	1.5 – 34.4	20.9	25	25
Barium, total	71.7 – 499	441	1,000	1,000
Beryllium, total	0.10 – 2.50	1.85	3	3
Cadmium, total	0.30 – 5.30	7.27	5	7.27
Chromium, total[d]	5 – 66	52.3	50	52.3
Cobalt, total	2.05 – 60.9	67.8	NE	67.8
Copper, total	1.4 – 90.5	59.9	200	200
Lead, total	0.5 – 120	42.7	25	42.7
Mercury, total	0.03 – 0.4	0.263	0.7	0.7
Nickel, total[d]	10 – 77.8	59.5	100	100
Selenium, total	1.0 – 25.0	10.1	10	10.1
Silver, total	0.1 – 10	15.5	50	50
Thallium, total	0.3 – 13.1	13.9	0.5	13.9
Tin, total	5.6 – 3,000	4,083	NE	4,083
Vanadium, total	0.6 – 73.1	69.6	NE	69.6
Zinc, total	5.71 – 256	127	2,000	2,000

NE - No NYSDEC TOGS 1.1.1 groundwater quality standard has been established for this analyte.

[a] Analytes listed are those identified in the 6 NYCRR Part 373-2 Appendix 33 List.

[b] Data used for the calculation of background values were taken from wells 301, 401, 706, and 1302 in the S&G unit on the north plateau for samples collected from 1991 to December 2008. The background concentration was set equal to the mean plus two standard deviations (as reported in WVDP-494). Ninety-five percent of measurements are expected to fall below this value. Data were rounded to three significant digits or the closest integer.

[c] Metals GSLs were set equal to the larger of the background concentration or the NYSDEC TOGS 1.1.1 Class GA Groundwater Quality Standards.

[d] Elevated chromium and nickel concentrations attributed to well corrosion were noted in wells 301, 401, and 706 over the monitoring period. All results suspected to be affected by corrosion (i.e., all chromium and nickel results for 301 and 401, and all results after May 2004 from 706) were excluded from the background calculation.

TABLE D-1C
Practical Quantitation Limits (PQLs)

COMPOUND	PQL (µg/L)	COMPOUND	PQL (µg/L)
6 NYCRR[a] Appendix 33 Volatiles		6 NYCRR[a] Appendix 33 Volatiles	
Acetone	10	Isobutyl alcohol	100
Acetonitrile	100	Methacrylonitrile	5
Acrolein	11	Methyl ethyl ketone	10
Acrylonitrile	10	Methyl iodide	5
Allyl chloride	5	Methyl methacrylate	5
Benzene	5	4-Methyl-2-pentanone	10
Bromodichloromethane	5	Methylene bromide	10
Bromoform	5	Methylene chloride	5
Bromomethane	10	Pentachloroethane	5
Carbon disulfide	10	Propionitrile	50
Carbon tetrachloride	5	Styrene	5
Chlorobenzene	5	1,1,1,2-Tetrachloroethane	5
Chloroethane	10	1,1,2,2-Tetrachloroethane	5
Chloroform	5	Tetrachloroethylene	5
Chloromethane	10	Toluene	5
Chloroprene	5	1,1,1-Trichloroethane (1,1,1-TCA)	5
1,2-Dibromo-3-chloropropane	5	1,1,2-Trichloroethane	5
Dibromochloromethane	5	1,2,3-Trichloropropane	5
1,2-Dibromoethane	5	Vinyl acetate	10
Dichlorodifluoromethane (DCDFMeth)	5	Vinyl chloride	10
1,1-Dichloroethane (1,1-DCA)	5	Xylene (total)	5
1,2-Dichloroethane (1,2-DCA)	5	cis-1,3-Dichloropropene	5
1,1-Dichloroethylene (1,1-DCE)	5	trans-1,2-Dichloroethylene (1,2-DCE[trans])	5
1,2-Dichloropropane	5	trans-1,3-Dichloropropene	5
Ethyl benzene	5	trans-1,4-Dichloro-2-butene	5
Ethyl methacrylate	5	Trichloroethylene (TCE)	5
2-Hexanone	10	Trichlorofluoromethane	5
6 NYCRR[a] Appendix 33 Metals		6 NYCRR[a] Appendix 33 Metals	
Aluminum[b]	200	Lead	3
Antimony	10	Manganese[b]	15
Arsenic	10	Mercury	0.2
Barium	200	Nickel	40
Beryllium	1	Selenium	5
Cadmium	5	Silver	10
Chromium	10	Thallium	10
Cobalt	50	Tin	3,000

Note: Specific quantitation limits are highly matrix dependent and may not always be achievable.

[a] Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York.

[b] Not a 6 NYCRR Appendix 33 parameter; sampled for the north plateau early warning program.

TABLE D-1C *(continued)*
Practical Quantitation Limits (PQLs)

COMPOUND	PQL (µg/L)	COMPOUND	PQL (µg/L)
6 NYCRR[a] Appendix 33 Semivolatiles		6 NYCRR[a] Appendix 33 Semivolatiles	
Acenaphthene	10	2,4-Dinitrotoluene	10
Acenaphthylene	10	2,6-Dinitrotoluene	10
Acetophenone	10	Diphenylamine	10
2-Acetylaminofluorene	10	Ethyl methanesulfonate	10
4-Aminobiphenyl	10	Famphur	15
Aniline	10	Fluoranthene	10
Anthracene	10	Fluorene	10
Aramite	20	Hexachlorobenzene	10
Benzo[a]anthracene	10	Hexachlorobutadiene	10
Benzo[a]pyrene	10	Hexachlorocyclopentadiene	24
Benzo[b]fluoranthene	10	Hexachloroethane	10
Benzo[ghi]perylene	10	Hexachlorophene	250
Benzo[k]fluoranthene	10	Hexachloropropene	10
Benzyl alcohol	10	Indeno(1,2,3,-cd)pyrene	10
Bis(2-chlorethyl)ether	10	Isodrin	10
Bis(2-chloroethoxy)methane	10	Isophorone	10
Bis(2-chloroisopropyl)ether	10	Isosafrole	10
Bis(2-ethylhexyl)phthalate	10	Kepone	50
4-Bromophenyl phenyl ether	10	Methapyrilene	40
Butyl benzyl phthalate	10	Methyl methanesulfonate	10
Chlorobenzilate	10	3-Methylcholanthrene	10
2-Chloronaphthalene	10	2-Methylnaphthalene	10
2-Chlorophenol	10	1,4-Naphthoquinone	10
4-Chlorophenyl phenyl ether	10	1-Naphthylamine	10
Chrysene	10	2-Naphthylamine	10
Di-n-butyl phthalate	10	Nitrobenzene	10
Di-n-octyl phthalate	10	5-Nitro-o-toluidine	10
Diallate	10	4-Nitroquinoline 1-oxide	40
Dibenz[a,h]anthracene	10	N-Nitrosodi-n-butylamine	10
Dibenzofuran	10	N-Nitrosodiethylamine	10
3,3-Dichlorobenzidine	10	N-Nitrosodimethylamine	10
2,4-Dichlorophenol	10	N-Nitrosodipropylamine	10
2,6-Dichlorophenol	10	N-Nitrosodiphenylamine	10
Diethyl phthalate	10	N-Nitrosomethylethylamine	10
Dimethoate	10	N-Nitrosomorpholine	10
7, 12-Dimethylbenz[a]anthracene	10	N-Nitrosopiperidine	50
3,3-Dimethylbenzidine	20	N-Nitrosopyrrolidine	10
2,4-Dimethylphenol	10	Naphthalene	10
Dimethyl phthalate	10	0,0,0-Triethyl phosphorothioate	10
4,6-Dinitro-o-cresol	25	0,0-Diethyl 0-2-pyrazinyl-phosphorothioate	10
2,4-Dinitrophenol	25		

Note: Specific quantitation limits are highly matrix dependent and may not always be achievable.
[a] Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York.

TABLE D-1C *(concluded)*
Practical Quantitation Limits (PQLs)

COMPOUND	PQL (µg/L)
6 NYCRR[a] Appendix 33 Semivolatiles	
p-(Dimethylamino)azobenzene	10
p-Chloroaniline	10
p-Chloro-m-cresol	10
p-Cresol	10
p-Dichlorobenzene	10
p-Nitroaniline	25
p-Nitrophenol	25
p-Phenylenediamine	35
Parathion	10
Pentachlorobenzene	10
Pentachloronitrobenzene	50
Pentachlorophenol	25
Phenacetin	10
Phenanthrene	10
Phenol	10
Pronamide	10
Pyrene	10
Safrole	10
1,2,4,5-Tetrachlorobenzene	10
Other Organic Compounds	
1,2-Dichloroethelyne (Total)	5
Tributyl phosphate	10

COMPOUND	PQL (µg/L)
6 NYCRR[a] Appendix 33 Semivolatiles	
2,3,4,6-Tetrachlorophenol	10
Tetraethyl dithiopyrophosphate	10
1,2,4-Trichlorobenzene	10
2,4,5-Trichlorophenol	25
2,4,6-Trichlorophenol	10
alpha,alpha-Dimethylphenethylamine	50
m-Cresol	10
m-Dichlorobenzene	10
m-Dinitrobenzene	10
m-Nitroaniline	25
o-Cresol	10
o-Dichlorobenzene	10
o-Nitroaniline	25
o-Nitrophenol	10
o-Toluidine	10
sym-Trinitrobenzene	10
2-Picoline	10
Pyridine	10
1,4-Dioxane	10

Note: Specific quantitation limits are highly matrix dependent and may not always be achievable.
[a] Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York.

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APPENDIX D-2

Groundwater Monitoring Data

TABLE D-2A
2009 Indicator Results From the Sand and Gravel Unit

Location Code	*Hydraulic Position* [a]	*Date Collected*	*pH SU*	*Conductivity µmhos/cm@ 25°C*	*Gross Alpha µCi/mL*	*Gross Beta µCi/mL*	*Tritium µCi/mL*
Groundwater Screening Levels [b]			*NA*	*NA*	*1.50E-08*	*1.00E-06*	*1.78E-07*
301	UP	Mar-09	6.72	1,148	-0.24±1.69E-09	7.84±2.25E-09	-7.91±4.88E-08
301	UP	Jun-09	7.18	2,096	-1.01±9.52E-09	8.62±4.48E-09	-8.16±3.36E-08
301	UP	Sep-09	6.44	1,564	-3.58±4.82E-09	1.09±0.40E-08	-7.11±4.40E-08
301	UP	Dec-09	6.82	1,107	2.68±4.69E-09	4.45±2.55E-09	-1.11±0.45E-07
302	UP	Jun-09	7.27	5,322	-1.37±2.46E-08	1.31±1.06E-08	-7.57±4.74E-08
302	UP	Dec-09	7.06	4,972	1.02±1.97E-08	-5.97±9.64E-09	0.54±4.59E-08
401	UP	Mar-09	6.88	2,220	-0.88±2.98E-09	6.72±3.60E-09	-5.47±4.93E-08
401	UP	Jun-09	7.23	2,450	-0.31±1.14E-08	1.92±4.67E-09	-1.02±0.47E-07
401	UP	Sep-09	7.09	3,240	-8.12±9.93E-09	1.46±6.64E-09	-1.57±4.47E-08
401	UP	Dec-09	7.04	2,275	0.01±3.00E-09	-1.70±2.56E-09	1.11±4.71E-08
402	UP	Jun-09	7.23	5,006	-1.54±2.27E-08	0.76±1.02E-08	1.67±4.77E-08
402	UP	Dec-09	7.17	5,224	-1.00±1.93E-08	4.27±9.32E-09	-0.56±3.36E-08
403	UP	Jun-09	7.54	1,044	2.66±5.31E-09	4.76±2.35E-09	-0.98±4.39E-08
403	UP	Dec-09	7.02	832	2.09±2.01E-09	0.19±2.75E-09	-2.16±4.64E-08
706	UP	Mar-09	6.69	618	0.29±1.14E-09	3.70±2.38E-09	-8.30±4.89E-08
706	UP	Jun-09	7.00	1,058	1.40±1.82E-09	7.60±2.50E-09	0.00±4.42E-08
706	UP	Sep-09	6.68	894	-1.12±2.04E-09	7.42±2.53E-09	-1.08±4.48E-08
706	UP	Dec-09	6.11	650	-0.35±1.18E-09	3.96±2.52E-09	-1.02±4.66E-08
1302	UP	Dec-09	6.89	970	-1.68±4.00E-09	-0.30±3.25E-09	-6.02±3.26E-08
1304	DOWN	Mar-09	7.13	3,172	-4.03±4.07E-09	7.68±4.11E-09	-1.01±0.35E-07
1304	DOWN	Jun-09	7.06	3,136	2.02±3.96E-09	1.34±0.51E-08	-6.69±4.74E-08
1304	DOWN	Sep-09	6.93	2,440	0.40±3.41E-09	3.24±3.22E-09	0.65±4.54E-08
1304	DOWN	Dec-09	7.08	1,567	2.76±3.17E-09	2.16±2.62E-09	-2.92±4.66E-08
103	DOWN	Mar-09	8.16	4,140	0.81±6.17E-09	5.91±0.91E-08	-0.99±4.99E-08
103	DOWN	Jun-09	8.59	2,251	1.01±9.72E-09	1.87±0.53E-08	1.85±4.78E-08
103	DOWN	Sep-09	8.25	1,752	2.73±5.82E-09	1.30±0.42E-08	-0.59±4.64E-08
103	DOWN	Dec-09	8.42	1,198	2.18±5.36E-09	7.80±2.86E-09	7.80±3.42E-08

Note: Bolding indicates a radiological concentration that exceeds the GSL.
NA - Not applicable
SU - Standard units
[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] The GSLs for radiological constituents are set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

TABLE D-2A *(continued)*
2009 Indicator Results From the Sand and Gravel Unit

Location Code	*Hydraulic Position [a]*	*Date Collected*	*pH SU*	*Conductivity µmhos/cm@ 25 °C*	*Gross Alpha µCi/mL*	*Gross Beta µCi/mL*	*Tritium µCi/mL*
Groundwater Screening Levels [b]			*NA*	*NA*	*1.50E-08*	*1.00E-06*	*1.78E-07*
104	DOWN	Mar-09	7.16	2,215	5.48±9.32E-09	**6.98±0.16E-05**	1.34±0.52E-07
104	DOWN	Jun-09	7.05	2,079	2.04±4.01E-09	**7.15±0.16E-05**	**2.20±0.51E-07**
104	DOWN	Sep-09	7.04	2,212	2.69±2.78E-09	**7.41±0.17E-05**	**1.87±0.49E-07**
104	DOWN	Dec-09	6.92	2,020	5.13±3.00E-09	**7.10±0.16E-05**	1.52±0.49E-07
111	DOWN	Mar-09	6.78	540	3.79±3.27E-09	**3.37±0.11E-06**	-0.40±5.01E-08
111	DOWN	Jun-09	6.84	904	8.32±3.52E-09	**7.16±0.19E-06**	5.59±3.44E-08
111	DOWN	Sep-09	6.58	957	7.46±1.89E-09	**7.15±0.15E-06**	4.12±4.70E-08
111	DOWN	Dec-09	6.39	767	5.06±1.90E-09	**5.76±0.16E-06**	7.01±4.77E-08
205	DOWN	Jun-09	7.62	3,615	-0.42±1.57E-08	1.28±0.71E-08	3.68±4.43E-08
205	DOWN	Dec-09	7.12	2,284	8.00±9.63E-09	8.30±4.43E-09	-3.42±4.60E-08
406	DOWN	Mar-09	6.86	1,227	-0.50±1.68E-09	5.98±2.11E-09	4.72±4.96E-08
406	DOWN	Jun-09	7.15	793	-1.88±3.39E-09	5.74±3.02E-09	1.13±4.76E-08
406	DOWN	Sep-09	7.12	812	-1.38±2.62E-09	3.47±3.42E-09	6.04±4.76E-08
406	DOWN	Dec-09	6.92	710	-1.54±3.65E-09	6.70±3.26E-09	6.57±4.84E-08
408	DOWN	Mar-09	7.23	3,547	-0.16±1.37E-08	**2.97±0.08E-04**	1.78±3.54E-08
408	DOWN	Jun-09	7.30	3,578	6.16±7.52E-09	**3.42±0.08E-04**	9.20±4.95E-08
408	DOWN	Sep-09	7.26	3,694	5.09±4.73E-09	**3.19±0.08E-04**	1.17±0.48E-07
408	DOWN	Dec-09	7.14	3,202	8.07±4.93E-09	**2.74±0.07E-04**	1.31±0.49E-07
501	DOWN	Mar-09	7.57	2,568	-3.44±9.65E-09	**1.16±0.03E-04**	0.20±5.02E-08
501	DOWN	Jun-09	7.54	2,620	2.76±5.40E-09	**1.29±0.03E-04**	2.99±4.82E-08
501	DOWN	Sep-09	7.28	2,800	1.13±2.71E-09	**1.39±0.03E-04**	1.18±4.66E-08
501	DOWN	Dec-09	7.35	2,322	1.02±2.00E-09	**1.28±0.03E-04**	6.95±4.76E-08
502	DOWN	Mar-09	7.41	2,576	0.18±1.04E-08	**1.25±0.03E-04**	0.80±5.03E-08
502	DOWN	Jun-09	7.50	2,428	0.00±4.10E-09	**1.18±0.03E-04**	4.19±4.84E-08
502	DOWN	Sep-09	7.33	2,759	2.81±3.31E-09	**1.27±0.03E-04**	5.92±4.76E-08
502	DOWN	Dec-09	7.34	1,244	3.85±2.88E-09	**1.07±0.02E-04**	6.86±4.76E-08
602A	DOWN	Jun-09	7.14	795	1.87±4.13E-09	1.69±0.40E-08	**1.91±0.50E-07**
602A	DOWN	Dec-09	6.82	657	0.00±3.63E-09	1.20±0.40E-08	**1.83±0.50E-07**
604	DOWN	Jun-09	6.52	1,296	-1.54±5.70E-09	6.91±2.68E-09	4.61±4.83E-08
604	DOWN	Dec-09	6.15	1,408	1.12±4.74E-09	5.75±2.66E-09	2.26±4.70E-08
8605	DOWN	Mar-09	7.04	1,299	8.99±6.54E-09	**7.43±0.20E-06**	9.60±5.18E-08
8605	DOWN	Jun-09	7.05	1,760	7.41±3.23E-09	**9.06±0.24E-06**	7.90±4.88E-08
8605	DOWN	Sep-09	6.65	1,858	8.58±3.90E-09	**7.35±0.20E-06**	8.63±3.38E-08
8605	DOWN	Dec-09	6.96	1,318	1.06±0.36E-08	**1.02±0.03E-05**	1.22±0.48E-07

Note: Bolding indicates a radiological concentration that exceeds the GSL.
NA - Not applicable
SU - Standard units
[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] The GSLs for radiological constituents are set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

TABLE D-2A *(continued)*
2009 Indicator Results From the Sand and Gravel Unit

Location Code	*Hydraulic Position [a]*	*Date Collected*	*pH SU*	*Conductivity µmhos/cm@ 25 °C*	*Gross Alpha µCi/mL*	*Gross Beta µCi/mL*	*Tritium µCi/mL*
Groundwater Screening Levels [b]			***NA***	***NA***	***1.50E-08***	***1.00E-06***	***1.78E-07***
8607	DOWN	Mar-09	6.42	1,200	-0.68±1.84E-09	2.17±0.29E-08	-8.71±4.91E-08
8607	DOWN	Jun-09	6.81	1,672	0.33±1.72E-09	2.69±0.39E-08	-5.14±4.77E-08
8607	DOWN	Sep-09	6.34	881	-1.51±0.76E-09	1.76±0.26E-08	7.50±3.36E-08
8607	DOWN	Dec-09	6.44	780	1.12±3.19E-09	1.25±0.39E-08	0.22±3.31E-08
8609	DOWN	Mar-09	7.14	2,240	-1.05±9.05E-09	**1.19±0.05E-06**	1.21±0.45E-07
8609	DOWN	Jun-09	7.26	2,213	-0.96±2.85E-09	**1.82±0.05E-06**	1.57±0.35E-07
8609	DOWN	Sep-09	6.72	2,207	0.48±2.12E-09	**1.46±0.06E-06**	**2.22±0.50E-07**
8609	DOWN	Dec-09	6.88	1,979	6.31±3.40E-09	**1.52±0.07E-06**	**2.36±0.50E-07**
105	DOWN	Mar-09	7.11	2,674	-0.29±7.38E-09	**9.19±0.16E-05**	1.60±0.53E-07
105	DOWN	Jun-09	7.09	2,540	-0.62±4.06E-09	**9.16±0.21E-05**	**1.98±0.50E-07**
105	DOWN	Sep-09	7.15	2,741	1.07±2.57E-09	**8.84±0.21E-05**	1.20±0.48E-07
105	DOWN	Dec-09	7.33	2,553	4.48±3.24E-09	**9.00±0.21E-05**	1.51±0.49E-07
106	DOWN	Mar-09	6.94	2,330	-2.63±8.92E-09	**2.27±0.09E-06**	**5.15±0.57E-07**
106	DOWN	Jun-09	6.92	1,805	-1.63±3.19E-09	**1.91±0.08E-06**	**7.00±0.58E-07**
106	DOWN	Sep-09	6.76	2,058	2.86±2.66E-09	**1.95±0.07E-06**	**6.21±0.56E-07**
106	DOWN	Dec-09	7.42	2,038	6.53±3.40E-09	**2.15±0.07E-06**	**6.16±0.56E-07**
116	DOWN	Jun-09	7.07	2,233	-0.54±3.53E-09	**1.31±0.03E-05**	1.23±0.50E-07
116	DOWN	Dec-09	7.29	1,836	0.77±1.51E-09	**1.20±0.03E-05**	1.32±0.49E-07
605	DOWN	Jun-09	7.08	916	-3.22±3.74E-09	3.10±0.49E-08	-6.95±4.36E-08
605	DOWN	Dec-09	6.60	608	-0.34±3.36E-09	2.08±0.45E-08	-7.22±4.62E-08
801	DOWN	Mar-09	6.89	2,404	1.05±9.33E-09	**2.14±0.05E-05**	0.80±5.03E-08
801	DOWN	Jun-09	6.87	1,604	0.42±2.99E-09	**1.36±0.03E-05**	6.46±4.83E-08
801	DOWN	Sep-09	6.61	1,668	1.76±2.07E-09	**1.34±0.03E-05**	9.84±4.80E-08
801	DOWN	Dec-09	6.94	1,190	1.57±1.45E-09	**1.04±0.03E-05**	1.02±0.48E-07
802	DOWN	Mar-09	6.60	129	5.18±5.32E-10	7.78±2.14E-09	-7.29±4.86E-08
802	DOWN	Jun-09	7.00	571	4.37±8.56E-10	1.60±0.08E-07	-0.59±4.40E-08
802	DOWN	Sep-09	6.91	1,257	-2.17±4.75E-09	4.02±0.36E-07	1.27±0.35E-07
802	DOWN	Dec-09	5.98	595	-1.05±2.86E-09	1.46±0.08E-07	5.50±4.76E-08
803	DOWN	Mar-09	7.13	1,334	0.82±2.22E-09	1.53±0.28E-08	-1.12±3.52E-08
803	DOWN	Jun-09	7.00	1,254	4.00±2.77E-09	1.88±0.33E-08	0.79±4.44E-08
803	DOWN	Sep-09	7.09	1,227	0.68±5.60E-09	1.56±0.43E-08	7.70±4.65E-08
803	DOWN	Dec-09	6.90	1,238	-0.66±5.35E-09	1.30±0.32E-08	-0.87±3.28E-08

Note: Bolding indicates a radiological concentration that exceeds the GSL.
NA - Not applicable
SU - Standard units
[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] The GSLs for radiological constituents are set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

TABLE D-2A *(concluded)*
2009 Indicator Results From the Sand and Gravel Unit

Location Code	*Hydraulic Position* [a]	*Date Collected*	*pH SU*	*Conductivity µmhos/cm@ 25 °C*	*Gross Alpha µCi/mL*	*Gross Beta µCi/mL*	*Tritium µCi/mL*
Groundwater Screening Levels [b]			***NA***	***NA***	***1.50E-08***	***1.00E-06***	***1.78E-07***
804	DOWN	Mar-09	6.81	1,776	0.00±2.40E-09	2.88±0.15E-07	1.59±5.02E-08
804	DOWN	Jun-09	6.75	1,252	0.84±1.64E-09	1.72±0.10E-07	5.46±4.84E-08
804	DOWN	Sep-09	6.81	898	3.85±3.89E-09	1.44±0.11E-07	9.93±4.80E-08
804	DOWN	Dec-09	6.52	794	0.00±3.12E-09	1.19±0.08E-07	3.63±4.73E-08
8603	DOWN	Jun-09	7.25	2,412	0.30±3.00E-09	**7.87±0.13E-05**	**2.16±0.51E-07**
8603	DOWN	Dec-09	6.98	2,368	0.47±1.60E-09	**7.44±0.17E-05**	**2.15±0.35E-07**
8604	DOWN	Jun-09	7.22	2,111	2.71±4.38E-09	**7.84±0.18E-05**	**1.95±0.50E-07**
8604	DOWN	Dec-09	7.09	2,138	3.34±1.83E-09	**8.50±0.13E-05**	**2.03±0.50E-07**
8612	DOWN	Mar-09	7.31	1,733	0.37±2.78E-09	3.50±2.98E-09	**1.45±0.51E-07**
8612	DOWN	Jun-09	7.15	1,724	-1.98±7.52E-09	1.25±4.68E-09	**1.71±0.50E-07**
8612	DOWN	Sep-09	7.05	1,790	-0.51±2.70E-09	1.71±2.74E-09	**2.59±0.51E-07**
8612	DOWN	Dec-09	7.08	1,736	4.85±6.66E-09	2.66±3.41E-09	**1.81±0.50E-07**
GSEEP	DOWN	Mar-09	6.63	872	-0.65±1.28E-09	8.53±2.97E-09	**2.18±0.54E-07**
GSEEP	DOWN	Jun-09	6.83	1,406	-2.69±5.68E-09	1.18±0.44E-08	**3.61±0.50E-07**
GSEEP	DOWN	Sep-09	6.50	1,549	-0.28±2.29E-09	1.52±0.35E-08	**3.86±0.51E-07**
GSEEP	DOWN	Dec-09	6.48	1,275	-0.45±1.49E-09	1.65±0.23E-08	**3.02±0.52E-07**
SP04	DOWN	Jun-09	NS	NS	-0.49±5.48E-09	2.42±0.16E-07	**2.00±0.48E-07**
SP04	DOWN	Dec-09	NS	NS	1.55±3.22E-09	3.15±0.16E-07	1.57±0.50E-07
SP06	DOWN	Jun-09	NS	NS	-4.40±5.19E-09	7.95±3.99E-09	1.00±0.46E-07
SP06	DOWN	Dec-09	NS	NS	-0.25±1.77E-09	1.22±0.28E-08	-4.06±4.63E-08
SP11	DOWN	Jun-09	NS	NS	-1.61±5.26E-09	1.36±0.13E-07	2.21±4.82E-08
SP11	DOWN	Dec-09	NS	NS	-0.83±1.80E-09	1.50±0.09E-07	-2.46±4.64E-08
SP12	DOWN	Jun-09	7.65	1,596	-2.82±7.02E-09	4.53±4.82E-09	1.43±0.47E-07
SP12	DOWN	Dec-09	7.18	1,900	4.14±4.33E-09	2.37±0.54E-08	1.40±0.50E-07
WP-A	DOWN	Sep-09	8.68	114	-2.01±2.84E-10	1.53±0.18E-08	**1.15±0.04E-05**
WP-C	DOWN	Sep-09	7.14	428	-0.88±7.12E-10	8.50±0.52E-08	**3.45±0.10E-05**
WP-H	DOWN	Sep-09	6.99	1,077	1.09±1.28E-09	**6.77±0.18E-06**	**7.84±0.58E-07**

Note: Bolding indicates a radiological concentration that exceeds the GSL.
NA - Not applicable
SU - Standard units
[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] The GSLs for radiological constituents are set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

TABLE D-2B
2009 Indicator Results From the Lavery Till-Sand Unit

Location Code	*Hydraulic Position [a]*	*Date Collected*	*pH SU*	*Conductivity µmhos/cm@ 25 °C*	*Gross Alpha µCi/mL*	*Gross Beta µCi/mL*	*Tritium µCi/mL*
Groundwater Screening Levels [b]			***NA***	***NA***	***1.50E-08***	***1.00E-06***	***1.78E-07***
204	DOWN	Mar-09	7.49	1,370	-1.33±1.56E-09	0.94±1.96E-09	-1.03±0.49E-07
204	DOWN	Jun-09	7.41	1,493	-0.39±7.34E-09	3.89±2.96E-09	-1.97±3.12E-08
204	DOWN	Sep-09	7.49	1,510	-1.72±4.84E-09	2.53±3.47E-09	1.09±4.52E-08
204	DOWN	Dec-09	7.60	1,596	6.34±6.17E-09	3.79±2.85E-09	-5.04±4.64E-08
206	DOWN	Jun-09	7.78	1,726	-3.56±8.09E-09	3.95±3.36E-09	-7.29±4.32E-08
206	DOWN	Dec-09	7.50	1,786	4.38±7.02E-09	-0.21±3.28E-09	-9.46±4.58E-08

Note: Bolding indicates a radiological concentration that exceeds the GSL.

NA - Not applicable

SU - Standard units

[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.

[b] The GSLs for radiological constituents are set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

TABLE D-2C
2009 Indicator Results From the Weathered Lavery Till Unit

Location Code	*Hydraulic Position* [a]	*Date Collected*	*pH SU*	*Conductivity µmhos/cm@ 25 °C*	*Gross Alpha µCi/mL*	*Gross Beta µCi/mL*	*Tritium µCi/mL*
Groundwater Screening Levels [b]			***NA***	***NA***	***1.50E-08***	***1.00E-06***	***1.78E-07***
908R	UP	Jun-09	7.27	1,398	7.24±3.74E-09	6.85±2.96E-09	-6.46±4.78E-08
908R	UP	Dec-09	6.79	1,679	5.93±7.61E-09	6.87±3.82E-09	-1.37±0.45E-07
1005	UP	Jun-09	7.43	754	3.19±1.91E-09	3.50±2.64E-09	-5.26±4.30E-08
1005	UP	Dec-09	6.96	756	3.52±4.98E-09	-0.21±3.30E-09	-5.01±4.60E-08
1008C	UP	Jun-09	7.70	604	3.18±8.81E-10	3.92±2.19E-09	1.45±4.85E-08
1008C	UP	Sep-09	7.11	636	NS	NS	NS
1008C	UP	Dec-09	7.15	599	-1.99±3.39E-09	1.20±2.83E-09	-3.26±4.64E-08
906	DOWN	Jun-09	7.60	622	2.51±1.04E-09	4.65±1.61E-09	-1.98±4.42E-08
906	DOWN	Dec-09	7.39	586	0.52±2.64E-09	1.63±2.02E-09	-6.61±4.66E-08
908	DOWN	Jun-09	7.12	2,648	1.02±0.64E-08	1.82±0.59E-08	0.78±4.42E-08
1006	DOWN	Jun-09	7.20	1,602	7.72±3.86E-09	5.36±2.76E-09	-6.64±4.73E-08
1006	DOWN	Dec-09	6.74	1,558	4.56±3.80E-09	2.82±3.34E-09	-1.13±0.45E-07
NDATR	DOWN	Mar-09	7.95	806	1.59±1.66E-09	6.24±0.22E-07	**1.46±0.05E-06**
NDATR	DOWN	Jun-09	8.16	958	-0.96±3.61E-09	**1.19±0.03E-06**	**1.13±0.06E-06**
NDATR	DOWN	Sep-09	7.11	1,131	3.19±1.61E-09	**1.75±0.04E-06**	**1.10±0.05E-06**
NDATR	DOWN	Dec-09	8.02	783	5.67±3.57E-09	**1.10±0.03E-06**	**1.82±0.08E-06**
909	DOWN	Mar-09	6.72	1,325	NS	NS	NS
909	DOWN	Jun-09	6.67	1,359	1.67±2.59E-09	3.48±0.18E-07	**8.77±0.60E-07**
909	DOWN	Dec-09	7.08	1,266	-1.35±2.93E-09	3.43±0.16E-07	**8.70±0.59E-07**

Note: Bolding indicates a radiological concentration that exceeds the GSL.
NA - Not applicable
NS - Not sampled
SU - Standard units
[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] The GSLs for radiological constituents are set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

TABLE D-2D
2009 Indicator Results From the Unweathered Lavery Till Unit

Location Code	Hydraulic Position [a]	Date Collected	pH SU	Conductivity µmhos/cm@ 25 °C	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL
Groundwater Screening Levels [b]			**NA**	**NA**	**1.50E-08**	**1.00E-06**	**1.78E-07**
405	UP	Mar-09	7.19	3,018	-2.13±4.55E-09	7.63±5.36E-09	0.96±4.91E-08
405	UP	Jun-09	7.28	2,170	-7.90±8.55E-09	6.15±4.15E-09	2.17±4.78E-08
405	UP	Sep-09	7.11	1,878	-1.32±5.19E-09	3.83±3.50E-09	1.64±4.68E-08
405	UP	Dec-09	6.19	1,477	3.26±3.70E-09	4.09±2.06E-09	2.00±4.73E-08
1303	UP	Mar-09	7.98	283	-1.33±5.52E-10	1.46±1.36E-09	-1.14±4.84E-08
1303	UP	Jun-09	7.78	272	7.57±5.93E-10	1.48±1.28E-09	-7.89±4.63E-08
1303	UP	Sep-09	7.97	274	0.62±5.27E-10	0.28±1.10E-09	0.24±4.52E-08
1303	UP	Dec-09	7.73	247	0.89±1.31E-09	1.76±1.80E-09	2.85±4.74E-08
110	DOWN	Mar-09	7.52	555	1.15±1.20E-09	0.61±2.19E-09	**9.33±0.63E-07**
110	DOWN	Jun-09	7.57	543	1.05±2.30E-09	2.41±1.97E-09	**8.12±0.60E-07**
110	DOWN	Sep-09	7.36	574	-0.38±1.61E-09	1.82±2.10E-09	**9.20±0.58E-07**
110	DOWN	Dec-09	7.48	500	-0.95±3.33E-09	0.85±2.80E-09	**8.79±0.59E-07**
704	DOWN	Mar-09	6.87	782	-0.67±1.32E-09	4.62±2.82E-09	-9.76±4.89E-08
704	DOWN	Jun-09	6.78	1,125	1.00±1.56E-09	4.17±2.75E-09	-8.56±3.36E-08
704	DOWN	Sep-09	6.27	932	-0.88±3.46E-09	4.95±2.51E-09	-1.41±4.53E-08
704	DOWN	Dec-09	6.90	894	0.48±3.96E-09	3.82±2.32E-09	-2.64±4.67E-08
707	DOWN	Jun-09	6.82	584	6.69±7.37E-10	2.91±1.45E-09	3.14±4.82E-08
707	DOWN	Dec-09	7.07	434	-0.80±2.57E-09	4.44±3.11E-09	1.83±4.67E-08
107	DOWN	Mar-09	7.31	646	0.15±1.12E-09	9.73±3.22E-09	2.86±5.02E-08
107	DOWN	Jun-09	7.50	692	-1.49±3.39E-09	1.17±0.33E-08	4.41±4.92E-08
107	DOWN	Sep-09	7.44	650	-1.13±2.48E-09	1.70±0.43E-08	1.74±0.34E-07
107	DOWN	Dec-09	7.37	586	1.57±3.04E-09	1.57±0.40E-08	7.90±4.82E-08
108	DOWN	Jun-09	7.82	544	1.82±3.07E-09	3.75±2.84E-09	4.95±4.93E-08
108	DOWN	Dec-09	7.66	510	2.79±2.72E-09	0.08±2.62E-09	1.52±0.49E-07
409	DOWN	Mar-09	8.01	326	1.01±0.64E-09	0.60±1.29E-09	-1.22±0.48E-07
409	DOWN	Jun-09	8.08	340	1.01±2.02E-09	2.17±2.10E-09	-1.28±0.46E-07
409	DOWN	Sep-09	8.10	346	-0.52±1.34E-09	1.47±1.80E-09	-6.54±4.40E-08
409	DOWN	Dec-09	7.90	332	0.00±1.44E-09	1.97±1.60E-09	-8.49±4.55E-08
910R	DOWN	Jun-09	7.26	1,556	1.15±0.44E-08	1.23±0.33E-08	-2.10±3.35E-08
910R	DOWN	Dec-09	7.20	765	**1.97±0.59E-08**	7.34±3.31E-09	-2.28±3.28E-08

Note: Bolding indicates a radiological concentration that exceeds the GSL.
NA - Not applicable
SU - Standard units
[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] The GSLs for radiological constituents are set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

TABLE D-2E
2009 Indicator Results From the Kent Recessional Sequence

Location Code	Hydraulic Position [a]	Date Collected	pH SU	Conductivity µmhos/cm@ 25 °C	Gross Alpha µCi/mL	Gross Beta µCi/mL	Tritium µCi/mL
Groundwater Screening Levels [b]			***NA***	***NA***	***1.50E-08***	***1.00E-06***	***1.78E-07***
901	UP	Jun-09	7.67	355	5.34±6.95E-10	1.73±1.81E-09	-6.56±4.37E-08
901	UP	Dec-09	7.31	361	0.47±2.36E-09	2.91±2.57E-09	-1.01±0.47E-07
902	UP	Mar-09	8.11	440	6.90±7.58E-10	3.90±1.42E-09	-2.60±3.43E-08
902	UP	Jun-09	8.09	446	1.07±0.93E-09	3.42±1.77E-09	-5.86±4.57E-08
902	UP	Dec-09	7.99	412	-1.53±2.17E-09	1.26±2.34E-09	-7.85±3.25E-08
1008B	UP	Dec-09	7.57	400	-0.36±2.34E-09	1.27±2.48E-09	-7.06±4.58E-08
903	DOWN	Jun-09	7.45	923	1.34±1.51E-09	2.74±2.59E-09	-1.41±3.19E-08
903	DOWN	Dec-09	7.66	920	-0.48±1.62E-09	0.28±2.22E-09	-1.04±0.46E-07
8610	DOWN	Jun-09	7.66	1,222	-3.52±4.56E-09	2.59±2.76E-09	-4.67±4.31E-08
8610	DOWN	Dec-09	7.3	1,210	0.28±2.12E-09	0.43±2.38E-09	-6.68±4.63E-08
8611	DOWN	Jun-09	7.68	1,052	0.28±4.45E-09	1.78±2.68E-09	-8.79±4.25E-08
8611	DOWN	Dec-09	6.96	1,071	1.79±2.30E-09	0.85±2.15E-09	-1.16±0.45E-07

Note: Bolding indicates a radiological concentration that exceeds the GSL.
NA - Not applicable
SU - Standard units
[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] The GSLs for radiological constituents are set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

TABLE D-2F
2009 Results for Metals in Groundwater
Compared with WVDP Groundwater Screening Levels

Location Code	*Hydraulic Position*	*Date Collected*	*Antimony*	*Arsenic*	*Barium*	*Beryllium*	*Cadmium*	*Chromium*	*Cobalt*	*Copper*
Groundwater Screening Levels [a]			*15.1 µg/L*	*25 µg/L*	*1000 µg/L*	*3 µg/L*	*7.27 µg/L*	*52.3 µg/L*	*67.8 µg/L*	*200 µg/L*
Sand and Gravel Unit										
706	UP	Mar-09	<10	<10	68	<1	<5	**116**	<50	<25
706	UP	Jun-09	<10	<10	124	<1	<5	**112**	<50	<25
706	UP	Sep-09	<10	<10	121	<1	<5	38	<50	<25
706	UP	Dec-09	<10	<10	83	<1	<5	**100**	<50	<25
1302	UP	Dec-09	<10	<10	82	<1	<5	<10	<50	<25
1304	DOWN	Mar-09	<10	<10	142	<1	<5	<10	<50	<25
1304	DOWN	Jun-09	<10	<10	163	<1	<5	<10	<50	<25
1304	DOWN	Sep-09	<10	<10	106	<1	<5	<10	<50	<25
1304	DOWN	Dec-09	<10	<10	93	<1	<5	<10	<50	<25
111	DOWN	Dec-09	<10	<10	<200	<1	<5	<10	<50	<25
502	DOWN	Jun-09	NS	<10	602	NS	<5	**2,080**	<50	70
502	DOWN	Dec-09	NS	<10	578	NS	<5	**1,955**	<50	63
8605	DOWN	Dec-09	<10	<10	<200	<1	<5	<10	<50	<25
Weathered Lavery Till Unit										
NDATR	DOWN	Mar-09	<10	<10	68	<1	<5	<10	<50	<25
NDATR	DOWN	Jun-09	<10	<10	102	<1	<5	<10	<50	<25
NDATR	DOWN	Sep-09	<10	<10	<200	<1	<5	<10	<50	<25
NDATR	DOWN	Dec-09	<10	<10	<200	<1	<5	<10	<50	<25
909	DOWN	Dec-09	<10	12	414	<1	<5	<10	<50	<25
Unweathered Lavery Till Unit										
405	UP	Mar-09	<10	<10	172	<1	<5	**556**	<50	<25
405	UP	Jun-09	<10	<10	107	<1	<5	32	<50	<25
405	UP	Sep-09	<10	<10	78	<1	<5	**62**	<50	<25
405	UP	Dec-09	<10	<10	82	<1	<5	37	<50	<25
1303	UP	Mar-09	<10	**33**	468	2	<5	**55**	<50	41
1303	UP	Jun-09	<10	18	284	<1	<5	24	<50	<25
1303	UP	Sep-09	<10	17	254	<1	<5	22	<50	<25
1303	UP	Dec-09	<10	20	288	1	<5	26	<50	<25

Note: Bolding indicates a metal concentration that exceeds the GSL.

[a] GSLs have been established by selecting the larger of the WVDP background concentrations or the 6 NYCRR TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1B).

TABLE D-2F *(concluded)*
2009 Results for Metals in Groundwater
Compared with WVDP Groundwater Screening Levels

Location Code	*Hydraulic Position*	*Date Collected*	*Lead*	*Mercury*	*Nickel*	*Selenium*	*Silver*	*Thallium*	*Tin*	*Vanadium*	*Zinc*
Groundwater Screening Levels [a]			*42.7 µg/L*	*0.7 µg/L*	*100 µg/L*	*10.1 µg/L*	*50 µg/L*	*13.9 µg/L*	*4,083 µg/L*	*69.6 µg/L*	*2,000 µg/L*
Sand and Gravel Unit											
706	UP	Mar-09	<3	<0.2	**529**	<5	<10	<10	<3,000	<50	<10
706	UP	Jun-09	<3	<0.2	**379**	<5	<10	<10	<3,000	<50	<10
706	UP	Sep-09	<3	<0.2	**268**	<5	<10	<10	<3,000	<50	<10
706	UP	Dec-09	<3	<0.2	**242**	<5	<10	<10.2	<3,000	<50	<10
1304	UP	Mar-09	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<10
1304	UP	Jun-09	<3	<0.2	<40	<5	<10	<10	<3,000	<50	12
1304	UP	Sep-09	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<10
1304	UP	Dec-09	<3	<0.2	<40	<5	<10	<10.2	<3,000	<50	14
1302	DOWN	Dec-09	<3	<0.2	<40	<5	<10	<10.2	<3,000	<50	<10
111	DOWN	Dec-09	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
502	DOWN	Jun-09	<3	<0.2	**203**	<5	<10	NS	NS	<50	<20
502	DOWN	Dec-09	<3	<0.2	**221**	<5	<10	NS	NS	<50	<20
8605	DOWN	Dec-09	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
Weathered Lavery Till Unit											
NDATR	DOWN	Mar-09	<3	<0.2	<40	<5	<10	<10	<3,000	<50	13
NDATR	DOWN	Jun-09	<3	<0.2	<40	<5	<10	<10	<3,000	<50	17
NDATR	DOWN	Sep-09	<3	<0.2	<40	<5	<10	<10	<3,000	<50	58
NDATR	DOWN	Dec-09	6	<0.2	<40	<5	<10	<10	<3,000	<50	67
909	DOWN	Dec-09	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<10
Unweathered Lavery Till Unit											
405	UP	Mar-09	<3	<0.2	**1,665**	<5	<10	<10	<3,000	<50	<10
405	UP	Jun-09	<3	<0.2	**2,490**	<5	<10	<10	<3,000	<50	<10
405	UP	Sep-09	<3	<0.2	**1,640**	<5	<10	<10	<3,000	<50	<10
405	UP	Dec-09	<3	<0.2	**1,570**	<5	<10	<10	<3,000	<50	<10
1303	UP	Mar-09	27	<0.2	74.2	<5	<10	<10	<3,000	**72**	142
1303	UP	Jun-09	12	<0.2	<40	<5	<10	<10	<3,000	<50	68
1303	UP	Sep-09	11	<0.2	<40	<5	<10	<10	<3,000	<50	64
1303	UP	Dec-09	14	<0.2	<40	<5	<10	<10	<3,000	<50	69

Note: Bolding indicates a metal concentration that exceeds the GSL.

[a] GSLs have been established by selecting the larger of the WVDP background concentrations or the 6 NYCRR TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1B).

TABLE D-2G
2009 Metals Results for Early Warning Monitoring Well 502

Location	*Date Collected*	*Aluminum µg/L*	*Iron µg/L*	*Manganese µg/L*
502	Jun-09	942	27,600	112
	Dec-09	869	27,800	128

TABLE D-2H
2009 Radioactivity in Groundwater From Selected Monitoring Locations

Location	*Hydraulic Position* [a]	*Date Collected*	*C-14 µCi/mL*	*Sr-90 µCi/mL*	*Tc-99 µCi/mL*	*I-129 µCi/mL*	*Cs-137 µCi/mL*	*Ra-226 µCi/mL*
Groundwater Screening Levels [b]			*2.82E-08*	*5.90E-09*	*5.02E-09*	*9.61E-10*	*1.03E-08*	*1.33E-09*
Sand and Gravel Unit								
401	UP	Dec-09	-0.56±2.49E-08	7.88±6.80E-10	-2.26±1.79E-09	-1.55±4.32E-10	0.05±1.78E-09	6.19±3.03E-10
1304	UP	Dec-09	-0.38±2.51E-08	2.44±6.68E-10	-1.49±2.09E-09	-0.76±7.45E-10	0.80±1.93E-09	2.48±1.94E-10
406	DOWN	Dec-09	0.70±2.54E-08	1.20±0.54E-09	-1.25±1.80E-09	5.00±4.28E-10	-1.35±1.81E-09	3.38±2.22E-10
408	DOWN	Dec-09	-2.86±2.51E-08	**1.87±0.01E-04**	1.84±0.26E-08	0.19±1.06E-09	-0.09±2.61E-09	4.04±2.57E-10
501	DOWN	Dec-09	NS	**7.79±0.05E-05**	NS	NS	NS	NS
502	DOWN	Dec-09	NS	**4.54±0.04E-05**	NS	NS	NS	NS
8609	DOWN	Dec-09	NS	**1.09±0.07E-06**	NS	NS	NS	NS
801	DOWN	Dec-09	NS	**8.46±0.20E-06**	NS	NS	NS	NS
Weathered Till Unit								
NDATR	DOWN	Jun-09	-0.22±2.66E-08	**6.04±0.07E-07**	-0.19±5.88E-09	**9.61±1.75E-09**	0.06±1.98E-09	3.81±2.03E-10
NDATR	DOWN	Dec-09	0.48±2.23E-08	**4.98±0.08E-07**	**7.94±1.77E-09**	**2.16±0.26E-08**	1.41±1.69E-09	2.32±2.08E-10
909	DOWN	Dec-09	-0.10±2.54E-08	**1.60±0.05E-07**	-0.99±1.84E-09	**9.50±1.86E-09**	-0.45±1.97E-09	6.20±3.25E-10

Location	*Hydraulic Position* [a]	*Date Collected*	*Ra-228 µCi/mL*	*U-232 µCi/mL*	*U-233/234 µCi/mL*	*U-235/236 µCi/mL*	*U-238 µCi/mL*	*Total U µg/mL*
Groundwater Screening Levels [b]			*2.16E-09*	*1.38E-10*	*6.24E-10*	*8.07E-11*	*4.97E-10*	*1.34E-03*
Sand and Gravel Unit								
401	UP	Dec-09	2.46±5.50E-10	-1.54±3.62E-11	1.17±0.92E-10	0.00±3.27E-11	1.29±0.92E-10	1.61±0.15E-04
1304	UP	Dec-09	0.03±5.16E-10	3.77±4.72E-11	1.76±0.99E-10	1.41±2.77E-11	4.22±4.78E-11	2.36±0.14E-04
406	DOWN	Dec-09	4.51±5.59E-10	-0.28±3.96E-11	-0.04±2.68E-11	0.00±2.48E-11	7.58±6.06E-11	9.50±0.83E-05
408	DOWN	Dec-09	1.01±0.41E-09	7.58±8.68E-11	5.53±2.18E-10	5.54±7.60E-11	4.55±1.97E-10	7.31±0.30E-04
Weathered Till Unit								
NDATR	DOWN	Jun-08	8.91±4.50E-10	4.91±8.12E-11	**1.98±0.39E-09**	-0.49±4.11E-11	**1.38±0.33E-09**	**2.74±0.13E-03**
NDATR	DOWN	Dec-08	5.01±4.57E-10	0.98±1.44E-10	**1.47±0.49E-09**	1.17±1.46E-10	**1.31±0.46E-09**	**3.49±0.13E-03**
909	DOWN	Jun-09	4.51±2.67E-10	NS	NS	NS	NS	NS
909	DOWN	Dec-09	9.86±6.51E-10	1.33±4.30E-11	4.52±1.61E-10	1.13±3.58E-11	3.60±1.42E-10	8.52±0.46E-04

Note: Bolding indicates a radiological concentration that exceeds the GSL.
NS - Not sampled
[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] The GSLs for radiological constituents were set equal to the larger of the background concentrations or the TOGS 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).

APPENDIX E

Summary of Biological Data

TABLE E-1
2009 Radioactivity Concentrations in Milk

Location	K-40 (µCi/mL)	Sr-90 (µCi/mL)	I-129 (µCi/mL)	Cs-137 (µCi/mL)
BFMFLDMN				
Annual	1.42±0.17E-06	6.72±9.17E-10	1.83±3.52E-10	-0.63±3.36-09

Note: The control milk sample (BFMCTLS) was last sampled in 2007. It will next be sampled in 2012.

TABLE E-2
2009 Radioactivity Concentrations in Venison

Location	% Moisture	H-3 (µCi/mL)	K-40 (µCi/g - dry)	Sr-90 (µCi/g - dry)	Cs-137 (µCi/g - dry)
Deer Flesh Background (BFDCTRL 12/09)	75.1	-0.50±1.25E-07	1.18±0.09E-05	-3.42±2.40E-09	1.88±1.70E-08
Deer Flesh Background (BFDCTRL 12/09)	73.8	-0.24±1.24E-07	1.08±0.11E-05	0.56±2.73E-09	0.86±1.97E-08
Deer Flesh Background (BFDCTRL 12/09)	71.9	3.80±1.11E-07	1.07±0.01E-05	2.97±2.88E-09	-0.65±1.24E-08
Deer Flesh Near-Site (BFDNEAR 11/09)	74.5	1.17±9.65E-08	1.29±0.14E-05	-1.29±2.61E-09	2.99±2.63E-08
Deer Flesh Near-Site (BFDNEAR 11/09)	75.2	1.97±1.31E-07	1.43±0.14E-05	0.00±2.70E-09	1.41±1.58E-08
Deer Flesh Near-Site (BFDNEAR 12/09)	73.9	-1.10±1.22E-07	1.09±0.11E-05	1.93±2.82E-09	1.10±1.89E-08

TABLE E-3
2009 Radioactivity Concentrations in Food Crops

The frequency of sampling of food crops has been decreased from annual to once every five years, consistent with guidance on periodic confirmatory sampling in DOE/EH-0173T. Food crops will next be sampled in CY 2012.

TABLE E-4
2009 Radioactivity Concentrations in Edible Portions of Fish

The frequency of sampling fish has been decreased from annual to once every five years, consistent with guidance on periodic confirmatory sampling in DOE/EH-0173T. Fish will next be sampled in CY 2012.

APPENDIX F

Summary of Direct Radiation Monitoring Data

TABLE F-1
Summary of 2009 Semiannual Averages of Off-Site TLD Measurements[a]
(mR±2 SD/quarter)

Location Number [b]	*1st Half*	*2nd Half*	*Location Average*
DFTLD01	16±1	17±1	16±1
DFTLD02	16±1	17±1	17±1
DFTLD03	14±1	15±2	14±1
DFTLD04	16±3	16±1	16±2
DFTLD05	15±1	17±3	16±2
DFTLD06	16±1	17±1	16±1
DFTLD07	14±1	14±1	14±1
DFTLD08	16±1	17±1	16±1
DFTLD09	16±1	17±1	16±1
DFTLD10	14±1	15±1	15±1
DFTLD11	15±1	15±1	15±1
DFTLD12	15±1	16±1	15±1
DFTLD13	16±1	17±1	17±1
DFTLD14	15±2	16±3	16±2
DFTLD15	15±1	16±1	16±1
DFTLD16	15±1	16±1	15±1
DFTLD20	14±1	14±2	14±1
DFTLD23	16±2	17±2	17±2

[a] The frequency of collection at the TLD locations was reduced from quarterly to semannual in 2008, however data are reported in units of mR per quarter for comparability with historical results.
[b] Off-site locations are shown on Figure A-11.

Conversion factor: Milliroentgen (mR) units are used to report exposure rates in air. To convert mR to mrem (dose to humans), a conversion factor of 1.03 must be applied. For example, a reported exposure rate of 18.1 mR/quarter would be equivalent to 18.6 mrem/quarter (based upon dose-equivalent phantom calibration using cesium-137).

TABLE F-2
Summary of 2009 Semiannual Averages of On-Site TLD Measurements[a]
(mR±2 SD/quarter)

Location Number [b]	*1st Half*	*2nd Half*	*Location Average*
DNTLD24	487±51	727±74	607±64
DNTLD28	17±1	19±1	18±1
DNTLD33	18±2	20±1	19±1
DNTLD35	18±2	19±2	18±2
DNTLD36	15±1	17±2	16±1
DNTLD38	39±5	41±6	40±5
DNTLD40	153±17	139±24	146±21
DNTLD43	15±1	16±1	15±1

[a] The frequency of collection at the TLD locations was reduced from quarterly to semannual in 2008, however data are reported in units of mR per quarter for comparability with historical results.
[b] On-site locations are shown on Figure A-10.

Conversion factor: Milliroentgen (mR) units are used to report exposure rates in air. To convert mR to mrem (dose to humans), a conversion factor of 1.03 must be applied. For example, a reported exposure rate of 18.1 mR/quarter would be equivalent to 18.6 mrem/quarter (based upon dose-equivalent phantom calibration using cesium-137).

APPENDIX G

Summary of Quality Assurance Crosscheck Analyses

TABLE G-1
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 20, February 2009

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?*[b]	*Analyzed by:*
MAPEP - 09 - GrF20, Air Filter - Gross Alpha/Beta							
Gross alpha	Air Filter	Bq/sample	0.152	0.348	>0.0–0.696	Yes	ELAB
Gross beta	Air Filter	Bq/sample	0.317	0.279	0.140–0.419	Yes	ELAB
MAPEP - 09 - RdF20, Air Filter - Radiological							
Am-241	Air Filter	Bq/sample	0.2327	0.205	0.144–0.267	Yes	GEL
Cs-137	Air Filter	Bq/sample	1.487	1.52	1.06–1.98	Yes	GEL
Co-60	Air Filter	Bq/sample	1.413	1.22	0.85–1.59	Yes	GEL
Pu-238	Air Filter	Bq/sample	0.169	0.1763	0.1234–0.2292	Yes	GEL
Pu-239/240	Air Filter	Bq/sample	0.151	0.157	0.110–0.204	Yes	GEL
Sr-90	Air Filter	Bq/sample	0.692	0.640	0.448–0.832	Yes	GEL
U-233/234	Air Filter	Bq/sample	0.197	0.198	0.139–0.257	Yes	GEL
U-238	Air Filter	Bq/sample	0.216	0.21	0.15–0.27	Yes	GEL
MAPEP - 09 - GrW20, Water - Gross Alpha/Beta							
Gross alpha	Water	Bq/L	0.655	0.635	>0.0–1.270	Yes	ELAB
Gross beta	Water	Bq/L	1.31	1.27	0.64–1.91	Yes	ELAB
Gross alpha	Water	Bq/L	0.506	0.635	>0.0–1.270	Yes	GEL
Gross beta	Water	Bq/L	1.337	1.27	0.64–1.91	Yes	GEL
MAPEP - 09 - MaW20, Water - Radiological							
Cs-137	Water	Bq/L	0.0487	[c]	[c]	Yes	ELAB
Co-60	Water	Bq/L	16.5	17.21	12.05–22.37	Yes	ELAB
H-3	Water	Bq/L	360	330.9	231.6–430.2	Yes	ELAB
Sr-90	Water	Bq/L	6.81	7.21	5.05–9.37	Yes	ELAB
Am-241	Water	Bq/L	0.605	0.636	0.445–0.827	Yes	GEL
Cs-137	Water	Bq/L	0.000001	[c]	[c]	Yes	GEL
Co-60	Water	Bq/L	16.8	17.21	12.05–22.37	Yes	GEL
H-3	Water	Bq/L	297	330.9	231.6–430.2	Yes	GEL
Pu-238	Water	Bq/L	1.107	1.18	0.83–1.53	Yes	GEL
Pu-239/240	Water	Bq/L	0.770	0.853	0.597–1.109	Yes	GEL
Sr-90	Water	Bq/L	7.43	7.21	5.05–9.37	Yes	GEL
Tc-99	Water	Bq/L	14.2	14.46	10.12–18.80	Yes	GEL
U-233/234	Water	Bq/L	2.797	2.77	1.94–3.60	Yes	GEL
U-238	Water	Bq/L	2.823	2.88	2.02–3.74	Yes	GEL

ELAB - WVDP Environmental Laboratory
GEL - GEL Laboratories, LLC
Note: This report includes only those matrix/analyte combinations performed in support of the analysis of samples collected at the WVDP and for which results are presented in this Annual Site Environmental Report.
[a] MAPEP monitors performance and requests corrective action as required.
[b] "Yes" - Result acceptable; "Pass" - Result acceptable with warning; "No" - Result not acceptable.
[c] Although no actual value or acceptance range was provided, the results were assessed by MAPEP as acceptable.

TABLE G-1 *(continued)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 20, February 2009

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?*[b]	*Analyzed by:*
MAPEP - 09 - MaW20, Water - Inorganic							
Antimony	Water	mg/L	<0.01	<0.01	[c]	Yes	GEL
Arsenic	Water	mg/L	0.972	0.96	0.67–1.25	Yes	GEL
Barium	Water	mg/L	0.298	0.2971	0.2080–0.3862	Yes	GEL
Beryllium	Water	mg/L	0.0534	0.0530	0.0371–0.0689	Yes	GEL
Cadmium	Water	mg/L	<0.005	<0.01	[c]	Yes	GEL
Chromium	Water	mg/L	1.98	1.95	1.37–2.54	Yes	GEL
Cobalt	Water	mg/L	<0.005	<0.025	[c]	Yes	GEL
Copper	Water	mg/L	7.51	7.31	5.12–9.50	Yes	GEL
Lead	Water	mg/L	1.21	1.239	0.867–1.611	Yes	GEL
Mercury	Water	mg/L	0.00488	0.00559	0.00391–0.00727	Yes	GEL
Nickel	Water	mg/L	3.58	3.62	2.53–4.71	Yes	GEL
Selenium	Water	mg/L	<0.015	<0.01	[c]	Yes	GEL
Thallium	Water	mg/L	4.08	4.19	2.93–5.45	Yes	GEL
Uranium - total	Water	mg/L	0.243	0.233	0.163–0.303	Yes	GEL
Vanadium	Water	mg/L	0.932	0.886	0.620–1.152	Yes	GEL
Zinc	Water	mg/L	0.380	0.404	0.283–0.525	Yes	GEL
MAPEP - 09 - MaS20, Soil - Inorganic							
Antimony	Soil	mg/kg	61.8	74.2	51.9–96.5	Yes	GEL
Arsenic	Soil	mg/kg	87.1	92	64–120	Yes	GEL
Barium	Soil	mg/kg	847	912	638–1186	Yes	GEL
Beryllium	Soil	mg/kg	36.1	40.0	28.0–52.0	Yes	GEL
Cadmium	Soil	mg/kg	10.2	11.99	8.39–15.59	Yes	GEL
Chromium	Soil	mg/kg	69.8	83	58–108	Yes	GEL
Cobalt	Soil	mg/kg	115	134	94–174	Yes	GEL
Copper	Soil	mg/kg	174	178.7	125.1–232.3	Yes	GEL
Lead	Soil	mg/kg	76.3	85.3	59.7–110.9	Yes	GEL
Mercury	Soil	mg/kg	0.199	0.1856	0.1299–0.2413	Yes	GEL
Nickel	Soil	mg/kg	209	255	179–332	Yes	GEL
Selenium	Soil	mg/kg	<1	<0.1	[c]	Yes	GEL
Silver	Soil	mg/kg	11.4	12.12	8.48–15.76	Yes	GEL
Thallium	Soil	mg/kg	285	347	243–451	Yes	GEL
Uranium - total	Soil	mg/kg	9	12.6	8.8–16.4	Pass	GEL
Vanadium	Soil	mg/kg	142	162.7	113.9–211.5	Yes	GEL
Zinc	Soil	mg/kg	360	422	295–549	Yes	GEL

GEL - GEL Laboratories, LLC

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[a] MAPEP monitors performance and requests corrective action as required.

[b] “Yes” - Result acceptable; “Pass” - Result acceptable with warning; “No” - Result not acceptable.

[c] Although no actual value or acceptable range was provided, the results were assessed by MAPEP as acceptable.

TABLE G-1 *(continued)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 20, February 2009

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?*[b]	*Analyzed by:*
MAPEP - 09 - MaS20, Soil - Radiological							
Am-241	Soil	Bq/kg	38.87	38.3	26.8–49.8	Yes	GEL
Cs-137	Soil	Bq/kg	612.7	605	424–787	Yes	GEL
Co-60	Soil	Bq/kg	3.6	4.113	[c]	Yes	GEL
Pu-238	Soil	Bq/kg	28.9	25.3	17.7–32.9	Yes	GEL
Pu-239/240	Soil	Bq/kg	0.34	0.29	[c]	Yes	GEL
K-40	Soil	Bq/kg	608.7	570	399–741	Yes	GEL
Sr-90	Soil	Bq/kg	262.3	257	180–334	Yes	GEL
Tc-99	Soil	Bq/kg	101.5	171	120–222	No	GEL
U-233/234	Soil	Bq/kg	144.33	149	104–194	Yes	GEL
U-238	Soil	Bq/kg	147.33	155	109–202	Yes	GEL
MAPEP - 09 - RdV20, Vegetation - Radiological							
Am-241	Veg	Bq/sample	0.338	0.306	0.214–0.398	Yes	GEL
Cs-137	Veg	Bq/sample	0.907	0.93	0.65–1.21	Yes	GEL
Co-60	Veg	Bq/sample	-0.010	[c]	[c]	Yes	GEL
Pu-238	Veg	Bq/sample	0.216	0.213	0.149–0.277	Yes	GEL
Pu-239/240	Veg	Bq/sample	0.163	0.168	0.118–0.218	Yes	GEL
Sr-90	Veg	Bq/sample	1.16	1.260	0.882–1.638	Yes	GEL
U-233/234	Veg	Bq/sample	0.478	0.460	0.322–0.598	Yes	GEL
U-238	Veg	Bq/sample	0.484	0.477	0.334–0.620	Yes	GEL
MAPEP - 09 - OrW20, Water - Organic Compounds							
Heptachlor	Water	µg/L	4.14	5.24	2.01–8.47	Yes	GEL
1,2,4-Trichlorobenzene	Water	µg/L	67.7	84.6	26.8–142.4	Yes	GEL
1,2-Dichlorobenzene	Water	µg/L	27.6	34.4	5.1–63.8	Yes	GEL
1,3-Dichlorobenzene	Water	µg/L	43.9	55.5	10.7–100.3	Yes	GEL
1,4-Dichlorobenzene	Water	µg/L	50.1	64.5	10.0–119.7	Yes	GEL
2,4,5-Trichlorophenol	Water	µg/L	127	149.1	63.8–234.3	Yes	GEL
2,4,6-Trichlorophenol	Water	µg/L	89.0	98.2	40.0–156.4	Yes	GEL
2,4-Dichlorophenol	Water	µg/L	113	114.6	48.4–180.8	Yes	GEL
2,4-Dimethylphenol	Water	µg/L	114	118.6	34.5–202.6	Yes	GEL
2,4-Dinitrophenol	Water	µg/L	<19.0	[c]	[c]	Yes	GEL
2,4-Dinitrotoluene	Water	µg/L	33.7	37.5	15.4–59.5	Yes	GEL
2,6-Dichlorophenol	Water	µg/L	56.4	60.7	24.7–96.8	Yes	GEL
2,6-Dinitrotoluene	Water	µg/L	56.5	64.0	31.4–96.7	Yes	GEL
2-Chloronaphthalene	Water	µg/L	92.7	120.9	49.4–192.4	Yes	GEL
2-Chlorophenol	Water	µg/L	132	144.0	52.6–235.3	Yes	GEL
2-Methylnaphthalene	Water	µg/L	77.3	73.0	21.4–124.5	Yes	GEL

GEL - GEL Laboratories, LLC

Note: This report includes only those matrix/analyte combinations performed in support of the analysis of samples collected at the WVDP and for which results are presented in this Annual Site Environmental Report.

[a] MAPEP monitors performance and requests corrective action as required.

[b] "Yes" - Result acceptable; "Pass" - Result acceptable with warning; "No" - Result not acceptable.

[c] Although no actual value or acceptable range was provided, the results were assessed by MAPEP as acceptable.

TABLE G-1 *(concluded)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 20, February 2009

Analyte	Matrix	Units	Reported Value	Reference Value	Acceptance Range	Accept?[b]	Analyzed by:
MAPEP - 09 - OrW20, Water - Organic Compounds							
2-Methylphenol	Water	µg/L	62.8	71.4	18.9–124.0	Yes	GEL
2-Nitrophenol	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
3 Methyl and 4-Methylphenol	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
4,6-Dinitro-2-methylphenol	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
4-Bromophenyl-phenylether	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
4-Chloro-3-methylphenol	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
4-Chlorophenyl-phenylether	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
4-Nitrophenol	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
Acenaphthene	Water	µg/L	93.3	121.6	60.3–182.8	Yes	GEL
Acenaphthylene	Water	µg/L	0.952	[c]	[c]	Pass	GEL
Anthracene	Water	µg/L	82.6	99.7	50.4–149.0	Yes	GEL
Benzo(a)anthracene	Water	µg/L	40.0	48.1	25.1–71.1	Yes	GEL
Benzo(a)pyrene	Water	µg/L	26.1	29.2	11.0–47.4	Yes	GEL
Benzo(b)fluoranthene	Water	µg/L	80.0	85.9	38.3–133.5	Yes	GEL
Benzo(g,h,i)perylene	Water	µg/L	<0.952	[c]	[c]	Yes	GEL
Benzo(k)fluoranthene	Water	µg/L	63.9	72.1	21.1–123.2	Yes	GEL
bis(2-chloroethoxy)methane	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
bis(2-chloroethyl)ether	Water	µg/L	33.4	40.0	15.0–64.9	Yes	GEL
bis(2-chloroisopropyl)ether	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
Bis(2-ethylhexyl)phthalate	Water	µg/L	58.8	56.3	19.8–92.9	Yes	GEL
Butylbenzylphthalate	Water	µg/L	65.1	56.9	9.9–103.9	Yes	GEL
Chrysene	Water	µg/L	19.8	23.6	11.1–36.1	Yes	GEL
Di-n-butylphthalate	Water	µg/L	57.4	58.8	23.4–94.2	Yes	GEL
Di-n-octylphthalate	Water	µg/L	56.7	54.2	16.8–91.6	Yes	GEL
Dibenzo(a,h)anthracene	Water	µg/L	<0.952	[c]	[c]	Yes	GEL
Dibenzofuran	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
Diethylphthalate	Water	µg/L	68.9	70.9	16.0–125.8	Yes	GEL
Dimethylphthalate	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
Fluoranthene	Water	µg/L	77.4	88.7	47.7–129.6	Yes	GEL
Fluorene	Water	µg/L	72.1	89.2	48.0–130.4	Yes	GEL
Hexachlorobenzene	Water	µg/L	25.9	43.0	21.5–64.4	Yes	GEL
Hexachlorobutadiene	Water	µg/L	53.0	68.7	12.0–125.3	Yes	GEL
Hexachlorocyclopentadiene	Water	µg/L	52.2	44.6	7.9–106.0	Yes	GEL
Hexachloroethane	Water	µg/L	49.4	59.9	9.7–110.1	Yes	GEL
Indeno(1,2,3-c,d)pyrene	Water	µg/L	<0.952	[c]	[c]	Yes	GEL
Isophorone	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
Napthalene	Water	µg/L	36.6	42.3	16.3–68.3	Yes	GEL
Nitrobenzene	Water	µg/L	81.6	82.2	33.6–130.7	Yes	GEL
Pentachlorophenol	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
Phenanthrene	Water	µg/L	<0.952	[c]	[c]	Yes	GEL
Phenol	Water	µg/L	46.5	88.6	15.8–211.6	Yes	GEL
Pyrene	Water	µg/L	64.6	72.5	28.2–116.8	Yes	GEL

GEL - GEL Laboratories, LLC
[a] MAPEP monitors performance and requests corrective action as required.
[b] "Yes" - Result acceptable; "Pass" - Result acceptable with warning; "No" - Result not acceptable.
[c] Although no actual value or acceptable range was provided, the results were assessed by MAPEP as acceptable.

TABLE G-2
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 21, July 2009

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?* [b]	*Analyzed by:*
MAPEP - 09 - GrF21, Air Filter - Gross Alpha/Beta							
Gross Alpha	Air Filter	Bq/sample	0.271	0.659	>0.0–1.318	Yes	ELAB
Gross Beta	Air Filter	Bq/sample	1.40	1.32	0.66–1.98	Yes	ELAB
MAPEP - 09 - RdF21, Air Filter - Radiological							
Am-241	Air Filter	Bq/sample	-0.0022	[c]	[c]	Yes	GEL
Cs-137	Air Filter	Bq/sample	1.397	1.40	0.98–1.82	Yes	GEL
Co-60	Air Filter	Bq/sample	1.127	1.03	0.72–1.34	Yes	GEL
Pu-238	Air Filter	Bq/sample	0.088	0.091	0.064–0.118	Yes	GEL
Pu-239/240	Air Filter	Bq/sample	0.149	0.138	0.097–0.179	Yes	GEL
Sr-90	Air Filter	Bq/sample	0.778	0.835	0.585–1.086	Yes	GEL
U-233/234	Air Filter	Bq/sample	0.31	0.300	0.210–0.390	Yes	GEL
U-238	Air Filter	Bq/sample	0.313	0.312	0.218–0.406	Yes	GEL
MAPEP - 09 - GrW21, Water - Gross Alpha/Beta							
Gross Alpha	Water	Bq/L	0.950	1.047	>0.0–2.094	Yes	ELAB
Gross Beta	Water	Bq/L	7.46	7.53	3.77–11.30	Yes	ELAB
Gross Alpha	Water	Bq/L	0.982	1.047	>0.0–2.094	Yes	GEL
Gross Beta	Water	Bq/L	7.277	7.53	3.77–11.30	Yes	GEL
MAPEP - 09 - MaW21, Water - Radiological							
Cs-137	Water	Bq/L	40.6	41.2	28.8–53.6	Yes	ELAB
Co-60	Water	Bq/L	15.1	15.4	10.8–20.0	Yes	ELAB
H-3	Water	Bq/L	660	634.1	443.9–824.3	Yes	ELAB
Sr-90	Water	Bq/L	12.3	12.99	9.09–16.89	Yes	ELAB
Am-241	Water	Bq/L	0.9527	1.04	0.73–1.35	Yes	GEL
Cs-137	Water	Bq/L	40.4	41.2	28.8–53.6	Yes	GEL
Co-60	Water	Bq/L	15.3	15.4	10.8–20.0	Yes	GEL
H-3	Water	Bq/L	674	634.1	443.9–824.3	Yes	GEL
Pu-238	Water	Bq/L	0.017	0.018	[c]	Yes	GEL
Pu-239/240	Water	Bq/L	1.580	1.64	1.15–2.13	Yes	GEL
Sr-90	Water	Bq/L	16.4	12.99	9.09–16.89	Pass	GEL
Tc-99	Water	Bq/L	12.6	10.0	7.0–13.0	Pass	GEL
U-233/234	Water	Bq/L	2.823	2.96	2.07–3.85	Yes	GEL
U-238	Water	Bq/L	3.003	3.03	2.12–3.94	Yes	GEL

ELAB - WVDP Environmental Laboratory
GEL - GEL Laboratories, LLC
Note: This report includes only those matrix/analyte combinations performed in support of the analysis of samples collected at the WVDP and for which results are presented in this Annual Site Environmental Report.
[a] MAPEP monitors performance and requests corrective action as required.
[b] "Yes" - Result acceptable; "Pass" - Result acceptable with warning; "No" - Result not acceptable.
[c] Although no actual value or acceptable range was provided, the results were assessed by MAPEP as acceptable.

TABLE G-2 *(continued)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 21, July 2009

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?[b]*	*Analyzed by:*
MAPEP - 09 - MaW21, Water - Inorganic							
Antimony	Water	mg/L	2.27	2.120	1.484–2.756	Yes	GEL
Arsenic	Water	mg/L	2.42	2.346	1.642–3.050	Yes	GEL
Barium	Water	mg/L	1.45	1.415	0.991–1.840	Yes	GEL
Beryllium	Water	mg/L	0.584	0.567	0.397–0.737	Yes	GEL
Cadmium	Water	mg/L	0.293	0.2989	0.2092–0.3886	Yes	GEL
Chromium	Water	mg/L	<0.005	<0.01	[c]	Yes	GEL
Cobalt	Water	mg/L	1.47	1.479	1.035–1.923	Yes	GEL
Copper	Water	mg/L	<0.01	<0.025	[c]	Yes	GEL
Lead	Water	mg/L	1.99	1.998	1.399–2.597	Yes	GEL
Mercury	Water	mg/L	0.00875	0.01075	0.00753–0.01398	Yes	GEL
Nickel	Water	mg/L	1.95	1.964	1.375–2.553	Yes	GEL
Selenium	Water	mg/L	0.317	0.3209	0.2246–0.4172	Yes	GEL
Thallium	Water	mg/L	2.46	2.431	1.702–3.160	Yes	GEL
Uranium - total	Water	mg/L	0.256	0.245	0.172–0.319	Yes	GEL
Vanadium	Water	mg/L	3.19	2.946	2.062–3.830	Yes	GEL
Zinc	Water	mg/L	7.64	8.12	5.68–10.56	Yes	GEL
MAPEP - 09 - MaS21, Soil - Inorganic							
Antimony	Soil	mg/kg	173	173.0	121.1–224.9	Yes	GEL
Arsenic	Soil	mg/kg	69.8	64.0	44.8–83.2	Yes	GEL
Barium	Soil	mg/kg	278	252	176–328	Yes	GEL
Beryllium	Soil	mg/kg	25.3	25.3	17.7–32.9	Yes	GEL
Cadmium	Soil	mg/kg	12.7	14.42	10.09–18.75	Yes	GEL
Chromium	Soil	mg/kg	72.5	76.4	53.5–99.3	Yes	GEL
Cobalt	Soil	mg/kg	56.5	66.8	46.8–86.8	Yes	GEL
Copper	Soil	mg/kg	71.4	63.1	44.2–82.0	Yes	GEL
Lead	Soil	mg/kg	21.9	23.6	16.5–30.7	Yes	GEL
Mercury	Soil	mg/kg	0.102	0.1093	0.0765–0.1421	Yes	GEL
Nickel	Soil	mg/kg	56.7	65.5	45.9–85.2	Yes	GEL
Selenium	Soil	mg/kg	9.94	11.60	8.12–15.08	Yes	GEL
Silver	Soil	mg/kg	<0.5	<0.2	[c]	Yes	GEL
Thallium	Soil	mg/kg	58.3	65.9	46.1–85.7	Yes	GEL
Uranium - total	Soil	mg/kg	14.8	17.6	12.3–22.9	Yes	GEL
Vanadium	Soil	mg/kg	73.6	71.1	49.8–92.4	Yes	GEL
Zinc	Soil	mg/kg	221	225	158–293	Yes	GEL

GEL - GEL Laboratories, LLC

[a] MAPEP monitors performance and requests corrective action as required.

[b] "Yes" - Result acceptable; "Pass" - Result acceptable with warning; "No" - Result not acceptable.

[c] Although no actual value or acceptable range was provided, the results were assessed by MAPEP as acceptable.

TABLE G-2 *(continued)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 21, July 2009

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?[b]*	*Analyzed by:*
MAPEP - 09 - MaS21, Soil - Radiological							
Am-241	Soil	Bq/kg	84.83	89.8	62.9–116.7	Yes	GEL
Cs-137	Soil	Bq/kg	683.3	669	468–870	Yes	GEL
Co-60	Soil	Bq/kg	332.3	327	229–425	Yes	GEL
Pu-238	Soil	Bq/kg	58.8	63.2	44.2–82.2	Yes	GEL
Pu-239/240	Soil	Bq/kg	106.67	116.3	81.4–151.2	Yes	GEL
K-40	Soil	Bq/kg	401.3	375	263–488	Yes	GEL
Sr-90	Soil	Bq/kg	423.3	455	319–592	Yes	GEL
Tc-99	Soil	Bq/kg	371.7	444	311–577	Yes	GEL
U-233/234	Soil	Bq/kg	202	209	146–272	Yes	GEL
U-238	Soil	Bq/kg	203.67	217	152–282	Yes	GEL
MAPEP - 09 - RdV21, Vegetation - Radiological							
Am-241	Veg	Bq/sample	0.175	0.171	0.120–0.222	Yes	GEL
Cs-137	Veg	Bq/sample	2.443	2.43	1.70–3.16	Yes	GEL
Co-60	Veg	Bq/sample	2.637	2.57	1.80–3.34	Yes	GEL
Pu-238	Veg	Bq/sample	0.003	0.0016	[c]	Yes	GEL
Pu-239/240	Veg	Bq/sample	0.241	0.258	0.181–0.335	Yes	GEL
Sr-90	Veg	Bq/sample	1.577	1.78	1.25–2.31	Yes	GEL
U-233/234	Veg	Bq/sample	0.531	0.525	0.368–0.683	Yes	GEL
U-238	Veg	Bq/sample	0.545	0.544	0.381–0.707	Yes	GEL
MAPEP - 09 - OrW21, Water - Organic Compounds							
Heptachlor	Water	µg/L	3.52	3.977	1.520–6.433	Yes	GEL
1,2,4-Trichlorobenzene	Water	µg/L	165	115.9	37.9–193.9	Yes	GEL
1,2-Dichlorobenzene	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
1,3-Dichlorobenzene	Water	µg/L	62.8	55.58	10.71–100.45	Yes	GEL
1,4-Dichlorobenzene	Water	µg/L	73.6	64.7	10.0–120.1	Yes	GEL
2,4,5-Trichlorophenol	Water	µg/L	76.8	71.68	31.43–111.94	Yes	GEL
2,4,6-Trichlorophenol	Water	µg/L	110	98.3	40.0–156.7	Yes	GEL
2,4-Dichlorophenol	Water	µg/L	161	114.8	48.5–181.0	Yes	GEL
2,4-Dimethylphenol	Water	µg/L	173	144.3	42.8–245.7	Yes	GEL
2,4-Dinitrophenol	Water	µg/L	<19.0	[c]	[c]	Yes	GEL
2,4-Dinitrotoluene	Water	µg/L	38.9	37.74	15.55–59.93	Yes	GEL
2,6-Dichlorophenol	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
2,6-Dinitrotoluene	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
2-Chloronaphthalene	Water	µg/L	105	95.6	38.8–152.4	Yes	GEL
2-Chlorophenol	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
2-Methylnaphthalene	Water	µg/L	104	73.2	21.5–124.9	Yes	GEL

GEL - GEL Laboratories, LLC
[a] MAPEP monitors performance and requests corrective action as required.
[b] “Yes” - Result acceptable; “Pass” - Result acceptable with warning; “No” - Result not acceptable.
[c] Although no actual value or acceptable range was provided, the results were assessed by MAPEP as acceptable.

TABLE G-2 *(concluded)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 21, July 2009

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?[b]*	*Analyzed by:*
MAPEP - 09 - OrW21, Water - Organic Compounds							
2-Methylphenol	Water	µg/L	67.2	71.6	18.9–124.3	Yes	GEL
2-Nitrophenol	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
3 Methyl and 4-Methylphenol	Water	µg/L	166	129.8	19.5–249.9	Yes	GEL
4,6-Dinitro-2-methylphenol	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
4-Bromophenyl-phenylether	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
4-Chloro-3-methylphenol	Water	µg/L	96.1	82.44	38.10–126.79	Yes	GEL
4-Chlorophenyl-phenylether	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
4-Nitrophenol	Water	µg/L	55.6	94.3	17.0–228.4	Yes	GEL
Acenaphthene	Water	µg/L	56.3	56.32	28.36–84.29	Yes	GEL
Acenaphthylene	Water	µg/L	19.8	20.74	9.14–32.35	Yes	GEL
Anthracene	Water	µg/L	23.6	26.31	13.24–39.38	Yes	GEL
Benzo(a)anthracene	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
Benzo(a)pyrene	Water	µg/L	78.6	71.20	27.09–115.31	Yes	GEL
Benzo(b)fluoranthene	Water	µg/L	49.2	49.02	20.85–77.20	Yes	GEL
Benzo(g,h,i)perylene	Water	µg/L	<0.952	[c]	[c]	Yes	GEL
Benzo(k)fluoranthene	Water	µg/L	29.5	31.17	7.97–54.37	Yes	GEL
bis(2-chloroethoxy)methane	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
bis(2-chloroethyl)ether	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
bis(2-chloroisopropyl)ether	Water	µg/L	89.8	84.3	28.4–140.2	Yes	GEL
Bis(2-ethylhexyl)phthalate	Water	µg/L	56.1	56.6	19.9–93.3	Yes	GEL
Butylbenzylphthalate	Water	µg/L	160	125.5	32.2–218.9	Yes	GEL
Chrysene	Water	µg/L	44.1	48.40	22.62–74.18	Yes	GEL
Di-n-butylphthalate	Water	µg/L	60.6	56.64	22.56–90.71	Yes	GEL
Di-n-octylphthalate	Water	µg/L	204	148.4	33.0–263.8	Yes	GEL
Dibenzo(a,h)anthracene	Water	µg/L	23.5	29.36	9.01–49.71	Yes	GEL
Dibenzofuran	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
Diethylphthalate	Water	µg/L	84.9	70.15	15.82–124.49	Yes	GEL
Dimethylphthalate	Water	µg/L	130	84.4	12.6–182.4	Yes	GEL
Fluoranthene	Water	µg/L	94.1	88.8	47.8–129.9	Yes	GEL
Fluorene	Water	µg/L	39.3	38.35	17.93–58.74	Yes	GEL
Hexachlorobenzene	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
Hexachlorobutadiene	Water	µg/L	144	106.6	20.7–192.4	Yes	GEL
Hexachlorocyclopentadiene	Water	µg/L	218	120.1	20.0–256.2	Yes	GEL
Hexachloroethane	Water	µg/L	49.1	44.75	7.05–82.46	Yes	GEL
Indeno(1,2,3-c,d)pyrene	Water	µg/L	<0.952	[c]	[c]	Yes	GEL
Isophorone	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
Napthalene	Water	µg/L	82.7	69.98	25.75–114.20	Yes	GEL
Nitrobenzene	Water	µg/L	91.0	76.7	31.3–122.0	Yes	GEL
Pentachlorophenol	Water	µg/L	88.6	94.7	30.1–159.3	Yes	GEL
Phenanthrene	Water	µg/L	51.0	52.77	29.41–76.13	Yes	GEL
Phenol	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
Pyrene	Water	µg/L	<0.952	[c]	[c]	Yes	GEL

GEL - GEL Laboratories, LLC

[a] MAPEP monitors performance and requests corrective action as required.

[b] "Yes" - Result acceptable; "Pass" - Result acceptable with warning; "No" - Result not acceptable.

[c] Although no actual value or acceptable range was provided, the results were assessed by MAPEP as acceptable.

TABLE G-3

Comparisons of Results From Crosscheck Samples Analyzed for Water Quality Parameters as Part of the EPA's 2009 Discharge Monitoring Report - Quality Assurance (DMR-QA) Study 29 (August 2009) for the National Pollutant Discharge Elimination System (NPDES)

Analyte	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range* [a]	*Accept?* [b]	*Analyzed by:*
Aluminum	µg/L	419	341	253–432	Yes	TestAmerica
Ammonia (as N)	mg/L	6.15	6.06	4.43–7.69	Yes	TestAmerica
Antimony	µg/L	497	526	368–633	Yes	TestAmerica
Arsenic	µg/L	80.5	76.3	59.7–92.4	Yes	TestAmerica
Barium	µg/L	239	239	207–269	Yes	TestAmerica
Biochemical oxygen demand	mg/L	106	122	61.8–182	Yes	TestAmerica
Cadmium	µg/L	64.9	67.1	56.4–77.4	Yes	TestAmerica
Chlorine (total residual)	mg/L	1.89	1.99	1.43–2.46	Yes	WWTF
Chromium (total)	µg/L	61.5	59.5	49.4–69.2	Yes	TestAmerica
Chromium (hexavalent)	µg/L	475	550	448–647	Yes	TestAmerica
Cobalt	µg/L	46.6	49.2	41.6–56.2	Yes	TestAmerica
Copper	µg/L	95.6	101	88.5–114	Yes	TestAmerica
Cyanide, total	mg/L	0.462	0.659	0.407–0.912	Yes	TestAmerica
Iron	µg/L	561	561	494–637	Yes	TestAmerica
Lead	µg/L	73.1	71.9	56.3–87.7	Yes	TestAmerica
Manganese	µg/L	114	112	101–127	Yes	TestAmerica
Mercury	µg/L	15.8	16.5	10.2–22.3	Yes	GEL
Nickel	µg/L	304	316	281–356	Yes	TestAmerica
Nitrate (as N)	mg/L	19.4	20.7	16.1–25	Yes	TestAmerica
Nitrite (as N)	mg/L	1.51	1.43	1.18–1.16	Yes	TestAmerica
Oil & Grease (Gravimetric)	mg/L	52.8	50.3	32.4–61.3	Yes	TestAmerica
pH	SU	8.53	8.53	8.33–8.73	Yes	ELAB
Phosphorus (total, as P)	mg/L	4.2	4.28	3.5–5.11	Yes	TestAmerica
Selenium	µg/L	261	267	209–310	Yes	TestAmerica
Silver	µg/L	28.7	29	24.2–33.5	Yes	TestAmerica
Sulfate	mg/L	68.6	64.4	53–74	Yes	TestAmerica
Settleable solids	mL/L	27	25.6	20.0–32.9	Yes	WWTF
Suspended solids (total)	mg/L	40	51	39.7–58.3	Yes	TestAmerica
Total dissolved solids	mg/L	281	267	199–335	Yes	ELAB
Total Kjeldahl nitrogen (as N)	mg/L	16.2	17.5	11.5–22.5	Yes	TestAmerica
Vanadium	µg/L	74.8	76.7	66.4–86.8	Yes	TestAmerica
Zinc	µg/L	134	133	113–160	Yes	TestAmerica

ELAB - WVDP Environmental Laboratory
GEL - GEL Laboratories, LLC
TestAmerica - TestAmerica Laboratories, Inc., Buffalo
WWTF - WVDP Wastewater Treatment Facility Laboratory
Note: Samples provided by National Environmental Laboratory Accreditation Conference (NELAC)-accredited providers.
[a] Acceptance limits are determined by NELAC-accredited providers.
[b] "Yes" - Result acceptable; "Pass" - Result acceptable but outside warning limits; "No" - Result not acceptable.

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APPENDIX H

West Valley Demonstration Project Act

West Valley Demonstration Project Act
(Public Law 96-368 [S. 2443]; October 1, 1980)

(As presented in Exhibit G of the Cooperative Agreement between United States Department of Energy and New York State Energy Research and Development Authority on the Western New York Nuclear Service Center at West Valley, New York; Effective October 1, 1980 as amended September 18, 1981.)

EXHIBIT G

WEST VALLEY PROJECT DEMONSTRATION ACT

PUBLIC LAW 96-368 [S. 2443]; October 1, 1980

WEST VALLEY DEMONSTRATION PROJECT ACT

For Legislative History of this and other Laws, see Table 1, Public Laws and Legislative History, at end of final volume

An Act to authorize the Department of Energy to carry out a high-level liquid nuclear waste management demonstration project at the Western New York Service Center in West Valley, New York.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

West Valley Demonstration Project Act. 42 USC 2021a note.

SECTION 1. This Act may be cited as the "West Valley Demonstration Project Act".

42 USC 2021a note.

SEC. 2. (a) The Secretary shall carry out, in accordance with this Act, a high level radioactive waste management demonstration project at the Western New York Service Center in West Valley, New York, for the purpose of demonstrating solidification techniques which can be used for preparing high level radioactive waste for disposal. Under the project the Secretary shall carry out the following activities:

Activities.

(1) The Secretary shall solidify, in a form suitable for transportation and disposal, the high level radioactive waste at the Center by vitrification or by such other technology which the Secretary determines to be the most effective for solidification.

(2) The Secretary shall develop containers suitable for the permanent disposal of the high level radioactive waste solidified at the Center.

(3) The Secretary shall, as soon as feasible, transport, in accordance with applicable provisions of law, the waste solidified at the Center to an appropriate Federal repository for permanent disposal.

(4) The Secretary shall, in accordance with applicable licensing requirements, dispose of low level radioactive waste and transuranic waste produced by the solidification of the high level radioactive waste under the project.

(5) The Secretary shall decontaminate and decommission—

(A) the tanks and other facilities of the Center in which the high level radioactive waste solidified under the project was stored,

(B) the facilities used in the solidification of the waste, and

(C) any material and hardware used in connection with the project,

in accordance with such requirements as the Commission may prescribe.

(b) Before undertaking the project and during the fiscal year ending September 30, 1981, the Secretary shall carry out the following:

Hearings.

(1) The Secretary shall hold in the vicinity of the Center public hearings to inform the residents of the area in which the Center is located of the activities proposed to be undertaken under the project and to receive their comments on the project.

(2) The Secretary shall consider the various technologies available for the solidification and handling of high level radioactive waste taking into account the unique characteristics of such waste at the Center.

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(3) The Secretary shall—

(A) undertake detailed engineering and cost estimates for the project.

(B) prepare a plan for the safe removal of the high level radioactive waste at the Center for the purposes of solidification and include in the plan provisions respecting the safe breaching of the tanks in which the waste is stored, operating equipment to accomplish the removal, and sluicing techniques,

(C) conduct appropriate safety analyses of the project, and

(D) prepare required environmental impact analyses of the project.

(4) The Secretary shall enter into a cooperative agreement with the State in accordance with the Federal Grant and Cooperative Agreement Act of 1977 under which the State will carry out the following:

42 USC 501 note.

(A) The State will make available to the Secretary the facilities of the Center and the high level radioactive waste at the Center which are necessary for the completion of the project. The facilities and the waste shall be made available without the transfer of title and for such period as may be required for completion of the project.

(B) The Secretary shall provide technical assistance in securing required license amendments.

State costs, percentage.

(C) The State shall pay 10 per centum of the costs of the project, as determined by the Secretary. In determining the costs of the project, the Secretary shall consider the value of the use of the Center for the project. The State may not use Federal funds to pay its share of the cost of the project, but may use the perpetual care fund to pay such share.

Licensing amendment application.

(D) Submission jointly by the Department of Energy and the State of New York of an application for a licensing amendment as soon as possible with the Nuclear Regulatory Commission providing for the demonstration.

(c) Within one year from the date of the enactment of this Act, the Secretary shall enter into an agreement with the Commission to establish arrangements for review and consultation by the Commission with respect to the project: *Provided,* That review and consultation by the Commission pursuant to this subsection shall be conducted informally by the Commission and shall not include nor require formal procedures or actions by the Commission pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, or any other law. The agreement shall provide for the following:

42 USC 2011 note. 42 USC 5801 note.

(1) The Secretary shall submit to the Commission, for its review and comment, a plan for the solidification of the high level radioactive waste at the Center, the removal of the waste for purposes of its solidification, the preparation of the waste for disposal, and the decontamination of the facilities to be used in solidifying the waste. In preparing its comments on the plan, the Commission shall specify with precision its objections to any provision of the plan. Upon submission of a plan to the Commission, the Secretary shall publish a notice in the Federal Register of the submission of the plan and of its availability for public inspection, and, upon receipt of the comments of the Commission respecting a plan, the Secretary shall publish a notice in the Federal Register of the receipt of the comments and of the availability of the comments for public inspection. If the Secre-

Publications in Federal Register.

tary does not revise the plan to meet objections specified in the comments of the Commission, the Secretary shall publish in the Federal Register a detailed statement for not so revising the plan.

(2) The Secretary shall consult with the Commission with respect to the form in which the high level radioactive waste at the Center shall be solidified and the containers to be used in the permanent disposal of such waste.

(3) The Secretary shall submit to the Commission safety analysis reports and such other information as the Commission may require to identify any danger to the public health and safety which may be presented by the project.

Reports and other information to Commission.

(4) The Secretary shall afford the Commission access to the Center to enable the Commission to monitor the activities under the project for the purpose of assuring the public health and safety.

(d) In carrying out the project, the Secretary shall consult with the Administrator of the Environmental Protection Agency, the Secretary of Transportation, the Director of the Geological Survey, and the commercial operator of the Center.

Consultation with EPA and others.

SEC. 3. (a) There are authorized to be appropriated to the Secretary for the project not more than $5,000,000 for the fiscal year ending September 30, 1981.

Appropriation authorization. 42 USC 2021a note.

(b) The total amount obligated for the project by the Secretary shall be 90 per centum of the costs of the project.

(c) The authority of the Secretary to enter into contracts under this Act shall be effective for any fiscal year only to such extent or in such amounts as are provided in advance by appropriation Acts.

SEC. 4. Not later than February 1, 1981, and on February 1 of each calendar year thereafter during the term of the project, the Secretary shall transmit to the Speaker of the House of Representatives and the President pro tempore of the Senate an up-to-date report containing a detailed description of the activities of the Secretary in carrying out the project, including agreements entered into and the costs incurred during the period reported on and the activities to be undertaken in the next fiscal year and the estimated costs thereof.

Report to Speaker of the House and President pro tempore of the Senate. 42 USC 2021a note.

SEC. 5. (a) Other than the costs and responsibilities established by this Act for the project, nothing in this Act shall be construed as affecting any rights, obligations, or liabilities of the commercial operator of the Center, the State, or any person, as is appropriate, arising under the Atomic Energy Act of 1954 or under any other law, contract, or agreement for the operation, maintenance, or decontamination of any facility or property at the Center or for any wastes at the Center. Nothing in this Act shall be construed as affecting any applicable licensing requirement of the Atomic Energy Act of 1954 or the Energy Reorganization Act of 1974. This Act shall not apply or be extended to any facility or property at the Center which is not used in conducting the project. This Act may not be construed to expand or diminish the rights of the Federal Government.

42 USC 2021a note.

42 USC 2011 note.

42 USC 5801 note.

(b) This Act does not authorize the Federal Government to acquire title to any high level radioactive waste at the Center or to the Center or any portion thereof.

SEC. 6. For the purposes of this Act:

Definitions. 42 USC 2021a note.

(1) The term "Secretary" means the Secretary of Energy.

(2) The term "Commission" means the Nuclear Regulatory Commission.

(3) The term "State" means the State of New York.

(4) The term "high level radioactive waste" means the high level radioactive waste which was produced by the reprocessing at the Center of spent nuclear fuel. Such term includes both liquid wastes which are produced directly in reprocessing, dry solid material derived from such liquid waste, and such other material as the Commission designates as high level radioactive waste for purposes of protecting the public health and safety.

(5) The term "transuranic waste" means material contaminated with elements which have an atomic number greater than 92, including neptunium, plutonium, americium, and curium, and which are in concentrations greater than 10 nanocuries per gram, or in such other concentrations as the Commission may prescribe to protect the public health and safety.

(6) The term "low level radioactive waste" means radioactive waste not classified as high level radioactive waste, transuranic waste, or byproduct material as defined in section 11 e. (2) of the Atomic Energy Act of 1954.

(7) The term "project" means the project prescribed by section
42 USC 2014. 2(a).

(8) The term "Center" means the Western New York Service Center in West Valley, New York.

Approved October 1, 1980.