WEST VALLEY DEMONSTRATION PROJECT ANNUAL SITE ENVIRONMENTAL REPORT CALENDAR YEAR 2011

CH2M HILL • B&W WEST VALLEY, LLC

Prepared by: CH2M HILL • B&W West Valley, LLC

Prepared for: U.S. Department of Energy
DOE-WVDP

Under: Contract DE-EM0001529

September 2012
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 United States (U.S.) Department of Energy (DOE) West Valley Demonstration Project (WVDP), summarizes the environmental protection program at the WVDP for calendar year 2011.

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. Generation, storage, and treatment of hazardous and mixed wastes are conducted in accordance with Resource Conservation and Recovery Act interim status regulations and New York State Environmental Conservation Law.

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 2011 was estimated to be 0.016 % of the 10-millirem (mrem) EPA limit. The dose from combined airborne and waterborne radiological releases in 2011 to the same individual was estimated to be 0.044 % of the 100-mrem DOE limit, verifying that dose received by off-site residents continues to be minimal.

The WVDP was operated in a safe manner during 2011. The employees achieved a 12-month rolling average of 4.5 million safe work hours without a lost-time work accident or illness, while accomplishing complex decontamination and waste management activities.

West Valley Environmental Services, LLC operated as contractor for the DOE from 2007 until June 2011, when DOE awarded the Phase 1 Decommissioning and Facility Disposition contract to CH2M HILL • B&W West Valley, LLC. Transition was executed from July 1, 2011 through August 29, 2011, ensuring continuity of all facets of site activities.

A separate contract was awarded to Safety and Ecology Corporation to implement work associated with the Phase 1 characterization support services, which are requirements of the Phase 1 Decommissioning Plan.

In September 2011, DOE and the New York State Energy Research and Development Authority (NYSERDA) jointly funded and awarded the Phase 1 Studies contract to Enviro Compliance Solutions, an independent, agency-neutral contractor, to administer contracts for all Phase 1 Study activities. DOE and NYSERDA intend to conduct additional scientific studies in order to facilitate interagency consensus to complete decommissioning of the remaining facilities.

If you have any questions or comments about the information in this report, please contact WVDP Communications at (716) 942-4601 or complete and return the enclosed survey.

Sincerely,

B. C. B

Bryan C. Bower, Director
West Valley Demonstration Project

West Valley Demonstration Project

Annual Site Environmental Report

for

Calendar Year 2011

Prepared for the U.S. Department of Energy

West Valley Demonstration Project Office

Under: Contract DE-EM0001529

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Disclaimer

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WVDP Annual Site Environmental Report

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10282 ROCK SPRINGS ROAD
WEST VALLEY, NY 14171

1. How do you use the *WVDP Annual Site Environmental Report?*

- ☐ To learn general information about the WVDP
- ☐ To learn about doses received for the current year
- ☐ To learn about site compliance information
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- ☐ Experience with science outside college setting
- ☐ Little or no scientific background

If you have questions or comments about the information in this report, please contact WVDP Communications at (716-942-4601)

Preface

Environmental monitoring at the West Valley Demonstration Project (WVDP) was conducted by CH2M HILL • B&W West Valley, LLC (CHBWV), 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 of CHBWV to conduct the WVDP in a safe, compliant, and cost-effective manner that protects human health and the environment. We achieve this by integrating environmental requirements and pollution prevention into our work planning and execution, and taking actions to minimize the environmental impacts of our operations. We establish and communicate environmental responsibilities, provide environmental training to our workforce, and implement controls to mitigate environmental hazards. These activities are conducted in accordance with our Environmental Management System.

This report represents a single, comprehensive source of on-site and off-site data collected during 2011. 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 located inside the back cover. Appendices B through G contain summaries of data obtained during 2011 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 WVDP Act.

A reader opinion survey has been inserted in this report. Requests for digital copies of the 2011 Annual Site Environmental Report (ASER) and questions regarding the report should be referred to WVDP Communications, 10282 Rock Springs Road, West Valley, New York 14171 (telephone: 716-942-4601). Additional Project information, including all WVDP ASERs, 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, to the United States (U.S.) Department of Energy (DOE) Headquarters, and to other interested stakeholders. In accordance with DOE Order 231.1B, "Environment, Safety, and Health Reporting," this document summarizes calendar year (CY) 2011 environmental monitoring data, describes the performance of the WVDP's environmental management system (EMS), confirms compliance with standards and regulations, and highlights important programs. WVDP activities are 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 shut down in 1976. In 1980, Public Law 96-368 (the WVDP Act) was passed, which authorized DOE to demonstrate a method for solidifying approximately 600,000 gallons (gal) (2.3 million liters [L]) 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 2011.

Record of Decision. In April 2010, DOE released a Record of Decision (ROD) for the Environmental Impact Statement (EIS) for the WVDP and the Western New York Nuclear Service Center (WNYNSC) (DOE/EIS-0226), allowing for the continued decommissioning and cleanup efforts at the site using a two-part phased decisionmaking process. Under the Phased Decisionmaking alternative, the work will be conducted in two phases. During Phase 1, which will take about 10 years, a number of highly contaminated facilities will be removed at a cost of approximately 1 billion dollars.

NYSERDA published its corresponding decision under the State Environmental Quality Review Act in a statement of findings in May 2010. Actions identified under Phase 1 Site Decommissioning will be carried out under a new facilities disposition contract discussed below. The complete EIS and the ROD can be viewed online at the DOE-WVDP website at www.wv.doe.gov.

On February 25, 2010, the U.S. Nuclear Regulatory Commission (NRC) transmitted to DOE-WVDP the "Technical Evaluation Report (TER) for the Phase 1 Decommissioning Plan (DP)," concluding that the Phase 1 DP was consistent with the preferred alternative in the EIS. NRC also determined that there is reasonable assurance that the proposed actions will meet the decommissioning criteria.

DOE/NYSERDA Consent Decree. DOE and NYSERDA reached an agreement on the cost sharing for cleanup of the WVDP and the WNYNSC by signing a Consent Decree on August 17, 2010 in the U.S. District Court, Western District of New York. While the Consent Decree defines the cost-sharing agreement, it does not affect in any way what the cleanup will be or the end state of the WVDP and the WNYNSC.

Contract Transition. West Valley Environmental Services, LLC (WVES) operated as contractor for DOE from 2007 until June 29, 2011, when DOE awarded the Phase 1 Decommissioning and Facility Disposition Contract to CH2M HILL • B&W West Valley, LLC (CHBWV). A 60-day "continuity of contract" period was executed by WVES from July 1, 2011 through August 29, 2011 to transition work activities to CHBWV. Transition activities ensured continuity of environmental monitoring and compliance, transfer of permits and licenses, and timely reporting to regulatory agencies. Other efforts focused on transitioning system and document access, and performing facility walkdowns and inspections.

CHBWV participated in a Regulatory Roundtable presentation regarding transition activities, project path forward, and regulatory integration.

Interim End State Contract Major Accomplishments (2007–August 2011). Major accomplishments toward achieving an Interim End State for the WVDP included:

- assisting DOE in developing a phased decision-making plan for decommissioning the WVDP;
- supporting DOE in preparing and finalizing the EIS for Decommissioning and/or Long-Term Stewardship for the WVDP and the WNYNSC, and the Phase 1 DP for the WVDP;
- maintaining a safe workplace with no lost-time injuries or illnesses;
- continuing decontamination of the main plant process building (MPPB);
- processing and shipping 171,000 cubic feet of low-level radioactive waste (LLW) off site for disposal; and
- installing mitigative measures for effective control of ground and surface water at the WVDP, including;
  - an 860-foot-long ion-exchange permeable treatment wall (PTW) in the north plateau to control the strontium-90 plume migration;
  - a geomembrane cover and slurry wall at the NRC-licensed disposal area (NDA); and
  - the tank and vault drying system (T&VDS) in the waste tank farm (WTF).

CHBWV Contract Scope (August 2011–June 30, 2017). Scope of the Phase I Decommissioning and Facility Disposition contract includes:

- packaging and relocating HLW canisters to new interim dry storage;
- dismantling and removing the vitrification facility and the MPPB;
- removing ancillary facilities; and
- continuing safe operations of the site, including:
  - managing and maintaining site infrastructure;
  - conducting environmental monitoring; and
  - maintaining the underground HLW storage tanks, the NDA, and the north plateau PTW.
  - maintaining the lagoon system.

Environmental Characterization Support Services. A separate contract was awarded by DOE to Safety and Ecology Corporation (SEC) to implement work associated with the Phase 1 Characterization support services, including work associated with the Phase 1 Characterization Sampling and Analysis Plan and the Final Status Survey Plan, which support Phase 1 decommissioning for the WVDP.

Services to be provided by SEC may include, but are not limited to:

- soil, sediment, and groundwater characterization;
- environmental monitoring; and
- preparation of applicable regulatory documentation supporting WVDP decommissioning activities.

Phase 1 Studies. In September 2011, DOE and NYSERDA jointly awarded the Phase 1 Studies contract to Enviro Compliance Solutions, an independent, agency-neutral contractor that is jointly funded by the agencies to administer contracts for all Phase 1 Study activities, including contracting with the facilitator, subject matter experts (SMEs), the independent scientific panel (ISP), and contractors performing the study activities. DOE and NYSERDA intend to conduct additional scientific studies in order to facilitate interagency consensus to complete decommissioning of the remaining facilities.

The Phase 1 Study process will employ the ISP, and teams of SMEs to evaluate the following Potential Areas of Study (PAS):

- erosion;
- groundwater flow and contaminant transport;
- catastrophic release of contamination and impact on Lake Erie;
- slope stability and slope failure;
- seismic hazard;
- probabilistic vs. deterministic dose and risk analysis;
- alternate approaches to, costs of, and risks associated with complete waste and tank exhumation;
- viability, cost, and benefit of partial exhumation of waste and removal of contamination;
- exhumation uncertainties and benefit of pilot exhumation activities;
- in-place closure containment technologies;
- engineered barrier performance;
- additional characterization needs; and
- cost discounting and cost benefit analyses over long time periods.

PTW Performance. Since completing the full-scale PTW, performance monitoring indicates the following:

- Groundwater flow patterns in the PTW area are similar to flow patterns observed prior to PTW construction, indicating that the PTW installation did not substantially alter groundwater flow conditions on the north plateau;

- Strontium-90 activity from groundwater wells inside the PTW typically have been substantially lower than strontium-90 activity levels upgradient of the PTW;

- Geochemical differences were observed in groundwater that has migrated into or through the zeolite, indicating that cation exchange is occurring; and

- Strontium-90 activity in groundwater immediately downgradient of the PTW is decreasing.

WTF T&VDS. With an ultimate goal of preventing the underground steel tanks from corroding under ambient tank and vault conditions, the WVDP installed a T&VDS in the WTF in 2010. The T&VDS was designed to reduce the liquid volumes in the tanks, and the harmful effects of corrosion on the underground waste tanks situated within concrete vaults originally installed in the 1960s. Corroded pipe was replaced with stainless-steel ventilation lines, a rotary dryer was installed, and the new T&VDS was brought on line before the end of December 2010. During the first 14 months of operation (as of the end of February 2012), the system has operated effectively, achieving the following results:

- evaporated all liquid from tanks 8D-1 and 8D-2;
- significantly reduced liquid levels in 8D-1 and 8D-2 vaults and pans;
- reduced liquid levels in tanks 8D-3 and 8D-4 by about 500 gal (1,893 L) per tank;
- evaporated all liquid from 8D-3 and 8D-4 vault;
- achieved lower relative humidity in the tanks and vaults further reducing the corrosion rate.

System operations continue to be monitored to reduce air infiltration, and individual air flows are adjusted as the tanks dry out.

Waste-Incidental-to-Reprocessing (WIR) Evaluation for the WVDP Melter. The melter, which was used during the HLW vitrification process, was flushed during shut down and characterized for radioactivity. The DOE-WVDP performed an evaluation of the melter, which contained pre-treated HLW, to determine if it met the WIR criteria of DOE Manual 435.1-1, "Radioactive Waste Management Manual." The basis of the evaluation was to determine whether the melter was incidental to reprocessing and may be managed under DOE's authority in accordance with the requirements of LLW. The evaluation was issued initially in draft form to facilitate consultation with the NRC, as well as state and public review and comment. The NRC performed their evaluation, requested additional information, and documented their review in the draft TER (September 30, 2011). In February 2012, after considering the evaluation, NRC comments, and public comments on the draft, DOE made its final determination that the melter is LLW.

The path forward for the melter is to determine a disposal location, grout to prepare for disposal, finalize and obtain Department of Transportation approval and route definition, coordinate schedule for transportation, then ship and dispose.

State Pollutant Discharge Elimination System (SPDES) Permit Noncompliance Events. During CY 2011, there was one SPDES permit limit exceedance for mercury, and two noncompliance events that occurred associated with the equalization basin and outfall 007.

- On March 20, 2011, the force main (underground transfer line) that transmits industrial wastewaters from the equalization basin to the wastewater treatment facility (WWTF) failed (breached), causing wastewaters to discharge onto the soil. The transfer line was secured (shut down) and the pump was isolated. An alternate line was put in service and the breached line was abandoned in-place. New York Department of Environmental Conservation (NYSDEC) was immediately notified of the event, and a Report of Noncompliance for an unintentional bypass was submitted to NYSDEC in the March 2011 SPDES discharge monitoring report.

- On October 17, 2011, NYSDEC was notified that the SPDES permit limit for mercury (200 nanograms/liter [ng/L]) was exceeded (346 ng/L) from outfall 007 at the WWTF, when the subcontract laboratory reported the results of the October 6, 2011 wastewater discharge compliance sample. The outfall discharge was immediately suspended. An investigation was initiated to determine the scope of potential mercury conditions within system operations. Discharges from this outfall remained suspended until February 14, 2012.

- When the WWTF discharge was suspended, the plant system operations were placed in recirculation mode. During recirculation operation, from October 28 through November 3, approximately 2,120 gal (8,025 L) of wastewater overflowed the tanks while flushing the system, and was discharged through outfall 007, resulting in an unintentional bypass. The unintentional bypass was immediately terminated, and NYSDEC was immediately notified of the noncompliance event via telephone and a five-day written notification was submitted. Samples were collected for specific SPDES permit constituents during the discharge and submitted to the laboratory for analysis. Results were reported within permit limits.

Once discharge from outfall 007 was suspended on October 17, CHBWV coordinated with Frank's Vacuum Truck Service and the Buffalo Sewer Authority to transport and treat WWTF wastewaters until the system could be restored. (Refer to "SPDES Permit Noncompliance Events" in the Environmental Compliance Summary.)

Safety Success. The radiological and hazardous work environment at the WVDP warrants strict adherence to safety procedures. During 2011, the WVDP workforce achieved a 12-month rolling average of 4.5 million safe work hours without a lost time work injury.

Environmental Management System

The WVDP EMS satisfies the requirements of DOE Order 436.1, "Departmental Sustainability," and is a key part of the WVDP Integrated Safety Management System. In 2011, 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. CHBWV received a certificate of registration for the International Organization for Standardization (ISO) 14001:2004 certification of it's EMS on July 31, 2012. (Refer to Chapter 1, "Environmental Management System.")

Compliance. WVDP management continued to provide strong support for environmental compliance in 2011. 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 2011:

- There was one SPDES permit limit exceedance and two noncompliance events that occurred associated with the equalization basin outfall 007. (Refer to previous discussion;)
- Inspections by the 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 U.S. Environmental Protection Agency (EPA) to ensure compliance with the Resource Conservation and Recovery Act Interim Status Facility regulations. No findings were noted;
- Requirements of the Emergency Planning and Community Right-to-Know Act were met by collecting information about hazardous materials used at the Project and making this information available to the appropriate emergency response organizations; and
- No exceedances to the EPA's National Emission Standards for Hazardous Air Pollutants (NESHAP) dose standard occurred in 2011.

Environmental Monitoring – Performance Indicators. As part of the WVDP EMS, environmental monitoring 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.

- Waterborne Radiological Releases

  Waterborne releases were from two primary sources. In 2011, treated process water was released in eight batches from lagoon 3, totaling approximately 13.7 million gal (51.9 million L). 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. During 2011, approximately 33.4 million gal (152 million L) flowed from the north plateau drainage channel, and radiological concentrations were closely monitored.

  There were no unplanned releases of waterborne radioactivity in 2011.

- Airborne Radiological Releases

  In 2011, the WVDP maintained six NESHAP permits for point source release of radiological airborne emissions. The primary controlled air emission point at the WVDP is the MPPB ventilation stack. Although emissions were low, there was one unplanned radiological airborne release at the WVDP during 2011. A ventilation upset was caused by the need for and replacement of worn bearings on the ventilation exhaust cell blower, which resulted in excessive vibration. This vibration may have contributed to higher-than-typical americium-241 and cesium-137 discharges from the MPPB stack in March and April 2011. Scheduled power outages in March and April may have also played a part in this release. While below alarm setpoints, these discharges were detected by stack monitoring equipment and are included in the MPPB stack source term modeled in this report. Dose to the maximally exposed off-site individual (MEOSI) from the MPPB stack in CY 2011 was 0.0045% of the 10-millirem (mrem) standard. Subsequent monitoring readings from this stack returned to normal.

- Estimated Dose

  In 2011, the estimated dose to a MEOSI from airborne emissions at the WVDP was 0.0016 mrem (0.000016 millisievert [mSv]), about 0.016% of the 10-mrem NESHAP standard. Estimated dose from waterborne sources in 2011 was about 0.042 mrem (0.00042 mSv), with 0.010 mrem (0.00010 mSv) attributable to liquid effluent releases and 0.032 mrem (0.00032 mSv) attributable to the north plateau drainage.

  Total estimated dose to the MEOSI from both airborne and waterborne sources in 2011 was 0.044 mrem (0.00044 mSv), about 0.044% 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 2011 was 0.22 person-rem (0.0022 person-Sv). This same population would have received approximately 522,000 person-rem from natural background radiation in 2011.

- Dose to Biota

  A dose to biota evaluation for CY 2011 concluded that aquatic and terrestrial biota (both plants and animals) populations 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 and documented under the site's SPDES permit. As noted previously in this chapter, there was one SPDES permit limit exceedance and two noncompliance events that occurred in 2011, associated with outfall 007 and the equalization basin.

Quality Assurance (QA). In 2011, the QA program continued for activities supporting the environmental and groundwater monitoring programs 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, environmental test samples with concentrations only known by the testing agency, were analyzed by the laboratories. Of 250 performance evaluation analyses conducted by or for the WVDP, 98.8% fell within acceptance limits.

Numerous inspections, audits, assessments, and surveillances of components of the environmental monitoring program were conducted in 2011. Although actions were recommended to improve the program, nothing was found that would compromise the quality of the data in this report or the environmental monitoring program in general. Refer to “EMS Audits and Other Audits and Assessments” in Chapter 1.

Conclusion

In addition to demonstrating compliance with environmental regulations and directives, evaluation of data collected in 2011 continued to indicate that WVDP activities pose no threat to public health or safety, or to the environment.

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INTRODUCTION

Site Location

The West Valley Demonstration Project (WVDP or Project) is located in western New York State, about 30 miles (mi) (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 United States (U.S.) Department of Energy (DOE) released approximately 15.5 acres (6.3 ha) 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 (ft) (400 meters [m]) 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 Figures 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 NYSERDA is conducted on a year-to-year basis in designated areas on the WNYNSC. No unescorted public access is allowed on the WVDP premises.

Land near the WNYNSC is used primarily for agriculture and arboriculture. Downgradient 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 mi (8 km) of the Project. The nearby population, approximately 9,200 residents within 6.2 mi (10 km) of the Project, relies largely on an agricultural economy. No major industries are located within this area.

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

J:/GIS/ArcMap/ASER/ASER_2010/ASER_2010_INT-1_20110516.mxd jrl/skw/afs

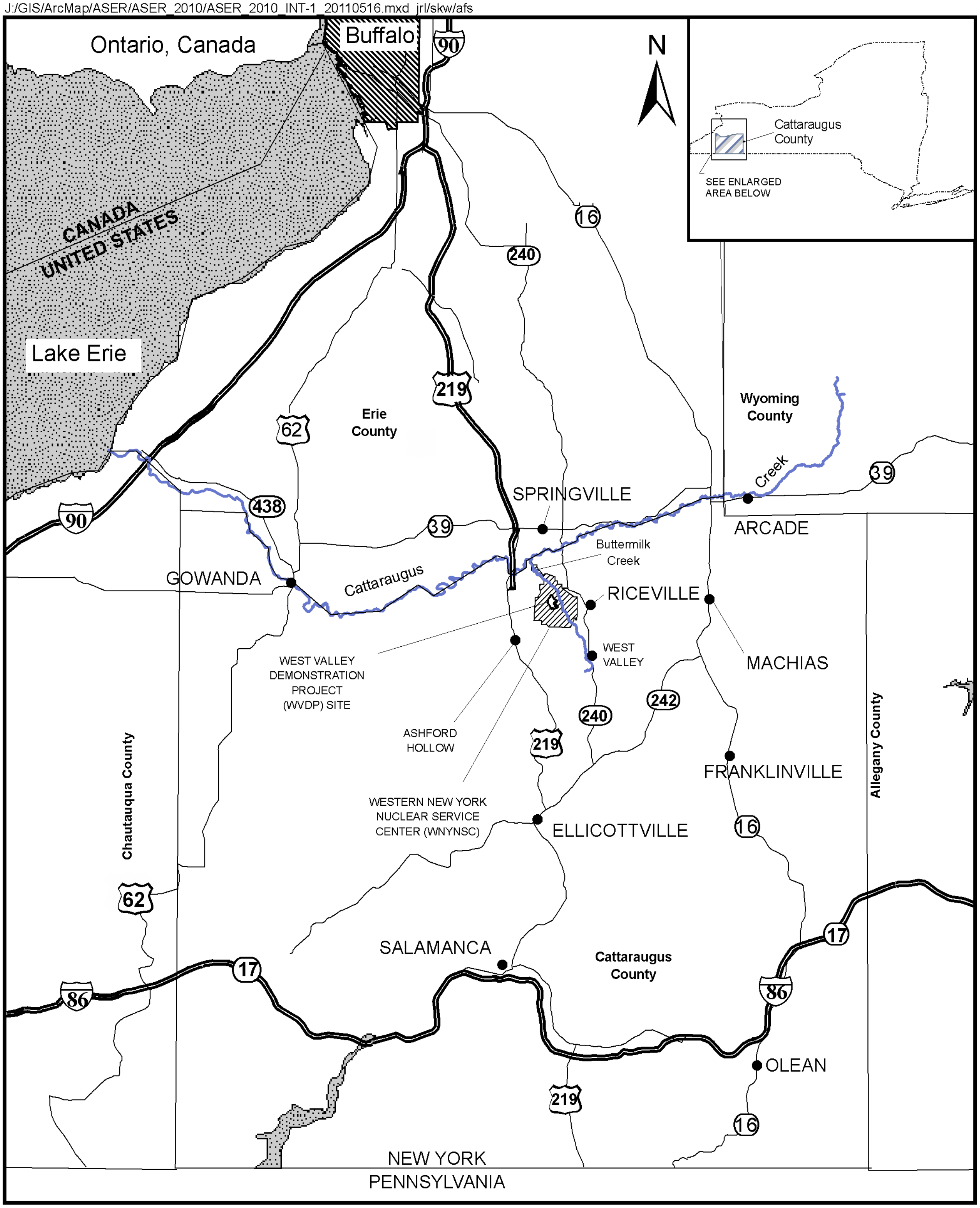


TABLE INT-1
Historic Timeline of the WNYNSC and the WVDP

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. A 5-acre landfill, the "United States (U.S.) Nuclear Regulatory Commission (NRC)-licensed disposal area (NDA)" was operated for disposal of waste generated from the reprocessing operations from 1966 until 1986. Also, 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 then notified the New York State Energy Research and Development Authority (NYSERDA), the successor to NYS OAD, 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	The 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 radioactive waste (HLW) stored in underground tanks, disposing of the waste that would be generated 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, 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	DOE and NRC entered into a Memorandum of Understanding that established specific agency responsibilities and arrangements for informal review and consultation by NRC. Because NYSERDA holds the license and title to the WNYNSC, NRC put the technical specifications of the license (CSF-1) in abeyance to allow DOE to carry out the responsibilities of the WVDP Act.
1982	West Valley Nuclear Services (WVNS), a Westinghouse subsidiary, was chosen by DOE to be the management and operating contractor. WVNS commenced operations at the WVDP on February 28, 1982.
1983	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. Between 1983 and 1986, 625 of those assemblies were returned to the utilities that owned them. 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. 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. NFS entered into an agreement with DOE in which 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-HLW would result from WVDP activities. On-site disposal of most of this waste was evaluated in an Environmental Assessment (EA [DOE/EA-0295, April 1986]), and a finding of no significant impact was issued. The Coalition on West Valley Nuclear Waste (The Coalition) and the Radioactive Waste Campaign filed suit contending an EIS should have been prepared. 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 DOE, The Coalition, and the Radioactive Waste Campaign. The lawsuit 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 (FR) 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 (SEQR) Act. To prepare for VIT, the integrated radwaste treatment system was constructed to process 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 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 present) 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, NYS 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, 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 (SWMUs) 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 or if there was 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. In 1999, a pilot-scale permeable treatment wall (PTW) was constructed to test this passive in-situ remediation technology. The VIT 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 VIT facility was completed, fully tested, and "cold operations" began.

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

Year	*Activity*
1996	The DOE and NYSERDA issued a draft EIS (DEIS) for completion of the WVDP and closure or long-term management of the WNYNSC. Following evaluation of the public comments on the DEIS, the Citizen Task Force was convened to enhance stakeholder understanding and input regarding the WVDP/WNYNSC closure process. VIT operations began in 1996 and continued into 2002, producing 275 10-foot-tall stainless-steel canisters of hardened radioactive glass containing up to 12 million curies of radioactive material (primarily cesium/strontium, without radioactivity from daughter products included). The glass melter was shut down in September 2002. NYSDEC and DOE entered into an Order on Consent negotiated under the Federal Facilities Compliance Act (FFCA) for handling, storage, and treatment of mixed wastes at the WVDP. 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 DOE.
1999	VIT 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 and 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). Initial decontamination efforts began in two significantly contaminated areas in the MPPB, the process mechanical cell and the general purpose cell, to place the cells in a safer configuration for future facility decommissioning. 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	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 site footprint reduction began as 20 office trailers were removed. In December, the 6 NYCRR Part 373-2 Permit Application (i.e., Part B) was submitted to NYSDEC.
2005	In June, 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 (TRU) waste was deferred, and the HLW canisters will remain in on-site storage until they can be shipped to a repository. In November, 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.
2006	An EA (DOE/EA-1552) evaluating the proposed decontamination, demolition, and removal of 36 facilities was issued. By the end of 2006, 11 of the 36 structures were removed. The DOE-WVDP office initiated a collaborative, consensus-based team process, referred to as the "Core Team," that involved NYSERDA, EPA, the New York State Department of Health, 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." Shipment of the cement-filled LLW drums was initiated.
2007	Demolition and removal of four more structures identified under DOE/EA-1552 was completed. On June 29, 2007, 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. In the fall of 2007, an interim measure to minimize water infiltration into the NDA was initiated with site surveys and soil borings.

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

Year	*Activity*
2008	During 2008, a trench was excavated along two sides of the NDA, on the south plateau. The trench was backfilled with bentonite and clay to form the slurry wall; a low-permeability subsurface barrier to infiltration. A geomembrane cover was placed over the entire landfill. On the north plateau, additional subsurface soil and groundwater samples were collected in the summer and fall of 2008 to further characterize chemical and radiological constituents within the contaminated groundwater plume beneath and downgradient of the MPPB. The revised DEIS for Decommissioning and/or Long-Term Stewardship at the WVDP and WNYNSC was issued in December for public review, which continued through September 8, 2009. Concurrently, the Proposed Phase 1 Decommissioning Plan (DP) for the WVDP was prepared and submitted to NRC.
2009	Extensive characterization was completed on the north plateau in 2009 to delineate the leading edge of the subsurface strontium-90 groundwater plume and to find a suitable material to capture and retain the contamination.
2010	In January, DOE and NYSERDA issued the final EIS for the WVDP and the WNYNSC (DOE/EIS-0226). The phased decisionmaking alternative was selected as the preferred alternative. The phase 2 decision was deferred for no more than 10 years. In February, NRC issued a Technical Evaluation Report (TER) for the DP, concluding that the DP was consistent with the preferred alternative in the EIS. A SEQR notice of completion for the EIS and acceptance of the EIS by NYSERDA was issued on January 27. On April 14th, DOE issued the Record of Decision (ROD) for the EIS, and on May 12, NYSERDA issued a SEQR Findings Statement, selecting the phased decisionmaking alternative. On August 17th, the DOE and NYSERDA reached an agreement and signed a Consent Decree that formally defined the cost sharing for cleanup of the WVDP and the WNYNSC. In September, a revised RCRA Part 373-2 Permit Application was submitted to NYSDEC. An 860-foot-long full-scale PTW near the leading edge of the strontium-90 plume was installed and completed. The Tank and Vault Drying System (T&VDS) was installed to reduce the harmful effects of corrosion on the underground waste tanks. MPPB deactivation activities continued.
2011	DOE awarded the Phase 1 Decommissioning and Facility Disposition contract to CH2M HILL • B&W West Valley, LLC (CHBWV) on June 29, 2011. The "continuity of contract" period extended to August 29, 2011 during which time work activities were transitioned, environmental monitoring continued, and licenses and permits were transferred to CHBWV. A separate contract was awarded to Safety and Ecology Corporation to implement work associated with the Phase 1 characterization support services, which are requirements of the Phase 1 DP. In September 2011, DOE and NYSERDA jointly awarded a Phase 1 Studies contract to Enviro Compliance Solutions to identify and implement the Phase 1 Studies. The objective of the studies is to use technical experts to conduct scientific studies that will facilitate interagency consensus for decisionmaking in the Phase 2 decommissioning process.

ENVIRONMENTAL COMPLIANCE SUMMARY

Compliance Program

DOE is currently focusing on accomplishing the Phase 1 decommissioning activities specified in the Record of Decision (ROD) for the Environmental Impact Statement (EIS) for Decommissioning and/or Long-Term Stewardship of the WVDP and the WNYNSC.

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.

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. A number of directives and orders have been revised and/or superceded by recent updates.

EPA, NYSDEC, and DOE have established standards for effluents that are intended to protect human health, safety, and the environment. DOE applies to 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 458.1 (Radiation Protection of the Public and the Environment, Change 2) and DOE-STD-1196-2011 (Derived Concentration Standards [DCSs]). A summary of the WVDP environmental permits is found in Table ECS-3. (See the compliance tables at the end of this chapter.)

2011 Accomplishments and Highlights at the WVDP

Contract Transition. West Valley Environmental Services LLC (WVES) operated as contractor for the DOE at the WVDP until June 29, 2011, when DOE awarded the Phase I Decommissioning and Facility Disposition contract to CH2M HILL • B&W West Valley, LLC (CHBWV). A 60-day "Continuity of Contract" period was executed by WVES from July 1, 2011 through August 29, 2011 to transition work activities to CHBWV.

TABLE ECS-1
Compliance Status Summary for the WVDP in CY 2011

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 DOE, NRC, and EPA.	See discussions of the WVDP Act, DOE Orders 435.1, and 458.1
Public Law 96-368	The WVDP Act of 1980 authorized DOE to carry out a HLW demonstration project at the WNYNSC (the Center) in West Valley, New York.	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 2011

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
Cooperative Agreement between DOE and NYSERDA	The Cooperative Agreement between DOE and NYSERDA established a cooperative framework for implementing the WVDP Act, effective October 1980, as amended in September 1981. In 1990, the first supplemental agreement was signed by DOE and NYSERDA which set forth specific provisions for preparing a joint EIS. A second supplemental agreement to the Cooperative Agreement was drafted in January 2010 and issued by DOE and NYSERDA in March 2011.	Except as delineated in specific sections of the agreement, DOE was given sole responsibility to carry out the requirements of the WVDP Act. The DOE ROD was issued in April 2010 for the WVDP and the WNYNSC. There are no current activities being conducted under the 1990 Supplemental Agreement. The second supplemental agreement sets forth special provisions for implementing and managing the Phase 1 studies as referenced in the EIS.
WVDP Memorandum of Understanding (MOU) between DOE and NRC	The 1981 MOU, mandated by the WVDP Act, established procedures for review and consultation by NRC with respect to activities conducted at the WNYNSC by DOE. 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 commitments made to NRC, DOE was required to prepare a DP for the Project and submit it to NRC for review.	NRC was authorized through the WVDP Act to prescribe decommissioning criteria for the WVDP. In 2002, NRC issued "Decommissioning Criteria for the WVDP (M-32) at the West Valley Site; Final Policy Statement" (67 FR 5003). NRC's role under the WVDP Act is to provide informal review and consultation. The "Phase 1 DP for the West Valley Demonstration Project" was prepared by DOE pursuant to its statutory obligations for decontamination and decommissioning of the WVDP under the WVDP Act. The DP was submitted to the NRC in December 2008, and March and December, 2009. In February 2010, NRC issued a TER on DOE's Phase 1 DP. NRC conducted a technical monitoring visit of the WVDP on April 26 through 28, 2011.
DOE Order 231.1B	DOE Order 231.1B, Environment, Safety, and Health Reporting (updated and approved on June 27, 2011), was issued to ensure that DOE and National Nuclear Security Administration receives timely and accurate information about events that could adversely affect the health, safety, and security of the public or workers, the environment, the operations of DOE facilities, or the credibility of the Department. This is accomplished through timely collection, reporting, analysis, and dissemination of data pertaining to environment, safety, and health issues as required by law or regulations, or in support of U.S. political commitments to the International Atomic Energy Agency.	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 231.1B.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2011

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
DOE Order 458.1	DOE Order 458.1, Radiation Protection of the Public and the Environment (including change 2 June, 2011), replaced DOE Order 5400.5. The Order established requirements to protect the public and environment against undue risk from radiation associated with radiological activities conducted under control of DOE pursuant to the AEA, by ensuring that (1) operations are conducted to limit radiation exposure to members of the public pursuant to limits established in the Order, (2) radiological clearance of DOE real and personal property is controlled, (3) potential radiation exposures to members of the public are as low as reasonably achievable, (4) routine and nonroutine releases are monitored and dose to the public is assessed, and (5) the environment is protected from the effects of radiation and radioactive material.	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 2011, estimated doses from airborne and waterborne releases to the maximally exposed off-site individual (MEOSI) were 0.044% of the 100-millirem (mrem) standard, and about 0.014% of natural background radiation. Refer to Chapter 3, "Dose Assessment," for further discussion.
DOE Order 435.1-1	DOE Order 435.1-1, 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 HLW was conducted in accordance with the "WVDP Waste Acceptance Manual;" TRU waste was managed in accordance with the "TRU Waste Management Program Plan;" 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 (FY) 2011 Update." In February 2012, DOE issued the "Waste Incidental to Reprocessing (WIR) Evaluation for the WVDP melter", pursuant to DOE Order 435.1-1. Refer later in this chapter for further discussion.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2011

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
DOE Order 436.1, and Executive Orders (EOs) 13423 and 13514	DOE Order 436.1, Departmental Sustainability, May 2, 2011 replaced DOE Order 450.1A, and DOE Order 430.2B. The Order also incorporates the initiatives of EOs 13423 and 13514. The Orders provided requirements and responsibilities for managing sustainability within DOE to 1) ensure the Department carries out its missions in a sustainable manner that addresses national energy security and global environmental challenges, and advances sustainable, efficient and reliable energy for the future, 2) institute cultural change to factor sustainability and greenhouse gas (GHG) reductions into all DOE decisions, 3) ensure DOE achieves the sustainability goals established in its Strategic Sustainability Performance Plan pursuant to applicable laws, regulations, and EOs.	The WVDP supports the objectives of DOE Order 436.1, and has an established culture of environmental stewardship through it's environmental management system (EMS). Pollution prevention, waste minimization, and energy efficiency have been incorporated into the culture through standard practices, procedures, training, and encouraging new ideas. On December 5, 2011, DOE-WVDP submitted the "WVDP FY 2012 Site Sustainability Plan" to DOE-Headquarters (HQ), which outlined performance status and planned goals to support DOE's sustainability mission. Refer to Chapter 1, "Environmental Management System (EMS)." The new Phase 1 decommissioning and facilities disposition contractor accepted the existing EMS, and thereafter, applied for and received a Certificate of Registration for the International Organization for Standardization 14001:2004 certification of its EMS on July 31, 2012.
Title 10 Code of Federal Regulations (10 CFR) Part 830, Subpart A	10 CFR Part 830, Nuclear Safety Management, Subpart A, Quality Assurance Requirements, and DOE O 414.1D Quality Assurance, provide the quality assurance (QA) program policies and requirements applicable to WVDP activities.	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.	NEPA documents are prepared at the WVDP to describe potential environmental effects associated with proposed 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 prepared and issued for public comment for major federal actions requiring an EIS. Based on the analyses presented, considering regulatory agency and public input, DOE determines the preferred alternative and issues a ROD. Refer later in this chapter for discussion of NEPA activities.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2011

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
6 NYCRR Part 617 NYS Environmental Conservation Law (ECL)	The NY SEQR Act 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 SEQR and NEPA processes.	The SEQR 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. Coordinated efforts were made at the WVDP to effectively utilize information from the federal EIS process to make the required SEQR Findings Statement for the WVDP and WNYNSC, which was issued in May 2010.
42 USC §6901 et seq., and NYS ECL	The 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 interim status regulations. NYSDEC performed a RCRA hazardous waste compliance inspection of the WVDP facilities on March 23, 2011 and reported no violations. DOE performed a surveillance of the RCRA hazardous and mixed waste inventory at the WVDP during June, 2011, and noted no findings or concerns. EPA performed a RCRA compliance inspection in September, 2011, and found no violations. A detailed discussion of RCRA activities is presented later in this chapter.
Amendment to 42 USC §6961	The 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. DOE entered into a Consent Order with NYSDEC for the WVDP in 1996.	The FFCA requires completing milestones identified in the STP plan volume. The WVDP STP for FY 2011 update was submitted to NYSDEC on February 7, 2012. Refer to "Mixed Waste Management", later in this chapter.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2011

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
Docket No. II RCRA 3008(h) 92-0202	DOE and NYSERDA entered into the RCRA §3008(h) Administrative Order on Consent with EPA (lead agency) and NYSDEC in March 1992. The state and federal RCRA regulations authorize the agencies to issue orders requiring RCRA corrective actions associated with the potential releases of hazardous waste and/or hazardous constituents from SWMUs at the WNYNSC.	Written procedures and site activities are compliant with the Consent Order. In accordance with the Consent Order, DOE submits quarterly reports to EPA and NYSDEC that summarize all RCRA §3008(h) activities and progress conducted at the WVDP for the representative quarter. A discussion of CY 2011 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 EPA and authorized states.	WVDP facility hazardous waste activities are reported biennially to EPA and NYSDEC. The RCRA 3016 Biennial Report for 2011 was submitted on January 30, 2012.
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 EPA via the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations. On April 5, 1995, DOE and EPA entered into an MOU concerning the Clean Air Act Emission Standards for Radionuclides 40 CFR Part 61 Including Subparts H, I, Q, and T. Nonradiological emissions are permitted under 6 NYCRR Part 201-4 (Minor Facility Registrations).	DOE maintained six NESHAP permits for radiological emissions and one Air Facility Registration Certificate for nonradiological emissions at the WVDP, during 2011. The annual NESHAP Report summarizing radiological emissions and estimated dose was submitted to the EPA. Estimated dose to the MEOSI from radiological air emissions during 2011 was 0.016% of the 10-mrem Subpart H standard. Refer to Chapter 3, "Dose Assessment," for discussion. In January, 2011, DOE performed a review of the NESHAP program. Although four findings were identified, the overall adequacy and implementation of the WVDP NESHAP program is considered effective. (See "EMS Audits and Other Audits and Assessments" section in Chapter 1.) In CY 2011, two utility steam boilers were responsible for nonradiological emissions of nitrogen and sulfur oxides at 0.61% of the 49.5-ton capping limit for maintaining the minor facility registration certificate.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2011

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. A modified SPDES permit became effective on July 1, 2011. Industrial wastewater was monitored for chemical constituents during lagoon discharges (outfall 001), and treated sanitary wastewater was monitored at outfall 007. SPDES-permitted storm water monitoring was completed during 2011 by sampling the eight drainage basins during storm events. During 2011, there was one SPDES permit limit exceedance for mercury at outfall 007, and two noncompliance events at outfall 007. Refer to "SPDES Permit Noncompliance Events" later in this chapter, and to "SPDES Permit Required Monitoring" in Chapter 2 for further discussion.
NYS ECL Article 17, Titles 7 and 8, and ECL Article 70	NYS ECL Article 17 (Titles 7 and 8), and ECL Article 70 regulate storm water discharges related to construction activity. Authorization was required from the NYSDEC, Division of Water, to utilize the general permit (GP-0-10-001) for management of storm water associated with construction activities during the CY 2010 construction and installation of the north plateau full-scale PTW.	DOE submitted to NYSDEC a Notice of Intent and a Storm Water Pollution Prevention Plan (SWPPP) for storm water discharges associated with construction activities for the north plateau PTW preconstruction and construction activities at the WVDP. All requirements of the SWPPP were met by December 2010, and the notice of termination (NOT) was submitted to NYSDEC in August 2011, following ground disturbance stabilization.
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 petroleum bulk storage (PBS) and chemical bulk storage (CBS) tanks. These laws also regulate spill reporting and cleanup. Under terms of a 1996 agreement, amended in 2005, DOE is not required to report a spill of petroleum product onto an impervious surface if the spill is less than five gal 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 PBS 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 was one reportable spill on April 27, 2011 (Spill # 110996), which was immediately reported to NYSDEC, cleaned up, and the cleanup materials were disposed of appropriately. There were also six additional smaller spills (less than five gal each) during CY 2011, which did not require immediate notification to NYSDEC, but were reported in quarterly reports.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2011

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
EO 11990	EO 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, that is hydrologically connected to the NYSDEC jurisdictional wetlands. In April 2011, updated wetland delineation was completed for areas impacted by the Erdman Brook erosion mitigation project. Refer to "Erdman Brook Erosion Mitigation", later in this chapter.
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 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. A SARA Title 313 report was prepared and submitted due to a small quantity of lead released from the zeolite during the PTW installation. A 13,000-gallon liquid nitrogen tank was installed in 2009 to support the nitrocision effort. Refer to Tables ECS-9 and ECS-10.
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 NYS 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 2011 results from analyses of drinking water were reported within limits to the CCHD. The CCHD routinely performs inspections of the treatment and distribution system.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2011

Citation	*Environmental Statute, DOE Directive, Executive Order, Agreement*	*WVDP Compliance Status*
10 CFR Part 851	10 CFR 851 "Worker Safety and Health Program" of 2006 requires DOE contractors to provide 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.	Procedures and programs are revised to maintain requirements that comply with 10 CFR 851. Any proposed modification that may invalidate a portion of the worker health and safety program at the WVDP must be approved by DOE-WVDP. The plan was reviewed in April 2012, and it was determined that no changes to the current plan were necessary.
10 CFR Part 835	10 CFR Part 835, Occupational Radiation Protection, November 2006 as amended June 2007, established radiation protection standards, limits, and program requirements for protecting individuals from ionizing radiation resulting from the conduct of DOE activities.	In July 2008, the "WVES Documented Radiation Protection Program and Implementation Plan for 10 CFR Part 835, as amended June 2007" was issued, and full compliance with 10 CFR 835 was achieved by January 1, 2011.
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.	ACM activities were managed in accordance with the site "Asbestos Management Plan" and activities were completed by personnel certified by NYSDOL. On March 22, 2011, the NYSDOL conducted an unannounced inspection of asbestos-handling activities at the WVDP, and reported no findings. 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 provide 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. During 2011, an average of 3.0 pounds per day of Steamate NA701 was used as a corrosion inhibitor. The herbicide Gramoxonone Inteon was applied at the site on June 10 and June 30, 2011. Thereafter, the SPDES permit-required drainage basins were sampled and all results were reported as not-detected for the active ingredient, Paraquat Dichloride.

TABLE ECS-1 *(continued)*
Compliance Status Summary for the WVDP in CY 2011

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 and documented. 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, Part 675	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 legislation was enacted to gain more complete information for managing the state's water resources.	A non-transient, non-community public water supply system for drinking water and operational purposes is maintained and operated at the WVDP. In compliance with the legislation, the "2011 WVDP Great Lakes Water Withdrawal Report" was submitted to NYSDEC on January 26, 2012. The WVDP withdrew an average of 93,278 gallons per day. An updated Water Withdrawal Registration Certificate (NYGL08701) was issued to DOE by NYSDEC on August 24, 2011.
NYS Public Health Law	Public Health Law, Article 5 (Laboratories), Section 502 (Environmental Laboratories, Examinations, and Certificates of Approval)	The WVDP Environmental Laboratory (ELAB) (URS Corporation Laboratory) is certified by NYSDOH for certain radiological and nonradiological constituents in potable and nonpotable water under the Environmental Laboratory Approval Program (ELAP). NYSDOH inspected the ELAB in October 2011, and found no deficiencies.
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.)	DOE maintains a U.S. Fish and Wildlife Bird Depredation Permit for the WVDP. Effective April 1, 2012, NYS implemented changes to NYS ECL 11-0521, no longer requiring a NYSDEC depredation license. (See Tables ECS-3 and ECS-12.)

TABLE ECS-1 *(concluded)*
Compliance Status Summary for the WVDP in CY 2011

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 of the WNYNSC have been conducted for historic and archaeological sites. Surveys revealed American Indian and historic homestead artifacts, consistent with the area.
EO 11988	EO 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 2011 at the WVDP that would develop or be adversely impacted by the 100-year floodplain within the premises.
40 CFR §144.26 and 144.24	EPA regulates injection of tracer solutions into groundwater monitoring wells, in accordance with the Underground Injection Control Program Regulation. On November 18, 2010, EPA authorized the injection of sodium bromide tracer solution into select wells within the north plateau.	Select wells in the north plateau PTW were used to inject sodium bromide tracer solution to support activities for remediation of the strontium-90 plume by estimating local groundwater flow velocities. The tracer tests were performed in February and March 2011.
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, 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 years, assess performance, and report to NYSDEC.	The system stimulated 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 decision-making 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). Closure was performed persuant to landfill closure regulatory requirements specified in the approved closure plan, which also requires post-closure perpetual maintenance and annual reporting in this ASER. The CDDL cover was inspected on June 16 and November 11, 2011 and all areas were found to be in good condition.

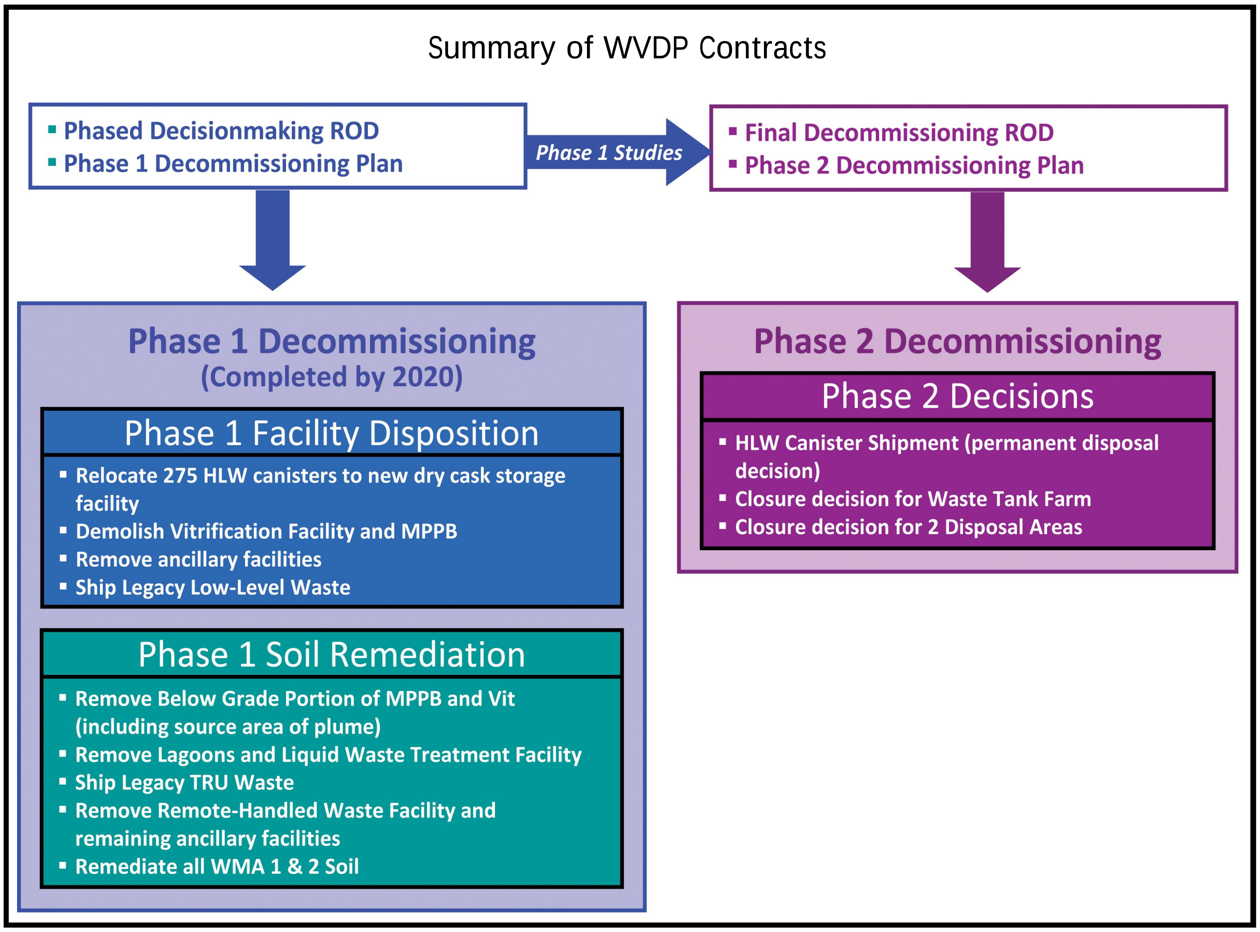
All activities were carried out in accordance with applicable permits, licenses, environmental laws, and regulations. The following accomplishments summarize major progress at the site.

Interim End State Contract Major Accomplishments (2007–August 2011). Major accomplishments toward achieving an Interim End State for the WVDP included:

- assisting DOE in developing a phased decision-making plan for decommissioning the WVDP;
- supporting DOE in preparing and finalizing the EIS for Decommissioning and/or Long-Term Stewardship for the WVDP and the WNYNSC, and the Phase 1 Decommissioning Plan (Phase 1 DP) for the WVDP;
- maintaining a safe workplace with no lost-time injuries or illnesses;
- continuing decontamination of the main plant process building (MPPB);
  - dismantling approximately 6 mi (9.7 km) of piping and over 50 tons (45 metric tons) of vessels and equipment from high-hazard areas;
  - remotely decontaminating 4,500 square feet of walls and floors in the head-end cells;
  - removing about 1,700 square feet of asbestos-containing materials.
- processing and shipping 171,000 cubic feet of waste off site for disposal; and
- installing mitigative measures for effective control of ground and surface water at the WVDP to include:
  - an 860-ft-long ion-exchange permeable treatment wall (PTW) in the north plateau to control the strontium-90 plume migration;
  - a geomembrane cover and slurry wall at the U.S. Nuclear Regulatory Commission (NRC)-licensed disposal area (NDA); and
  - the tank and vault drying system (T&VDS) in the waste tank farm (WTF).

CHBWV Contract Scope (August 2011–June 30, 2017). Scope of the Phase I Decommissioning and Facility Disposition contract includes:

- packaging and relocating canisters of high-level waste (HLW) to new interim dry storage;



- dismantling and removing the vitrification (VIT) facility and the MPPB;
- removing ancillary facilities;
- continuing safe operations of the site, including:
  - managing and maintaining site infrastructure;
  - conducting environmental monitoring;
  - maintaining the underground HLW storage tanks, the NDA, and the north plateau PTW.
  - maintaining the lagoon system.

Continuity of Contract. Transition activities from WVES to CHBWV continued throughout the 60-day transition period to ensure continuity of environmental monitoring and compliance, transfer of permits and licenses, and timely reporting to regulatory agencies. The Resource Conservation and Recovery Act (RCRA) Part A Permit Application was transferred to CHBWV on August 29, 2011. The asbestos-handling license was issued to CHBWV in October 2011. Other efforts focused on transitioning system and document access, and performing facility walk-downs and inspections.

CHBWV participated in a Regulatory Roundtable presentation regarding transition activities, project path forward, and regulatory integration.

State Pollutant Discharge Elimination System (SPDES) Permit Noncompliance Events. During calendar year (CY) 2011, there was one SPDES permit limit exceedance and two additional noncompliance events that occurred associated with the equalization basin and outfall 007.

- On March 20, 2011, the force main (underground transfer line) that transmits industrial wastewaters from the equalization basin to the wastewater treatment facility (WWTF) failed (breached), causing wastewaters to discharge onto the soil. The transfer line was secured (shut down) and the pump was isolated. An alternate line was put in service and the breached line was abandoned in-place. NYSDEC was immediately notified of the event, and a Report of Noncompliance for an unintentional bypass was submitted to NYSDEC in the March 2011 SPDES discharge monitoring report.

- On October 17, NYSDEC was notified that the SPDES permit limit for mercury (200 nanograms/liter [ng/L]) was exceeded (346 ng/L [parts per trillion]) from outfall 007 at the WWTF, when the subcontract laboratory reported the results of the October 6, 2011 wastewater discharge compliance sample. The outfall discharge was immediately suspended. An investgiation was initiated to determine the scope of potential mercury conditions within system operations. Discharges from this outfall remained suspended until February 14, 2012.

- When the WWTF discharge was suspended, the plant system operations were placed in recirculation mode. During recirculation operation, from October 28 through November 3, approximately 2,120 gallons (gal) (8,025 liters[L]) of wastewater overflowed the tanks while flushing the system, and was discharged through outfall 007, resulting in an unintentional bypass. The unintentional bypass was immediately terminated, and NYSDEC was immediately notified of the noncompliance event via telephone and a five-day written notification was submitted. Samples were collected for specific SPDES permit constituents during the duration of flow and were submitted to the laboratory for analysis. Results were reported within permit limits.

Once suspension of discharge from outfall 007 occurred on October 17, CHBWV coordinated with Frank's Vacuum Truck Service and the Buffalo Sewer Authority (BSA) to transport and treat WWTF wastewaters until the system could be cleaned and restored to service.

A concurrent investigation identified possible causes of the elevated mercury levels. Samples were obtained and evaluated throughout system operations including but not limited to: tanks, grinder stations, and sludge. It was determined that mercury was present in the aeration tank sludge that was subsequently traced to the Nessler reagent, used for ammonia analysis in the WWTF. The remaining supply of Nessler reagent was removed from the WWTF, and a new analytical method for ammonia was put into use. Sampling continued at strategic locations, and the decision was made to clean out all process tanks and sludge within the WWTF system and transport it to the BSA for disposal. With the system cleaned and maintained in recirculation mode, process control sampling was conducted at the onset of obtaining the seed material, to determine if the WWTF process would meet the SPDES permit limits.

On February 9, 2012, NYSDEC was notified of the pending restart of the WWTF, and with confirmatory laboratory results, the discharge from outfall 007 was restarted on February 14, 2012.

PTW Performance. Since completion of the full-scale PTW, performance monitoring has indicated the following:

- Groundwater flow patterns in the PTW area are similar to flow patterns observed prior to PTW construction, indicating that the PTW installation did not substantially alter groundwater flow conditions on the north plateau;

- Strontium-90 activity from groundwater wells inside the PTW have typically been substantially lower than strontium-90 activity levels upgradient of the PTW;

- Geochemical differences were observed in groundwater that has migrated into or through the PTW zeolite, indicating that cation exchange is occurring; and

- Strontium-90 activity in groundwater immediately downgradient of the PTW is decreasing.

WTF and the T&VDS. With an ultimate goal of preventing the underground steel tanks from corroding under ambient tank and vault conditions, the WVDP installed a T&VDS in the WTF in 2010. The T&VDS was designed to reduce the liquid volumes in the tanks, and thereby the harmful effects of corrosion on the underground waste tanks situated within concrete vaults originally installed in the 1960s. Corroded pipe was replaced with stainless-steel ventilation lines, a rotary dryer was installed, and the T&VDS was brought on line before the end of December 2010. During the first 14 months of operation (as of the end of February 2012), the system has operated effectively, achieving the following results:

- evaporated all liquid from tanks 8D-1 and 8D-2;
- significantly reduced liquid levels in 8D-1 and 8D-2 vaults and pans;
- reduced liquid levels in tanks 8D-3 and 8D-4 by about 500 gal (1,893 L) per tank;
- evaporated all liquid from 8D-3/8D-4 vault;
- achieved lower relative humidity in the tanks and vaults, further reducing the corrosion rate.

System operations continue to be monitored to reduce air infiltration, and individual air flows are adjusted as the tanks dry out.

Waste-Incidental-to-Reprocessing (WIR) Evaluation for the WVDP Melter. The melter, which was used during the HLW VIT process, was flushed during shut down and characterized for radioactivity. The DOE-WVDP performed an evaluation of the melter, to determine if it met the WIR criteria of DOE Manual 435.1-1, "Radioactive Waste Managemenet Manual." The basis of the evaluation was to determine whether the melter was incidental to reprocessing and may be managed under DOE's authority in accordance with the requirements of low-level waste (LLW).

The evaluation was issued initially in draft form to facilitate consultation with NRC, as well as state and public review and comment. NRC performed their evaluation, requested additional information, and documented their review of the draft in the TER (September 30, 2011). In February 2012, after consideration of the evaluation, NRC comments, and public comments on the draft, DOE made its final determination that the melter is LLW.

The path forward for the melter is to determine a disposal location, grout to prepare for disposal, finalize and obtain U.S. Department of Transportation (DOT) approval and route definition, coordinate schedule for transportation, then ship and dispose.

National Environmental Policy Act (NEPA)

NEPA requires 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 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, 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. Therefore, 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 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, DOE will determine the preferred alternative and issue a ROD regarding the action.

Since the Project began, a number of proposed site activities have warranted environmental impact evaluations. A summary of the significant NEPA document history is presented in Table ECS-2. Decisions resulting from the EISs and associated RODs and EAs were required before starting new waste management and remediation activities at the Project.

EIS Issued. On April 14, 2010, DOE issued the ROD for the EIS, "Decommissioning and/or Long-Term Stewardship at the WVDP and the WNYNSC" (DOE/EIS-0226), selecting the phased decisionmaking alternative. In Phase 1, DOE will decommission the MPPB, the VIT facility, remote-handled waste facility (RHWF), the wastewater treatment lagoons, and a number of other facilities. No decommissioning actions will be taken on the underground HLW tanks or the NDA, and the HLW canisters will be safely stored on site. NYSERDA will manage the SDA. Phase 1 is expected to take up to 10 years, during which time DOE will manage the site's remaining facilities in a safe manner. The Phase 2 decision will be made within 10 years of the EIS ROD.

NYSERDA issued a New York State Environmental Quality Review Findings Statement for the phased decisionmaking preferred alternative on May 12, 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).

Phase 1 DP for the WVDP. On December 5, 2008, the DOE issued the "Phase 1 DP for the West Valley Demonstration Project, West Valley, NY" (73 Federal Register 74162) and transmitted it for NRC review. The DP addressed Phase 1 of the proposed two-phased approach for WVDP decommissioning, consistent with the preferred alternative selected in the ROD and the Findings Statement for the WVDP and the WNYNSC.

On December 18, 2009, DOE submitted revision 2 of the Phase I DP after incorporating responses to NRC's comments.

On February 25, 2010, NRC transmitted to DOE-WVDP a TER 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) for the WVDP. The Phase 1 DP required the preparation of two supplemental documents, the CSAP and the FSSP. These two documents provide the specific details of sampling activities to support Phase 1 decommissioning of the WVDP. The CSAP describes the radiological environmental data collection activities (surface and subsurface soils, sediments, and groundwater) that will specifically support the implementation of the Phase 1 decommissioning actions within the WVDP premises as described in the Phase 1 DP. CSAP data collection activites will include the establishment of background data sets, evaluate the presence of radionuclides of interest in the WVDP waste management areas (WMAs), evaluate the extent of radiological contamination of surface soil, subsurface soil, and stream sediment, and identify the required extent of the WMA 1 and WMA 2 excavations.

The FSSP provides the technical basis and sampling protocols to demonstrate that specific portions of the WVDP premises meet the Phase 1 radiological cleanup goals for surface and subsurface soils identified in the Phase 1 DP. The FSSP is consistent with the Multi-Agency Radiation Survey and Site Investigation Manual. The FSSP applies to the subsurface soils exposed in the deep WMA 1 and WMA 2 excavations, and potentially to surface soils outside those excavations where subsurface contamination is not present.

Environmental Characterization Services Contract. In December 2010, DOE awarded the Environmental Characterization Services contract to Safety and Ecology Corporation (SEC) to provide environmental characterziation services to support Phase 1 decommissioning activities at the WVDP. SEC will be responsible for implementing the data collection activities described in the CSAP and the FSSP.

Services to be provided by SEC may include, but are not limited to:

- soil, sediment, and groundwater characterization;
- environmental monitoring; and
- preparing applicable regulatory documentation supporting decommissioning activities at the WVDP.

TABLE ECS-2
NEPA Documents Affecting DOE Activities at the WVDP

Year	Action	Outcome
1982	The final EIS and associated ROD were issued outlining the actions DOE proposed for solidification of the liquid HLW contained in the underground tanks (DOE-EIS-0081).	The initial period of WVDP Act work activities, 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	DOE and 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 WNYNSC (the Center).	The draft EIS was issued in 1996.
1996	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 issuing the draft EIS, and despite long negotiations, 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 DOE formed a stakeholder advisory group (the West Valley Citizen Task Force [CTF]) to provide additional input to the public comment process required by the NEPA.	The CTF mission is to provide stakeholder input to decisionmaking for development of a closure option for the WVDP and the WNYNSC.
1997	DOE-HQ 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 WM PEIS (DOE/EIS-0200F) 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	DOE issued a ROD for nationwide management of HLW, Vol. 64, 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	DOE issued a ROD for nationwide management of 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	DOE published an NOI (66 FR 16447) formally announcing its rescoping plan for preparing the waste management EIS for the WVDP. DOE published an Advance NOI (66 FR 56090), announcing in advance, its intention to prepare an EIS for Decommissioning and/or Long-Term Stewardship at the WVDP and the WNYNSC.	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. The advanced NOI informed interested parties of a pending EIS and provided opportunity for public comments early in the process.
2003	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, TRU waste, and HLW.

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

Year	*Action*	*Outcome*
2003	DOE, in cooperation with NYSERDA, issued an NOI (68 FR 12044) to issue an EIS for "Decommissioning and/or Long-Term Stewardship at the WVDP and the WNYNSC."	Based on 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	DOE issued a ROD, based on alternative A, for the "WVDP Waste Management EIS (WVDP WM EIS-0337)" (70 FR 35073).	The HLW canisters will 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 for disposal at commercial or DOE sites.
2005	On August 26, 2005, The Coalition filed a complaint in the U.S. District Court, Western District of New York, against DOE regarding the NEPA process at the WVDP. The Coalition contended that 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 DOE is not empowered to reclassify waste at the WVDP using the "WIR" 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 EA (DOE/EA-1552) evaluated the proposed decontamination, demolition, and removal of select site facilities. A finding of no significant impact (FONSI) was issued.	The EA, with the FONSI, cleared the way for removal of 36 facilities that were (or in the next four years would be) no longer required to support WVDP activities.
2007	DOE issued an NOI to prepare an EIS for the disposal of Greater-Than-Class-C (GTCC) LLW (72 FR 40135). In March 2011, DOE issued the draft EIS for the disposal of GTCC LLW and GTCC-like waste.	Nine scoping meetings were held throughout 2007; the draft was never issued. On February 25, 2011, a notice of availability for the Draft GTCC EIS was issued with the 120-day public comment period ending on June 27, 2011.
2008	DOE issued a notice of availability for the revised "Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the WVDP and WNYNSC (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, DOE issued the "Final EIS (FEIS) for Decommissioning and/or Long-Term Stewardship at the WVDP and WNYNSC (DOE/EIS-0226 [Revised])". On April 14, 2010, DOE issued the ROD for the FEIS, selecting the phased decisionmaking alternative as the preferred alternative. On May 12, 2010, NYSERDA issued a SEQR Findings Statement selecting the phased decisionmaking alternative as the preferred alternative.	In Phase 1 of the phased decisionmaking preferred alternative, DOE will decommission the MPPB, the VIT facility, RHWF, the wastewater treatment lagoons, and a number of other facilities. The Phase 2 decision will be made within 10 years of the EIS ROD.

Phase 1 Studies. In September 2011, DOE and NYSERDA jointly awarded the Phase 1 Studies contract to Enviro Compliance Solutions, an independent, agency-neutral contractor that is jointly funded by the agencies to administer contracts for all Phase 1 Study activities, including contracting with the facilitator, SMEs, the ISP, and contractors performing the study activities. DOE and NYSERDA intend to conduct additional scientific studies in order to facilitate interagency consensus to complete decommissioning of the remaining facilities.

The Phase 1 Study process will employ the ISP, and teams of SMEs to evaluate the following Potential Areas of Study (PAS):

- erosion;
- groundwater flow and contaminant transport;
- catastrophic release of contamination and impact on Lake Erie;
- slope stability and slope failure;
- seismic hazard;
- probabilistic vs. deterministic dose and risk analysis;
- alternate approaches to, costs of, and risks associated with complete waste and tank exhumation;
- viabilitly, cost, and benefit of partial exhumation of waste and removal of contamination;
- exhumation uncertainties and benefit of pilot exhumation activities;
- in-place closure containment technologies;
- engineered barrier performance;
- additional characterization needs; and
- cost discounting and cost benefit analyses over long time periods.

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. A hazardous waste permit is required for facilities that store large quantities of hazardous waste for more than 90 days or treat or dispose of hazardous waste at the facility.

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, EPA has delegated the authority to issue permits and enforce these regulations to NYSDEC. In addition, 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 - RCRA Part A Permit Application. In 1984, DOE notified EPA of hazardous waste activities at the WVDP and identified DOE as a hazardous waste generator. In 1990, to comply with 6 NYCRR Part 373-3, a RCRA Part A (i.e., Part A) 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. RCRA 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 RCRA waste management operations. Revisions to the RCRA Part A Permit Application were submitted to NYSDEC on February 3, 2010 and were conditionally approved by NYSDEC on June 9, 2011.

In accordance with the 6 NYCRR Part 373-3 requirements, 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 complete 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 and facilities are decontaminated and/or removed. When specified in the closure plan, confirmatory sampling and analysis are performed, and data are evaluated and presented to NYSDEC in a closure certification report to document completion of closure activities.

The hazardous waste storage lockers have undergone clean-closure activities and sampling in December 2011, to confirm clean closure per the RCRA hazardous waste management unit closure plan. The RCRA closure certification report for the hazardous waste storage lockers was submitted to NYSDEC on March 14, 2012, and a revised and re-certified report was submitted on August 9, 2012 to address NYSDEC comments.

The closure plan for the cement solidification system will be submitted in 2012, and closure plans for the remaining units were submitted with the RCRA Part B Permit application, as described below.

6 NYCRR Part 373-2 Permit Application. In 2003, NYSDEC officially requested the submittal of a 6 NYCRR Part 373-2 Permit Application (i.e., Part B) for the

WVDP. The completed permit application was transmitted to NYSDEC in December 2004. This application included RCRA closure plans for all interim status units in accordance with the 6 NYCRR Part 373-3 Permit Application.

On April 16, 2009, NYSDEC officially requested the submittal of a revised 6 NYCRR Part 373-2 Permit Application for the WVDP. The permit application excluded process information and closure plans for any operating hazardous waste management unit in which no waste would be stored after May 1, 2012, as such units were assumed to be closed under interim status. The revised permit application was submitted to NYSDEC on September 30, 2010. Due to the scope and breadth of the permit application, DOE and NYSERDA agreed to NYSDEC's request for an indefinite suspension of NYSDEC's completeness review in January 2011.

On March 22, 2012, NYSDEC notified NYSERDA and DOE that they may suspend further action relative to a Part 373 (i.e., Part B) Permit. As part of this approach, processing of the September 2010 Part 373 Permit Application, including revisions, will be deferred to authority provided by the RCRA Consent Order for corrective actions and the 6 NYCRR Part 373-3, Part A (Interim Status) Permit Application. At the completion of all interim status closure activities, the 6 NYCRR Part 373-2 (Part B) Permit Application will be revised to include corrective actions, and the closure and post closure requirements for the remaining facilities/units.

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

- RCRA Facility Investigation (RFI)

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

  As many SWMUs are contiguous, or close together making separate monitoring impractical, most were grouped into larger units, called super SWMUs (SSWMUs); terminology unique to the WVDP, and is not an official regulatory term. SSWMU descriptions and the individual constituent SWMUs, are presented in Table ECS-4. Figures A-7 and A-8 in Appendix A show the WVDP SSWMU locations. The final RFI reports were submitted in 1997, completing the Consent Order investigative activities. No corrective actions were required at that time.

  Groundwater monitoring, as recommended in the RFI reports and approved by EPA and NYSDEC, continued during 2011 per the Consent Order requirements. The groundwater program and monitoring results at the WVDP are discussed in Chapter 4 "Groundwater Protection Program."

- Current Conditions Report

  Pursuant to a request from NYSDEC, a report entitled "WVDP 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 was revised and submitted on September 29, 2010, incorporating changes in the operational status of each SWMU and providing updated environmental monitoring data. This document supported, and summary information was incorporated with, the revised 6 NYCRR Part 373-2 Permit Application.

- Corrective Measures Study (CMS)

  In 2004, NYSDEC requested CMSs 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 (CDDL) (SWMU #1); and
  - The Low-Level Waste Treatment Facility (SWMUs #17, #17a, and #17b).

The CMS Work Plan was conditionally approved by NYSDEC in October 2006. The draft CMS reports were revised in 2010 to be consistent with the EIS and the ROD and provide corrective measures evaluations. The revised documents were submitted to NYSDEC and EPA on September 29, 2010.

- Interim Measure (IM)

The NDA (SSWMU #9) is regulated under the Consent Order. As an IM in 1990, a trench system was constructed through the weathered Lavery till along the northeast and northwest sides of the NDA to intercept and collect groundwater potentially contaminated with a mixture of n-dodecane and tributyl phosphate (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 LLW2 for processing. Monitoring results in 2011 detected no TBP in groundwater from the NDA interceptor trench.

NDA Cap - Per the "CMS Work Plan for Select SWMUs" and in response to Core Team comments on the work plan, DOE evaluated engineering controls to improve the NDA cap integrity. As a result, 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.

In 2008, an approximate 850-ft-long low permeability slurry wall constructed along the south and western sides of the NDA to limit lateral groundwater migration. Part two of the project involved resurfacing the entire five-acre (2 ha) landfill with additional soils, re-grading, compacting, and applying an impermeable geomembrane cover. The IM was within the scope and intent of the CX for small-scale, short-term cleanup actions, described in 10 Code of Federal Regulations (CFR) §1021, Subpart D, Appendix B, B6.1.

An IM effectiveness report, "Hydrogeologic Changes Observed at the NDA since the 2008 IM and Recommendations for Long-Term Monitoring," was prepared and submitted to NYSDEC. The evaluation showed that lower groundwater elevation measurements have measureably decreased the groundwater flow through the NDA. The volume of water pumped from the NDA interceptor trench has decreased significantly, to 84,373 gal (383,567 L) in CY 2011, compared with pre-IM volumes. Refer to Chapter 4, "Groundwater Protection Program." The most notable analytical change since installating the IM involves increases in the gross beta and strontium-90 concentrations at trench sampling location NDATR. The increased concentrations are likely attributable to the decreased water volumes accumulating in the trench, resulting in less dilution.

In May 2011, the entire NDA cap was inspected, including storm water basins, walkways, ballast tubes, pipe penetrations, and the anchor trench. All field seams and pipe penetrations within the NDA basins and perimeter drainage swale were air lance tested. Additionally, the condition of each field seam and pipe penetration on the cap was observed, noting minor repairs; however, the overall cap condition was good, with no general deterioration of the geomembrane noted. Minor separations were resealed and/or caulked.

- Quarterly Reporting to EPA and NYSDEC

Per the Consent Order, DOE transmits a quarterly progress report to EPA and NYSDEC, summarizing all Consent Order activities at the WVDP for the previous quarter. The report includes progress and accomplishments, contacts with local community interest groups and regulatory agencies pertaining to consent order activities at the WVDP, changes to personnel, projected future work activities, and an inventory of mixed waste that was generated from decontamination activities during the reporting period. Other reports submitted to EPA and NYSDEC under the Consent Order are the groundwater exception reports, and the NDA water level reports for the interceptor trench and the 2008 IM.

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 2011 was submitted to NYSDEC in February 2012.

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 2011 was submitted to NYSDEC on July 1, 2011. Every other year, the Annual Status Report, essentially an abbreviated version of the biennial update, is submitted. The CY 2011 Annual Status Report for the Hazardous Waste Reduction Plan was submitted to NYSDEC on June 27, 2012.

Mixed Waste Management. Mixed wastes that cannot be treated or disposed of within one year are managed according to the "Site Treatment Plan (STP)," prepared by the DOE under requirements of the Federal Facilities Compliance Act (an amendment to RCRA), in accordance with a Consent Order agreement. The annually updated plan describes the development of treatment capabilities and technologies for treating mixed waste. The fiscal year (FY) 2010 update brought the waste stream inventory and treatment information current to the end of FY 2011. The FY 2011 plan identified four proposed milestones for waste streams managed under the WVDP STP, all of which were completed by January 12, 2012. Alternative schedules and treatment options were developed for two of the milestones. During 2011, 49,148 pounds (22.3 metric tons) of hazardous and mixed waste were shipped off site for disposal. (See Table ECS-5.)

When there is a change to a mixed waste stream treatment technology, a Treatability Study Report is required to be submitted to NYSDEC in accordance with requirements of 6 NYCRR Part 371.1. No treatability studies were performed in CY 2011 and none are planned for CY 2012.

Nonhazardous, Regulated Waste Management. Nonradioactive, nonhazardous material was shipped off site to solid waste management facilities in 2011. Certain components of this waste (lead-acid batteries and spent lamps [i.e., universal wastes]) were reclaimed or recycled at off-site, authorized reclamation and recycling facilities. Digested sludge from the site sanitary wastewater treatment facility was shipped to the BSA for disposal. Sanitary treated wastewater was routinely sampled and discharged to Erdman Brook in compliance with the WVDP's SPDES permit. (See Tables ECS-5 and ECS-6.)

Waste Minimization and Pollution Prevention. The annual pollution prevention report was submitted to DOE summarizing recycling and waste generation information. See Table ECS-6, "Recycled Materials for FY 2011;" Table ECS-7, "Executive Order 13514 Pollution Prevention/Waste Minimization Accomplishments in 2011;" and Chapter 1, "Environmental Management System (EMS)." Reports are submitted to DOE to document hazardous waste reduction efforts, as discussed previously in the "Hazardous Waste Management" section.

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 the migrating groundwater plume. Some of these activities were performed within and along the CDDL's southern edge. Activities included Geoprobe® soil sampling and installing microwells within the CDDL. In accordance with the closure plan, NYSDEC was notified of these activities. In 2010, a full-scale PTW was installed, south of the CDDL. Construction of the PTW did not impact the CDDL. See "Strontium-90 Remediation Activities" in Chapter 4. A general inspection of the CDDL, to note the overall conditions of the grounds, was performed in the spring and fall of 2011.

Storm Water Pollution Prevention Plan (SWPPP)

On July 1, 2010, DOE submitted to NYSDEC a Notice of Intent (NOI) and an SWPPP applying for authorization from NYSDEC to utilize the SPDES General Permit (GP-0-10-001) for the management of storm water associated with preconstruction and construction activities while installing the north plateau PTW. NYSDEC granted authorization on July 7, 2010. The NOI and SWPPP were developed to address storm water, soil and sediment erosion control, and water quality requirements consistent with NYSDEC Storm Water Guidance Manual. All activities at the PTW construction site were in compliance with the requirements of GP-0-10-001, the SWPPP, and the NOI. The final requirement under GP-0-10-001, the issuance of the notice of termination, was submitted to NYSDEC in August 2011, following completion of the ground disturbance stabilization associated with the construction of the PTW.

Environmental Issues

Unplanned Nonradiological Waterborne Release. There was one unplanned nonradiological release from SPDES outfall 007 on October 6, 2011, when the mercury concentration of 346 ng/L exceeded the SPDES permit limit of 200 ng/L and caused a noncompliance event. Refer to "SPDES Permit Noncompliance Events" earlier in this chapter. There were no unplanned waterborne releases of radiological constituents from the WVDP in 2011.

Unplanned Radiological Airborne Release. Although emissions were low, there was one unplanned radiological airborne release at the WVDP during 2011. A ventilation upset was caused by the need for and replacement of worn bearings on the ventilation exhaust cell (VEC) blower, which resulted in excessive vibration. This vibration may have contributed to higher-than-typical americium-241 and cesium-137 discharges from the MPPB stack in March and April 2011. Scheduled power outages in March and April may have also played a part in this release. While below alarm setpoints, these discharges were detected by stack monitoring equipment and are included in the main stack source term modeled in this report. The dose to the maximally exposed off-site individual (MEOSI) from the main stack in CY 2011 was 0.0045% of the 10-millirem (mrem) standard. Subsequent monitoring readings from this stack returned to normal.

Although there were minor smoldering events in the RHWF and MPPB during 2011, it was found that no radiological air emissions resulted.

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 CY of interest and (2) using EPA-approved computer models to estimate dose to the MEOSI. 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-mrem/year compliance standard. (See Chapter 3 for a discussion of dose assessment methodology.)

NESHAP regulations in Title 40 CFR 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.

During planning for building demolitions and discontinuing stack operations, DOE submitted an initial request to EPA in June 2007 for approval to use environmental air measurements to demonstrate NESHAP compliance at the WVDP. The plan included a one-year period of using both the "measure and model" and the "environmental measurement" approach to confirm compliance. EPA granted interim conditional approval in CY 2009, with an extension in 2011, subject to incorporating suggested changes.

The ambient air monitoring network was installed in 2012. The network consists of 16 ambient air sampling stations (one for each of the 16 wind directions), strategically located and operated in areas that provide coverage for airborne radiological environmental measurements to support NESHAP compliance during demolition activities.

In addition, one high-volume sampler is co-located in the sector most often identified as the critical receptor. This sampler serves as an independent source of data for comparison with the compliance network data at that location. Ambient air continues to be monitored at the background location, although data from this sampler is not used to demonstrate NESHAP compliance under normal operating conditions.

Erdman Brook Erosion Mitigation. Following installation of erosion mitigration measures in Erdman Brook near the SDA's north slope in 2009, additional erosion features were identified at points upstream and downstream of the 2009 work. In April, 2011, updated wetland delineations were performed in areas to be impacted by construction activities. During the first half of 2011, design work for addtional erosion mitigation measures was completed, and work activities in these areas designated as Federally protected wetlands was permitted under the Nationwide Permit 27 - Stream and Wetland Restoration Activities. Construction activities were from October 2011 to December 2011. Approximately 30 percent of the current phase of work was completed in the 2011 field season, and the remainder of the current project was completed in 2012. The work was performed by NYSERDA, but jointly funded by DOE and NYSERDA.

Safety Inspections of the WNYNSC Dams. A severe rain event in August 2009 caused flood damage to areas of the reservoirs and spillways of the two dams located on the WNYNSC property. These dams are maintained because they provide water for drinking and operational purposes for the WVDP. Standard operating procedure for maintenance, inspection, and operation of the lake dams and emergency spillway have been enhanced. Ongoing assessments and studies occurred during 2011.

Project Assessment Activities in 2011

Throughout CY 2011, 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 (ISMS) requirements. The IAP applies to all disciplines including, but not limited to, safety and health, operations, maintenance, environmental protection, quality, decontamination and decommissioning (D&D), 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.

DOE-WVDP 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 were not 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	Updates	Status
WVDP RCRA Part A Permit Application (EPA ID #NYD980779540)	NYSDEC Hazardous Waste	Provides interim status under RCRA for treatment and storage of hazardous waste.	DOE is currently operating under the February 2010 RCRA Part A Permit Application. Revisions were submitted to NYSDEC in February 2010, and conditionally approved on June 9, 2011.	On August 29, 2011, the permit was transferred to CHBWV.
6 NYCRR Part 373-2 (i.e., Part B) Permit Application (Rev. 1)	NYSDEC Hazardous Waste	Provides final status under RCRA for treatment and storage of hazardous waste.	Submitted a revised application to NYSDEC on September 30, 2010. In January 2011, NYSDEC review was suspended indefinitely.	On March 22, 2012, NYSDEC suspended action relative to the Part B until completion of Phase 1 work. Thereafter, remaining hazardous waste management units will be subject to RCRA permitting.
Air Facility Registration Certificate (9-0422-00005/00099)	NYSDEC / Air Emissions	Certificate caps nitrogen oxide and sulfur oxide emissions from two boilers.	None	No expiration date.
MPPB Ventilation (WVDP-687-01)	EPA / NESHAP	MPPB ventilation radionuclide emissions (originally the Liquid Waste Treatment System [LWTS])	Conditional approval received on July 9, 2009 to discontinue monitoring after establishing an ambient monitoring network and meeting EPA criteria, with a 24-month extension granted by the EPA on July 14, 2011.	Original approval on December 22, 1987. Modified on May 25, 1989 for laboratories. Modified February 18, 1997 to include the slurry-fed ceramic melter. No expiration date.
VIT Facility Heating, Ventilation, and Air-Conditioning (HVAC) System (no permit number)	EPA / NESHAP	VIT Facility HVAC system for radionuclide emissions	Facility being used for remote waste processing.	Approved on February 18, 1997. No expiration date.
01-14 Building Ventilation System (WVDP-187-01)	EPA / NESHAP	Ventilation of radionuclide emissions in the 01-14 building.	Building being readied for demolition.	Original approval on October 5, 1987. Modified on May 25, 1989 for LWTS. No expiration date.

Note: Permit and license expiration dates are current as of September 2012.

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

Permit Name and Number	*Agency / Permit Type*	*Description*	*Updates*	*Status*
Contact Size-Reduction Facility (WVDP-287-01)	EPA / NESHAP	Contact size-reduction and decontamination facility radionuclide emissions	Ventilation not in service; ventilated with portable ventilation units (PVUs).	Approved on October 5, 1987. No expiration date.
Supernatant Treatment System (STS) /Permanent Ventilation System (PVS) (WVDP-387-01)	EPA / NESHAP	STS ventilation for radionuclide emissions	System receives air ventilated from T&VDS.	Original approval on October 5, 1987. Modified on May 4, 1998 for full-time ventilation of waste tank farm. No expiration date.
Outdoor Ventilated Enclosures (OVEs) / PVUs (WVDP-587-01)	EPA / NESHAP	Fifteen PVUs for removal of radionuclides.	Since 2007, EPA approval to expand usage of PVUs from 10 to 15. DOE tracks usage on the basis of annual cumulative estimated dose.	Original approved on December 22, 1987. Modified on December 10, 2007 for 15 units. No expiration date.
SPDES (NY0000973)	NYSDEC / Effluent water	Monitors discharges to surface waters from various on-site sources.	An amended SPDES permit was issued by NYSDEC, effective July 1, 2011.	The permit expires on June 30, 2016.
North plateau PTW storm water discharges associated with construction activities (NYR 10S797)	NYSDEC / Division of Water	NYSDEC authorization was required to utilize the general permit (GP-0-10-001) to manage storm water associated with construction activities during installation of the north plateau PTW.	A NOI and storm water pollution prevention plan (SWPPP) was submitted to NYSDEC for storm water discharges associated with construction activities for the north plateau PTW preconstruction and construction activities at the WVDP.	All requirements of the SWPPP were met by December 2010, and the NOT was submitted to NYSDEC in August 2011, following ground disturbance stabilization.
NYSDOH ELAP Certification to URS Corporation, Lab ID #10474 EPA Lab Code NY01259	NYSDOH / ELAP certification	Certification of the ELAB for the analysis of potable and nonpotable water samples for specific radiological and nonradiological constituents.	Certification is held by URS Corporation Laboratory. Effective February 2009, the certificate was revised to remove total suspended solids. The certification was renewed on April 1, 2012.	Certification was terminated on June 30, 2012.

Note: Permit and license expiration dates are current as of September 2012.

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

Permit Name and Number	*Agency / Permit Type*	*Description*	*Updates*	*Status*
Frank's Vacuum Truck Service (Permit #12-05-TR285)	Sanitary sewage sludge hauler permit	Permit issued to hauler of waste from the wastewater treatment facility.	Permit effective July 1, 2012.	Permit expires June 30, 2013.
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 will be needed, a permit application will be submitted under the existing CBS registration.
Public Water System ID #NY0417557	CCHD	The WVDP is a non-transient non-community public drinking water system.	None	No expiration date.
PBS (#9-008885)	NYSDEC / PBS 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, 2016.
Asbestos-Handling License WVES #33657	NYSDOL / asbestos-handling and sampling activities	Asbestos contractors license with specific variances for handling and monitoring.	The asbestos-handling license ended August 29, 2011 at the end of the WVES contract.	License expired.
Asbestos-Handling License CHBWV #61646	NYSDOL / asbestos-handling and sampling activities	Asbestos contractors license with specific variances for handling and monitoring.	CHBWV was granted asbestos-handling license in October 2011.	License expires on September 30, 2012; 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	Two Class A Low-Hazard dams on the WNYNSC property, that supply water for drinking and operational purposes, are maintained 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.
Great Lakes Water Withdrawl Registration Certificate (NYGL08701)	NYSDEC	The legislation was enacted to gain more complete information for managing the NYS's water resources.	Certificate issued August 24, 2011.	Certificate expires on August 24, 2013.
Underground Injection Control Program Regulation (UICID: 11NY00906001)	EPA Groundwater Compliance Section	EPA regulates injection of tracer solutions into groundwater wells.	Several wells in the north plateau PTW were used to inject sodium bromide tracer solution to estimate groundwater flow velocities.	On November 18, 2010, EPA authorized operation of injection wells.

Note: Permit and license expiration dates are current as of September 2012.

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

Permit Name and Number	*Agency / Permit Type*	*Description*	*Updates*	*Status*
Bird Depredation License (32)	NYSDEC / Division of Fish and Wildlife	State license for the removal of nests of migratory birds.	License effective October 1, 2011.	Effective April 1, 2012, NYS implemented changes to NYS ECL 11-0521, no longer requiring a depredation license. Federal permitting is required.
Bird Depredation Permit (MB747595-0)	U.S. Fish and Wildlife Service	Federal permit for the limited taking of migratory birds and active bird nests.	License was submitted on October 1, 2011.	Permit expires September 30, 2012.
Nationwide Permit Number 27 (NWP-27) Stream and Wetland Restoration Activities	Joint Application; NYSDEC and USACE	Stream and wetland restoration activities at Erdman Brook and Franks Creek.	Permit effective on September 14, 2011	Permit expires on March 18, 2013.

Note: Permit and license expiration dates are current as of September 2012.

TABLE ECS-4
WVDP RCRA SSWMUs and Constituent SWMUs
Identified in the RFI

SSWMU	*SWMU #*	*Constituent SWMUs*
SSWMU #1 – Low-Level Waste Treatment Facilities (LLWTF)	3, 4, 17, 17a, and 17b	Former Lagoon 1 LLWTF and 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 – LWTS	18, 18a Sealed Rooms, and 22	LWTS Cement solidification system All sealed rooms in the MPPB (per the RFI Workplan and Current Conditions Report).
SSWMU #4 – HLW Storage and Processing Area	12/12a, 13, 19, and 20	HLW tank farm, VIT test facility waste storage areas, STS, and HLW VIT 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 additions (LSAs) #1 and #2 hardstands, old and new hardstand storage areas LAG storage building, lag storage extension and LSAs #3 and #4, and the drum supercompactor
SSWMU #7 – Chemical Process Cell Waste Storage Area (CPC-WSA)	14	CPC-WSA
SSWMU #8 – CDDL	1	CDDL
SSWMU #9 – 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 – SDA	NA	The SDA is a closed radioactive waste landfill that is contiguous with the Project premises and is owned and managed by 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)*
WVDP RCRA SSWMUs and Constituent SWMUs
Identified in the RFI

WVDP RCRA 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	VIT 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-integrity container and SUREPAK™ staging area
	45	Breach in laundry wastewater line
	46	VIT vault and empty container hardstand
	47	RHWF
	----	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 During 2011

Waste Description/ Facility	*Type of Project Generating Waste*	*Quantity in 2011*	*Discussion*
LLW	Includes all sources of generation	74,500 cubic feet (ft^3) (2,110 cubic meters [m^3])	Waste packaged and shipped
TRU waste	TRU waste processing	1,825 ft^3 (51.7 m^3)	Legacy TRU waste processed in preparation for shipment.
Hazardous and Mixed LLW	Waste management according to the STP	49,148 pounds (lb) (22.3 metric tons [mt])	Waste packaged and shipped during CY 2011
Radiological wastewater from the LLWTF (LLW2 [WNSP001])	NYSDEC regulates point-source liquid effluent discharges of treated process wastewater through the SPDES permit for the WVDP.	Approximately 13,700,000 gallons (gal) (51,800,000 liters [L])	During CY 2011, eight batches of wastewater were processed through the LLW2. This included groundwater recovered from the north plateau groundwater recovery system (NPGRS) and groundwater pumped from the NDA interceptor trench.
Treated sewage and industrial wastewaters (WNSP007)	Wastewater processing, discharge	Approximately 1,610,000 gal (60,900,000 L)	The wastewater treatment facility (WWTF) treated sanitary wastewater that was discharged through outfall WNSP007 in CY 2011.
NPGRS	Pump and treat strontium-90 contaminated groundwater	Approximately 3,320,000 gal (12,600,000 L)	The NPGRS operated to recover groundwater from an area near the leading edge of the strontium-90 plume on the north plateau. Water was treated by ion exchange in the LLW2 to remove strontium-90, then transferred to the lagoons.
NDA interceptor trench	Interceptor trench (WNNDATR) and groundwater pre-treatment	Approximately 84,400 gal (319,000 L)	Groundwater was pumped and transferred to the LLW2. No n-dodecane or tributyl phosphate were encountered in CY 2011. No pre-treatment was necessary.
Digested sanitary sludge	Waste shipping and disposal	Approximately 430,000 gal (1,630,000 L)	Digested sludge and wastewater from the WWTF were shipped to the Buffalo Sewer Authority for disposal during CY 2011.
Asbestos	Asbestos management and abatement	3,372 linear feet pipe insulation; 1,914 ft^2 asbestos-containing vessel/duct insulation and floor tile.	Insulation was removed from steam piping, vessels and ventilation ducts and floor tile was removed in the MPPB during CY 2011.
Universal waste	Spent bulbs/spent batteries	Bulbs - 1,000 lb.(0.5 ton) Batteries - 800 lbs. (0.4 ton)	Waste disposed of as universal waste.

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

TABLE ECS-6
Recycled Materials for FY 2011

Recycled Materials	*2011 Quantity*
Mixed paper and corrugated cardboard	54,300 lbs (24.6 mt)
Aluminum	70 lbs (0.032 mt)
Copper	1,047 lbs (0.47 mt)
Iron / steel	42,180 lbs (19.1 mt)
Styrofoam	30 lbs (0.014 mt)
Toner cartridges	885 lb (0.4 mt)
Wood	2,280 lbs 1.03 mt)
Fluorescent bulbs	962 lbs (0.44 mt)
Electronics reuse and recycling	19,842 lbs (9.0 mt)

TABLE ECS-7
EO 13514 Pollution Prevention/Waste Minimization Accomplishments in 2011

DOE Sustainability Award Nomination for Operation of a PTW for Mitigation for Strontium-90 in Groundwater
The WVDP selected a passive PTW technology to mitigate the spread of strontium-90 - contaminated groundwater at the WVDP. Installed in the fall of 2010, the PTW is intended to replace the existing NPGRS. The PTW is an 860-foot-long trench approximately three feet wide and up to 30 feet deep. It is a full-scale application of this technology, using a naturally-occurring zeolite-containing mineral (clinoptilolite) for in-situ selective absorption of strontium-90. The PTW was installed using a single-pass trenching system, which excavated the native soil through the surficial aquifer down to the clay confining layer and concurrently back-filled the trench with the treatment media. Upon completing the PTW construction, monitoring wells were installed to augment the existing 22 up- and down-gradient wells to evaluate its performance as a radiological groundwater contaminant mitigative measure. The performance monitoring objectives are to; 1) monitor the physical integrity of the PTW and its components, 2) assess the strontium-90 affected groundwater in the PTW vicinity, and 3) monitor and assess the removal from the groundwater moving through the PTW. During the first year of monitoring, the PTW construction and ongoing monitoring has demonstrated that all of the design functional requirements have been achieved. DOE has been nominated for a DOE Sustainability Award for operation of the PTW and mitigating strontium-90 in groundwater, based on benefits of the mitigation unit including: 1) "Sustainability" - construction is designed to meet a 20-year hydraulic and treatment performance life, 2) "Waste Minimization" - avoidance of the current use of the pump-and-treat system which generates high volumes of wastewater requiring treatment, 3) "Energy Efficiency" - this is a passive operation that requires no utilities, 4) "Resources" - the treatment media is a naturally occurring mineral with significant cation exchange capacity, 5) "Health, Safety, and Environment" - the treatment media is non-toxic, easily installed and is below ground preventing inadvertent human exposure to the absorbed strontium-90, and 6) "Cost Effective" - the PTW requires no operation and maintenance with the exception of limited landscaping, erosion control, and periodic inspection of above-ground ancillary systems.

TABLE ECS-7 *(concluded)*
EO 13514 Pollution Prevention/Waste Minimization Accomplishments in 2011

Installation of the WTF T&VDS
Through utilization of the site's EMS, the WVDP designed and successfully installed a T&VDS to evaporate remaining residual liquids inside four underground tanks in the WTF, evaporate groundwater that infiltrates into the associated underground vaults and containment pans, and maintain a low relative humidity inside the tanks and vaults so that tank corrosion is essentially halted. The EMS facilitated the process to ensure that all regulatory requirements were addressed, energy efficient components were utilized, and waste minimization was optimized. By evaporating the liquid external to the tanks, the need for liquid pumping and treatment was eliminated, the rate of external tank corrosion was greatly reduced, and the potential for a tank leak will be eliminated after the tank interiors are dried out. The WTF consists of two 760,000-gal carbon steel tanks, each contained in an underground steel-reinforced concrete vault, and two 15,000 gal stainless steel tanks both contained within a common underground steel-reinforced concrete vault. Residual liquids in these tanks at the start of this drying project were approximately 25,700 gal. The system is currently operating as expected and tank and vault liquid levels are decreasing. As of January 2012, 19,400 gal of residual radiologically contaminated liquids from the four tanks have been evaporated in addition to thousands of gallons of liquids evaporated from the three underground vaults.

TABLE ECS-8
WVDP 2011 Air Quality Noncompliance Episodes

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

TABLE ECS-9
Status of EPCRA (SARA Title III) Reporting at the WVDP for CY 2011

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 Chemical Release Inventory Reporting	Not Required

TABLE ECS-10
Reportable Chemicals Above EPCRA 312 Threshold Planning Quantities (TPQ) Stored at the WVDP in 2011

Chemicals Stored at the WVDP Above the TPQ		
Diesel fuel/No. 2 Fuel Oil	Ion-exchange media	Sulfuric acid
Unleaded Gasoline	Lead-acid batteries	Liquid nitrogen
Oils - various grades	Natural Zeolite	

TABLE ECS-11
WVDP NPDES/SPDES[a] Permit Noncompliance Episodes in 2011

Permit Type	*Outfall(s)*	*Parameter*	*No. of Permit Exceptions*	*No. of Samples Taken*	*No. of Compliant Samples*	*Percent Compliant Samples*
SPDES	All	All	1	1,723	1,722	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.

Note: The WVDP is currently executing the requirements of DOE O 458.1, including its allied derived concentration standards (DCSs).

TABLE ECS-12
WVDP Migratory Bird Nest Depredation Episodes in FY 2011

Permit/License Type	*Parameter*	*Permit/License Limit*	*Total Removed in 2011*
U.S. Fish and Wildlife - Bird Depredation Permit	Removal of Active Barn Swallow Nests	20	1
U.S. Fish and Wildlife - Bird Depredation Permit	Removal of Active American Robin Nests	15	0
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	2
U.S. Fish and Wildlife - Bird Depredation Permit	Removal of Active Common Grackle Nests	15	0
NYSDEC - Bird Depredation License	Removal of Inactive Migratory Bird Nests	Not limited	11

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ENVIRONMENTAL MANAGEMENT SYSTEM

ISMS Implementation

A plan to integrate environmental, safety, health, and quality (ESH&Q) management programs at the WVDP was developed and verified in 1998. Environmental SMEs routinely participate in a site-wide work review group to review work plans, identify ESH&Q concerns, and specify practices that ensure work is performed safely. For 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.

EMS

During the ISMS development, the EMS was identified as an integral part of the ISMS. The WVDP EMS, as established, implements sound stewardship practices that are protective of the air, water, land, and other natural and cultural resources potentially impacted by DOE operations and by which DOE cost effectively meets or exceeds compliance with applicable environmental, public health, and resource protection requirements. The EMS objectives implement sustainable practices for enhancing environmental, energy, and transportation management performance.

CY 2011 was a transition year for the WVDP. The work scope transitioned from the Interim End State contract, to implementing initial phases of the Phased Decisionmaking ROD, by selecting a new site contractor, and addressing changes to DOE Orders that directly impacted the WVDP's ISMS and EMS.

In June 2011, DOE awarded the contract to CHBWV for the Phase 1 Decommissioning and Facility Disposition activities. During a 60-day contract transition period, the previous contractor wrapped up it's work and turned over the operational responsibilities to CHBWV, effective August 29, 2011. Refer to "Contract Transition" in the Environmental Compliance Summary (ECS). During contract transition, CHBWV reviewed the Project's existing policies and procedures and accepted those that it would need to conduct its scope of work, including the EMS. To ensure continuing effectiveness of the WVDP ISMS, DOE-WVDP conducted an end-of-contract program review and assessments to document that the ISMS is implemented at the WVDP. However, it was found that some facets of the system were not always effective. To ensure ISMS is fully and effectively implemented, the program will undergo a Phase 1 and Phase 2 verification by the DOE in FY 2012.

In May 2011, DOE approved DOE Order 436.1, "Departmental Sustainability," canceling DOE Order 430.2B, "Departmental Energy, Renewable Energy, and Transportation Management," and DOE Order 450.1A, "Environmental Protection Program," the orders on which the WVDP EMS is based. DOE Order 436.1 has two major objectives, described below.

The first objective emphasizes compliance with the sustainability requirements of the following Executive Orders (EOs) and legislation:

- EO 13423, "Strengthening Federal Environmental, Energy, and Transportation Management;"
- EO 13514, "Federal Leadership in Environmental, Energy, and Economic Performance;"
- National Energy Conservation Policy Act;
- Energy Policy Acts of 1992 and 2005;
- Energy Independence and Security Act of 2007;
- Inventory and reporting requirements of the Emergency Planning and Community Right-to-Know Act, Sections 301 through 313; and
- Pollution prevention reporting requirements of the Pollution Prevent Act of 1990.

To support the federal government's sustainability goals, contractors must develop site sustainability plans (SSPs) to identify their respective contributions toward meeting the goals. Contractors must integrate their SSPs with operational plans as applicable.

The second objective addresses the EMS, in that contractors must develop and implement a system that is certified by, or conforms with, ISO 14001:2004. Site sustainability goals must be integrated into the EMS.

The environmental monitoring program is an important component of the EMS, ensuring accomplishment of its mission.

The elements of the WVDP EMS are summarized in Table 1-1.

Environmental Policy

Activities at the WVDP during 2011 were conducted in full compliance with applicable environmental statutes, DOE directives, EOs, and state laws and regulations. Refer to Table ECS-1, "Compliance Status Summary for the WVDP in CY 2011," for details.

Environmental Aspects

The environmental aspects of site activities have been identified within the elements of the WVDP EMS. 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 presented in the ECS.

The WVDP is currently in the D&D phase of operations; therefore, current work scope encompasses waste management and disposition, decontamination, deactivation, facility disposition, and infrastructure reduction. For each facility or structure that is considered for demolition, the base environmental aspects are identified and addressed during work planning with the assistance of hazard control specialists. 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 WVDP contracts with subcontractors as specific terms and conditions. Environmental regulatory reviews are conducted to identify, evaluate, and document changes to applicable environmental regulations. Items that have an effect upon compliance activities at the WVDP are communicated to other appropriate Project personnel.

Objectives and Targets

The EMS objectives and targets, established and achieved under the previous contractor's EMS, were reported in the CY 2010 Annual Site Environmental Report (ASER), and were closed-out in June 2011. The goals were intended to prevent pollution, reduce environmental hazards, protect the public and the environment, reduce waste disposal costs, and improve operational capability. The goals and objectives were evaluated using the graded approach that took into consideration that buildings and infrastructure will be demolished in the coming years.

The WVDP's "Waste Minimization and Pollution Prevention Awareness Plan" establishes the strategic framework for integrating waste minimization and pollution prevention into waste generating and reducing activities, procuring recycled products, reusing existing products, and using methods that conserve energy. The comprehensive program drives continual effort to prevent or minimize pollution, with the overall objective of reducing health and safety risks, and protecting the environment. Refer to the ECS Table ECS-6, "Recycled Materials for FY 2011," and Table ECS-7, "Executive Order 13514 Pollution Prevention/Waste Minimization Accomplishments in FY 2011."

Since the WVDP EMS was based on superceded DOE Order 450.1A, the new contractor revised the program and received a Certificate of Registration for the ISO 14000:2004 certification of its EMS on July 31, 2012, in accordance with the requirements of DOE Order 436.1. New objectives and targets will be established by CHBWV during CY 2012 to align with and assist in achieving the goals in the SSP.

Environmental Management Program

An environmental management program is a key element to successfully implementing an EMS. The program is implemented by the "WVDP EMS policy," which describes how the objectives and targets are achieved and clearly defines responsibilities and timeframes. It also provides for modifications to ensure that environmental management will apply to new developments and new or modified activities. This is accomplished through routine review and update of

TABLE 1-1
Elements of the CY 2011 WVDP EMS Implementation

Environmental Policy	
It is WVDP policy to conduct all activities, including design, construction, testing, startup, operation, maintenance, and decontamination and decommissioning in a manner appropriate to the nature, scale, and environmental impacts of those activities. Also, to comply with applicable federal and NYS laws and regulations for protection of the environment, continual improvement, the prevention and/or minimization of pollution, and public outreach, including stakeholder involvement. The WVDP EMS provides the policy and requirements to implement sustainable practices for enhancing environmental, energy, and transportation management., which provides the framework for environmental protection at the WVDP.	
Planning	
Environmental Aspects	Since the WVDP is currently in the deactivation, decontamination, and demolition phase, the significant environmental aspects are related to those activities. The environmental aspects of the WVDP work scope are addressed in work instruction packages with the assistance of Hazard Control Specialists, and all building demolitions require the completion of a Demolition Readiness Checklist. The 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 or spills, and their subsequent mitigation and future prevention.
Legal and Other Requirements	WVDP programs and operations adhere to legal and other requirements that are established by DOE Orders, Guides, Manuals, and Technical Standards and federal and NYS laws and regulations. Proposed and recently issued regulatory requirements are assessed for impact to site activities.
Objectives and Targets	The Orders require goals be established to integrate sustainable environmental stewardship goals into the site's operations as a cost-effective business practice. They place emphasis on compliance with sustainable energy conservation and energy independence EOs to reduce energy intensity needs, purchase renewable energy where economically feasible, operate alternate fuel vehicles, and reduce potable water consumption. The WVDP objectives and measurable targets, established and achieved under the previous contractor's EMS, were reported in the CY 2010 ASER, and submitted to DOE in June 2011. Transition activities to the new DOE Order 436.1 and the Site Sustainability Plan (SSP) will result in developing updated objectives and goals which align with DOE-WVDP's SPP for FY 2012.
Environmental Management Program	A key element to successful implementation of an EMS, is an environmental management program that describes aspects of environmental policy implementation applicable to the organization, and may be subdivided to address specific elements of the organization's operations. This is accomplished through policies and procedures, project schedules, milestone tracking, and commitment tracking.

TABLE 1-1 *(continued)*
Elements of the CY 2011 WVDP EMS 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. Management representatives have defined roles, responsibilities and authorities 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 actual or potential significant environmental impacts 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	Communication among the DOE, it's contractors, and external parties is a key element of the EMS. Key external parties include the regulatory agencies, local emergency responders, and stakeholders. Communications with the local stakeholders include monthly meetings with the CTF and quarterly meetings with the general public. Project information, including this entire 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 document availability at locations where operations essential to the effective functioning of the EMS are performed; provide for periodic review and revision; require prompt removal of obsolete documents from all points of issue and use; and require identification of any obsolete document retained for legal use and/or record preservation purposes. Records pertaining to the EMS are classified, inventoried, indexed, retained, and disposed of in accordance with records retention requirements.
Operational Control	Operational control is maintained through adherence to site procedures, which provide step-by-step instruction to operate within requirements, maintain compliance, and prevent environmental upsets. Those operations and activities that have the potential for significant environmental aspects have been identified and objectives and targets to reduce their potential have been established.
Emergency Preparedness and Response	An emergency preparedness and response program with specialized staff provides timely response to emergency situations, and prevents and mitigates the environmental impacts that may be associated with them. Emergency preparedness and response procedures are reviewed and revised routinely and after accidents or emergency situations occur, when appropriate. Drills and exercises are conducted to assess the effectiveness of the emergency management programs.

TABLE 1-1 *(concluded)*
Elements of the CY 2011 WVDP EMS Implementation

Checking and Corrective Action	
Monitoring and Measurement	The EMS is monitored and measured for effectiveness, as well as key characteristics of site operations and activities that can have a significant environmental impact. 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. Data 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	A process for periodically evaluating compliance with applicable legal requirements is in place. This activity is included under the "Legal and Other Requirements" EMS element.
Nonconformance and Corrective and Preventive Action	Responsibilities and authorities for handling and investigating nonconformances, taking action to mitigate any associated impacts, and for initiating and completing corrective and preventative actions have been developed.
Records	Environmental records are identified, maintained, and dispositioned in accordance with records retention requirements for record maintenance. These include training records and the results of audits and other reviews. Environmental records must be legible, identifiable, and traceable to the activity or service involved. Records are maintained so they are retrievable and protected against damage or loss.
EMS Audit (Assessments)	EMS assessments are performed to determine whether or not the EMS conforms to the policy requirements; that the EMS has been properly implemented and maintained; and to provide information to management on the assessment results. 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 addresses opportunity for improvement, the need for change, including environmental policy, and environmental objectives and targets.	
EMS Validation	
In order for the EMS to be considered fully implemented, it must meet the following: * The EMS must be the subject of a formal audit by a qualified party outside the control or scope of the EMS; * The ESH&Q Manager and the DOE-WVDP Director have recognized and addressed the findings of the audit; * The ESH&Q Manager and the DOE-WVDP Director have declared conformance of the EMS to the requirements of the DOE Orders. These steps must be completed at least once every three years.	

policies and procedures, as well as through project schedules, milestone tracking, and commitment tracking.

Structure and Responsibility

All project personnel are responsible for adherence to the site's EMS policies. In addition, specific management representatives have defined responsibility and authority for ensuring that EMS requirements are implemented in accordance with the policy, and for reporting to staff management. During 2011, audits were performed by internal and external agencies to identify areas for improvement and assess compliance to the EMS principles. For further discussion of audits, refer to "EMS Audits and Other Audits and Assessments" later in this chapter.

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. The WVDP operated throughout 2011 in a safe manner that was protective of its workers, the public, and the environment.

The radiological and hazardous work environment at the WVDP warrants strict adherence to safety procedures. During 2011, the WVDP workforce achieved a 12-month rolling average of 4.5 million safe work hours without a lost time work injury.

To accelerate cleanup projects at the site (funded under the American Recovery and Reinvestment Act [ARRA]), 68 employees received training and were introduced to the WVDP's strong safety culture, including the EMS program. The training department developed a systematic approach to assessing individual qualifications and tailoring training requirements to the individuals. The new personnel brought a wealth of field expertise, including hazardous materials management, welding, asbestos-handling certifications, and heavy equipment operation. The ARRA work continued throughout the duration of the contract, ending August 2011.

10 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 legislation superseded DOE Order 440.1A, "Worker Protection Management for DOE Federal and Contractor Employees," which directed compliance with specific Occupational Safety and Health Administration (OSHA) requirements.

Similar to the OSHA requirements, the rule established the framework for an effective worker health and safety program to provide DOE contractor workers with a safe and healthy workplace in which 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" described how the WVDP complied with 10 CFR 851. The plan was reviewed in April 2012 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 (GET) 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.

Safety-Trained Supervisor Program. A WVDP certification program is maintained whereby employees complete extensive training to become safety-certified. Standards are established by the Council on Certification of Health, Environmental, and Safety Technologists, and the certification is offered by the Board of Certified Safety Professionals. Certified personnel help ensure that the workforce stayed current with safety knowledge and practices that are applicable to managers, supervisors, and lead personnel. This is especially important in the hazardous work environment at the WVDP, where every worker is expected to be responsible for safety. The WVDP certified personnel recertify every five years by completing or conducting 30 hours of safety, health, or environmental training.

Communication

Communication continued and increased during 2011 between regulatory agencies, stakeholders, employees, and other interested parties. Activities were transitioned from the Interim End State contractor to the new contractor for the Phase I Decommissioning and Facility Disposition contract. Regulatory Roundtable presentations also enhanced the flow of information to regulatory agencies on a regular basis.

During 2011, the DOE-WVDP issued a draft WIR Evaluation of the WVDP melter. The evaluation was initially issued in draft form to facilitate consultation with NRC, as well as state and public review and comment. NRC comments and public comments on the draft assisted DOE in making it's final determination. Refer to "WIR Evaluation for the WVDP Melter" in the ECS.

DOE and NYSERDA plan to hold regular meetings with stakeholders and the public to discuss progress in the Phase 1 Study process. A climate change workshop was held on August 2, 2012. Refer to "Phase 1 Studies" in the ECS.

EMS Documentation, Document Control, and Records

All EMS documentation is maintained, updated, and controlled per the WVDP records retention requirements, or in accordance with specific regulatory requirements for records maintenance (e.g., NESHAP). During 2011, quarterly status/progress reports describing accomplishments related to EMS targets, goals, and objectives were submitted to DOE. On November 9, 2011, the "Annual Report on Sustainable Acquisition and Pollution Prevention Progress for FY 2011" was submitted via the online Federal Facilities Environmental Stewardship and Compliance Assistance Center website.

Operational Control

NDA Interceptor Trench and Pretreatment System. Radioactively contaminated n-dodecane, in combination with TBP, was discovered in groundwater at the NDA's northern boundary in 1983, shortly after DOE assumed control of the WVDP. Investigations during 1983 and 1984 determined the source and location of the kerosene-contaminated water to be from eight 1,000-gal tanks buried in the NDA. In 1985, these tanks were exhumed and the contaminated absorbent and tanks were treated and packaged for disposal. To mitigate subsurface migration of potential remaining organic mixture, an interceptor trench and liquid pre-treatment system (LPS) were installed in 1990. In 2008, a slurry wall was installed upgradient of the NDA and a geomembrane cover was installed over the NDA footprint.

Operations personnel maintain the water levels in the NDA trench and environmental monitoring personnel monitor for releases from the NDA. As in previous years, n-dodecane/TBP was not detected in the trench water; therefore, no water was treated by the LPS in 2011. Approximately 84,400 gal (319,000 L) of radiologically contaminated water were pumped and transferred from the interceptor trench to the LLW2 during CY 2011. Refer to Chapter 4, "Groundwater Protection Program," under "Groundwater Sampling Observations on the South Plateau: WLT and the NDA" for a discussion of results of surface and groundwater monitoring in the vicinity of the NDA.

North Plateau Full-Scale PTW. A plume of strontium-90 contaminated groundwater migrating to the north-northeast, has been monitored for nearly two decades. The contamination source was determined to originate from a piping leak that entered the ground below the southwest corner of the MPPB, prior to Project operations. In October and November 2010, an 860-foot-long zeolite-filled full-scale PTW was installed along the existing roadway south of the CDDL. The PTW allows groundwater to pass through, while adsorbing the radioactive strontium-90. The zeolite used as the PTW is a natural mineral with a porous structure that adsorbs positively charged ions, such as strontium. Sixty-six groundwater monitoring wells were installed to monitor the wall's performance. The work for this project was completed using ARRA funding. Refer to Chapter 4, "Groundwater Protection Program," under "Strontium-90 Plume Remediation Activities" for further discussion.

Emergency Preparedness and Response

In the event of health, safety, or environment emergencies, the incident commander (IC) activates the emergency operations center (EOC) and the technical support center (TSC) in accordance with site emergency response organization (ERO) procedures.

Throughout 2011, Emergency Management, ERO, and Operations personnel participated in 28 drills and/or exercises.

On June 22, 2011, the "Beyond Design Basis Accident EOC Activation Exercise" was conducted. A Beyond Design Basis accident is an event more severe than the event that formed the design basis of the WVDP infrastructure and safety systems. In this scenario, an extremely unlikely earthquake caused substantial damage to the site, personnel injuries, total loss of power, and the potential of the spread of contamination. The exercise objectives included: activation and declaration that the EOC as operational; completion of the notification process within the desired time frame; collaborative functionality of the ERO personnel to safely minimize the hazards; identification of steps to protect personnel and prevent potential spread of contamination; and development of an initial plan for recovery.

In this scenario, the combined EOC and TSC staff effectively evaluated the event and took appropriate actions to protect personnel, the environment, and the facility. They discussed measures for personnel accountability, off-site communications, logistics, characterization of contamination spread and dose rates. An appropriate recovery plan approach was developed and discussed; recognizing that in a real event, this would take weeks or months given the nature of the proposed damage. Overall, the actions evaluated in this exercise demonstrated proper training and knowledge of emergency response processes and procedures for a Beyond Design Basis event.

On June 27, 2011, a Transportation Event Management Organization (TEMO) Exercise, "LLW Transportation Accident" was completed. The TEMO correctly assessed the event, verified or provided guidance to the on-scene IC on emergency response, provided appropriate technical advice upon request, and developed plans for immediate response and recovery.

The ERO refresher training was updated and completed by 62 individuals. The emergency management sections of GET and the CHBWV annual mandatory briefing were also updated to reflected changes in the program. The CHBWV management team was provided training in ERO expectations and their assigned EOC positions.

Environmental Monitoring and Measurement

Since the WNYNSC is not an active nuclear fuel reprocessing facility, the environmental monitoring program at the WVDP focuses on measuring radiological and chemical constituents associated with the aged residual by-products of former Nuclear Fuel Services Inc. (NFS) operations, the Project's former HLW treatment operations, and the current operations for management of HLW, transuranic, and LLW.

Exposure to radioactivity from site activities could occur through air, water, and food pathways. Therefore, these potential pathways are monitored at the WVDP. Air and surface water pathways are the primary means by which radioactive material could move off site.

The on- 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- and off-site radioactivity levels 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. 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 40 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 currently be present at less than 1/100,000 of their 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 radiological and 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 contained, sampled, and analyzed before its release through a SPDES-permitted outfall. In 2011, about 13.7 million gal (57.8 million L) of water were discharged through outfall 001, the lagoon 3 weir. Table 1-2 summarizes the estimated radioactivity releases in the 2011 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 above the 10-year average. (See "Predicted Dose From Waterborne Releases" in Chapter 3.)

Effective operation of the site WWTF is indicated by compliance with the applicable discharge limits regu-

TABLE 1-2
2011 Radioactivity Releases Versus 10-Year Averages[a]

Radionuclide	*10-Year Average Curies*	*2011 Curies*	*% of 10-Year Average*
Aqueous Discharge LLW2			
Tritium	0.084	0.039	47%
Gross Alpha and Beta	0.017	0.021	130%
Airborne Discharge ANSTACK			
Gaseous			
Tritium	0.012	0.0072	62%
Iodine-129	0.00012	0.000018	15%
Particulate			
Gross Alpha and Beta	0.00017	0.00042	250%

[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.

lated by the SPDES permit. Approximately 60 chemical and water quality constituents are monitored regularly. The analytical results are reported to the NYSDEC via monthly Discharge Monitoring Reports (DMRs), required under the SPDES program. There was one SPDES effluent limit exceedance, for mercury at outfall 007, during 2011 and two noncompliance events. (See "SPDES Permit Noncompliance Events" in the ECS.) Historical limit exceptions are discussed in previous ASERs. Although the goal of the LLW2 and 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.

The north plateau groundwater recovery system (NPGRS) operated throughout 2011, recovering groundwater from an area within the western lobe of the strontium-90 plume on the north plateau. During 2011, approximately 3.3 million gal (12.6 million L) were recovered and treated by ion exchange to remove strontium-90. The water was transferred to the lagoon system and ultimately discharged through the lagoon 3 weir. For a more-detailed discussion of the plume and the NPGRS, see "Strontium-90 Plume Remediation Activities in 2011" in Chapter 4.

Environmental Management of Airborne Emissions. During operations, ventilated air from various WVDP facilities is 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.

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. Therefore, 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 typically not necessary.

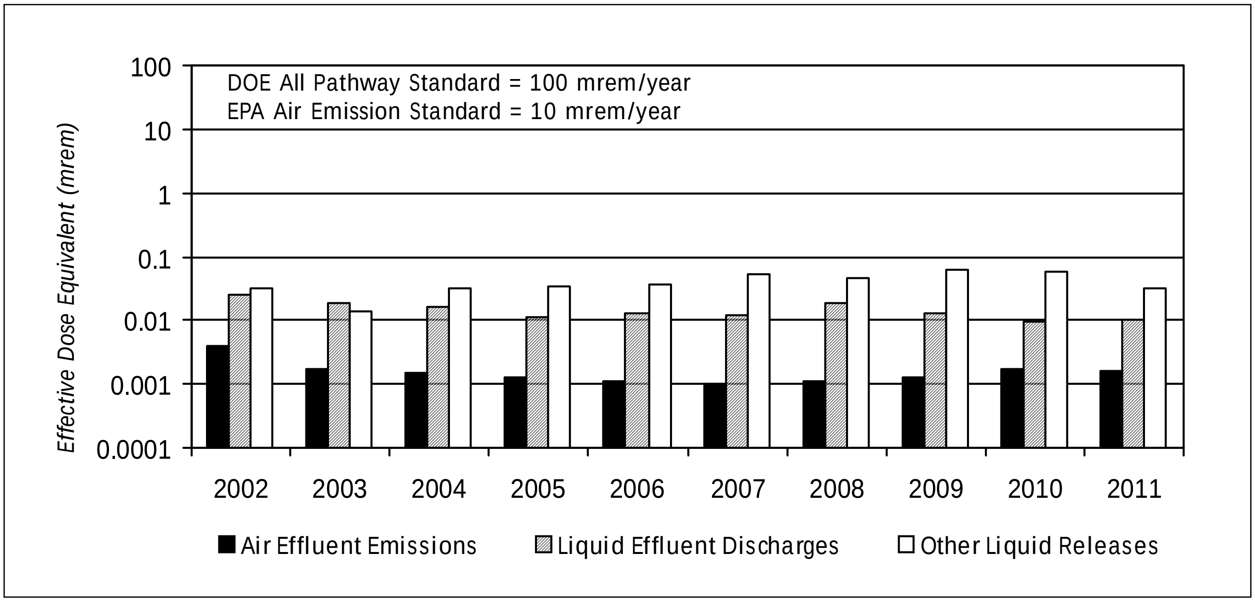
Table 1-3 shows the gaseous and particulate matter radioactivity emissions from the MPPB (location ANSTACK) in 2011 compared to averages from the previous 10-year period. Tritium and iodine-129 were well below the 10-year average. However, gross alpha and gross beta annual total for ANSTACK in 2011 was 250% of the 10-year average. This increase was due to activity released during the first half of the year during power interruption and stack blower issues. Nevertheless, the impact of this release was inconsequential to human health and the environment as discussed in "Unplanned Radiological Airborne Release" in Chapter 2.

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 (ALARA) policy, the low potential radiological dose to the MEOSI is an indicator of well-managed radiological operations.

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



The relative dose equivalents for radiological air emissions, liquid effluent discharges, and other liquid releases (including drainage from the WNSWAMP ditch) from 2002 through 2011 are graphed on Figure 1-1. Note that, when summed, the total dose is well below the DOE standard of 100 mrem per year. The consistently low effluent concentrations 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 458.1 and RCRA §3008(h) Consent Order requirements, as approved by NYSDEC and EPA. Monitoring continued during 2011. Refer to Chapter 4, "Groundwater Protection Program," for details.

Environmental Management of Radiation Exposure. Ambient environmental radiation is measured with thermoluminescent dosimeters (TLDs) at on- and off-site locations. (See Figures A-10 through A-12.) Consistent with historical data, 2011 results from three of the eight TLDs located near on-site waste storage facilities on the north plateau were generally higher than background. Results from perimeter TLDs that would be more representative of exposure to the public were statistically indistinguishable from background concentrations. (See "Environmental Radiation" in Chapter 2.)

Nonconformance and Corrective and Preventative Action

Throughout CY 2011, comprehensive evaluations, reviews, audits, and assessments were performed evaluating the implementation of EMS elements at the WVDP. During CY 2011, there was one SPDES permit limit exceedance and two noncompliance events that occurred at the equalization basin, SPDES outfall 007 (see "SPDES Permit Noncompliance Events" in the ECS). There were no regulatory inspection findings. Results from various assessments indicate that an effective EMS has been implemented at the WVDP. Performance against metrics is outstanding and there were few environmental performance issues.

When a deficiency or issue is noted during an audit or assessment, corrective actions are initiated in a timely manner. In addition, there is a robust and well-managed operating experience program (Lessons Learned) at the WVDP. During CY 2011, over 2,100 items (internal and external) were screened for Lessons Learned applicability, resulting in 68 Lessons Learned being issued. Refer later in this chapter to "EMS Audits and Other Audits and Assessments" for further discussion.

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. Subcontractor laboratories providing analytical services for the environmental monitoring program are contractually required to maintain a QA program consistent with WVDP requirements.

10 CFR Part 830, Subpart A, "Quality Assurance Requirements," Section 830.122, "Quality Assurance Criteria," and DOE Order 414.1D, "Quality Assurance" (DOE, April 2011), document the QA program policies and requirements applicable to WVDP activities. The WVDP QA program implements the 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 are presented below.

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. WVDP program, project, and task managers 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, precisely specified, and verified for correctness upon receipt.

Training. Anyone performing an activity supporting 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 controlled so that only approved and current procedures are used.

Equipment or particular items affecting environmental data quality 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 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. All activity records must be kept to verify work done and by whom. Records must be clearly traceable to an item or activity. Records such as field data sheets, chain-of-custody (C-O-C) 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 sample type, 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 continually collected in the same location. 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 sample information, 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.

C-O-C 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 C-O-C form. Subcontract laboratories are required by contract to maintain internal C-O-C 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 2011, samples were collected by ELAB personnel. On-site analyses were performed at the ELAB or the WWTF laboratory. Off-site analyses were performed by General Engineering Laboratory (GEL) (Charleston, South Carolina), TestAmerica Laboratories, Inc. (Buffalo, New York), and Environmental Dosimetry Company (Sterling, Massachusetts). As samples were collected, shipped, and analyzed, C-O-C documentation was maintained to track sample possession from 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 NYS, both on-site and subcontract analytical laboratories are required to maintain the relevant 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 constituent of interest concentrations traceable to the National Institute of Standards and Technology (NIST) 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 have 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 DOE to participate in formal crosscheck programs to test the quality of environmental measurements being reported to DOE by its contractors. Crosscheck samples for radiological constituents are analyzed on site by the ELAB and off site by GEL. In 2011, the WVDP participated in the DOE Radiological Environmental Sciences Laboratory Mixed Analyte Performance Evaluation Program (MAPEP), which provides performance evaluation samples for both radiological and nonradiological constituents. Results are listed in Appendix G.

- Nonradiological Crosschecks

  As a SPDES Permittee, the WVDP is required to participate in the EPA DMR QA performance evaluation studies (2011 DMR QA Study #31) 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 sample analyses that contain radiological contamination participate in the DOE MAPEP program.

  In 2011, nonradiological crosschecks were analyzed by the WVDP WWTF Laboratory, the ELAB, GEL, and TestAmerica. Results are summarized in Appendix G.

TABLE 1-3
Summary of Crosschecks Completed in 2011

Type	*Number Reported*	*Number Within Acceptance Limits*	*Percent Within QC Limits*
Radiological	92	90	97.8%
Non-radiological	158	157	99.4%
All types	250	247	98.8%

Results for 2011 from all laboratories that analyzed samples from the WVDP monitoring program are summarized in Table 1-3. As presented, 98.8% of the crosschecks performed in 2011 were acceptable.

Data Management

The Environmental Laboratory Information Management System (ELIMS) is a database system used at the WVDP to establish environmental sample identification numbers, maintain the sample data log, track samples, manage field and analytical data, and record data validation status and results. The ELIMS is used as a controlled-source database for generating reports and statistical evaluations of data sets to support environmental monitoring and surveillance activities. Subcontract laboratories are requested to provide data in electronic format for direct entry into the ELIMS 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 data quality and usability. A graded approach is applied that, based upon data quality objectives, dictates the review rigor of the documentation associated with sample collection and/or sample analysis. In the WVDP environmental program, data are validated per approved standard procedures before it is assigned approval status and made ready for data assessment.

Data Assessment and Reporting

Approved 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.

Environmental monitoring program data 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.

EMS Audits and Other Audits and Assessments

Audits, assessments, and surveillances are an important part of improving the WVDP's safety program. An Integrated Assessment Council, made up of representatives from different departments, has been established 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 (IAP) are tracked in a centralized database, statused weekly with senior management, and trended via a quarterly performance analysis program.

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. Audit personnel (whether external or internal) are empowered and encouraged to bring safety-related issues to the immediate attention of management and, if serious enough, to stop work.

During an audit or assessment, a "finding" is a non-compliance 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.

DOE-WVDP Audit of the NESHAP Program. During January 24–26, 2011, the DOE-WVDP conducted an assessment of the NESHAP program at the WVDP, through interviewing personnel and organizations, observing work activities, and reviewing pertinent documents. Among the elements evaluated were compliance with 40 CFR Part 61, and EPA requirements relative to air emissions and reporting.

Four findings were identified resulting from the assessment; two findings were a request for more information, one finding was the need for a minor procedural modification, and one finding resulted in re-establishment of annual stack inspections as described in the cover letter of the NESHAP report to the EPA. The overall adequacy and implementation of the WVDP NESHAP program was considered effective. All findings were promptly addressed and the assessment was closed.

FY 2011 ISMS and QA Effectiveness Review. CHBWV assumed operation of the WVDP under the Phase 1 Decommissioning and Facility Disposition contract on July 1, 2011, and performed a limited effectiveness review for the performance period of August 29, 2011 through September 30, 2011. The effectiveness review time frame was extended to allow for contractor transition.

Work documents, event and injury reports, self-assessments, due diligence findings, employee concerns, and external surveillances were reviewed to provide supportive details for comparison with the ISMS and QA effectiveness criterion. CHBWV concluded that adequate ISMS and QA programs are in place, and have been appropriately staffed for the near-term work associated with the Phase 1 Contract. Supplemental human performance and safety culture improvements are underway to ensure achievement of FY 2012 performance measures, objectives, and commitments.

NYSDOH ELAP Audit of the ELAB. NYSDOH performed a two-day audit of the ELAB from October 12–13, 2011 for ELAP certification. All certified analysis procedures and QA/QC practices were reviewed. No findings or observations were ntoed, and the laboratory was found to be in compliance with the requirements of 6 NYCRR Subpart 55-2 for good laboratory practice.

DOE-WVDP Audit of the CHBWV Environmental Protection Programs. DOE-WVDP audited the environmental protection programs from November 1 through 8, 2011. The audit identified no concerns, two findings, and one commendable practice. The first finding was related to required updates to waste stream codes in the STP for the submerged bed scrubber and Tank 8D-4 wastes. Once these wastes are sampled, analyzed, and the data are evaluated, they may be reclassified with updated waste codes, if appropriate. The second finding was procedural, in that the standard operating procedure (SOP) for maintaining the surface of the CDDL states that the CDDL surface should be compacted in the spring using a vibratory roller. With concurrence from NYSDEC, the SOP has been revised to state that compaction of soils will only be done if required, due to settling or disturbance of the cover. A commendable practice was noted for the effective staff training requirement and tracking mechanism utilized in the ELAB by the training coordinator.

With the exception of the two findings, all other activities evaluated during the audit were found to be effective and in compliance with applicable federal, state, DOE, and CHBWV program requirements. Environmental programs associated with hazardous waste management are effective, with elements of sustained effective performance and identified opportunities for improvement.

CHBWV Audit of GEL Laboratories. CHBWV conducted an external QA audit of GEL on December 12–15, 2011. The audit's purpose was to assess QA and technical programs to verify compliance with the CHBWV contract and verify corrective actions which addressed issues identified during previous audits.

The audit resulted in one finding, two observations, and two commendable practices. The finding was a repeat observation from the 2010 audit that noted a discrepancy between the "GEL QA Plan" and the "Bioassay Data Review, Validation, and Package Assembly" procedure. The first states that a certificate of analysis report is reviewed by the Project Manager or Project Manager Assistant, whereas the latter states that "the package is then reviewed by the validator, team, or group leader."

The first observation noted a discrepancy regarding the requirement to procure Type II suppliers to provide analytical, calibration, or waste management services, but contrary to this, the approved vendor list categorized waste brokers and calibration services vendors as Type I vendors. The second observation noted a discrepancy in the title of a referenced appendix SOP that was changed during the last revision in May 2011. The referenced title was updated appropriately.

The commendable practices stand out as positive aspects of GEL's operations. The first commendable practice noted GEL's retention of personnel who take pride in their work and appear to be very motivated to perform quality work. Retention of valued personnel allows GEL to maintain a sound overall program that enhances the application of valuable lessons learned. The second commendable practice was noted in efficiently using technology for sample and data handling, as well as individual personnel training records and training notifications.

An audit closure notification letter, as well as objective evidence, was provided to CHBWV on March 12, 2012, providing necessary documentation needed to support resolution of the audit finding and observations.

The audit team concluded that GEL Laboratories demonstrated a mature, well-defined QA program which was effectively administered.

QA Audit of the ELAB. On December 19–20, 2011, CHBWV performed an external QA audit of the ELAB, fulfilling the annual requirements of the National Environmental Laboratory Accreditation Conference standard. The ELAB has a QA program that is based on NQA-1, 1989 and is integrated with CHBWV's QA program. The audit focused on program elements in accordance with the standard. Although the audit identified two findings regarding QA records, the report concluded that the ELAB QA program is implemented and effective.

The first finding identified access to quality records were not always controlled and identified when the record storage containers were not under direct laboratory control. Even though the storage cabinets were identified as belonging to the ELAB, additional specific labeling was secured prior to the audit closeout. In addition, staff were retrained on the need to keep cabinets locked at all times, when left unattended.
The second finding identified multiple cabinets of materials in the analytical laboratory in the MPPB, which have not been categorized as record vs nonrecord. The laboratory has been "principally closed" for an extended period, and many of those remaining documents are radioactive-source certificates for materials that still reside in the laboratory. Laboratory staff are working with appropriate property management personnel to disposition the sources, and maintain the appropriate records. Other records were compiled and transferred to Records.

Other audited items included procurement document control, porcedural compliance, control of purchasing items and services, identification and control of items, handling, storing, shipping, and packaging items. No deficiencies were found in these items.

Environmental Assessments and Surveillances

During 2011, self-assessments were conducted to verify programmatic effectiveness and functional compliance with site procedures and applicable regulations.

DOE-WVDP Oversight Assessment of the North Plateau Plume Mitigation – PTW Installation. From October 2010 through March 24, 2011, DOE performed an oversight assessment of the PTW installation. The criteria used to assess the project were from DOE Order 413.3B, "Program and Project Management for the Acquisition of Capital Assets." The surveillance focused on installation activities, site preparation, material delivery, construction of the soil catchment, trenching, soil management, PTW and soil catchment closure, decontamination/demobilization, and well installation. Assessment personnel reviewed activities focusing on health and safety, radiation safety, QA, environmental protection, and overall compliance with work documents, as well as various field changes that were initiated during construction. The assessment identified six comments which were previously addressed by the contractors. There were no concerns or findings associated with this assessment.

Surveillance of Groundwater Tracer Dilution Tests. On February 23, 2011, a QA surveillance was conducted in the lab and in the field to ensure compliance with procedures related to well tracer dilution tests performed in the PTW. Specific areas of interest were instrument calibrations, equipment setup and assembly, data collection intervals, and measurement records. Results of the surveillance were satisfactory.

Supplier Surveillance. On March 23, 2011, a supplier surveillance was performed to verify calibration of scales and required documentation per purchase order requirements. Technicians were observed performing calibrations of scales in the ELAB, using NIST standards, documenting, reviewing calibration, and applying calibration stickers to each instrument. Results of the surveillance were satisfactory.

DOE-WVDP Oversight Assessment of the SPDES Best Management Plan (BMP) and SWPPP. On March 28, 2011, DOE-WVDP performed an assessment of the SPDES BMP and SWPPP for the WVDP, evaluating compliance with the SPDES permit BMP requirements. There were no concerns or findings associated with the assessment; however, it was recommended that the noted comments might be addressed in the next revision of the SPDES BMP and SWPPP.

DOE-WVDP Oversight Assessment of the Air Monitoring Program. In August 2011, DOE-WVDP performed an assessment of the WVDP air monitoring program, evaluating compliance with NESHAP rules and regulations. The air monitoring program was designed to ensure that public health and safety and the environment continue to be protected, from potential releases of radioactive substances due to site activities. The assessment scope covered the ambient and point source monitoring program including: sampler maintenance and calibration; effluent stack operations and alarm response; sample collection, receipt and handling, instrument calibration; and ambient air sampler siting. There were no findings or concerns identified during the assessment. The air monitoring program was found to be adequate and in compliance with NESHAP regulations.

DOE-WVDP Operational Inspection of the WVDP Stack Air Effluent Monitoring and Sampling Systems. During the period from August 24, 2011 to December 2, 2011, DOE-WVDP observed the operational inspection and sampling processes at the monitoring and sampling systems associated with effluent air monitoring at the WVDP. The assessment criteria were based on DOE Orders and Standards, and 10 CFR. There were no concerns identified during the assessment, but one finding was identified. The finding was related to a requirement that "exit routes must be free and unobstructed." The exit route from the stack shed on the MPPB roof was not free of obstruction. The object was cleared and the route was verified to be unobstructed. DOE also noted five comments that were provided for consideration to improve safety and performance.

WVES Environmental Affairs Assessment of RCRA Hazardous/Mixed Waste Container Storage Management. During March 16–23, 2011, Environmental Affairs conducted observations and assessments of RCRA hazardous/mixed waste containers stored in the interim status facilities, satellite accumulation areas, 90-day storage areas, and observed activities related to universal waste management. There were three findings identified relating to missing or improper labels, missing or inconsistent start/stop dates, and one label with incorrect identification, based on regulatory nomenclature. Information was immediately provided to appropriate supervisors, and all conditions were corrected and posted appropriately immediately or within 24 hours.

WVES Environmental Affairs Assessment of Environmental Monitoring Procedural Updates to Address SPDES Permit Update Requirements. An assessment of the affected environmental monitoring procedures and the plan for implementating updates to address the sampling and analytical requirements of the revised SPDES permit, effective July 1, 2011, was performed during June 13–20, 2011. The "Environmental Monitoring Program Plan," "Monitoring Plan for Storm Water Discharges at the WVDP," and the Clean Water Act (CWA)/ SPDES BMP and SWPPP were reviewed and assessed for compliance with the CWA requirements. There were no concerns or findings identified during the assessment. Favorable practices were noted relating to the substantial review and evaluation of affected procedures, providing advanced review drafts, and issuance of the procedures in a timely manner to allow for implementation prior to the July 1, 2011 effective date of the revised SPDES permit.

WVES Environmental Affairs Assessment of the BMP for the Management of Lead Bullets at the Live-Fire Range (LFR). Environmental Affairs performed an assessment of the LFR on June 15, 2011. The LFR continues to be used by security staff at the WVDP for training. The assessment covered current conditions at the LFR, and evaluated the need for mitigative measures to control potential migration of chemical constituents to the surrounding environment. No findings were identified during the assessment. Observations noted the need for mowing the heavy vegetation to prevent tripping and insect hazards, and recommended performing housekeeping to remove debris.

EMS Management Review

As discussed under the "FY 2011 ISMS and QA Effectiveness Review," senior management performed and submitted an annual effectiveness review and declaration to DOE on November 29, 2011. This effectiveness review included review of the WVDP EMS. CHBWV concluded that adequate ISMS and QA programs are in place, and have been appropriately staffed for near-term work associated with Phase 1 decommissioning and facility disposition.

EMS Validation

The WVDP EMS was validated and recognized by EPA as a well-established system with a proven compliance record. In 2009, a third-party audit of the EMS was conducted as part of DOE Order 450.1A implementation. The audit concluded that the EMS was fully implemented and a declaration was transmitted to DOE-HQ. This audit is required to be performed once every three years. Similarly, validation of DOE Order 436.1 (Departmental Sustainability) implementation will be obtained by CHBWV when practical. A key element is the development of the SSP.

EMS Experiences

EMS Challenges. During 2011, some DOE Orders changed as did the site contractor, thereby necessitating adjustments. One of which was CHBWV committing to becoming ISO 14001 registered and align the site's EMS program with EO 13514, DOE Order 436.1, and the DOE's Strategic Sustainability Performance Plan (SSPP). A training program will be developed to communicate the changes in the site's EMS program to both management and the workforce.

A major challenge for the WVDP is minimizing waste generation when the major work consists of demolishing radiologically contaminated facilities. Overcoming this challenge is accomplished by detailed work planning that considers methods to minimize each of the environmental aspects of the work and draws upon the lessons learned from other projects.

EMS Best Practices/Lessons Learned. The EMS Best Practices/Lessons Learned process is best exemplified by the design and installation of the north plateau PTW and the WTF T&VDS. Both projects are discussed in the ECS under the "2011 Accomplishments and Highlights at the WVDP" section. Performance monitoring of both systems have been very favorable throughout CY 2011.

EMS Benefits to Agency Mission. The benefits of implementing an EMS at the WVDP are to maintain compliance, reduce operating costs, integrate environmental programs into the mission and overall safety culture, increase employee involvement, and reduce environmental impacts. These specifically include:

- minimizing the environmental impacts of D&D activities;
- reusing excess materials by transfer to other DOE facilities, Federal and State agencies, various DOE-sponsored programs, donation programs, auctions, and sales; and
- safe removal of asbestos from highly radiologically contaminated areas.

DOE-WVDP SSP Goals and Performance

The DOE-WVDP is committed to supporting the goals of DOE Order 436.1, "Departmental Sustainability," to:

- ensure that the DOE carries out it's missions in a sustainable manner to address national energy security and global environmental challenges, and advances sustainable, efficient, and reliable energy for the future;
- institute wholesale cultural changes to factor sustainability and greenhosue gas (GHG) reductions into all management decisions; and
- ensure DOE achieves the sustainability goals established in the SSPP pursuant to applicable laws, regulations and EOs, related performance scorecards, and sustainability initiatives.

The WVDP has a well-established culture of environmental stewardship. The WVDP's EMS promotes pollution prevention, waste minimization, and energy and water conservation. These are incorporated into the site's culture through standard practices, procedures, training, and encouragement of new ideas. The SSP for the WVDP was prepared and applicable goals were established to support the sustainability goals of the Order. Even though many of the DOE's sustainability goals do not apply to the WVDP, energy, water consumption, and GHG emissions will decrease as decommissioning activities progress and parts of the site footprint are returned to their natural state. Table 1-4 presents a summary of the WVDP's FY 2011 performance status and planned actions for FY 2012 for those sustainability goals that are applicable at the WVDP.

Summary

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

During 2011, there was one SPDES effluent permit limit exceedance for mercury at outfall 007, and two noncompliance events also associated with the outfall. (See "SPDES Permit Noncompliance Events" in the ECS.) Although there was one unplanned radiological airborne release at the main stack during the first semiannual period of 2011, the impact of the release was inconsequential to human health and the environment. Refer to "Unplanned Radiological Airborne Release" in Chapter 2.

TABLE 1-4
DOE - SSP Goal Summary and Performance Status

SSP Goal #	DOE Goal	FY 2011 WVDP Performance Status	WVDP Planned Actions and Contributions
Goal 1	28% Scope 1 & 2 GHG reduction by FY 2010 from FY 2008 baseline	2008 baseline established. Scope 1 & 2 GHG reduced by 14.3% Note: applies to fleet vehicles and energy consumption only	Cessation of operations and demolition of buildings & structures is underway and will continue during the next 6 years. Reduce fleet as appropriate.
Goal 2	7.5% of site's annual electricity consumption from renewable sources by FY 2013 and thereafter (5% FY 2010–2012)	10% renewable energy credits (RECs) (5% old, 5% new)	Additional RECs will be purchased as available.
Goal 3	2% annual reduction in fleet petroleum consumption by FY 2020 relative to 2005 baseline	Acquired 3 electric carts from another DOE facility. 17.5% reduction from FY 2005.	Alternate Fuel is not available; use of electric carts will be encouraged; fuel consumed primarily for short-distance site activities.
Goal 4	75% of light duty vehicle purchases must consist of alternate fuel vehicles (AFVs) by FY 2015	45% of the fleet are AFV One vehicle was replaced in FY 2011 with an AFV	AFVs will be purchased as older vehicles are replaced.
Goal 5	Reduce fleet inventory by 35% within the next 3 years relative to FY 2005 baseline	Fleet size in FY 2005 - 18 Fleet size in FY 2011 - 22 18% increase	Operations for fleet reductions will be evaluated.
Goal 6	13% Scope 3 GHG reduction by FY 2020 from a 2008 baseline	Minimal reduction from 2008 baseline	Few options are available for this small site population in the rural location.
Goal 7	Divert at least 50% of nonhazardous solid waste, excluding construction and demolition debris, by FY 2015	24.7% diverted in FY 2011.	Continue to explore avenues to increase recycling and diversion
Goal 8	Divert at least 50% of construction and demolition materials and debris by FY 2015	Tracking for construction and demolition waste was not in place for 2011; however, no demolition took place. All waste was tracked as municipal solid waste.	A mechanism has been established for tracking construction and demolition waste in FY 2012 and beyond.
Goal 9	Procurements meet sustainability requirements and include sustainable acquisition clause (95% each year)	100% met in FY 2011.	Continue to meet goal.
Goal 10	Electronic Stewardship - 100% of eligible personal computers, laptops, and monitors with power management actively implemented and in use by FY 2012	95% enabled	Continue to provide guidance to site personnel on importance of using power saving options.

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ENVIRONMENTAL MONITORING

Monitoring Program

The WVDP environmental monitoring program goal 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. Water, air, and other environmental media samples are collected 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 on maps showing the 2011 sampling locations. In accordance with DOE Order 458.1 (Change 2), 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., 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, their concentrations. Data from each sampling location are compared with regulatory or guidance limits (if applicable) to identify any exceedances. DOE published DOE-STD-1196-2011 (which includes the DCSs) in April 2011, replacing the DOE derived concentration guides (DCGs) (found in superceded DOE Order 5400.5), as guidance levels for radiological constituents in air and water. These DCSs are presented in Table UI-4 in the “Useful Information” section of this report, and are used throughout this ASER as comparative standards. Refer to the ECS for further discussion. 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 constituent concentrations, are occurring. If indicated, follow-up actions are evaluated and implemented as warranted.

Waterborne Effluent Monitoring

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 LLW2 and the WWTF. After leaving the Project at the site security fence, Franks Creek receives drainage from the northeast swamp areas on the north plateau and from Quarry Creek, which receives drainage from the north swamp location WNSW74A. Franks Creek then flows into Buttermilk Creek, which, after flowing northward through the WNYNSC, enters Cattaraugus Creek and leaves the WNYNSC. (See Figures A-2 and A-5.)

Waterborne Radiological Releases. Two locations, the lagoon 3 weir at outfall 001 (WNSP001 on Figure A-2) and a natural drainage from the northeast swamp (monitoring point WNSWAMP on Figure 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 the north swamp [point WNSW74A] on the north plateau, 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.)

Discharge through the lagoon 3 weir at SPDES outfall WNSP001 into Erdman Brook is the primary controlled point source of liquid release from the Project. Eight batch releases totaling about 13.7 million gal (51.8 million L) were discharged from WNSP001 in 2011. Drainage from the WNSWAMP location in CY 2011 was estimated to be approximately 33.4 million gal (126 million L). Estimates of curies released from these two sources in 2011 and average radionuclide concentrations are summarized in Tables 2-1 and 2-2.

DOE-STD-1196-2011 defines DCSs as radionuclide concentrations that, under conditions of continuous exposure for one year by one exposure mode, would result in an effective dose equivalent of 100 mrem (1 millisievert [mSv]). The DCSs are applicable only at

TABLE 2-1
Total Radioactivity Discharged at Lagoon 3 (WNSP001) in 2011 and Comparison of Concentrations with DOE DCSs

Isotope [a]	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *(Becquerels)*	*Average Concentration (µCi/mL)*	*DCS* [d] *(µCi/mL)*	*Ratio of Concentration to DCS*
Gross Alpha	1.14±0.10E-03	4.21±0.38E+07	2.20±0.20E-08	NA[e]	NA
Gross Beta	2.03±0.03E-02	7.50±0.12E+08	3.91±0.06E-07	NA[e]	NA
H-3	3.93±0.10E-02	1.45±0.04E+09	7.59±0.19E-07	1.9E-03	0.0004
C-14	6.11±5.92E-04	2.26±2.19E+07	1.18±1.14E-08	6.2E-05	0.0002
K-40	5.91±7.13E-04	2.19±2.64E+07	1.14±1.38E-08	NA[f]	NA
Co-60	0.26±2.53E-05	0.96±9.35E+05	0.50±4.88E-10	7.2E-06	<0.0001
Sr-90	9.89±0.12E-03	3.66±0.05E+08	1.91±0.02E-07	1.1E-06	0.1736
Tc-99	4.71±0.55E-04	1.74±0.20E+07	9.10±1.07E-09	4.4E-05	0.0002
I-129	5.93±2.70E-05	2.20±1.00E+06	1.15±0.52E-09	3.3E-07	0.0035
Cs-137	1.72±0.06E-03	6.38±0.21E+07	3.33±0.11E-08	3.0E-06	0.0111
U-232[g]	2.89±0.09E-04	1.07±0.04E+07	5.58±0.18E-09	9.8E-08	0.0569
U-233/234[g]	1.98±0.09E-04	7.32±0.32E+06	3.82±0.17E-09	6.6E-07[h]	0.0058
U-235/236[g]	9.43±2.00E-06	3.49±0.74E+05	1.82±0.39E-10	7.2E-07	0.0003
U-238[g]	1.64±0.08E-04	6.08±0.29E+06	3.17±0.15E-09	7.5E-07	0.0042
Pu-238	6.85±1.41E-06	2.53±0.52E+05	1.32±0.27E-10	1.5E-07	0.0009
Pu-239/240	4.64±1.21E-06	1.72±0.45E+05	8.96±2.33E-11	1.4E-07	0.0006
Am-241	7.13±1.53E-06	2.64±0.57E+05	1.38±0.30E-10	1.7E-07	0.0008
Sum of Ratios					0.26

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: 5.18E+10 milliliters (mL) (1.37E+07 gal)

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

[d] DCSs are listed for reference only. DCSs 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 DCSs do not exist for indicator parameters gross alpha and gross beta.

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

[g] Total uranium (grams [g]) = 4.70±0.06E+02; average uranium concentration (micrograms [µg]/mL) = 9.08±0.12E-03

[h] The DCS for U-233 is used for this comparison.

TABLE 2-2
Total Radioactivity Released at Northeast SWAMP (WNSWAMP) in 2011 and Comparison of Concentrations with DOE DCSs

Isotope [a]	N	Discharge Activity [b] (Ci)	Radioactivity [c] (Becquerels)	Average Concentration (µCi/mL)	DCS [d] (µCi/mL)	Ratio of Concentration to DCS
Gross Alpha	26	0.01±1.46E-04	0.05±5.40E+6	-0.01±1.16E-09	NA[e]	NA
Gross Beta	26	4.16±0.05E-01	1.54±0.02E+10	3.29±0.04E-06	NA[e]	NA
H-3	26	7.08±1.96E-03	2.62±0.73E+08	5.60±1.55E-08	1.9E-03	<0.0001
C-14	2	-0.29±3.52E-03	-0.11±1.30E+08	-0.23±2.79E-08	6.2E-05	<0.0005
Sr-90	12	2.09±0.01E-01	7.74±0.04E+09	1.66±0.01E-06	1.1E-06	1.51
I-129	2	-1.68±7.49E-05	-0.62±2.77E+06	-1.33±5.92E-10	3.3E-07	<0.0018
Cs-137	12	-0.20±4.93E-05	-0.08±1.83E+06	-0.16±3.90E-10	3.0E-06	<0.0001
U-232[f]	2	-6.14±4.72E-06	-2.27±1.74E+05	-4.86±3.73E-11	9.8E-08	<0.0005
U-233/234[f]	2	1.70±0.89E-05	6.28±3.28E+05	1.34±0.70E-10	6.6E-07[g]	0.0002
U-235/236[f]	2	1.49±3.43E-06	0.55±1.27E+05	1.18±2.72E-11	7.2E-07	<0.0001
U-238[f]	2	9.98±6.70E-06	3.69±2.48E+05	7.90±5.30E-11	7.5E-07	0.0001
Pu-238	2	-3.13±3.43E-06	-1.16±1.27E+05	-2.48±2.72E-11	1.5E-07	<0.0002
Pu-239/240	2	-4.28±3.95E-06	-1.58±1.46E+05	-3.39±3.12E-11	1.4E-07	<0.0002
Am-241	2	1.07±3.37E-06	0.39±1.25E+05	0.84±2.66E-11	1.7E-07	<0.0002
Sum of Ratios						1.51

Note: The average pH at this location was 6.95 Standard Units (SU).
N - Number of samples
NA - Not applicable
[a] Half-lives are listed in Table UI-4.
[b] Total estimated volume released: 1.26E+11 mL (3.34E+07 gal)
[c] 1 Ci = 3.7E+10 Bq; 1 Bq= 2.7E-11 Ci
[d] DCSs are listed for reference only. DCSs are applicable at the point at which water is avilable for ingestion by the public (i.e., at the site boundary) but not to release point concentrations, as might be inferred from their inclusion on this table.
[e] DOE DCSs do not exist for indicator parameters gross alpha and gross beta.
[f] Total Uranium (g) = 6.22±1.30E+00; Average Total Uranium (µg/mL) = 4.92±1.03E-05
[g] The DCS for U-233 is used for this comparison.

locations where members of the public could be exposed to effluents containing contaminants. Note that DCSs 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 DCSs, each annual average radionuclide concentration was divided by its respective DCS 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 2011 was approximately 0.26, below the 1.0 criterion. However, the sum of ratios from WNSWAMP was 1.51, above the DOE-STD-1196-2011 criterion. As in past years, the elevated sum of ratios was almost entirely attributable to strontium-90.

Drainage at the WNSWAMP location 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 DCS (1.1E-06 microcurie per milliliter [µCi/mL]) in mid-2004, again exceeded the DCS in 2011. Recently, monthly concentrations of strontium-90 decreased below the DCS in late December 2011 but have returned to slightly above the strontium-90 DCS in June 2012. Gross beta biweekly concentrations have fluctuated seasonally since December 2011 both above and below the DCS. This decrease below the DCS may be attributable to the effects of the full-scale PTW installation. (See Figure 4-7 in Chapter 4, "Groundwater Protection Program.") Activities to limit migration of the strontium-90 groundwater plume, including installing the 860-foot-long full-scale PTW, 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.)

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 (Figure A-2), and specifies the sampling and analytical requirements for each.

Effective July 1, 2011, NYSDEC issued a modified permit for the WVDP which removed two storm water outfalls (S02 and S40) that no longer exist as drainage basins. An additional storm water location (S43) was added that was tentatively identified in 2006 and characterized in 2007 in a wetland near the LFR on the WNYNSC.

The conditions and requirements of the 2011 SPDES permit are summarized in Appendix B-1. The permit identifies 23 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 WWTF;
- outfall 116 (pseudo-monitoring point WNSP116, as noted on the permit), a location in Franks Creek that represents the confluence of outfalls WNSP001, WNSP007, and WNSP008 (which has been capped since 2001, and was removed from the July 1, 2011 SPDES permit modifications), as well as storm water runoff, groundwater seepage, and augmentation water. Samples from upstream sources are used to calculate total dissolved solids at this location and to demonstrate compliance with the SPDES permit limit for this parameter;
- outfall 01B (monitoring point WNSP01B), an internal monitoring point for the liquid waste treatment system evaporator effluent, was monitored for flow and total mercury. No effluent was processed or released from this outfall in 2011; and
- nineteen storm water discharge outfalls that 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 WVDP locations, (2) the amount of rainfall, (3) the storm event duration, and (4) the resulting flow at the outfalls. The 19 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.

During CY 2011, the collection of storm water samples for all eight outfalls during the first semiannual period and seven of the eight outfalls during the second semiannual period proved difficult to complete while maintaining the sampling criteria required of storm events. As the semiannual periods were coming to an end, samples were collected from outfalls during storm events, staying as close to the qualifying conditions as possible.

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.

SPDES Mercury Permit Limit Exceedance. The modified SPDES permit included the requirement to sample outfall 007 for total mercury, with a compliance limit of 200 ng/L. On October 17, NYSDEC was notified that the SPDES permit limit for mercury (200 ng/L) was exceeded from outfall 007, when the subcontract laboratory reported the results (346 ng/L) of the October 6, 2011 wastewater discharge compliance sample. The outfall discharge was immediately suspended, and an investigation was initiated to determine the scope of potential mercury conditions within system operations.

Once suspension of discharge to outfall 007 occurred on October 17, CHBWV coordinated with Frank's Vacuum Truck Service and the BSA to transport and treat WWTF wastewaters until the system could be restored.

A concurrent investigation began, to identify the possible causes of the elevated mercury levels. Samples were obtained and evaluated throughout system operations, tanks, the grinder station, and sludge. A significant amount of mercury was found in the aeration tank sludge that was traced to the Nessler reagent used for ammonia analysis in the WWTF. The remaining supply of Nessler reagent was removed from the WWTF, and a new analytical method for ammonia was initiated. Sampling continued at strategic locations, and a decision was made to clean out all process tanks and sludge within the WWTF and transport it to BSA for disposal. With the system cleaned and maintained in recirculation mode, process control sampling was conducted at the onset of obtaining the seed material to determine if the treatment process of the plant would meet the SPDES permit limits. On February 9, 2012, NYSDEC was notified of the pending WWTF restart, and with confirmatory laboratory results, the discharge from outfall 007 was restarted on February 14, 2012.

Refer to "SPDES Permit Noncompliance Events" in the ECS.

Airborne Effluent Monitoring

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 NESHAP regulations to ensure that public health and safety and the environment are protected. At the WVDP in 2011, radiological releases have been 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 on Figure A-6 in Appendix A. Releases are evaluated and reported to EPA in the annual NESHAP report.

Measured radionuclide concentrations in air are also compared with DCSs. Unlike NESHAP dose criteria, the DCSs are expressed in µCi/mL and can be directly compared with measurements from the monitoring program. Although the DCSs are applicable only where the public may breathe air containing radionuclides, the DCSs are used at the WVDP as a tool for evaluating airborne emissions at the release point. DCSs 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 usually assumed to come from plutonium-239/240 and strontium-90, respectively, because the DCSs for these radionuclides are the most limiting for major WVDP particulate emissions. No DCSs were exceeded by airborne emissions on an annualized basis during 2011. 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 radionuclide quantity released from the facility. Emissions are sampled for radioactivity in both particulate (e.g., strontium-90 and plutonium-239/240) 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 MPPB Ventilation Stack. The primary controlled air emission point at the WVDP is the MPPB ventilation stack, monitoring location code ANSTACK, which vents to the atmosphere at a height of 208 ft (63.4 m). This stack has historically released ventilation exhaust from several MPPB facilities, including the liquid waste treatment system, the analytical

TABLE 2-3
Total Radioactivity Released at Main Plant Stack (ANSTACK) in 2011 and Comparison of Concentrations with DOE DCSs

Isotope [a]	*N*	*Total Activity Released* [b] *(Ci)*	*Average Concentration (µCi/mL)*	*Maximum Concentration (µCi/mL)*	*DCS* [c] *(µCi/mL)*	*Ratio of Concentration to DCS*
Gross Alpha	26	2.01±0.04E-05	2.71±0.05E-14	2.70E-13	--	--
Gross Beta	26	4.01±0.03E-04	5.40±0.03E-13	5.31E-12	--	--
H-3	26	7.20±0.09E-03	9.70±0.12E-12	3.10E-11	2.1E-07	<0.0001
Co-60	2	1.98±0.78E-07	2.67±1.04E-16	4.27E-16	3.6E-10	<0.0001
Sr-90	2	1.16±0.01E-04	1.56±0.01E-13	3.30E-13	1.0E-10	0.0016
I-129	2	1.79±0.18E-05	2.42±0.24E-14	2.46E-14	1.0E-10	0.0002
Cs-137	2	1.08±0.07E-04	1.46±0.10E-13	3.05E-13	8.8E-10	0.0002
Eu-154	2	2.16±2.16E-07	2.91±2.91E-16	6.45E-16	7.5E-11	<0.0001
U-232[d]	2	4.84±1.37E-08	6.53±1.85E-17	1.42E-16	4.7E-13	0.0001
U-233/234[d]	2	6.60±1.32E-08	8.89±1.77E-17	1.47E-16	1.0E-12[e]	<0.0001
U-235/236[d]	2	8.63±5.75E-09	1.16±0.78E-17	9.99E-18	1.2E-12	<0.0001
U-238[d]	2	2.81±0.66E-08	3.79±0.90E-17	4.52E-17	1.3E-12	<0.0001
Pu-238	2	1.56±0.08E-06	2.10±0.11E-15	4.37E-15	8.8E-14	0.0239
Pu-239/240	2	4.46±0.14E-06	6.01±0.19E-15	1.27E-14	8.1E-14	0.0742
Am-241	2	7.58±0.40E-06	1.02±0.05E-14	2.15E-14	9.7E-14	0.1052
Sum of Ratios						0.21

N - Number of samples
-- DCSs 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 cubic feet per minute = 7.42E+14 mL/year
[c] DCSs 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: 7.44±0.17E-02 g; average = 1.00E±0.02E-12 µg/mL
[e] DCS for U-233 used for this comparison.

laboratories, and off-gas from the former VIT system. In 2011, the MPPB stack continued to release ventilation exhaust from a variety of facility spaces.

Total curies released from the MPPB stack in 2011 are listed in Table 2-3, together with annual averages, maxima, and a comparison of average isotopic concentrations with the applicable DCSs. The sum of ratios for radiological concentrations from ANSTACK was 0.21, 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.)

Unplanned Radiological Airborne Release. During a period from March 9, 2011 through April 20, 2011, elevated gross alpha and gross beta activity was observed from the biweekly particulate air sample filters from the MPPB stack (sampling location ANSTACK). In mid-March and early April 2011, power outages caused a disturbance in the normal MPPB ventilation system. Additionally, VEC blower maintenance activities undertaken at that time due to bearing failure of one of the original NFS blowers, caused a resuspension and redistribution of legacy contamination within the stack. Although elevated activity was recorded during this sampling period, the concentration soon returned to more normal levels.

The first semiannual air particulate composite of the year (comprised of 26 biweekly filters) was analyzed for specific routine radionuclides and showed elevated levels of activity for some isotopes. Both alpha- and beta-emitting isotopes were elevated. Nevertheless, the total curies released from the MPPB stack and the sum of the ratios for the radionuclide concentrations were well below the DOE guidelines. Refer to Table 2-3, and Chapter 3, "Dose Assessment."

Although there were minor smoldering events in the RHWF and the MPPB during 2011, it was found that no radiological air emissions resulted.

Other On-Site Air Sampling Systems. Sampling systems similar to those of the MPPB are used to monitor airborne effluents from the former VIT 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/permanent ventilation system stack (ANSTSTK), the container sorting and packaging facility ventilation stack (ANCSPFK), and the RHWF stack (ANRHWFK) (Figure A-6).

Permitted outdoor ventilation enclosures with portable ventilation units (OVE/PVUs) are used to provide the ventilation necessary for personnel safety 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 the data collected are included in annual evaluations of airborne emissions.

Appendix C presents total radioactivity released for specific radionuclides at each of the on-site air sampling locations, with the exception of ANCSRFK ventilation, which did not operate in 2011. Although this facility was used in 2011, it was ventilated with an OVE/PVU.

Isotopic results did not exceed the DCSs at any of the air emission sampling locations during 2011.

Nonradiological Air Emissions. Nonradiological air emissions at the WVDP are regulated under an air facility registration certificate that caps (limits) nitrogen and sulfur oxide emissions (NO_x and SO_2, respectively) from the facility at 49.5 tons per year each. (See Table ECS-3.) The certificate applies to two site utility steam boilers, which are the primary sources of NO_x and SO_2 at the site. Based on natural gas usage, the boilers are estimated to have released about 0.30 tons of NO_x and 0.000022 tons of SO_2 in 2011, which is 0.61% of the capping limit.

Other units with the potential to emit non-radiological pollutants, such as generators listed in the certificate, are exempted with the understanding that each unit operates less than 500 hours per year.

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 north and south plateaus could be detected. Appendices B-4 through B-6 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 Figure A-5. Results are presented in Appendix B-5. 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.

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 at this location 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 NDA, under the control of DOE, and the SDA, under the control of NYSERDA), lie on the south plateau. These disposal sites are possible contaminant sources 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

TABLE 2-4
2011 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	5	ANSTACK (Gross alpha, gross beta, H-3, Sr-90, I-129, Cs-137, U-232, Pu-238, Pu-239/240, Am-241); ANSTSTK (H-3, I-129); ANCSPFK (I-129); ANVITSK (I-129); ANRHWFK (I-129)
Surface water (2 background locations, one on Buttermilk Creek and one [historical] on Cattaraugus Creek)				
On-site controlled effluents	2	WNSP007 (total Hg)	2	WNSP001 (Gross alpha, Gross beta, H-3, Sr-90, Tc-99, 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 mercury (Hg), total antimony, total dissolved solids [TDS]); WNSP007 (Gross beta, total Hg)
On-site surface water	7	WNSWAMP (Sr-90) WNSP006 (TDS)	6	WNSP006 (Gross beta, Sr-90, Cs-137, U-232, U-233/234, U-238, TDS); WNSP005 (Gross beta, Sr-90); WNSWAMP (Gross beta, Sr-90); WNSW74A (Gross beta, Sr-90); WNNDADR (Gross beta, H-3, Sr-90); WNERB53 (Gross beta)
Off-site surface water	2	WFBCTCB[b] (total Fe[c])	2	WFBCTCB (Gross alpha, gross beta, total Fe, total titanium) WFFELBR (Gross beta)
Drinking water (1 background location) WNURRAW				
On-site drinking water	1	0	1	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	1	BFDNEAR (Cs-137)
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 2011.
[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.

used to store drums of processed LLW. 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) DCSs, gross beta concentrations have routinely exceeded background concentrations at both WNNDADR and WNERB53, as have tritium and strontium-90 concentrations at WNNDADR. Residual soil contamination from past waste burial activities is thought to be the source.

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

Figure 2-1 is a plot of average gross beta and strontium-90 concentrations in surface water at sample points WNNDADR and WNERB53 before and after completion of the IM. In CY 2011, average concentrations were between 65% and 85% lower than historical concentrations, indicating the IM has been effective in reducing groundwater migration through the NDA, which affects infiltration into and surface water drainage at these points.

Although tritium concentrations at WNNDADR in CY 2011 remained above background (Figure 2-2), concentrations continued to trend downward, as noted in previous ASERs. 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 Figure A-2). In 2011, radionuclide concentrations at this point were indistinguishable from background.

- North Plateau

  Besides the effluent and drainage locations discussed earlier in the liquid effluents section, a location on the east side of the MPPB (point WNSP005) monitors surface drainage on the north plateau. Annual average gross beta and strontium-90 concentrations statistically exceeded background concentrations at this sampling location during CY 2011. One other sample point, WNSP006, is sampled at Franks Creek at the security fence. WNSP006 is downgradient of the Lagoon 3 outfall (point WNSP001). In 2011, concentrations at WNSP006 exceeded background for gross beta, strontium-90, cesium-137, uranium-232, uranium-233/234, uranium-238, and total dissolved solids.

  On the north plateau, possible contaminant sources that could affect surface water include the HLW tanks, MPPB, the lagoon system associated with the LLW2, waste handling and storing facilities, and seepage from the strontium-90 groundwater plume.

- 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.

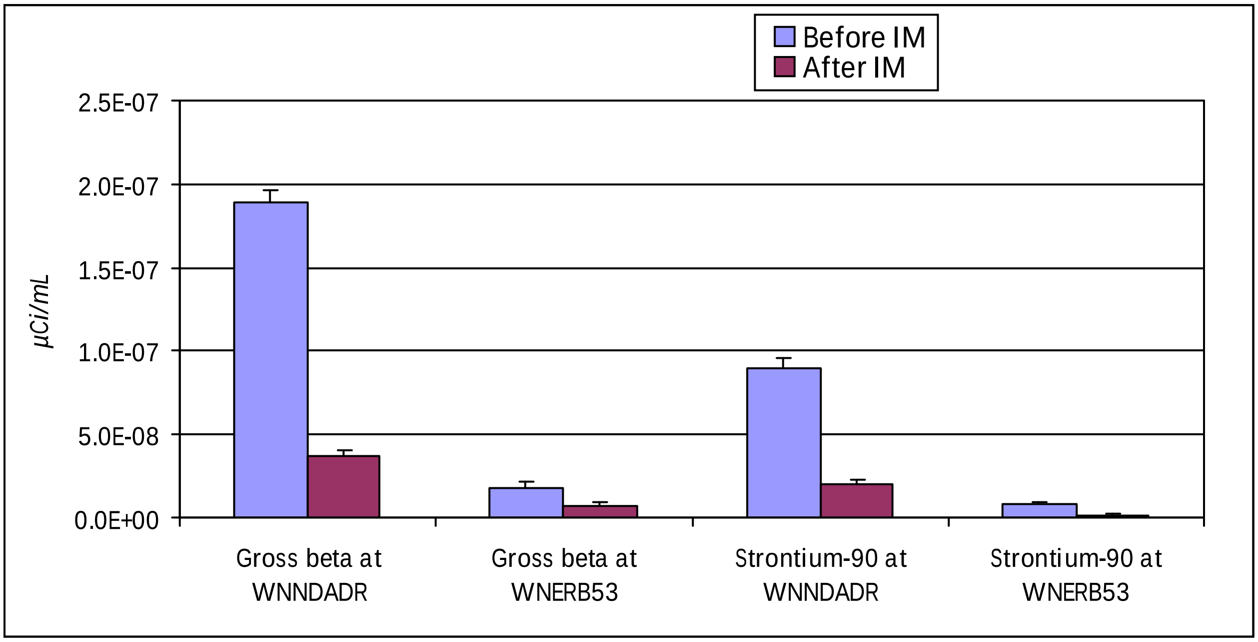
  – Buttermilk Creek receives surface drainage from the WNYNSC. The background monitoring point is located upstream of the WVDP at Fox Valley Road (WFBCBKG) and the downstream point is located at Thomas Corners Bridge (WFBCTCB), just before where Buttermilk Creek enters Cattaraugus Creek.

  – Background samples were collected from Cattaraugus Creek at Bigelow Bridge, at Route 240, 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 four of 11 on-site and off-site surface water monitoring locations affected by the WVDP in 2011.

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 1.91 mg/L. However, the limit was also

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

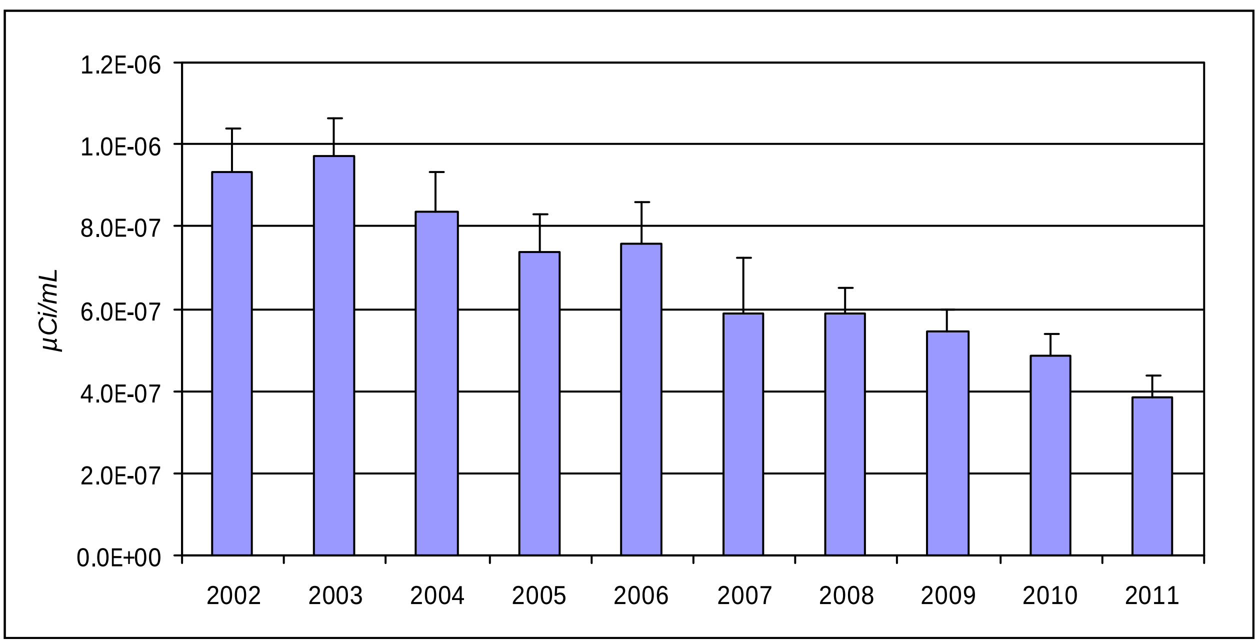


Note: The upper limit of the uncertainty term is indicated with each point. Average gross beta and strontium-90 background concentrations in Buttermilk Creek (WFBCBKG) in CY 2011 were 1.69±2.08E-09 and 1.25±0.84E-09 µCi/mL, respectively.

[a] Sample point WNNDADR is located downstream, immediately north of the NDA.

[b] Sample point WNERB53 is located farther downstream on Erdman Brook.

FIGURE 2-2
Average Concentration of Tritium in Surface Water at WNNDADR: 2002–2011



Note: The upper limit of the uncertainty term is indicated with each point. Average background tritium concentration in Buttermilk Creek (WFBCBKG) in CY 2011 was <4.64E-08 µCi/mL.

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 0.16 mg/L to 7.4 mg/L. These fluctuating, elevated levels of iron are thought to reflect natural variability of stream conditions, and are not related to WVDP activities.

A DCS was exceeded at the northeast swamp (WNSWAMP), where the average strontium-90 concentration was 1.66E-06 µCi/mL. (The strontium-90 DCS is 1.1E-06 µCi/mL.) Refer to the WNSWAMP discussion earlier in this chapter and Chapter 4, "North Plateau Strontium-90 Plume."

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.

The highest average gross beta result at WFFELBR over the last 10 years (5.99E-09 µCi/mL in 2006) was about 0.6% of the DCS for strontium-90 (1.1E-06 µCi/mL). The average result in 2011 (3.41E-09 µCi/mL) was about 0.3% of the DCS.

Drinking Water. Project drinking water (potable water) and utility water are 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, NYSDOH, and Cattaraugus County Health Department (CCHD) regulations. Results from 2011 indicated that no radiological contaminants were found in on-site drinking water and that the Project's drinking water continued to remain below the maximum containment levels and drinking water standards of EPA, NYSDOH, and the CCHD. The results are presented in Appendix B-6.

Ambient Air. In 2011, samples for radionuclides in air were collected at one background location at Great Valley (AFGRVAL), 18 mi (29 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.

During mid-CY 2012, an ambient air monitoring network was installed within a circle around the WNYNSC. The network consists of 16 monitoring stations strategically located in each of the 16 wind directions. The air samplers will provide coverage for airborne radiological measurements to support NESHAP compliance during demolition activities. Refer to "EPA Interim Approval to use Environmental Measurements for NESHAP Compliance in the ECS."

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 stream bottom 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 Figure 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 [see Figure A-5]). Soil samples are collected at one background and three former near-site air sampling locations and are analyzed for radiological constituents (Figures A-5 and A-12). Soil and sediment samples were last collected in 2007, and will next be collected in 2012.

Food. Food samples are collected from locations near the site (Figure A-9) and from remote locations (Figure 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. Fish, apples, beans, and corn were last collected in 2007 and will next be collected in 2012. Edible portions are analyzed for radionuclides. 2011 data are presented in Appendix E.

In 2011, milk and deer were collected and data have consistently demonstrated that the Project has little or no effect on local food sources. All results were indistinguishable from background in 2011, with the exception of one near-site deer (of the three deer analyzed), for which the cesium-137 concentration was above historical background. 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.")

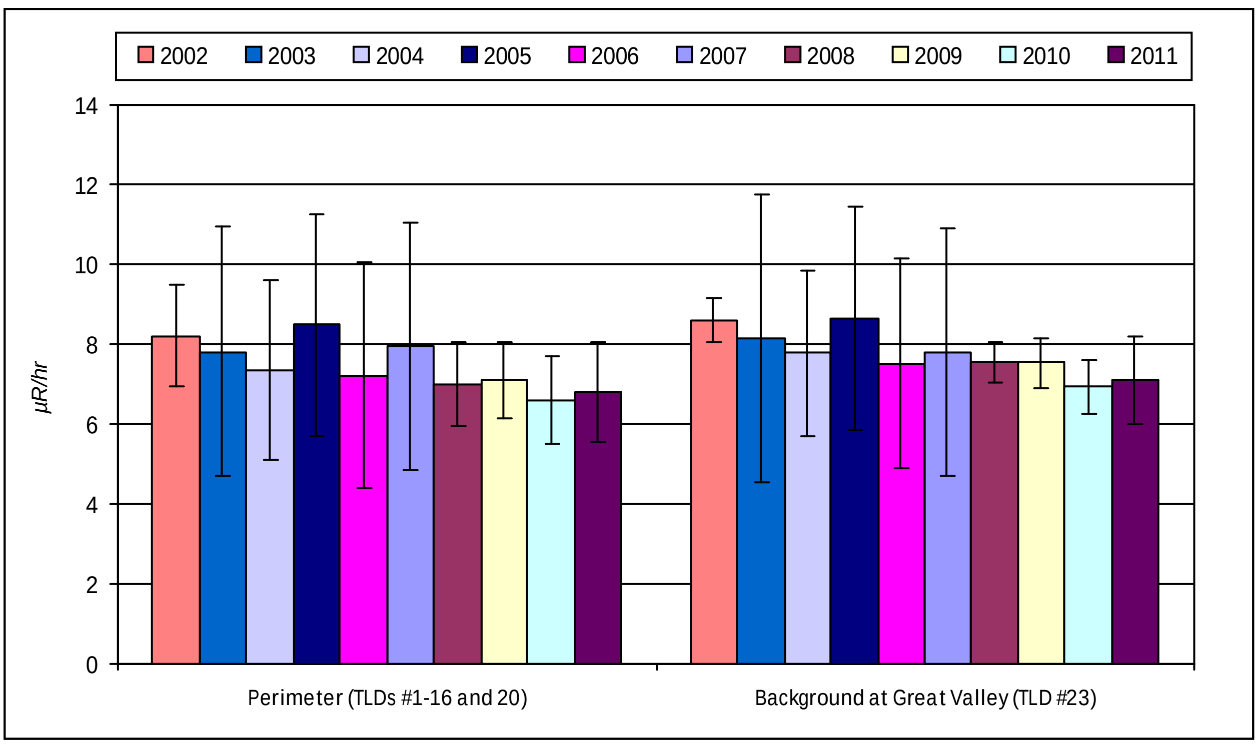
Environmental Radiation. TLDs are placed on site at waste management units, at the WVDP security fence, around the WNYNSC perimeter and the access road, and at a background location remote from the site. The TLDs directly measure radiation in the environment.

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 2-3 presents a graph of average annual exposure rates (in microroentgen per hour) 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. Perimeter TLD locations (off site) are shown on Figure A-11 in Appendix A, and the data are presented in Table F-1 in Appendix F.

Consistent with historical data, results from three of eight TLDs located near on-site waste storage facilities on the north plateau in 2011 were generally higher than background results. 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. On-site TLD locations are shown on Figure A-10 in Appendix A, and the data are presented in Table F-2 in Appendix F.

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 ELAB. Monthly CY 2011 precipitation totals compared with 10-year monthly averages are presented in Table 2-5.

FIGURE 2-3
10-Year Trends of Environmental Radiation Levels at Perimeter and Background Thermoluminescent Dosimeters (TLDs)



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

TABLE 2-5
WVDP 2011 Monthly Precipitation Totals
Compared With 10-Year Monthly Averages

Month	*Monthly Total (inches)*	*10-Year Monthly Average (2002 through 2011)*
January	1.99	2.96
February	3.93	2.32
March	4.02	2.83
April	6.48	2.78
May	5.76	2.97
June	3.44	3.45
July	1.79	4.39
August	4.29	4.15
September	2.19	3.68
October	4.39	3.46
November	3.41	3.66
December	3.88	3.89
Total (inches)	45.6	40.5
(Centimeters)	115.7	102.9

Barometric pressure is measured with instrumentation located in the ELAB. The meteorological tower supplies data to the primary digital and analog data acquisition systems located within the ELAB. The systems are provided with either uninterruptible or standby power backup in the event of site power failures. In 2011, the data recovery rate (the time valid data were logged versus the total elapsed time) was 97%.

Documentation, such as meteorological system calibration records, site log books, and analog strip charts, is stored in protected archives. "Wind roses" showing the predominant wind direction as measured at the meteorological tower (60-m and 10-m elevations) are shown on Figure 2-4. The 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 an air release occurred, meteorological data would be used to predict the direction of plume migration.

Special Projects

Special projects may be conducted outside the scope of the routine environmental monitoring program to address topics of environmental interest. The following special projects were performed during 2011:

Japanese Fukushima Daiichi Nuclear Power Plant Incident. On March 11, 2011, the Fukushima Daiichi nuclear power plant in Japan was damaged by a major earthquake, followed by a devastating tsunami. The incident was globally reported and cited that the damaged reactors leaked waterborne and airborne radioactive material.

The WVDP maintains a background low-volume ambient air sampling station in Great Valley, NY, located approximately 18 mi (29 km) south of the Project. The air sampling data are used as the background for estimates of airborne radioactivity comparisons with near- or on-site airborne sample data. The Great Valley background station currently provides monthly charcoal cartridges for collecting volatile radionuclides (i.e., long-lived iodine-129), and biweekly fiber filters for collecting particulate long-lived radionuclides of interest in air.

Samples were routinely collected and analyzed shortly after the disaster to determine if any potential effects could be identifiable regionally. Interestingly, the charcoal filters gathered on March 22 and April 19 exhibited low detectable concentration levels of short-lived radioactive iodine-131, and the fiber filters collected during this same sample period exhibited low detectable concentration levels of short-lived cesium-134 and long-lived cesium-137. These radionuclides are not normally observed at this location and are some of the isotopes that would be expected from this type of incident. The concentrations quickly returned to baseline nondetectable levels shortly thereafter. The low radionuclides levels detected would have had no impact on regional health or the environment; however, sampler sensitivity was demonstrated. This is the same type of ambient air sample station set-up that was deployed in mid-2012 to implement the ambient air network around the WVDP. Refer to "EPA Interim Approval to

Use Environmental Measurements for NESHAP Compliance" in the ECS.

Meteorological Station at the SDA and Stream Flow Monitoring. In 2010, NYSERDA completed installing a suite of meteorological instruments at the SDA. This included instruments to measure total precipitation (i.e., rain, snow, and sleet); temperature, relative humidity; barometric pressure; wind speed; and wind direction. The instruments are equipped with a battery-powered backup system to ensure data continuity during power outages. Precipitation data have been uninterrupted since June 1, 2010. Configuration and testing of the remaining parameters was completed in the summer of 2010, and data have been uninterrupted since October 1, 2010.

In June 2011, NYSERDA completed installing a stage recorder on Buttermilk Creek at Thomas Corners Road Bridge (near the confluence with Cattaraugus Creek). Equipment configuration and testing (and installation of a backup solar power supply) was completed in October 2011. Data collection has been uninterrupted since October 15, 2011. Data are logged at these stations every 10 minutes and transmitted via cellular modem to NYSERDA's office. NYSERDA maintains an interactive meteorological database for the SDA station on the internet at: http://v4.wqdata.com/webdblink/nyserda.php.

Light Detection and Ranging (LiDAR) Mapping and Orthophotography. In 2010, NYSERDA (jointly funded by DOE) conducted an aerial LiDAR mapping and orthoimagery project. After an extensive ground control survey in October, the entire Buttermilk Creek watershed (including the WNYNSC and SDA) was mapped and photographed from a small airplane on November 1st and 2nd. A detailed topographic map of the Buttermilk Creek watershed was developed with a resolution (grid size) of 1.0 m. For the WNYNSC and the SDA, a resolution of 0.5 m was achieved. This project represents the most accurate and comprehensive large-scale topographic mapping of the Buttermilk Creek watershed, ever completed.

In conjunction with the LiDAR mapping, high-resolution digital photographs were acquired of the Buttermilk Creek watershed. From these images, rectified orthophotographs were produced with a pixel size of three inches (for the WNYNSC and SDA), and six inches (for the balance of the Buttermilk Creek watershed). In 2011, NYSERDA used the topographic data and aerial photographs for erosion and hydrologic analysis and modeling, change detection, erosion mitigation design and construction, and mapping of existing and planned infrastructure. NYSERDA plans to repeat the survey every five to seven years.

Monitoring Program Changes

Changes to the sampling program during 2011 were associated with the July 1, 2011 SPDES permit renewal. SPDES sampling point WNSP008 was removed from the permit and SPDES limits and action levels are specified in Table B-1A. Two storm water locations, that no longer exist as drainage basins, were removed from the permit, and one storm water location was added at the LFR.

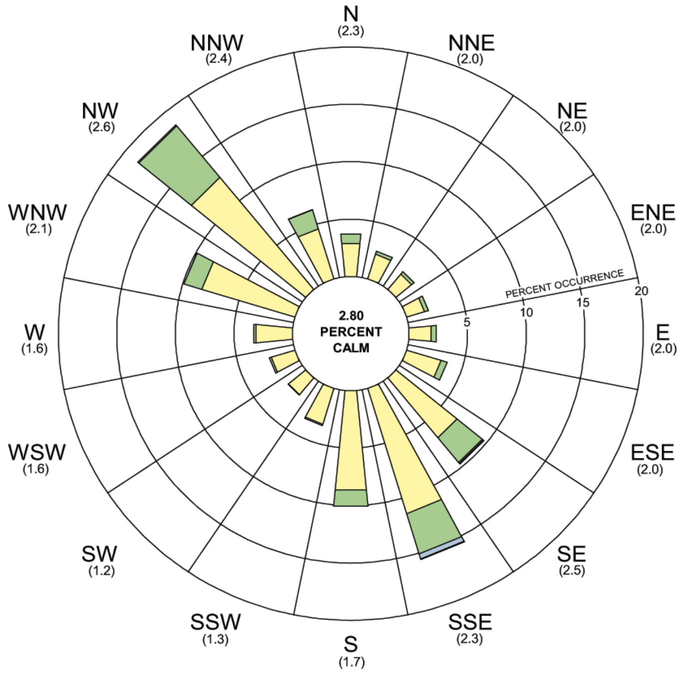
NYSDOH re-established a radiological environmental surveillance/sampling program at the WVDP, beginning in January 2012. The program includes co-located water, biological, and TLD samples.

Summary

As in the past, although concentrations of certain radiological and nonradiological constituents from samples collected within the security fence exceeded comparison levels or background concentrations, few results from near-site or downstream locations accessible to the public did. (See Table 2-4.)

Monitoring results from CY 2011 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 2-4
Wind Frequency and Speed From the Meteorological Tower (10-m and 60-m Elevations)
January 1–December 31, 2011



Meteorological Tower (10-m)

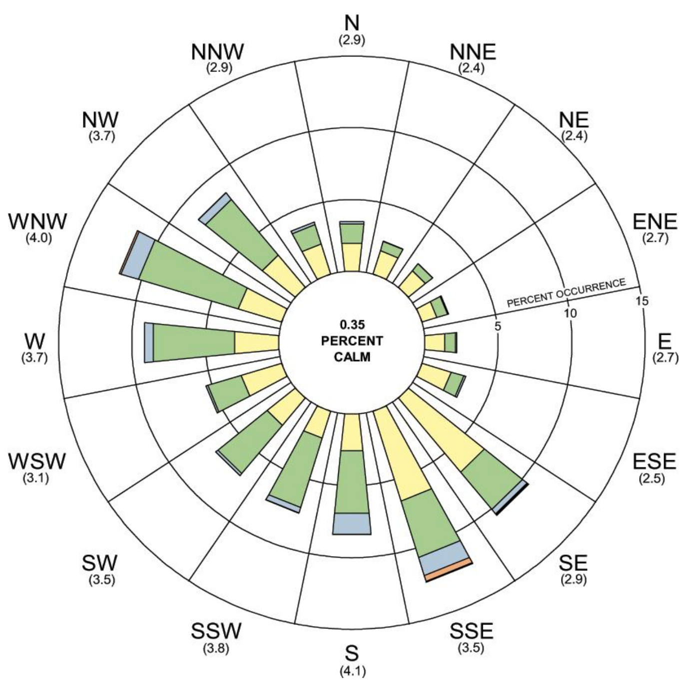
Key:

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 (60-m)

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DOSE ASSESSMENT

Sources of Radiation at the WVDP (or Project)

Members of the public are routinely exposed to natural and man-made sources of ionizing radiation. An individual living in the U.S. is estimated to receive an average annual effective dose equivalent (EDE) of about 620 mrem (6.2 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 than from any other source, 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 (Figure 3-1). The other half, also about 310 mrem/year, is from man-made sources, including: diagnostic and therapeutic x-rays, tomography, and fluoroscopy; 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 NFS 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.

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 lo-

FIGURE 3-1
Comparison of Doses From Natural and Man-Made Sources to the Dose From 2011 WVDP Effluents

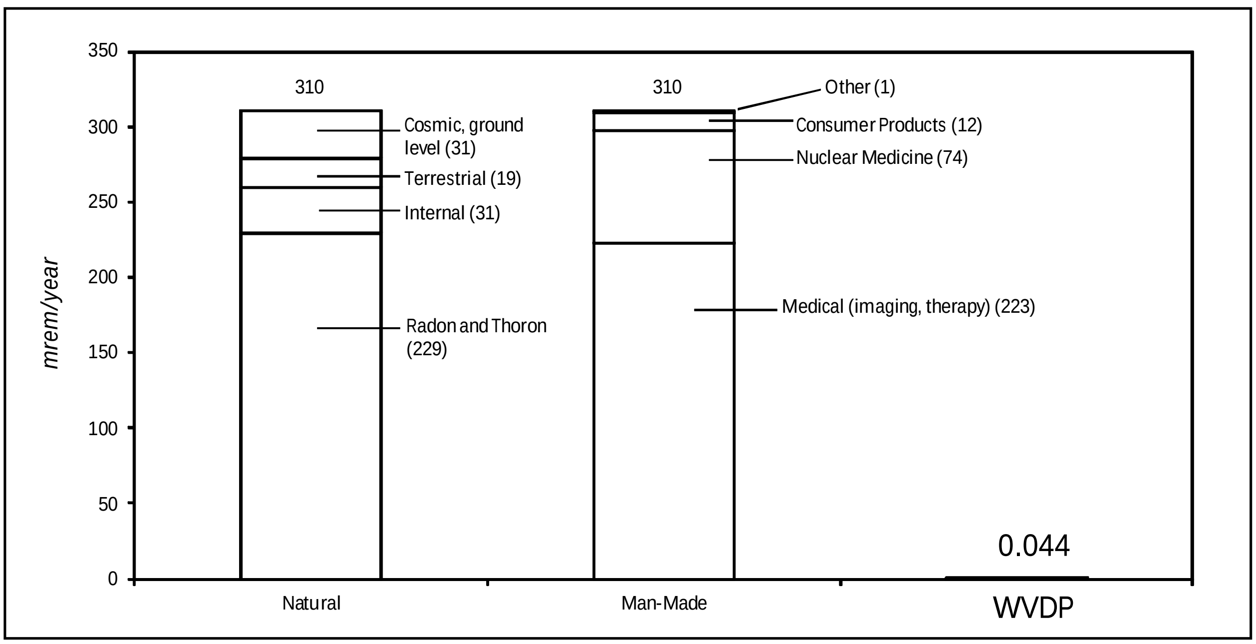


TABLE 3-1
Potential Exposure Pathways from the WVDP to the Local Off-Site Population

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.

cal off-site population and describes the rationale for including or excluding each pathway when calculating dose from the WVDP or Project.

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 CY 2000 census was incorporated into WVDP analyses in 2003. Population around the WVDP by sector and distance is presented on 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 receptor in each sector. The Canadian population within a 50-mi (80-km) radius of the site (Statistics Canada, 2001) is included with the U.S. population in dose calculations. Population information is required when using computer models for annual dose assessments. An estimated 1.68 million people live within 50 mi (80 km) of the site. If the WVDP becomes aware of the need to update land use information, it does so, even if full field verification for all sectors is not required.

Dose Assessment Methodology

Dose to the public is evaluated using a two-part method consistent with the requirements of DOE Order 458.1. First, measurements (and/or estimates) of radionuclide concentrations in liquid and air released from the Project are assembled from the CY of interest. The EPA- and DOE-approved models are then used to estimate the EDE to the MEOSI and the collective EDE to the population within a 50-mi (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. Refer to the “Useful Information” section for discussion of ionizing radiation.

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 and millisievert, 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 EDE, also expressed in units of rem or Sv, 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. For waterborne releases, the EDE is calculated by multiplying the organ dose equivalent by the organ-weighting factors developed by the International Commission on Radiological Protection in Publications 26 (1977) and 30 (1979). For airborne emissions, the EDE calculation is based upon factors in Federal Guidance Report 13, and NCRP report Number 123. 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 50-year period following intake is called the 50-year committed effective dose equivalent (CEDE). The CEDE sums the dose to an individual over 50 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.

Determination of Radionuclide Concentrations in the Environment From Liquid and Airborne 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 2011.)

Dose to the Public

Each year an estimate is made of the potential radiological dose to the public that is attributable to WVDP operations and effluents during that CY. 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 DOE or EPA.

Figure 3-1 shows the estimated (all pathway) maximum individual dose from the WVDP in CY 2011 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 (0.044 mrem [0.00044 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 CY, 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 radionuclide emissions are regulated by EPA under the Clean Air Act and its implementing regulations. DOE facilities are subject to 40 CFR 61, Subpart H, 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 2011 from stacks and diffuse sources on the WVDP were modeled using EPA-approved CAP88-PC computer code (Trinity Engineering, December 2007). 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 2011 (radionuclide releases in curies per year) were input into the CAP88-PC code, as were wind data collected from the on-site meteorological tower during 2011 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-mi (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. Based on the non-radon airborne radioactivity released from all site sources during 2011 (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 0.0016 mrem (0.000016 mSv) from airborne releases. (See Table 3-2.) The computer model estimated that this MEOSI, who was assumed to eat only locally produced foods throughout the year, was located 1.2 mi (1.9 km) north-northwest of the site.

The dose from airborne sources is equal to about 3 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 EPA and mandated by DOE Order 458.1.

Iodine-129, a long-lived radionuclide, has routinely been found in main stack emissions. During HLW VIT, iodine-129 releases increased because gaseous iodine was not as efficiently removed by the VIT process off-gas treatment system as were most other radionuclides. As more HLW was removed from the tanks and converted into glass, less waste was available to emit iodine-129 and the total emitted decreased. In 2011, iodine-129 concentrations remained at (or below) pre-VIT levels and accounted for about 12% of the dose to an off-site individual from airborne emissions. A comparison of the dose proportions from various nuclides is presented on Figure 3-2. Note that for this 2011 report, Figure 3-2 presents the primary nuclides or nuclide groups for all airborne emissions, including diffuse sources. As work activities at the WVDP progress toward decommissioning and/or facility demolition, the importance of diffuse sources to dose estimates is expected to increase, and the number of point sources amendable to normal effluent monitoring will decrease. Therefore, these diffuse sources (primarily from the LLW2 lagoons during CY 2011) have been added to the annual totals for the purpose of this presentation.

Collective Population Dose (Airborne). About 1.68 million people were estimated to reside in the U.S. and Canada within 50 mi (80 km) of the WVDP. (See Figure A-13.) This population received an estimated 0.0170 person-rem (0.000170 person-Sv) total EDE from radioactive nonradon airborne emissions released from WVDP point and diffuse sources during 2011. The resulting average EDE per individual was 0.0000101 mrem (0.000000101 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 NYSDOH in the NYS Sanitary Code (10 NYCRR 5-1.52). Radionuclides are not regulated under the site's SPDES permit. However, special requirements in the permit specify that radionuclide concentrations in the discharge are subject to requirements of DOE Order 5400.5 (replaced by DOE Order 458.1, "Radiation Protection of the Public and the Environment.")

As shown in Table 3-1, the public water source and residential wells are located upgradient of the WVDP

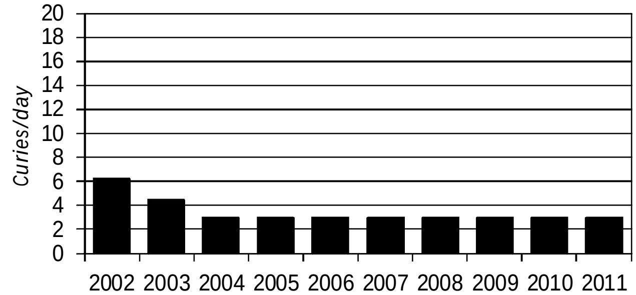
Radon-220

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

As reported in Chapter 2 of the 1996 WVDP ASER (West Valley Nuclear Services Company and Dames & Moore, June 1997), thoron levels were observed to increase during startup of the 1996 HLW VIT process. An estimate of thoron released during each waste concentration cycle was developed and used to determine a theoretical annual release. During the VIT phase, an average of about 12 curies per day were assumed to have been released. In 2011, with the VIT 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 2011, would have been 0.082 mrem (0.00082 mSv), and the collective dose to the population within a 50-mi (80-km) radius would have been 4.6 person-rem (0.046 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 VIT completed, thoron releases have decreased to pre-VIT 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

FIGURE 3-2
Air Emissions From All Sources: Dose Percent by Radionuclide in CY 2011

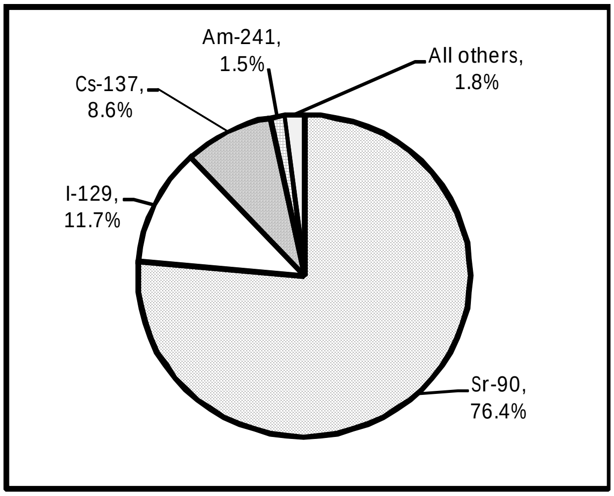


FIGURE 3-3
Water Releases: Dose Percent by Radionuclide in CY 2011

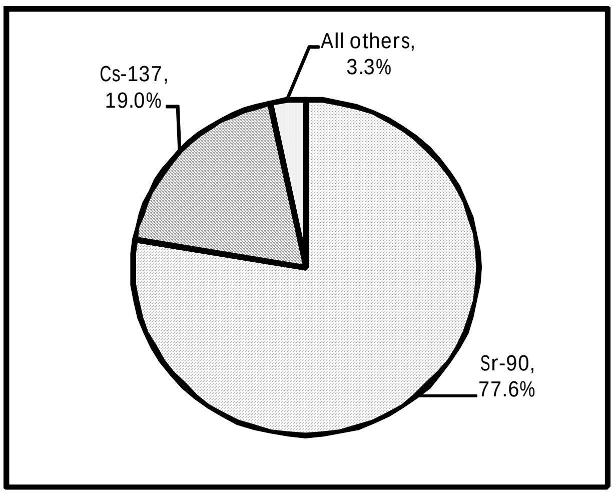
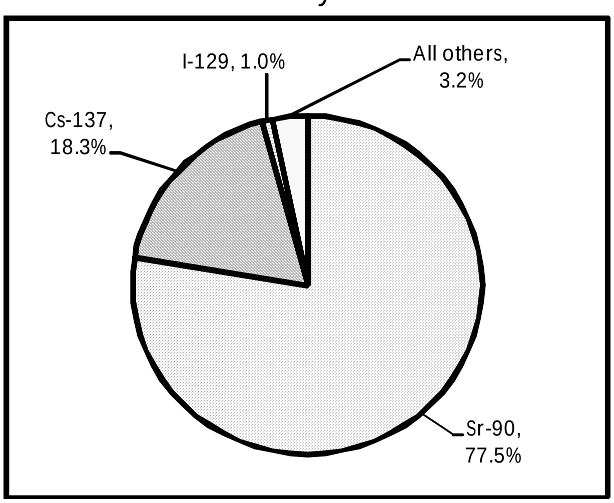


FIGURE 3-4
All Sources: Dose Percent by Radionuclide in CY 2011



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 drinking water limits is not 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 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 "Manual for Radiological Assessment of Environmental Releases at the WVDP," WVDP-065 (CHBWV, 2012).

Eight batches of liquid effluents, totaling about 13.7 million gal (51.8 million L), were released from the lagoon 3 weir WNSP001 (SPDES point 001) during 2011. 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-mi (80-km) radius of the WVDP. (See Table 3-2.)

In addition to measurements from WNSP001, radioactivity measurements from WWTF effluents (WNSP007) were included in the EDE calculations. The french drain at WNSP008, a third release point that was listed in the SPDES permit, has been sealed off since 2001 and was removed from the modified SPDES permit in July 2011.

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. A comparison of dose proportions attributable to specific waterborne radionuclides is shown on Figure 3-3. As presented, strontium-90 and cesium-137 account for almost all of the estimated waterborne dose, at 77.6% and 19.0%, respectively.

There were no unplanned releases of waterborne radioactivity in 2011.

Maximum Dose (Waterborne) to an Off-Site Individual. Based on the radioactivity in liquid effluents discharged from the WVDP (lagoon 3 and the WWTF) during 2011, an off-site individual could have received a maximum EDE of 0.010 mrem (0.00010 mSv). (See Table 3-2.) About 78% of this dose was from cesium-137. The MEOSI EDE due to drainage from the north plateau was 0.032 mrem (0.00032 mSv). About 97% of the north plateau dose was attributable to strontium-90, largely from the WNSWAMP drainage point.

The combined EDE to the MEOSI from liquid effluents and drainage was 0.042 mrem (0.00042 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 2011, the population living within 50 mi (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 0.21 person-rem (0.0021 person-Sv). The resulting average EDE per individual is 0.00012 mrem (0.0000012 mSv), which is a very small percentage of the dose received by the average person from natural background radiation (310 mrem or 3.1 mSv).

Predicted Dose From All Pathways

The potential dose to the public from both airborne and liquid effluents released from the Project in 2011 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 0.044 mrem (0.00044 mSv). This dose is 0.044% of the 100-mrem (1-mSv) annual limit in DOE Order 458.1. As in past years, CY 2011 results continued to demonstrate

TABLE 3-2
Summary of Annual Effective Dose Equivalents (EDE) to an Individual and Population From WVDP Releases in 2011

Exposure Pathways	Annual EDE	
	MEOSI [a] mrem (mSv)	Collective EDE [b] person-rem (person-Sv)
Airborne Releases[c]	1.6E-03 (1.6E-05)	1.7E-02 (1.7E-04)
% EPA standard (10 mrem)	0.016%	NA
Waterborne Releases[d]	4.2E-02 (4.2E-04)	2.1E-01 (2.1E-03)
Effluents only	1.0E-02 (1.0E-04)	1.5E-02 (1.5E-04)
North plateau drainage	3.2E-02 (3.2E-04)	1.9E-01 (1.9E-03)
Total From All Pathways	4.4E-02 (4.4E-04)	2.2E-01 (2.2E-03)
% DOE standard (100 mrem) - air and water combined	0.044%	NA
% of natural background (310 mrem; 522,000 person-rem) - received from air and water combined	0.014%	0.000043%
Estimated Airborne Radon-220[e]	8.2E-02 (8.2E-04)[f]	4.6E+00 (4.6E-02)[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 mi (1.9 km) north-northwest of the MPPB.

[b] A population of 1.68 million is estimated to reside in the U.S. and Canada within 50 mi (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 Manual for Radiological Assessment of Environmental Releases at the WVDP, WVDP-065 (CHBWV, 2012).

[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.

WVDP compliance with applicable radiation standards for protection of the public and the environment. Table 3-3 presents the total curies released to the atmosphere from all sources at the WVDP. As presented on Figure 3-4, the largest proportion of estimated EDE to an off-site individual in 2011 was from strontium-90 via the waterborne pathway.

In CY 2011, the total collective EDE to the population within 50 mi (80 km) of the site was 0.22 person-rem (0.0022 person-Sv), with an average EDE of 0.00013 mrem (0.0000013 mSv) per individual.

Figure 3-5 shows the calculated annual dose to the hypothetical MEOSI over the last 10 years. As shown by this figure, the largest portion is due to waterborne contributions, which were approximately 30% lower in 2011 than those in 2010.

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

Calculated Dose From Food. Most radionuclide concentrations in near-site food samples were statistically indistinguishable from concentrations in background samples. In 2011, one near-site deer sample exhibited cesium-137 concentrations above historical background. Conservative dose estimates due to consuming near-site deer and milk were estimated to be about 0.89 mrem/year (0.0089 mSv/year), which is about 0.14% of the dose received by an average individual due to natural and other man-made

TABLE 3-3
WVDP Radiological Dose and Release Summary

WVDP Radiological Dose Reporting Table CY 2011						
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
0.044	0.00044	0.044	0.22	0.0022	1,684,000	522,000
mrem	(mSv)		person-rem	(person-Sv)		person-rem

WVDP Radiological Atmospheric Emissions[b] CY 2011 in Ci and 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)
1.05E-02	NA	NA	NA	1.87E-04	2.54E-05	2.44E-04	2.57E-07	6.03E-06	7.59E-06	1.10E+03
(3.88E+08)				(6.93E+06)	(9.41E+05)	(9.01E+06)	(9.51E+03)	(2.23E+05)	(2.81E+05)	(4.05E+13)

WVDP Liquid Effluent Releases[d] of Radionuclide Material - CY 2011 in Ci and Bq						
Tritium	Fission and Activation Products ($T_{1/2}$>3 hr)	Total Radioiodine	Total Radiostrontium	Total Uranium[e]	Total Plutonium	Total Other Actinides
4.60E-02	5.97E-03	8.27E-05	2.19E-01	6.87E-04	8.22E-06	1.95E-05
(1.70E+09)	(2.21E+08)	(3.06E+06)	(8.12E+09)	(2.54E+07)	(3.04E+05)	(7.23E+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-mi (80-km) radius (Statistics Canada, 2001).

[b] Air releases are from point and diffuse sources.

[c] Total uranium (airborne) (g) = 1.38E-01

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

[e] Total uranium (waterborne) (g) = 4.81E+02

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

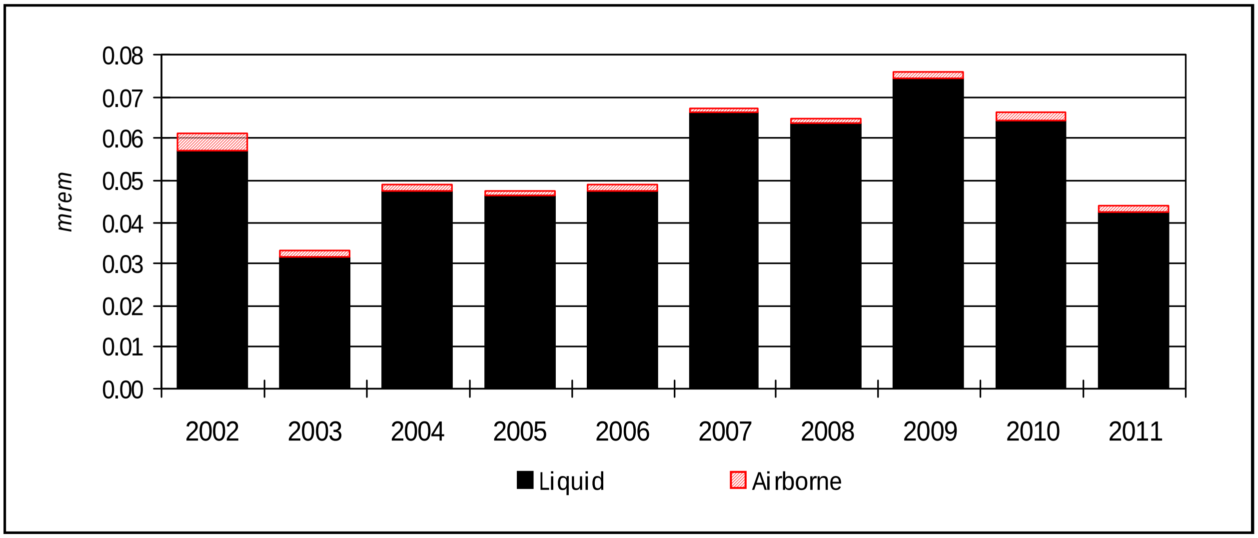
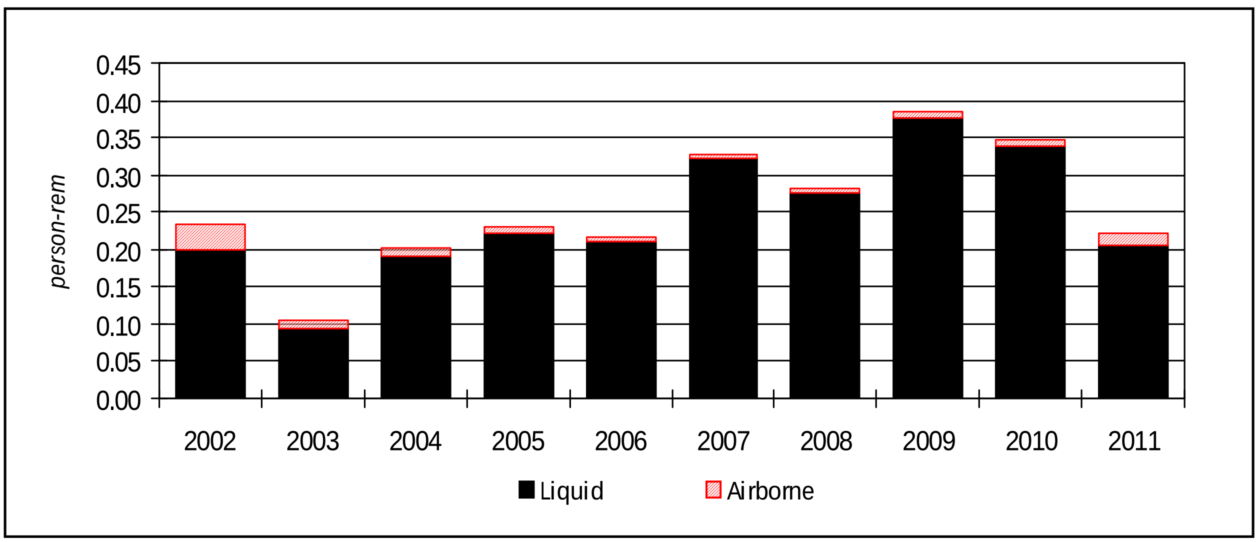


FIGURE 3-6
Collective Effective Dose Equivalent From Liquid and Airborne Effluents to the Population Residing Within 50 Miles (80 km) of the WVDP



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

sources in 2011. (See Figure 3-1, "Comparison of Doses from Natural and Man-Made Sources to the Dose from 2011 WVDP Effluents.") This estimate assumes the individual consumes the maximum quantities of each food item. These independent estimates confirmed the low modeled dose estimates based on air and water effluents, as summarized in Table 3-2. Food crops and fish were not sampled in 2011, but will be sampled in 2012.

Risk Assessment

Estimates of cancer risk from ionizing radiation have been presented by the 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 (International Commission on Radiological Protection [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 2011 was about 3 per 100 million (a risk of 0.00000003). 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

DOE ensures protection of the public and environment through the implementation of the standards and requirements set forth in DOE Order 458.1. In addition to discharges to the environment, the release of property containing residual radioactive materials is considered a potential contributor to 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 458.1, Requirements, Section 4.j. 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 plant and animal populations residing in or near these media or taking food or water from these media may be exposed to a greater extent than are humans. Therefore, 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 2011 to evaluate radiation doses to aquatic and terrestrial biota within the confines of the WNYNSC, which includes the WVDP. Doses were assessed for compliance with the limit in DOE Order 458.1 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 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 2011 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 458.1 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 0.144 and 0.270, 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 0.0039 rad/day to an aquatic animal and 0.014 rad/day to a riparian animal, far below the 1 rad/day standard from DOE Order 458.1 for dose to a native aquatic animal. Upper bounding doses associated with the terrestrial system evaluation were 0.0025 rad/day to a terrestrial animal and 0.027 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 2011.

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

TABLE 3-4
2011 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	1.28	2.99E-02	3,130	5.74	1.83E-03	0.032
Strontium-90	279	29.8	1.07E-01	583	1.22	2.09E-03	0.109
All Others	NA	NA	3.32E-03	NA	NA	5.17E-04	0.004
Sum of Fractions			1.40E-01			4.44E-03	0.144
Estimated upper bounding dose to an aquatic animal = 0.0039 rad/day; to a riparian animal = 0.014 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	1.28	2.13E-06	20.8	4.64	2.23E-01	0.223
Strontium-90	54,500	29.8	5.47E-04	22.5	1.01	4.47E-02	0.045
All Others	NA	NA	2.22E-06	NA	NA	1.32E-03	0.001
Sum of Fractions			5.51E-04			2.69E-01	0.270
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.

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 radiation dose. Additionally, estimates indicated that populations of biota at the WVDP are exposed at a fraction of 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 2011.

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GROUNDWATER PROTECTION PROGRAM

Groundwater Monitoring Program

The groundwater monitoring program (GMP) at the WVDP has been designed to comply with all applicable state and federal regulations and to meet the requirements of DOE Order 458.1, "Radiation Protection of the Public and the Environment," (including Change 2, June 6, 2011) and the RCRA §3008(h) Administrative Order on Consent.

DOE Order 458.1, Section 4.i.2, states that "Groundwater must be protected from radiological contamination to ensure compliance with dose limits in the Order and consistent with ALARA process requirements. To this end, DOE must ensure that: baseline conditions of the groundwater quality are documented; possible sources of, and potential for, radiological contamination are identified and assessed; strategies to control radiological contamination are documented and implemented; monitoring methodologies are documented and implemented; and groundwater monitoring activities are integrated with other environmental monitoring activities."

Compliance with the Consent Order and the conclusions in the RFI reports require routine monitoring of certain analytes at specified groundwater monitoring locations. (See the "RCRA 3008(h) Administrative Order on Consent" and the "RCRA Facility Investigation [RFI]" section of the ECS.)

Environmental Surveillance. The WVDP EMS (Chapter 1) includes requirements for environmental monitoring to detect and evaluate changes in the environment resulting from Project (or pre-Project) activities and for assessing the effect of such changes on the public and the environment, including changes due to groundwater contamination. The WVDP EMS also implements a site-wide approach for groundwater protection; the "WVDP Groundwater Protection Management Program Plan" documents the Project's approach for groundwater protection from Project activities.

The primary objectives of the groundwater monitoring plan are to identify, delineate, and monitor groundwater migration pathways that could transport contaminants off site and to support mitigative actions. To accomplish these goals, the GMP outlines a groundwater monitoring well network designed to monitor groundwater conditions in the subsurface geologic units that represent potential routes of contaminant migration. For a description of these geologic units refer to "Geology and Hydrogeology" later in this chapter.

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

Highlights of the site groundwater monitoring history and the evolution of the GMP are summarized in Table 4-1. Groundwater monitoring to evaluate the performance of the full-scale PTW installed in November 2010 on the north plateau is discussed in detail later in this chapter.

Geology and Hydrogeology

The WNYNSC 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). (See Figure 4-1.) Erdman Brook bisects the WVDP into the north and south plateaus. The MPPB, waste tanks, and lagoons are located on the north plateau. The drum cell, the NDA, and the SDA are located on the south plateau. (See Figure A-1.)

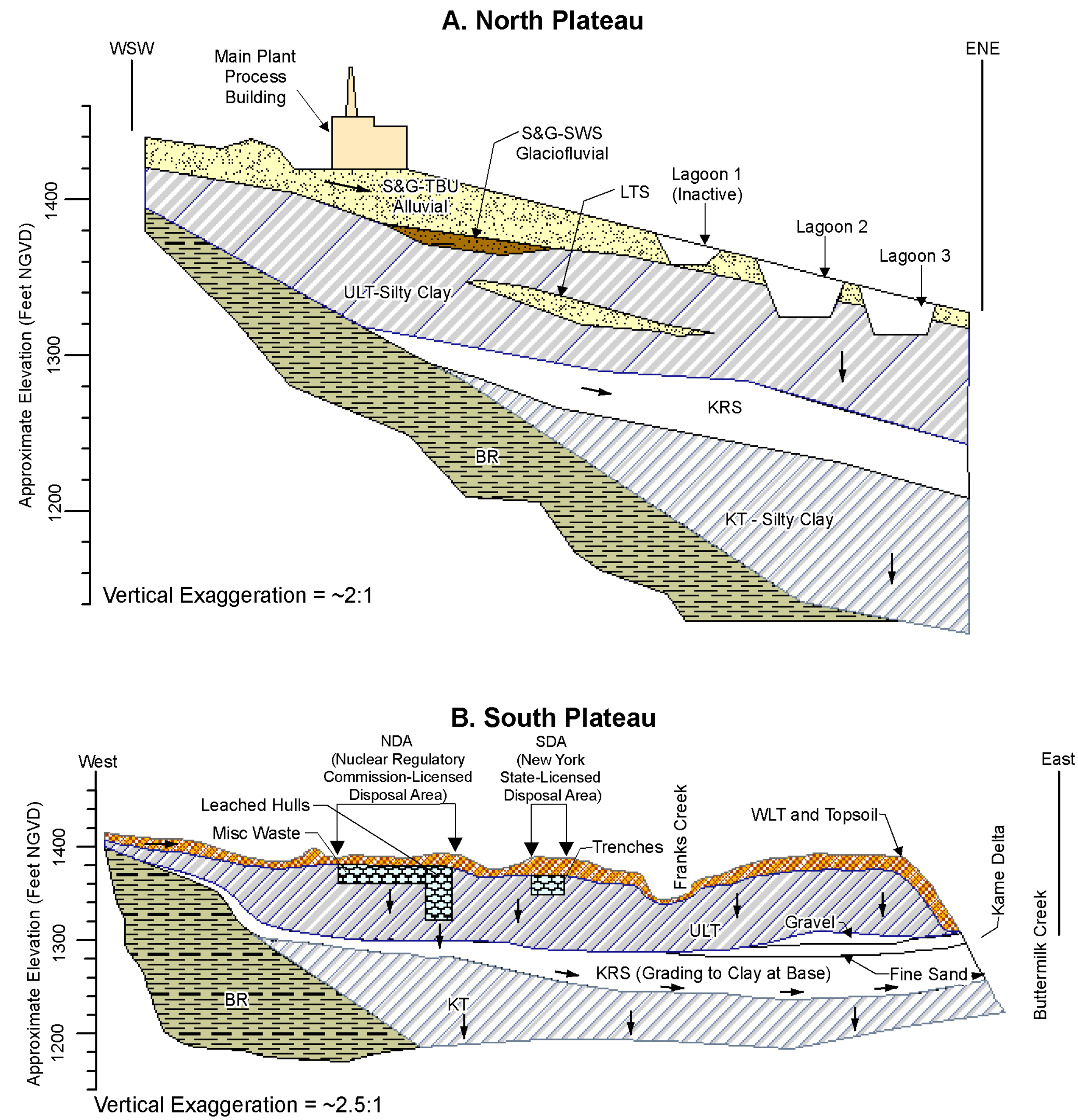
The glacial sediments overlying the bedrock consist of a sequence of three silt- and clay-rich glacial tills of Lavery, Kent, and possibly Olean age. The tills are separated by stratified fluvio-lacustrine deposits (silty or silty/sandy lakebed sediments). The glacial sediments above the Kent till, which include the Kent recessional sequence, the weathered Lavery till (WLT) and unweathered Lavery till (ULT), the intra-Lavery till-sand, and the alluvial sand and gravel (S&G) unit,

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

Year	*Highlight*
1961–1980	From the time the WNYNSC was established in 1961, to passage of the WVDP Act in 1980, groundwater at the WVDP was periodically sampled by NFS, the New York Geological Society, and the United States Geological Survey during construction of the MPPB, for spill investigations, and for post-NFS research studies.
1982	Groundwater monitoring at the WVDP began in 1982 under DOE and the site subcontractor, WVNS.
1984	By 1984, 40 wells provided groundwater monitoring coverage near the MPPB and the NDA.
1986	Additional wells were installed to supplement the existing groundwater monitoring network.
1990–1991	Ninety-six wells were installed upgradient and downgradient of the WVDP SWMUs for DOE and RCRA monitoring programs. (The total included wells at the SDA area.)
1992	The RCRA 3008(h) Order on Consent was signed.
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 beneath the MPPB, extending northeast.
1993–1994	An 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 analytical constituents were tailored to each sampling point for a more focused and cost-effective program. The NPGRS was installed near the leading edge of the main lobe of the strontium-90 plume to minimize migration, which consisted of three extraction wells to recover groundwater for treatment by ion exchange.
1996	Several groundwater seeps on the northeast edge of the north plateau were added to the monitoring program.
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 PTW was installed in the eastern lobe of the plume to test this passive in-situ remediation technology. Well points were installed near the pilot-scale PTW.
2000–2001	Additional wells and well points were installed across the leading edge of the strontium-90 plume to monitor the plume's movement and assess the effectiveness of the pilot PTW.
2003	Four new wells were installed to monitor groundwater upgradient and downgradient of the newly constructed RHWF.
2005	Number of analytes or sampling frequencies were reduced at 14 groundwater monitoring wells.
2007	The GMP was 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 downgradient groundwater.
2008	Two replacement wells, and 21 piezometers, 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	An approximately 860-foot-long full-scale PTW was installed along the leading edges of the strontium-90 plume. Sixty-six groundwater monitoring wells were installed upgradient, downgradient, and within the PTW to monitor wall performance. Four new wells were installed downgradient of the MPPB to supplement the strontium-90 source area monitoring.
2011	Groundwater monitoring continued throughout CY 2011 per the GMP, the "North Plateau Groundwater Monitoring Plan," and the "North Plateau PTW Performance Monitoring Plan." There were no changes to the programs and no wells were installed or decommissioned in 2011.

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

J:/GIS/ArcMap/ASER/ASER_2010/ASER_2010_Fig4-1_20110602.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)*	

are generally regarded as the predominant 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. The S&G unit consists of two subunits: the thick-bedded unit (TBU) and the slackwater sequence (SWS). It only exists on the Project's north plateau. See Table 4-2 for the descriptions and the geographic distribution of these units.

Routine Groundwater Monitoring Program

Groundwater Monitoring Network. The WVDP groundwater monitoring network is an essential component of meeting the requirements of DOE Order 458.1. Groundwater is routinely monitored across the north and south plateaus and in the six hydrogeologic units described in Table 4-2. In CY 2011, groundwater samples were collected from 69 on-site, routine groundwater monitoring locations, including 63 monitoring wells and well points, five groundwater seepage points, and one trench sump (see Figures A-7 and A-8). Many of the wells monitor one or more of the SWMUs or SSWMUs per the Consent Order. Table 4-3 lists the wells in the routine groundwater monitoring network, the geologic units monitored, and the analytes measured in CY 2011. Table 4-4 identifies the analytical parameters defined in each analyte group.

The monitoring frequency and the constituents analyzed under the groundwater monitoring plan are a function of regulatory requirements, historical site activities, current operating practices, and ongoing evaluations of groundwater data. Tables 4-5 and 4-6 provide an overview of groundwater monitoring performed during CY 2011, organized by geographic area and monitoring purpose.

Groundwater monitoring is also performed on the PTW and the north plateau strontium-90 groundwater plume discussed later in this chapter.

Groundwater Elevation Monitoring. Groundwater levels are measured at the monitoring network wells in conjunction with the quarterly analytical sampling. (See Figures A-7 and A-8 in Appendix A.) These data are used to produce maps depicting groundwater flow directions and gradients. Long-term trend graphs are used to illustrate variations in groundwater elevations over time, including seasonal fluctuations or changes resulting from installing water diversions, such as geomembrane covers, trenches, or slurry walls, and groundwater treatment systems (e.g., the north plateau pumping wells and the full-scale PTW).

Determining groundwater flow direction is critical for monitoring groundwater that is or may become impacted by contaminant migration, such as the strontium-90 plume. Surface water elevations are also measured on the north plateau where the water table in the S&G unit intersects the ground surface, providing additional groundwater flow data.

Groundwater elevation mapping of the WLT on the south plateau helps evaluate the effectiveness of the NDA interceptor trench, the slurry wall, and geomembrane cover. (See "Groundwater Sampling Observations on the South Plateau: WLT 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 analytical detection limits.

Trigger level exceptions, defined as measurements above an upper trigger level or below a lower trigger level, may be the result of normal seasonal fluctuations, laboratory analytical problems, or changes in groundwater quality. Response actions are identified for each analytical result exceeding a trigger level. After each sampling event, the current trigger level exceptions are compiled, evaluated, summarized with recommended response actions, and reported to NYSDEC.

Groundwater Screening Levels (GSLs). In 2009, GSLs were developed during the CMS preparations 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 are discussed in detail in Appendix D. Analytical results for 2011 were compared with applicable GSLs, and the results are summarized in Table 4-9 at the end of this chapter.

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 ft/day (3.2E-03 centimeters [cm]/second [sec])	Surficial unit on the north plateau
Sand and Gravel; Slackwater Sequence	Interbedded silty sand and gravel layers composed of Pleistocene-age glaciofluvial deposits partially separated from the S&G-TBU by a discontinuous silty clay interval	Flow is to the northeast along gravel layers toward Franks Creek.	17 ft/day (6.0E-03 cm/sec)	Underlies a portion of the north plateau
Weathered Lavery Till	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 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	Surficial unit on the south plateau
Unweathered Lavery Till	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 (8.1E-07 cm/sec)	Underlies both the north and south plateaus
Lavery Till Sand	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	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.	0.01 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 2011.

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

Well ID	SSWMU	Gradient Position	Analyte Group (See Table 4-4)	Well ID	SSWMU	Gradient Position	Analyte Group (See Table 4-4)
Sand and Gravel Wells							
103[a]	1, 3	D	I, RI, V	803[a]	8	D	I, RI, SV, V
104	1	C	I, RI	804[a]	8	D	I, RI, V
105	1	C	I, RI	1302[b]	NA	U	I, RI, M,
106	1	D	I, RI	1304[b]	NA	U	I, RI, M, R
111[a]	1	D	I, RI, M, SV, V	8603	8	U	I, RI
116[a]	1, 8	C, U	I, RI, V	8604	1	C	I, RI
205	2	D	I, RI	8605[a]	1, 2	D	I, RI, M, SV, V
301[a]	3	B, U	I, RI	8607[a]	4, 6	D, U	I, RI, V
302	3	U	I, RI	8609[a]	3, 4, 6	D, D, U	I, RI, S, V
401[a]	3, 4	B, U	I, RI, R	8612[a]	8	D	I, RI, SV, V
402	4	U	I, RI	MP-01[a]	3	D	I, RI, M, R-MP, SV, V, T
403	4	U	I, RI	MP-02[a]	3	D	I, RI, M, R-MP, SV, V, T
406[a]	4, 6	D, U	I, RI, R, V	MP-03[a]	3	D	I, RI, M, R-MP, SV, V, T
408[a]	3, 4	D	I, RI, R, V	MP-04[a]	3	D	I, RI, M, R-MP, SV, V, T
501[a]	5	U	I, RI, S, V	WP-A[c]	NA	NA	I, RI
502[a]	5	D	I, RI, S, SM, V	WP-C[c]	NA	NA	I, RI
602A	6	D	I, RI	WP-H[c]	NA	NA	I, RI
604	6	D	I, RI	SP04[d]	NA	NA	RI
605	6	D	I, RI	SP06[d]	NA	NA	RI
706[a]	7	B, D	I, RI, M	SP11[d]	NA	NA	RI
801[a]	6, 8	U, D	I, RI, S, V	SP12[a,d]	8	D	I, RI, V
802	8	D	I, RI, V	GSEEP[a,d]	8	C, 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	1005[a]	9, 10	C, U	I, RI
908R[a]	9	B, U	I, RI	1006[a]	9, 10	C, D	I, RI
909[a]	9	D	I, RI, M, R, SV, V	1008C[a]	9, 10	B, U	I, RI
NDATR[a]	9	D	I, RI, M, R, SV, V				
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	D	I, RI, M	1301[b]	NA	D	I, RI
409	4	D	I, RI	1303[b]	NA	U	I, RI, M
Kent Recessional Sequence Wells							
901[a]	9	U	I, RI	1008B	10	B, 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 some parameters at this well is required by the RCRA §3008(h) Consent Order.
[b] Monitors upgradient or downgradient of the RHWF.
[c] Monitors north and east of the MPPB.
[d] Monitors groundwater emanating from seeps along the edge of the north plateau.

TABLE 4-4
WVDP Groundwater Sampling and Analysis Agenda

Analyte Group	*Description of Parameters*
Indicator Parameters (I)	pH, specific conductance (field measurements)
Radiological Indicator Parameters (RI)	Gross alpha, gross beta, tritium
Volatile Organic Compounds (V)	6 NYCRR Part 373-2 Appendix 33 Volatile Organic Compounds
Semivolatile Organic Compounds (SV)	6 NYCRR Part 373-2 Appendix 33 Semivolatile Organic Compounds and tributyl phosphate
Groundwater metals (M)	6 NYCRR Part 373-2 Appendix 33 Metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, silver, thallium, vanadium, zinc)
Special Monitoring Parameters for early warning wells (SM)	Aluminum, arsenic, barium, cadmium, chromium, cobalt, copper, Iron, lead, manganese, mercury, nickel, selenium, silver, vanadium, zinc
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
Radioisotopic Analyses MPPB Area (R-MP)	Carbon-14, potassium-40, cobalt-60, strontium-90, technetium-99, iodine-129, cesium-137, europium-154, neptunium-237, plutonium-238, plutonium-239/240, plutonium-241, uranium-232, uranium-233/234, uranium-235/236, uranium-238, americium-240, curium-244
Strontium-90 (S)	Strontium-90
Turbidity (T)	Turbidity

TABLE 4-5
WVDP 2011 Groundwater Monitoring Overview by Geographic Area[a]

Number of...	*Total WVDP*	*North Plateau*	*South Plateau*
Monitoring Points Sampled - Analytical	69	55	14
Monitoring Points - Water Elevations Only	73	34	39
Monitoring Events	4	4	4
Analyses (analyses groups)	1,084	926	158
Results (individual)	8,224	6,643	1,581
Percent of Nondetectable Results	84%	84%	88%
Water Elevation Measurements	536	324	212

[a] Does not include PTW monitoring.

TABLE 4-6
WVDP 2011 Groundwater Monitoring Overview by Purpose

Number of...	*Total*	*Regulatory/ Waste Management*	*Environmental Surveillance*
Monitoring Points Sampled - Analytical	69	38	31
Monitoring Points - Water Elevations Only	73	1	72
Monitoring Events	4	4	4
Analyses (analyses groups)	1,084	746	338
Results (individual)	8,224	7,321	903
Percent of Nondetectable Results	84%	88%	53%
Water Elevation Measurements	536	148	388

North Plateau Strontium-90 Plume

Elevated gross beta has been observed on the north plateau since 1993, and is predominantly confined to the S&G unit, the shallowest hydrogeologic unit on the north plateau. (See the highlights for 1993 and 1994 in Table 4-1.) The routine groundwater monitoring plan network for the S&G unit on the north plateau includes 44 monitoring locations, three well points, and five groundwater seepage locations.

In April 2011, DOE issued a new technical standard (DOE-STD-1196-2011) that established a revised set of radiological concentration standards for radiological environmental protection programs at DOE facilities and sites. These DCSs were used in the evaluation of the groundwater data collected in 2011. Because there is no DCS for gross beta in liquid effluents, the strontium-90 DCS (1.1E-06 µCi/mL) is used as a conservative basis for comparison where beta-emitting radionuclides are detected in groundwater. Historical monitoring has established that strontium-90 is the most predominant beta emitter found in site groundwater. The strontium-90 concentrations would be expected to be about one-half of the gross beta result because the beta includes strontium-90 and its daughter product, yttrium-90. Therefore, monitoring wells are routinely sampled for gross beta concentrations, supported by periodic sample measurement at select wells for strontium-90 analysis. For the purpose of the following discussions, the strontium-90 DCS is used for comparison with both gross beta and strontium-90. (See the "Useful Information" section at the end of this report for a discussion of DOE DCSs, and Table UI-4 for a list of the DCSs for radionuclides of interest at the WVDP.)

Figure 4-2 shows the current extent of the strontium-90 plume, as defined by the 1.0E-06-µCi/mL gross beta isopleth, at three time intervals spanning 18 years (in 1994, 2002, and 2011). As shown, the plume's western boundary has remained relatively constant since 1994, but the plume's northern and eastern extents have migrated to the northeast and east. The leading edge has divided into three small lobes because of the variable groundwater flow rate, due to the heterogeneous nature of the sediments within the S&G unit. The uneven distribution of coarse and fine soils within the subsurface creates preferential pathways for groundwater flow. The groundwater monitoring plan wells that monitor the plume and the measured gross beta concentrations are shown on the figure.

Gross beta concentration trends over the last 10 years at monitoring wells located within the plume and near former lagoon 1 are shown on Figures 4-3 through 4-8. 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 1.0E-09 µCi/mL range) and data from the central plume (with concentrations in the 1.0E-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 in groundwater from wells located immediately downgradient of the MPPB, the strontium-90 source area, and along the western edge of the plume (well 8609). Well 408 and the four MPPB wells (MP-01, -02, -03, and -04, installed in CY 2010), located northeast of the MPPB, exhibit the highest gross beta concentrations of any routinely monitored wells in the GMP. They are located closest to the source area and are directly downgradient of the MPPB. The average annual gross beta concentrations in 2011 at these wells ranged from a high of 3.27E-04 µCi/mL at location MP-02 to a low of 2.01E-04 µCi/mL at location MP-03. All gross beta concentrations from the MPPB wells are significantly above the DCS for strontium-90 (1.1E-06 µCi/mL). Gross beta concentrations, near the plume's western edge at well 8609, remained relatively stable at about two orders of magnitude lower than the concentrations directly downgradient of the MPPB.

Figure 4-4 illustrates gross beta concentrations in wells 104, 501, 502, and 8604 centrally located within the plume's source area. Gross beta concentrations in these wells did not change significantly in 2011 compared with 2010.

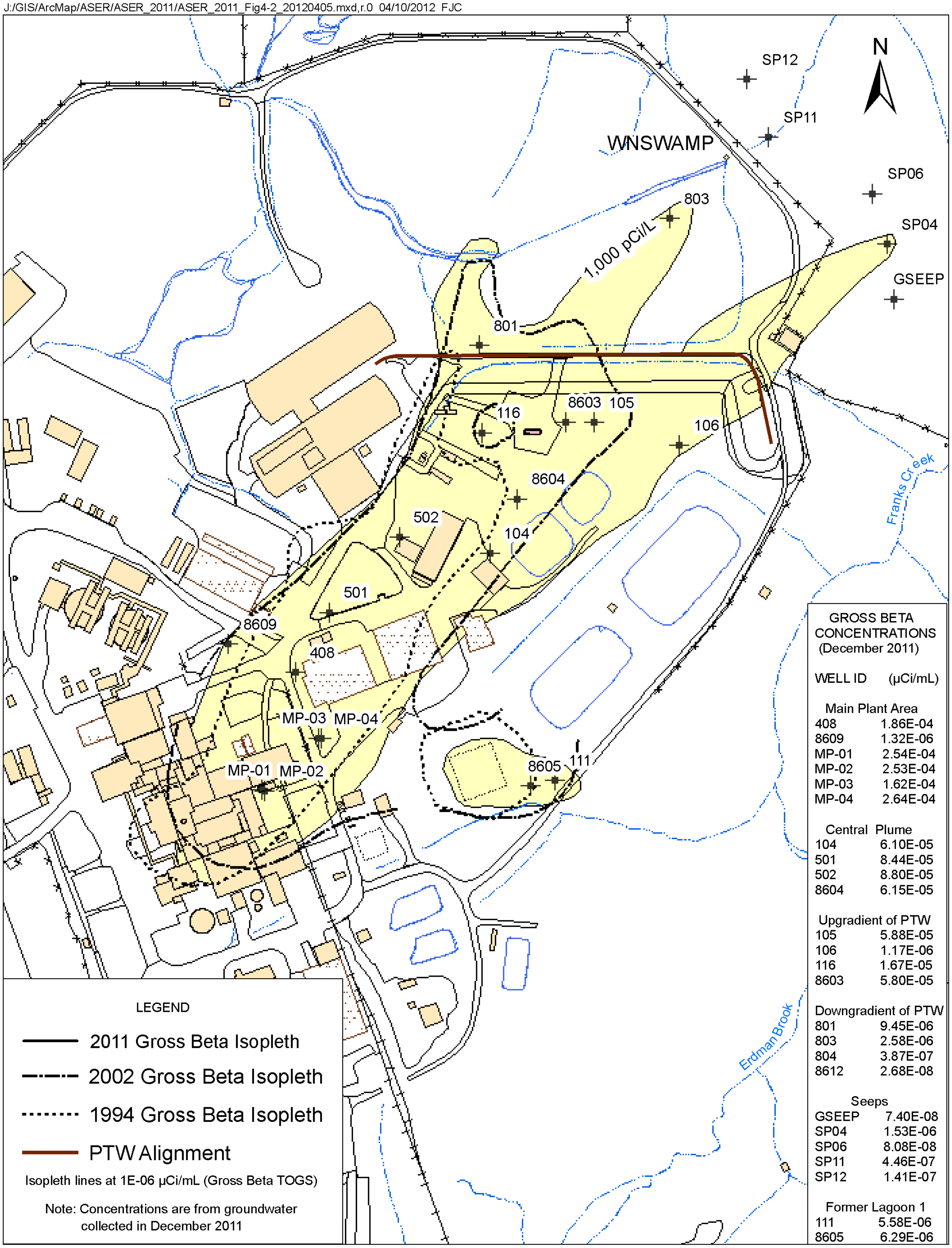
Figure 4-5 illustrates gross beta concentrations at monitoring wells 105, 106, 116, and 8603, upgradient of the PTW.

The plume's leading edge had migrated past the area of the PTW before it was installed in 2010. Strontium-90-contaminated groundwater present in the subsurface, prior to the PTW installation, continued to migrate to the northeast.

Gross beta concentrations at wells 803 and 8612 (Figure 4-6) exhibit increases from 2009 through 2011. The concentrations at well 803, closest to the

FIGURE 4-2
North Plateau Strontium-90 Plume Plotted by Gross Beta Data: 1994, 2002, and 2011

J:/GIS/ArcMap/ASER/ASER_2011/ASER_2011_Fig4-2_20120405.mxd,r.0 04/10/2012 FJC



leading edge, increased by over 1,000 pCi/L in 2011, as the contaminated groundwater (downgradient of the PTW) continued to migrate. The annual average gross beta concentrations at wells 801, 803, 804, and 8612, increased in 2011.

Monitoring at North Plateau Seeps. Groundwater is also monitored along the northeast edge of the north plateau, where it seeps from the steep banks incised by Erdman Brook and Franks Creek. The downgradient seepage locations (GSEEP, SP04, SP06, SP11, and SP12), located east of the CDDL outside of the WVDP fenceline, monitor conditions on the edge of the north plateau where groundwater discharges to the surface. (See Figure 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 were plotted against surface water background values because water from seepage points occasionally may include surface water (i.e., at seepage location SP11). Annual average concentrations at all five monitored seep locations increased during 2011.

The highest gross beta concentration among the seepage locations has been observed at SP04, which increased to over 1,000 pCi/L in 2011. This location first exhibited a significant increase in mid-2007, continuing to increase to an annual average concentration of approximately 116% of the strontium-90 DCS in 2011. The second highest gross beta concentration at the seep sampling locations occurred at SP11, located within the discharge area of the swamp drainage ditch. The annual average gross beta at this seep location has slowly increased since monitoring began in 1996. The annual average 2011 concentration is the highest of record and represents approximately 36% of the DCS for strontium-90. The gross beta activity detected at SP11 is believed to be the result of contaminated groundwater from the S&G unit that entered the northeast swamp drainage ditch, and percolated back into the ground. The 2011 annual average gross beta concentrations at seep locations SP06, SP12, and GSEEP also increased during 2011.

Monitoring at the Northeast Swamp Drainage. The western and central lobes of the plume are partially intercepted by the northeast swamp drainage ditch flowing west to east across the plume's leading edge (see Figure 4-2 and Figure A-2 in Appendix A). The surface water flow rate in this ditch is measured biweekly. Surface water samples are collected monthly and analyzed for radiological constituents at sampling location WNSWAMP located at the WVDP property boundary. Groundwater from the north plateau plume seeping into this ditch is believed to be the main source of the strontium-90 activity at WNSWAMP. Approximately 33.4 million gal (126 million L) of water flowed through this monitoring point in 2011. (See "Effluent Monitoring" in Chapter 2.)

As shown on Figure 4-8, annual average strontium-90 concentrations at WNSWAMP have been above the strontium-90 DCS for nine of the last 10 years. Gross beta and strontium-90 concentrations at WNSWAMP exhibit seasonal variability. The average annual strontium-90 concentration measured in samples from WNSWAMP decreased in 2011 to a level approximately equal to the 2005 annual average concentration. The flow through WNSWAMP accounted for an annual estimated dose of 3.2E-02 mrem in 2011. See "Maximum Dose (Waterborne) to an Off-Site Individual" 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 2011 were indistinguishable from historical concentrations from the Cattaraugus Creek background surface water location at Bigelow Bridge (WFBIGBR).

Strontium-90 Plume Remediation Activities

Full-Scale PTW. In November 2010, an 860-ft-long full-scale PTW was installed to treat the north plateau strontium-90 plume. The PTW was installed along the existing roadway south of the CDDL, as shown on Figures 4-2 and 4-3. A map view and cross-section of the PTW installation is shown on Figure 4-9. The PTW was installed through the entire thickness of the S&G unit (including the TBU and the SWS, where present), and was keyed into the underlying, low-permeability ULT. Granular clinoptilolite (i.e., zeolite), a natural mineral with a porous structure that traps positively charged ions by ion exchange, including strontium, while allowing the groundwater to pass through, was used in the PTW. A lined storm water drainage ditch (SmartDitch™) was also installed in September 2010 south of the PTW to intercept storm water from upland site areas and route it around the PTW to Franks Creek. The PTW was designed to address three remedial action objectives (RAOs):

- RAO 1: Reduce or eliminate strontium-90 presence in groundwater seepage leaving or potentially exiting the north plateau to as low as practically achievable, with a goal to be less than the DCG of 1.0E-06 µCi/L (the RAOs for the PTW were determined before the DCGs were replaced by the DCSs);

- RAO 2: Minimize the future expansion of the strontium-90 plume beyond its current mapped limits; and

- RAO 3: Ensure that a technology selected for current containment of the strontium-90 plume does not preclude any strategies for addressing the plume during site decommissioning.

The PTW placement was chosen to not impact the CDDL, thereby not capturing the leading edge of the plume (November 2010). Strontium-90 concentrations within these lobes may continue to increase for a period of time, and then eventually decrease when groundwater treated by the PTW begins to reach these downgradient areas. Recent PTW monitoring shows evidence of treated groundwater exiting the PTW immediately downgradient of the wall.

DOE is also evaluating long-term strategies for plume management, including excavating subsurface soils from the source area beneath the MPPB. Removal of the MPPB and the plume source area are components of DOE's ROD for decommissioning and/or long-term stewardship of the WVDP and the WNYNSC.

PTW Performance Monitoring Plan (PTWPMP). The PTWPMP was developed and implemented immediately following the PTW installation. This plan describes the performance monitoring requirements for the full-scale PTW. Data collected during the first year of monitoring is reported in the quarterly and annual PTW performance monitoring reports, which evaluate whether the functional requirements for the PTW are being met. The general objectives of the PTWPMP include:

- Monitoring the physical integrity of the PTW and its components;

- Assessing the movement of strontium-90-affected groundwater in the vicinity of the PTW; and

- Assessing the removal of strontium-90 from groundwater moving through the PTW.

The PTW performance monitoring system consists of 21 existing groundwater monitoring wells, and 66 wells installed within and immediately adjacent to the PTW. The baseline PTWPMP testing activities performed in January 2011 included: (1) tracer dilution tests in select wells within the PTW to assess flow velocities (i.e., using non-reactive sodium bromide solution as a tracer), (2) hydraulic conductivity testing in select wells within and adjacent to the PTW, and (3) continuous hydraulic head monitoring. Analytical monitoring includes sampling and analysis for strontium-90, as well as for geochemical parameters to evaluate ion-exchange processes occurring within the wall. Quarterly sampling, monthly and continuous monitoring of water levels, and monthly inspections were performed throughout 2011. Monitoring data collected to date indicates:

- groundwater flow patterns in the PTW area were similar to flow patterns observed prior to PTW construction, suggesting the PTW installation did not substantially alter groundwater flow conditions on the north plateau;

- strontium-90 activity in groundwater from wells inside and immediately downgradient of the PTW is currently generally lower than strontium-90 levels in the groundwater plume immediately upgradient of the PTW;

- geochemical differences have been observed in groundwater that has migrated into or through the zeolite, indicating cation exchange is occurring; and

- strongium-90 concentrations are decreasing immediately downgradient of the PTW.

These observations indicate the ongoing processes within the PTW are currently achieving the RAOs and the functional requirements of the PTW.

North Plateau Groundwater Monitoring Program (NPGMP). A supplementary NPGMP was also developed in 2010, in conjunction with the completion of the full-scale PTW. The primary objective of the NPGMP is to monitor the strontium-90 plume migration in groundwater farther upgradient and downgradient of the PTW than the areas monitored under the PTWPMP. This monitoring program, which includes quarterly gross beta sampling at 26 well locations and water level measurements at 40 well locations, was performed concurrent with the PTWPMP throughout 2011.

Groundwater seep and surface water samples continue to be collected on the north plateau as part of other site sampling programs (Environmental Monitoring Program Plan and the Groundwater Monitoring Plan).

PTW Protection and BMP. The North Plateau PTW Protection and BMP describes best management practices implemented to increase the effectiveness and longevity of the PTW. The practices included elimination of road-salt use near the PTW, storm water management via the upgradient Smart-Ditch™, and monthly inspections. An operation and maintenance plan was established to ensure proper use and maintenance of the access roads and drainage systems associated with the PTW.

NPGRS. In 1995, the NPGRS was installed to slow the advance of the strontium-90 plume. (See Figure 4-2.) The NPGRS consists of three wells that extract contaminated groundwater. Extracted groundwater is transferred to the LLW2 for treatment by ion exchange to remove strontium-90. Treated water is ultimately discharged through the lagoon system to Erdman Brook via the SPDES-permitted outfall 001.

The NPGRS operated throughout 2011, processing about 3.3 million gal (12.6 million L) of water. The system has extracted and processed approximately 62.8 million gal (238 million L) since November 1995. The NPGRS may no longer be needed because of the PTW; therefore, closure of this system would be performed under SPDES.

North Plateau Groundwater Quality Early Warning Monitoring for NPGRS. Early-warning monitoring of groundwater directly upgradient of the NPGRS is performed to provide the monitoring results that 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 2011 were below concentrations likely to affect SPDES permit compliance. (See Appendix D-2.)

Pilot-Scale PTW. A pilot-scale PTW was constructed in 1999 with a clinoptilolite, selected for its ability to adsorb strontium-90 ions from groundwater. The data collected during the testing operation of the pilot PTW helped determine that the PTW technology was an effective remediation method for strontium-90-contaminated groundwater. Three wells within the pilot-scale PTW continue to be monitored under the NPGMP to support delineation of flow and transport of the plume across the north plateau, as well as providing continuous monitoring data for the pilot wall.

Other Groundwater Sampling Observations on the North Plateau

Monitoring Near Former Lagoon 1. Southeast of the strontium-90 plume, elevated gross beta concentrations are documented 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 DCS and are remaining stable from year to year, as shown in the 10-year trend graph on Figure 4-10. The gross beta activity source is assumed to be the radiologically contaminated material used as backfill and the residual sediment within former lagoon 1.

Tritium in North Plateau Groundwater. 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. Tritium has a relatively short half-life (about 12.3 years) and dilution from surface water infiltration and groundwater recharge contributes to the decrease. Residual tritium activity is attributed to former nuclear fuel reprocessing operations. 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 2011, 3.36E-05 µCi/mL, occurred at well point WP-C, downgradient of the MPPB (see Figure A-7). This concentration was approximately two orders of magnitude below the DCS for tritium of 1.9E-03 µCi/mL.

Radioisotopic Sampling Results on the North Plateau. In addition to being analyzed for gross alpha, gross beta, tritium, and strontium-90, samples from eight groundwater wells in the north plateau S&G unit (401, 406, 408, 1304, and MP-01 through MP-04) were analyzed for specific radionuclides (see Tables 4-3 and 4-4). The maximum radionuclide concentrations measured during 2011 are presented in Table 4-7.

The MPPB wells (MP-01, -02, -03, and -04) were also analyzed for radioisotopes not previously included in the WVDP groundwater analytical suites, including neptunium-237, plutonium-238, plutonium-239/240, plutonium-241, americium-241, and curium-243/244, to investigate their presence as a result of former MPPB operations. None of these radionuclides have been

TABLE 4-7
2011 Maximum Concentrations of Radionuclides[a] in Groundwater at the WVDP Compared With WVDP Groundwater Screening Levels (GSLs)[b]

Radionuclide	*Regulatory Compliance*			*Environmental Surveillance*			*GSL (µCi/mL)*
	Well ID With Maximum Concentration	*Flag [c]*	*Maximum Concentration (µCi/mL)*	*Well ID With Maximum Concentration*	*Flag [c]*	*Maximum Concentration (µCi/mL)*	
Tritium	110		9.49E-07	WP-C		3.36E-05	1.78E-07
Strontium-90	MP-01		1.94E-04	–		–	5.90E-09
Technetium-99	MP-02		5.55E-08	–		–	5.02E-09
Iodine-129	NDATR		2.10E-08	–		–	9.61E-10
Cesium-137	NDATR	J	1.32E-09	–		–	1.03E-08
Radium-226	401		6.27E-10	–		–	1.33E-09
Radium-228	408	J	1.14E-09	–		–	2.16E-09
Uranium-233/234	909		1.31E-09	–		–	6.24E-10
Uranium-235/236	MP-03	J	1.42E-10	–		–	8.07E-11
Uranium-238	909		1.10E-09	–		–	4.97E-10
Total Uranium	909	J	3.06E-03	–		–	1.34E-03

Note: Bolding indicates that the radionuclide exceeds the GSL.
– Indicates that none of the environmental surveillance wells exhibited positive results for these radionuclides or were not sampled for these radionuclides.
[a] The table presents the maximum concentrations of all radionuclides that were positively detected in groundwater wells at the WVDP; all other radionuclides were not positively detected.
[b] GSLs for radiological constituents are set equal to the larger of the background concentrations or NYSDEC Technical and Operational Guidance Series 1.1.1 Class GA Groundwater Quality Standards (see Table D-1A).
[c] The "J" flag indicates the result is an estimated value.

detected to date at the MPPB wells. (See Appendix D, Table D-2H.)

Two sampling locations in the south plateau (well 909 and the NDA sump [NDATR]) are also analyzed for specific radionuclides. Results are discussed later in this chapter. (Note that radium-226, radium-228, uranium-234, and uranium-238 occur naturally in the environment.) (See Appendix D-1.)

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 of these compounds exceeding NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Class GA Groundwater Quality Standards were detected in some groundwater samples collected during the RFI.

Currently, the only S&G unit monitoring location with consistent positive VOC detections is well 8612, located northeast and downgradient of the CDDL at the northeast edge of the north plateau. (See Table 4-8, and Figure A-7 in Appendix A.) Figure 4-11 illustrates the concentration ranges of four VOCs detected at well 8612. Only one VOC (1,2-Dichloroethylene [total] [1,2-DCE-t]) continues to be detected slightly above the TOGS 1.1.1 Class GA Groundwater Quality Standard. The concentration of 1,2-DCE-t at well 8612 continued decreasing during 2011 from 14 micrograms per liter (µg/L) in March to 11 µg/L in December. These concentrations are not significantly above detection limit of 5.0 µg/L. The VOCs detected in well 8612 are presumed to be from wastes buried in the CDDL.

TBP, an SVOC; has been continually detected in groundwater from well 8605, down-gradient of former lagoon 1 since monitoring began. The maximum concentration measured in 2011 (126 µg/L) was significantly lower than the historic high of 700 µg/L measured in December 1996. TBP has also been detected in well 111, located near well 8605, but at concentrations, close to the quantitation limit of 10 µg/L. (See Figure 4-12.) TBP is thought to be residual from contamination from liquid waste management activities in the former lagoon 1 area during nuclear fuel reprocessing. A TOGS 1.1.1 water quality standard is not established for TBP.

A summary of maximum concentrations of VOCs and SVOCs detected in WVDP groundwater wells in 2011, that exceeded TOGS 1.1.1 criteria, is provided in Tables 4-8 and 4-9.

Metals Sampling on the North Plateau. In 2005, 2007, and 2008, select groundwater wells were sampled to evaluate metals concentrations in groundwater impacted by the strontium-90 plume migrating from the MPPB source area. The 2008 Geoprobe® investigation was performed to collect soil and groundwater data to further evaluate metals concentrations within the strontium-90 plume. Using newly established groundwater background metals concentrations and the TOGS 1.1.1 Class GA Groundwater Quality 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 2011, only routine metals sampling was performed, as outlined in the GMP. The sampling results were compared with the established GSLs and background levels (see Table 4-9). The only metals detected above background in groundwater in 2011 were barium, chromium, and nickel. Barium was detected above background concentrations at wells 502 and MP-01. Nickel and chromium were detected, as in previous years, at concentrations above the GSLs in wells 405 and 502, and nickel was detected above the GSL at well 706 (see Appendix D-26). All three of these wells are stainless-steel wells that have historically shown evidence of corrosion. (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 Sampling Observations on the South Plateau: WLT and the NDA

IM. In 1990, a trench system was constructed through the WLT along the northeast and northwest sides of the NDA to intercept and collect potentially contaminated groundwater containing 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 transferred to the LLW2 for processing. In 2011, no TBP or VOCs were detected in groundwater from the NDA interceptor trench. Groundwater elevations are monitored quarterly in and around the interceptor trench to ensure that an inward gradient is maintained, thereby minimizing potential migration of contaminated groundwater.

A second IM, to stabilize the NDA cover and to minimize infiltration of surface water and precipitation into and groundwater migration through the NDA, was completed in December 2008. This included installing a geosynthetic cap over the NDA, a low-permeability subsurface groundwater slurry wall upgradient of the NDA, and surface water drainage diversions. (See also “Interim Measure [IM]” under “RCRA 3008(h) Consent Order” in the ECS and “NDA Interceptor Trench and Pretreatment System” in Chapter 1.) Twenty-one piezometers were installed to monitor groundwater elevation both upgradient and downgradient of the slurry wall. Water level data from 2009 through 2011 suggest that water levels under the geomembrane continue to decline. Water levels in piezometers outside the cap and 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 reduced water volume extracted from the interceptor trench since the cap and barrier wall were installed is the strongest indication that the IM is effectively reducing flow through the

TABLE 4-8
2011 Summary of Maximum Concentrations of Organic Constituents in Select WVDP Groundwater Wells

Constituent	*Regulatory/Waste Management Monitoring Program*		*New York State Class GA Groundwater Quality Standards* [a] *(μg/L)*
	Well with the Highest Concentration	*Maximum Concentration (μg/L)*	
1,2-Dichloroethylene (total)	8612	14	5.0
Tributyl phosphate	8605	126	NA

NA - Not applicable.
[a] Source: 6 NYCRR Part 703, Division of Water TOGS 1.1.1, Class GA Groundwater Quality Standards.

NDA. The volume pumped from the NDA trench in 2011 (84,375 gal [383,567 L]) was approximately one-fifth of the volume pumped in CY 2007, before the IM. (See Figure 4-14.)

Refer to ECS "IM" under "RCRA §3008(h) Administrative Order on Consent" for further discussion of the NDA IM.

Radioisotopic Sampling Results on the South Plateau. Gross beta, tritium, and several radioisotope concentrations in groundwater from NDATR (see Table 4-9 and Appendix A, Figure A-8) continued to be elevated with respect to GSLs and to concentrations in background monitoring locations on the south plateau. Gross beta concentrations at NDATR have decreased slightly from the maximum observed in September 2009 after the 2008 IM. The increases immediately following the installation of the upgradient slurry wall and cap are believed to be attributable to less dilution of water collected in the trench because groundwater and surface water infiltration into the NDA was significantly reduced. Similar to the north plateau, strontium-90 is the predominant contributing radioisotope to the measured gross beta concentrations in the NDA trench water.

Samples from NDATR also exhibited the highest concentrations for iodine-129 and cesium-137. The cesium-137 concentrations in 2011 were estimated at an order of magnitude below the GSL. (See Table 4-7.) Elevated iodine-129 concentrations observed since the 2008 IM are believed to be attributable to less dilution of the water that collects within the trench.

WLT well 909 also exhibited elevated tritium, strontium-90, and several uranium radioisotope concentrations above the GSL during 2011, consistent with historical values, as shown in Table 4-7 and Appendix D. Recent gross beta and strontium-90 concentrations at well 909 are remaining stable.

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

Additional Monitoring and Investigations

Groundwater Monitoring Downgradient of the WTF. HLW in the underground tanks was removed and solidified through the VIT process and the tanks now contain the residual waste. In 2005, DOE evaluated the current and historical groundwater conditions in the WTF vicinity. 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 potential leaks from the tanks. The natural inward hydraulic gradient is influenced by periodically pumping a dewatering well (DWW), located outside the vault, that also 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. During 2011, gross beta concentrations at well 8607 increased slightly in March 2011, then decreased again to the near background levels observed since 2006. The underground waste tanks are being stabilized by a T&VDS that began operating in December 2010. This system is successfully reducing the liquid volume in the tanks and vaults through evaporation. (See "WTF and the T&VDS" in the ECS.)

Summary

Evaluation of groundwater results from 2011 continued to show that the most widespread area of groundwater contamination at the WVDP is the strontium-90 plume in the S&G unit on the north plateau. Efforts to reduce contaminant levels in the downgradient portions of the north plateau plume included the 2010 installation of the full-scale PTW across the leading edge. Longer-term measures described in Phase 1 of the EIS preferred alternative selected by DOE in the ROD (April 2010), as discussed in the ECS, include removing the MPPB, removing the lagoons, and remediating the source of the north plateau plume.

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. Measures to reduce water moving through the NDA included installing a slurry wall and geomembrane cover in 2008.

TABLE 4-9
2011 Groundwater Monitoring Results Exceeding GSLs and Background Levels

RADIOLOGICAL PARAMETERS								
Number of Locations exceeding GSLs[a] or Background[b]		*Geologic Unit (plateau)*	*Groundwater Sampling Location*					
Gross Alpha								
1 > GSL	9 > BKG	S&G (NP)	SP04	106	111	8605	MP-03	MP-04
		WLT (SP)	908R	1006				
		ULT (SP)	910R					
Gross Beta								
21 > GSL	38 > BKG	S&G (NP)	GSEEP	104	401	802	8607	MP-04
			SP04	105	408	803	8609	WP-A
			SP06	106	501	804	8612	WP-C
			SP11	111	502	8603	MP-01	WP-H
			SP12	116	605	8604	MP-02	
			103	205	801	8605	MP-03	
		ULT (NP)	107					
		WLT (SP)	NDATR	908R	909			
Tritium								
16 > GSL	16 > BKG	S&G (NP)	GSEEP	104	106	8603	MP-02	WP-C
			SP04	105	803	MP-01	WP-A	WP-H
		ULT (NP)	108	110				
		WLT (SP)	NDATR	909				
Strontium-90								
12 > GSL	12 > BKG	S&G (NP)	408	502	803	MP-01	MP-03	
			501	801	8609	MP-02	MP-04	
		WLT (SP)	NDATR	909				
Technetium-99								
5 > GSL	5 > BKG	S&G (NP)	408	MP-01	MP-02	MP-03	MP-04	
Iodine-129								
2 > GSL	2 > BKG	WLT (SP)	NDATR	909				
Uranium-233/234								
5 > GSL	5 > BKG	S&G (NP)	MP-02	MP-03	MP-04			
		WLT (SP)	NDATR	909				
Uranium-235/236								
3 > GSL	3 > BKG	S&G (NP)	MP-02	MP-03	MP-04			
Uranium-238								
4 > GSL	4 > BKG	S&G	MP-03	MP-04				
		WLT (SP)	NDATR	909				
Total Uranium								
2 > GSL	2 > BKG	WLT (SP)	NDATR	909				

TABLE 4-9 *(concluded)*
2011 Groundwater Monitoring Results Exceeding GSLs and Background Levels

METALS					
Number of Locations exceeding GSLs[a] or Background[b]		*Geologic Unit (plateau)*	*Groundwater Sampling Location*		
Barium					
0 > GSL	2 > BKG	S&G (NP)	502	MP-01	
Chromium					
2 > GSL	2 > BKG	S&G (NP)	405	502	
Nickel					
3 > GSL	3 > BKG	S&G (NP)	405	502	706
ORGANICS					
Chloroform					
0 > TOGS	2 > DL	S&G (NP)	502	MP-01	
1,2-Dichlorothene (total)					
1 > TOGS	1 > DL	S&G (NP)	8612		
Tributyl phosphate					
no TOGS[c]	2 > DL	S&G (NP)	111	8605	

Note: Bolded wells indicate 2011 results that exceed GSLs. Unbolded wells indicate 2011 results that exceed background.

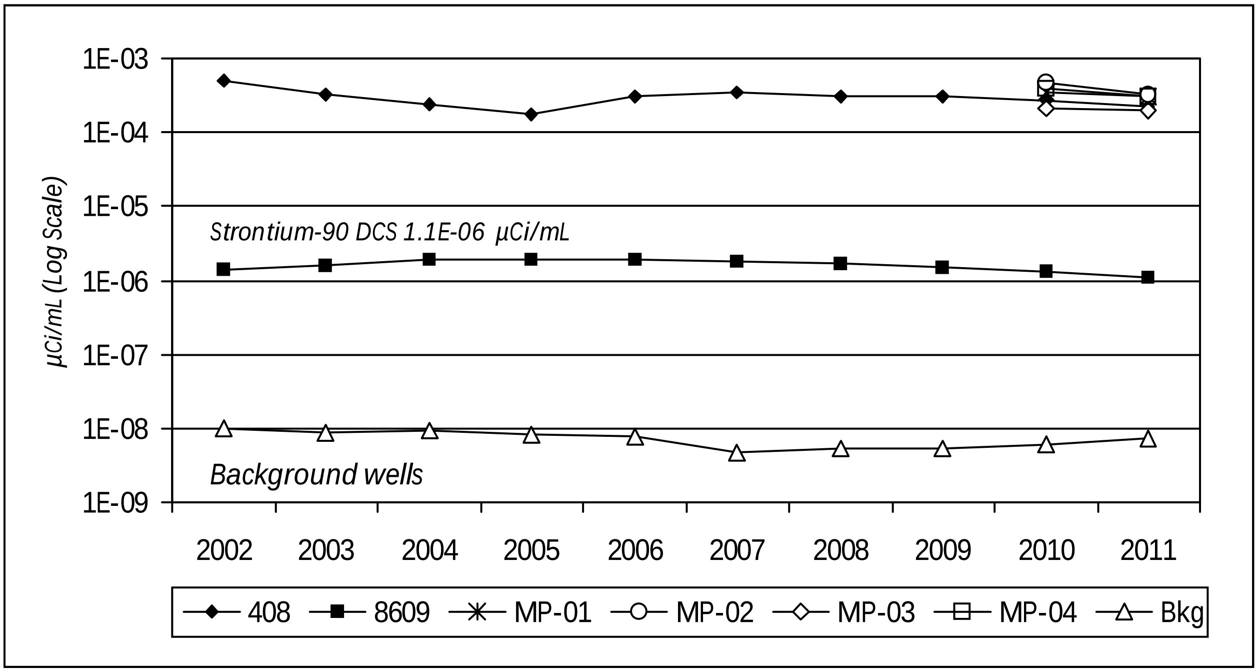
KEY:
BKG - Background
DL - Detection Limit
GSL - Groundwater Screening Level
NP - North Plateau
S&G - Sand and Gravel
SP - South Plateau
TOGS - NYSDEC TOGS 1.1.1 Class GA Groundwater Standards
ULT - Unweathered Lavery Till
WLT - Weathered Lavery Till

[a] The site-specific GSLs for radiological constituents were set equal to the larger of the WVDP background concentrations or the 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 equal to 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.

[b] The data used for the calculation of background values collected from 1991 through September 2009 were taken from background wells 301, 401, 706, and 1302 in the sand and gravel unit on the north plateau. The background concentration was set to the upper limit of the 95% confidence interval.

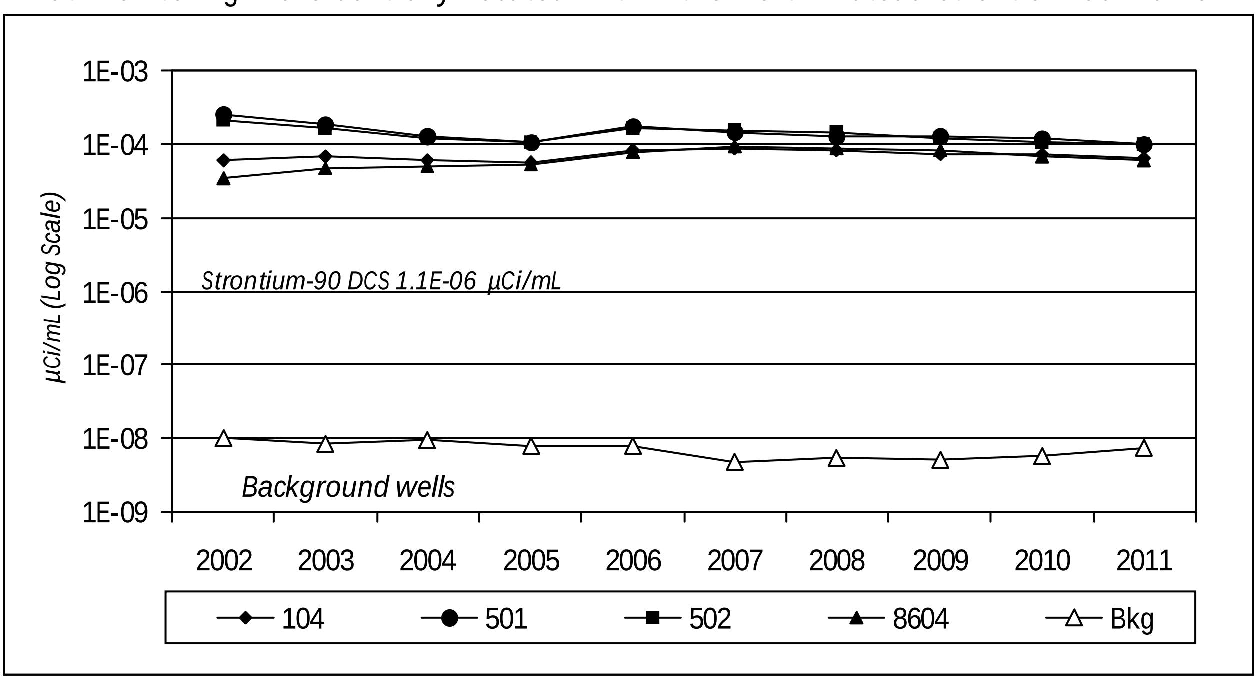
[c] No TOGS 1.1.1 standard has been established for tributyl phosphate.

FIGURE 4-3
Annual Average Gross Beta Concentrations
at Monitoring Wells Downgradient of the North Plateau Strontium-90 Plume Source Area



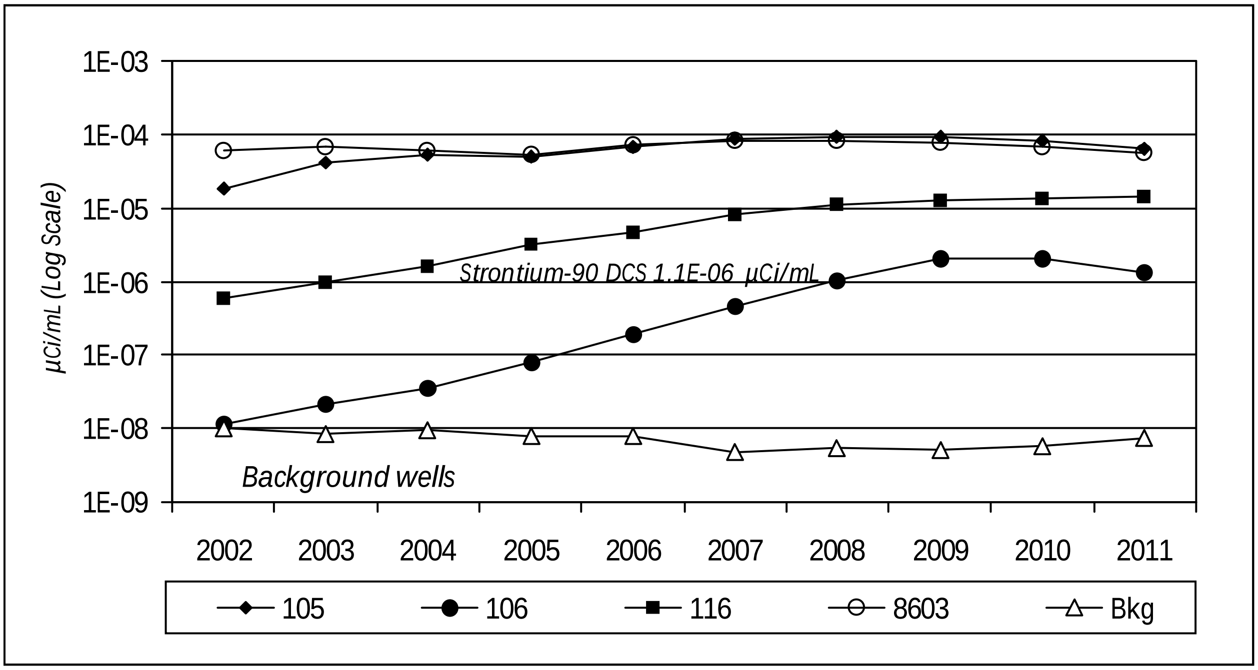
Note: S&G background (Bkg) wells 301, 401, 706, and 1302 are averaged for this comparison.

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



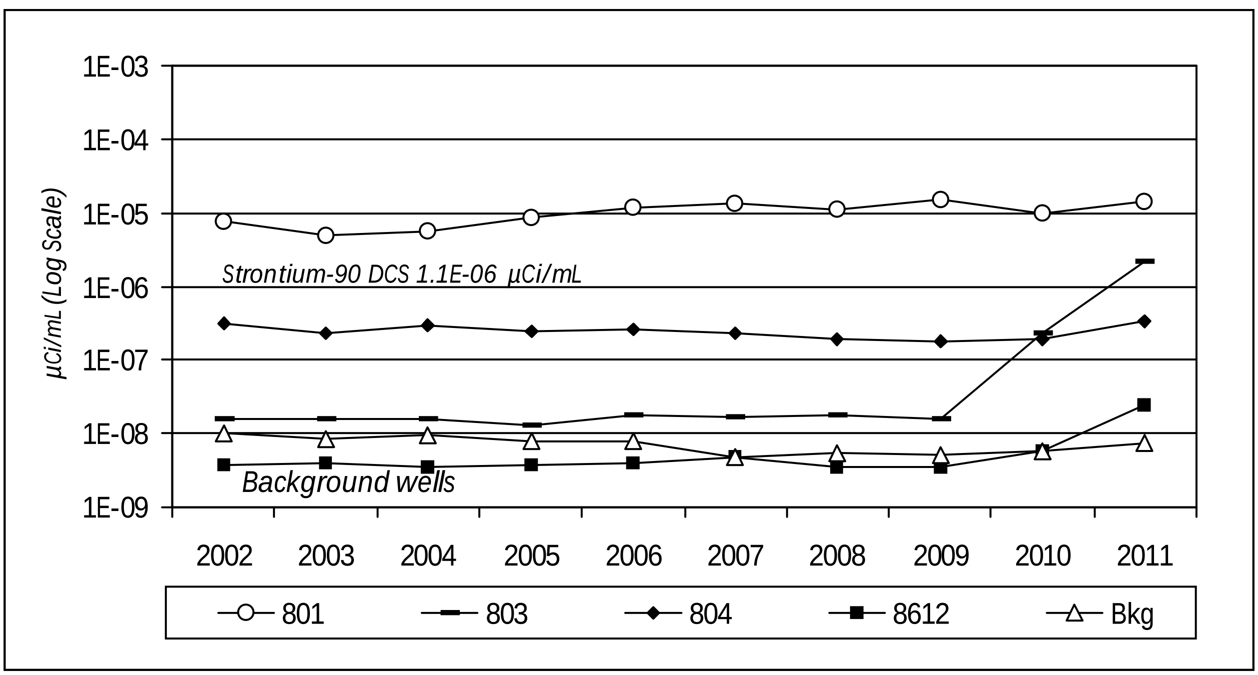
Note: S&G background (Bkg) wells 301, 401, 706, and 1302 are averaged for this comparison.

FIGURE 4-5
Annual Average Gross Beta at Monitoring Wells Upgradient of the PTW



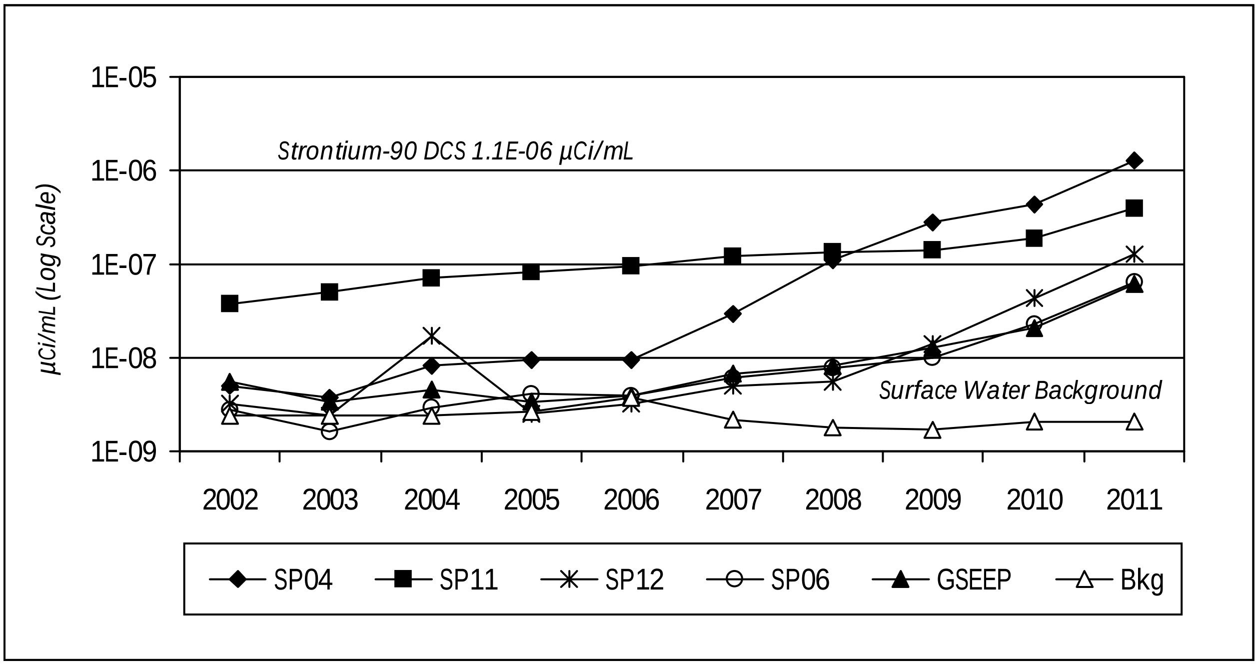
Note: S&G background (Bkg) wells 301, 401, 706, and 1302 are averaged for this comparison.

FIGURE 4-6
Annual Average Gross Beta at Monitoring Wells Downgradient of the PTW



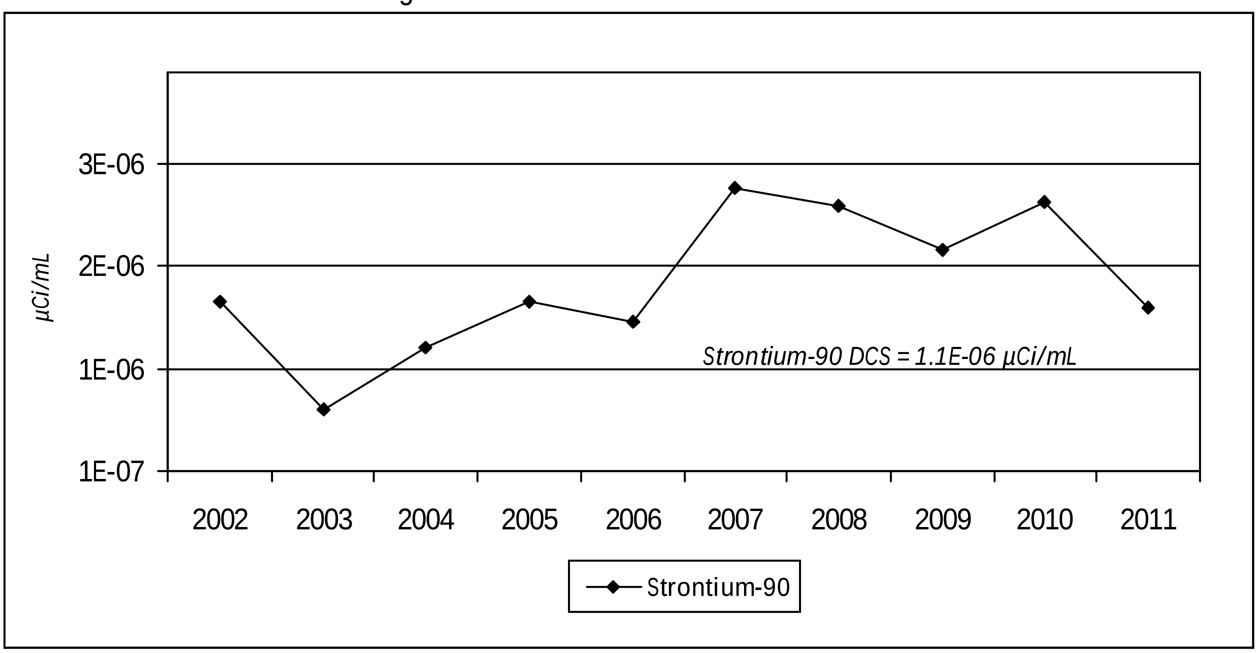
Note: S&G background (Bkg) wells 301, 401, 706, and 1302 are averaged for this comparison.

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



Note: Background (Bkg) from surface water sampling location WFBCBKG at Felton Bridge upgradient of the WVDP.

FIGURE 4-8
Annual Average Strontium-90 Concentrations at WNSWAMP



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

FIGURE 4-9
Map View and Cross-Section of the PTW Installation

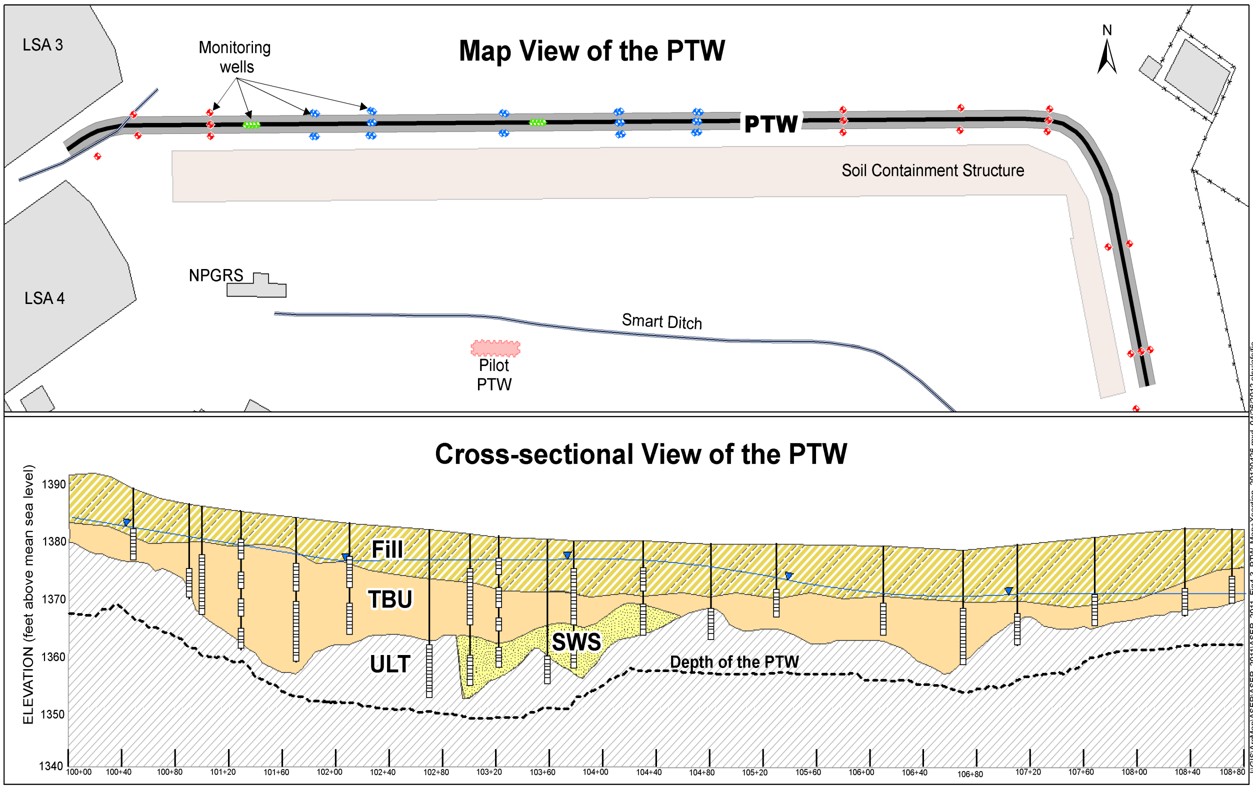
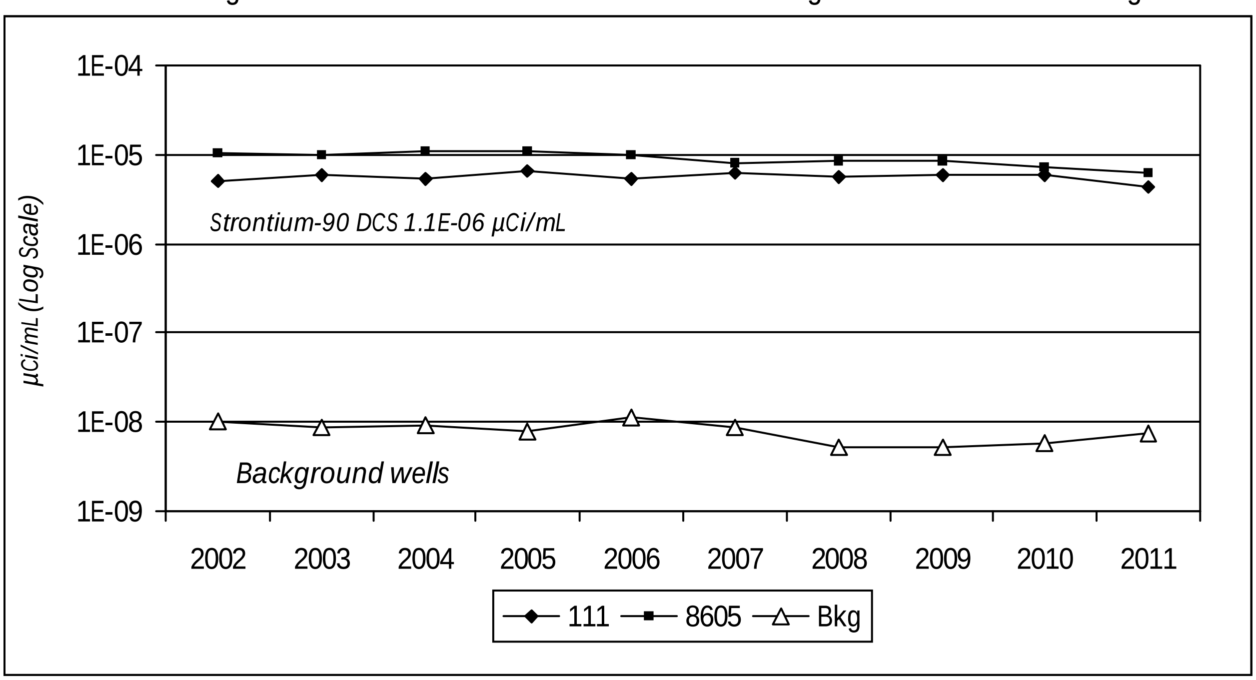
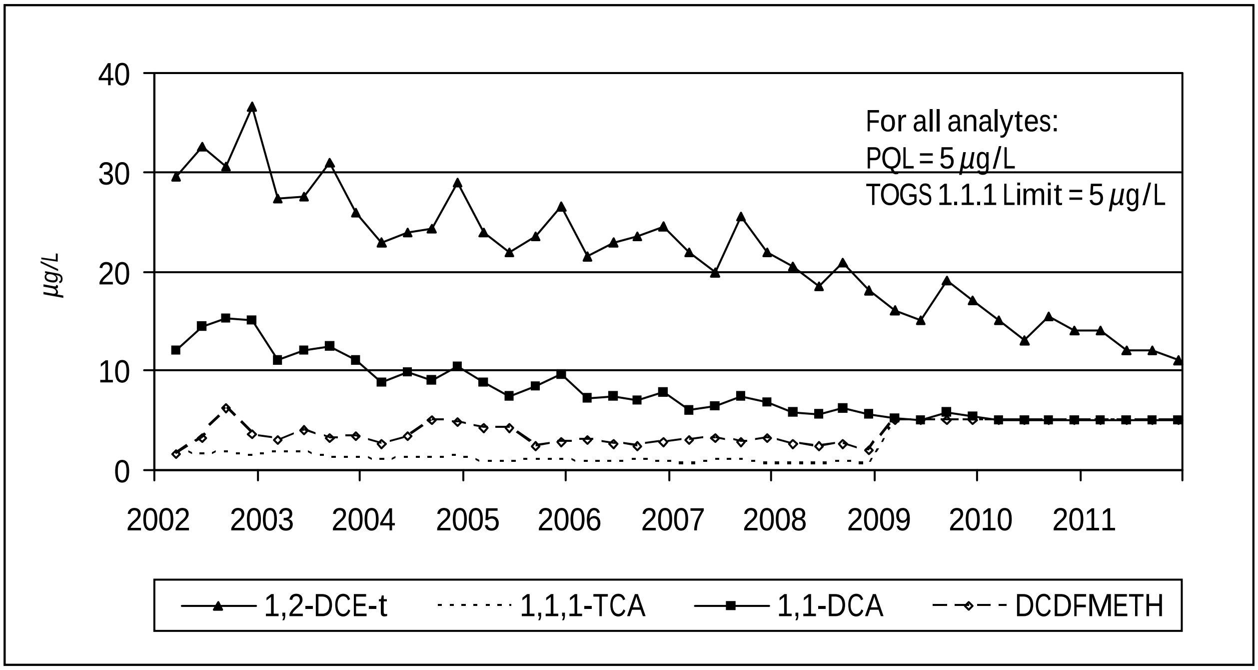


FIGURE 4-10
Annual Average Gross Beta Concentrations at Monitoring Wells Near Former Lagoon 1



Note: S&G background (Bkg) wells 301, 401, 706, and 1302 are averaged for this comparison.

FIGURE 4-11
Concentrations of 1,2-DCE-t, 1,1,1-TCA, 1,1-DCA, and DCDFMeth at Well 8612 in the S&G Unit



Note: PQL = Practical Quantitation Limit
1,2-DCE-t = 1,2-Dichloroethylene (total)
1,1,1-TCA = 1,1,1-Trichloroethane
1,1-DCA = 1,1-Dichloroethane
DCDFMeth = Dichlorodifluoromethane

FIGURE 4-12
Concentrations of Tributyl Phosphate at Monitoring Wells Near Former Lagoon 1 in the S&G Unit

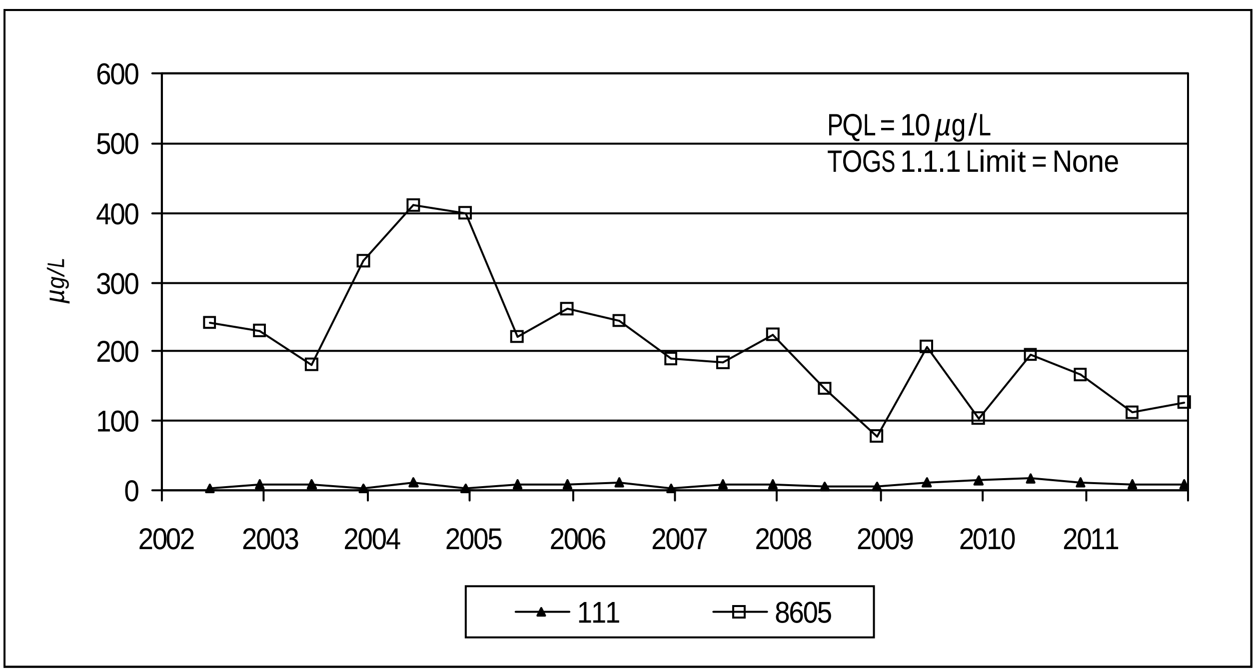
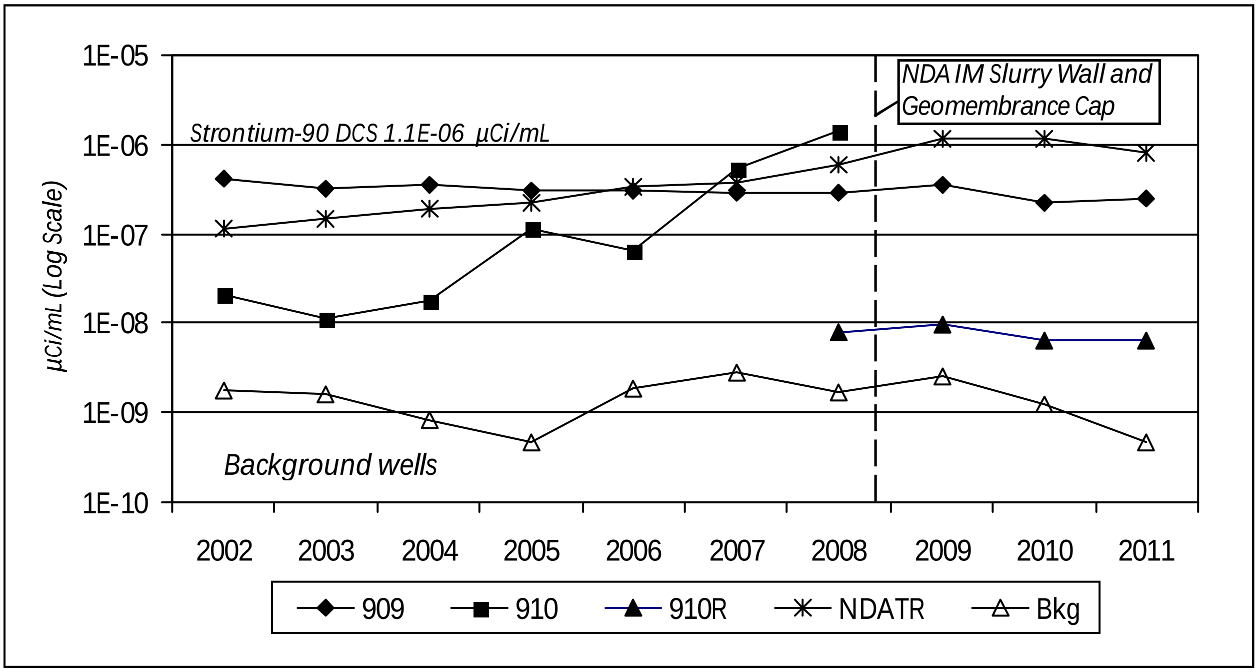
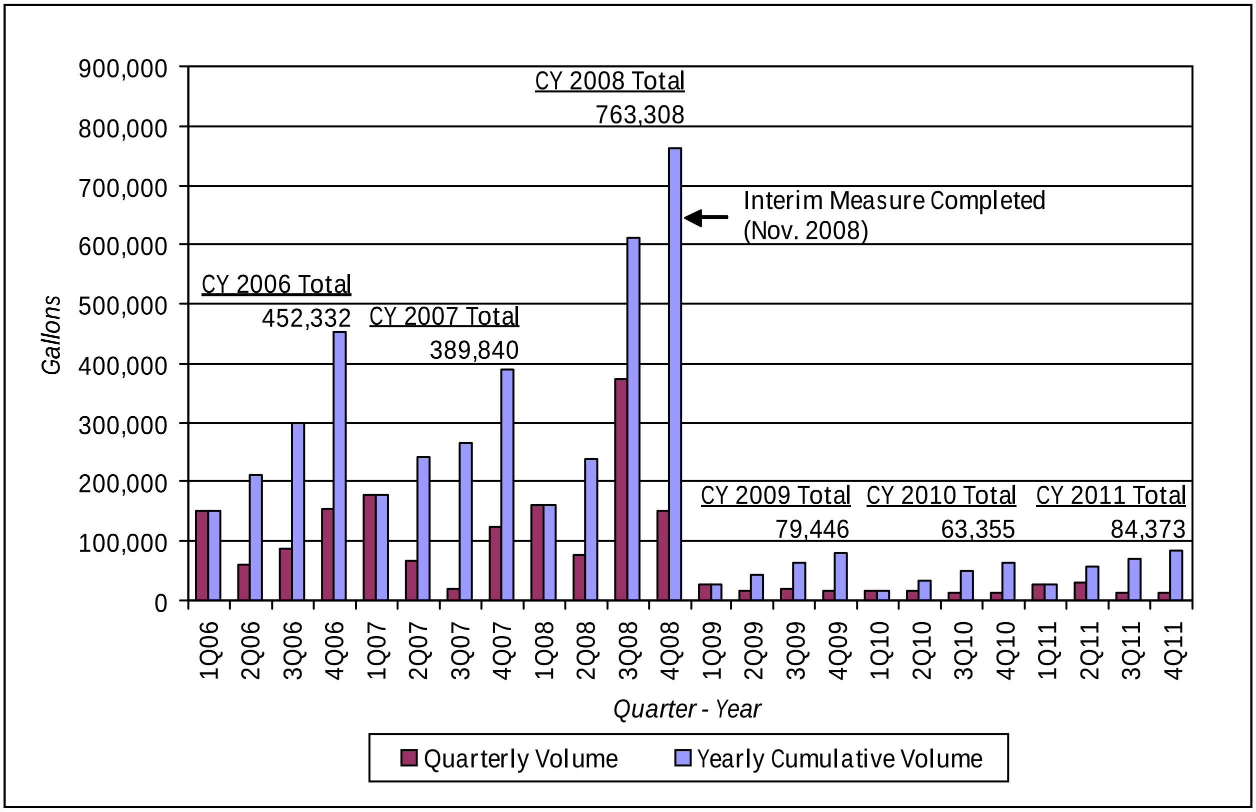


FIGURE 4-13
Annual Average Gross Beta Concentrations
at Monitoring Wells Downgradient of the NDA and at the NDA Trench



Notes: WLT 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 4-14
Volume of Water Pumped From the NDA Interceptor Trench



Note: 1Q = Jan–Mar
2Q = Apr–Jun
3Q = Jul–Sep
4Q = Oct–Dec

APPENDIX A

2011 Environmental Monitoring Program

Environmental Monitoring Program Drivers and Sampling Rationale

The following schedule represents the WVDP routine environmental monitoring program for 2011. This schedule met or exceeded the requirements of DOE Order 458.1, "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 NESHAP regulations in 40 CFR 61, Subpart H, and the SPDES, respectively). Specific groundwater monitoring is required by the 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 EPA. Nonradiological releases in water effluent and storm water drainage points covered under SPDES permit are reported monthly to 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 ASER, which is prepared as directed in DOE Order 231.1B, "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 2011. Routine sampling locations are shown on Figures 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 Air, Water, Soil/sediment, Biological, or Direct measurement. The second character specifies oN-site or oFf-site. The remaining characters describe the specific location (e.g., AFGRVAL is Air oFf-site at GReat VALley). 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 458.1, Change 2	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 458.1, Change 2	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 458.1, Change 2 (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 458.1, Change 2	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 458.1, Change 2	DOE/EH-0173T, Section 5.10 (basis and guidance for environmental surveillance, water); NYSDOH ELAP certification for potable water
On-Site Groundwater (Appendix A, pp. A-12 and A-13)	
RCRA §3008(h) Order on Consent (nonradiological); DOE Order 458.1, Change 2	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 458.1, Change 2	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 458.1, Change 2	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 458.1, Change 2	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 (Figures A-2 through A-4) *(concluded)* Page

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

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

[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 on-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	Continuous	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	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
	Grab	Twice during discharge; 8–16 per year	Settleable solids, TDS, Dissolved Oxygen (DO)
	24-hour composite	Twice during discharge; 8–16 per year	BOD_5, TSS, NH3, TKN, total Fe
	Grab	Once during discharge; 4–8 per year	Total Hg, pH, total recoverable Co, Se, V, total residual chlorine, oil & grease, surfactant (as LAS)
	24-hour composite	Once during discharge; 4–8 per year	Total Al, total recoverable As, dissolved sulfide, NO3-N, NO2-N, SO4
	24-hour composite	Quarterly; 4 per year for the first year[b]	Whole Effluent Toxicity (WET) Testing
	Grab	Semiannually; 2 per year	Cyanide amenable to chlorination, Heptachlor
	24-hour composite	Semiannually; 2 per year	Bromide, B, total Mn, Ni, total recoverable Cu, Cr, Pb, Ti, Zn
	Grab	Annually; 1 per year	Total recoverable Cr+6, Dichlorodifluoromethane, trichlorofluoromethane, 3,3-dichlorobenzidine, tributyl phosphate, xylene, hexachlorobenzene, 2-butanone, alpha-BHC, chloroform
	24-hour composite	Annually; 1 per year	Total Ba, Sb, total recoverable Cd
	Calculated from BOD5 and TKN	Twice during discharge; 8–16 per year	Ultimate Oxygen Demand (UOD)
WNSP01B[a] Internal process monitoring point	Continuous	Recorded when operating	Total flow, elapsed flow time
	Grab 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.

[b] WET testing shall be performed quarterly for the first year, and repeat the quarterly sampling every five years.

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
	Grab	2 per month; 24 per year	pH, settleable solids, TDS, dissolved oxygen (DO), oil & grease
	24-hour composite	2 per month; 24 per year	TSS, BOD5, NH3, total Fe
	Grab	Monthly; 12 per year	Total residual chlorine, total Hg
	24-hour composite	Monthly; 12 per year	TKN (as N), NO2-N,
	24-hour composite	3 per month, 36 per year	Flow rate (gpm)
	Continuous	Monthly; 12 per year	Total flow, flow time
	Calculated from BOD5 and TKN	Monthly; 12 per year	Ultimate Oxygen Demand (UOD)
	24-hour composite	Quarterly; 4 per year for the first year[b]	Whole Effluent Toxicity (WET) Testing
	Grab	Annually; 1 per year	Chloroform
WNURRAW[a] Utility room raw water	Composite	Weekly; 52 per year	Total Fe
	Grab	Three per lagoon discharge: pre-discharge, near beginning, near end, 12–24 per year	TDS
	Grab[c]	Monthly; 12 per year	TOC, alkalinity
WNSP006 Franks Creek at the security fence	Timed continuous composite	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	Three per lagoon discharge: pre-discharge, near beginning, near end, 12–24 per year	TDS, flow rate
Storm Water Outfalls			
Group 1[a] WNSO04 (S04)	First flush grab	Semiannually; 2 per year	pH, oil & grease, BOD5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, Cd, Cr, Cr+6, Se, V, TKN, ammonia (as NH3), NO3-N, NO2-N, total nitrogen (as N)
	Flow-weighted composite	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.
[b] WET testing shall be performed quarterly for the first year, and repeat the quarterly sampling every five years.
[c] Resulted are reported to the CCHD.

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	Semiannually; 2 per year	pH, oil & grease, BOD5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, surfactant (as LAS)
	Flow-weighted composite	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	Semiannually; 2 per year	pH, oil & grease, BOD5, TSS, TDS, total P, Al, Fe, Hg, total recoverable Cu, Pb, Zn, TKN, ammonia (as NH3), NO3-N, NO2-N, alpha-BHC, total nitrogen (as N)
	Flow-weighted composite	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	Semiannually; 2 per year	pH, oil & grease, BOD5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, surfactant (as LAS)
	Flow-weighted composite	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	Semiannually; 2 per year	pH, oil & grease, BOD5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, V, TKN, ammonia (as NH3), NO3-N, NO2-N, surfactant (as LAS), sulfide, settleable solids, total nitrogen (as N)
	Flow-weighted composite	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) WNSO41 (S41) WNSO42 (S42) WNSO43 (S43)	First flush grab	Semiannually; 2 per year	pH, oil & grease, BOD5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, V, TKN, ammonia (as NH3), NO3-N, NO2-N, surfactant (as LAS), sulfide, settleable solids, total nitrogen (as N)
	S43 only, grab	Semiannually; 2 per year	Total recoverable Pb
	Flow-weighted composite	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	Semiannually; 2 per year	pH, oil & grease, BOD5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, TKN, ammonia (as NH3), NO3-N, NO2-N, surfactant (as LAS), sulfide, total nitrogen (as N)
	Flow-weighted composite	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	Semiannually; 2 per year	pH, oil & grease, BOD5, TSS, TDS, total P, Al, Fe, total recoverable Cu, Pb, Zn, TKN, ammonia (as NH3), NO3-N, NO2-N, surfactant (as LAS), total nitrogen (as N)
	Flow-weighted composite	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 sampling event	pH
On-Site Surface Water			
WNSWAMP Northeast swamp drainage	Timed continuous composite liquid	Biweekly; 26 per year	Gross alpha/beta, H-3, pH, flow (at WNSWAMP only)
WNSW74A North swamp drainage	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			
WNDFLTR Utility room (entry point [EP-02]) potable water storage tank	Grab liquid[a] Grab[b]	Annually; 1 per year Quarterly; 4 per year	As, Ba, Be, Cd, Cr, Hg, Ni, Sb, Se, Tl, cyanide, fluoride TOC
WNDNKMP Main plant drinking water	Grab liquid	Annually; 1 per year	Gross alpha/beta, H-3
WNDNKEL Environmental Laboratory drinking water	Grab liquid[c]	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, 910R, 8610, 8611, trench NDATR)	Grab liquid Direct field measurement	Quarterly during the fiscal year (generally[d]); 4 per year Twice each sampling event; 8 per year for wells sampled quarterly	Gross alpha/beta, H-3. Select locations for radioisotopic analyses, VOCs, SVOCs, or metals Conductivity, pH

Note: Pb and Cu are sampled at various drinking water locations once every three years, based on CCHD guidance. Five locations were sampled in CY 2011. The CCHD collects monthly distribution system samples for total coliform and residual chlorine, and reports to the WVDP.

[a] Primary inorganic chemical results are reported to the CCHD. A sample for NO_3 (as total nitrate) is collected by the CCHD.

[b] Total organic carbon is sampled quarterly and reported to the CCHD.

[c] Disinfection byproducts are sampled annually and reported to the CCHD.

[d] 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, 1008B, 1008C) Remote-handled waste facility (not in a SSWMU): (wells 1301, 1302, 1303, 1304)	Grab liquid	Quarterly during the fiscal year (generally[a]); 4 per year	Gross alpha/beta, H-3. Select locations for radioisotopic analyses, VOCs, SVOCs, or metals
	Direct field measurement	Twice each sampling event; 8 per year for wells sampled quarterly	Conductivity, pH
Main plant processing building downgradient wells (installed in 2010): (wells MP-01, MP-02, MP-03, MP-04)	Grab liquid	Quarterly during the fiscal year (generally[a]); 4 per year	Gross alpha/beta, H-3, Radioisotopic analyses, VOCs, SVOCs, metals, and turbidity
	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 historical 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 2011

Description of Changes

Changes to the sampling program during 2011 were associated with the July 2011 SPDES permit renewal. SPDES sampling point WNSP008, which had been capped since 2001, was removed from the permit and SPDES limits and action levels are specified in Table B-1A. Two storm water locations, that no longer exist as drainage basins, were removed from the permit and one storm water location at the live-fire range was added to the permit.

The New York State Department of Health re-established a radiological environmental surveillance/sampling program at the WVDP, beginning in January 2012. The program includes co-located water, biological, and TLD samples.

FIGURE A-1
West Valley Demonstration Project Base Map

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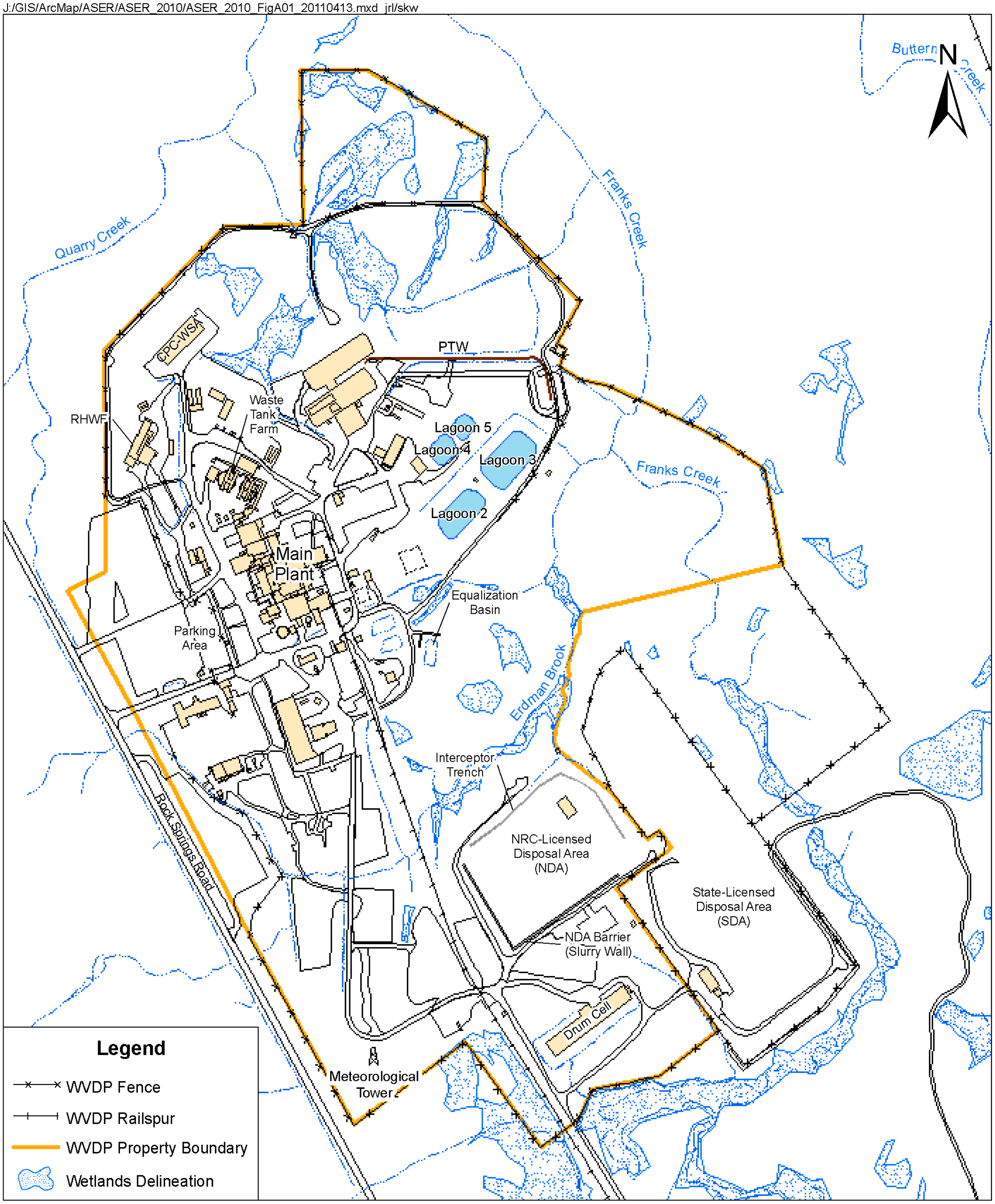

FIGURE A-2
On-Site Surface Water, Drinking Water, and Soil/Sediment Sampling Locations

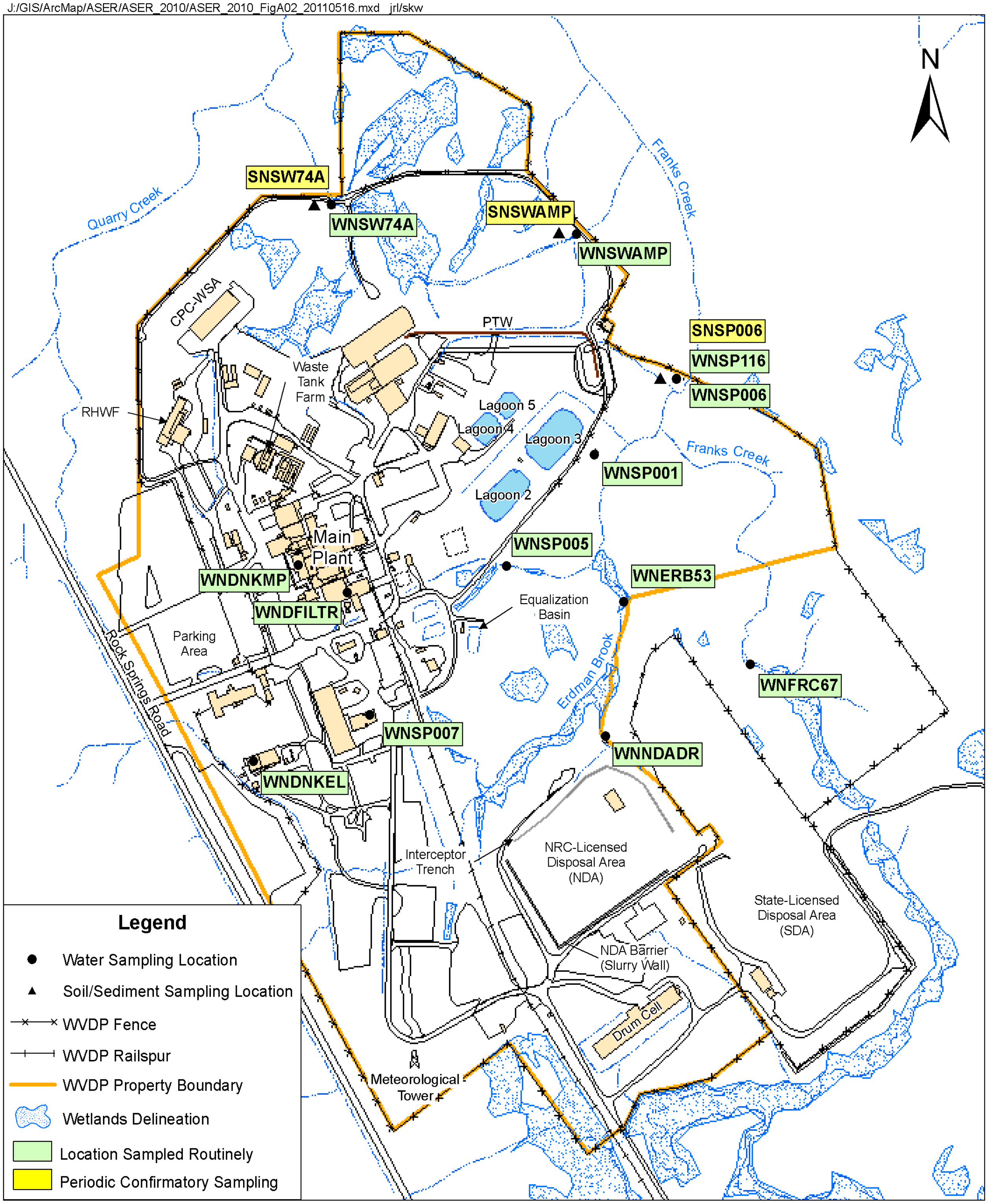

FIGURE A-3
On-Site Storm Water Outfalls

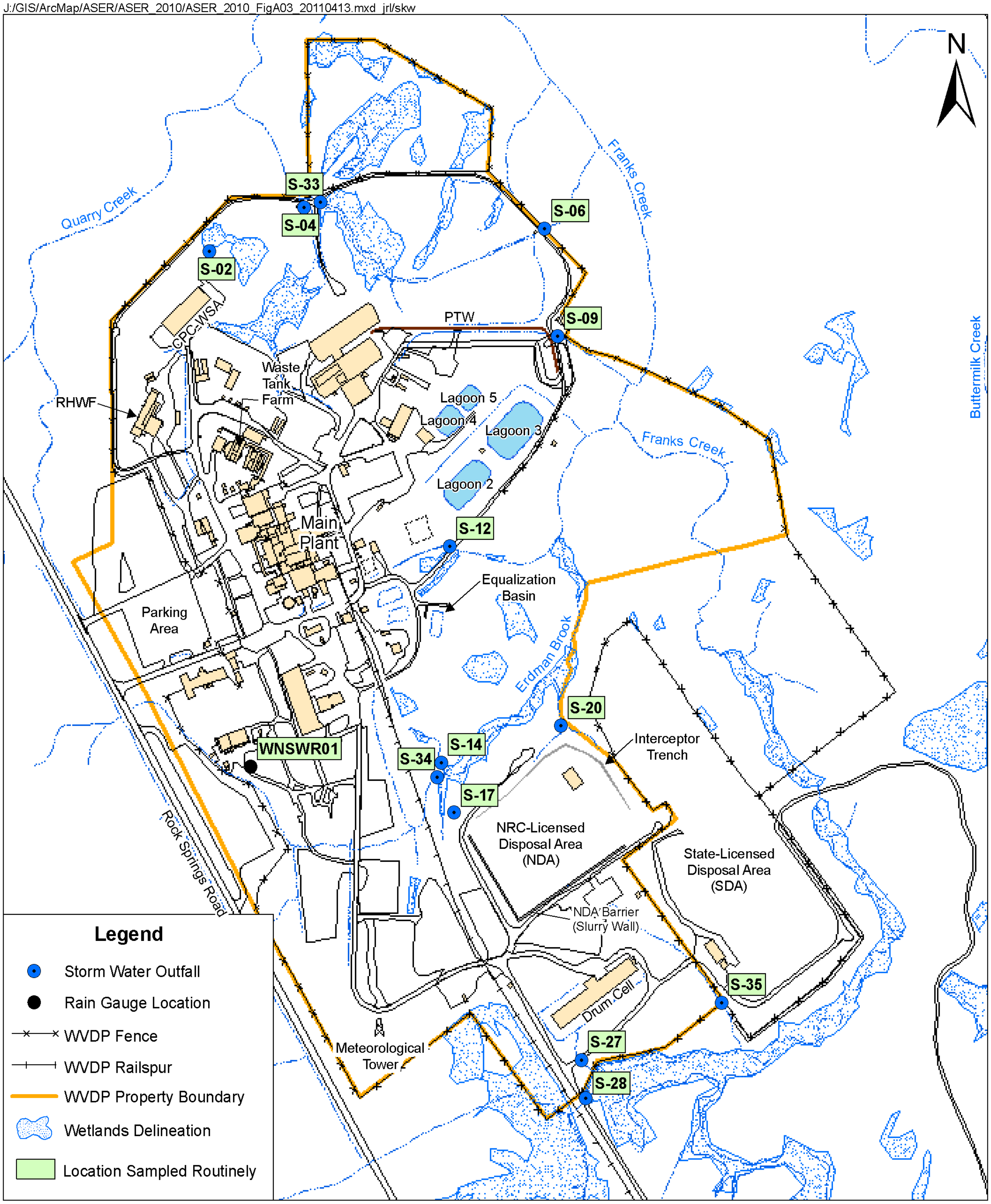

FIGURE A-4
Rail Spur Storm Water Outfalls

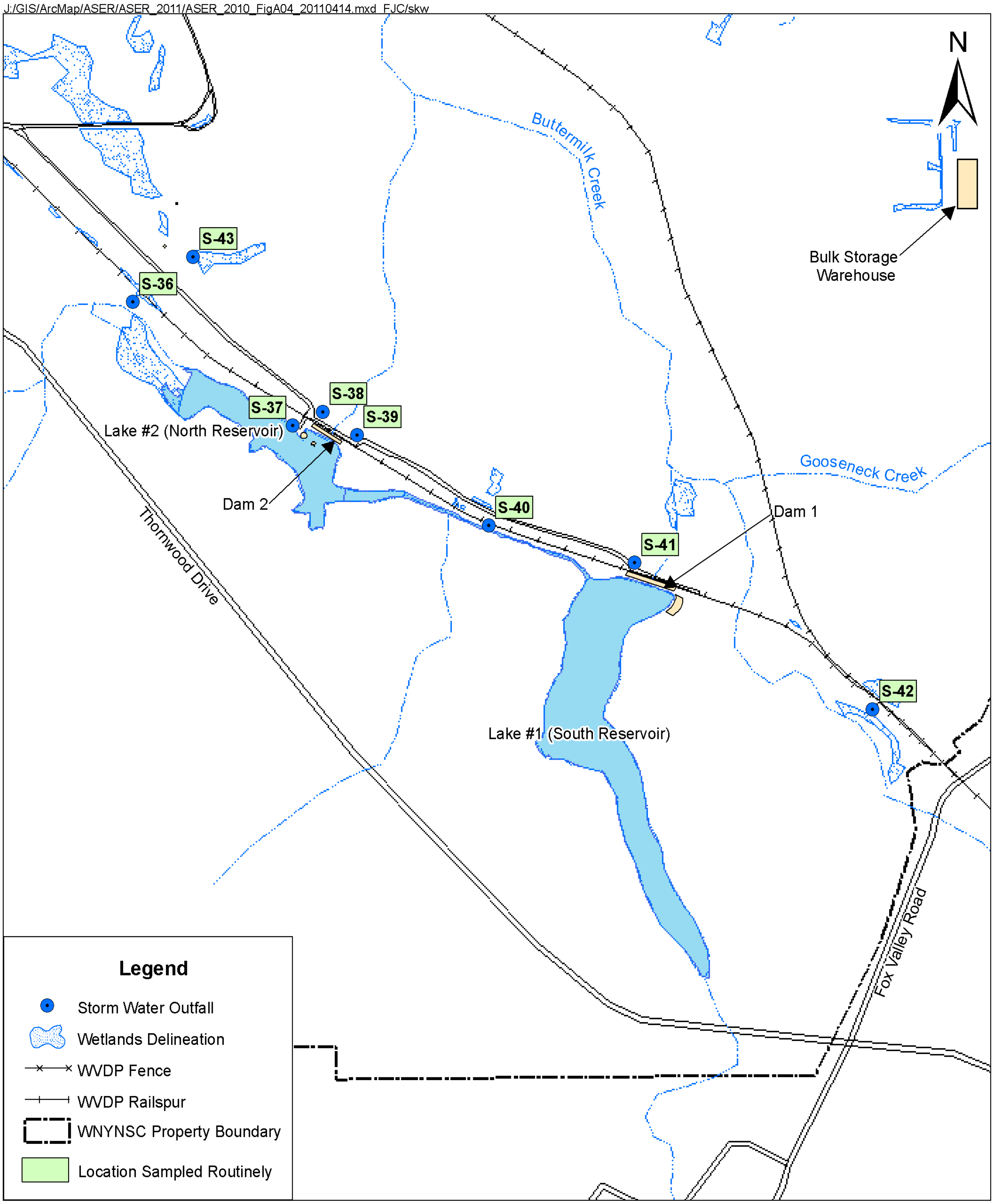

FIGURE A-5
Off-Site Surface Water and Soil/Sediment Sampling Locations

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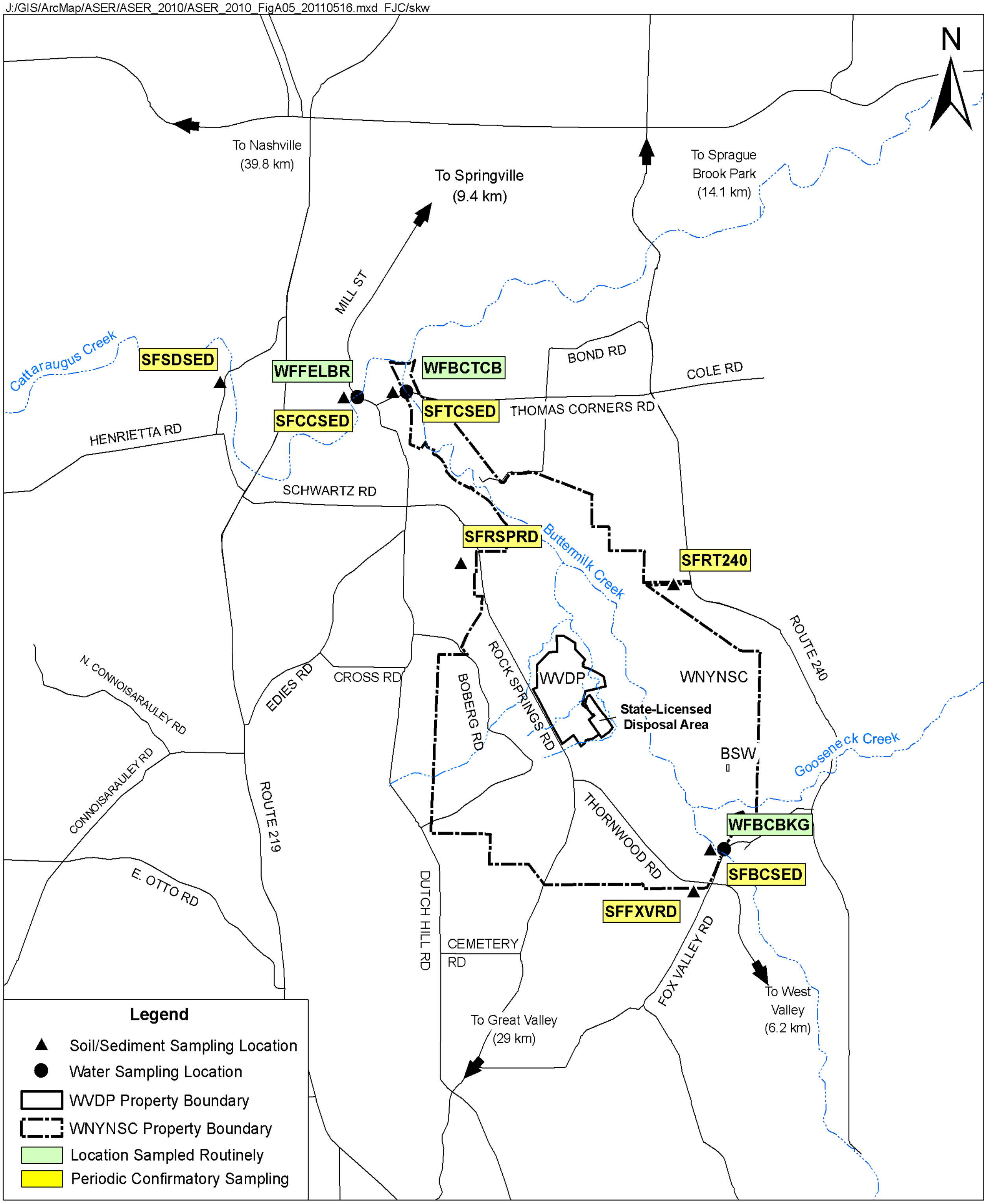

FIGURE A-6
On-Site Air Monitoring and Sampling Locations

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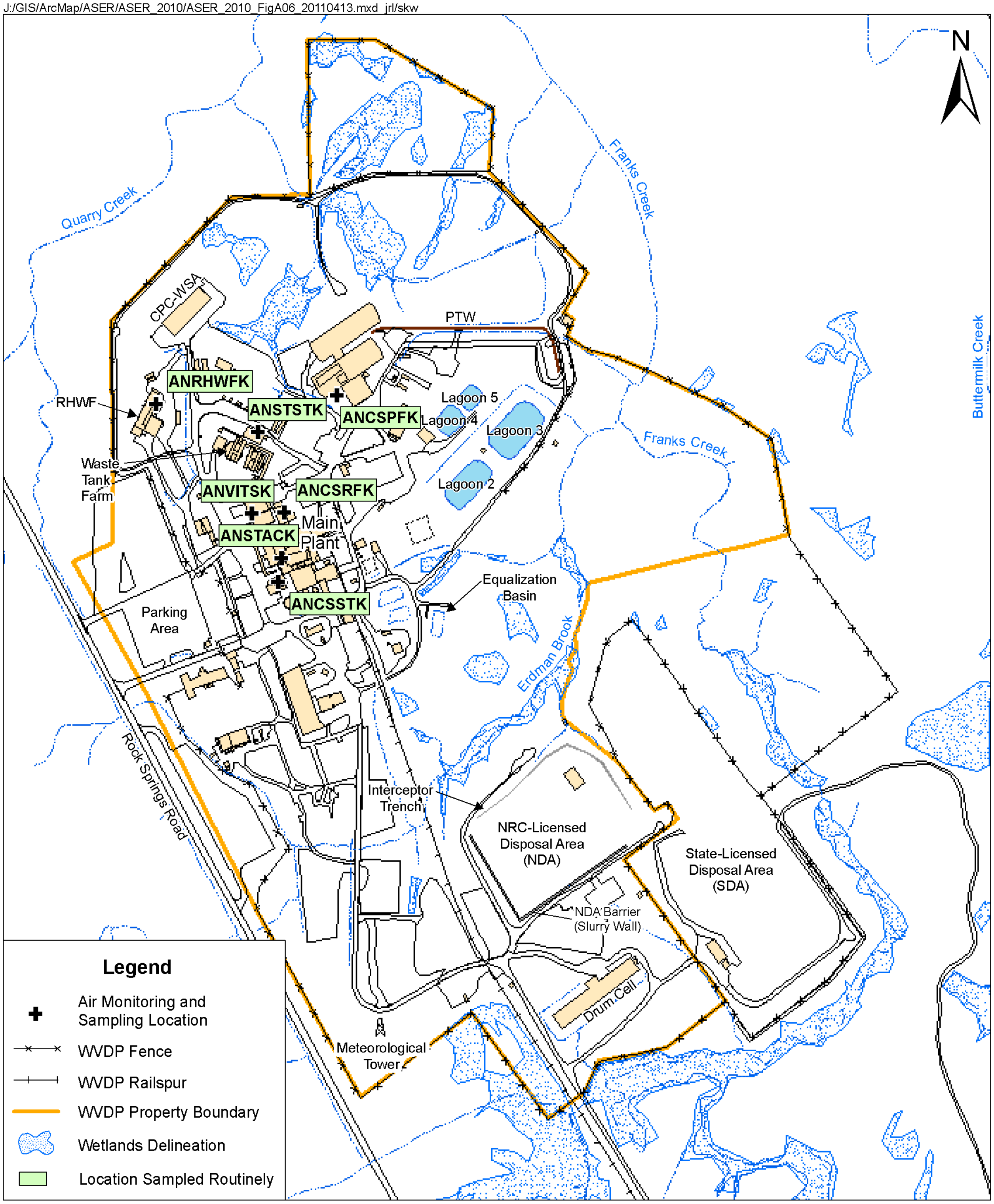

FIGURE A-7
North Plateau Groundwater Monitoring Network
(Includes Wells Used for Water-Level Measurements)

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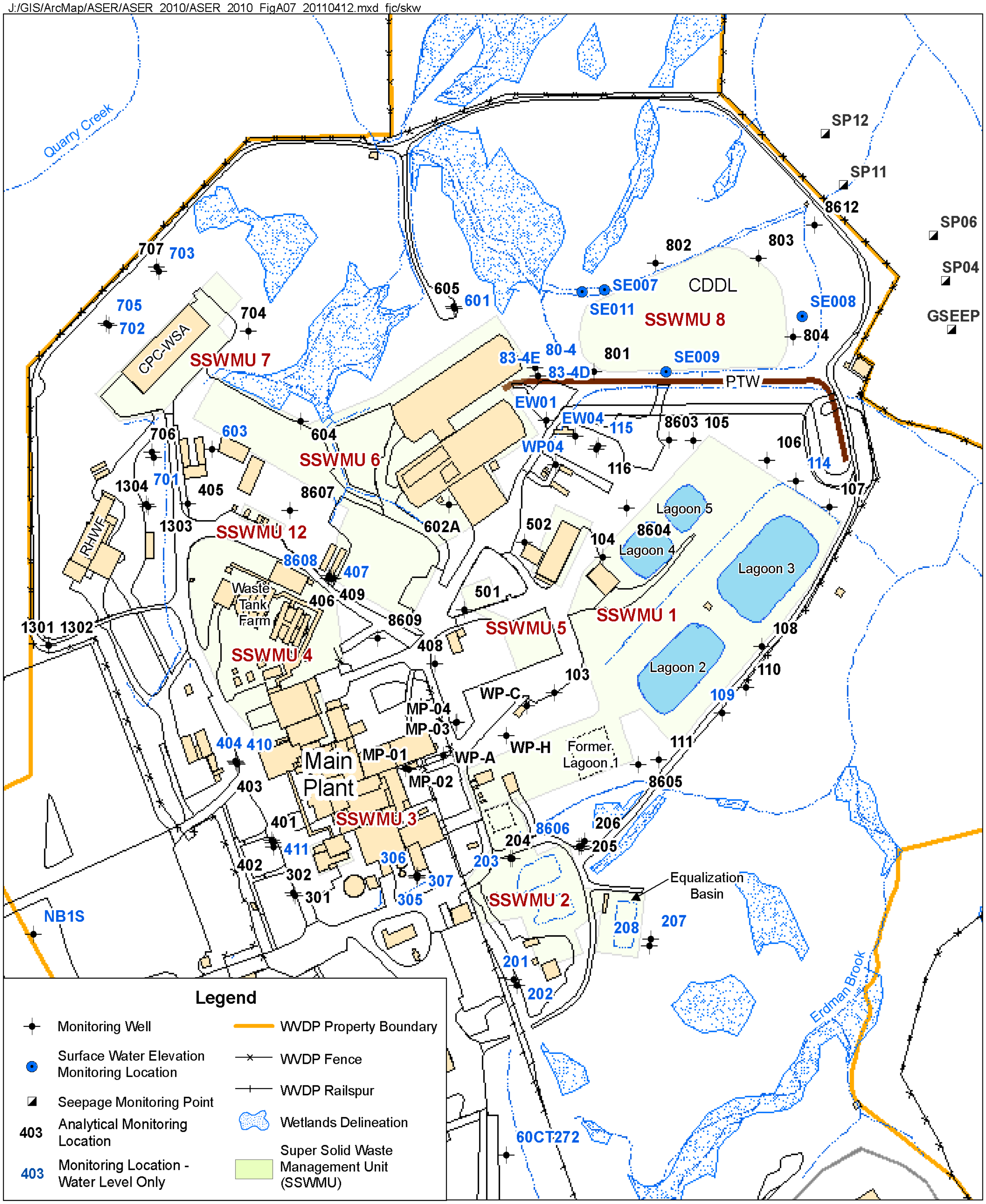

FIGURE A-8
South Plateau Groundwater Monitoring Network
(Includes Wells Used for Water-Level Measurements)

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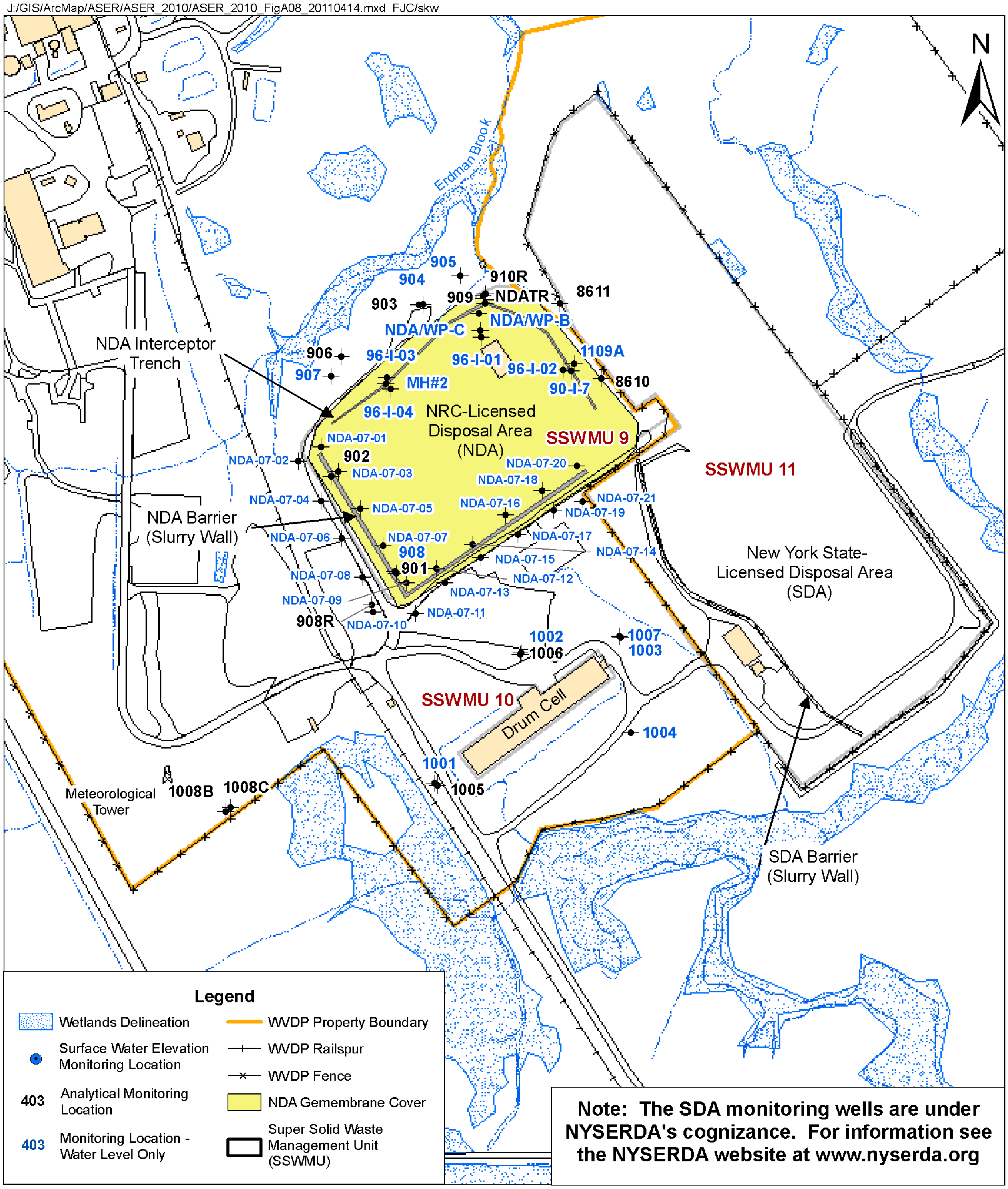

Note: The SDA monitoring wells are under NYSERDA's cognizance. For information see the NYSERDA website at www.nyserda.org

FIGURE A-9
Biological Sampling Locations

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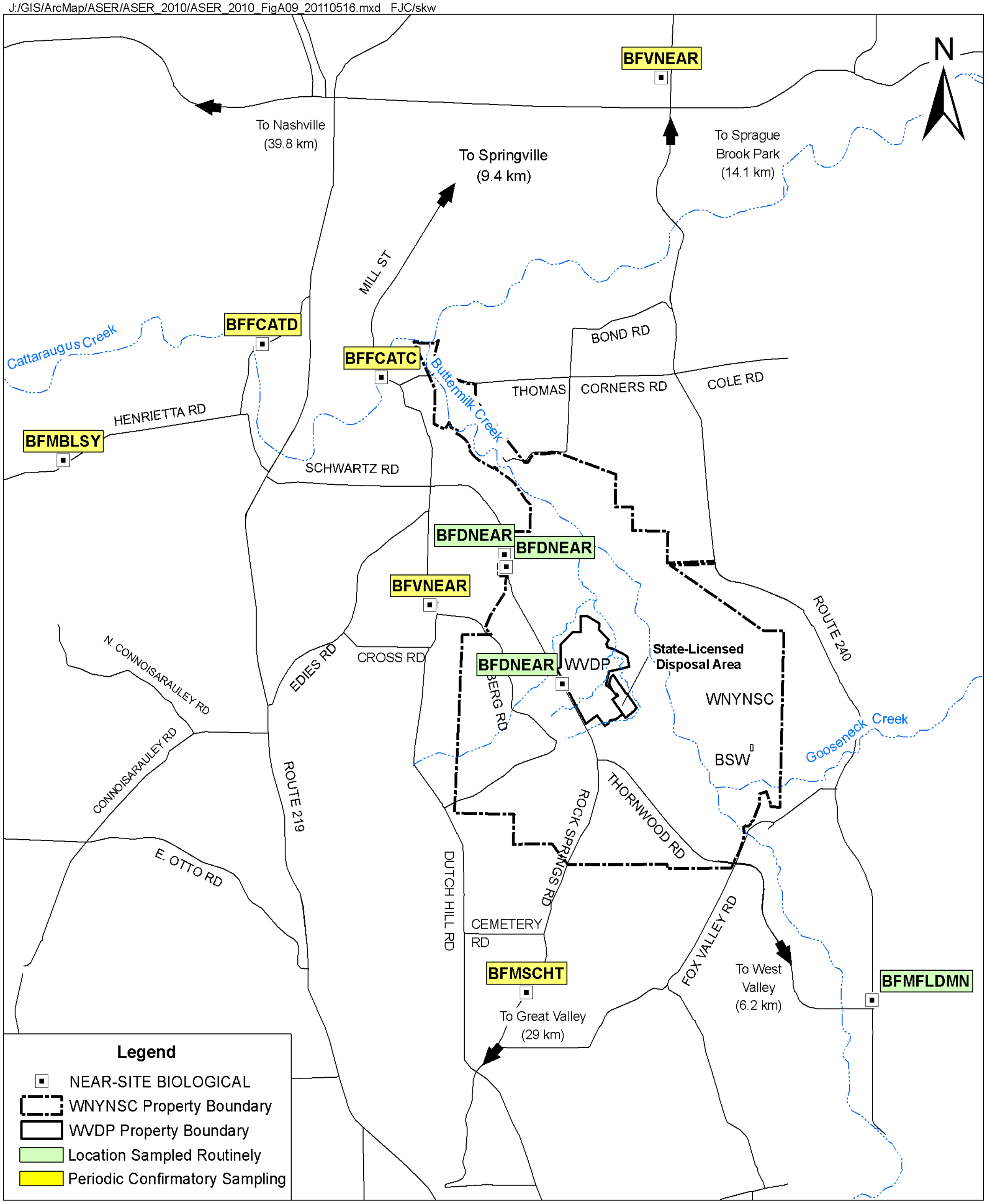

FIGURE A-10
Location of On-Site Thermoluminescent Dosimeters (TLDs)

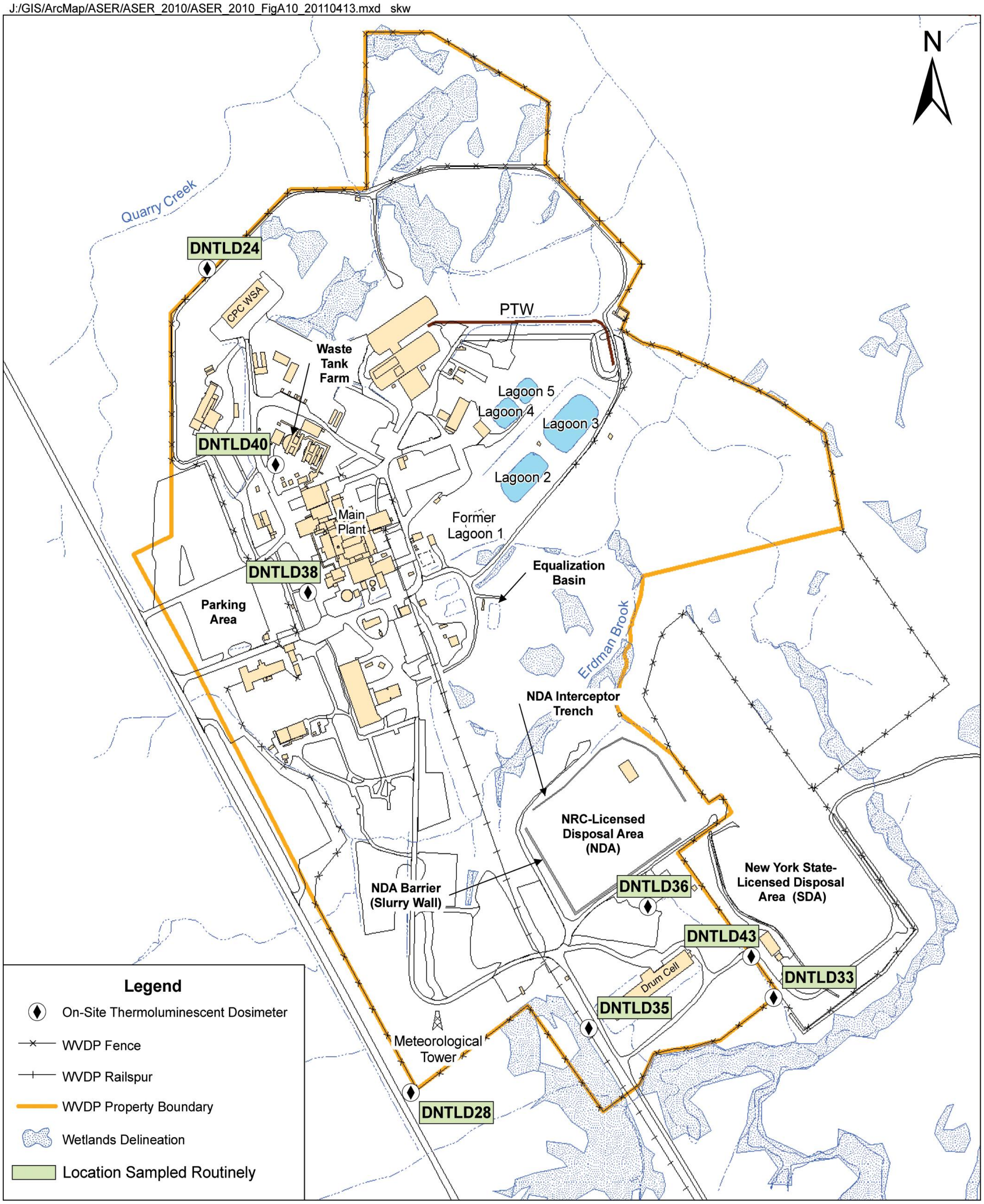

FIGURE A-11
Location of Off-Site Thermoluminescent Dosimeters (TLDs) Within 5 Kilometers of the WVDP

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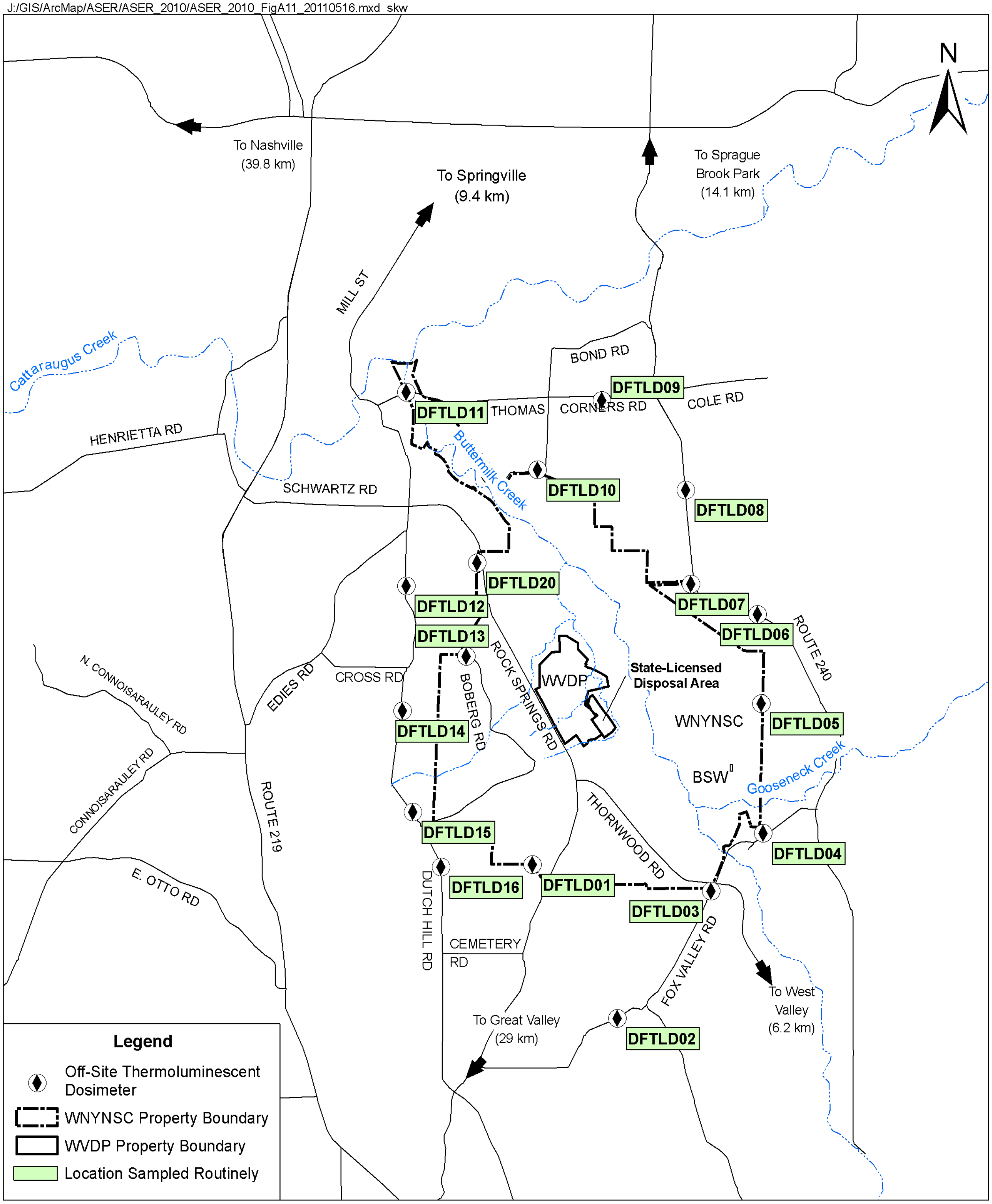

FIGURE A-12
Environmental Sampling Locations More Than 5 Kilometers From the WVDP

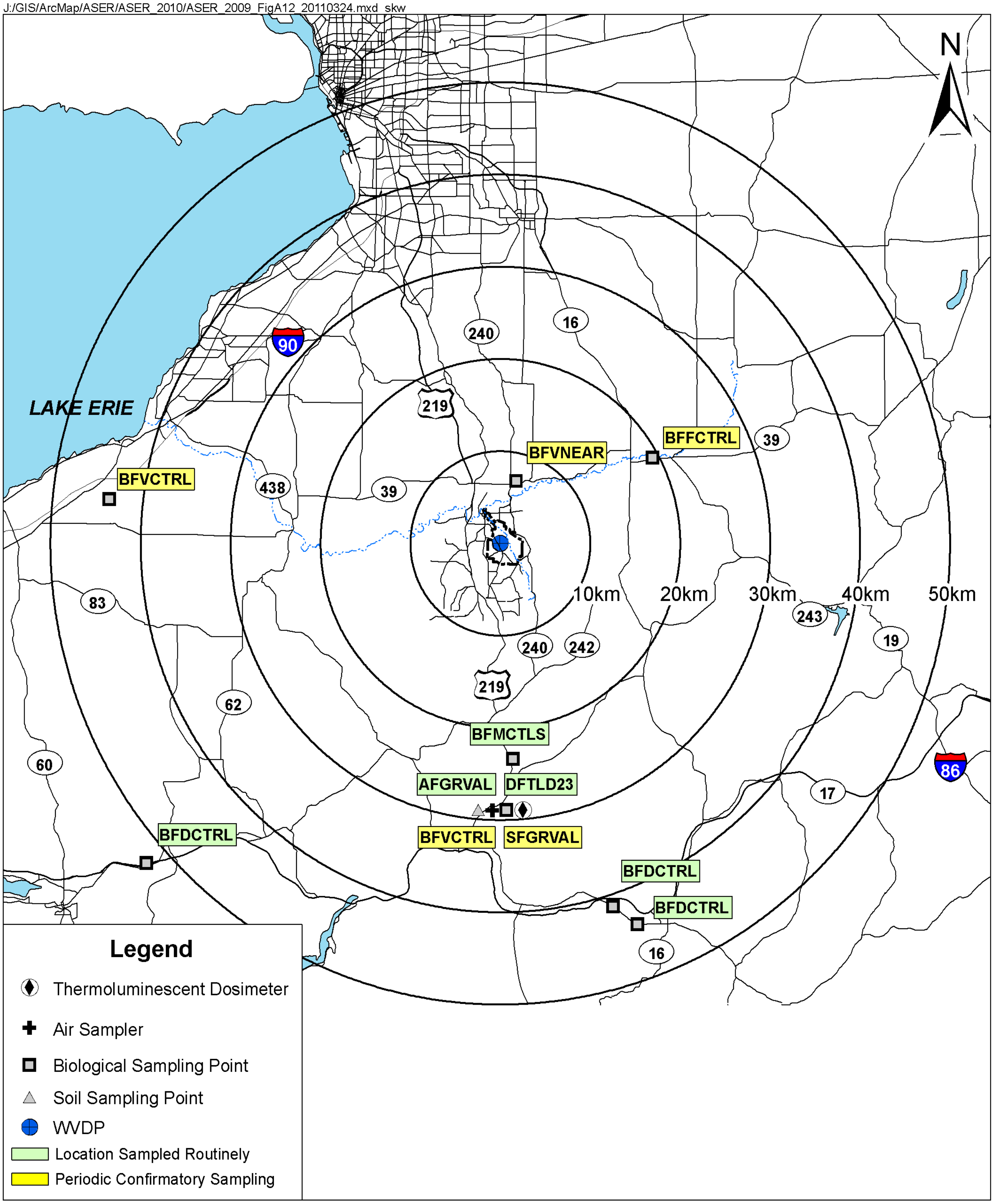

FIGURE A-13
Population by Sector Within 80 Kilometers of the WVDP (2002 Estimate)

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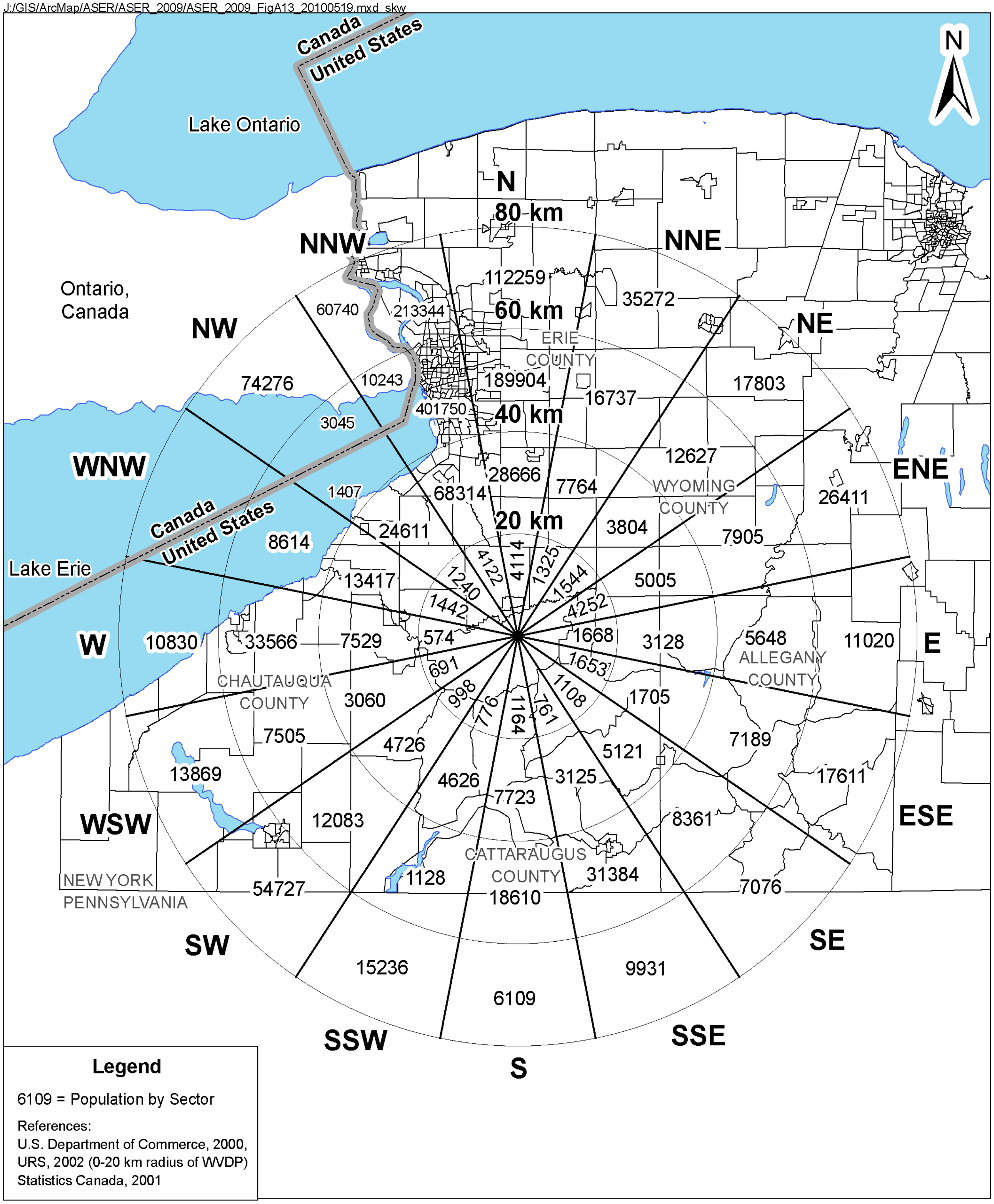

USEFUL INFORMATION

This section provides background information that may be useful to the reader in understanding and interpreting the results presented in this 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 DOE DCSs. 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, 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.

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 HLW mixture at the 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 WVDP HLW.

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 µCi/mL, with SI units (Bq/L) in parentheses. (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 Sv equals 100 rem. One rem equals 1,000 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 millisievert [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 U.S. the average total annual exposure to low-level background radiation is estimated to be about 620 mrem or 6.2 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 (NCRP 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 U.S. is about 0.31 rem/year, and estimated annual dose from activities at the WVDP in 2011 was calculated to be about 0.000044 rem/year [0.044 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 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 parameter 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.

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
Radioactivity	curie	Ci	Flow rate	gallons per day	gpd
	millicurie	mCi		gallons per minute	gpm
	microcurie	µCi		million gallons per day	mgd
	nanocurie	nCi		cubic feet per minute	cfm
	picocurie	pCi		liters per minute	lpm
	becquerel	Bq		meters per second	m/sec

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
cubic feet	mL	28,316.85

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

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 parts per million [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 EPA for air emissions and that established by DOE regarding all exposure modes from DOE activities.

Radiological air emissions other than radon from DOE facilities are regulated by EPA under the NESHAP regulation (40 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 458.1 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 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 NYSDOH in

CAP88-PC Computer Code

The WVDP ASER summarizes the airborne radioactivity released (see Appendix C) and the effect from those releases (Chapter 3) in a manner consistent with that required by EPA. The computer code Clean Air Act Assessment Package-1988 for personal computers (CAP88-PC), Version 3.0, approved in February 2006, is used to perform radiation dose and risk calculations from WVDP airborne releases. According to EPA website from whence the most recent release can be obtained, any approved version of the code can be used for compliance.

Version 3.0 of CAP88-PC (Trinity Engineering Associates, Inc., December 2007, which updates edits issued in November 2006, and March and October of 2007) was first approved by 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 earlier versions. This version uses weighting factors that consider the sensitivity of various human organs to radiation. The model also calculates how long radioactive material will remain in a particular organ or system. Together, these factors are used to calculate dose and cancer risk. 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.

At this juncture, EPA accepts the use of any of the three approved versions of CAP88 for compliance purposes. The WVDP used Version 2.0 in 2009 for airborne dose assessment and has used the recommended Version 3.0 code since 2010.

the NYS Sanitary Code (10 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.

DOE DCS. A DCS 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 458.1). DCSs are applicable only at locations where members of the public could be exposed to air or water containing contaminants. DCSs for radionuclides measured at the WVDP are listed in Table UI-4. At the WVDP, DCSs are used as a screening tool for evaluating liquid effluents and airborne emissions. (DCSs are not used to estimate dose.)

SPDES Permit Requirements. On July 1, 2011, a modified SPDES permit became effective for the WVDP., and requirements of the CY 2011 SPDES permit are summarized in Appendix B-1. The site's SPDES permit defines points where sampling must be conducted, sampling frequency, the type of samples to be collected, nonradiological constituents for which samples must be analyzed, and the limits applicable to these constituents. Results are reported monthly to the NYSDEC in DMRs.

Radionuclides are not regulated under the SPDES permit. However, special requirements in the permit specify that the concentration of radionuclides in the discharge is subject to requirements of DOE Order 458.1 (including Change 2), “Radiation Protection of the Public and the Environment.”

Water Quality Classifications, Standards, and Limits for Ambient Water. The objective of the CWA of 1972 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, NYS 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, NYS has further classified its jurisdictional waters and established ambient water standards, guidelines, and 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 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 EPA and by NYSDOH. These standards are expressed as MCLs or MCL 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 2011; therefore, no soil or sediment data were available for comparison with applicable guidelines (e.g., from NRC, EPA, and NYSDEC). Therefore, the guideline levels that were presented in the 2008 ASER have not been included in the 2011 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 4-9.

TABLE UI-4
U.S. Department of Energy Derived Concentration Standards (DCSs)[a] for Inhaled Air or Ingested Water (µCi/mL)

Radionuclide	*Half-life (years)* [b]	*DCSs in Inhaled Air* [c]	*DCSs in Ingested Water*
Gross Alpha[d]	NA	8.1E-14 (as Pu-239/240)	9.8E-08 (as U-232)
Gross Beta[d]	NA	1.0E-10 (as Sr-90)	1.1E-06 (as Sr-90)
Tritium (H-3)	1.23E+01	2.1E-07[e]	1.9E-03
Carbon-14 (C-14)	5.70E+03	6.1E-07[f]	6.2E-05
Potassium-40 (K-40)	1.25E+09	2.6E-10	4.8E-06
Cobalt-60 (Co-60)	5.27E+00	3.6E-10	7.2E-06
Strontium-90 (Sr-90)	2.89E+01	1.0E-10	1.1E-06
Technetium-99 (Tc-99)	2.11E+05	9.2E-10	4.4E-05
Iodine-129 (I-129)	1.57E+07	1.0E-10	3.3E-07
Cesium-137 (Cs-137)	3.00E+01	8.8E-10	3.0E-06
Europium-154 (Eu-154)	8.59E+00	7.5E-11	1.5E-05
Uranium-232 (U-232)	6.89E+01	4.7E-13	9.8E-08
Uranium-233 (U-233)	1.59E+05	1.0E-12	6.6E-07
Uranium-234 (U-234)	2.46E+05	1.1E-12	6.8E-07
Uranium-235 (U-235)	7.04E+08	1.2E-12	7.2E-07
Uranium-236 (U-236)	2.34E+07	1.2E-12	7.2E-07
Uranium-238 (U-238)	4.47E+09	1.3E-12	7.5E-07
Plutonium-238 (Pu-238)	8.77E+01	8.8E-14	1.5E-07
Plutonium-239 (Pu-239)	2.41E+04	8.1E-14	1.4E-07
Plutonium-240 (Pu-240)	6.56E+03	8.1E-14	1.4E-07
Americium-241 (Am-241)	4.32E+02	9.7E-14	1.7E-07

[a] DCSs 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] The DCS selection for air utilized the default type lung absorption rates for each nuclide, based on guidance from ICRP-72 for particulate aerosols when no specific chemical information is available.

[d] Because there are no DCGs for gross alpha and gross beta concentrations, the values for the most restrictive alpha and beta emitters at the WVDP (Pu-239/240 for alpha in air, U-232 for alpha in water, and Sr-90 for both air and water gross beta concentration) are used as a conservative basis for comparison at locations for which there are no radionuclide-specific data, in which case a more appropriate DCS may be applied.

[e] The DCS for tritium represents the water vapor standard, selected from Table 5, DOE-STD-1196-2011.

[f] The DCS for carbon-14 represents the dioxide chemical form, selected from Table 5, DOE-STD-1996-2011.

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 (U.S.) 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 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).

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 standard (DCS) - 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 millirem (mrem) (1 millisievert [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 radioactive 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) - A process that describes the programs, policies, and procedures used at the WVDP to ensure the establishment of 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.

ISO (International Organization for Standardization) - An international network of nongovernmental standards institutes that forms a bridge between the public and private sectors, and is the largest standards organization in the world. ISO enables a consensus to be reached on solutions that meet both the requirements of business and the broader needs of society.

ISO 14001:2004 - A standard for an EMS, which requires an organization to:

- Determine the organization's impact on the environment and relevant regulations to the operations of the business;
- Create a plan to control the organization's processes to minimize the environmental impact;
- Monitor the effectiveness of the system at meeting objectives, as well as legal and other; and
- Continually analyze the results and improve the organization's systems.

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 EPA (and by 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 radioactive waste (LLW) - Radioactive waste not classified as high-level radioactive 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.

Nitrocision® - A robotically controlled, pressurized, liquid nitrogen tooling system used to remove high-activity fixed contamination from cell and equipment surfaces.

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 (NYSDEC, 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 50-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

Note: For abbreviations of units of measure, see Table UI-2, "Units of Measure Used in This ASER," in the "Useful Information" section.

A

ACM - Asbestos-Containing Material
AEA - Atomic Energy Act
AF - Alternate Fuel
AFV - Alternate Fuel Vehicles
ALARA - As Low As Reasonably Achievable
alpha-BHC - alpha-hexachlorocyclohexane
ANSI - American National Standards Institute
AOC - Ashford Office Complex
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

BAT - Best Available Technology
BCG - Biota Concentration Guide
BEIR - Biological Effects of Ionizing Radiation
BMP - Best Management Plan
BOD_5 - Biochemical Oxygen Demand (5-day)
BR - Shale Bedrock
BSA - Buffalo Sewer Authority

C

C-O-C - Chain of Custody
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
CHBWV - CH2M HILL • B&W West Valley, LLC
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
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
DCA - Dichloroethane
DCDFMeth - Dichlorodifluoromethane
DCE - Dichloroethylene
DCS - Derived Concentration Standards
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

EA - Environmental Assessment
ECL - (New York State) Environmental Conservation Law
ECS - Environmental Compliance Summary
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
ELIMS - Environmental Laboratory Information Management System
EMS - Environmental Management System
EO - Executive Order
EOC - Emergency Operations Center
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 - General Engineering Laboratories LLC
GET - General Employee Training
GHG - Greenhouse Gas
GMP - Groundwater Monitoring Program
GPC - General Purpose Cell
GSL - (Site-Specific) Groundwater Screening Levels
GTCC - Greater Than Class C

H

HDPE - High-Density Polyethylene
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

I

IAEA - International Atomic Energy Agency
IAP - Integrated Assessment Program
IC - Incident Commander
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
ISP - Independent Scientific Panel
IWSF - Interim Waste Storage Facility

K

KRS - Kent Recessional Sequence
KT - Kent Till
KWhr - Kilowatt hour

L

LAS - Linear Alkylate Sulfonate
LCSN - Lamont Cooperative Seismographic Network
LDR - Land Disposal Restriction
LFR - Live-Fire Range
LiDAR - Light Detection and Ranging
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

N

6 NYCRR - New York Official Compilation of Codes, Rules, and Regulations
NCRP - National Council on Radiation Protection and Measurements
NDA - Nuclear Regulatory Commission (NRC)-Licensed Disposal Area
NDATR - NDA Interceptor Trench
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
NOT - Notice of Termination
NOV - Notice of Violation
NO_2-N - Nitrite (as N)
NO_3-N - Nitratte (as N)
NO_x - Nitrogen Oxides
NPDES - National Pollutant Discharge Elimination System
NPGMP - North Plateau Groundwater Monitoring Plan
NPGRS - North Plateau Groundwater Recovery System
NPOC - Nonpurgeable Organic Carbon
NRC - (U.S.) Nuclear Regulatory Commission
NTS - Nevada Test Site
NTU - Nephelometric Turbidity Unit
NWP - Nationwide Permit
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

PAS - Potential Areas of Study
PBS - Petroleum Bulk Storage
PC - Personal Computer
PCB - Polychlorinated Biphenyl
PE - Professional Engineer
PEIS - Programmatic Environmental Impact Statement
PMC - Process Mechanical Cell
PMP - Performance Monitoring Plan
PNL - Pacific Northwest Laboratory
POC - Principal Organic Contaminant
PQL - Practical Quantitation Limit
PTW - Permeable Treatment Wall
PTW PMP - Permeable Treatment Wall Performance Monitoring Plan
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
RAO - Remedial Action Objectives
RCRA - Resource Conservation and Recovery Act
REC - Renewable Energy Credit
REM - Roentgen Equivalent Man
RFI - RCRA Facility Investigation
RFP - Request for Proposal
RHWF - Remote-Handled Waste Facility
RMW - Regulated Medical Waste
ROD - Record of Decision

S

S&G - Sand and Gravel Unit
SAR - Safety Analysis Report
SARA - Superfund Amendments and Reauthorization Act

SBS - Submerged Bed Scrubber
SD - Standard Deviation
SDA - (New York) State-Licensed Disposal Area
SDWA - Safe Drinking Water Act
SEC - Safety and Ecology Corporation
SEQR - (New York) State Environmental Quality Review Act
SI - Systeme Internationale (International System of Units)
SME - Subject Matter Expert
SMS - Safety Management System
SNR - Supplier Nonconformance Report
SO_x - Sulfur Oxides
SOP - Standard Operating Procedure
SPCC - Spill Prevention, Control, and Countermeasures (Plan)
SPDES - (New York) State Pollutant Discharge Elimination System
SRM - Standard Reference Material
SSP - Site Sustainability Plan
SSPP - Strategic Sustainability Performance Plan
SSWMU - Super Solid Waste Management Unit
STP - Site Treatment Plan
STS - Supernatant Treatment System
SU - Standard Unit
SVOC - Semivolatile Organic Compound
SWMU - Solid Waste Management Unit
SWPPP - Storm Water Pollution Prevention Plan
SWS - Slack Water Sequence

T

T&VDS - Tank and Vault Drying System
TAGM - Technical and Administrative Guidance Memorandum
TBP - Tributyl Phosphate
TBU - Thick-Bedded Unit
TCE - Trichloroethylene
TDS - Total Dissolved Solids
TEDE - Total Effective Dose Equivalent
TEMO - Transportation Event Management Organization
TER - Technical Evaluation Report
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
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
UIC - Underground Injection Control
ULT - Unweathered Lavery Till
URS - URS - Energy & Construction Division
USACE - U.S. Army Corps of Engineers
USC - United States Code
USGS - United States Geological Survey
UV - Ultraviolet

V

VEC - Ventilation Exhaust Cell
VIT - Vitrification
VLDPE - Very-Low-Density Polyethylene
VOC - Volatile Organic Compound
VPP - (U.S. DOE) Voluntary Protection Program

W

WET - Whole Effluent Toxicity
WIR - Waste-Incidental-to-Reprocessing
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
WVCS - West Valley Central School
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-1 - Extraction Cell 1
XC-3 - Extraction Cell 3

REFERENCES AND BIBLIOGRAPHY

(For a bibliographical listing that includes basis documents not specifically cited in the text, see the WVDP Annual Site Environmental Report for 2003. [Available on the DOE-WVDP website at www.wv.doe.gov])

American National Standards Institute, Inc. August 20, 1975. *American National Standard: Performance Testing, and Procedural Specifications for Thermoluminescent Dosimetry (Environmental Applications).* ANSI N545-1975.

American Society of Mechanical Engineers. 1989. *Quality Assurance Program Requirements for Nuclear Facilities.* ASME-NQA-1. New York: The American Society of Mechanical Engineers.

Brookhaven National Laboratory. April 2005. *Nuclear Wallet Cards.* National Nuclear Data Center. Upton, New York.

CHBWV. October 27, 2011. *Groundwater Monitoring Plan*. Current revision. WVDP-239.

_____________. November 29, 2011. *WVDP Safety Management System (SMS) Description.* WVDP-310, including Addendum 1, *WVDP Worker Safety and Health Plan*, Current revision, April 19, 2012.

_____________. January 12, 2012. *Site Treatment Plan: Fiscal Year 2011 Update*. Current revision. WVDP-299.

_____________. February 2012. *New York State Department of Environmental Conservation Hazardous Waste Report for 2011.*

_____________. February 29, 2012. *Environmental Monitoring Program Plan*. Current revision. WVDP-098.

_____________. April 26, 2012. *Manual for Radiological Assessment of Environmental Releases at the WVDP.* Current revision. WVDP-065.

_____________. May 1, 2012. *West Valley Demonstration Project (WVDP) Waste Acceptance Manual.* Current revision. WVDP-200.

_____________. May 2, 2012. *Clean Water Act/State Pollutant Discharge Elimination System Best Management Practices and Storm Water Pollution Prevention Plan for the West Valley Demonstration Project.* Current revision. WVDP-206.

Citizen Task Force. July 29, 1998. *West Valley Citizen Task Force Final Report.*

Executive Order 11988. May 24, 1977. *Floodplain Management*. 42 FR 26951.

Executive Order 11990. May 25, 1977. *Protection of Wetlands*. 42 FR 26961.

Executive Order 13101. September 16, 1998. *Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition.* 63 FR 49643. (Revoked by Executive Order 13423, January 24, 2007.)

Executive Order 13148. April 26, 2000. *Greening the Government Through Leadership in Environmental Management*. 65 FR 24595. (Revoked by Executive Order 13423, January 24, 2007.)

Executive Order 13423. January 24, 2007. *Strengthening Federal Environmental, Energy, and Transportation Management.* 72 FR 3919.

Executive Order 13514. October 5, 2009. *Federal Leadership in Environmental, Energy, and Economic Performance.* 74 FR 52117.

Federal Guidance Report 13. (FGR 13, EPA99)

International Atomic Energy Agency (IAEA). 1992. *Effects of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards.* Technical Report Series No. 332, IAEA, Vienna, Austria.

International Commission on Radiological Protection. 1977. *Recommendations of the International Commission on Radiological Protection.* ICRP Publication 26. Oxford: Pergamon Press.

_____________. 1979. *Recommendations of the International Commission on Radiological Protection – Limits for Intakes of Radionuclides by Workers*. ICRP Publication 30. Oxford: Pergamon Press.

_____________. 1991. *Recommendations of the International Commission on Radiological Protection.* ICRP Publication 60, Pergamon Press, New York.

International Organization for Standardization. 1996. *Environmental Management Systems.* ISO 14001:2004.

Long, E.R., and L.G. Morgan. 1990. *The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National States and Trends Program.* National Oceanic Atmospheric Administration (NOAA) Technical Memorandum No. 5, OMA52, NOAA National Ocean Service, Seattle, Washington.

Mitrey, R.J. October 28, 1986. Correspondence from New York State Department of Environmental Conservation to J.P. Hamric, Department of Energy, Idaho Operations Office, West Valley Project Office, regarding the construction landfill.

National Council on Radiation Protection and Measurements. 1987. *Ionizing Radiation Exposure of the Population of the United States*. NCRP-93. Bethesda, Maryland.

National Council on Radiation Protection and Measurements. 2009. *Ionizing Radiation Exposure of the Population of the United States*. NCRP Report No. 160. Bethesda, Maryland.

National Environmental Laboratory Accreditation Conference (NELAC) Standard. June 2003, effective July 2005.

National Research Council. 1990. *Health Effects of Exposure to Low Levels of Ionizing Radiation.* Biological Effects of Ionizing Radiation (BEIR) V. Washington: National Academy Press.

New York State. nd. Environmental Conservation Law (ECL). Article 27, *Collection, treatment, and Disposal of Refuse and Other Solid Waste.* Title 9. Industrial Hazardous Waste Management.

_____________. nd. ECL. Article 15. *Water Resources*. Title 5. Protection of Water.

_____________. nd. ECL. Article 15. *Water Resources*. Title 33. Water Withdrawal Reporting.

_____________. nd. ECL. Article 17. *Water Pollution Control. Title 8. State Pollutant Discharge Elimination System*.

_____________. nd. ECL. Article 24. *Freshwater Wetlands Act*.

_____________. nd. ECL. Article 40. *Hazardous Substances Bulk Storage Act*.

_____________. nd. Navigation Law. Article 12. *Oil Spill Prevention, Control, and Compensation*.

_____________. nd. Public Health Law. Article 5. Laboratories. Section 502. *Laboratories; Examinations; Certificates of Approval.*

New York State Department of Environmental Conservation. nd. Title 6, New York Codes, Rules, and Regulations (6 NYCRR). *Environmental Conservation Rules and Regulations.*

_____________. nd. *Hazardous Waste Management Facilities.* 6 NYCRR Subpart 373.

_____________. nd. *Management of Specific Hazardous Waste.* 6 NYCRR Subpart 374.

_____________. nd. *Solid Waste Management Facilities*. 6 NYCRR Part 360.

_____________. nd. Title 6 NYCRR, Subchapter D, *Water Regulation,* Parts 595 *(Releases of Hazardous Substances Reporting, Response and Corrective Action)*; 596 *(Hazardous Substance Bulk Storage Regulations)*, 597 *(List of Hazardous Substances)*, 598 *(Handling and Storage of Hazardous Substances)*; and 599 *(Standards for New or Modified Hazardous Substance Storage Facilities)*.

_____________. December 27, 1985 (amended February 12, 1992). Title 6 NYCRR Parts 612 *(Registration of Petroleum Storage Facilities)*, 613 *(Handling and Storage of Petroleum)*, and 614 *(Standards for New and Substantially Modified Petroleum Storage Facilities).*

_____________. December 31, 1988 (last revised May 12, 2006). *Used Oil.* 6 NYCRR Subpart 360-14.

_____________. January 24, 1994. *Determination of Soil Cleanup Objectives and Cleanup Levels.* Technical and Administrative Guidance Memorandum (TAGM) #4046.

_____________. 1995. *Appendix 33 - Groundwater Monitoring List.* Title 6 NYCRR Subpart 373-2.

_____________. January 1, 1996. *State Environmental Quality Review.* Title 6 NYCRR, Part 617.

_____________. September 3, 1996. *Federal Facility Compliance Act: Order on Consent.*

_____________. June 1998. *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.* Technical and Operational Guidance Series (TOGS) 1.1.1.

_____________. January 25, 1999. *Technical Guidance for Screening Contaminated Sediments.*

_____________. March 19, 1999. *Stipulation of Agreement Pursuant to Section 17-0303 of the Environmental Conservation Law and Section 176 of the Navigation Law*.

_____________. January 2003. Draft Technical and Operational Guidance Series (TOGS) #5.1.9. *In-Water and Riparian Management of Sediment and Dredge Material.*

_____________. March 10, 2003 (amended May 12, 2006). 6 NYCRR Part 364, *Waste Transportation*, Subpart 364.9. *Standards for the Tracking and Management of Medical Waste.*

_____________. February 1, 2004 and modification dates January 1, 2005 and September 1, 2006. *State Pollutant Discharge Elimination System (SPDES) Discharge Permit NY0000973.*

______________. October 21, 2004. Air Facility Registration Certificate in accordance with 6 NYCRR Part 201-4.

______________. September 5, 2006. *Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities.* 6 NYCRR Subpart 372.

______________. September 5, 2006. *Identification and Listing of Hazardous Wastes.* 6 NYCRR Subpart 371.

______________. September 5, 2006. *Interim Status Standards for Owners and Operators of Hazardous Waste Facilities.* 6 NYCRR Subpart 373-3.

______________. September 6, 2006. *Final Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.* 6 NYCRR Subpart 373-2.

______________. September 6, 2006. *Hazardous Waste Management System - General.* 6 NYCRR Subpart 370.

______________. December 5, 2006. *Land Disposal Restrictions*. 6 NYCRR Subpart 376.

New York State Department of Health. nd. *Environmental Laboratory Approval Program (ELAP) Certification Manual.*

______________. nd. Title 10, New York Code, Rules, and Regulations (10 NYCRR). *Sources of Water Supply. Part 5 (Drinking Water Supplies) and Part 170 (Sources of Water Supply).*

New York State Energy Research and Development Authority. May 12, 2010. *State Environmental Quality Review Findings Statement.*

Pacific Northwest Laboratory (PNL). November 1988. Napier, B.A., Strenge, D.L., Pelequin, R.A., and Ramsdell, J.V. *GENII - The Hanford Environmental Radiation Dosimetry Software System.* Version 1.485, PNL-6584.

Parks B.L. March 1992. *User's Guide for CAP88-PC*. Version 1.0. Las Vegas, NV: U.S. Environmental Protection Agency Office of Radiation Programs. 402-B-92-001.

______________. June 1997. *CAP88-PC Version 2.0 User's Guide.* Germantown, Maryland. U.S. Department of Energy.

Persaud, D., Jaagumagi, R., and A. Hayton. 1992. *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario*. Ontario Ministry of the Environment, Queen's Printer for Ontario.

Rickard, L.V. 1975. *Correlation of the Silurian and Devonian Rocks in New York State.* New York State Museum and Science Service Map and Chart Series No. 24.

Simpson, D.B., and B.L. McGill. 1980. *LADTAP II: A Computer Program for Calculating Radiation Exposure to Man from Routine Release of Nuclear Reactor Liquid Effluents.* Technical Data Management Center. ORNL/NUREG/TDMC-1.

Standish, P.N. 1985. *Closure of the Construction Landfill Site.* Letter (WD:85:0434) to W.H. Hannum, Department of Energy, West Valley Project Office.

Statistics Canada. 2001. *Population and Dwelling Counts for Canada, Provinces and Territories, and Census Subdivisions (Municipalities), 2001 and 1996 censuses -- 100% data*, and *topic-based tabulations*. <http://www.statcan.ca/english/census01/products/standard>

Trinity Engineering Associates, Inc. March 2006. *CAP88-PC Version 3.0 User Guide.*

U.S. Congress. 1918. *Migratory Bird Treaty Act.* 16 United States Code (USC) §703 *et seq.*

_____________. 1954. *Atomic Energy Act of 1954*. 42 USC §2011 *et seq.*

_____________. 1966. *National Historic Preservation Act of 1966.* 16 USC §470 *et seq.*

_____________. 1969. *National Environmental Policy Act of 1969*. 42 USC §4321 *et seq.*

_____________. 1970. *Clean Air Act of 1970*. 42 USC §7401 *et seq.*

_____________. 1973. *Endangered Species Act of 1973.* 16 USC §1531 *et seq.*

_____________. 1974. *Safe Drinking Water Act*. 42 USC §300f *et seq.*

_____________. 1976. *Resource Conservation and Recovery Act of 1976*. Public Law 94-580, 90 Stat. 2795, 42 USC §6901 *et seq.*

_____________. 1976. *Toxic Substances Control Act*. 15 USC §2601 *et seq.*

_____________. 1977. *Federal Water Pollution Control Act of 1977.* 33 USC §1251 *et seq.* (Also known as the Clean Water Act)

_____________. October 1, 1980. *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.* Public Law 96-368 [S. 2443]. Congressional Record, Vol. 126. (Also known as the WVDP Act)

_____________. 1980. *Comprehensive Environmental Response, Compensation, and Liability Act of 1980.* Public Law 96-510, 42 USC §9601 *et seq.*

_____________. 1986. *Emergency Planning and Community Right-to-Know Act of 1986*. 42 USC §11001 *et seq.*

_____________. October 17, 1986. *Superfund Amendments and Reauthorization Act (SARA) of 1986*. Public Law 99-499, 100 Stat. 1613, Title 10.

_____________. 1992. *Federal Facilities Compliance Act of 1992.* Amendment to Section 6001 of the Solid Waste Disposal Act (42 USC 6961).

_____________. 1996. *Federal Insecticide, Fungicide, and Rodenticide Act.* 7 USC §136 *et seq.*

U.S. Department of Commerce. U.S. Census Bureau. Census 2000.

U.S. Department of Energy. nd. *National Environmental Policy Act Implementing Procedures.* 10 CFR Part 1021. Subpart D, *Typical Classes of Actions*. Appendix B, *Categorical Exclusions Applicable to Specific Agency Actions*. B6-1, *Small-scale, short-term cleanup actions under RCRA, Atomic Energy Act, or other authorities.*

_____________. nd. *Quality Assurance Criteria.* 10 CFR 830.122.

_____________. 1981. *West Valley Demonstration Project Memorandum of Understanding Between the U.S. Department of Energy and the U.S. Nuclear Regulatory Commission.*

_____________. July 1981. *A Guide for Environmental Radiological Surveillance at U.S. Department of Energy Installations*. DOE/EP-0023. Washington, D.C.

______________. July 1983. *A Guide for Effluent Radiological Measurements at DOE Installations.* DOE/EP-0096. Washington, D.C.

______________. January 1991. *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance.* DOE/EH-0173T. Washington, D.C.

______________. May 1997. *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste*. DOE/EIS-0200-F.

______________. July 9, 1999. *Radioactive Waste Management.* DOE Order 435.1, including Change 1 (August 28, 2001). Washington, D.C.

______________. August 26, 1999. *Record of Decision for the Department of Energy's Waste Management Program: Storage of High-Level Radioactive Waste.* 64 FR 46661.

______________. October 1999. *Expediting Cleanup Through a Core Team Approach.* DOE/EH-413-9911.

______________. February 25, 2000. *Record of Decision for the Department of Energy's Waste Management Program: Treatment and Disposal of Low-Level Waste and Mixed Low-Level Waste*; *Amendment of the Record of Decision for the Nevada Test Site.* 65 FR 10061.

______________. October 26, 2000. *National Environmental Policy Act Compliance Program*. DOE Order 451.1B, including Change 3 (January 19, 2012). Washington, D.C.

______________. March 26, 2001. *Revised Strategy for the Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center and Solicitation of Scoping Comments*. 66 FR 16447.

______________. May 2, 2001. *Department of Energy Management of Cultural Resources.* DOE Policy 141.1.

______________. November 6, 2001. *Advance Notice of Intent to Prepare an Environmental Impact Statement to Evaluate Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center.* 66 FR 56090.

______________. July 2002. DOE Standard: *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota.* DOE-STD-1153-2002. Washington, D.C.

______________. January 2003. *Estimating Radiation Risk from Total Effective Dose Equivalent (TEDE).* Interagency Steering Committee on Radiation Standards (ISCORS) Technical Report No. 1. DOE/EH-412/0015/0502, Rev. 1.

______________. March 13, 2003. *Notice of Intent to Prepare an Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Services Center*. 68 FR 12044.

______________. May 16, 2003. *Notice of Availability of the West Valley Demonstration Project Draft Waste Management Environmental Impact Statement*. 68 FR 26587.

______________. December 2003. *West Valley Demonstration Project Waste Management Environmental Impact Statement*. DOE/EIS-0337F.

______________. January 2004. Users Guide: *RESRAD-BIOTA: A Tool for Implementing a Graded Approach to Biota Dose Evaluation*. Version 1. DOE/EH-0676. (ISCORS Technical Report 2004-2).

______________. June 16, 2005. *Record of Decision for WVDP Waste Management Activities*. 70 FR 35073.

______________. February 2006. *Worker Safety and Health Program.* 10 CFR 851.

______________. September 14, 2006. *Environmental Assessment for the Decontamination, Demolition, and Removal of Certain Facilities at the West Valley Demonstration Project.* DOE/EA-1552. West Valley, New York.

______________. June 4, 2008. *Radioactive Material Transportation Practices Manual*. DOE M 460.2-1.

______________. December 5, 2008. *Notice of Availability of 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.* 73 FR 74160.

______________. December 5, 2008. *Proposed Phase 1 Decommissioning Plan for the West Valley Demonstration Project, West Valley, New York.* 73 FR 74162.

______________. December 2008, March 2009, and December 2009. P*hase 1 Decommissioning Plan for the West Valley Demonstration Project.* Revs. 0, 1, and 2. Prepared by: Washington Safety Management Solutions - URS Washington Division and Science Applications International Corporation.

______________. November 18, 2009. *RESRAD-BIOTA for Windows.* Argonne National Laboratory, with support from U.S. EPA and U.S. NRC.

______________. April 14, 2010. *Record of Decision: Final Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center.*

______________. February 11, 2011. *Radiation Protection of the Public and the Environment.* DOE Order 458.1, including Change 2 (June 6, 2011). Washington, D.C. (Canceled DOE O 5400.5.)

______________. April 2011. *DOE Standard Derived Concentration Technical Standard.* DOE-STD-1196-2011. Washington, D.C. (Replaced DOE DCGs.)

______________. April 25, 2011. *Integrated Safety Management DOE O 450.2 for Use with Integrated Safety Management Policy DOE P 450.4A*.

______________. April 25, 2011. *Quality Assurance.* DOE Order 414.1D.

______________. May 2011. Rev. 1. *Phase I Final Status Survey Plan.* West Valley Demonstration Project. Prepared by Argonne National Laboratory, Environmental Science Division, Argonne, Illinois.

______________. May 2, 2011. *Departmental Sustainability*. DOE Order 436.1 (canceled DOE O 450.1A and 430.2B).

______________. June 2011. Rev. 1. *Phase I Characterization Sampling and Analysis Plan.* West Valley Demonstration Project. Rev. 0. Prepared by Argonne National Laboratory, Environmental Science Division, Argonne, Illinois.

______________. June 17, 2011. *Worker Protection Management for DOE Federal and Contractor Employees.* DOE Order 440.1B. Washington, D.C.

______________. June 27, 2011. *Environment, Safety, and Health Reporting*. DOE Order 231.1B. Washington, D.C.

______________. September 2011. *West Valley Demonstration Project Annual Site Environmental Report. Calendar Year 2010.* Prepared by CH2M HILL • B&W West Valley, LLC.

______________. February 2012. *Waste-Incidental-to-Reprocessing Evaluation for the West Valley Demonstration Project Vitrification Melter*.

U.S. Department of Energy and New York State Energy Research and Development Authority. 1981. *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.

______________. October 1, 1990. *Supplemental Agreement to the Cooperative Agreement Between the United States Department of Energy and the New York State Energy Research and Development Authority Setting Forth Procedures and Responsibilities for the Preparation of a Joint Environmental Impact Statement for the Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center.*

______________. December 2008. *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).

______________. January 29, 2010. *Final Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center.* Prepared by DOE and the New York State Energy Research and Development Authority (NYSERDA). DOE/EIS-0226.

______________. March 14, 2011. *Second Supplemental Agreement to the Cooperative Agreement Between the United States Department of Energy and the New York State Energy Research and Development Authority Setting Forth Special Provisions for the Identification, Implementation, and Management of the Phase 1 Studies for the Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center.*

U.S. Department of Transportation. nd. 49 CFR Chapter 1, *Pipeline and Hazardous Materials Safety Administration, Department of Transportation*. Part 172. *Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements.*

U.S. Environmental Protection Agency. nd. 40 Code of Federal Regulations, *Protection of the Environment*, Chapter 1, *Environmental Protection Agency*.

______________. March 1983. *Mercury, Method 245.1 (Manual Cold Vapor Technique).* Methods for Chemical Analysis of Water and Wastes. Environmental Monitoring and Support Laboratory. Cincinnati, Ohio.

______________. 1984a. *Drinking Water Guidelines*. 40 CFR 141, *National Secondary Drinking Water Regulations*, Subpart B, *Maximum Contaminant Levels*.

______________. 1984b. *Drinking Water Guidelines*. 40 CFR 143, *National Secondary Drinking Water Regulations*, Section 143.3, *Secondary Maximum Contaminant Levels*.

______________. December 15, 1989. *National Emission Standards for Hazardous Air Pollutants: Standards for Radionuclides.* 40 CFR 61, including update of September 9, 2002. Subpart H. *National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities.* Washington, D.C.: U.S. Government Printing Office, as amended.

______________. 1992. *Region II Administrative Order on Consent. Docket No. II RCRA 3008(h) -92-0202. In the Matter of: Western New York Nuclear Service Center.*

______________. March 17, 1994. Communication from P.A. Giardina, Chief Radiation Branch, U.S. EPA Region II, to T.J. Rowland, Director, U.S DOE. NESHAP Compliance Approval for (1) Periodic Confirmatory Measurements and (2) HVAC Stack Effluent Monitoring Changes.

______________. 1995. *Comprehensive Procurement Guidelines for Products Containing Recovered Material.* 40 CFR 247.

______________. October 16, 1996. *Code of Environmental Management Principles*. 61 FR 54062.

______________. August 2002. Method 1631, Revision E: *Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry.* EPA-821-R-02-019.

______________. October 9, 2002. Memorandum of Understanding Between the Environmental Protection Agency and the Nuclear Regulatory Commission. *Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites.*

______________. July 9, 2009. Communication from R. Borsellino, Acting Director, EPA Division of Environmental Planning and Protection, to B.C. Bower, Director U.S. DOE-WVDP. *Approval to implement environmental measurements for rad-NESHAP compliance and to modify the MPPB stack.*

______________. July 14, 2011. Communication from K. Bricke, Acting Director, EPA Division of Environmental Planning and Protection, to B.C. Bower, Director U.S. DOE-WVDP. *Approval request to grant a 24-month extension of the interim approval to use ambient measurements to demonstrate RAD-NESHAP Compliance to modify the MPPB stack.*

U.S. General Accounting Office. May 2001. *Nuclear Waste Agreement Among Agencies Responsible for the West Valley Site is Critically Needed.* Report to Congressional Requestors. GAO-01-314.

U.S. Nuclear Regulatory Commission. October 1977. *Regulatory Guide 1.109: Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I*.

______________. July 1997. *Radiological Criteria for License Termination.* 10 CFR Part 20, Appendix E.

______________. February 1, 2002. *Decommissioning Criteria for the West Valley Demonstration Project (M-32) at the West Valley Site; Final Policy Statement.* 67 FR 5003.

______________. September 2006. *Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria.* NUREG-1757, Vol. 2.

______________. February 25, 2010. *U.S. Nuclear Regulatory Commission Technical Evaluation Report on the U.S. Department of Energy Phase 1 Decommissioning Plan for the West Valley Demonstration Project.*

URS Group, Inc. April 8, 2002. *Land Use Survey*. Rev. 0. AR #2002-171.

West Valley Environmental Services LLC. March 24, 2004 and May 3, 2010. *TRU Waste Management Program Plan.* Rev. 0 and Rev. 1. WVDP-417.

______________. October 15, 2008. *Characterization Plan for the Mitigation of the Leading Edge of the WVDP North Plateau Strontium-90 Plume.* Rev. 1. WVDP-489.

______________. December 23, 2008. *WVDP Groundwater Protection Management Program Plan*. Current revision. WVDP-091.

______________. April 28, 2009. *West Valley Demonstration Project North Plateau Plume Area Characterization Report.* Rev. 0. WVDP-494.

______________. June 10, 2009. *WVDP Environmental Management System.* Current revision. WV-980.

______________. June 16, 2009. *Waste Minimization/Pollution Prevention Awareness Plan.* Current revision. WVDP-087.

______________. July 23, 2009. *Asbestos Management Plan*. Current revision. WVDP-072.

______________. June 28, 2010. *CY 2009 Annual Status Report for the Hazardous Waste Reduction Plan.*

______________. October 7, 2010. *North Plateau Groundwater Monitoring Plan.* Current revision. WVDP-518.

______________. October 14, 2010. *North Plateau Permeable Treatment Wall Protection and Best Management Plan.* Current revision. WVDP-516.

______________. March 15, 2011. *North Plateau Permeable Treatment Wall Performance Monitoring Plan.* Rev. 1. WVDP-512.

______________. April 14, 2011. *Low-Level Waste Management Program Plan.* Current revision. WVDP-019.

______________. June 27, 2011. *Monitoring Plan for Storm Water Discharges at the West Valley Demonstration Project.* Current revision. WVDP-233.

West Valley Nuclear Services Co., Inc. May 1, 1995. *Subsurface Probing Investigation on the North Plateau at the West Valley Demonstration Project.* Rev. 0. WVDP-220.

______________. March 1996. *Environmental Information Document, Volume III: Hydrology, Part 4.* WVDP-EIS-009.

______________. June 11, 1999. *1998 Geoprobe® Investigation in the Core Area of the North Plateau Groundwater Plume.* Rev. 0. WVDP-346.

______________. November 17, 2005. *PCB and PCB-Contaminated Material Management Plan.* Rev. 8. WVDP-080.

______________. January 2007. *Corrective Measures Study Work Plan for the West Valley Demonstration Project.* Rev. 0. WVDP-462.

______________. August 16, 2007. *Sampling and Analysis Plan for Background Subsurface Soil on the North Plateau.* Current revision. WVDP-466.

______________. August 16, 2007. *Sampling and Analysis Plan for the North Plateau Plume Area*. Current revision. WVDP-465.

West Valley Nuclear Services Co., Inc. and Dames & Moore. June 1997. *West Valley Demonstration Project Site Environmental Report, Calendar Year 1996.*

______________. July 1997. *Resource Conservation and Recovery Act Facility Investigation Report, Vol.1: Introduction and General Site Overview.* WVDP-RFI-017.

______________. June 1998. *Final Report: Evaluation of the Pilot Program to Investigate Chromium and Nickel Concentrations in Groundwater in the Sand and Gravel Unit.*

West Valley Nuclear Services Co. and URS Group, Inc. January 2001. *Results of Corrosion Evaluation in Selected Stainless Steel Monitoring Wells on the North Plateau and Recommendations for Long-Term Management*.

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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 001	*Parameter*	*Effluent Limit*	*Sample Frequency*
001; Process and Storm Wastewater	Flow	Monitor - MGD	Continuous
	Aluminum	4.0 mg/L	1/batch
	Ammonia as (NH_3)	2.1 mg/L	2/batch
	pH	6.5–8.5 SU	1/batch
	Dissolved Oxygen (DO)	3.0 mg/L (minimum)	2/batch
	Oil and grease	15.0 mg/L	1/batch
	Solids, total suspended	45 mg/L	2/batch
	Solids, Settleable	0.3 mg/L	2/batch
	Solids, Total dissolved	Monitor	2/batch
	BOD_5	10.0 m/L	2/batch
	TKN (as N)	Monitor	2/batch
	Nitrate (as N)	Monitor	1/batch
	Nitrite (as N)	0.1 mgL	1/batch
	Ultimate oxygen demand (UOD)	22.0 mg/L	2/batch
	Chlorine, total residual	0.1 mg/L	1/batch
	Arsenic, total recoverable	0.15 mg/L	1/batch
	Cadmium, total recoverable	0.002 mg/L	1/year
	Iron, total	Monitor	2/batch
	Chromium, total recoverable	0.11 mg/L	2/year
	Chromium, hexavalent, total recoverable	0.011 mg/L	1/year
	Copper, total recoverable	0.014 mg/L	2/year
	Cyanide, amenable to chlorination	0.005 mg/L	2/year
	Manganese, total	2.0 mg/L	2/year
	Lead, total recoverable	0.006 mg/L	2/year
	Nickel, total	0.079 mg/L	2/year
	Selenium, total recoverable	0.004 mg/L	1/batch
	Sulfate	Monitor	1/batch
	Sulfide, dissolved	0.4 mg/L	1/batch
	Cobalt, total recoverable	0.005 mg/L	1/batch
	Vanadium, total recoverable	0.014 mg/L	1/batch
	Zinc, total recoverable	0.13 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
	Tributylphosphate	0.1 mg/L	1/year
	Heptachlor	0.01 µg/L	2/year
	Surfactant (as LAS) - interim	Monitor	1/batch
	Surfactant (as LAS) - final	0.04 mg/L	1/batch
	Xylene	0.05 mg/L	1/year
	2-butanone	0.5 mg/L	1/year
	Hexachlorobenzene	0.2 µg/L	1/year
	Mercury, total	50 ng/L	1/batch
	Alpha - BHC	0.01 µg/L	1/year

TABLE B-1A *(continued)*
West Valley Demonstration Project State Pollutant Discharge Elimination System (SPDES) Sampling Program

Outfall 001	*Parameter*	*Action Levels*	*Sample Frequency*
001; Process and Storm Wastewater	Antimony	1.0 mg/L	1/year
	Barium	0.5 mg/L	1/year
	Boron	2.0 mg/L	2/year
	Bromide	5.0 mg/L	2/year
	Chloroform	0.3 mg/L	1/year
	Titanium	0.65 mg/L	2/year
	Whole Effluent Toxicity (WET) Testing		
	WET - Acute Invertebrate	0.3 TUa	4/year
	WET - Acute Vertebrate	0.3 TUa	4/year
	WET - Chronic Invertebrate	1.0 TUc	4/year
	WET - Chronic Vertebrate	1.0 TUc	4/year

Outfall 007	*Parameter* [a]	*Effluent Limit*	*Sample Frequency*
007; Sanitary and Utility Wastewater	pH	6.5–8.5 SU	2/month
	Dissolved oxygen (DO)	3.0 mg/L (minimum)	2/month
	Flow	Monitor - MGD	1/month
	Oil and Grease	15.0 mg/L	2/month
	Solids, total suspended	45 mg/L	2/month
	Solids, settleable	0.3 mg/L	2/month
	Solids, total dissolved	Monitor	2/month
	BOD_5	10.0 mg/L	2/month
	Ammonia (as NH_3)	2.1 mg/L	2/month
	TKN (as N)	Monitor	1/month
	Nitrite (as N)	0.1 mg/L	1/month
	Ultimate oxygen demand (UOD)	22.0 mg/L	1/month
	Iron, total	Monitor	2/month
	Chlorine, total residual	0.1 mg/L	1/month
	Mercury, total - interim limit	200 ng/L	1/month
	Mercury, total - final limit	50 ng/L	1/month
	Chloroform	0.20 mg/L	1/year
	Whole Effluent Toxicity (WET) Testing		
	WET - Acute Invertebrate	0.3 TUa	4/year
	WET - Acute Vertebrate	0.3 TUa	4/year
	WET - Chronic Invertebrate	1.0 Tuc	4/year
	WET - Chronic Vertebrate	1.0 TUc	4/year

Outfall 01B	*Parameter*	*Action Levels*	*Sample Frequency*
01B; Mercury Pre-Treatment Process	Flow	Monitor - MGD	Continuous
	Mercury, total	Monitor - 50 ng/L	2/discharge

Sum of Outfalls	*Parameter*	*Action Levels*	*Sample Frequency*
001 and 007	Iron, total	Monitor - 1.0 mg/L	1/month

[b] The effluent limit at outfall 001 is used for the limits at these outfalls for these constituents.

TABLE B-1A *(concluded)*
West Valley Demonstration Project State Pollutant Discharge Elimination System (SPDES) Sampling Program

Monitoring Point	*Parameter*	*Action Levels*	*Sample Frequency*
116	Solids, total dissolved	Monitor - 500 mg/L	2/discharge

Monitoring Point	*Parameter*	*Compliance Limit*	*Sample Frequency*
Stormwater Outfalls (All)	Oil & grease	<15 mg/L	1/event
Outfall S43	Lead, total[a]	0.006 mg/L	1/event
Outfall S09 & S12	Mercury	50 ng/L	1/event

[a] The effluent limit at outfall 001 is used at this outfall as a guideline for lead concentration.

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 Standards (DCSs)[a] in Ingested Water

Radionuclide	*Units*	*Concentration in Ingested Water*
Gross Alpha (as U-232)[b]	µCi/mL	9.8E-08
Gross Beta (as Sr-90)[b]	µCi/mL	1.1E-06
Tritium (H-3)	µCi/mL	1.9E-03
Carbon-14 (C-14)	µCi/mL	6.2E-05
Potassium-40 (K-40)	µCi/mL	4.8E-06
Cobalt-60 (Co-60)	µCi/mL	7.2E-06
Strontium-90 (Sr-90)	µCi/mL	1.1E-06
Technetium-99 (Tc-99)	µCi/mL	4.4E-05
Iodine-129 (I-129)	µCi/mL	3.3E-07
Cesium-137 (Cs-137)	µCi/mL	3.0E-06
Europium-154 (Eu-154)	µCi/mL	1.5E-05
Uranium-232 (U-232)	µCi/mL	9.8E-08
Uranium-233 (U-233)	µCi/mL	6.6E-07
Uranium-234 (U-234)	µCi/mL	6.8E-07
Uranium-235 (U-235)	µCi/mL	7.2E-07
Uranium-236 (U-236)	µCi/mL	7.2E-07
Uranium-238 (U-238)	µCi/mL	7.5E-07
Plutonium-238 (Pu-238)	µCi/mL	1.5E-07
Plutonium-239 (Pu-239)	µCi/mL	1.4E-07
Plutonium-240 (Pu-240)	µCi/mL	1.4E-07
Americium-241 (Am-241)	µCi/mL	1.7E-07

[a] DCS: Derived Concentration Standard. DCSs are established in DOE-STD-1196-2011 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 (1mSv).

[b] Because there are no DCSs for gross alpha and gross beta concentrations, the DCSs for the most restrictive alpha and beta emitters at the WVDP, uranium-232 and strontium-90 (9.8E-08 and 1.1E-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 DCS may be applied.

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APPENDIX B-2

Process Effluent Data

TABLE B-2A
Comparison of 2011 Lagoon 3 (WNSP001) Liquid Effluent Radioactivity Concentrations With U.S. DOE-Derived Concentration Standards (DCSs)

Isotope [a]	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *(Becquerels)*	*Average Concentration (µCi/mL)*	*DCS* [d] *(µCi/mL)*	*Ratio of Concentration to DCS*
Gross Alpha	1.14±0.10E-03	4.21±0.38E+07	2.20±0.20E-08	NA[e]	NA
Gross Beta	2.03±0.03E-02	7.50±0.12E+08	3.91±0.06E-07	NA[e]	NA
H-3	3.93±0.10E-02	1.45±0.04E+09	7.59±0.19E-07	1.9E-03	0.0004
C-14	6.11±5.92E-04	2.26±2.19E+07	1.18±1.14E-08	6.2E-05	0.0002
K-40	5.91±7.13E-04	2.19±2.64E+07	1.14±1.38E-08	NA[f]	NA
Co-60	0.26±2.53E-05	0.96±9.35E+05	0.50±4.88E-10	7.2E-06	<0.0001
Sr-90	9.89±0.12E-03	3.66±0.05E+08	1.91±0.02E-07	1.1E-06	0.1736
Tc-99	4.71±0.55E-04	1.74±0.20E+07	9.10±1.07E-09	4.4E-05	0.0002
I-129	5.93±2.70E-05	2.20±1.00E+06	1.15±0.52E-09	3.3E-07	0.0035
Cs-137	1.72±0.06E-03	6.38±0.21E+07	3.33±0.11E-08	3.0E-06	0.0111
U-232[g]	2.89±0.09E-04	1.07±0.04E+07	5.58±0.18E-09	9.8E-08	0.0569
U-233/234[g]	1.98±0.09E-04	7.32±0.32E+06	3.82±0.17E-09	6.6E-07[h]	0.0058
U-235/236[g]	9.43±2.00E-06	3.49±0.74E+05	1.82±0.39E-10	7.2E-07	0.0003
U-238[g]	1.64±0.08E-04	6.08±0.29E+06	3.17±0.15E-09	7.5E-07	0.0042
Pu-238	6.85±1.41E-06	2.53±0.52E+05	1.32±0.27E-10	1.5E-07	0.0009
Pu-239/240	4.64±1.21E-06	1.72±0.45E+05	8.96±2.33E-11	1.4E-07	0.0006
Am-241	7.13±1.53E-06	2.64±0.57E+05	1.38±0.30E-10	1.7E-07	0.0008
Sum of Ratios					0.26

NA - Not applicable

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

[b] Total volume released: 5.18E+10 mL (1.37E+07 gal)

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

[d] DCSs are listed for reference only. DCSs 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 DCSs do not exist for indicator parameters gross alpha and gross beta.

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

[g] Total U (g) = 4.70±0.06E+02; Average U (µg/mL) = 9.08±0.12E-03

[h] The DCS for U-233 is used for this comparison.

TABLE B-2B

2011 SPDES Results for Outfall 001 (WNSP001): Water Quality

Permit Limit	*Ammonia (as NH_3) (mg/L)*		*BOD $_5$ day (mg/L)*		*Discharge Rate (MGD)*		*Chlorine,[a] Total Redisual (mg/L)*	
January to June Permit	*Monitor*		*10.0 mg/L daily maximum*		*Monitor*		*NA*	
Month	*Avg*	*Max*	*Avg*	*Max*	*Avg*	*Max*	*Avg*	*Max*
January	0.090	0.11	<2.0	<2.0	0.232	0.292	--	--
February	0.11	0.15	<2.0	<2.0	0.308	0.327	--	--
March	0.062	0.087	<2.0	<2.0	0.288	0.322	--	--
April	0.034	0.038	<2.0	<2.0	0.246	0.258	--	--
May[b]	--	--	--	--	--	--	--	--
June	<0.014	0.020	<2.0	<2.0	0.247	0.283	--	--
July 1, 2011 Permit	*2.1 mg/L daily maximum*		*10.0 mg/L daily maximum*		*Monitor*		*0.1 mg/L daily maximum*	
July	<0.010	0.011	2.5	2.8	0.214	0.237	0.08	0.08
August[b]	--	--	--	--	--	--	--	--
September	0.034	0.038	3.7	3.8	0.163	0.199	0.07	0.07
October[b]	--	--	--	--	--	--	--	--
November[b]	--	--	--	--	--	--	--	--
December	0.098	0.11	<2.0	<2.0[c]	0.265	0.335	0.06	0.06

Permit Limit	*Dissolved Oxygen[a] (mg/L)*		*Nitrogen, total Kjeldahl[a] (as N) (mg/L)*		*Nitrate (as N) (mg/L)*		*Nitrite (as N) (mg/L)*	
January to June Permit	*NA*		*NA*		*Monitor*		*0.1 mg/L daily maximum*	
Month	*Min*	*Max*	*Avg*	*Max*	*Avg*	*Max*	*Avg*	*Max*
January	--	--	--	--	0.50	0.52	<0.02	<0.02
February	--	--	--	--	0.52	0.53	<0.02	<0.02
March	--	--	--	--	0.96	0.99	<0.02	<0.02
April	--	--	--	--	1.0	1.1	<0.02	<0.02
May[b]	--	--	--	--	--	--	--	--
June	--	--	--	--	0.12	0.16	<0.02	<0.02
July 1, 2011 Permit	*3.0 mg/L minimum*		*Monitor*		*Monitor*		*0.1 mg/L daily maximum*	
July	6.8	6.9	0.70	0.72	<0.011	<0.011	<0.02	<0.02
August[b]	--	--	--	--	--	--	--	--
September	9.2	12.2	0.94	0.96	<0.011	<0.011	<0.02	<0.02
October[b]	--	--	--	--	--	--	--	--
November[b]	--	--	--	--	--	--	--	--
December	9.4	13.4	0.32	0.36	0.39	0.39	<0.02	<0.02

Note: No results exceeded the permit limits.

MGD - Million gallons per day

NA - Parameter was not listed in the SPDES permit until revision issued on July 1, 2011; therefore no applicable limit.

[a] Parameter was added to the SPDES permit for 001, effective July 1, 2011.

[b] No discharge this month

[c] The BOD_5 was analyzed past holding time, and the result was flagged “unreliable.”

TABLE B-2B *(continued)*
2011 SPDES Results for Outfall 001 (WNSP001): Water Quality

Permit Limit	Oil & Grease (mg/L)		pH (standard units)		Solids, Settleable (mL/L)		Solids, Total Dissolved (mg/L)	
January to June Permit	15.0 mg/L daily maximum		6.5 to 8.5		0.3 mL/L daily maximum		Monitor	
Month	Avg	Max	Min	Max	Avg	Max	Avg	Max
January	<1.6	<1.6	7.8	7.8	<0.1	<0.1	888	921
February	<1.5	1.5	7.8	7.8	<0.1	<0.1	758	858
March	<1.5	<1.5	7.9	7.9	<0.1	<0.1	745	770
April	<1.5	<1.5	8.1	8.1	<0.2	0.2[a]	750	765[b]
May[b]	--	--	--	--	--	--	--	--
June	<1.4	<1.4	7.0	7.0	<0.1	<0.1	768	782
July 1, 2011 Permit	15.0 mg/L daily maximum		6.5 to 8.5		0.3 mL/L daily maximum		Monitor	
July	<1.4	<1.4	7.4	7.4	<0.1	<0.1	875	930
August[d]	--	--	--	--	--	--	--	--
September	<1.4	<1.4	7.2	7.2	<0.1	<0.1	985	992
October[d]	--	--	--	--	--	--	--	--
November[d]	--	--	--	--	--	--	--	--
December	<1.4	<1.4	7.9	7.9	<0.1	<0.1	782	822

Permit Limit	Solids, Total Suspended (mg/L)		Sulfate (as S) (mg/L)		Sulfide, (as S) Dissolved (mg/L)		Surfactant[c] (as LAS) (mg/L)	
January to June Permit	45 mg/L daily maximum		Monitor		0.4 mg/L daily maximum		NA	
Month	Avg	Max	Avg	Max	Avg	Max	Avg	Max
January	<4.0	<4.0	41	42	<0.05	<0.05	--	--
February	<4.0	<4.0	40	42	<0.05	<0.05	--	--
March	<4.0	<4.0	30	35	<0.05	<0.05	--	--
April	6.8	8.4	23	25	<0.05	<0.05	--	--
May[d]	--	--	--	--	--	--	--	--
June	<4.0	<4.0	45	47	<0.05	<0.05	--	--
July 1, 2011 Permit	45 mg/L daily maximum		Monitor		0.4 mg/L daily maximum		Monitor	
July	6.6	8.4	45	45	<0.05	<0.05	0.014	0.014
August[d]	--	--	--	--	--	--	--	--
September	11.4	13.2	70	70	<0.05	<0.05	<0.052	<0.052
October[d]	--	--	--	--	--	--	--	--
November[d]	--	--	--	--	--	--	--	--
December	<4.0	<4.0	45	45	<0.05	<0.05	<0.013	<0.013

Note: No results exceeded the permit limits.
LAS - Linear alkylate sulfonate
NA - Parameter was not listed in the SPDES permit until revision issued on July 1, 2011; therefore no applicable limit.
[a] Settleable solids sample analyzed past holding time, result is considered “estimated.”
[b] Total dissolved solids sample analyzed past holding time, result is considered “estimated.”
[c] Parameter frequency changed from twice per year to once per discharge, effective July 1, 2011.
[d] No discharge this month

TABLE B-2B *(concluded)*
2011 SPDES Results for Outfall 001 (WNSP001): Water Quality

Permit Limit	*Ultimate Oxygen Demand (UOD)* [a] *(mg/L)*	
January to June Permit	*NA*	
Month	*Avg*	*Max*
January		
February		
March		
April		
May [b]		
June		
July 1, 2011 Permit	*22.0 mg/L daily maximum*	
July	6.85	7.49
August [b]	--	--
September	9.75	9.86
October [b]	--	--
November [b]	--	--
December	<4.46	<4.65

Note: No results exceeded the permit limits.
NA - Parameter was not listed in the SPDES permit until revision issued on July 1, 2011; therefore no applicable limit.
[a] Parameter was added to the SPDES permit for 001, effective July 1, 2011.
[b] No discharge this month

TABLE B-2C
2011 SPDES Results for Outfall 001 (WNSP001): Metals

Permit Limit	Aluminum, Total (mg/L)		Arsenic, [a] Dissolved (mg/L)		Arsenic, [b] Total Recoverable (mg/L)		Cobalt, Total Recoverable (mg/L)	
January to June Permit	14.0 mg/L daily maximum		0.15 mg/L daily maximum		NA		0.005 mg/L daily maximum	
Month	Avg	Max	Avg	Max	Avg	Max	Avg	Max
January	0.585	0.585	0.0019	0.0019	--	--	<0.0006	<0.0006
February	0.160	0.160	0.0015	0.0015	--	--	<0.0006	<0.0006
March	0.159	0.159	0.0011	0.0011	--	--	0.0007	0.0007
April	0.578	0.578	0.0010	0.0010	--	--	<0.0006	<0.0006
May [c]	--	--	--	--	--	--	--	--
June	0.242	0.242	0.0011	0.0011	--	--	<0.0006	<0.0006
July 1, 2011 Permit	4.0 mg/L daily maximum		NA		0.15 mg/L daily maximum		0.005 mg/L daily maximum	
July	0.20	0.20			0.0018	0.0018	<0.0006	<0.0006
August [c]	--	--	--	--	--	--	--	--
September	1.0	1.0			0.0051	0.0051	<0.0006	<0.0006
October [c]	--	--	--	--	--	--	--	--
November [c]	--	--	--	--	--	--	--	--
December	0.55	0.55	--	--	0.0018	0.0018	0.0003	0.0003

Permit Limit	Iron, Total (mg/L)		Mercury, Total (ng/L)		Selenium, Total Recoverable (mg/L)		Vanadium, Total Recoverable (mg/L)	
January to June Permit	Monitor		200 ng/L daily maximum		0.004 mg/L daily maximum		0.014 mg/L daily maximum	
Month	Avg	Max	Avg	Max	Avg	Max	Avg	Max
January	0.508	0.519	7.64	7.71	<0.001	0.002	0.0012	0.0012
February	0.522	0.857	8.42	9.09	<0.0005	<0.0006	<0.0011	<0.0011
March	0.438	0.700	6.78	7.71	<0.0004	0.0004	0.0013	0.0013
April	0.495	0.582	3.69	3.95	<0.0004	<0.0004	0.0012	0.0012
May [c]	--	--	--	--	--	--	--	--
June	0.863	1.12	2.38	2.77	<0.0005	0.0005	<0.0011	<0.0011
July 1, 2011 Permit	Monitor (mg/L)		50 ng/L maximum		0.004 mg/L daily maximum		0.014 mg/L daily maximum	
July	0.860	1.05	4.27	4.27	<0.002	<0.002	<0.0011	<0.0011
August [c]	--	--	--	--	--	--	--	--
September	1.21	1.25	9.4	9.4	0.0007	0.0007	0.0013	0.0013
October [c]	--	--	--	--	--	--	--	--
November [c]	--	--	--	--	--	--	--	--
December	0.639	0.741	11	11	0.002	0.002	<0.0011	<0.0011

Note: No results exceeded the permit limits.
NA - Parameter was not listed in the SPDES permit until revision issued on July 1, 2011; therefore no applicable limit.
[a] Parameter was removed from the SPDES permit renewal for 001, effective July 1, 2011.
[b] Parameter was added to the SPDES permit for 001, effective July 1, 2011.
[c] No discharge this month

TABLE B-2D

2011 SPDES Results for Outfall 007 (WNSP007): Water Quality and Iron

Permit Limit	Ammonia (as NH_3) (mg/L)		BOD_5 (mg/L)		Chlorine, Total Residual (mg/L)		Discharge Rate (MGD)		Dissolved Oxygen [a] (mg/L)	
January to June Permit	Monitor		10.0 mg/L daily maximum		0.1 mg/L daily maximum		Monitor		NA	
Month	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Min	Max
January	<0.011	0.016	<2.5	3.6	0.04	0.08	0.005	0.012		
February	<0.023	0.032	<2.0	2.1	0.04	0.06	0.005	0.012		
March	<0.010	0.012	<2.0	<2.0	0.02	0.04	0.008	0.021		
April	<0.020	0.028	<2.2	2.6	0.05	0.06	0.009	0.020		
May	<0.015	0.027	<2.0	<2.0	0.01	0.02	0.007	0.013		
June	<0.014	0.020	<2.1	2.2	0.02	0.03	0.005	0.011		
July 1, 2011 Permit	2.1 mg/L daily maximum		10.0 mg/L daily maximum		0.1 mg/L daily maximum		Monitor		3.0 mg/L daily minimum	
July	0.023	0.024	<2.0	<2.0	0.02	0.02	0.004	0.008	9.8	10.7
August	0.027	0.029	<2.4	2.7	0.01	0.01	0.005	0.013	8.6	8.7
September	<0.022	0.035	<2.5	3.0	0.06	0.06	0.003	0.013	8.0	9.4
October	<0.009	<0.009	<2.0	<2.0	0.02	0.02	0.004	0.012	9.5	9.5
November	0.050	0.050	2.1	2.1	0.02	0.02	0.002	0.002	8.8	8.8
December [c]	--	--	--	--	--	--	--	--	--	--

Permit Limit	Iron, Total (mg/L)		Mercury, Total [a] (as Hg) (ng/L)		Nitrogen, Total Kjeldahl [a] (as N) (mg/L)		Nitrite (as N) (mg/L)		Oil & Grease (mg/L)	
January to June Permit	Monitor		NA		NA		0.1 mg/L daily maximum		15.0 mg/L daily maximum	
Month	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
January	0.115	0.134					<0.02	<0.02	<1.7	1.9
February	0.100	0.168					<0.02	<0.02	<1.5	<1.5
March	0.0446	0.0478					<0.02	<0.02	<1.5	<1.6
April	<0.0275	0.0368					<0.02	<0.02	<1.4	<1.5
May	0.0439	0.0638					<0.02	<0.02	<1.5	1.8
June	0.0274	0.0308					<0.02	<0.02	<1.4	<1.4
July 1, 2011 Permit	Monitor		200 ng/L daily maximum		Monitor		0.1 mg/L daily maximum		15.0 mg/L daily maximum	
July	0.0788	0.114	88.3	88.3	<0.15	<0.15	<0.02	<0.02	<1.4	<1.4
August	0.0351	0.0351	93.0	93.0	<0.33	0.51	<0.02	<0.02	<1.9	2.4
September	<0.0206	0.0219	53.0	53.0	<0.15	<0.15	<0.02	<0.02	<1.4	<1.4
October	0.0241	0.0241	346	346 [b]	0.38	0.38	<0.02	<0.02	<1.4	<1.4
November	0.0748	0.0748	113	113	<0.15	<0.15	<0.02	<0.02	<1.4	<1.4
December [c]	--	--	--	--	--	--	--	--	--	--

NA - Parameter was not listed in the SPDES permit until revision issued on July 1, 2011; therefore no applicable limit.

[a] Parameter was added to the SPDES permit renewal for 007, effective July 1, 2011.

[b] The permit limit (200 ng/L) was exceeded for mercury at outfall 007 (346 ng/L) on October 6, 2011.

[c] There was no discharge from outfall 007 during December 2011.

TABLE B-2D *(concluded)*
2011 SPDES Results for Outfall 007 (WNSP007): Water Quality and Iron

Permit Limit	*pH (standard units)*		*Solids Settleable (mL/L)*		*Solids Total Dissolved* [a] *(mg/L)*		*Solids Total Suspended (mg/L)*		*Ultimate Oxygen Demand* [a] *(mg/L)*	
January to June Permit	*6.5 to 8.5 maximum*		*0.3 mL/L daily maximum*		*NA*		*45 mg/L daily maximum*		*NA*	
Month	*Min*	*Max*	*Avg*	*Max*	*Avg*	*Max*	*Avg*	*Max*	*Avg*	*Max*
January	7.5	7.9	<0.1	<0.1			<4.0	<4.0		
February	7.4	7.9	<0.1	<0.1			<4.0	<4.0		
March	7.3	7.6	<0.1	<0.1			<4.3	4.8		
April	6.9	7.8	<0.1	<0.1			<4.0	<4.0		
May	7.2	7.6	<0.1	<0.1			<4.0	<4.0		
June	7.3	7.8	<0.1	<0.1			<4.0	<4.0		
July 1, 2011 Permit	*6.5 to 8.5 maximum*		*0.3 mL/L daily maximum*		*Monitor*		*45 mg/L daily maximum*		*22.0 mg/L daily maximum*	
July	8.1	8.2	<0.1	<0.1	956	1100	<4.0	<4.0	<3.69	<3.69
August	7.6	7.9	<0.1	<0.1	610	638	<4.0	<4.0	<5.03	<5.33
September	7.3	7.6	<0.1	<0.1	759	873	<4.0	<4.0	<5.19	<5.19
October	8.1	8.1	<0.1	<0.1	634	802	<4.0	<4.0	<4.74	<4.74
November	7.2	7.2	[b]	[b]	858	858	<4.0	<4.0	<3.84	<3.84
December [c]	--	--	--	--	--	--	--	--	--	--

Note: No results exceeded the permit limits.

[a] Parameter was added to the SPDES permit, effective July 1, 2011.

[b] Collected sample volume was insufficient to complete the analysis of the settleable solids.

[c] There was no discharge from outfall 007 during December 2011.

TABLE B-2E
2011 SPDES Results for Sums of Outfalls 001, 007, and 116: Water Quality

Permit Limit	Ammonia [a,b] (as NH_3) Flow-Weighted		BOD_5 [b] Flow-Weighted		Iron Total Net Effluent Limitation	
January to June Permit	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	<0.062	0.067	<2.0	<2.0	0.00	0.00
February	<0.065	0.148	<2.0	<2.0	0.00	0.00
March	<0.044	<0.085	<2.0	<2.0	0.00	0.00
April	<0.029	0.037	<2.0	<2.0	0.00	0.00
May	<0.015	0.027	<2.0	<2.0	0.00	0.00
June	<0.039	0.060	<2.0	<2.0	0.00	0.00
July 1, 2011 Permit	NA	NA	NA		1.0 mg/L daily maximum	
July					0.00	0.00
August					0.00	0.00
September					<0.06	<0.06
October					0.00	0.00
November					0.00	0.00
December					0.32	0.32

[a] Sum of Outfalls 001 and 007 only
[b] Parameter was removed from the SPDES permit for 007, effective July 1, 2011.

2011 Results for Outfall 116

Permit Limit	Total Dissolved Solids (mg/L)	
January to June Permit	500 mg/L daily maximum	
Month	Avg	Max
January	326	350
February	250	312
March	261	264
April	196	244[a]
May [b]	--	--
June	401	402
July 1, 2011 Permit	500 mg/L daily maximum	
July	409	436
August [b]	--	--
September	394	397
October [b]	--	--
November [b]	--	--
December	291	336

[a] The subcontract laboratory analyzed the total dissolved solids sample past holding time, the result is considered an “estimate.”
[b] No discharge this month

TABLE B-2F
2011 Annual, Semiannual, and Quarterly SPDES Results for Outfall 001:
Metals, Organics, and Water Quality

Permit Limit Parameters	*Permit Limit*	*Monitoring Frequency*	*Sample Date*	*Maximum Measured*
2-Butanone	0.5 mg/L daily maximum	Annual	February 2011	<0.002
3,3-Dichlorobenzidine	0.01 mg/L Daily maximum	Annual	February 2011	<0.0008
Alpha-BHC	0.00001 mg/L daily maximum	Annual	July 2011	<0.007
Cadmium, Total Recoverable	0.002 mg/L daily maximum	Annual	February 2011	<0.0003
Chromium VI, Total Recoverable	0.011 mg/L daily maximum	Annual	February 2011	<0.005
Chromium, Total Recoverable	0.3 mg/L daily maximum	Semiannual	February 2011 July 2011	<0.0009 0.0005
Copper, Soluble	Monitor mg/L	Semiannual	February 2011 July 2011	0.0041 N/A
Copper, Total Recoverable	0.030 mg/L daily maximum	Semiannual	February 2011 July 2011	0.0040 0.0034
Cyanide, Amenable to chlorination	0.022 mg/L daily maximum	Semiannual	February 2011 July 2011	<0.005 <0.005
Dichlorodifluoromethane	0.01 mg/L daily maximum	Annual	February 2011	<0.0003
Heptachlor	0.00001 mg/L daily maximum	Semiannual	February 2011 July 2011	<0.000004 <0.000007
Hexachlorobenzene	0.02 mg/L daily maximum	Annual	February 2011	<0.0003
Lead, Total Recoverable	0.006 mg/L daily maximum	Quarterly	February 2011 March 2011 June 2011 July 2011	0.0006 0.0003 0.0006 0.0003
Manganese, Total	2.0 mg/L daily maximum	Semiannual	February 2011 July 2011	0.043 0.091
Nickel, Total	0.14 mg/L daily maximum	Semiannual	February 2011 July 2011	0.0032 0.0023
Surfactant (as LAS)	0.4 mg/L daily maximum	Semiannual	February 2011 September 2011	0.03 <0.05
Tributyl phosphate	32 mg/L daily maximum	Annual	February 2011	<0.0008
Trichlorofluoromethane	0.01 mg/L daily maximum	Annual	February 2011	<0.0005
Xylene	0.05 mg/L daily maximum	Annual	February 2011	<0.001
Zinc, Total Recoverable	0.48 mg/L daily maximum	Semiannual	February 2011 July 2011	0.011 0.0039

Note 1: Dissolved copper was removed from the permit, effective July 1, 2011.
Note 2: Surfactant was changed from semiannual collection to once per batch.

TABLE B-2G
2011 SPDES Action Level Requirement Monitoring Results for Outfall 001:
Metals and Water Quality

Outfall	Action Level Parameters	Action Level	Monitoring Frequency	Sampling Date	Maximum Measured (mg/L)
001	Antimony, Total	1.0 mg/L daily maximum	Annual	February 2011	<0.0068
	Barium, Total	0.5 mg/L daily maximum	Annual	July 2011	0.02
	Boron, Total	2.0 mg/L daily maximum	Quarterly	February 2011 June 2011 July 2011	0.039 0.038 0.042
	Bromide, Total	5.0 mg/L daily maximum	Quarterly	February 2011 June 2011 July 2011	0.63 0.67 0.49
	Chloroform	0.3 mg/L daily maximum	Annual	February 2011	<0.0005
	Titanium, Total	0.65 mg/L daily maximum	Semiannual	February 2011 July 2012	0.0024 0.0035

TABLE B-2H
2011 SPDES Results for Outfall 01B (WNSP01B): Water Quality

Internal process monitoring point did not operate during 2011

TABLE B-2I
2011 PARAQUAT DICHLORIDE[a] Data For Storm Water Discharge Monitoring

2011 PARAQUAT DICHLORIDE[a] Data for Storm Water Discharge Monitoring

Outfall	Date	Time	Units	N	Concentration
Storm Water Outfall S12	06/23/11	17:20	mg/L	1	<0.00033
Storm Water Outfall S14	06/23/11	17:15	mg/L	1	<0.00033
Storm Water Outfall S17	06/23/11	17:00	mg/L	1	<0.00033
Storm Water Outfall S28	06/23/11	17:00	mg/L	1	<0.00033
Storm Water Outfall S34	06/23/11	17:10	mg/L	1	<0.00033

[a] The site applied the herbicide Paraquat Dichloride at the WVDP on June 10, 2011. In accordance with the SPDES permit, storm water sampling is required within 60 days, from the drainage basins potentially affected by the application of herbicide.

2011 PARAQUAT DICHLORIDE[a] Results for WNSP001 and WNSP007

Outfall	Date	Time	Units	N	Concentration
WNSP001	07/13/11	14:10	mg/L	1	<0.00033
WNSP007	07/13/11	9:15	mg/L	1	<0.00033

[a] The site applied the herbicide Paraquat Dichloride at the WVDP on June 30, 2011. In accordance with the SPDES permit, sampling is required within 60 days, from the drainage basins potentially affected by the application of herbicide.

TABLE B-2J
2011 Radioactivity Results for Sewage Treatment Outfall (WNSP007)

Isotope[a]	N[b]	Discharge Activity[c] (Ci)	Radioactivity[d] Becquerels	Average Concentration (µCi/mL)	DCS (µCi/mL)	Ratio of Concentration to DCS
Gross Alpha	10	1.10±1.33E-05	4.08±4.93E+05	1.81±2.19E-09	NA[e]	NA
Gross Beta	10	1.01±0.10E-04	3.74±0.34E+06	1.66±0.15E-08	NA[e]	NA
Tritium	10	-1.33±0.93E-04	-4.91±3.44E+06	-2.18±1.52E-08	1.9E-03	<0.0001
Sr-90	1	5.32±6.46E-06	1.97±2.39E+05	0.87±1.06E-09	1.1E-06	<0.0010
Cs-137	1	2.82±4.97E-06	1.04±1.84E+05	4.62±8.15E-10	3.0E-06	<0.0003
Sum of Ratios						<0.0013

N - Number of samples
NA - Not applicable
[a] Half-lives are listed in Table UI-4.
[b] Total volume released; 1.61E+06 gal (6.09E+09 mL)
[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq); 1 Bq = 2.7E-11 Ci
[d] DOE derived concentration standards (DCSs) 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
2011 Storm Water Discharge Monitoring Data for Outfall Group 1

Storm Water Outfall S04

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			06/07/11	*06/07/11*
Aluminum, Total	mg/L	2	0.30	1.1
Ammonia (as NH_3)	mg/L	2	0.037	<0.009
BOD_5	mg/L	2	3.9	2.4
Cadmium, Total Recoverable	mg/L	2	0.000051	0.000043
Chromium, Total Recoverable	mg/L	2	0.0020	0.0018
Chromium, Hexavalent, Total Recoverable	mg/L	2	<0.005	<0.005
Copper, Total Recoverable	mg/L	2	0.0055	0.0047
Iron, Total	mg/L	2	1.7	1.5
Lead, Total Recoverable	mg/L	2	0.0012	0.0014
Nitrogen, Nitrate (as N)	mg/L	2	0.37	0.47
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<1.1	<0.95
Nitrogen, Total Kjeldahl	mg/L	2	0.67	0.46
Oil & Grease[a]	mg/L	1	4.0	NR
pH	SU	1	7.4	NR
Phosphorous, Total	mg/L	2	0.11	0.082
Selenium, Total Recoverable	mg/L	2	<0.00044	<0.00044
Solids, Total Dissolved	mg/L	2	629	408
Solids, Total Suspended	mg/L	2	<4.0	22
Vanadium, Total Recoverable	mg/L	2	0.0023	0.0016
Zinc, Total Recoverable	mg/L	2	0.029	0.015
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.3	
Rainfall During Sampling Event	inches	--	0.18	
Total Flow During Sampling Event	gallons	--	150,000	
Maximum Flow Rate During Sampling Event	gpm	--	1,100	

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-3A *(concluded)*
2011 Storm Water Discharge Monitoring Data for Outfall Group 1

Storm Water Outfall S04

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			10/27/11	*10/27/11*
Aluminum, Total	mg/L	2	0.37	0.15
Ammonia (as NH_3)	mg/L	2	<0.009	0.025
BOD_5	mg/L	2	<2.0	<2.0
Cadmium, Total Recoverable	mg/L	2	<0.000018	<0.000018
Chromium, Total Recoverable	mg/L	2	0.00048	0.0001
Chromium, Hexavalent, Total Recoverable	mg/L	2	<0.005	<0.005
Copper, Total Recoverable	mg/L	2	0.0018	0.0016
Iron, Total	mg/L	2	0.67	0.22
Lead, Total Recoverable	mg/L	2	0.00027	0.00011
Nitrogen, Nitrate (as N)	mg/L	2	<0.011	<0.011
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<1.0	<1.0
Nitrogen, Total Kjeldahl	mg/L	2	0.99	0.99
Oil & Grease[a]	mg/L	1	3.0	NR
pH	SU	1	6.6	NR
Phosphorous, Total	mg/L	2	<0.005	<0.005
Selenium, Total Recoverable	mg/L	2	<0.00044	<0.00044
Solids, Total Dissolved	mg/L	2	333	326
Solids, Total Suspended	mg/L	2	<4.0	<4.0
Vanadium, Total Recoverable	mg/L	2	0.00023	<0.00018
Zinc, Total Recoverable	mg/L	2	0.0081	0.0042
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.7	
Rainfall During Sampling Event	inches	--	0.71	
Total Flow During Sampling Event	gallons	--	316,000	
Maximum Flow Rate During Sampling Event	gpm	--	2,100	

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
2011 Storm Water Discharge Monitoring Data for Outfall Group 2

Storm Water Outfall S06

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			06/23/11	*06/23/11*
Aluminum, Total	mg/L	3	0.068 / 0.068	0.31
BOD_5	mg/L	3	<1.0 / 1.3	1.4
Copper, Total Recoverable	mg/L	3	0.00068 / 0.00062	0.00092
Iron, Total	mg/L	3	0.27 / 0.26	0.32
Lead, Total Recoverable	mg/L	3	<0.00050 / <0.00050	<0.00050
Oil & Grease[a]	mg/L	2	1.7 / 1.8	NR
pH	SU	2	7.2 / 7.2	NR
Phosphorous, Total	mg/L	3	<0.015 / <0.015	<0.015
Solids, Total Dissolved	mg/L	3	396 / 401	377
Solids, Total Suspended	mg/L	3	2.8 / 2.9	6.8
Surfactant (as LAS)	mg/L	3	<0.016 / <0.016	0.016
Zinc, Total Recoverable	mg/L	3	0.0045 / 0.0055	0.0075
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.5	
Rainfall During Sampling Event	inches	--	0.68	
Total Flow During Sampling Event	gallons	--	12,000	
Maximum Flow Rate During Sampling Event	gpm	--	96	

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-3B *(concluded)*
2011 Storm Water Discharge Monitoring Data for Outfall Group 2

Storm Water Outfall S33

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			10/27/11	*10/27/11*
Aluminum, Total	mg/L	3	0.084 / 0.075	0.099
BOD_5	mg/L	3	<2.0 / <2.0	<2.0
Copper, Total Recoverable	mg/L	3	0.0011 / 0.0012	0.00096
Iron, Total	mg/L	3	0.86 / 1.1	0.86
Lead, Total Recoverable	mg/L	3	<0.00019 / <0.00012	0.00013
Oil & Grease[a]	mg/L	2	2.6 / 3.6	NR
pH	SU	1	6.9	NR
Phosphorous, Total	mg/L	3	<0.005 / <0.042	0.026
Solids, Total Dissolved	mg/L	3	314 / 309	300
Solids, Total Suspended	mg/L	3	6.8 / 7.6	<4.0
Surfactant (as LAS)	mg/L	3	<0.013 / <0.013	0.017
Zinc, Total Recoverable	mg/L	3	0.0038 / 0.0050	0.0044
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.7	
Rainfall During Sampling Event	inches	--	0.71	
Total Flow During Sampling Event	gallons	--	89,000	
Maximum Flow Rate During Sampling Event	gpm	--	580	

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
2011 Storm Water Discharge Monitoring Data for Outfall Group 3

Storm Water Outfall S12

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			06/07/11	*06/07/11*
Alpha-BHC	mg/L	2	<0.0000061	<0.0000063
Aluminum, Total	mg/L	2	0.66	0.99
Ammonia (as NH_3)	mg/L	2	0.017	0.034
BOD_5	mg/L	2	<2.0	<2.0
Copper, Total Recoverable	mg/L	2	0.0031	0.0033
Iron, Total	mg/L	2	0.76	1.0
Lead, Total Recoverable	mg/L	2	0.0010	0.0011
Nitrogen, Nitrate (as N)	mg/L	2	0.12	0.13
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<0.38	<0.79
Nitrogen, Total Kjeldahl	mg/L	2	0.24	0.64
Oil & Grease[a]	mg/L	1	2.1	NR
pH	SU	1	7.4	NR
Phosphorous, Total	mg/L	2	<0.005	0.022
Solids, Total Dissolved	mg/L	2	124	154
Solids, Total Suspended	mg/L	2	14	16
Zinc, Total Recoverable	mg/L	2	0.013	0.012
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.3	
Rainfall During Sampling Event	inches	--	0.18	
Total Flow During Sampling Event	gallons	--	140,000	
Maximum Flow Rate During Sampling Event	gpm	--	880	

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)*
2011 Storm Water Discharge Monitoring Data for Outfall Group 3

Storm Water Outfall S09

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			11/14/11	*11/14/11*
Alpha-BHC	mg/L	2	<0.0000067	<0.0000067
Aluminum, Total	mg/L	2	9.5	9.4
Ammonia (as NH_3)	mg/L	2	0.18	0.094
BOD_5	mg/L	2	3.6	4.1
Copper, Total Recoverable	mg/L	2	0.012	0.015
Iron, Total	mg/L	2	11	11
Lead, Total Recoverable	mg/L	2	0.010	0.0084
Mercury, Total (1631E)	ng/L	1	28.3	NR
Nitrogen, Nitrate (as N)	mg/L	2	0.026	0.16
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<0.59	<1.2
Nitrogen, Total Kjeldahl	mg/L	2	0.54	1.0
Oil & Grease[a]	mg/L	1	<1.4	NR
pH	SU	1	9.3	NR
Phosphorous, Total	mg/L	2	0.40	0.66
Solids, Total Dissolved	mg/L	2	188	87
Solids, Total Suspended	mg/L	2	6.4	142
Zinc, Total Recoverable	mg/L	2	0.25	0.13
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.7	
Rainfall During Sampling Event	inches	--	1.06	
Total Flow During Sampling Event	gallons	--	207,000	
Maximum Flow Rate During Sampling Event	gpm	--	3,400	

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
2011 Storm Water Discharge Monitoring Data for Outfall Group 4

Storm Water Outfall S34

Analyte	Units	N	First Flush Grab	Flow-weighted Composite
			06/07/11	06/07/11
Aluminum, Total	mg/L	2	0.62	1.3
BOD_5	mg/L	2	<2.0	3.3
Copper, Total Recoverable	mg/L	2	0.0054	0.0037
Iron, Total	mg/L	2	1.8	1.8
Lead, Total Recoverable	mg/L	2	0.0035	0.0015
Oil & Grease[a]	mg/L	1	<1.4	NR
pH	SU	1	7.1	NR
Phosphorous, Total	mg/L	2	0.13	0.10
Solids, Total Dissolved	mg/L	2	462	355
Solids, Total Suspended	mg/L	2	133	47
Surfactant (as LAS)	mg/L	2	<0.013	<0.013
Zinc, Total Recoverable	mg/L	2	0.063	0.026
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.3	
Rainfall During Sampling Event	inches	--	0.18	
Total Flow During Sampling Event	gallons	--	50,000	
Maximum Flow Rate During Sampling Event	gpm	--	370	

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)*
2011 Storm Water Discharge Monitoring Data for Outfall Group 4

Storm Water Outfall S34

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			10/27/11	*10/27/11*
Aluminum, Total	mg/L	2	0.78	0.74
BOD_5	mg/L	2	<2.0	<2.0
Copper, Total Recoverable	mg/L	2	0.0019	0.0014
Iron, Total	mg/L	2	0.73	0.76
Lead, Total Recoverable	mg/L	2	0.00057	0.00046
Oil & Grease[a]	mg/L	1	<1.4	NR
pH	SU	1	7.6	NR
Phosphorous, Total	mg/L	2	0.044	<0.005
Solids, Total Dissolved	mg/L	2	172	158
Solids, Total Suspended	mg/L	2	15	4.4
Surfactant (as LAS)	mg/L	2	<0.013	<0.013
Zinc, Total Recoverable	mg/L	2	0.014	0.014
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.7	
Rainfall During Sampling Event	inches	--	0.71	
Total Flow During Sampling Event	gallons	--	255,000	
Maximum Flow Rate During Sampling Event	gpm	--	1,500	

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
2011 Storm Water Discharge Monitoring Data for Outfall Group 5

Storm Water Outfall S28

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			06/23/11	*06/23/11*
Aluminum, Total	mg/L	2	2.3	1.8
Ammonia (as NH_3)	mg/L	2	0.028	0.021
BOD_5	mg/L	2	4.0	<2.0
Copper, Total Recoverable	mg/L	2	0.015	0.0026
Iron, Total	mg/L	2	2.3	2.0
Lead, Total Recoverable	mg/L	2	0.0062	0.0010
Nitrogen, Nitrate (as N)	mg/L	2	0.084	<0.011
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<2.3	<0.76
Nitrogen, Total Kjeldahl	mg/L	2	2.2	0.73
Oil & Grease[a]	mg/L	1	<1.4	NR
pH	SU	1	7.1	NR
Phosphorous, Total	mg/L	2	0.042	0.027
Solids, Settleable	ml/L	2	0.1	<0.1
Solids, Total Dissolved	mg/L	2	122	105
Solids, Total Suspended	mg/L	2	56	37
Sulfide	mg/L	2	<0.052	<0.052
Surfactant (as LAS)	mg/L	2	<0.013	<0.013
Vanadium, Total Recoverable	mg/L	2	0.0042	0.0016
Zinc, Total Recoverable	mg/L	2	0.10	0.010
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.5	
Rainfall During Sampling Event	inches	--	0.68	
Total Flow During Sampling Event	gallons	--	130,000	
Maximum Flow Rate During Sampling Event	gpm	--	1,000	

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-3E *(concluded)*
2011 Storm Water Discharge Monitoring Data for Outfall Group 5

Storm Water Outfall S14

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			10/27/11	*10/27/11*
Aluminum, Total	mg/L	2	0.098	0.068
Ammonia (as NH_3)	mg/L	2	0.036	0.057
BOD_5	mg/L	2	<2.0	<2.0
Copper, Total Recoverable	mg/L	2	0.0020	0.0013
Iron, Total	mg/L	2	0.45	0.47
Lead, Total Recoverable	mg/L	2	0.00010	0.000080
Nitrogen, Nitrate (as N)	mg/L	2	0.021	<0.011
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<1.5	<1.2
Nitrogen, Total Kjeldahl	mg/L	2	1.5	1.2
Oil & Grease[a]	mg/L	1	<1.4	NR
pH	SU	1	7.3	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	635	653
Solids, Total Suspended	mg/L	2	<4.0	<4.0
Sulfide	mg/L	2	<0.052	<0.052
Surfactant (as LAS)	mg/L	2	<0.013	0.029
Vanadium, Total Recoverable	mg/L	2	<0.00018	<0.00018
Zinc, Total Recoverable	mg/L	2	0.0032	0.0020
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.7	
Rainfall During Sampling Event	inches	--	0.71	
Total Flow During Sampling Event	gallons	--	406	
Maximum Flow Rate During Sampling Event	gpm	--	2.6	

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
2011 Storm Water Discharge Monitoring Data for Outfall Group 6

Storm Water Outfall S43

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			06/23/11	*06/23/11*
Aluminum, Total	mg/L	2	8.5	7.6
Ammonia (as NH_3)	mg/L	2	0.065	0.023
BOD_5	mg/L	2	4.0	2.5
Copper, Total Recoverable	mg/L	2	0.0048	0.0041
Iron, Total	mg/L	2	5.6	4.4
Lead, Total Recoverable	mg/L	2	0.0036	0.0023
Nitrogen, Nitrate (as N)	mg/L	2	0.027	<0.011
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<0.80	<2.4
Nitrogen, Total Kjeldahl	mg/L	2	0.75	2.4
Oil & Grease[a]	mg/L	1	<1.4	NR
pH	SU	1	7.2	NR
Phosphorous, Total	mg/L	2	0.073	0.025
Solids, Settleable	ml/L	2	0.7	<0.1
Solids, Total Dissolved	mg/L	2	103	93
Solids, Total Suspended	mg/L	2	133	76
Sulfide	mg/L	2	<0.052	<0.052
Surfactant (as LAS)	mg/L	2	<0.013	<0.013
Vanadium, Total Recoverable	mg/L	2	0.0044	0.0038
Zinc, Total Recoverable	mg/L	2	0.020	0.012
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	4.5	
Rainfall During Sampling Event	inches	--	0.68	
Total Flow During Sampling Event	gallons	--	7,100	
Maximum Flow Rate During Sampling Event	gpm	--	60	

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)*
2011 Storm Water Discharge Monitoring Data for Outfall Group 6

Storm Water Outfall S36

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			10/27/11	*10/27/11*
Aluminum, Total	mg/L	2	1.8	0.43
Ammonia (as NH_3)	mg/L	2	0.038	0.034
BOD_5	mg/L	2	<2.0	<2.0
Copper, Total Recoverable	mg/L	2	0.0030	0.0016
Iron, Total	mg/L	2	3.1	0.79
Lead, Total Recoverable	mg/L	2	0.0010	0.00047
Nitrogen, Nitrate (as N)	mg/L	2	0.12	0.11
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<1.1	<0.89
Nitrogen, Total Kjeldahl	mg/L	2	1.0	0.76
Oil & Grease[a]	mg/L	1	<1.4	NR
pH	SU	1	7.2	NR
Phosphorous, Total	mg/L	2	<0.005	<0.005
Solids, Settleable	ml/L	2	0.2	0.1
Solids, Total Dissolved	mg/L	2	219	228
Solids, Total Suspended	mg/L	2	42	8.8
Sulfide	mg/L	2	<0.052	<0.052
Surfactant (as LAS)	mg/L	2	<0.013	<0.013
Vanadium, Total Recoverable	mg/L	2	0.0011	0.00043
Zinc, Total Recoverable	mg/L	2	0.031	0.014
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.7	
Rainfall During Sampling Event	inches	--	0.71	
Total Flow During Sampling Event	gallons	--	4,200	
Maximum Flow Rate During Sampling Event	gpm	--	12	

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
2011 Storm Water Discharge Monitoring Data for Outfall Group 7

Storm Water Outfall S20

Analyte	Units	N	First Flush Grab	Flow-weighted Composite
			06/07/11	06/07/11
Aluminum, Total	mg/L	2	0.51	0.11
Ammonia (as NH_3)	mg/L	2	0.76	0.86
BOD_5	mg/L	2	11.4	4.5
Copper, Total Recoverable	mg/L	2	0.0035	0.0019
Iron, Total	mg/L	2	0.84	0.16
Lead, Total Recoverable	mg/L	2	0.00078	0.0012
Nitrogen, Nitrate (as N)	mg/L	2	2.5	1.1
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<4.5	<2.6
Nitrogen, Total Kjeldahl	mg/L	2	2.0	1.5
Oil & Grease[a]	mg/L	1	<1.4	NR
pH	SU	1	7.2	NR
Phosphorous, Total	mg/L	2	0.084	0.048
Solids, Total Dissolved	mg/L	2	133	39
Solids, Total Suspended	mg/L	2	<4.0	4.4
Sulfide	mg/L	2	<0.052	<0.052
Surfactant (as LAS)	mg/L	2	<0.013	<0.013
Zinc, Total Recoverable	mg/L	2	0.010	0.0059
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.3	
Total Rainfall During Sampling Event	inches	--	0.18	
Total Flow During SamplingEvent	gallons	--	75,000	
Maximum Flow Rate During Sampling Event	gpm	--	480	

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)*
2011 Storm Water Discharge Monitoring Data for Outfall Group 7

Storm Water Outfall S20

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			08/09/11	*08/09/11*
Aluminum, Total	mg/L	2	0.32	0.36
Ammonia (as NH_3)	mg/L	2	0.10	0.034
BOD_5	mg/L	2	2.5	<2.0
Copper, Total Recoverable	mg/L	2	0.00098	0.00080
Iron, Total	mg/L	2	0.42	0.48
Lead, Total Recoverable	mg/L	2	0.00035	0.00036
Nitrogen, Nitrate (as N)	mg/L	2	0.69	0.31
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<0.93	<0.48
Nitrogen, Total Kjeldahl	mg/L	2	0.22	<0.15
Oil & Grease[a]	mg/L	1	<1.4	NR
pH	SU	1	7.4	NR
Phosphorous, Total	mg/L	2	<0.005	<0.005
Solids, Total Dissolved	mg/L	2	23	15
Solids, Total Suspended	mg/L	2	8.0	4.8
Sulfide	mg/L	2	<0.052	<0.052
Surfactant (as LAS)	mg/L	2	0.037	0.018
Zinc, Total Recoverable	mg/L	2	0.0063	0.0058
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.1	
Total Rainfall During Sampling Event	inches	--	0.27	
Total Flow During SamplingEvent	gallons	--	72,000	
Maximum Flow Rate During Sampling Event	gpm	--	580	

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
2011 Storm Water Discharge Monitoring Data for Outfall Group 8

Storm Water Outfall S27

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			06/07/11	*06/07/11*
Aluminum, Total	mg/L	2	0.99	0.47
Ammonia (as NH_3)	mg/L	2	<0.009	0.011
BOD_5	mg/L	2	2.2	<2.0
Copper, Total Recoverable	mg/L	2	0.0029	0.0036
Iron, Total	mg/L	2	0.91	0.58
Lead, Total Recoverable	mg/L	2	0.00095	0.0023
Nitrogen, Nitrate (as N)	mg/L	2	0.088	0.11
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<0.84	<1.3
Nitrogen, Total Kjeldahl	mg/L	2	0.73	1.2
Oil & Grease[a]	mg/L	1	<1.4	NR
pH	SU	1	7.5	NR
Phosphorous, Total	mg/L	2	0.095	0.035
Solids, Total Dissolved	mg/L	2	175	207
Solids, Total Suspended	mg/L	2	9.6	93
Surfactant (as LAS)	mg/L	2	<0.013	<0.013
Zinc, Total Recoverable	mg/L	2	0.0098	0.012
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	7.3	
Rainfall During Sampling Event	inches	--	0.18	
Total Flow During Sampling Event	gallons	--	5,000	
Maximum Flow Rate During Sampling Event	gpm	--	59	

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-3H *(concluded)*
2011 Storm Water Discharge Monitoring Data for Outfall Group 8

Storm Water Outfall S35

Analyte	*Units*	*N*	*First Flush Grab*	*Flow-weighted Composite*
			10/27/11	*10/27/11*
Aluminum, Total	mg/L	2	1.4	1.2
Ammonia (as NH_3)	mg/L	2	0.014	0.045
BOD_5	mg/L	2	<2.0	<2.0
Copper, Total Recoverable	mg/L	2	0.0024	0.0020
Iron, Total	mg/L	2	0.78	0.82
Lead, Total Recoverable	mg/L	2	0.0021	0.0016
Nitrogen, Nitrate (as N)	mg/L	2	0.071	<0.011
Nitrogen, Nitrite (as N)	mg/L	2	<0.020	<0.020
Nitrogen, Total (as N)	mg/L	2	<0.83	<0.86
Nitrogen, Total Kjeldahl	mg/L	2	0.74	0.83
Oil & Grease[a]	mg/L	1	3.0	NR
pH	SU	1	7.0	NR
Phosphorous, Total	mg/L	2	<0.005	<0.005
Solids, Total Dissolved	mg/L	2	238	265
Solids, Total Suspended	mg/L	2	18	15
Surfactant (as LAS)	mg/L	2	<0.013	<0.013
Zinc, Total Recoverable	mg/L	2	0.022	0.017
Rain Event Summary				
pH of Rainfall During Sampling Event	SU	1	6.7	
Rainfall During Sampling Event	inches	--	0.71	
Total Flow During Sampling Event	gallons	--	27,000	
Maximum Flow Rate During Sampling Event	gpm	--	164	

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.

APPENDIX B-4

Site Surface Drainage, Subsurface Drainage, and Contained Water Data

TABLE B-4A
2011 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	3.73E-09	1.98±4.10E-09	4.08E-09		9.8E-08[c]
Gross Beta	µCi/mL	4	8.34E-08	2.35±0.19E-07	5.40E-07		1.1E-06[d]
Tritium	µCi/mL	4	<4.57E-08	3.81±4.75E-08	8.20E-08		1.9E-03
Sr-90	µCi/mL	2	4.07E-08	1.28±0.06E-07	2.15E-07		1.1E-06
Cs-137	µCi/mL	2	<1.14E-09	0.88±1.52E-09	<1.82E-09		3.0E-06
pH	SU	4	7.01	7.26	7.64		6.0–9.5

N - Number of samples
[a] DOE ingestion-based DCSs 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 U-232
[d] Beta as Sr-90

TABLE B-4B

Comparison of 2011 Surface Water at the North Swamp (WNSW74A) Radioactivity Concentrations with U.S. DOE-Derived Concentration Standards (DCSs)

RADIOACTIVE CONSTITUENTS

Isotope [a]	*N*	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *(Becquerels)*	*Average Concentration (μCi/mL)*	*DCS (μCi/mL)*	*Ratio of Concentration to DCS*
Gross Alpha	26	4.54±4.44E-05	1.68±1.64E+06	9.70±9.49E-10	NA[d]	NA
Gross Beta	26	7.12±0.48E-04	2.64±0.18E+07	1.52±0.10E-08	NA[d]	NA
Tritium	26	-2.53±6.20E-04	-0.94±2.30E+07	-0.54±1.32E-08	1.9E-03	<0.0001
C-14	2	-0.69±1.08E-03	-2.55±4.01E+07	-1.47±2.31E-08	6.2E-05	<0.0004
Sr-90	12	3.01±0.20E-04	1.11±0.07E+07	6.43±0.42E-09	1.1E-06	0.0059
I-129	2	-0.73±2.26E-05	-2.68±8.37E+05	-1.55±4.83E-10	3.3E-07	<0.0015
Cs-137	12	1.98±1.56E-05	7.31±5.78E+05	4.22±3.34E-10	3.0E-06	0.0001
U-232[e]	2	-0.55±1.38E-06	-2.05±5.09E+04	-1.18±2.94E-11	9.8E-08	<0.0003
U-233/234[e]	2	2.22±2.03E-06	8.21±7.50E+04	4.74±4.33E-11	6.6E-07[f]	<0.0001
U-235/236[e]	2	0.27±1.06E-06	1.00±3.94E+04	0.58±2.27E-11	7.2E-07	<0.0001
U-238[e]	2	1.83±1.63E-06	6.79±6.03E+04	3.92±3.48E-11	7.5E-07	<0.0001
Pu-238	2	-1.90±9.11E-07	-0.70±3.37E+04	-0.41±1.95E-11	1.5E-07	<0.0001
Pu-239/240	2	1.60±1.53E-06	5.93±5.65E+04	3.42±3.62E-11	1.4E-07	<0.0003
Am-241	2	0.33±1.18E-06	1.21±4.36E+04	0.70±2.52E-11	1.7E-07	<0.0002
Sum of Ratios						0.009

Note: The average pH at this location was 7.24 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 (1.24E+07 gal)

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

[d] DOE-derived concentration standards (DCSs) do not exist for indicator parameters gross alpha and gross beta.

[e] Total Uranium (g) = -0.44±1.06E+01; Average Total Uranium (μg/mL) = 0.95±2.25E-04

[f] DCS for U-233 is used for this comparison.

TABLE B-4C
Comparison of 2011 Surface Water at the Northeast SWAMP (WNSWAMP) Radioactivity Concentrations with U.S. DOE-Derived Concentration Standards (DCSs)

Isotope [a]	*N*	*Discharge Activity* [b] *(Ci)*	*Radioactivity* [c] *(Becquerels)*	*Average Concentration (µCi/mL)*	*DCS* [d] *(µCi/mL)*	*Ratio of Concentration to DCS*
Gross Alpha	26	-0.01±1.46E-04	0.05±5.40E+6	-0.01±1.16E-09	NA[e]	NA
Gross Beta	26	4.16±0.05E-01	1.54±0.02E+10	3.29±0.04E-06	NA[e]	NA
Tritium	26	7.08±1.96E-03	2.62±0.73E+08	5.60±1.55E-08	1.9E-03	<0.0001
C-14	2	-0.29±3.52E-03	-0.11±1.30E+08	-0.23±2.79E-08	6.2E-05	<0.0005
Sr-90	12	2.09±0.01E-01	7.74±0.04E+09	1.66±0.01E-06	1.1E-06	1.51
I-129	2	-1.68±7.49E-05	-0.62±2.77E+06	-1.33±5.92E-10	3.3E-07	<0.0018
Cs-137	12	-0.20±4.93E-05	-0.08±1.83E+06	-0.16±3.90E-10	3.0E-06	<0.0001
U-232[f]	2	-6.14±4.72E-06	-2.27±1.74E+05	-4.86±3.73E-11	9.8E-08	<0.0005
U-233/234[f]	2	1.70±0.89E-05	6.28±3.28E+05	1.34±0.70E-10	6.6E-07[g]	0.0002
U-235/236[f]	2	1.49±3.43E-06	0.55±1.27E+05	1.18±2.72E-11	7.2E-07	<0.0001
U-238[f]	2	9.98±6.70E-06	3.69±2.48E+05	7.90±5.30E-11	7.5E-07	0.0001
Pu-238	2	-3.13±3.43E-06	-1.16±1.27E+05	-2.48±2.72E-11	1.5E-07	<0.0002
Pu-239/240	2	-4.28±3.95E-06	-1.58±1.46E+05	-3.39±3.12E-11	1.4E-07	<0.0002
Am-241	2	1.07±3.37E-06	0.39±1.25E+05	0.84±2.66E-11	1.7E-07	<0.0002
Sum of Ratios						1.51

Note: The average pH at this location was 6.95 SU.
N - Number of samples
NA - Not applicable
[a] Half-lives are listed in Table UI-4.
[b] Total estimated volume released: 1.26E+11 mL (3.34E+07 gal)
[c] 1 curie (Ci) = 3.7E+10 becquerels (Bq); 1 Bq= 2.7E-11 Ci
[d] DCSs are listed for reference only. DCSs are applicable at the point at which water is avilable for ingestion by the public (i.e., at the site boundary) but not to release point concentrations, as might be inferred from their inclusion on this table.
[e] DOE DCSs do not exist for indicator parameters gross alpha and gross beta.
[f] Total Uranium (g) = 6.22±1.30E+00; Average Total Uranium (µg/mL) = 4.92±1.03E-05
[g] The DCS for U-233 is used for this comparison.

TABLE B-4D
2011 Radioactivity in Surface Water Drainage Between the NDA and the SDA (WNNDADR)

Analyte	*Units*	*N*	*WNNDADR Concentrations*		
			Minimum	*Average*	*Maximum*
Gross Alpha	µCi/mL	12	<5.70E-10	1.17±1.44E-09	2.66E-09
Gross Beta	µCi/mL	12	2.21E-08	3.71±0.38E-08	5.15E-08
Tritium	µCi/mL	12	2.59E-07	3.85±0.50E-07	4.61E-07
Sr-90	µCi/mL	2	1.75E-08	2.00±0.25E-08	2.25E-08
I-129	µCi/mL	2	<6.85E-10	-1.16±8.05E-10	<9.10E-10
Cs-137	µCi/mL	12	<1.11E-09	0.55±1.19E-09	1.20E-09

N - Number of samples

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APPENDIX B-5

Ambient Surface Water Data

TABLE B-5A
2011 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	1.56±1.81E-09	5.48E-09	98	<3.59E-10–4.62E-09	9.8E-08[d]
Gross Beta	µCi/mL	12	3.25±2.29E-09	4.74E-09	98	<9.03E-10–1.37E-08	1.1E-06[e]
Tritium	µCi/mL	12	-0.17±4.67E-08	6.72E-08	98	<4.46E-08–2.65E-07	1.9E-03
Sr-90	µCi/mL	12	2.98±9.33E-10	1.42E-09	98	<3.57E-10–1.10E-08	1.1E-06
Cs-137	µCi/mL	12	4.77±9.24E-10	1.16E-09	98	<1.34E-09–5.29E-09	3.0E-06
pH	SU	39	7.84	8.22	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 DCSs 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 for Class "B" as a comparative reference for nonradiological results

[c] Values represent composite concentrations weighted to monthly stream flow.

[d] Alpha as U-232

[e] Beta as Sr-90

TABLE B-5B
2011 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	1.82±1.64E-09	3.27E-09	12	<5.82E-10–2.36E-09	9.8E-08[c]
Gross Beta	µCi/mL	12	6.29±2.45E-09	9.28E-09	12	<1.79E-09–4.15E-09	1.1E-06[d]
Tritium	µCi/mL	12	1.29±4.78E-08	1.27E-07	12	<3.43E-08–7.38E-08	1.9E-03
Sr-90	µCi/mL	2	9.94±8.15E-10	1.12E-09	2	1.09E-09–1.41E-09	1.1E-06
Cs-137	µCi/mL	2	1.18±1.15E-09	1.37E-09	2	<1.13E-09–<1.25E-09	3.0E-06

N - Number of samples

[a] Background location

[b] DOE ingestion-based DCSs for 100-mrem/yr dose limit are provided as a guideline for radiological results in the absence of water quality standards.

[c] Alpha as U-232

[d] Beta as Sr-90

TABLE B-5B *(continued)*
2011 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	<0.05	<0.05	0.09–2.1
Antimony, Total	mg/L	2	<0.003	<0.003	--
Arsenic, Dissolved	mg/L	2	<0.005	<0.005	0.150
Barium, Total	mg/L	2	0.07	0.08	--
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	0.0035[b]
Calcium, Total	mg/L	12	40.8	57.3	--
Chloride	mg/L	2	21	21	--
Chromium, Dissolved	mg/L	2	<0.01	<0.01	0.127[b]
Cobalt, Total	mg/L	2	<0.005	<0.005	0.005[c]
Copper, Dissolved	mg/L	2	<0.005	<0.005	0.016[b]
Oxygen, Dissolved	mg/L	2	9.6	10	4.0 (min)
Fluoride	mg/L	2	9.6	<0.10	3.85[b]
Hardness	mg/L	12	135	193	--
Iron, Total	mg/L	2	1.43	1.91	0.30
Lead, Dissolved	mg/L	2	<0.0005	<0.0005	0.0076[b]
Magnesium, Total	mg/L	12	8	17.35	--
Manganese, Total	mg/L	2	0.03	0.05	--
Mercury, Dissolved, Method 1631	µg/L	1	<0.000508	<0.000508	0.0007
Nickel, Dissolved	mg/L	2	<0.04	<0.04	0.091[b]
Nitrate-N	mg/L	2	<0.11	0.17	--
Nitrite-N	mg/L	2	<0.02	<0.02	0.10
NPOC	mg/L	2	2.8	2.9	--

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)*
2011 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	7.65	7.77	6.5–8.5
Selenium, Dissolved	mg/L	2	<0.001	<0.001	0.0046
Sodium, Total	mg/L	2	15.3	17	--
Solids, Total Dissolved	mg/L	2	192	227	500
Solids, Total Suspended	mg/L	2	<17	28	--
Sulfate	mg/L	2	21.9	25.9	--
Sulfide (as S)	mg/L	2	<0.05	<0.05	0.002
Surfactant	mg/L	2	<0.03	0.03	0.04
Thallium, Total	mg/L	2	<0.008	<0.008	0.008[c]
Titanium, Total	mg/L	2	<0.0592	0.0684	--
TOX	mg/L	2	<0.01	<0.01	--
Vanadium, Total	mg/L	2	<0.0100	<0.0100	0.014[c]
Zinc, Dissolved	mg/L	2	<0.02	<0.02	0.145[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
2011 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	38	1.68±1.95E-09	6.50E-09	12	<5.82E-10–2.36E-09	9.8E-08[c]
Gross Beta	µCi/mL	38	4.04±0.46E-08	1.34E-07	12	<1.79E-09–4.15E-09	1.1E-06[d]
Tritium	µCi/mL	38	3.24±4.72E-08	2.93E-07	12	<3.43E-08–7.38E-08	1.9E-03
C-14	µCi/mL	4	0.58±3.10E-08	3.37E-08	2	<3.10E-08–<3.76E-08	6.2E-05
Sr-90	µCi/mL	12	1.56±0.21E-08	3.37E-08	2	1.09E-09–1.41E-09	1.1E-06
Tc-99	µCi/mL	4	-0.18±2.12E-09	<2.69E-09	2	<1.97E-09–<2.37E-09	4.4E-05
I-129	µCi/mL	4	-0.76±9.30E-10	<9.96E-10	2	<5.00E-10–<9.33E-10	3.3E-07
Cs-137	µCi/mL	12	2.25±1.73E-09	5.10E-09	2	<1.13E-09–<1.25E-09	3.0E-06
U-232	µCi/mL	4	1.46±0.95E-10	2.62E-10	2	<4.38E-11–<4.54E-11	9.8E-08
U-233/234	µCi/mL	4	3.23±1.31E-10	3.91E-10	2	<4.66E-11–1.44E-10	6.6E-07[e]
U-235/236	µCi/mL	4	1.56±3.36E-11	<4.95E-11	2	<2.74E-11–<3.21E-11	7.2E-07
U-238	µCi/mL	4	2.08±1.03E-10	2.52E-10	2	<4.24E-11–<6.10E-11	7.5E-07
Total U	µg/mL	4	6.66±0.32E-04	9.36E-04	2	2.15E-04–3.48E-04	--
Pu-238	µCi/mL	4	-1.44±2.49E-11	<3.11E-11	2	<1.81E-11–<4.09E-11	1.5E-07
Pu-239/240	µCi/mL	4	-0.16±2.68E-11	<3.63E-11	2	<2.75E-11–<4.27E-11	1.4E-07
Am-241	µCi/mL	4	1.57±3.28E-11	<3.95E-11	2	<2.51E-11–<2.53E-11	1.7E-07

N - Number of samples
-- No guideline or standard available for these analytes
[a] Background location
[b] DOE ingestion-based DCSs for 100-mrem/yr dose limit are provided as a guideline for radiological results.
[c] Alpha as U-232
[d] Beta as Sr-90
[e] DCG for U-233 is used for this comparison.

TABLE B-5D
2011 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	1.63±2.29E-09	2.41E-09	12	<5.82E-10–2.36E-09	9.8E-08[d]
Gross Beta	µCi/mL	4	6.60±2.71E-09	7.25E-09	12	<1.79E-09–4.15E-09	1.1E-06[e]
Tritium	µCi/mL	4	2.02±4.09E-08	1.20E-07	12	<3.43E-08–7.38E-08	1.9E-03
Sr-90	µCi/mL	2	1.23±1.02E-09	1.41E-09	2	1.09E-09–1.41E-09	1.1E-06
Cs-137	µCi/mL	2	-0.01±1.13E-09	<1.14E-09	2	<1.13E-09–<1.25E-09	3.0E-06
pH	SU	4	7.29	7.86	292	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 DCSs 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 U-232
[e] Beta as Sr-90

TABLE B-5E
2011 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	0.32±1.54E-09	<2.12E-09		12	<5.82E-10–2.36E-09	9.8E-08[d]
Gross Beta	µCi/mL	4	1.82±2.37E-09	3.01E-09		12	<1.79E-09–4.15E-09	1.1E-06[e]
Tritium	µCi/mL	4	0.86±4.40E-08	5.54E-08		12	<3.43E-08–7.38E-08	1.90E-03
Sr-90	µCi/mL	2	7.32±8.63E-10	<9.20E-10		2	1.09E-09–1.41E-09	1.10E-06
Cs-137	µCi/mL	2	0.74±1.16E-09	1.21E-09		2	<1.13E-09–<1.25E-09	3.00E-06
pH	SU	4	7.11	7.39		292	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 DCSs for 100-mrem/yr dose limit are provided as a guideline for radiological results.

[c] New York State Water Quality Standards for Class "D" surface waters as a standard for nonradiological results

[d] Alpha as U-232

[e] Beta as Sr-90

TABLE B-5F
Ten-Year Average and Maximum 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		9.8E-08[d]
Gross Beta	µCi/mL	98	2.64±1.35E-09	1.37E-08		1.1E-06[e]
Tritium	µCi/mL	98	0.71±7.79E-08	2.65E-07		1.9E-03
Sr-90	µCi/mL	98	1.27±1.46E-09	1.10E-08		1.1E-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 DCSs 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 U-232

[e] Beta as Sr-90

TABLE B-5G
Radioactivity and pH in Surface Water at Fox Valley Road
Buttermilk Creek Background (WFBCBKG)

Analyte	Units	N	WFBCBKG [a] Concentrations Average	WFBCBKG [a] Concentrations Maximum	Reference Values Guideline [b] or Standard [c]
Gross Alpha	µCi/mL	12	0.89±1.34E-09	2.36E-09	9.8E-08[d]
Gross Beta	µCi/mL	12	1.69±2.08E-09	4.15E-09	1.1E-06[e]
Tritium	µCi/mL	12	0.63±4.64E-08	7.38E-08	1.9E-03
C-14	µCi/mL	2	-2.47±3.45E-08	<3.76E-08	6.2E-05
Sr-90	µCi/mL	2	1.25±0.84E-09	1.41E-09	1.1E-06
Tc-99	µCi/mL	2	-0.20±2.18E-09	<2.37E-09	4.4E-05
I-129	µCi/mL	2	0.68±7.48E-10	<9.33E-10	3.3E-07
Cs-137	µCi/mL	2	0.08±1.19E-09	<1.25E-09	3.0E-06
U-232	µCi/mL	2	0.77±4.46E-11	<4.54E-11	9.8E-08
U-233/234	µCi/mL	2	8.71±7.68E-11	1.44E-10	6.6E-07[f]
U-235/236	µCi/mL	2	-0.64±2.98E-11	<3.21E-11	7.2E-07
U-238	µCi/mL	2	4.74±5.25E-11	<6.10E-11	7.5E-07
Pu-238	µCi/mL	2	-1.28±3.16E-11	<4.09E-11	1.5E-07
Pu-239/240	µCi/mL	2	-0.60±3.59E-11	<4.27E-11	1.4E-07
Am-241	µCi/mL	2	-0.48±2.52E-11	<2.53E-11	1.7E-07
pH	SU	292	Range: 6.4–8.7		6.0–9.5

N - Number of samples

[a] Radiological data are from samples collected in CY 2011. 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 DCSs for 100-mrem/yr dose limit are provided as a guideline for radiological results.

[c] The New York State Water Quality Standard for Class “D” is provided as a comparative reference for pH.

[d] Alpha as U-232

[e] Beta as Sr-90

[f] DCS for U-233 used for this comparison

APPENDIX B-6

Potable Water (Drinking Water) Data

TABLE B-6A
2011 Radioactivity and Water Quality Results in Potable Water at the WVDP

Analyte	*Units*	*N*	*WNDNKMP*	*WNDNKEL*	*Standard* [a]
Gross Alpha	µCi/mL	1	4.00±8.20E-10	NA	1.5E-08
Gross Beta	µCi/mL	1	7.96±9.64E-10	NA	5E-08
Tritium	µCi/mL	1	-3.75±4.56E-08	NA	2E-05
Haloacetic Acids-Five (5)	mg/L	1	NA	0.03	0.06
Total Trihalomethanes	mg/L	1	NA	0.05	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.

TABLE B-6B
2011 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	0.0239	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	<0.004	0.10
Cyanide, Total	mg/L	1	NA	<0.010	0.2
Fluoride	mg/L	1	NA	<0.10	2.2
Free Residual Chlorine	mg/L	1,094	0.4	2.31	0.2–4.0
Iron, Total	mg/L	1	NA	<0.050	0.3
Manganese, Total	mg/L	1	NA	0.0055	--
Mercury, Total	mg/L	1	NA	<0.0002	0.002
Nickel, Total	mg/L	1	NA	<0.005	--
TOC	mg/L	12	1.0	2.4	--
Selenium, Total	mg/L	1	NA	<0.001	0.05
Thallium, Total	mg/L	1	NA	<0.0002	0.0005
Turbidity	NTU	2,169	0.1	0.6	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
2011 Water Quality Results in Utility Room Raw (Untreated) Water

Analyte	Units	N	Untreated Raw Water Concentrations		
			Minimum	Average	Maximum
Alkalinity	mg/L	12	36.8	72.3	108
Iron, Total	mg/L	54	0.186	2.11	13.5
Solids, Total Dissolved	mg/L	24	91	127	173
TOC	mg/L	12	1.1	2.2	3.5

Note: Chemical constituent sampling is required by, and reported to, the Cattaraugus County Department of Health.
N - Number of samples
TOC - Total organic carbon

TABLE B-6D
2011 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	14	Range: 0.04–2.31	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
2011 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	3/1/2011	<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

TABLE B-6F
2011 Copper and Lead Results from On-Site Tap Water Locations at the WVDP

Analyte	Units	N	WNDNK01	WNDNK06	WNDNK10	WNDNK13	WNDNK15	90th Percentile [a]	Standard [a]
Copper, Total	mg/L	1	0.016	0.26	0.057	0.24	0.14	0.25	1.3
Lead, Total	mg/L	1	0.002	0.005	0.0001	0.0004	0.025	0.015	<0.015

N - Number of samples
[a] The 90th percentile calculation is used to evaluate exceedance of the action limit.
[b] New York State Department of Health MCLs for drinking water used as a comparative reference

APPENDIX C

Summary of Air Monitoring Data

TABLE C-1
2011 Effluent Airborne Radioactivity at Main Stack (ANSTACK)

Isotope [a]	*N*	*Total Activity Released* [b] *(Ci)*	*Average Concentration (µCi/mL)*	*Maximum Concentration (µCi/mL)*	*DCS* [c] *(µCi/mL)*	*Ratio of Concentration to DCS*
Gross Alpha	26	2.01±0.04E-05	2.71±0.05E-14	2.70E-13	--	--
Gross Beta	26	4.01±0.03E-04	5.40±0.03E-13	5.31E-12	--	--
H-3	26	7.20±0.09E-03	9.70±0.12E-12	3.10E-11	2.1E-07	<0.0001
Co-60	2	1.98±0.78E-07	2.67±1.04E-16	4.27E-16	3.6E-10	<0.0001
Sr-90	2	1.16±0.01E-04	1.56±0.01E-13	3.30E-13	1.0E-10	0.0016
I-129	2	1.79±0.18E-05	2.42±0.24E-14	2.46E-14	1.0E-10	0.0002
Cs-137	2	1.08±0.07E-04	1.46±0.10E-13	3.05E-13	8.8E-10	0.0002
Eu-154	2	2.16±2.16E-07	2.91±2.91E-16	6.45E-16	7.5E-11	<0.0001
U-232[d]	2	4.84±1.37E-08	6.53±1.85E-17	1.42E-16	4.7E-13	0.0001
U-233/234[d]	2	6.60±1.32E-08	8.89±1.77E-17	1.47E-16	1.0E-12[e]	<0.0001
U-235/236[d]	2	8.63±5.75E-09	1.16±0.78E-17	9.99E-18	1.2E-12	<0.0001
U-238[d]	2	2.81±0.66E-08	3.79±0.90E-17	4.52E-17	1.3E-12	<0.0001
Pu-238	2	1.56±0.08E-06	2.10±0.11E-15	4.37E-15	8.8E-14	0.0239
Pu-239/240	2	4.46±0.14E-06	6.01±0.19E-15	1.27E-14	8.1E-14	0.0742
Am-241	2	7.58±0.40E-06	1.02±0.05E-14	2.15E-14	9.7E-14	0.1052
Sum of Ratios						0.21

N - Number of samples
-- Derived concentration standards (DCSs) 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] DCSs 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: 7.44±0.17E-02 g; average = 1.00E±0.02E-12 µg/mL
[e] DCS for U-233 used for this comparison.

TABLE C-2
2011 Effluent Airborne Radioactivity at Vitrification System HVAC (ANVITSK)

Isotope	N	Total Activity Released (Ci)	Average Concentration (µCi/mL)	Maximum Concentration (µCi/mL)	DCS [a] (µCi/mL)
Gross Alpha	26	-0.24±2.12E-08	-0.65±5.71E-17	<3.73E-16	--
Gross Beta	26	2.75±4.84E-08	0.74±1.31E-16	1.53E-15	--
Co-60	2	2.40±2.79E-08	6.48±7.51E-17	<1.08E-16	3.6E-10
Sr-90	2	0.99±2.14E-08	2.66±5.77E-17	<9.99E-17	1.0E-10
I-129	2	7.43±1.51E-07	2.00±0.41E-15	2.03E-15	1.0E-10
Cs-137	2	0.37±2.49E-08	0.99±6.70E-17	<9.81E-17	8.8E-10
Eu-154	2	-5.49±7.82E-08	-1.48±2.11E-16	<3.03E-16	7.5E-11
U-232[b]	2	0.18±1.92E-09	0.49±5.18E-18	<8.55E-18	4.7E-13
U-233/234[b]	2	1.07±0.29E-08	2.89±0.78E-17	3.52E-17	1.0E-12
U-235/236[b]	2	1.13±1.05E-09	3.06±2.84E-18	<4.76E-18	1.2E-12
U-238[b]	2	8.70±2.54E-09	2.34±0.69E-17	2.64E-17	1.3E-12
Pu-238	2	0.43±1.30E-09	1.16±3.50E-18	<5.65E-18	8.8E-14
Pu-239/240	2	0.43±1.36E-09	1.15±3.66E-18	<5.78E-18	8.1E-14
Am-241	2	1.30±1.44E-09	3.50±3.88E-18	<7.31E-18	9.7E-14

N - Number of samples
-- Derived concentration standards (DCSs) are not specified for gross alpha and beta activity.
[a] DCSs 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: 2.37±0.06E-02 g; average = 6.38±0.17E-11 µg/mL

TABLE C-3
2011 Effluent Airborne Radioactivity at 01-14 Building (ANCSSTK)

Isotope	N	Total Activity Released (Ci)	Average Concentration (µCi/mL)	Maximum Concentration (µCi/mL)	DCS [a] (µCi/mL)
Gross Alpha	26	-0.33±8.46E-09	-0.23±5.88E-17	<1.94E-16	--
Gross Beta	26	0.34±1.91E-08	0.24±1.33E-16	<7.75E-16	--
Co-60	2	0.52±1.02E-08	3.58±7.05E-17	<1.24E-16	3.6E-10
Sr-90	2	-4.29±7.80E-09	2.98±5.42E-17	<8.70E-17	1.0E-10
I-129	2	4.84±2.64E-08	3.36±1.83E-16	6.24E-16	1.0E-10
Cs-137	2	6.81±8.99E-09	4.73±6.25E-17	<1.11E-16	8.8E-10
Eu-154	2	1.63±2.92E-08	1.14±2.03E-16	<3.50E-16	7.5E-11
U-232[b]	2	-5.30±6.93E-10	-3.68±4.81E-18	<8.07E-18	4.7E-13
U-233/234[b]	2	3.52±1.18E-09	2.45±0.82E-17	3.08E-17	1.0E-12
U-235/236[b]	2	1.24±4.39E-10	0.86±3.05E-18	<4.57E-18	1.2E-12
U-238[b]	2	4.91±1.28E-09	3.14±0.89E-17	4.39E-17	1.3E-12
Pu-238	2	-2.99±4.38E-10	-2.08±3.04E-18	<4.96E-18	8.8E-14
Pu-239/240	2	5.23±5.96E-10	3.62±4.14E-18	<6.05E-18	8.1E-14
Am-241	2	2.22±5.00E-10	1.54±3.47E-18	<6.01E-18	9.7E-14

N - Number of samples
-- Derived concentration standards (DCSs) are not specified for gross alpha and beta activity.
[a] DCSs 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: 9.04±0.23E-03 g; average = 6.28±0.16E-11 µg/mL

TABLE C-4
2011 Effluent Airborne Radioactivity at Contact Size-Reduction Facility (ANCSRFK)

Ventilation Off; System Did Not Operate During CY 2011

TABLE C-5
2011 Effluent Airborne Radioactivity at Supernatant Treatment System (ANSTSTK)

Isotope	*N*	*Total Activity Released (Ci)*	*Average Concentration (µCi/mL)*	*Maximum Concentration (µCi/mL)*	*DCS [a] (µCi/mL)*
Gross Alpha	26	-6.07±4.26E-09	-9.09±6.37E-17	<3.75E-16	--
Gross Beta	26	2.65±1.09E-08	3.96±1.63E-16	8.65E-15	--
H-3	26	7.08±0.62E-05	1.06±0.09E-12	2.09E-12	2.1E-07
Co-60	2	-2.98±4.85E-09	-4.46±7.26E-17	<1.23E-16	3.6E-10
Sr-90	2	0.38±5.05E-09	5.70±7.55E-17	<1.30E-16	1.0E-10
I-129	2	5.81±0.48E-07	8.70±0.71E-14	1.36E-13	1.0E-10
Cs-137	2	2.37±0.84E-08	3.54±1.25E-16	8.66E-16	8.8E-10
Eu-154	2	-0.37±1.61E-08	-0.55±2.40E-16	<3.90E-16	7.5E-11
U-232[b]	2	-1.38±3.07E-10	-2.06±4.59E-18	<7.26E-18	4.7E-13
U-233/234[b]	2	1.01±0.54E-09	1.51±0.81E-18	2.40E-17	1.0E-12
U-235/236[b]	2	1.73±2.53E-10	2.59±3.79E-18	6.52E-18	1.2E-12
U-238[b]	2	3.49±3.47E-10	5.23±5.20E-18	6.63E-18	1.3E-12
Pu-238	2	-0.66±2.16E-10	-0.98±3.24E-18	<5.49E-18	8.8E-14
Pu-239/240	2	1.78±2.01E-10	1.76±3.00E-18	<4.55E-18	8.1E-14
Am-241	2	1.02±3.07E-10	1.53±4.60E-18	<6.87E-18	9.7E-14

N - Number of samples

-- Derived concentration standards (DCSs) are not specified for gross alpha and beta activity.

[a] DCSs 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: 2.81±0.08E-03 g; average = 4.21±0.12E-11 µg/mL

TABLE C-6
2011 Effluent Airborne Radioactivity at Container Sorting and Packaging Facility (ANCSPFK)

Isotope	N	Total Activity Released (Ci)	Average Concentration (µCi/mL)	Maximum Concentration (µCi/mL)	DCS [a] (µCi/mL)
Gross Alpha	25[b]	0.07±1.03E-09	0.43±6.07E-17	4.80E-16	--
Gross Beta	25[b]	5.03±2.41E-09	2.98±1.43E-16	1.11E-15	--
Co-60	2	0.97±1.34E-09	5.71±7.95E-17	1.36E-16	3.6E-10
Sr-90	2	1.64±1.21E-09	9.68±7.13E-17	1.90E-16	1.0E-10
I-129	2	1.24±0.11E-07	7.33±0.67E-15	8.95E-15	1.0E-10
Cs-137	2	0.49±1.23E-09	2.90±7.24E-17	<1.08E-16	8.8E-10
Eu-154	2	-1.66±4.29E-09	-0.98±2.54E-16	<3.89E-16	7.5E-11
U-232[c]	2	-0.36±1.32E-10	-2.13±7.83E-18	<1.46E-17	4.7E-13
U-233/234[c]	2	3.52±1.28E-10	2.08±0.76E-17	2.54E-17	1.0E-12
U-235/236[c]	2	1.19±0.81E-10	7.02±4.80E-18	1.11E-17	1.2E-12
U-238[c]	2	4.00±1.34E-10	2.36±0.80E-17	3.14E-17	1.3E-12
Pu-238	2	-4.57±5.51E-11	-2.70±3.26E-18	<5.28E-18	8.8E-14
Pu-239/240	2	3.50±6.66E-11	2.07±3.93E-18	<6.35E-18	8.1E-14
Am-241	2	1.25±0.74E-10	7.40±4.36E-18	1.56E-17	9.7E-14

N - Number of samples

-- Derived concentration standards (DCSs) are not specified for gross alpha and beta activity.

[a] DCSs 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: 1.02±0.03E-03 g; average = 6.01±0.15E-11 µg/mL

TABLE C-7
2011 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)	DCS [a] (µCi/mL)
Gross Alpha	194	8.86±5.62E-09	5.20±3.30E-17	7.54E-14	--
Gross Beta	194	7.14±1.27E-08	4.20±0.74E-16	5.26E-12	--
Co-60	3	-0.98±2.28E-09	-0.58±1.34E-17	<2.83E-14	3.6E-10
Sr-90	3	0.46±2.31E-09	0.27±1.36E-17	<2.22E-14	1.0E-10
Cs-137	3	1.97±2.03E-09	1.15±1.19E-17	1.73E-17	8.8E-10
Eu-154	3	-3.61±5.01E-09	-2.12±2.94E-17	<4.81E-14	7.5E-11
U-232[b]	3	-2.46±4.52E-10	-1.44±2.66E-18	<4.77E-15	4.7E-13
U-233/234[b]	3	4.80±0.57E-09	2.82±0.33E-17	2.96E-17	1.0E-12
U-235/236[b]	3	5.59±2.05E-10	3.28±1.21E-18	3.05E-18	1.2E-12
U-238[b]	3	5.19±0.57E-09	3.05±0.34E-17	3.37E-17	1.3E-12
Pu-238	3	0.43±1.14E-10	2.54±6.71E-19	<1.17E-15	8.8E-14
Pu-239/240	3	-0.49±1.28E-10	-2.88±7.52E-19	<1.17E-15	8.1E-14
Am-241	3	3.12±2.19E-10	1.83±1.29E-18	2.91E-15	9.7E-14

N - Number of samples

-- Derived concentration standards (DCSs) are not specified for gross alpha and beta activity.

[a] DCSs 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: 1.35±0.03E-02 g; average = 7.91±0.18E-11 µg/mL

TABLE C-8
2011 Effluent Airborne Radioactivity at Remote-Handled Waste Facility (ANRHWFK)

Isotope	*N*	*Total Activity Released (Ci)*	*Average Concentration (µCi/mL)*	*Maximum Concentration (µCi/mL)*	*DCS[a] (µCi/mL)*
Gross Alpha	26	-0.25±1.21E-08	-0.21±1.02E-16	<4.46E-16	--
Gross Beta	26	5.75±2.87E-08	4.85±2.42E-16	5.89E-15	--
Co-60	2	-0.65±1.50E-08	-0.55±1.27E-16	<1.84E-16	3.6E-10
Sr-90	2	1.34±1.34E-08	1.13±1.13E-16	<1.89E-16	1.0E-10
I-129	2	1.18±0.10E-06	9.98±0.83E-15	1.17E-14	1.0E-10
Cs-137	2	0.96±1.39E-08	0.81±1.17E-16	<1.75E-16	8.8E-10
Eu-154	2	0.18±4.92E-08	0.15±4.15E-16	<6.72E-16	7.5E-11
U-232[b]	2	-0.32±1.62E-09	-0.27±1.36E-17	<2.47E-17	4.7E-13
U-233/234[b]	2	5.20±1.63E-09	4.39±1.37E-17	4.57E-17	1.0E-12
U-235/236[b]	2	1.16±0.89E-09	9.77±7.53E-18	1.51E-17	1.2E-12
U-238[b]	2	4.70±1.58E-09	3.97±1.33E-17	4.54E-17	1.3E-12
Pu-238	2	0.85±6.80E-10	0.72±5.74E-18	<8.27E-18	8.8E-14
Pu-239/240	2	-3.05±7.62E-10	-2.57±6.43E-18	<9.59E-18	8.1E-14
Am-241	2	3.44±6.05E-10	2.90±5.10E-18	<8.02E-18	9.7E-14

N - Number of samples

-- Derived concentration standards (DCSs) are not specified for gross alpha and beta activity.

[a] DCSs 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: 1.34±0.04E-02 g; average = 1.13±0.03E-10 µg/mL

TABLE C-9
2011 Ambient Airborne Radioactivity at Background Great Valley Location (AFGRVAL)

Isotope	*N*	*AFGRVAL µCi/mL*	
		Average	*Maximum*
Gross Alpha	26	7.43±6.97E-16	2.12E-15
Gross Beta	26	1.58±0.22E-14	2.44E-14
K-40	2	0.76±1.91E-15	<2.05E-15
Co-60	2	-0.95±1.32E-16	<1.52E-16
Sr-90	2	0.03±1.35E-16	<1.66E-16
I-129	2	-2.48±1.62E-16	<1.94E-16
Cs-137[a]	2	2.29±1.56E-16	5.35E-16
Eu-154	2	1.28±3.31E-16	<3.49E-16
U-232[b]	2	-0.08±1.26E-17	<1.38E-17
U-233/234[b]	2	3.70±1.82E-17	4.70E-17
U-235/236[b]	2	6.62±9.65E-18	1.16E-17
U-238[b]	2	3.53±1.73E-17	3.94E-17
Pu-238	2	0.34±1.00E-17	<1.27E-17
Pu-239/240	2	0.03±1.05E-17	<1.06E-17
Am-241	2	0.27±1.12E-17	<1.27E-17

N - Number of samples

[a] Cesium-137 concentrations were detectable during the 2011 first semiannual sampling period due to the effects of the Fukushima Daiichi Japan tsunami and nuclear reactor disaster in March 2011.

[b] Total Uranium: AFGRVAL average = 1.16±0.06E-10 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 for the Corrective Measures Studies in 2009 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.

Groundwater Screening Levels 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 well 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* [a] *(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* [a] *(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)

6 NYCRR[a] Appendix 33 Volatile Organic Compounds			
Compound	PQL	Compound	PQL
Acetone	10	cis-1,3-Dichloropropene	5
Acetonitrile	100	Ethyl Benzene	5
Acrolein	11	Ethyl methacrylate	5
Acrylonitrile	5	2-Hexanone	10
Allyl chloride	5	Isobutyl alcohol	100
Benzene	5	Methacrylonitrile	5
Bromodichloromethane	5	Methyl ethyl ketone	10
Bromoform (methyl bromide)	5	Methyl iodide	5
Bromomethane	10	Methyl methacrylate	5
Carbon disulfide	10	4-Methyl-2-pentanone (MIBK)	10
Carbon tetrachloride	5	Methylene bromide	10
Chlorobenzene	5	Methylene chloride	5
Chloroethane	10	Pentachloroethane	5
Chloroform	5	Propionitrile	50
Chloromethane (methyl chloride)	10	Styrene	5
Chloroprene	5	1,1,1,2-Tetrachloroethane	5
1,2-Dibromo-3-chloropropane	5	1,1,2,2-Tetrachloroethane	5
Dibromochloromethane	5	Tetrachloroethylene	5
1,2-Dibromoethane	5	Toluene	5
trans-1,4-Dichloro-2-butene	5	1,1,1-Trichloroethane (1,1,1-TCA)	5
1,1-Dichloroethane (1,1-DCA)	5	1,1,2-Trichloroethane (1,1,2-TCA)	5
1,2-Dichloroethane (1,2-DCA)	5	Trichloroethylene (TCE)	5
1,1-Dichloroethylene (1,1-DCE)	5	Trichlorofluoromethane	5
trans-1,2-Dichloroethylene (1,2-DCE[trans])	5	1,2,3-Trichloropropane	5
Dichlorodifluoromethane (DCDF Meth)	5	Vinyl acetate	10
1,2-Dichloropropane	5	Vinyl chloride	10
trans-1,3-Dichloropropene	5	Xylene (total)	5
6 NYCRR[a] Appendix 33 Metals	PQL	6 NYCRR[a] Appendix 33 Metals	PQL
Aluminum[b]	200	Lead	3
Antimony	10	Manganese	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)

6 NYCRR[a] Appendix 33 Volatile Organic Compounds			
Compound	PQL	Compound	PQL
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	10
Analine	10	Fluoranthene	10
Anthracene	10	Fluorene	10
Aramite	10	Hexachlorobenzene	10
Benzo[a]anthracene	10	Hexachlorobutadiene	10
Benzo[a]pyrene	10	Hexachlorocyclopentadiene	10
Benzo[b]fluoranthene	10	Hexachloroethane	10
Benzo[ghi]perylene	10	Hexachlorophene	10
Benzo[k]fluoranthene	10	Hexachloropropene	10
Benzyl alcohol	10	Indeno(1,2,3,-cd)pyrene	10
Bis(2-chloroethyl)ether	10	Isodrin	10
Bis(2-chloroethoxy)methane	10	Isophorone	10
Bis(2-chloroisopropyl)ether	10	Isosafrole	10
Bis(2-ethylhexyl)phthalate	10	Kepone	10
4-Bromophenyl phenyl ether	10	Methapyrilene	10
Butyl benzyl phthalate	10	Methyl methanesulfonate	10
Chlorobenzilate	10	3-Methylcholanthrene	10
2-Chloronaphthalene	10	2-Methylnapthalene	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]anthracine	10	N-Nitrosodi-n-butylamine	10
Dibenzofuran	10	N-Nitrosodiethylamine	10
3,3-Dichlorobenzidine	10	N-Nitrosodimethylamine	10
2,4-Dichlorophenol	10	N-Nitroso-di-n-propylamine	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	10
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	O,O-Diethyl O-2-pyrazinylphosphorothioate	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)

6 NYCRR[a] Appendix 33 Volatile Organic Compounds			
Compound	PQL	Compound	PQL
p-(Dimethylamino)azobenzene	10	2,3,4,6-Tetrachlorophenol	10
p-Chloroaniline	10	Tetraethyl dithiopyrophosphate	10
p-Chloro-m-cresol	10	1,2,4-Trichlorobenzene	10
p-Cresol	10	2,4,5-Trichlorophenol	25
p-Dichlorobenzene	10	2,4,6-Trichlorophenol	10
p-Nitroaniline	25	alpha,alpha-Dimethylphenethylamine	50
p-Nitrophenol	25	m-Cresol	10
p-Phenylenediamine	10	m-Dichlorobenzene	10
Parathion	10	m-Dinitrobenzene	10
Pentachlorobenzene	10	m-Nitroanaline	25
Pentachloronitrobenzene	10	o-Cresol	10
Pentachlorophenol	25	o-Dichlorobenzene	10
Phenacetin	10	o-Nitroaniline	25
Phenanthrene	10	o-Nitrophenol	10
Phenol	10	o-Toluidine	10
Pronamide	10	sym-Trinitrobenzene	10
Pyrene	10	2-Picoline	10
Safrole	10	Pyridine	10
1,2,4,5-Tetrachlorobenzene	10	1,4-Dioxane	10
Other Organic Compounds			
1,2-Dichloroethylene (Total)	5		
N-Dodecane	60		
Tributyl phosphate	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
2011 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-11	6.94	1,326	1.80±1.51E-09	8.71±2.92E-09	4.22±4.72E-08
301	UP	Jun-11	6.09	1,594	0.00±2.47E-09	1.02±0.43E-08	2.96±4.89E-08
301	UP	Sep-11	6.61	2,285	-0.79±1.29E-08	1.09±0.64E-08	-2.41±4.78E-08
301	UP	Dec-11	6.84	1,237	3.64±4.62E-09	6.60±2.65E-09	1.97±4.94E-08
302	UP	Jun-11	6.18	4,704	6.66±8.70E-09	0.77±1.01E-08	-0.34±4.84E-08
302	UP	Dec-11	7.05	4,584	1.31±1.67E-08	0.92±7.71E-09	-1.92±4.89E-08
401	UP	Mar-11	7.21	2,636	2.57±2.66E-09	1.62±0.54E-08	1.48±4.66E-08
401	UP	Jun-11	6.87	3,057	-0.74±4.36E-09	8.96±6.82E-09	3.76±4.84E-08
401	UP	Sep-11	6.81	2,351	0.21±1.25E-08	4.04±5.19E-09	1.21±4.85E-08
401	UP	Dec-11	7.3	3,346	0.42±1.10E-08	1.22±0.62E-08	-5.23±4.85E-08
402	UP	Jun-11	6.71	5,362	0.00±7.89E-09	0.27±1.13E-08	2.33±4.86E-08
402	UP	Dec-11	7.12	5,336	0.80±1.80E-08	1.19±0.96E-08	-2.10±4.88E-08
403	UP	Jun-11	6.53	2,327	1.54±3.64E-09	1.02±0.52E-08	-1.52±4.80E-08
403	UP	Dec-11	6.81	1,312	-1.39±3.96E-09	4.65±2.60E-09	1.37±4.95E-08
706	UP	Mar-11	7.10	626	1.15±0.83E-09	9.84±3.02E-09	-3.15±4.57E-08
706	UP	Jun-11	6.64	866	1.71±1.78E-09	9.11±2.80E-09	-3.21±4.77E-08
706	UP	Sep-11	6.71	982	-0.31±5.40E-09	8.81±2.82E-09	-3.38±4.61E-08
706	UP	Dec-11	6.8	632	0.99±1.45E-09	6.42±2.10E-09	1.78±4.66E-08
1302	UP	Dec-11	7.09	1,126	2.57±2.95E-09	1.59±2.43E-09	-2.38±4.65E-08
1304	DOWN	Mar-11	7.13	2,608	2.75±2.68E-09	8.56±5.19E-09	1.47±4.64E-08
1304	DOWN	Jun-11	7.00	3,303	-0.72±5.06E-09	2.62±6.99E-09	-3.83±4.67E-08
1304	DOWN	Sep-11	6.59	1,832	2.50±6.43E-09	4.93±3.96E-09	4.08±4.69E-08
1304	DOWN	Dec-11	7.22	1,536	-2.00±5.31E-09	3.64±2.92E-09	-4.18±4.64E-08
103	DOWN	Mar-11	7.93	4,178	3.32±3.99E-09	8.32±1.21E-08	3.28±4.72E-08
103	DOWN	Jun-11	7.76	2,920	5.52±5.24E-09	4.86±0.86E-08	-2.30±3.32E-08
103	DOWN	Sep-11	7.95	2,011	-4.92±8.07E-09	2.08±0.52E-08	0.86±4.84E-08
103	DOWN	Dec-11	8.45	1,450	3.03±5.40E-09	1.28±0.35E-08	-6.91±4.84E-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)*
2011 Indicator Results From the Sand and Gravel Unit

Location Code	*Hydraulic Position* [a]	*Date Collected*	*pH SU*	*Conductivity µmhos/cm@ 25 ºC*	*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-11	7.02	1,890	2.86±5.83E-09	6.56±0.28E-05	1.95±0.50E-07
104	DOWN	Jun-11	7.02	1,812	1.97±2.56E-09	6.44±0.15E-05	1.43±0.50E-07
104	DOWN	Sep-11	7.05	1,896	0.97±6.97E-09	6.50±0.15E-05	7.99±4.96E-08
104	DOWN	Dec-11	7.03	1,872	2.18±7.70E-09	6.10±0.14E-05	9.46±5.09E-08
111	DOWN	Mar-11	6.78	466	1.99±1.92E-09	2.60±0.12E-06	8.98±4.91E-08
111	DOWN	Jun-11	6.57	453	2.92±1.46E-09	2.96±0.10E-06	4.47±4.82E-08
111	DOWN	Sep-11	6.79	1,168	7.72±4.19E-09	6.08±0.13E-06	-0.20±4.81E-08
111	DOWN	Dec-11	6.83	955	5.43±4.79E-09	5.58±0.16E-06	5.44±3.33E-08
205	DOWN	Jun-11	6.86	3,932	0.00±5.17E-09	1.67±0.82E-08	-1.03±4.84E-08
205	DOWN	Dec-11	6.66	2,078	2.60±6.80E-09	4.89±3.90E-09	-5.04±4.84E-08
406	DOWN	Mar-11	6.85	1,422	1.38±1.43E-09	1.18±0.33E-08	0.58±4.66E-08
406	DOWN	Jun-11	6.74	1,136	1.04±1.90E-09	6.59±2.67E-09	-3.31±4.77E-08
406	DOWN	Sep-11	7.00	852	-0.68±3.30E-09	6.27±2.95E-09	1.29±4.84E-08
406	DOWN	Dec-11	7	902	1.98±3.20E-09	5.82±3.57E-09	-0.50±3.47E-08
408	DOWN	Mar-11	7.09	3,018	1.33±9.04E-09	2.32±0.11E-04	7.73±4.75E-08
408	DOWN	Jun-11	6.26	3,508	2.82±4.37E-09	2.32±0.06E-04	3.19±4.87E-08
408	DOWN	Sep-11	6.65	3,414	1.20±1.36E-08	2.31±0.06E-04	3.68±3.47E-08
408	DOWN	Dec-11	7.19	3,231	0.07±1.26E-08	1.86±0.04E-04	-2.58±4.60E-08
501	DOWN	Mar-11	7.03	2,241	-0.98±6.35E-09	1.02±0.04E-04	7.36±4.74E-08
501	DOWN	Jun-11	7.19	2,679	1.58±3.10E-09	9.59±0.23E-05	0.19±4.83E-08
501	DOWN	Sep-11	6.75	2,770	-0.71±9.95E-09	1.18±0.03E-04	6.77±4.78E-08
501	DOWN	Dec-11	7.35	2,435	-2.25±9.35E-09	8.44±0.20E-05	3.66±3.51E-08
502	DOWN	Mar-11	6.95	2,174	-0.96±6.22E-09	9.58±0.42E-05	5.52±4.73E-08
502	DOWN	Jun-11	6.48	2,590	2.63±3.42E-09	1.06±0.03E-04	2.11±4.88E-08
502	DOWN	Sep-11	6.99	2,536	3.79±9.42E-09	1.01±0.02E-04	4.17±4.72E-08
502	DOWN	Dec-11	7.32	2,402	-5.36±9.03E-09	8.80±0.21E-05	1.10±4.66E-08
602A	DOWN	Jun-11	6.64	796	-0.20±1.17E-09	1.09±0.40E-08	1.45±0.51E-07
602A	DOWN	Dec-11	6.79	694	0.16±2.40E-09	6.28±3.00E-09	1.41±0.49E-07
604	DOWN	Jun-11	6.62	1,492	1.03±2.43E-09	8.57±3.46E-09	-4.88±4.75E-08
604	DOWN	Dec-11	6.38	1,656	0.00±5.10E-09	1.04±0.33E-08	2.57±4.66E-08
8605	DOWN	Mar-11	7.20	596	5.26±2.78E-09	6.40±0.27E-06	1.17±0.48E-07
8605	DOWN	Jun-11	6.66	1,021	7.71±3.09E-09	6.30±0.18E-06	4.79±4.68E-08
8605	DOWN	Sep-11	6.54	1,781	1.61±0.88E-08	6.18±0.18E-06	6.81±4.81E-08
8605	DOWN	Dec-11	6.83	1,392	1.05±0.67E-08	6.29±0.17E-06	4.90±3.40E-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)*
2011 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-11	6.42	2,190	1.25±1.83E-09	4.85±0.65E-08	5.14±4.71E-08
8607	DOWN	Jun-11	6.34	1,496	-1.47±1.73E-09	3.36±0.49E-08	-1.81±4.59E-08
8607	DOWN	Sep-11	6.68	1,490	0.37±6.61E-09	2.68±0.44E-08	2.00±4.72E-08
8607	DOWN	Dec-11	6.64	964	0.21±2.44E-09	1.65±0.29E-08	-0.43±4.87E-08
8609	DOWN	Mar-11	6.94	1,721	-0.77±3.55E-09	9.36±0.41E-07	1.39±0.49E-07
8609	DOWN	Jun-11	7.05	1,857	0.86±2.39E-09	8.91±0.45E-07	9.82±4.77E-08
8609	DOWN	Sep-11	6.91	1,974	7.92±9.01E-09	1.27±0.06E-06	1.18±0.49E-07
8609	DOWN	Dec-11	7.02	2,028	2.36±6.48E-09	1.32±0.05E-06	1.31±0.51E-07
105	DOWN	Mar-11	7.32	2,089	-0.45±5.96E-09	6.88±0.30E-05	2.97±0.52E-07
105	DOWN	Jun-11	7.26	2,086	4.27±3.60E-09	6.20±0.15E-05	1.64±0.51E-07
105	DOWN	Sep-11	7.18	2,057	2.74±8.09E-09	5.99±0.14E-05	2.20±0.51E-07
105	DOWN	Dec-11	7.3	2,168	-2.53±8.36E-09	5.88±0.14E-05	1.83±0.37E-07
106	DOWN	Mar-11	6.94	1,307	0.00±4.12E-09	1.32±0.07E-06	7.01±0.57E-07
106	DOWN	Jun-11	6.81	1,491	2.07±2.34E-09	1.53±0.06E-06	8.05±0.60E-07
106	DOWN	Sep-11	6.61	1,553	7.68±6.68E-09	1.39±0.07E-06	7.55±0.42E-07
106	DOWN	Dec-11	6.79	1,374	2.09±6.18E-09	1.17±0.06E-06	3.24±0.54E-07
116	DOWN	Jun-11	7.03	1,587	2.54±2.57E-09	1.18±0.03E-05	9.18±5.00E-08
116	DOWN	Dec-11	7.09	2,070	-0.96±8.07E-09	1.67±0.04E-05	3.19±4.98E-08
605	DOWN	Jun-11	6.55	968	0.22±1.45E-09	1.94±0.35E-08	-0.46±4.87E-08
605	DOWN	Dec-11	6.76	687	0.82±1.09E-09	2.82±0.25E-08	-5.56±4.55E-08
801	DOWN	Mar-11	6.88	1,588	3.10±5.01E-09	2.02±0.09E-05	7.30±4.75E-08
801	DOWN	Jun-11	6.22	1,502	0.62±1.72E-09	1.68±0.04E-05	5.33±4.92E-08
801	DOWN	Sep-11	6.41	1,131	5.34±5.11E-09	1.06±0.03E-05	8.53±4.79E-08
801	DOWN	Dec-11	6.67	968	0.79±3.09E-09	9.45±0.17E-06	7.76±4.78E-08
802	DOWN	Mar-11	7.15	156	1.14±0.48E-09	2.46±0.25E-08	3.17±4.69E-08
802	DOWN	Jun-11	6.54	162	0.33±1.15E-09	2.41±0.24E-08	-4.86±4.73E-08
802	DOWN	Sep-11	6.60	926	-0.57±4.93E-09	4.14±0.18E-07	0.00±4.67E-08
802	DOWN	Dec-11	6.94	620	0.00±10.00E-10	2.23±0.10E-07	5.33±4.70E-08
803	DOWN	Mar-11	7.19	2,097	3.16±4.60E-09	1.56±0.06E-06	2.12±0.50E-07
803	DOWN	Jun-11	5.93	2,199	2.14±2.72E-09	1.93±0.06E-06	3.71±4.91E-08
803	DOWN	Sep-11	6.99	2,229	8.39±6.94E-09	2.57±0.08E-06	1.08±0.49E-07
803	DOWN	Dec-11	7.29	2,275	-4.45±8.99E-09	2.58±0.09E-06	1.12±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)*
2011 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-11	7.19	1,228	4.84±9.49E-10	3.49±0.20E-07	8.12±4.77E-08
804	DOWN	Jun-11	7.15	2,158	1.72±4.28E-09	2.19±0.12E-07	-2.74±4.77E-08
804	DOWN	Sep-11	6.42	1,682	-8.07±7.90E-09	3.87±0.20E-07	6.78±4.78E-08
804	DOWN	Dec-11	6.8	1,354	-0.69±2.33E-09	4.02±0.20E-07	1.40±4.68E-08
8603	DOWN	Jun-11	7.49	2,160	0.95±2.63E-09	5.82±0.14E-05	2.41±0.50E-07
8603	DOWN	Dec-11	7.33	2,200	3.12±9.22E-09	5.80±0.14E-05	1.75±0.51E-07
8604	DOWN	Jun-11	7.17	1,885	1.71±2.65E-09	5.88±0.14E-05	1.24±0.48E-07
8604	DOWN	Dec-11	7.15	2,082	1.51±8.75E-09	6.15±0.14E-05	1.10±0.34E-07
8612	DOWN	Mar-11	7.05	2,011	1.21±1.76E-09	1.66±0.51E-08	1.32±0.34E-07
8612	DOWN	Jun-11	7.15	2,158	-1.47±3.19E-09	2.72±0.61E-08	4.20±4.67E-08
8612	DOWN	Sep-11	7.03	2,102	-4.01±9.59E-09	2.68±0.59E-08	7.95±3.35E-08
8612	DOWN	Dec-11	7.25	2,204	-2.37±7.60E-09	2.46±0.52E-08	1.35±0.51E-07
GSEEP	DOWN	Mar-11	6.46	1,106	0.00±5.28E-10	2.33±0.45E-08	3.30±0.51E-07
GSEEP	DOWN	Jun-11	6.35	1,599	1.52±3.15E-09	5.86±0.76E-08	3.16±0.51E-07
GSEEP	DOWN	Sep-11	6.59	1,515	2.21±5.69E-09	7.40±0.85E-08	3.51±0.53E-07
GSEEP	DOWN	Dec-11	6.58	1,327	-0.56±4.56E-09	8.37±0.64E-08	2.66±0.53E-07
SP04	DOWN	Mar-11	NS	NS	8.21±6.22E-09	9.78±0.43E-07	9.28±4.78E-08
SP04	DOWN	Jun-11	NS	NS	1.80±5.10E-09	1.18±0.06E-06	1.77±0.50E-07
SP04	DOWN	Sep-11	NS	NS	9.79±8.51E-09	1.53±0.07E-06	2.00±0.35E-07
SP04	DOWN	Dec-11	NS	NS	1.98±6.83E-09	1.42±0.06E-06	1.29±0.51E-07
SP06	DOWN	Mar-11	NS	NS	3.33±2.26E-09	2.69±0.33E-08	1.60±4.70E-08
SP06	DOWN	Jun-11	NS	NS	-0.25±1.74E-09	3.74±0.52E-08	4.09±4.86E-08
SP06	DOWN	Sep-11	NS	NS	-0.51±6.06E-09	8.08±0.94E-08	5.86±4.75E-08
SP06	DOWN	Dec-11	NS	NS	0.65±5.51E-09	1.15±0.08E-07	2.98±4.75E-08
SP11	DOWN	Mar-11	NS	NS	6.94±6.50E-09	2.82±0.16E-07	7.94±4.78E-08
SP11	DOWN	Jun-11	NS	NS	-0.99±2.14E-09	3.28±0.29E-07	9.71±3.37E-08
SP11	DOWN	Sep-11	NS	NS	1.67±4.90E-09	4.46±0.23E-07	4.68±4.73E-08
SP11	DOWN	Dec-11	NS	NS	-3.29±6.45E-09	5.28±0.26E-07	4.58±4.78E-08
SP12	DOWN	Mar-11	7.10	945	4.15±6.61E-09	5.78±0.67E-08	9.40±4.83E-08
SP12	DOWN	Jun-11	6.81	1,999	1.26±3.40E-09	1.09±0.12E-07	6.89±4.87E-08
SP12	DOWN	Sep-11	NS	NS	2.30±7.30E-09	1.41±0.14E-07	8.55±4.78E-08
SP12	DOWN	Dec-11	7.33	2,521	0.00±7.42E-09	2.14±0.14E-07	6.74±4.79E-08

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-2A *(concluded)*
2011 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*
WP-A	DOWN	Sep-11	6.38	114	2.09±6.65E-10	1.69±0.23E-08	1.07±0.02E-05
WP-C	DOWN	Sep-11	6.50	697	0.46±1.94E-09	9.64±0.76E-08	3.36±0.07E-05
WP-H	DOWN	Sep-11	5.72	1,165	6.77±4.66E-09	5.30±0.16E-06	7.24±0.57E-07
MP-01	DOWN	Mar-11	6.78	3,340	0.29±1.02E-08	3.60±0.18E-04	3.82±0.52E-07
MP-01	DOWN	Jun-11	6.79	3,926	7.19±6.07E-09	3.56±0.11E-04	7.92±4.78E-08
MP-01	DOWN	Sep-11	7.16	3,432	0.34±1.25E-08	2.98±0.07E-04	7.68±4.76E-08
MP-01	DOWN	Dec-11	7.27	3,108	-0.07±1.21E-08	2.54±0.06E-04	5.00±4.81E-08
MP-02	DOWN	Mar-11	6.81	2,295	1.03±4.21E-09	3.82±0.01E-04	2.73±1.17E-07
MP-02	DOWN	Jun-11	6.82	2,496	1.13±2.32E-09	3.63±0.01E-04	1.26±1.04E-07
MP-02	DOWN	Sep-11	7.02	2,474	-1.92±1.05E-09	3.10±0.02E-04	1.32±0.94E-07
MP-02	DOWN	Dec-11	7.18	2,111	-2.53±1.01E-09	2.53±0.01E-04	3.12±1.12E-07
MP-03	DOWN	Mar-11	6.95	1,874	1.23±5.63E-09	2.56±0.11E-04	7.22±3.36E-08
MP-03	DOWN	Jun-11	7.19	1,552	0.92±1.79E-09	1.57±0.04E-04	2.91±3.30E-08
MP-03	DOWN	Sep-11	6.99	1,956	1.01±0.84E-08	2.28±0.05E-04	3.98±4.71E-08
MP-03	DOWN	Dec-11	7.43	1,670	3.56±7.15E-09	1.62±0.04E-04	0.30±3.34E-08
MP-04	DOWN	Mar-11	6.85	2,114	8.23±7.17E-09	3.65±0.16E-04	1.05±0.48E-07
MP-04	DOWN	Jun-11	6.83	1,932	1.15±2.25E-09	3.01±0.07E-04	5.79±4.78E-08
MP-04	DOWN	Sep-11	6.74	2,038	1.03±0.85E-08	2.91±0.06E-04	4.79±4.69E-08
MP-04	DOWN	Dec-11	7.36	1,831	0.43±7.40E-09	2.64±0.06E-04	2.01±4.78E-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-2B
2011 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-11	7.35	1,587	2.11±1.77E-09	1.28±3.10E-09	2.13±4.63E-08
204	DOWN	Jun-11	7.26	1,716	0.00±2.51E-09	3.51±4.03E-09	4.75±4.85E-08
204	DOWN	Sep-11	7.17	1,728	-0.53±9.19E-09	1.68±4.33E-09	-2.60±4.78E-08
204	DOWN	Dec-11	7.3	1,751	3.29±5.87E-09	2.03±3.34E-09	-3.05±4.89E-08
206	DOWN	Jun-11	7.15	1,989	2.86±3.74E-09	2.91±4.30E-09	1.36±4.87E-08
206	DOWN	Dec-11	7.11	1,965	0.00±6.24E-09	2.57±4.36E-09	-1.24±4.90E-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
2011 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-11	6.90	1,803	6.14±7.97E-09	3.92±0.42E-08	-2.60±4.55E-08
908R	UP	Sep-11	NS	NS	6.69±5.21E-09	8.24±3.42E-09	NS
908R	UP	Dec-11	6.87	1,512	8.03±4.44E-09	4.76±2.53E-09	-1.27±0.47E-07
1005	UP	Jun-11	6.61	796	1.70±1.30E-09	5.55±2.69E-09	-2.00±4.58E-08
1005	UP	Dec-11	7.29	658	0.79±1.64E-09	2.07±2.58E-09	-5.73±4.80E-08
1008C	UP	Jun-11	7.02	593	4.00±8.99E-10	0.39±2.25E-09	-1.40±4.57E-08
1008C	UP	Dec-11	7.73	525	1.14±1.46E-09	0.53±1.84E-09	-6.06±4.81E-08
906	DOWN	Jun-11	6.89	601	3.20±3.48E-09	6.53±3.38E-09	1.20±4.63E-08
906	DOWN	Dec-11	7.46	524	2.22±1.03E-09	5.15±1.32E-09	-3.07±4.82E-08
1006	DOWN	Jun-11	6.77	1,548	4.28±3.36E-09	3.77±3.13E-09	-3.20±4.56E-08
1006	DOWN	Dec-11	7.14	1,458	8.78±4.42E-09	6.05±2.60E-09	-3.97±4.83E-08
NDATR	DOWN	Mar-11	7.40	686	3.49±2.64E-09	6.00±0.21E-07	3.00±0.51E-07
NDATR	DOWN	Jun-11	7.06	966	1.63±1.06E-09	9.04±0.23E-07	2.46±0.51E-07
NDATR	DOWN	Sep-11	6.55	1,007	6.01±5.22E-09	1.04±0.04E-06	3.47±0.52E-07
NDATR	DOWN	Dec-11	8.05	698	1.20±1.55E-09	5.98±0.21E-07	2.36±0.37E-07
909	DOWN	Jun-11	6.58	1,314	0.91±7.63E-09	1.97±0.12E-07	6.98±0.41E-07
909	DOWN	Dec-11	6.69	1,442	-1.07±2.83E-09	2.85±0.15E-07	8.56±0.61E-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
2011 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-11	7.21	1,521	0.00±8.36E-10	4.99±3.05E-09	6.97±4.74E-08
405	UP	Jun-11	6.87	2,040	2.42±3.17E-09	2.44±3.38E-09	-1.22±4.83E-08
405	UP	Sep-11	6.97	1,696	-2.08±7.07E-09	2.97±2.92E-09	0.33±4.90E-08
405	UP	Dec-11	7.1	1,614	3.13±5.06E-09	2.68±2.65E-09	1.20±4.94E-08
1303	UP	Mar-11	7.93	250	7.10±4.34E-10	1.61±1.42E-09	-0.88±3.26E-08
1303	UP	Jun-11	7.72	258	1.45±5.68E-10	0.72±1.45E-09	-1.83±4.74E-08
1303	UP	Sep-11	6.64	268	0.89±1.21E-09	1.08±1.47E-09	-2.15±4.62E-08
1303	UP	Dec-11	8.07	294	0.20±1.15E-09	1.13±1.43E-09	-7.15±4.58E-08
110	DOWN	Mar-11	7.23	499	1.53±0.62E-09	3.52±1.61E-09	9.49±0.61E-07
110	DOWN	Jun-11	7.35	500	1.13±1.30E-09	1.87±2.99E-09	8.61±0.60E-07
110	DOWN	Sep-11	7.36	520	0.19±3.29E-09	2.31±3.00E-09	8.26±0.60E-07
110	DOWN	Dec-11	7.48	522	0.13±1.93E-09	1.20±2.32E-09	7.20±0.60E-07
704	DOWN	Mar-11	6.72	1,365	1.15±1.38E-09	1.07±0.34E-08	7.98±3.37E-08
704	DOWN	Jun-11	6.09	934	1.71±1.98E-09	6.78±2.73E-09	-4.76±4.75E-08
704	DOWN	Sep-11	6.60	940	1.57±5.68E-09	6.92±2.66E-09	-2.38±4.62E-08
704	DOWN	Dec-11	6.74	889	1.19±2.04E-09	6.02±2.90E-09	0.59±4.63E-08
707	DOWN	Jun-11	6.12	435	0.00±1.53E-09	4.53±1.67E-09	-4.31±4.76E-08
707	DOWN	Dec-11	6.4	394	-1.14±8.05E-10	5.26±1.82E-09	2.57±4.66E-08
107	DOWN	Mar-11	7.16	682	1.98±1.11E-09	2.17±0.39E-08	1.05±0.49E-07
107	DOWN	Jun-11	6.92	788	0.91±1.66E-09	1.84±0.34E-08	4.16±4.84E-08
107	DOWN	Sep-11	7.18	712	-0.78±4.47E-09	1.88±0.33E-08	1.34±0.51E-07
107	DOWN	Dec-11	7.85	604	1.74±2.38E-09	1.43±0.30E-08	6.02±5.05E-08
108	DOWN	Jun-11	7.52	528	2.60±1.08E-09	1.43±1.73E-09	1.75±0.50E-07
108	DOWN	Dec-11	7.57	639	2.22±1.57E-09	1.84±1.67E-09	2.22±0.53E-07
409	DOWN	Mar-11	7.91	317	1.14±0.42E-09	2.85±1.08E-09	1.97±3.34E-08
409	DOWN	Jun-11	7.75	288	9.76±5.84E-10	2.20±1.19E-09	-5.84±4.73E-08
409	DOWN	Sep-11	7.56	322	0.62±1.34E-09	3.25±1.14E-09	-4.79±4.70E-08
409	DOWN	Dec-11	8.03	324	2.37±1.01E-09	2.10±1.07E-09	-6.33±4.52E-08
910R	DOWN	Jun-11	6.91	1,464	1.35±0.47E-08	7.22±3.42E-09	-3.40±4.55E-08
910R	DOWN	Dec-11	7.1	1,402	1.10±0.46E-08	5.55±2.28E-09	-1.26±0.47E-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-2E

2011 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-11	7.04	390	2.38±2.24E-09	4.73±2.42E-09	-6.58±4.48E-08
901	UP	Dec-11	7.28	413	1.87±1.25E-09	3.64±1.72E-09	-3.99±4.59E-08
902	UP	Jun-11	7.93	427	1.25±2.22E-09	2.37±2.25E-09	-5.00±4.52E-08
902	UP	Dec-11	7.61	438	1.14±1.20E-09	1.28±1.66E-09	1.20±4.67E-08
1008B	UP	Dec-11	7.87	332	6.71±9.80E-10	2.77±1.43E-09	-6.65±4.80E-08
903	DOWN	Jun-11	7.35	941	0.87±3.71E-09	3.28±2.12E-09	-8.28±3.32E-08
903	DOWN	Dec-11	7.16	958	0.45±1.77E-09	1.24±2.58E-09	-6.15±4.53E-08
8610	DOWN	Jun-11	6.95	1,360	-0.28±1.95E-09	5.76±2.81E-09	-6.77±4.47E-08
8610	DOWN	Dec-11	7.78	1,325	2.34±5.12E-09	5.90±2.83E-09	-5.47±4.82E-08
8611	DOWN	Jun-11	6.99	1,194	1.51±2.21E-09	2.88±2.84E-09	-3.19±4.53E-08
8611	DOWN	Dec-11	7.48	1,139	-3.52±4.08E-09	2.57±2.33E-09	-4.59±4.82E-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-2F

2011 Metals Results for Early Warning Monitoring Well 502

Location	*Date Collected*	*Aluminum µg/L*	*Iron µg/L*	*Manganese µg/L*
502	Jun-10	329	10,700	65
	Dec-10	<200	12,450	210

TABLE D-2G
2011 Results for Metals in Groundwater
Compared with WVDP Groundwater Screening Levels

Location Code	Hydraulic Position	Date Collected	Antimony µg/L	Arsenic µg/L	Barium µg/L	Beryllium µg/L	Cadmium µg/L	Chromium µg/L	Cobalt µg/L	Copper µg/L
Groundwater Screening Levels [a]			15.1	25	1,000	3	7.27	52.3	67.8	200
Sand and Gravel Unit										
706	UP	Mar-11	<3	<10	<200	<1	<5	14	<50	<25
706	UP	Jun-11	<3	<10	<200	<1	<5	22	<50	<25
706	UP	11-Sep	<3	<10	<200	<1	<5	21	<50	<25
706	UP	Dec-11	<3	<10	<200	<1	<5	32	<50	<25
1302	UP	Dec-11	<3	<10	<200	<1	<5	<10	<50	<25
1304	DOWN	Mar-11	<3	<10	<200	<1	<5	<10	<50	<25
1304	DOWN	Jun-11	<3	<10	<200	<1	<5	<10	<50	<25
1304	DOWN	Sep-11	<3	<10	<200	<1	<5	<10	<50	<25
1304	DOWN	Dec-11	<3	<10	<200	<1	<5	<10	<50	<25
111	DOWN	Dec-11	<10	<10	<200	<1	<5	<10	<50	<25
502	DOWN	Jun-11	NS	<10	551	NS	<5	357	<50	<25
502	DOWN	Dec-11	NS	<10	560	NS	<5	754	<50	34
8605	DOWN	Dec-11	<10	<10	<200	<1	<5	<10	<50	<25
MP-01	DOWN	Mar-11	<10	<10	481	<1	<5	14	<50	<25
MP-01	DOWN	Jun-11	<10	<10	515	<1	<5	12	<50	<25
MP-01	DOWN	Sep-11	<10	<10	430	<1	<5	<10	<50	<25
MP-01	DOWN	Dec-11	<10	<10	392	<1	<5	<10	<50	<25
MP-02	DOWN	Mar-11	<10	<10	<200	<1	<5	<10	<50	<25
MP-02	DOWN	Jun-11	<10	<10	<200	<1	<5	29	<50	<25
MP-02	DOWN	Sep-11	<10	<10	<200	<1	<5	<10	<50	<25
MP-02	DOWN	Dec-11	<10	<10	<200	<1	<5	<10	<50	<25
MP-03	DOWN	Mar-11	<10	<10	309	<1	<5	<10	<50	<25
MP-03	DOWN	Jun-11	<10	<10	<200	<1	<5	<10	<50	<25
MP-03	DOWN	Sep-11	<10	<10	280	<1	<5	<10	<50	<25
MP-03	DOWN	Dec-11	<10	<10	216	<1	<5	<10	<50	<25
MP-04	DOWN	Mar-11	<10	<10	279	<1	<5	<10	<50	<25
MP-04	DOWN	Jun-11	<10	<10	214	<1	<5	<10	<50	<25
MP-04	DOWN	Sep-11	<10	<10	211	<1	<5	<10	<50	<25
MP-04	DOWN	Dec-11	<10	<10	223	<1	<5	<10	<50	<25

Note: Bolding indicates a metal concentration that exceeds the GSL.
NS - Not sampled
[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 *(continued)*
2011 Results for Metals in Groundwater
Compared with WVDP Groundwater Screening Levels

Location Code	*Hydraulic Position*	*Date Collected*	*Lead µg/L*	*Mercury µg/L*	*Nickel µg/L*	*Selenium µg/L*	*Silver µg/L*	*Thallium µg/L*	*Tin µg/L*	*Vanadium µg/L*	*Zinc µg/L*
Groundwater Screening Levels [a]			*42.7*	*0.7*	*100*	*10.1*	*50*	*13.9*	*4,083*	*69.6*	*2,000*
Sand and Gravel Unit											
706	UP	Mar-11	<3	<0.2	82	<5	<10	<0.5	<3,000	<50	<20
706	UP	Jun-11	<3	<0.2	100	<5	<10	<0.5	<3,000	<50	<20
706	UP	Sep-11	<3	<0.2	170	<5	<10	<0.5	<3,000	<50	<20
706	UP	Dec-11	<3	<0.2	104	<5	<10	<0.5	<3,000	<50	<20
1302	DOWN	Dec-11	<3	<0.2	<40	<5	<10	<0.5	<3,000	<50	<20
1304	UP	Mar-11	<3	<0.2	<40	<5	<10	<0.5	<3,000	<50	<20
1304	UP	Jun-11	<3	<0.2	<40	<5	<10	<0.5	<3,000	<50	<20
1304	UP	Sep-11	<3	<0.2	<40	<5	<10	<0.5	<3,000	<50	<20
1304	UP	Dec-11	<3	<0.2	<40	<5	<10	<0.5	<3,000	<50	<20
111	DOWN	Dec-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
502	DOWN	Jun-11	<3	<0.2	120	<5	<10	NS	NS	<50	<20
502	DOWN	Dec-11	<3	<0.2	188	<5	<10	NS	NS	<50	<20
8605	DOWN	Dec-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-01	DOWN	Mar-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-01	DOWN	Jun-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-01	DOWN	Sep-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-01	DOWN	Dec-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-02	DOWN	Mar-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-02	DOWN	Jun-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-02	DOWN	Sep-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-02	DOWN	Dec-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-03	DOWN	Mar-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-03	DOWN	Jun-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-03	DOWN	Sep-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-03	DOWN	Dec-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-04	DOWN	Mar-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-04	DOWN	Jun-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-04	DOWN	Sep-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
MP-04	DOWN	Dec-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20

Note: Bolding indicates a metal concentration that exceeds the GSL.
NS - Not sampled
[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 *(concluded)*
2011 Results for Metals in Groundwater
Compared with WVDP Groundwater Screening Levels

Location Code	*Hydraulic Position*	*Date Collected*	*Antimony µg/L*	*Arsenic µg/L*	*Barium µg/L*	*Beryllium µg/L*	*Cadmium µg/L*	*Chromium µg/L*	*Cobalt µg/L*	*Copper µg/L*
Groundwater Screening Levels [a]			*15.1*	*25*	*1,000*	*3*	*7.27*	*52.3*	*67.8*	*200*
Weathered Lavery Till Unit										
NDATR	DOWN	Mar-11	<10	<10	<200	<1	<5	<10	<50	<25
NDATR	DOWN	Jun-11	<10	<10	<200	<1	<5	<10	<50	<25
NDATR	DOWN	Sep-11	<10	<10	<200	<1	<5	<10	<50	<25
NDATR	DOWN	Dec-11	<10	<10	<200	<1	<5	<10	<50	<25
909	DOWN	Dec-11	<3	14	326	<1	<5	<10	<50	<25
Unweathered Lavery Till Unit										
405	UP	Mar-11	<3	<10	<200	<1	<5	138	<50	<25
405	UP	Jun-11	<3	<10	<200	<1	<5	13	<50	<25
405	UP	Dec-11	<3	<10	<200	<1	<5	21	<50	<25
1303	UP	Mar-11	<3	12	310	<1	<5	15	<50	<25
1303	UP	Jun-11	<3	<10	<200	<1	<5	<10	<50	<25
1303	UP	Sep-11	<3	<10	212	<1	<5	<10	<50	<25
1303	UP	Dec-11	<3	<10	<200	<1	<5	<10	<50	<25

Location Code	*Hydraulic Position*	*Date Collected*	*Lead µg/L*	*Mercury µg/L*	*Nickel µg/L*	*Selenium µg/L*	*Silver µg/L*	*Thallium µg/L*	*Tin µg/L*	*Vanadium µg/L*	*Zinc µg/L*
Groundwater Screening Levels [a]			*42.7*	*0.7*	*100*	*10.1*	*50*	*13.9*	*4,083*	*69.6*	*2,000*
Weathered Lavery Till Unit											
NDATR	DOWN	Mar-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
NDATR	DOWN	Jun-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	26
NDATR	DOWN	Sep-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	63
NDATR	DOWN	Dec-11	<3	<0.2	<40	<5	<10	<10	<3,000	<50	<20
909	DOWN	Dec-11	<3	<0.2	<40	<5	<10	<0.5	<3,000	<50	<20
Unweathered Lavery Till Unit											
405	UP	Mar-11	<3	<0.2	2,300	<5	<10	<0.5	<3,000	<50	<20
405	UP	Jun-11	<3	<0.2	2,420	<5	<10	<0.5	<3,000	<50	<20
405	UP	Dec-11	<3	<0.2	1,950	<5	<10	<0.5	<3,000	<50	<20
1303	UP	Mar-11	20	<0.2	<40	<5	<10	<0.5	<3,000	<50	51
1303	UP	Jun-11	<3	<0.2	<40	<5	<10	<0.5	<3,000	<50	<20
1303	UP	Sep-11	9	<0.2	<40	<5	<10	<0.5	<3,000	<50	32
1303	UP	Dec-11	5	<0.2	<40	<5	<10	<0.5	<3,000	<50	22

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-2H
2011 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-11	-1.90±1.77E-08	3.90±9.35E-10	-0.53±2.22E-09	0.38±8.33E-10	0.51±1.12E-09	6.27±2.12E-10
1304	UP	Dec-11	-1.47±1.78E-08	1.06±0.97E-09	0.09±2.22E-09	-4.82±6.48E-10	0.09±1.12E-09	1.66±1.31E-10
406	DOWN	Dec-11	-1.98±1.75E-08	1.74±1.21E-09	3.51±2.27E-09	-1.50±8.22E-10	1.21±0.87E-09	1.65±1.21E-10
408	DOWN	Dec-11	0.09±2.98E-08	1.21±0.01E-04	1.41±0.25E-08	2.38±6.80E-10	0.00±1.31E-09	5.32±2.12E-10
501	DOWN	Dec-11	NS	5.14±0.04E-05	NS	NS	NS	NS
502	DOWN	Dec-11	NS	5.58±0.05E-05	NS	NS	NS	NS
8609	DOWN	Dec-11	NS	8.82±0.17E-07	NS	NS	NS	NS
801	DOWN	Dec-11	NS	6.26±0.05E-06	NS	NS	NS	NS
803	DOWN	Mar-11	NS	8.15±0.13E-07	NS	NS	NS	NS
MP-01	DOWN	Mar-11	0.81±2.93E-08	1.94±0.01E-04	3.09±0.24E-08	0.72±1.17E-09	0.21±1.54E-09	NS
MP-01	DOWN	Dec-11	-0.84±2.95E-08	1.54±0.01E-04	2.17±0.27E-08	5.72±9.81E-10	0.61±1.49E-09	NS
MP-02	DOWN	Mar-11	-0.29±2.89E-08	1.89±0.01E-04	5.55±0.29E-08	-0.29±9.60E-10	-0.18±4.84E-09	NS
MP-02	DOWN	Dec-11	-0.30±2.96E-08	1.62±0.01E-04	3.39±0.30E-08	-0.54±1.13E-09	1.95±2.95E-09	NS
MP-03	DOWN	Mar-11	1.22±2.94E-08	1.40±0.01E-04	2.98±0.25E-08	0.51±1.09E-09	1.31±1.41E-09	NS
MP-03	DOWN	Dec-11	0.88±3.00E-08	9.47±0.06E-05	1.38±0.25E-08	0.54±7.20E-10	0.17±1.29E-09	NS
MP-04	DOWN	Mar-11	0.76±2.93E-08	1.91±0.01E-04	3.60±0.25E-08	6.20±8.32E-10	0.21±1.50E-09	NS
MP-04	DOWN	Dec-11	0.09±2.97E-08	1.53±0.01E-04	2.56±0.29E-08	0.97±1.08E-09	0.29±1.47E-09	NS
Weathered Till Unit								
NDATR	DOWN	Jun-11	1.50±3.13E-08	4.08±0.10E-07	2.62±2.20E-09	1.78±0.27E-08	1.32±1.15E-09	4.16±2.06E-10
NDATR	DOWN	Dec-11	0.15±1.73E-08	3.59±0.10E-07	3.85±2.16E-09	2.10±0.33E-08	0.63±1.11E-09	0.80±1.44E-10
909	DOWN	Dec-11	-0.51±1.84E-08	1.39±0.05E-07	-0.32±2.19E-09	9.60±2.93E-09	0.09±1.13E-09	4.62±2.02E-10

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).

[c] Result for I-129 at wells 408 and MP-01 were qualified as “not detected” and are therefore not bolded even though the result presented is greater than the GSL.

TABLE D-2H *(continued)*
2011 Radioactivity in Groundwater From Selected Monitoring Locations

Location	Hydraulic Position [a]	Date Collected	Np-237 [b] µCi/mL	Pu-238 [b] µCi/mL	Pu-239/240 [b] µCi/mL	Pu-241 [b] µCi/mL	Am-241 [b] µCi/mL	Cm-243/244 [b] µCi/mL
Sand and Gravel Unit								
MP-01	DOWN	Mar-11	-2.40±2.97E-11	0.09±3.33E-11	1.39±3.13E-11	-1.20±6.24E-09	0.10±3.72E-11	-0.42±3.53E-11
MP-01	DOWN	Dec-11	0.51±3.88E-11	1.85±3.47E-11	0.34±2.58E-11	5.58±8.91E-09	2.47±4.26E-11	-1.99±3.04E-11
MP-02	DOWN	Mar-11	7.06±6.16E-11	-0.26±2.87E-11	0.67±2.67E-11	0.52±7.18E-09	1.60±3.46E-11	0.37±2.78E-11
MP-02	DOWN	Dec-11	9.28±9.66E-11	2.50±4.00E-11	2.84±3.94E-11	9.94±9.59E-09	2.01±3.22E-11	-2.48±2.77E-11
MP-03	DOWN	Mar-11	0.95±2.52E-11	-0.86±2.52E-11	0.05±2.59E-11	2.21±6.16E-09	0.68±2.85E-11	-1.02±3.00E-11
MP-03	DOWN	Dec-11	-4.01±5.54E-11	0.00±2.21E-11	1.98±3.17E-11	-1.31±7.11E-09	6.37±5.59E-11	-2.45±3.00E-11
MP-04	DOWN	Mar-11	-0.81±2.39E-11	-0.93±2.10E-11	1.00±2.83E-11	7.74±6.39E-09	-1.28±2.60E-11	-0.88±2.60E-11
MP-04	DOWN	Dec-11	-0.31±1.14E-10	1.10±2.15E-11	1.93±3.08E-11	7.87±7.45E-09	0.05±2.57E-11	-0.66±5.24E-11

[a] Hydraulic position is relative to other wells within the same hydrogeologic unit.
[b] Groundwater screening levels have not been established for Np-237, Pu-238, Pu-239/240, Pu-241, Am-241, or Cm-234/244.

TABLE D-2H *(concluded)*
2011 Radioactivity in Groundwater From Selected Monitoring Locations

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-11	6.36±4.10E-10	-1.73±3.45E-11	2.44±1.12E-10	2.98±4.12E-11	1.54±0.87E-10	5.49±0.31E-04
1304	UP	Dec-11	1.66±3.30e-10	-1.76±3.66E-11	9.02±7.15E-11	0.71±2.81E-11	2.34±1.13E-10	3.24±0.14E-04
406	DOWN	Dec-11	4.04±3.24E-10	1.77±3.49E-11	3.07±4.88E-11	-0.86±2.54E-11	6.38±6.86E-11	3.49±0.38E-04
408	DOWN	Dec-11	1.14±0.60E-09	5.39±7.56E-11	4.31±1.61E-10	7.45±6.53E-11	3.20±1.37E-10	1.21±0.10E-03
MP-01	DOWN	Mar-11	NS	6.76±6.58E-11	4.37±1.59E-10	6.20±6.46E-11	3.83±1.47E-10	NS
MP-01	DOWN	Dec-11	NS	8.29±7.20E-11	5.24±1.95E-10	1.87±3.66E-11	1.96±1.22E-10	NS
MP-02	DOWN	Mar-11	NS	3.00±6.01E-11	7.05±2.23E-10	9.09±7.97E-11	3.81±1.63E-10	NS
MP-02	DOWN	Dec-11	NS	5.82±7.72E-11	4.47±1.88E-10	1.14±0.95E-10	4.29±1.81E-10	NS
MP-03	DOWN	Mar-11	NS	0.37±4.17E-11	9.51±2.29E-10	1.42±0.88E-10	7.50±2.04E-10	NS
MP-03	DOWN	Dec-11	NS	2.82±5.57E-11	7.34±2.21E-10	8.18±7.58E-11	5.92±1.99E-10	NS
MP-04	DOWN	Mar-11	NS	3.29±7.07E-11	1.18±0.27E-09	1.23±0.94E-10	1.08±0.26E-09	NS
MP-04	DOWN	Dec-11	NS	4.50±8.97E-11	1.29±0.26E-09	6.41±5.94E-11	7.19±1.94E-10	NS
Weathered Till Unit								
NDATR	DOWN	Jun-11	1.79±2.99E-10	-3.46±4.57E-11	1.10±0.29E-09	3.55±7.01E-11	1.02±0.28E-09	2.46±0.09E-03
NDATR	DOWN	Dec-11	4.87±3.32E-10	3.69±5.35E-11	1.06±0.25E-09	3.92±5.38E-11	8.33±2.23E-10	1.18±0.08E-03
909	DOWN	Dec-11	7.94±3.39E-10	-0.38±2.71E-11	1.31±0.28E-09	2.79±4.49E-11	1.10±0.26E-09	3.06±0.14E-03

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).
[c] Result for U-235/236 at well MP-02 was qualified as “not detected” and are therefore not bolded even though the result presented is greater than the GSL.

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APPENDIX E

Summary of Biological Data

TABLE E-1
2011 Radioactivity Concentrations in Milk

Location	*K-40 (µCi/mL)*	*Sr-90 (µCi/mL)*	*I-129 (µCi/mL)*	*Cs-137 (µCi/mL)*
BFMFLDMN Annual	1.18±0.16E-06	1.04±1.15E-09	0.43±2.30E-10	0.14±4.25E-09

Note: The control milk sample (BFMCTLS) was last sampled in 2007. It will next be sampled in 2012.

TABLE E-2
2011 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 12/11)	74.3	-0.53±1.32E-07	9.60±1.24E-06	-0.05±2.75E-09	4.20±2.34E-08
Deer Flesh Background (BFDCTRL 12/11)	70.0	-0.14±1.32E-07	7.51±0.99E-06	-3.29±2.70E-09	1.65±2.18E-08
Deer Flesh Background (BFDCTRL 12/11)	72.2	0.57±1.33E-07	1.16±0.12E-05	1.45±2.83E-09	6.74±3.32E-08
Deer Flesh Near-Site (BFDNEAR 10/11)	71.4	0.98±1.26E-07	1.01±0.11E-05	-2.32±2.39E-09	1.42±0.13E-06
Deer Flesh Near-Site (BFDNEAR 10/11)	73.1	-0.43±1.21E-07	9.82±1.17E-06	-0.83±2.55E-09	9.10±5.11E-08
Deer Flesh Near-Site (BFDNEAR 11/11)	74.7	-0.52±1.20E-07	1.20±0.14E-05	-0.33±2.54E-09	6.38±2.54E-08

TABLE E-3
2011 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
2011 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.

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APPENDIX F

Summary of Direct Radiation Monitoring Data

TABLE F-1
Summary of 2011 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	15±1	17±1	16±1
DFTLD03	13±1	14±1	14±1
DFTLD04	14±1	16±1	15±1
DFTLD05	14±1	16±1	15±1
DFTLD06	14±1	16±1	15±1
DFTLD07	12±1	14±1	13±1
DFTLD08	14±1	17±2	16±2
DFTLD09	15±1	16±1	16±1
DFTLD10	13±1	14±1	14±1
DFTLD11	13±1	15±1	14±1
DFTLD12	[c]	16±1	16±1
DFTLD13	15±2	17±1	16±1
DFTLD14	14±1	16±1	15±1
DFTLD15	13±1	16±1	15±1
DFTLD16	15±1	16±1	15±1
DFTLD20	12±1	14±1	13±1
DFTLD23	15±1	16±1	16±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] Off-site locations are shown on Figure A-11.
[c] The TLD at this location was lost in the field. The second semiannual exposure reading was reported as the average.

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 2011 Semiannual Averages of On-Site TLD Measurements[a]
(mR±2 SD/quarter)

Location Number [b]	*1st Half*	*2nd Half*	*Location Average*
DNTLD24	555±64	567±40	561±53
DNTLD28	16±2	18±1	17±1
DNTLD33	17±1	19±1	18±1
DNTLD35	17±1	20±2	19±2
DNTLD36	16±1	18±1	17±1
DNTLD38	45±5	55±11	50±8
DNTLD40	123±13	129±12	126±12
DNTLD43	14±1	15±2	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 24, March 2011

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?* [b]	*Analyzed by:*
MAPEP – 11 – GrF24, Air Filter – Gross Alpha/Beta							
Gross alpha	Air Filter	Bq/sample	0.309	0.659	0.198–1.120	Yes	ELAB
Gross beta	Air Filter	Bq/sample	1.40	1.323	0.662–1.985	Yes	ELAB
MAPEP – 11 – RdF24, Air Filter – Radiological							
Am-241	Air Filter	Bq/sample	0.0022	[c]	*False positive*	Yes	GEL
Cs-137	Air Filter	Bq/sample	2.375	2.28	1.60–2.96	Yes	GEL
Co-60	Air Filter	Bq/sample	0.013	[c]	*False positive*	Yes	GEL
Pu-238	Air Filter	Bq/sample	0.092	0.096	0.067–0.125	Yes	GEL
Pu-239/240	Air Filter	Bq/sample	0.073	0.0765	0.0536–0.0995	Yes	GEL
Sr-90	Air Filter	Bq/sample	1.373	1.36	0.95–1.77	Yes	GEL
U-233/234	Air Filter	Bq/sample	0.184	0.178	0.125–0.231	Yes	GEL
U-238	Air Filter	Bq/sample	0.183	0.185	0.130–0.241	Yes	GEL
MAPEP – 11 – GrW24, Water – Gross Alpha/Beta							
Gross alpha	Water	Bq/L	1.17	1.136	0.341–1.931	Yes	ELAB
Gross beta	Water	Bq/L	2.83	2.96	1.48–4.44	Yes	ELAB
Gross alpha	Water	Bq/L	1.019	1.136	0.341–1.931	Yes	GEL
Gross beta	Water	Bq/L	3.140	2.96	1.48–4.44	Yes	GEL
MAPEP – 11 – MaW24, Water – Radiological							
Cs-137	Water	Bq/L	29.7	29.4	20.6–38.2	Yes	ELAB
Co-60	Water	Bq/L	24.6	24.6	17.2–32.0	Yes	ELAB
H-3	Water	Bq/L	254	243	170–316	Yes	ELAB
Sr-90	Water	Bq/L	8.36	8.72	6.10–11.34	Yes	ELAB
Am-241	Water	Bq/L	0.4877	0.529	0.370–0.688	Yes	GEL
Cs-137	Water	Bq/L	29.9	29.4	20.6–38.2	Yes	GEL
Co-60	Water	Bq/L	24.75	24.6	17.2–32.0	Yes	GEL
H-3	Water	Bq/L	225.3	243	170–316	Yes	GEL
Pu-238	Water	Bq/L	1.005	1.064	0.745–1.383	Yes	GEL
Pu-239/240	Water	Bq/L	0.755	0.809	0.566–1.052	Yes	GEL
Sr-90	Water	Bq/L	8.05	8.72	6.10–11.34	Yes	GEL
Tc-99	Water	Bq/L	8.6	8.99	6.29–11.69	Yes	GEL
U-233/234	Water	Bq/L	1.537	1.50	1.05–1.95	Yes	GEL
U-238	Water	Bq/L	1.457	1.54	1.08–2.00	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 environmental samples collected as part of the WVDP monitoring program or special investigations.
[a] MAPEP monitors performance and requests corrective action as required.
[b] "Yes" - Result acceptable; "W" - Result acceptable with warning 20%<Bias<30%; "No" - Result not acceptable.
[c] Not detected, reported as a statistically zero result.
[d] 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 24, March 2011

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?* [b]	*Analyzed by:*
MAPEP – 11 – MaW24, Water – Inorganic							
Antimony	Water	mg/L	6.45	6.37	4.46–8.28	Yes	GEL
Arsenic	Water	mg/L	3.36	3.17	2.22–4.12	Yes	GEL
Barium	Water	mg/L	0.945	0.942	0.659–1.225	Yes	GEL
Beryllium	Water	mg/L	0.477	0.489	0.342–0.636	Yes	GEL
Cadmium	Water	mg/L	0.478	0.489	0.342–0.636	Yes	GEL
Chromium	Water	mg/L	1.12	1.13	0.79–1.47	Yes	GEL
Cobalt	Water	mg/L	2.96	2.96	2.07–3.85	Yes	GEL
Copper	Water	mg/L	1.84	1.66	1.16–2.16	Yes	GEL
Lead	Water	mg/L	0.683	0.694	0.486–0.902	Yes	GEL
Mercury	Water	mg/L	0.0952	0.098	0.069–0.127	Yes	GEL
Nickel	Water	mg/L	1.55	1.66	1.16–2.16	Yes	GEL
Selenium	Water	mg/L	0.930	0.908	0.636–1.180	Yes	GEL
Thallium	Water	mg/L	2.26	2.23	1.56–2.90	Yes	GEL
Uranium – total	Water	mg/L	0.121	0.125	0.088–0.163	Yes	GEL
Vanadium	Water	mg/L	4.74	4.60	3.22–5.98	Yes	GEL
Zinc	Water	mg/L	7.03	7.08	4.96–9.20	Yes	GEL
MAPEP – 11 – MaS24, Soil – Inorganic							
Antimony	Soil	mg/kg	23.7	35.5	24.9–46.2	No	GEL
Arsenic	Soil	mg/kg	30.6	28.1	19.7–36.5	Yes	GEL
Barium	Soil	mg/kg	216	252	176–328	Yes	GEL
Beryllium	Soil	mg/kg	13.4	15.1	10.6–19.6	Yes	GEL
Cadmium	Soil	mg/kg	7.18	8.35	5.85–10.86	Yes	GEL
Chromium	Soil	mg/kg	74.6	88.6	62.0–115.2	Yes	GEL
Cobalt	Soil	mg/kg	35.8	42.1	29.5–54.7	Yes	GEL
Copper	Soil	mg/kg	95	93.8	65.7–121.9	Yes	GEL
Lead	Soil	mg/kg	30	37.5	26.3–48.8	Yes	GEL
Mercury	Soil	mg/kg	0.167	0.162	0.113–0.211	Yes	GEL
Nickel	Soil	mg/kg	95.2	119	83–155	Yes	GEL
Selenium	Soil	mg/kg	10.2	11.0	7.7–14.3	Yes	GEL
Silver	Soil	mg/kg	18.7	16.09	11.26–20.92	Yes	GEL
Thallium	Soil	mg/kg	51.0	55.6	38.9–72.3	Yes	GEL
Uranium – total	Soil	mg/kg	13.7	14.9	10.4–19.4	Yes	GEL
Vanadium	Soil	mg/kg	62.8	68.0	47.6–88.4	Yes	GEL
Zinc	Soil	mg/kg	162	183	128–238	Yes	GEL

GEL - GEL Laboratories, LLC

Note: This report includes only those matrix/analyte combinations performed in support of the analysis of environmental samples collected as part of the WVDP monitoring program or special investigations.

[a] MAPEP monitors performance and requests corrective action as required.

[b] "Yes" - Result acceptable; "W" - Result acceptable with warning 20%<Bias<30%; "No" - Result not acceptable.

TABLE G-1 *(continued)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 24, March 2011

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?* [b]	*Analyzed by:*
MAPEP – 11 – MaS24, Soil – Radiological							
Am-241	Soil	Bq/kg	64.93	61.1	42.8–79.4	Yes	GEL
Cs-137	Soil	Bq/kg	783	758	531–985	Yes	GEL
Co-60	Soil	Bq/kg	493.5	482	337–627	Yes	GEL
Pu-238	Soil	Bq/kg	0.59	0.48	[c]	Yes	GEL
Pu-239/240	Soil	Bq/kg	90.87	98.0	68.6–127.4	Yes	GEL
K-40	Soil	Bq/kg	588	540	378–702	Yes	GEL
Sr-90	Soil	Bq/kg	112.8	160	112–208	W	GEL
Tc-99	Soil	Bq/kg	5.8	[d]	*False positive*	Yes	GEL
U-233/234	Soil	Bq/kg	175.33	176	123–229	Yes	GEL
U-238	Soil	Bq/kg	195.67	184	129–239	Yes	GEL
MAPEP – 11 – RdV24, Vegetation – Radiological							
Am-241	Veg	Bq/sample	0.002	[d]	*False positive*	Yes	GEL
Cs-137	Veg	Bq/sample	-0.068	[d]	*False positive*	Yes	GEL
Co-60	Veg	Bq/sample	5.060	4.91	3.44–6.38	Yes	GEL
Pu-238	Veg	Bq/sample	0.110	0.102	0.071–0.133	Yes	GEL
Pu-239/240	Veg	Bq/sample	0.1277	0.141	0.099–0.183	Yes	GEL
Sr-90	Veg	Bq/sample	2.430	2.46	1.72–3.20	Yes	GEL
U-233/234	Veg	Bq/sample	0.158	0.163	0.114–0.212	Yes	GEL
U-238	Veg	Bq/sample	0.159	0.168	0.118–0.218	Yes	GEL
MAPEP – 11 – OrW24, Water – Organic Compounds							
Heptachlor	Water	μg/L	1.24	1.35	0.50–2.19	Yes	GEL
1,2,4-Trichlorobenzene	Water	μg/L	71.9	73.52	22.88–124.16	Yes	GEL
1,2-Dichlorobenzene	Water	μg/L	41.6	46.79	7.75–85.84	Yes	GEL
1,3-Dichlorobenzene	Water	μg/L	69.6	79.42	15.01–143.84	Yes	GEL
1,4-Dichlorobenzene	Water	μg/L	<9.52	[d]	[d]	Yes	GEL
2,4,5-Trichlorophenol	Water	μg/L	<9.52	[d]	[d]	Yes	GEL
2,4,6-Trichlorophenol	Water	μg/L	63.8	69.41	27.89–110.92	Yes	GEL
2,4-Dichlorophenol	Water	μg/L	102	90.96	37.75–144.17	Yes	GEL
2,4-Dimethylphenol	Water	μg/L	82.1	74.35	20.30–128.40	Yes	GEL
2,4-Dinitrophenol	Water	μg/L	<19.0	[d]	[d]	Yes	GEL
2,4-Dinitrotoluene	Water	μg/L	<9.52	[d]	[d]	Yes	GEL
2,6-Dichlorophenol	Water	μg/L	<9.52	[d]	[d]	Yes	GEL
2,6-Dinitrotoluene	Water	μg/L	<9.52	[d]	[d]	Yes	GEL
2-Chloronaphthalene	Water	μg/L	<0.952	[d]	[d]	Yes	GEL
2-Chlorophenol	Water	μg/L	98.7	110.65	40.88–180.43	Yes	GEL
2-Methylnaphthalene	Water	μg/L	47.0	40.95	9.84–72.06	Yes	GEL

GEL - GEL Laboratories, LLC

Note: This report includes only those matrix/analyte combinations performed in support of the analysis of environmental samples collected as part of the WVDP monitoring program or special investigations.

[a] MAPEP monitors performance and requests corrective action as required.

[b] “Yes” - Result acceptable; “W” - Result acceptable with warning 20%<Bias<30%; “No” - Result not acceptable.

[c] Although no actual value or acceptance range was provided, the results were assessed by MAPEP as acceptable.

[d] Not detected, reported as a statistically zero result.

TABLE G-1 *(concluded)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 24, March 2011

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?*[b]	*Analyzed by:*
MAPEP – 11 – OrW24, Water – Organic Compounds							
2-Methylphenol	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
2-Nitrophenol	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
3 Methyl and 4-Methylphenol	Water	µg/L	72.8	73.33	10.89–141.30	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	141	142.26	66.91–217.61	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	10.7	13.88	7.57–20.20	Yes	GEL
Acenaphthylene	Water	µg/L	<0.952	[c]	[c]	Yes	GEL
Anthracene	Water	µg/L	<0.952	[c]	[c]	Yes	GEL
Benzo(a)anthracene	Water	µg/L	<0.952	[c]	[c]	Yes	GEL
Benzo(a)pyrene	Water	µg/L	26.3	27.81	10.45–45.17	Yes	GEL
Benzo(b)fluoranthene	Water	µg/L	21.0	23.09	8.56–37.61	Yes	GEL
Benzo(g,h,i)perylene	Water	µg/L	19.9	19.90	4.41–35.40	Yes	GEL
Benzo(k)fluoranthene	Water	µg/L	29.1	31.61	8.11–55.10	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	112	117.10	38.78–195.43	Yes	GEL
Bis(2-ethylhexyl)phthalate	Water	µg/L	64.7	72.26	25.52–118.99	Yes	GEL
Butylbenzylphthalate	Water	µg/L	47.7	46.90	6.60–87.21	Yes	GEL
Chrysene	Water	µg/L	20.0	22.84	10.73–34.95	Yes	GEL
Di-n-butylphthalate	Water	µg/L	63.2	63.65	25.41–101.90	Yes	GEL
Di-n-octylphthalate	Water	µg/L	125	218.10	29.49–226.70	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	68.0	65.92	14.64–117.20	Yes	GEL
Dimethylphthalate	Water	µg/L	98.4	78.43	11.68–169.33	Yes	GEL
Fluoranthene	Water	µg/L	45.2	44.81	23.92–65.71	Yes	GEL
Fluorene	Water	µg/L	91.1	93.11	50.29–135.94	Yes	GEL
Hexachlorobenzene	Water	µg/L	25.2	29.10	13.88–44.32	Yes	GEL
Hexachlorobutadiene	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
Hexachlorocyclopentadiene	Water	µg/L	<9.52	[c]	[c]	Yes	GEL
Hexachloroethane	Water	µg/L	<9.52	[c]	[c]	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	102	92.39	33.38–151.41	Yes	GEL
Nitrobenzene	Water	µg/L	68.9	60.43	24.76–96.10	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	41.4	83.39	14.86–199.28	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; "W" - Result acceptable with warning 20%<Bias<30%; "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 25, September 2011

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?* [b]	*Analyzed by:*
MAPEP – 11 – GrF25, Air Filter – Gross Alpha/Beta							
Gross Alpha	Air Filter	Bq/sample	0.00124	[c]	*False positive*	Yes	ELAB
Gross Beta	Air Filter	Bq/sample	-0.0103	[c]	*False positive*	Yes	ELAB
MAPEP – 11 – RdF25, Air Filter – Radiological							
Am-241	Air Filter	Bq/sample	0.1097	0.147	0.103–0.191	W	GEL
Cs-137	Air Filter	Bq/sample	1.945	2.60	1.82–3.38	W	GEL
Co-60	Air Filter	Bq/sample	2.525	3.20	2.24–4.16	W	GEL
Pu-238	Air Filter	Bq/sample	0.096	0.1183	0.0828–0.1538	Yes	GEL
Pu-239/240	Air Filter	Bq/sample	0.094	0.135	0.095–0.176	No	GEL
Sr-90	Air Filter	Bq/sample	1.213	1.67	1.17–2.17	W	GEL
U-233/234	Air Filter	Bq/sample	0.116	0.162	0.113–0.211	W	GEL
U-238	Air Filter	Bq/sample	0.105	0.168	0.118–0.218	No	GEL
MAPEP – 11 – GrW25, Water – Gross Alpha/Beta							
Gross Alpha	Water	Bq/L	1.04	0.866	0.260–1.472	Yes	ELAB
Gross Beta	Water	Bq/L	4.79	4.81	2.41–7.22	Yes	ELAB
Gross Alpha	Water	Bq/L	0.876	0.866	0.260–1.472	Yes	GEL
Gross Beta	Water	Bq/L	5.003	4.81	2.41–7.22	Yes	GEL
MAPEP – 11 – MaW25, Water – Radiological							
Cs-137	Water	Bq/L	0.116	[c]	*False positive*	Yes	ELAB
Co-60	Water	Bq/L	29.3	29.3	20.5–38.1	Yes	ELAB
H-3	Water	Bq/L	1072	1014	710–1318	Yes	ELAB
Sr-90	Water	Bq/L	12.5	14.2	9.9–181.5	Yes	ELAB
Am-241	Water	Bq/L	3.0667	3.18	2.23–4.13	Yes	GEL
Cs-137	Water	Bq/L	-0.06	[c]	*False positive*	Yes	GEL
Co-60	Water	Bq/L	30.45	29.3	20.5–38.1	Yes	GEL
H-3	Water	Bq/L	965.7	1014	710–1318	Yes	GEL
Pu-238	Water	Bq/L	0.0148	0.016	[d]	Yes	GEL
Pu-239/240	Water	Bq/L	2.247	2.40	1.68–3.12	Yes	GEL
Sr-90	Water	Bq/L	14.47	14.2	9.9–18.5	Yes	GEL
Tc-99	Water	Bq/L	0.20	[c]	*False positive*	Yes	GEL
U-233/234	Water	Bq/L	2.673	2.78	1.95–361	Yes	GEL
U-238	Water	Bq/L	2.787	2.89	2.02–3.76	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 environmental samples collected as part of the WVDP monitoring program or special investigations.
[a] MAPEP monitors performance and requests corrective action as required.
[b] "Yes" - Result acceptable; "W" - Result acceptable with warning 20%<Bias<30%; "No" - Result not acceptable.
[c] Although no actual value or acceptable range was provided, the results were assessed by MAPEP as acceptable.
[d] Sensitivity evaluation, reported a statistically zero result.

TABLE G-2 *(continued)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 25, September 2011

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?* [b]	*Analyzed by:*
MAPEP – 11 – MaW25, Water – Inorganic							
Antimony	Water	mg/L	6.38	6.98	4.89–9.07	Yes	GEL
Arsenic	Water	mg/L	4.97	5.09	3.56–6.62	Yes	GEL
Barium	Water	mg/L	0.914	1.07	0.75–1.39	Yes	GEL
Beryllium	Water	mg/L	0.461	0.530	0.371–0.689	Yes	GEL
Cadmium	Water	mg/L	0.544	0.612	0.428–0.796	Yes	GEL
Chromium	Water	mg/L	1.69	1.88	1.32–2.44	Yes	GEL
Cobalt	Water	mg/L	2.01	2.37	1.66–3.08	Yes	GEL
Copper	Water	mg/L	1.25	1.33	0.93–1.73	Yes	GEL
Lead	Water	mg/L	0.645	0.739	0.517–0.961	Yes	GEL
Mercury	Water	mg/L	0.107	0.111	0.078–0.144	Yes	GEL
Nickel	Water	mg/L	1.69	1.94	1.36–2.52	Yes	GEL
Selenium	Water	mg/L	0.930	1.05	0.74–1.37	Yes	GEL
Thallium	Water	mg/L	3.86	4.77	3.34–6.20	Yes	GEL
Uranium – total	Water	mg/L	0.226	0.234	0.164–0.304	Yes	GEL
Vanadium	Water	mg/L	5.54	6.02	4.21–7.83	Yes	GEL
Zinc	Water	mg/L	6.38	7.15	5.01–9.30	Yes	GEL
MAPEP – 11 – MaS25, Soil – Inorganic							
Antimony	Soil	mg/kg	122	137	96–178	Yes	GEL
Arsenic	Soil	mg/kg	103	108	76–140	Yes	GEL
Barium	Soil	mg/kg	645	690	483–897	Yes	GEL
Beryllium	Soil	mg/kg	26.2	26.2	18.3–34.1	Yes	GEL
Cadmium	Soil	mg/kg	18.2	19.0	13.3–24.7	Yes	GEL
Chromium	Soil	mg/kg	125	130	91–169	Yes	GEL
Cobalt	Soil	mg/kg	155	162	113–211	Yes	GEL
Copper	Soil	mg/kg	94.6	93.6	65.5–121.7	Yes	GEL
Lead	Soil	mg/kg	90.4	94.5	66.2–122.9	Yes	GEL
Mercury	Soil	mg/kg	0.147	0.148	0.104–0.192	Yes	GEL
Nickel	Soil	mg/kg	170	179	125–233	Yes	GEL
Selenium	Soil	mg/kg	14.7	16.1	11.3–20.9	Yes	GEL
Silver	Soil	mg/kg	39.0	41.7	29.2–54.2	Yes	GEL
Thallium	Soil	mg/kg	171	182	127–237	Yes	GEL
Uranium – total	Soil	mg/kg	22.76	22.2	15.5–28.9	Yes	GEL
Vanadium	Soil	mg/kg	209	220	154–286	Yes	GEL
Zinc	Soil	mg/kg	695	757	530–984	Yes	GEL

GEL - GEL Laboratories, LLC
[a] MAPEP monitors performance and requests corrective action as required.
[b] "Yes" - Result acceptable; "W" - Result acceptable with warning 20%<Bias<30%; "No" - Result not acceptable.
[c] Although no actual value or acceptable range was provided, the results were assessed by MAPEP as acceptable.
[d] Analyte was not evaluated by MAPEP.

TABLE G-2 *(continued)*
Crosscheck Sample Comparisons From the DOE Mixed Analyte Performance Evaluation Program (MAPEP)[a]; Study 25, September 2011

Analyte	*Matrix*	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range*	*Accept?* [b]	*Analyzed by:*
MAPEP – 11 – MaS25, Soil – Radiological							
Am-241	Soil	Bq/kg	0.31	0.259	[c]	Yes	GEL
Cs-137	Soil	Bq/kg	990.5	979	685–1,273	Yes	GEL
Co-60	Soil	Bq/kg	665.5	664	451–837	Yes	GEL
Pu-238	Soil	Bq/kg	90.9	93.6	65.5–121.7	Yes	GEL
Pu-239/240	Soil	Bq/kg	76.6	77.4	54.2–100.6	Yes	GEL
K-40	Soil	Bq/kg	692	625	438–813	Yes	GEL
Sr-90	Soil	Bq/kg	333.3	320	224–416	Yes	GEL
Tc-99	Soil	Bq/kg	166	182	127–237	Yes	GEL
U-233/234	Soil	Bq/kg	273.67	263	184–342	Yes	GEL
U-238	Soil	Bq/kg	287.33	274	192–356	Yes	GEL
MAPEP – 11 – RdV25, Vegetation – Radiological							
Am-241	Veg	Bq/sample	0.205	0.222	0.155–0.289	Yes	GEL
Cs-137	Veg	Bq/sample	4.720	4.71	3.30–6.12	Yes	GEL
Co-60	Veg	Bq/sample	3.480	3.38	2.37–4.39	Yes	GEL
Pu-238	Veg	Bq/sample	0.111	0.124	0.087–0.161	Yes	GEL
Pu-239/240	Veg	Bq/sample	0.0031	0.0007	[c]	Yes	GEL
Sr-90	Veg	Bq/sample	1.380	1.26	0.88–1.64	Yes	GEL
U-233/234	Veg	Bq/sample	0.352	0.357	0.250–0.464	Yes	GEL
U-238	Veg	Bq/sample	0.337	0.370	0.259–0.481	Yes	GEL
MAPEP – 11 – XaW25, Water – Radiological							
I-129	Water	Bq/L	8.723	9.5	6.7–12.4	Yes	GEL

GEL - GEL Laboratories, LLC
[a] MAPEP monitors performance and requests corrective action as required.
[b] "Yes" - Result acceptable; "W" - Result acceptable with warning 20%<Bias<30%; "No" - Result not acceptable.
[c] Although no actual value or acceptable range was provided, the results were assessed by MAPEP as acceptable.
[d] Not detected, reported as a statistically zero result.

TABLE G-3

Comparisons of Results From Crosscheck Samples Analyzed for Water Quality Parameters as Part of the EPA's 2011 Discharge Monitoring Report - Quality Assurance (DMR-QA) Study 31 (2011) for the National Pollutant Discharge Elimination System (NPDES)

Analyte	*Units*	*Reported Value*	*Reference Value*	*Acceptance Range* [a]	*Accept?* [b]	*Analyzed by:*
Aluminum	µg/L	2,950	2,890	2,390–3,360	Yes	TestAmerica
Ammonia (as N)	mg/L	9.36	9.68	7.16–12.1	Yes	TestAmerica
Antimony	µg/L	259	265	179–322	Yes	TestAmerica
Arsenic	µg/L	539	547	459–641	Yes	TestAmerica
Barium	µg/L	565	546	473–615	Yes	TestAmerica
Biochemical oxygen demand	mg/L	72.1	66.7	33.6–99.8	Yes	TestAmerica
Cadmium	µg/L	495	501	427–569	Yes	TestAmerica
Chlorine (total residual)	µg/L	200	217	157–277	Yes	WWTF
Chromium (total)	µg/L	756	756	659–855	Yes	TestAmerica
Chromium (hexavalent)	µg/L	809	753	616–885	Yes	TestAmerica
Cobalt	µg/L	418	432	379–485	Yes	TestAmerica
Copper	µg/L	369	366	330–403	Yes	TestAmerica
Cyanide, total	mg/L	0.616	0.546	0.326–0.769	Yes	TestAmerica
Iron	µg/L	681	680	599–771	Yes	TestAmerica
Lead	µg/L	1,290	1,300	1,150–1,460	Yes	TestAmerica
Manganese	µg/L	3,030	2,890	2,600–3,220	Yes	TestAmerica
Mercury, 1631E	µg/L	5.83	6.29	3.88–8.61	Yes	GEL
Nickel	µg/L	974	984	885–1,100	Yes	TestAmerica
Nitrate (as N)	mg/L	7.79	7.66	5.96–9.25	Yes	TestAmerica
Nitrite (as N)	mg/L	0.879	0.848	0.670–1.02	Yes	TestAmerica
Oil & Grease (Gravimetric)	mg/L	83.5	85.0	59.4–99.6	Yes	TestAmerica
pH	SU	7.62	7.65	7.45–7.85	Yes	ELAB
Phosphorus (total, as P)	mg/L	7.27	7.00	5.78–8.30	Yes	TestAmerica
Selenium	µg/L	1,490	1,480	1,180–1,710	Yes	TestAmerica
Silver	µg/L	384	385	330–441	Yes	TestAmerica
Sulfate	mg/L	55	51.2	41.9–59.1	Yes	TestAmerica
Settleable solids	mg/L	32	25.3	19.8–32.5	Yes	WWTF
Settleable solids	mL/L	16.5	16.7	12.6–21.7	Yes	TestAmerica
Suspended solids (total)	mg/L	35.6	40.4	30.3–47.0	Yes	TestAmerica
Total dissolved solids	mg/L	394	380	289–471	Yes	ELAB
Total dissolved solids	mg/L	502	463	354–571	Yes	TestAmerica
Total Kjeldahl nitrogen (as N)	mg/L	12.3	12.0	7.97–15.6	Yes	TestAmerica
Vanadium	µg/L	602	643	563–719	Yes	TestAmerica
Zinc	µg/L	684	702	603–808	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; "W" - Result acceptable with warning 20%<Bias<30%; "No" - Result not acceptable.

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.

42 USC 501 note.

(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:

(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-

Publication 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.

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(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 2(a).

42 USC 2014.

(8) The term "Center" means the Western New York Service Center in West Valley, New York.

Approved October 1, 1980.