INTRODUCTION

The West Valley Demonstration Project (WVDP) site is located about 50 kilometers (30 mi) south of Buffalo, New York (Fig. 1-1). The Project occupies about 90 hectares (200 acres) within the 1,354-hectare (3,345-acre) Western New York Nuclear Service Center (WNYNSC). The Project site includes a security-fenced area of about 63 hectares (156 acres) that contains the plant facilities.

Activities at the West Valley Demonstration Project are directed toward treatment, solidification, and transport of the high-level waste, leading toward decontaminating and decommissioning the West Valley Demonstration Project and the facilities. This report on the environmental monitoring program at the WVDP provides information about the radioactive and chemical constituents on and around the WNYNSC and the effect, if any, of Project activities on the environment.

The geography, economy, climate, biology, and geology of the region are principal factors in assessing possible effects of site activities on the surrounding population and environment and are an integral consideration in the design and structure of the environmental monitoring program.

Location

The WVDP is located on New York State's western plateau at an average elevation of 400 meters (1,300 ft). The communities of West Valley, Riceville, Ashford Hollow, and the village of Springville are located within 8 kilometers (5 mi) of the plant. Several roads and a railway pass through the WNYNSC, but hunting, fishing, public access, and human habitation is not permitted on the WNYNSC.

Socioeconomics

The WNYNSC lies within the town of Ashford in Cattaraugus County. The nearby population, approximately 9,200 residents within 10 kilometers (6.2 mi) of the Project, relies primarily on an agricultural economy. No major industries are located within this area.

The land immediately adjacent to the WNYNSC is used primarily for agriculture and arboriculture. Cattaraugus Creek is used locally for swimming, canoeing, and fishing. Although some irrigation water for nearby golf course greens and tree farms is taken from Cattaraugus Creek, no public water supply is drawn from the creek downstream of the WNYNSC.

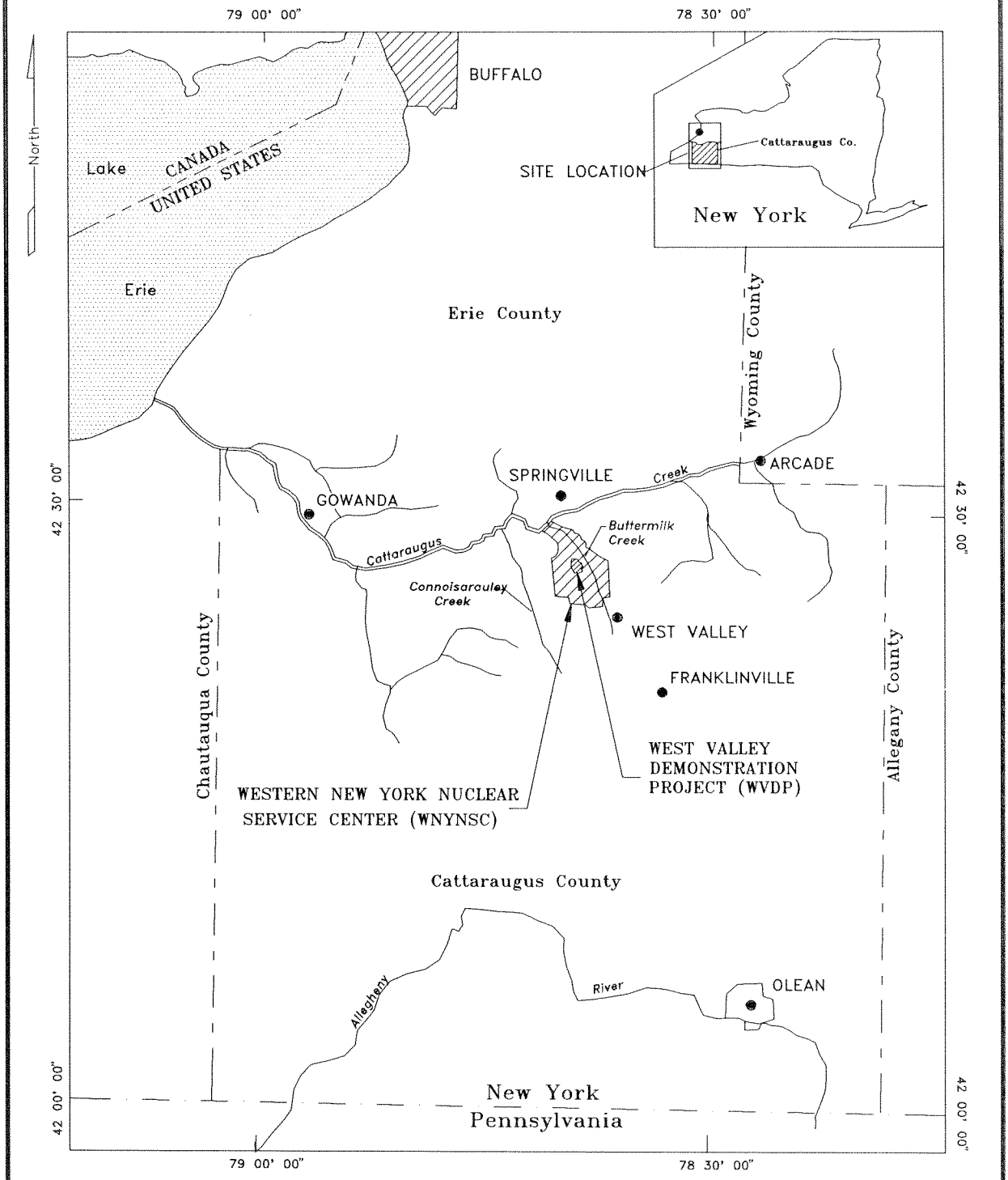

Figure 1-1
Location of the
Western New York Nuclear Service Center

Climate

Although there are recorded extremes of 37°C (98.6°F) and - 42°C (- 43.6°F) in the region, the Western New York climate is moderate, with an average annual temperature of 7.2°C (45.0°F). Rainfall is relatively high, averaging about 104 centimeters (41 in) per year. The 122 centimeters (48 in) of precipitation in 1992 marked a relatively wet year — 17% above the area average. Precipitation is evenly distributed throughout the year and is markedly influenced by Lake Erie to the west and, to a lesser extent, by Lake Ontario to the north. Regional winds were generally from the west and south at about 4 m/sec (9 mph) during 1992.

Biology

The Western New York Nuclear Service Center 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 birds, reptiles, and small mammals. No endangered species on the federal endangered species list are known to be present on the WNYNSC.

Geology and Groundwater Hydrology

The site is underlain by up to five geologic units with varying degrees of permeability. These unconsolidated deposits occupy an older valley that is cut into the sedimentary bedrock underlying the entire region. The bedrock is exposed in the upper drainage channels on the hillsides.

The soil is mainly silty glacial till consisting of unconsolidated rock fragments, pebbles, sand, and clays. The uppermost till unit is the Lavery, a very dense, compact, gray, silty clay. Below the Lavery till is a more granular zone, the recessional unit, sometimes referred to as the lacustrine unit, which is made up of silts, sands, and, in some places, gravels that overlie a layered clay. The recessional unit, in turn, is underlain by an older glacial till, the Kent till, which is quite similar to the Lavery. On certain parts of the site, particularly the north plateau, coarse-grained alluvial sand and gravels overlie the Lavery till.

There are three water-bearing units in the site area. The topmost unit, an unconfined unit, is present in the upper 5 meters (16 ft) of weathered Lavery till on the south plateau and in the upper 1.5 to 12 meters (5 to 40 ft) of the alluvial gravels on the north plateau. High ground to the west of the WVDP and Buttermilk Creek valley to the east each intersect this unit. (In the unweathered Lavery till several shallow, isolated, water-transmitting strata also occur at various other locations within the site boundary but do not appear to be continuous enough to provide avenues for the movement of groundwater from on-site to off-site areas.)

The recessional sequence, which underlies the Lavery till beneath most of the site, is another significant water-bearing unit.

The uppermost weathered bedrock is a third water-bearing unit that consists of fractured and decomposed shale and rubble ranging in thickness up to 3 meters (10 ft) along the top of the solid, unweathered bedrock.

The groundwater flow patterns are related to the recharge and downgradient movement for these aquifers. Groundwater in the surficial unit tends to move east or northeast, away from Rock Springs Road. (See Fig. 2-1.) Most of this groundwater empties into Frank's Creek. Groundwater recharging the recessional unit from bedrock and the Lavery till flows to the northeast and discharges to Buttermilk Creek. Groundwater from the lower aquifer tends to move east toward the lowest point of the valley, about 300 to 350 meters (980 to 1,148 ft) west of Buttermilk Creek, and may emerge to flow north-northwest as surface water. All surface drainage from the WNYNSC is to Buttermilk Creek, which flows into Cattaraugus Creek and ultimately into Lake Erie.

Information in this Report

Individual chapters in this report include information on compliance with regulations, general information about the monitoring program and significant activities in 1992, summaries of the results of radiological and nonradiological monitoring, and calculations of doses to the population. Where appropriate, graphs and tables are included to illustrate important trends and concepts. The bulk of the data, however, is furnished in the appendices following the text.

Appendix A summarizes the 1992 environmental monitoring program at both on-site and off-site locations. Samples are designated by a coded abbreviation indicating sample type and location. (A complete listing of the codes is found in the index to *Appendix A*.) *Appendix A* lists the kinds of samples taken, the frequency of collection, the parameters analyzed, the location of the sample points, and a brief rationale for the monitoring activities conducted at each location.

Appendix B provides a partial list of the radiation protection standards set by the Department of Energy. It also lists federal and state regulations that affect the WVDP and environmental permits held by the site.

Appendix C summarizes analytical data from air, water, sediment, and biological samples (meat, milk, food crops, and fish) as well as direct radiation measurements and meteorological monitoring.

Appendix D provides data from the comparison of identically prepared samples (crosscheck analyses) by both the WVDP and independent laboratories. Radiological concentrations in crosscheck samples of air, water, soil, and vegetation are reported here as are chemical concentrations from water crosscheck samples.

Appendix E summarizes the data collected from on-site groundwater monitoring. Tables and graphs report concentrations at various locations for parameters such as gross alpha and gross beta, tritium, cesium isotopes, and dissolved metals.

Environmental Monitoring Program

The environmental monitoring program for the West Valley Demonstration Project began in February 1982. The program has been developed to detect changes in the environment resulting from Project activities and to assess the effect of any such changes on the human population and the environment surrounding the site.

The monitoring network and sample collection schedule have been structured to accommodate specific biological and physical characteristics of the area. Among the several factors considered in designing the environmental monitoring program were the kinds of wastes and other byproducts produced by the processing of high-level waste; possible routes that radiological and nonradiological contaminants could follow into the environment; geologic, hydrologic, and meteorological site conditions; quality assurance standards for monitoring and sampling procedures and analyses; and the limits and standards set by federal and state governments and agencies. As new processes and systems become part of the program, additional monitoring is provided.

Monitoring and Sampling

The environmental monitoring program consists of on-site effluent monitoring and on-site and off-site environmental surveillance in which samples are measured for both radiological and nonradiological constituents. It includes both the continuous recording of data and the collecting of soil, sediment, water, air, and other samples at various times.

Monitoring and sampling of environmental media provide two ways of assessing the effects of on-site radioactive waste processing. Monitoring gen-

erally is a continuous process of measurement that allows rapid detection of any potential effects on the environment from site activities. Sampling is slower than monitoring in indicating results because it must be followed by laboratory analysis of the collected material, but it allows much smaller quantities of radioactivity to be detected through the analysis.

Exposure Pathways Monitored at the West Valley Demonstration Project

The major pathways for potential movement of possible contaminants away from the site are by surface water drainage and airborne transport. For this reason the environmental monitoring program emphasizes the collection of air and surface water samples. Samples are collected on-site from locations such as plant ventilation stacks as well as various water effluent points and surface water drainage locations. Samples of air, water, soils, and biota from the environment surrounding the site would indicate any radioactivity that might reach the public from site releases.

Water and Sediment Pathways

Effluent water is collected regularly or, in the case of lagoon 3, when the lagoon water is released, and the samples are analyzed for various parameters, including gross alpha and gross beta, tritium, pH, conductivity, strontium-90, and gamma isotopes. Additional analyses of composite samples determine metals content, biochemical oxygen demand, organic chemicals, and specific isotopic radioactivity.

On-site groundwater and surface water samples are collected regularly and analyzed, at a minimum, for gross alpha and beta, tritium, and pH. Selected samples are analyzed for conductivity, chlorides, phenols, heavy metals, volatile organic compounds, and other parameters. Potable water on the site is analyzed monthly for radioactivity and annually for chemical constituents. Residential drinking water wells located near the site are sampled annually and analyzed for gross alpha and gross beta, tritium, gamma isotopes, pH, and conductivity.

Permits and Regulations

Data gathering, analysis, and reporting to meet stringent federal and state requirements and standards are an integral part of the monitoring program. The current program meets the requirements of DOE Orders 5400.1, 5400.5, and DOE Regulatory Guide DOE/EH-0173T.

The West Valley Demonstration Project also participates in the State Pollutant Discharge Elimination System (SPDES) as required by the New York State Department of Environmental Conservation (NYSDEC), which regulates discharges of liquid effluents containing nonradiological pollutants. The SPDES permit identifies the outfalls where liquid effluents are released to site drainage and specifies the sampling and analytical requirements for each outfall.

In addition, the site operates under state-issued air discharge permits for nonradiological plant effluents. Radiological air discharges must also comply with the National Emissions Standards for Hazardous Air Pollutants (NESHAPs).

For more information see the ENVIRONMENTAL COMPLIANCE SUMMARY: CALENDAR YEAR 1992. *Environmental permits are listed in* APPENDIX B.

Off-site surface waters, primarily from Cattaraugus Creek and Buttermilk Creek, are sampled both upstream of the Project for background

radioactivity and downstream to measure possible Project contributions. Sediments deposited downstream of the facility and at upstream background locations are collected semiannually and analyzed for gross alpha, gross beta, and specific radionuclides. (See *Appendix C-1* for water and sediment data summaries.)

Air Pathways

Effluent air emissions are continuously monitored for alpha and beta activity. Remote alarms indicate any unusual rise in radioactivity. Air particulate filters, which are retrieved and analyzed weekly for gross radioactivity, are also composited quarterly and analyzed for strontium-90 and specific gamma- and alpha-emitting nuclides.

Iodine-129 and tritium also are measured in effluent ventilation air. At two locations silica gel-filled columns are used to extract water vapor that is then distilled from the desiccant and analyzed for tritium. Four samplers contain activated charcoal adsorbent that is analyzed for radioiodine. The silica gel columns are analyzed weekly; the charcoal is collected weekly and composited for quarterly analysis.

Off-site sampling locations include those considered most representative of background conditions and those most likely to be downwind of airborne releases. Among the criteria used to position off-site air samplers are prevailing wind direction, land usage, and the location of population centers.

Air is continuously sampled at nine locations. Background samplers are located in Great Valley and Dunkirk, New York. Nearby community samplers are in Springville and West Valley, New York. (See Figure A-9 in *Appendix A*.) Five samplers are located on the perimeter of the WNYNSC. (See Fig. 2-2 in Chapter 2, *Environmental Monitoring*.) These samples are analyzed for parameters similar to the effluent air samples. (See *Appendix C-2* for air monitoring data summaries.) An additional perimeter air sampler was sited at the bulk storage warehouse on Buttermilk Road east of the site and began operation in December 1992.

Atmospheric Fallout

An important contributor to environmental radioactivity is atmospheric fallout. Sources of fallout materials include earlier atmospheric testing of atomic explosives and residual radioactivity from the Chernobyl nuclear power plant accident. Four site perimeter locations and one on-site location currently are sampled for fallout using pot-type samplers that are collected every month. Long-term fallout is determined by analyzing soil collected annually at each of the nine perimeter and off-site air samplers. (See *Appendix C-2* for fallout data summaries and *Appendix C-1* for soil data summaries.)

Food Pathways

Another potentially significant pathway is through domesticated farm animals and produce raised near the WVDP and through game animals and fish that include the WVDP in their range. Appropriate animal and fish samples are gathered and analyzed for radionuclide content in order to reveal any long-term trends. Fish are collected at several locations along Cattaraugus Creek and its tributaries at various distances downstream from the WVDP. Beef, milk, hay, and produce are collected at nearby farms and at selected locations well away from any possible WVDP influence. (See *Appendix C-3* for biological data summaries.)

Direct Radiation Measurement

Direct penetrating radiation is measured using thermoluminescent dosimeters (TLDs) located on- and off-site. Measurement points within the site are placed near selected waste management units and around the inner security fence. Other measurement locations are situated around the site perimeter and access road and at background locations remote from the WVDP. Forty-one measurement points were used in 1992. The TLDs are retrieved quarterly and read out on-site to obtain

the integrated gamma exposure. (See *Appendix C-4* for direct radiation data summaries.)

Meteorological Monitoring

Meteorological data are continuously gathered and recorded on-site. Wind speed and direction, barometric changes, dew point, temperature, and rainfall are all measured. Such data are valuable in evaluating long-term trends and in developing dispersion models. In the event of an emergency, immediate access to the most recent data is indispensable for predicting the path and concentration of any materials that become airborne. (See *Appendix C-6* for meteorological data summaries.)

Quality Assurance and Control

The work performed by and through the on-site Environmental Laboratory is regularly reviewed by several agencies for accuracy and compliance with applicable regulations. Audits of the laboratory routinely focus on proper record keeping and reporting, timely calibration of equipment, training of personnel, adherence to accepted procedures, and general laboratory safety.

The Environmental Laboratory also participates in several quality assurance crosscheck programs administered by federal or state agencies. (See *Appendix D* for a summary of crosscheck performance.) Outside laboratories contracted to perform analyses for the WVDP also are regularly subjected to performance audits.

Environmental monitoring management continued to strengthen its formal self-assessment program, developing and implementing new strategies and procedures for ensuring high quality data. Experienced senior scientists and specialists in varying disciplines follow an annual schedule of quarterly internal appraisals, produce a formal report with recommended corrective actions, and track the planned actions for their implementation.