ENVIRONMENTAL MONITORING

Pathway Monitoring

The effluent and environmental monitoring program provides data on surface waters, soils, sediments, food and produce, and on the effluent air and liquids that could provide pathways for the movement of radionuclides or hazardous substances from the WVDP to the public. Both radiological and nonradiological parameters are monitored in order to ascertain the effect of Project activities.

Sediments are sampled upstream and downstream of the West Valley Demonstration Project (WVDP). The food pathway is monitored by collecting samples of beef, hay, milk, and produce at both near-site and remote locations, samples of fish upstream and downstream of the site, and venison samples from the on-site deer herd and from background locations. Direct radiation on-site, at the perimeter of the site, and at background locations is also monitored to provide additional data.

The primary focus of the monitoring program, however, is on air and water pathways, as these are the major means of transport of radionuclides from the site.

The radionuclides present at the WVDP site are residues from the reprocessing of commercial nuclear fuel during the 1960s and early 1970s. A very small fraction of these radionuclides is released off-site annually through ventilation systems and liquid discharges and makes a negligible contribution to the radiation dose to the surrounding population through a variety of exposure pathways. (See Chapter 4, Table 4-2.)

Air and Water Pathways

Air and liquid effluents are monitored on-site by collecting samples at locations where radioactivity or other regulated substances are released or might be released. These include plant ventilation stacks and various water effluent outfalls.

Surface water samples are collected from the tributaries of Cattaraugus Creek that flow through the Western New York Nuclear Service Center (WNYNSC) and from drainage channels within the Project site.

Both air and water samples are collected at site perimeter locations where the highest concentrations of transported radionuclides might be expected. Samples are also collected at remote locations to provide background concentration data.

Sampling Codes

The complete environmental monitoring schedule is detailed in *Appendix A* (pp. A-i through A-55). This schedule provides information on monitoring and reporting requirements and the types and extent of sampling and monitoring at each location. An explanation of the codes that identify the sample medium and the specific sampling or monitoring location is also found in *Appendix A* (p. A-iii). For example, a sample location code such as AFGRVAL indicates an air sample (A), off-site (F), at the Great Valley (GRVAL) sampling station.

These codes are used throughout this report for ease of reference and to be consistent with the data reported in the appendices.

Air Sampler Location and Operation

Air samplers are located at points remote from the WVDP, at the perimeter of the site, and on the site itself. Figure 2-1 shows the locations of the on-site air effluent monitors and samplers; Figure 2-2 (p. 2-4) and Figure A-9 in *Appendix A* (p. A-55) show the location of the perimeter and remote air samplers.

Air samples are collected by drawing air through a very fine filter with a vacuum pump. The total volume of air drawn through the sampler is measured and recorded. The filter traps particles of dust that are then tested in the laboratory for radioactivity. At the Rock Springs Road, Great Valley, and New York State-licensed disposal area (SDA) locations samples are also collected for iodine-129 and tritium analyses. (A more detailed description of the air sampling program follows below.)

Water Sampler Location and Operation

Automatic samplers collect surface water at points along drainage channels within the WNYNSC that are most likely to show any radioactivity released from the site and at a background station upstream of the site. (Grab samples are collected at several other surface water locations both on- and off-site.) Figure 2-3 (p. 2-5) shows the location of the on-site surface water monitoring points. (On-site automatic samplers operate at locations WNSP006, WNNDADR, WNSW74A, and WNSWAMP.) Figure 2-4 (p. 2-6) shows the location of the off-site automatic surface water monitoring points. (Off-site locations are WFBCTCB, WFFELBR, and the background location, WFBCBKG.)

Water samplers draw water through a tube extending to an intake below the stream surface. An electronically controlled battery-powered pump first blows air through the sample line to clear any debris. The pump then reverses to collect a sample, reverses again to clear the line, then resets itself. The cycle is repeated after a preset interval. The pump and sample container are housed in an insulated and heated shed to allow sampling throughout the year. (A more detailed description of the water sampling program follows below.)

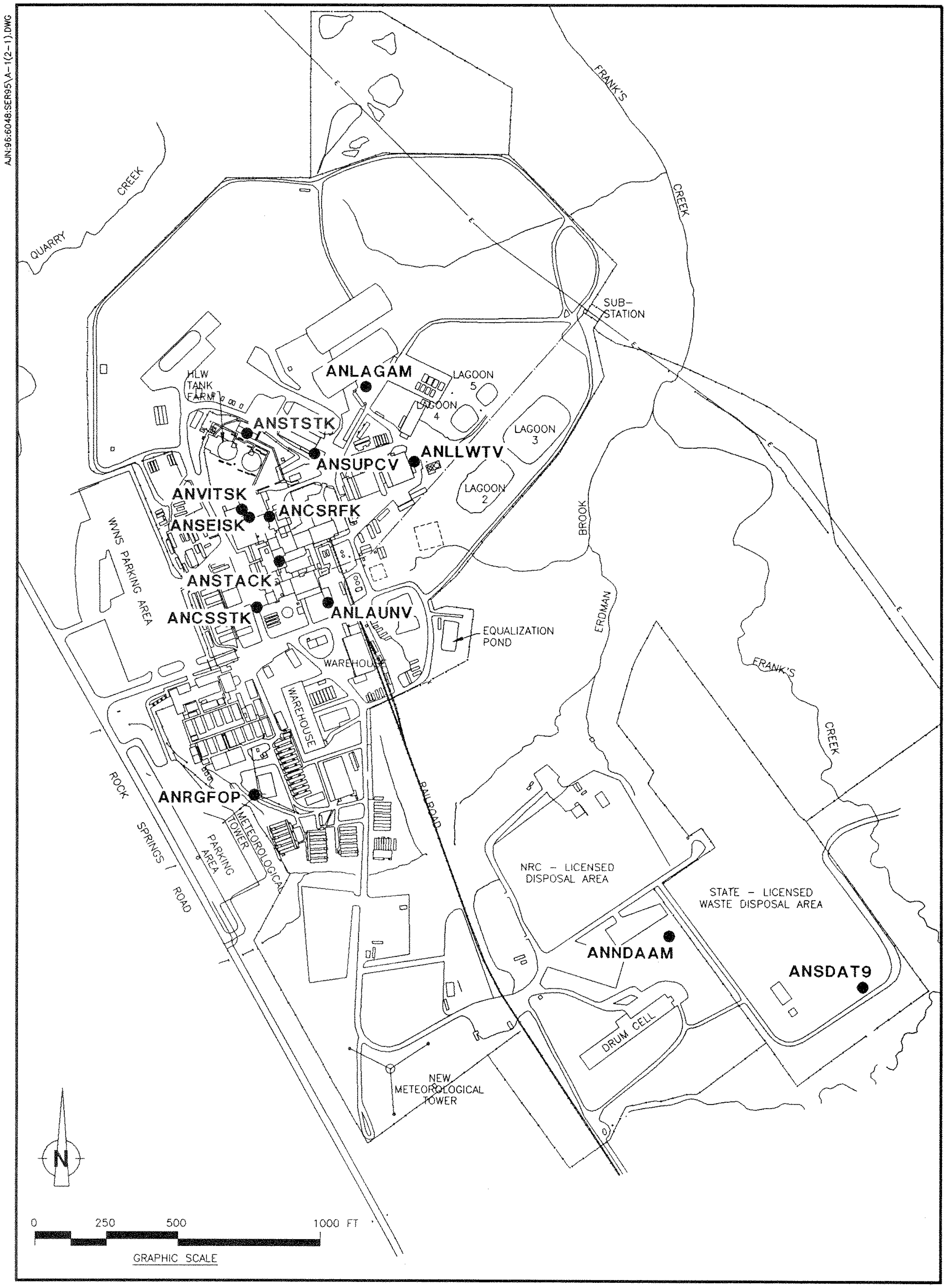

Figure 2-1. On-site Air Monitoring and Sampling Points.

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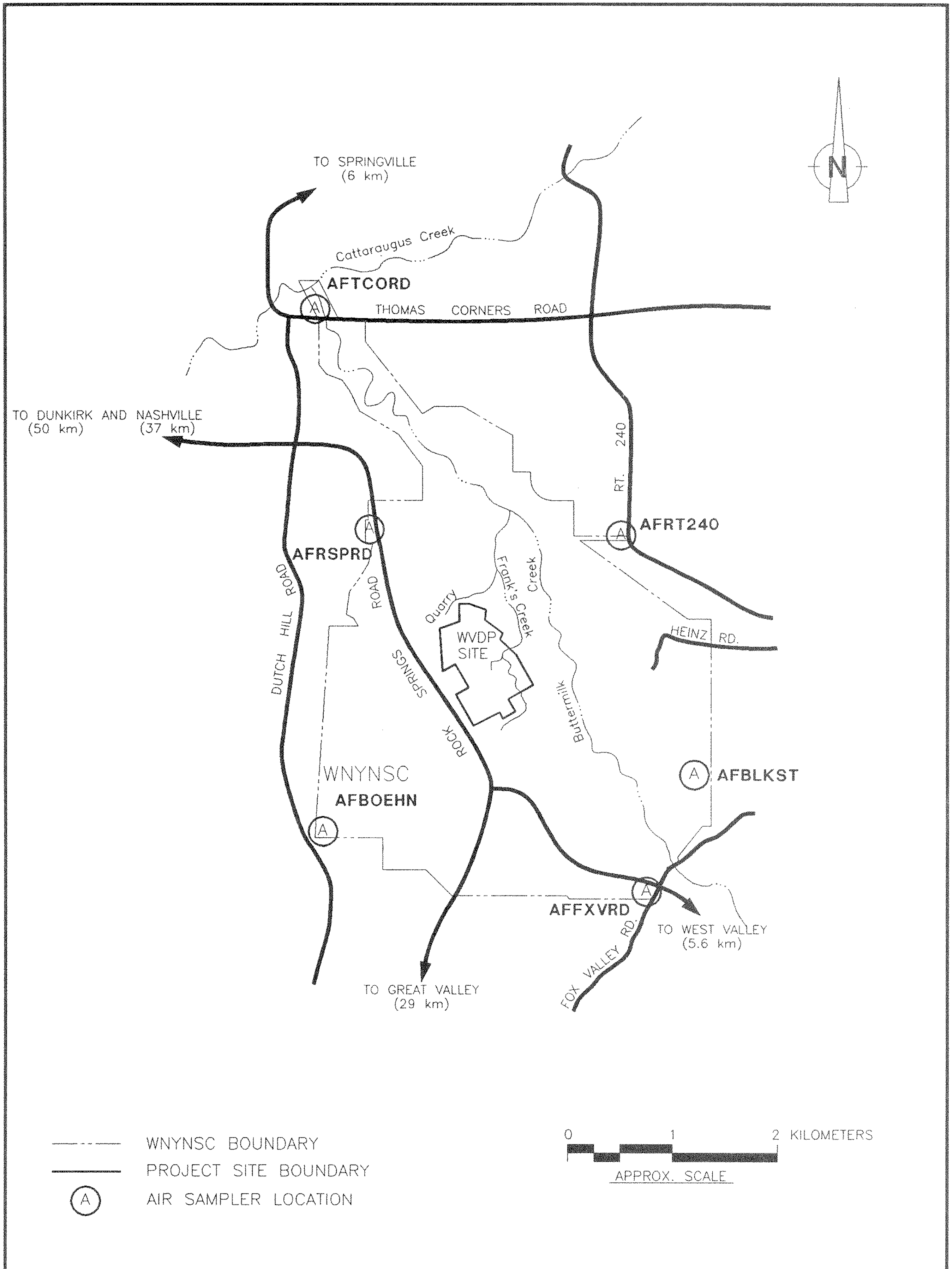


Figure 2-2. Location of Perimeter Air Samplers.

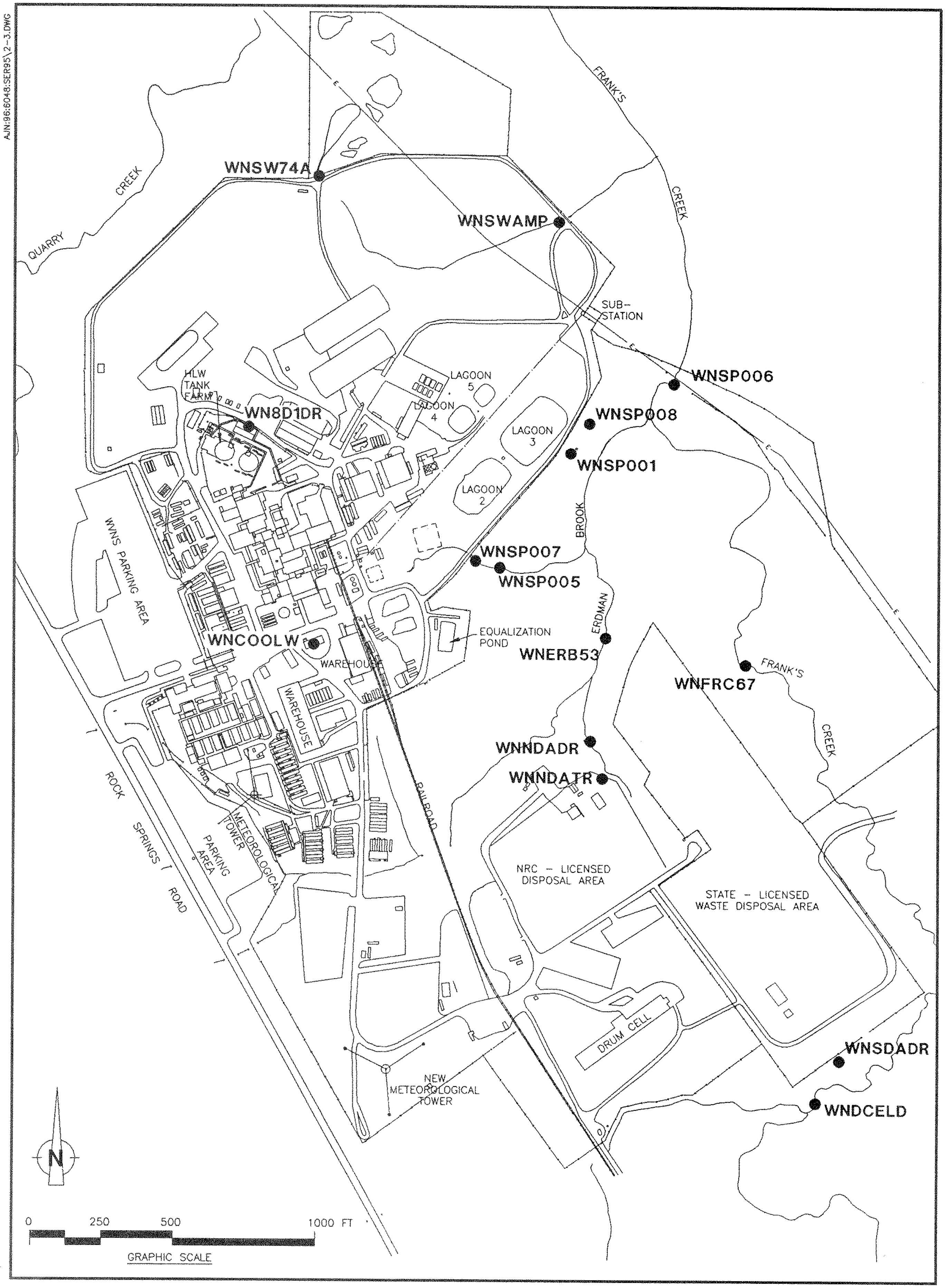


Figure 2-3. Sampling Locations for On-site Surface Water.

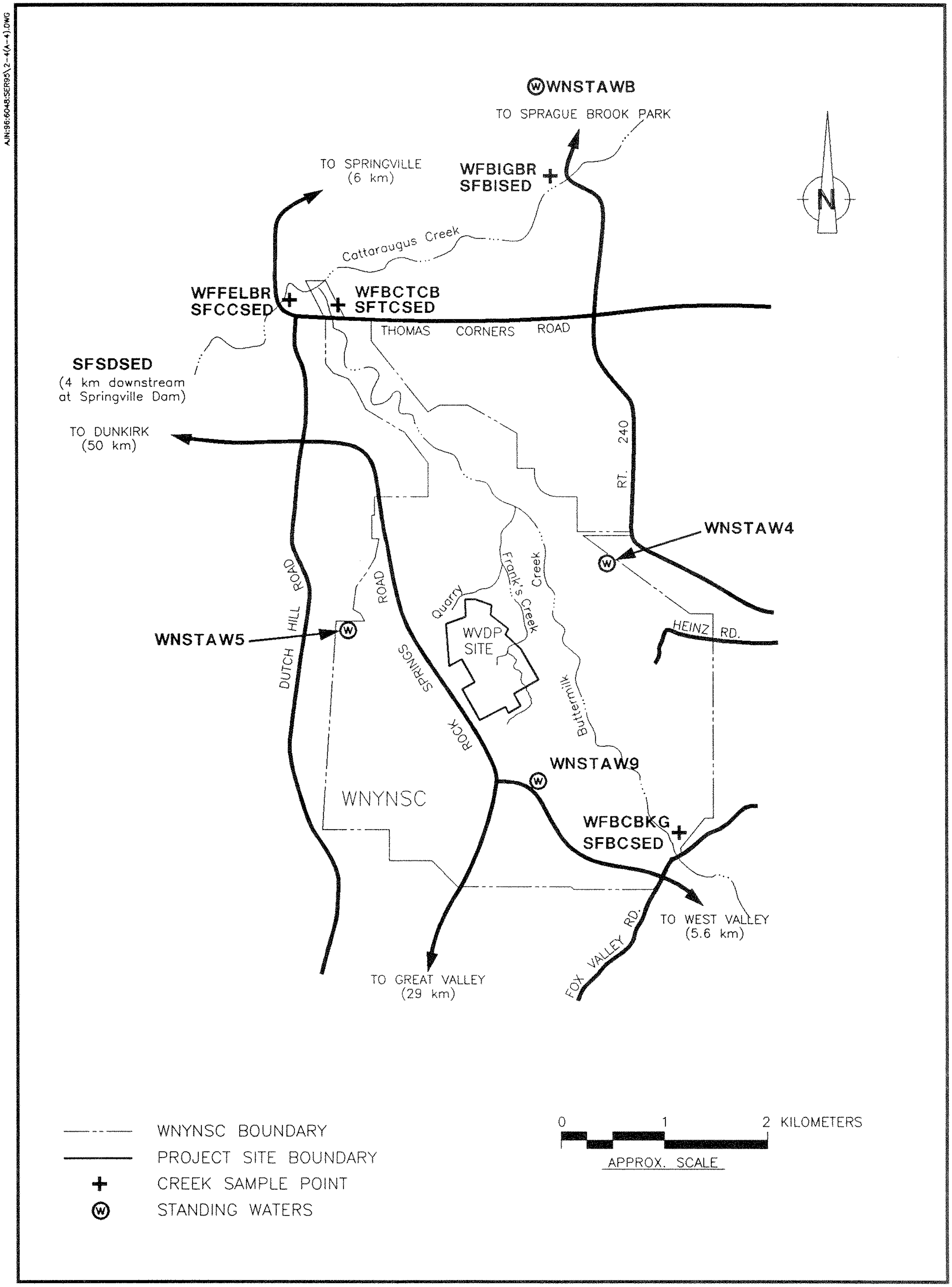


Figure 2-4. Location of Off-site Surface Water and Sediment Samples.

Radiological Monitoring

Surface Water and Sediment Monitoring

On-site Surface Water Sampling

A map of on-site surface water sampling locations is found on Figure 2-3 (p. 2-5).

Low-level Waste Treatment Facility Sampling Location

The largest single source of radioactivity released to surface waters from the Project is the discharge from the low-level waste treatment facility through the lagoon 3 weir (WNSP001 on Fig. 2-3 [p. 2-5]) into Erdman Brook, a tributary of Frank's Creek. There were five batch releases totaling about 38.8 million liters (10.3 million gal) in 1995. In addition to composite samples collected near the beginning and end of each discharge, a total of fifty-two effluent grab samples, one for each day of discharge, were collected and analyzed.

The total amounts of radioactivity from specific radionuclides in the lagoon 3 effluent are listed in *Appendix C-1*, Table C-1.1 (p. C1-3). The observed annual average concentration of each radionuclide released is divided by its corresponding Department of Energy derived concentration guide (DCG) in order to determine what percentage of the DCG was released. (DOE standards and DCGs for radionuclides of interest at the WVDP are found in *Appendix B* [p. B-3].) As a DOE policy, the sum of the percentages calculated for all radionuclides released must not exceed 100%. In 1995 the annual average isotopic concentrations from the lagoon 3 effluent discharge weir combined to be less than 43% of the DCGs, compared to about 44% in 1994. (See Table C-1.2 [p. C1-4].)

In the course of preparing existing facilities to support vitrification, cleaning water was processed in the low-level waste treatment facility (LLWTF). Variations in waste stream constituents noted within the last few years could have contributed to a shift in final liquid effluent isotopic ratios. Possibly related to these waste stream transients, higher concentrations of strontium-90 and uranium-232 have been observed in the lagoon 3 effluent from 1993 through 1995. Improved LLWTF operation has reduced cesium-137 concentrations in the final effluent since 1992.

Frank's Creek Sampling Location

A water sampling station (WNSP006) is located on Frank's Creek where Project site drainage leaves the security-fenced area, more than 4.0 kilometers (2.5 mi.) from the nearest public access point. (See Fig. 2-3 [p. 2-5].) This sampler collects a 50-mL aliquot (a small volume of water) every half-hour. Samples are retrieved weekly and composited both monthly and quarterly. (Data are found in Table C-1.4 [p. C1-6].) Weekly samples are analyzed for tritium and gross alpha and beta radioactivity as well as pH and conductivity. The monthly composite is analyzed for strontium-90 and gamma-emitting isotopes. (See *Glossary*, "gamma isotopic.") A quarterly composite is analyzed for carbon-14, iodine-129, alpha-emitting radionuclides, and total uranium.

The most significant beta-emitting radionuclides at WNSP006 were cesium-137 at less than 2.01E-08 µCi/mL (0.74 Bq/L) and strontium-90 at 6.56E-08 µCi/mL (2.43 Bq/L) during the months of highest concentration. This corresponds to less than 0.67% of the DCG for cesium-137 and 6.56% of the DCG for strontium-90. The annual average concentration of cesium-137 at WNSP006 was less than 0.5% of the DCG, and the strontium-90 concentration was 2.5% of the strontium-90 DCG. Tritium, at an annual average of 3.29E-06 µCi/mL (1.22E+02 Bq/L), was 0.16% of the DCG value. Of the fifty-two samples collected and analyzed for gross alpha during 1995, twelve were above the detection limit. The annual average was less than 2.39E-09 µCi/mL (8.86E-02 Bq/L) gross alpha or less than 7.97% of the DCG for americium-241.

The nine-year trends of gross alpha, gross beta, and tritium concentrations at location WNSP006 are shown on Figure 2-5. The trend of baseline gross beta activity seems to be stable over time, with fluctuations related to treated WVDP liquid effluent discharges. A stable trend is also observed farther downstream at the Felton Bridge sampling location, the first point of public access to surface waters leaving the WVDP site.

North Swamp and Northeast Swamp Sampling Locations

The north and northeast swamp drainages on the site's north plateau are two major channels for surface water and emergent groundwater to collect. Samples from the north swamp drainage at location WNSW74A and from the northeast swamp drainage at sampling point WNSWAMP are collected from the automated sampler every week. (See Fig. 2-3 [p. 2-5].) Samples from both locations are analyzed weekly for gross alpha, gross beta, tritium, pH, and conductivity. Composites of weekly samples are also analyzed for a full range of specific radionuclides. Semiannual grab samples from these locations are analyzed for additional chemical parameters.

Results for samples collected at location WNSW74A, which monitors drainage to Quarry Creek from the northern end of the Project premises, are summarized in *Appendix C-1*, Table C-1.8 (p. C1-9). Gross beta concentrations at this location are four to eight times higher than the average value observed at background location WFBCBKG but still are seventy times lower than the DCG for strontium-90. (See *Appendix B* [p. B-3].) Tritium at this location is below the detection limit. The highest monthly strontium-90 result at WNSW74A was less than 2.9% of its DCG.

Sampling point WNSWAMP also monitors surface water drainage from the site's north plateau. (See Tables 2-1 and 2-2 and *Appendix C-1*, Table C-1.7 [p.C1-8].) Waters from this drainage run

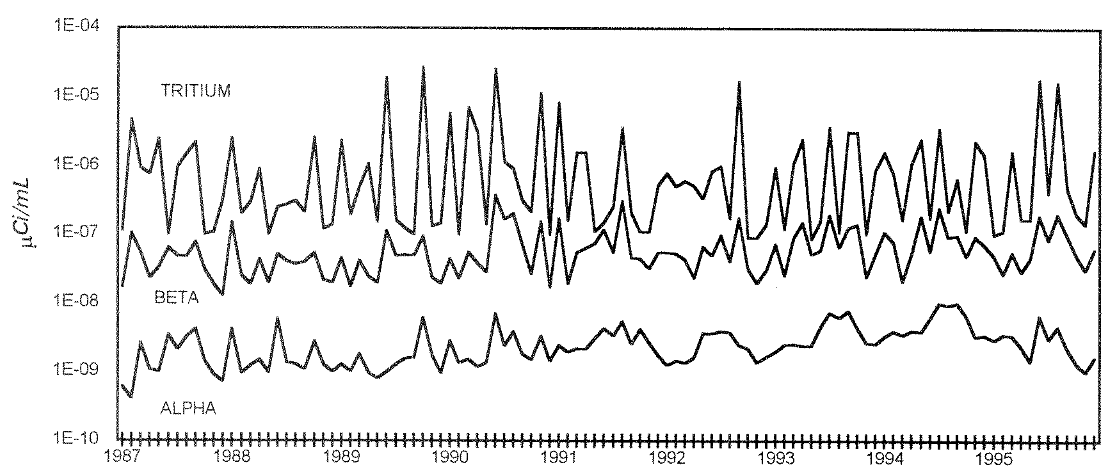


Figure 2-5. Nine-Year Trends of Gross Alpha, Gross Beta, and Tritium Concentrations at Sampling Location WNSP006

Table 2 - 1

1995 Gross Alpha Activity at Surface Water Sampling Locations

Location	Number of Samples	Range µCi/mL	Range Bq/L	Annual Average µCi/mL	Annual Average Bq/L
OFF-SITE					
WFBIGBR	12	<5.36E-10 — <3.18E-09	<1.98E-02 — <1.18E-01	0.11±1.40E-09	0.39±5.19E-02
WFBCBKG	12	<5.39E-10 — <1.46E-09	<1.99E-02 — <5.40E-02	4.24±9.62E-10	1.57±3.56E-02
WFBCTCB	12	<5.13E-10 — <1.66E-09	<1.90E-02 — <6.14E-02	0.57±1.04E-09	2.10±3.85E-02
WFFELBR	52	4.21E-10 — <3.64E-09	1.56E-02 — <1.35E-01	0.50±1.57E-09	1.85±5.80E-02
ON-SITE					
WNNDADR	12	<6.41E-10 — <5.00E-09	<2.37E-02 — <1.85E-01	0.54±2.67E-09	1.99±9.89E-02
WNSWAMP	52	<1.02E-09 — <9.80E-09	<3.77E-02 — <3.63E-01	2.92±4.25E-09	1.08±1.57E-01
WNSW74A	52	<6.44E-10 — 8.30E-09	<2.38E-02 — 3.07E-01	0.25±2.81E-09	0.09±1.04E-01
WNSP006	52	<4.73E-10 — 1.42E-08	<1.75E-02 — 5.25E-01	1.66±2.39E-09	6.16±8.86E-02

Table 2 - 2

1995 Gross Beta Activity at Surface Water Sampling Locations

Location	Number of Samples	Range µCi/mL	Range Bq/L	Annual Average µCi/mL	Annual Average Bq/L
OFF-SITE					
WFBIGBR	12	9.60E-10 — 4.75E-09	3.55E-02 — 1.76E-01	2.95±1.46E-09	1.09±0.54E-01
WFBCBKG	12	1.04E-09 — 5.27E-09	3.85E-02 — 1.95E-01	2.59±1.20E-09	9.57±4.44E-02
WFBCTCB	12	4.97E-09 — 1.73E-08	1.84E-01 — 6.40E-01	8.77±1.57E-09	3.24±0.58E-01
WFFELBR	52	1.16E-09 — 6.68E-09	4.29E-02 — 2.47E-01	3.15±1.48E-09	1.16±0.55E-01
ON-SITE					
WNNDADR	12	1.43E-07 — 2.97E-07	5.29E+00 — 1.10E+01	2.17±0.10E-07	8.01±0.35E+00
WNSWAMP	52	1.25E-06 — 4.96E-06	4.63E+01 — 1.84E+02	2.81±0.04E-06	1.04±0.01E+02
WNSW74A	52	9.46E-09 — 2.17E-08	3.50E-01 — 8.03E-01	1.42±0.32E-08	5.26±1.19E-01
WNSP006	52	1.74E-08 — 3.49E-07	6.44E-01 — 1.29E+01	7.47±0.56E-08	2.77±0.20E+00

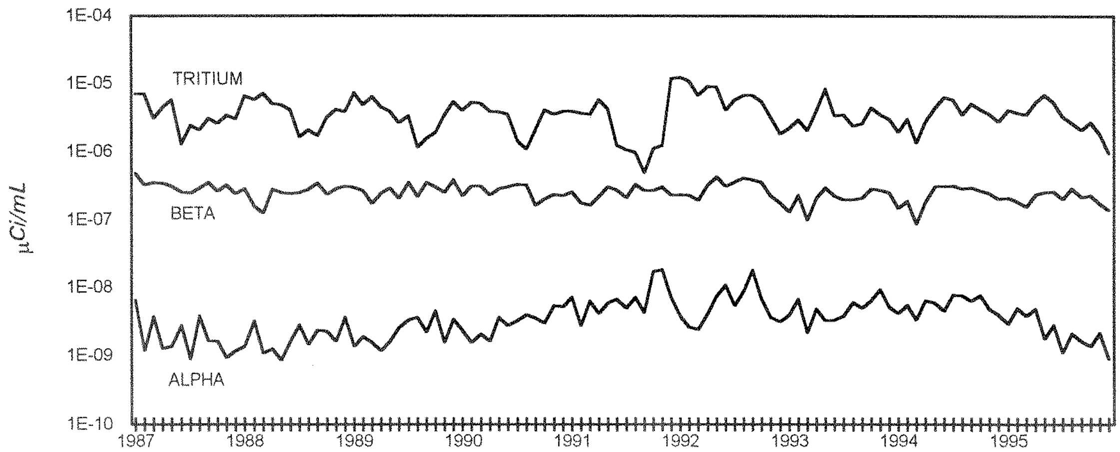


Figure 2-6. Nine-Year Trends of Gross Alpha, Gross Beta, and Tritium Concentrations at Sampling Location WNNDADR

into Frank's Creek downstream of location WNSP006. An upward trend in gross beta concentration from 1993 through 1995 at location WNSWAMP is discussed later in this chapter under **Special Monitoring** (p. 2-30). The average tritium concentration at this location in 1995 was 3.39E-07 μCi/mL, which is above that observed at the background location WFBCBKG but well below the 2E-03 μCi/mL DCG for tritium.

Other Surface Water Sampling Locations

Sampling point WNSP005, which monitors drainage from behind and to the east of the main plant, and WNFRC67, which monitors surface waters draining from the east side of the SDA, are both grab-sampled on a monthly basis. Samples are analyzed for pH, gross alpha, gross beta, and tritium.

Another sampling point, WN8D1DR, is at a storm sewer manhole access that originally collected surface and shallow groundwater flow from the high-level waste tank farm area. The access has since been valved off from the original high-level waste tank farm drainage area. A sample is taken from the access point and is analyzed weekly for gross alpha and beta, tritium, and pH. A monthly composite is analyzed for gamma radionuclides and strontium-90. (See **Special Monitoring** [p. 2-30].) However, samples collected from this location are not thought to be indicative of either local groundwater or surface water conditions.

NDA Sampling Locations

The surface water drainage path downstream of the Nuclear Regulatory Commission (NRC)-licensed disposal area (NDA) is monitored at location WNNDADR using an automated sampler. Weekly samples are analyzed for tritium, nonpurgeable organic carbon (NPOC), and total organic halogens (TOX). Samples are composited and analyzed on a monthly basis for gross alpha, gross beta, tritium, and gamma-emitting radionuclides. Quarterly composites analyzed for strontium-90 and iodine-129 and semiannual grab samples analyzed for chemical parameters provide data useful for confirming the effectiveness of the NDA interceptor trench.

Gross beta concentrations at location WNNDADR averaged 2.17E-07 μCi/mL in

1995. (See Table 2-2 [p. 2-9] and Table C-1.19 [p. C1-16] in *Appendix C-1*.) Concentrations at this location were above the average seen at background location WFBCBKG but are all well below the DCG for strontium-90 (1E-06 μCi/mL). In fact, the highest quarterly composite isotopic strontium-90 result was only 11% of its DCG. The overall trend for gross beta concentrations at this location has remained relatively constant over time. (See Fig. 2-6.) Except for seasonal variations, the same is true of tritium.

A key indicator of any possible migration of nonradiological contaminant from the NDA would be the presence of significant iodine-129 in samples from WNNDADR. The third- and fourth-quarter 1995 iodine-129 values at WNNDADR were marginally positive, yet they were not significantly higher than the analytical detection limit. By way of comparison, iodine-129 values obtained from waters collected from the NDA interceptor trench (WNNDATR), closer to the NDA, were all below the analytical detection limit. (See *Appendix C-1*, Table C-1.20 [p. C1-17].) It should be noted that while tritium activity in trench waters is generally higher than that seen at WNNDADR farther downstream, gross beta activity is actually higher downstream at WNNDADR than in waters from the interceptor trench. Residual contamination from past waste burial activities in soils outside the NDA are the likely source of gross beta activity in samples from WNNDADR.

Downstream of WNNDADR, on Erdman Brook and to the west of the SDA, is sampling point WNERB53. Weekly samples collected from this point are analyzed for pH, gross alpha, gross beta, and tritium. In addition to samples collected by the WVDP, independent samples are collected and analyzed by the New York State Department of Health (NYSDOH) at this location and at WNFRC67, which monitors waters draining from the east side of the SDA.

Near-site Standing Pond Water

In addition to sampling water from flowing streams, water from ponds and lakes within the retained premises (WNYNSC) also is sampled. Tests for various radiological and water quality parameters are performed annually to verify that no major changes in standing water within the Project facility environs are occurring.

Four ponds were tested in 1995 and found to be within the historical range observed at these locations for gross alpha, gross beta, and tritium. These results were also compared to a background sample from a pond 14 kilometers (8.7 mi) north of the Project (WNSTAWB, Fig. 2-4 [p. 2-6]) and were found to be statistically the same. (See Table C-1.21 [p. C1-18].)

Off-site Surface Water Sampling

A map showing off-site surface water and sediment sample locations is found in Figure 2-4 (p. 2-6). Radiological concentration data from off-site sample points show that average gross beta radioactivity concentrations in Buttermilk Creek below (downstream of) the WVDP site generally tend to be higher than concentrations above (upstream of) the site, presumably because small amounts of radioactivity from the site enter Buttermilk Creek via Frank's Creek. This is particularly observable during periods of lagoon 3 discharge. Tables 2-1 and 2-2 (p. 2-9) list the ranges and annual averages for gross alpha and gross beta activity at surface water locations. Additional information is available in the *Appendix C-1* tables for all off-site surface water monitoring locations.

Cattaraugus Creek at Felton Bridge Sampling Location

An off-site sampler (WFFELBR) is located on Cattaraugus Creek at Felton Bridge just downstream of Cattaraugus Creek's confluence with Buttermilk Creek, which is the major surface drainage from the WNYNSC. (See Fig. 2-4 [p. 2-6].)

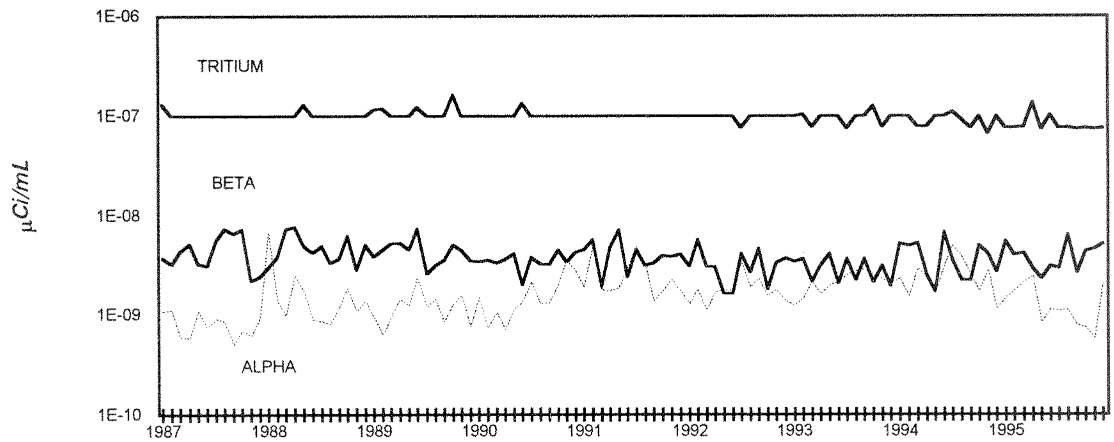


Figure 2-7. Nine-Year Trends of Gross Alpha, Gross Beta, and Tritium Concentrations at Sampling Location WFFELBR

The sampler collects a 50-mL aliquot from the creek every half-hour. A chart recorder registers the stream depth during the sampling period so that a flow-weighted weekly sample can be proportioned into a monthly composite. The weekly samples are analyzed for gross alpha, gross beta, tritium, and pH, and the sample composite is analyzed for gross alpha, gross beta, tritium, strontium-90, and gamma-emitting radionuclides.

The highest concentrations in monthly composite water samples from Cattaraugus Creek during 1995 show strontium-90 to be only 0.6% of the DCG for strontium-90 in water. There were no positive detections of cesium-137 in Cattaraugus Creek during 1995. (See Table C-1.24 [p. C1-20].) The yearly average gross beta activity for Cattaraugus Creek at Felton Bridge is not significantly higher than background levels. Figure 2-7 shows the nine-year trends for Cattaraugus Creek samples analyzed for gross alpha, gross beta, and tritium. Note that for the most part, tritium concentrations represent method detection limits and not actually detected radioactivity. Gross beta activity appears to have remained constant or to have declined slightly at this location since 1987.

Fox Valley Road and Thomas Corners Bridge Sampling Locations

In addition to the Cattaraugus Creek sampler, two surface water monitoring stations are located on Buttermilk Creek both upstream and downstream of the WVDP. (See Fig. 2-4 [p. 2-6].) Samplers collect water from a background location upstream of the Project at Fox Valley Road (WFBCBKG) and from a location at Thomas Corners Road that is downstream of the plant and upstream of Buttermilk Creek's confluence with Cattaraugus Creek (WFBCTCB).

These samplers collect a 25-mL aliquot every half-hour. Samples were retrieved biweekly up to August 1995 and are now collected weekly. Samples are composited monthly and analyzed for tritium, gross alpha, and gross beta radioactivity. A quarterly composite is analyzed for gamma-emitting radionuclides and strontium-90. Quarterly composite samples from the Fox Valley Road location also are analyzed for carbon-14, iodine-129, alpha radionuclides, and total uranium. (Table C-1.22 [p. C1-19] shows monthly and quarterly radioactivity concentrations upstream of the site at Fox Valley; Table

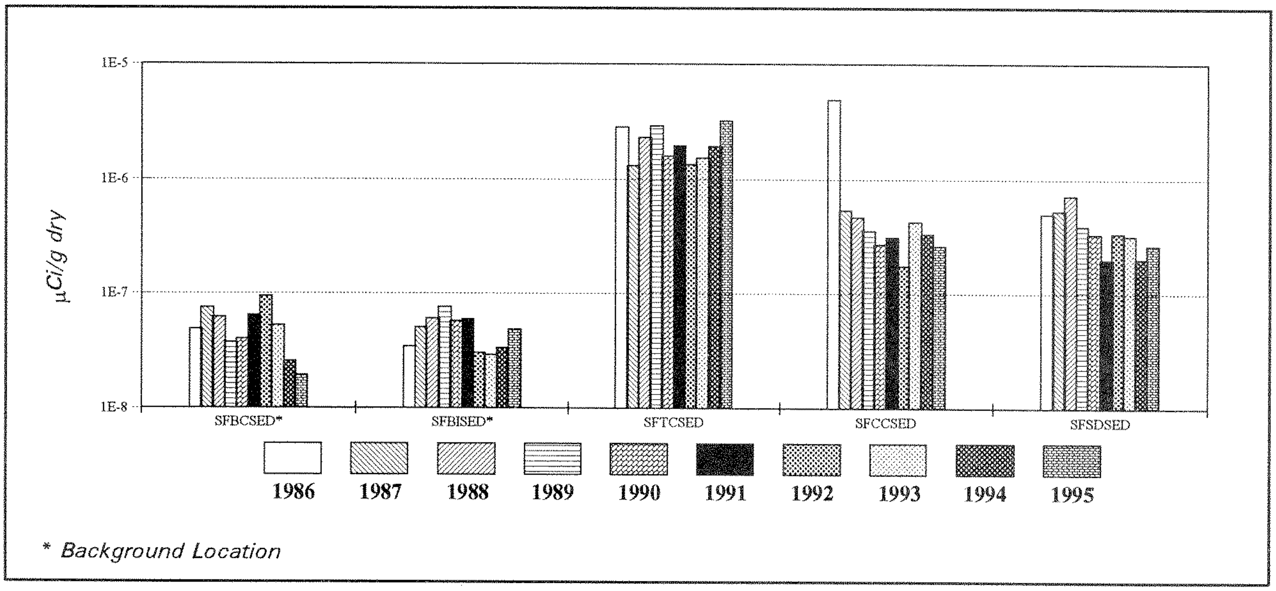


Figure 2-8. Ten-Year Trends of Cesium-137 (µCi/g dry) in Stream Sediment for Two Locations Upstream and Three Locations Downstream of the WVDP

C-1.23 [p. C1-20] shows monthly and quarterly radioactivity concentrations downstream of the site at Thomas Corners.)

The data from these locations show that tritium and gross beta concentrations downstream of the site are only marginally higher than background concentrations upstream of the site.

Because dairy cattle have access to waters at the Thomas Corners Bridge sampling point, this sample point represents an important link in the pathway to humans. In actuality, gross beta includes other radionuclides from naturally occurring sources as well as from manmade sources. If the maximum beta concentration in Buttermilk Creek downstream of the Project at Thomas Corners Bridge were, however, attributable entirely to strontium-90, then the radioactivity would represent only 1.7% of the DCG.

Sediment Sampling

A map showing sediment sampling locations is found on Figure 2-4 (p. 2-6).

Sediments are grab-sampled semiannually at or near three of the automatic water sampling locations and at two additional points. Downstream locations are Buttermilk Creek at Thomas Corners Road (SFTCSED), Cattaraugus Creek at Felton Bridge (SFCCSED), and Cattaraugus Creek at the Springville dam (SFSDSED). Upstream background locations are Buttermilk Creek at Fox Valley Road (SFBCSED) and Cattaraugus Creek at Bigelow Bridge (SFBISED).

A comparison of annual averaged cesium-137 concentrations from 1986 to 1995 for these five sampling locations is illustrated in Figure 2-8. As reported in previous years, cesium-137 concentrations in sediments collected downstream of the WVDP are higher than those observed in samples collected from background locations (SFBCSED or SFBISED). As the figure indicates, although the measured cesium-137 concentrations for 1995 were higher than some previous years' values, overall, the concentrations appear to be decreasing or staying constant with time at the downstream locations. While the cesium-137 activity in downstream Cattaraugus Creek sediments (at locations SFCCSED and SFSDSED) is elevated relative to upstream val-

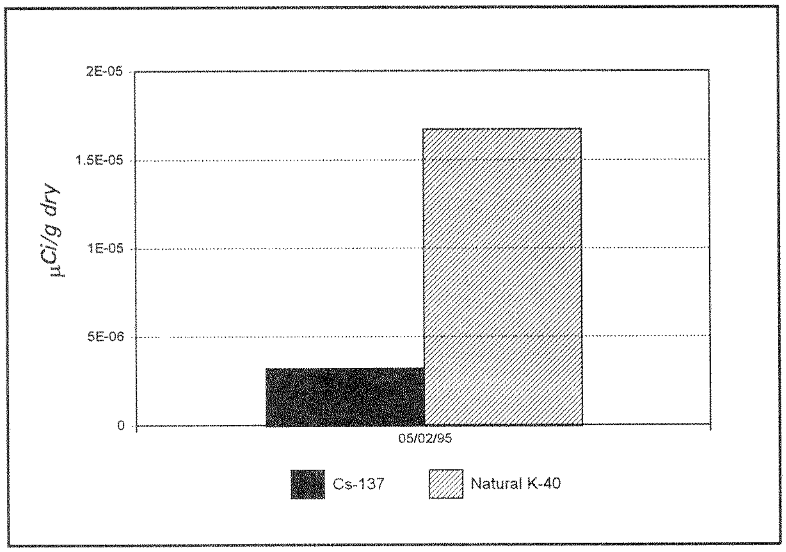


Figure 2-9. Comparison of Cesium-137 with Naturally Occurring Potassium-40 Concentrations (μCi/g dry) in 1995 at Downstream Sampling Location SFTCSED

ues, it is comparable to or less than historical background concentrations (as measured at SFGRVAL and SFDNKRK) in surface soil in Western New York.

A comparison of cesium-137 to the naturally occurring gamma-emitter potassium-40 (Fig. 2-9) for the downstream location nearest the Project (Buttermilk Creek at Thomas Corners Road — SFTCSED) indicates that cesium-137 is present at levels lower than naturally occurring gamma emitters. Results of sediment sampling upstream and downstream of the Project are tabulated in *Appendix C-1*, Table C-1.31 (p. C1-25). When alpha isotopic results for background location SFBCSED are compared to those for SFTCSED, downstream of the site, no significant differences are observed.

Air Monitoring

On-site Ventilation Systems

Permits obtained from the U.S. Environmental Protection Agency (EPA) allow air to be released from plant ventilation stacks during normal operations. The air released must meet criteria specified in the NESHAP regulations to ensure that the environment and the public's health and safety are not adversely affected. Dose-based comparisons of WVDP emissions against NESHAP criteria are presented in Chapter 4. Although less stringent than NESHAP criteria, DOE DCGs are more conducive to concentration-based comparisons and are used here in this chapter for evaluating concentrations of radionuclides in WVDP emissions.

Parameters measured include gross alpha and gross beta, tritium, and various radionuclides such as cesium-137 and strontium-90. When comparing concentrations with dose limits for screening purposes, gross alpha and beta radioactivities are assumed to come from americium-241 and strontium-90, respectively, because the dose effects for these radionuclides are the most limiting for particulate emissions at the WVDP. (DOE standards and DCGs for radionuclides of interest at the WVDP are found in *Appendix B* [p. B-3].)

The exhaust from each permitted fixed ventilation system on-site is continuously filtered, monitored, and sampled as it is released to the atmosphere. Specially designed isokinetic sampling nozzles continuously remove a representative portion of the exhaust air, which is then drawn through very fine glass fiber filters to trap any particles. Sensitive detectors continuously monitor the radioactivity on these filters and provide readouts of alpha and beta radioactivity levels.

A separate sampling unit on the ventilation stack of continuously operated systems contains another filter that is removed every week and tested in the laboratory. This sampling system also may contain an activated carbon cartridge used to collect a sample that is analyzed for iodine-129.

In addition to these samples, water vapor from the main plant ventilation stack (ANSTACK) and the supernatant treatment system (ANSTSTK) is collected by trapping moisture in silica gel desiccant columns. The trapped water is distilled from the silica gel desiccant and analyzed for tritium.

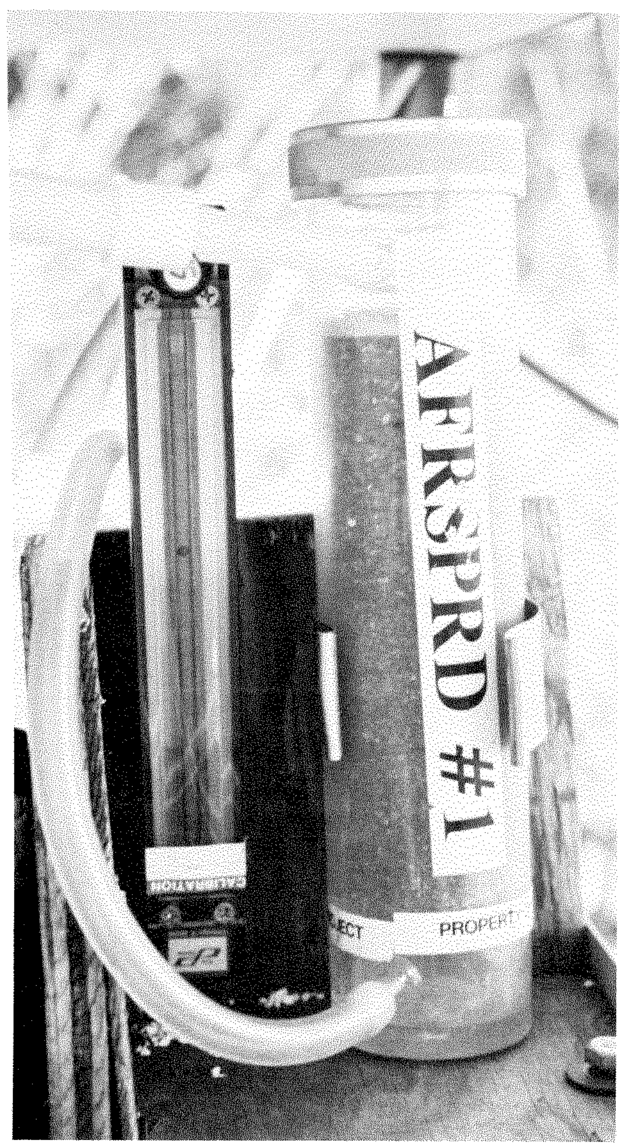
Because tritium, iodine, and other isotopic concentrations are quite low, the large-volume samples collected weekly from the main plant stack and from other emission-point samplers provide the only practical means of determining the amount of specific radionuclides released from the facility. In addition to scheduled sampling and analysis of ANSTACK filters for those parameters defined in *Appendix A* of this report, filters are routinely analyzed for strontium-89 and cesium-137 as part of operational monitoring.

The Main Plant Ventilation Stack

A map showing on-site air monitoring and sampling points may be found in Figure 2-1 (p. 2-3).

The main ventilation stack is potentially the greatest contributor to releases. The main stack sampling system collects a continuous air sample from this emission point. A high sample-collection flow rate through multiple intake nozzles ensures a representative sample for both the weekly sample and the on-line monitoring system. The total quantity of gross alpha, gross beta, and tritium released each month from the main stack, based on weekly measurements, is shown in *Appendix C-2,* Table C-2.1 (p. C2-3). Figure 2-10 (p. 2-16) shows the nine-year trends for the main stack samples analyzed for gross alpha and gross beta activity. The figure indicates a steady five-year downward trend in activity observed for both gross alpha and gross beta from 1987 to mid-1992. From mid-1992 throughout mid-1995 both gross alpha and beta activities rose slightly and then leveled off. During the third and fourth quarters of 1995 concentrations of gross alpha, gross beta, and gamma-emitting radionuclides in ventilated air increased due to transfers of cesium-loaded zeolite from waste tank 8D-1 to 8D-2.

A comparison of airborne radioactivity concentrations released from the main plant ventilation system during these operations with the DOE DCG in Table C-2.2 (p. C2-4) indicates that at the point of stack discharge, average radioactivity levels were already below concentration guide-



Silica Gel Columns from the Rock Springs Road Ambient Air Sampler

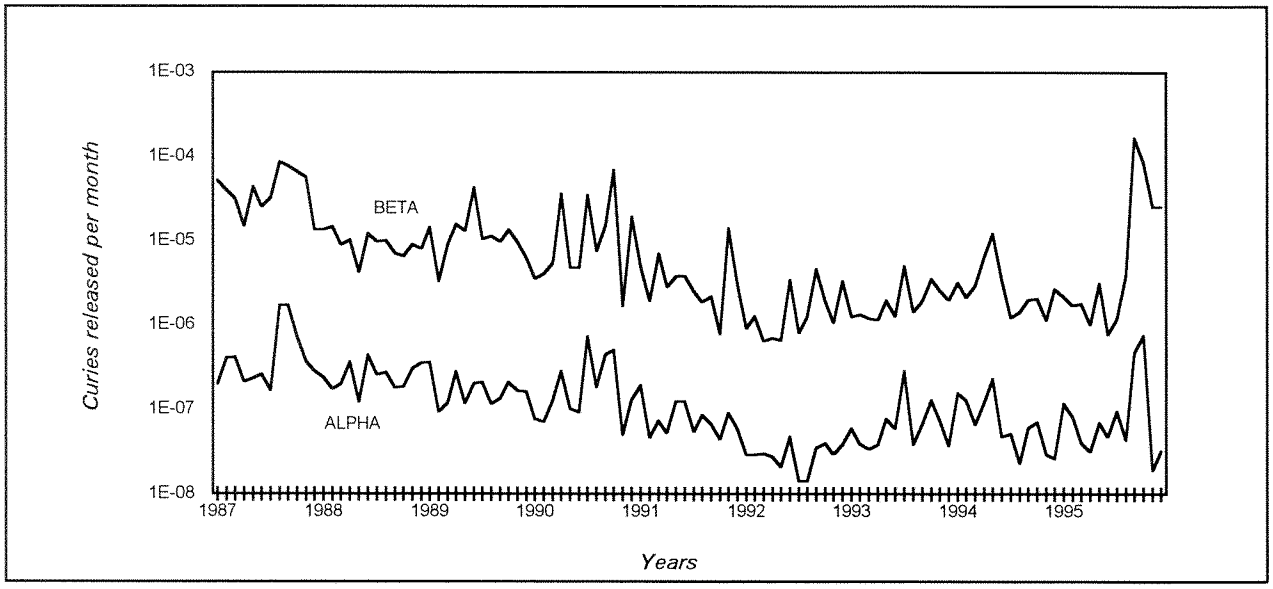


Figure 2-10. Nine-Year Trends of Gross Alpha and Gross Beta Activity at the Main Stack Sampling Location (ANSTACK)

lines for airborne radioactivity in an unrestricted environment. Airborne concentrations from the stack to the site boundary are reduced by an average factor of about 200,000. Samples from ambient air perimeter monitors at the site boundary confirm that these operations had no effect on air quality at these perimeter locations.

Vitrification Facility Sampling System

In November 1995 new sampling and monitoring equipment was brought on-line at the vitrification facility in order to check its operation before it is used during vitrification. The vitrification heating, ventilation, and air conditioning (HVAC) stack — ANVITSK — and the seismically protected backup sampler — ANSEISK — will monitor non-off-gas ventilation releases from the vitrification building. Air exhausted to the environment will be monitored for radioactivity. Results gathered to date (Tables C-2.3 and C-2.4 [p. C2-5]) represent initial pre-vitrification baseline or background levels.

Other On-site Sampling Systems

- Sampling systems similar to those of the main stack monitor airborne effluents from the 01-14 building, formerly the cement solidification system ventilation stack (ANCSSTK), the contact size-reduction facility ventilation stack (ANCSRFK), and the supernatant treatment system ventilation stack (ANSTSTK).

In August 1995, new radioactive-emissions monitoring equipment was brought on-line at the cement solidification ventilation stack (ANCSSTK). This system replaced the original monitoring equipment as part of the changes to the facility from handling cement solidification equipment to containing vitrification off-gas treatment system components.

The 1995 samples from ANCSSTK, ANCSRFK, and ANSTSTK showed detectable gross radioactivity in some cases, including specific beta- and alpha-emitting radionuclides, but did not approach any Department of Energy effluent limitations. Tables C-2.5 through C-2.7 (pp. C2-6 through C2-8) show monthly totals of gross alpha and

Global Fallout Sampling

Global fallout is sampled at four of the perimeter air sampler locations and at the base of the original on-site meteorological tower. Precipitation from all of the locations is collected and analyzed every month. Results from these measurements are reported in nCi/m^2 per month for gross alpha and gross beta and in μCi/mL for tritium. (The 1995 data from these analyses and precipitation pH measurement data are found in Appendix C-2, Table C-2.27 [p. C2-23] .)

Fallout-pot data indicate short-term effects. Long-term deposition is measured by surface soil samples collected annually near each air sampling station. Soil sample data are found in Table C-1.30 [p. C1-24] of Appendix C-1.

The measured concentrations are typical of normal background concentrations in the region, with one exception. Soil from the Rock Springs Road air sampler has consistently shown a higher-than-background cesium-137 concentration. This sampler is known to be within an extended area of elevated cesium activity that was identified by a 1979 survey, well before the Project was initiated.

beta radioactivity and quarterly total radioactivity released for specific radionuclides for each of these sampling locations.

- Three other operations are routinely monitored for airborne radioactive releases: the supercompactor volume-reduction ventilation system (ANSUPCV), the low-level waste treatment facility ventilation system (ANLLWTVC and ANLLWTVH), and the contaminated clothing laundry ventilation system (ANLAUNV).

  Results for samples collected in 1995 from the supercompactor ventilation (ANSUPCV) are presented in Table C-2.8 (p. C2-9). Routine supercompactor system operation was curtailed in April 1994 due to reduced operational needs. Since then, it has operated only for short periods of one day to one week. The supercompactor stack is monitored continuously when the system is operating.

  The low-level waste treatment facility ventilation system and the contaminated clothing laundry ventilation system are sampled for gross alpha and gross beta radioactivity. Data for these two facilities are presented in Tables C-2.9 through C-2.11 (pp. C2-10 and C2-11).

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

  In 1995 average discharges at the point of release from portable outdoor ventilation units were well below DOE guidelines for alpha and beta radioactivity in an unrestricted environment. Dilution from the point of release to the site boundary would further reduce these concentrations.

- In February 1995 ambient air monitors were installed near the lag storage area (ANLAGAM) and near the NDA (ANNDAAM). Results of this monitoring are presented in *Appendix C-2*, Tables C-2.12 and C-2.13 (pp. C2-12 and C2-13).

- An ambient air sampler (ANSDAT9) provides monitoring of potential diffuse releases of radioactivity associated with the SDA, which is managed by the New York State Energy and Research Development Authority. The ANSDAT9 sampler could also detect site-wide releases to ambient air. Results of this monitoring are presented in *Appendix C-2*, Table C-2.14 (p. C2-14).

Perimeter and Remote Air Sampling

Maps of perimeter and remote air sampling locations may be found in Figure 2-2 (p. 2-4) and Figure A-9 (p. A-55).

As in previous years, airborne particulate samples for radiological analysis were collected continuously at six locations around the perimeter of the site and at five remote locations at Great Valley, West Valley, Springville, Dunkirk, and, beginning in 1995, Nashville, New York.

Perimeter locations — on Fox Valley Road, Rock Springs Road, Route 240, Thomas Corners Road, Dutch Hill Road, and at the site's bulk storage warehouse — were chosen to provide historical continuity or because the location would best represent the highest potential airborne concentration of radioactivity. The nine-year trends of gross alpha and gross beta concentrations at the Rock Springs Road location are shown in Figure 2-11.

The remote locations provide data from nearby communities — West Valley and Springville — and from more distant background areas. Concentrations measured at Great Valley (AFGRVAL, 29 km south of the site), Dunkirk (AFDNKRK, 50 km west of the site), and Nashville (AFNASHV, 37 km west of the site in the town of Hanover), are considered representative of regional natural background radiation.

(The Dunkirk air sampler [AFDNKRK] was removed from service in June 1995 because of difficulties in maintaining a lease agreement for the property on which it was placed. The ambient air samplers at Dunkirk and Nashville [AFNASHV] were operated in parallel for six weeks in order to study the effects of relocating the Dunkirk sampler. The results of this study indicated that there is no appreciable difference in the data obtained from the analysis of the air filters collected from the samplers.)

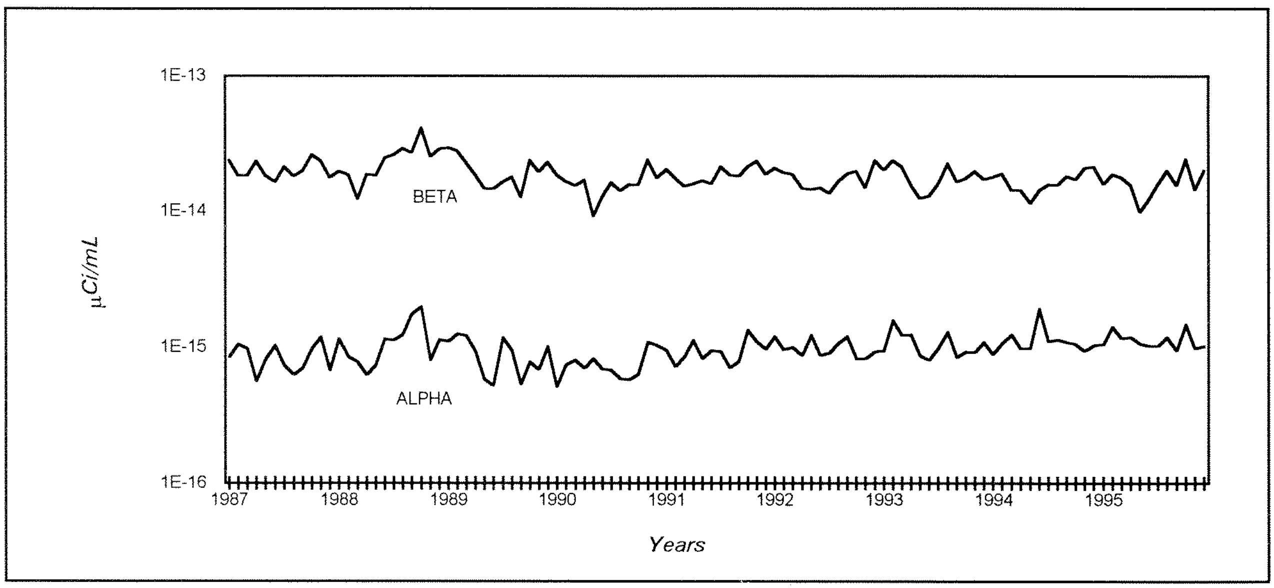


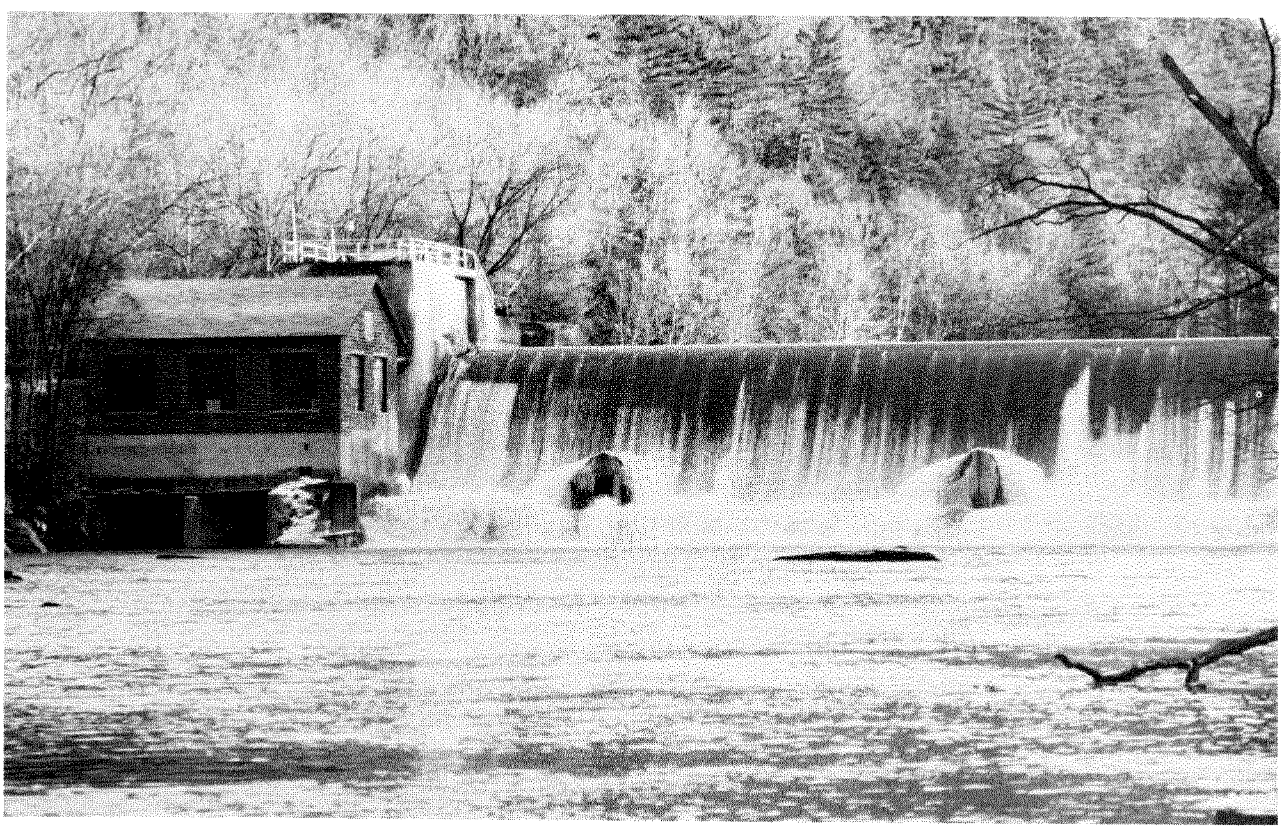
Figure 2-11. Nine-Year Trends of Gross Alpha and Gross Beta Concentrations at the Rock Springs Road Sampling Location (AFRSPRD)

The six perimeter samplers and the four remote samplers maintain an average flow of about 40 L/min (1.4 ft^3/min) through a 47-millimeter glass fiber filter. The sampler heads for each of the locations are set at 1.7 meters above the ground, the height of the average human breathing zone.

Filters from off-site and perimeter samplers are collected weekly and analyzed after a seven-day "decay" period to remove interference from short-lived naturally occurring radioactivity. Gross alpha and gross beta measurements of each filter are made weekly using a low-background gas proportional counter. The gross alpha and gross beta ranges and annual averages for each of the ambient sampling points are provided in Tables 2-3 and 2-4 (p. 2-20). The 1995 concentration ranges are similar to those seen in 1994. Near-site sample concentrations are indistinguishable from background and all reflect normal seasonal variations.

In addition, quarterly composites, each consisting of thirteen weekly filters from each sample station, are analyzed. Data from these samplers are provided in *Appendix C-2,* Tables C-2.16 through C-2.26 (pp. C2-16 to C2-22). Although tritium (as hydrogen-tritium oxide [HTO]) was positively detected on several occasions at the Rock Springs Road location near the site, those concentrations were the same as positive concentrations observed at the Great Valley background location.

The 1995 data for the three samplers that have been in operation since before 1982 — Fox Valley, Thomas Corners, and Route 240 — averaged about 1.77E-14 µCi/mL (6.56E-04 Bq/m^3) of gross beta activity in air. This average is comparable to 1994 data. The average gross beta concentration at the Great Valley background station was 4.02E-14 µCi/mL (1.49E-03 Bq/m^3) in 1994, and in 1995 averaged 1.78E-14 µCi/mL (6.60E-04 Bq/m^3).



Springville Dam on Cattaraugus Creek

Table 2 - 3

1995 Gross Alpha Activity at Off-site, Perimeter, and On-site Ambient Air Sampling Locations

Location	Number of Samples	Range		Annual Average	
		μCi/mL	Bq/m^3	μCi/mL	Bq/m^3
AFFXVRD	52	<6.96E-16 — 2.00E-15	<2.58E-05 — 7.40E-05	0.73±1.04E-15	2.69±3.85E-05
AFRSPRD	52	<8.19E-16 — 2.29E-15	<3.03E-05 — 8.47E-05	0.93±1.07E-15	3.44±3.95E-05
AFRT240	52	<4.81E-16 — 2.52E-15	<1.78E-05 — 9.32E-05	0.91±1.07E-15	3.36±3.96E-05
AFSPRVL	52	<7.16E-16 — 2.87E-15	<2.65E-05 — 1.06E-04	0.76±1.03E-15	2.83±3.81E-05
AFTCORD	52	<7.30E-16- — 2.52E-15	<2.70E-05 — 9.32E-05	0.75±1.11E-15	2.76±4.11E-05
AFWEVAL	52	<6.82E-16 — 2.31E-15	<2.52E-05 — 8.55E-05	0.83±1.06E-15	3.07±3.91E-05
AFGRVAL	52	<6.90E-16 — <6.44E-15	<2.55E-05 — <2.38E-04	0.91±1.50E-15	3.37±5.54E-05
AFBOEHN	52	<6.99E-16 — 2.90E-15	<2.59E-05 — 1.07E-04	0.92±1.13E-15	3.40±4.19E-05
AFDNKRK	24	<7.18E-16 — 2.55E-15	<2.66E-05 — 9.44E-05	0.94±1.04E-15	3.50±3.85E-05
AFNASHV	34	<5.47E-16 — 2.40E-15	<2.02E-05 — 8.88E-05	0.93±1.07E-15	3.46±3.97E-05
AFBLKST	52	<5.82E-16 — 3.16E-15	<2.15E-05 — 1.17E-04	0.84±1.06E-15	3.13±3.91E-05
ANLAGAM	44	<3.87E-16 — 1.75E-15	<1.43E-05 — 6.48E-05	5.63±7.04E-16	2.08±2.60E-05
ANNDAAM	44	<5.72E-16 — 3.27E-15	<2.12E-05 — 1.21E-04	9.56±7.92E-16	3.54±2.93E-05

Table 2 - 4

1995 Gross Beta Activity at Off-site, Perimeter, and On-site Ambient Air Sampling Locations

Location	Number of Samples	Range		Annual Average	
		μCi/mL	Bq/m^3	μCi/mL	Bq/m^3
AFFXVRD	52	7.72E-15 — 3.14E-14	2.86E-04 — 1.16E-03	1.84±0.36E-14	6.82±1.32E-04
AFRSPRD	52	8.74E-15 — 3.38E-14	3.23E-04 — 1.25E-03	1.69±0.33E-14	6.25±1.23E-04
AFRT240	52	6.70E-15 — 3.19E-14	2.48E-04 — 1.18E-03	1.77±0.34E-14	6.56±1.26E-04
AFSPRVL	52	8.04E-15 — 2.79E-14	2.97E-04 — 1.03E-03	1.55±0.33E-14	5.73±1.21E-04
AFTCORD	52	8.10E-15 — 3.38E-14	3.00E-04 — 1.25E-03	1.71±0.36E-14	6.35±1.32E-04
AFWEVAL	52	7.12E-15 — 4.50E-14	2.63E-04 — 1.67E-03	2.03±0.36E-14	7.50±1.32E-04
AFGRVAL	52	7.42E-15 — 3.60E-14	2.75E-04 — 1.33E-03	1.78±0.42E-14	6.60±1.55E-04
AFBOEHN	52	6.74E-15 — 4.44E-14	2.49E-04 — 1.64E-03	2.02±0.37E-14	7.48±1.36E-04
AFDNKRK	24	8.77E-15 — 2.49E-14	3.24E-04 — 9.21E-04	1.67±0.32E-14	6.16±1.20E-04
AFNASHV	34	8.13E-15 — 3.85E-14	3.01E-04 — 1.42E-03	1.90±0.35E-14	7.01±1.29E-04
AFBLKST	52	4.40E-15 — 3.42E-14	1.63E-04 — 1.27E-03	1.76±0.34E-14	6.50±1.25E-04
ANLAGAM	44	<1.32E-15 — 2.51E-14	<4.88E-05 — 9.29E-04	1.08±0.22E-14	4.01±0.81E-04
ANNDAAM	44	7.52E-15 — 3.09E-14	2.78E-04 — 1.14E-03	1.64±0.25E-14	6.08±0.92E-04

Off-site Surface Soil Sampling

Maps of off-site surface soil sampling locations may be found in Figures A-6 and A-9 (pp. A-52 and A-55).

Soil from the upper two inches of the ground near the perimeter air samplers is collected annually to measure the radioactivity deposited by worldwide fallout. Samples were collected in 1995 from ten locations: six points on the perimeter of the retained premises (WNYNSC), two in nearby communities, and two in locations 30 to 50 kilometers distant from the Project. Analyses for cesium-137, strontium-90, plutonium-239/240, and americium-241 at all ten locations and analyses for uranium radionuclides at three points were compared among the sample locations.

The 1995 results (Table C-1.30 [p. C1-24]) show that with the exception of two cesium-137 results from the northeast and northwest perimeter sampler locations and one cesium-137 result from the West Valley sampler, detectable concentrations of strontium-90, cesium-137 (both present in worldwide fallout), cobalt-60, and manmade alpha-emitting radionuclides were within the same range of uncertainty as background samples. Even the slightly higher cesium-137 results remain within the range observed at background locations during the past five years.

It should be noted that the consistency of low-level positive cesium-137 results over the years at the SFRSPRD location does support the existence of known cesium contamination of soil in that area, thought to have originated from previous plant operations.

Radioactivity in the Food Chain

Maps showing biological sampling points are found in Figures A-9 (p. A-55) and 2-12 (p. 2-22).

Each year food samples are collected from locations near the site and from remote locations (Fig. 2-12). Fish and deer are collected during periods when they would normally be taken by sportsmen for consumption. In addition, milk is collected monthly and beef semiannually from cows grazing near the site and at remote locations. Hay, corn, apples, and beans are collected at the time of harvest.

Fish

Under a collector's permit fish are obtained by electrofishing, a method that temporarily stuns the fish, allowing them to be netted for collection. This method allows a more species-selective control as compared to sport fishing, with unwanted fish being returned to the creek unharmed.

Twenty fish samples are collected every year (ten semiannually) above the Springville dam from the portion of Cattaraugus Creek that is downstream of WNYNSC drainage (BFFCATC). Ten fish samples are also collected annually from Cattaraugus Creek below the dam (BFFCATD), including species that migrate nearly forty miles upstream from Lake Erie. These specimens are representative of sport fishing catches in the creek downstream of the dam at Springville.

Twenty control fish are taken every year (ten semiannually) from waters that are not influenced by site runoff (BFFCTRL). These control samples, containing no radioactivity from WVDP effluents, allow comparisons with the concentrations found in fish taken from site-influenced waters. The control samples are representative of the species collected in Cattaraugus Creek downstream from the WVDP. A combined total of fifty fish were collected from these locations.

The edible portion of each individual fish collected was analyzed for strontium-90 content and the gamma-emitting radionuclides cesium-134 and cesium-137. (See Table C-3.4 [p. C3-6] in *Appendix C-3* for a summary of the results.) Throughout the year concentrations of strontium-90 ranged from below the minimum detectable con-

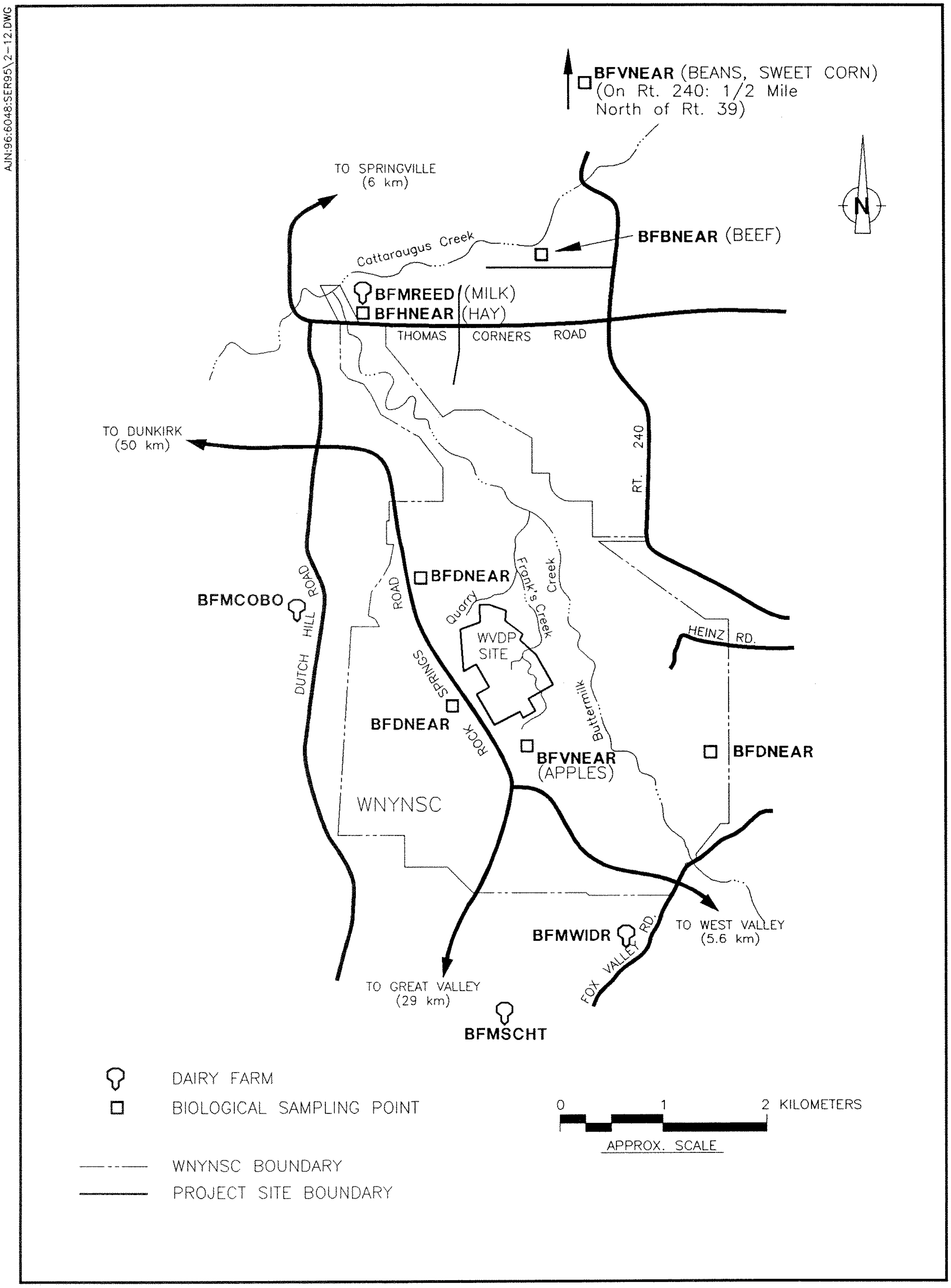


Figure 2-12. Near-site Biological Sampling Points.

Electrofishing in Cattaraugus Creek

centration (see *Glossary*) to a maximum of 1.01E-07 µCi/g at BFFCATC and from below the minimum detectable concentration to 1.94E-08 µCi/g at the control location (BFFCTRL). As discussed in *Chapter 4, Radiological Dose Assessment* [p. 4-9], strontium-90 has been observed in marginally higher concentrations than background in the population of bottom-feeding fish downstream of the site but above the Springville dam. Despite this small difference, all downstream fish concentrations are still within the range of Project historical background values.

Although six fish collected downstream of the site showed marginally positive detections for cesium-137, these cesium concentrations were all within the range of those seen at the background location. Two downstream fish samples had positive detections of cesium-134 but were not statistically different from concentrations in background fish.

Venison

Specimens from an on-site deer herd also are analyzed for radioactive components. Historically, concentrations of radioactivity in deer flesh have been very low and Project activities have not been shown to affect the local herd.

For the second year during the large-game hunting season, hunters were allowed access to the WNYNSC, excluding the WVDP premises, during the large-game hunting season, in a controlled hunting program established by the New York State Energy Research and Development Authority (NYSERDA). Thirty-eight deer were collected during this program.

Venison from three deer taken by hunters from the area around the WNYNSC was analyzed and the data compared with those from deer collected far from the site in the towns of Friendship, Carrollton, and Hinsdale, New York. Low levels of radioactivity were detected for both near-site and control samples for cesium-137 and naturally occurring potassium-40. Results for these samples are shown in Table C-3.2 (p. C3-4) in *Appendix C-3*. Concentrations in near-site deer were at or below background levels for those radionuclides in 1995. The range in concentrations observed was similar to previous years. Cesium-134 was not detected in any near-site or control deer during 1995. Tritium concentrations in near-site deer were the same as those found in background deer. Positive strontium-90 concentrations in near-site deer were not statistically different from levels seen at control locations.

Beef

Again in 1995, as in previous years, very little difference in isotopic concentration has been observed between near-site and control herds. Beef samples taken semiannually from near-site and remote locations are analyzed for tritium, strontium-90, and gamma-emitting radionuclides such as cesium-134 and cesium-137.

In 1995 there was one marginally positive detection for strontium-90 in a near-site beef sample. However, this value was not statistically different from a control sample. Results for all near-site and control samples were near or below the minimum detectable concentrations for tritium and cesium-134. Although two positive cesium-137 results were obtained, both were for control samples. These results are presented in Table C-3.2 (p. C3-4) in *Appendix C-3*.

Milk

Monthly milk samples were taken in 1995 from dairy farms near the site and from control farms at some distance from the site. (See Fig. 2-12 [p. 2-22].) Quarterly composites of monthly samples from the maximally exposed herd to the north (BFMREED) and quarterly composites of milk from a nearby herd to the northwest (BFMCOBO) were prepared. Single annual samples were taken from herds near the WVDP to the southeast (BFMWIDR) and the south (BFMSCHT). Monthly samples from control herds (BFMCTLN and BFMCTLS) were also prepared as quarterly composites. (See Fig. A-9 in *Appendix A* [p. A-55] for control sample locations.)

Each milk sample was analyzed for strontium-90, iodine-129, gamma-emitting radionuclides (naturally occurring potassium-40 and cesium-134 and cesium-137), and tritium. Strontium-90 was detectable in all near-site and control samples. The strontium-90 results for near-site milk ranged from 7.33E-10 to 4.19E-09 μCi/mL (0.027 to 0.155 Bq/L), and the control milk samples ranged from 8.71E-10 to 2.96E-09 μCi/mL (0.032 to 0.110 Bq/L). Although the first-quarter composite result for near-site location BFMCOBO was higher than the highest control sample seen in 1995, it is statistically the same as historical background values.

One near-site composite showed a positive value for cesium-137. This positive detection is not statistically different from historical background values. Two marginally positive iodine-129 results seen in near-site milk samples were not statistically different from marginally positive background concentrations seen in 1995. Three marginally positive tritium detections were not statistically different from the range of background values seen. The results of all of these analyses are shown in Table C-3.1 (p. C3-3) in *Appendix C-3*.

Fruit and Vegetables

Results from the analysis of beans, apples, sweet corn, and hay collected during 1995 are presented in Table C-3.3 (p. C3-5) in *Appendix C-3*. Tritium was detected in near-site corn and bean samples at levels that were not significantly higher than historical background samples.

Positive strontium-90 results were obtained in all samples in 1995. Of these positive results, only the near-site apple sample, collected from on-site trees not used for human consumption, indicated strontium at a significantly higher concentration than its background. This value is several times higher than that observed in 1994 but is still within the range of other biological matrix control values.

Cesium-137 was detected in near-site hay samples but at a concentration statistically identical to its background.

Two marginally positive cobalt-60 values observed in near-site beans and apples were at levels statistically no different from background bean and apple values. Overall results obtained for 1995 are comparable to previous years.

Direct Environmental Radiation Monitoring

The current monitoring year, 1995, was the twelfth full year in which direct penetrating radiation was monitored at the WVDP using TLD-700 lithium fluoride thermoluminescent dosimeters (TLDs). These dosimeters, used solely for environmental monitoring, consist of five TLD chips laminated on a card bearing the location identification and other information. The cards are placed at each monitoring location for one calendar quarter (three months) and are then processed to obtain the integrated gamma radiation exposure.

During 1995, the WVDP switched from processing TLD packages on-site to supply and processing by an independent off-site contractor. The same TLD materials, packaging, and placement have been retained with the new contract. (See *Appendix D*, Table D-4 [p. D-7] for a comparison of on-site and subcontractor results.)

Monitoring points are located around the WNYNSC perimeter and the access road, at the waste management units, at the site security fence, and at background locations remote from the WVDP site. (See Figs. 2-13 and 2-14 [pp. 2-26 and 2-27] and Fig. A-9 [p. A-55].) The TLDs are numbered in order of their installation. The monitoring locations are as follows:

THE PERIMETER OF THE WNYNSC: TLDs #1-16, #20

THE PERIMETER OF THE WVDP SITE-SECURITY FENCE: TLDs #24, #26-34

ON-SITE SOURCES OR SOLID WASTE MANAGEMENT UNITS: TLDs #18 and #32-36 (RTS drum cell); #18, #19, #33, #42, and #43 (SDA); #24 (component storage, near the WVDP site security fence); #25 (the maximum measured exposure rate at the closest point of public access); #38 (main plant and cement solidification system); #39 (parking lot security fence closest to the vitrification facility); #40 (high-level waste tank farm).

NEAR-SITE COMMUNITIES: TLDs #21 (Springville); #22 (West Valley)

BACKGROUND: TLDs #17 (Five Points Landfill in Mansfield); #23 (Great Valley); #37 (Dunkirk/Nashville); #41 (Sardinia). The Nashville location replaced the Dunkirk location in June 1995.

Measured exposure rates were comparable to those of 1994. There was no significant difference between the pooled quarterly average background TLDs (#17, #23, #37, and #41) and the pooled average for the WNYNSC perimeter locations for the 1995 reporting period.

Appendix C-4 (pp. C4-1 through C4-5) provides a summary of the results by calendar quarter for each of the environmental monitoring locations along with averages for comparison. The fourth-quarter data were provided by the new subcontractor.

The quarterly averages and individual location results show differences due to seasonal variation. The data obtained for all four calendar quarters compared favorably to the respective quarterly data in 1994. The quarterly average of the seventeen WNYNSC perimeter TLDs was 18.4 milliroentgen (mR) per quarter (17.6 mrem per quarter) in 1995.

The perimeter TLD quarterly averages since 1987, expressed in microroentgen per hour (μR/hr), are shown in Figure 2-15.

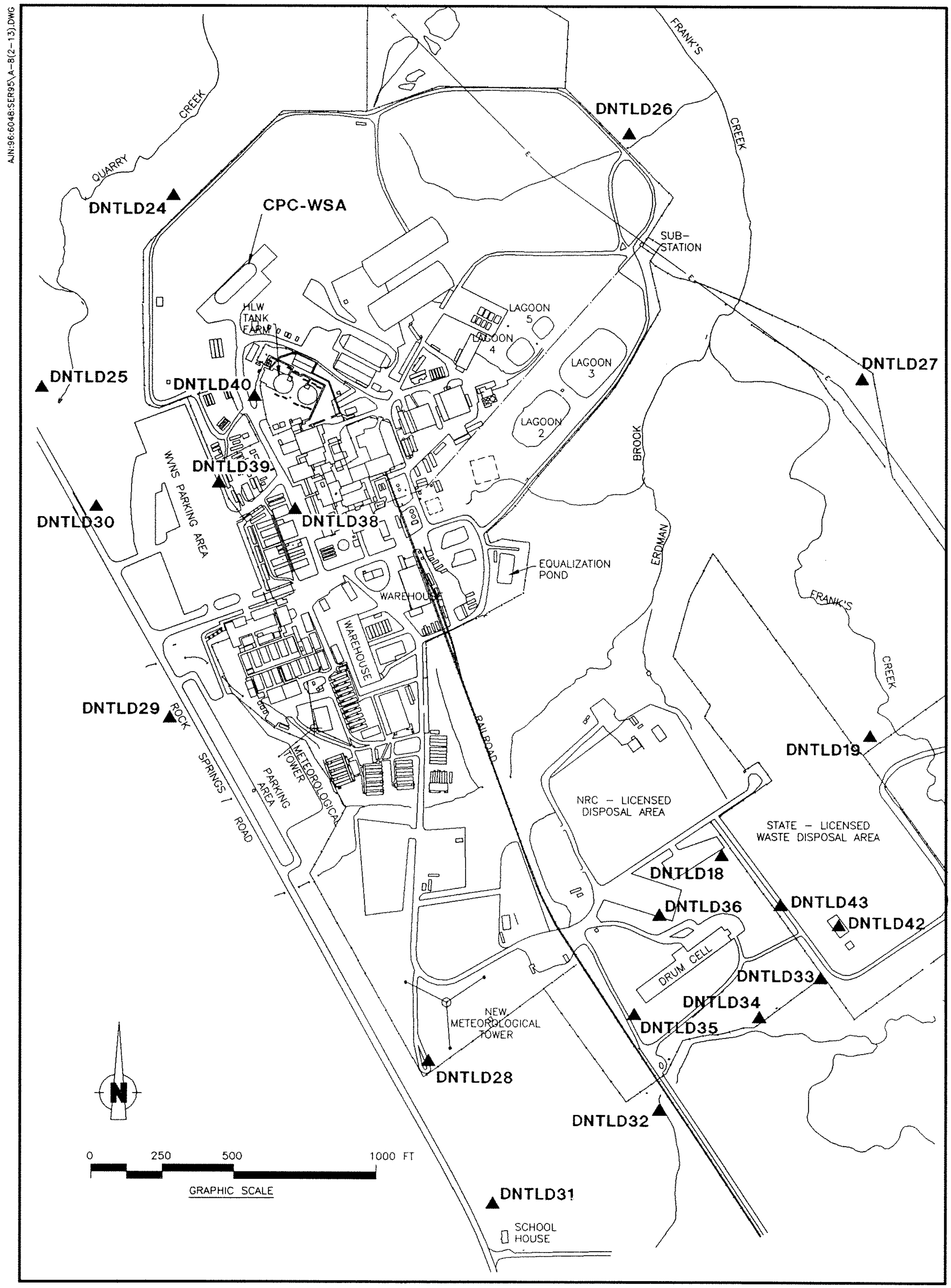


Figure 2-13. Location of On-site Thermoluminescent Dosimeters (TLDs).

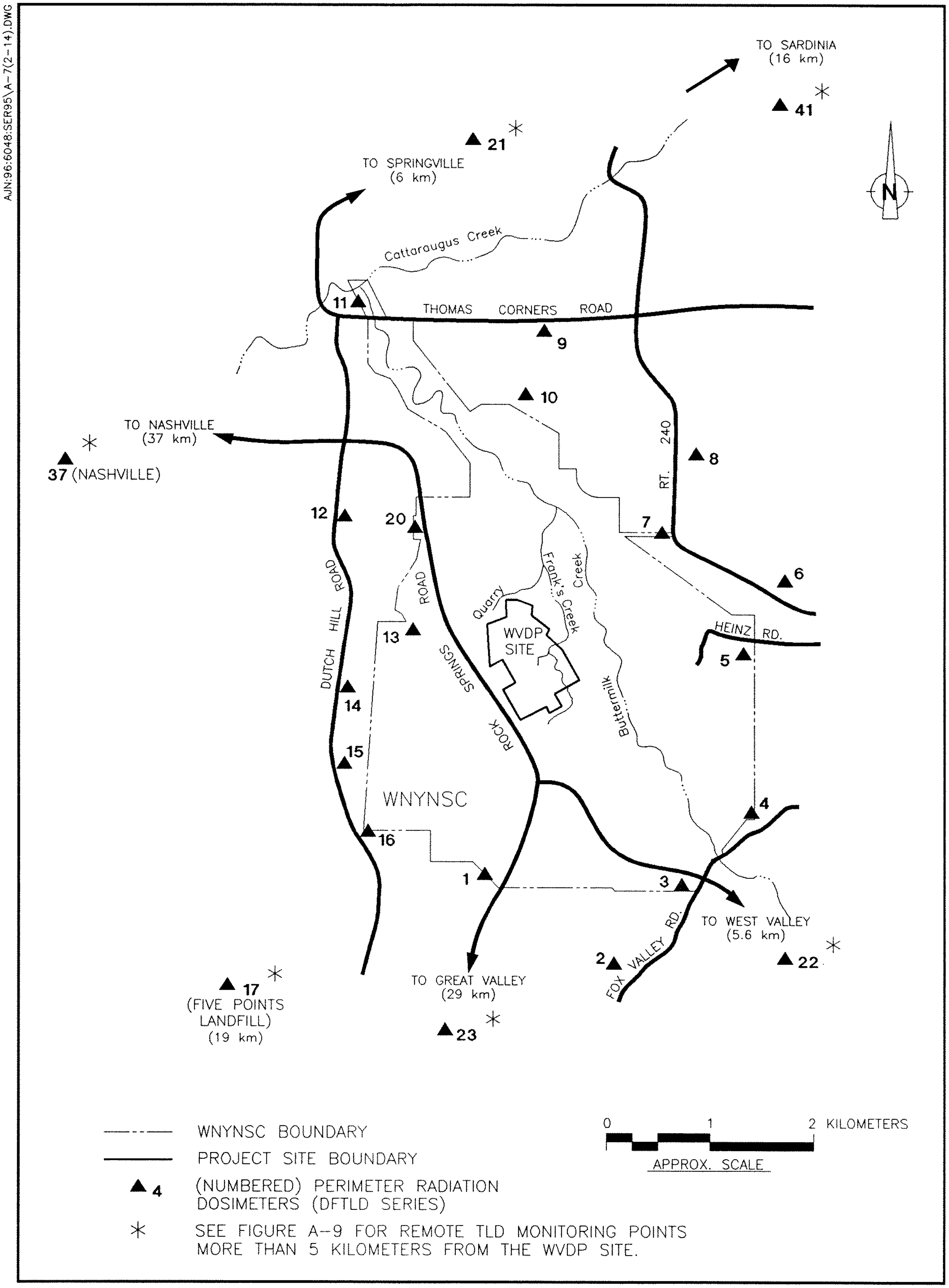


Figure 2-14. Location of Off-site Thermoluminescent Dosimeters (TLDs).

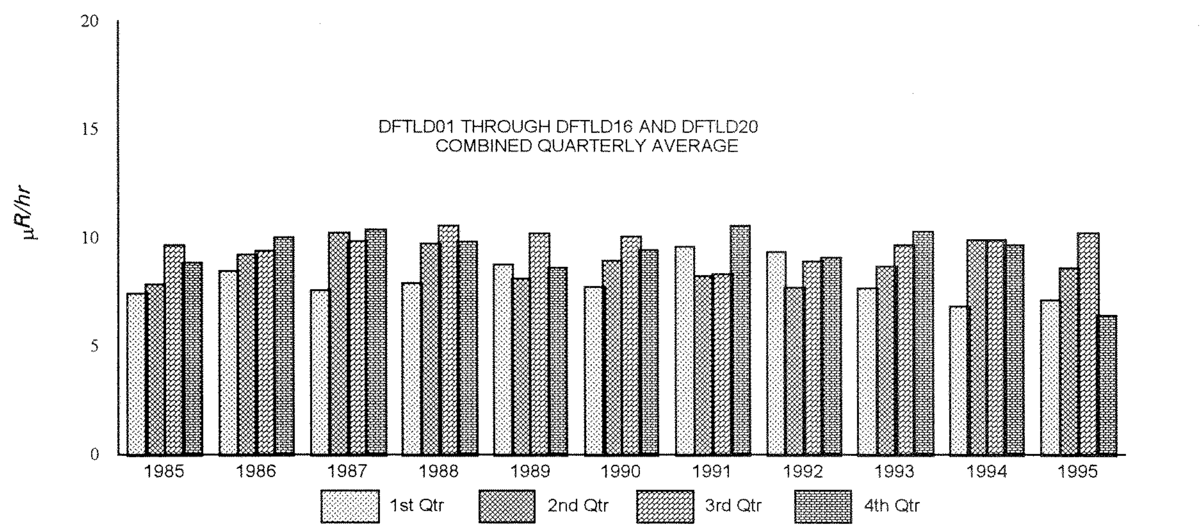


Figure 2-15. Ten-Year Trend of Environmental Radiation Levels (μR/hr)

On-site Radiation Monitoring

The dosimeter at location #19 near the SDA routinely shows radiation exposures slightly above those seen at WNYNSC perimeter locations. Locations #25, #29, and #30 on the public access road west of the facility and #26 at the east security fence also showed small elevations above background. Although above background, the readings are relatively stable from year to year. (See *Appendix C-4*, Table C-4.1 [p. C4-3].)

Location #24 on the north inner facility fence is a co-location site for one NRC TLD. (See *Appendix D*, Table D-4 [p. D-7].) This point received an average exposure of 0.39 milliroentgens (mR) per hour during 1995, as opposed to 0.47 mR/hr in 1994, 0.48 mR/hr in 1993, and 0.52 mR/hr in 1992. Sealed containers of radioactive components and debris from the plant decontamination work are stored nearby. The decline in exposure rate over time is due to radioactive decay of the materials stored within. The storage area is well within the WNYNSC boundary and is not accessible by the public.

Locations around the integrated radwaste treatment storage building — the drum cell — for the most part stayed the same or decreased slightly during the 1995 calendar year. The average dose rate at location #35, however, increased slightly, possibly due to the rearrangement of waste packages in the drum cell. The average dose rate at these locations (TLDs #18, #32, #33, #34, #35, and #36) was 0.024 mR/hr in 1995, similar to the level observed in 1994. These exposure rates, which are above background levels, reflect the placement in the building of drums containing decontaminated supernatant mixed with cement. The drum cell and the surrounding TLD locations are well within the WNYNSC boundary and are not accessible by the public.

Results from locations #27, #28, and #31 at the security fence are near background. These locations are more distant from on-site radioactive waste storage areas.

Results for two new locations added in 1994, #42 and #43, are above background locations, reflecting their positions near waste storage areas.

Perimeter and Off-site Radiation Monitoring

The perimeter TLDs (TLDs #1-16 and #20) are located in the sixteen compass sectors around the facility near the WNYNSC boundary. The quarterly averages for these TLDs (Fig. 2-15 [p. 2-28]) indicate no trends other than normal seasonal fluctuations. TLDs #17, #21-23, #37, and #41 monitor near-site community and background locations. The results from these monitoring points are essentially the same as the perimeter TLDs. Figure C-4.1 in *Appendix C-4* (p. C4-3) shows the average quarterly exposure rate at each off-site TLD location. Figure C-4.2 (p. C4-4) shows the average quarterly exposure rate at each on-site TLD.

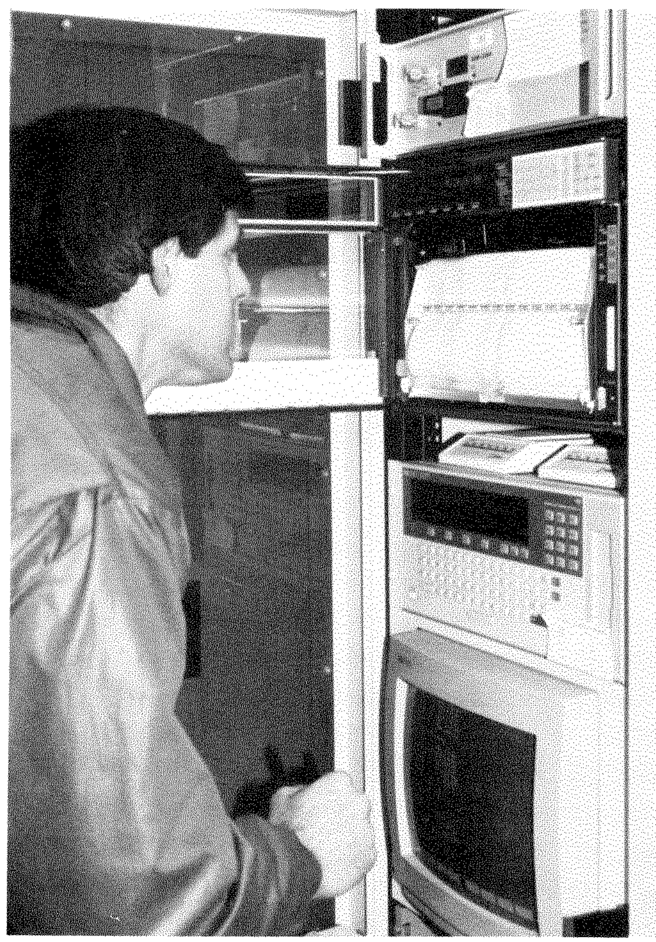
Meteorological Monitoring

Meteorological monitoring at the WVDP provides representative and verifiable data that characterize the local and regional climatology of the site. These data are used primarily to assess potential effects of routine and nonroutine releases of airborne radioactive materials and to calculate dispersion models for any releases that may exceed DOE effluent limits.

Since dispersive capabilities of the atmosphere are dependent upon wind speed, wind direction, and atmospheric stability (which is a function indicated by the difference in temperature between the 10-meter and 60-meter elevations), these parameters are closely monitored and are available to the emergency response organization at the WVDP.

The on-site 60-meter meteorological tower (Fig. 2-1 [p. 2-3]) continuously monitors wind speed and wind direction. Temperatures are measured at both 60-meter and 10-meter elevations. In addition, an independent, remote 10-meter meteorological station located approximately 5 kilometers south of the site on a hillcrest on Dutch Hill Road continuously monitors wind speed and wind direction. (See Fig. A-9 [p. A-55].) Dewpoint, precipitation, and barometric pressure are also monitored at the on-site meteorological tower location.

The two meteorological locations supply data to the primary digital and analog data acquisition systems located within the Environmental Laboratory. On-site systems are provided with either uninterruptible or standby power backup in case of site power failures. In 1995 the on-site system data recovery rate (time valid data was logged versus total elapsed time) was 97.7%. Figures C-6.1 and C-6.2 in *Appendix C-6* (pp. C6-3 and



Checking Data from the Meteorological Tower

C6-4) illustrate 1995 mean wind speed and wind direction at the 10-meter and 60-meter elevations. Regional data at the 10-meter elevation are shown in Figure C-6.3 (p. C6-5).

Weekly and cumulative total precipitation data are illustrated in Figures C-6.4 and C-6.5 in *Appendix C-6* (p. C6-6). Precipitation in 1995 was approximately 87 centimeters (34 in), 17% below the annual average of 104 centimeters (41 in).

Information such as meteorological system calibration records, site log books, and analog strip charts are stored in protected archives. Electronic files containing meteorological data are copied (downloaded) daily and stored off-site. Meteorological towers and instruments are examined three times weekly for proper function and are calibrated semiannually and/or whenever instrument maintenance might affect calibration.

Special Monitoring

NRC-licensed Disposal Area (NDA) Interceptor Trench and Pretreatment System

Radioactively contaminated n-dodecane in combination with tributyl phosphate (TBP) was discovered at the northern boundary of the NDA in 1983, shortly after the Department of Energy assumed control of the WVDP site. Extensive sampling and monitoring through 1989 revealed the possibility that the n-dodecane/TBP could migrate. To contain this subsurface organic contaminant migration, an interceptor trench and liquid pretreatment system (LPS) were built.

The trench was designed to intercept and collect subsurface water, which could be carrying n-dodecane/TBP, in order to prevent the material from entering the surface water drainage ditch leading into Erdman Brook. The LPS was installed to decant the n-dodecane/TBP from the water and to remove iodine-129 from the collected water before its transfer to the low-level waste treatment facility. The separated n-dodecane/TBP would be stored for subsequent treatment and disposal. In response to a 1994 functional readiness review of the system, operator training was conducted and LPS structure make-up air control was improved.

In 1995 no water containing n-dodecane/TBP was encountered in the trench and no water or n-dodecane/TBP has been treated by the LPS. It should be noted that although it does not by itself demonstrate the effectiveness of the interceptor trench, environmental monitoring results for samples collected just outside of the NDA have never contained analytes indicating the presence of n-dodecane/TBP.

Water-level data from wells and piezometers monitoring the weathered Lavery till indicate that the water table in the NDA is sloping towards and is captured by the trench, further supporting the effectiveness of the trench in intercepting and collecting groundwater.

Radiological and nonradiological monitoring data for waters collected from the trench (WNNDATR) and from the drainage just downstream (WNNDADR) have been discussed in this chapter under the on-site surface water section. Results of sampling of the NDA monitoring wells 909 and 910 are presented in *Chapter 3, Groundwater Monitoring*, Table 3-1 (pp. 3-7 through 3-12).

Northeast Swamp Drainage Monitoring

In 1993 trend analyses of surface and groundwater monitoring results began to indicate increasing gross beta concentrations in waters discharged through the northeast swamp drainage as monitored at sampling points WNDMPNE and WNSWAMP. (WNDMPNE and WNSWAMP monitored the same location; samples collected as part of the groundwater program were identified as WNDMPNE and surface water samples were identified as WNSWAMP. See *Chapter 3, Groundwater Monitoring* [p. 3-23].)

Upon examination, a small seasonal groundwater seep was discovered that appeared to be a major contributor of strontium-90 to this drainage path. An investigation was initiated to characterize the source of this seep, its effect on surface water quality, and to provide information for mitigative action, if deemed necessary. A series of samples were collected throughout the north plateau area using a Geoprobe® unit. This truck-mounted unit drives a metal sampling rod into the ground to a predetermined depth. Using this method, groundwater and soil beneath and downgradient of the process building were sampled between July 14, 1994 and October 19, 1994. During this investigation, groundwater was collected from eighty locations, and soil samples were collected from four locations.

Sampling results indicate that a narrow, elliptically shaped plume of elevated gross beta activity, extending northeastward from the south end of the process building to the construction and demolition debris landfill, is present in groundwater within the sand and gravel unit. The plume is approximately 300 feet wide and 800 feet long. The highest gross beta activities in groundwater and soil were measured at two locations near the south end of the process building. Isotopic characterization of the groundwater and soil suggests that strontium-90 and its daughter product, yttrium-90, contribute most of the gross beta activity in groundwater and soil beneath and downgradient of the process building. At this time the primary source of contamination is believed to be an area in the southwest corner of the process building associated with acid recovery operations conducted by the previous site operator, Nuclear Fuel Services, Inc. (NFS), prior to any WVDP activities.

During 1995, routine ground- and surface water sampling continued to monitor radiological discharges through the northeast swamp drainage. (See *Appendix C-1*, Table C-1.7 [p. C1-8] and *Appendix E*, Table E-1 [p. E-3].)

The maximum monthly gross beta concentration observed at WNSWAMP during 1995 was 4.55±0.04E-06 µCi/mL (168 Bq/L) during September. Since then, gross beta and strontium-90 concentrations have diminished somewhat.

The mean gross beta result for December 1995 was 2.12±0.02E-06 µCi/mL (78.4 Bq/L). The December 1995 strontium-90 composite result for location WNSWAMP was 9.89±0.21E-07 µCi/mL (36.6 Bq/L). The DOE DCG of 1.0E-06 µCi/mL for strontium-90 pertains to an annualized average, which currently (January 1995 – December 1995) is 1.25±0.03E-06 µCi/mL (125% of the DOE DCG). Although the annualized average surface water strontium-90 concentration exceeded the strontium-90 DOE DCG at sampling location WNSWAMP (on the WVDP premises), monitoring downstream at the first point of possible public access (WFFELBR) continued to show gross beta concentrations to be indistinguishable from background (WFBIGBR).

A number of actions were undertaken by the WVDP in 1995 to communicate north plateau contamination issues to concerned regulatory agencies and to mitigate the movement of strontium-90 in site groundwater:

- The final Geoprobe® report describing the principal findings of this investigation, including potential sources and mitigative alternatives, was completed and submitted to NYSDEC in April 1995. This report complied with schedule provisions of the WVDP's SPDES permit.

- In November 1995, the WVDP installed and began operation of a groundwater pump-and-treat system. Recovered well water, after pretreatment, is directed to the site's low-level waste treatment facility for additional treatment before it is discharged to the environment through the monitored lagoon system. In

1995 approximately 935,000 liters (247,000 gal) were processed in this manner. The pump-and-treat system is currently being evaluated along with other technologies to determine if there are more effective methods for treating the groundwater.

Waste Tank Farm Underdrain Monitoring

Notable increases in gross beta and tritium activity at location WN8D1DR, attributable to surface contamination, were described in the 1993 and 1994 annual Site Environmental Reports. In the past this location received subsurface drainage from the high-level waste tank farm area and channeled it to a nearby surface water drainage. Since July 1993 this underdrain has been valved off (isolated) from the site's storm drain system, preventing water from freely flowing to the surface drainage. However, samples continue to be taken from the original collection point, a storm sewer access.

Drum Cell Monitoring

Liquid high-level waste (through supernatant treatment and sludge wash) processed by the integrated radwaste treatment system (IRTS) produced, through 1995, 19,877 drums of low-level cement-solidified waste. Liquid pretreatment operations were completed in May 1995. Drums produced during all phases of liquid waste processing are currently being stored aboveground in the IRTS drum cell.

Most of the gamma radiation emitted from these drums is shielded by the configuration in which the drums are stacked. However, some radiation is emitted through the roof of the drum cell, which is unshielded. This radiation scatters in air and adds to the existing naturally occurring gamma-ray background.

Radiation exposure levels are monitored at various locations around the drum cell perimeter and at the closest location accessible by the public — approximately 300 meters (984 ft) west at the security fence at Rock Springs Road. Baseline measurements had been taken in 1987 and 1988 before the drums were placed. Two types of measurements were taken: instantaneous, using a high-pressure ion chamber (HPIC), and cumulative, using thermoluminescent dosimeters.

The strength of the gamma-ray field can vary considerably from day to day because of changes in meteorological conditions. TLD measurements provide a more accurate estimate of long-term changes in the radiation field because they integrate the radiation exposure over an entire calendar quarter. Such quarterly readings show evidence of a seasonal cycle. Background radiation levels can vary annually depending on such factors as average temperature, air pressure, humidity, precipitation (including snow cover on the ground), and solar activity during a particular year. The TLD measurements at the Rock Springs Road location (TLDs #28 and #31) are presented in *Appendix C-4*, Table C-4.1 (p. C4-3).

The most recent data also show that exposure rates at Rock Springs Road are the same as or only slightly greater than those seen before any drums were placed in the drum cell.

Closed Landfill Maintenance

Closure of the on-site nonradioactive construction and demolition debris landfill (CDDL) was completed in August 1986. The landfill area was closed in accordance with the New York State Department of Environmental Conservation (NYSDEC) requirements for this type of landfill, following a closure plan (Standish 1985) approved by NYSDEC. To meet routine post-closure requirements, the CDDL cover was inspected in March and September 1995 and was found to be in proper condition. Adequate drainage was maintained to ensure that no obvious ponding or soil erosion occurred and that the grass planted on the clay and soil cap was cut.

Results of groundwater monitoring in the general area of the closed landfill are presented in *Chapter 3, Groundwater Monitoring* (p. 3-24).

Storm Water Monitoring Program

During the summer and fall of 1995, eleven storm water outfalls were sampled to characterize the storm water leaving the WVDP site and to collect data for use in a storm water permit reapplication. First-flush grab samples were collected during the first thirty minutes of the storm and flow-weighted composite samples were collected over the duration of the storm. The samples were analyzed for the parameters currently monitored as part of the existing State Pollutant Discharge Elimination System (SPDES) permit program and for several radionuclides.

The applicable regulations require that samples be collected from the discharge resulting from a storm event that precipitates more than 0.1 inches and begins at least seventy-two hours after the previous measurable storm event.

Qualifying events were identified by monitoring storm rainfall amounts and measuring the period of time after the end of each event.

The analytical data measured from the storm water samples were compiled in a new SPDES permit application for the site, encompassing all storm water outfalls and the previously permitted outfalls. The permit application is to be submitted to NYSDEC early in 1996.

For more information see the *Environmental Compliance Summary: Calendar Year 1995* (p. lvii).

Residential and Municipal Well Sampling

In addition to sampling at the locations listed in *Appendix A* (A-vi and A-vii), the on-site Environmental Laboratory occasionally is authorized to analyze samples sent in by local residents and municipalities at their request and at no cost to the residents or municipalities. Potable water samples from private residences near the site were analyzed this year for gross alpha, gross beta, tritium, potassium-40, cobalt-60, and cesium-137. All samples were at or below background activity.

Special Studies

Evaporation Rate Study

A special study was conducted in October 1995 to provide a realistic estimate of the evaporation rate of tritiated water from the low-level waste treatment facility lagoons during 1994. This study was initiated in response to concerns that the calculations performed for the 1994 National Emissions Standard for Hazardous Air Pollutants (NESHAP) report might be overly conservative.

Two computational methods were evaluated and compared to published estimated values for evaporation rates from shallow lakes and reservoirs in the Western New York region. The first method involved the same calculation performed for the 1994 report except that daily average WVDP meteorological values were used instead of annual average values in order to provide a more realistic estimate. In addition, more detailed data for lagoon 3 water temperatures and tritium concentrations were obtained for this study. The evaporation rate derived using the first method was 34 inches per year (or 0.17 Ci H-3/yr). The second computational approach incorporated estimates of the site humidity over different periods of the year and also provided an estimate of daily evaporation rates. This second method resulted in an estimate of up to 50 inches per year (or 0.25 Ci H-3/yr).

The conclusion reached by this study was that the estimate of 30 inches per year evaporation from the lagoons used in the 1994 annual NESHAP report is not overly conservative and is within the expected 25 to 35 inches per year water evaporation rate cited in the literature for the Western New York region.

Other Studies

No other special studies such as the previously completed small mammal study and the survey of trees near the NDA were conducted in 1995. (See the 1994 Site Environmental Report for a discussion of these studies.)

Nonradiological Monitoring

Air Monitoring

Nonradiological emissions and plant effluents are controlled and permitted under NYSDEC and EPA regulations. The regulations that apply to the WVDP are listed in Table B-2 (p. B-4) in *Appendix B*. The individual air permits held by the WVDP are identified and described in Table B-3 (p. B-5 through B-9).

The nonradiological air permits are for sources of regulated pollutants that include particulates, ammonia, nitric acid mist and oxides of nitrogen, and sulfur. However, monitoring of these parameters currently is not required.

Surface Water Monitoring

Liquid discharges are regulated under the State Pollutant Discharge Elimination System (SPDES). The WVDP holds a SPDES permit that identifies the outfalls where liquid effluents are released to Erdman Brook (Fig. 2-16) and specifies the sampling and analytical requirements for each outfall. This permit was modified in 1990 to include additional monitoring requirements at outfall WNSP001. The WVDP applied for a renewed SPDES permit in 1992. It was received in early January 1994 and went into effect on February 1, 1994 with the expanded monitoring requirements and, in some cases, more stringent discharge limitations. The permit was again modified in April and November of 1994 and in June 1995.

Three outfalls were identified in the 1995 permit:

- outfall WNSP001, discharge from the low-level waste treatment facility
- outfall WNSP007, discharge from the sanitary and industrial wastewater treatment facility
- outfall WNSP008, groundwater effluent from the perimeter of the low-level waste treatment facility storage lagoons.

The conditions and requirements of the current SPDES permit are summarized in Table C-5.1 (p. C5-3) in *Appendix C-5*.

Some of the more significant features of the SPDES permit are the requirements to report five-day biochemical oxygen demand (BOD-5), total dissolved solids, iron, and ammonia data as flow-weighted concentrations and to apply a net discharge limit for iron. The net limit allows the Project to account for amounts of iron that are naturally present in the site's incoming water. The flow-weighted limits apply to the sum of the Project effluents but allow the more dilute effluents to be factored into the formula for determining compliance with permit conditions.

The SPDES monitoring data for 1995 are displayed in Figures C-5.2 through C-5.53 in *Appendix C-5* (pp. C5-6 through C5-23). The WVDP reported six noncompliance episodes in 1995 (Table C-5.2 [p. C5-4]). See the *Environmental Compliance Summary: Calendar Year 1995* (p. li).

Semiannual grab samples at locations WNSP006 (Frank's Creek at the security fence), WNSWAMP (northeast swamp drainage), WNSW74A (north swamp drainage), and WFBCBKG (Buttermilk Creek at Fox Valley) were taken in 1995. These samples are screened

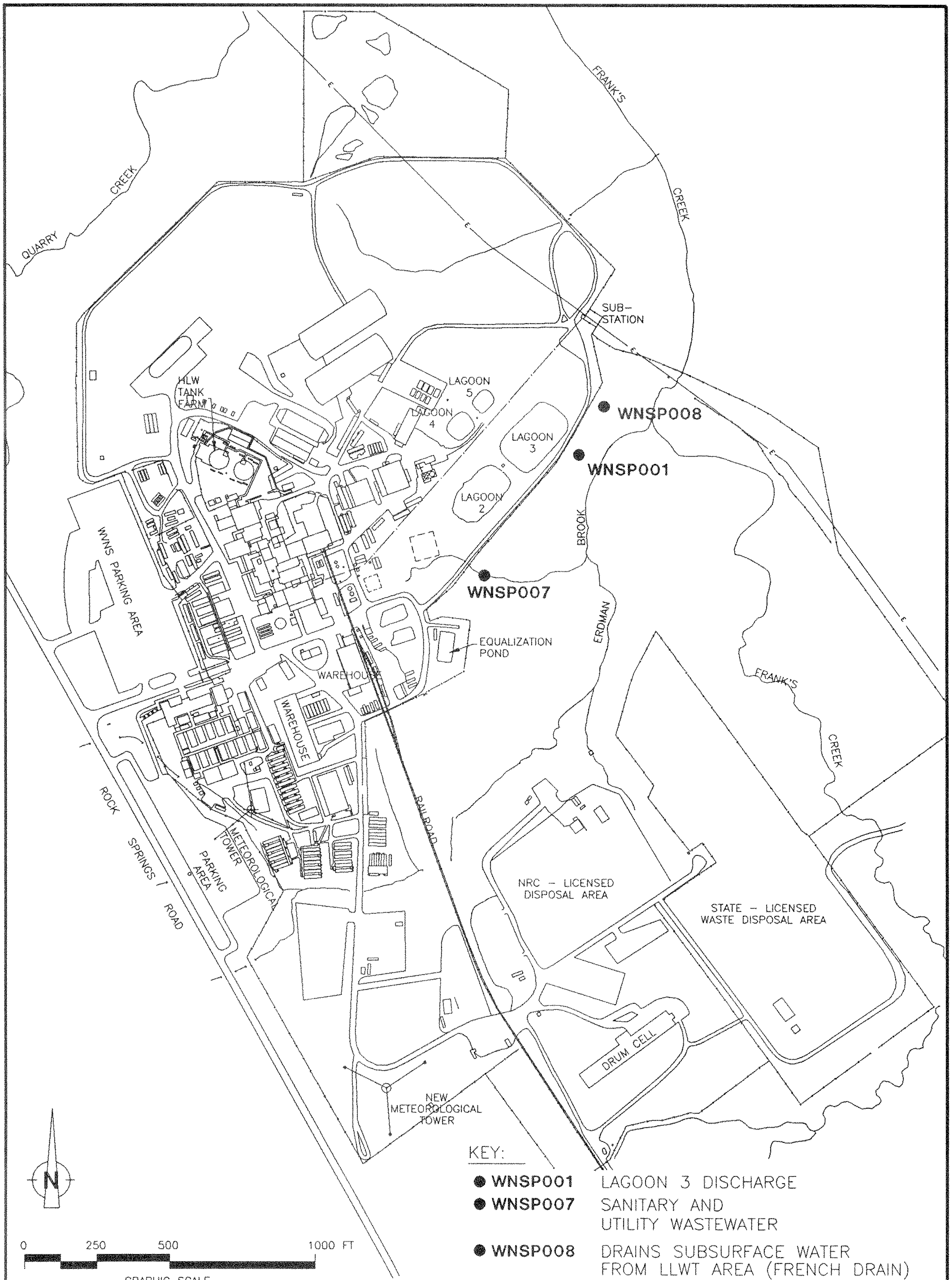


Figure 2-16. SPDES Monitoring Points.

for organic constituents and selected anions, cations, and metals. Results of these measurements for all of these locations are found in Table C-1.27 (p. C1-22) in *Appendix C-1*.

Appendix C-1, Tables C-1.19 and C-1.20 (pp. C1-16 and C1-17), present NPOC (non-purgeable organic carbon), total organic halogens (TOX), and pH data for two locations that help monitor the NDA, WNNDADR and WNNDATR. (See Fig. 2-3 [p. 2-5].) When NPOC and TOX values at both locations are compared, the data suggest that even with moderate fluctuation there is little if any significant difference.

Drinking Water Monitoring

As a result of changes in EPA and New York State monitoring requirements, the site drinking water was sampled for copper and lead concentrations. (See **Safe Drinking Water Act** in the *Environmental Compliance Summary: Calendar Year 1995* [p. liv].) Samples also were collected for nitrate, fluoride, and metals concentrations analyses. This sampling activity will be repeated annually as part of the site's drinking water monitoring effort.

Lagoon 3 Phytoplankton and Chlorophyll Sampling

As part of the investigation into lagoon 3 BOD-5 increases during the summer months, the effects of both phytoplankton and chlorophyll in the lagoon system were investigated. The Environmental Laboratory collected several samples from the lagoons that were then analyzed by the State University of New York at Brockport. The investigation indicated that the lagoon system produces high phytoplankton biomass and chlorophyll levels. The conclusion drawn from the sampling was that phosphorous levels in the lagoon system, which were producing high organic matter, were the ultimate cause of the elevated BOD.

Lagoon 3 was treated with hydrogen peroxide and resampled. The results from this sampling showed that the addition of hydrogen peroxide did not significantly reduce chlorophyll or phytoplankton biomass levels. Brockport recommended the use of an algicide that would not increase the total phosphorous levels in the lagoon to control the biomass levels in the lagoon system. This recommendation is under consideration.