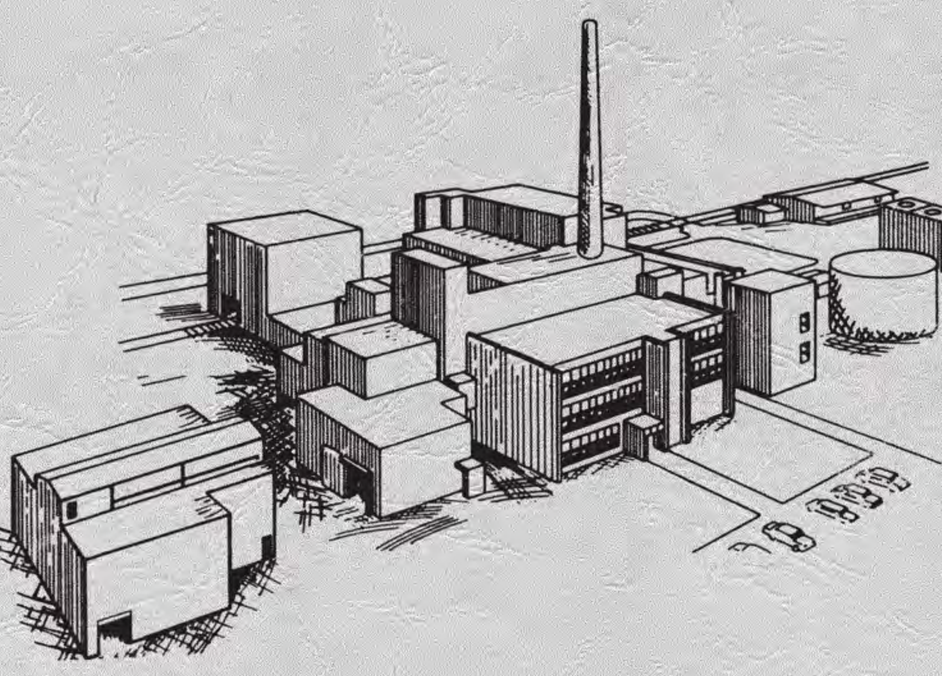
WVDP-040

1984 PRE-OPERATIONAL ENVIRONMENTAL MONITORING REPORT WEST VALLEY DEMONSTRATION PROJECT

March 1985

West Valley Nuclear Services Company, Inc.



1984

PREOPERATIONAL ENVIRONMENTAL MONITORING REPORT

WEST VALLEY DEMONSTRATION PROJECT

March, 1985

Operated for the U.S. Department of Energy

by

West Valley Nuclear Services Company, Inc.

Rock Springs Road

West Valley, New York 14171-0191

WVDP 040, Rev. 0

JES0085:ENG-31

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

LIST OF TABLES

LIST OF TABLES (continued)

LIST OF TABLES (continued)

LIST OF FIGURES

LIST OF FIGURES (continued)

LIST OF FIGURES (continued)

DISCLAIMER

1.0 INTRODUCTION

This report is submitted in accordance with DOE Order 5484.1 and presents a summary of environmental monitoring data collected at the West Valley Demonstration Project (WVDP) from January 1, 1984 through December 31, 1984 to meet the requirements of Technical Specification 5.1 The program implemented by West Valley Nuclear Services Company will provide data in full compliance with DOE recommendations for calendar year 1985.

On February 26, 1982, the responsibility for operation and maintenance of the former Nuclear Fuel Services, Inc. (NFS) reactor fuel reprocessing facility was transferred to the Department of Energy (DOE). Public Law No. 96-368, enacted in 1980, mandated the demonstration of technology for solidification of the 2.2 million litres (580,000 gallons) of liquid high-level radioactive waste that were produced by commercial fuel reprocessing at the West Valley plant and are now held in underground storage tanks at the facility. The DOE selected West Valley Nuclear Services Company (WVNS) as the contractor to implement the provisions of this law.

When WVNS assumed operational control, NFS was conducting an environmental monitoring program appropriate to the shutdown maintenance operating status of the facility in accordance with Technical Specification 5.1 under NRC License CSF-1. WVNS recognized that the NFS program required substantial change in order to prepare for the high-level waste solidification operations currently scheduled for start-up in September 1988. Accordingly in 1982 WVNS began to implement a full-scale environmental surveillance program in support of these planned operations and by early 1985 had fully implemented this program. As recommended in DOE Order 5484.1, Chapter III, Paragraph 1, this allows more than two years to gather preoperational environmental baseline data before solidification operations begin.

A comprehensive Environmental Evaluation (EE) was published in June, 1984 to initiate the decision-making process for disposal of Project low-level radioactive waste. The intent of the Project is to phase out the methods used by NFS and replace them with engineered disposal technology. The EE evaluated the environmental impact of engineered shallow land burial and determined that anticipated impacts were within acceptable regulatory levels.

Based on the review of the EE by the Department of Energy Headquarters and the Idaho Operations Office, the Project staff has been directed to assist the DOE with the preparation of an Environmental Assessment to be published in August, 1985.

Although the reprocessing plant is not now being used for its original purpose, it is being maintained in shutdown status. This requires continual operation of basic services, including low-level radioactive waste management. The facility operation includes periodic disposal of solid radioactive waste from decontamination and maintenance activity (plant wastes) in the formerly licensed disposal area. Liquid wastes resulting from plant activities are processed on-site at the low-level waste treatment facility (LLWT) prior to discharge.

The WVDP site is located in a rural setting approximately 50 km (30 mi) south of Buffalo, New York (Figure 1-1), at an average elevation of 400 m (1,300 ft) on New York State's western plateau. The plant facilities used by the Project occupy approximately 63 hectares (156 acres) of chain-link fenced area within a 1,350 hectare (3,300 acre) reservation that constitutes the Western New York Nuclear Service Center (WNYNSC). The communities of West Valley, Riceville, Ashford Hollow, and the village of Springville are located within 8 km (5 mi) of the plant. Several roads and one railway pass through the Center, but no human habitation and no hunting, fishing, or public access are permitted on the WNYNSC.

The land immediately adjacent to the WNYNSC is used primarily for agriculture and arboriculture. Cattaraugus Creek to the north is used for water recreation (swimming, canoeing, and fishing) in the summer. Although limited irrigation of adjacent golf course greens and tree farms is taken from the Cattaraugus Creek, no public water supply is drawn from the creek downstream of the WNYNSC.

The average annual temperature in the region is 7.2°C (45.0°F) with recorded extremes of 37°C (98.6°F) and -42°C (-43.6°F). Rainfall is relatively high, averaging about 104 cm (41 in) per year. Precipitation is evenly distributed throughout the year and is markedly influenced by Lake Erie to the west and Lake Ontario to the north. All surface drainage from the WNYNSC is to Buttermilk Creek which flows into Cattaraugus Creek and ultimately into Lake Erie. Regional winds are predominantly from the west and south at over 4 m/sec (9 mi/hr) during most of the year. WVNS is currently studying the influences of local topography on-site wind patterns. Wind rose data and site specific meteorological information are being developed, and a final meteorological summary report will be issued in fiscal year 1985.

The WNYNSC lies within the northern hardwood forest region, and the diversity of its vegetation is typical of the area. Equally divided between forest and open land, the site provides habitats especially attractive to white-tailed deer and the various birds, reptiles, and small mammals indigenous to the region. No endangered species are known to be present on the reservation.

The geology of the site is characterized by glacial deposits of varying thickness in the valley areas, underlain by sedimentary rocks which are exposed in the upper drainage channels in hillsides. The soil is principally silty till consisting of unconsolidated rock fragments, pebbles, sand, and clays. There is an aquifer in the upper 6 m (20 ft) of granular fluvial materials concentrated near the western edge of the site; high ground to the west and the Buttermilk Creek drainage to the east intersect this aquifer, precluding off-site continuity. Several shallow, isolated, water-bearing strata also occur at various other locations within the site boundary but do not appear to be continuous. The zone at which the till meets bedrock forms another aquifer that ranges in depth from 2 m (6 ft) underground on the hillsides to 170 m (560 ft) deep just east of the boundary of the facility exclusion area.

LOCATION OF WESTERN NEW YORK NUCLEAR SERVICE CENTER

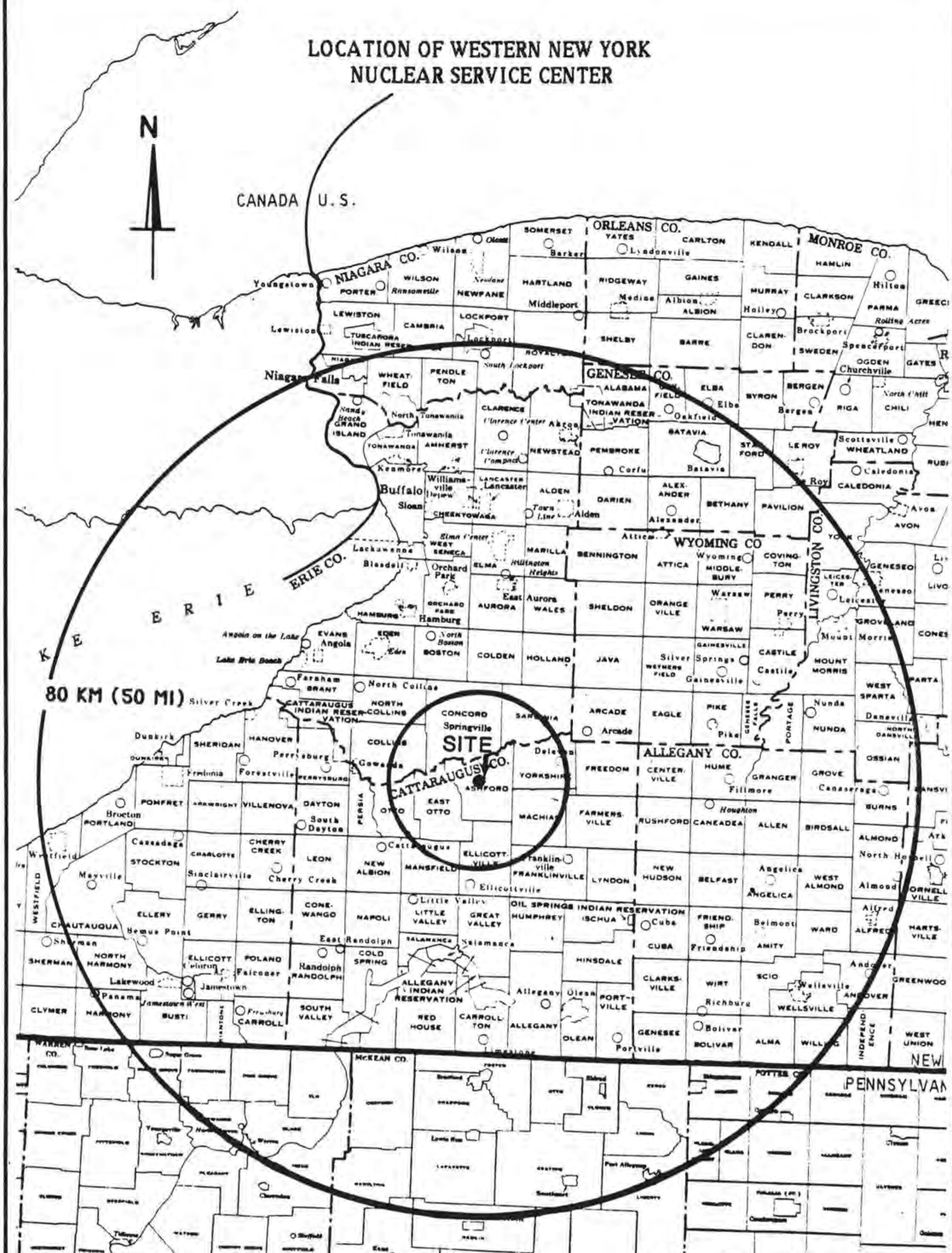


FIGURE 1-1

2.0 SUMMARY

In most environmental media collected from the Project environs, radionuclide concentrations could not be distinguished from radioactivity which occurs naturally or has been deposited from weapons testing. Radioactivity levels in surface water and in fish directly downstream of the Project appeared slightly lower than those of previous years. The content of radioactivity in venison from the single on-site deer specimen was comparable to levels in samples from the past several years but higher than for the 1983 sample. Although small amounts of radioactivity were discharged during the course of Project activities, radioactivity levels in air and water effluents were well within the concentration guides of DOE Order 5480.1, Chapter XI. A total of 0.00083 curies of particulate radioactivity was discharged to the air, and 0.093 curies of radioactivity (excluding 7.6 curies of tritium as tritiated water) were released to Buttermilk Creek. The resultant collective and individual dose estimates to the surrounding population from these releases imply negligible consequences with regard to impacts on human health.

The maximum hypothetical dose an individual could have received from 1984 WVDP activities is about 0.27% of the protection standard. The collective population dose to persons living within 80 km (50 mi) of the site was estimated to be 0.15 person-rem. This is equivalent to an average individual dose of 0.00009 millirem as compared approximately to 100 millirem received from natural sources.

No increase in radioactivity over previous years' levels was observed in groundwater monitoring wells on-site and off-site around the perimeter of the site. Special surface and groundwater monitoring activities initiated in December 1983 demonstrated that radioactivity in a burial area monitoring well was confined to that immediate area and did not appear in adjacent monitoring wells or surface water.

Concentrations of particulate radioactivity in air measured at the site boundary were no different statistically than those reported from New York State Department of Health background samples for 1982 and 1983. Samples of water obtained off-site from Cattaraugus Creek (which receives Buttermilk Creek drainage from the entire site) contained two detectable man-made isotopes: tritium and strontium-90. Buttermilk Creek is not used as a drinking water supply for humans, but the water is accessible to dairy cattle at one location on the creek downstream of the site. Radionuclide concentrations in milk samples from this herd were at or below detectable limits for all fuel-cycle isotopes. Thermoluminescent dosimeters placed around the site perimeter indicated that direct external radiation exposure was within the range expected from natural background in this region and was statistically the same as background measurements at a remote location.

Nonradioactive chemical water quality measurements indicated no discharges which would adversely affect the waters receiving site effluents. Several water quality measurements have exceeded the permitted limits at the discharge point, but effluent stream consolidation and conditioning are now in progress to eliminate the cause of these excursions. Studies to more clearly identify potential sources and preventative measures for possible future effluent problems are also underway.

3.0 ENVIRONMENTAL MONITORING PROGRAM - DESCRIPTION AND RESULTS

This report reflects some of the changes in the environmental monitoring network which have been implemented in the past two years to provide an enhanced level of environmental surveillance in anticipation of high-level waste solidification activities. The complete surveillance program as it was implemented in 1984 and will be operated in 1985 (including effluent, on-site, and off-site monitoring) is summarized in tabular form in Appendix A.

The major pathways for off-site movement of radionuclides are by surface water runoff and airborne transport. The environmental monitoring program therefore emphasizes the collection of air and geohydrological samples. The ingestion and assimilation of radionuclides by game animals and fish that include the WNYNSC in their range is another significant potential pathway. In addition to the radiological environmental monitoring program, WVNS participates in the State Pollution Discharge Elimination System (SPDES) and operates under state-issued air and water discharge permits for Nonradiological plant effluents. Section 3.2 summarizes Nonradiological monitoring in 1984 and Appendix C-5 provides greater detail on these activities.

3.1 Radiological Monitoring

Air, water, and selected biological media were sampled and analyzed to meet Department of Energy and plant Technical Specification monitoring requirements. To meet guidelines and provide appropriate reference parameters, a number of other sampling points were added or upgraded in 1984.

3.1.1 Radioactivity in Air

In 1984, airborne particulate radioactivity was sampled continuously by three air samplers at locations shown in Figure 3-1. Each air sampler, mounted on a 4-metre high tower, maintains an average air flow of about 40 litres/min (1.5 ft^3/min) through a 47 mm glass fiber filter. During 1984 another air sampler was added on Rock Springs Road near the closest residence downwind of the plant (Figure 3-1), and additional samplers were located in Great Valley, Springville, and West Valley (Figure 3.2). These four new samplers operate at the same rate as the three mounted on towers, but the sampler head is at 1.7 metres above the ground (the height of the average breathing zone).

The filters were 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 were made using a low-background gas proportional counter. The average concentrations ranged from 1.27 E-14 to 2.82 E-14 microcuries per millilitre (uCi/ml) beta, and 6.5 E-16 to 1.68 E-15 uCi/ml alpha activity.

In all cases, the measured activities were below 1 E-12 uCi/ml beta, and 2 E-14 uCi/ml alpha, the most limiting concentration guides listed in DOE Order 5480.1 for releases to uncontrolled areas. (The standards and concentration guides from DOE Order 5480.1 are reproduced as Appendix B. Results of the analyses of perimeter air sample filters are presented in Appendix C-2.) For comparison, the 1982 and 1983 data from the New York State Department of Health indicated a normal background concentration of gross beta activity in air which averaged 2 E-14 uCi/ml in Albany, New York (Huang, 1984). These measurements indicate that site activities have no discernible influence on off-site airborne radioactivity.

At four perimeter locations, three of which coincide with air samplers, fallout is collected in open pots. The data from these collections are presented in Appendix C-2. Because of the low concentrations, the large volume samples from the plant ventilation stack provide the only practical means of determining the amount of specific radionuclides released from the facility. The average monthly concentrations for gross alpha and beta radioactivity released from the stack, based on the 52 weekly filter measurements, are shown in Table C-2.1 of Appendix C-2. The results of analyses for specific radionuclides in the four quarterly composites of stack effluent samples are also listed in Table C-2.1.

A new stack sampling system that meets the current ANSI N13.1 standards for sampling from nuclear facilities was installed in mid-1984. A higher flow rate and multiple nozzles assure a more representative sample for both the long-term sample collection and the on-line monitoring system. The variations in concentrations of airborne radioactivity sampled through the in-stack probe reflect the level of in-cell decontamination activities within the facility. Even at this most concentrated point of airborne effluent release, average concentrations were still below the concentration guides for airborne radioactivity released to an unrestricted area.

3.1.2 Radioactivity in Surface Water and Sediment

Four automatic water samplers collect surface water at points along the site drainage channels. Off-site water samples are collected continuously from Cattaraugus Creek at Felton Bridge just downstream of the confluence with Buttermilk Creek, the major surface drainage from the WNYNSC (Figure 3-1).

The Cattaraugus Creek sampler continuously removes a small volume of water (approximately 400 ml/hr) from the creek; a stream stage-level chart recorder provides a means of flow-weighting the weekly composite based on relative stream depth. Gross alpha, beta, and tritium analyses are performed each week, and a weighted monthly composite is analyzed for Sr-90 and gamma emitting isotopes. A grab sample taken monthly from a background location at Cattaraugus Creek upstream of the Buttermilk Creek confluence is analyzed for gross alpha, beta, and tritium. The most elevated concentrations in samples from Cattaraugus Creek during 1984 show Sr-90 to be less than 2 percent of the concentration guide for unrestricted effluent. Gross alpha and gamma emitting isotopes were so low as to be below the detection limit in Cattaraugus Creek water for 5 of the 12 months represented (Table C-1.6) On the average, however, the concentration of radioactivity in Cattaraugus Creek increases detectably after Buttermilk Creek joins it.

During 1983 three surface water monitoring stations in addition to the Cattaraugus Creek samples were put into service. These samplers currently operate in a time composite mode, collecting a 2.5 ml aliquot every half-hour. At each station the composite samples are collected biweekly, composited monthly, and analyzed for tritium, gross alpha, and gross beta radioactivity. These installations collect water from an upstream background location on Buttermilk Creek (Fox Valley Road) and a downstream location at Thomas Corners Road near the confluence of Cattaraugus Creek (Figure 3-1). The third station is on Franks Creek (also known as Erdman Brook) just upstream of the point where Project site drainage leaves the security area (Figure 3-3). Radiological concentration data from these sample points show that average radioactivity concentrations are generally higher in Buttermilk Creek below the WVDP site than above, presumably because a small amount of activity enters Buttermilk Creek from the site via Franks Creek.

The range of gross beta activity, for example, was 2.5 E-9 to 7.2 E-9 uCi/ml upstream in Buttermilk Creek at Fox Valley, and from 5.9 E-9 to 21.4 E-9 uCi/ml in Buttermilk Creek at Thomas Corners Bridge. Nonradiological water quality measurements taken at the Franks Creek location are discussed in Section 3.2 of this report.

Sediments from Buttermilk Creek and Cattaraugus Creek were analyzed for gamma-emitting isotopes. The results are at levels comparable to past analyses during the Project. Data are presented in Appendix C-1.

The largest single source of radioactivity released to surface waters is the discharge from the Low-Level Waste Treatment (LLWT) system through the Lagoon 3 weir (SPDES 001, see Figure 3-3) and into Erdman Brook. There were six batch releases (a total of about 51 million litres) from Lagoon 3 in 1984. The effluent was grab sampled daily during the 52 days of release and analyzed. The total amounts of activity in the effluent are listed in Table C-1.1. Of the activity released from Lagoon 3, 3.6% of tritium and 7.7% of other radioactivity originated in the New York State disposal area and not from previous or current Project operations. (See Table C-1.11.)

3.1.3 Radioactivity in the Food Chain

Samples of fish and game animals were collected both near and remote from the site during periods when they would normally be taken by sportsmen for consumption. Milk and beef from cows grazing near the site and at remote locations were also collected and analyzed during 1984. The results of these analyses are presented as Appendix C-3.

Fish samples were taken semiannually during 1984 above the Springville dam from the portion of Cattaraugus Creek which receives WNYNSC drainage. Nine fish were collected from this section of the stream during both periods. The Sr-90 content in flesh and skeleton, and gamma emitting isotopes in flesh were determined for each specimen.

Control data are included in this report to permit comparison with the concentrations found in fish taken from site-influenced drainage. For this purpose a number of fish were taken from waters that could not have been influenced by site runoff and the edible portions of them were analyzed in a similar manner; these control (natural background) samples were representative of some of the species collected in Cattaraugus Creek as well as species common in ponds and lakes. The 1984 concentrations of strontium and cesium isotopes in the edible flesh show a slight downward trend compared to 1983 data (WVNS, 1983): the Sr-90 content in the skeleton showed a marked downward trend from previous measurements during recent years (Wilcox and Smokowski, n.d.) The statistical treatment of the fish data presented in Appendix C-3 is specified by the site reporting requirements.

Portions of a single deer from a resident herd on the east side of the WNYNSC were analyzed. The concentration of cesium-137 in deer flesh was considerably higher than the concentration in the previous year's sample, but still within the range seen in samples within the last 5 years. Data from a control, or background, deer sample collected in 1984 from an Allegany County location 80 km from the site are shown for comparison. The concentration of radioactivity in meat from a local beef animal was indistinguishable from the concentration in a control sample.

Although the dairy cattle sampled monthly in 1984 reside adjacent to the site and receive the maximum exposure of any dairy herd, the concentration of Sr-90 in milk ranged only from 1.1 to 2.8 pCi/l. Iodine-129 and gamma emitting isotopes were not detectable. Control milk samples from the Albany, New York area, provided under a cooperative agreement by the New York State Department of Health laboratory and analyzed by WVDP, showed a concentration of 2.9 pCi/l of Sr-90 in 1984.

In Section 4 of this report, radionuclides present in the human food chain are discussed and their contribution to the radiation exposure of the public is assessed. Although in many cases the concentrations of specific radionuclides were below the analytical detection limit, for purposes of the dose assessment they were considered present at the minimum detectable concentration. Although the maximum concentrations of radioactivity found in some biological samples were above background levels, the dose associated with consumption of these samples would be far below the protection standards.

3.1.4 Direct Environmental Radiation

1984 was the first complete year in which direct environmental radiation monitoring at WVDP relied solely on TL-700 LiF dosimetry. The uncertainty of individual results and averages were acceptable and measurements were more precise than in 1983. There were no significant differences between the background TLDs and those on the site perimeter.

In 1984, four new TLD locations were added to the program: one at the Rock Springs Road air sampler (AFRSPRD), one in Great Valley (AFGRVAL), one in Springville (AFSPRVL), and one in West Valley (AFWEVAL). The Great Valley site will serve as a second background location.

Dosimeters used to measure ambient penetrating radiation during 1984 were processed on-site. The system uses Harshaw TL-700 lithium fluoride Thermoluminescent Dosimetry (TLD) materials which are maintained apart from the occupational dosimetry TLDs as a select group for environmental monitoring. The environmental TLD package consists of five TL chips laminated in a thick card bearing the I.D. and other information. These cards are placed at each monitoring location for one calendar quarter (3 months) and then processed on-site to obtain the integrated gamma radiation dose.

Monitoring points are located around the site perimeter, at the waste disposal area, and at background locations remote from the WVDP site. Appendix C-4 provides a summary of the results for each location by quarter along with averages for comparison.

The quarterly averages and individual location results show differences due to seasonal variation in snow cover. During the first quarter (January through March) of 1984 the average quarterly exposure (0.0119 roentgen) decreased due to snow cover. The second quarter (April to June) average was also low (0.0111 R) due to snow cover and heavy rains. The third quarter of 1984 (July to September), with no snow cover and low rainfall, had the highest quarterly average (0.0162 R). Moderate rainfall and snow cover in the fourth quarter (October to December) decreased the quarterly average to 0.0132 R.

This short-term (1 year) evaluation indicates that seasonal variation due to rainfall and snow cover has a significant effect on ambient penetrating radiation measurements around the WVDP site.

Presumably, because of their proximity to the disposal area, two locations near the waste burial area (18 and 19 on Figure 3-1) showed a small increase in radiation exposure compared to the perimeter locations.

3.2 Nonradiological Monitoring

West Valley Demonstration Project nonradioactive effluents are regulated by the New York State Department of Environmental Conservation (NYSDEC). Air discharges are insignificant at present and monitoring is not required. Liquid effluents are monitored as a requirement of the State Pollution Discharge Elimination System (SPDES) permit issued and enforced by NYSDEC.

The WVDP SPDES permit identifies six locations where monitoring is required. They are shown in Figure 3-4 and described in Table C-5.1 of Appendix C-5, which also provides further information on the items discussed below.

During 1984 there were 18 instances of noncompliance with discharge limits. Of these, seven are related to iron concentrations in Erdman Brook, six are associated with operation of the sewage treatment plant, two are attributed to sampling or analytical error, two lead excursions at Lagoon 3 (point 001) are being investigated and a pH excursion at point 001 was caused by excess caustic from the low-level waste treatment facility.

The iron excursions in Erdman Brook (measured at point 006) were caused by accumulation of particulate iron on the raw water clarifier which subsequently was backflushed to Erdman Brook where ambient iron concentrations are very near the permit limit of 1.0 milligram per litre (mg/l). Consolidation of this outfall with outfall 004 into a flow equalization basin should alleviate the problem of slug flow discharge of iron to Erdman Brook. This is planned for implementation in 1985.

The sewage treatment plant which is operating beyond its design capacity was the location of excursions beyond permit limits for BOD-5 and pH. A larger capacity treatment plant is being installed and should eliminate the compliance problems at this location.

The environmental impacts associated with these noncompliance episodes are negligible because of their small magnitude and short duration, the chemical nature of the noncomplying parameters, and natural dilution by a factor of approximately 1,000 between SPDES 006 and Cattaraugus Creek at the site boundary (the nearest point of public access).

3.2.1 Pollution Abatement Projects

The WVDP began construction of a new sewage treatment plant during 1984. This plant represents an improved method of sewage treatment compared to the existing facility and provides adequate capacity for the projected total work force at the project.

The plant consists of a grinder station where raw sewage is received, mixed, and transported via a force main to a multichambered extended aeration plant. This plant provides biological treatment (secondary treatment) of the sewage to reduce BOD and includes sludge settling and return capabilities as well as sludge washing (removal) capability. Following aeration and biological treatment, the effluent is disinfected by chlorination before discharge.

The sewage plant initially will discharge to Erdman Brook via existing SPDES outfall 004. Eventually it will discharge to a flow equalization basin where the flow will be mixed with other nonradioactive liquid effluents before being discharged to Erdman Brook via a new SPDES outfall.

Utilization of the sewage plant and the flow equalization basin is expected to reduce dramatically the number of SPDES noncompliance episodes at the WVDP.

3.3 Groundwater Monitoring

3.3.1 Hydrology of the Site

The WVDP site lies within the Glaciated Allegheny Plateau section of the Appalachian Plateau Physiographic Province. The section is a maturely dissected plateau with surficial bedrock units of Devonian shales and sandstones. Bedding dips gently (4 to 7.5 metres per km) and uniformly to the south. The plateau has been subjected to the erosional and depositional actions of repeated glaciations, resulting in accumulation of till, outwash, and lacustrine deposits over the area.

The hydrogeology of the WVDP site has been and continues to be extensively investigated. The following paragraphs provide a simplified but accurate synopsis of the site geology and the pathways for radionuclide migration through this geologic system.

The WVDP site is underlain by a thick sequence of silty clay tills and more granular deposits overlying a bedrock valley that has been carved through Devonian shales by Cattaraugus Creek and its tributaries. Figure 3-5 shows a generalized east-west cross section through the site. The uppermost till unit is the Lavery, a very compact gray silty clay. The Lavery is approximately 6 m thick at the western boundary of the WVDP and thickens to the east. At the western edge of the developed portion of the WVDP, the Lavery is approximately 30 m thick. In situ measurements of the hydraulic conductivity in the Lavery have generally ranged between 10^{-9} and 10^{-7} cm/sec.

The upper 3 m (approximately) of the Lavery have been chemically weathered by leaching and oxidation and mechanically weathered by bioturbation. The hydraulic conductivity of the weathered till is much higher that of than the underlying unweathered parent material, probably as a result of increased fracture flow.

The northern portion of the WVDP site is blanketed by a layer of alluvial gravels up to 6 m thick. These gravels extend from the plant area northward; they are not encountered in the disposal areas in the southern part of the WVDP site.

Below the Lavery till is a more granular unit. Referred to locally as the Lacustrine Unit, it comprises silts, sands and, in some areas, gravels which overlie a varved clay. The Lacustrine is believed to be more permeable than the Lavery, but little permeability testing has been performed in this unit. Prior modelers of site hydrogeology have generally assumed hydraulic conductivities on the order of 10^{-5} to 10^{-4} cm/sec-- conservative in consideration of the gradation of the Lacustrine Unit materials.

Free field groundwater flow through the described geosystem occurs in two aquifers and to a considerably lesser extent in the aquaclude between them. The upper aquifer is a transient water table aquifer in the weathered till and, where it is encountered, the alluvial gravels. To a lesser extent, the highly fractured upper metre of the unweathered till is also part of this aquifer. This unit is generally unsaturated, but immediately after periods of intensive runoff, such as a spring thaw, significant quantities of groundwater are believed to flow through this unit. The primary flow occurs through the extensive system of fractures which dissects this unit.

The lower aquifer is an unconfined aquifer in the Lacustrine Unit. The piezometers embedded in this unit all exhibit phreatic heads below the top of this unit. The total recharge mechanism for the unit is not well defined because of a paucity of data, but it is reasonable to conclude from available data that the unit is recharged from the fractured bedrock and downward seepage through the overlying Lavery till. The bedrock recharge zone to the west is recharged at outcrops in the uplands to the west of the site. Flow through this unit appears to be to the east toward Buttermilk Creek.

The aquaclude that separates these two aquifers is the Lavery. Its mass permeability is extremely low but it does permit seepage. When the weathered till is acting as a transient aquifer, a vertical gradient of unity exits in the till and causes water to move downward, but at a very low rate.

The USGS and NYSGS have performed extensive hydrogeologic investigations in and around the area once used by NFS for solid waste disposals and now contemplated as a potential site for disposal of Project wastes. All of these studies assumed that the groundwater pathway from the disposal trenches was one-dimensional downward seepage through the unweathered till. This was based on observations of water levels in well screen piezometers and some simplifying assumptions. No measurements were made to characterize unsaturated flow in the weathered till.

The observation of solvent in the shallow weathered till some 60 ft (18 m) away from its point of disposal casts considerable doubt on some of the assumptions which neglected flow in the unsaturated zone. Therefore, as part of the preparation of the Environmental Assessment for low-level waste disposal, WVNS has implemented extensive explorations and an instrumentation network to characterize and monitor flow in the unsaturated weathered till. Because data from the solvent seepage explorations indicated rapid fluctuations in the level of the transient perched water table, the instrumentation network uses real-time data loggers that record water levels at hourly intervals.

The hypothesis of one-dimensional downward flow is also being tested as part of this exploration program. The well screen piezometers all have significant time lags. (For example if the piezometric level rose one foot, it might take more than a year before the rise was evident in a well screen piezometer. This could mask a lateral flow component, particularly a transient one.) WVNS has therefore installed pneumatic pore pressure transducers which have a time lag of less than one minute.

The results of this investigation will be reported in the Environmental Assessment scheduled to be published in August, 1985.

3.3.2 Groundwater Monitoring in 1984

A program of sampling groundwater both on the Project site as well as from wells at residences around its perimeter was carried out in 1984. The shallow wells in this program fall into four groups:

1. A group of dug shallow wells installed north of and immediately surrounding the main plant building were monitored for several years before Project start-up and are therefore used for reference to examine long-term trends.

2. The U.S. Geological Survey (USGS) series 80 wells form an outer ring around the facility dug wells.

3. The USGS series 82 wells are grouped around the formerly-licensed disposal area.

4. Private wells around the perimeter are used for drinking water by site neighbors.

Appendix A gives more information on sampling requirements, and Appendix C-1 summarizes results of the radiological analyses of samples from the wells. Except for those on-site wells that historically show localized contamination, there was no indication of fuel-cycle isotopes in these wells.

3.4 Special Monitoring

In November of 1983, contamination was encountered in a recently drilled USGS series 82 ground water monitoring well near the formerly licensed NFS solid radioactive waste disposal area. In the samples analyzed, the organic contaminant contained concentrations of alpha emitters on the order of 10^{-5} uCi/ml and beta/gamma emitters at about 10^{-4} uCi/ml. This led to an extensive examination of ground and surface water near that location. Samples were collected from closely spaced sampling wells and surface streams adjacent to the suspect area. Although subsequent evaluations and test borings did confirm the subsurface presence of a contaminated organic fluid, monitoring of surface water and wells adjacent to surface waters failed to show any transport away from the immediate vicinity of the disposal area. In 1984, monitoring of all downstream points (including more frequent sampling of drainage water immediately below the suspect area) indicated no detectable increase in radioactive contaminants. A decontamination effort was initiated in 1984 to remove the fluid from within the disposal area; continued monitoring of adjacent groundwater has shown no further migration from the original area. The USNRC, the agency under whose jurisdiction the solvent was disposed of, has contracted with Oak Ridge National Laboratory to review the solvent transport phenomena and to develop plans for further investigation and remediation.

During the summer and fall of 1984, a comprehensive aerial survey of the WNYNSC including the West Valley Demonstration Project site was performed by EG&G under DOE sponsorship. Measurements utilized not only state-of-the-art gamma radiation instruments but also high resolution photography and multi-spectral scanning data. The final report is in preparation by EG&G and careful attention is being given to comparison with previously acquired data from the same area.

LOCATIONS OF PERIMETER ENVIRONMENTAL MONITORING STATIONS

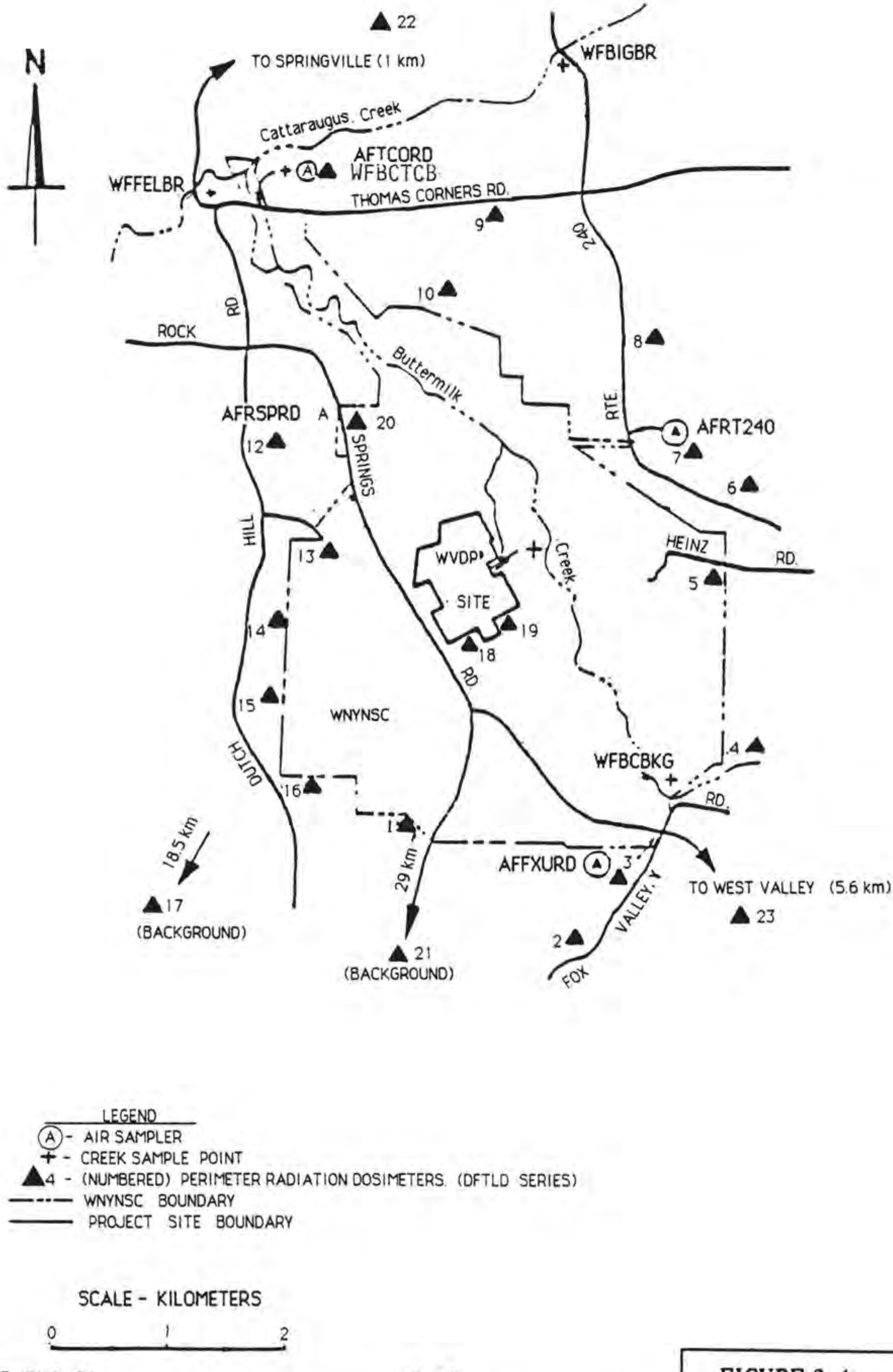


FIGURE 3-1

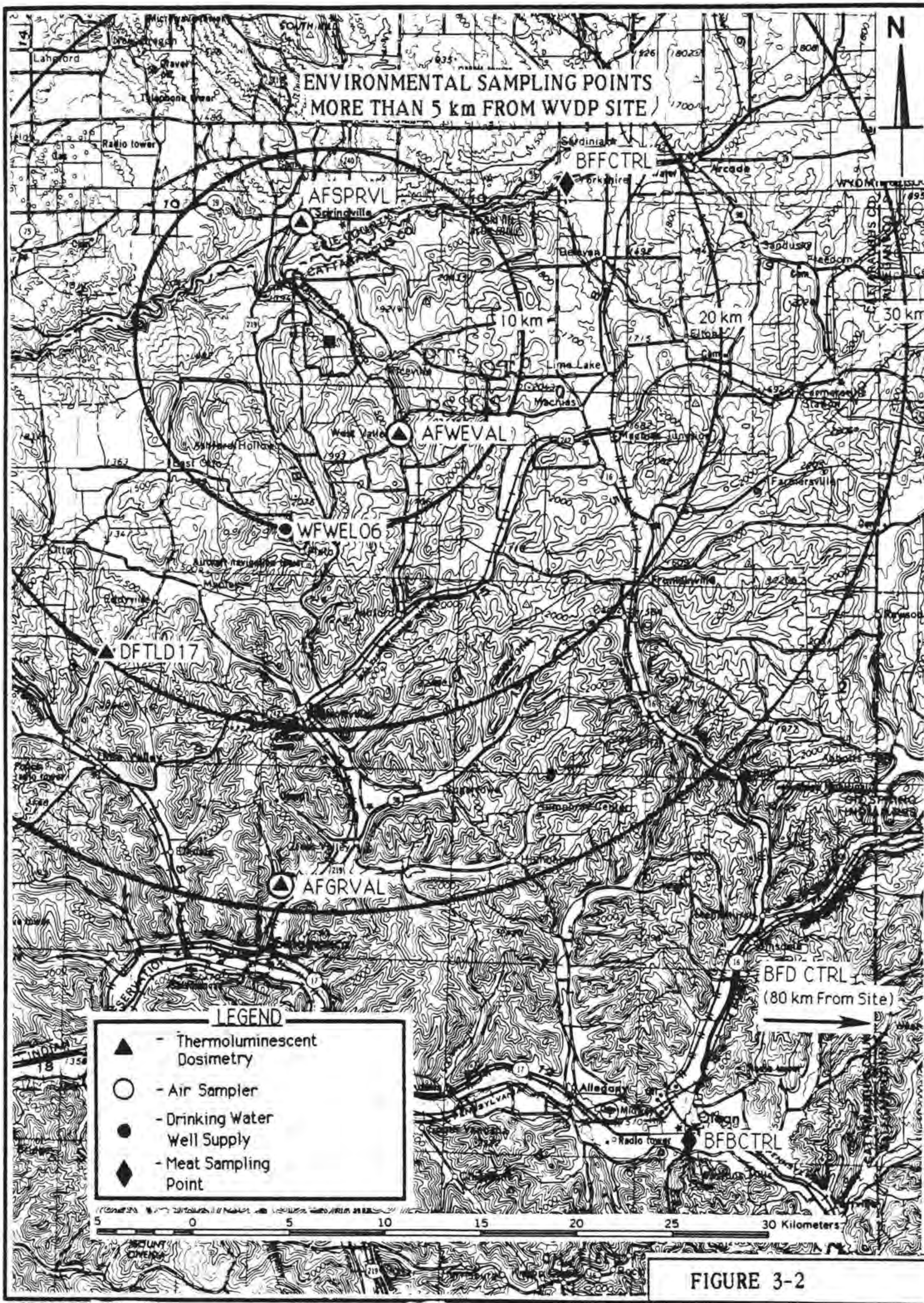

ENVIRONMENTAL SAMPLING POINTS
MORE THAN 5 km FROM WVDP SITE
N
AFSPRVL
BFFCTRL
10 km
20 km
30 km
AFWEVAL
WFWEL06
DFTLD17
AFGRVAL
BFD CTRL
(80 km From Site)
BFBCTRL
LEGEND
▲ - Thermoluminescent Dosimetry
○ - Air Sampler
● - Drinking Water Well Supply
◆ - Meat Sampling Point
5 0 5 10 15 20 25 30 Kilometers

FIGURE 3-2

LOCATION OF EFFLUENT
RADIOLOGICAL MONITORING POINTS ONSITE

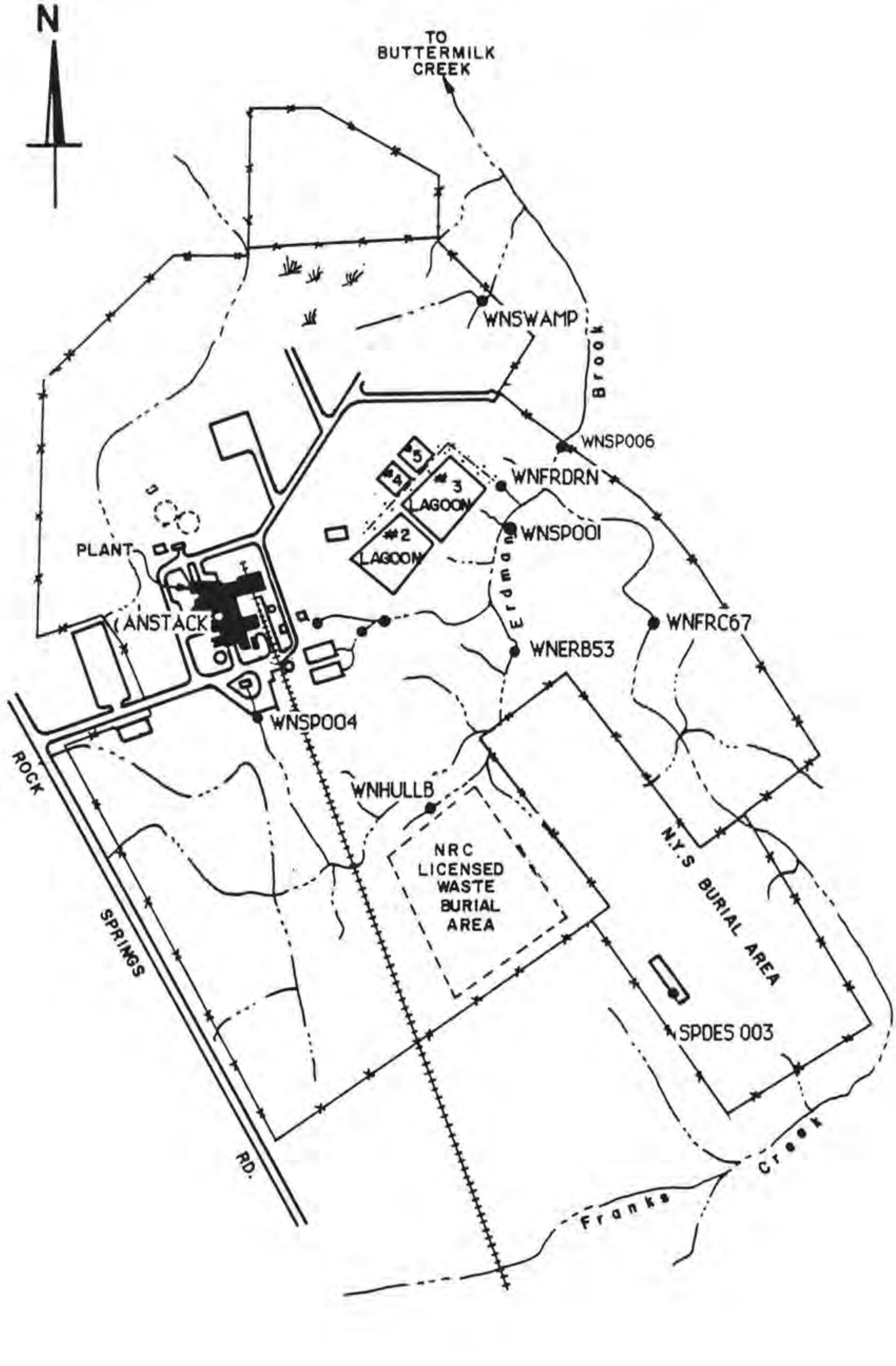
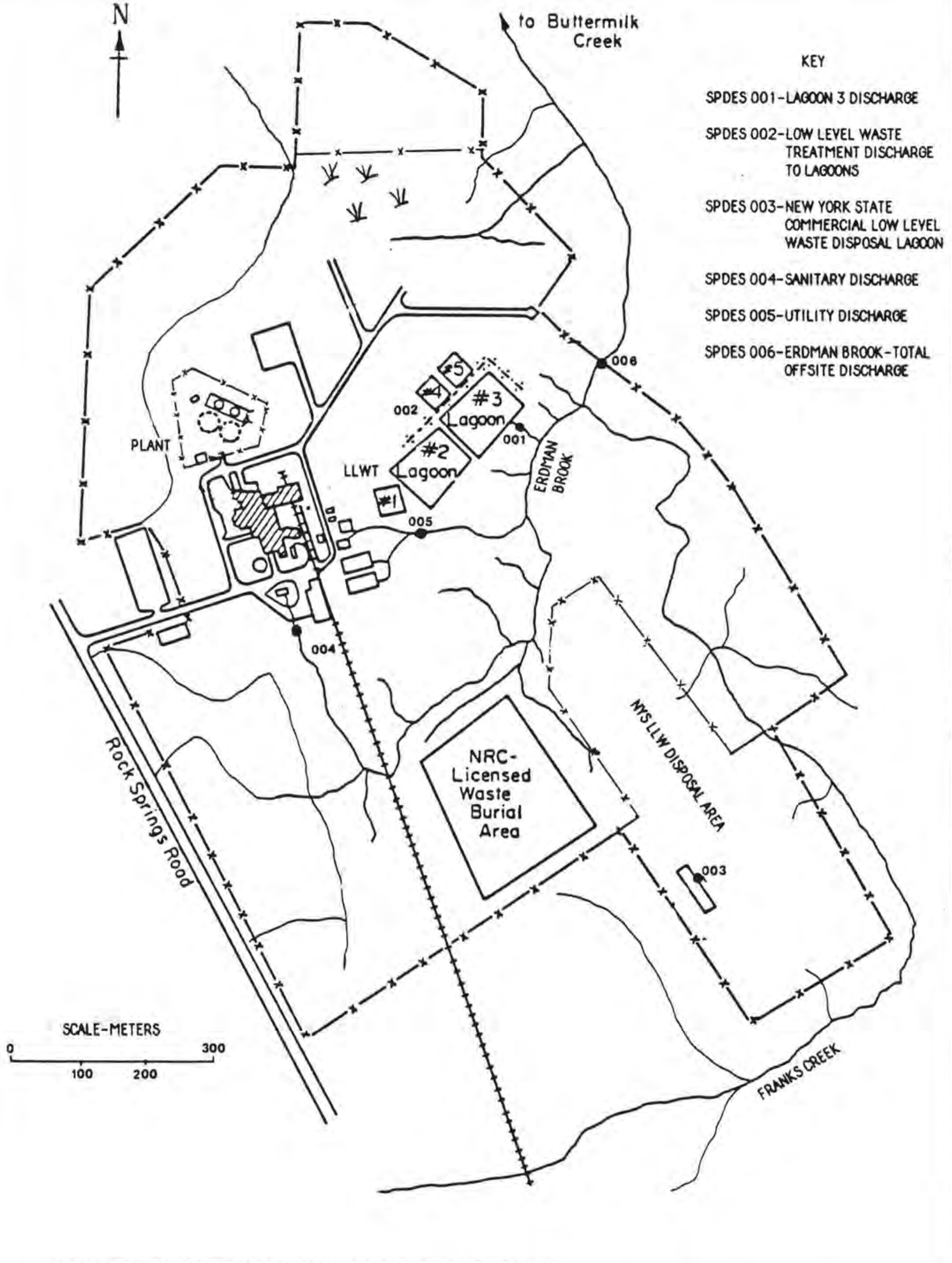
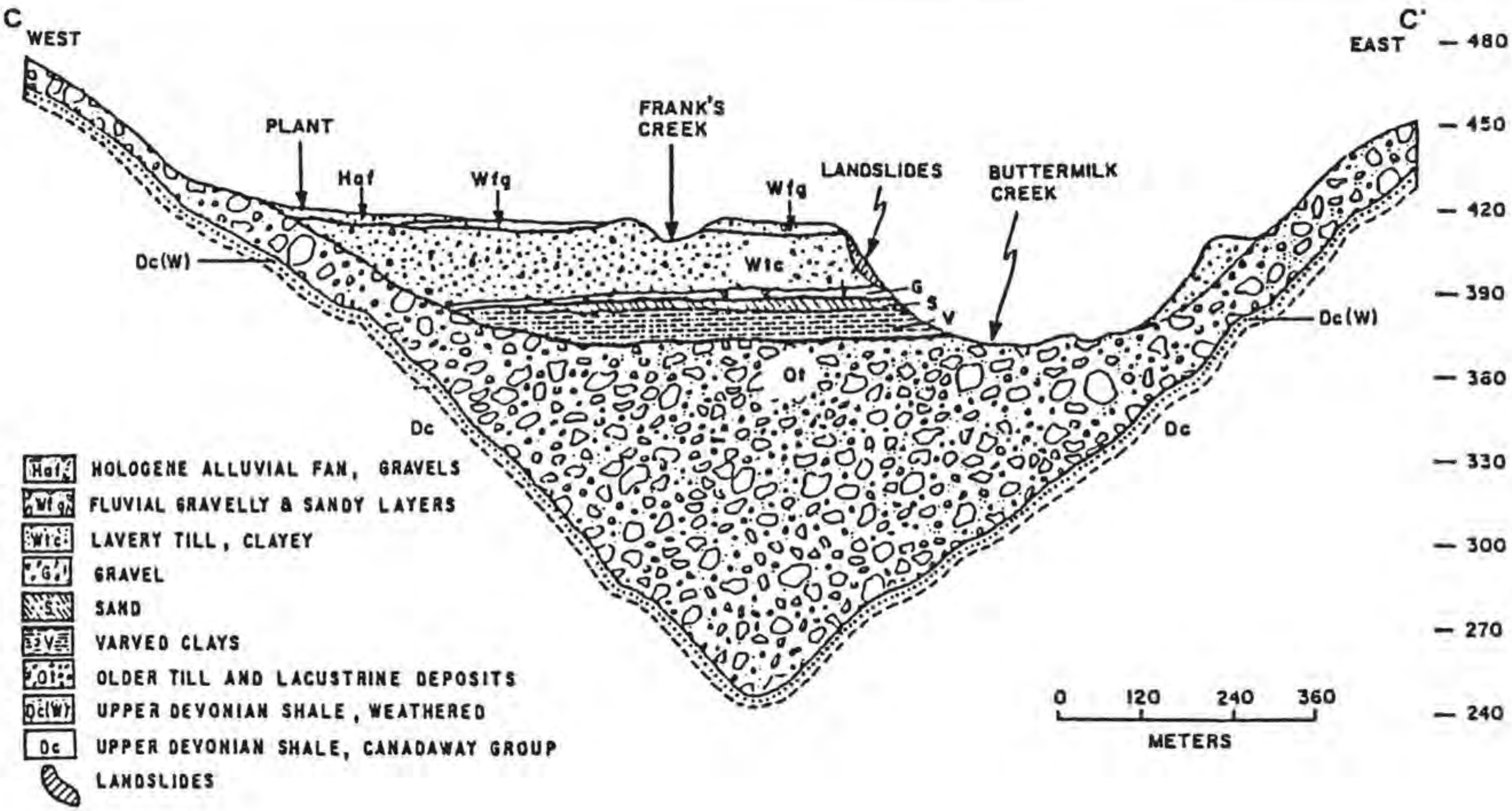


FIGURE 3-3



LOCATIONS OF SPDES MONITORING POINTS ONSITE

FIGURE 3-4



NOTE:
Vertical scale = 1/4 horizontal scale.
Adapted from Dana et al. (1979a).

GENERALIZED EAST-WEST GEOLOGIC CROSS SECTION AT THE WEST VALLEY DEMONSTRATION PROJECT

FIGURE 3-5

4.0 RADIOLOGICAL DOSE ASSESSMENT

4.1 Methodology

The potential radiological impacts resulting from the release of radioactivity during 1984 have been estimated by calculating radiation doses received by the maximally exposed off-site individual and the population within an 80 km radius of the WVDP facility. The potential pathways of exposure to the general public from radioactive effluents released by the WVDP operations are shown in Figure 4-1. The exposure modes considered in the dose calculations are:

- Direct exposure from immersion in air containing radionuclides,
- Direct radiation from ground surfaces contaminated by deposited radionuclides,
- Immersion in contaminated water,
- Inhalation of airborne radionuclides, and
- Ingestion of contaminated water and food produced from the land and surface waters in the area.

Because the ridges and hills in the vicinity of the WVDP frequently channel the winds, strong systematic deviations from straight-line air flow over long distance are expected. To realistically account for the terrain effects on wind flow, a fine grid, two-dimensional wind field was developed using the WNDSRF3 code and meteorological data measured hourly at seven stations around the WVDP and the three nearest National Weather Service stations. The wind field data were then input to the EPM3 code, a variable-trajectory Gaussian puff dispersion code for calculating the radionuclide concentrations from routine operational releases. The EPM3 code is formulated according to the guidelines described by NRC in Regulatory Guide 1.111. The assumption underlying the code is that a number of discrete puffs are serially released from the source to simulate a continuous plume. Each puff is assumed to have a Gaussian concentration distribution in three dimensions. Puffs expand in size as they move downwind from the source in response to spatial and temporal wind and stability conditions. Each puff is transported independently by the nonuniform wind field and is tracked until it leaves the grid region. Concentration and deposition are computed at each grid receptor location.

A detailed discussion of the computer codes WNDSRF3 and EPM3 is given in the WVDP Safety Analysis Report, Supplements Volume.

This 1984 Environmental Monitoring Report is based on analyses that use relative concentration values calculated for gaseous effluents released from the WVDP plant at a height of 60 metres and at ground level. Twelve-month meteorological data (August 1983 through July 1984) are used as a basis for the dispersion calculations.

The calculated annual average relative concentration values for 60 metre and ground level releases are given in Tables 4-1 and 4-2 for each of the sixteen 22.5 degree wind sectors in an 80 km radius circle centered at the WVDP plant. The maximum mean annual relative concentration values at the point of an actual residence in the vicinity of the site are 1.4×10^{-7} sec/m^3 (at 2.3 km SW) and 1.4×10^{-6} sec/m^3 (at 1.4 km NW) for stack and ground level releases.
To calculate the radiation doses to the maximally exposed individual and the population within 80 km from the plant, relative concentration values are used as input to the AIRDOS-EPA code (Moore et al., 1979). The radiation dose commitment to the maximally exposed individual and the collective dose to the population within 80 km from the WVDP from the water pathway were calculated using the computer code LADTAP II (Simpton and McGill, n.d.). Both LADTAP II and AIRDOS-EPA implement the NRC Regulatory Guide 1.109 recommendations for terrestrial food chains.

The dose estimates were made by calculating radionuclide concentrations in air, rates of deposition on ground surfaces, ground surface concentrations, intake rates via inhalation, and ingestion of meat, milk, and fresh vegetables. Site specific data on production and consumption of milk, meat, and agricultural products were used in computing the collective population dose.

The area surrounding the facilities is shown in Figure 1-1. It was overlaid with an 80 km radius grid system with the facility at its center. The grid system was further divided into 10 concentric regions and 16 compass directions. For each sector formed by the grid system, the specific human populations, beef and dairy cattle populations, and agricultural areas were assumed to be as described in Figures 4-2 through 4-9.

For each radionuclide of concern, the inhalation dose conversion factors used are for an activity median aerodynamic diameter (AMAD) of 0.3 micrometer. For alpha emitters, the dose conversion factors are derived by using a quality factor of 20 as per ICRP recommendation (Dunning, n.d.). All of the doses from internal exposure are 50-year committed dose equivalents and are calculated for the 50-year period following inhalation or ingestion. The internal dose conversion factors used in this report are from Dunning.

In this report, the effective dose equivalent, as well as the dose equivalent to the thyroid, lungs, bone, liver, kidneys, and gastrointestinal tract were considered to determine the critical organs for various potential pathways of exposure. These estimates were based on parameters applicable to an average adult. The collective population dose estimate in person-rem is the effective dose equivalent commitment to the whole body as calculated in accord with the recommendations of the ICRP (ICRP, 1977).

In addition to these estimates of dose commitments based on dispersion modeling, the dose to a hypothetical maximally exposed individual who consumed locally produced milk, fish, and venison (deer) was predicted. Measured radionuclide concentrations from samples of milk, fish, and venison were used in these calculations. Many of the nuclides which may be present in these samples are often below the detectable limit. In such cases, the radionuclide concentration was assumed to be the limit of detection.

4.2 Source Term Estimates

4.2.1 Airborne Radioactive Effluents

There are three points on the plant site from which ventilation systems release low concentrations of airborne radioactivity. These three locations are:

1. Main plant process stack,
2. Laundry exhaust vent, and
3. LLWT ventilation exhaust.

The air released from these vents is sampled continuously and the collected particulates are periodically analyzed. The results of measurements during 1984 are summarized in Table 4-3. A total of 1.1×10^{-5} Ci of gross alpha activity and 8.1×10^{-4} Ci of gross beta/gamma was released from these three vents during the year. More than 99 percent of the activity was discharged through the main plant stack.

4.2.2 Liquid Radioactive Effluents

There were three sources of liquid effluents from WVDP operations in 1984:

1. Lagoon No. 3 discharges (six planned releases),

2. Sewage treatment outfall, and

3. Ground water releases from the swamp drain and french drain.

The volumes of the liquid effluents and the radioactivity they contained (reported in WVDP 1984 Effluent and On-Site Discharge Report, March, 1985) are summarized in Table 4.4. All liquids were discharged via Buttermilk Creek. For conservative radiological dose calculations, americium-241 was assumed to represent all gross alpha activity in both gaseous and liquid effluents. The gross beta activity was assumed to be represented by Sr-90. Although Sr-90 and Am-241 were actually not present in as high a concentration as assumed, they would be the most limiting isotopes in any mixture of radionuclides found in Project effluents. (See Appendix B.)

4.3 Potential Radiation Doses to the Public

4.3.1 Maximum Hypothetical Individual Radiation Exposure

The point of maximum potential radiation exposure in the vicinity of the site from airborne radioactivity is located about 2.3 km SW of the WVDP plant. A hypothetical maximum effective dose equivalent of 0.0025 mrem was calculated as a result of WVDP airborne releases during 1984 when all possible pathways were considered. The calculated dose commitment to bone surface (the critical organ) at this location was 0.02 mrem. The maximum hypothetical exposures are less than 0.002 percent of the allowable standard promulgated in DOE Order 5480.1.

An important potential contributor to the dose commitment from radioactivity in the terrestrial food-chain is the airborne pathway to the pasture and then to cow and to milk. Measurements of radioactivity in the milk produced at the nearest dairy farm to the WVDP facility indicated that no I-129, Cs-134, or Cs-137 was present in concentrations above the limits of detection. The maximum dose to an individual from ingestion of about 1 litre of this milk per day was estimated by assuming that the nuclides were present in amounts equal to the detection limits. This conservative calculation predicts a dose commitment of 15 mrem to the thyroid and an effective dose equivalent commitment of 1.0 mrem. Despite their extreme conservatism, these calculated maximum potential doses are less than 1 percent of the allowable standards. Further improvement in the detection limit will permit more realistic estimates of the dose commitment due to consumption of milk produced in the vicinity of the WVDP. These more realistic estimates are expected to be substantially lower than the small maximum values quoted above.

Estimates were made of the hypothetical maximum dose commitments to an adult from consumption of 21 kg per year of fish (the maximum value recommended in NRC Regulatory Guide 1.109) caught in Cattaraugus Creek. From the measured concentrations of radionuclides in the edible parts of the fish (see Table C-3.4), the maximum organ dose commitment to an individual was estimated to be 0.5 mrem to bone surfaces. The maximum effective dose equivalent commitment to an individual was calculated to be 0.28 mrem from consumption of 21 kg of fish.

The hypothetical dose commitment also was estimated for an individual who consumed 45 kg of venison. The measured radionuclide concentrations (Table C-3.2) in the flesh of a deer taken about a kilometre away from the WVDP in the fourth quarter of 1984 was used as the basis for this estimate. The dose commitment was calculated to be 0.25 mrem to the bone surface and 0.33 mrem for an effective dose equivalent commitment. Table 4-3 summarizes the potential radiation doses to individual adult members of the general public at the points of highest potential exposure from gaseous and liquid effluents from the WVDP facility operations during 1984. Although no direct pathway to drinking water from airborne or liquid effluents was found or evaluated for exposure, drinking well water data are presented in Appendix C.

4.3.2 Collective Dose to the Population

The collective effective dose equivalent commitment to the population within an 80 km radius of the WVDP from operations during 1984 was estimated to be 0.02 person-rem from gaseous effluents and 0.13 person-rem from liquid effluents. These estimates are based on the releases summarized in Tables 4-3 and 4-4 and the use of the AIRDOS-EPA and LADTAP II codes as described in Section 4.1.

These collective doses may be compared to an estimated annual 170,000 person-rem to the same population resulting from natural background radiation. Based on the collective dose given above and a total population of 1.7 million in the region, the average effective dose equivalent to an individual residing within 80 km of the WVDP was about 8.8×10^{-5} mrem during 1984--insignificant when compared to the average dose to each individual of approximately 100 mrem per year from natural sources.

TABLE 4 - 1

Relative Concentration Values (sec/m^3) by Sector From 60 Metre Stack Release

RECEPTOR AZIMUTH (DEGREES)	Distance (metres) 805.0	2414.0	4023.0	5633.0	7242.0
22.50	1.34865E-08	1.71927E-08	1.53659E-08	1.16008E-08	1.00686E-08
45.00	3.03278E-08	6.62833E-08	1.19462E-07	2.28011E-08	1.79982E-08
67.50	3.64481E-08	7.69928E-08	1.02821E-07	9.41885E-08	5.77431E-08
90.00	3.74919E-08	6.31151E-08	5.99791E-08	5.94198E-08	3.82357E-08
112.50	5.65527E-08	6.61298E-08	1.00890E-07	6.25578E-08	5.45213E-08
135.00	6.47129E-08	4.14320E-08	4.15299E-08	5.34836E-08	5.67103E-08
157.50	3.90271E-08	4.06824E-08	6.03020E-08	4.09102E-08	2.77476E-08
180.00	3.81781E-08	1.22124E-07	5.71550E-08	3.28513E-08	1.65135E-08
202.50	3.39626E-08	1.18178E-07	3.81683E-08	2.06887E-08	1.37497E-08
225.00	2.65459E-08	1.33789E-07	1.40559E-08	1.47592E-08	2.14601E-08
247.50	2.28710E-08	1.40234E-07	9.92964E-09	9.23873E-09	1.20779E-08
270.00	1.89206E-08	5.87795E-08	8.15801E-09	4.43197E-09	3.40148E-09
292.50	1.80572E-08	2.08576E-08	7.37967E-09	7.54285E-09	6.41255E-09
315.00	1.64857E-08	1.12181E-08	5.58730E-09	3.48013E-09	4.18897E-09
337.50	1.37407E-08	8.56651E-09	6.98284E-09	6.43618E-09	1.03046E-08
360.00	1.63022E-08	1.86618E-08	1.33696E-08	1.43328E-08	1.57260E-08

RECEPTOR AZIMUTH (DEGREES)	12070.0	24140.0	40234.0	56327.0	72420.0
22.50	3.76277E-08	4.60131E-09	1.47900E-09	4.16372E-10	2.13197E-10
45.00	1.14274E-08	1.28140E-08	3.44087E-09	8.05384E-10	3.94584E-10
67.50	1.83720E-08	9.47802E-09	2.61500E-09	8.27191E-10	4.15068E-10
90.00	1.31074E-08	4.10035E-09	1.79761E-09	9.47011E-10	5.42868E-10
112.50	1.79356E-08	3.37901E-09	1.27255E-09	7.68376E-10	4.88769E-10
135.00	2.17244E-08	4.63600E-09	1.59818E-09	9.12074E-10	6.59780E-10
157.50	1.22420E-08	3.63091E-09	1.25836E-09	7.58553E-10	3.65875E-10
180.00	5.12675E-09	1.39954E-09	7.05623E-10	3.11794E-10	1.85159E-10
202.50	4.33084E-09	1.20774E-09	4.64639E-10	3.76650E-10	2.20628E-10
225.00	4.05277E-09	9.84525E-10	3.82512E-10	2.98694E-10	2.65110E-10
247.50	5.01156E-09	8.45959E-10	3.46917E-10	2.67128E-10	1.88775E-10
270.00	2.40747E-09	1.31323E-09	4.71842E-10	2.33383E-10	1.46546E-10
292.50	3.13835E-09	8.59511E-10	3.11297E-10	1.78562E-10	1.59762E-10
315.00	3.96969E-09	8.37388E-10	3.62375E-10	1.98663E-10	1.45786E-10
337.50	3.50730E-08	1.98774E-09	5.06830E-10	2.95021E-10	2.01301E-10
360.00	1.08030E-08	3.06156E-09	8.97284E-10	4.01882E-10	2.13954E-10

TABLE 4 - 2

Relative Concentration Values (sec/m^3) by Sector From Ground Level Release

RECEPTOR AZIMUTH (DEGREES)	Distance (metres) 805.0	2414.0	4023.0	5633.0	7242.0
22.50	1.49512E-06	3.97532E-07	1.47083E-07	8.42645E-08	5.33960E-08
45.00	1.64903E-06	3.53979E-07	1.37949E-07	4.90462E-08	3.72500E-08
67.50	1.03133E-06	2.02443E-07	9.76274E-08	6.36793E-08	4.29648E-08
90.00	1.12677E-06	1.93299E-07	7.68176E-08	4.17450E-08	2.62357E-08
112.50	1.85268E-06	2.85787E-07	1.13283E-07	5.70845E-08	3.65770E-08
135.00	2.07273E-06	2.98862E-07	1.13469E-07	6.26892E-08	4.29658E-08
157.50	1.23256E-06	1.83867E-07	7.49610E-08	3.87072E-08	2.45899E-08
180.00	9.11350E-07	1.21526E-07	4.69202E-08	2.12329E-08	1.26233E-08
202.50	5.43176E-07	8.27004E-08	3.14103E-08	1.62575E-08	1.04974E-08
225.00	6.51885E-07	7.38846E-08	2.38500E-08	1.47004E-08	1.10149E-08
247.50	4.49106E-07	8.76961E-08	1.99028E-08	1.24286E-08	1.17705E-08
270.00	8.33984E-07	9.80329E-08	2.08584E-08	9.69459E-09	6.36376E-09
292.50	1.51654E-06	2.19763E-07	3.25829E-08	3.23126E-08	2.15832E-08
315.00	3.09325E-06	6.30377E-07	7.04640E-08	2.02217E-08	2.77029E-08
337.50	6.43818E-06	1.39608E-07	5.78384E-08	6.06062E-08	1.03569E-07
360.00	3.61907E-06	4.15637E-07	9.97603E-08	1.26180E-07	1.51884E-07

RECEPTOR AZIMUTH (DEGREES)	12070.0	24140.0	40234.0	56327.0	72420.0
22.50	3.04523E-08	2.98528E-09	8.55379E-10	3.03205E-10	1.46205E-10
45.00	2.15690E-08	5.14011E-09	1.73757E-09	6.37543E-10	3.64292E-10
67.50	1.54270E-08	5.34287E-09	1.92672E-09	8.74415E-10	5.08823E-10
90.00	9.70648E-09	3.01629E-09	1.45596E-09	8.22257E-10	4.93815E-10
112.50	1.29208E-08	3.20793E-09	1.16046E-09	7.54841E-10	4.73182E-10
135.00	1.64306E-08	3.86002E-09	1.31326E-09	7.71110E-10	5.18604E-10
157.50	1.02799E-08	2.75939E-09	9.61845E-10	5.49548E-10	2.85193E-10
180.00	4.31490E-09	1.06545E-09	4.04546E-10	1.98032E-10	1.31576E-10
202.50	3.84823E-09	9.15400E-10	3.95853E-10	2.51647E-10	1.43985E-10
225.00	3.37117E-09	8.69089E-10	3.30965E-10	2.44201E-10	1.30591E-10
247.50	3.00494E-09	7.52568E-10	3.28716E-10	2.37072E-10	1.50662E-10
270.00	2.83375E-09	1.13770E-09	4.49876E-10	2.28808E-10	1.51995E-10
292.50	7.62140E-09	1.26463E-09	3.63726E-10	1.88658E-10	1.46872E-10
315.00	2.43399E-08	8.55431E-10	4.37296E-10	2.11385E-10	1.16099E-10
337.50	2.36564E-08	1.78745E-09	5.95391E-10	3.21227E-10	2.20000E-10
360.00	2.55674E-08	3.41404E-09	9.24519E-10	3.80997E-10	1.83592E-10

TABLE 4-3

RADIOACTIVITY RELEASED TO THE ATMOSPHERE DURING 1984

Release Point	Total Curies Released: Gross Alpha	Gross Beta	Specific Nuclides	
Main Plant Stack	1.1-05	8.1-04	Sr-90	1.6-04
			Ru-106	1.5-05
			I-129	9.4-05
			Cs-134	2.6-06
			Cs-137	5.1-04
Laundry Vent	6.1-08	1.5-06	None Identified	
LLWT Vent	1.1-07	3.1-06	None Identified	

TABLE 4-4

RADIOACTIVITY RELEASED IN LIQUID

EFFLUENTS DURING 1984

Release Point	Volume Released (Litres)	Released Radioactivity (Ci)					
		Gross Alpha	Gross Beta	H-3	Sr-90	I-129	Cs-137
Lagoon 3	5.2+07	1.2-02	8.1-02	7.3	8.5-03	1.1-03	6.3-02
Sewage Treatment Outfall	6.1+06	9.8-06	3.1-04	1.4-03	1.3-04	9.3-06	------
Swamp Drain	6.1+07	------	------	1.3-01	------	------	------
French Drain	6.8+06	------	------	1.6-01	------	------	------
TOTAL	1.2+08	1.2-02	8.1-02	7.6	8.6-03	1.1-03	6.3-02

TABLE 4-5

SUMMARY OF HYPOTHETICAL ESTIMATED DOSE COMMITMENTS

TO AN ADULT INDIVIDUAL AT LOCATIONS OF MAXIMUM EXPOSURE DURING 1984

Pathway	Location	50-Year Dose Commitment (mrem) Effective Whole Body Equivalent	Critical Organ
Gaseous Effluents			
All Pathways*	Nearest residence (2.3 km SW)	0.0025	0.02 Bone Surface
Milk	Produced 4 km NE	1.0	15 Thyroid
Venison	Deer taken within 1 km of WVDP	0.33	0.33 Whole Body
Liquid Effluents			
Fish	Collected in Cattaraugus Creek below WVDP	0.28	0.50 Bone Surface

*Estimates based on measured radioactivity in airborne effluents (Table 4-3) and dispersion and radiological dose calculations described in Section 4.1. All other values based on measured concentrations in food and consumption rates for maximally exposed individuals recommended in U.S. NRC Regulatory Guide 1.109.

Note: Annual average whole body dose from natural background sources in the U.S. is about 100 mrem.

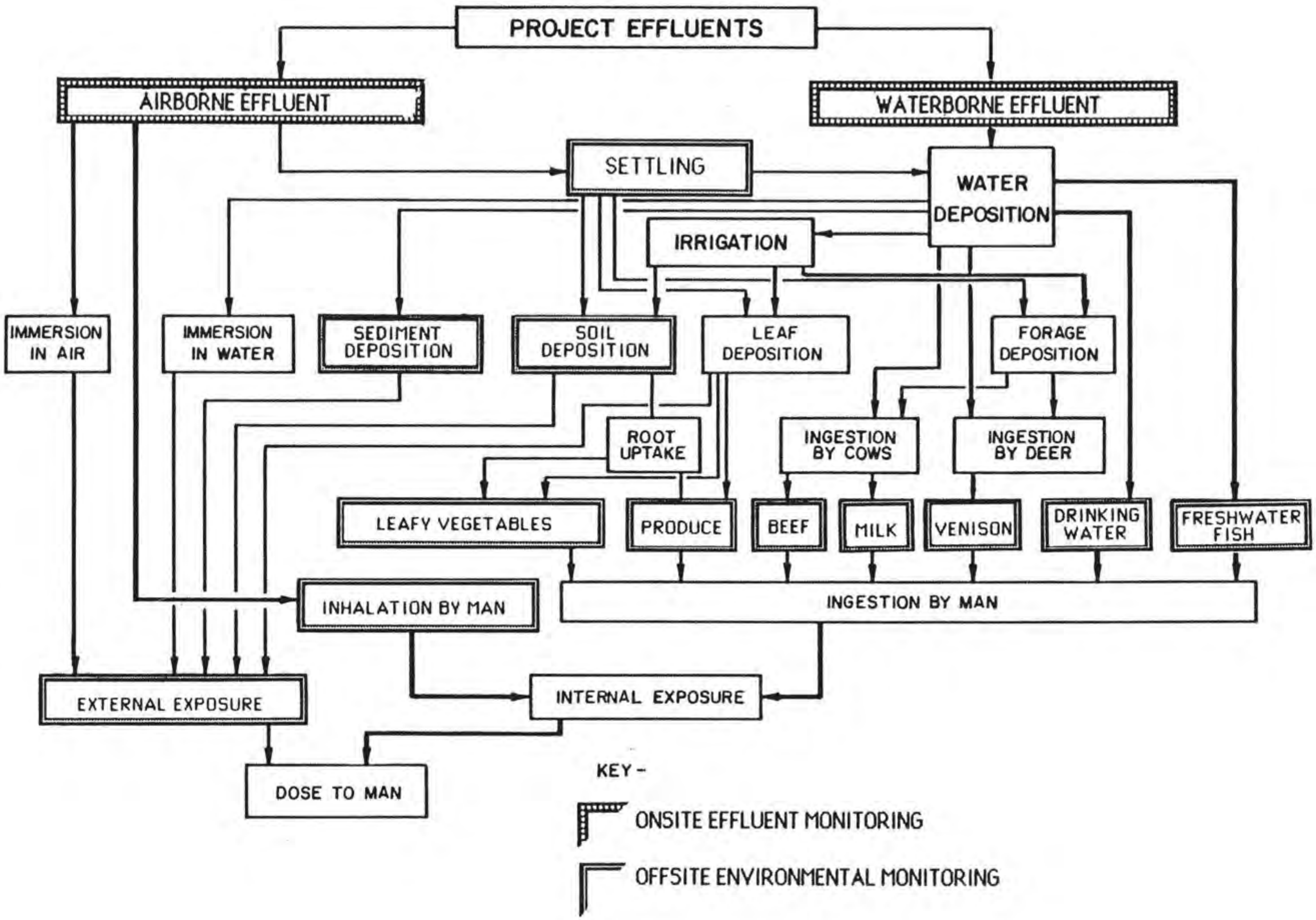
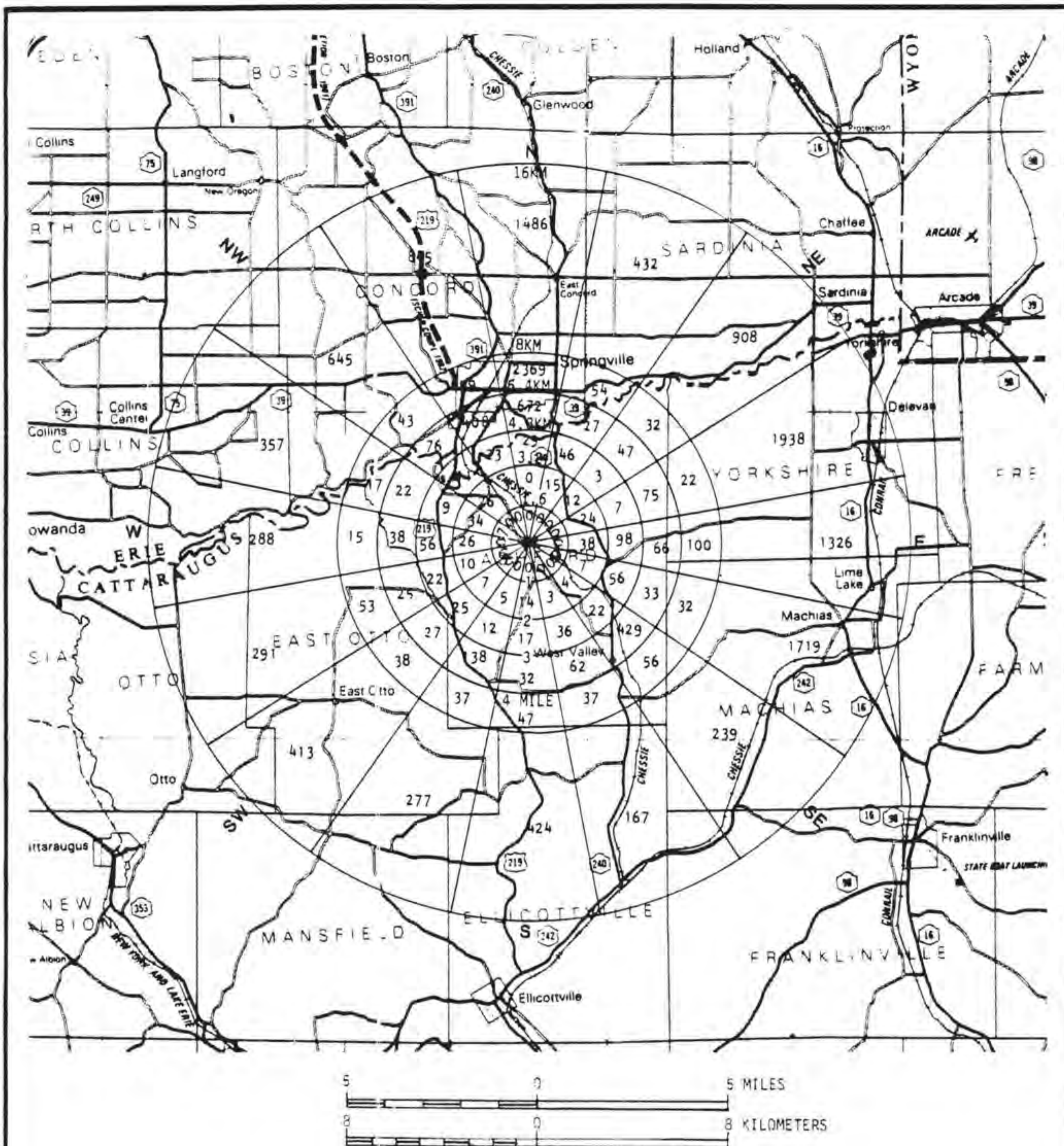


FIGURE 4-1

COMPARTMENT MODEL OF PATHWAYS AND MONITORING INTERCEPT POINTS



1990 POPULATION PROJECTIONS BY SECTOR

WITHIN 16 KILOMETERS (10 MILES) OF SITE

FIGURE 4-2

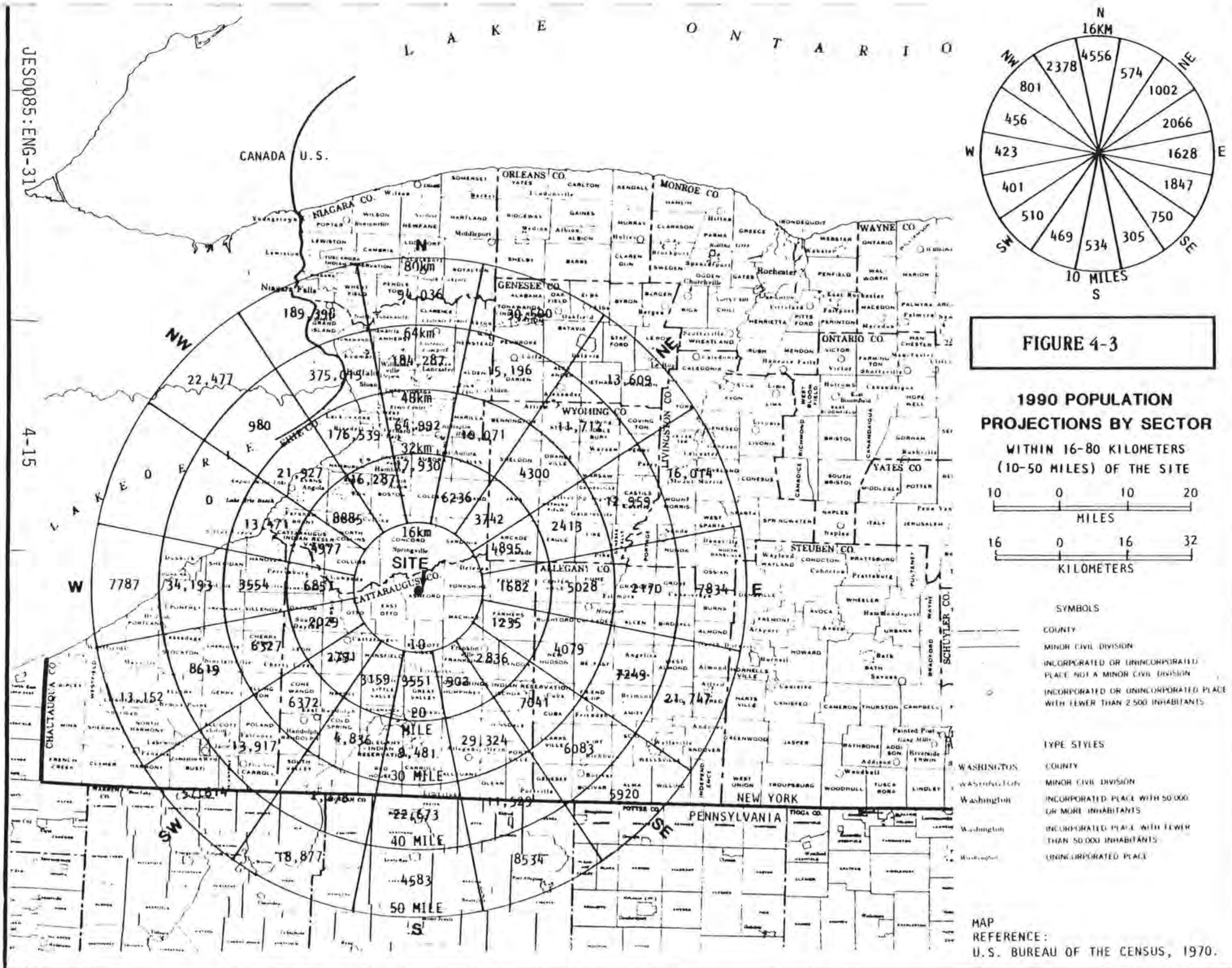
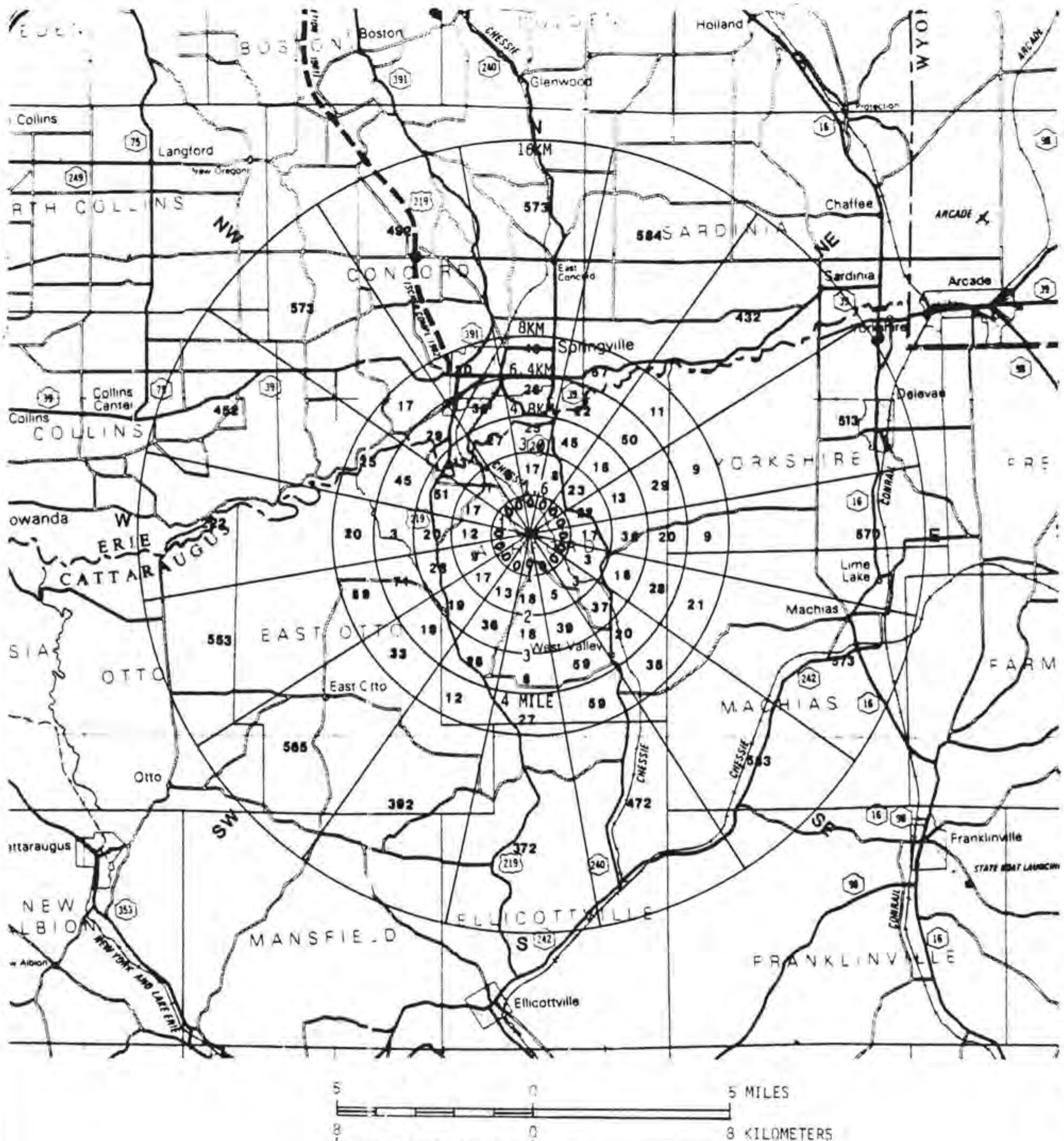


FIGURE 4-3

1990 POPULATION PROJECTIONS BY SECTOR

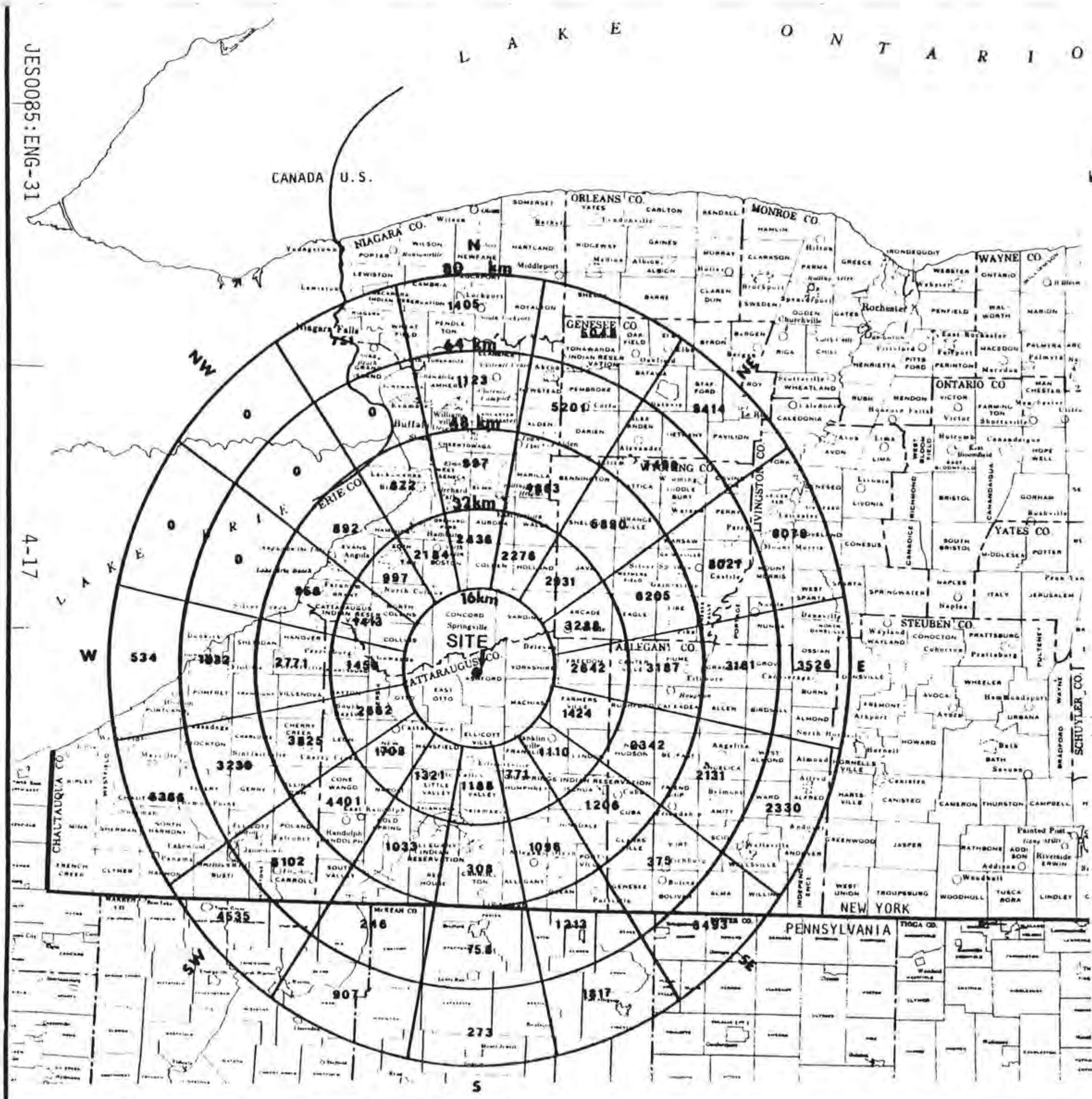
WITHIN 16-80 KILOMETERS (10-50 MILES) OF THE SITE



NUMBER OF DAIRY COWS BY SECTOR

WITHIN 16 KILOMETERS (10 MILES) OF SITE

FIGURE 4-4



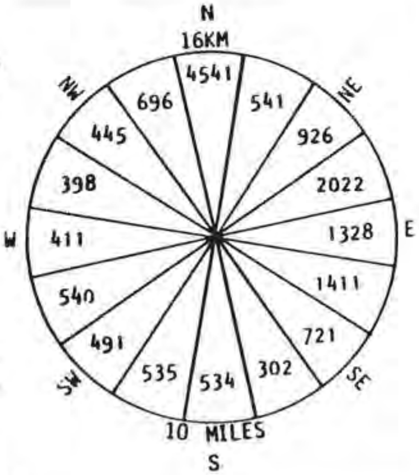


FIGURE 4-5

NUMBER OF DAIRY COWS BY SECTOR

WITHIN 16-80 KILOMETERS (10-50 MILES) OF THE SITE

10 0 10 20
MILES

16 0 16 32
KILOMETERS

SYMBOLS

COUNTY

MINOR CIVIL DIVISION

INCORPORATED OR UNINCORPORATED PLACE NOT A MINOR CIVIL DIVISION

INCORPORATED OR UNINCORPORATED PLACE WITH FEWER THAN 2 500 INHABITANTS

TYPE STYLES

WASHINGTON — COUNTY

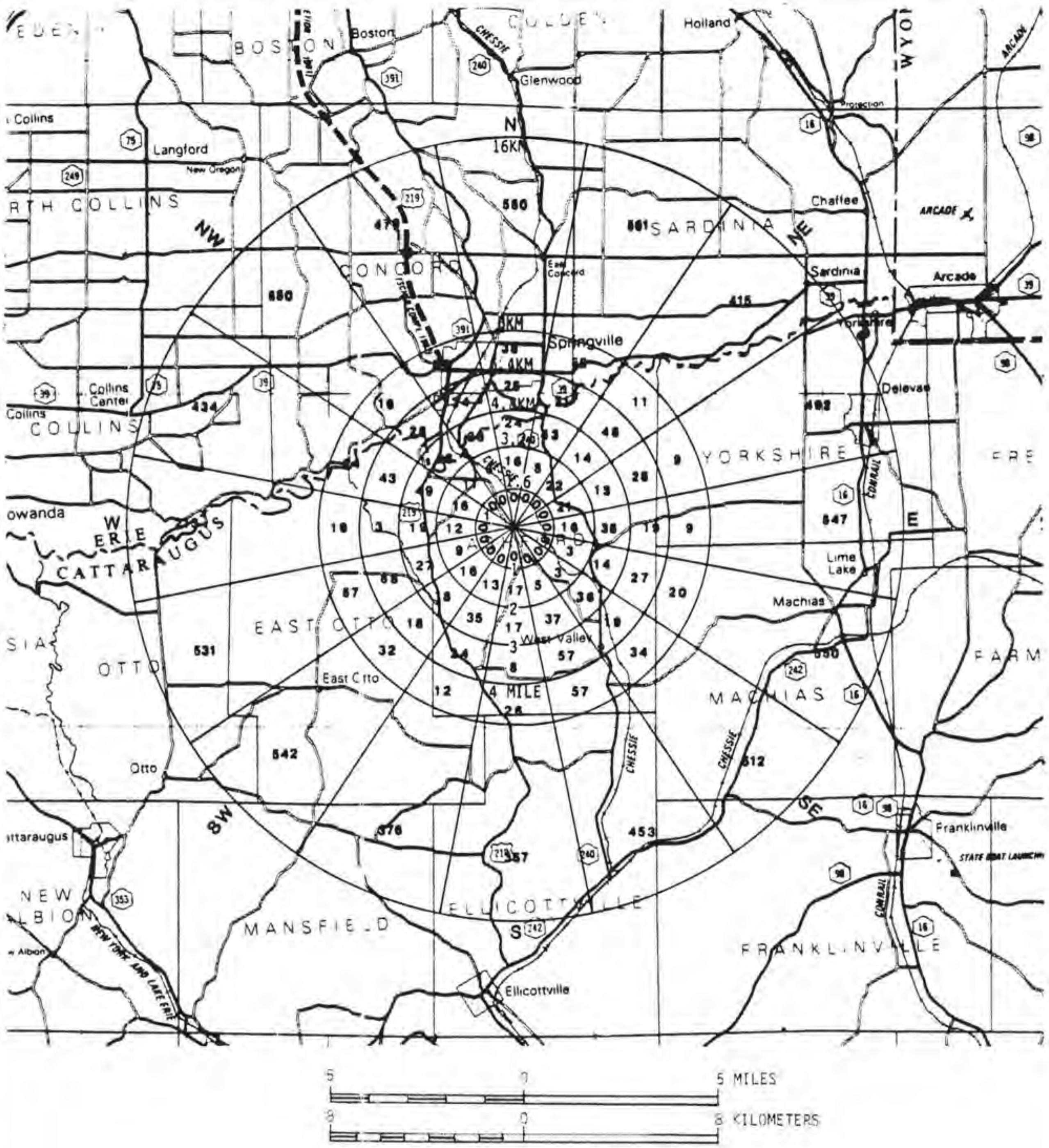
WASHINGTON — MINOR CIVIL DIVISION

Washington — INCORPORATED PLACE WITH 50 000 OR MORE INHABITANTS

Washington — INCORPORATED PLACE WITH FEWER THAN 50 000 INHABITANTS

Washington — UNINCORPORATED PLACE

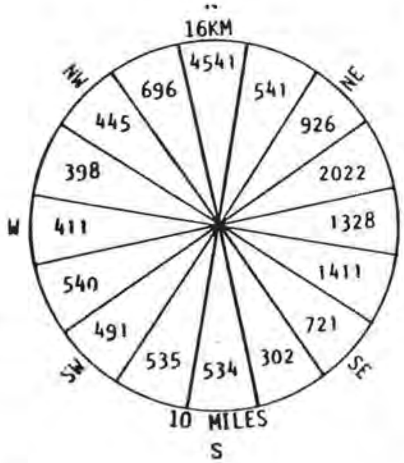
MAP REFERENCE:
U.S. BUREAU OF THE CENSUS, 1970.



NUMBER OF MEAT-PRODUCING ANIMALS BY SECTOR

WITHIN 16 KILOMETERS (10 MILES) OF SITE

FIGURE 4-6



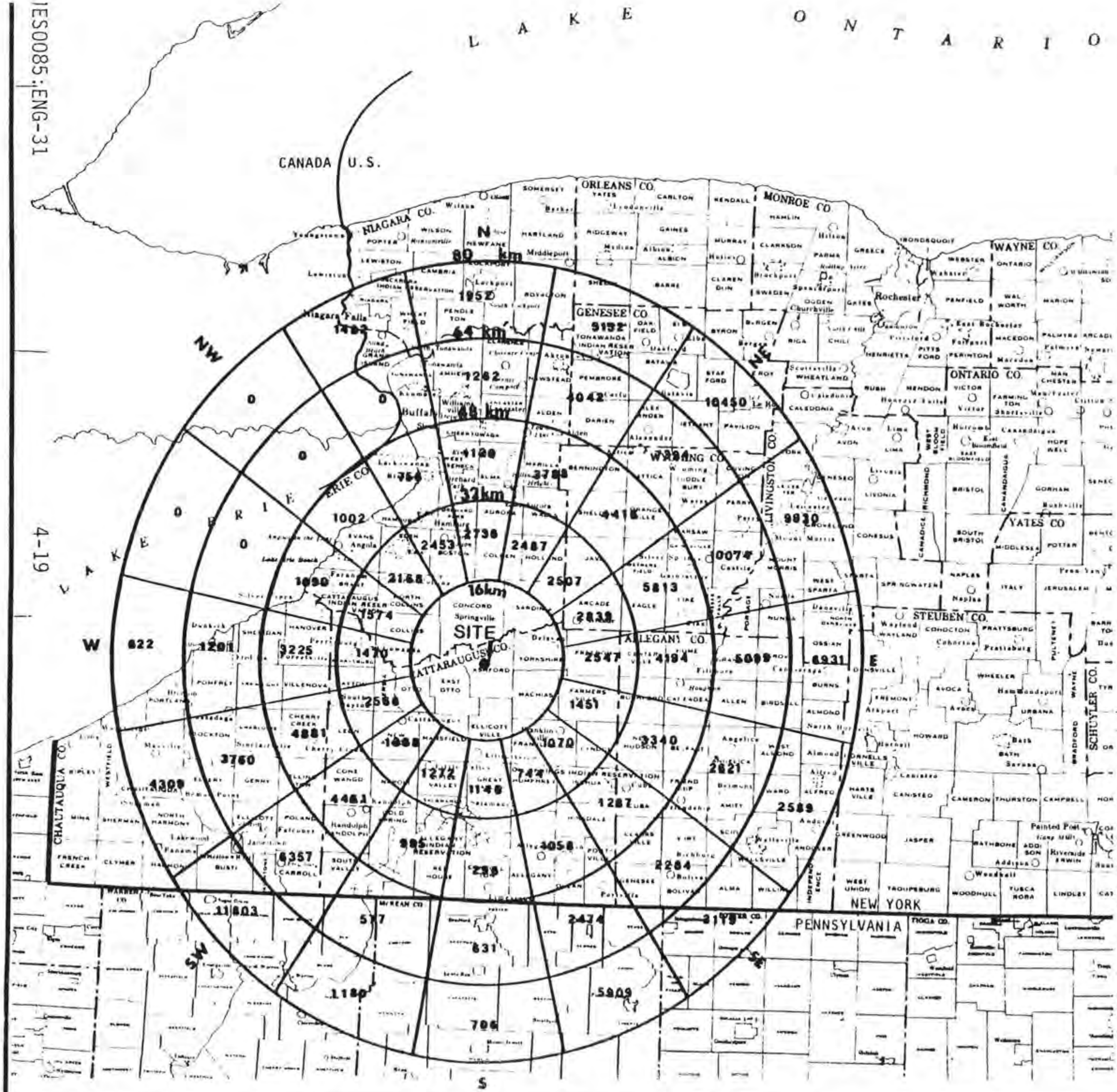


FIGURE 4-7

NUMBER OF MEAT-PRODUCING ANIMALS BY SECTOR

WITHIN 16-80 KILOMETERS (10-50 MILES) OF THE SITE

10 0 10 20
MILES

16 0 16 32
KILOMETERS

SYMBOLS

COUNTY

MINOR CIVIL DIVISION

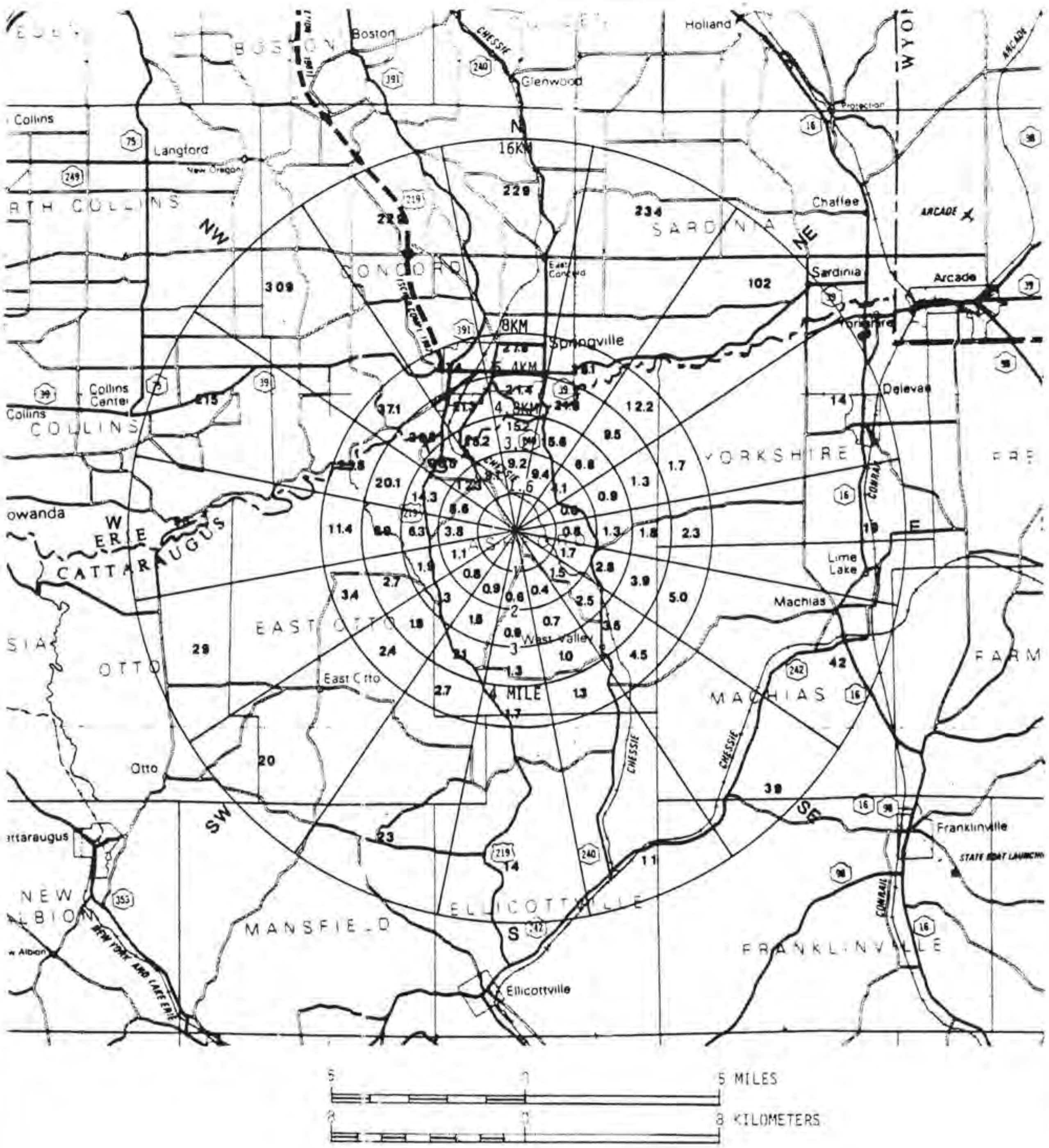
INCORPORATED OR UNINCORPORATED PLACE NOT A MINOR CIVIL DIVISION

INCORPORATED OR UNINCORPORATED PLACE WITH FEWER THAN 2,500 INHABITANTS

TYPE STYLES

WASHINGTON	COUNTY
WASHINGTON	MINOR CIVIL DIVISION
Washington	INCORPORATED PLACE WITH 50,000 OR MORE INHABITANTS
Washington	INCORPORATED PLACE WITH FEWER THAN 50,000 INHABITANTS
Washington	UNINCORPORATED PLACE

MAP REFERENCE:
U.S. BUREAU OF THE CENSUS, 1970.



AGRICULTURAL PRODUCE LAND AREA (ha) BY SECTOR

WITHIN 16 KILOMETERS (10 MILES) OF SITE

FIGURE 4-8

JES0085:ENG-31

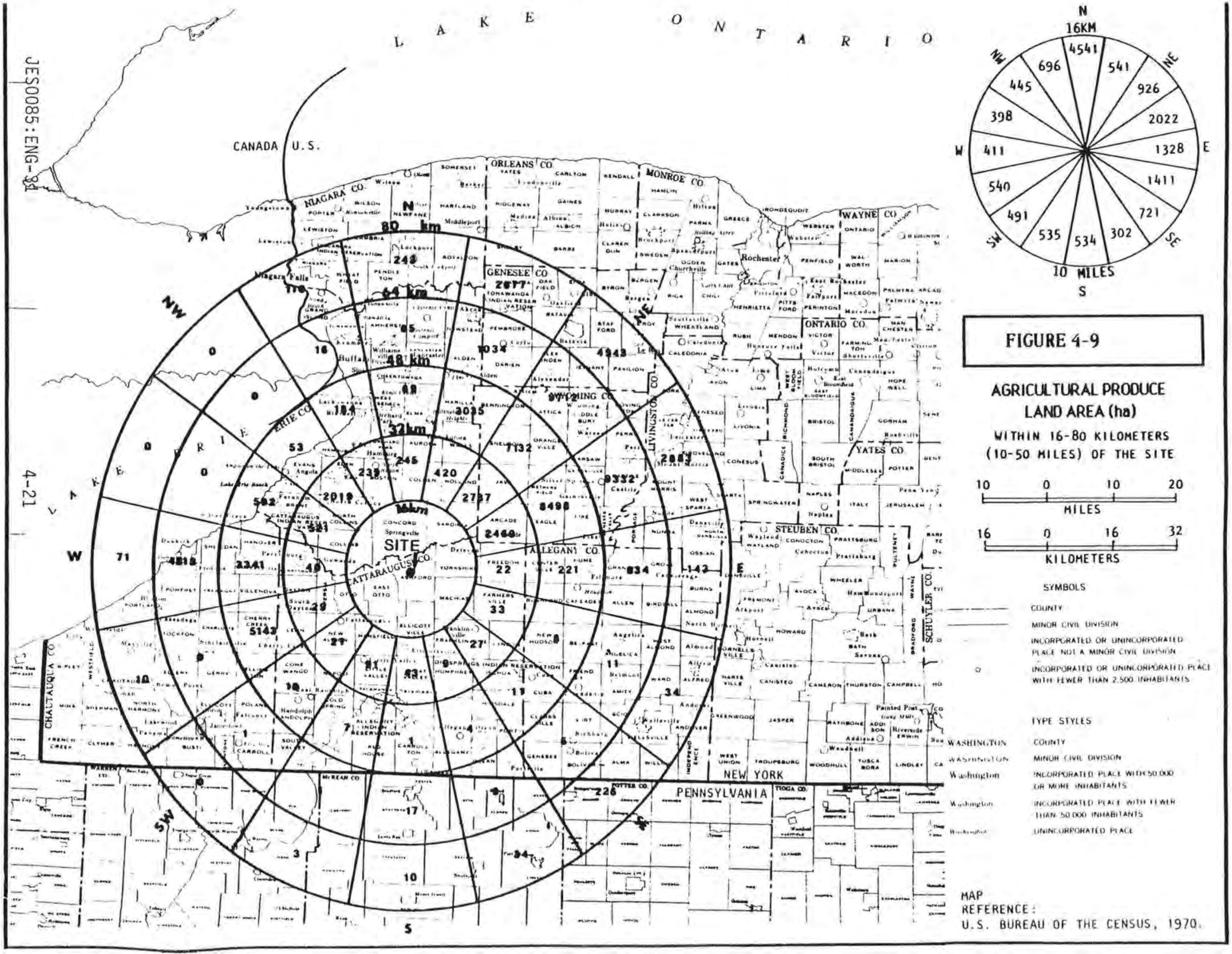


FIGURE 4-9

AGRICULTURAL PRODUCE LAND AREA (ha)

WITHIN 16-80 KILOMETERS (10-50 MILES) OF THE SITE

5.0 STANDARDS AND QUALITY ASSURANCE

5.1 Environmental Standards and Regulations

The following environmental standards and regulations are applicable at the WVDP site boundary:

- o DOE Order 5480.1, "Requirements for Radiation Protection," August 1981.
- o U.S. Federal Radiation Council, Background Material for the development of Radiation Protection Standard, Report No. 1, (1960) and Report No. 2 (1961), Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.
- o U.S. Environmental Protection Agency, National Primary and Secondary Ambient Air Quality Standards, 40 CFR 50, 1980.
- o Department of Environmental Conservation, State of New York, Environmental Conservation Law of New York State, Title 8, Article 19, October 18, 1972.

The standards and guides for releases of radionuclides at the WVDP are those of DOE Order 5480.1 Chapter XI, dated August 13, 1981, entitled, "Requirements for Radiation Protection." Radiation protection standards and selected radioactivity concentration guides from Chapter XI are listed in Appendix B. When there is a difference between soluble and insoluble chemical forms, the most restrictive guide is listed. These listed guides are virtually identical to those in the Code of Federal Regulations (CFR), Title 10, Part 20. Ambient air and water quality standards contained in the individual SPDES permits issued for the facility are listed in Table C-5.2

5.2 Quality Assurance

Off-site laboratories performed most of the radiochemical analyses for the environmental samples collected during 1984. The documented quality assurance plan used by these laboratories includes periodic interlaboratory cross-checks, prepared standard and blank analyses, routine instrument calibration, and use of standardized procedures.

Sample collection, preparation, and most instrumental radiometric analyses were performed at the WVDP site environmental laboratory for all media collected. In 1984, radiochemical determination of Sr-90 in water was added to the list of procedures performed at the WVDP site. For all continuous sampling equipment, measurement devices, and counting instruments, periodic calibration was maintained using standards traceable to the National Bureau of Standards. Off-site laboratories analyze duplicates of approximately 10% of the samples analyzed on-site for the same parameters. Also in 1984, a formal documentation of quality assurance polices and performance criteria was completed for use in the environmental monitoring program. The scope of the quality assurance program includes sample collection methods and record keeping; sample preparation, preservation, shipping, and inventory control; analytical measurements, standards and backgrounds, and calibrations; data reduction, analysis of trends, and reporting formats. The program also defines requirements for review and corrective action.

A cross-check program was not formally in place at WVDP for radiometric measurements in 1984, but a summary of off-site laboratory split sample comparisons including U.S. Environmental Protection Agency (EPA) cross-check results for Nonradiological water quality parameters is included in Appendix D. All the parameters tested in the EPA cross-check program were within the acceptable limits. The split sample measurements were compared among the WVDP on-site analytical radiochemistry lab, the WVDP contract laboratory (EAL), and a DOE laboratory (RESL); they are generally in close agreement.

5.3 Statistical Reporting Of Data

Except where noted, individual analytical results are reported with plus or minus (+/-) two analytical standard deviations (2σ) indicating the counting uncertainty. The arithmetic averages were calculated using actual results, including zero and negative values. In the final results, if the 95 percent confidence interval included zero, the measurement was assumed to indicate no discernable activity. Less than (<) values indicate the Lower Limit of Detection (LLD) for that analysis. These LLD values will vary among samples, especially in biological media where sample size cannot be easily standardized.

The total statistical uncertainty, including systematic uncertainty plus the random counting uncertainty, is not reported separately for the 1984 data. In most cases, systematic uncertainties due to glassware or balance variation are a small percentage of the large counting uncertainties at environmental levels. The notation normally used in laboratory reporting to convey the total uncertainty is in the form: (V.00 +/- R.0; T.0) E-00 where "V.00" is the analytical value to three significant figures, "+/-R.0" is the random uncertainty to two significant figures, "T.0" is the total of random plus systematic uncertainties, and "E-00" is the exponent of 10 used to signify the magnitude of the parenthetical expression.

6.0 REFERENCES

Dunning, Donald E., "Estimates of Internal Dose Equivalent from Inhalation and Ingestion of Selected Radionuclides," WIPP-DOE-176, undated.

Huang, J., New York State Department of Health, Bureau of Environmental Radiation Protection, Albany, New York, personal communication, April 11, 1984.

ICRP Publication 26. "Recommendations of the International Commission on Radiological Protection," Annals of the ICRP, Vol. 1, No. 3, 1977.

"Long Term Management of Liquid High-Level Radioactive Wastes Stored at the Western New York Nuclear Services Center, West Valley," DOE/EIS-0081, June 1982.

Moore, R. E., et al., "AIRDOS-EPA: A Computerized Methodology for Estimating Environmental Concentrations and Dose to Man from Airborne Releases of Radionuclides," ORNL-5532, June 1979.

"National Council on Radiation Protection and Measurements, Washington, DC, "Environmental Radiation Measurements, NCRP Report No. 50,"December 1976.

Oak Ridge National Laboratory (ORNL), 1980, "User's Manual for LADTAP II - A Computer Program for Calculating Radiation Exposure to Man from Routine Release of Nuclear Reactor Liquid Effluents," NUREG/CR-1276, May, 1980.

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

U. S. Nuclear Regulatory Commission (NRC), 1977, "Regulatory Guide 1.109 Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 60, Appendix I," October, 1977.

U. S. Nuclear Regulatory Commission (NRC), 1977, 'Regulatory Guide 1.111 Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors,' July, 1977.

West Valley Demonstration Project, 1984 Effluent and On-site discharge Report, March, 1985.

West Valley Nuclear Services Co., Inc., "Environmental Monitoring Program Report for the West Valley Demonstration Project," May 1983.

Wilcox, D. P. and Smokowski, R. T., "Nuclear Fuel Services Environmental Reports," Nuclear Fuel Services, West Valley, New York, Nos. 25 through 31, July 1978 - December 1981 inclusive.

7.0 DISTRIBUTION

J. Turi	DOE-HQ
W. Hannum	DOE-PO
T. DeBoer	NYSERDA
R. Spaunburgh	NYSERDA
R. Novitzki	USGS
R. Fakundiny	NYSGS
L. Meyer	USEPA, Washington, DC
P. Giardina	USEPA, Region II
R. Mitre	NYSDEC, Region 9
K. Rimawi	NYSDOH
T. Clark	NRC
P. Merges	NYSDEC, Albany
P. Hamric	DOE-ID
Technical File- Public Information	WVNS

APPENDIX A

EFFLUENT, ON-SITE, AND OFF-SITE RADIOLOGICAL MONITORING PROGRAM 1984 IMPLEMENTATION

Table A-1

EFFLUENT AND ON-SITE RADIOLOGICAL MONITORING PROGRAM
1984 IMPLEMENTATION

SAMPLE LOCATION AND I. D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Main plant ventilation exhaust stack **ANSTACK**	Release point for airborne radioactive exhaust Required by: DOE 5484.1, Tech Spec 5.1.2, 5.1.4, 4.1.1 Reported: Internal Monthly Summary Annual Effluent Report Annual Environmental Report	Continuous off-line air particulate monitor[a] Continuous off-line air particulate and iodine sampler[a]	Continuous measurement of fixed filter, replaced weekly Weekly collection of filter paper and charcoal absorber	104 104	Real time alpha and beta monitoring Filters for gross alpha/ beta Quarterly composites: filters for Sr-90, gamma isotopic; Charcoal for I-129
Lagoon 3 discharge Weir **WNSP001**	Primary point of liquid effluent batch release Required by: DOE 5484.1 Tech Spec 5.1.1 5.1.4, 4.2 SPDES Reported: NYSDEC Monthly DMR Annual Effluent Report Annual Environmental Report	Grab Liquid	Daily, during Lagoon 3 discharge	40-80	Daily: Gross beta, pH. Every sixth daily sample: gross alpha/ beta, H-3, Sr-90, gamma isotopic; 24 hour composite for metals, NH_3 Weighted monthly composite of daily samples, and 24 hour composite: gross alpha/ beta, H-3, Sr-90, I-129, gamma isotopic Quarterly weighted composite of daily samples: U isotopic, Pu isotopic

[a]Isokinetic sampling probe placed at the 80-foot level within the stack.

BLC0008

Table A-1 (Cont'd)

EFFLUENT AND ON-SITE RADIOLOGICAL MONITORING PROGRAM
1984 IMPLEMENTATION

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Erdman Brook at security fence **WNSP006**	Combined facility liquid discharge Required by: DOE 5484.1	Continuous proportional sample liquid	Monthly* (Composite of biweekly collections)	12	Gross alpha/beta, H-3 (Total Fe biweekly) Quarterly composite: gamma isotopic, Sr-90
	Reported: Internal Monthly Summary NYSDEC Monthly DMR Annual Environmental Report	Grab liquid	biweekly	26	NH_3,pH
Plant Effluent Interceptors **WNINTER**	Untreated liquid to LLWT plant input lagoon Required by: Tech Spec 4.2 Reported: Internal Review	Grab Liquid	Once per transfer	150-250	Quarterly composite: gross alpha/beta, H-3, Sr-90
(33) Onsite Ground water (wells) **WNWNF-series** **WNW80-series** **WNW82-series**	Ground water monitoring wells around site facilities Required by: DOE 5484.1 Reported: Annual Environmental Report	Grab liquid	Semiannual*	66	Gross alpha/beta, H-3, pH

*Samples to be split (shared with NYSDOH)

Table A-1 (Cont'd)

EFFLUENT AND ON-SITE RADIOLOGICAL MONITORING PROGRAM
1984 IMPLEMENTATION

SAMPLE LOCATION AND I. D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Sanitary Waste Discharge **WNSP004**	Liquid effluent point for sewage treatment plant Required by: DOE 5484.1 SPDES Reported: NYSDEC Monthly DMR	Grab liquid	Weekly	52	Gross beta, pH, settleable solids Monthly composite: gross alpha/beta, H-3, and Sr-90 Quarterly composite: BOD, suspended solids
	Annual Effluent Report Annual Environmental Report		Semiannually	2	Gross alpha/beta, H-3, gamma isotopic Sr-90, I-129
N.E. Swamp drainage **WNSWAMP**	Site surface drainage Required by: DOE 5484.1	Grab liquid	Weekly	52	H-3
	Reported: Annual Effluent Report		Monthly*		Gross alpha/beta, H-3

*Samples to be split (shared with NYSDOH)

BLC0008

Table A-1 (Cont'd)

EFFLUENT AND ON-SITE RADIOLOGICAL MONITORING PROGRAM 1984 IMPLEMENTATION

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
French Drain **WNFRDRN**	Drains subsurface water from LLWT lagoon area	Grab liquid	Weekly	52	H-3
	Required by: DOE 5484.1				
	Reported: Annual Effluent Report		Monthly	12	Gross alpha/beta
Franks Creek E of NYSLLWB **WNFRC67**	Drains NYS Low Level Waste Burial area	Grab liquid	Monthly	12	Gross alpha/beta, H-3
	Required by: DOE 5484.1		Weekly*		
	Reported: Internal review NYSERDA				
Erdman Brook N of burial areas **WNERB53**	Drains NYS and WVDP disposal areas	Grab liquid	Weekly*	52	Gross alpha/beta, H-3
	Required by: DOE 5484.1				
	Reported: Internal Review NYSERDA				

*Samples to be split (shared with NYSDOH).

BLC0008

Table A-1 (Cont'd)

EFFLUENT AND ON-SITE RADIOLOGICAL MONITORING PROGRAM
1984 IMPLEMENTATION

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Ditch N of WVDP NDA **WNHULLB**	Drains WVDP disposal area Required by: DOE 5484.1 Reported: Internal Review	Grab liquid	Weekly (when flowing)	30	Gross beta and H-3
Cooling water pipe **WNSFILT**	Discharges sand filter backwash liquid Required by: DOE 5484.1 Reported by: Internal Review	Grab liquid	Monthly	12	Gross beta
Condensate Pipe **WNCONDP**	Discharges drainage water from utility ditch[b] Required by: DOE 5484.1 Reported: Internal Review	Grab liquid	Monthly	12	Gross beta

*Samples to be split (shared with NYSDOH)

[b]Utility ditch drains steam condensate from traps along the side of the utility room.

BLC0008

Table A-1 (Cont'd)

EFFLUENT AND ON-SITE RADIOLOGICAL MONITORING PROGRAM 1984 IMPLEMENTATION

SAMPLE LOCATION AND I. D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Condensate and Cooling Water Ditch **WNSP005**	Combined drainage from pipes and settling ponds Required by: DOE 5484.1 SPDES Reported: Internal Review NYSDEC Monthly DMR	Grab liquid	Monthly	12 12	Gross beta Suspended solids, pH on 24 hr. composite
Settling Basin Outfall **WNSETLB**	Drains settling basins that receive discharge water from demineralizer backwash Required by: DOE5484.1 Reported: Internal Review	Grab liquid	Monthly	12	Gross alpha/beta, H-3
Cooling Tower Basin **WNCOOLW**	Cools plant utility steam system water Required by: DOE 5484.1 Reported: Internal Review	Grab liquid	Weekly	52	Gross beta

*Samples to be split (shared with NYSDOH)

BLC0008

Table A-1 (Cont'd)

EFFLUENT AND ON-SITE RADIOLOGICAL MONITORING PROGRAM
1984 IMPLEMENTATION

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
(9) Onsite Standing water (ponds not receiving effluent) **WNSTAW-series**	Water within vicinity of plant airborne or ground water effluents Required by: DOE 5484.1 Reported: Internal Review	Grab liquid	Annually	9	Gross alpha/beta, H-3, pH
Site Potable Water **WNDRNKW**	Source of water within site perimeter Required by: DOE 5484.1 Reported: Internal Review	Grab liquid	Monthly	12	Gross alpha/beta, H-3

BLC0008

Table A-2

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
1984 IMPLEMENTATION

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Cattaraugus Creek at Felton Bridge location WFFELBR	Unrestricted surface waters receiving plant effluents Required by: DOE 5484.1 Tech Spec 5.1.1, 5.1.4 Reported: Internal Monthly Summary Annual Environmental Report	Flow weighted continuous liquid	Weekly*	52	Weekly for gross alpha/beta, H-3; Monthly composite for gamma isotopic and Sr-90

*Samples to be split (shared with NYSDOH)

BLC0008

Table A-2 (Cont'd)

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
1984 IMPLEMENTATION

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Cattaraugus Creek upstream of Buttermilk Creek confluence at Bigelow Bridge **WFBIGBR**	Unrestricted surface water background Required by: DOE 5484.1 Reported: Annual Environmental Report	Grab liquid	Monthly	12	Gross alpha/beta, H-3
Buttermilk Creek, just upstream of Cattaraugus Creek confluence at Thomas Corners Road **WFBCTCB**	Restricted surface waters receiving plant effluents Required by: DOE 5484.1 Tech Spec 5.1.4 Reported: Annual Environmental Report	Composite continuous liquid	Biweeky	26	Monthly for gross alpha/beta, H-3; Quarterly composite for gamma isotopic and Sr-90
Buttermilk Creek control location near Fox Valley **WFBCBKG**	Restricted surface water background Required by: DOE 5484.1 Reported: Internal Monthly Summary Annual Environmental Report	Composite continuous liquid	Biweekly	26	Monthly for gross alpha/beta, H-3; Quarterly composite for gamma isotopic and SR-90

BLC0008

Table A-2 (Cont'd)

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
1984 IMPLEMENTATION

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Wells near WVDP outside WNYNSC Perimeter 3.0 Km WNW WFWEL01 1.5 Km NW WFWEL02 4.0 Km NW WFWEL03 3.0 Km NW WFWEL04 2.5 Km SW WFWEL05 11.0 Km SSW WFWEL06 4.0 Km NNE WFWEL07 2.5 Km ENE WFWEL08 3.0 Km SE WFWEL09 7.0 Km N WFWEL10	Drinking supply ground water near facility. Required by: DOE 5484.1 Reported: Annual Environmental Report	Grab liquid	Biennially	10 (year of collection)	Gross alpha/beta, H-3, gamma isotopic

BLC0008

Table A-2 (Cont'd)

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
1984 IMPLEMENTATION

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
3.0 Km SSE at Fox Valley **AFFXVRD**	Particulate air samples around WNYNSC perimeter	Continuous air particulate	Weekly	364	Weekly (each filter) gross alpha/beta
3.7 Km NNW at Thomas Corners Road **AFTCORD**	Required by: DOE 5484.1 Tech Spec 5.4.1				Quarterly: (Each station) composite filters for Sr-90, gamma isotopic.
2.0 Km NE of Route 240 **AFRT240**	Reported: Annual Environmental Report				
1.5 Km NW on Rock Springs Road (added in 1984) **AFRSPRD**					
29 Km S at Great Valley (back-ground added in 1984) **AFGRVAL**					
7 Km at Springville (added in 1984) **AFSPRVL**					
6 Km SSE at West Valley (added in 1984) **AFWEVAL**					

BLC0008

Table A-2 (Cont'd)

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
1984 IMPLEMENTATION

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES RFORMED/ COMPOSITE FREQUENCY
2.5 Km Sw **AFDHFOP** 3.0 Km SSE **AFFXFOP** 3.7 Km NNW **AFTCFOP** 2.0 Km NE **AF24FOP**	Fallout particulate and fluid collection around WNYNSC perimeter Required by: DOE 5484.1 Reported: Annual Environmental Report	Integrating liquid	Monthly	48	Gross alpha/beta, H-3
(7) Surface soil (at each air particulate sampler) 47 Km W at Dunkirk 26 Km SSW at Little Valley **SF-series**	Long-term fallout accumulation Required by: DOE 5484.1 Reported: Annual Environmental Report	Surface plug composite soil	Triennially*	9 (year of collection)	Gamma isotopic, Sr-90, and Pu

*Samples to be split (shared with NYSDOH)

BLC0008

Table A-2 (Cont'd)

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
1984 IMPLEMENTATION

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Buttermilk Creek at Thomas Corners Road **SFTCSED** Buttermilk Creek at Fox Valley Road (background)* **SFBCSED** Cattaraugus Creek at Felton Bridge **SFCCSED** Cattaraugus Creek at Springville Dam* **SFSDSED** Cattaraugus Creek at Bigelow Bridge (background) **SFBISED**	Deposition in sediment downstream of facility effluents Required by: DOE 5484.1 Tech Spec 5.1.4 Reported: Annual Environmental Report	Grab steam sediment	Semiannually * (split two only)	10	Gross alpha/beta, isotopic gamma and Sr-90

*Samples to be split (shared with NYSDOH)

BLC0008

Table A-2 (Cont'd)

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
1984 IMPLEMENTATION

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Cattaraugus Creek downstream of the Buttermilk Creek confluence **BFFCATC** Control sample from nearby stream not affected by WVDP (7 Km or more upstream of site effluent point) **BFFCTRL**	Fish in waters down-stream of facility effluents Required by: DOE 5484.1 Tech Spec 5.1.4 Reported: Annual Environmental Report	Individual collection, biological	Semiannually*	36 (each sample point is 9 fish)	Isotopic gamma and Sr-90 in edible portions; Sr-90 in skeleton (down stream only)

*Samples to be split (shared with NYSDOH)

BLC0008

Table A-2 (Cont'd)

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
1984 IMPLEMENTATION

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Dairy farm, 3.8* Km NNW **BFMREED**	Milk from animals foraging around facility perimeter	Grab biological	Monthly* (BFMREED)	12	Gamma isotopic, Sr-90, and I-129 on annual samples and quarterly composites of monthly samples
Dairy farm, 2.5* Km ENE **BFMZIMM**	Required by: DOE 5484.1 Tech Spec 5.1.4		Annual (others)* (split 2 only)	3	
Dairy farm, 1.9 Km WNW **BFMCOHO**	Reported: Annual Environmental Report				
Control location* (central NY State sample to be provided by NYSDOH) **BFMCTRL**					

*Samples to be split (shared with NYSDOH)

BLC0008

Table A-2 (Cont'd)

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
1984 IMPLEMENTATION

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
(3) Nearby downwind location **BFVNEAR** (3) Remote locations (16 Km or more from facility) **BFVCTRL**	Fruit and vegetables grown near facility perimeter Required by: DOE 5484.1 Reported: Annual Environmental Report	Grab Biological	Annually,* at harvest	6	Gamma isotopic and Sr-90 analyses of edible portions
Beef animal from nearby farm in downwind direction **BFBNEAR** Beef animal from control location (16 Km or more from facility) **BFBCTRL**	Meet-Beef foraging near facility perimeter Required by: DOE 5484.1 Reported: Annual Environmental Report	Grab biological	Semiannually*	4	Gamma isotopic analysis of meat.

*Samples to be split (shared with NYSDOH)

BLC0008

Table A-2 (Cont'd)

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
1984 IMPLEMENTATION

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
In vicinity of the site **BFDNEAR** Control animal (16 Km or more from facility) **BFDCTRL**	Meat-Deer foraging near facility perimeter Required by: DOE 5484.1 Tech Spec 5.1.4 Reported: Annual Environmental Report	Individual collection biological	Annually, during hunting season* During year as available*	2	Gamma isotopic analyses of meat

*Samples to be split (shared with NYSDOH)

8LC0008

Table A-2 (Cont'd)

OFF-SITE RADIOLOGICAL MONITORING PROGRAM
1984 IMPLEMENTATION

SAMPLE LOCATION AND I.D. CODE	MONITORING/REPORTING REQUIREMENTS	SAMPLING TYPE/MEDIUM	COLLECTION FREQUENCY	TOTAL ANNUAL SAMPLES	ANALYSES PERFORMED/ COMPOSITE FREQUENCY
Thermoluminescent Dosimetry (TLD) (16) at each of 16 compass sectors, at nearest accessible perimeter point (2) at corners of NYS LLW burial area 1500 m NW (nearest downwind receptor) "5 Points" landfill, 19 Km SW (background) Great Valley, 29 Km S (background added in 1984) Springville 7 Km N (added in 1984) West Valley 6 Km SSE (added in 1984) **DFTLD-series**	Direct Radiation around facility Required by: DOE 5484.1 Tech Spec 5.1.4 Reported: Annual Environmental Report	Integrating LiF TLD	Quarterly* (data shared from overlap locations)	92	Quarterly gamma dose

*Samples to be split (shared with NYSDOH)

BLC0008

LOCATION OF EFFLUENT RADIOLOGICAL MONITORING POINTS ONSITE

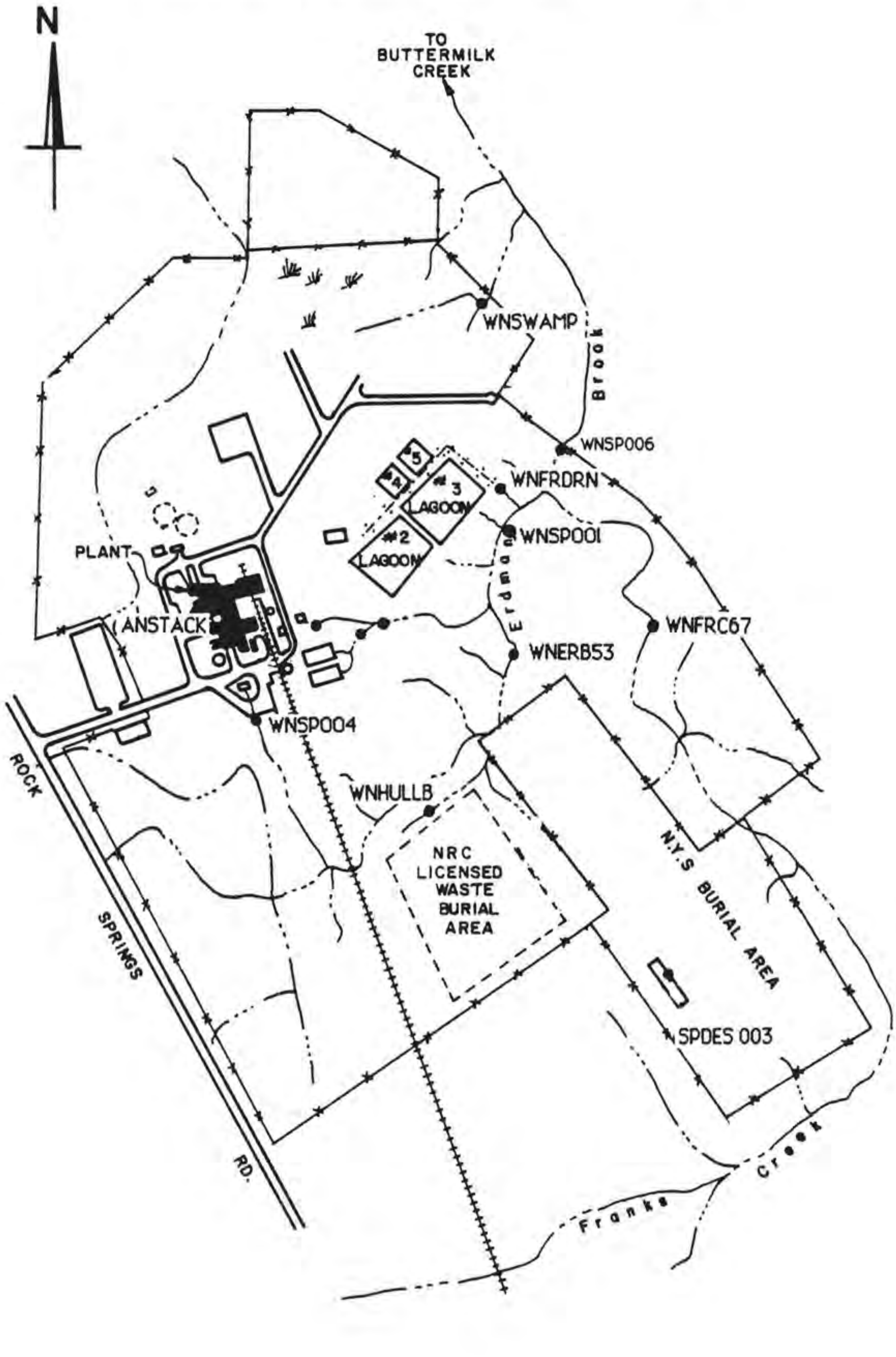


FIGURE A-1

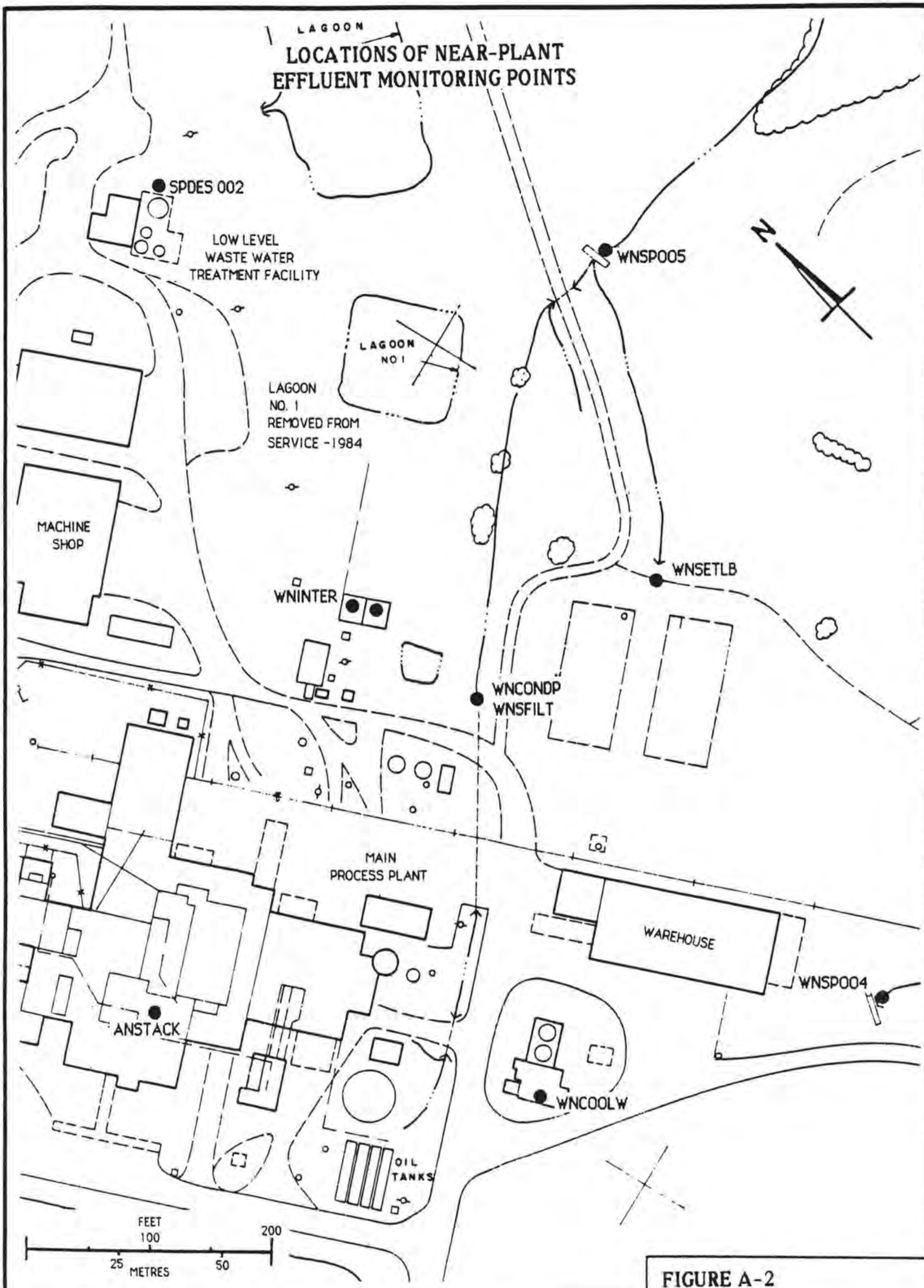
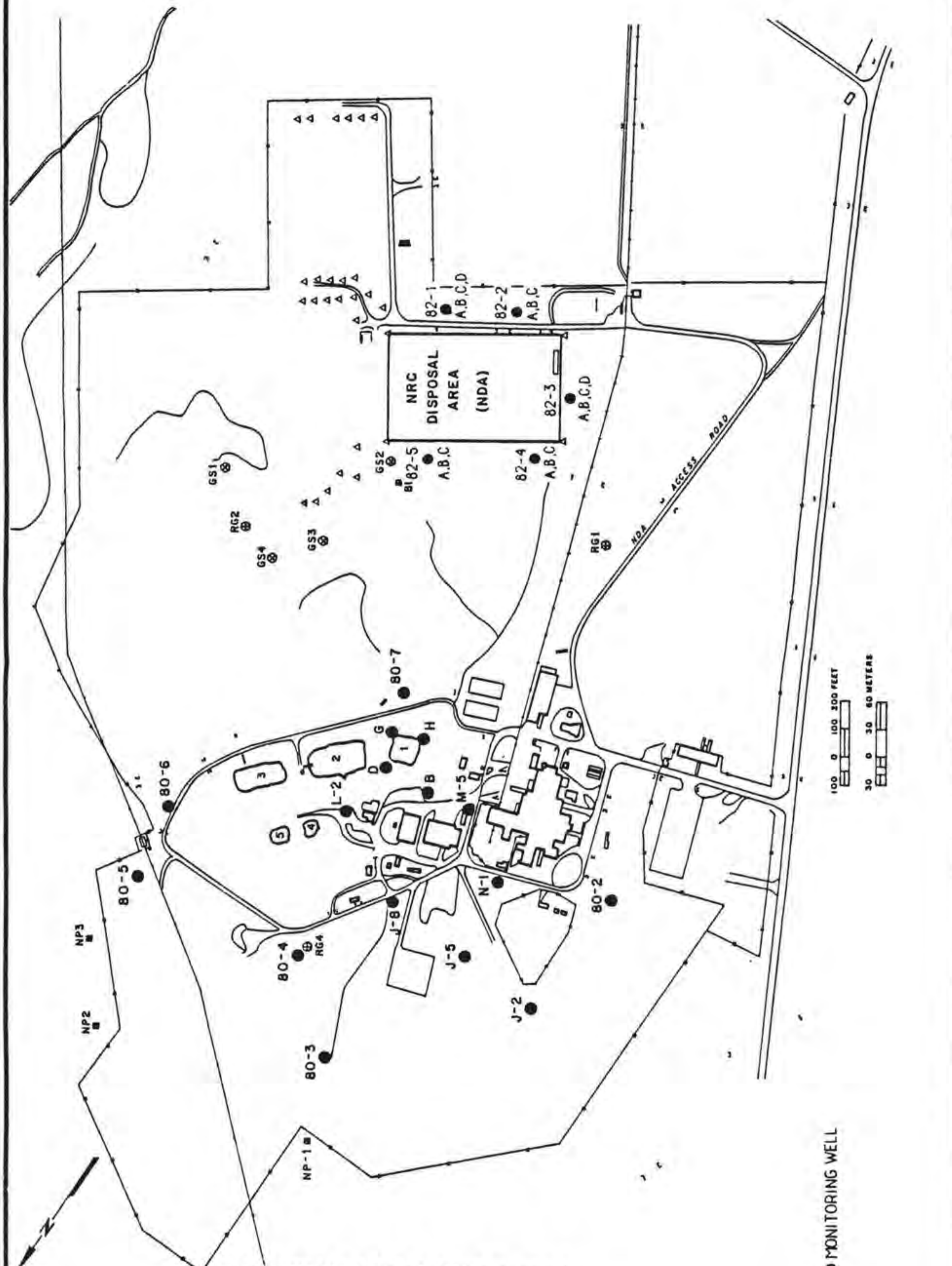

LOCATIONS OF NEAR-PLANT EFFLUENT MONITORING POINTS
LAGOON
SPDES 002
LOW LEVEL WASTE WATER TREATMENT FACILITY
WNSP005
LAGOON NO 1
LAGOON NO. 1 REMOVED FROM SERVICE -1984
MACHINE SHOP
WNINTER
WNSETLB
WNCONDP
WNSFILT
MAIN PROCESS PLANT
WAREHOUSE
WNSP004
ANSTACK
WNCOOLW
OIL TANKS
FEET
100
200
25
METRES
50

FIGURE A-2



LOCATION OF ON-SITE WELLS
MONITORED IN 1984

FIGURE A-3

LOCATIONS OF PERIMETER ENVIRONMENTAL MONITORING STATIONS

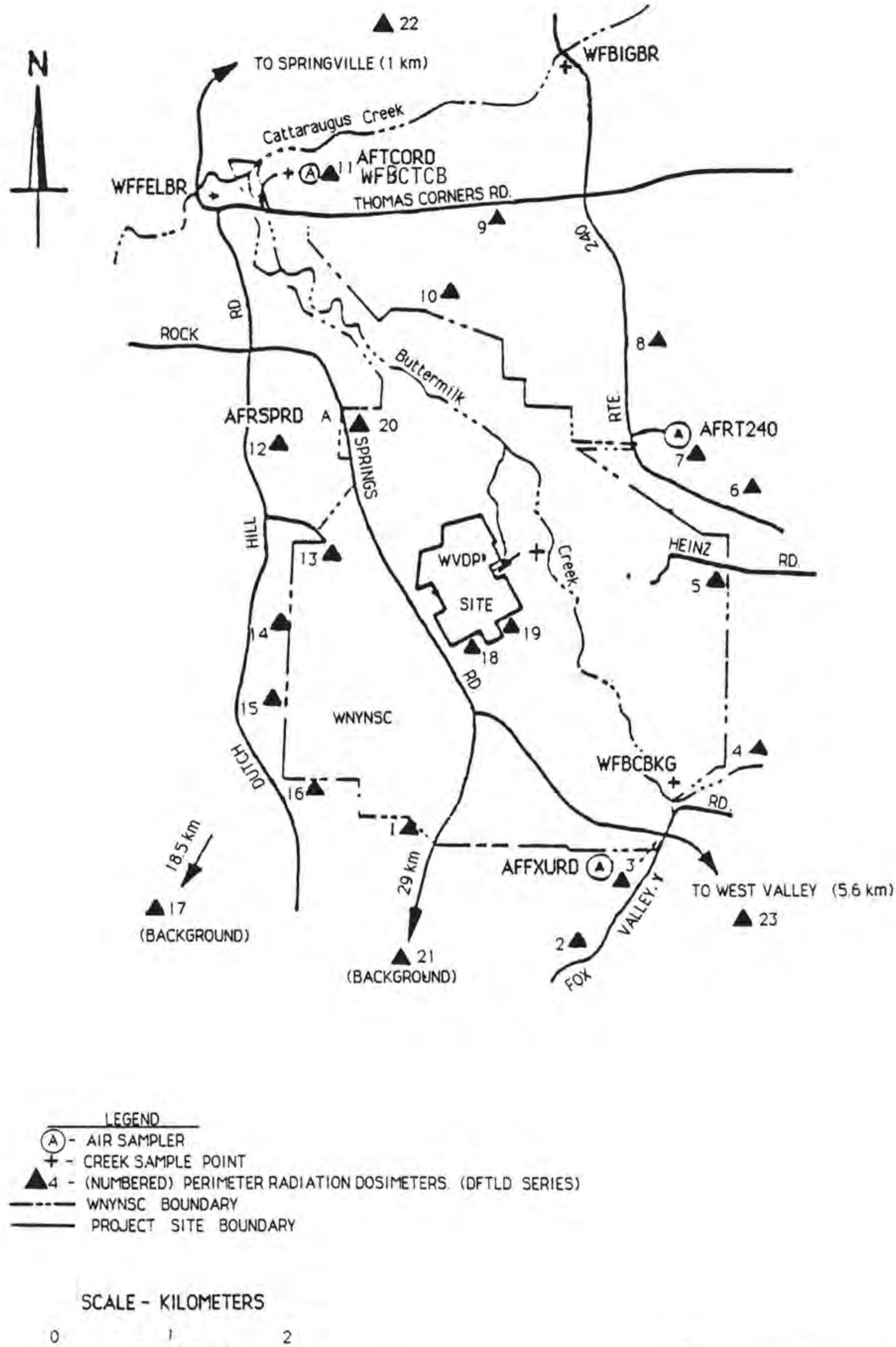


FIGURE A-4

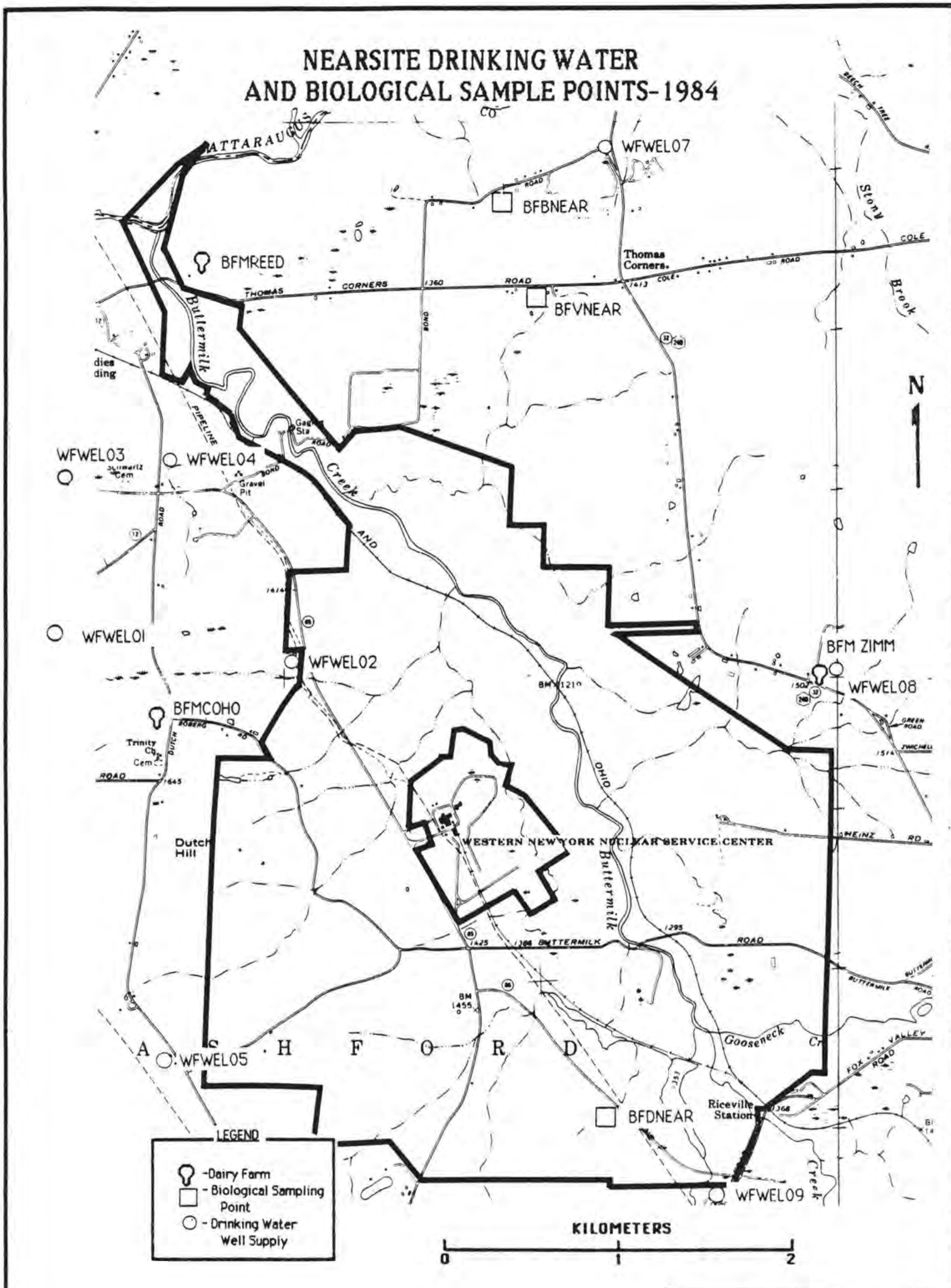

NEARSITE DRINKING WATER
AND BIOLOGICAL SAMPLE POINTS-1984
WFWEL07
BFBNEAR
BFMREED
Thomas Corners
THOMAS CORNERS ROAD
BFVNEAR
COLE ROAD
Stony Brook
Buttermilk
N
WFWEL03
WFWEL04
Creek
WFWEL01
WFWEL02
BFM ZIMM
WFWEL08
BFMCOHO
Trinity Cem.
Dutch Hill
WESTERN NEW YORK NUCLEAR SERVICE CENTER
OHIO
Buttermilk
BUTTERMILK ROAD
HEINZ RD
Gooseneck Cr
FOX VALLEY ROAD
A S H F O R D
WFWEL05
BFDNEAR
Riceville Station
WFWEL09
Creek
LEGEND
-Dairy Farm
- Biological Sampling Point
- Drinking Water Well Supply
KILOMETERS
0
1
2

FIGURE A-5

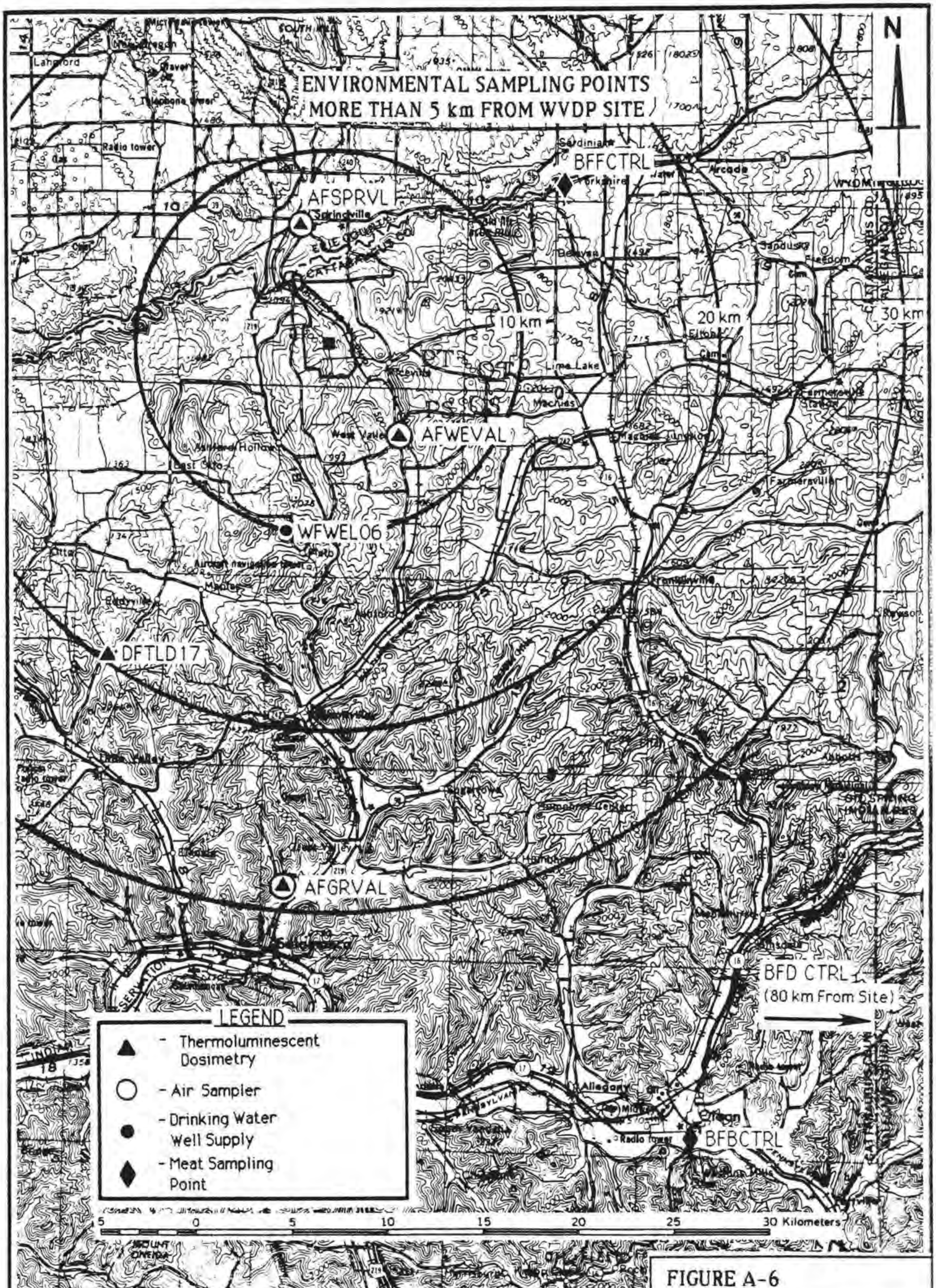

ENVIRONMENTAL SAMPLING POINTS
MORE THAN 5 km FROM WVDP SITE
N
BFFCTRL
AFSPRVL
AFWEVAL
WFWEL06
DFTLD17
AFGRVAL
BFBCTRL
BFD CTRL
(80 km From Site)
10 km
20 km
30 km
LEGEND
- Thermoluminescent Dosimetry
- Air Sampler
- Drinking Water Well Supply
- Meat Sampling Point
5 0 5 10 15 20 25 30 Kilometers

FIGURE A-6

APPENDIX B

STANDARDS AND CONCENTRATION GUIDES

TABLE B-1
STANDARDS AND CONCENTRATION GUIDES
(DOE Order 5480.1, Chapter XI)

Radiation Protection Standards
Annual Whole-Body Dose Equivalent (mRem/year)

Individuals at Points of Maximum Probable Exposure	500
Suitable Sample of the Exposed Population	170

Concentration Guides for Effluent Releases to Uncontrolled Areas (μCi/ml)

Radionuclide	In Air	In Water
Gross alpha	2×10^{-14}	3×10^{-8}
Gross beta[a]	1×10^{-12}	3×10^{-8}
Am-241	2×10^{-13}	4×10^{-6}
Sb-125	9×10^{-10}	1×10^{-4}
Ar-41	4×10^{-8}	-
Ba-140	1×10^{-9}	2×10^{-5}
Cs-134	4×10^{-10}	9×10^{-6}
Cs-137	5×10^{-10}	2×10^{-5}
H-3	2×10^{-7}	3×10^{-3}
I-129	2×10^{-11}	6×10^{-8}
I-131	1×10^{-10}	3×10^{-7}
Kr-85	3×10^{-7}	-
Kr-85m	1×10^{-7}	-
Kr-87	2×10^{-8}	-
Kr-88	2×10^{-8}	-
Pu-238	7×10^{-14}	5×10^{-6}
Pu-239	6×10^{-14}	5×10^{-6}
Pu-240	6×10^{-14}	5×10^{-6}
Ru-106	2×10^{-10}	1×10^{-5}
Sr-90	3×10^{-11}	3×10^{-7}
Xe-133	3×10^{-7}	-
Xe-135	1×10^{-7}	-
Xe-138	3×10^{-8}	-

[a] Based on the most restrictive beta emitter (Ra-228)

APPENDIX C-1

SUMMARY OF WATER AND SEDIMENT MONITORING DATA

TABLE C - 1.1
TOTAL RADIOACTIVITY OF LIQUID EFFLUENTS RELEASED
FROM WVDP LAGOON 3 IN 1984* (CURIES)

	ALPHA	BETA	H-3	CS-137	SR-90	I-129
1ST QTR.	5.11+/-5.2 E-4	3.91+/-0.1 E-2	1.36+/-.03	4.28+/-0.1 E-2	2.76+/-0.3 E-3	1.00+/-0.2 E-4
2ND QTR.	1.32+/-1.9 E-4	1.53+/-0.2 E-2	7.85+/-0.2 E-1	8.12+/-0.3 E-3	7.85+/-0.9 E-4	4.72+/-1.2 E-5
3RD QTR.	0.34+/-1.0 E-4	6.80+/-1.2 E-3	4.49+/-0.1 E-1	1.21+/-0.1 E-3	1.85+/-0.2 E-3	4.28+/-0.7 E-5
4TH QTR.	1.10+/-0.2 E-2	1.98+/-0.3 E-2	4.65+/-0.1	1.08+/-0.2 E-2	3.06+/-0.2 E-3	8.71+/-1.5 E-4
1984 TOTALS	1.17+/-0.3 E-2	8.10+/-0.7 E-2	7.24+/-0.2	6.29+/-0.3 E-2	8.46+/-0.8 E-3	1.06+/-0.2 E-3
AVERAGE(uCi/ml) CONCENTRATION	2.27 E-7	1.57 E-6	1.41 E-4	1.22 E-6	1.64 E-7	2.01 E-8
PERCENT OF REG**	NOT APPLICABLE	ISOTOPES IDENTIFIED	4.7%	6.1%	54.7%	33.5%

	U-238	U-234	U-235	PU-238	PU-239
1ST QTR.	3.03+/-0.3 E-5	4.59+/-0.4 E-5	1.43+/-0.7 E-6	1.81+/-0.7 E-6	8.36+/-4.9 E-7
2ND QTR.	1.19+/-0.1 E-5	1.40+/-0.1 E-5	5.21+/-2.2 E-7	7.66+/-3.3 E-7	4.12+/-2.3 E-7
3RD QTR.	6.98+/-1.0 E-6	9.98+/-1.2 E-6	1.84+/-3.60 E-7	6.19+/-4.1 E-7	4.64+/-3.1 E-7
4TH QTR.	1.84+/-0.8 E-3	7.22+/-1.3 E-4	1.41+/-0.3 E-4	1.32+/-0.2 E-5	9.20+/-1.7 E-6
1984 TOTALS	1.89+/-0.8 E-3	7.92+/-1.4 E-4	1.43+/-0.3 E-4	1.64+/-0.3 E-5	1.09+/-0.3 E-5
AVERAGE(uCi/ml) CONCENTRATION	3.7 E-8	1.54 E-8	2.78 E-9	3.18 E-10	2.12 E-10
PERCENT OF REG**	6.1%	0.4%	0.06%	< 0.01%	< 0.01%

*Includes radioactivity from New York State low level waste burial area (Table C - 1.11)
Total volume released as treated effluent - 5.15 E7 litres (1)

**Recommended Concentration Guides per DOE Order 5480.1, Attachment XI-1, for uncontrolled releases at site boundary. Concentrations listed above for Lagoon 3 effluents are substantially higher than concentrations at boundary where RCGs actually apply.

WPC0016

TABLE C - 1.2
RADIOACTIVITY CONCENTRATIONS
IN SURFACE WATER UPSTREAM OF WVDP
AT FOX VALLEY (WFBCBKG) uCi/ml

	ALPHA	BETA	H-3	SR-90	CS-137
JAN	7.12+/-4.1 E-10	5.63+/-1.1 E-09	< 1.74 E-07		
FEB	6.38+/-4.0 E-10	6.93+/-1.2 E-09	< 1.71 E-07		
MAR	5.22+/-3.6 E-10	5.56+/-1.1 E-09	< 1.86 E-07		
1ST QTR.				— —*	— —*
APR	4.26+/-3.2 E-10	6.23+/-1.2 E-09	< 1.73 E-07		
MAY	3.48+/-2.6 E-10	4.86+/-1.1 E-09	< 1.68 E-07		
JUN	< 1.68 E-10	3.36+/-1.0 E-09	< 1.68 E-07		
2ND QTR.				7.00+/-3.0 E-10	< 7.0 E-08
JUL	< 2.33 E-10	4.53+/-1.1 E-09	2.95+/-1.7 E-07		
AUG	< 1.64 E-10	2.54+/-1.0 E-09	< 1.68 E-07		
SEP	4.49+/-3.3 E-10	6.50+/-1.3 E-09	< 1.67 E-07		
3RD QTR.				6.56+/-2.7 E-09	< 7.0 E-08
OCT	< 1.23 E-10	2.80+/-1.0 E-09	< 1.76 E-07		
NOV	< 2.53 E-10	7.24+/-1.4 E-09	2.42+/-1.9 E-07		
DEC	< 2.30 E-10	2.86+/-1.0 E-09	< 1.63 E-07		
4TH QTR.				4.75+/-1.9 E-09	< 7.0 E-08

*Not available this quarter

WPC0016

TABLE C - 1.3
RADIOACTIVITY CONCENTRATIONS
IN SURFACE WATER DOWNSTREAM OF
WVDP AT THOMAS CORNERS (WFBCTCB) uCi/ml

	ALPHA	BETA	H-3	SR-90	CS-137
JAN	8.27+/-4.4 E-10	1.36+/-0.2 E-08	7.75+/-1.8 E-07		
FEB	< 2.60 E-10	9.42+/-1.4 E-09	< 1.72 E-07		
MAR	1.33+/-0.6 E-09	1.92+/-0.2 E-08	3.22+/-1.9 E-07		
1ST QTR.				___ ___*	___ ___*
APR	4.83+/-3.4 E-10	9.18+/-1.4 E-09	< 1.70 E-07		
MAY	5.82+/-3.3 E-10	7.25+/-1.3 E-09	< 1.68 E-07		
JUN	7.21+/-4.1 E-10	5.94+/-1.2 E-09	< 1.65 E-07		
2ND QTR.				1.81+/-0.2 E-08	< 7.0 E-08
JUL	4.89+/-3.4 E-10	8.29+/-1.4 E-09	3.36+/-1.7 E-07		
AUG	4.49+/-3.3 E-10	9.73+/-1.5 E-09	< 1.65 E-07		
SEP	8.56+/-4.5 E-10	2.14+/-0.2 E-08	< 1.73 E-07		
3RD QTR.				4.81+/-2.5 E-09	< 7.0 E-08
OCT	9.55+/-4.7 E-10	1.48+/-0.2 E-08	4.49+/-0.3 E-06		
NOV	4.67+/-3.4 E-10	1.12+/-0.2 E-08	1.64+/-0.2 E-06		
DEC	8.39+/-4.5 E-10	1.16+/-0.2 E-08	3.33+/-1.7 E-07		
4TH QTR.				2.34+/-0.4 E-08	< 7.0 E-08

*Not available this quarter

TABLE C - 1.4
RADIOACTIVITY CONCENTRATIONS
IN SURFACE WATER
DOWNSTREAM OF WVDP
AT FRANKS CREEK (WNSP006) uCi/ml

	ALPHA	BETA	H-3	SR-90	CS-137
JAN	< 1.99 E-10	1.03+/-0.1 E-07	1.15+/-0.1 E-05		
FEB	4.08+/-3.2 E-10	1.07+/-0.1 E-07	3.56+/-0.2 E-06		
MAR	6.38+/-4.0 E-10	6.64+/-0.4 E-08	5.54+/-1.9 E-07		
1ST QTR.				___ ___*	___ ___*
APR	1.46+/-0.6 E-09	1.85+/-0.1 E-07	7.92+/-1.8 E-07		
MAY	3.48+/-2.6 E-10	4.70+/-0.3 E-08	3.24+/-0.2 E-06		
JUN	< 1.98 E-10	5.95+/-0.3 E-08	3.77+/-0.8 E-06		
2ND QTR.				4.54+/-0.7 E-09	2.04+/-0.9 E-07
JUL	6.60+/-3.8 E-10	6.28+/-0.4 E-08	1.14+/-0.2 E-06		
AUG	< 1.98 E-10	1.13+/-0.1 E-07	7.47+/-0.3 E-06		
SEP	4.49+/-3.3 E-10	4.50+/-0.3 E-08	1.26+/-0.2 E-06		
3RD QTR.				5.65+/-0.6 E-08	< 7.0 E-08
OCT	3.63+/-0.9 E-09	1.21+/-0.1 E-07	2.40+/-0.1 E-05		
NOV	4.67+/-3.4 E-10	1.06+/-0.1 E-07	5.10+-/1.7 E-07		
DEC	1.52+/-0.2 E-08	1.05+/-0.1 E-07	5.31+/-0.1 E-05		
4TH QTR.				3.11+/-0.4 E-08	1.56+/-1.4 E-07

*Not available this quarter

WPC0016

TABLE C - 1.5
RADIOACTIVITY CONCENTRATIONS
IN SURFACE WATER UPSTREAM OF BUTTERMILK
CREEK AT BIGELOW BRIDGE (WFBIGBR) uCi/ml

	ALPHA	BETA	H-3
JAN	< 2.33 E-10	5.20+/-1.1 E-09	< 1.72 E-07
FEB	5.39+/-3.6 E-10	7.61+/-1.3 E-09	2.46+/-1.9 E-07
MAR	2.93+/-2.8 E-10	5.76+/-1.2 E-09	< 1.86 E-07
APR	4.83+/-3.4 E-10	5.76+/-1.1 E-09	< 1.59 E-07
MAY	9.43+/-4.7 E-10	1.29+/-0.2 E-08	3.97+/-1.8 E-07
JUN	< 2.57 E-10	4.01+/-1.0 E-09	< 1.64 E-07
JUL	6.63+/-3.4 E-10	1.00+/-0.2 E-08	< 1.71 E-07
AUG	3.72+/-3.1 E-10	1.30+/-0.2 E-08	< 1.86 E-07
SEP	< 1.20 E-10	1.47+/-0.9 E-09	< 1.65 E.07
OCT	< 1.59 E-10	2.54+/-1.0 E-09	< 1.76 E-07
NOV	4.27+/-3.2 E-10	3.57+/-1.1 E-09	< 1.72 E-07
DEC	7.43+/-4.2 E-10	6.87+/-1.3 E-09	< 1.70 E-07

TABLE C - 1.6
RADIOACTIVITY CONCENTRATIONS
IN SURFACE WATER DOWNSTREAM OF
BUTTERMILK CREEK AT FELTON BRIDGE (WFFELBR) uCi/ml

	ALPHA	BETA	H-3	SR-90	CS-137
JAN	< 1.22 E-10	4.73+/-1.1 E-09	4.60+/-1.8 E-07	3.96+/-3.8 E-09	< 3.14 E-08
FEB	1.04+/-0.5 E-09	1.84+/-0.2 E-08	< 1.87 E-07	< 3.67 E-09	< 5.88 E-08
MAR	4.65+/-3.4 E-10	7.73+/-1.3 E-09	< 1.75 E-07	3.33+/-3.3 E-09	< 4.0 E-08
APR	9.43+/-4.7 E-10	8.16+/-1.3 E-09	2.28+/-1.7 E-07	< 3.21 E-09	< 5.88 E-08
MAY	7.12+/-4.1 E-10	1.47+/-0.2 E-08	3.37+/-1.6 E-07	< 3.92 E-09	< 7.84 E-08
JUN	< 1.68 E-10	3.95+/-1.0 E-09	< 1.68 E-07	< 3.92 E-09	< 5.68 E-08
JUL	< 1.68 E-10	5.71+/-1.2 E-09	< 1.65 E-07	< 3.92 E-09	< 5.88 E-08
AUG	< 1.64 E-10	2.93+/-1.0 E-09	3.22+/-1.8 E-07	4.0+/-3.9 E-09	< 5.88 E-08
SEP	3.32+/-2.8 E-10	8.51+/-1.4 E-09	< 1.60 E-07	3.81+/-1.9 E-09	< 5.88 E-08
OCT	3.14+/-2.8 E-10	4.02+/-1.0 E-09	3.14+/-1.7 E-07	2.31+/-1.5 E-09	< 7.84 E-08
NOV	< 2.61 E-10	7.09+/-1.4 E-09	< 1.59 E-07	5.91+/-2.3 E-09	< 7.84 E-08
DEC	1.07+/-0.5 E-09	2.24+/-0.2 E-08	1.34+/-0.2 E-06	5.40+/-2.2 E-09	< 7.0 E-08

TABLE C - 1.7
RADIOACTIVITY CONCENTRATIONS IN SHALLOW WELLS
NEAR SITE FACILTIIES

LOCATION CODE	SPRING 1984 (uCi/ml)			FALL 1984 (uCi/ml)		
	ALPHA	BETA	TRITIUM	ALPHA	BETA	TRITIUM
WNWNFSB	NOT ACCESSIBLE			9.64+/-1.5 E-09	5.49+/-0.0 E-06	4.40+/-0.3 E-06
WNWNFSD	NOT ACCESSIBLE			3.08+/-0.8 E-09	1.01+/-0.0 E-06	4.39+/-0.1 E-05
WNWNFSG	NOT ACCESSIBLE			1.87+/-0.7 E-09	3.16+/-0.0 E-06	1.6+/-0.0 E-05
WNWNFSH	NOT ACCESSIBLE			WELL REMOVED	LAGOON 1	CLEAN-UP
WNWNFL2	5.39+/-3.6 E-10	2.68+/-0.2 E-08	4.97+/-0.2 E-06	< 1.22 E-10	2.27+/-0.2 E-08	3.39+/-0.2 E-06
WNWNFM5	WELL REMOVED	SPRING 1984				
WNWNFJ2	< 2.57 E-10	1.98+/-0.2 E-08	< 1.68 E-07	< 1.18 E-10	1.10+/-0.2 E-08	< 1.66 E-07
WNWNFJ5	1.12+/-0.5 E-09	2.14+/-0.2 E-08	2.12+/-1.7 E-07	3.11+/-2.8 E-10	8.20+/-1.4 E-09	5.58+/-1.8 E-07
WNWNFJ8	1.52+/-0.6 E-09	1.62+/-0.2 E-08	1.79+/-0.1 E-05	< 2.00 E-10	2.47+/-1.0 E-09	1.79+/-0.1 E-05
WNW80 2	5.98+/-3.8 E-10	7.73+/-1.3 E-09	< 1.66 E-07	< 2.00 E-10	3.23+/-1.0 E-09	< 1.63 E-07
WNW80 3	1.98+/-1.4 E-09	2.32+/-0.1 E-07	< 1.74 E-07	1.98+/-1.4 E-09	2.32+/-0.1 E-07	< 1.66 E-07
WNW80 4	3.67+/-3.0 E-10	5.10+/-1.1 E-09	3.92+/-1.7 E-07	< 1.94 E-10	2.62+/-1.0 E-09	< 1.62 E-07
WNW80 5	1.12+/-0.5 E-09	6.08+/-1.2 E-09	< 1.76 E-07	< 1.61 E-10	7.69+/-7.7 E-09	9.59+/-1.7 E-07
WNW80 6	3.67+/-3.0 E-10	3.55+/-1.0 E-09	5.02+/-0.3 E-06	DRY		
WNW80 7	8.84+/-4.5 E-10	1.00+/-0.2 E-08	< 1.75 E-07	< 1.94 E-10	4.58+/-1.2 E-09	1.97+/-1.6 E-07

TABLE C - 1.8
RADIOACTIVITY CONCENTRATIONS IN SHALLOW WELLS
NEAR THE NRC DISPOSAL AREA

LOCATION CODE	SPRING 1984 (uCi/ml) ALPHA	BETA	TRITIUM	FALL 1984 (uCi/ml) ALPHA	BETA	TRITIUM
WNW821A	1.69+/-0.6 E-09	2.25+/-0.2 E-08	< 1.62 E-07	3.11+/-2.7 E-10	6.09+/-1.3 E-09	< 1.56 E-07
WNW821B	1.89+/-0.9 E-09	2.08+/-0.3 E-08	< 1.61 E-07	2.54+/-2.5 E-09	1.52+/-0.9 E-08	< 1.59 E-07
WNW821C	1.49+/-0.7 E-08	8.36+/-1.6 E-08	< 1.59 E-07	1.05+/-0.5 E-08	1.05+/-0.2 E-07	< 1.70 E-07
WNW821D	NO CASING			NO CASING		
WNW822A	3.23+/-1.8 E-09	3.85+/-0.7 E-07	< 1.63 E-07	3.76+/-2.2 E-09	1.40+/-0.7 E-08	< 1.63 E-07
WNW822B	1.12+/-0.5 E-08	1.58+/-0.2 E-07	2.72+/-1.6 E-07	< 2.85 E-09	3.47+/-1.1 E-08	< 1.63 E-07
WNW822C	DRY			DRY		
WNW823A	2.38+/-0.8 E-09	8.33+/-1.4 E-09	< 1.73 E-07	8.86+/-4.4 E-10	6.59+/-1.3 E-09	< 1.63 E-07
WNW823B	DRY			DRY		
WNW823C	DRY			DRY		
WNW823D	DRY			DRY		
WNW824A1	9.43+/-4.7 E-10	2.04+/-0.2 E-08	2.21+/-1.7 E-07	< 2.23 E-10	4.48+/-1.1 E-09	2.22+/-0.2 E-06
WNW824A2	8.73+/-5.2 E-10	1.99+/-0.2 E-08	4.36+/-1.7 E-07	< 1.78 E-10	1.03+/-0.2 E-08	2.75+/-1.6 E-07
WNW824A3	1.17+/-0.6 E-09	2.19+/-0.2 E-08	3.38+/-1.7 E-07	4.60+/-3.8 E-10	6.29+/-1.5 E-09	2.72+/-1.7 E-07
WNW824B	2.39+/-1.5 E-09	4.03+/-0.6 E-08	< 1.68 E-07	NO CASING - SAMPLE	NOT ACCESSIBLE	
WNW824C	DRY			DRY		
WNW825A	NOT ACCESSIBLE			NOT ACCESSIBLE		
WNW825B	NOT ACCESSIBLE			NOT ACCESSIBLE		
WNW825C	NOT ACCESSIBLE			NOT ACCESSIBLE		

TABLE C - 1.9

Radioactivity Concentrations in Potable Well Water Around the WVDP Site - 1984

(μCi/mℓ)

SAMPLE I.D.	ALPHA	BETA	TRITIUM
WFWEL01	<2.00 E-10	1.76 ± 0.9 E-09	<1.55 E-07
WFWEL02	<1.87 E-10	1.59 ± 0.8 E-09	1.23 ±1.0 E-07
WFWEL03	<1.67 E-10	2.19 ± 0.9 E-09	<1.39 E-07
WFWEL04	<2.00 E-10	2.10 ± 0.9 E-09	<1.51 E-07
WFWEL05	<1.23 E-10	2.29 ± 0.9 E-09	<1.64 E-07
WFWEL06	<1.23 E-10	1.48 ± 0.8 E-09	<1.38 E-07
WFWEL07	<2.00 E-10	<7.25 E-10	<1.53 E-07
WFWEL08	<2.30 E-10	4.61 ± 1.1 E-09	<1.58 E-07
WFWEL09	<1.67 E-10	2.39 ± 0.9 E-09	<1.31 E-07
WFWEL10	<1.67 E-10	9.67 ± 7.6 E-10	<1.48 E-07

NOTE: All samples were analyzed for gamma-emitting isotopes. Nuclides other than those naturally occurring were not found (Cs-137 was all < 7.0 E-08 μCi/mℓ)

TABLE C - 1.10

Radioactivity of Stream Sediment Around WVDP Site in 1984

Stream Sediment 1984 (upper 6 inches)

Buttermilk Creek @ Thomas Corners		
1st Qtr, 1984 (SFTCSED)	^{137}Cs & ^{40}K identified*	
Buttermilk Creek @ Thomas Corners		
3rd Qtr, 1984 (SFTCSED)	^{137}Cs & ^{40}K identified*	
	Concentration (μCi/g)wet	
4th Qtr, 1984	^{40}K**	^{137}Cs
Buttermilk Creek @ Fox Valley (SFBCSED)	7.78 ± 0.4 E-06	6.72 ± 3.7 E-08
Buttermilk Creek @ Thomas Corners (SFTCSED)	1.04 ± 0.1 E-05	6.40 ± 0.3 E-06
Cattaraugus Creek @ Bigelow Bridge (SFBISED)	8.21 ± 0.4 E-06	4.19 ± 3.6 E-08
Cattaraugus Creek @ Felton Bridge (SFCCSED)	7.84 ± 1.0 E-06	9.40 ± 1.7 E-07
Cattaraugus Creek @ Springville Dam (SFSDSED)	8.25 ± 1.3 E-06	4.36 ± 1.3 E-07

*Not quantified, 1st 3 quarters of 1984
**Naturally occurring gamma emitting isotope

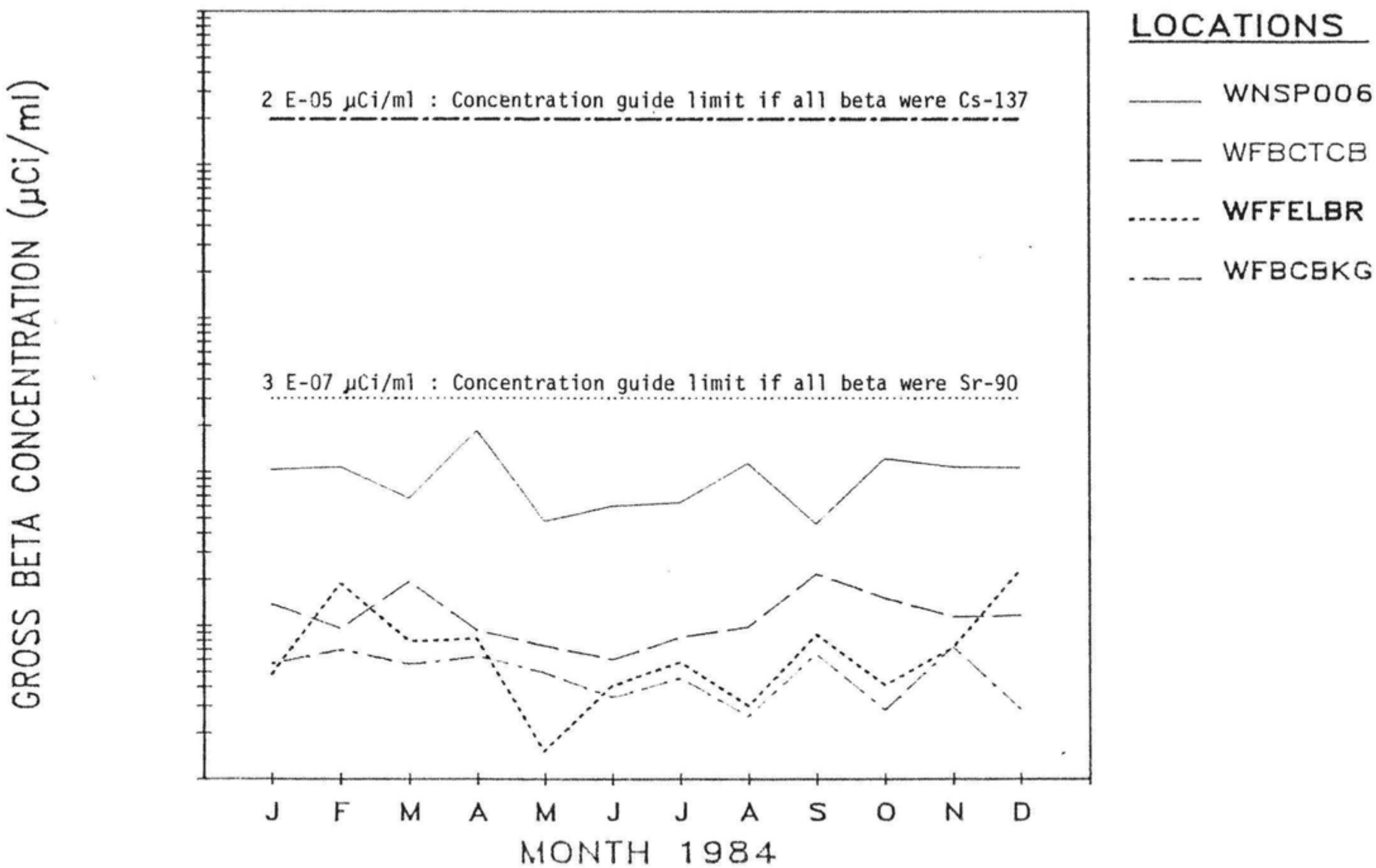
NOTE: Sediment was counted at normal moisture of 18%. Moisture determination is an average of measurements made on air-dried sediments from the same locations.

TABLE C - 1.11

Contribution by New York Low Level Waste Burial Area to Radioactivity in 1984 WVDP Liquid Effluents (Ci)

	Gross Alpha	Gross Beta	Tritium
1984 Totals	<7.6 E-06	7.07 ± 0.4 E-03	2.68 ± 0.1 E-01
	Sr-90	I-129	Cs-137
	3.47 ± 0.3 E-03	2.13 ± 0.5 E-06	3.08 ± 1.4 E-05

FIGURE C-1.1
GROSS BETA CONCENTRATION IN SURFACE WATER DOWNSTREAM OF WVDP-1984



APPENDIX C-2

SUMMARY OF AIR MONITORING DATA

TABLE C - 2.1
1984 AIRBORNE RADIOACTIVE EFFLUENT ACTIVITY TOTALS
FROM MAIN VENTILATION STACK (ANSTACK) CURIES

	ALPHA	BETA	SR-90	I-129	CS-134	CS-137
JAN	1.91+/-0.0 E-06	1.07+/-0.0 E-04				
FEB	4.43+/-0.0 E-07	1.21+/-0.0 E-04				
MAR	8.19+/-0.0 E-07	6.52+/-0.0 E-05				
1ST QTR.			3.71+/-0.4 E-05	5.89+/-0.9 E-06	1.58+/-0.3 E-06	3.20+/-.02 E-04
APR	4.78+/-0.0 E-07	2.82+/-0.0 E-05				
MAY	1.75+/-0.0 E-06	2.51+/-0.0 E-05				
JUN	1.50+/-0.0 E-06	2.38+/-0.0 E-04				
2ND QTR.			1.04+/-0.1 E-04	3.38+/-0.3 E-05	5.60+/-1.3 E-07	1.07+/-0.1 E.04
JUL	6.15+/-0.0 E-07	1.64+/-0.0 E-05				
AUG	9.21+/-0.0 E-07	4.80+/-0.0 E-05				
SEP	1.53+/-0.0 E-06	3.42+/-0.0 E-05				
3RD QTR.			1.45+/-0.4 E-05	7.93+/-1.9 E-06	1.57+/-1.0 E-07	2.99+/-.05 E-05
OCT	3.18+/-0.0 E-07	9.37+/-0.0 E-05				
NOV	5.10+/-0.0 E-07	2.02+/-0.0 E-05				
DEC	2.67+/-0.0 E-07	1.31+/-0.0 E-05				
4TH QTR.			8.46+/-2.0 E-06	4.58+/-0.5 E-05	2.97+/-1.0 E-07	7.69+/-.06 E-05
TOTAL FOR 1984	1.11 E-05	8.10 E-04	1.64 E-04	9.35 E-05	2.59 E-06	5.14 E-04
MAXIMUM PERMISSIBLE*	4.38 E-02	3.11 E-00				
PERCENT OF MAXIMUM PERMISSIBLE	0.025	0.026				

*Based on 0.1 mCi/sec alpha plus beta limit from Technical Specifications total volume released - 8.1 E9 cubic metres

WPC0016

TABLE C - 2.2
RADIOACTIVITY CONCENTRATIONS IN AIRBORNE PARTICULATE
AROUND WVDP ENVIRONS-1984

AIR SAMPLER AT THOMAS CORNERS (AFTCORD)

	UCI/ML ALPHA	UCI/ML BETA
JAN	1.21+/-0.8 E-15	2.51+/-0.3 E-14
FEB	7.04+/-5.9 E-16	2.07+/-0.3 E-14
MAR	9.54+/-9.3 E-16	1.89+/-0.3 E-14
APR	6.82+/-6.6 E-16	1.41+/-0.3 E-14
MAY	8.23+/-6.7 E-16	1.27+/-0.3 E-14
JUN	7.17+/-6.0 E-16	1.49+/-0.3 E-14
JUL	6.88+/-6.0 E-16	1.77+/-0.3 E-14
AUG	9.56+/-7.2 E-16	1.79+/-0.3 E-14
SEP	7.69+/-6.3 E-16	2.07+/-0.3 E-14
OCT	1.30+/-0.9 E-15	2.82+/-0.3 E-14
NOV	7.71+/-6.9 E-16	2.00+/-0.3 E-14
DEC	8.56+/-8.3 E-16	2.38+/-0.3 E-14

AIR SAMPLER AT ROUTE 240 (AFRT240)

	UCI/ML ALPHA	UCI/ML BETA
JAN	1.40+/-1.1 E-15	2.82+/-0.5 E-14
FEB	1.04+/-0.9 E-15	2.20+/-0.4 E-14
MAR	1.68+/-1.1 E-15	1.74+/-0.4 E-14
APR	1.10+/-1.0 E-15	1.44+/-0.4 E-14
MAY	1.00+/-1.0 E-15	1.49+/-0.4 E-14
JUN	8.31+/-7.8 E-16	1.78+/-0.4 E-14
JUL	6.50+/-7.0 E-16	1.73+/-0.4 E-14
AUG	7.83+/-9.9 E-16	2.27+/-0.4 E-14
SEP	1.27+/-1.0 E-15	2.19+/-0.4 E-14
OCT	1.63+/-1.1 E-15	2.91+/-0.5 E-14
NOV	7.80+/-7.4 E-16	1.96+/-0.4 E-14
DEC	1.35+/-1.1 E-15	2.34+/-0.4 E-14

AIR SAMPLER AT FOX VALLEY (AFFXVAL)

	UCI/ML ALPHA	UCI/ML BETA
JAN	1.21+/-0.7 E-15	2.27+/-0.3 E-14
FEB	8.87+/-6.2 E-16	1.74+/-0.3 E-14
MAR	8.50+/-6.1 E-16	1.65+/-0.3 E-14
APR	9.50+/-7.6 E-16	1.22+/-0.3 E-14
MAY	8.39+/-5.0 E-16	1.37+/-0.2 E-14
JUN	6.34+/-5.0 E-16	1.44+/-0.2 E-14
JUL	6.08+/-6.4 E-16	1.70+/-0.3 E-14
AUG	8.70+/-5.3 E-16	2.04+/-0.3 E-14
SEP	6.99+/-6.2 E-16	1.79+/-0.3 E-14
OCT	8.74+/-6.6 E-16	2.44+/-0.3 E-14
NOV	1.15+/-0.7 E-15	1.62+/-0.3 E-14
DEC	8.60+/-6.3 E-16	2.11+/-0.3 E-14

AIR SAMPLER AT SPRINGVILLE (AFSPRVL)*

	UCI/ML ALPHA	UCI/ML BETA
JUL	9.97+/-9.9 E-16	1.68+/-0.3 E-14
AUG	1.22+/-0.7 E-15	2.21+/-0.3 E-14
SEP	1.01+/-0.6 E-15	1.94+/-0.3 E-14
OCT	1.01+/-0.6 E-15	2.37+/-0.3 E-14
NOV	7.98+/-5.9 E-16	1.96+/-0.3 E-14
DEC	1.25+/-0.7 E-15	2.56+/-0.3 E-14

AIR SAMPLER AT ROCK SPRINGS ROAD (AFRSPRD)*

	UCI/ML ALPHA	UCI/ML BETA
MAY	7.31+/-6.4 E-16	1.82+/-0.4 E-14
JUN	7.01+/-5.9 E-16	1.57+/-0.3 E-14
DEC	6.75+/-5.8 E-16	1.47+/-0.3 E-14

*Sampler operated for only those months reported

TABLE C - 2.3
RADIOACTIVITY IN FALLOUT (nCi/m^2/mo)

MONTH - 1984	DUTCH HILL (AFDHFOP) GROSS ALPHA	DUTCH HILL (AFDHFOP) GROSS BETA	DUTCH HILL (AFDHFOP) H-3 (uCi/ml)	FOX VALLEY ROAD (AFFXFOP) GROSS ALPHA	FOX VALLEY ROAD (AFFXFOP) GROSS BETA	FOX VALLEY ROAD (AFFXFOP) H-3 (uCi/ml)
January	2.21 E-02	0.20+/-0.03	2.77+/-1.76 E-07	3.23 E-02	0.32+/-0.03	< 1.79 E-07
February	1.66 E-02	0.21+/-0.03	< 1.85 E-07	1.97 E-02	0.28+/-0.03	< 1.72 E-07
March	1.27 E-02	0.14+/-0.02	< 1.64 E-07	1.42 E-02	0.22+/-0.02	< 1.72 E-07
April	SAMPLE	CONTAINER	MISSING	1.60 E-02	0.28+/-0.03	5.87+/-1.74 E-07
May	3.26 E-02	0.62+/-0.04	7.25+/-1.64 E-07	1.77 E-02	0.52+/-0.04	4.59+/-1.68 E-07
June	1.38 E-02	0.38+/-0.03	2.38+/-1.69 E-07	1.47 E-02	0.33+/-0.03	< 1.68 E-07
July	1.23 E-02	0.11+/-0.02	< 1.94 E-07	9.08 E-03	0.12+/-0.02	< 1.89 E-07
August	1.41 E-02	0.33+/-0.03	1.71+/-1.66 E-07	1.41 E-02	0.38+/-0.03	< 1.72 E-07
September	1.93 E-02	0.30+/-0.03	< 1.67 E-07	7.73 E-03	0.24+/-0.03	< 1.67 E-07
October	1.31 E-02	0.23+/-0.03	< 1.76 E-07	8.30 E-03	0.23+/-0.03	< 1.81 E-07
November	1.74 E-02	0.24+/-0.03	< 1.54 E-07)	2.30 E-02	0.33+/-0.03	< 1.82 E-07
December	1.38 E-02	0.19+/-0.02	2.46+/-1.60 E-07	1.38 E-02	0.28+/-0.03	< 1.52 E-07

MONTH - 1984	ROUTE 240 (AF24FOP) GROSS ALPHA	ROUTE 240 (AF24FOP) GROSS BETA	ROUTE 240 (AF24FOP) H-3 (uCi/ml)	THOMAS CORNERS ROAD (AFTCFOP) GROSS ALPHA	THOMAS CORNERS ROAD (AFTCFOP) GROSS BETA	THOMAS CORNERS ROAD (AFTCFOP) H-3 (uCi/ml)
January	3.16 E-02	0.26+/-0.03	< 1.70 E-07	2.52 E-02	0.38+/-0.03	< 1.73 E-07
February	2.45 E-02	0.26+/-0.03	< 1.73 E-07	3.32 E-02	0.34+/-0.03	< 1.73 E-07
March	1.03 E-02	0.14+/-0.02	< 1.80 E-07	1.51 E-02	0.20+/-0.02	< 1.75 E-07
April	1.37 E-02	0.18+/-0.02	2.42+/-1.63 E-07	2.08 E-02	0.28+/-0.03	2.35+/-1.49 E-07
May	1.92 E-02	0.66+/-0.05	4.27+/-1.51 E-07	2.15 E-02	1.07+/-0.06	4.66+/-1.58 E-07
June	1.55 E-02	0.31+/-0.03	< 1.70 E-07	1.07 E-02	0.28+/-0.03	2.22+/-1.64 E-07
July	9.08 E-03	0.14+/-0.02	< 1.85 E-07	1.63 E-02	0.13+/-0.02	< 1.81 E-07
August	1.64 E-02	0.36+/-0.03	< 1.81 E-07	2.06 E-02	0.65+/-0.04	< 1.72 E-07
September	5.33 E-02	0.22+/-0.03	< 1.76 E-07	1.49 E-02	0.35+/-0.03	< 1.66 E-07
October	1.31 E-02	0.25+/-0.03	< 1.90 E-07	2.18 E-02	0.25+/-0.03	< 1.65 E-07
November	1.82 E-02	0.31+/-0.03	< 1.62 E-07	1.35 E-02	0.33+/-0.03	2.74+/-1.66 E-07
December	8.38 E-03	0.27+/-0.03	< 1.58 E-07	1.15 E-02	0.32+/-0.03	< 1.60 E-07

TABLE C - 2.4

TOTAL PRECIPITATION AT WEST VALLEY DEMONSTRATION PROJECT - 1984

WEEK OF	RAINFALL*	CUM TOTAL FOR 1984		WEEK OF	RAINFALL*	CUM TOTAL FOR 1984	
JAN 1-4	0.23 inches	0.23 inches		JULY 1-8	1.37 inches	25.98 inches	
JAN 4-10	0.55 inches	0.78 inches		JULY 8-15	0.61 inches	26.59 inches	
JAN 10-23	0.06 inches	0.84 inches		JULY 15-22	0.37 inches	26.96 inches	
JAN 23-30	0.23 inches	1.07 inches		JULY 22-31	0.84 inches	27.80 inches	
JAN 30-6	0.34 inches	1.41 inches		AUG 1-5	0.06 inches	27.86 inches	
FEB 6-14	0.75 inches	2.16 inches		AUG 5-12	2.43 inches	30.29 inches	
FEB 14-20	0.55 inches	2.71 inches		AUG 12-19	0.91 inches	31.20 inches	
FEB 20-27	0.19 inches	2.90 inches		AUG 19-26	0.47 inches	31.67 inches	
FEB 27-4	1.24 inches	4.14 inches		AUG 26-3	1.73 inches	33.40 inches	
MAR 4-12	0.30 inches	4.44 inches		SEPT 3-10	0.30 inches	33.70 inches	
MAR 12-18	0.55 inches	4.99 inches		SEPT 10-17	2.03 inches	35.73 inches	
MAR 18-25	0.37 inches	5.36 inches	1st Quarter Total: 6.01 inches	SEPT 17-24	0.04 inches	35.77 inches	3rd Quarter Total: 12.26 inches
MAR 25-2	0.65 inches	6.01 inches		SEPT 24-1	1.10 inches	36.87 inches	
APR 2-9	1.26 inches	7.27 inches		OCT 1-8	0.19 inches	37.06 inches	
APR 9-16	0.71 inches	7.98 inches		OCT 8-15	0.28 inches	37.34 inches	
APR 16-22	0.30 inches	8.28 inches		OCT 15-22	0.70 inches	38.04 inches	
APR 22-29	1.35 inches	9.63 inches		OCT 22-29	1.02 inches	39.06 inches	
APR 29-6	1.09 inches	10.72 inches		OCT 29-5	0.85 inches	39.91 inches	
MAY 6-13	2.59 inches	13.31 inches		NOV 5-12	1.25 inches	41.16 inches	
MAY 13-20	1.27 inches	14.58 inches		NOV 12-19	0.65 inches	41.81 inches	
MAY 20-28	2.92 inches	17.50 inches		NOV 19-27	0.05 inches	41.86 inches	
MAY 28-3	0.30 inches	17.80 inches		NOV 27-3	1.10 inches	42.96 inches	
JUN 3-10	0.03 inches	17.83 inches		DEC 3-10	0.85 inches	43.81 inches	
JUN 10-18	5.76 inches	23.59 inches		DEC 10-17	0.55 inches	44.36 inches	
JUN 18-24	0.87 inches	24.46 inches	2nd Quarter Total: 18.60 inches	DEC 17-26	0.55 inches	44.91 inches	4th Quarter Total: 9.74 inches
JUN 24-1	0.15 inches	24.61 inches		DEC 26-31	1.70 inches	46.51 inches	

*Includes snow as equivalent rainfall

APPENDIX C-3

SUMMARY OF BIOLOGICAL SAMPLE DATA

TABLE C - 3.1
RADIOACTIVITY CONCENTRATION IN MILK - 1984
(uCi/ml)

	SR-90	I-129	CS-134	CS-137
Control (BFMCTRL) 2nd QTR. 1984	2.88+/-0.4 E-9	< 6.3 E-10	< 1.27 E-8	< 1.24 E-8
NNW Farm (BFMREED) 2nd QTR. 1984	1.05+/-0.3 E-9	< 1.1 E-8*	< 7.54 E-9	< 6.78 E-9
NNW FARM (BFMREED) 3rd QTR. 1984	2.78+/-0.4 E-9	< 4.2 E-10	< 9.45 E-9	< 1.03 E-8
WNW Farm (BFMCOBO) August 1984	4.72+/-0.6 E-9	< 1.3 E-9	< 1.25 E-8	< 1.29 E-8
NNW Farm (BFMREED) 4th Qtr. 1984	1.53+/-0.3 E-9	< 3.1 E-10	< 8.89 E-9	< 1.01 E-8
ENE Farm (BFMZIMM) September 1984	3.93+/-0.8 E-9	< 2.7 E-9	______**	______**

*Low sample volume reduced analytical sensitivity.
** This analysis not available

TABLE C - 3.2
RADIOACTIVITY CONCENTRATIONS IN MEAT
(uCi/kg)

	CS-134	CS-137
Deer Flesh - Near site (BFDNEAR) December 1984	< 4.66 E-5	4.80+/-0.4 E-4
Deer Flesh - Background (BFDCTRL) August 1984	< 4.76 E-5	< 5.91 E-5
Beef Flesh - Near site (BFBNEAR) December 1984	< 3.97 E-5	< 5.32 E-5
Beef Flesh - Background (BFBCTRL) December 1984	< 3.16 E-5	< 4.26 E-5

TABLE C - 3.3
RADIOACTIVITY CONCENTRATIONS IN FOOD CROP SEPTEMBER 1984
(uCi/g) DRY

	SR-90	K-40	CO-60	CS-137
Potatoes (BFVNEAR)	7.08+/-0.8 E-7	1.66+/-0.2 E-5	< 6.98 E-8	< 1.67 E-7
Squash (BFVNEAR)	3.53+/-0.4 E-8	1.64+/-0.2 E-5	< 1.63 E-7	< 1.34 E-7
Beets (BFVNEAR)	8.44+/-3.3 E-9	3.27+/-0.2 E-5	< 1.95 E-7	< 1.71 E-7

TABLE C - 3.4
RADIOACTIVITY CONCENTRATIONS IN FISH FROM STREAMS AROUND WVDP

(BFFCATC)

Cattaraugus Creek Fish - 2nd Quarter 1984
Concentration (uCi/kg) Dry

	Flesh SR-90	Flesh CS-134	Flesh CS-137	Skeleton SR-90
MEDIAN	4.60 E-5	5.70 E-4	5.15 E-4	3.20 E-4
AVERAGE GEOMETRIC DEVIATION	1.60	1.88	1.75	1.44
MAXIMUM	6.21+/-1.7 E-5	< 1.23 E-3	< 1.04 E-3	5.04+/-1.0 E-4
MINIMUM	1.61+/-0.7 E-5	< 2.96 E-4	< 3.02 E-4	1.99+/-0.9 E-4

Cattaraugus Creek Fish - 3rd Quarter 1984
Concentration (uCi/kg) Dry

	Flesh SR-90	Flesh CS-134	Flesh CS-137	Skeleton SR-90
MEDIAN	6.60 E-5	5.10 E-4	4.05 E-4	3.50 E-4
AVERAGE GEOMETRIC DEVIATION	1.63	1.34	1.28	1.58
MAXIMUM	8.47 +/-1.5 E-5	< 6.37 E-4	< 6.06 E-4	5.94+/-0.9 E-4
MINIMUM	< 2.74 E-5	< 3.10 E-4	< 3.27 E-4	< 1.53 E-4

(BFFCTRL)

Background Fish - 2nd Quarter 1984
Concentration (uCi/kg) Dry

	Flesh SR-90	Flesh CS-134	Flesh CS-137
MEDIAN	7.50 E-6	2.70 E-4	2.75 E-4
AVERAGE GEOMETRIC DEVIATION	2.38	1.46	1.46
MAXIMUM	1.95+/-1.2 E-5	< 3.57 E-4	< 3.76 E-4
MINIMUM	2.69+/-2.5 E-6	< 1.47 E-4	< 1.51 E-4

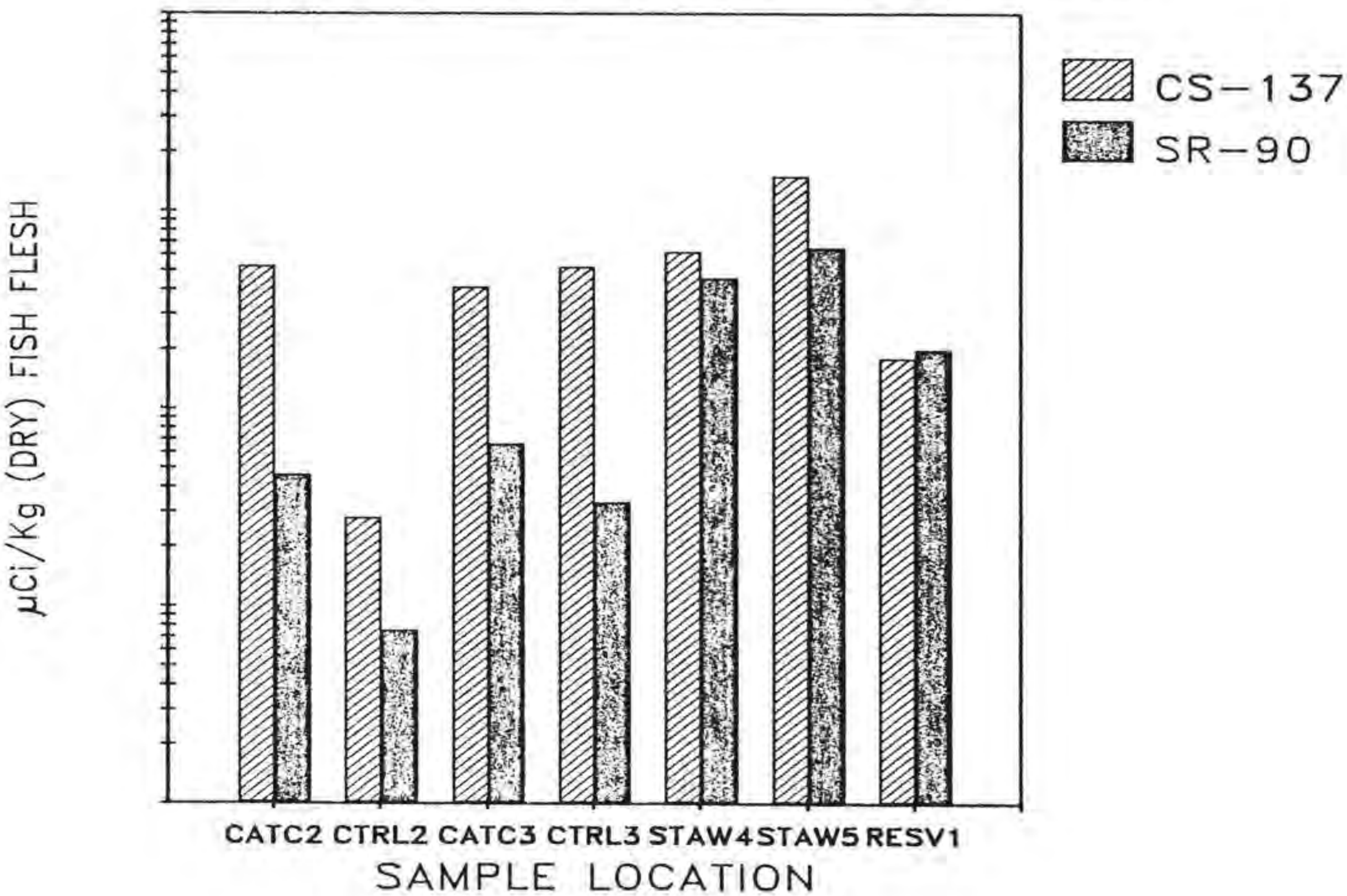
Background Fish - 3rd Quarter 1984
Concentration (uCi/kg) Dry

	Flesh SR-90	Flesh CS-134	Flesh CS-137
MEDIAN	3.33 E-5	5.90 E-4	5.12 E-4
AVERAGE GEOMETRIC DEVIATION	1.59	1.45	1.38
MAXIMUM	5.22+/-2.0 E-5	< 8.53 E-4	< 8.06 E-4
MINIMUM	< 1.88 E-5	< 3.06 E-4	< 2.88 E-4

TABLE C - 3.5
RADIOACTIVITY CONCENTRATIONS IN FISH
FROM PONDS ON WNYNSC RESTRICTED AREA

	Background Fish - August 1984 Pond west of site (BNSTAW5) Concentration (uCi/kg) Dry			Background Fish August 1984 Reservoir south of site (BNRESV1) Concentration (uCi/kg) Dry			Background Fish August 1984 Pond east of site (BNSTAW4) Concentration (uCi/kg) Dry		
		Flesh			Flesh			Flesh	
	SR-90	CS-134	CS-137	SR-90	CS-134	CS-137	SR-90	CS-134	CS-137
MEDIAN	6.5 E-4	1.67 E-03	1.47 E-03	1.98 E-04	1.62 E-04	1.77 E-04	4.55 E-04	5.60 E-04	6.10 E-04
AVERAGE GEOMETRIC DEVIATION	3.53	1.37	1.47	1.74	1.46	1.35	1.64	1.25	1.27
MAXIMUM	1.91+/-0.4 E-03	< 3.13 E-03	< 3.49 E-03	4.44+/-0.8 E-04	< 2.53 E-04	< 2.31 E-04	6.68+/-0.9 E-04	< 7.25 E-04	< 8.36 E-04
MINIMUM	1.26+/-0.4 E-04	< 1.35 E-03	1.14 E-03	1.06+/-0.2 E-04	< 9.88 E-05	< 1.21 E-04	1.73+/-0.3 E-04	< 4.16 E-04	< 4.54 E-04

FIGURE C-3.1
COMPARISON OF RADIOACTIVITY IN FISH SAMPLES FROM AROUND WVDP-1984



APPENDIX C-4

SUMMARY OF DIRECT RADIATION MONITORING

TABLE C-4.1

TLD SUMMARY - 1984

(Roentgen +/- 3SD)

Location ⸸	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Location Average
1	0.0079 +/- 0.002	0.0104 +/- 0.001	0.0172 +/- 0.007	0.0144 +/- 0.003	0.0125 +/- 0.0041
2	0.0112 +/- 0.002	0.0099 +/- 0.002	0.0144 +/- 0.006	0.0123 +/- 0.003	0.0120 +/- 0.0019
3	0.0100 +/- 0.004	0.0092 +/- 0.001	0.0150 +/- 0.005	0.0120 +/- 0.003	0.0116 +/- 0.0026
4	0.0105 +/- 0.004	*	0.0164 +/- 0.005	0.0135 +/- 0.003	0.0135 +/- 0.0030
5	0.0117 +/- 0.002	0.0082 +/- 0.002	0.0148 +/- 0.007	0.0132 +/- 0.002	0.0120 +/- 0.0028
6	0.0108 +/- 0.006	0.0095 +/- 0.003	0.0163 +/- 0.011	0.0118 +/- 0.003	0.0121 +/- 0.0030
7	0.0113 +/- 0.004	0.0108 +/- 0.001	0.0098 +/- 0.021	0.0127 +/- 0.003	0.0112 +/- 0.0012
8	0.0116 +/- 0.006	0.0088 +/- 0.003	0.0140 +/- 0.004	0.0120 +/- 0.002	0.0116 +/- 0.0021
9	0.0113 +/- 0.003	0.0096 +/- 0.006	0.0145 +/- 0.007	0.0112 +/- 0.004	0.0117 +/- 0.0021
10	0.0104 +/- 0.005	0.0102 +/- 0.002	0.0152 +/- 0.007	0.0130 +/- 0.005	0.0122 +/- 0.0024
11	0.0145 +/- 0.005	0.0115 +/- 0.001	0.0178 +/- 0.012	0.0132 +/- 0.004	0.0143 +/- 0.0027
12	0.0115 +/- 0.003	0.0107 +/- 0.001	0.0148 +/- 0.011	0.0117 +/- 0.004	0.0122 +/- 0.0018
13	0.0140 +/- 0.005	0.0123 +/- 0.002	0.0180 +/- 0.005	0.0140 +/- 0.004	0.0146 +/- 0.0024
14	0.0134 +/- 0.005	0.0123 +/- 0.003	0.0155 +/- 0.007	0.0132 +/- 0.004	0.0136 +/- 0.0014
15	0.0133 +/- 0.002	0.0125 +/- 0.002	0.0151 +/- 0.007	0.0130 +/- 0.004	0.0135 +/- 0.0011
16	0.0120 +/- 0.005	0.0128 +/- 0.002	0.0175 +/- 0.011	0.0147 +/- 0.004	0.0143 +/- 0.0024
17	0.0118 +/- 0.004	0.0129 +/- 0.002	0.0192 +/- 0.011	0.0138 +/- 0.004	0.0144 +/- 0.0033
18	0.0147 +/- 0.004	0.0133 +/- 0.002	0.0229 +/- 0.003	0.0176 +/- 0.004	0.0171 +/- 0.0042
19	0.0143 +/- 0.004	0.0138 +/- 0.003	0.0193 +/- 0.005	0.0139 +/- 0.004	0.0153 +/- 0.0027
20	**	0.0125 +/- 0.003	0.0161 +/- 0.010	0.0119 +/- 0.002	0.0135 +/- 0.0023
Quarterly Average	0.0119 +/- 0.0018	0.0111 +/- 0.0017	0.0162 +/- 0.0026	0.0132 +/- 0.0014	0.0131 +/- 0.0015

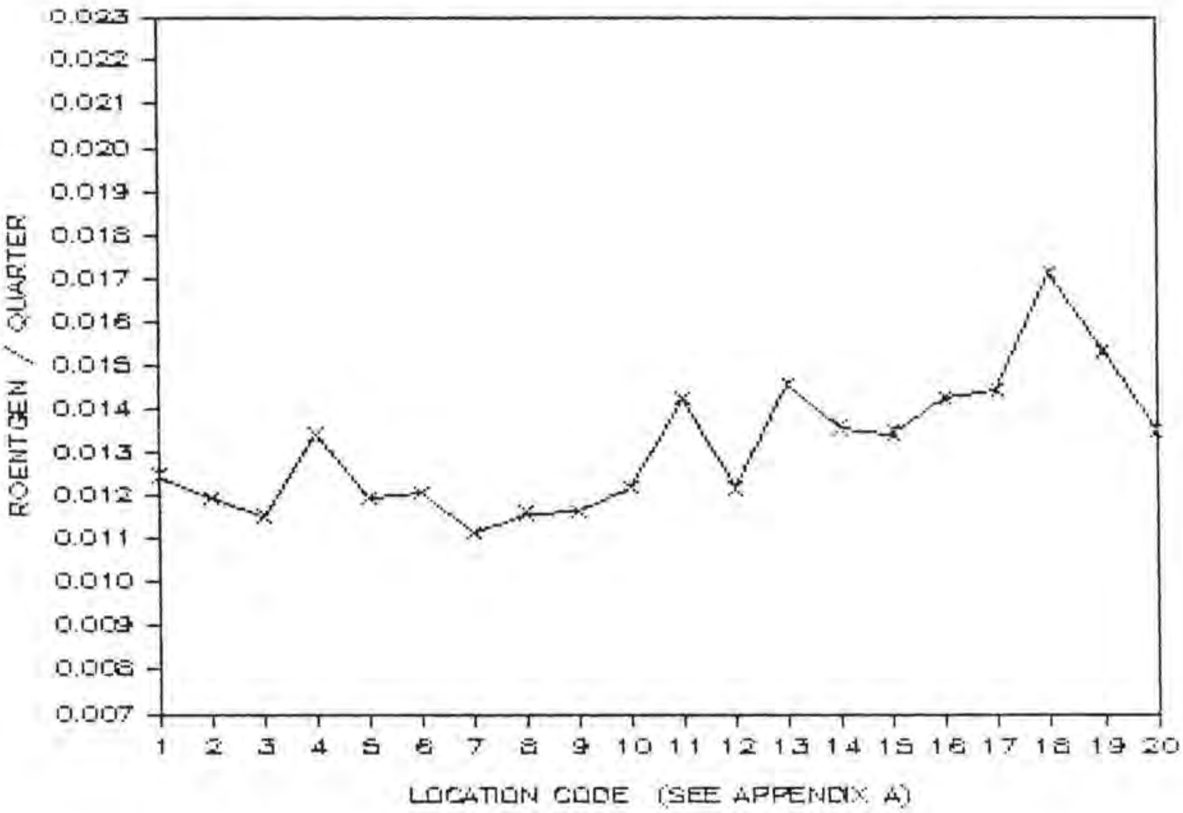
* - TLD Package Destroyed By Animals

** - TLD Package Not Placed Until Second Quarter

⸸ - See Figure A-1 for locations

FIGURE C-4.1

SUMMARY OF AVERAGE GAMMA RADIATION AROUND WVDP - 1984



APPENDIX C-5

SUMMARY OF NONRADIOLOGICAL MONITORING

APPENDIX C-5 - SUMMARY OF NONRADIOLOGICAL MONITORING

Nonradiological emissions and plant effluents are controlled and permitted under the New York State and USEPA pollution discharge elimination system. Airborne emissions arise from two natural gas-fired boilers, two nitric acid tank vents, an office paper waste incinerator, and a glass melter off gas scrubber - all of which are covered under New York State permits. Plant liquid effluents controlled by the National Pollution Discharge Elimination System (NPDES) include two points in the LLWT process stream (points 001 and 002), the sewage treatment plant effluent (004), the steam system condensate and water treatment filter drain (005), and the combined plant effluent discharge point (006). The locations of these points are shown in Figure C-5.1 and described in Table C-5.1. Environmental permits for WVDP are identified and described in Table C-5.2.

A third point in the LLWT stream, effluent from the New York State burial ground lagoon, is included in the permit as SPDES 003. This point is monitored only for radioactivity and volume but upper limits are not imposed because this stream is regulated after treatment at points 001, 002 and 006.

Although there are periodic New York State inspections of the air emission points, routine sampling and analysis of Nonradiological emissions from these points are not required. Discharges from these points are well below the levels requiring monitoring under the state permit system.

The water effluent points are sampled for specific chemical parameters depending on the effluent stream characteristics. During discharges, liquid effluents are monitored at point 001 for heavy metals (Ba, Cr, Cu, Pb, Mn, Ni and Zn), unionized ammonia, suspended solids, pH and temperature. Suspended solids are also measured in the LLWT plant (002) during plant operations, monthly at the Utility Room discharge (005), and quarterly at the sewage treatment plant outfall (004). BOD-5 is also measured quarterly at point 004. Samples are collected twice a month at point 006 for iron, ammonia, pH and temperature; the latter three values are used to calculate unionized ammonia. Measurements of pH are made monthly at point 005 and weekly at point 004. Settleable solids are also measured weekly at point 004.

Radioactivity is also reported for points 001, 003, and 004 under the SPDES reporting system, but radionuclide discharge limits are not imposed by the state permits.

The results of the SPDES Nonradiological monitoring and reporting program for all six outfalls are presented in Figures C-5.2 through C-5.26. The SPDES sampling and analysis program is summarized in Table C-5.4.

Noncompliance Episodes

In 1984 a total of 18 WVDP discharges exceeded the maximum permitted limits. These noncompliance episodes are summarized in Table C-5.3.

Six noncompliances were related to operation of the sewage treatment plant, an extended aeration system capable of treating 5,000 gallons of raw sewage per day. The expansion of the WVDP work force over the past year has resulted in increased sewage volumes which now exceed the capacity of the treatment plant. Hence, BOD-5 levels have been inadequate and pH is more difficult to control. These problems are expected to be solved when a new 10,000 gpd extended aeration plant is brought on-line.

Seven noncompliance episodes were for iron concentrations in Erdman Brook at SPDES 006. This has been a continuing problem at the WVDP because of the naturally high (with respect to the permit limits) iron in the raw water supply. This iron, primarily of the particulate form, is collected on the raw water clarifier. When the clarifier is backflushed, the iron particulates are released as a concentrated slug via SPDES outfall 005 to Erdman Brook. The SPDES permit requires that outfall 005 be sampled during filter backwash.

This problem is expected to be solved when all Project nonradioactive contaminated outfalls are combined into a single discharge point. As part of a Project-wide effort to reduce volumes of noncontaminated water that are processed through the Low-Level Waste Treatment System, several process streams will be routed to a flow equalization basin which will also contain effluents from outfalls 004 and 005. Combination of these streams will integrate the effects of slug discharges over a larger volume of water and will make monitoring and discharge control easier.

Two specific noncompliances, unionized ammonia at SPDES 001 (1/84) and pH at SPDES 005 (11/84), are the result of analytical and sample control errors. During 1984, WVDP on-site analytical capabilities have been expanded to allow all SPDES sample analysis to be performed on-site. This will provide timely analysis and allow suspect streams to be resampled within the required sampling time frame.

The sole pH excursion at SPDES 001 was the result of the accidental addition of a small amount of caustic to the LLWTF effluent. Because this effluent had been previously treated by ion exchange, its buffering ability was greatly reduced and the caustic caused a rapid change in pH for a brief period.

The two remaining permit excursions are for slightly elevated lead concentrations at SPDES 001. The cause of these excursions at this outfall is being investigated but is unknown at present.

TABLE C-5.1

West Valley Demonstration Project

State Pollution Discharge Elimination System

Monitoring Locations

Location #	Name	Description
001	Lagoon 3	o Batch Discharge of Treated Process Water to Erdman Brook
		o Monitored for: pH, flow, temperature, total suspended solids, unionized ammonia, and heavy metals
		o Approximately 52,000 m^3 discharged in 1984
002	Low Level Waste Treatment Facility (LLWTF)	o Effluent from flocculation/ clarifier ion exchange treatment system for process liquid effluents
		o Batch operated; discharged to Lagoon 3
		o Monitored for: total suspended solids
003	New York State Commercial Low-Level Waste Burial Trench Leachate Collection Lagoon	o Lagoon used infrequently (approximately every 3-4 years) to collect infiltration/leachate from trench in NYS Commercial LLW Burial Ground for processing in LLWTF
		o Precipitation collected in lagoon is transferred to LLWTF 2-3 times per year
		o DOE required to accept this stream per cooperative agreement with New York State

TABLE C-5.1 (continued)

Location #	Name	Description
		o Monitored for: flow
		o Approximately 700 m^3 transferred in 1984
004	Sewage Treatment Plant	o Extended aeration plant
		o Continuous discharge to Erdman Brook
		o Monitored for: BOD-5, pH, total suspended solids, and settleable solids
005	Utility Room Discharge	o Continuous overflow of raw water clarifier
		o Intermittent backflush of clarifier
		o Discharges to Erdman Brook
		o Monitored for: pH, total suspended solids
006	Erdman Brook	o Receiving stream for all Project liquid effluents
		o Located downstream from outfalls 001, 004, and 005
		o Monitored for: temperature, pH, ammonia, unionized ammonia, and iron

Table C-5.2

West Valley Demonstration Project

Environmental Permits

Permit #	Issued by	Expiration Date	Type of Permit
042200-0114-00002 WC	NYSDEC	6/89	Certificate to operate air contamination source - boiler
042200-0114-00003 WC	NYSDEC	6/89	Certificate to operate air contamination source - boiler
042200-0114-00004 WR	NYSDEC	6/89	Certificate to operate air contamination source - incinerator
042200-0114-00010 WI	NYSDEC	6/89	Certificate to operate air contamination source - Low Level Waste Treatment Facility Nitric Acid Storage Tank
042200-0114-01401 WI	NYSDEC	6/89	Certificate to operate air contamination source - Nitric Acid Bulk Storage Tank
042200-0114-08401-I	NYSDEC	12/85	Certificate to operate air contamination source - Glass Melter Off-Gas System
NY-0000973	NYSDEC	7/83 *	State Pollution Discharge Elimination System (SPDES permit)

*Permit is presently undergoing renewal review by NYSDEC.

Table C-5.3
West Valley Demonstration Project
1984 SPDES Noncompliance Episodes

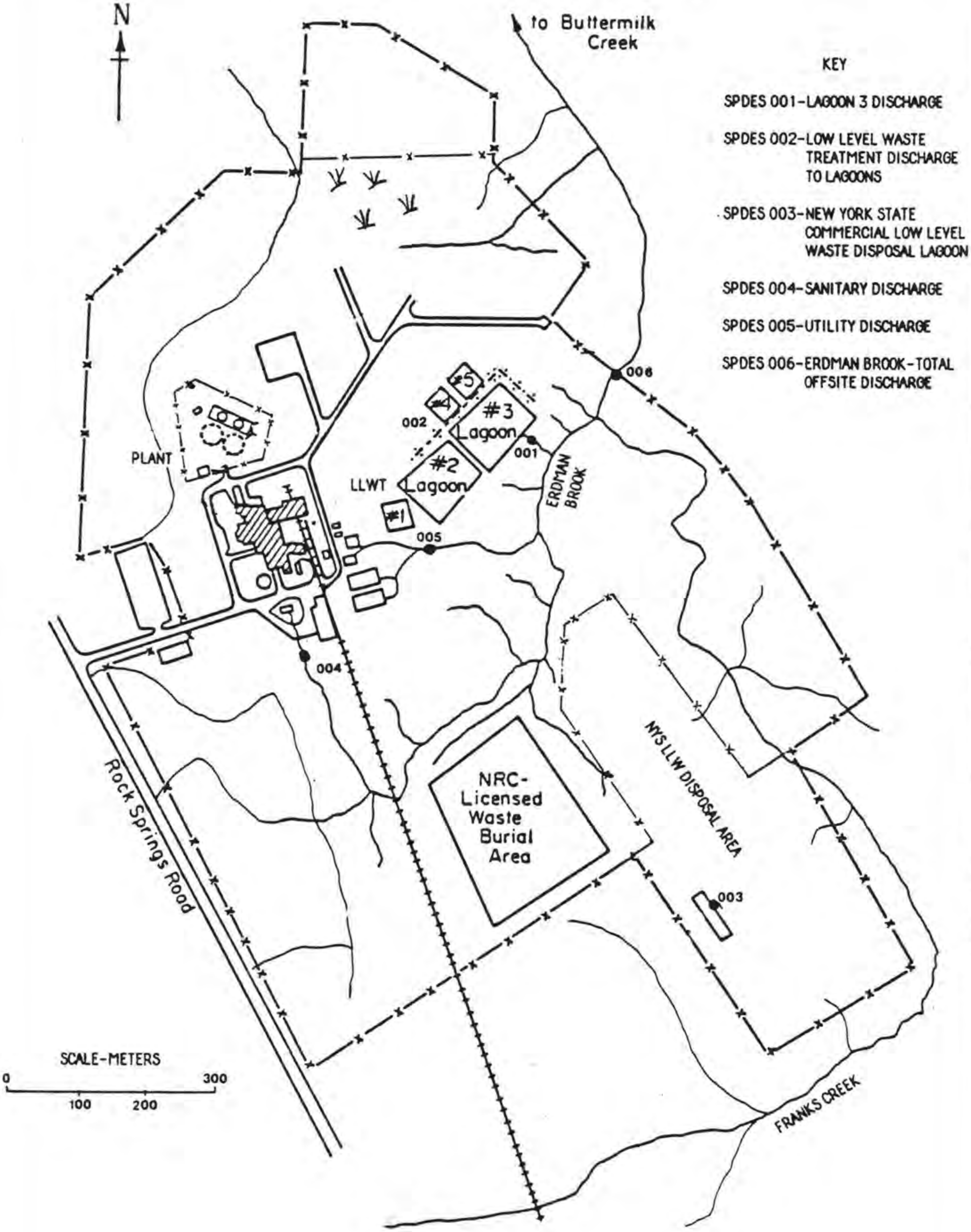
Date	Outfall	Parameter	Limit	Value
1/84	001	Unionized Ammonia	0.15 mg/l	< 0.2 mg/l
	004	BOD-5	45 mg/l	51 mg/l
2/84	006	Iron	1.00 mg/l	2.4; 1.8 mg/l
4/84	004	BOD-5	45 mg/l	79 mg/l
	006	Iron	1.00 mg/l	1.4 mg/l
5/84	001	Lead	0.03 mg/l	0.06 mg/l
	006	Iron	1.00 mg/l	1.1 mg/l
6/84	004	Settleable Solids	0.3 ml/l	1.76/5.0 ml/l
7/84	004	pH	6.0 - 9.0	5.6
	004	BOD-5	45 mg/l	130 mg/l
8/84	001	Lead	0.03 mg/l	0.04 mg/l
	001	pH	6.0 - 9.0	9.8
	006	Iron	1.0 mg/l	2.8 mg/l
9/84	004	pH	6.0 - 9.0	5.9
10/84	006	Iron	1.0 mg/l	1.2 mg/l
11/84	005	pH	6.0 - 9.0	Data unavailable
	006	Iron	1.0 mg/l	4.5 mg/l
12/84	005	Iron	1.0 mg/l	2.53 mg/l

Table C-5.4

West Valley Demonstration Project

SPDES Sampling Program

Outfall #	Parameter	Limit	Sampling Frequency
001	Barium	1.0 mg/l	Monthly during discharge
	Chromium	0.05 mg/l	Monthly during discharge
	Copper	0.2 mg/l	Monthly during discharge
	Lead	0.03 mg/l	Monthly during discharge
	Manganese	1.0 mg/l	Monthly during discharge
	Nickel	0.3 mg/l	Monthly during discharge
	Zinc	0.3 mg/l	Monthly during discharge
	Unionized Ammonia	0.15 mg/l	Monthly during discharge
	Total Suspended Solids	No limit	Monthly during discharge
	Temperature	90° F	Monthly during discharge
	pH	6.0 - 9.0	Monthly during discharge
002	Total Suspended Solids	100 mg/l	Monthly
003	Flow volume	No limit	Per discharge
004	pH	6.0 - 9.0	Weekly
	BOD-5	45.0 mg/l	Quarterly
	Total Suspended Solids	45.0 mg/l	Quarterly
	Settleable Solids	0.3 ml/l	Weekly
005	pH	6.0 - 9.0	Monthly
	Total Suspended Solids	100.0 mg/l	Monthly
006	Iron	1.0 mg/l	Twice per month
	Ammonia	2.0 mg/l	Twice per month
	Unionized Ammonia	0.15 mg/l	Twice per month
	pH	6.0 - 9.0	Twice per month
	Temperature	32° C	Twice per month



LOCATIONS OF SPDES MONITORING POINTS ONSITE

FIGURE C-5.1

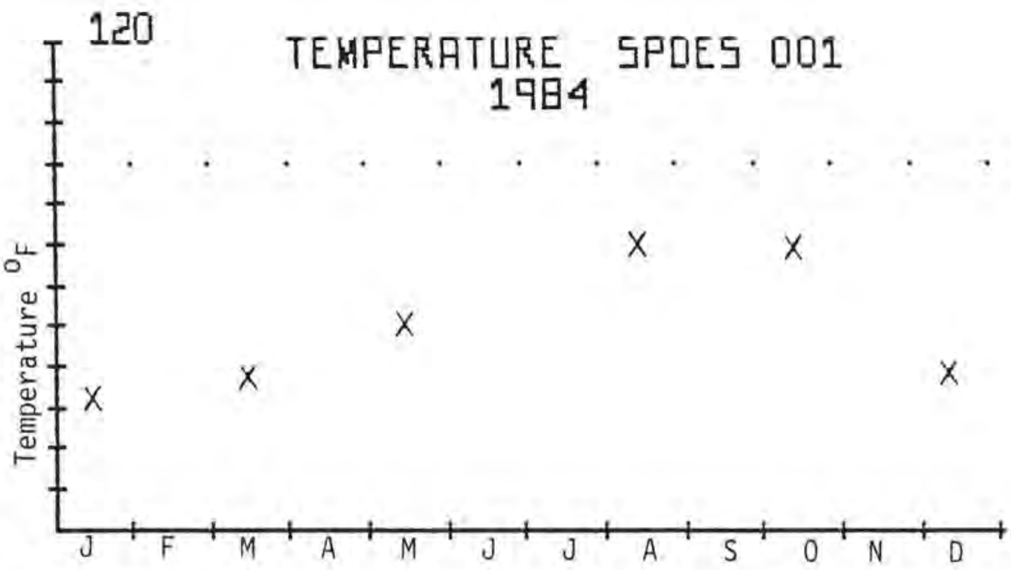


Figure C - 5.2

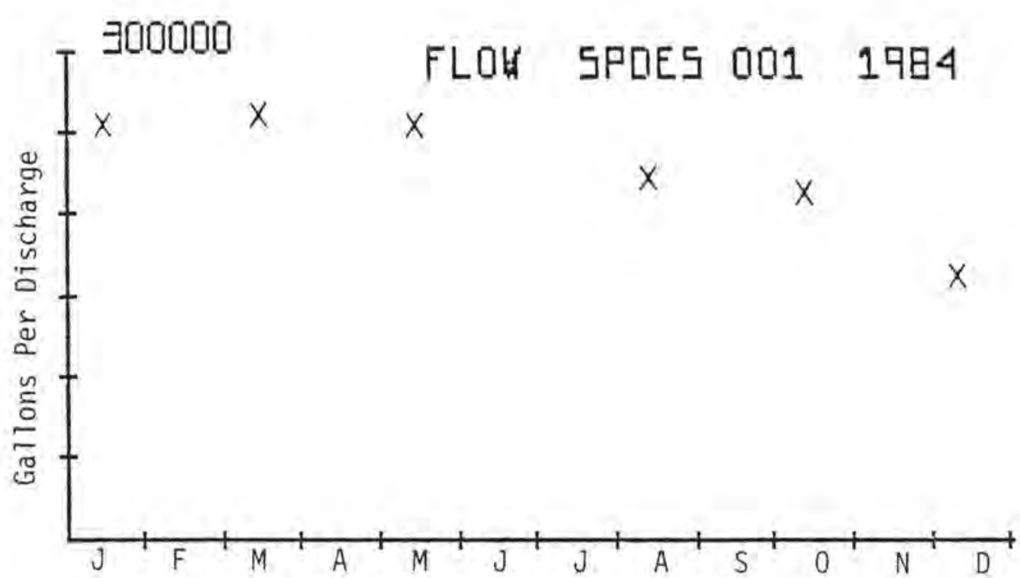


Figure C - 5.3

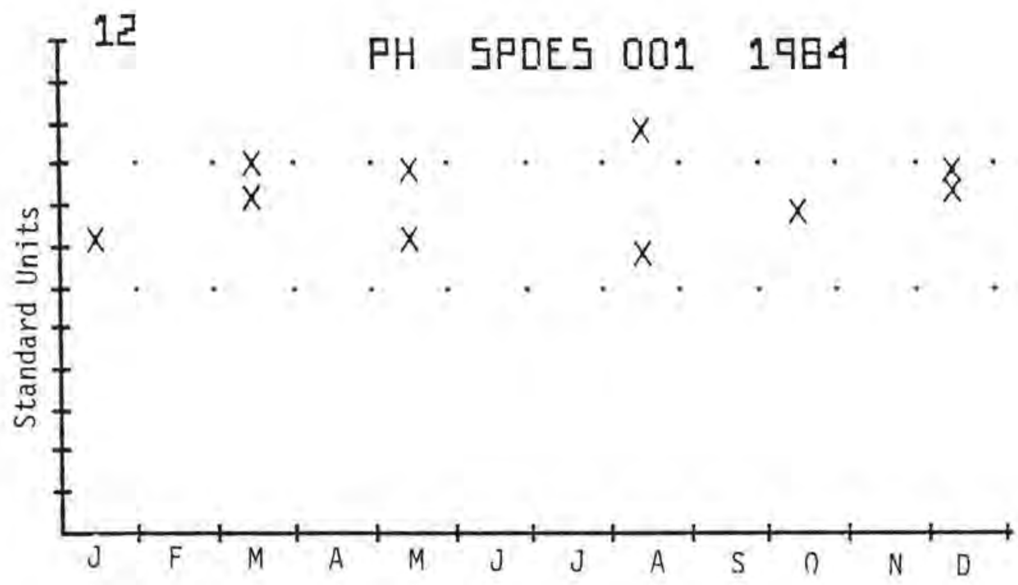


Figure C - 5.4

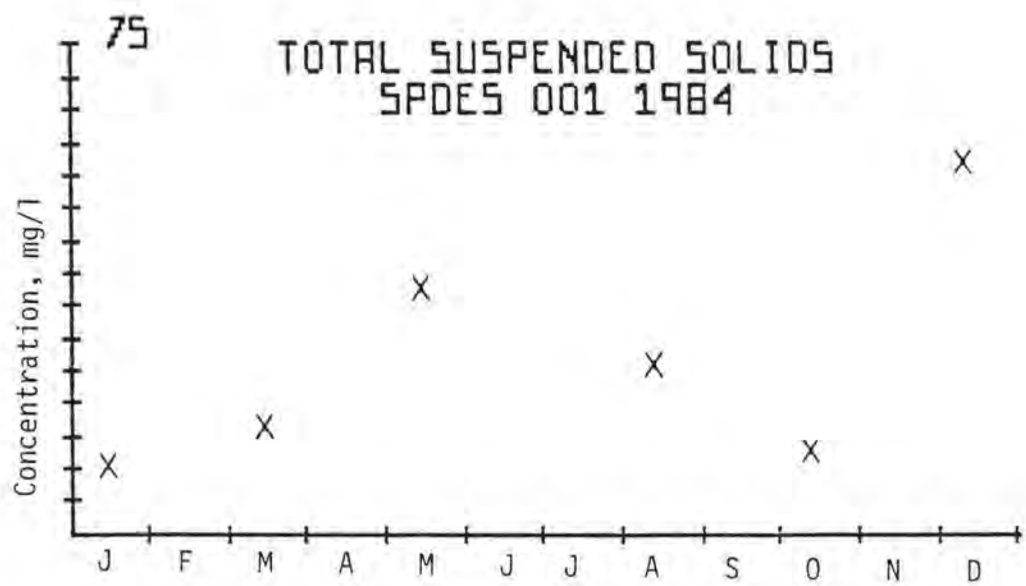


Figure C - 5.5

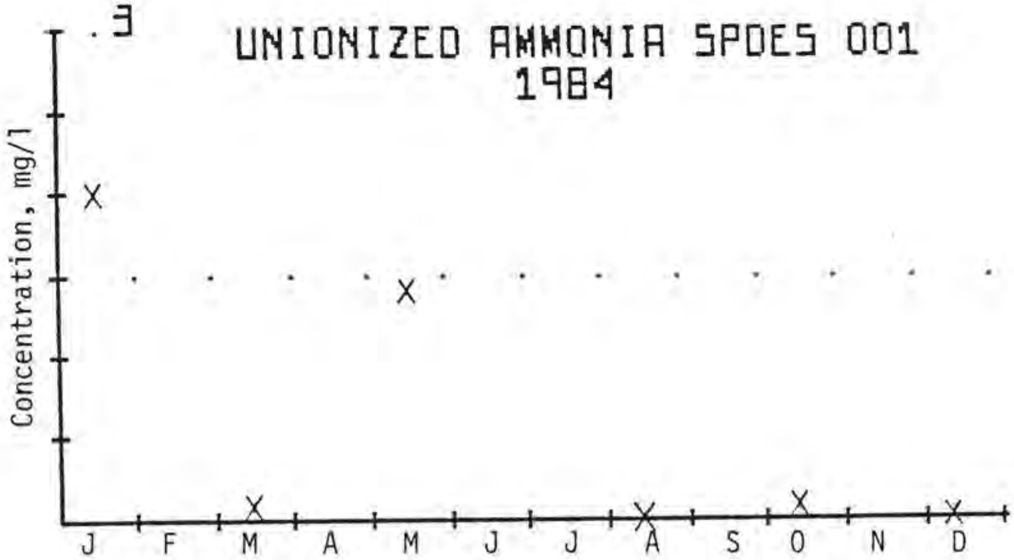


Figure C - 5.6

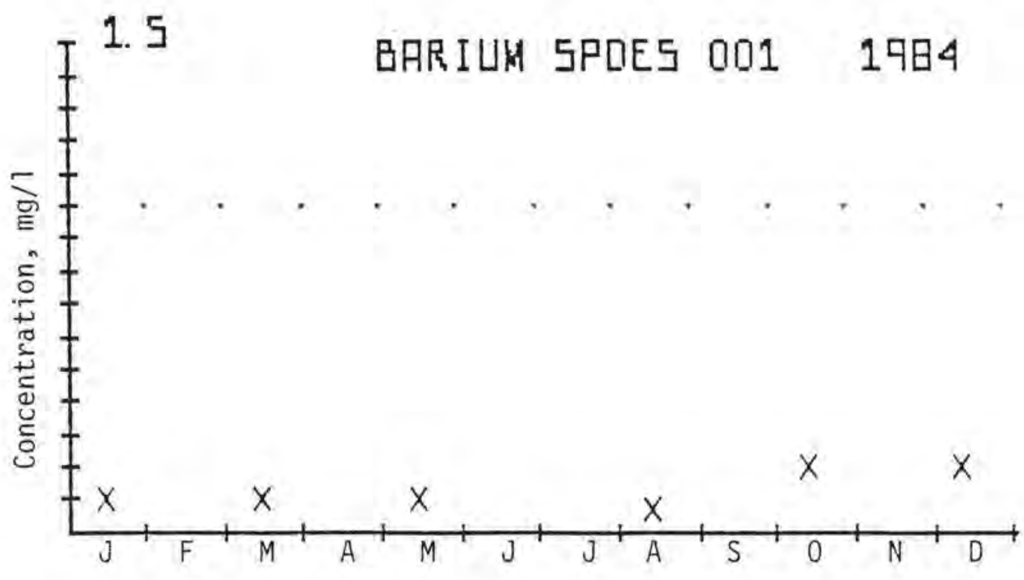


Figure C - 5.7

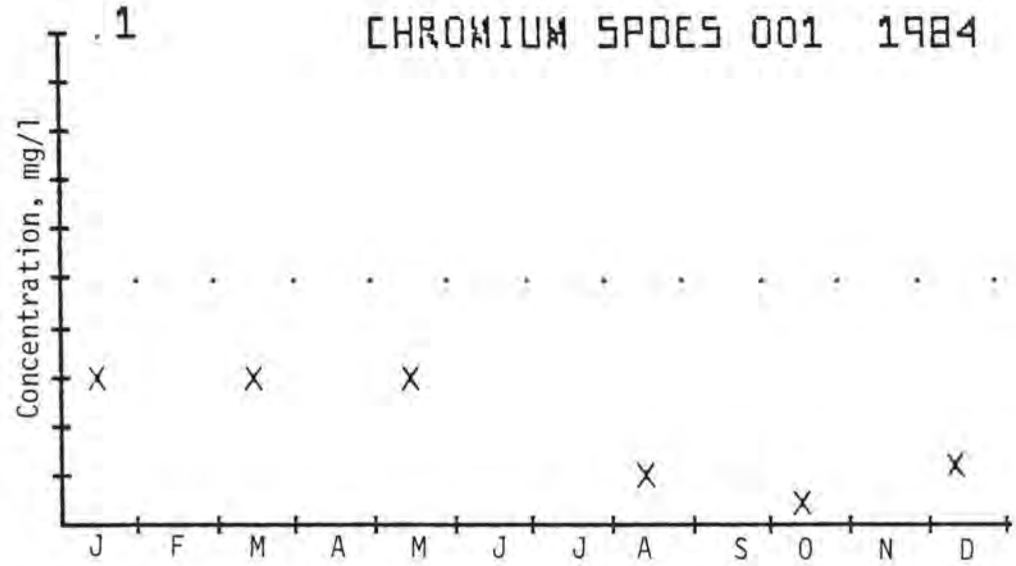


Figure C - 5.8

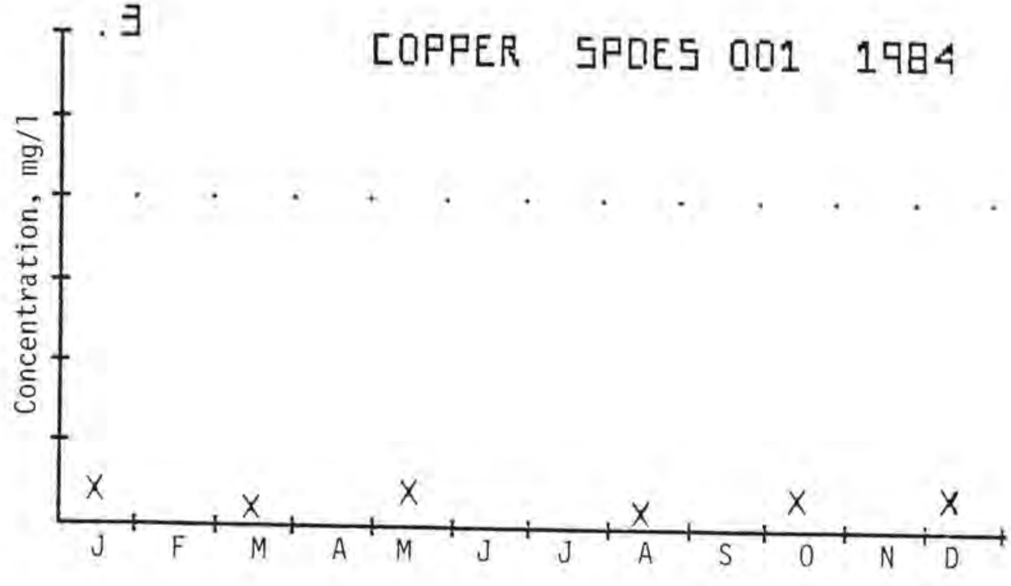


Figure C - 5.9

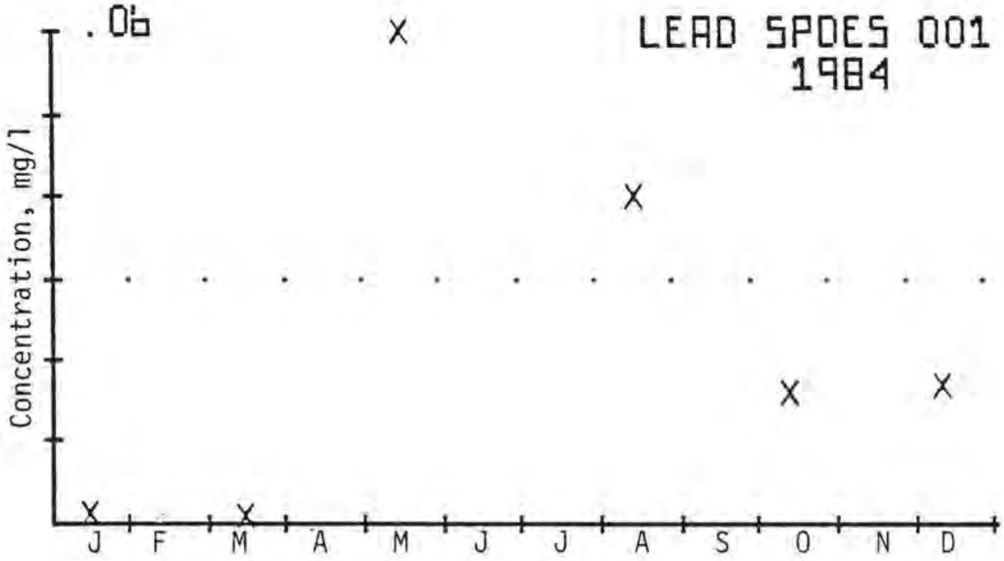


Figure C - 5.10

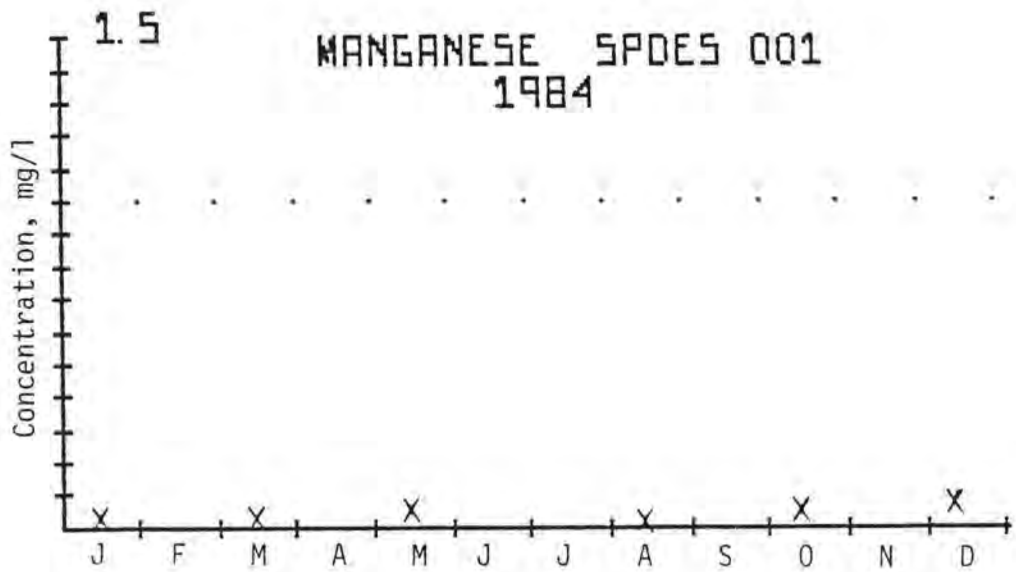


Figure C - 5.11

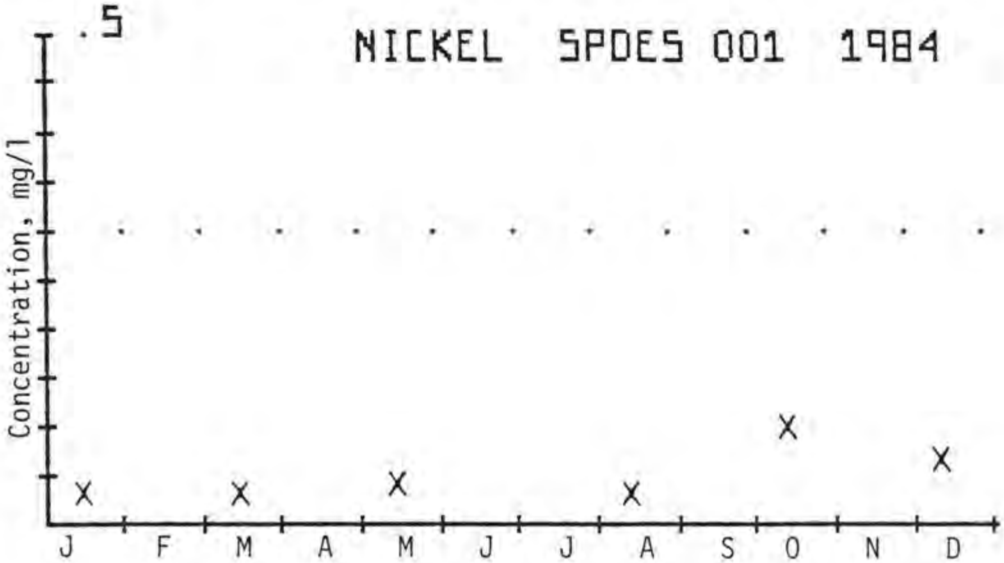


Figure C - 5.12

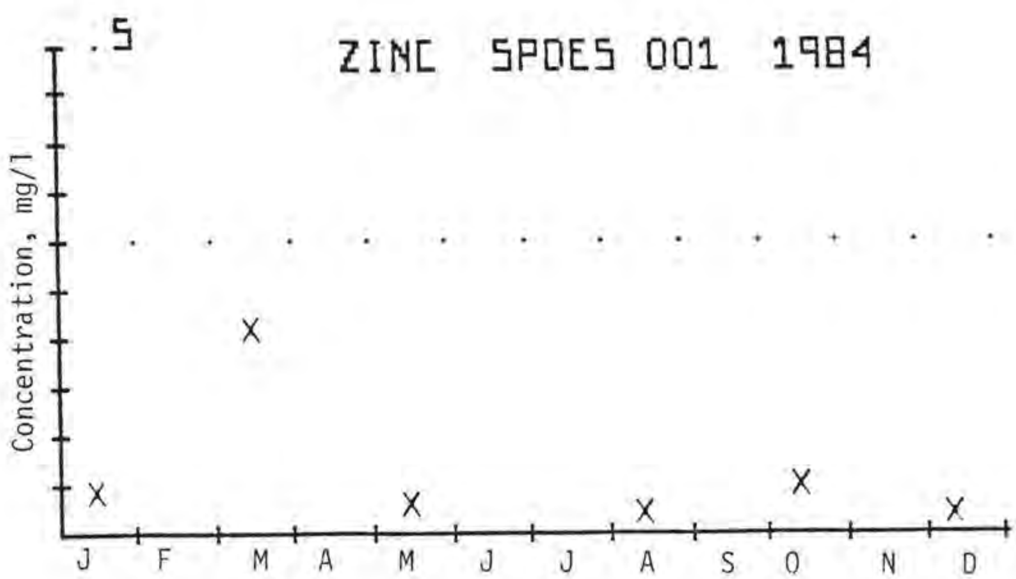


Figure C - 5.13

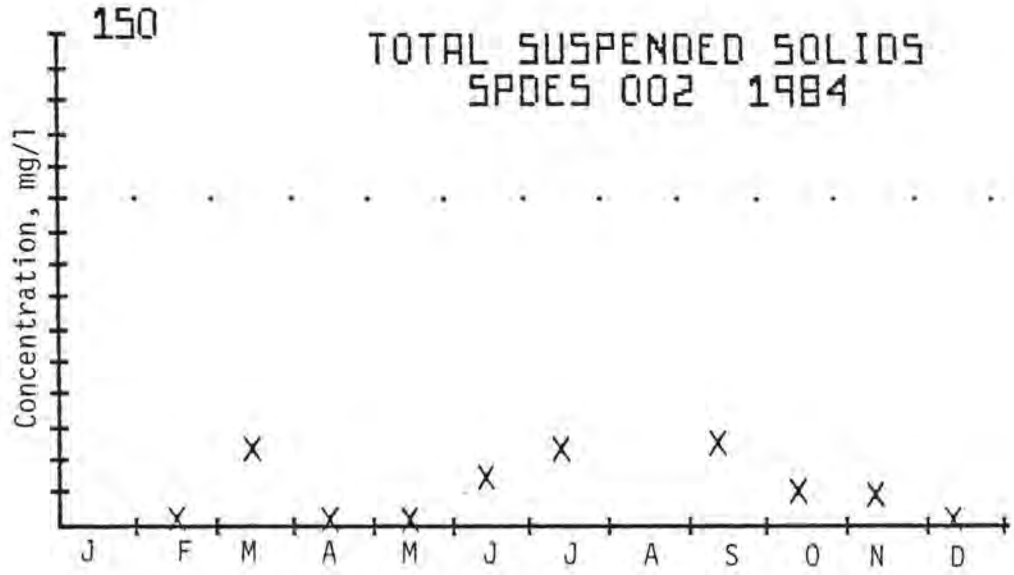


Figure C - 5.14

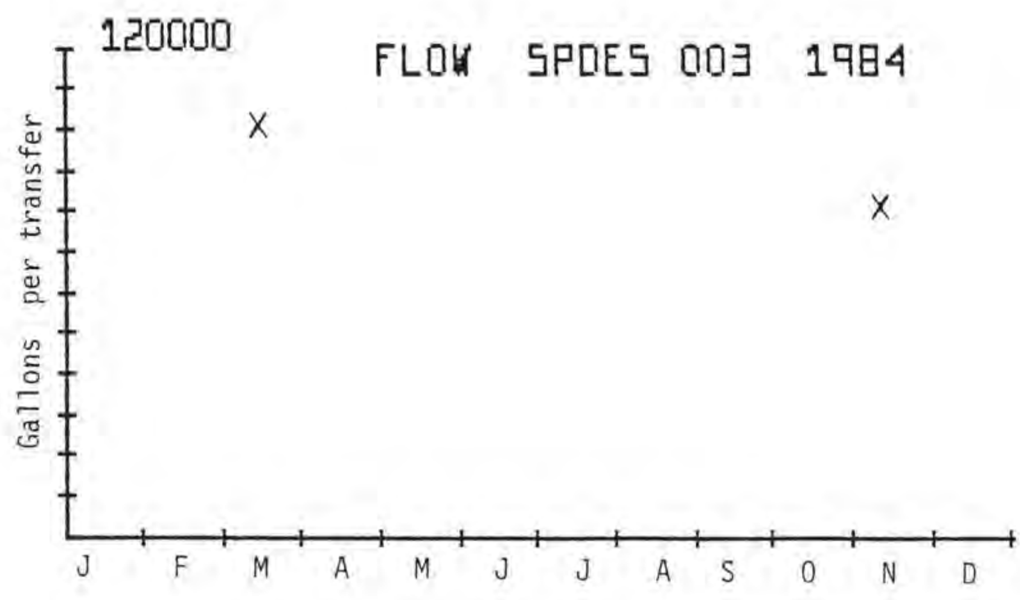


Figure C - 5.15

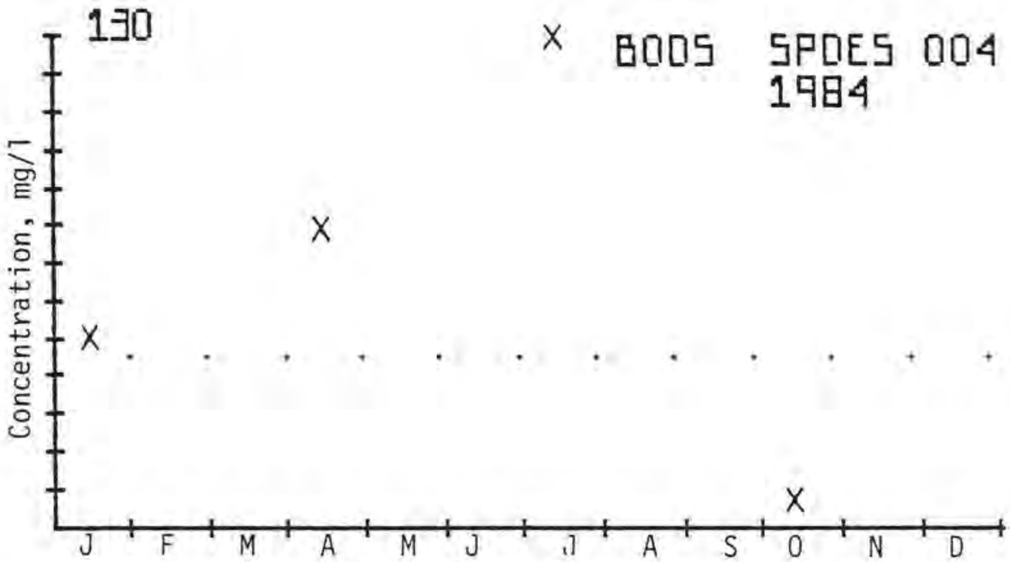


Figure C - 5.16

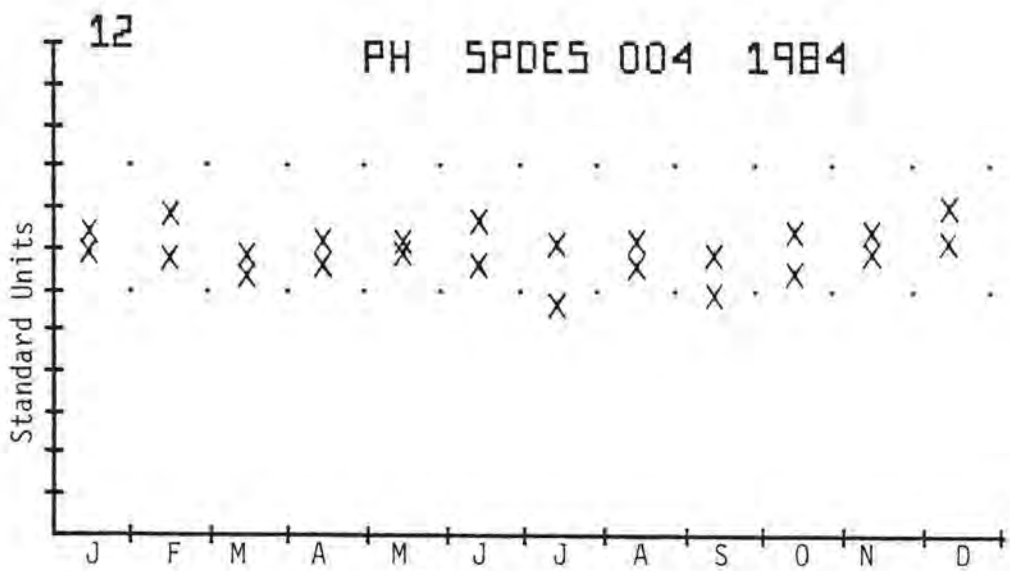


Figure C - 5.17

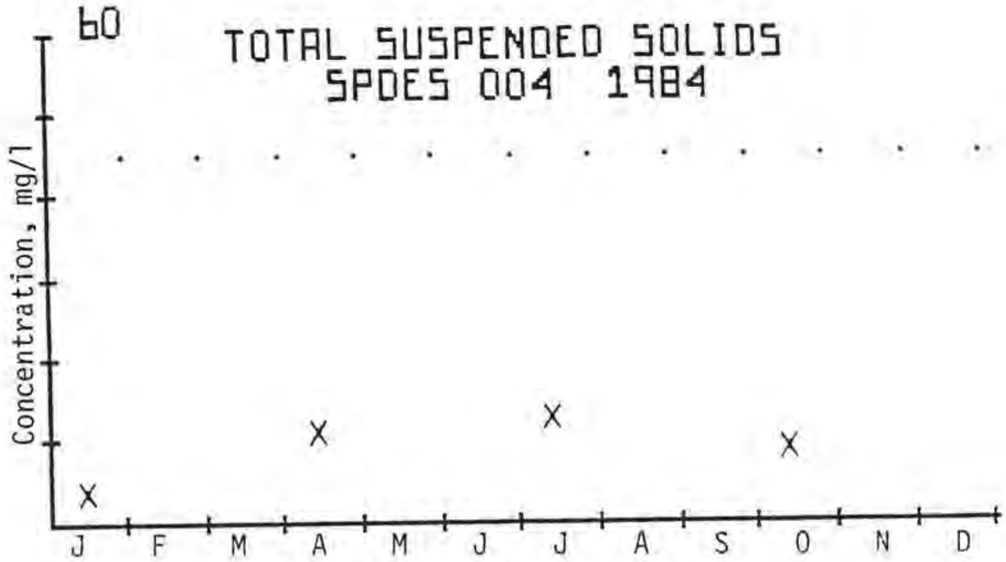


Figure C - 5.18

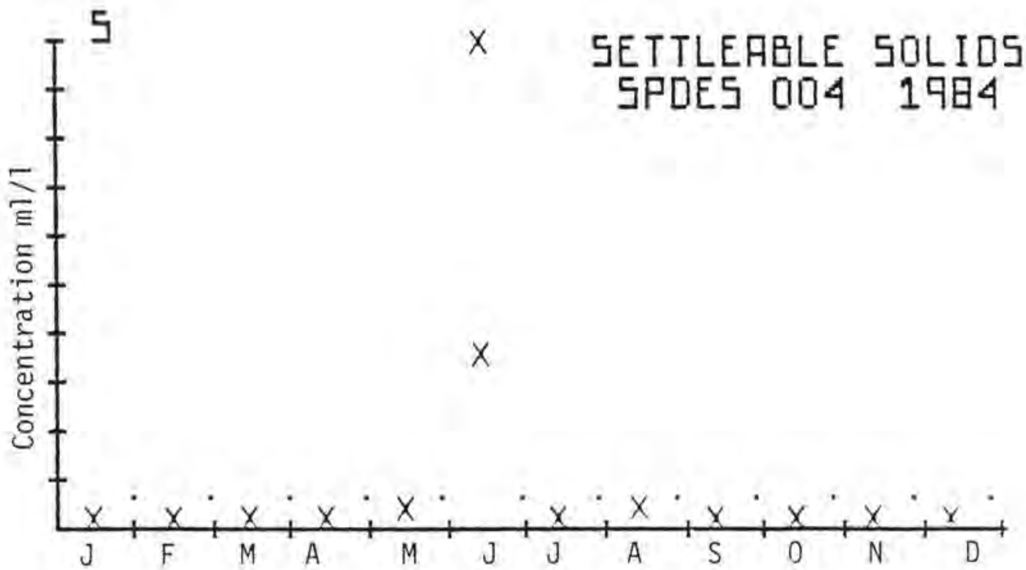


Figure C - 5.19

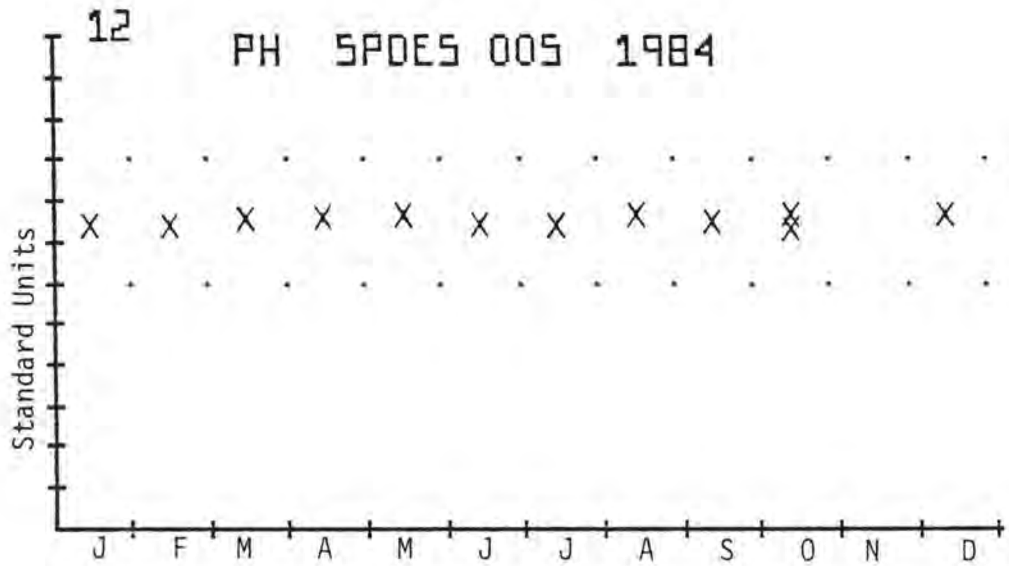


Figure C - 5.20

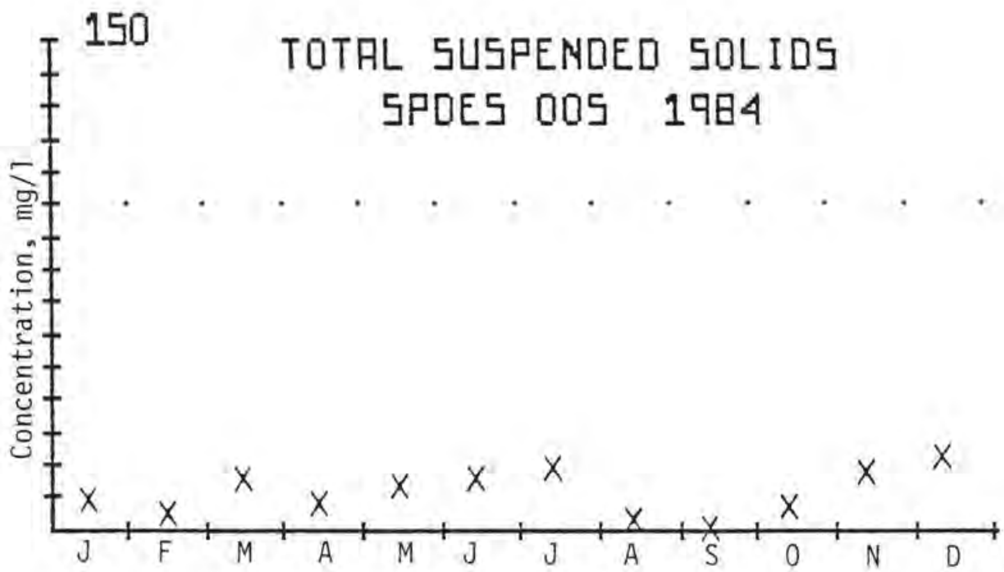


Figure C - 5.21

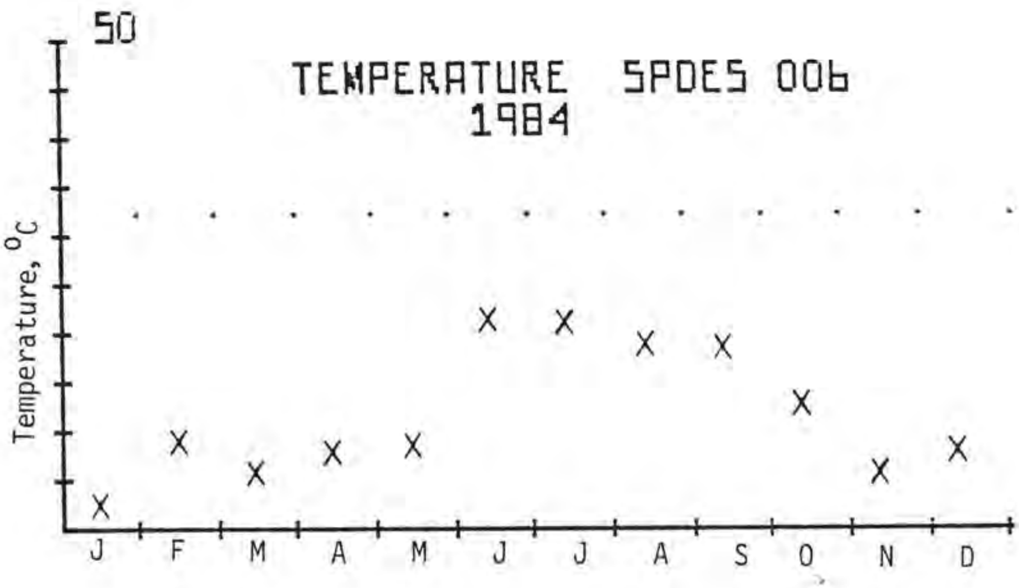


Figure C - 5.22

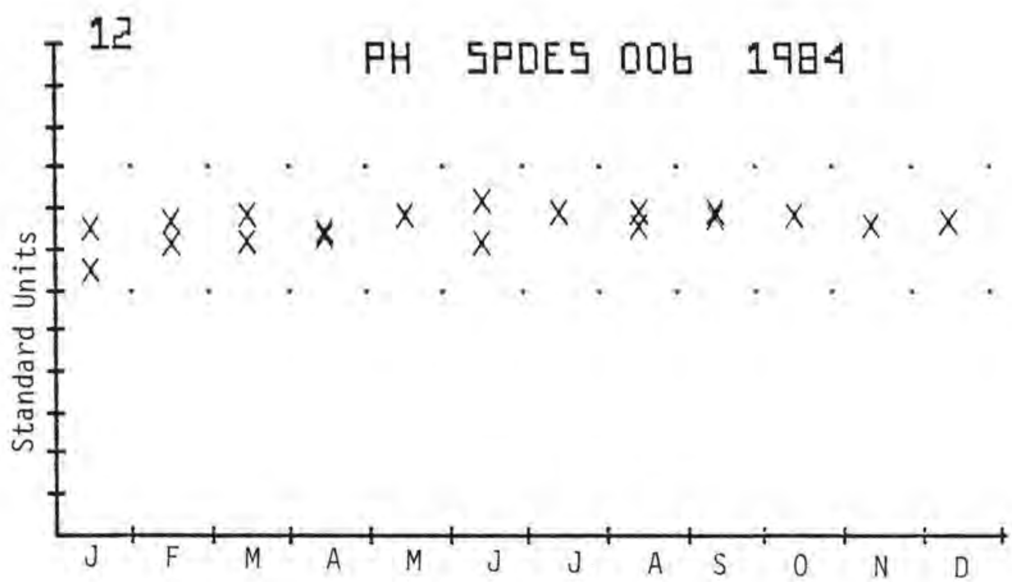


Figure C - 5.23

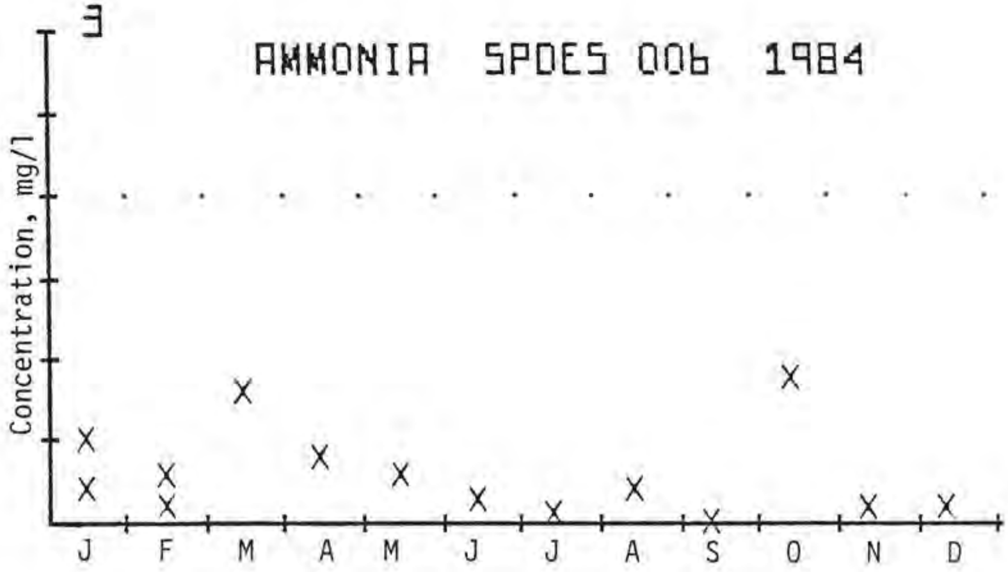


Figure C - 5.24

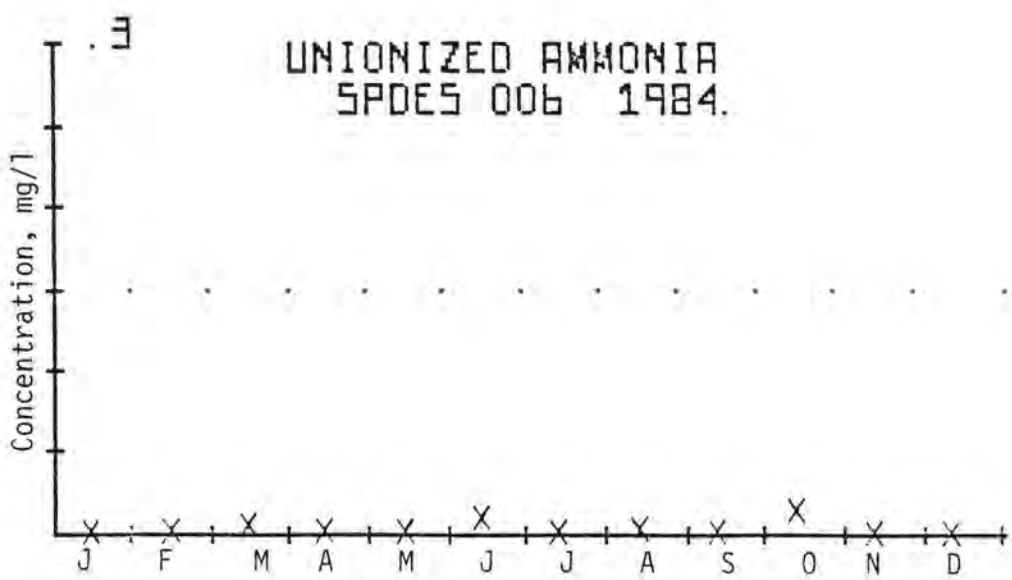


Table C - 5.25

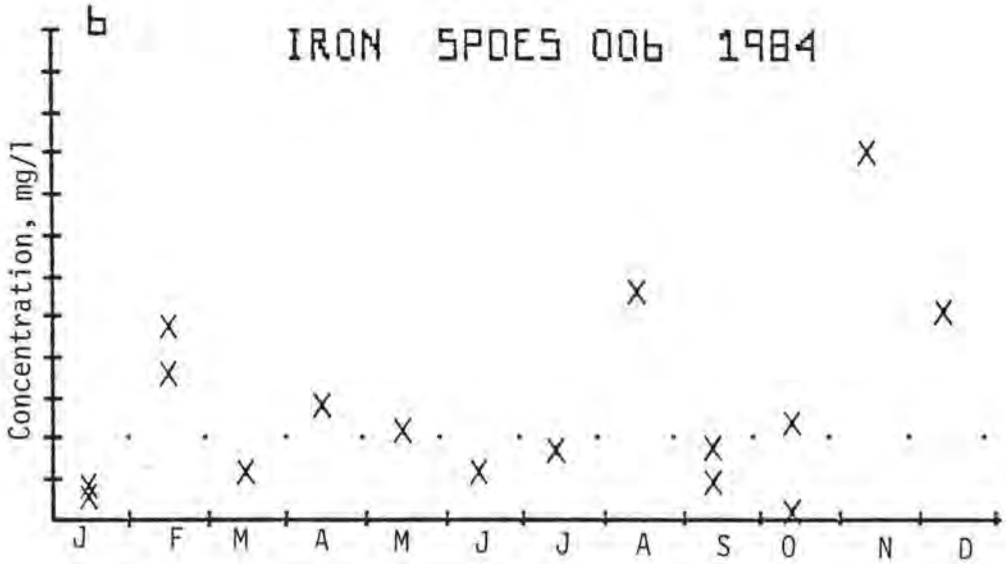


Figure C - 5.26

APPENDIX D

SUMMARY OF QUALITY ASSURANCE ANALYSES

TABLE D - 1.1

NON RADIOLOGICAL EPA CROSS-CHECK SUMMARY

PARAMETER METALS	Report Value (ug/l)	EPA "TRUE VALUE" (ug/l)	LAB PERFORMING THE ANALYSIS
Cr	134	124	EAL
Cu	274	260	EAL
Fe	979	926	EAL
Pb	364	341	EAL
Mn	614	590	EAL
Ni	365	372	EAL
Zn	337	349	EAL
NH_3 - N	6.3	5.68	EAL
pH	7.7	7.70	SITE ENVIRONMENTAL LAB
Susp. Solids	37.6 (mg/l)	39.9 (mg/l)	SITE ENVIRONMENTAL LAB
BOD-5	27.0 (mg/l)	31.1 (mg/l)	EAL

TABLE D - 1.2

COMPARISON OF RADIOLOGICAL CONCENTRATIONS IN SPLIT SAMPLES - 1984

LABORATORY PERFORMING ANALYSES (Results in μCi/mℓ)

SAMPLE I.D.	Date	Parameter	WVDP Env. Lab	WVDP Anal. Lab	EAL	RESL
Cattaraugus Creek (WFFELBR)	Jan., 1984	Gross B	4.73 ± 1.1 E-09			<1.0 E-08
	Feb., 1984	Gross B	1.84 ± 0.2 E-08			1.8 ± 1.2 E-08
	Mar., 1984	Gross B	7.73 ± 1.3 E-09			<1.2 E-08
	Apr., 1984	Gross B	8.16 ± 1.3 E-09			<1.2 E-08
	May, 1984	Gross B	1.47 ± 0.2 E-08			1.8 ± 1.2 E-08
	June, 1984	Gross B	3.95 ± 1.0 E-09			<1.2 E-08
	July, 1984	Gross B	5.71 ± 1.2 E-09			<1.2 E-08
	Aug., 1984	Gross B	2.93 ± 1.0 E-09			<1.2 E-08
	Sep., 1984	Sr-90	3.81 ± 1.9 E-09			3.7 ± 3.1 E-09
	Oct., 1984	Sr-90	2.31 ± 1.5 E-09			5 ±4 E-09
	Nov., 1984	Sr-90	5.91 ± 2.3 E-09			<3.92 E-09
	Nov., 1984	Cs-137	<7.0 E-08			<7.84 E-08
Sewage Outfall Composite (WNSP004)	Oct., 1984	Sr-90	5.60 ± 1.8 E-09			<3.92 E-09
	Nov., 1984	Sr-90	1.43 ± 0.3 E-08			7.0 ± 5.9 E-09
WNBCBKG	4th Qtr, 1984	Sr-90	4.75 ± 1.9 E-09		1.83 ± 0.4 E-09	
WNBCTCB	4th Qtr, 1984	Sr-90	2.34 ± 0.4 E-08		4.59 ± 1.0 E-09	
WNSP006	4th Qtr, 1984	Sr-90	3.11 ± 0.4 E-08		2.76 ± 0.4 E-08	
Lagoon 3 Effluent: WNSP001	Oct., 1984	Sr-90	2.37 ± 0.2 E-07	1.98 ± 0.2 E-07	2.28 ± 0.4 E-07	
WNSP001	Dec., 1984	Sr-90	1.85 ± 0.1 E-07		1.69 ± 0.2 E-07	
WNLAG3B	10/16/84	Sr-90	2.25 ± 0.2 E-07	1.94 ± 0.2 E-07		
WNSP001 Comp.	Oct., 1984	Sr-90	2.21 ± 0.2 E-07	2.51 ± 0.2 E-07	2.34 ± 0.3 E-07	
WNSP001 Comp.	Dec., 1984	Sr-90	2.09 ± 0.1 E-07		1.76 ± 0.2 E-07	
WNLAG4D	10/11/84	Sr-90	2.10 ± 0.2 E-07	2.08 ± 0.2 E-07		