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 four years to provide an enhanced level of environmental surveillance in anticipation of high-level waste solidification activities. The surveillance program as implemented in 1985, was operated throughout 1986 (including effluent, on-site, and off-site monitoring). A number of new monitoring points as identified in the 1986 program plan were implemented during the year, most of them addressing specifically anticipated requirements for monitoring several new Project activities scheduled for FY87 and FY88. The major pathways for off-site movement of radionuclides are by surface runoff and airborne transport. The environmental monitoring program therefore emphasizes the collection of air and surface water samples. The ingestion and assimilation of radionuclides by game animals and fish that include the WNYNSC in their range is another potentially significant pathway which is monitored by collection and analyses of appropriate specimens. Soil and vegetation radionuclide content is also measured for long-term trends.

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 1986, and Appendix C-5 provides greater detail on these activities. Section 3.3 specifically addresses groundwater monitoring at the Project site.

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 provide appropriate reference parameters, several additional sampling points were added in 1986 in support of scheduled Project facilities soon to become operational (see Appendix A-1).

3.1.1 Radioactivity in Air

In 1986, airborne particulate radioactivity was collected continuously by four perimeter air samplers at locations shown in Figure 3-1 and by three remote samplers. The concentrations measured at each of these stations are given in Tables C-2.2.1 through C-2.2.7. Three of the perimeter air samplers, mounted on 4-metre high towers, maintain an average air flow of about 40 litres/min (1.5 ft^3/min) through a 47 mm glass fiber filter. The fourth perimeter air sampler is located on Rock Springs Road near the residence which would be subject to the highest average relative concentration of airborne effluent from a long-term, ground-level release from the plant (AFRSPRD, see Figure 3-1).This fourth perimeter sampler and the three remote samplers all operate with the same air flow rate as the three mounted on towers, but the sampler head is at 1.7 metres above the ground (the height of the average human breathing zone) versus the standard 4 metres. The three remote samplers were located in Great Valley , Springville, and West Valley (Figure 3-2). Concentrations measured at Great Valley (AFGRVAL), 28 km south of the site, are considered to be representative of natural background.

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 monthly concentrations ranged from 1.0 E-14 to 1.8 E-13 microcuries per millilitre (µCi/ml), or 3.7 E-04 to 6.7 E-03 becquerels per cubic metre (Bq/m^3) of beta activity, and 4.4 E-16 to 2.4 E-15 µCi/ml (1.6 E-05 to 8.9 E-05 Bq/m^3) of alpha activity. Additionally, quarterly composites consisting of 13 weekly filters from each sample station were analyzed. Prior to May of 1986, Cs-137 was not detected in any samples: Sr-90 was detected in three of seven samples, including 2 positive indications from background stations. On May 10, 1986, the fallout from the Chernobyl incident in the Ukraine, USSR, was first detected at the West Valley Demonstration Project. Ruthenium-103, I-131, Cs-134, Cs-136, Cs-137, and La-140 were among the isotopes detected after May 1986, but these isotopes appeared to be in equal concentrations for both near-site and remote air sampler locations. Therefore, although an increased sampling schedule in addition to the routine program was implemented, no evidence of radioactivity in addition to worldwide fallout was detected near the Project in air samples.

In all cases, the measured monthly gross activities were below 3 E-12 μCi/ml (1.1 E-01 Bq/m^3) beta, and 7 E-15 μCi/ml (2.6 E-04 Bq/m^3) alpha, the most limiting DOE concentration guides for any of the isotopes present at WVDP. (The standards and concentration guides for radionuclides of interest at West Valley are reproduced from the DOE orders in Appendix B.) Results of the analyses of perimeter air sample filters are presented in Appendix C-2. For comparison, the 1982, 1983 and 1984 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 μCi/ml (7.4 E-04 Bq/m^3) in Albany, New York (Huang, 1984). Annual data for the three samplers which have been in operation since 1983 are compared in Figure C-2.2. The values average about 1.8 E-14 μCi/ml (6.7 E-04 Bq/m^3) of gross beta activity in air, with an apparent rise in 1986 after May. The annual average gross beta concentration at the Great Valley background station was 1.9 E-14 μCi/ml (7.0 E-04 Bq/m^3) in 1985, but averaged 2.8 E-14 μCi/ml (1.0 E-03 Bq/m^3) in 1986.

At four perimeter locations, three of which are co-located with air samplers, fallout is collected in open pots. The data from these analyses also are presented in Appendix C-2, Table C-2.3.1 and C-2.3.2.

The total quantity of gross alpha and beta radioactivity released each month from the main stack, based on the weekly filter measurements, is 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.

The main ventilation stack (ANSTACK) sampling system was modified in mid-1984 by adding an alpha monitor and a new isokinetic multiport sampling probe. A high flow rate and multiple nozzles assure a representative sample for both the long-term collection filter and the on-line monitoring system. Variations in concentrations of airborne radioactivity reflect the level of in-cell decontamination activities within the facility (Figure C-2.1). However, at the point of discharge, average radioactivity levels were still below the concentration guides for airborne radioactivity in an unrestricted environment.

Because of the low concentrations, the large volume samples from the plant stack provide the only practical means of determining the amount of specific radionuclides released from the facility.

In November of 1985 a sampling system similar to the main stack system was put on-line to monitor the Cement Solidification System ventilation stack (ANCSSTK). Based on analyses of the weekly samples, no detectable radioactivity was discharged from this point in 1985 (WVDP 1986). The 1986 samples showed a slight increase in gross radioactivity and uranium isotopes, but did not approach any DOE effluent limitations. Two other facilities are routinely monitored for airborne radioactivity releases: the Low-Level Waste Treatment (LLWT) facility, for radioactive water treatment, and the contaminated clothing laundry. The total amount of radioactivity discharged from all three latter facilities is less than 0.3% of the airborne radioactivity released from the site, and is not a significant factor in the airborne pathway in 1986.

Surface soil samples (0 to 5 cm depth) collected in 1982 and 1985 from various locations in the environs around the Project, including the air sampling station locations, were analyzed in 1986 and are reported in Tables C-2.4.1 and C-2.4.2. Two of the nine samples (Dunkirk and Little Valley) are located respectively 48 km West, and 26 km SSW. The remainder are located at their respective air sample station locations. Data from one sediment sample collected in 1982 from Sprague Brook, 16 km NNE, are also included.

3.1.2 Radioactivity in Surface Water and Sediment

Four automatic samplers (Figure C-1.1) collect surface water at points along the site drainage channels. An off-site sampler is located on Cattaraugus Creek (at Felton Bridge) just downstream of the confluence with Buttermilk Creek, the major surface drainage from the WNYNSC (Figure 3-1). This sampler (WFFELBR) 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.

In addition to the Cattaraugus Creek sampler, three surface water monitoring stations are in service upstream of the Buttermilk Creek/Cattaraugus Creek confluence. These installations collect water from a background location on Buttermilk Creek upstream of the Project (WFBCBKG) and a downstream location at Thomas Corners Road before the confluence with Cattaraugus Creek (WFBCTCB). The third station (WNSP006) 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). These samplers currently operate in a time composite mode, collecting a 25 ml aliquot every half-hour. The samples are collected biweekly, composited monthly, and analyzed for tritium, gross alpha, and gross beta radioactivity. A quarterly composite of the biweekly sample is analyzed for gamma-emitting isotopes and Sr-90. Quarterly samples from WNSP006 also are analyzed for I-129.

Radiological concentration data from these sample points show that average gross radioactivity concentrations generally tend to be higher in Buttermilk Creek below the WVDP site than above, presumably because of the small amount of activity from the site which enters via Franks Creek (see Figure C-1.1). However, the average concentrations below the site in Buttermilk and Cattaraugus are not statistically significantly higher than the background (upstream) concentrations. The range of gross beta activity, for example, was 1.5 E-09 to 1.0 E-08 µCi/ml (5.6 E-02 to 3.7 E-01 Bq/L) upstream in Buttermilk Creek at Fox Valley (WFBCBKG), and from 3.2 E-09 to 1.3 E-08 µCi/ml (1.2 E-01 to 4.8 E-01 Bq/L) in Buttermilk Creek at Thomas Corners Bridge (WFBCTCB). The most elevated concentrations in monthly composite water samples from Cattaraugus Creek during 1986 show Sr-90 to be less than 1.3 percent of the DOE derived concentration guide for drinking water. Gross alpha and gamma emitting isotopes were below the detection limit in Cattaraugus Creek water for 7 of 12 and 10 of 12 months respectively (Table C-1.6). A plot of monthly gross beta activity in Cattaraugus Creek for four years is presented in Figure C-1.2. No trend is apparent over this extended period.

Sediments from Buttermilk Creek and Cattaraugus Creek were analyzed for gross activity, Sr-90, gamma-emitting isotopes and transuranic nuclides. The results are comparable to previous analyses during the past three years. Data for 1986 are presented in Table C-1.10. A comparison of 1983, 1985 and 1986 gross beta activity in sediment from Buttermilk Creek is presented in Figure C-1.3. Data for 1984 were not available for this parameter.

The largest single source of radioactivity released to surface waters from the Project is the discharge from the low-level waste treatment system through the Lagoon 3 weir (WNSP001, Figure 3-3) into Erdman Brook. There were six batch releases (a total of about 50 million litres) from Lagoon 3 in 1986. The effluent was grab sampled daily during the 47 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, 7.7% of the tritium and 2.2% of the other gross radioactivity originated in the New York State disposal area (based on measurements of water transferred in 1986 from the state area to the LLWT) 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 1986. The results of these analyses are presented in Appendix C-3.

Fish samples were taken semiannually during 1986 above the Springville dam from the portion of Cattaraugus Creek which receives WNYNSC drainage (BFFCATC, see Table C-3.4 and Figure

C-3.1). Ten fish were collected from this section of the stream during each period. The Sr-90 content in flesh and skeleton, and gamma emitting isotopes in flesh were determined for each specimen. An equal number of fish samples (BFFCATD) were taken from Cattaraugus Creek below the dam, including species which migrate nearly 40 miles upstream from Lake Erie. These specimens were representative of sport fishing catches in the drainage downstream of the dam at Springville.

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 similar number of fish were taken from waters that are not influenced by site runoff (BFFCTRL) and their edible portions were analyzed for the same isotopes; these control (natural background) samples were representative of the species collected in Cattaraugus Creek downstream from the WVDP. The concentrations of strontium-90 in the edible flesh of all fish sampled in 1986 show a significant increase compared to 1985 data (WVDP, 1986). The Sr-90 content in the skeleton of fish downstream of the site reversed the downward trend from previous measurements during recent years (Figure C-3.2). The log-normal statistical treatment of the fish data presented in Table C-3.4 is appropriate to the sample type being reported (DOE/EP-0023).

Portions of a single deer from a resident herd on the southeast side of the WNYNSC were analyzed. The concentration of Cs-137 and Sr-90 in deer flesh was a bit higher than the concentration in the previous year's sample (Figure C-3.3). Data from a control, or background, deer sample collected in 1986 from a Chautauqua County location 65 km southwest of the site also indicated an increase in radioactivity, and are shown in Table C-3.2 for comparison.

The concentration of radioactivity in meat from semiannual samples of local beef animals was indistinguishable from the concentration in control samples (Table C-3.2), both showing a detectable level of isotopes associated with recent global fallout.

The dairy cattle milk sampling program in 1986 was expanded considerably over 1985 and previous years. Besides the quarterly composite sample of the maximally exposed herd to the north (BFMREED), an additional quarterly composite of milk from a nearby herd to the northwest (BFMCOBO) and several single samples from the south (BFMWIDR), southwest (BFMHAUR), and two control herds (BFMCTRLN and BFMCTRLS) were collected. Each sample or composite was analyzed for Sr-90, H-3, I-129, and gamma emitting isotopes (Table C-3.1). Strontium-90 in samples from near the site ranged from 2.5 E-09 to 6.9 E-09 µCi/ml (9.3 E-02 to 2.6 E-01 Bq/L) compared to the control samples at 2.2 E-09 µCi/ml (8.1 E-02 Bq/L) and 3.2 E-09 µCi/ml (1.2 E-01 Bq/L). Iodine-129 was not detected in any samples to the lower limit of detection (LLD) of 5 E-10 µCi/ml (1.9 E-02 Bq/L). Cesium-137 and other gamma emitting fuel cycle isotopes were also not detected. Tritium was added to the analyses performed, with all results below the detection limit of 4 E-07 µCi/ml (15 Bq/L).

Based on the samples analyzed in 1986 (Table C-3.3), there was no detectable difference in the concentration of tritium or gamma emitting isotopes in corn, potatoes, or beans grown at near-site and remote locations. Sweet corn from a field over 30 km north of the site showed a barely detectable amount of Cs-137, as compared to corn from a field 8 km north of the site, near Springville, in which Cs-137 was not detectable. Samples of potatoes and green beans from both near the site and remote locations did show an overall difference in Sr-90. The crops from near the site all contained Sr-90 in concentrations slightly above those from remote samples.

In Section 4 of this report, radionuclides present in the human food chain are discussed and their contribution to the potential for radiation exposure of the public is assessed. Although the maximum concentrations of radioactivity found in some biological samples were above background levels, the potential dose associated with consumption of these samples would be far below the protection standards.

3.1.4 Direct Environmental Radiation

The current monitoring year, 1986, was the third full year in which direct penetrating radiation was monitored at WVDP using TL-700 LiF thermoluminescent dosimeters (TLDs). The uncertainty of individual results and averages were acceptable and measured exposure rates were comparable to those of 1985. There were no significant differences in the data collected from the background TLDs (locations 17 and 23) and those on the WNYNSC perimeter (see Figure 3-1 for TLD perimeter locations) for the 1986 reporting period.

Dosimeters used to measure ambient penetrating radiation during 1986 were processed on-site. The system used Harshaw TL-700 lithium fluoride chips which are maintained apart from the occupational dosimetry TLDs as a select group solely for environmental monitoring. The environmental TLD package consists of five TLD chips laminated in a thick card bearing the location I.D. and other information. These cards are placed at each monitoring location for one calendar quarter (3 months) and then processed to obtain the integrated gamma radiation exposure.

Monitoring points are located, as shown on Figures 3-1 and 3-2, around the site perimeter and access road, at the waste disposal area, at the inner facility fence, and at background locations remote from the WVDP site. Appendix C-4 provides a summary of the results for each of the environmental monitoring locations by calendar quarter along with averages for comparison (Table C-4.1).

The quarterly averages and individual location results show very slight differences due to seasonal variation (Figure C-4.1). During the first quarter (January through March) of 1986 the average quarterly exposure was decreased due to snow cover. The second quarter (April to June) average was a bit higher but not enough to attribute a significant exposure to fallout. The third quarter of 1986 (July to September), with no snow cover but relatively high rainfall, had a higher quarterly average. Average rainfall with little snow cover in the fourth quarter (October to December) was expected to yield a quarterly average comparable to the third quarter, but it was significantly higher. These data indicate that seasonal variation in 1986 due to rainfall and snow cover did not have as significant an effect on ambient penetrating radiation measurements around the WVDP site as was noted in 1984 and 1985 (Figure C-4.2). A possible cause of the slight rise in average TLD measurements could be the heavier than average summer rains, which would wash out radionuclides suspended in the atmosphere.

Presumably because of their proximity to the LLW disposal area, the dosimeters at two locations which are not part of the off-site monitoring program (18 and 19 on Figure 3-1) showed a small elevation in radiation exposure compared to the WNYNSC perimeter locations. Location 25, on the public access road through the site north of the facility, also showed a small elevation above background due to the storage of decontamination wastes near location 24 within the site security area.

Location 24 on the north security fence, like locations 18 and 19, is not included in the environmental monitoring program; however, it is a co-location site for a U. S. Nuclear Regulatory Commission (USNRC) TLD (Table D-1.4). This point received an average exposure of 0.91 milliroentgen per hour during 1986. This exposure is primarily attributable to the nearby storage of sealed containers of radioactive components and debris from plant decontamination efforts. The storage area is well within the WNYNSC boundary (as are 18 and 19) and not readily accessible to the public. TLD locations 26 through 30 are located along the Project Security Fence, forming an inner ring of monitoring around the facility area.

3.2 Nonradiological Monitoring

West Valley Demonstration Project effluents are regulated for nonradiological parameters by the New York State Department of Environmental Conservation (NYSDEC). Stationary sources of atmospheric pollutants are authorized by either a permit to construct or a certificate to operate. Liquid effluents are monitored as a requirement of the State Pollution Discharge Elimination System (SPDES) permit issued and enforced by NYSDEC.

3.2.1 Air Discharges

The WVDP presently holds 6 certificates to operate stationary sources and 1 permit to construct a new source of airborne effluents. These permits are for minor sources of regulated pollutants such as particulates, nitric acid mist, and oxides of nitrogen. Monitoring these parameters is not required because of their insignificant concentrations and small mass discharge.

The individual air permits held by the WVDP are identified and described in Table C-5.1.

3.2.2 Aqueous Discharges

The WVDP holds a SPDES permit which identifies the outfalls where liquid effluents are released to Erdman Brook (shown i Figure 3-4 and Figure C-5.1) and specifies the sampling and analytical requirements for each outfall. During 1985, this permit was renewed in a substantially modified form, and 198 is the first full year of operation under these requirements. Three outfalls are identified on the permit. These are comprised of outfall 001, discharge from the low level waste treatment facility; outfall 007, discharge from the sanitary and utility effluent mixing basin; and outfall 008, effluent from the french drain on the perimeter of the low level waste treatment facility storage lagoons. The conditions and requirements of the new SPDES permit are summarized in Table C-5.2.

The most significant features of the SPDES permit are a requirement to report data as flow weighted concentrations and the application of a "net" discharge limit for iron. Tl net limit allows for subtraction of incoming (background) amounts of iron from the values reported in the Project effluent. The flow weighted limits apply to the total discharge of Project effluents but allow maximum credit for dilute waste streams in determining compliance with effluen concentration limits specified in the permit.

3.2.3 Results

The SPDES monitoring data are displayed in Figures C-5.2 through C-5.23. Generally, these data indicate that Project effluents were within permit limits. However, the WVDP reported a total of 33 noncompliance episodes. These are discussed in Appendix C-5.

3.2.4 Pollution Abatement Projects

During 1986, the WVDP completed two pollution control and abatement projects. These were installation of monitoring wells to provide expanded groundwater monitoring coverage of waste management units and closure of the construction and demolition debris landfill.

3.2.4.1 Expanded Groundwater Monitoring

The groundwater monitoring program was expanded to provide monitoring consistent with the minimum technical requirements for groundwater monitoring at RCRA interim status facilities. The units incorporated into the monitoring program are the high level radioactive waste storage tank area, the low level radioactive waste treatment and storage lagoons and the NRC licensed low-level radioactive waste disposal area. The applicability of RCRA to these units is uncertain within the present regulatory postures assumed by DOE and EPA, but the Project considers it prudent to implement additional monitoring to address RCRA concerns pending resolution of the regulatory issues. The details of the expanded monitoring program are discussed in Section 3.3.2.

3.2.4.2 Closure of Landfill

Closure of the on-site nonradioactive construction and demolition debris landfill was accomplished in August 1986, although this facility was removed from active service in 1985. The site was closed in accordance with New York State Department of Environmental Conservation (NYSDEC) requirements for construction and demolition debris landfills following a closure plan (Standish, 1985) which was approved by NYSDEC. Routine inspection and maintenance of the closed facility is required as part of the closure requirements. These activities include checking areas for proper drainage (i.e. no obvious ponding or soil erosion) and cutting the grass planted on the soil and clay cap. Should more extensive maintenance or repair be necessary, it will be described in detail in future environmental reports.

3.3 Groundwater Monitoring Program

3.3.1 Hydrology of the Site

The hydrogeology of the WVDP site has been and continues to be extensively investigated. Appendix E provides a synopsis of the site geology and the pathways for contaminant migration through this geologic system. A generalized east-west cross-section through the site is depicted in Figure 3-5.

3.3.2 Groundwater Monitoring

A program of sampling groundwater both on the Project site as well as from wells at residences around its perimeter was carried out in 1986. The shallow wells in this program fall into five 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 which form an outer ring around the facility dug wells.

3. The USGS series 82 wells that are grouped around the formerly-licensed disposal area. Selected series 75 wells also fall into this category.

4. Additional monitoring wells which were installed by Project scientists to supplement the existing groundwater monitoring network around specifically identified waste management areas to expand the non-radiological water quality data base.

5. Private wells around the perimeter that are used for drinking water by site neighbors (half of these are sampled each year).

Appendix A gives more information on sampling requirements and on the location of these wells (shown in Figures A-3, A-5 and A-6). Appendix C-1 summarizes results of the radiological analyses of samples from the wells (Tables C-1.7, -1.8, and -1.9).

In order to more effectively monitor several specific on-site areas which have the potential for radiological and nonradiological ground water contamination, a more comprehensive ground water monitoring program was approved by DOE and implemented in 1986.

The areas identified for additional groundwater monitoring are:

A. Low-Level Radioactive Waste Lagoon System
B. High-Level Radioactive Waste Tank Complex
C. NRC Licensed Disposal Area (Area utilized by NFS prior to 1982, including areas used by WVNS for disposal of plant solid low-level radioactive wastes).

These areas are shown in Figure 3-6. The low-level waste lagoon system includes four active lagoons (Nos. 2 through 5) and one inactive lagoon (No. 1). During the operation of the Nuclear Fuel Services (NFS) fuel reprocessing plant, wastewater from the reprocessing operations entered the system through Lagoon 1 and passed to Lagoon 2 for temporary storage. Wastewater was withdrawn from these two lagoons for treatment, after which the water was pumped to Lagoons 4 and 5, and thence to Lagoon 3, from which it was discharged to Erdman Brook.

Lagoon 1 was removed from active service in 1984. At that time, bottom sediments that could easily be removed were transferred to Lagoon 2, and contaminated soil and paving material removed from the hardstand area were placed at the bottom of the cleaned out lagoon. The lagoon was then filled and covered with clean local borrow soil. Lagoons 2 and 3 are excavated into the natural clay/silty till soil available at the bottom of the lagoons. Lagoons 4 and 5 were each lined with a synthetic membrane in the late 1970s.

The high-level waste tank complex includes 2.1 million litres of neutralized liquid high-level radioactive waste (HLW) derived from the Purex process and 45,600 litres of acidic liquid HLW derived from the Thorex process. The neutralized liquid waste is stored in a carbon steel tank (8D-2) in a reinforced concrete vault located underground. The tank rests on a 30 cm thick layer of perlite blocks which is in turn supported by a 7.6 cm layer of pea gravel contained in a carbon steel pan. The vault pad is a minimum of 60 cm thick and rests on a 10 cm thick leveling slab. The concrete vault is immediately underlain by a 1.2 m layer of pea gravel that overlies the natural soil. The acidic liquid waste is stored in a stainless steel tank (8D-4) in a reinforced concrete vault, similar to that described for the neutralized waste tank vault.

The portion of the NRC Licensed Disposal Area of concern to this document is shown on Figure 3-6. It comprises the 2.9 hectare rectangular area primarily used by NFS for disposal of highly radioactive fuel hardware, as well as other solid wastes generated during reprocessing operations. The NFS burials were limited to a U-shaped band following the perimeter of the north, east and west boundaries of the rectangular area. The area inside this 'U' comprises an area of 0.4 hectares, some of which has been used for disposal of low-level radioactive wastes that resulted from the WVDP's maintenance of the shut down reprocessing plant (plant waste).

For the three waste management areas considered, a monitoring well system comprised of 14 wells has been designed. In addition, a groundwater seep and an existing monitoring station at the french drain outlet in the lagoon area are included in the monitoring program. Of the 14 wells, five were existing wells installed by the USGS as observation wells, and the remaining nine wells were installed in the Summer of 1986. The locations of these wells and monitoring points are shown on Figure 3-6.

The location of the upgradient and downgradient monitoring wells was selected on the basis of: (1) known groundwater flow patterns in the given area; and, (2) the presence and proximity of other potential contamination sources close to the waste management area. Wells were located so that no other possible contamination source would lie between the well (downgradient or upgradient) and the waste management area which it is to monitor.

As shown on Figure 3-6, six monitoring wells are included in the Low-Level Waste Lagoon System. Wells 80-5, 80-6, 86-3, and 86-4 are all downgradient wells and Well 86-6 is upgradient of the lagoon system. Two locations are existing USGS wells (80-5 and 80-6, respectively). Well 86-5 is designed to monitor the quality of groundwater flowing beneath old Lagoon 1 in the direction of Erdman Brook. The outlet for the french drain (WNSP008) and a groundwater seep along the western bank of Frank's Creek are included in the monitoring system for this area. The outlet for the french drain is currently also a sampling point (008) under the New York State SPDES permit. This drain serves as a sink for a major portion of the surficial groundwater flowing in the immediate vicinity of the lagoon system, and provides an indication of the change in the local groundwater quality over time. The groundwater seep located on the upper western bank of Frank's Creek provides an indication of the groundwater quality in the surficial deposits, along with monitoring wells 80-5 and 80-6. It is not clear just how much groundwater flowing beneath the lagoon system escapes discharge to the french drain. However, it is believed that some of the deeper surficial groundwater, particularly on the northern sides of Lagoons 4 and 5, tends to flow eastward or northeastward toward Frank's Creek.

Four wells were selected to monitor the High-Level Waste Tank Complex. Wells 86-7, 86-8 and 86-9 are new downgradient wells, while existing well 80-2 serves as the upgradient well. Wells 86-7 through 86-9 are located along the major flow paths passing through the tank complex as determined by Yager (1985). At the same time, they were placed clearly upgradient of the hardstand and salvage areas.

Four wells were selected to monitor the disposal unit within the NRC Licensed Disposal Area. All four tap the Lacustrine Unit. Wells 86-11 and 86-12 are new downgradient wells located along the northeastern boundary of the area, and just upgradient of the New York State commercial disposal area. Well 82-1D is located downgradient of the western one-third of the NDA. Well 83-2D is located clearly upgradient of the disposal unit.

The parameters and sampling schedule shown in Table 3-1 will be followed for the groundwater monitoring program. The category III groundwater contamination indicator parameters were selected after considering the type, quantities and concentrations of constituents in the wastes of the three waste management areas, in addition to their mobility, persistence and detectability. These parameters are sensitive indicators and at the same time are representative of the wastes existing at the three areas.

At each sampling, sufficient liquid is obtained (if possible) from each well for four replicate analyses of each groundwater monitoring parameter. At each sampling event, the depth to the static water level from a leveled reference point (generally top of the well casing) is measured and recorded prior to purging the well and taking the necessary water sample.

Sampling and analysis is performed in accordance with accepted practice formalized in approved procedures to ensure the reliability and retrievability of water quality data.

In addition to monitoring the wells described above, a number of existing wells (the WNW80- and 82- series) will continue to be sampled routinely; however, in the future these samples will be analyzed for a variety of water quality parameters (see Appendix A) as well as for radioactivity. The location of these existing wells is shown on Figure A-3. Note that several of the wells are also included in Figure 3-6 because they were incorporated into the revised groundwater monitoring plan.

3.4 Special Monitoring

Two special monitoring activities took place in 1986. The first was special sampling for the effects of the Chernobyl incident in late April. The effects of the fallout can be noted in routine background air and biological samples, and a detailed description of WVDP sampling is in Appendix F. The second major effort involved a stream bed gamma survey and sample collection on Cattaraugus Creek from Springville to Lake Erie. Results of this survey were in agreement with the 1984 aerial survey, and no concentrated radioactive material was found. The details of this survey are also described in Appendix F.

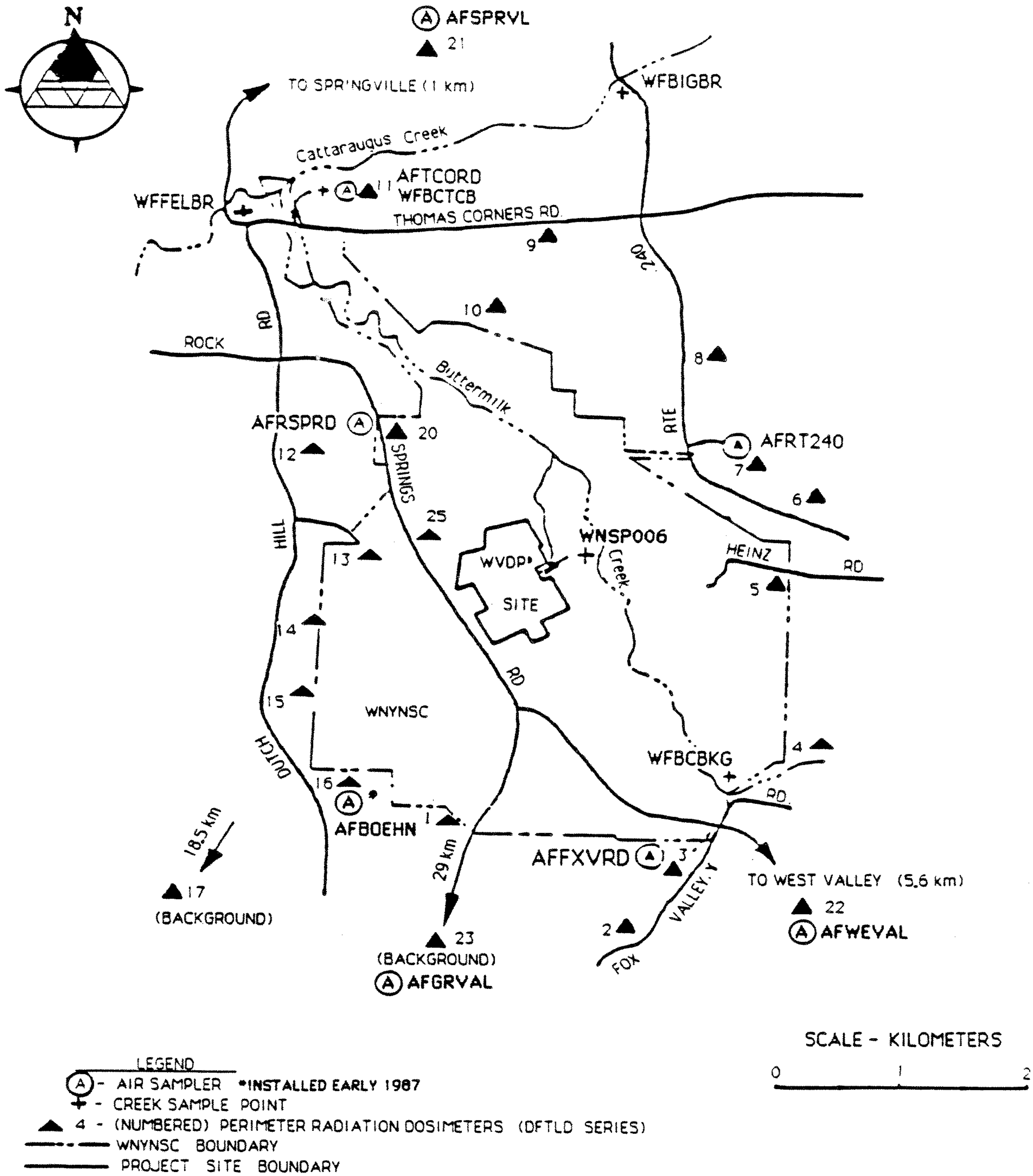


FIGURE 3-1
Locations of Perimeter Environmental Monitoring Stations


ENVIRONMENTAL SAMPLING POINTS
MORE THAN 5 km FROM WVDP SITE
N
BFVCTRL
32Km NNW
BFVNEAR
AFSPRVL
WFWEL10
BFFCATC
BFFCATD
BFFCTRL
10 km
20 km
30 km
AFWEVAL
WFWEL06
DFTLD17
BFDCTRL
65Km SW
AFGRVAL
BFBCTRL
LEGEND
- Thermoluminescent Dosimetry
- Air Sampler
- Drinking Water Well Supply
- Meat Sampling Point
- Vegetation Sampling Point
5 0 5 10 15 20 25 30 Kilometers

FIGURE 3-2

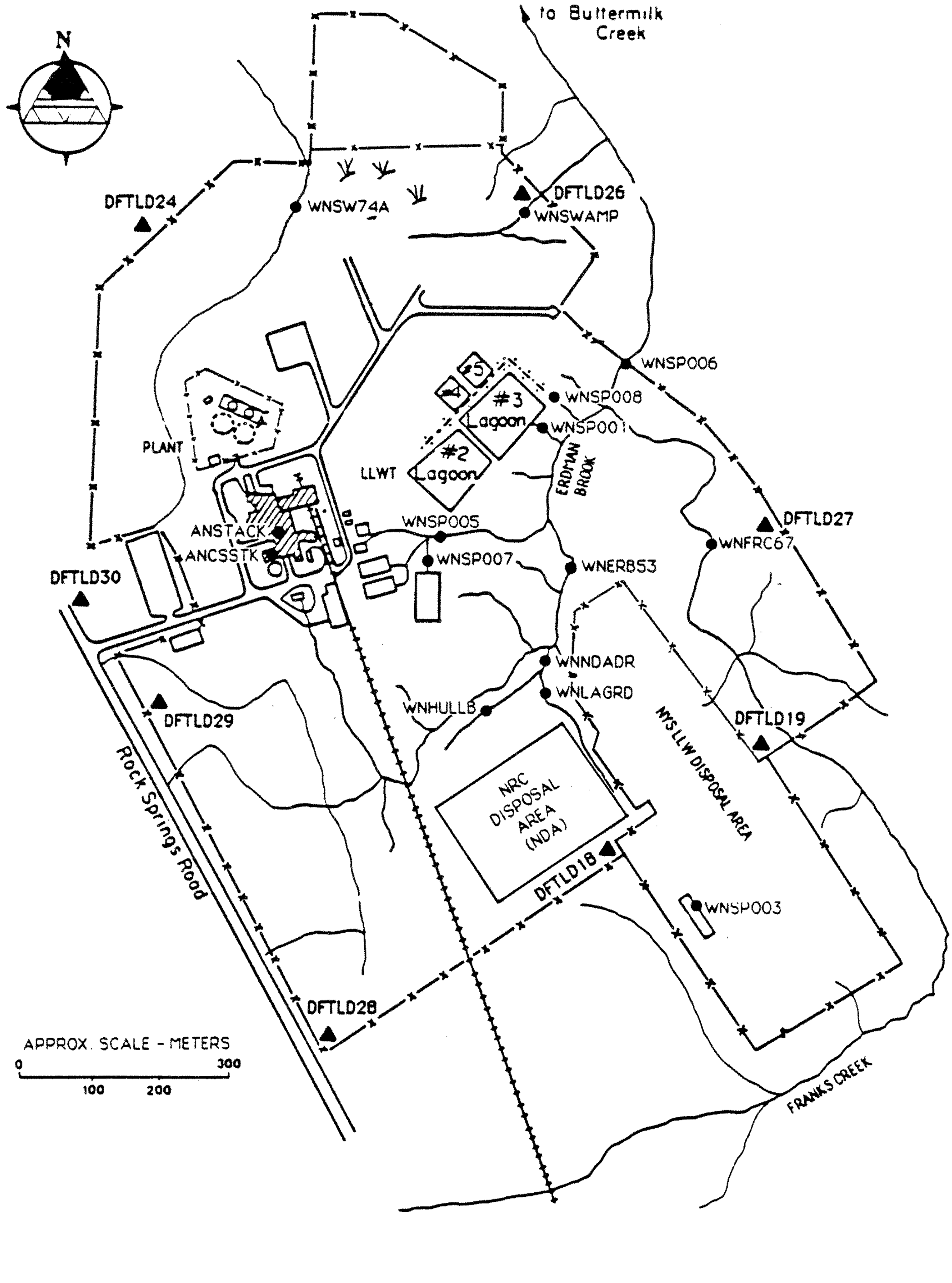


FIGURE 3-3
Location of
Radiological Monitoring Points On-site

KEY

WNSP 001-LAGOON 3 DISCHARGE

WNSP 003-NEW YORK STATE COMMERCIAL LOW LEVEL WASTE DISPOSAL LAGOON

WNSP 007-SPDES 007 MIXING BASIN, CONSTRUCTED IN 1985

WNSP 008-DRAINS SUBSURFACE WATER FROM LLWT AREA (FRENCH DRAIN)

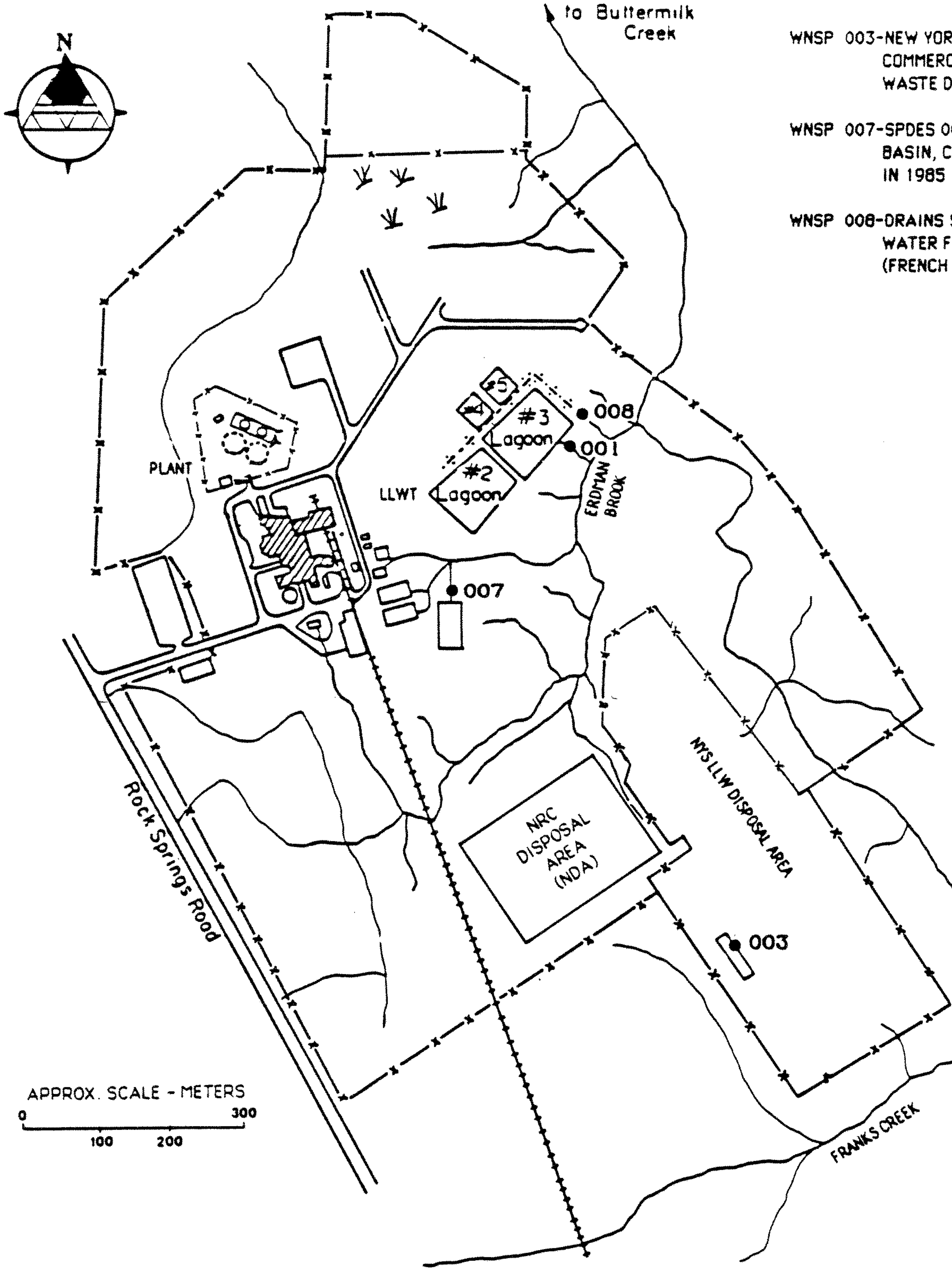
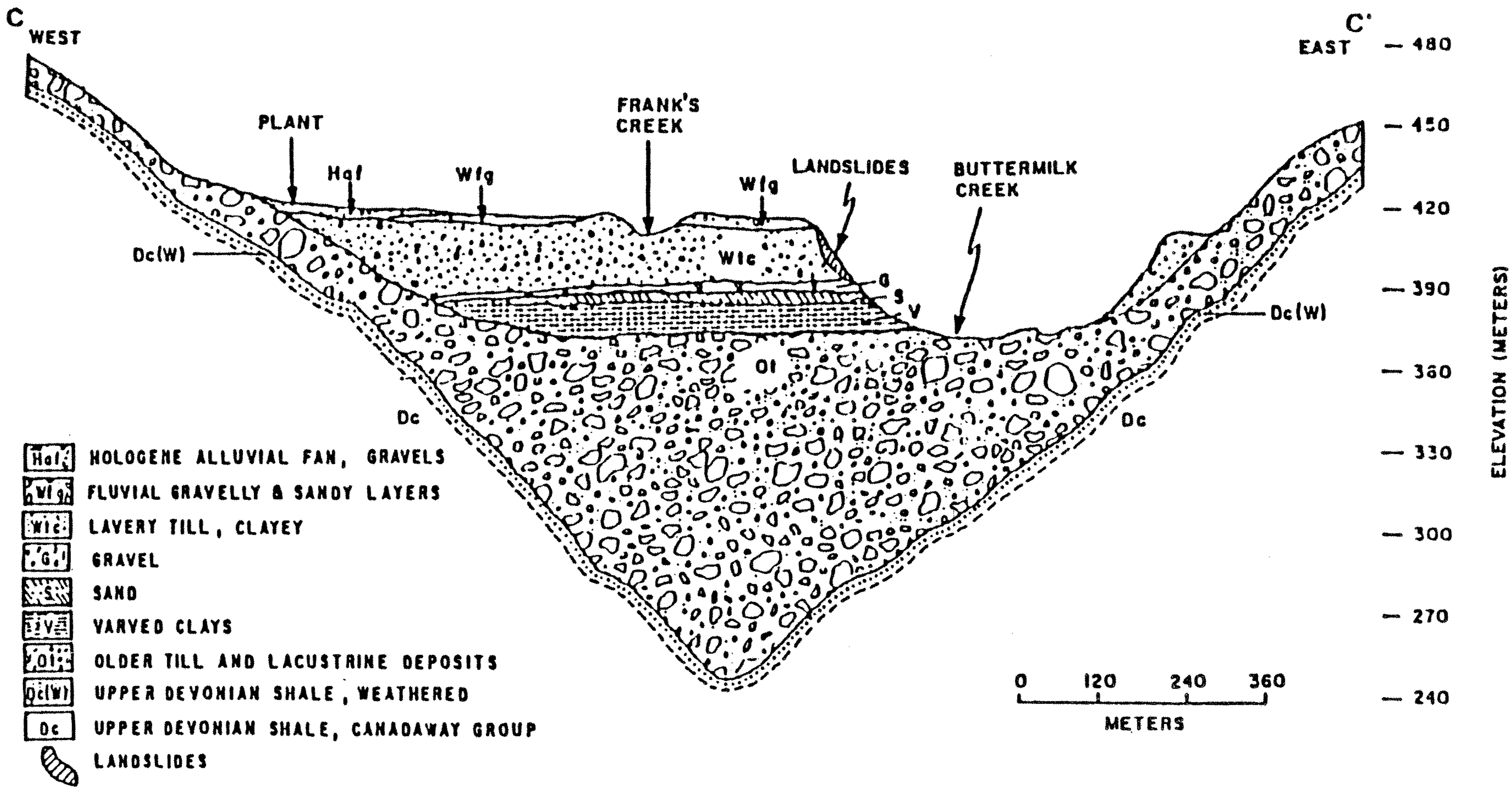


FIGURE 3-4
Locations of SPDES Monitoring Points On-site



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

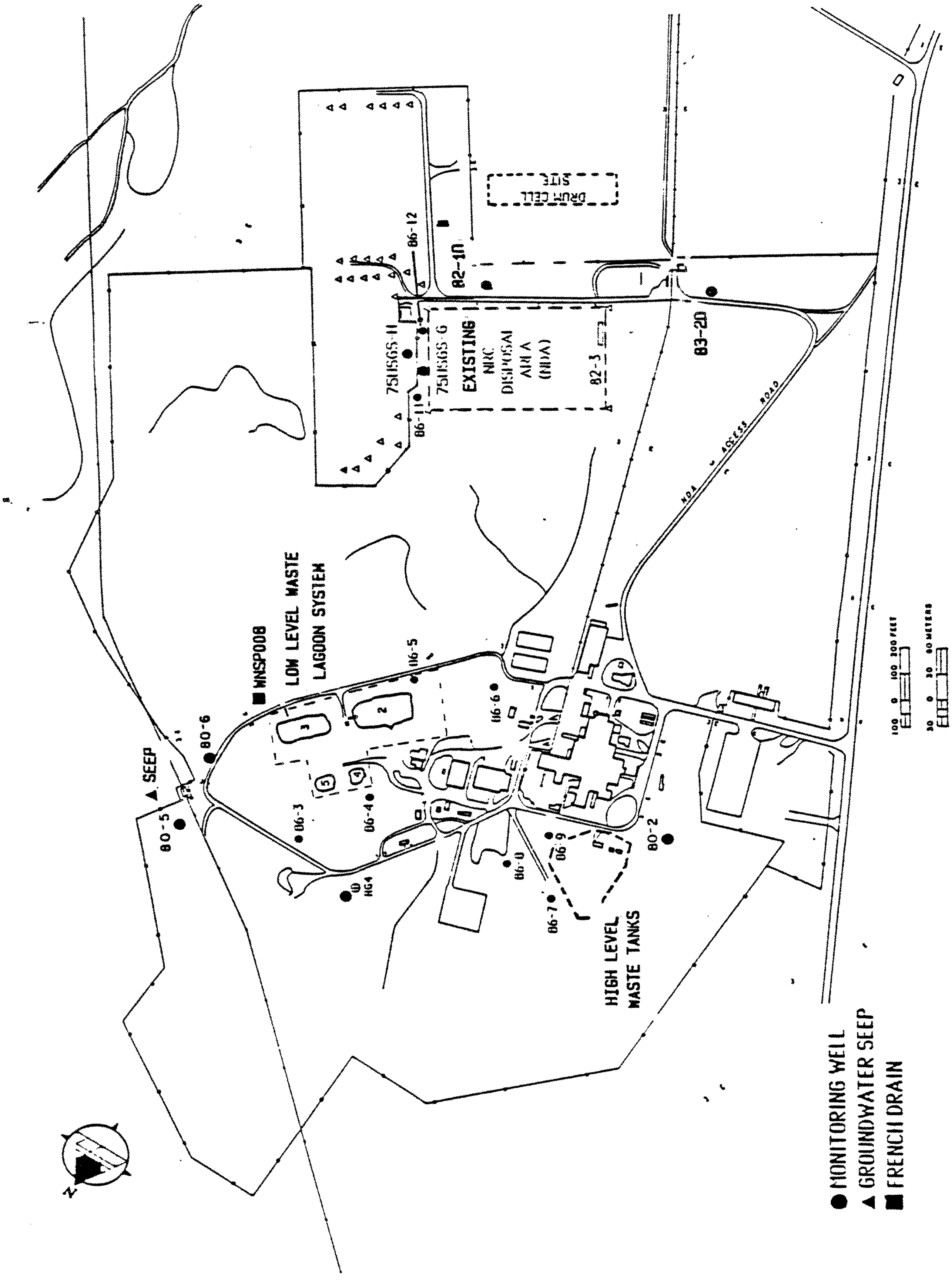


FIGURE 3-6
Location of Groundwater Monitoring
Area Sample Points

TABLE 3-1
SCHEDULE OF GROUNDWATER SAMPLING AND ANALYSIS

Category	Parameter	Frequency	Comment
I. EPA Interim Drinking Water Standards	Arsenic Barium Cadmium Chromium Fluoride Lead Mercury Nitrate (as N) Seleium Silver Radium Gross Alpha Gross Beta	Quarterly for 1^{st} year.	Annually after 1st year except coliform and pesticides.
	Coliform Bacteria Endrin Lindane Methoxychlor Toxaphene 2, 4-D 2, 4, 5-TP Silvex		May be omitted if demonstrated that wastes do not contain these compounds and site history does not indicate past usage.
II. Groundwater Quality Indicators	Chloride Iron Manganese Phenols Sodium Sulfate	Quarterly for 1^{st} year, annually therafter.	
III. Groundwater Contamination Indicators	Nitrate pH Conductivity Total Organic Carbon Total Organic Halogen Tritium Gross Alpha Gross Beta Specific Gamma Emitters	Quarterly for 1^{st} year, semi-annually thereafter.	All indicator parameters must be measured in 4 replicates of each sample. Same as pesticides in Category I selected by WVNS as indicators of waste treatment/disposal at WVDP.
IV. Groundwater Elevations		Once before collecting each well sample.	