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SITE PLAN FOR NIAGARA FALLS STORAGE SITE
LEWISTON, NEW YORK

DECEMBER 1989

Prepared for

UNITED STATES DEPARTMENT OF ENERGY

OAK RIDGE OPERATIONS OFFICE

Under Contract No. DE-AC05-81OR20722

By

Bechtel National, Inc.

Oak Ridge, Tennessee

Bechtel Job No. 14501

EA # 54

FOREWORD

This document is one of a series of plans, each prepared for a specific site requiring stabilization, decontamination, and/or disposal of low-level radioactive contamination under the U.S. Department of Energy (DOE) Surplus Facilities Management Plan. The objective of this site plan is to describe remedial action objectives and discuss how they will be accomplished in accordance with the project summary work breakdown structure. In addition to background information, each phase of the remedial action project is described, including what has been accomplished. This site plan serves as a working reference document for the project management contractor and DOE. It will be reviewed and updated annually to reflect progress, changes, and new information regarding the scope of work at the site.

CONTENTS

*The subsection letter descriptors A through J correspond with the Level 3 work breakdown structure for FUSRAP/SFMP (E is reserved).

FIGURES

TABLES

ACRONYMS

AEC	Atomic Energy Commission
BNI	Bechtel National, Inc.
DOE	Department of Energy
EPA	Environmental Protection Agency
EPDM	ethylene propylene diene monomer
IWCF	Interim Waste Containment Facility
MED	Manhattan Engineer District
MSP	Middlesex Sampling Plant
NFSS	Niagara Falls Storage Site
NYSDEC	New York State Department of Environmental Conservation
ORAU	Oak Ridge Associated Universities
PRAR	post-remedial action report
ROD	record of decision
SPDES	State Pollutant Discharge Elimination System

I. NAME AND LOCATION OF SITE

The Niagara Falls Storage Site (NFSS) occupies approximately 191 acres in a generally rural setting in northwestern New York. The site is owned by the U.S. Department of Energy (DOE). It lies within the Town of Lewiston (Niagara County), approximately 4 mi south of Lake Ontario and 10 mi north of the city of Niagara Falls. NFSS and its regional setting are shown in Figure I-1; Figure I-2 is an aerial photograph of the site.

Access to the site is controlled by a 7-ft-high fence that encloses the DOE property. Land uses immediately adjacent to the site are varied. It is bordered by a hazardous waste disposal site, a sanitary landfill, and land that is currently vacant. Other land uses in the vicinity of the site include truck farms, orchards, and rural single-family dwellings. The nearest permanent residence is 0.7 mi southwest of the site. The population of Niagara County was 227,000 in 1980, and the population density was about 430 persons per square mile (Ref. 1).

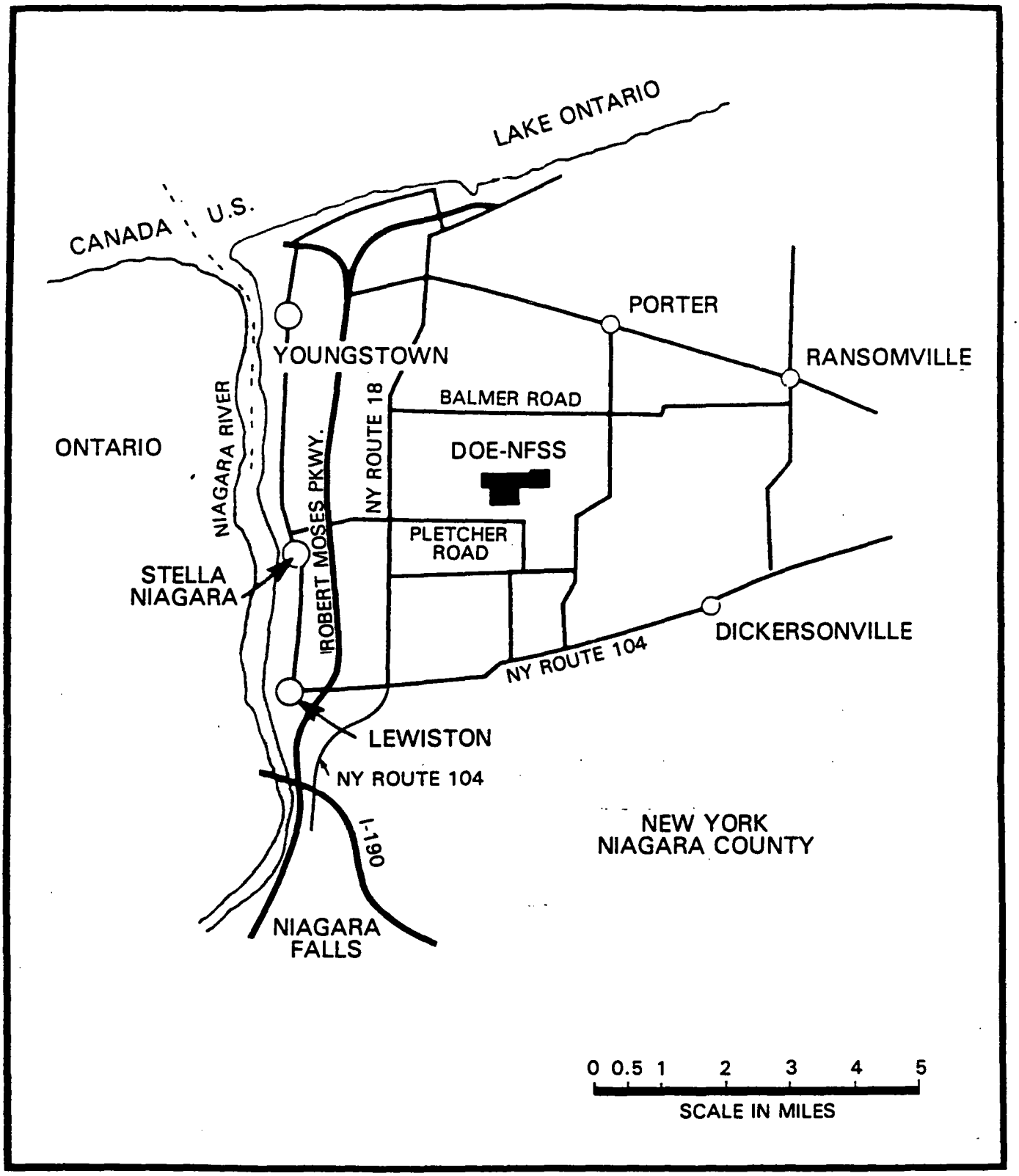

FIGURE I-1 THE REGIONAL SETTING OF NFSS

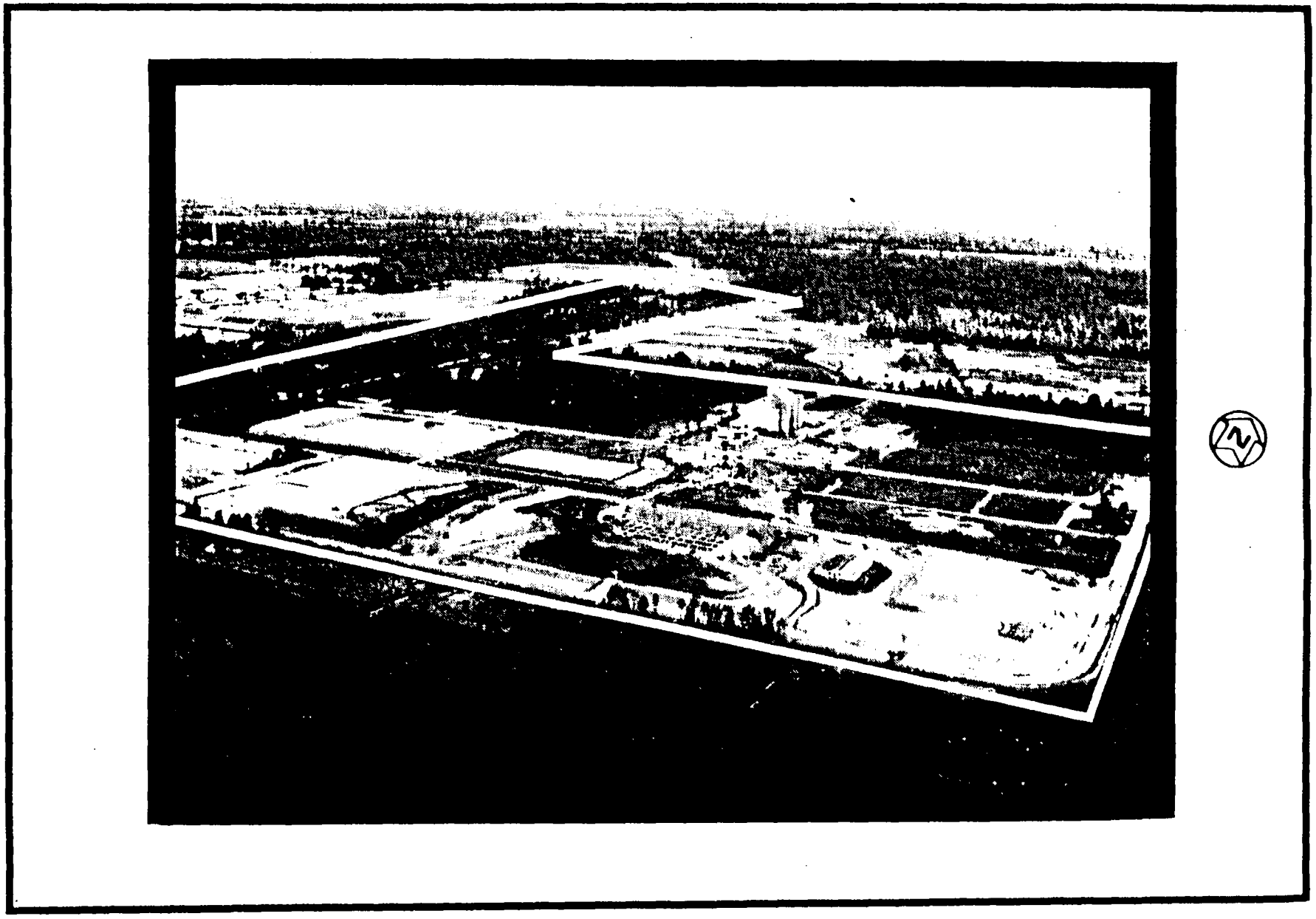

FIGURE 1-2 AERIAL VEIW OF NFSS

II. HISTORY

NFSS is a remnant of the original 1,511-acre site that was used during World War II by the Manhattan Engineer District (MED) project and was a portion of the Department of the Army's Lake Ontario Ordnance Works. Except for nonradioactive boron-10 enrichment operations conducted from 1954 to 1958 and from 1964 to 1971, the site's major use from 1944 to the present has been for storage of low-level radioactive residues resulting from the production of uranium during the MED project and subsequent Atomic Energy Commission (AEC) projects.

The first materials to arrive at the site were low-grade residues and by-products from the Linde Air Products Division of Union Carbide Corporation in Tonawanda, New York (L-30, L-50, and R-10 residues), and from the Middlesex Sampling Plant (MSP) in Middlesex, New Jersey (F-32 residues). The L-30 and L-50 residues were stored in Buildings 411, 413, and 414, and the F-32 residues were stored in the recarbonation pit directly west of Building 411. The R-10 residues, as well as associated iron cake, were stored in an open area north of Building 411. These residues were subject to environmental processes that transported contaminants into the soil and drainageways, resulting in contamination of other portions of the site and off-site drainageways. The small quantity of Middlesex sands resulting from decontamination activities at MSP was stored in Building 410. In 1949, pitchblende residues (the K-65 residues) resulting from uranium extraction operations conducted at a St. Louis plant were transported to the site in drums. Some of these were stored outdoors along existing roads and rail lines; others were stored in Building 410. Between 1950 and 1952, the K-65 residues were transferred to a concrete water tower (Building 434) modified to receive and contain the residues.

In 1979, Battelle Columbus Laboratories performed a comprehensive radiological survey of NFSS. Battelle published its findings in June 1981 (Ref. 2), and the report served as the basis for interim remedial action planning at the site.

III. SUMMARY OF REQUIRED ACTIONS

Since 1980, various steps have been taken at NFSS to minimize potential radiological risks and prevent migration of residues. In the fall of 1980, the vent at the top of Building 434 (the former water tower in which the K-65 residues were stored) was capped to reduce emissions of radon to the environment.

In 1981, remedial action was performed on a triangular-shaped area located just beyond NFSS. Approximately 450 yd^3 of contaminated material was excavated from this vicinity property and subsequently relocated to the R-10 waste storage area.

In 1982, Buildings 413 and 414 (used for storing the L-50 residues) were upgraded and sealed. To prevent further migration of residues, contaminated soil near the R-10 pile was moved onto the pile, and a dike and cutoff wall were constructed around the R-10 area. The R-10 pile area was then covered with an ethylene propylene diene monomer (EPDM) liner, which markedly reduced radon emanation from the R-10 area.

In 1983 and 1984, the dike was extended around Building 411, the EPDM liner was removed, additional contaminated soil and rubble from on- and off-site areas were placed on the pile, the pile was covered with the first layer of the interim clay cap, and the superstructures of Buildings 410 and 411 were removed. In 1984, 77 percent of the K-65 residues were transferred from Building 434 to Building 411.

Construction activities during 1985 included completion of the transfer of K-65 residues from Building 434 to the Interim Waste Containment Facility (IWCF), demolition of Buildings 423 and 434, remedial action on vicinity properties near the site, and continuation of installation of the cap over the wastes in the IWCF. These activities involved excavating approximately 14,000 yd^3 of contaminated materials from on- and off-site areas, transferring 1,450 yd^3 of building rubble to the IWCF, and treating and discharging 3,183,000 gal of impounded water in accordance with State Pollutant Discharge Elimination System (SPDES) permit requirements, as determined by the New York State Department of Environmental Conservation (NYSDEC).

During 1986, the cap over the residues in the 10-acre IWCF was closed, Building 409 was demolished, and organic rubble

was removed and disposed of in the organic materials burial area. Building 409 inorganic material was left in the basement, where voids were filled with concrete. Building 430 was reduced to rubble, which was allowed to remain on the foundation slab. Buildings 431 and 432, the radium vaults, were decontaminated and then demolished because they were structurally unsound. Dewatering of residues was completed. Geotechnical instrumentation was installed in the waste containment area and 36 monitoring well installations were completed.

In FY 1987, two holding ponds used to support water management were demolished and site construction forces were demobilized.

Remedial action was completed in 1988 on 80 isolated areas of residual radioactivity on the site. With the exception of one spot that exhibited chemical contamination and could not be cleaned up, this remedial action completed all radiological cleanup for the site. Remaining actions include investigating the extent of chemical contamination on the site, finding a permanent solution for disposal of the K-65 residues with which the U.S. Environmental Protection Agency (EPA) will concur, upgrading or closing on-site wells not meeting specifications, and removing asbestos from Building 401 followed by its demolition and disposal.

The major documentation expected to be prepared for this site is summarized in Table III-1. Section VII, Bibliography, identifies site reports published since the site was designated.

TABLE III-1

LIST OF DOCUMENTS

Document Name
1. Site designation
2. Characterization report
3. Engineering evaluation of remedial action alternatives
4. Action description memorandum
5. Environmental impact statement
6. Record of decision
7. Environmental monitoring reports
8. Closure/post-vlosure plan
9. Performance monitoring report
10. Post-remedial action report - 1983/84
11. Post-remedial action report - Off-site Post-remedial action report - On-site
12. Verification report
13. Certification docket - Off-site Certification docket - On-site
14. Final waste containment design report

IV. REMEDIAL ACTION

A. Site Characterization and Scoping

In 1981, Battelle Columbus Laboratories first characterized NFSS and the Central Drainage Ditch (Ref. 2). The on-site portion of the Battelle survey was supplemented by Bechtel National, Inc. (BNI) in 1984; this supplemental survey consisted of scan surveys and soil sampling of railroad beds, roads, major drainage ditches, building foundations, and known burial areas. With the following exceptions, all areas of contamination in excess of applicable remedial action criteria were noted by both surveys; exceptions included the area adjacent to Building 434 and Buildings 401, 409, and 423 (Figure IV-1). Vicinity properties were surveyed and designated in 1983 and 1984 by Oak Ridge Associated Universities (ORAU). The methodology and findings of these characterizations are described in Refs. 3 through 29.

The site characterization resulted in the identification of buildings, soils, and vegetation contaminated in excess of remedial action guidelines. Additionally, stored and buried residues were found to emanate radon in excess of current guidelines. The most significant areas of contamination and associated hazards found on the site were as follows.

- The five residue storage buildings (410, 411, 413, 414, and 434) located on the site represented a total estimated volume of 14,500 yd^3. In addition, three associated buildings were significantly contaminated with residues.

- Buildings 423, 431, and 432 were found to have significant surface contamination.

- Approximately 10.4 acres of the 191-acre site were found to contain 81,500 yd^3 of contaminated soil with radium-226 concentrations in excess of guideline levels.

- A total length of 19,650 ft of the primary on-site and adjacent off-site drainage ditches were found to contain 28,600 yd^3 of sediments having radioactive concentrations in excess of the 5-pCi/g guideline for radium-226.

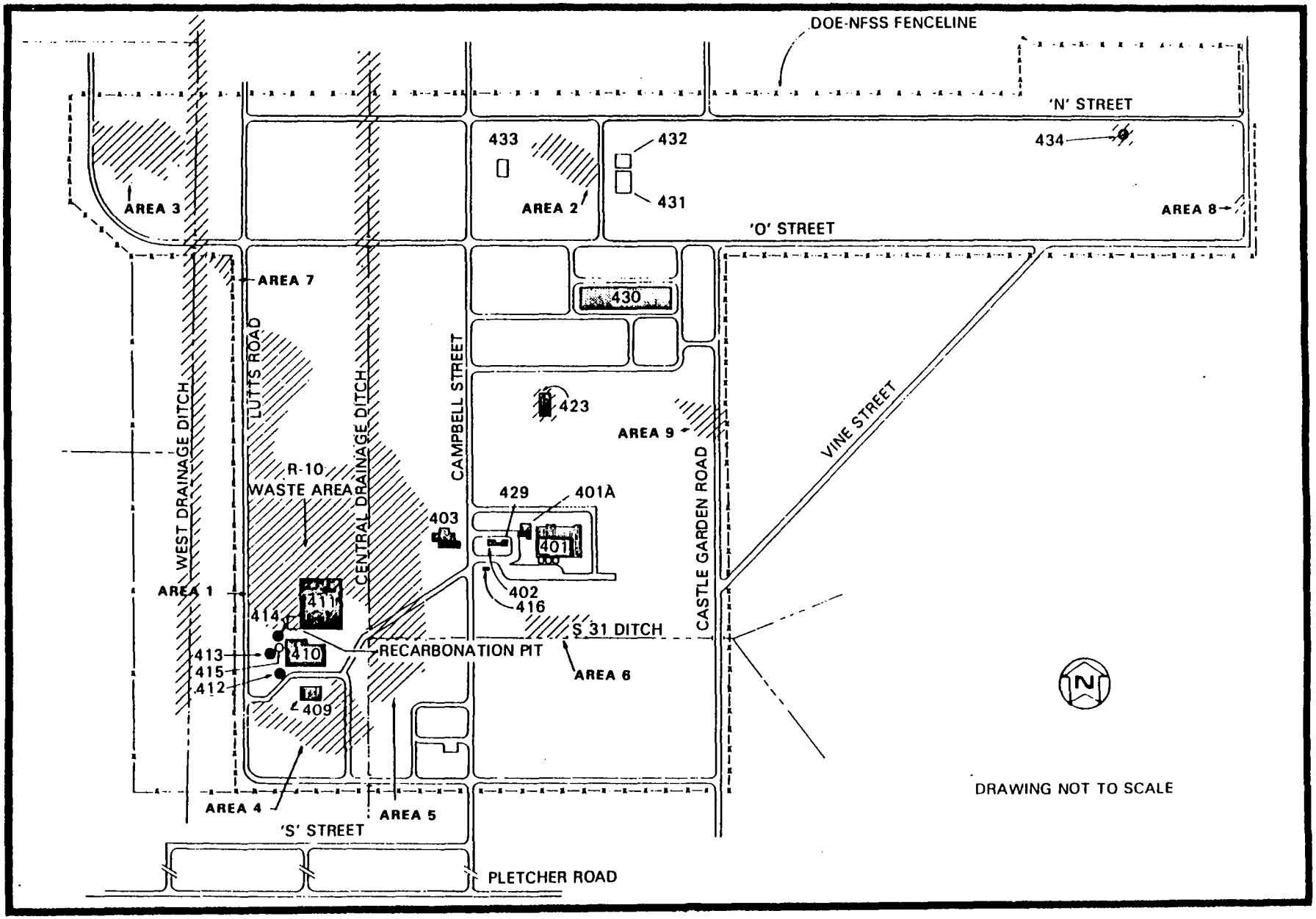

FIGURE IV-1 CONTAMINATED LAND AREAS AT NFSS PRIOR TO INTERIM REMEDIAL ACTIONS

- Radon-222 levels in air in the southwest storage area ranged from 1 to 440 pCi/L. The New York state standard for controlled areas is 30 pCi/L. The maximum atmospheric radon-222 concentration at the site perimeter was 5.7 pCi/L. These concentrations exceeded the standard of 3 pCi/L for uncontrolled sites. The source term responsible for elevated atmospheric radon-222 was found to be the southwest on-site storage area, which included the R-10 residues and three residue storage buildings.

1. Preparation for Characterization

In preparation for the radiological characterization survey, visits were made to assess the physical characteristics of the site and obtain access agreements and permits. Historical research included reviews of various inventory records, radiological and chemical analysis results, and the processes used to extract uranium.

2. Performance of Characterization

A comprehensive designation survey of off-site properties was performed by the Radiological Site Assessment Program of ORAU during 1983 and 1984. The objective of the survey was to provide a comprehensive assessment of the radiological conditions and associated potential health effects, if any, on off-site properties. Radiological information collected included:

- Direct gamma exposure rates and surface beta-gamma dose rates
- Locations of elevated surface residues
- Concentrations of radionuclides in surface and subsurface soil
- Concentrations of radionuclides in subsurface water
- Concentrations of radionuclides in sediment from major drainage ditches on the property

Characterization of the site and vicinity properties centered on the identification and quantification of radioactive contamination. The characterization included (1) residues, (2) buildings and other structures, (3) undeveloped land, (4) drainage pathways, and (5) saturated zones.

The residues stored within buildings at the site were physically and chemically characterized to provide data necessary for evaluations of alternative extraction, storage, and disposal options.

Buildings and other structures on the site were radiologically characterized using a 2-m by 2-m grid for instrument and smear analyses of all interior surfaces of buildings not used for residue storage. A minimum of 30 percent of surfaces were surveyed in buildings having significant inaccessible areas. Foundations and concrete pads were also surveyed. Residue storage buildings and associated structures were characterized to determine chemical and radiochemical properties, radon concentrations, and radiological exposures associated with the stored residues.

Undeveloped land was radiologically characterized by instrument surveys, total activity screening of surface soil samples, and quantitative analyses of selected samples from a 15-m by 15-m grid established throughout the site. Depth profiles were established. Thermoluminescent dosimeters were used to establish gamma and X-ray exposures in both background and significantly contaminated areas. Permanent monitoring wells were established in saturated zones of on-site coring locations in several contaminated areas. Radon levels in air and contaminant concentrations in vegetation were established in both background and contaminated areas.

Ditches and creeks draining the site were investigated to determine contamination exceeding DOE guidelines in sediments. Off-site migration was quantified by investigating all potential drainage pathways from the site to Lake Ontario. Subsurface migration of contaminants was evaluated by characterizing saturated zones in the primary contaminated areas and at the west and north boundaries of the site. Initial instrument surveys

were conducted in the on-site drainage pathways using survey meters to measure gamma rates at a distance of 1 m and beta-gamma rates at a distance of 1 cm above the surface. Off-site sampling was conducted at intervals of 100 ft, and the samples were analyzed for radium-226; a few selected samples were analyzed for chemical contaminants.

Radionuclides of particular interest were total uranium, radium-226, radon-222 and its particulate alpha-emitting daughters, and lead-210. Metals emphasized included lead, copper, cobalt, chromium, arsenic, nickel, titanium, zinc, and zirconium.

3. Reporting

The designation survey results are reported in Refs. 2 through 29. These survey results were used for design engineering. No additional characterizations were performed.

4. Further Characterization

Additional characterization may be needed to determine the presence, absence, or extent of chemical contamination.

B. Preliminary Engineering

The goal of engineering activities was to develop a method for interim disposal of radioactive wastes at NFSS and vicinity properties with the ability to upgrade to a final disposal facility. As an interim step in the process of developing a method for permanent disposal of the waste material, radioactive wastes at NFSS and vicinity properties were consolidated within the IWCF. This consolidation provided for more stable and improved storage conditions, minimized exposure of workers and the public to radiation, and will ensure compliance with DOE orders and all other applicable federal and state regulations; however, the consolidation will not jeopardize or preclude any long-term option for the site. The design of the IWCF fulfills DOE requirements for waste containment, environmental protection, and personnel radiation protection. The construction materials and methods specified meet or exceed established criteria and standards and are consistent with the passive design concept assumed for the

containment facility, which is designed to meet all requirements for a minimum of 25 years. Details of the design are discussed in Design Report for the Interim Waste Containment Facility at the Niagara Falls Storage Site (Ref. 30).

To alleviate EPA concerns over the permanent storage of the K-65 residues, DOE is investigating alternatives for long-term management. As part of this effort, researchers at Pacific Northwest Laboratory in Richland, Washington, have been contracted to conduct a bench-scale test of in situ vitrification, a potential technique for further immobilization of radioactive material contained in soil. The bench-scale test is designed to provide a realistic assessment of the feasibility, potential benefits, and risks of in situ vitrification before any large-scale implementation of this technology. Technical concerns to be addressed will include process performance and waste form characteristics.

Various options for the ultimate configuration of the site are discussed in Section D, Design Engineering.

C. Environmental Compliance

An action description memorandum (Ref. 31) was issued in 1983. The final environmental impact statement (Ref. 1) was published in April 1986, followed by issuance of the DOE record of decision (ROD) (Ref. 32) on the long-term disposition of NFSS in August 1986.

The ROD (Ref. 32) selects an alternative for on-site management of the wastes. On-site, long-term management of the residues will be subject to compliance with EPA disposal criteria when they are developed. For the radioactive wastes at NFSS, DOE has selected long-term, in-place management consistent with the guidance provided in the EPA regulation for uranium mill tailings (40 CFR 192). For the radioactive K-65 residues at NFSS, it is DOE's intent to provide for long-term, in-place management consistent with future applicable EPA guidance. If future analyses show that in-place management cannot meet EPA guidance, another option will need to be selected that meets EPA guidance and is environmentally acceptable. Further environmental compliance review is anticipated subsequent to additional design of the long-term facility for the radioactive residues.

D. Design Engineering

In early 1984, an evaluation of remedial action alternatives for the final disposal of radioactive wastes at NFSS was performed. The final environmental impact statement (Ref. 1) indicated the preferred alternative to be long-term management at NFSS indefinitely. The following design engineering activities will be undertaken to implement the ROD.

- Subcontract packages will be prepared to: relocate the 10-in. potable water line to the town of Lewiston, relocate Lutts Road, relocate and install the perimeter security fence, install an additional intrusion barrier over Building 411, install the final cap, replace or close wells, remove asbestos from Building 401 and demolish it, and remove the last remaining contaminated spot.

- An addendum to Design Report for the Interim Waste Containment Facility at the Niagara Falls Storage Site (Ref. 30) will be issued to document the design of the final waste containment configuration selected by DOE.

- To resolve EPA concerns over long-term management of the K-65 residues, data will be gathered during bench-scale testing of the in situ vitrification process at Pacific Northwest Laboratory and large-scale implementation of the technology will be assessed.

F. Site Access

Access to the site is controlled by a 7-ft chain-link fence that is routinely inspected and repaired.

G. Remedial Action Operations

1. Site Conditions Prior to Remedial Action

Radiological conditions at the NFSS prior to remedial action were reported by Battelle in 1981 (Ref. 2). In 1981, contamination was present on several on-site land areas, in residues stored in various locations on the site, and in the on- and off-site drainage areas contaminated as a result of erosion and

migration of radioactive materials. In addition, several vicinity properties located adjacent to or near NFSS were known to be contaminated in excess of DOE guidelines.

These contaminated areas are described in Section IV-A of this plan and in Ref. 2. Figure IV-1 shows the features of NFSS and the structures at the site before initiation of remedial action.

2. Completed and Continuing Remedial Action

Remedial action at NFSS is conducted in accordance with the DOE Niagara Falls Storage Site Project Management Plan (Ref. 33), which requires consolidation of the residues and wastes within an engineered waste containment area.

Over the past 14 years, various remedial action activities have been conducted at NFSS. In 1972, approximately 15,000 yd^3 of contaminated material was excavated from off-site areas and placed on the R-10 pile at the site (Ref. 33).

Major remedial action activities accomplished from 1981 through 1988 are summarized below.

1981

- Removed approximately 450 yd^3 of contaminated material from an off-site area and stored it at the NFSS

1982

- Stabilized R-10 residues
- Developed and put into service the site water treatment facility and vehicle decontamination facility

1983

- Performed on-site/off-site cleanup (approximately 54,000 yd^3 of contaminated material was excavated and placed in the waste containment area)

- Developed waste containment area
- Demolished Building 412
- Prepared Building 410 for storage of water during slurry transfer operations in Building 411

1984

- Began cap construction with the placement of a 3-ft-thick clay blanket on the northern portion of the IWCF
- Completed demolition of Buildings 410 and 415
- Began removal of K-65 residues from Building 434

1985

- Placed a 3-ft-thick clay blanket on the southern portion of the IWCF
- Completed removal of K-65 residues from Building 434
- Demolished Buildings 423 and 434
- Constructed temporary ponds for water treatment
- Closed Ponds 1 and 2

1986

- Performed final cleanup of several on-site areas and approved off-site properties
- Demolished Building 409
- Closed Pond 5 and the north, south, east, and west ponds
- Completed site demobilization
- Began installation of monitoring wells and moisture detection system instrumentation

1987

- Completed installation of monitoring wells and moisture detection system instrumentation
- Closed Ponds 3 and 4
- Repaired perimeter fence in several locations
- Performed maintenance of IWCF
- Removed buried drums from vicinity property G and stored them on site

1988

- Completed cleanup of 81 hot spots from on-site and ditch repair

3. Site Conditions After Completion of Remedial Action

During remedial action, the residues and radioactively contaminated soils, sediments, and building rubble were emplaced and compacted within the confines of the IWCF (Figure IV-2). The K-65 residues (transferred from Building 434) are segregated in Building 411 (within the IWCF).

4. Remaining Remedial Action

Remedial action consistent with the design engineering is still required to remove the one remaining radioactively contaminated spot, remove asbestos from Building 401, demolish Building 401, and install the long-term cap.

H. Waste Transportation

All collected wastes are currently stored at NFSS. The alternative preferred by DOE for final disposal (long-term management at NFSS indefinitely) does not require further transportation of wastes, provided that future EPA guidance does not preclude long-term management of residues at NFSS.

I. Site Surveillance and Maintenance

The preferred alternative for final disposal of wastes at NFSS, long-term management at NFSS indefinitely, requires

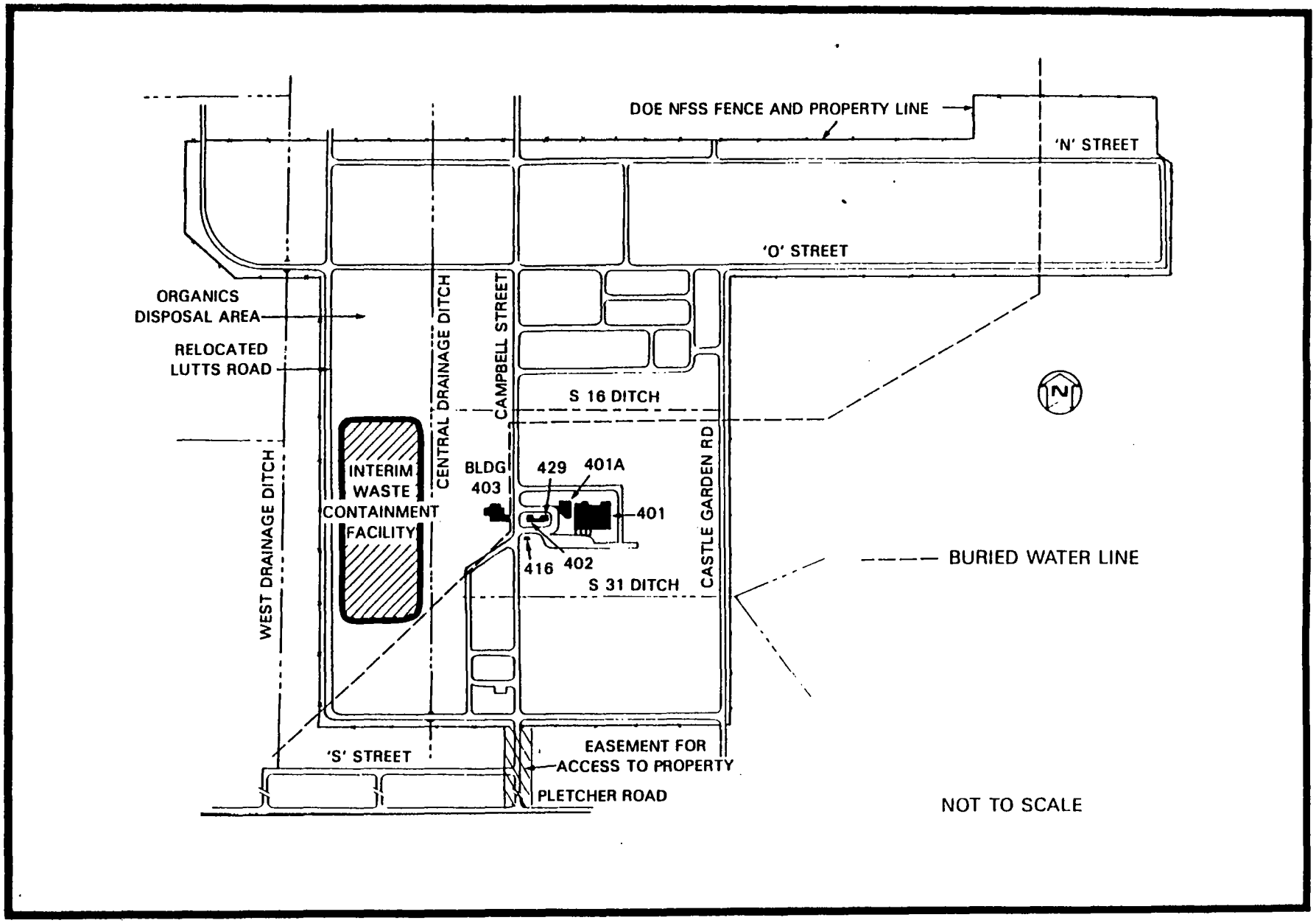

FIGURE IV-2 NFSS FOLLOWING COMPLETION OF INTERIM REMEDIAL ACTION

5 years of full maintenance and surveillance and at least 195 years of custodial maintenance and surveillance.

Surveillance of the cap will include regular performance of the following:

- o Surface - walkover inspections, grid surveys, and aerial photography
- o Subsurface - vibrating wire pressure transducer measurements, pneumatic pressure transducer measurements, and environmental monitoring

J. Final Report

Documentation of the results of remedial action performed at the site will be contained in the post-remedial action report (PRAR) and the certification docket. The PRAR describes the origin of contamination, methods used to determine the extent of contamination, types of remedial action performed, and data on the current radiological status of the site. The certification docket includes a summary of activities at the site (site history and description, radiological history and status, remedial action summary, and history of selection process); documents, illustrations, and tables supporting certification of the site; and a list of additional documents relevant to certification of the site.

V. COST AND SCHEDULE

Estimated costs associated with the portion of work specifically addressing the NFSS site during the time period covered by this plan are listed in Figures V-1 and V-2. The costs shown are in year-of-expenditure dollars. The schedule of work for FY 91 through FY 95 as illustrated in Figure V-3 and the text of this plan are based on current progress and priorities.

($000)

ACTIVITY	FY 90	FY 91	FY 92	FY 93	FY 94	FY 95
BNI						
ASSESSMENT (B&R AH-10-05-01)	-	-	-	-	-	-
CLEANUP* (B&R AH-10-05-02)	1,124	2,265	530	3,855	5,885	3,915
SUBTOTAL	1,124	2,265	530	3,855	5,885	3,915
ANL	-	-	-	-	-	-
HQ	-	-	-	-	-	-
TOTAL	1,124	2,265	530	3,855	5,885	3,915
NOTE: Dollars are BA						

*Cleanup costs include costs for surveillance and maintenance of the site.
See Section IV-I for a description of surveillance and maintenance activities.

FIGURE V-1 SFMP, NIAGARA FALLS STORAGE SITE BUDGET

FY90 DETAIL — NIAGARA FALLS STORAGE SITE, NY

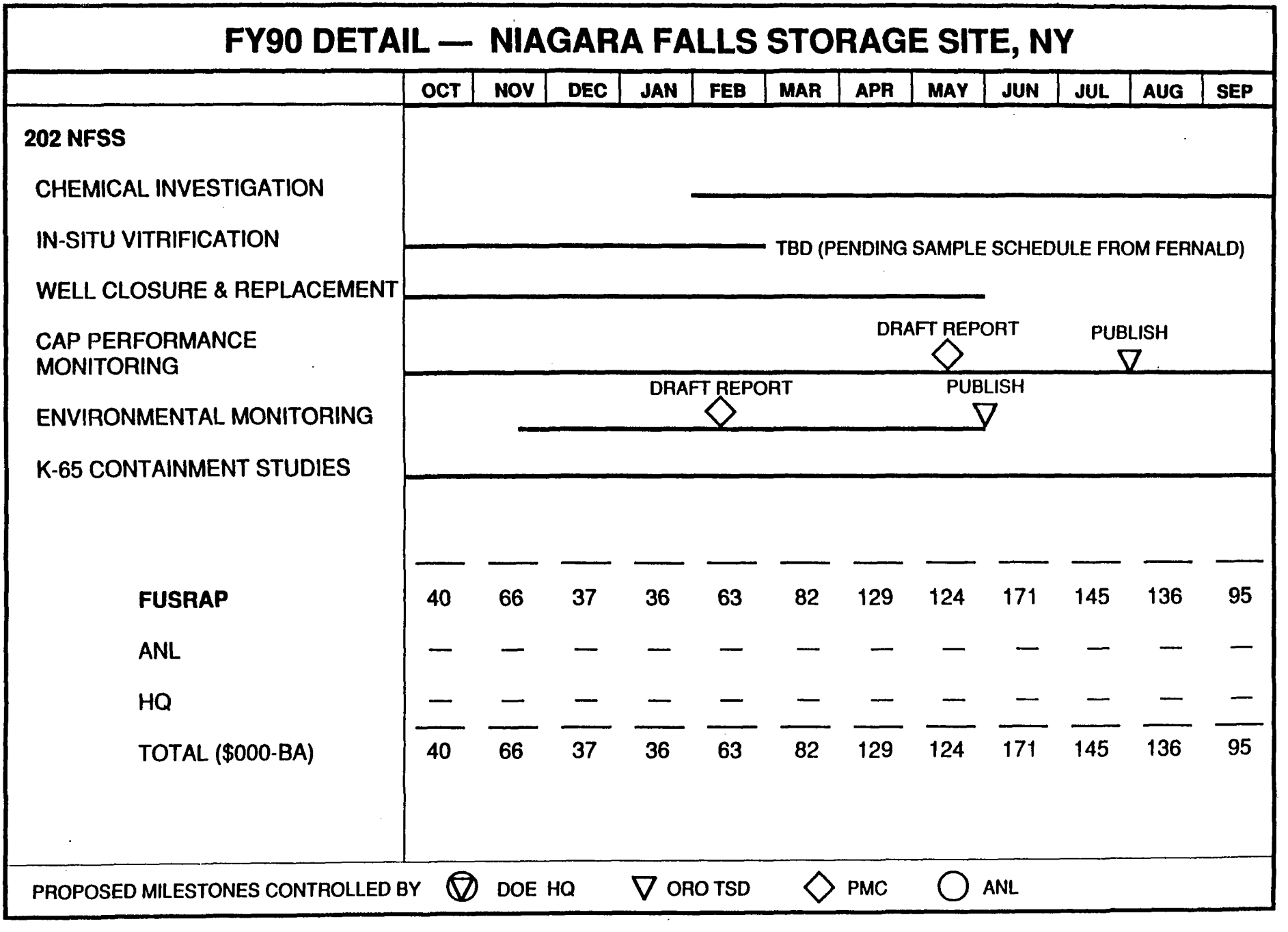

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FIGURE V-2 FY 90 DETAIL

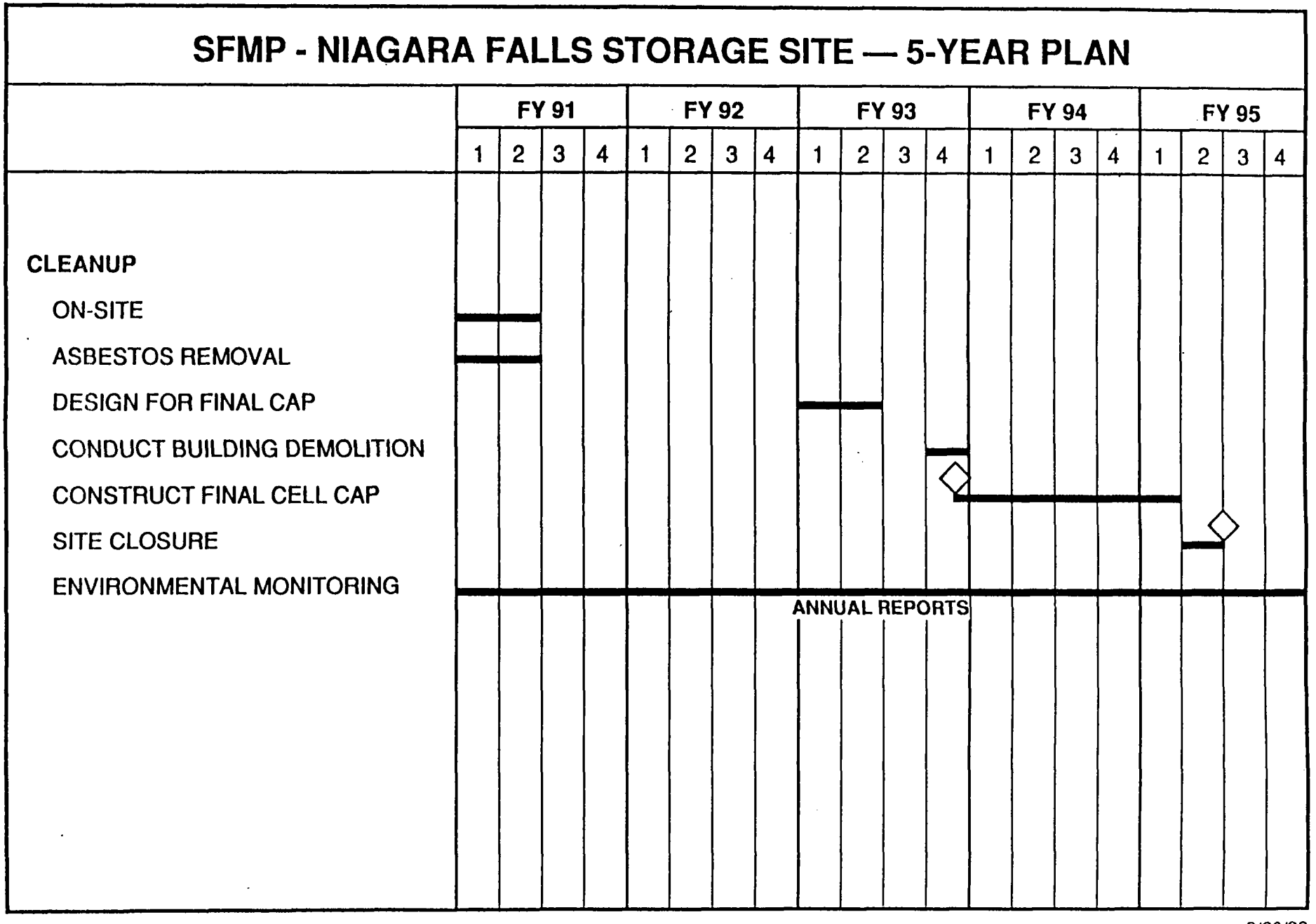

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FIGURE V-3 FY 91 - 95 SCHEDULE

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