INITIAL ASSESSMENT STUDY

NAVAL COMPLEX (NC) GREAT LAKES, ILLINOIS

UIC: N00210

Prepared by:

Rogers, Golden & Halpern
1216 Arch Street, Sixth Floor
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in association with

BCM Eastern Inc.
One Plymouth Meeting Mall
Plymouth Meeting, Pennsylvania 19462

Contract No. N62474-84-C-3386

Initial Assessment Study Team Members

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Roger D. Moose, Project Manager/Hydrogeologist
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Prepared for:

ENVIRONMENTAL RESTORATION DEPARTMENT
Naval Energy and Environmental Support Activity
Port Hueneme, California 93043

March 1986

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EXECUTIVE SUMMARY

This report presents the results of an Initial Assessment Study (IAS) conducted at the Naval Complex (NC) Great Lakes, North Chicago, Illinois. NC Great Lakes consists of the Naval Training Center (NTC), the Naval Hospital (NAVHOSP), and the Public Works Center (PWC). The purpose of the IAS is to identify and assess sites posing a potential threat to human health or to the environment due to contamination from past hazardous materials operations.

Based on information from historical records, aerial photographs, field inspections, and personnel interviews, a total of 14 potentially contaminated sites were identified at NC Great Lakes. Each of the sites was evaluated with respect to contamination characteristics, migration pathways, and pollutant receptors.

Both surface water and ground water are potential contaminant migration pathways in the study area. Runoff from the activity may enter either Skokie Ditch or Pettibone Creek; furthermore, ground water supplies much of the flow for Pettibone Creek and may supply water for intermittent flow in Skokie Ditch. Although neither of these streams is used as a source of potable or industrial water in the immediate area of the activity, both streams do flow into other bodies of water that are used for these purposes. Moreover, Pettibone Creek flows directly into Lake Michigan, which is used extensively for sport fishing, while Skokie Ditch becomes the Skokie River, which eventually drains into the Mississippi River.

This study concludes that, while none of the sites poses an immediate threat to human health or to the environment, seven sites warrant further investigation under the Navy Assessment and Control of Installation Pollutants (NACIP) program to assess potential long-term impacts. A Confirmation Study, involving sampling and monitoring of the seven sites, is recommended to either confirm or refute the presence of the suspected contamination and to better define the extent of any problems that may exist. The seven sites recommended for Confirmation Studies are:

- Site 1, Golf Course Landfill
- Site 4, Fire Fighting Training Area
- Site 5, Transformer Storage "Boneyard"
- Site 6, Mainside Transformer Storage Area
- Site 7, RTC Silk-Screening Shop
- Site 8, Exchange Service Station
- Site 12, Harbor Dredge Spoil Area

The results of the Confirmation Studies will be used to evaluate the necessity of conducting Remedial Measures or cleanup operations at these seven sites.

This study also recommends that a cleanup operation be undertaken at Site 10, NTC Rifle Range, due to documented contamination of the site caused by the accumulation of 70 years' worth of lead in the soil.

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FOREWORD

The Department of the Navy developed the Navy Assessment and Control of Installation Pollutants (NACIP) program to identify and control environmental contamination from past use and disposal of hazardous substances at Navy and Marine Corps installations. The NACIP program is part of the Department of Defense Installation Restoration Program and is similar to the Environmental Protection Agency's "Superfund" Program authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

In the first phase of the NACIP program, a team of engineers and scientists conducts an Initial Assessment Study (IAS). The IAS team collects and evaluates evidence of contamination that may pose a potential threat to human health or to the environment. The IAS includes a review of archival and activity records, interviews with activity personnel, and an on-site survey of the activity. This report documents the findings of an IAS at the Naval Complex (NC) Great Lakes, Illinois.

Confirmation Studies under the NACIP program were recommended for seven sites at NC Great Lakes. Northern Division, Naval Facilities Engineering Command (NORTHNAVFACENGCOM) will assist NC Great Lakes in implementing the recommendations. In addition, a cleanup operation was recommended for an eighth site where a contamination problem has already been documented.

Questions regarding this report should be referred to NEESA Code 112N at AUTOVON 360-3351, FTS 799-3351, or commercial 805-982-3351. Questions concerning confirmation work or other follow-on efforts should be referred to NORTHNAVFACENGCOM Code 114 at AUTOVON 443-6280 or FTS/commercial 215-897-6280.

R. S. Moreau
LCDR, CEC, USN
Environmental Officer
Naval Energy and Environmental Support Activity

ACKNOWLEDGEMENTS

The Initial Assessment Study team commends the support, assistance, and cooperation provided by the Northern Division, Naval Facilities Engineering Command (NORTHNAVFACENGCOM); Naval Energy and Environmental Support Activity (NEESA); and personnel at Naval Complex Great Lakes. In particular, the team gratefully acknowledges the outstanding effort provided by the following people, who participated in the successful completion of the study:

- LCDR G. R. Rodriguez, Staff Civil Engineer, NTC Great Lakes
- Ken Feldhausen, Environmental Affairs Officer, NTC Great Lakes
- Elizabeth B. Luecker, Environmental Engineer, NEESA
- Gerald A. Hels, Environmental Engineer, NEESA
- David Smith, Environmental Engineer, NORTHNAVFACENGCOM
- Activity personnel who gave their time and provided details of present and past waste generation and past waste disposal practices

CHAPTER 1. INTRODUCTION

1.1 PROGRAM BACKGROUND. Past hazardous waste disposal methods, although acceptable at the time, have often caused unexpected long-term problems through release of hazardous pollutants into the soil and ground water. In response to a growing recognition of these problems, the U.S. Congress directed the U.S. Environmental Protection Agency (EPA) to develop a comprehensive national program to manage past disposal sites. The program is outlined in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of December 1980.

1.1.1 DOD Program. Department of Defense (DOD) efforts in this area preceded the nationwide CERCLA program. In 1975, the U.S. Army developed for DOD a pilot program to investigate past disposal sites at military installations. In 1980, DOD named this program the Installation Restoration Program and instructed the services to comply with program guidelines.

1.1.2 Navy Program. The Navy manages its part of the program, the Navy Assessment and Control of Installation Pollutants (NACIP), in three phases. Phase one, the Initial Assessment Study (IAS), identifies disposal sites and contaminated areas caused by past hazardous substance storage, handling, or disposal practices at naval activities. These sites are then individually evaluated with respect to their potential threat to human health or to the environment. Phase two, the Confirmation Study, verifies or characterizes the extent of contamination present and provides additional information regarding migration pathways. Phase three, the Remedial Measures, provides the required corrective measures to mitigate or eliminate confirmed problems.

1.2 AUTHORITY. The Chief of Naval Operations (CNO) initiated the NACIP program in OPNAVNOTE 6240 of 11 September 1980, superseded by OPNAVINST 5090.1 of 26 May 1983. Naval Facilities Engineering Command (NAVFACENGCOM) manages the program within the existing structure of the Naval Environmental Protection Support Service (NEPSS), which is administered by the Naval Energy and Environmental Support Activity (NEESA). NEESA conducts the program's first phase, the IAS, in coordination with NAVFACENGCOM Engineering Field Divisions (EFD's). Activities are selected for an IAS by CNO, based on recommendations by NAVFACENGCOM, the EFD's, and NEESA. Approval of the Great Lakes Naval Complex, North Chicago, Illinois, for an IAS is contained in CNO letter ser 451/5U393185 of 15 March 1985.

1.3 SCOPE.

1.3.1 Past Operations. The NACIP program focuses attention on past hazardous substances storage, use, and disposal practices on Navy property. Current practices are regularly surveyed for conformity to State and Federal regulations, and therefore are not included in the scope of the NACIP program. The IAS addresses operational nonhazardous disposal and storage areas only if they were hazardous waste disposal or storage areas in the

past. Current operations are investigated solely to determine what types and quantities of chemicals or other materials were used and what disposal methods were practiced in the past.

1.3.2 **Results.** If necessary, an IAS recommends Remedial Measures to be performed by the activity or EFD, or recommends Confirmation Studies to be administered by the EFD under the NACIP program. Based on these recommendations, NAVFACENGCOM schedules Confirmation Studies for those sites which have been determined by scientific and engineering judgment to be potential hazards to human health or to the environment.

1.4 INITIAL ASSESSMENT STUDY.

1.4.1 **Records Search.** The IAS begins with an investigation of activity records followed by a records search at various government agencies including EFD's, national and regional archives and records centers, and U.S. Geological Survey offices. In this integral step, study team members review records to assimilate information about the activity's past missions, industrial processes, waste disposal records, and known environmental contamination. Examples of records include activity master plans and histories, environmental impact statements, cadastral records, and aerial photographs. Appendix A lists the agencies contacted during this study.

1.4.2 **On-Site Survey.** After the records search, the study team conducts an on-site survey to complete documentation of past operations and disposal practices and to identify potentially contaminated areas. With the assistance of an activity point-of-contact, the team inspects the activity during ground and aerial tours, and interviews long-term employees and retirees.

Information obtained from interviews is verified by data from other sources or from corroborating interviews before inclusion in the report. If information for certain sites is conflicting or inadequate, the team may collect samples for clarification.

1.4.3 **Confirmation Study Ranking System.** With information collected during the study, team members evaluate each site for its potential hazard to human health or to the environment. A two-step Confirmation Study Ranking System (CSRS), developed by NEESA, is used to systematically evaluate the relative severity of potential problems. The two steps of the CSRS are a flowchart and a numerical ranking model. The first step is a flowchart based on type of waste, containment, and hydrogeology. This step eliminates innocuous sites from further consideration. If the flowchart indicates a site poses a potential threat to human health or to the environment, the second step, the model, is applied. This model assigns a numerical score from 0 to 100 to each site. The score reflects the characteristics of the waste, the potential migration pathways from the site, and possible contaminant receptors on and off the activity.

1.4.4 **Site Ranking.** After scoring a site, engineering judgment is applied to determine the need for a Confirmation Study or for an immediate Remedial Measure. At sites recommended for further work, CSRS scores are

used to rank the sites in a prioritized list for scheduling projects. For a more detailed description, refer to NEESA 20.2-042, Confirmation Study Ranking System.

1.4.5 Confirmation Study Criteria. A Confirmation Study is recommended for sites at which (1) sufficient evidence exists to indicate the presence of contamination and (2) the contamination poses a potential threat to human health or to the environment.

1.5 CONFIRMATION STUDY. Generally, the EFD conducts the Confirmation Study in two phases -- verification and characterization. In the verification phase, short-term analytical testing and monitoring determines whether specific toxic and hazardous materials, identified in the IAS, are present in concentrations considered to be hazardous. Normally, the IAS recommends verification phase sampling and monitoring. The design of the characterization phase usually depends on results from the verification phase. If required, a characterization phase, using longer-term testing and monitoring, provides more detailed information concerning the horizontal and vertical distribution of contamination migrating from sites, as well as site hydrogeology. If sites require remedial actions or additional monitoring programs, the Confirmation Study recommendations include the necessary planning information for the work, such as design parameters.

1.6 IAS REPORT CONTENTS. In this report, the significant findings and conclusions from the IAS are presented in Chapter 2. Recommendations are presented in Chapter 3. Chapter 4 describes general activity information, history, biology, and physical features. Chapters 5 through 8 trace the use of chemicals and hazardous materials from storage and transfer, through manufacturing and operations, to waste processing and disposal. The latter chapters provide detailed documentation to support the findings and conclusions in Chapter 2. A general location map of NC Great Lakes is shown in Figure 1-1.

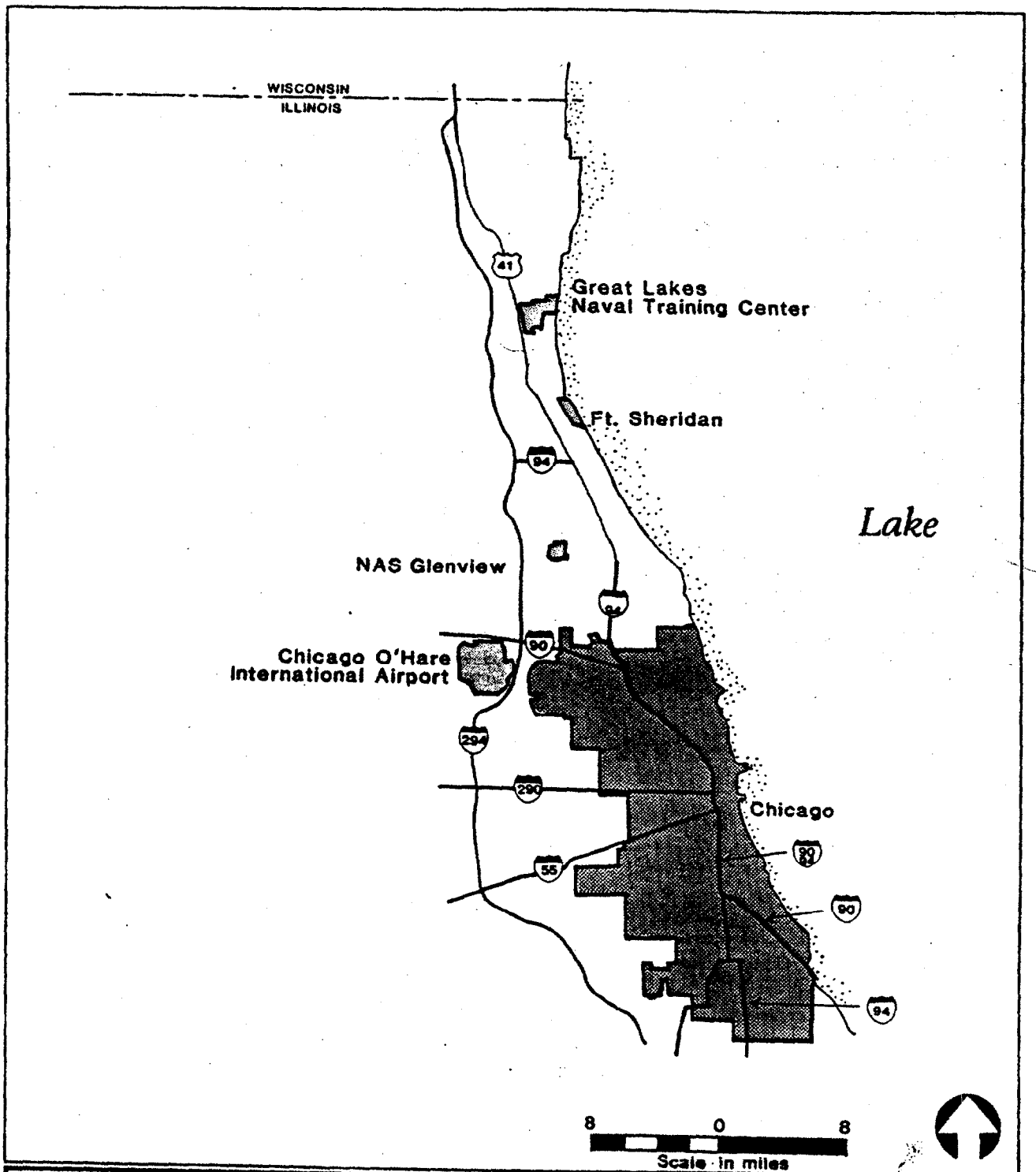


Figure 1-1

General Location Map,
NC Great Lakes

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

CHAPTER 2. SIGNIFICANT FINDINGS AND CONCLUSIONS

2.1 INTRODUCTION. This chapter summarizes the significant findings and conclusions of the Initial Assessment Study (IAS) regarding characteristics of the disposal and spill sites identified at Naval Complex (NC) Great Lakes. First, aspects of the local geology, surface drainage, and hydrogeology are discussed with regard to potential contaminant migration pathways. Next, conditions at sites recommended for Confirmation Studies are summarized. Finally, sites not recommended for Confirmation Studies are discussed.

2.2 HYDROGEOLOGY AND MIGRATION POTENTIAL. Two pathways for the migration of contaminants exist at NC Great Lakes. These pathways are ground water transport in the shallow till and sand-and-gravel aquifers, and surface water runoff to Skokie Ditch or Pettibone Creek.

2.2.1 Ground Water. NC Great Lakes is underlain by a sheet of glacial material up to 250 feet thick. This material ranges from completely unsorted to well sorted. Where unsorted, the glacial till commonly forms aquitards; sorted materials comprise local aquifers. Figure 4-8 maps the locations of buried aquifers at NC Great Lakes.

Hydraulic conductivities in till are typically very low, with values in the range of 10 to the minus 12 centimeters per second (cm/sec). The generally flat nature of these sheet-like deposits results in very low hydraulic gradients. Ground water flow through these materials is governed by these low conductivities and gradients, and is severely restricted.

Aquifers interspersed throughout the till represent pathways for the migration of pollutants. In the area of NC Great Lakes, the gravelly aquifer between the glacial till and the underlying limestone is occasionally tapped for water; this aquifer lies at a minimum depth of 170 feet. It can be concluded that there is infinitesimal likelihood of contaminants reaching this tapped aquifer.

It must be noted that NC Great Lakes is underlain by three shallower, localized aquifers. These lie at depths of 10 to 15 feet, 15 to 50 feet, and 50 feet or more beneath NC Great Lakes and the surrounding area. The shallowest of these local aquifers may serve as a conduit for the migration of polluted ground waters; it is highly unlikely that polluted ground waters can reach any of the deeper aquifers. None of these aquifers is utilized as a source of potable water. Figure 4-8 shows the location of these aquifers.

Locally, aquifers near NC Great Lakes are hydraulically connected to the local streams, and contaminated ground water from these aquifers may reach Skokie Ditch or Pettibone Creek, and then be carried off-base.

2.2.2 Surface Water. NC Great Lakes lies in two drainage basins - the North Branch Chicago River Drainage Basin and the Lake Michigan North Drainage Basin. The divide between the basins lies along Green Bay Road. Precipitation which does not infiltrate the relatively impervious surficial material will travel as overland flow into either Skokie Ditch or Pettibone Creek.

Water in Skokie Ditch is not potable or suitable for agricultural purposes. Illinois water quality standards for ammonia-nitrogen, fecal coliform, and dissolved oxygen are commonly violated in Skokie Ditch downstream from NC Great Lakes. It is doubtful that NC Great Lakes is a significant contributor to these pollution loads, as the only discharge from the activity that may reach Skokie River comes from the storm sewers that drain Forrestal Village. This condition is typical of the poor water quality in the entire North Branch Chicago River Drainage Basin (Northern Division, Naval Facilities Engineering Command (NORTHNAVFACENGCOM), 1980).

Pettibone Creek drains the Mainside area of NC Great Lakes and empties into Lake Michigan at the activity's harbor. Pettibone Creek has on occasion been a conduit for spilled chemicals generated by industrial activity immediately off-base. According to the Illinois Environmental Protection Agency (IEPA), Pettibone Creek has the highest incidence of violations of water quality parameters and the highest number of separate violations in the Lake Michigan North Drainage Basin. Sediments in the Boat Basin receive these pollutants, which accumulate therein.

Contamination from Pettibone Creek could possibly enter the water intake serving the activity, although this is not considered a serious problem due to the intake's remote location (8,000 feet offshore) and the dilution of any contamination by the waters of Lake Michigan.

2.3 SITES RECOMMENDED FOR CONFIRMATION STUDY. Of the 14 disposal or spill sites identified at NC Great Lakes, seven are recommended for Confirmation Studies. Figures 2-1a and 2-1b show the locations of these sites.

2.3.1 <u>Site 1, Golf Course Landfill</u>. The Golf Course Landfill (Figure 2-2) is a 49-acre site, located at the northwestern corner of NC Great Lakes. The site is located under the fairways, greens, and tees of at least 12 holes of the present Golf Course. The northern and western boundaries of the site are also activity boundaries. The Fire Fighting Training Area forms parts of the southern and eastern boundaries of this disposal area.

The site was the active disposal area for NC Great Lakes during the period 1942 through 1967. There was a hiatus during the years when the land title was passed to the Veterans' Administration. No record of other land disposal areas existing during this time period was found. It is estimated that as much as 1.5 million tons of material may have been burned or disposed of at this site. In 1967, the area was closed and covered with ash and a thin layer of topsoil.

The site was operated as a trench-burn landfill. A dragline was used for trench excavation. Each trench was approximately 8 feet wide and was dug to at least the top of the water table (6 to 8 feet in this area). Occasionally, the trenches had several feet of water standing in the bottom. General refuse and trash were disposed of directly into these trenches. Free liquid oil, such as waste engine oil, from activity shops was also disposed of in this manner. When a significant volume of material was disposed of into a trench, the pile was ignited and allowed to burn to

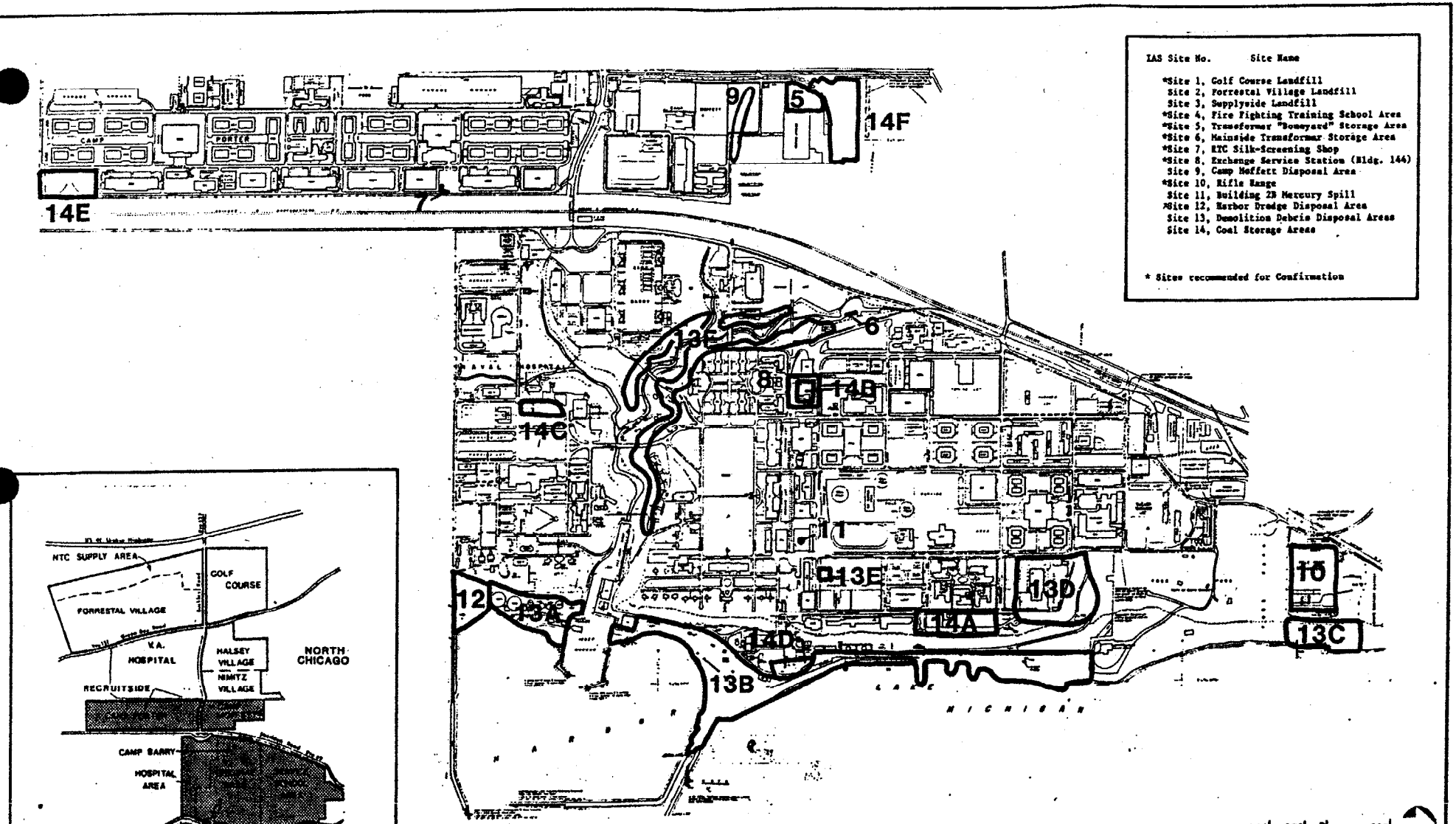


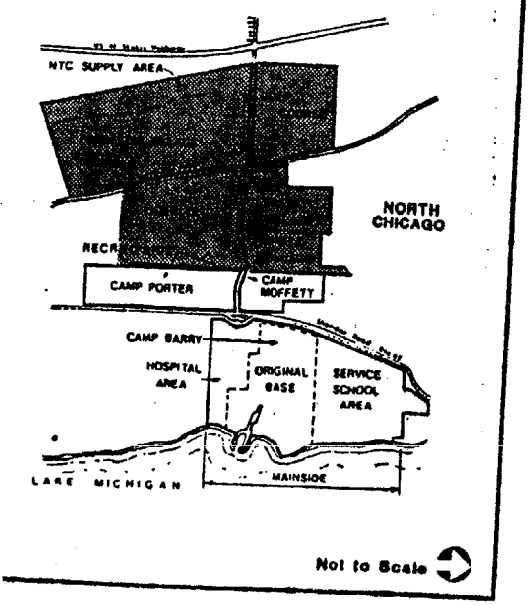
Figure 2-1a

Sites Recommended for Confirmation Studies and Other Disposal Sites

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

IAS Site No.	Site Name
*Site 1,	Golf Course Landfill
Site 2,	Forrestal Village Landfill
Site 3,	Supplyside Landfill
*Site 4,	Fire Fighting Training School Area
*Site 5,	Transformer "Boneyard" Storage Area
*Site 6,	Mainside Transformer Storage Area
*Site 7,	NTC Silk-Screening Shop
*Site 8,	Exchange Service Station (Bldg. 144)
Site 9,	Camp Moffett Disposal Area..
*Site 10,	Rifle Range
Site 11,	Building 23 Mercury Spill
*Site 12,	Harbor Dredge Disposal Area
Site 13,	Demolition Debris Disposal Areas
Site 14,	Coal Storage Areas

* Sites recommended for Confirmation



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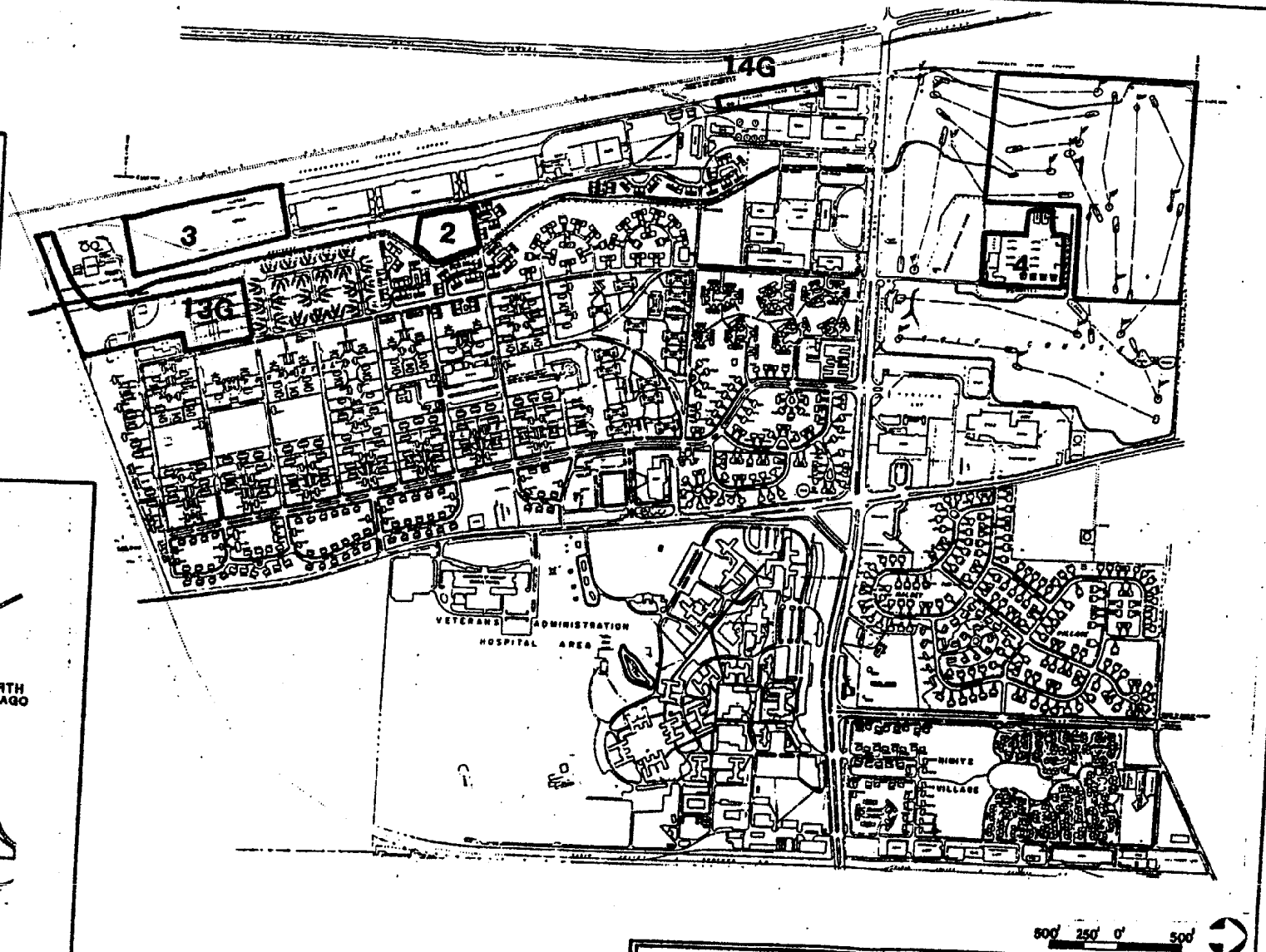

Figure 2-1b

Sites Recommended for Confirmation Studies and Other Disposal Sites

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

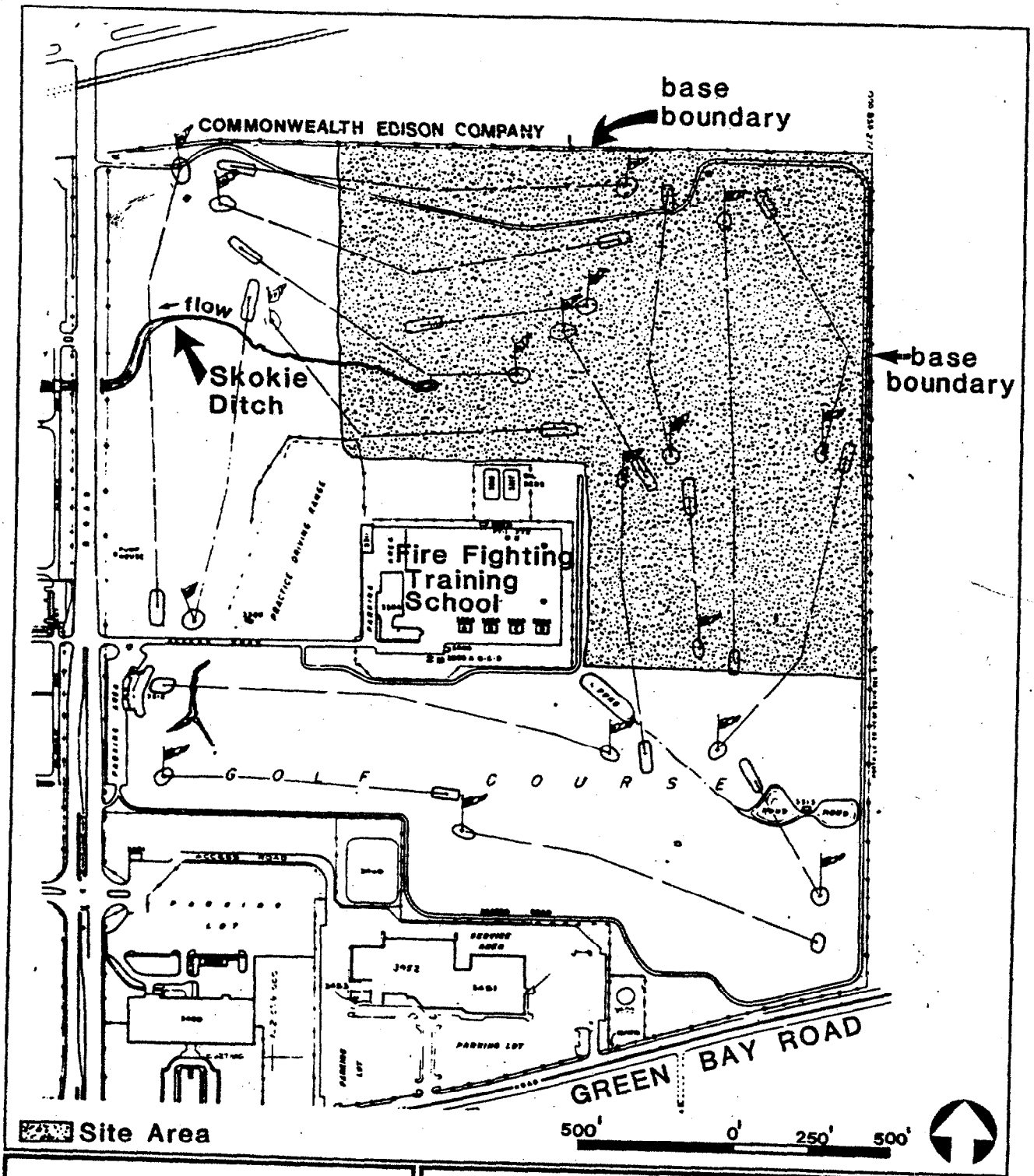

Figure 2-2

Site 1, Golf Course Landfill

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

completion. Proceeding in this manner, the trenches were progressively filled and covered from west to east and north to south.

Coal ash from the activity was also disposed of at this site. Reportedly, ash was encountered for the first several feet when holes were being dug for trees within the disposal area. Other chemicals which may have been disposed of at this site include perchloroethylene (PCE), transformer oils containing polychlorinated biphenyls (PCB's), and solvents including carbon tetrachloride, Solvent 144, and motor crankcase oil. Small volumes of other solvents and household hazardous wastes are also known to have been disposed of into the landfill.

The shallow subsurface at NC Great Lakes is composed of glacial till which has few, if any, continuous sand stringers which could carry ground water to a remote location. The primary pathway is by way of Skokie Ditch, a perennial stream which rises on the disposal site. Skokie Ditch flows in a southerly direction from the site, passing the Supplyside area of the activity and exiting from Navy property after passing the Green Bay Sewage Treatment Plant in Forrestal Village. From there, Skokie Ditch, which has become the Skokie River, discharges into the Chicago River and finally into the Mississippi River. Skokie Ditch is a sluggish, almost stagnant stream in this area, except immediately after a storm. No fishing has been reported in close proximity to the activity. After leaving the activity, Skokie Ditch passes several industrial plants and drains into the Skokie River. These plants are also potential contributors to the stream flow.

Although there is no demonstrable migration of contaminants from this landfill to Skokie Ditch, such contamination is very plausible. Potential receptors of contaminants would include fish taken from Skokie Ditch downstream of the activity and other industrial land uses, and any person entering the area; it is noteworthy that the area is fenced off to prevent people from wandering into it. Because of the variety of toxic materials which may have been disposed of there, and the close proximity of human receptors, Site 1, Golf Course Landfill, is recommended for a Confirmation Study.

2.3.2 **Site 4, Fire Fighting Training Area.** The Fire Fighting Training Area (Figure 2-3) has been in constant use since 1942. This 10-acre training area is used to train all recruits in fire fighting techniques by letting them fight practice fires in open steel tanks and in smoke practice buildings. These fires are set with #2 fuel oil which is floated on water. Gasoline is used to ignite the fuel oil.

In about 1979, a centrifugal oil/water separator was installed in the waste line between the training areas and the lagoons (located west of the training area) to which the wastes generated by the training exercises are directed. Oil removed from the separator and residual oil skimmed manually from the lagoons was drummed and the 55-gallon drums were stored along the western fence line of the training area.

From 1942 to 1979, waste petroleum, oils, and lubricants (POL's) and waste solvents from other NC Great Lakes activities were also collected in this

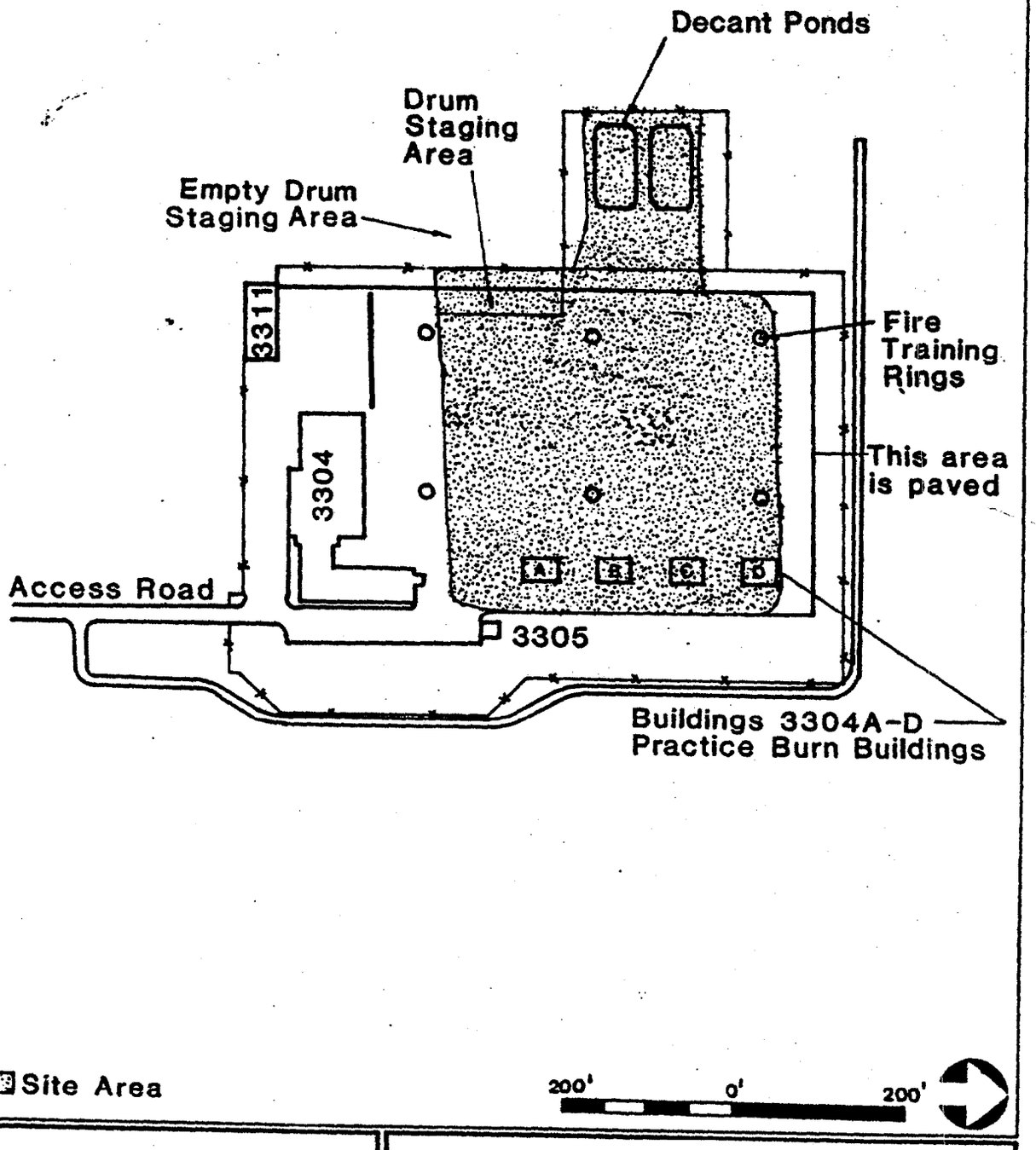

Figure 2-3

Site 4, Fire Fighting Training Area

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

area. Some of this material was burned in the training exercises on an as-available basis. The remainder, also in 55-gallon drums, was allowed to accumulate along with the oil that had been skimmed from the lagoons and removed from the separator. The practice of accepting these materials was discontinued in 1979; however, the storage of the approximately 300 drums that had accumulated continued until 1983, when the first of a series of contracts were let with waste disposal firms to haul away the liquid wastes which were stored in these drums. All of the drums had been emptied by the spring of 1985, and the empty drums were awaiting disposal as scrap by the Defense Reutilization and Marketing Office (DRMO), formerly the Defense Property Disposal Office (DPDO).

The area where the 300 drums were stored is a soil pad and is heavily soaked with residual oil from spillage. The area is not diked, and runoff could reach the Skokie Ditch during heavy rains.

Specific chemicals which may have been stored in the drums include Solvent 144, turpentine, gasoline, #2 diesel fuel, crankcase motor oil, and antifreeze. Degradation of some of this material before it entered the soil and limited evaporation of the more volatile components of gasoline and solvents before they got below the top 6 inches of soil are likely.

Given the possibility of contamination from the solvents and gasoline used in the liquid waste-burning episodes of the past, and the potential migration of any contaminants lost to the environment into Skokie Ditch, the pathways and potential receptors are the same as those described for the Golf Course Landfill. Individuals entering the fenced area and the wildlife (fish) in Skokie River are the main receptors identified. Site 4, Fire Fighting Training Area, is recommended for a Confirmation Study.

2.3.3 <u>Site 5, Transformer Storage "Boneyard"</u>. Located in the northern end of Camp Moffett, the Transformer Storage "Boneyard" area (Figure 2-4) is southwest of Building 1517, east of the Elgin, Joliet & Eastern Railroad right-of-way. From 1945 to 1985, this location was the primary storage area for out-of-service transformers, including those filled with PCB oils. Prior to 1985, stored transformers were moved about within the entire storage area and, at one time or another, could have been anywhere within the area. In 1985, the PCB transformers were moved into a storage facility specifically designed to hold them (Building 1405). There are currently about 40 non-PCB transformers and capacitors in storage in the area.

Waste materials in the Transformer Storage "Boneyard" included transformer oils, PCB transformer oils, and lead insulation from high voltage cables. Four surface soil samples collected in the Transformer Storage "Boneyard" in 1984 had PCB levels of between 50 and 100 parts per million (ppm). These wastes are for the most part tied up in the shallow soils; the most likely migration pathway is being tracked out on vehicular tires or the shoes of employees who walk in that area. Receptors would thus include those employees who frequently work in the Transformer Storage "Boneyard" and those who work in nearby areas to which "Boneyard" employees may track the contaminated soils. Site 5, Transformer Storage "Boneyard," is recommended for a Confirmation Study.

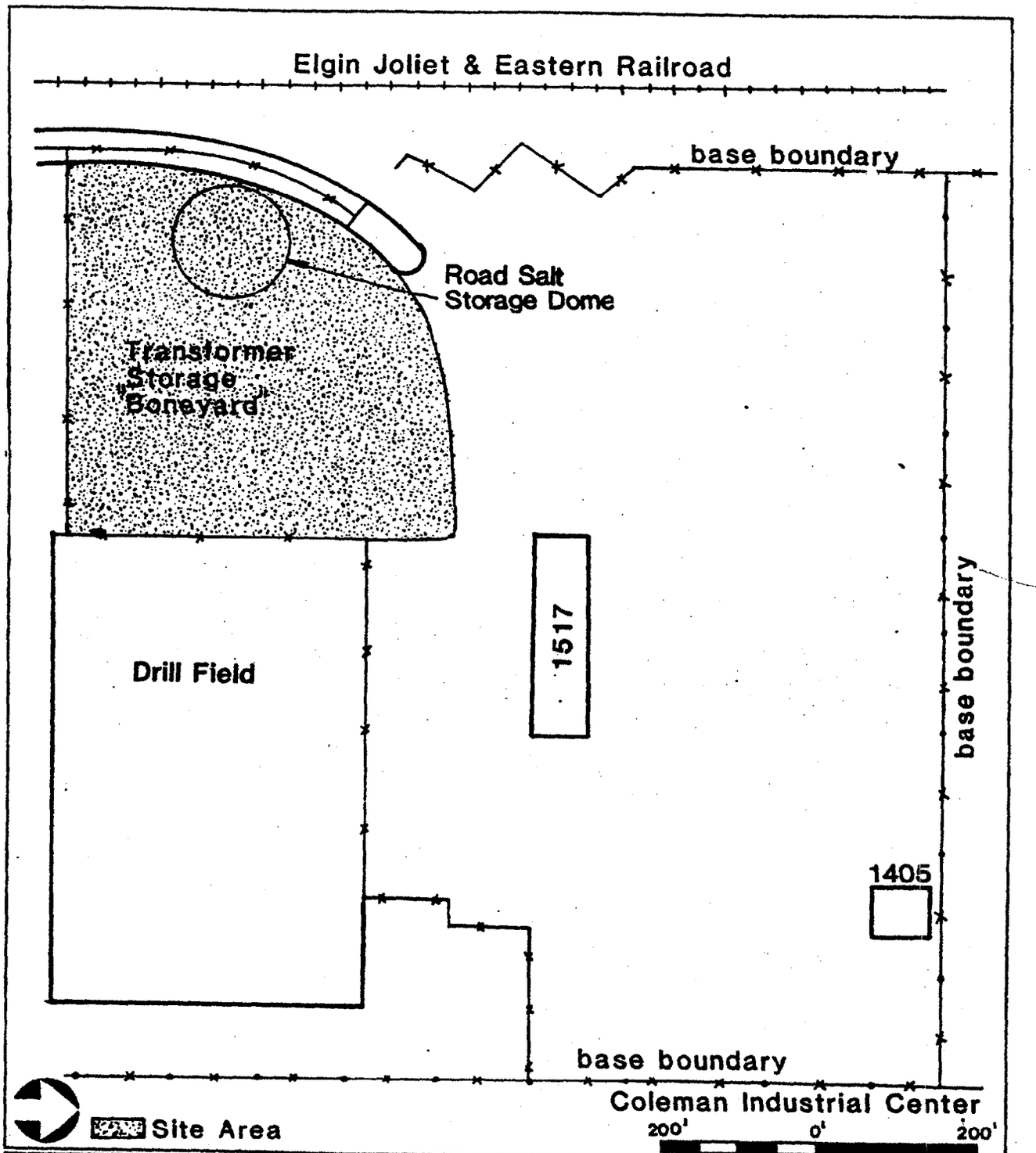

Figure 2-4

Site 5, Transformer Storage "Boneyard"

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2.3.4 Site 6, Mainside Transformer Storage Area. Six transformers containing PCB oils were stored from 1979 to 1981 on the basement floor (a dirt floor) of Building 226 (Figure 2-5). The basement floor is at grade with the ground surface immediately west of the building. The building has since been razed to the foundation level. These foundation walls remain standing, and act as bulkheads to maintain the higher ground elevations found on the east side of the building.

While the transformers were stored there, vandals removed the tops of six of them and spilled the contents out on the ground prior to stripping out the copper. The entire liquid contents of the transformers (totaling approximately 132 gallons of PCB oil) was lost. No cleanup of the site was made.

During the on-site visit, a tour of the disposal site was made. The soils inside the foundation wall were stained with oil, especially in the southeast corner of the foundation area. This was the only area of the foundation without a thick stand of weeds.

Pathways include possible erosion of the contaminated soils into a nearby storm sewer inlet which discharges into Pettibone Creek; contaminants could also be picked up by the shoes of casual visitors who may wander into the area. The area is not secured, but is substantially off the beaten track, even of the jogging trail which passes nearby. Potential receptors include the fish and organisms of Pettibone Creek, the harbor, and Lake Michigan, into which Pettibone Creek discharges. Some sport fishermen take fish from the shore and nearshore areas of Lake Michigan, possibly introducing the contamination into the human food chain. Site 6, Mainside Transformer Storage Area, is recommended for a Confirmation Study.

2.3.5 Site 7, RTC Silk-Screening Shop. The Recruit Training Center (RTC) Silk-Screening Shop (Figure 2-6) is located in the RTC Training Aids Branch in Building 1212. This shop has been in its present location since at least 1965. The various flags and banners used by the recruits during parades, graduations, etc., are made in this shop. The screens are painted or dyed with ink during their preparation. Materials used include water- and oil-based lacquers and enamels, mineral spirits, acetone, thinner, direct photographic emulsions, and ink products. The specific materials used have reportedly changed over the years.

As of August 1985, wastes generated by the RTC Silk-Screening Shop were no longer disposed of on the ground; they are now disposed of in a 55-gallon drum that is emptied by a private contractor hired through DRMO.

Upon completion, the finished silk screens are washed with water in a booth located in the northeast corner of Building 1212. This wash booth had a 2-inch drain in the bottom that penetrated the exterior wall and ended in mid-air. Any material passing through the drain emptied onto the unpaved ground immediately outside the building. This practice continued from 1965 to 1985. The ground surrounding the outlet (an area of approximately 3 feet by 15 feet) is obviously stained. Upon closer examination it can be seen that

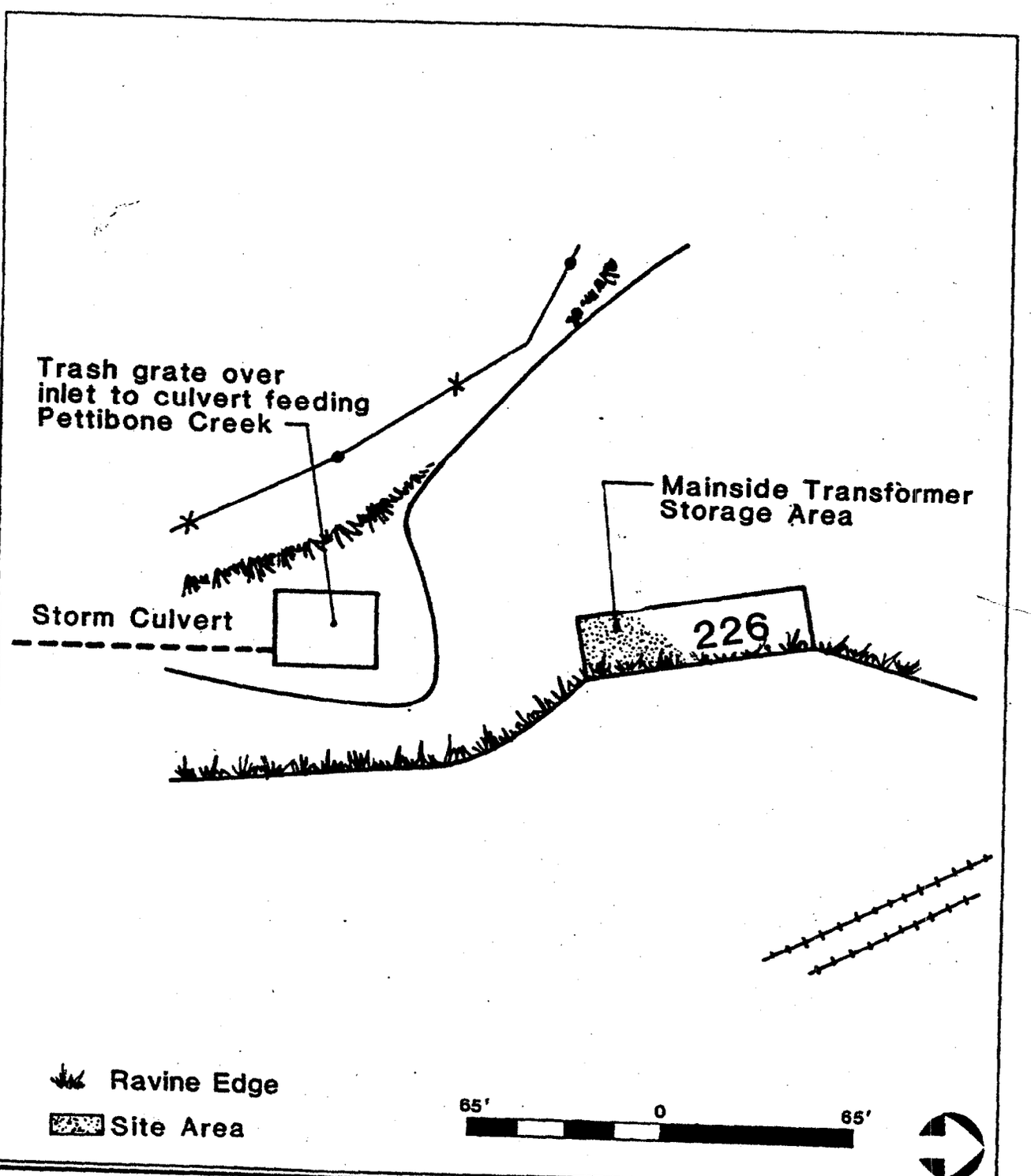

Figure 2-5

Site 6, Mainside Transformer Storage Area

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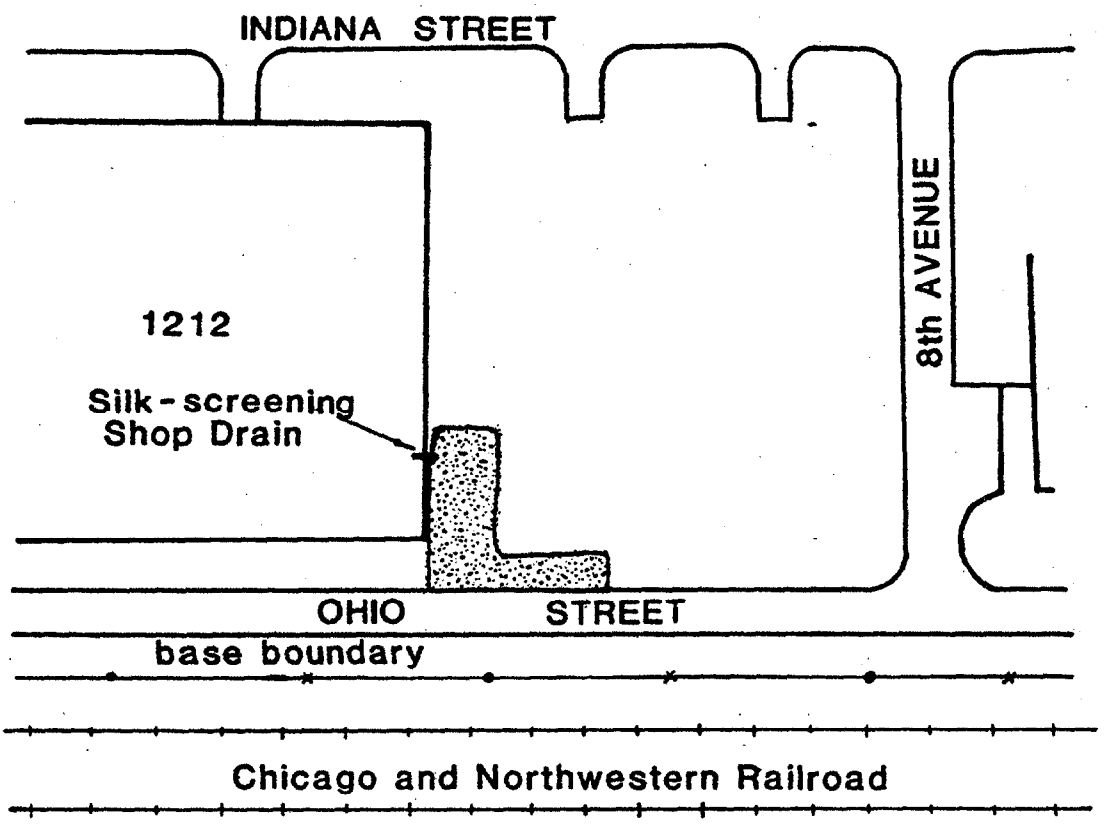

Site Area

100' 0' 100'

Figure 2-6

Site 7, RTC Silk-Screening Shop

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the staining continues north and east into the dirt road behind the building where, reportedly, the effluent often formed pools during periods of heavy discharge.

The pools remained until they either infiltrated the soil, were flushed away by precipitation, or evaporated. It is unlikely that waste which infiltrated the surface entered the buried sand-and-gravel glacial aquifers that underlie the activity. In the vicinity of this site, the water-bearing zones which could be considered to be aquifers lie at a depth of approximately 15 to 50 feet below the ground surface. The tight nature of the surface materials here would restrict the migration of contaminants into these deeper layers. A more likely pathway would be via storm water runoff, which may have carried the contamination directly into Pettibone Creek via overland flow or through the storm sewers. Once in the creek, the contamination would be free to flow directly into Lake Michigan (although upon entering Pettibone Creek the wash waste would be diluted by a factor of several orders of magnitude).

Possible receptors include the fish and other organisms living in Pettibone Creek, the harbor, and Lake Michigan. Direct exposure of personnel living in the RTC camps is likely to be limited because of the relative inaccessibility of the area within RTC, and the lack of idle time allocated to personnel in the area. Site 7, RTC Silk-Screening Shop, is recommended for a Confirmation Study.

2.3.6 **Site 8, Exchange Service Station.** In 1983, 3,000 gallons of leaded gasoline leaked at the Navy Exchange service station (Figure 2-7) on the Mainside area of the activity (Building 144). Approximately 3,000 gallons of gasoline were released when a line leading to the station's underground storage tanks ruptured. Wells were installed by an outside contractor to pump out the contaminated ground water and gasoline. The recovered fuel was delivered to the Fire Fighting Training Area (Site 4). Contaminated water was removed from the activity by an outside contractor. After the recoverable gasoline was removed from the ground, contaminated soil was also removed for off-base disposal. A 24-hour fire watch was put in effect, and the area was monitored by the Fire Department for a month following the spill.

Despite the cleanup at the spill site, the odor of gasoline can still be detected in the basement of the Post Office (Building 112), which is within 100 feet of the spill site, after a heavy rain (residual gasoline remaining in the subsurface is displaced by percolating rainwater). This area is underlain by a sand-and-gravel aquifer at a depth of less than 15 feet below the surface. Gasoline may have entered this aquifer and been carried to Pettibone Creek or Lake Michigan. At the very least, residual gasoline contamination remains in the soils underlying the service station.

Pathways include migration in the shallow subsurface sorted sand aquifer which could ultimately discharge into Pettibone Creek, several hundred feet west of the spill site. Receptors include employees in the Post Office (Building 112) and the organisms in Pettibone Creek, the harbor, and Lake Michigan. Sport fishermen eating their catches from the nearby areas of the

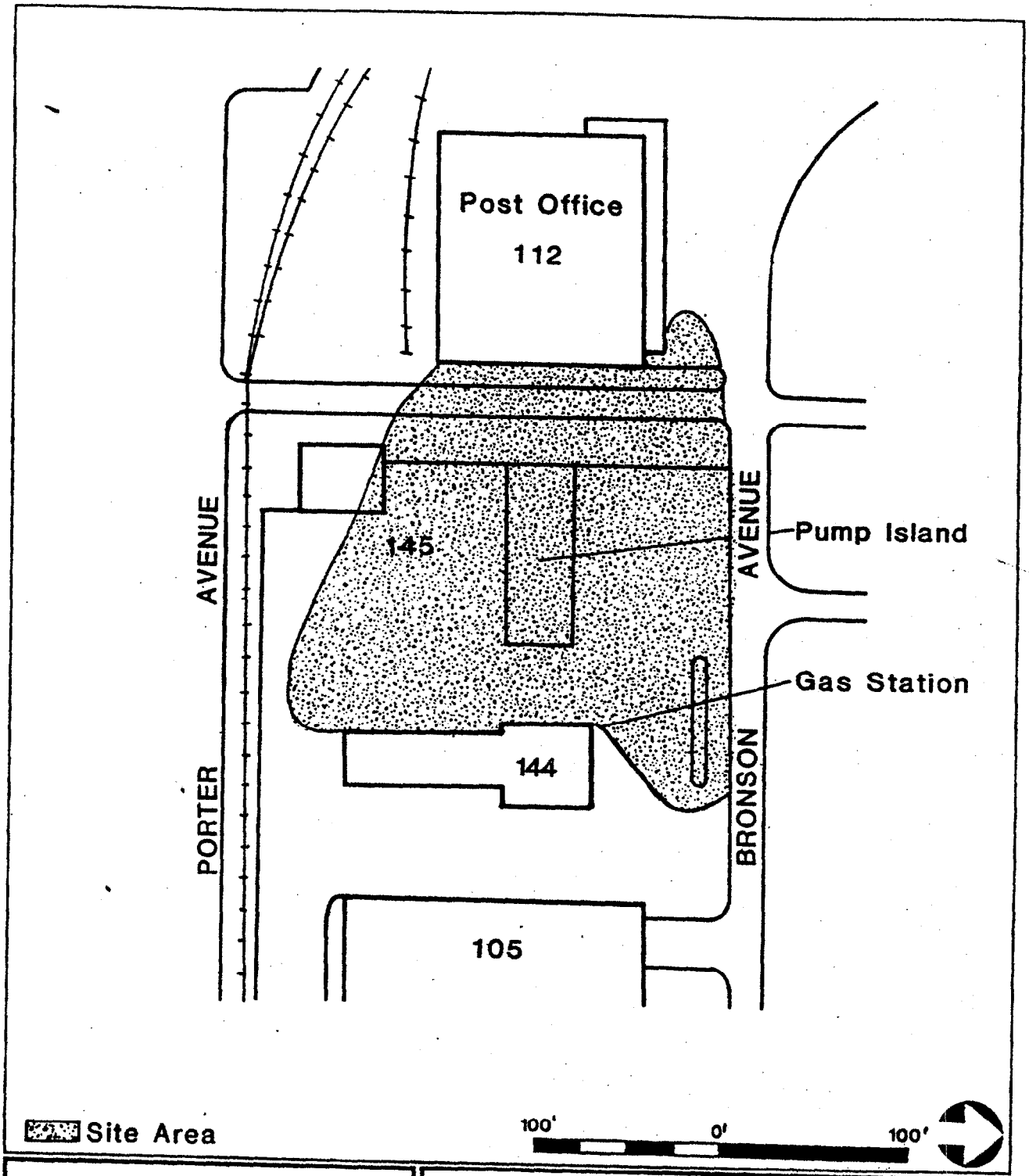

Figure 2-7

Site 8, Exchange Service Station

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lake could ingest fractions of the gasoline from this source. Site 8, Exchange Service Station, is recommended for a Confirmation Study.

2.3.7 **Site 12, Harbor Dredge Spoil Area.** The harbor has been dredged twice in the history of NC Great Lakes, in 1952 and 1970. Dredge spoils were disposed of in the area outlined in Figure 2-8.

Recent analysis of the in-place harbor sediment by the IEPA indicated a sludge worm population of 10,000 worms per square foot (NORTHNAVFACENGCOM, 1984). Populations of 100 worms per square foot are considered to represent contaminated conditions. Such a worm population is indicative of sediments that are extremely rich in organic matter. Moreover, the organic-rich sediments may reflect conditions of poor water circulation within the harbor area.

The dredge spoils taken from the harbor in 1952 and 1970 would also be expected to be organically rich, although exposure to the air would have resulted in oxidation and accelerated decomposition of the organics.

Contaminants entering the harbor area are highly diluted by harbor water and the waters of Lake Michigan. The IEPA has determined, in fact, that the waters of Pettibone Creek transport some quantities of pesticides into the lake and harbor (NORTHNAVCFACENGCOM, 1984). However, according to the IEPA these quantities do not represent a threat to humans or to the environment due to dilution by lake waters (NORTHNAVFACENGCOM, 1984).

The NC Great Lakes Master Plan cites contaminantion of the Inner Harbor sediments with heavy metals, PCB, and oils. The source of these contaminants is apparently the industries located upstream from the activity. Some of these industries are identified in the land use section of Chapter 4 of this report. The Inner Harbor is not Navy property; however, Site 12, the Harbor Dredge Spoil Area, is Navy property.

Hazardous wastes generated by private industry upstream of the activity may have entered the harbor, and these wastes may pose a threat to the environment, even though there is no history of direct dumping in the harbor. Similarly, the sediments dredged from the harbor in 1952 and 1970 may contain concentrations of hazardous materials high enough to warrant further study. Hence, Site 12, Harbor Dredge Spoil Area, is recommended for a Confirmation Study.

2.4 SITES NOT RECOMMENDED FOR CONFIRMATION STUDY. Seven of the 14 potentially contaminated sites found at NC Great Lakes are not recommended for Confirmation Studies. The locations of these sites are shown in Figures 2-1a and 2-1b.

2.4.1 **Site 2, Forrestal Landfill.** The Forrestal Landfill (Figure 2-9) was the first controlled disposal area used by NC Great Lakes. This operation started in 1967 and ended in 1969. The 4-acre area is located between Superior Street and Skokie Ditch, south of Virginia Court. The site was operated as a trench-type landfill with no burning. This site represented a transition step from the largely uncontrolled operation of the Golf Course

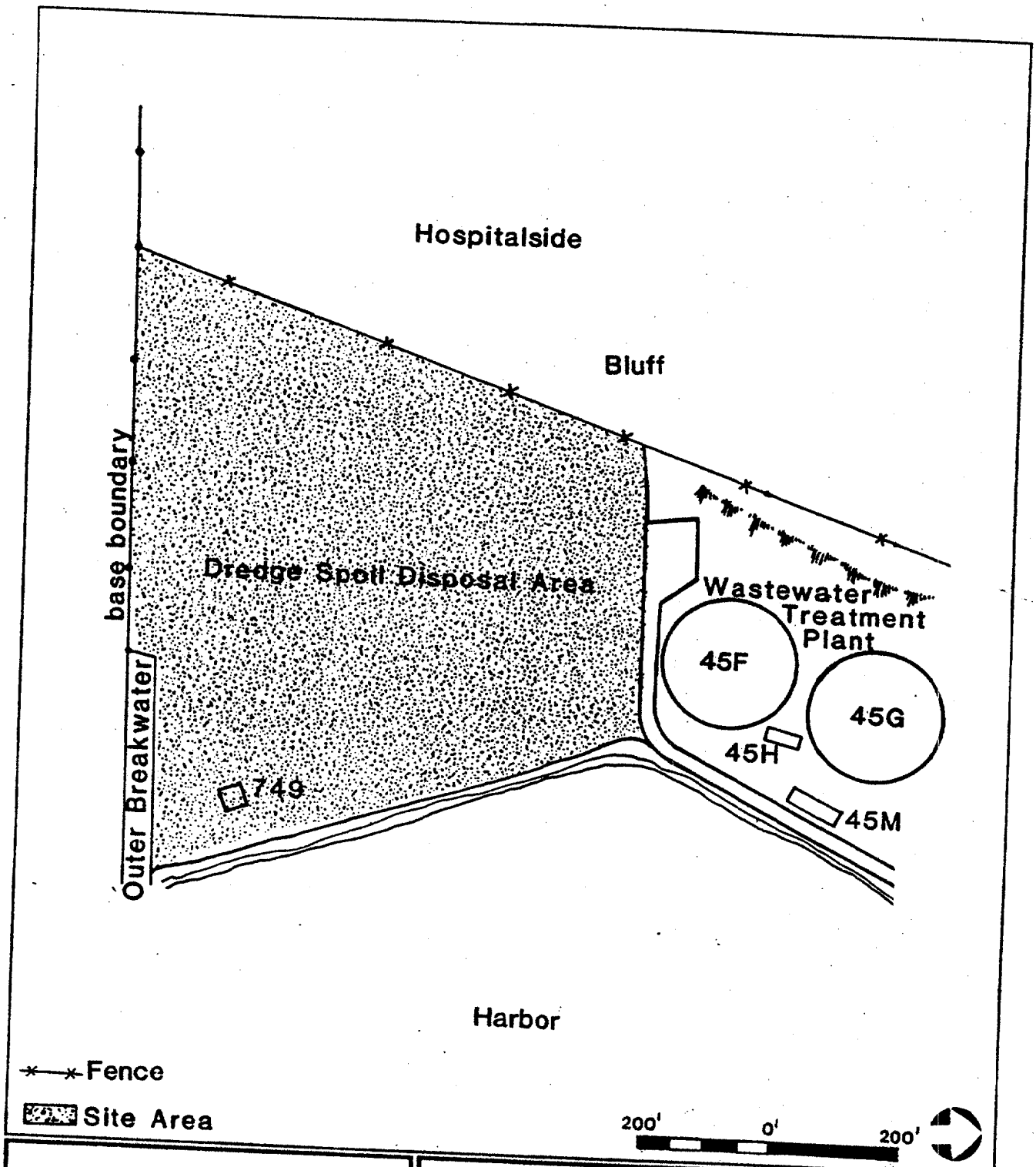

Figure 2-8

Site 12, Habor Dredge Spoil Area

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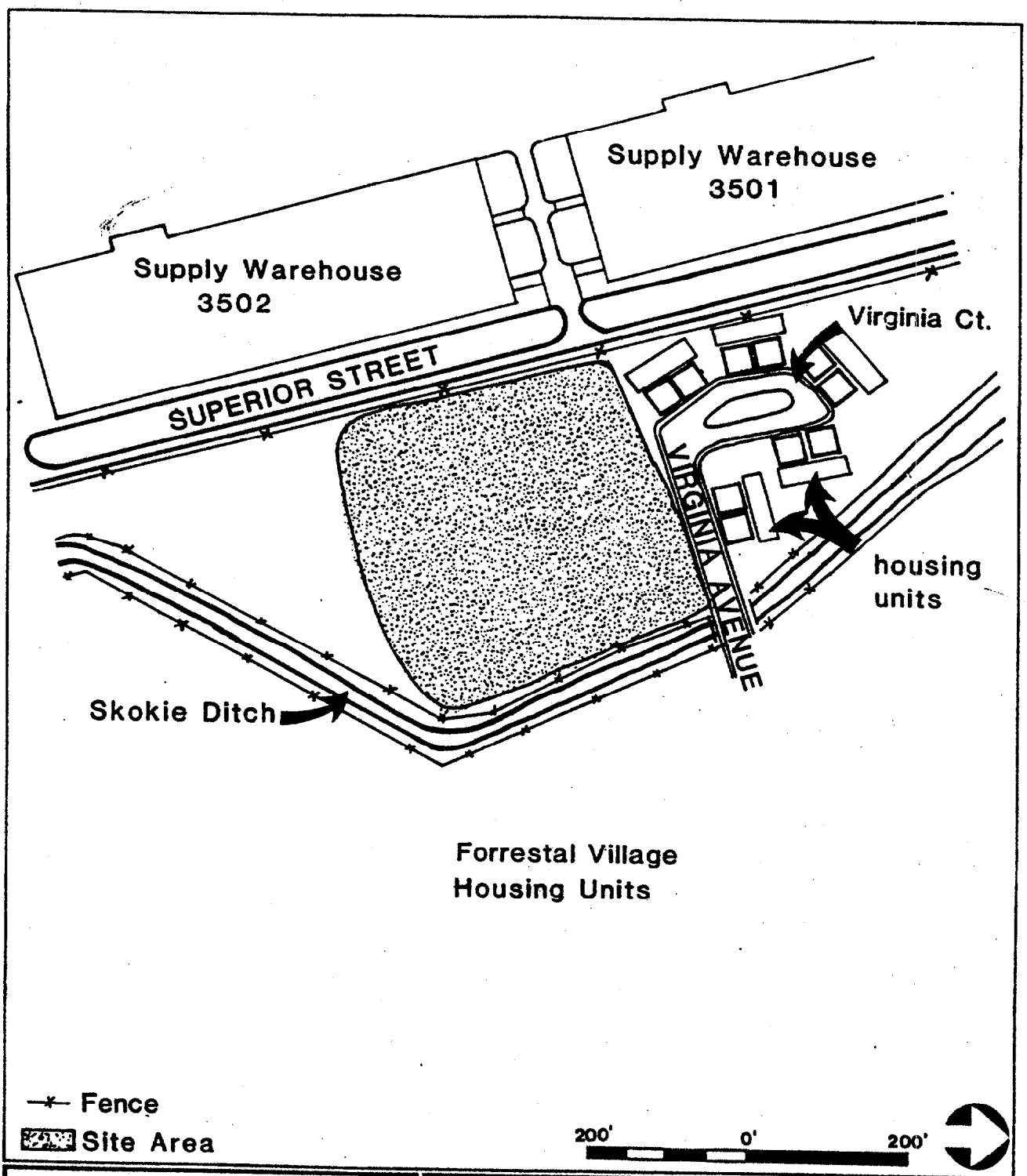

Figure 2-9

Site 2, Forrestal Landfill

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Landfill (Site 1) to the fully controlled operation of the Supplyside Landfill (Site 3). A guard shack was constructed to limit access to the Forrestal Landfill.

The total volume of material disposed of in the Forrestal Landfill was limited by the size of the parcel involved and the fact that the material disposed of there was not burned. In addition, the period during which the site was operated coincided with the period during which responsibility for waste collection from most activity housing switched from Navy personnel to private contractor, with disposal off Navy property. It is estimated that the site contains approximately 76,000 cubic yards of refuse. No hazardous wastes were disposed of in this landfill.

Degradation products from a site like this include alcohols and methane gas (from degradation of organic wastes). Skokie Ditch is the eastern border of the site and, as described for the Golf Course Landfill, is the most likely pathway for waterborne materials leaving the site. Ground water pathways are not likely since the glacial till material in the shallow subsurface does not permit migration of water. Because some of the housing units in Forrestal Village are within 100 feet of the landfill, gas migration through soil should be considered as a possible pathway.

Receptors of waste products which migrate off the landfill site could include residents of the housing units on Virginia Court, provided that gas migration could be documented, and users of the waters of Skokie River and the streams into which Skokie Ditch empties. However, because gas migration has not been documented in the first 10 years since the closure of the landfill, when it would most likely have occurred, and no hazardous wastes were disposed of at this site, Site 2, Forrestal Landfill, is not recommended for a Confirmation Study.

2.4.2 **Site 3, Supplyside Landfill.** Supplyside Landfill (Figure 2-10) is the disposal area shown in the General Development Map in the southwest corner of NC Great Lakes and labeled "Closed Sanitary Landfill Area." It is adjacent to the activity boundary and south of the Supply Department warehouse (Building 3503), and extends almost to the westward extension of Alabama Avenue.

Supplyside Landfill has recently (1985) been regraded with final cover which was to be seeded for the first time during the 1985 growing season. The grading was performed by Naval Construction Batallion 401, a tenant command on the activity. The landfill surface rises 15 to 20 feet above the surrounding grade on the east and the west. Skokie Ditch drains the surface water from the area and lies adjacent to the landfill on the east. On the west, an area of poorly drained land begins at the fence marking the activity boundary and occupies several acres of the Commonwealth Edison Company right-of-way.

This landfill operated during the period 1969 to 1983, at which time it was closed; since then, all refuse has been sent off-base for disposal. The period of operation was concurrent with the institution of additional

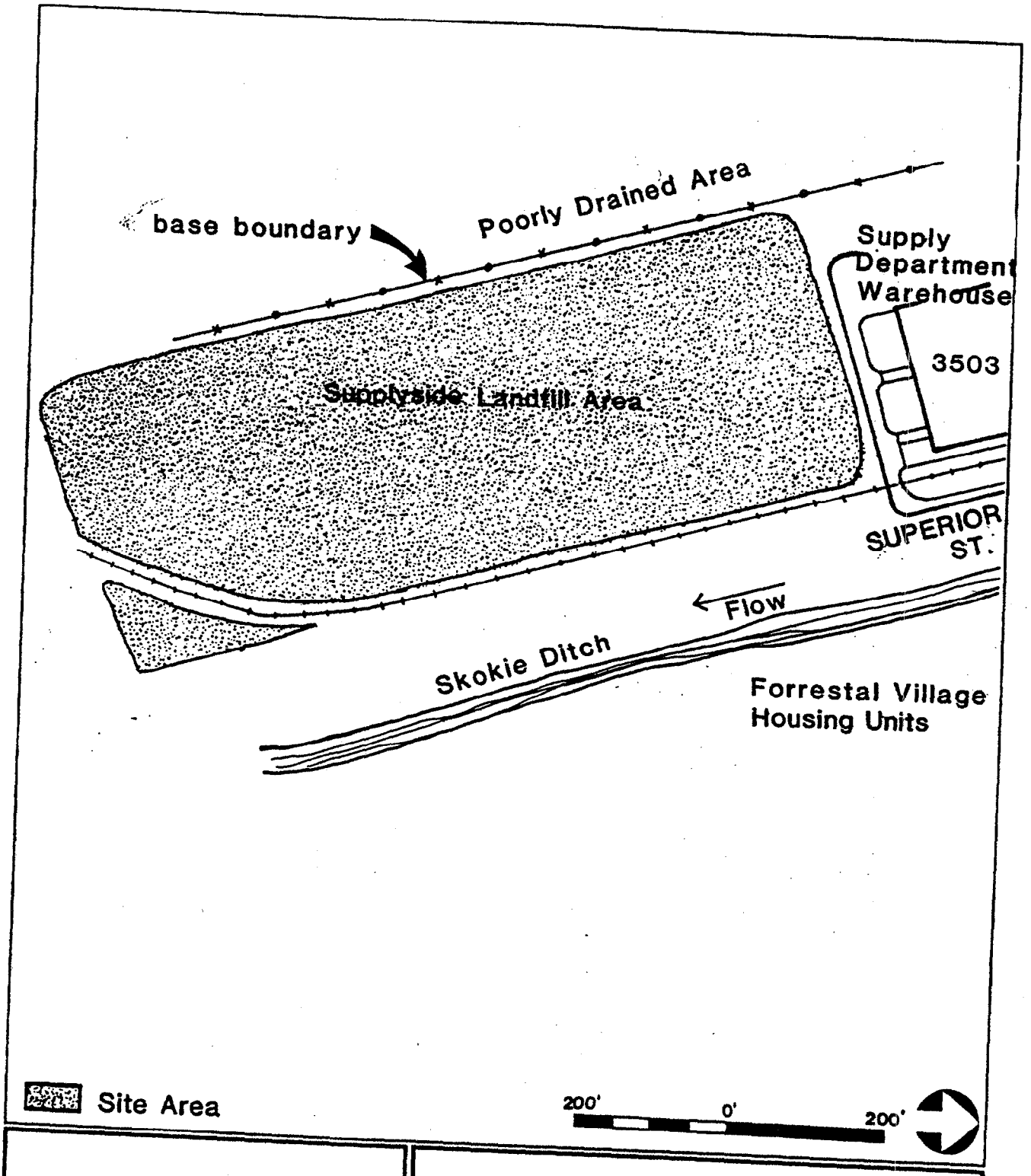

Figure 2-10

Site 3, Supplyside Landfill

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controls and monitoring of landfill operations. These actions resulted in the additional control necessary to ensure that proper disposal of hazardous materials would be carried out. The landfill was operated as a trench-type landfill, with four parallel trenches on this particular site, which covers an area about 400 feet by 1,000 feet. Landfilling was conducted on both sides of the rail spur. There was never any intentional burning of refuse on this site.

The main components of disposed material at the Supplyside Landfill site were mixed office waste and some galley waste. All household wastes were disposed of off-base by contract collectors/haulers. No liquids were accepted for disposal at the Supplyside Landfill, nor were metals or sanitary wastes. Chemical wastes likely to have been disposed of in the landfill include residues of spent chemical cleaners, solvents, and oils on waste building materials or rags used for cleanup. Specific cleaners like Solvent 144 and trichloroethane, formica glue (contact cement), and cement grout for tiling jobs are likely to have been components of this category. Other wastes typical of an office source like typewriter ribbons, paper, and ink are thought to have been major constituents of the landfill waste.

Skokie Ditch, on the eastern margin of the Supplyside Landfill, is the most likely pathway for migration of any landfill-generated contaminants. Even in the unlikely event that ground water pathways exist, discharge to this gaining segment of Skokie Ditch is the most likely discharge point for the ground water and any dissolved constituents. Sites 1, 2, and 3 lie within a 1-mile reach of Skokie Ditch. Site 3 is the farthest downstream of these three sites. From the farthest downstream point where the landfill borders the Skokie Ditch to the point where the ditch crosses the activity boundary is a distance of 1,000 feet.

The site is currently being monitored under the terms of a 3-year post-closure monitoring agreement with the State of Illinois. Both surface and ground water monitoring are being conducted. IEPA has approved the activity's monitoring program for the Supplyside Landfill. Site 3, Supplyside Landfill, is not recommended for a Confirmation Study.

2.4.3 Site 9, Camp Moffett Disposal Area. A 1980 excavation to repair a portion of the roadway in Camp Moffett which had collapsed uncovered a variety of galley-type wastes. These wastes included stainless steel serving trays and food wastes. The excavation went to the limit of reach of the backhoe which was available (approximately 8 feet below the surface) and did not reach the bottom of the fill. No effort was made to determine the lateral extent of the fill; however examination of older aerial photographs and topographic maps of the area suggests that the area was once a narrow, V-shaped ravine, a former tributary of Pettibone Creek (Figure 2-11). No other information is available about the Camp Moffett Disposal Area.

There is no information to suggest that any hazardous waste disposal occured at the Camp Moffett Disposal Area. Therefore, Site 9, Camp Moffett Disposal Area, is not recommended for a Confirmation Study.

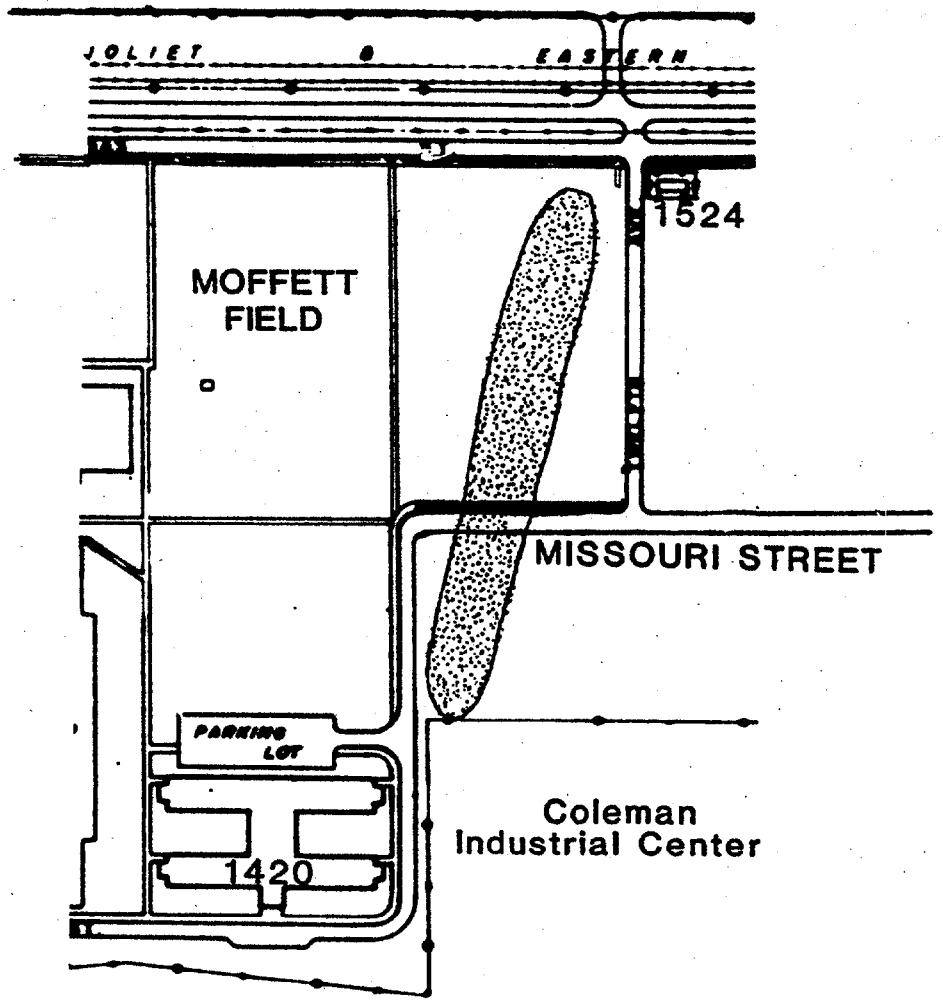

Figure 2-11

Site 9, Camp Moffett
Disposal Area

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2.4.4 **Site 11, BE/E School Gyro Compass Room.** On the third floor of Building 2B, rooms 329, 330, 330A, and 330B (Figure 2-12) housed 15 gyro compasses from 1942 until 1976. Each mechanism contained 10 to 15 pounds of elemental mercury. Reserve mercury was stored in a locker located in room 330C. The gyromechanisms were dismantled in 1976 and sent via Supply to DRMO (then DPDO).

A large puddle of mercury was discovered under the storage locker in room 330C in 1979 during conversion of the rooms from laboratories into classrooms. Further investigation revealed the presence of mercury in between the floor tiles and the baseboard edging in the room. School personnel called the Public Works Center (PWC), which apparently contacted Preventative Medicine and the Fire Department. Preventative Medicine personnel vacuumed the area for mercury. Personnel report no problems with mercury since 1979. The four rooms have been used as classrooms since 1979.

Because all of the mercury was cleaned up and disposed of, and the rooms have tested within acceptable limits for mercury vapor, Site 11, BE/E School Gyro Compass Room, is not recommended for a Confirmation Study.

2.4.5 **Site 13, Demolition Debris Disposal Areas.** During the course of the on-site visit by the IAS team, several areas which were used for the disposal of inert demolition debris were discovered. Each of the demolition debris areas discovered is described in this section, and is illustrated in Figures 2-13a and 2-13b.

Demolition Debris Disposal Sites 13A, 13B, and 13C are located along the shoreline of Lake Michigan. These sites include the entire shoreline, exclusive of the immediate vicinity of the Inner Harbor and Boat Basin. The sites include areas where fill was placed both behind and in front of bulkheads and piers that were constructed to protect the bluffs from coastal erosion. Most of this fill material was comprised of bricks, concrete, and other building materials large enough to provide protection for the receding shoreline. These materials may be examined in the actual shore zone, and especially in the vicinity of the Skeet Range (Building 743), where typical building demolition debris material is clearly visible. On-ground inspection revealed that only inert materials had been disposed of there.

Some of the material was placed by the Naval Construction Batallion Unit 401, some by the Public Works Center, and some by contractors working on the activity. Between 1981 and 1984, Naval Construction Batallion Unit 401 placed fill at the Rifle Range shoreline (Site 13C) to restore the bluff after particularly severe erosion. No active disposal was evidenced during the on-site visit.

Site 13D included the area along the western and southern sides of Zeigemeier Street as it rises from the shoreline onto the Mainside campus. The disposal site is bounded by the bluff to the east, Zeigemeier Street on the north and Paul Jones Street on the west, and ends north of Cluverius Street. Disposal there ended prior to the development and construction of Building 621, the ET A-School, in 1969. PWC personnel also noted problems with installing portable building anchor systems in the area east of

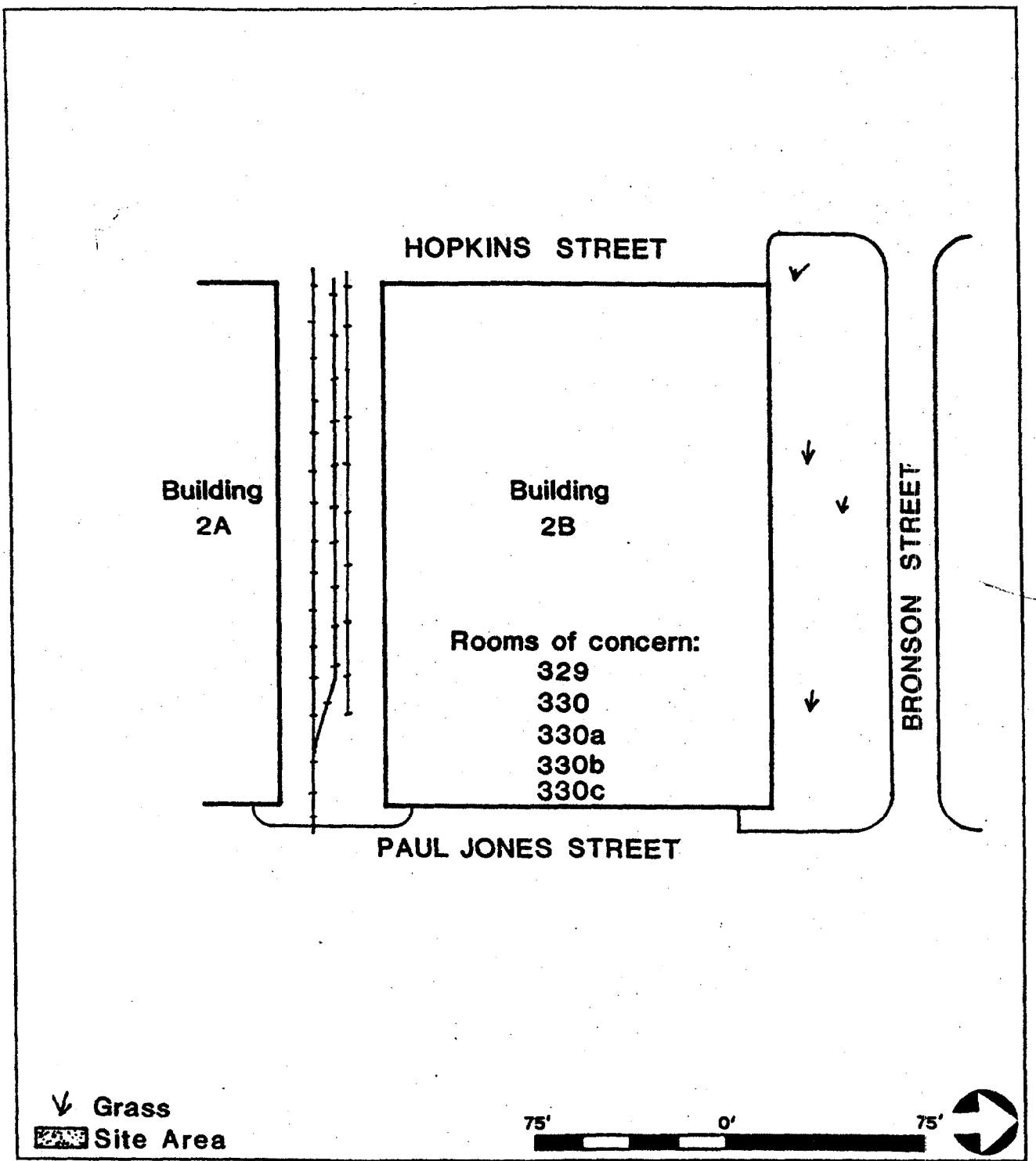

Figure 2-12

Site 11, BE/E School
Gyro Compass Room

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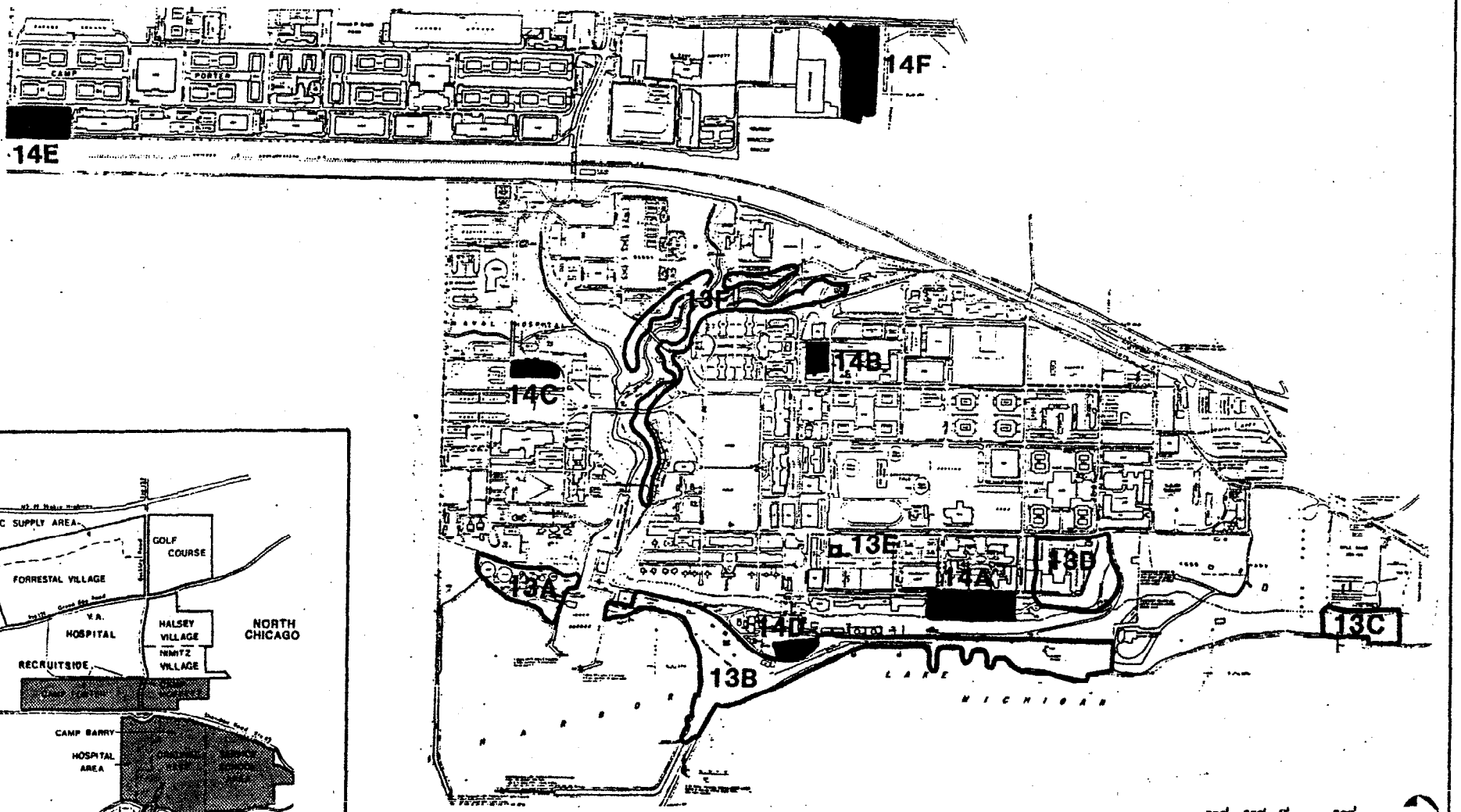

Figure 2-13a

Site 13, Demolition Debris Disposal Areas, and Site 14, Former Coal Storage Areas

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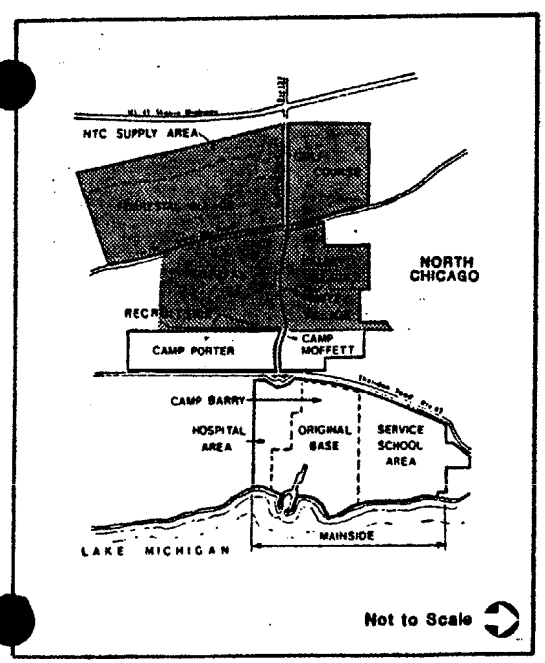

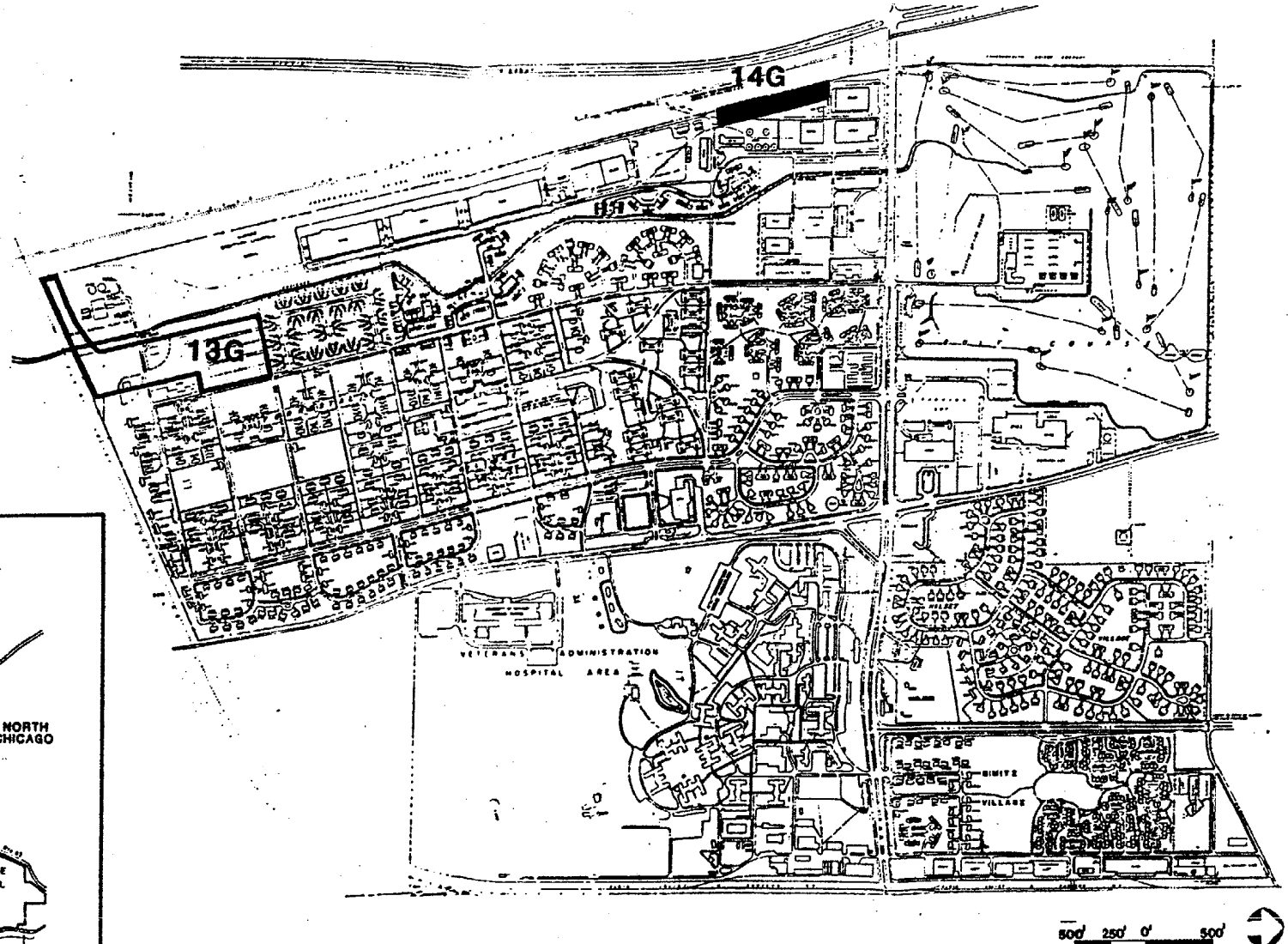

Former Demolition Debris Disposal Areas

Former Coal Storage Areas

Figure 2-13b

Site 13, Demolition Debris Disposal Areas, and Site 14, Former Coal Storage Areas

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Building 621, on top of the bluff. The present appearance of the area provides no clue to the existence of the demolition debris and no seepage was observed on the bluff.

Site 13E was a former swimming pool facility located on the north side of Bronson Avenue, opposite Building 122. The facility had been out of service due to leakage of the concrete walls and was filled during the period 1984 to 1985 by the Naval Construction Battalion Unit 401. Completion of this project preceded the 1985 on-site visit of the IAS team by several weeks.

Site 13F is along the banks of Pettibone Creek. Based upon examination of topographic maps, archive photographs, and general development maps, the location of the top of these banks has moved up to 100 feet toward the stream bed. This is consistent with the observations of many activity personnel who related that coal ash had been disposed of almost anywhere on the activity where fill was required for grading purposes.

The final demolition debris disposal site (Site 13G) is in the area of the present Auto Hobby Shop (Building 2110). Prior to the construction of the new trailer court area along Great Lakes Drive, Arkansas Road, and Georgia Road, this area was used for demolition debris disposal. Disposal of this inert material proceeded south from Delaware Avenue, around Building 2110, and across Alabama Avenue to the southern activity boundary. The area along the southern activity boundary and south of Sewage Disposal Plant No. 2 was filled along a 50- to 100-foot swath from the vicinity of Building 2262 to the southwest corner of the activity. Some of the evidence supporting this observation includes the difficulty experienced by PWC personnel in installing tiedown facilities in the trailer court area, the general lay of the land in that area, and the surface appearance of the grounds in the playing fields south of Alabama Avenue. No sign of material other than demolition debris was encountered in these areas. No outcroppings of these materials were found in Skokie Ditch.

Since no leachates are expected from these disposal areas, they are provided for purposes of documentation only, and Site 13, Demolition Debris Disposal Areas, is not recommended for a Confirmation Study.

2.4.6 Site 14, Former Coal Storage Areas. Coal was used as the primary source of fuel for space heating and power at NC Great Lakes from the activity's inception until coal was phased out in favor of oil at the Mainside power station. Coal was stored at various locations throughout the activity during the period of its use. These locations are identified in this section because of the potential concern about leachates developing from coal residues which may remain at these locations.

Each of the sites that once were used to store coal is described elsewhere in this report (Chapter 8); these sites are discussed here for documentation purposes. None of these sites poses a likely threat via the development of leachates, primarily because most or all of the coal which would be the potential source of contamination has been removed. The only coal pile presently remaining at the activity is located at Site 14D, where some fine-grained high sulfur coal used to fire the experimental fluidized bed

combustor is still stored. A contract is expected to be let soon to have an off-base contractor remove the coal which remains there (NAVFACENGCOM, personal communication, 1985).

2.5 SITES RECOMMENDED FOR REMEDIAL MEASURES. One of the 14 sites examined by the IAS team is recognized by the Navy as being contaminated with hazardous wastes. The site is the NTC Rifle Range; it is shown in Figure 2-14.

2.5.1 Site 10, NTC Rifle Range. The NTC Rifle Range (Figure 2-14) is located on a 14.2-acre plot at the extreme northeastern corner of NC Great Lakes. The Rifle Range has been located at this site since the land was purchased in 1918. In the past, this had been the primary firearms training and practice facility for the activity. No Navy training takes place there at the present time; it is currently being used by the Department of Justice, Federal Bureau of Investigation as a training and practice facility.

In August 1984, NORTHNAVFACENGCOM conducted a preliminary investigation to determine the amount of environmental contamination at the site. Unfired rounds of old ammunition were found in the uppermost soil layer throughout the site, and may extend down to 8 feet below the surface. It appeared that these items had been buried in the soil and had surfaced due to erosion. NORTHNAVFACENGCOM investigators concluded that a serious safety hazard would exist were the Navy to access the land without first sweeping the entire site for ordnance.

The cost for demilitarizing the site has been estimated at approximately $554,000, which is close to the fair market value of the site (NORTHNAVFACENGCOM ESR #21-696-250, September, 1984). Because of the documented site contamination, Site 10, NTC Rifle Range, is not recommended for a Confirmation Study; however, it is recommended for cleanup under this program, if and when the site ceases to be used as a rifle range.

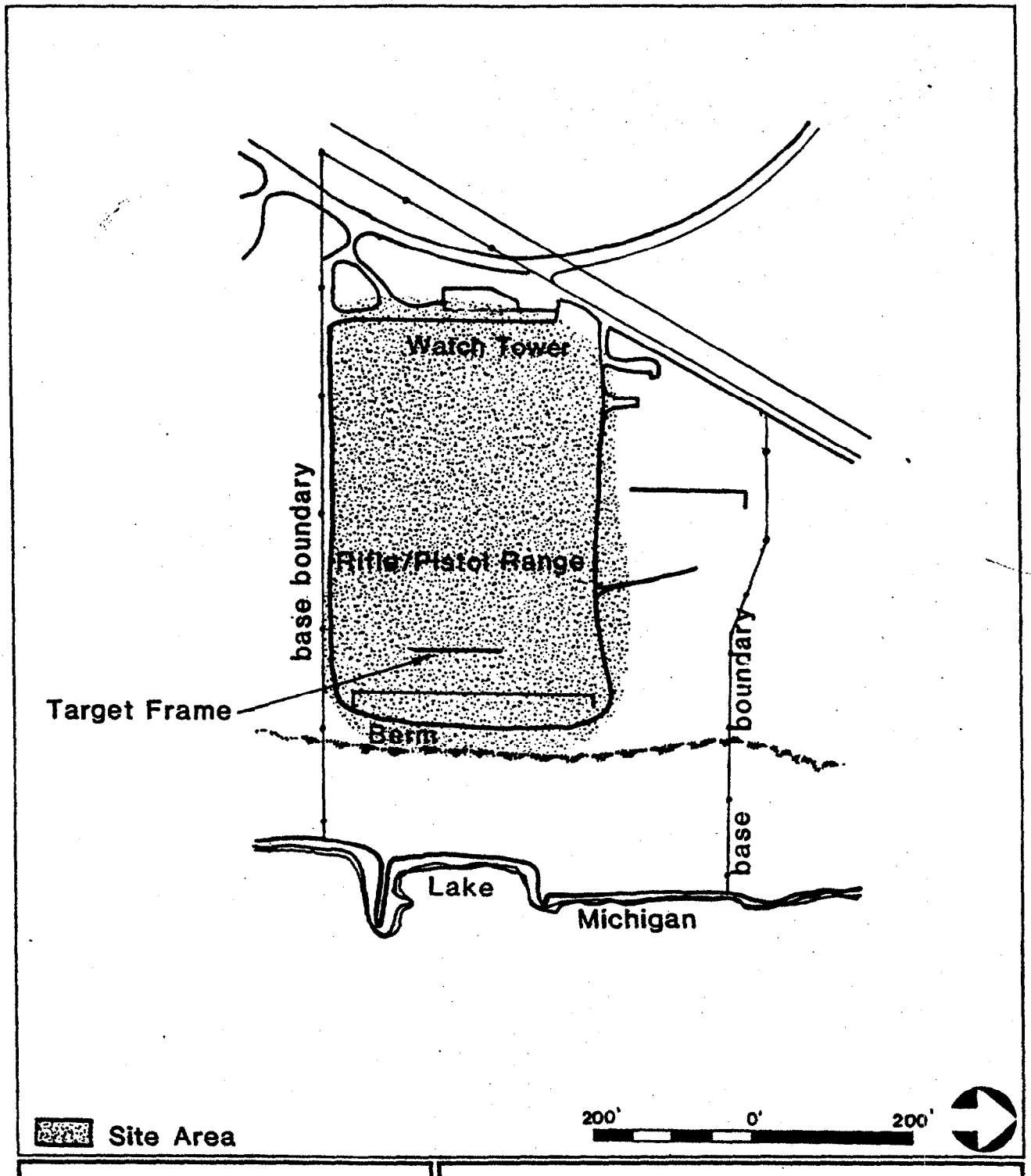

Figure 2-14

Site 10, NTC Rifle Range

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Great Lakes, Illinois

CHAPTER 3. RECOMMENDATIONS

3.1 INTRODUCTION. This chapter provides recommended courses of action for the eight potentially contaminated sites identified at NC Great Lakes. These sites may pose a potential threat to human health or to the environment. Confirmation Studies, phase II of the NACIP program, are recommended for seven of these sites (Table 3-1):

- Site 1, Golf Course Landfill
- Site 4, Fire Fighting Training Area
- Site 5, Transformer Storage "Boneyard"
- Site 6, Mainside Transformer Storage Area
- Site 7, RTC Silk-Screening Shop
- Site 8, Exchange Service Station
- Site 12, Harbor Dredge Spoil Area

The eighth site that poses a potential hazard to human health is Site 10, the NTC Rifle Range. This site is recommended for Remedial Measures only if and when the site is no longer being used as a target range.

The field investigation programs presented address only the verification phase of the confirmation program. Design of a characterization investigation will, in general, be dependent upon the results of the verification study. The technical elements utilized in the recommended field programs include soil borings, surface water sampling, and construction of monitoring wells. Data collected from the field programs will be sufficient to:

- determine if migration of toxic materials away from a specific site is occurring;
- establish the direction of ground water movement in the shallow water table aquifer; and
- in instances where spillage of toxic materials is suspected, establish whether these materials have been retained in the shallow subsurface.

3.2 CONFIRMATION STUDY RECOMMENDATIONS.

3.2.1 Site 1, Golf Course Landfill. (Figure 3-1)

Ground water monitoring wells:	Install 6 wells at locations shown in Figure 3-1
Types of samples:	Ground water: One sample taken quarterly from each well, 24 samples annually.
	Surface water: One sample quarterly from sampling point on Buckley Road (see Figure 3-1 and Remarks).

Table 3-1

Summary of Confirmation Study Recommendation,
NC Great Lakes, Illinois

Site No.	Site Name	Map Coordinates	CSRS Score	Number of Wells	Number and Type of Samples	Frequency of Sampling	Parameters
1	Golf Course	Most of Area E	4.14	6	24 ground water samples annually	quarterly	TDS, pH, TOC, volatile organics, chloride, zinc, iron, lead, mercury
					4 surface water samples annually	quarterly	
4	Fire Fighting Training Area	FF-22 and FF-23	7.70	3	12 ground water annually;	quarterly	Oil, grease, tetraethyl lead, xylene, volatile organics
					14 soil samples		
5	Transformer Storage "Boneyard"	S-24	4.85	-	32 soil samples	one time	PCB
6	Mainside Transformer Storage Area	M-26	8.05	-	10 soil samples	one time	PCB
7	RTC Silk-Screening Shop	Q-16	13.2	-	10 soil samples	one time	Volatile organics
8	Exchange Service Station	L-23 L-24	7.58	3	12 ground water samples	quarterly	Tetraethyl lead, xylene, volatile organics
12	Harbor Dredge Spoil Area	G-16	12.0	-	30 sludge samples	one time	PCB, lead, zinc, chromium, volatile organics

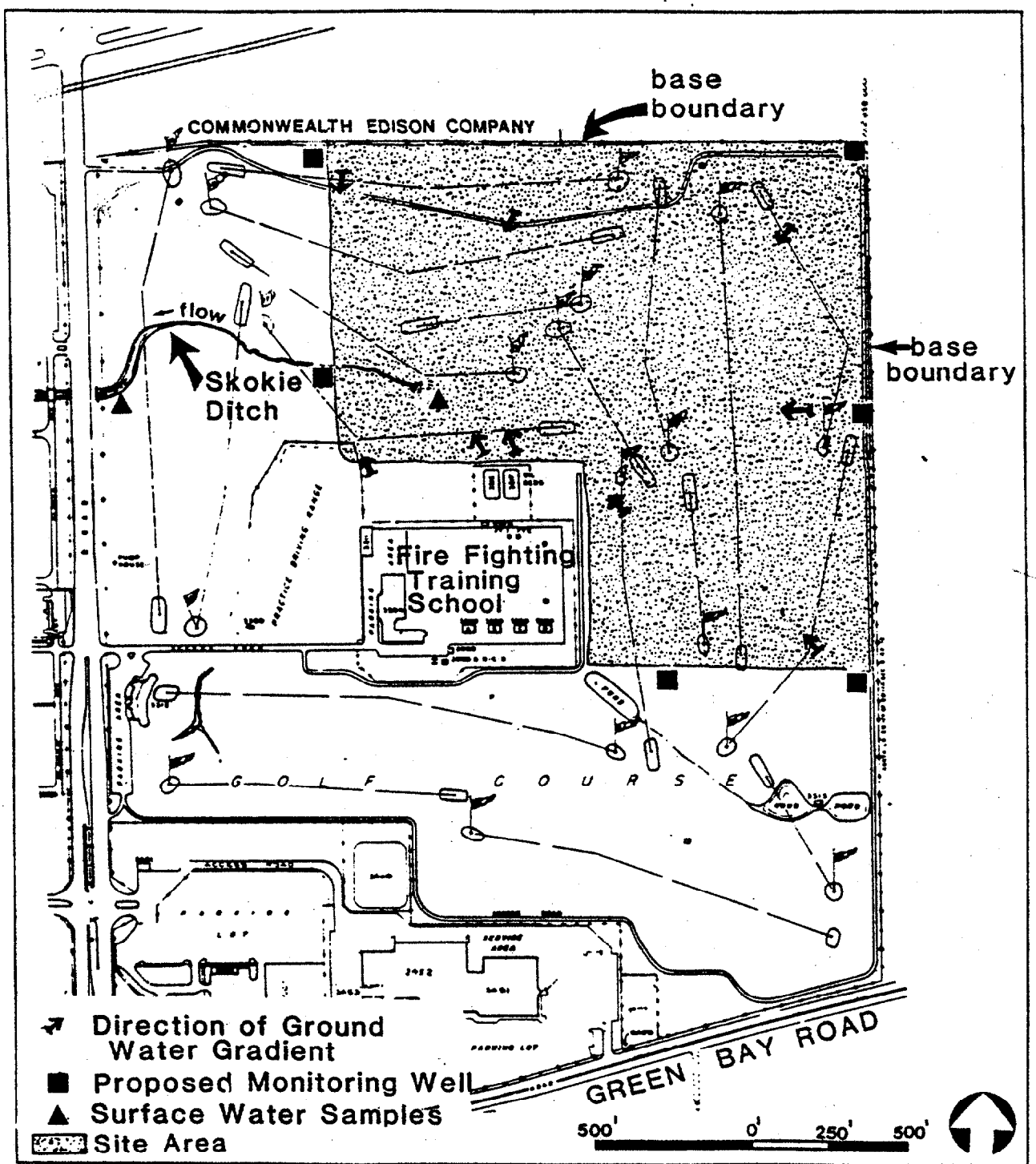


Figure 3-1

Site 1, Golf Course
Landfill
Monitoring Wells
and Sampling Locations

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

Test parameters: Total dissolved solids (TDS), pH, total organic carbon (TOC), volatile organics, chloride, zinc, iron, lead, mercury, water level

In northernmost surface water location: Evaluate water table level only.

Remarks: Stilling wells to measure surface water stage (elevation) should be placed at the Skokie Ditch surface monitoring points shown in Figure 3-1. Ground water monitoring wells should be screened so that top of water table intercepts screens throughout seasonal water level fluctuations. It is assumed that a 10-foot screen length is used.

3.2.2 Site 4, Fire Fighting Training Area. (Figure 3-2)

Ground water monitoring wells: Install three; two downgradient and one upgradient of site as shown in Figure 3-2.

Types of samples: Ground water: one sample from each well, taken quarterly; 12 samples annually.

Soil samples: one sample from each location, 14 samples total.

Test parameters: oil, grease, tetraethyl lead, xylene, volatile organics, pH, water level

Remarks: Ground water monitoring wells should be screened so that top of seasonal high water table intercepts the screen throughout water table level fluctuations. It is assumed that a 10-foot screen length is used.

3.2.3 Site 5, Transformer Storage "Boneyard". (Figure 3-3)

Type of sample: Soil samples.

Number of samples: 32, taken one time.

Test parameter: PCB

Remarks: Take 22 samples at designated points in grid pattern, as shown in Figure 3-3. Take 10 samples at discretionary locations where there is evidence of spillage. Soil samples should represent a composite of top 6 inches of soil at each location. Deeper compositing is necessary if visual signs of contamination (staining) go deeper.

3.2.4 Site 6, Mainside Transformer Storage Area. (Figure 3-4)

Types of sample: Soil samples.

Number of samples: 10, taken one time.

Test parameter: PCB.

Remarks: Samples should be taken at designated points in grid pattern, as shown in Figure 3-4. Samples should be representative of top 6 inches of soil; deeper sampling is recommended if deeper staining appears.

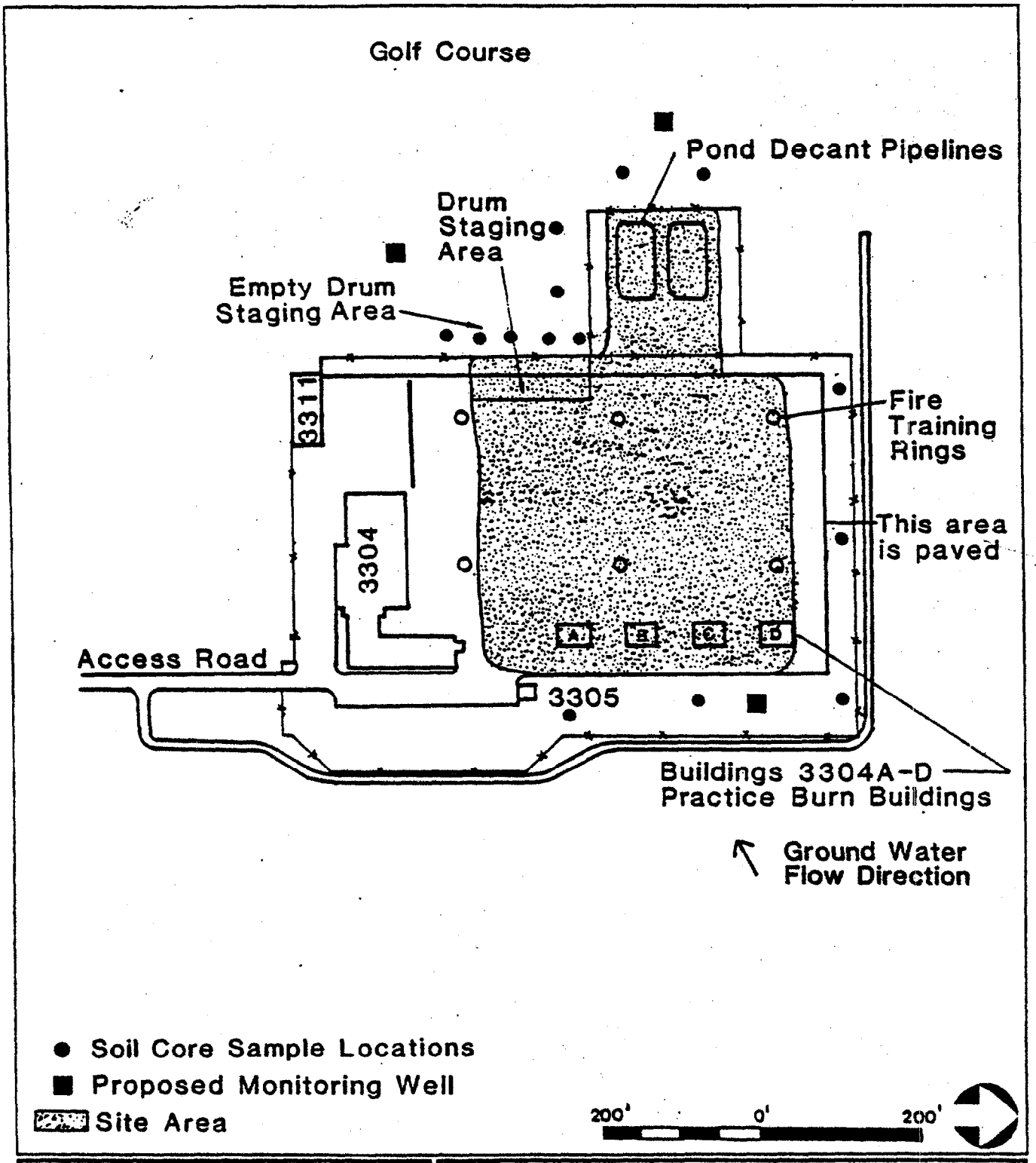


Figure 3-2

Site 4, Fire Fighting Training Area Monitoring Wells and Sampling Locations

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

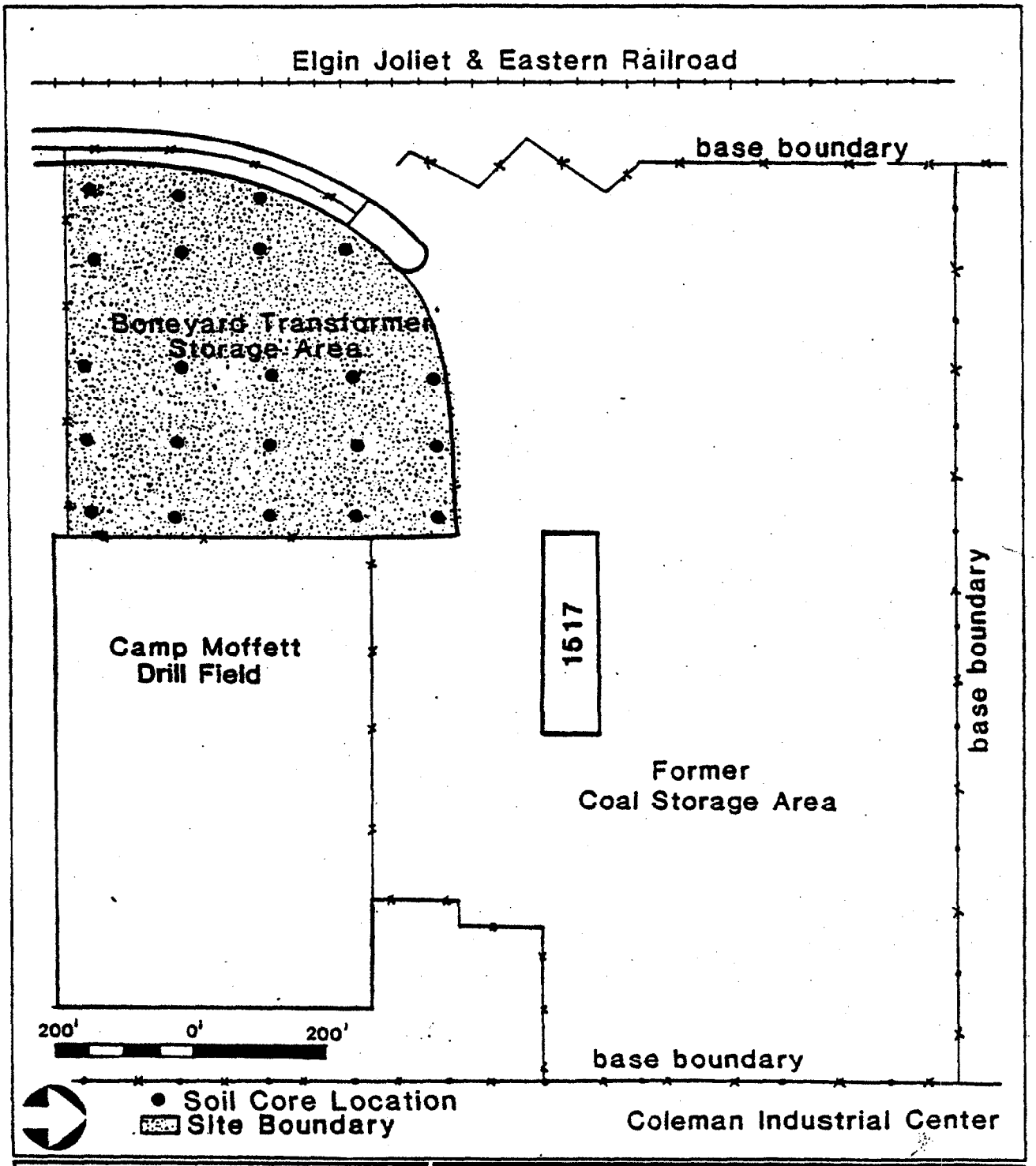


Figure 3-3

Site 5, Transformer Storage "Boneyard" Sampling Locations

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

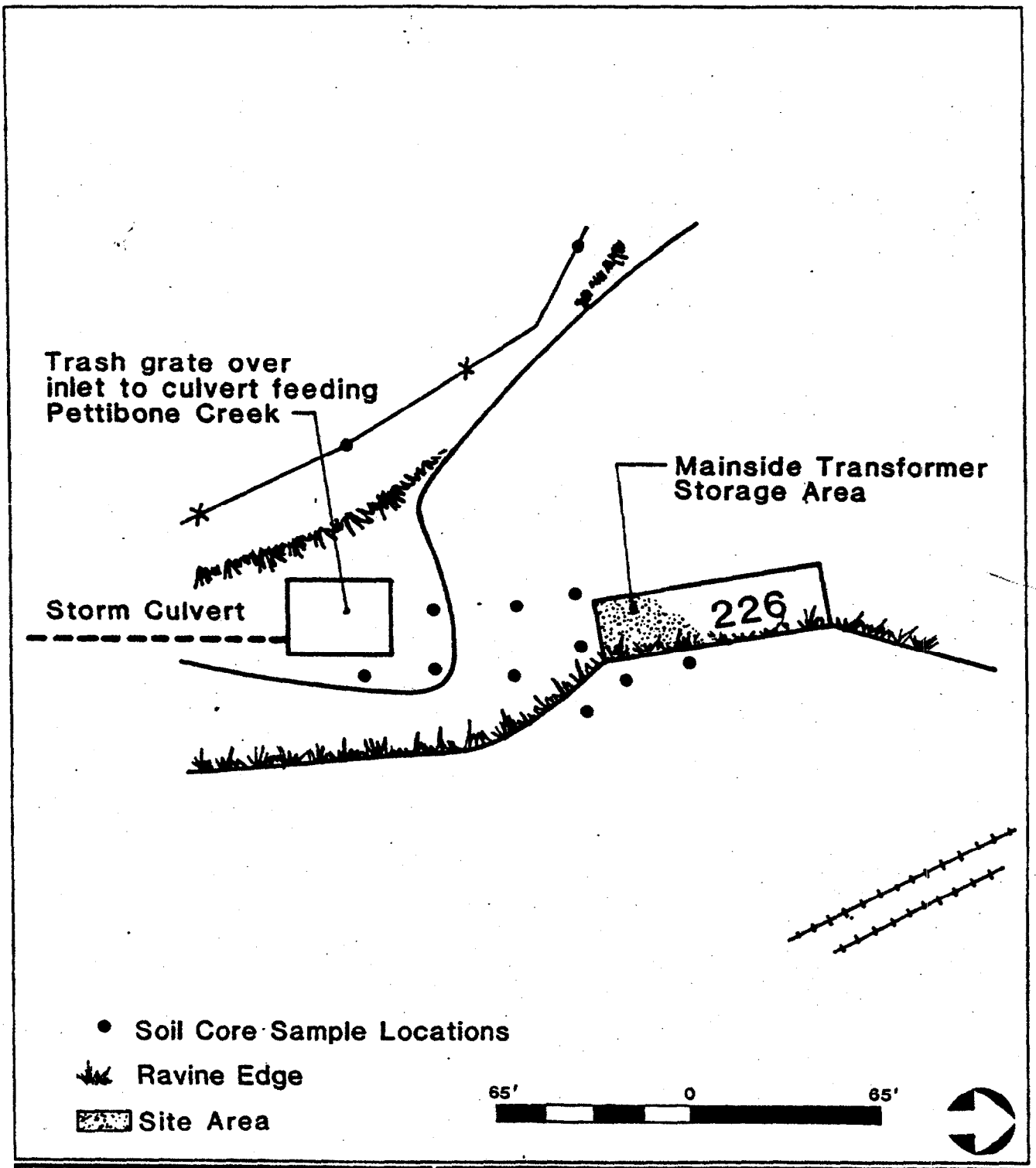


Figure 3-4

Site 6, Mainside Transformer Storage Area Sampling Locations

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

3.2.5 Site 7. RTC Silk-Screening Shop. (Figure 3-5)

Type of samples:	Soil cores.
Number of samples:	10, taken one time.
Test parameter:	Volatile organics.

Remarks: Take 10 samples, 5 in the locations shown in Figure 3-5 and 5 at discretionary locations where there is evidence of spillage. Samples should be representative composite of top 6 inches of soil; deeper samples should be taken if deeper staining appears.

3.2.6 Site 8. Exchange Service Station. (Figure 3-6)

Ground water monitoring wells:	Install 3 wells at locations shown in Figure 3-5.
Type of sample:	Ground water.
Number of samples:	12; one sample from each well, quarterly, for one year.
Test parameters:	Tetraethyl lead, xylene, volatile organics, water level.

Remarks: Ground water monitoring wells should be screened so that the top of the water table intercepts the screen throughout seasonal water table fluctuatiuons. It is assumed that a 10-foot screen length is used.

3.2.7 Site 12. Harbor Dredge Spoil Area. (Figure 3-7)

Types of sample:	Soil cores.
Number of samples:	30; taken one time.
Test parameters:	PCB, lead, zinc, chromium, volatile organics.

Remarks: Cores should penetrate to the bottom of the sludge deposits. Take samples from top, middle, and bottom of core at each location shown in Figure 3-7, so that samples are representative of sludge composition throughout the deposit.

3.3 RECOMMENDATIONS OTHER THAN CONFIRMATION STUDIES.

3.3.1 Site 10. NTC Rifle Range. The Navy has confirmed that lead-containing ordnance is present under the surface of the NTC Rifle Range (Figure 3-8). For this reason, tests to reconfirm this fact are unnecessary. It is the recommendation of the Initial Assessment Study (IAS) team that operations to remove the lead and unspent ordnance be initiated, if and when the site ceases to be used as a target range.

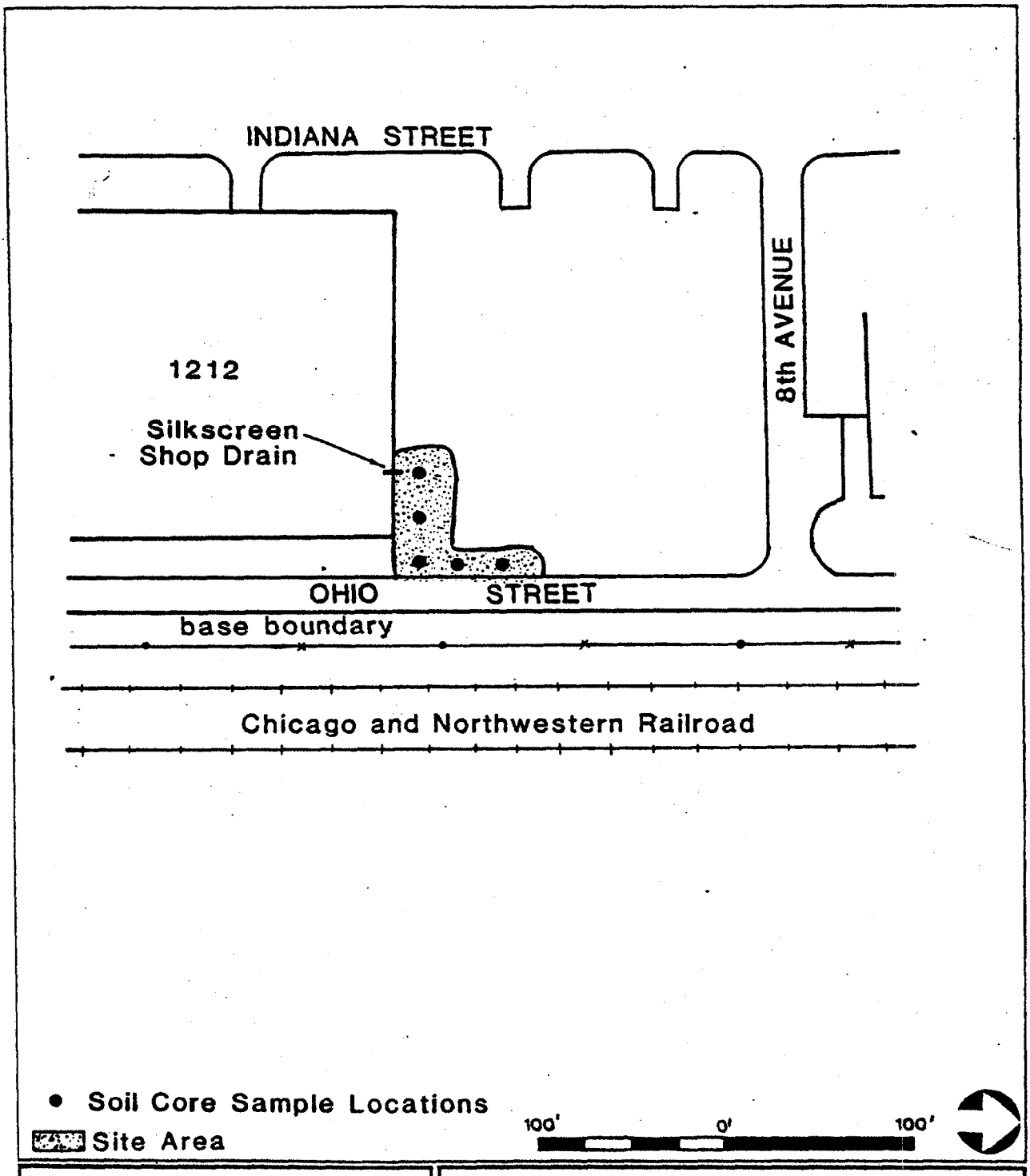


Figure 3-5

Site 7, RTC Silk-Screening Shop Sampling Locations

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

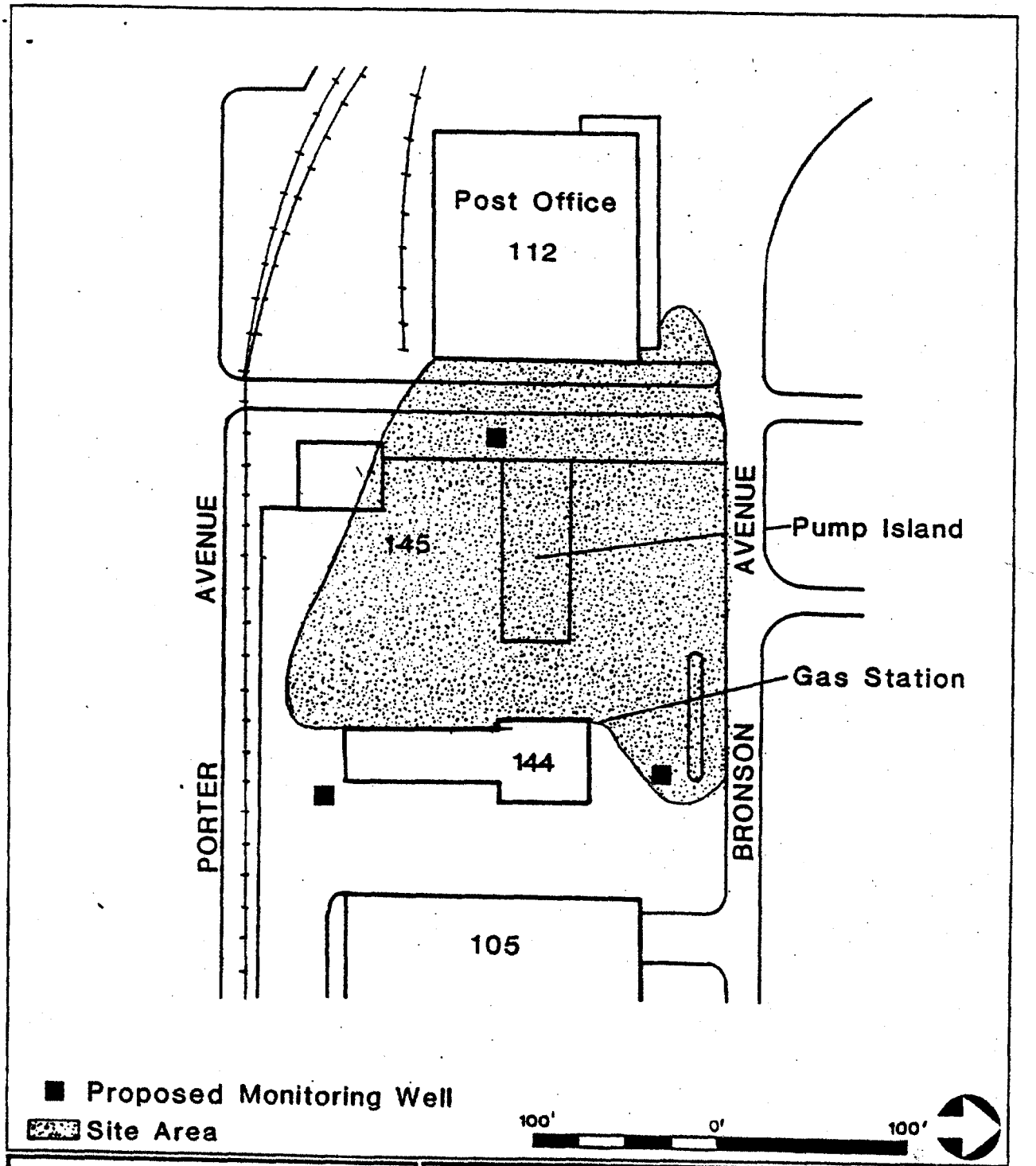


Figure 3-6

Site 8, Exchange Service Station Sampling Locations

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

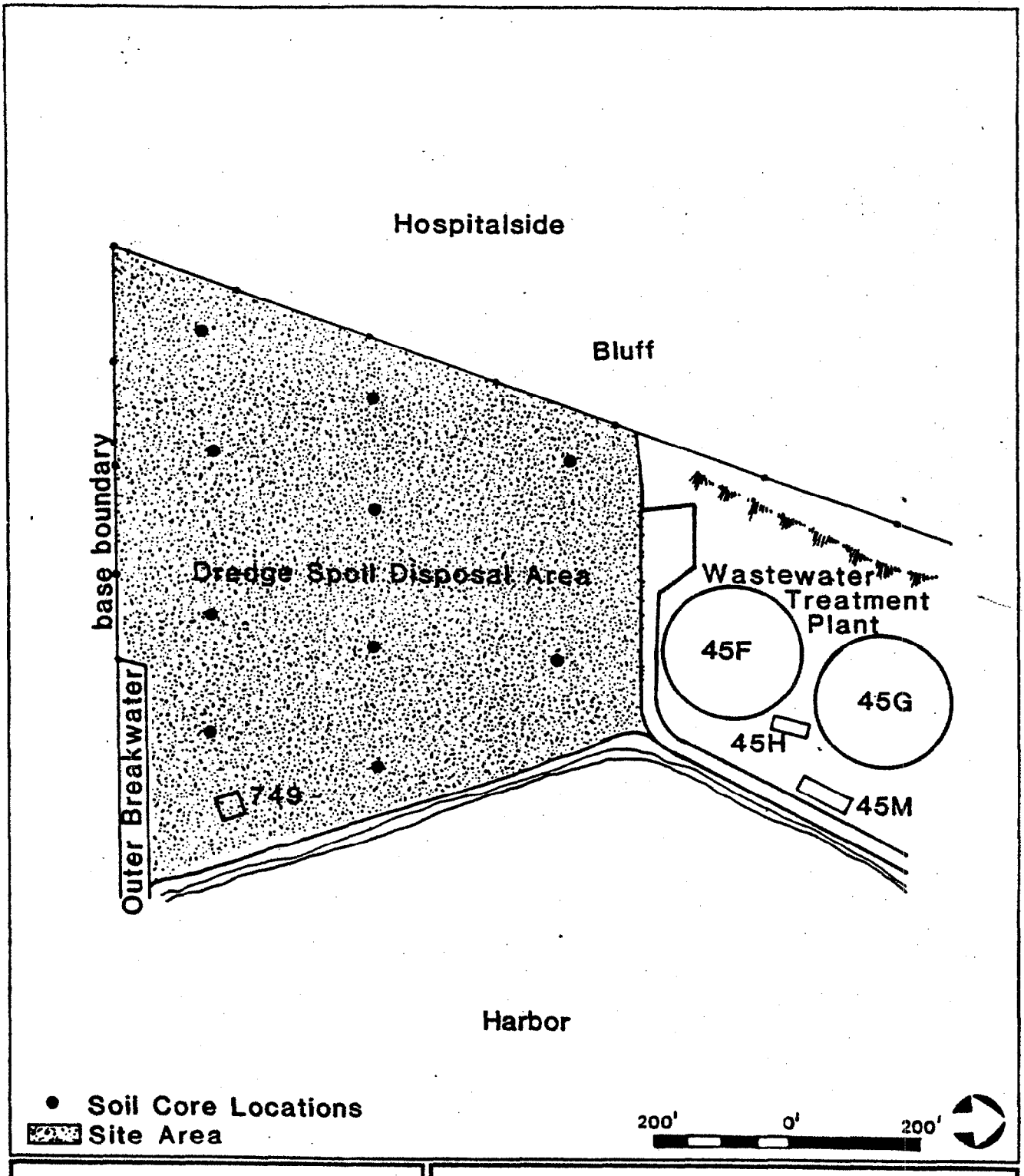
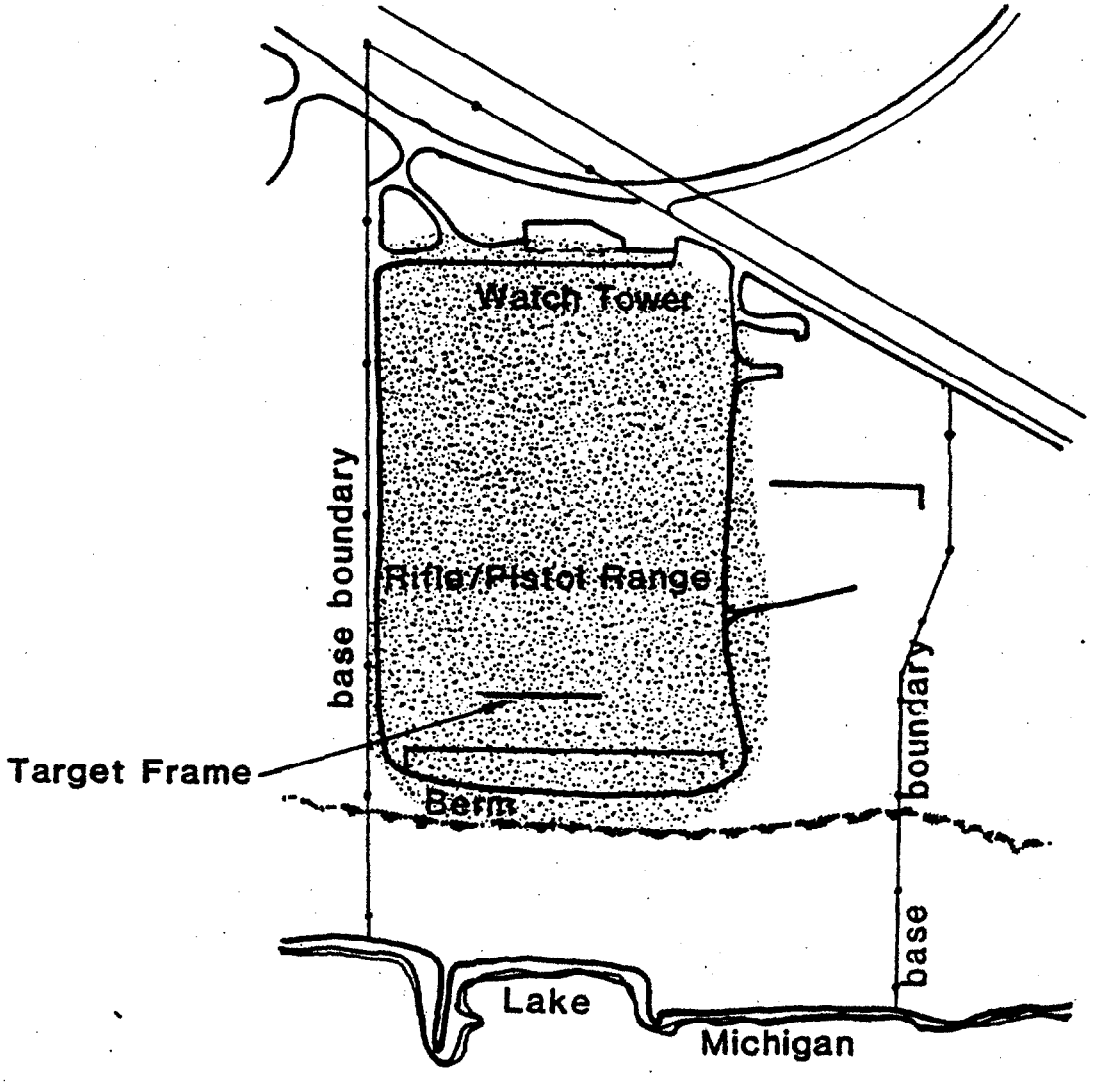


Figure 3-7

Site 12, Harbor Dredge Spoil Area Sampling Locations

Initial Assessment Study
Naval Complex
Great Lakes, Illinois



Site Area

200' 0' 200'

Figure 3-8

Site 10, NTC Rifle Range

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

3.3.2 All Remaining Sites. The remainder of the sites discussed by the IAS team have been judged to pose no threat to human health or to the environment. Nevertheless, it is recommended that a permanent record of these sites be maintained so that any future development plans can incorporate pertinent information about these sites.

CHAPTER 4. BACKGROUND

4.1 GENERAL. Naval Complex (NC) Great Lakes is located in Shields Township, Lake County, Illinois, on the shore of Lake Michigan (Figure 4-1). Dedicated in 1911, it is the largest naval training center (1,650 acres) in the United States and possibly in the world (NORTHNAVFACENGCOM, 1980). It is bounded on the west by U.S. 41 (Skokie Highway), on the north by the City of North Chicago, and on the south by the Veterans' Administration Hospital and Golf Course and by the Shore Acres Country Club. Lake Michigan lies to the east (Figure 4-2).

4.1.1 Mission of the Activity. The mission of NC Great Lakes is "to exercise command over, and coordinate the efforts of the assigned subordinate activities in effecting basic indoctrination (recruit training) for enlisted personnel, and initial skill, advanced, and/or other specialized training for officer and enlisted personnel of the regular Navy and the Navy Reserve, and to support other activities as directed by higher authority" (NORTHNAVFACENGCOM, 1980).

The full complement of host, tenant, and support operations personnel at NC Great Lakes consists of 22,883 military (529 officers, 22,354 enlisted men and recruits) and 3,087 others (American civilians and foreign nationals).

The Naval Training Center is the major activity; it consists of the Administrative Command, the Recruit Training Command, and the Service School Command. Supporting roles are performed by the Public Works Center and the Naval Regional Medical Center.

Of the 30 tenant commands, only the following were found to generate significant quantities of hazardous waste: the Hospital Corps School, the Naval Regional Dental Center, the Naval Dental Research Institute, and the Navy Publication and Printing Service Office. The remaining tenant commands generate only paper. Additional quantities of hazardous waste were generated by the two support organizations, the Naval Regional Medical Center and the Public Works Center.

4.1.2 Adjacent Land Use. A variety of land uses presently surround NC Great Lakes. The most highly urbanized land uses abut the activity's northern boundary where North Chicago's industrial zone is located. Some of the surrounding industry in the drainage area of Pettibone Creek includes Fansteel Company (North), Tantalum Place, North Chicago; Fansteel Company (South), Tantalum Place, North Chicago; Lavin & Sons, N. Chicago Refiners, Sheridan Street, North Chicago; Ammco Tools, Inc., Commonwealth Avenue, North Chicago; and Car Shop, Elgin, Joliet & Eastern RR, North Chicago (this facility was reported to be in operation at some point in the past).

At least one of these industries was responsible for a fuel oil spill within the past 2 years. The spill affected Pettibone Creek, and the industry paid an outside contractor to clean up the creek, including that part of it that is on Navy property.

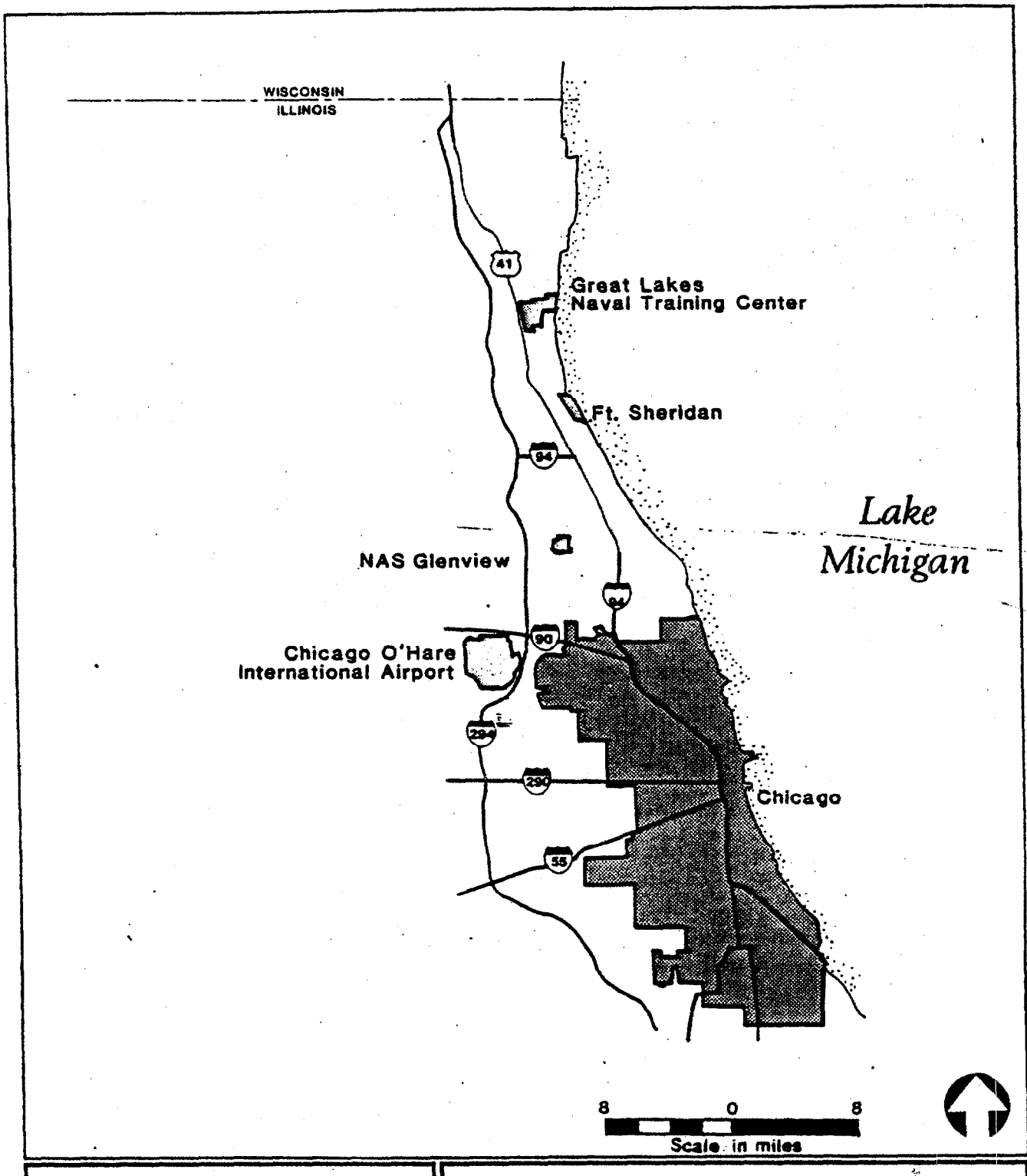


Figure 4-1

General Location Map,
NC Great Lakes

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

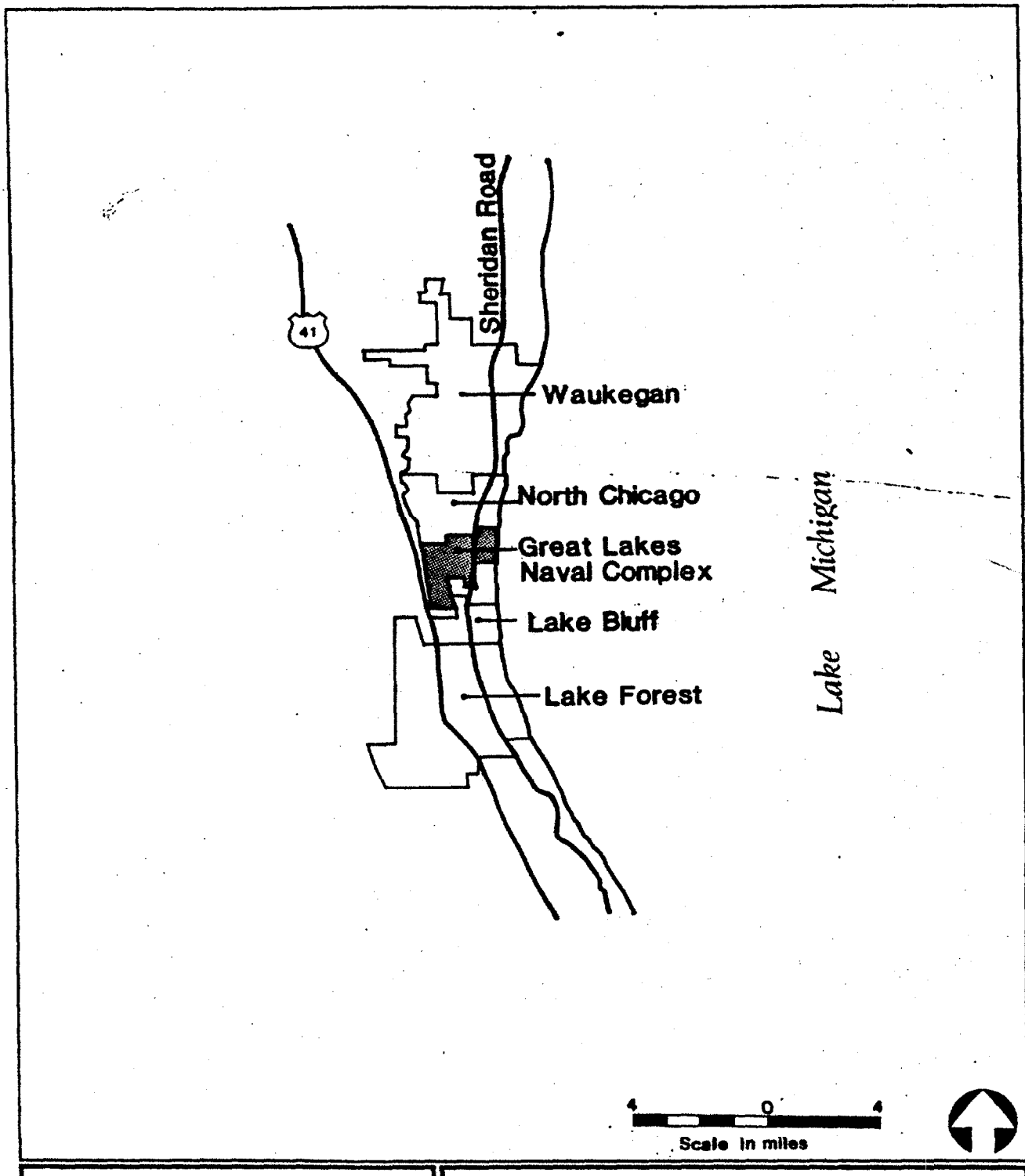


Figure 4-2

Immediate Area
Surrounding
NC Great Lakes

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

Much of the area beyond the northwest boundary of the activity comprises unincorporated lands of the County and lies vacant except for scattered retail and residential uses. Primarily industrial uses are found adjacent to the activity's western boundary, while the land adjacent to the southern boundary is a mixture of public open space and residential land use.

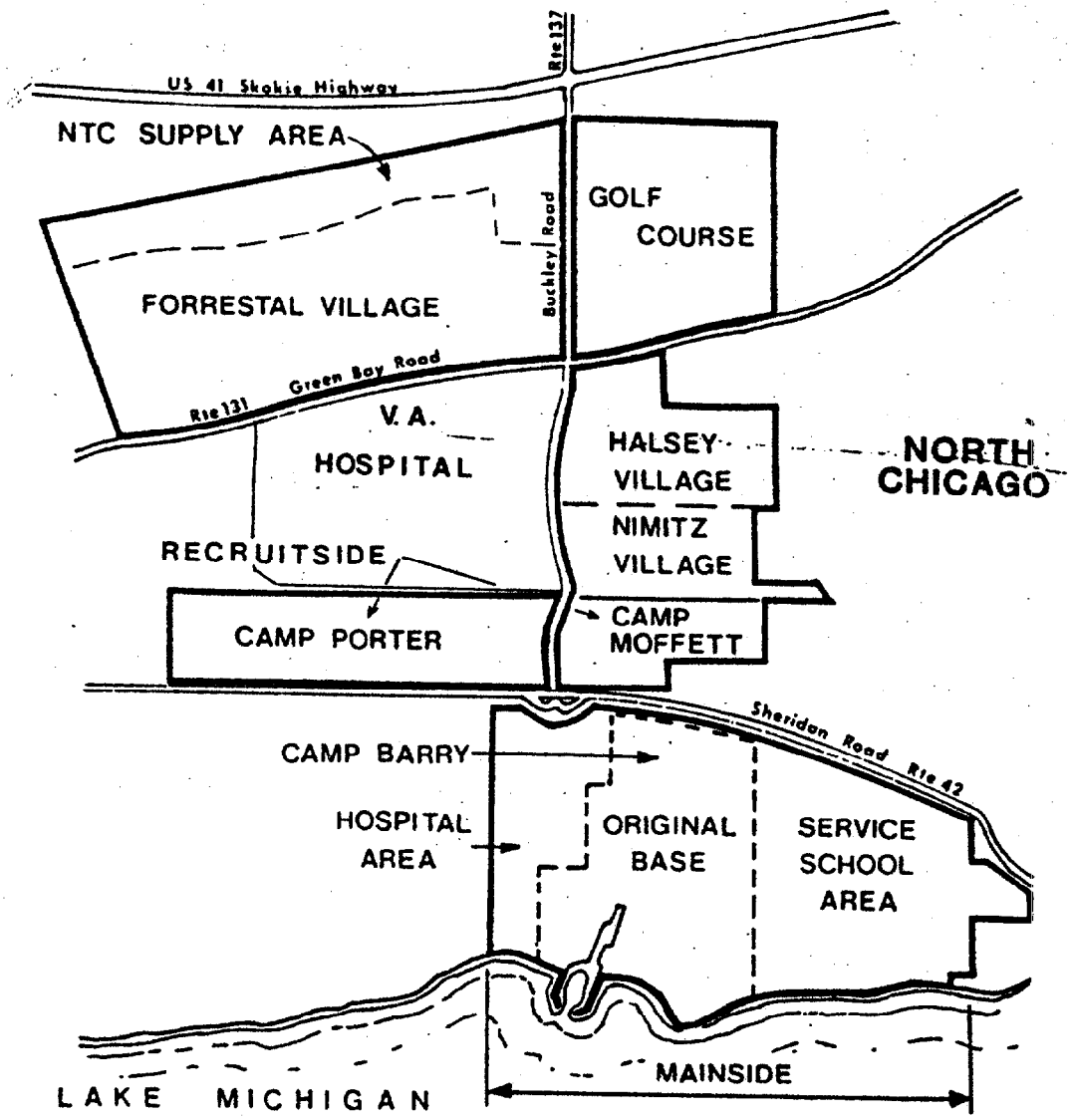
4.2 HISTORY. In 1902, Congress appropriated $5,000 to investigate sites in the Midwest on which to establish a naval training station. After considering 37 Great Lakes' sites, a board of officers recommended the present Lake Bluff location, a 167-acre tract overlooking Lake Michigan. Advantages of this site included its proximity to Chicago and its excellent rail transportation via the Chicago and Northwestern Railroad and the now-defunct Chicago North Shore and Milwaukee Railroad.

The location presented two major drawbacks, however. The first drawback to the location was the bitter opposition generated in Congress by the suggestion that Lake Bluff be developed as a naval training station. Congressman George E. Foss, representative of the 13th Illinois Congressional District and chairman of the Committee on Naval Affairs, maneuvered to overcome this obstacle by pressing for the Naval Appropriations Act of 1904. When the legislation was enacted, the President appointed a board that consisted of one officer and two civilians. The Board subsequently gave Lake Bluff the highest recommendation. The second drawback to the site was cost; even at the turn of the century lakefront property in this area was selling for over $1,000 per acre. To overcome this drawback, Congressman Foss persuaded the Merchant's Club of Chicago to establish a fund through which private donations could be accepted toward purchase of the land. The club raised $175,000 for the required 167 acres and offered the property to the Navy for a $1.00 fee, with the stipulation that the training station be built there.

In April 1904, the Naval Appropriations Act empowered the President to approve the Board's report and authorized purchase of the site. Previously, Congress had authorized $250,000 for the purchase of the land in its Naval Appropriations Act, thereby giving Congressional approval to the purchase.

Captain A. A. Ross, first Commandant of NC Great Lakes, accepted command of the activity on behalf of the government on July 1, 1905. Six years later, the activity was ready to accept its first recruit for training. Ross presided at commissioning ceremonies on July 1, 1911, and the activity was officially dedicated by President Taft on October 28, 1911. The original activity, which consisted of 39 permanent buildings, was bounded on the west by Sheridan Road, on the north by Bronson Avenue, on the east by Lake Michigan, and on the south by an irregular line through what is now Hospitalside (Figure 4-3). Expansion to the present boundaries was accomplished by various land acquisitions from 1917 to 1942.

When the United States entered World War I, the population at NC Great Lakes expanded quickly. Immediately prior to the war (April 1, 1917), 50 buildings served a complement of 2,500 men. At the peak of the war, the



Not to Scale

Figure 4-3

NC Great Lakes

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

activity expanded to 1,200 acres, 775 buildings, and 47,721 men (as of August 27, 1918), thus becoming the largest naval station in the United States.

To accommodate the huge influx of personnel, the original Instruction Building and Drill Hall facing the parade ground on Mainside were converted to barracks, and thousands of tents were erected in vacant areas of the activity. The Service School Command expanded from 4 schools to 17, and under the direction of Captain W.A. Moffett, seven completely self-contained regimental units were designed and constructed. Each unit housed 1,726 men and included an administration building, an instruction building, a drill hall, a galley and mess hall, a dispensary, and a steam heating plant. By October 1917, all personnel were moved out of tents and into temporary frame buildings. Most of these temporary buildings were demolished upon cessation of hostilities in 1918, although some stood through World War II.

By 1922, the Navy had stopped training recruits at NC Great Lakes, and consideration was being given to closing the activity. Through the efforts of the Union League Club of Chicago and the Chicago, Waukegan, and North Chicago Chambers of Commerce, Congress was persuaded to restore NC Great Lakes to its prewar training status.

By 1932 all of the land west of Sheridan Road had been transferred to the Veterans' Administration Hospital. The activity was then composed of 102 buildings on 507 acres. Only one of the 17 service schools that had been in operation during World War I remained in active status; however, by July 1933 no training activities were conducted and the entire complement authorized for manning the activity consisted of a Marine Guard detachment of 40 men, a Fire Department of eight men, and a small public works force. The only regular maintenance activity consisted of mowing Ross Field.

The activity was reopened for training in 1935. The limited national emergency declared by President Roosevelt in 1939 marked the beginning of the second period of major growth for NC Great Lakes. Service schools were reopened in 1940, and, just prior to Pearl Harbor, authorization was given for the construction of temporary frame barracks. By 1942, eight camps, each housing a regimental unit of 4,500 recruits, had been constructed, bringing the activity's population to 44,000 men. By September of the same year, six more of these camps were constructed in the Green Bay Road area, and the population of NC Great Lakes grew to 68,000 men. By March 1944 the activity had reached an all-time peak strength of 100,156 men.

Though hostilities ended in 1945, NC Great Lakes did not again revert to its prewar status as it had after World War I. The Navy retained many of the temporary World War II buildings in order to meet commitments relating to the Korean and Vietnam conflicts. Since the Vietnam conflict, training requirements at NC Great Lakes have remained at a high peacetime level. A complement of approximately 9,000 officers and men is stationed at the activity, maintaining facilities and conducting the training of the 80,000 recruits and students graduated annually. Today, NC Great Lakes consists of some 1,060 buildings on approximately 1,650 acres of land, with a replacement value of more than $1 billion.

4.3 LEGAL ACTIONS. There have been no legal actions taken against NC Great Lakes for violations of environmental laws.

4.4 BIOLOGICAL FEATURES.

4.4.1 Ecosystems. The natural environment of NC Great Lakes can be characterized as a relatively flat glacial drift deposit bordered by steep lake-facing bluffs cut with steeply sloping ravines. The most distinctive characteristic of this bluff-ravine complex is the continual erosion of the unconsolidated glacial material that makes up the bluff faces and ravine walls (United States Department of Agriculture (USDA), 1970; NORTHNAVFACENGCOM, 1980).

Intensive development of NC Great Lakes since 1911 has removed most of the natural vegetation of oak, hickory, maple, and other hardwoods. The only native woodlands present occur primarily on the steeply sloped ravine of Pettibone Creek, running across the Mainside part of the activity, and the bluffs facing Lake Michigan. Ecosystems of note on the base are the Pettibone Creek ravine; the Skokie Ditch area (which is the headwater region of the Skokie River); the Golf Course; and the narrow lakeshore/dune/steep coastal bluffs area.

The bank of Pettibone Creek is forested with white oak (Quercus alba), red oak (Quercus falcata), European larch (Larix decidua), white (Pinus strobus) and Scotch pine (Pinus sylvestris), and maple (genus Acer). Shrubs include raspberry (genus Rubus), and blackberry bushes (also genus Rubus). Wild grape (genus Vitis) and numerous perennial weeds cover the slopes.

The principal mammal found in this area is the rat (Rattus norvegicus), which burrows in the soft Hennepin loam and scrounges for refuse from nearby homes. Presently there are programs aimed at rodent control in operation at NC Great Lakes. Groundhog (Marmota monax), raccoon (Procyon lotor), squirrel (family Sciuridae), opossum (Didelphis virginiana), rabbit (Oryctolagus cuniculus), and chipmunk (genus Tamias) may also be found here.

Children and pets from nearby houses play in Pettibone Creek, which supports minnows (family Cyprinidae), aquatic insects, frogs (order Salientia), and salamanders (order Caudata). The water is slow moving due to low gradients, and is prone to stagnation during dry spells.

Skokie Ditch, an upgraded ditch with intermittent flow, comprises a second ecosystem. There is less vegetation along the ditch than occurs along Pettibone Creek, although a few willow trees (genus Salix) are close to the ditch in some areas. Some mammals (such as groundhogs, squirrels, rats, opossum, rabbits) may inhabit this area, although in lesser numbers than are found in the Pettibone Creek area. Frogs, salamanders, mosquitos (family Culicidae), and various aquatic insects inhabit the ditch on a seasonal basis.

Flat grassy areas such as the Golf Course comprise another type of undeveloped area at NC Great Lakes that may be viewed as an ecosystem.

Vegetation includes planted grasses and various planted exotic and native trees and shrubs. Squirrels and rabbits are the principal mammals found in the flat grassy areas; occasionally wild animals (such as those listed above) enter the area from farmland at the western margin of the activity.

The activity's shoreline along Lake Michigan comprises another ecosystem. It stretches about 2 miles along the lake and varies in width from approximately 100 feet at its northern end to a maximum of approximately 1,500 feet in the recreation area. The shore has been built out all along the activity boundary, and is lined with construction debris to impede erosion by the lake waters. The small foredune area along the shore is planted with American beachgrass (Ammophila arenaria). The area behind the beach is planted with bluegrass (genus Poa) and fescue (genus Festuca). Outside of these planted areas some natural vegetation can be found, including sedges (genus Carex), tall reed grass (genus Phragmites), and other herbaceous species.

This shoreline plant community is important to the integrity of the adjacent bluffs, but it has been disappearing as development of the lakefront continues. Numerous studies have shown that high lake levels which remove the narrow protective beaches result in accelerated erosion of the shore bluffs.

The steeply sloping bluff area adjacent to the shoreline rises approximately 70 feet above the water level and extends 1.25 miles along the activity's shoreline. The slope is heavily vegetated with a mixture of central and northern hardwood species, principally elm (genus Ulmus), mixed oak, sugar maple (Acer saccharum), soft maple, and ash (genus Fraxinus). Also present is a dense cover of shrubby species, including blueberry (genus Vaccinium), huckleberry (genus Gaylussacia), blackberry, willow, osier, and sassafras (S. albidum).

As previously mentioned the bluff face is composed of unconsolidated material deposited by glacial advances. While the dense cover of trees and shrubs on the shore bluff helps to stabilize the bluff face, it is still subject to erosion and slumping.

The shallow water near the shore of Lake Michigan supports abundant aquatic life. Aquatic insects, crustaceans such as crayfish (genus Cambarus), mollusks such as freshwater clams (genera Unio or Anodanta), and aquatic plants live in sandy and muddy substrates along the shore. Panfish, including sunnies (Lepomis gibbosus), bluegills (Lepomis machrochirus), crappies (Pomoxis annularis and Pomoxis nigro-masculatus), and white (Morone americana) and yellow perch (Perca flavescens), are fairly common in these shallow, warm waters. The panfish feed on the insects, minnows, and algae that thrive in the nearshore environment.

Coho salmon (Oncorhynchus kisutch), largemouth (Micropterus salmoides) and smallmouth bass (Micropterus dolomieu), lake trout (Salvelinus namaycush), pike (Esox lucius), and pickerel (genus Esox) are among the more common game fish in the lake. Lake whitefish (Coregonus clupeaformis), muskelunge (Esox

masquinongy), and trout (family Salmonidae) are occasionally caught by fishermen outside the harbor area. These gamefish typically feed on smelt (genus Osmerus) and panfish.

Especially common fish in the activity's harbor complex include the various types of panfish listed above and largemouth bass. These fish provide sportfishing opportunities in the harbor complex and should be considered as potential receptors of hazardous wastes that may enter the harbor via Pettibone Creek. Filter-feeding freshwater clams are also considered primary receptors of any hazardous wastes that exist in the water as particulate matter.

The bird population on the activity consists mostly of pigeons (family Columbidae), starlings (Sturnus vulgaris), and English sparrows (Passer domesticus). These birds are currently the focus of pest control programs. Various songbirds also inhabit the base, and seagulls (family Laridae) are always seen along the shore, along with a smaller number of ducks (family Anatidae).

4.4.2 **Rare, Threatened, and Endangered Species.** Under the Endangered Species Act of 1973 the Federal Government has designated for protection a number of plant and animal species that are in danger of extinction, or are likely to become endangered, throughout all or a significant part of their range (50 CFR 17.11 and 17.12). The State of Illinois passed an Endangered Species Act in 1972 to strengthen protection for plants and animals endangered or threatened with extinction by the State.

Currently, the Federal Government recognizes seven endangered animal species and one endangered plant species with ranges that include Illinois. The Illinois Department of Conservation recognizes an additional 65 animal species and 364 plant species that are either threatened or endangered as breeding populations in Illinois. Appendix B contains lists of all threatened and endangered plant, fish, bird, and terrestrial mammal species found in Illinois.

As of 1984 there were no known threatened or endangered plant species occurring on or near NC Great Lakes (NORTHNAVFACENGCOM, 1984a). However, the shoreline plant community found on the activity has been recognized as a dwindling natural resource worthy of protection (Illinois State Geological Survey (ISGS), 1977).

There are no terrestrial animal species native to the Great Lakes area that are considered threatened or endangered by the State or the Federal Government (NORTHNAVFACENGCOM, 1984). However, the State does consider a number of fish species to be threatened, including the lake whitefish and the lake sturgeon (Acipenser fulvescens). It is possible that individuals of these species periodically enter waters in close proximity to NC Great Lakes.

4.5 PHYSICAL FEATURES.

4.5.1 **Climatology.** NC Great Lakes is located in a region characterized by frequent changes in temperature, humidity, cloudiness, and wind

direction. The climate type is continental with warm summers and very cold winters. Prolonged warm spells and major droughts are infrequent but long spells of dry weather may occur during the growing season.

The normal daily average temperature for January is 25 degrees F., and for July is 75 degrees F. The lowest recorded temperature was -24 degrees F.; the highest recorded temperature was 105 degrees F. The average growing season lasts from April 30 through October 20. The mean annual precipitation is 34 inches, which peaks in June and is lowest in February. Mean annual snowfall ranges from 40 to 60 inches. Average winds are westerly at 11 miles per hour in winter, shifting to south-southwesterly at 9 miles per hour in summer (National Oceanic and Atmospheric Administration (NOAA), 1970).

Seasonal climate conditions have been shown to have a direct relationship to the bluff recession rate, a continuing problem in many lakeshore areas. The most severe rate occurs in late winter (February-March) when the first major thaw occurs (with many subsequent freeze-thaw cycles), precipitation is higher, and there is a higher frequency of onshore wave attacks. Data suggest that the synergistic effect of these four factors is primarily responsible for severe bluff recession.

4.5.2 **Topography.** Lake County is in the Wheaton Morainal Country of the Great Lakes section of the Central Lowland Province. This province is gently sloping and poorly drained, with many streams ending in depressions and marshes.

There are three topographic subcomplexes in Lake County, whose characteristics are influenced by the region's morainal geology. These are the Beach-Dune Complex, the Upland-Moraine Complex, and the Bluff-Ravine Complex. NC Great Lakes lies atop the Bluff-Ravine Complex.

The Bluff-Ravine Complex occurs within the narrow Lake Michigan watershed and consists of level tablelands which are typically bordered by steep lake-facing bluffs and a network of interior ravines. The most distinctive feature of this complex is its continual degradation by erosion. The two most damaging erosive forces are the pounding of waves from the lake and the surface runoff over the ravine walls. Numerous studies have shown that high lake levels which remove the narrow protective beaches result in accelerated rates of bluff erosion. Bluff and beach erosion may also result from such factors as loss of vegetation, natural weakness of bluff material, oversteep slopes, ground water seeps and springs in the bluffs, and deprivation of littoral drift sediments along the shore by shore structures farther north (ISGS, 1977).

Ravines have also formed in this unstratified glacial till, making the bluff area extremely erodible and prone to slumping. Ravines are particularly sensitive to increases in surface runoff, which intensifies the water erosion over and through the ravine walls. At NC Great Lakes there are 1.25 miles of lake bluffs and 1.5 miles of ravine carrying the activity's major stream, Pettibone Creek (NORTHNAVFACENGCOM, 1980).

Almost all of the land on which NC Great Lakes is situated has a constant elevation of 650 feet above mean sea level, plus or minus 10 feet. The exceptions to this rule are found in the Pettibone Creek area (600 feet) and the east end of the activity along Lake Michigan (590 feet).

4.5.3 Geology. NC Great Lakes is part of the glaciated Central Lowland region. Before glaciation, the land surface in the vicinity of what is now NC Great Lakes was formed by consolidated sedimentary rocks. These layers of much older limestones and shales are the result of ancient marine deposition by seas that periodically covered the area. In general, these bedrock layers are horizontal or dip gently eastward. The bedrock is presently covered with a superficial layer of glacial till that averages a depth of 170 feet (NORTHNAVFACENGCOM, 1980; Flint, 1971). This till was laid down by several periods of glacial activity during the last 600,000 years (Flint, 1971). It is usually traceable as a continuous blanket-like unit, due to the horizontal character of the underlying bedrock.

Silurian bedrock (Niagran and Alexandrian limestone) lies beneath the till layer at minimum depths of 170 feet. The limestone is impervious to water, and all water-bearing strata that could possibly serve as pathways for the migration of contaminants occur in the overlying layers of glacial till. To a large degree, the till material is derived from the limestone (Flint, 1971). Frequently, the till layer is 200 or more feet thick (Flint, 1971; Illinois Department of Public Health, miscellaneous dates, 1971 to present). Figure 4-4 shows a geologic cross section of the shallow till layers underlying NC Great Lakes.

The thick layer of glacial material, the only geologic unit that underlies the activity, is important for controlling development. The predominant glacial deposit in Lake County is the Wadsworth till member (clayey phase and sandy phase), an unsorted material consisting of elements ranging from clay to large boulders. Because this till is unsorted, i.e., it has not been exposed to the sorting action of water or wind, interstices between rocks in the till are filled with fine clay-sized particles. Consequently, the till can be practically impermeable to water.

Hydraulic conductivities for clayey tills may be 10 to the minus 12 centimeters per second (cm/sec), meaning that water may only migrate 10 meters through the till in 10,000 years (Freeze and Cherry, 1979).

Well logs from Lake Bluff addresses all show till extending to a minimum depth of 170 feet and frequently extending 210 feet or more. Although till is the dominant type of glacial deposit in the NC Great Lakes area, well logs show localized sorted volumes of glacial material throughout the till. These discontinuous stringers and lenses may serve as aquifers. A representative well log from Lake Bluff (Figure 4-5) shows 10 feet of brown clay, followed by 148 feet of blue clay, 13 feet of broken rock-gravel, and limestone, which begins at 171 feet in this case. Fill, or 2 to 3 feet of topsoil, may occur (Hoover Water Well Company well logs, 1968 to 1985).

Surface expression of till is flat, consisting of low ridges and hills interspersed with depressions and lakes. A sandy facies crops out along the lakeshore at the foot of the bluffs along Lake Michigan.

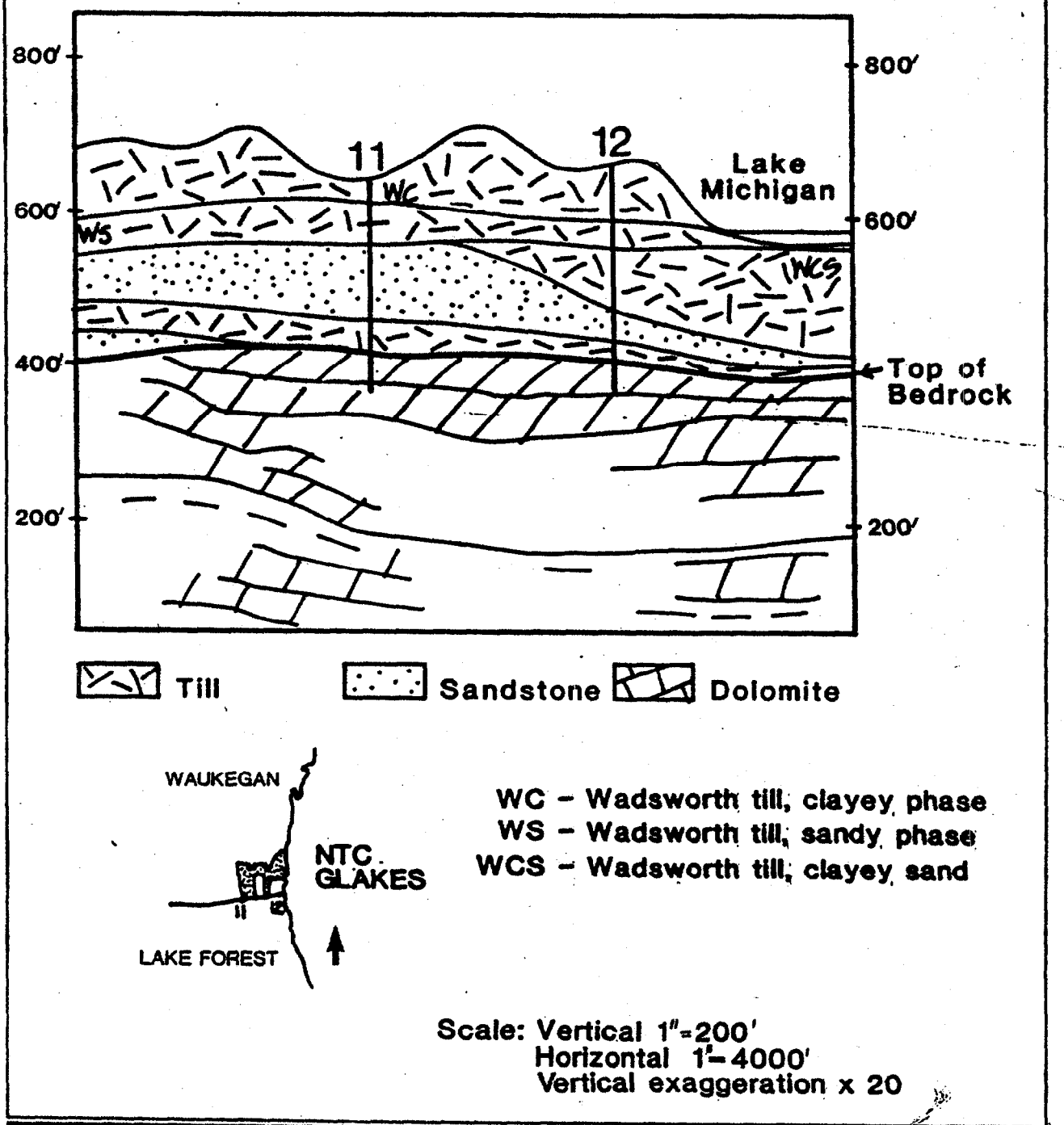


Figure 4-4

Geologic Cross Section,
NC Great Lakes

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

Figure 4-5
Representative Well
Log, Vicinity of
NC Great Lakes

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

White Copy – Ill. Dept. of Public Health
Yellow Copy – Well Contractor
Blue Copy – Well Owner

INSTRUCTIONS TO DRILLERS

FILL IN ALL PERTINENT INFORMATION REQUESTED AND MAIL ORIGINAL TO STATE DEPARTMENT OF PUBLIC HEALTH, CONSUMER HEALTH PROTECTION, 535 WEST JEFFERSON, SPRINGFIELD, ILLINOIS, 62761. DO NOT DETACH GEOLOGICAL/WATER SURVEYS SECTION. BE SURE TO PROVIDE PROPER WELL LOCATION.

ILLINOIS DEPARTMENT OF PUBLIC HEALTH WELL CONSTRUCTION REPORT

1. Type of Well
   a. Dug____. Bored____. Hole Diam. 6 in. Depth 198 ft.
   Curb material _____. Buried Slab: Yes____ No____
   b. Driven _____. Drive Pipe Diam. _____ in. Depth _____ ft.
   c. Drilled X. Finished in Drift X. In Rock _____.
   Tubular _____. Gravel Packed _____.
   d. Grout:

(KIND)	FROM (Ft.)	TO (Ft.)

2. Distance to Nearest:
   Building _____ Ft. Seepage Tile Field _____
   Cess Pool _____ Sewer (non Cast iron) _____
   Privy _____ Sewer (Cast iron) _____
   Septic Tank _____ Barnyard _____
   Leaching Pit _____ Manure Pile _____
3. Well furnishes water for human consumption? Yes X No____
4. Date well completed 3/23/79
5. Permanent Pump Installed? Yes____ Date _____ No X
   Manufacturer _____ Type _____ Location _____
   Capacity _____ gpm. Depth of Setting _____ Ft.
6. Well Top Sealed? Yes X No____ Type _____
7. Pitless Adapter Installed? Yes____ No____
   Manufacturer _____ Model Number _____
   How attached to casing? _____
8. Well Disinfected? Yes X No____
9. Pump and Equipment Disinfected? Yes____ No____
10. Pressure Tank Size _____ gal. Type _____
    Location _____
11. Water Sample Submitted? Yes X No____

REMARKS:

IDPH 4.065
1/74 – KNB-1

GEOLOGICAL AND WATER SURVEYS WELL RECORD

10. Property owner LA SALLE DEVELOPMENT Co Well No. Armour Estates, Lake Bluff
    Address P.O. Box 827, Palatine, Il
    Driller John P Lichter License No. 102-6
11. Permit No. 70191 Date 12/14/78
12. Water from Limestone & Gravel County Lake
    at depth 171 to 198 ft.
14. Screen: Diam. 5 in.
    Length: 3 ft. Slot 10
    Sec. 16.
    Twp. 44N
    Rge. 12E
    Elev. _____

MAP LOCATION IN SECTION PLAT
NE¼ NE¼

15. Casing and Liner Pipe

Diam. (in.)	Kind and Weight	From (Ft.)	To (Ft.)
6	Black	grade	168

16. Size Hole below casing: 6 in.
17. Static level 93 ft. below casing top which is 1 ft. above ground level. Pumping level _____ ft. when pumping at 15 gpm for _____ hours.

18. FORMATIONS PASSED THROUGH	THICKNESS	DEPTH OF BOTTOM
Brown Clay	10	10
BlueClay	148	158
Broken rock-gravel	13	171
Limestone	27	198

(CONTINUE ON SEPARATE SHEET IF NECESSARY)

SIGNED _____ DATE 6/19/79

The ISGS has evaluated the engineering properties of the geologic material underlying the activity in Circular 481 (1973) and found the subsurface material to be generally favorable for most construction. The major problem that may be expected is poor drainage; often the low permeability of the till creates a water table near the surface, causing construction difficulties as well as inefficient operation of facilities such as septic systems.

4.5.4 Soils. The native soils of the area have been classified into the Morley-Beecher-Hennepin Association, a grouping of soil types that characteristically occur together. This association occurs as a long, narrow belt extending along the shore of Lake Michigan from below Waukegan to the southern border of Lake County (USDA, 1970).

In general, most soils in the area of NC Great Lakes have properties suitable for development with few limitations. However, one limitation of these soils is their high shrink-swell potential due to the high clay content in the soil and underlying till. Additionally, where drainage is a problem in these silty soils, frost heave is a common limiting factor. According to Naval Facilities Design Manual 2, frost penetration depth in this area is 40 inches. These soil problems can be overcome without much difficulty through the use of suitable engineering and construction practices.

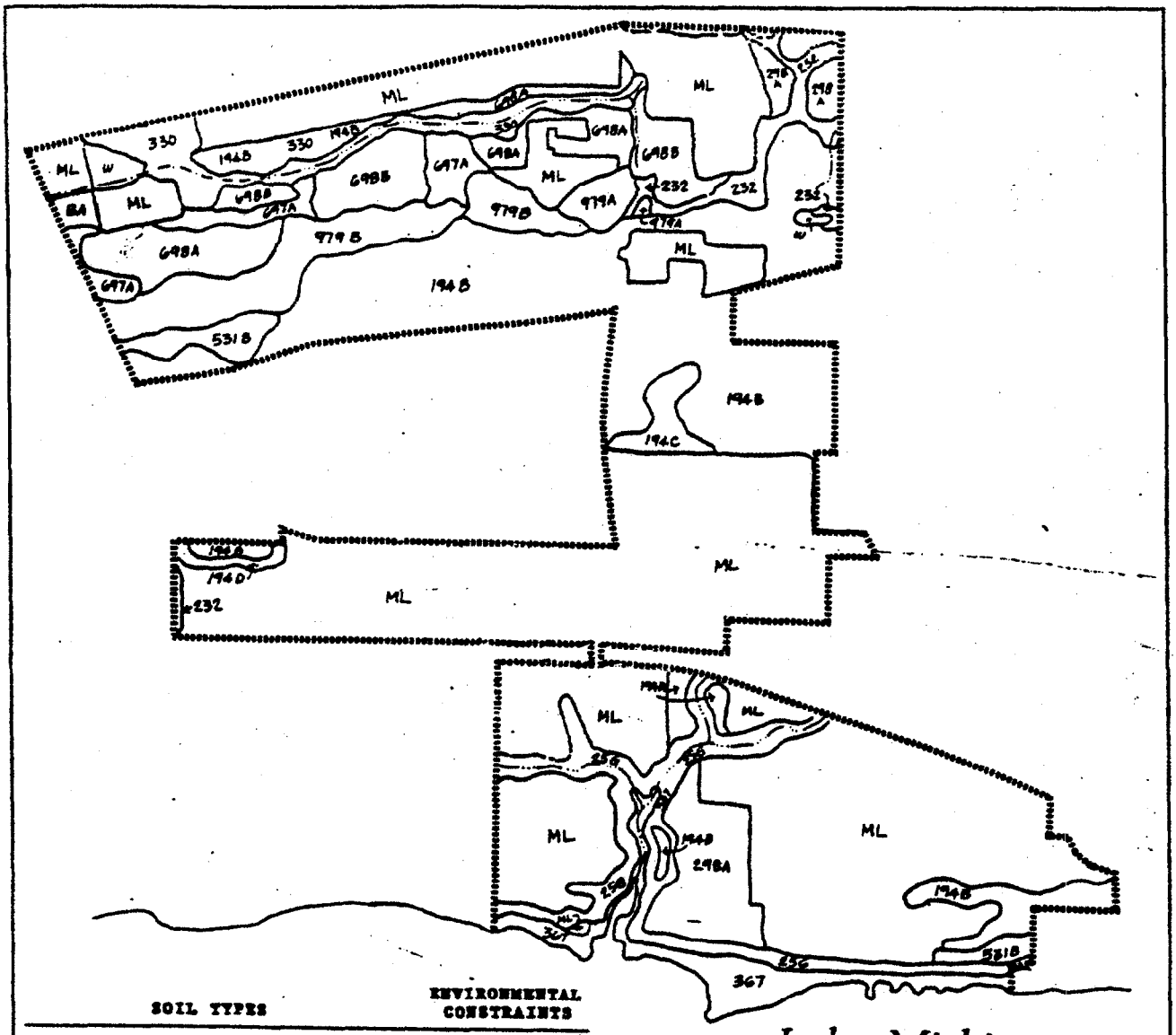
The following discussion enumerates and briefly describes the soil types that occur at NC Great Lakes (NORTHNAVFACENGCOM, 1980; USDA, 1970). Figure 4-6 accompanies the discussion and shows locations and potential uses of soils at NC Great Lakes.

The Morley series consists of deep soils that range from well-drained to moderately well-drained. These soils have arisen in thin, silty deposits of silty clay loam texture. Permeability is low because the subsoil is clayey; the underlying material is calcareous, silty clay derived from glacial till. Moisture capacity is high and the water table is 3 feet or more from the surface.

Three Morley soil types occur on NC Great Lakes: Morley silt loam 194B, with 2 to 4 percent slopes; Morley silt loam 194C, with 4 to 7 percent slopes; and Morley silt loam 194D, with 7 to 12 percent slopes. Each soil typically occurs at the top of morainic ridges, has moderately slow drainage, is farmed infrequently off the activity, and is prone to erosion.

The Beecher series soil type at NC Great Lakes is Beecher silt loam 298B. The soil is gently sloping and poorly drained, and formed from thin deposits of silty clay. Large areas of the soil are farmed off the activity. Seasonal water table levels are high.

Hennepin soils occur on steep, well-drained slopes. Hennepin loam 25G has 30 to 60 percent slopes, making it unsuitable for uses other than recreation.



SOIL TYPES		ENVIRONMENTAL CONSTRAINTS
MADELAND	ML	
HENNEPIN LOAM	256-G	STEEP
MORLEY SILT LOAM	194-B	
MORLEY SILT LOAM	194-C	
MORLEY SILT LOAM	194-D	
ASHKUM SILTY CLAY LOAM	232	WET
BEECHER SILT LOAM	298-A	
PEOTONE SILTY CLAY LOAM	330	WET
BEACH SAND	367	COASTAL BEACH
MARKHAM SILT LOAM	531-B	
WAUCONDA SILT LOAM	697-A	
GRAYS SILT LOAM	698-A	
GRAYS SILT LOAM	698-B	
GRAYS AND MARKHAM SILT LOAMS	979-A/B	
BARROW ARES	BA	

Figure 4-6

Soils Map,
NC Great Lakes

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

Ashkum silty clay loam 232 is level, is found in low-lying areas, and is subject to ponding. Tile drainage is common, and almost all soil of this type occurring in the NC Great Lakes area is farmed. Poor drainage limits development.

Peotone silty clay loam is level, is subject to ponding, and is generally artificially drained. The soil is farmed off the activity, but a high water table limits construction.

Markham silt loam 531B has 4 percent slopes, and lies atop morainic ridges. The soil derives from glacial till, and drainage is poor.

Wauconda silt loam 697A is deep soil with moderate permeability and a slope of 0 to 2 percent. The soil is frequently cultivated off the activity. Limitations derive from a seasonal high water table level.

Grays series soils are deep soils that range from well-drained to moderately well-drained and are derived from calcareous silt and sand. Permeability is moderate. Grays silt loam 698A has 0 to 2 percent slopes, has no farming limitations, and is suitable for development. Grays silt loam 698B has 2 to 4 percent slopes, and has few limitations save a tendency to erode due to the underlying gravelly substratum.

Grays and Markham silt loams 979A and 979B are low permeability soils that occur between glacial moraines in Lake County. These soils are poorly drained and are used primarily for farming off the activity.

Borrow Areas (BA) have had soil removed; in some cases only shallow layers are removed, although in other cases several feet of soil may have been removed, exposing the underlying glacial till. Borrow Areas support little vegetation.

Beach sand occurs along the shore of Lake Michigan. It is suitable for recreational use.

Madeland (ML) consists of areas of manmade cuts and fill, and is generally covered with roads and buildings. Fill material is not necessarily soil.

Beach sand is unstable and subject to wave action from the lake; Hennepin loam with extreme slopes poses a severe erosion hazard; and Ashkum and Peotone soils in low-lying areas are subject to ponding, high water table, and high shrink-swell. Some of the properties of the site soils are listed in Table 4-1.

4.5.5 <u>Surface Water</u>. NC Great Lakes is located within two major drainage basins: Lake Michigan North Drainage Basin (St. Lawrence River) and the North Branch Chicago River Drainage Basin (Mississippi River). The drainage divide separating these two watersheds occurs along Green Bay Road. Areas east of the road drain into the lake, and areas west of the road drain into the Skokie River, called the Skokie Ditch where it originates on the activity.

Table 4-1

Major Soil Types at NC Great Lakes
(Source: USDA, 1970)

Soil Unit	Symbol	Percent Slope	Drainage Class	Depth to High Water Table(feet)	Subsoil Texture	Underlying Material	Designated Prime Agricul. Soil	Agricul. Limitations	Development Limitations
Hennepin loam	25G	30-60	2	3 +	silt loam	calc. silt loam	No	E	ST, E, FH
Del Rey silt loam	192A	0-2	4	1 - 3	s.c.l.	lake sediments	Yes	SHWT, SP	SHWT, FH
Morley silt loam	194B	2-4	2-3	3 +	s.c.l.	calc. glac. till	Yes	SP	FH, CS
Morley silt loam	194C	4-7	2-3	3 +	s.c.l.	calc.glac. till	No	SP	FH, CS
Morley silt loam	194D	7-12	2-3	3 +	s.c.l.	calc. glac. till	No	SP, E	FH, CS
Ashkum silty clay loam	232		5	0 - 1	s.c.l.	glac. till	Yes	HWT	HWT, P, S, F
Beecher silt loam	298A	0-2	4	1 - 3	s.c.l.	calc. glac. till	Yes	SP	SHWT, FH
Beecher silt loam	298B	2-4	4	1 - 3	s.c.l.	calc. glac. till	Yes		SHWT, FH
Peotone silty clay loam	330		6	0 - 1	s.c.l.	calc. s.c.l.	Yes	SH, WT	HWT, S, FH,
Beach sand	367			0 - 1			No	U	U, GW
Markham silt loam	531B	1-4	2-3	3 +	s.c.l.	calc. glac. till	Yes	SP	FH
Wauconda silt loam	697A	0-2	4	1 - 3	s.c.l.	calc. silt & sand	Yes		SHWT, FH, S
Grays silt loam	698A	0-2	2-3	3 +	s.c.l.	calc. outwash sed.	Yes		FH
Grays silt loam	698B	2-4	2-3	3 +	s.c.l.	calc. outwash sed.	Yes		FH
Wauconda & Beecher silt loams	978A	0-2		1 - 3			Yes	SP	SHWT
Grays and Markham silt loams	979A	0-2		3 +	s.c.l.	s.c.l.	Yes	SP	
Grays and Markham silt loams	979B	2-4		3 +	s.c.l.	calc. glac. till	Yes	SP	
Borrow area	BA		Variable	Variable			No		
Madeland	ML		Variable	Variable			No		

Usage Limitation Codes

U	Unstable
FH	Frost Heave
CS	Clayey Subsoil
P	Ponding
HWT	High Water Table
SHWT	Seasonal High Water Table
S	Seepage
SP	Slow Percolation
GW	Groundwater Contamination Potential
E	Erosion
ST	Steep Slopes

Drainage Classes

1. excessively drained
2. well drained
3. moderately well drained
4. somewhat poorly drained
5. poorly drained
6. very poorly drained

Stream patterns in the area are irregular, and the streams carry small volumes of water. The two major streams that drain NC Great Lakes are Pettibone Creek, a narrow stream with a steeper overall gradient than the other area streams, and the Skokie River, which rises on the activity and has been channelized between Buckley Road and Alabama Avenue (Figure 4-7). Some of the hydrologic characteristics of area streams are presented in Table 4-2.

The Illinois Environmental Protection Agency (IEPA) has classified both drainage basins within which NC Great Lakes lies as water quality limited; that is, the water quality does not meet established standards and/or is not expected to do so, even after the prescribed 1983 effluent limitations are in effect.

Sampling by IEPA has indicated some violation of water quality standards in all tributary streams of both watersheds. In the Lake Michigan North Drainage Basin, Pettibone Creek has had the highest number of parameters violated and the highest number of violations. However, due to the relatively miniscule amount of water that flows through Pettibone Creek into Lake Michigan, the potential for significant impact on the lake's pollution load is minimal.

In the Skokie River (i.e., downstream from NC Great Lakes), Illinois water quality standards for ammonia-nitrogen, fecal coliform, and dissolved oxygen are commonly violated. This condition is typical of the poor water quality of the entire North Branch Chicago River Drainage Basin; it results from high pollution loads, and is further aggravated by very sluggish flows (NORTHNAVFACENGCOM, 1980). In the vicinity of NC Great Lakes, Skokie Ditch/River is a depression that may intersect the water table as it rises following periods of heavy precipitation. At present, Skokie Ditch receives storm water runoff from storm sewers that serve Forrestal Village. Since this runoff is the only known discharge from NC Great Lakes into Skokie Ditch, the activity's contribution to ammonia-nitrogen and fecal coliform violations in Skokie River would be minimal, if not insignificant.

4.5.6 Ground Water. Due to the proximity and acceptable water quality of Lake Michigan, NC Great Lakes does not rely on ground water wells for drinking water. However, both the glacial till and the underlying bedrock were used in the past as sources of ground water. Presently, water from the hydrologically isolated region of the till-bedrock interface is used as a source of ground water (Illinois Department of Public Health, 1978; Hoover Water Well Source, 1968; see also following discussion). Water for the activity is supplied from Lake Michigan.

The water table is usually within 10 feet of the ground surface and may intersect the surface in low-lying depressions. The water table intersects Pettibone Creek, and it intersects Skokie Ditch infrequently, following periods of heavy rain. Ground water movement is predominantly horizontal through the till, and rates of movement are slow due to the very low hydraulic conductivities. There is also a vertical component to ground water flow as a result of fracturing in the till. However, compaction of the till at increasing depth, and infilling of interstices and fractures

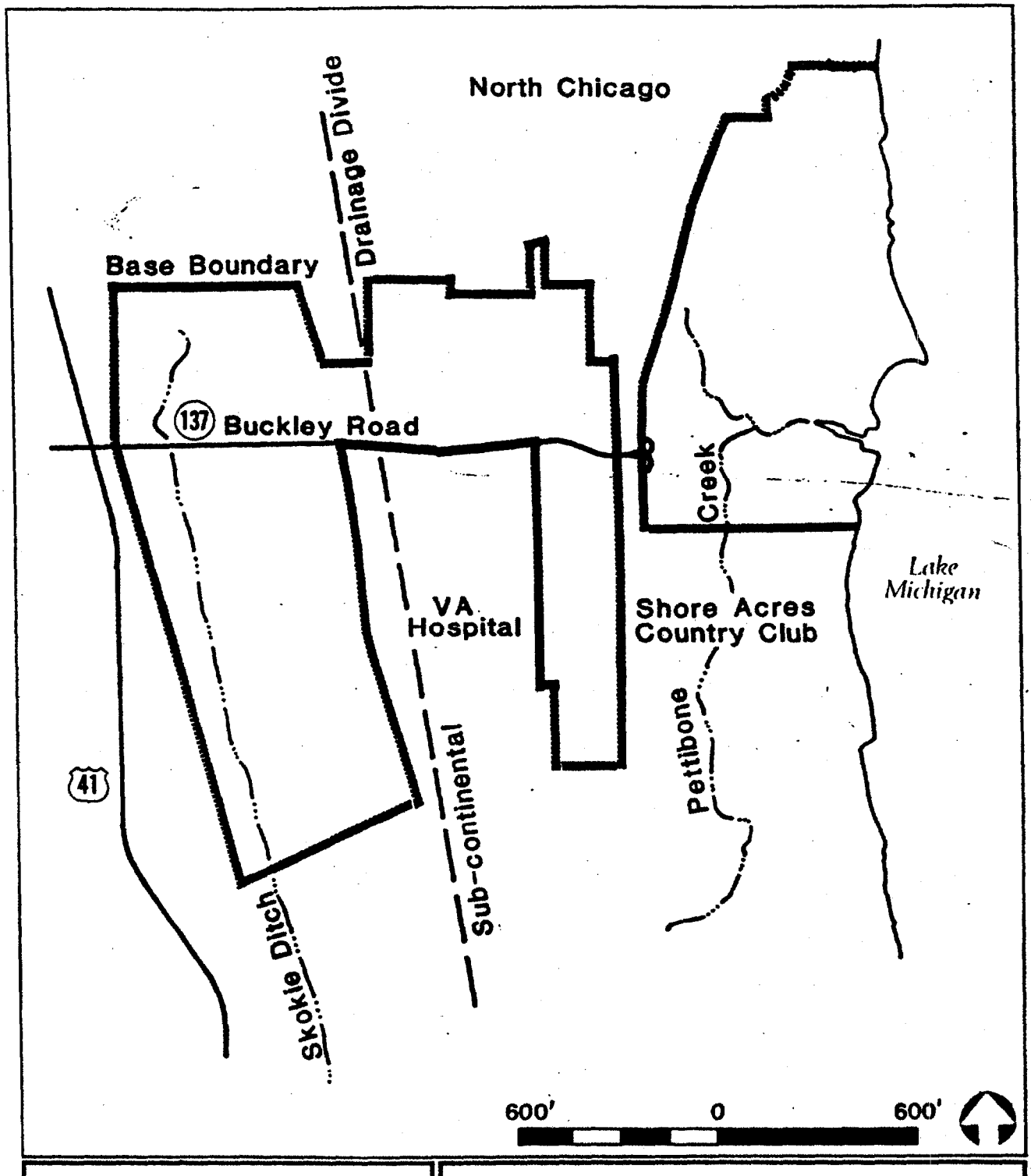


Figure 4-7

Site Features Map,
NC Great Lakes

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

Table 4-2

Area Stream Characteristics,
Vicinity of NC Great Lakes

Stream	Length (Miles)	Average Width (Ft.)	Water Surface (Acres)	Gradient (Ft/Mile)	Drainage Area (Sq.Miles)
Bull Creek	.9	4.0	.4	NA	NA
Dead Rober	1.5	105.0	27.2	9.3	6.0
Kellogg Ravine	9.5	6.0	6.9	3.1	6.2
Pettibone Creek	3.7	3.0	1.3	40.0	5.4
Lake Michigan Tributary	4.0	6.0	2.9	30.0	1.5
Waukegan River	8.5	4.0	4.1	21.8	9.0
No. Branch Chic. River	50.6	69.0	432.2	2.5	200.0
Skokie River	22.0	20	NA	4.0	32.9
West Fork No. Branch of Chicago River	8.3	8.3	18.4	2.0	30.0

NA: Not Available

Source: Sheaffer, J.R., and Zeizel, A.J., 1966.

with calcareous cement, hydrologically isolate the deep-lying limestones from the overlying till by preventing vertical flow at depth.

The consolidated sedimentary bedrock underlying NC Great Lakes forms a ground water reservoir. Many private and commercial wells are drilled into the Niagran and Alexandrian limestone, with typical yields of 25 to 40 gallons per minute. The consolidated rocks are hydraulically isolated from the overlying till.

Sand and gravel lenses, stringers, and beds located throughout the till sheet may serve as localized aquifers. At the bedrock-till interface (170 feet) is a sand-and-gravel aquifer which is a comparatively undeveloped source of potable water. Provided that these lenses and the sand-and-gravel aquifer are not overpumped, they may be reliable, long-term providers of ground water. Figure 4-8 shows the location and depth of some of these aquifers beneath the activity.

Where unfractured, the finer silty phase of the till is relatively impervious to water. In-place hydraulic conductivities are commonly on the order of 10 to the minus 12 cm/sec. Due to the extremely low hydraulic conductivities, coupled with the relatively low gradients common to the area, it may take ground water 10,000 years to travel 10 meters through the till.

4.6 MIGRATION POTENTIAL. Two pathways for the migration of contaminants exist at NC Great Lakes. These pathways are ground water transport in the shallow till and sand-and-gravel aquifers, and surface water runoff to Skokie Ditch or Pettibone Creek.

4.6.1 Ground Water. NC Great Lakes is underlain by a sheet of glacial material up to 250 feet thick. This material ranges from completely unsorted to well sorted. Where unsorted, the glacial till commonly forms aquitards; sorted materials comprise local aquifers.

There are three main aquifers at NC Great Lakes that may serve as migration pathways for contaminants. (The deep-lying sand-and-gravel aquifer located at the interface of the till and the limestone bedrock will not be considered as a pathway because it is hydrologically isolated from the shallower till layers, and will therefore neither receive nor transmit contaminants.) The area north of Buckley Road is underlain by a shallow aquifer less than 15 feet from the surface. Forrestal Village and the southern half of Camp Porter are underlain by an aquifer that rests at a minimum depth of 50 feet. The remaining area between these two aquifers lies at depths ranging from 15 to 50 feet (Figure 4-8).

Hydraulic conductivities in till are typically very low, with values in the range of 10 to the minus 12 cm/sec. The generally flat nature of these sheet-like deposits results in very low hydraulic gradients, and this fact combines with the low conductivities to severely restrict ground water flow through these materials. Given a gradient of 0.5 and a hydraulic conductivity of 10 to the minus 12 cm/sec, ground water would require nearly 10,000 years to travel 10 meters through this material.

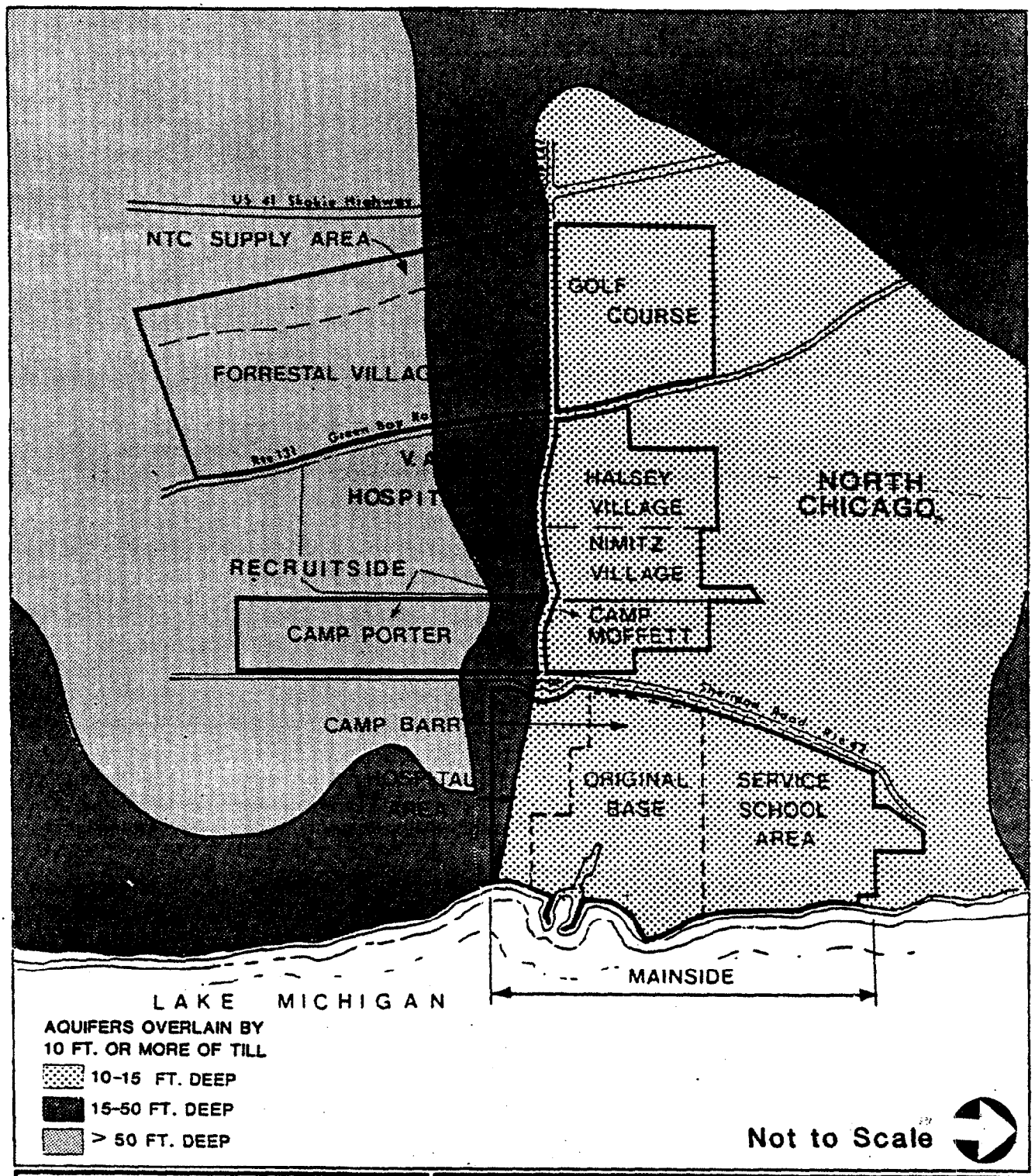


Figure 4-8

Buried Aquifers,
NC Great Lakes

Initial Assessment Study
Naval Complex
Great Lakes, Illinois

The well sorted sand-and-gravel sheets and lenses that are interspersed throughout the glacial till represent potential pathways for the migration of pollutants. Hydraulic conductivities in this material are several orders of magnitude higher than those found in the surrounding glacial till. These deposits are often of sufficient areal extent to provide reliable sources of ground water. Well logs from NC Great Lakes show that one sand-and-gravel aquifer is used (infrequently) as a source of potable or agricultural water; this aquifer is at the interface between the glacial till and the underlying limestone, and consists of limestone rubble. Well logs from the area indicate that this aquifer lies at a minimum depth of about 170 feet.

It has been observed that glacial materials of high clayey content in parts of the Midwest have networks of hairline fractures. These fissures are predominantly vertical and may serve as conduits for ground water movement. In general, however, hydraulic conductivity in such fractured tills decreases with depth as a result of compression from overburden loading. Moreover, fissures are frequently cemented shut in tills with a high calcareous component; the glacial till in the area of NC Great Lakes is highly calcareous (USDA, 1970; Flint, 1971).

For practical purposes, then, the plus 200-foot-thick till at NC Great Lakes has very little potential for vertical ground water migration. Furthermore, the clayey soils at the surface would inhibit penetration and migration of polluted waters.

Finally it must be said that hydraulically connected aquifers at very shallow depths could possibly transmit contaminated ground water to Skokie Ditch, Pettibone Creek, or Lake Michigan, if they were located below contaminated sites (although this is unlikely to occur).

4.6.2 Surface Water. NC Great Lakes lies within two drainage basins - the North Branch Chicago River and Lake Michigan North. The divide between these two basins lies approximately along Green Bay Road. Precipitation which does not infiltrate into the relatively impervious surficial material will travel as overland flow into either Skokie Ditch or Pettibone Creek.

The water in Skokie Ditch is not used as a source of potable or agricultural water in the immediate vicinity of NC Great Lakes. Illinois water quality standards for ammonia-nitrogen, fecal coliform, and dissolved oxygen are commonly violated in Skokie Ditch downstream from NC Great Lakes and the other industries which lie within the ditch's drainage area. This condition is fairly typical of the generally poor water quality in the entire North Branch Chicago River Drainage Basin (NORTHNAVFACENGCOM, 1980; see also section 4.5.5).

Pettibone Creek drains the Mainside area of NC Great Lakes and industrialized areas to the north of the activity, and receives discharge from storm sewers in North Chicago. The creek empties into Lake Michigan at the NC Great Lakes harbor. According to activity personnel, Pettibone Creek has on occasion been a conduit for spilled chemicals generated by industries located immediately off the activity. According to IEPA, Pettibone Creek has had the highest number of violations of water quality parameters and the

highest number of separate violations in the Lake Michigan North Drainage Basin. Parameters violated include those for PCB's and heavy metals. The receptors of this contaminant load are the sediments of the boat basin. These sediments support a huge population of sludge worms, indicative of severe contamination. Another potential receptor of contamination from Pettibone Creek is the potable water intake serving the activity. This is not considered a serious problem, however, due to the intake's remote location (8,000 feet offshore) and the dilution of contamination by the waters of Lake Michigan.

CHAPTER 5. WASTE GENERATION

5.1 GENERAL. Naval Complex (NC) Great Lakes is primarily a training facility; large-scale maintenance operations are not conducted on the activity. The generation of hazardous waste is confined mainly to the Public Works Center (PWC), the Hospital Command, and the Service School Command. Minor quantities are also generated by the other commands and tenant operations. Within this section, past operations are described as completely as possible; however, due to the frequent complete turnover of military personnel at the activity, it is often extremely difficult to find any personnel with tenure greater than 1 or 2 years. For this reason, current operations are discussed to enhance understanding of past waste generation practices.

Past and present operations at NC Great Lakes are discussed by command, branch, and shop. Whenever possible, waste types, quantities, and disposal practices have been identified for each operation or shop. If applicable, past locations where particular operations were quartered are also identified.

A summary of waste generation from all waste-generating activities at NC Great Lakes is presented in Table 5-1. In most cases current annual generation rates were used to develop a total waste generation quantity based on the duration of the operation and the population of the activity during the relevant time period.

5.2 NAVAL ADMINISTRATIVE COMMAND.

5.2.1 Fire Stations. Three fire stations have served NC Great Lakes since the 1950's, although the fire station in Mainside has existed since the activity became operative in 1904. The fire stations are located in Buildings 106, 108H, and 2912. Each fire station has a complement of 12 men. Workload has decreased significantly within the last 5 years, due primarily to fire inspections and information dissemination. The fire stations used to respond to seven calls per day; today the average has decreased to less than one call per day.

The fire stations generate no wastes. Aqueous Film Forming Foam (AFFF) has been in use since 1980 for fighting petroleum fires. Prior to 1980, a high protein foam was used; however, use of this compound was discontinued due to its highly corrosive nature.

The Fire Department has been called upon often in the past to clean up gasoline spills at the various service stations on the activity. Department personnel have used an absorbent, Absorball, to soak up spilled gasoline since 1975. The gasoline-soaked Absorball is placed in plastic bags by the firemen and then is picked up by PWC for off-base disposal. Prior to 1975 gasoline spills were treated by washing the gasoline down the storm sewers.

5.2.2 Photo Lab. The ADCOM (Administrative Command, a subordinate command of NC Great Lakes) Photo Lab can develop black-and-white, color, and

Table 5-1

Summary of Waste Generation, NC Great Lakes

Operation	Waste Material	Disposal Rate (gallons/year)	Disposal Practice 1	Duration of Practice
Naval Administrative Command:				
Photo Lab	Photographic chemicals: bromides, acetic acid, formaldehyde, bleach, acetone, alcohols; paper, film (black-and-white and color)	360, plus waste paper	Sanitary drains at previous location	1942-1973
			Sanitary drains	1973-1985
Navy Exchange:				
Service Station	Waste oil	1,000's gallons	Off-base recycling	1958-1985
	Antifreeze	100's gallons	Storm sewer drains	1958-1985
Laundry and Dry Cleaning	Perchlorethylene	recycled	Off-base	1973-1983
Photo Lab	Photographic chemicals: bromides, acetic acid, formaldehyde, bleach, acetone, alcohols; paper, film	1,300	Sanitary drains	before 1981
			Fixer recycled at previous location	1981-1985
			Sanitary drains	1973-1985
Recreational Services Department:				
Auto Hobby Shop	POL's	4,000	Private contractor	1958-1983
		5,400	Private contractor	1983-1985
	Stoddard solvent	undetermined	Storm sewer	1958-1973
	Stoddard solvent	recycled	Off-base	1973-1975

Table 5-1 (contd.)

Summary of Waste Generation, NC Great Lakes

Operation	Waste Material	Disposal Rate (gallons/year)	Disposal Practice 1	Duration of Practice
Ceramic Hobby Shop	Paint	2 (consumed)	Dumpster *	
Golf Course	POL	110	Burned at Fire Training Ctr.	pre-1968-1982
	POL	110	Private Contractor	1982-1985
	Stoddard Solvent	20	Burned at Fire Training Ctr.	pre-1968
	Stoddard Solvent	recycled	Off-base contractor	1968-1985
	12 v. batteries	30	Exchanged for deposit	1968-1985
	Pesticide containers	12	Dumpster	1967-1985
Recruit Training Command:				
RTC Rifle Range	Lead, brass	340,000 rounds	Recycled	1981-1985
	Lead, brass	½340,000 rounds	Recycled	1967-1981
	Lead, brass,	½340,000 rounds	Taken to landfill	1942-1967
	CLP = Clean, Lube Protect gun oil	0.095 gal/yr.	Dumpster *	1942-1985
	Bore cleaner - #6850-00-224-6663	0.095 gal/yr.	Dumpster *	1942-1985
Airman Laboratory	PD 680	0.150	Dumpster *	1981-1985
	Paint thinner	0.150	DRMO	1981-1985
	Paint	0.025	Dumpster *	1981-1985
	Varnish	0.025	Dumpster *	1981-1985
	Hydraulic fluid	0.025	Dumpster *	1981-1985

Table 5-1 (contd.)

Summary of Waste Generation, NC Great Lakes

Operation	Waste Material	Disposal Rate (gallons/year)	Disposal Practice 1	Duration of Practice
Building and Equipment Maintenance	POL's	110	DRMO	1943-1985
	Paint thinner	0.05	Dumpster	1943-1985
	Floor wax and stripper	0.05	Dumpster	1943-1985
	Spray lacquer	0.05	Dumpster	1975-1985
	RV batteries	10	DRMO	1943-1985
Motor Pool	Batteries	10 units/year	DRMO	1965-1985
RTC Silk-Screening Shop	Wash waste: alcohol, turpentine, linseed oil, latex paint, inks, acetone, gasoline	1,400	Onto ground	1972-1985
Public Works Department:				
Motor Vehicle Maintenance	POL's	5,200	DRMO	1942-1985
	Batteries	1,460	DRMO	1942-1985
	Paint	2	Sanitary sewer	1942-1985
Paint and Sign Shop	Paint: latex	0.05	Dumpster	1980-1985
	oil	0.05	Dumpster	pre-1970-1980
	Saf Peel surfactant	0.05	Dumpster	1982-1985
	Solution waste: mineral spirits, latex, oil varnish, oil-based stains, and acetone	2,200	Sanitary sewer	pre-1970-1985

Table 5-1 (contd.)

Summary of Waste Generation, NC Great Lakes

Operation	Waste Material	Disposal Rate (gallons/year)	Disposal Practice 1	Duration of Practice
Carpentry Shop	asbestos	undetermined	Dumpster	1947-1980
	Latex and oil paints	3 quarts	Dumpster *	1947-1985
	Latex primers	3 quarts	Dumpster *	1980-1985
	Solvent 144	11	Dumpster *	1978-1985
High Voltage Shop	1,1,1-trichloroethane	0.5	Dumpster *	1978-1985
HVAC Shop	Latex and oil primer	1	Dumpster *	1954-1985
	WD-40 Lubricant	1	Dumpster *	
Machine Shop	Solvent 144	110	DRMO	1942-1985
Tool Room	Solvent 144	30	DRMO	1983-1985
Cement Finishing Shop	"Lance" brand sealers	0.25	Dumpster *	1968-1985
	Form oil	0.25	Dumpster *	1968-1985
	Cement epoxy	1	Dumpster *	1968-1985
	Spray paint	1	Dumpster *	1968-1985
Welding and Sheet Metal Shop	Water soluble cutting oil	0.075	Dumpster *	1934-1985
	Scrap metal	undetermined	DRMO	1982-1985
Pipe Shop	Water soluble cutting oil	0.175	Dumpster *	1983-1985
	Uranine dye	2 pounds	Sanitary sewer	1973-1985
	OXOFF acid cleaner	200	Sanitary sewer	1973-1985
	COMMAND caustic cleaner	50	Sanitary sewer	1973-1985
Bricklayers Shop	18% muriatic acid solution	½125	Sprayed on location	pre-1968
	18% muriatic acid solution	125	Sprayed on location	1968-1983
	18% muriatic acid solution	500	Sprayed on location	1983-1985

Table 5-1 (contd.)

Summary of Waste Generation, NC Great Lakes

Operation	Waste Material	Disposal Rate (gallons/year)	Disposal Practice 1	Duration of Practice
Roofers Shop	Roof coating and sealant	275 (consumed)	Dumpster *	1968-1985
	Gasoline	1 (consumed)	Dumpster *	1968-1985
Sandblasters Shop	Black Beauty grit	750 pounds	Left on-site	1968-1985
Service School Command:				
EM/IC School	Stoddard solvent	0.050	Dumpster *	1942-1985
	Paints	0.175	Dumpster *	1942-1985
	Glass cleaner	0.050	Dumpster *	1942-1985
	Tric spray	0.005	Dumpster *	1942-1985
	Saf-Peel	0.325	Dumpster *	1942-1985
	"Bostic" thinner	0.400	Dumpster *	1942-1985
	WD-40 lubricant	0.008	Dumpster *	1942-1985
	Isopropyl alcohol	0.030	Dumpster *	1942-1985
Fire Control Technician, Opticalman, and Instrument Control	Alcohols	0.060	Dumpster *	1954-1985
	Acetone	0.025	Dumpster *	1954-1985
	Penetrating oil	0.010	Dumpster *	1954-1985
	Paint	5	Dumpster	1954-1985
	Thinner	8	DRMO	1954-1985
	PD 680	48	DRMO	1954-1985
	Glass cleaner	6	Sanitary sewer	1954-1985
	Gear oil	48	DRMO	1954-1985
NTC Rifle Range	lead, brass, live ordnance	undetermined	Left on ground, or sent to landfill	1918-1981

Table 5-1 (contd.)

Summary of Waste Generation, NC Great Lakes

Operation	Waste Material	Disposal Rate (gallons/year)	Disposal Practice 1	Duration of Practice
Gunnery School	PD 680	1.75	DRMO	1954-1985
	Hydraulic/transmission fluid	3,500	DRMO	1954-1985
	Grease	120	DRMO	1954-1985
	Mineral oil	0.025	Dumpster *	1954-1985
	Corrosion inhibitor	1.5	Dumpster *	1954-1985
	Thinner	0.06	Dumpster *	1954-1985
Steam Propulsion School	POL's	1,200	Outside contractor	1961-1985
	Acetone	1 (consumed)	Dumpster *	1961-1985
	Ammonium molybdate	1.5	Sanitary sewer	1961-1985
	Nitric acid	4	Sanitary sewer	1961-1985
	Chloride indicator tablets	3,000 units/year	Sanitary sewer	1961-1985
	Mercuric nitrate solution	4	DRMO	1961-1985
	Trisodium phosphate	6	Sanitary sewer	1961-1985
	Disodium phosphate	5	Sanitary sewer	1961-1985
	Morpholine	18	Sanitary sewer	1961-1985
	Lubricating oil	1	Outside contractor	1961-1985
	Cutting oil	0.010	Dumpster *	1961-1985
	Diesel fuel	5	Outside contractor	1961-1985
	Paint	3.25	Dumpster *	1961-1985
	PD 680 - Stoddard solvent	0.025	Dumpster *	1961-1985
	Spray solvent	0.035	Dumpster *	1961-1985

Table 5-1 (contd.)

Summary of Waste Generation, NC Great Lakes

Operation	Waste Material	Disposal Rate (gallons/year)	Disposal Practice 1	Duration of Practice
Hospital Command:				
Nuclear Medicine	Iodine 125	200 milliCuries/yr.	All disposed in dumpster after 10 half-lives (declared non-radioactive)	1970-1985
	Iodine 123	10,400 milliCuries/yr.		
	Iodine 131	1,200 milliCuries/yr.		
	TC 99M	78 milliCuries/yr.		
	Ga 67	260 milliCuries/yr.		
	Th 201	260 milliCuries/yr.		
	Cobalt 51	120 milliCuries/yr.		
	Cobalt 58	10 milliCuries/yr.		
	Iodine 131 waste (urine)		Incinerated	1970-1985
	Cobalt 58 waste (urine)		Incinerated	
	Acetone		Dumpster *	
X-ray	Photographic fixer and developers: alcohols, bleaches, bromides, acetoness	2650	Sanitary sewer after silver recovery	1981-1985
	Photographic fixer and developers: alcohols, bleaches, bromides, acetones	2650	Sanitary sewer after silver recovery	1961-1981

Table 5-1 (contd.)

Summary of Waste Generation, NC Great Lakes

Operation	Waste Material	Disposal Rate (gallons/year)	Disposal Practice 1	Duration of Practice
Photo Lab	Photographic chemicals: alcohol, bromides, acetic acid, acetone, bleaches, formaldehyde, film, paper	14	Sanitary sewer after silver recovery	1967-1985
	Photographic chemicals: alcohol, bromides, acetic acid, acetone, bleaches, formaldehyde, film, paper	14	Sanitary sewer	pre-1967
Incinerator	Ash	36 cu. yards/year	Off-base landfill	1967-1975
	Ash	36 cu. yards/year	Activity landfills	pre-1967
Naval Regional Dental Clinic	Waste compressor oil	9	PWC disposal	1976-1985
	Waste amalgam	100 lbs/year	DRMO	1983-1985
	Waste amalgam	300 lbs/year	DRMO	1976-1983
	X-ray solution: bromides, alcohols, acetate, formaldehyde	1800 lbs/year	DRMO	1975-1985
	X-ray solution: bromides, alcohols, acetate, formaldehyde	1800 lbs/year	Sanitary sewer	pre-1975
	Scrap lead	100 lbs/year	DRMO	1976-1985
	Mercury	5 lbs/year	DRMO	1976-1985

Table 5-1 (contd.)

Summary of Waste Generation, NC Great Lakes

Operation	Waste Material	Disposal Rate (gallons/year)	Disposal Practice 1	Duration of Practice
Dental Research Institute	Acids, bases	35	Sanitary sewer	1948-1985
	Organic wastes	9	DRMO	1948-1985
	Mice, rats, hamsters, monkeys	350 units	Incinerated	1948-1985
Print Shop	POL's	Trace	Rags sent to laundry	1983-1985
	Ink	Trace	Rags sent to laundry	1983-1985
	Perchloroethylene	0.50	Dumpster (cans rinsed)	1975-1985
	Perchloroethylene	½0.50	Dumpster	pre-1975
	Photographic fixer and developers: alcohol, bromides, acetate, formaldehyde, bleach	320	Sanitary sewer after silver recovery	1981-1985
	Photographic fixer and developers: alcohol, bromides, acetate, formaldehyde, bleach	½320	Sanitary sewer	pre-1981
CBU 401:				
	POL's	350	Off-site recycling	1975-1985
	POL's	350	Burned in Fire Fighting Training Center	pre-1975
	Lead-acid batteries	36 units	DRMO	1954-1985

* Assumes a waste generation rate of 0.5% in empty containers, rags, etc.

1 Dumpster contents were sent to Golf Course Landfill from 1942 to 1967, to Forrestal Landfill from 1968 to 1969, to Supplyside Landfill from 1969 to 1983, and were sent off-base, 1983 to 1985.

Cibachrome film. Originally located in Building 27, the lab has been located in Building 1 since 1982. Chemicals used by the lab are as follows: black-and-white developer Kodak D-76 (diluted 1:1 with water); black-and-white paper developer Kodak Royal Print Activator; color developer Kodak E-6LJ (color bleach); and Kodak fixer. Since 1975, spent fixer, film, and paper have been taken to the Defense Reutilization and Marketing Office (DRMO) for silver recovery. Spent black-and-white and color developers are poured down the drain leading into the sanitary sewers. Color bleach, an acid, comes with a neutralizer which is mixed in before it is poured down the drain. At least 95 percent of all negatives are either given to customers or stored permanently in the lab's files.

5.2.3 Navy Exchange.

5.2.3.1 Service Stations. Two service stations serve NC Great Lakes. They are located in Buildings 144 and 2710. The station in Building 2710 sells only gasoline. The other station, which has been located in Building 144 since January 1958, sells gasoline and provides routine automobile maintenance.

Waste oil has been stored in an aboveground tank and sold to an off-base contractor for reclamation since 1975. Used antifreeze is poured down the floor drains. All used engine parts and empty fluid containers are placed in a dumpster for off-base disposal. It is likely that, prior to the initiation of the current practices, spent oils, antifreeze and grease, and oil-soaked rags were discarded in the Golf Course Landfill (Site 1), which was operative prior to 1967. From 1967 to 1975, it is likely that much of the waste oil was stored at the Fire Fighting Training Area (Site 4) and burned during fire fighting exercises.

In 1983 a gasoline spill occurred at the service station on the Mainside area of the activity (Building 144). Approximately 3,000 gallons of gasoline were spilled when a line leading to underground storage tanks ruptured. The spill was cleaned up, and the gasoline-soaked soil was dug up and carried off-base. The area was monitored by the Fire Department for a month following the spill.

Despite the thorough cleanup at the spill site, the odor of gasoline has been reported in the basements of nearby buildings, particularly the Post Office, after heavy rains.

Also within the last 2 years, several gasoline spills took place at the service station in Building 2710. These spills, of several hundred gallons each, have been fairly regular occurrences. Since 1980 the spills have been cleaned up using an absorbing medium. Prior to 1980, spilled gasoline was washed into the storm sewers that lead to Skokie Ditch on the north side of the activity.

5.2.3.2 Laundry and Dry Cleaning. Dry cleaning has been performed on the activity since 1973. Prior to that all dry cleaning was performed off-base. Dry cleaning facilities were located in Building 415 until 1983,

when they moved to their present location in Building 105. A small VALCLEAN dry cleaning system, using Freon 113, has also been in operation in Building 415 since early 1985.

Perchloroethylene (PCE) has always been used for dry cleaning on the activity. The chemical is currently stored in a 3,000-gallon aboveground tank in Building 105; the tank has a full-service contract for maintenance. Prior to 1983, the chemical was stored in 55-gallon drums, and taken off-base for recycling by a contractor.

5.2.3.3 Photo Lab. The Naval Exchange operates a photo lab in Building 1312, located in the Recruit Training area. It is the only Exchange-operated photo lab in the Navy, and has been in Building 1312 since 1971. Chemicals used include bromides, acetic acid, bleach, acetone, formaldehyde, film, and paper. Together these chemicals constitute the 360 gallons of waste produced each year by this photo lab. Silver recovery was begun in 1981; prior to that, all spent chemicals were flushed down the sanitary sewer. At present, solutions not containing silver are flushed down the sanitary sewer. Used negatives and old pictures are thrown into the dumpster along with the other trash. The workload is much heavier now than in the past; thus, waste quantities can be assumed to have been much lower in the past.

5.2.4 Recreational Services Department. The Recreational Services Department at NC Great Lakes is in charge of the Auto Hobby Shop (Building 2110), the Ceramic Hobby Shop (Building 155), and the Golf Course.

5.2.4.1 Auto Hobby Shop. The Auto Hobby Shop was established in 1958, in Building 2110; previously, this building housed a rifle range. Prior to 1983, waste oils and other fluids drained from motor vehicles went into a 1,000-gallon underground storage tank. This tank was pumped out quarterly by a private contractor. In 1983, the tank was found to have a leak after complaints from the contractor of water contamination in the waste oil. PWC personnel removed the tank and surrounding soil and cemented the floor drain inside the building that led into the tank. The tank was inspected and the problem proved to be with the pipe fitting at the top of the tank, through which the contents were pumped out of the tank. Because this fitting was at the top of the tank, there was very little if any leakage out of the tank; rather, percolating rainwater was leaking into the tank.

All waste oils, transmisson fluid, and antifreeze generated by the Auto Hobby Shop now go into a 275-gallon aboveground storage tank that is emptied approximately twice per month by the same contractor. Parts cleaning is done in three separate cleaning stations consisting of a 35-gallon drum of SK solvent, a wash basin, and a circulating pump. The spent solvent is removed and replaced regularly by a private contractor. There are no painting or bodywork facilities on the premises. Discarded parts including tires, brakes, and starters are disposed of in dumpsters. Large parts such as engine blocks and cylinder heads are hauled off-base by a private contractor. These practices have continued for at least the last 3 years; many wastes generated by the Auto Hobby Shop prior to that time may have been disposed of in the Golf Course Landfill.

5.2.4.2 Ceramic Hobby Shop. The Ceramic Hobby Shop has been in operation since 1977, in Building 155. No chemical wastes are generated at the shop. Small quantities of paints are used, and the empty 2-ounce jars are disposed of in the dumpsters.

5.2.4.3 Golf Course. The Golf Course at NC Great Lakes was originally a 9-hole course which coexisted with the Fire Fighting Training Center and the landfilling activities of the Golf Course Landfill. From 1942 (the date of acquisition) to 1967, the Golf Course provided recreation, as well as a buffer between the landfill and Navy housing situated along Green Bay Road (the present site of the Commissary Store, Buildings 3451, 3452, and 3453). In 1967, concurrent with the closure of the Golf Course Landfill, the course was expanded to 18 holes.

The Golf Course Shop provides several services including maintenance and improvement of the grounds, pesticide applications, golf cart maintenance, and maintenance of the grounds equipment. In general, the grounds maintenance activities are conservative with respect to the application of fertilizers and pesticides. The areas of the course which were formerly used for the landfill are obvious because of problems with settling and the presence of steam plant coal ash fill, which was used as a final cover material before topsoil was applied.

Solvent usage is limited to a small 20-gallon tank in a batch-type parts cleaning area which recycles solvent into a tank. The tank is maintained periodically by an outside contractor. This practice dates back to at least 1983.

Waste crankcase oils and antifreeze from golf carts and grounds equipment are collected in a 55-gallon drum stored outside the maintenance building (Building 3311). These wastes were previously carried over to the neighboring Fire Fighting Training Area once or twice a year, where they were burned during training exercises. This practice ended in 1982, however, and now the drum containing the wastes is hauled off-base by a commercial waste oil processor.

5.2.5 Supply Department. The Supply Department is responsible for the procurement and distribution of all materials for NC Great Lakes. It is located in Buildings 3601, 3602, and 3603. The only waste generated is material that arrives in damaged containers. These materials are repackaged and sent back through DRMO. All outdated or off-spec materials are also handled by DRMO, which sells usable material and contracts for removal of unusable material by a private disposal firm.

5.3 RECRUIT TRAINING COMMAND.

5.3.1 RTC Rifle Range. The RTC Rifle Range has been located in Building 910 since 1942. Approximately 340,000 rounds of small arms ammunition (.22 caliber, .45 caliber, 12 gauge) per year are delivered from the Mainside armory to the Rifle Range. Spent ammunition is collected from the floor of the range and deposited into a 22-gallon can. This waste lead and brass is collected by DRMO once every 2 to 3 months. Chemicals used at the Rifle

Range include CLP brand cleaner (20 cases/year, each case containing 150 pint bottles), and standard issue bore cleaner #6850-00-224-6663 (375 1-gallon cans/year). Solvents are used on rags, and most of the solvent evaporates. Rags are reused as long as possible, then disposed of in the dumpsters, along with the empty solvent cans.

5.3.2 **Airman Laboratory.** The Airman Laboratory has been located in Building 929 since 1981 and generates very little waste. Cleaning solvent (PD 680) and paint thinner are used at the rate of 30 gallons/year each. All the cleaning solvent evaporates, and the used thinner is taken to Building 1212 for storage prior to disposal by DRMO. Small amounts of paints, varnish, and hydraulic fluid are also used by the laboratory (less than 5 gallons/year of each). These materials are stored in two fireproof metal cabinets. These storage and usage practices have been in effect since 1981.

5.3.3 **Building and Equipment Maintenance.** Building and Equipment Maintenance for the Recruit Training Command has been located in Building 1212 since 1943. Besides building maintenance operations, a Small Engine Shop and a Battery Locker are maintained in the same building.

The Small Engine Shop currently has one parts-cleaning station, which is maintained by an outside contractor. The shop also has an old parts cleaning tank (#4312-1454) that used Stoddard Solvent (30-gallon capacity); it is probable that used solvent was disposed of in the Golf Course Landfill (Site 1). The tank is currently unused and appears to have been unused for at least several years. Used engine oil and transmission fluid are collected in 55-gallon drums for pickup and disposal by DRMO, at the rate of approximately two drums/year. Waste generation rates have been approximately constant for the last 2 years.

There are no drains in the Battery Locker, and the batteries are not drained before being turned in to DRMO for disposal; DRMO retrieves batteries in this manner twice a year. Less than 10 batteries/year are disposed of in this manner. This practice has been in effect since prior to 1982.

5.3.4 **RTC Silk-Screening Shop.** The RTC Silk-Screening Shop has been located in Building 1212 since 1943. Personnel use mineral spirits, paint thinner, latex varnish, oil-based stains, inks, and acetone. The chemical composition of the substances used in printing operations at the RTC Silk-Screening Shop has changed recently, as manufacturers have upgraded and changed their formulas, and as different inks and thinners have been used.

Paint thinner is presently used at the rate of 3 gallons/week. Direct photo emulsion is used at the rate of 5 gallons/year. A large booth used for spraying and washing the finished silk screens is located in the northeast corner of the building. This booth has a drainpipe that penetrates the wall of the building and empties onto the ground outside. During busy periods, up to 200 gallons/week of wash waste were disposed of through this drain and onto the ground. This practice was started in 1972, when the booth was opened, and resulted in a prominent staining of the ground surrounding the

drain. The practice was discontinued in August 1985. (It is worth noting that the stained area is discussed as Site 7, RTC Silk-Screening Shop.)

5.4 SERVICE SCHOOL COMMAND.

5.4.1 EM/IC School. The EM/IC (Electricians Mate/Interior Communications Technician) School has been located in Building 2B since 1942, and expanded into Building 2C in 1964. EM/IC School provides basic electronics ("A-School") courses, advanced maintenance training ("C7-School") courses, and phone communication and navigational ("ICC1-School") courses. Course-work is based on a textbook, with some hands-on training involving small electrical components.

In Building 2C, all chemicals, primarily cleaning fluids such as paint remover, paint thinner, and waxes, are consumed in use. Empty containers are disposed of in trash dumpsters. Personnel reported that two to three 12-ounce cans of trichloroethylene per year were used for parts cleaning as recently as 1983, and that this material was also consumed in use. Broken electric components are sent through Supply to DRMO for disposal if they cannot be repaired.

In Building 2B, the same chemicals (see above) are consumed in use. All empty containers and used rags are discarded in trash dumpsters. Chemical generation has been constant since the late 1960's.

Rooms 329, 330, 330A, and 330B housed 15 gyro compasses from 1942 until 1976. Each mechanism contained 10 to 15 pounds of elemental mercury. EM/IC students removed, filtered, and replaced the mercury in each gyromechanism every 3 months. Reserve mercury was stored in a locker located in room 330C. The gyromechanisms were dismantled in 1976 and sent by way of Supply to DRMO. In 1979 a puddle of mercury somewhat less than 3 feet in diameter was discovered under the storage locker in room 330C. Further investigation revealed the presence of mercury in between the floor tiles and the baseboard edging in the room. School personnel called PWC, which contacted Preventative Medicine and the Fire Department. Personnel from all three groups arrived at the school, and Preventative Medicine vacuumed the area for mercury. Subsequent analyses for mercury vapor have been reported as below detection.

5.4.2 Fire Control Technician, Opticalman, and Instrument Control School. The Fire Control Technician, Opticalman, and Instrument Control (FT/OM/IC) School has existed at NC Great Lakes since 1954. FT/OM/IC consists of an "A-School" (Building 616) and a "C-School" (Building 617).

5.4.2.1 A-School. Several water-based paints are used in the school and consumed in use. Waste paint thinner and PD 680 (8 gallons/year and 50 gallons/year, respectively) are collected in a waste oil barrel and emptied into a waste oil tank located outside Building 325. Glass cleaner is diluted 15:1 with water; wasted cleaner goes directly into school drains. Five gallons/year of waste paint are disposed of into trash dumpsters. All other chemicals (waste paint thinner and PD 680) are consumed in use, with empty containers disposed of in trash dumpsters. Chemicals are

requisitioned and received from Supply. Volatile chemicals are stored in flammable materials lockers throughout the building; other household chemicals are stored on shelves.

5.4.2.2 **C-School.** Waste oil (up to 50 gallons/year) was disposed of directly into trash dumpsters until early 1985, when personnel began to dispose of the oil in the waste oil tank outside Building 325. Acetone, alcohols, and Permatex are consumed in use. Primer is also consumed in use.

Spent potassium hydroxide battery cells are replaced approximately once every 18 months. Spent cells are sent by way of Supply to DRMO for disposal.

5.4.3 **ET School.** The ET (Electronics Technician) School, located in Building 621, provides instruction in basic electrical theory. There are no laboratories associated with this school. The school generates only paper waste.

5.4.4 **Gunnery School.** The Gunnery School has existed in Building 521 since 1954. Waste PD 680, hydraulic fluid, transmission fluid, and greases are drained into 55-gallon barrels that are kept on the main deck of Building 521, outside a fire wall. A private contractor comes in annually to replace oils and fluids inside all gunnery machinery in the school. The contractor drains the spent fluids into the school's waste oil barrels, which are taken away by Supply personnel to DRMO, drained, and returned to the school. The total annual amount of waste petroleum, oils, and lubricants (POL's) from the Gunnery School is approximately 3,500 gallons/year. All other chemicals are consumed in use, with empty containers disposed of in trash dumpsters. Reportedly, waste quantities for the school have been reasonably constant for the past 10 to 15 years.

5.4.5 **Basic Electricity and Electronics, and Instructor Training Schools.** The Basic Electricity and Electronics (BE/E), and Instructor Training (IT) Schools have been located in Building 621 since 1969.

There are no chemical wastes generated in either school. Household chemicals are consumed in use, and the empty containers are disposed of in trash dumpsters.

The building was built on top of one of the former Demolition Debris Disposal Areas (Site 13B). Reportedly, disposal stopped during the mid-1950's. Building 621 experienced a shift in foundation (about a 1-inch drop) several years ago.

5.4.6 **Steam Propulsion School.** The Steam Propulsion School has existed at NC Great Lakes since 1961. It consists of a "600-psi" propulsion facility, a "1200-psi" propulsion facility, and classrooms in Building 236. Waste-generating facilities within the school include the 600-psi and 1200-psi facilities and the Steam Propulsion Repair Shop.

5.4.6.1 **Steam Propulsion Repair Shop.** Waste oils and diesel fuel (less than 10 gallons/year) are emptied into an 800-gallon underground waste oil

tank located outside Building 229. Acetone is consumed in use (1 gallon/year), and residual ammounts of waste paint from brush cleaning are emptied along with thinner into the sanitary sewer.

5.4.6.2 1200-psi Propulsion Facility. The 1200-psi Propulsion Facility has been located in Building 239 since 1978.

Boiler water testing and treatment are performed within the school. Ammonium molybdate, nitric acid, and chloride indicator tablets used in boiler water testing are emptied down lab sinks. Used mercuric nitrate ($HgNO_3$) solution is emptied into a 5-gallon bucket and poured through a high-capacity filter cartridge (Fisher Scientific, Catalog Number 903520 D8901 cartridge) that removes the $HgNO_3$ from solution. The filtrate flows into a lab sink. Once a week the cartridge becomes saturated with mercury, and lab personnel then replace the cartridge, seal both ends, and call PWC to take the cartridge, empty $HgNO_3$ vials, and any mercury-contaminated equipment or rags to Supply. Supply personnel forward the materials to DRMO for disposal at a Level 1 landfill. These practices have apparently continued without change since 1978.

All treatment chemicals used in the facility leave the boiler plant via blowdown to the sanitary sewer system. Hydrochloric acid and caustic soda are injected into influent boiler water by a shore demineralizer system, and the algacide is injected by means of a "unilock" system. Both systems are supplied, operated, and maintained by a private contractor who removes all waste.

Approximately 600 gallons of lacquer and paints are used each year in the 1200-psi Propulsion Facility. Paints are stored in six flammable materials storage lockers located throughout Building 239. Paints are consumed in use, with empty cans disposed of into trash dumpsters. Diesel fuel (10 gallons/year) is used as a general cleaning solvent. A substantial amount of POL waste (spent fluids from the boiler engine, diesel fuel) is generated by the facility. An estimated 4,000 gallons/year of waste fluids (including water, sludges, and oil) drain from the engine bilges into a 1,000-gallon underground oil/water separator, which discharges water into Pettibone Creek. PWC personnel drain less than 1,000 gallons of oil from the separator once a year.

5.4.6.3 600-psi Propulsion Facility. The 600-psi Propulsion Facility has been located in Building 229 since 1961.

Ammonium molybdate, nitric acid, and chloride indicator tablets are used and emptied down lab sinks. Used mercuric nitrate ($HgNO_3$) solution is emptied into a 5-gallon bucket and poured through a high-capacity filter cartridge (Fisher Scientific, Catalog Number 903520 D8901 cartridge) that removes the $HgNO_3$ from solution. The filtrate flows into a lab sink. Once a month the cartridge becomes saturated with mercury, and lab personnel then replace the cartridge, seal both ends, and call PWC to take the cartridge, empty $HgNO_3$ vials, and any mercury-contaminated equipment or rags to Supply. Supply personnel forward the materials to DRMO for disposal in a Level 1 landfill.

It is possible that prior to establishment of mercury monitoring, which was instituted in the late 1960's, mercury-containing compounds from these operations were disposed of in the then-operative Golf Course Landfill (Site 1). All treatment chemicals leave the boiler plant via blowdown to the sanitary sewer system.

The 600-psi Propulsion Facility uses 40 to 50 gallons of lacquer paints/year. Paints are stored in flammable materials storage lockers located in the basement of Building 229. Paints are consumed in use, with empty cans disposed of into trash dumpsters. Five gallons/year of PD 680 and 50 to 75 12-ounce spray cans/year of solvent are consumed in use. POL waste (200 gallons/year) drains from the engine bilges into a converted underground fuel tank that remained when an emergency generator was removed from Building 229 in the early 1970's. PWC personnel drain the tank for waste POL removal.

5.4.7 NTC Rifle Range. The NTC Rifle Range (Site 10) is located on a 14.2 acre plot at the northeastern corner of NC Great Lakes. The Rifle range has opeated at this location since 1918. At present, the Rifle Range is used by the Department of Justice, Federal Bureau of Investigation as a training and practice facility.

Shell casings and slugs of fired ammunition were left on the ground at the range, and these remain at the site (NORTHNAVFACENGCOM, 1984). Also, some live ordnance inadvertently dropped on the ground remains at the site in the uppermost soil layers (NORTHNAVFACENGCOM, 1984).

In August of 1984, the Northern Division, Naval Facilities Engineering Command (NORTHNAVFACENGCOM) conducted a study of the site and concluded that there is a high potential for lead contamination at the site. The cost of demilitarizing the site is estimated at $554,000, which is close to the fair market value of the site.

5.5 NAVAL CONSTRUCTION BATTALION UNIT 401. Naval Construction Battalion (CB) Unit 401 has occupied Buildings 3215, 3216B, and 3216C since 1954. Building 3215 houses the administrative offices, 3216B is the motor vehicle shop, and 3216C is an inside storage area. A battery locker is located in the southeast corner of Building 3216C.

CB Unit 401 provides support to the Administrative Command in the area of civil engineering projects. Recent projects which reflect this responsibility include the filling and grading of an old outdoor swimming pool area near Building 122 and the filling of the lakefront shoreline along the NTC Rifle Range.

Wastes generated by CB Unit 401 are principally the mixed office wastes generated in Building 3215, and the waste oil and lubricants from motor vehicle repair in Building 3216B. The individual projects may generate rubble.

Maintenance and repair of motor vehicles, including wheeled loaders, graders, dump trucks, bulldozers and pickup trucks, are the main activities which generate waste. These wastes consist primarily of used crankcase oil, gear lubricants, hydraulic fluids, and antifreeze. These wastes are collected in an aboveground 400-gallon tank on the west side of Building 3216B, and are removed from the activity by an outside contractor. This has been the practice since prior to 1982. The annual volume of waste material produced averages 350 gallons. Between 10 and 15 batteries are turned in to DRMO per year. Both new and used batteries are stored in the battery locker, a concrete-floored room with no deck drains. The room shows the signs of having been a battery locker for many years, but no signs of spillage exist outside.

5.6 **PUBLIC WORKS CENTER.** The Public Works Center (PWC) is responsible for the management and maintenance of all real property on the activity, including natural resources, activity infrastructure, buildings, and most vehicles. Additionally, PWC is responsible for planning facilities, including development of requirements, engineering services, and potential military construction projects. Administrative offices for PWC are located in Building 1A. These offices generate paper waste.

The Facilities Engineering Division, which is adminstered by PWC, was responsible for monitoring the closure of the Supplyside Landfill. A discussion of those shops that produce hazardous wastes follows.

5.6.1 **Motor Vehicle Maintenance Shop.** The PWC Motor Vehicle Maintenance Shop has been located in Building 106 since the 1950's. Prior to that, it was located in Building 3216. The maintenance shop currently services 500 vehicles, ranging from lawn mowers to large trucks. This number has been steady for the past 20 years. However, in the 1950's, there were approximately 900 Public Works vehicles.

The shop produces 100 gallons of waste oil per week. This oil is stored in a 450-gallon underground storage tank. This tank is periodically pumped out by DRMO. In the 1970's, oil was stored in 55-gallon drums, which were removed by DRMO every 10 days or so. Approximately 12 barrels of new oil are presently stored in Building 106. When these barrels are empty, they are steam cleaned in an area of the shop that drains into the underground storage tank, and are taken to DRMO for disposal. The underground storage tank is periodically pumped out by a DRMO contractor. It is likely that the Motor Vehicle Maintenance Shop supplied some waste oils that were disposed of in the Golf Course Landfill before current practices were initiated.

The shop disposes of three to four batteries per day. Battery acid is run through a baking soda and limestone bed and drains into the underground storage tank; the tank is periodically pumped by a private contractor, and the neutralized acid is removed off-base. The old battery shells are removed to DRMO on a periodic basis. The shop also uses a small amount of hydraulic fluid.

The shop operates a small paint booth for touch-up work. An air/waterfall system is used to capture paint particles from the air. The captured paint is carried into the sanitary sewer.

5.6.2 **Motor Pool.** The Public Works Motor Pool currently houses 500 pieces of equipment; this number has remained steady over the past 20 years. The Motor Pool has been located in Building 1600 for at least 20 years. The pool's gas terminal is located in an adjacent structure (Building 1600A). This building contains three gas pumps and a few oil drums with nozzles for topping off vehicles. The gas terminal has been located in Building 1600A for 8 years. Prior to that it was located in Building 1712; the empty gas tanks at this old location were removed in 1983. It is likely that in the past wastes generated by the Motor Pool were disposed of in the Golf Course Landfill.

5.6.3 **Machine Shop and Tool Room.** The Machine Shop fabricates metal components to specifications measured by shop personnel who visit job locations. The Tool Room maintains a central set of tools. The Machine Shop and Tool Room are both located in Building 4. The Tool Room has been in existence for 2 years.

The Tool Room uses solvent only in a closed parts tank. Solvent 144 is used. It is supplied from a single 55-gallon drum which is kept with the flammable materials locker in the rear of the shop. The parts tank works with a charge of 25 to 30 gallons of solvent at a time, which is replenished to maintain the fluid level as the solvent is lost to evaporation. When the sludge in the bottom of the tank builds up, the entire contents of the tank is drained. This results in 25 to 30 gallons of solvent/sludge waste per year. The waste is disposed of into a 55-gallon waste barrel in the neighboring Machine Shop.

The Machine Shop consists of typical metal-forming equipment like lathes, mills, and saws. Oil is used for lubrication, for washing cuttings out of the active cutting area of a tool, and as a seal treatment in air compressors. Solvent 144 is used for cleaning parts in a batch tank. The shop uses one 55-gallon drum for the solvent and produces two 55-gallon drums of waste solvents and oil per year (including the Tool Room waste). This level of waste generation is estimated to be consistent with past waste generation rates from this shop. Waste oils and metal cuttings were presumably disposed of for a time in the Golf Course Landfill, which was operative during the beginning years of Machine Shop operations.

5.6.4 **Pipe Shop.** The Pipe Shop, located in Building 104 since before 1973, maintains the plumbing of the activity. Shop personnel use 35 gallons/year of cutting oil, all of which is consumed. Uranine dye, used for sewer leak detection, is consumed at the rate of 2 pounds/year. Heating systems are cleaned with OXOFF, a hydrochloric acid cleaner, and then neutralized with COMMAND caustic cleaner. Two hundred gallons/year of OXOFF and 50 gallons/year of COMMAND are used in this manner. After being cleaned, the heating systems are flushed into the sanitary sewers.

5.6.5 **Welding and Sheet Metal Shop.** The Welding and Sheet Metal Shop has been located in Building 104 since the creation of the shop in 1934. Prior to 1934, it was known as the Blacksmith's Shop. A water-soluble cutting oil is consumed at the rate of 1 gallon/year. Scrap metal, the only waste generated, is taken to DRMO for salvage.

5.6.6 **Carpentry Shop.** The Carpentry Shop has performed most of the carpentry-type maintenance on both NC Great Lakes activity buildings and housing units. The shop has been located in Building 104 since about 1968. The shop also provides services to remote Navy locations such as Glenview NAS, and to Fort Sheridan (Army) and other government facilities as far away as Niagara Falls, New York. When on remote assignment, wastes generated are left at the job location.

The Carpentry Shop generates 2 to 3 quarts of waste Solvent 144, which is used to clean up after tiling jobs, per year. Even lesser amounts of paint and paint thinner (used to provide a primer coat on raw wood left outdoors) waste are generated.

Tile tools and the finished work are cleaned up with Solvent 144, which the Carpentry Shop obtains 1 gallon at a time (roughly once a year) from the Electrical Shop in Building 103. Any excess material is stored in a flammable materials storage locker in the shop. Most of the material used either evaporates or is soaked up on rags or towels used in cleaning the tools. Wastes are taken to the waste thinner containers in the Paint Shop. Small quantities (less than 4 or 5 ounces per job location) may have been disposed of into dumpsters at the job location on rags or with other dry trash. This material would have found its way into the activity landfill in use at that time.

Current usage rates are 5 gallons of Solvent 144 per year, of which about 2 to 3 quarts become waste. In the past, before the maintenance of housing units was contracted out, more material was used. A peak rate of 55 to 110 gallons/year was estimated, with the same ratio of waste production (10 to 15 percent).

Prior to use of Solvent 144 (also known as "White Lightning"), shop personnel used paint thinner for cleanups. They switched to Solvent 144 as soon as it became available to them (about 1982), since it was a more effective cleaning agent.

Paints (primarily latex primer) are used by Carpentry Shop personnel whenever they do outside work which will not be painted by the Paint Shop within a reasonably short time. At one time brushes were cleaned with paint thinner, which was sometimes discarded into the dry refuse at the job location and sometimes brought back to the Paint Shop waste thinner containers. Current practice is to use latex-based paints which do not require thinners.

Former Carpentry Shop (now Lagging Shop) personnel also do the asbestos rip-outs. This has been a big job over the past several years, dating from

the time asbestos hazards were first recognized. A separate group was formed and received the proper training to do these rip-outs; precautions were taken and the work was monitored to ensure the safety of the workers and the proper disposal of the wastes. Wastes were double-bagged, saturated with water, and hauled off-base for disposal by an outside contractor. Most of this work was done since 1982. Asbestos-containing wastes were probably disposed of in the Golf Course Landfill prior to the recognition of asbestos as a hazardous waste. The quantities of asbestos were probably small, however, since they were generated only as localized carpentry-maintenance was performed in small areas of specific buildings.

5.6.7 **Bricklayers Shop.** The Bricklayers Shop has been located in Building 2016 since 1981. Personnel, materials, and equipment were located in Building 210B (PW/Grounds Shop/Office) from 1968 to 1981. Additional materials and equipment for bricklaying have been stored in Building 1517 since 1977. Muriatic acid solution (18 percent) is requisitioned from and delivered by Supply. The solution is and has been diluted and sprayed directly on brick walls. Since 1983, 500 gallons/year of diluted muriatic acid have been used; 125 gallons/year were used from 1968 to 1983. Spent acid has evaporated in use and/or drained to grounds adjacent to areas where it is used (no wastes are collected). Empty 10-gallon acid drums are reclaimed by the supplying company. The shop workload increased approximately 50 percent from 1983 to the present and 25 percent from 1980 to 1983, and was relatively constant from 1968 to 1980.

5.6.8 **Roofers Shop.** The Roofers Shop has operated from Building 2016 since 1981. Personnel, materials, and equipment were located in Building 210B (PW/Grounds Shop/Office) from 1968 to 1981. Additional materials and equipment for roofing have been stored in Building 1517 since 1977. Chemicals are requisitioned from and delivered by Supply. Chemicals used by shop personnel include roof sealants ("Tremco" and "Monroe" brands), roof coating ("Mightyplate" and "Randustrial" brands), and gasoline. Less than 1 gallon/year of waste fuel gas is generated. Between 5 and 10 gallons/year of sealant and coating wastes are also generated. These wastes are discarded in a 55-gallon drum. Empty barrels and remaining compounds are hauled off-base directly by building trades personnel. The shop workload has increased approximately 50 percent from 1983 to the present and 25 percent from 1980 to 1983, and was relatively constant from 1968 to 1980.

5.6.9 **Sandblasters Shop.** The Sandblasters Shop has operated from Building 2016 since 1981. Personnel, materials, and equipment were located in Building 210B (PW/Grounds Shop/Office) from 1968 to 1981. Additional materials and equipment for sandblasting have been stored in Building 1517 since 1977. Materials are requisitioned from and delivered by Supply. The shop personnel use "Black Beauty" grit in 50-pound bags to sandblast buildings, facilities, barrels/containers, and anything else on the activity that requires sandblasting. Buildings and other nonportable outside facilities are sandblasted in-place, and the used grit and sandblasted materials fall to adjacent grounds. Portable equipment (barrels, etc.) is sandblasted in the yard outside Building 1517. Hydraulic fluid and oils for pneumatic tools are handled by PWC personnel. The shop workload has

increased approximately 50 percent from 1983 to the present and 25 percent from 1980 to 1983, and was relatively constant from 1968 to 1980.

5.6.10 Cement Finishing Shop. The Cement Finishing Shop has operated from Building 2016 since 1981. Personnel, materials, and equipment were located in Building 210B (PW/Grounds Shop/Office) from 1968 to 1981. Additional materials and equipment for finishing have been stored in Building 1517 since 1977. Materials are requisitioned from and delivered by Supply.

LANCE concrete sealer, epoxy cement, and lacquer spray paint are consumed in use. Empty containers are disposed of in trash dumpsters. The shop workload has increased approximately 50 percent from 1983 to the present and 25 percent from 1980 to 1983, and was relatively constant from 1968 to 1980.

5.6.11 Paint and Sign Shop. The Paint and Sign Shop has been located in Buildng 68H since 1970. Prior to that date painting was not centralized, with each location taking care of its own painting requirements. The Paint and Sign Shop normally employs 12 to 15 painters full-time; additional summer help expands the staff to 25 during peak activity.

Most of the paints now used are latex/water-based paints, so very small amounts of turpentine and paint thinner waste are generated. It is probable that at some time in the recent past a change in operational procedures occurred, and water-based paints replaced less convenient oil-based paints. The date of this change, however, is unknown.

Any thinner or tool-cleaning waste that is generated is stored in a 55-gallon drum for pickup and disposal by PWC; ammounts are on the order of 3 gallons/year. Used cans of paint are placed into the dumpster with the regular trash, usually at the location where they are used. In the past, washes generated in the brush-cleaning operations were disposed of in sinks in the shop. Prior to 1970, waste washes were probably disposed of at the painting job location.

A wet cascade spray booth in the sign shop sees only occasional use. A surfactant (SAF-PEEL) is added to the water to retard bacterial growth and keep paint particles suspended. The holding tank is flushed to the sanitary sewer once each quarter. The additive and agitation prevent the buildup of any significant sludge deposits. Caustic-based strippers are occasionally used in the booth, and these also are washed down the sanitary sewer during the quarterly holding tank cleaning.

Leftover full cans of paint are returned through DRMO for resale. Any lead-based paints that cannot be sold are disposed of through PWC. Partially full paint cans are disposed of in the regular trash dumpster. It is estimated that 100 partially filled 1-gallon cans per year are disposed of in this manner.

5.6.12 Locksmith Shop. The Locksmith Shop uses only a minimal amount of penetrating oil (WD-40 brand) in spray cans and a pint-sized squeeze bottle of Solvent 144 (1 pint/year), all of which is consumed in use. The Locksmith Shop also generates waste locks, which are discarded in dumpsters.

5.6.13 **Electric Shop.** The Electric Shop has been located in Building 104 since at least 1968. Until 1983, the Electric Shop included a Motor Shop; this shop has since been discontinued. When the Motor Shop was in operation, personnel used two 55-gallon drums of Solvent 144 per year. This solvent was used in a spray booth for parts cleaning. It was replenished occasionally, and all of it eventually evaporated. Copper wire, scrap iron, and used circuit boards are turned in to DRMO for salvage. This operation has continued unchanged since 1968.

5.6.14 **High Voltage Shop.** The High Voltage Shop, located in Building 103, is responsible for high voltage electricity transmission lines on the activity. Shop personnel perform the periodic transformer inspections but do not perform maintenance on polychlorinated biphenyl (PCB) transformers except under emergency conditions. High Voltage Shop personnel are trained in the handling of PCB material; however, PCB transformer maintenance is performed by an outside contractor.

There are seven PCB transformers currently out of service and in storage in Building 1405. All transformers not in service and other scrap and new cable materials have been stored in the "boneyard" south and west of Building 1517 (Site 5). A new building has just been completed for the storage of these transformers pending their disposal. It is located at the northern end of Camp Moffett, behind Building 1517. This is the staging area (also Site 5), which is used to accumulate waste for pickup by DRMO or by a contractor. There were approximately 40 units in storage in the boneyard at the time of the visit by the IAS team. None of these units contained PCB.

PCB transformers were stored on the lower level of Building 226 prior to its demolition. In 1981 there was a PCB spill incident related to the attempted theft of transformer metals (Site 6), but this area is no longer used for storage.

Current waste generation is minimal. Connections to transformer banks and maintenance of the lines are the major elements of the current workload. Cable splices are cleaned with 1,1,1-trichloroethane, which is supplied on presoaked towels in 2- to 4-ounce pop-top cans. These towels limit the quantity of material used and the amount of waste generated. Used towels are disposed of with the general activity refuse. Most of the 1,1,1-trichloroethane evaporates during use of the towels.

High Voltage Shop operations also include removal of underground cable. Scrap metal recovered from the removal of underground cable is cut into lengths and accumulated for DRMO. When a sufficient quantity is available, it is taken to the DRMO yard. Three trailer loads (approximately 10 tons per load) of waste lead-shielded cable were removed and transferred to the DRMO yard in the last 9 months; this translates into a 10.8 ton/year rate of waste generation.

In the past, before the hazards of PCB's were known, maintenance of PCB transformers included draining of PCB oils from transformers, followed by

dilution of these contents. Maintenance operations were performed on location, where the transformers were installed. In 1982 some PCB-contaminated switchgear was also worked on. This was described as an unusual assignment based upon current workloads.

5.6.15 **Heating, Ventilation, and Air-Conditioning (HVAC) Shop.** The HVAC Shop maintains all electrical, pneumatic, and manually controlled HVAC equipment at the activity. The shop has been located in Building 2016 since 1978. It was located in Building 103 (PWC Electronics/Maintenance Shop) from 1954 until 1978, and in Building 104A before 1954.

There are presently 26 cooling towers in use at NC Great Lakes. Water treatment chemicals are applied to the cooling systems by the HOH Chemical Company under a 3-year contract.

Chemicals are requisitioned from and delivered by Supply. Paints, WD-40, and Capella oil are stored in a flammable materials locker within the HVAC Shop. Freon in 55-pound cylinders and acetylene containers is stored on the floor in the shop; these containers are refilled and returned by Supply personnel as required. The shop workload has decreased to approximately 25 percent of pre-1983 workloads due to internal contractual agreements within PWC. The workload was reasonably constant before 1983.

5.6.16 **Utilities Division Wastewater Treatment Plant.** The Utilities Division formerly handled activity wastewater at two wastewater treatment plants. One plant is located on the Lake Michigan shoreline at the south end of the activity waterfront and received most of the waste from the main acitivity operations, including Hospitalside, Recruitside, and Mainside operations. The second plant (Green Bay Sewage Treatment Plant, in Forrestal Village) is located at the southwestern corner of the activity and received waste from activity housing areas and Supply Department and DRMO facilities. Both plants were activated sludge plants, and used no chemicals except chlorine.

Neither plant has operated since the activity was connected to the North Shore Sanitation District (NSSD) system in 1975. Effluent discharges went either into Lake Michigan (from the plant on the lake) or into the Skokie Ditch (from the Forrestal Village plant). Sludges were pumped into drying beds located on the south side of the inner boat basin. After agreements were signed to join the North Shore Sanitation District, these beds were removed under the assumption that they would no longer be required. When the North Shore connection was delayed, sludge from the lakefront plant was trucked over to the Forrestal Village plant lagoons.

Dried treated sludge was made available to activity personnel for home gardening use. Other sludge was used for on-base horticulture or disposed of on local farms (land spreading). In 1977-1978, the last of the wastewater treatment plant sludge was removed from the Forrestal Village area, and disposed of off-base.

Raw sludge from the lakefront plant was pumped at the rate of 10,000 to

15,000 gallons/day (5-day week) into trailer trucks for transfer to the Forrestal Village sludge drying lagoons. All dried (raw) sludge was disposed of off-base.

5.6.17 **Pest Control Shop.** The Pest Control Shop has been located in Building 68H since 1984. From approximately 1972 through 1984, it was located in Building 210B. Prior to that, the shop occupied a basement room in Building 216 from 1968 to 1972, and a room in Building 112 for a part of 1968. Prior to 1968, pest control operations were carried out by private contractors.

The primary function of the shop is insect control, but small amounts of herbicides and rodenticides are also used. The primary insecticides used are baygon diazinon, pyrethrum, and ficam W; additional pesticides too numerous to enumerate here are listed in Table 6-2. Chlordane and dichloro-diphenyl-ethane have not been used since 1971.

Sprayers are rinsed with alcohol between applications and the rinse is sprayed on-site. Empty containers are triple rinsed and disposed of in the regular trash dumpster. It is estimated that 7 to 10 gallons of pesticide per week are used year round. No pesticide containers from this shop ever went into activity landfills, as landfill operations ended before the activity took over its own pest control operations.

5.6.18 **Emergency Shop.** The Emergency Shop provides immediate service to activity buildings and housing units during the off-hours. Shop personnel perform small jobs which do not involve fabrication or other long-term commitments of personnel, time, and materials. The Emergency Shop vehicles carry a limited quantity of solvent, paint thinner, and paint in stock. Typical quantities of each material are less than 1 gallon. The Emergency Shop workload is divided almost equally between housing and the activity.

5.7 **HOSPITAL COMMAND.** Medical facilities have existed at NC Great Lakes since 1911, when the original U.S. Hospital, Great Lakes, Illinois, was commissioned. The hospital originally had only 81 beds. In 1918, the hospital's capacity was increased to 300 patients/day because of World War I. However, the hospital reached its greatest capacity during World War II. There were 38,384 admissions to the original hospital in 1943, including the all-time peak load of 8,179 in-patients. The original hospital served until 1961, when the present hospital (Building 200H) became fully operational.

The new hospital at NC Great Lakes, Building 200H, was commissioned in 1960 and became fully operational in 1961. Originally constructed as a 1,000-bed facility, the hospital housed as many as 1,400 beds during the Vietnam era. The hospital currently has an 800-bed capacity, with a reported Average Daily Patient Loading (ADPL) of 150.

Facilities within the hospital include the X-Ray Department, the Photo Lab, the Pharmacy, and all medical laboratories at NC Great Lakes (except Nuclear Medicine). Other medical facilities at NC Great Lakes include the Nuclear Medicine Department and the hospital incinerator.

Administrative medical personnel at NC Great Lakes became acutely aware of the potential hazards of industrial wastes during the late 1970's. A survey of all chemicals stored in Building 38H that were typically used within the Hospital Command was completed in 1981. Chemical wastes were taken off-base for disposal by a private contractor in 1981. It is probable that hazardous wastes generated by the Hospital Command prior to 1981 were discarded in the landfills operating at the time.

5.7.1 **Laboratory Department.** Individual labs include Hematology, Coagulation, Immunochemistry, Histology, Microbiology, Urinalysis, Clinical Chemistry, Bloodbank, Cytology, and Morgue Cognizance. Laboratory services have existed in Building 200H since 1961. Chemicals commonly used by the labs include methanol (stains), propane (lab burners), acetone (destaining), xylene (tissue sample preparation), elemental mercury (instruments, gauges), ethanol (tissue processing), formaldehyde (tissue processing), hydrochloric acid (urine preservative), acetic acid (urine preservative), and sulfuric acid (slide preparation). These chemicals are consumed in use. Residues and containers are sent to the hospital incinerator.

5.7.2 **Nuclear Medicine.** The Nuclear Medicine Department consists of two shops, the Drug Screening Lab and the Nuclear Medicine Lab. The department has been located in Building 38H since its inception in 1970.

5.7.2.1 **Drug Screening Lab.** Iodine 125, an isotope with a half-life of 60 days, is used in the Drug Screening Lab. This substance, which comes in liquid form and is stored in glass vials, has been (and continues to be) used at the rate of 200 milliCuries/year. This practice may have continued since 1970.

Iodine 125 is stored in a lead vault located in the Nuclear Medicine Lab. Used iodine and radioactively contaminated materials (vials, tubes, gloves, etc.) are collected in 55-gallon barrels that are stored by lab personnel in a lead vault located in the basement of Building 81H (Medical Supply). Approximately 15 55-gallon barrels of isotope-related wastes are generated every 2 weeks. The barrels are taken off-base bimonthly by a licensed private contractor.

5.7.2.2 **Nuclear Medicine Lab.** The following isotopes are used in the Nuclear Medicine Lab:

Isotope	Half-Life	Quantity/Form/Container
Iodine 125	60 days	200 milliCuries/year, liquid, glass vial
Iodine 123	13.2 hours	200 microCuries/week, capsules
Iodine 131	8.08 days	100 microCuries/month, capsules
Technium 99M	6 hours	1.5 milliCuries/week, in lead generators
Gallium 67	78.2 hours	5 milliCuries/week, liquid, glass vial
Thorium 201	3 days	5 milliCuries/week, liquid, glass vial
Cobalt 51	220 days	20 milliCuries/year, liquid, glass vial
Cobalt 58	78 days	10 milliCuries/year, capsules

Isotopes are stored in a lead vault in the Nuclear Medicine Department. Wastes from used Gallium 67, Thorium 201, Iodine 123, Iodine 125, and Cobalt 51 are held in the lead vault for at least 10 half-lifes. After 10 half-lifes, these materials are no longer classified as being radioactive, and are disposed of in trash dumpsters. Wastes from Iodine 131 (including urine and any materials that come in contact with a patient during his/her visit) and Cobalt 58 (urine) are stored in the lead vault for 10 half-lifes and burned in the hospital incinerator. Used lead generators containing Technium 99M are taken to the lead vault in Building 81H and taken off-base by private contractor. These practices and quantities have remained the same since 1970.

The Nuclear Medicine Department uses 1 to 2 gallons/year of acetone, which is consumed in use. Any broken or malfunctioning equipment containing radioactive materials is sent to Naval Electrical Systems Command for repair. Personnel interviewed knew of no previous accidents within the department or elsewhere at NC Great Lakes.

5.7.3 **X-Ray Department.** The hospital X-Ray Department uses standard photographic developer and fixers such as formaldehyde, bleach, alcohol, and acetone. Since about 1981, the developer has gone through a silver recovery process prior to disposal to the sanitary sewer. In the last few years the fixing solution has been treated in the same manner. From 1961 to 1981 fixer was disposed of in the sanitary sewer, with water used to dilute the acetone. Peacetime usage is estimated at 30 gallons/week of fixer and 20 gallons/week developer. Empty plastic containers are disposed of with normal trash. Processed film is kept for 5 years and then shipped to a private contractor for processing. The radiation source is handled on a contract basis with a private contractor through Medical Repair.

5.7.4. **Photo Lab.** The hospital Photo Lab is responsible for all photography assignments for the hospital. Black-and-white, color print (Kodak C-41), and color slide (Kodak E-6 and Ciba) chemicals are used. All process chemicals are sent to Medical Repair for silver recovery. Prior to 1975, all chemicals were disposed of in the Photo Lab sink. The chemical usage rate has been 12 to 15 gallons/year from 1967 through the present.

5.7.5 **Pharmacy.** The Pharmacy has been located in Building 200H since the hospital became operational in 1961. Materials handled by the Pharmacy include various vaccines, biologicals, and other prescription and non-prescription drugs. Materials are requisitioned weekly through Supply in accordance with physicians' requests.

The only wastes generated within the Pharmacy are materials that are not used before their expiration dates. Vaccines and toxic biologicals are burned in the hospital incinerator. Unused drugs are returned to the respective pharmaceutical companies or disposed of in dumpsters.

5.7.6 **Incinerator.** The hospital incinerator is rated at 250 pounds/hour and is operated by PWC at this capacity for 10 hours/day, 5 days/week. This has been the schedule since 1982, when the incinerator started to receive

waste from the Veterans' Administration (VA) hospital. Prior to that time the incinerator operated 3 days/week, 6 hours/day. The VA waste is estimated to be about 30 percent of the total. The incinerator is used primarily to burn pathological waste; however, on occasion confidential documents are burned as well. Exhaust gases are scrubbed prior to release to the atmosphere.

Ash and scrubber blowdown are collected in a 6-cubic-yard dumpster which is emptied by the Transportation Department approximately once every 2 months. Waste currently is trucked to off-base landfills. Prior to the closing of the activity landfills the ash was disposed of in whatever landfill was operative at the time.

5.8 TENANT COMMANDS.

5.8.1 Naval Regional Dental Center. The Naval Regional Dental Center (NRDC) at NC Great Lakes includes: Building 73, Dental Clinic Administration/Repair Shop (built in 1976); Building 152, Prosthetics Clinic (built in 1944); Building 237, Staff Dental Clinic (built in 1976); Building 1523, Recruit Dental Clinic (built in 1975); and Building 1017, Recruit Staff Dental Clinic (built in 1964).

The Prosthetics Clinic performs dental surgery and major dental fixture work. It generates no chemical wastes. The only waste generated from the administration building is 8 to 10 gallons/year of waste compressor oil that is drained from repair shop equipment and taken to PWC for disposal.

Current waste generation from the dental clinics includes: waste amalgam, 7 to 8 pounds/month; X-ray solution, 150 pounds/month; scrap lead, 100 pounds/year; and mercury, less than 6 pounds/year. These rates have been constant since at least 1976. Prior to 1975, elemental mercury was handled by DRMO (then Defense Property Disposal Office, or DPDO) as a raw material.

Dental clinic wastes are sent by way of Supply to DRMO for disposal or reclamation. Waste amalgam generations were 2 to 3 times greater prior to 1983, when the clinics acquired machines to produce fillings from capsules.

Silver reclamation of waste X-ray solution reportedly began 8 to 10 years ago. X-ray solution was emptied into clinic lab sinks before 1975. Waste X-ray solution, mercury, and scrap lead generation rates have been relatively constant since 1975.

5.8.2 Naval Dental Research Institute. The dental research facility has been located in Building 1H since 1974, when it was moved from Building 600. The department was started in 1948 as part of the Dental Clinic and became a separate branch in 1967. The institute is responsible for research in the field of dental procedures for the Navy.

The institute employs 40 to 45 people, including administrative personnel. The chemicals used consist mainly of inorganic laboratory chemicals, although toluene and alcohol are used occasionally for the fixing of biologi-

cal specimens. Acidic and basic wastes are flushed down the sinks to the sanitary sewer; water is added to neutralize the pH. Organic wastes such as saliva, blood, and animal carcasses are stored in a 5-gallon container for disposal by DRMO. It is estimated that less than 10 gallons per year of organic waste are generated by the institute, and this amount will be greatly reduced in the near future when histopathology research is phased out. Current rates of organic waste generation are equal to or slightly lower than past rates.

Mice and rats are the primary research animals used at the institute. Hamsters and monkeys were used at various times in the past. All sacrificed animals are sent to the hospital incinerator for disposal.

5.8.3 **Naval Publication and Printing Service Office (NPPSO).** NPPSO has been operating in Building 2A since about 1952. Prior to that time the shop was located in Building 222, near Building 237. Chemical usage in the shop falls into four major categories: oils and lubricants, inks, cleaning solvents, and photographic chemicals.

Lubricating oil WD-40 is consumed in use, and any leaks and spills are cleaned with rags. Rags are in turn cleaned by an off-base laundry.

Approximately 28 pounds of ink per week are used by NPPSO. This represents an increase of about 50 percent over the ink usage of 15 years ago, when more duplicating than printing was done. The only waste ink generated is residue on the cleaning rags, which are cleaned by an off-base laundry.

Blankrola 1 (perchlorethylene) is used as a cleaning solvent for the printing equipment. Usage was estimated at 100 gallons/year. Blankrola 2 (believed to be trichloroethane) will be used when the current stock of Blankrola 1 is exhausted.

Blankrola currently is purchased in 55-gallon drums which are triple rinsed and disposed of through DRMO. Prior to about 1975 the solvent was purchased in 5-gallon cans which were disposed of unrinsed in the dumpster. It is likely that these cans and their residual contents were disposed of in the Golf Course Landfill.

Since 1981 photo chemicals have been processed for silver recovery, then disposed of down the sanitary sewer. Prior to 1981 all chemicals were discarded in the sanitary sewer. Only black-and-white photo chemicals are used by NPPSO. Usage is estimated at 5 gallons/week of fixer and 5 gallons/month of equalizer.

CHAPTER 6. MATERIAL HANDLING: STORAGE AND TRANSPORTATION

6.1 INDUSTRIAL STORAGE.

6.1.1 Materials Storage: Defense Reutilization and Marketing Office. The Defense Reutilization and Marketing Office (DRMO), formerly known as the Defense Property Disposal Office (DPDO), has been located in Building 3212A since 1941. DRMO is the Department of Defense organization which has been responsible for disposal of surplus government property of any type. After the Resource Recovery and Conservation Act defined hazardous waste, DRMO assumed responsibility for contract disposal of these materials as well.

DRMO at NC Great Lakes is a tenant activity that arranges for the removal of industrial wastes from the activity as well as from several other military installations in the region. Typical wastes that DRMO takes responsibility for the removal of include paints, polychlorinated biphenyls (PCB's), pesticides, batteries, and tires. Shops and facilities that need waste pickups send completed 1348 forms to the Public Works Center (PWC), from which the requests are dispatched to DRMO. DRMO is responsible for wastes once it has made written responses to the pickup requests.

Waste materials turned in to DRMO are generally stored at the shop generating the waste until off-base removal is arranged. The generating shop retains physical custody of the waste, while paperwork management is handled by DRMO. This has been the practice since about 1967, when the NC Great Lakes Commander placed strict controls on material which could be disposed of in the three activity landfills (Site 1, 1942 to 1967; Site 2, 1967 to 1969; Site 3, 1969 to 1983).

DRMO facilities at NC Great Lakes include two large warehouses and a storage yard. Flammable materials are stored in a separate room on pallets in one of the warehouses, as are hazardous materials. The present flammable material storage system appears to be consistent with past practice, though lesser amounts of these materials are stored now. Some of the flammable wastes were formerly stored at Site 4, the Fire Fighting Training Area, prior to being burned during training exercises there. The outdoor storage area located south and west of Building 3212A and currently used by DRMO had formerly been used as a coal storage pile (Site 14G, use began in 1943).

6.1.2 Chemical and Hazardous Materials Storage. The Supply Department purchases chemicals for most shops and operations at NC Great Lakes. Many shops maintain their own set of vendor catalogs from which they prepare orders before turning them in to Supply. Supply then places the order and delivers the material. Flammable and hazardous materials are stored in secure lockers in the individual shops.

6.1.3 Petroleum, Oils, and Lubricants (POL's) Storage. The major fuel storage facilities in use at NC Great Lakes are listed in Table 6-1. These facilities provide a total storage capacity of approximately 3,354,000 gallons.

Table 6-1

Storage Tanks at NC Great Lakes

Building or Tank No.	Capacity (Gallons)	Tank Type	Material Stored
11E	400,000	aboveground	#6 fuel oil
11F	400,000	aboveground	#6 fuel oil
11K	1,000,000	aboveground	#6 fuel oil
11L	1,000,000	aboveground	#6 fuel oil
11 east MUSE (Mobile Utilities Support Equipment) generator	2,000	underground	#2 fuel oil
1	550	underground	#2 fuel oil
11 west MUSE generator	500	aboveground	#2 fuel oil
12	250	aboveground	gasoline
13	unknown	underground	gasoline
106FD	1,000	underground	gasoline
137VA	unknown	underground	gasoline
144NE	600	underground	gasoline
144NE	40,000	underground	gasoline
200H WS	unknown	underground	#2 fuel oil
229	12,500	underground	#2 fuel oil
229	1,000	underground	#2 fuel oil
229	700	inside building	lube oil
229	400	inside building	#2 fuel oil
238	5,000	underground	#2 diesel fuel
239	18,500	underground	#2 diesel fuel
239	12,000	underground	#2 diesel fuel
324	14,000	underground	#2 diesel fuel
325	16,890	aboveground	fuel oil
325	16,890	aboveground	fuel oil
326	210,000	aboveground	fuel oil
811	10,000	underground	#2 fuel oil
1600A	20,000	underground	gasoline
1600A	6,000	underground	diesel fuel
1912	150	inside building	gasoline
2216A	1,000	underground	#2 fuel oil
2710	40,000	underground	gasoline
2710	11,000	underground	gasoline
3114A	1,000	underground	gasoline
3216	12,000	underground	gasoline
3217	2,250	aboveground	#2 fuel oil
3400	40,000	underground	#6 fuel oil
3305A	5,000	underground	#2 fuel oil
3305B	5,000	aboveground	#2 fuel oil
3305C	4,000	aboveground	#2 fuel oil
3305D	4,000	underground	#2 fuel oil
3511	40,000	underground	#6 fuel oil

The main fuel oil tanks (Buildings 11K and 11L) have experienced numerous oil spills, which were usually the result of tank-filling activities. Spilled oil was always contained within the concrete berm surrounding the tanks.

The service stations run by Naval Exchange have been the sites of gasoline spills. The spills in Building 2710 have been the result of careless tank-filling procedures; the Fire Department is called in to clean up these spills. Fire Department personnel report that such spills are not unusual, with from four to eight spills of up to several hundred gallons of gasoline each occurring within the last 2 years. The Fire Department uses Absorball to absorb the spilled gasoline. Gasoline-contaminated Absorball is collected in plastic bags and picked up by a private contractor for disposal off-base.

In 1979, Building 144 was the scene of a major leak (Site 8). A leak in an underground storage tank went unnoticed until gasoline appeared in the storm sewers and Post Office basement. Shallow wells were drilled surrounding the tank and were pumped for several days to remove the gasoline. Gasoline fumes continue to show up occasionally in the Post Office basement (within 300 feet of the tanks which leaked), particularly after heavy rains.

6.1.4 Pesticide Storage. The Pest Control Shop (Building 68-H) maintains an estimated 1-month supply of pesticides. Approximately 30 to 40 gallons of pesticides are used per month, year-round. The supply of pesticides is replenished as necessary through the Supply Department.

The Pest Control Shop originated on the activity in 1968, and historical rates of pesticide usage have been determined to be approximately equal to the present usage rate. The first Pest Control Shop was housed in Building 112 (the present activity Post Office) and stayed there for less than 1 year. This shop then occupied space in the basement of Building 216 from 1968 through 1972 (Building 216 was demolished approximately 5 years after the Pest Control Shop moved out of the building). From 1972 through 1984, the shop was housed in Building 210B. The shop moved into Building 68-H in 1984. The inventory of pesticides maintained by this shop at the end of 1984 is listed in Table 6-2. This inventory is typical of pesticide storage since the shop originated on the activity. No report of spillage, leakage, or packing problems was found.

Golf Course personnel maintain a 1-year supply (maximum) of herbicides for use on their grounds. In the course of a year, all of this material is applied to the grounds. The sprayer is rinsed by diluting the residue and applying the rinseate to the grounds. The herbicides (in dry powder form) are delivered to the Golf Course in bags. After these bags are emptied, they are disposed of with general activity refuse.

6.1.5 Polychlorinated Biphenyls (PCB's) Storage. Out-of-service transformers, capacitors, and other devices that may have contained PCB insulating fluid have always been stored in the Public Works Center "boneyard" (Site 5), located adjacent to the southwest corner of Building 1517. There is no roof over any part of the area, and the ground is

Table 6-2

Pesticide Inventory,
Public Works Center, NC Great Lakes,
December 1984

Pesticide Name	Percent	Formulation	Unit	Amount on Hand
Malathion	57	EC	Gal.	89
Carbaryl (Sevin)	80	W.P.	Lb.	187
Phostoxin	55	Tablets	Cn	3
Diazinon	12.5	EC	Gal.	7
Diazinon	47.5	EC	Gal.	16.5
Baygon	14.6	EC	Gal.	3
Diazinon	2.0	Dust	Lb.	35
Kroke (Pyrethrin)		Aerosol	Cn	54
Rozol (rodenticide)	0.005	Grain mixed bait	Lb.	20
Lindane	99.0	Dust	Cn (2 oz.)	63
Pyrethrum (ULD)	3.0	Ready to use	Gal.	15
Malathion (Cynthion)	91.0	Ready to use	Gal.	18
Ficam (Bendiocarb)	.76	W.P.	Bx (10 pkts)	23 packets
Warfarin (rodenticide)	0.3	To dilute in dry cereal	Cn (1 lb.)	80
Borid (boric acid)	1.0	Powder	Lb.	6
Drione (Pyrethrin)	1.0	Dust	Lb.	50
Pyrethrin (synergized)	0.40	Ready to use	Gal.	10
<u>Herbicides</u>				
Bromacil	80	W.P.	Lb.	40
2-4-D	2.77	EC	Gal.	5
Methar (30)	18.90	EC	Gal.	4
Terra-Var	2.0	Granular	Lb.	10
<u>Surveyed, but on Hand</u>				
Lead arsenate	58	Powder	Lb.	160
Sodium fluoride	not listed	Granular	Cn (1 lb.)	9 (not to be used)

saturated with oily residue in spots. In 1984, however, a fully enclosed, freestanding PCB storage building (Building 1405) was constructed along the perimeter of Navy property, north of Building 1517.

Another location where PCB transformers were stored is the basement of former Building 226, an old steam plant (Site 6). Between 1979 and 1981, this temporary basement storage area had a dirt floor and contained at least six PCB transformers. These transformers were opened and turned over by vandals, who drained the 132 gallons of fluids and removed the copper. The transformers were removed several years ago, and the area is not presently being used for storage. This area is discussed as Site 6, Mainside Transformer Storage Area.

6.1.6 Storage Lots and Scrapyards. Almost all of the scrap material generated by NC Great Lakes is stored at the DRMO facilities. Scrap metals, such as empty barrels, vehicles, etc., are stored in the lot behind Building 3212C until the material is sold at public auction. Waste POL's are retained at the shop where they are generated until DRMO arranges for removal with an outside contractor. This has been the practice since the 1940's.

Another scrap storage area is located southwest of Building 1517 (Site 5). Scrap metal, drums, and electric transformers, some of which contained PCB's, have been stored in this area since 1942. Most of the material, which includes lead-shielded cable (which is stored only until a large enough volume of material is accumulated to warrant a scrap contract through DRMO), bodies of old electrical devices, and copper cable, is inert. There has been spillage of tarry electrical insulation material and PCB-laden oil at this site. No disposal is done in this area. Site 5 is discussed in more detail in Chapter 8.

An automotive "boneyard" is located just north of this second scrap area. Several dozen vehicles in various states of cannibalization are located there. They are being used as sources of spare parts for other vehicles which are still in service. There is no disposal in this area. Vehicles which can no longer provide useful parts are transferred to the DRMO yard for sale.

6.1.7 Coal Storage. Coal was the major fuel source for NC Great Lakes from its origin until the mid-1970's, when the boilers were changed to the oil-firing type. Each of the areas where coal was stockpiled are described in detail in Chapter 8 (Sites 14A through 14G). These descriptions were compiled largely from old maps and photographs. At one time or another, every barracks had its own coal furnace. There were major coal storage piles at several locations on the activity from which coal was trucked to steam plants and barracks. There were also centralized heating facilities right from the activity's inception which provided steam for the nonresidential buildings.

One major coal pile was located near the steam plant (Building 11), on the shore of the lake. A very high concrete trestle was constructed along with the building, from which coal dropped approximately 40 feet to the pile on

the beach. This arrangement caused some problems -- coal dust would blow into the residential area on Perry Street -- and was discontinued in 1911 after a brief trial.

From 1911 until at least 1943, and perhaps as late as 1954, the coal for the Building 11 steam plant was stored in large piles on the edge of the bluff, at the present site of the Officer's Club. This pile was approximately 200 feet wide and at various times extended from the trestle tracks north as far as Cluverius Avenue.

Another coal pile was located at the present location of Building 144 from 1911 through the early 1950's. One railroad line served this pile, the pile near the Building 11 steam plant, and the Hospitalside steam plant at Building 58H. There was no outside coal pile at Building 58H; coal was supplied to the indoor bunker as needed.

The three Recruitside steam plants each had outdoor coal storage piles from 1942 into the 1950's. These piles were not as large as the piles on Mainside, as they were intended primarily for the individual steam plants which they served. Another large coal storage pile was located at Camp Moffett. This major pile covered most of the area north of Building 1517, and, at times, the area east of Building 1517 from the north property line southward to the drill field.

Another coal storage pile was located in the NC Supply Area from 1942 until coal was replaced as the major activity fuel. This pile covered the present DRMO scrapyard and part of the area behind Building 3215, the Construction Battalion Administration Building. As with all of the other coal storage areas except for the one in the Building 11 area, there is no current indication of their previous use, except for the scattered coal which remains on the surface. At Building 11, some high-sulfur Illinois coal remains from a fluidized bed combustion experiment. This remaining coal is slated for off-base removal in the near future.

6.2 MATERIAL AND WASTE TRANSPORTATION.

6.2.1 Petroleum, Oils, and Lubricants. Most POL's used at NC Great Lakes are ordered through the Supply Department and delivered by vendors directly to the shops and operations where they are to be used. The Supply Department tests incoming shipments of fuel and gasoline for water content and specific gravity. If the shipment passes inspection, the fuel is unloaded at the receiving tank or operation. Several accidental spills which occurred during unloading have been reported by Fire Department personnel. Most of the spills reported at NC Great Lakes occurred while vendors were filling activity tanks. (Filling of the storage tanks has always been handled by the outside vendor.) Areas reporting fuel spillage during tank-filling activities include both Navy Exchange service stations (Buildings 144 and 2710) and the lakeshore fuel oil storage tanks (Buildings 11K and 11L).

6.2.2 Hazardous Waste. Since the late 1970's or early 1980's, DRMO has had the responsibility for handling and disposal of hazardous waste at NC

Great Lakes. Shops or operations that generate hazardous waste notify PWC, which then contacts DRMO. The material remains in the physical custody of the generator, while DRMO handles the paperwork and arranges with a private contractor for its removal from the activity.

Prior to the late 1970's and early 1980's all waste was handled by PWC. Most of the time it was not segregated. At various times, segregated POL was taken by either the generating shop or PWC to the Fire Fighting Training Area (Site 4), or to the activity landfill (Site 1, 1942 to 1967 only) for disposal. In the past, much of the waste that is now classified hazardous may have been mixed with general activity refuse, especially if the quantity was small and could be absorbed by the predominantly paper office waste. Thus, these wastes may have been disposed of into the activity landfills (Sites 1, 2, and 3).

6.2.3 Solid Waste. Until 1980, collection of the activity's solid waste was the responsibility of PWC. From 1942 until 1980, all refuse was taken to one of three landfills located on naval property: the Golf Course Landfill (Site 1), the Forrestal Village Landfill (Site 2), or the Supplyside Landfill (Site 3). The waste generation rate in 1977, with a base population of 30,000, was approximately 40 tons/day, broken down as follows: 25 percent cardboard, 25 percent residential, 20 percent commercial, 20 percent paper, 5 percent food waste, 2.5 percent yard waste, and 2.5 percent mixed office waste. Prior to 1967, when strict directives were issued concerning the types of waste which could be disposed of in the activity landfill (Site 1), small amounts of hazardous waste may have been disposed of along with the general mixed office, residential, and shop waste. It is also known that POL wastes were disposed of in the Golf Course Landfill (Site 1) in the past.

Although the population of the activity has fluctuated widely (high wartime levels compared to low peacetime levels), the 1977 waste generation rate is considered representative of the entire 1942-1980 period during which waste was disposed of in on-base facilities.

A private contractor currently handles solid waste disposal at NC Great Lakes. All disposal is off the activity.

CHAPTER 7. WASTE PROCESSING

7.1 SEWAGE TREATMENT PLANT. NC Great Lakes has been serviced by the North Shore Sanitation District (NSSD) since 1975. The NSSD plant is located north of the activity's northern boundary, on the shoreline of Lake Michigan.

The Navy has a service contract with NSSD to transfer all sewage from the Navy-owned Green Bay Sewage Treatment Plant (in Forrestal Village) to a collection point at the Mainside plant on the shore of Lake Michigan, where a pumping and transmission system delivers the sewage to NSSD facilities in North Chicago. The service contract with NSSD limits the Navy to 10 million gallons per day (MGD), which is expected to exceed all future requirements. During storms, however, infiltration into the system causes maximum flows to exceed 10 MGD. To prevent the excess from overflowing into Lake Michigan, the Mainside sewage treatment plant sludge beds (which are no longer in use) are used to temporarily store these surges.

NC Great Lakes is divided into two gravity sewerage systems by Green Bay Road, which runs north-south on a topographic high. All sewage originating from west of Green Bay Road flows to the former Green Bay Sewage Treatment Plant in Forrestal Village, from which it is pumped to the former Mainside plant. Sewage originating east of Green Bay Road flows directly to the Mainside plant where it, along with the sewage from the Green Bay plant, is pumped to NSSD for treatment in North Chicago.

In the past, the Navy operated two sewage treatment plants to handle wastes. The original plant served the entire Mainside and Recruitside areas, including Hospitalside and Navy housing units east of Green Bay Road. This plant underwent several modifications during its time of operation, some to increase its life-span and others to improve its level of treatment. When first constructed, raw sewage from Hospitalside was transported to this plant at the base of the bluff on the lake via an open flume. This flume was later modified to a closed pipe to eliminate odor problems. Effluent was disposed of through a diffuser into Lake Michigan. Sludges that had been digested in the plant digesters were dried in drying beds adjacent to the inner boat basin prior to the anticipated hookup to the NSSD in 1975. The beds were removed in 1975 prior to the actual hookup to the NSSD facility. Digested sludges from the Mainside treatment plant were trucked to the Green Bay treatment plant sludge drying lagoons during the period between the removal of the Mainside sludge drying beds and the hookup to NSSD. Sludges had always been used on the activity for landscaping and were made available for use by activity personnel.

A second Navy-operated sewage treatment plant, the Green Bay plant, was located in the southwest corner of Forrestal Village. This plant served the activity facilities west of Green Bay Road. Effluent was discharged to Skokie Ditch, which exited the activity just a few yards south of the Green Bay Road plant site. Sludges, including the sludges from the Mainside plant during the aforementioned transition period, were dried in a series of shallow lagoons and prepared for distribution to grounds maintenance

personnel and to residents. No dried sludges were landfilled on the activity, but a substantial volume was used as a soil amendment. Neither of the former Navy-operated sewage treatment plants is currently operating as a treatment plant.

7.2 HOSPITAL INCINERATOR. The hospital incinerator has been in operation since 1942. From 1942 to 1982 the 250-pound/hour batch incinerator was operated 2 or 3 days/week. Beginning in the summer of 1982, pathological waste was accepted from the Veterans' Administration (VA) Hospital, and from that date through the present the incinerator has run 5 days/week, 8 to 10 hours/day. Approximately 30 percent of the total waste processed is received from the VA Hospital. Ash waste from the hospital incinerator averaged approximately 3 cubic yards per month from 1942 to 1982.

The pathological incinerator was designed by Brule and its rated capacity is 250 pounds/hour by batch feed. Natural gas is used to fire the two primary burners and the afterburner to maintain a temperature of 1,200 to 1,300 degrees Fahrenheit. Exhaust gases are scrubbed to remove particles and gaseous emissions. Ash from the incinerator was disposed in the activity landfills (Sites 1, 2, and 3).

Ash and scrubber blowdown from the incinerator are collected in a 6-cubic-yard dumpster which is emptied off-base. The waste generation rate will be reduced in the near future when histopathology research is phased out.

Mice and rats are the primary research animals used at the hospital. Hamsters and monkeys were used at various times in the past. All sacrificed animals are sent to the hospital incinerator for disposal.

CHAPTER 8. DISPOSAL SITES AND POTENTIALLY CONTAMINATED AREAS

Fourteen potentially contaminated areas were identified at NC Great Lakes during this study. Information presented was compiled from on-site examinations, interviews, and records review. Table 8-1 summarizes the information collected at these sites.

8.1 SITE 1, GOLF COURSE LANDFILL. The Golf Course Landfill was located at the northwestern corner of NC Great Lakes. As Figure 8-1 shows, the site is located under the fairways, greens, and tees of at least 12 holes of the present NC Great Lakes Golf Course. The site occupies 49 acres and is located at coordinates HH25 on the General Development Map. The northern and western boundaries of the site are also activity boundaries; the Fire Fighting Training Area forms parts of the southern and eastern boundaries of this former disposal area. Access to the site was from Buckley Road, south of the site. Reportedly, there was never a gate to limit access to the site.

The site was the active disposal area for NC Great Lakes from 1942 through 1967. There may have been a hiatus of disposal activity during the years when the land title was passed to the Veterans' Administration; however, no record of other land disposal areas existing during this time period was found. In 1967, the area was closed and covered when more stringent controls were placed on land disposal by the activity Commander.

Because the site was used as a trench-burn landfill, it is impossible to estimate the volume of material which was disposed of at the site based on its physical dimensions; rather, by prorating the volume of material comprising the present disposal rate of 400 tons/day (5-day week) back in time, we can estimate that approximately 1.5 million tons of material were disposed of there. In addition, this site apparently received the bulk of the coal ash which was disposed of on the activity. Records of the use of coal ash for other landscaping and grading needs were not kept; therefore, it is difficult to estimate the total volume of ash disposed of at this site. During the on-site visit, an excavation was opened in a roadway bordering Ross Field; the excavation revealed approximately 2-1/2 to 3 feet of what appeared to be ash under the roadbed. This is reportedly typical of other locations on the activity.

The first step in the trench-burn process was the excavation of a trench into the earth. At NC Great Lakes, a dragline was used for this excavation. Each trench was approximately 8 feet wide and 6 to 8 feet deep (the distance to the top of the water table in this area). Occasionally, a trench may have had water in the bottom during the active disposal process. General refuse and trash were disposed of directly into these trenches. Reportedly, oil was also disposed of into the waste trenches. When material came close to filling the trench, the pile was ignited and allowed to burn to completion. Proceeding in this manner, the trenches were progressively filled and covered. Several local residents recalled the large smoky plumes rising from this area.

Table 8-1

Summary of Disposal Sites and Waste Types, NC Great Lakes

Site	Shop	Waste Material	Years of Disposal Operation	Generation Rate/Yr.	Total
Site 1, Golf Course Landfill	RTC Rifle Range	Lead, brass	1942-1967	340,000 rounds some recycled	undetermined
		CLP = Clean, Lube Preserve gun oil	1942-1962	0.095 gal/yr.	4 gal.
		Bore cleaner #6850-00-224-6663	1942-1962	0.095 gal/yr.	4 gal.
	Building and Equipment Maintenance	POL	1943-1967	100 gal/yr.	<2,400 gal.*
		Paint thinner	1943-1967	0.05 gal/yr.	1.2 gal.
		12 v. batteries	1965-1967	10	20 batteries
	Motor Vehicle Maintenance	POL	1942-1967	5,200	<130,000*
	Carpentry Shop	Asbestos	1947-1967	unknown	unknown
		Solvent 144	1947-1967	11 gal.	220*
		Oil primer and oil-based paint	1947-1967	1 gal.	20 gal.
	HVAC Shop	Oil-based paint	1954-1967	1 gal	23*
		WD-40 lubricant	1959-1967	1 gal	23*
	Machine Shop	Solvent 144	1942-1967	110	3,850*
	Welding and Sheet Metal Shop	Cutting oil	1934-1967	1 gal	33
		Scrap metal	1934-1967	unknown	unknown
	EM/IC School	Stoddard solvent (PD 680)	1942-1967	0.05	1
		Oil paint	1942-1967	0.175	3.50
		WD-40 Oil	1942-1967	0.008	0.20
		Isopropyl alcohol	1942-1967	0.030	0.75
	Fire Control Technician, Opticalman, and Instrument Control School	Alcohols	1954-1967	0.060 gal/yr.	0.780
		Acetone	1954-1967	0.025 gal/yr.	0.325
		penetrating oil	1954-1967	0.010 gal/yr.	0.130
		Turpentine/linseed oil	1954-1967	0.040 gal/yr.	0.520
		Oil paints	1954-1967	0.025 gal/yr.	0.325
		Stoddard solvent	1954-1967	48 gal/yr.	624*
		Gear oil	1954-1967	48 gal/yr.	624*

Table 8-1 (contd.)

Summary of Disposal Sites and Waste Types, NC Great Lakes

Site	Shop	Waste Material	Years of Disposal Operation	Generation Rate/Yr.	Total
Site 1 (cont'd.)	Gunnery School	Stoddard Solvent	1954-1967	1.75 gal/yr.	22.75
		Hydraulic/transmission fluid	1954-1967	3,500 gal/yr.	45,500
		Grease	1954-1967	120 gal/yr.	1,560
		Mineral oil	1954-1967	0.025 gal/yr.	0.325
		Corrosion inhibitor	1954-1967	0.08 gal/yr.	1.04
		Turpentine/linseed oil	1954-1967	0.06 gal/yr.	0.78
	Dental Research Institute	Animal carcasses	1948-1967	350 carcesses	8,050
	Naval Construction Battallion Unit 401	POL	1954-1967	350 gal/yr.	8,050 gal.*
		Lead-acid batteries	1954-1967	36 batteries	828
	Steam Propulsion School	Acetone	1961-1967	0.005 gal/yr.	0.030
		Mercuric nitrate solution	1961-1967	0.020 gal/yr.	0.120
		Cutting oil	1961-1967	0.010 gal/yr.	0.060
		Oil paints	1961-1967	3.250 gal/yr.	19.500
		Stoddard solvent	1961-1967	0.025 gal/yr.	0.150
		Spray solvent	1961-1967	0.035 gal/yr.	0.210
Site 2, Forrestal Landfill	All shops	Mixed office waste	1968-1969	-	273,000 cubic yards
Site 3, Supply-side Landfill	All shops	Mixed office waste	1969-1983	-	1.02 million cubic yards

Table 8-1 (contd.)

Summary of Disposal Sites and Waste Types, NC Great Lakes

Site	Shop	Waste Material	Years of Disposal Operation	Generation Rate/Yr.	Total
Site 4, Fire Fighting Training Area	Auto Hobby Shop, Golf Course, Building and Equipment Maintenance, Motor Vehicle Maintenance, Carpentry Shop, EM/IC School, Steam Propulsion School	POL, Stoddard solvent, WD-40	?-1985	unknown	unknown*
Site 5, Transformer Storage "Boneyard"	PWC jurisdiction	PCB oil	N/A	N/A	unknown
Site 6, Main-side Transformer Storage Area	PWC jurisdiction	PCB oil	N/A	N/A	132 gals. spilled
Site 7, RTC Silk-Screening Shop	RTC Silk-Screening Shop	Oil- and water-based paints, turpentine, linseed oil, acetone, bleach, inks, alcohol	1972-1985	1,400 gal/yr. washwaste	18,200 gal.
Site 8, Exchange Service Station	Exchange Service Station	Gasoline spill	1982	3,000 gal.	3,000 gal.
Site 9, Camp Moffett Disposal Area	All shops	Galley wastes	pre-1942	unknown	

Table 8-1 (contd.)

Summary of Disposal Sites and Waste Types, NC Great Lakes

Site	Shop	Waste Material	Years of Disposal Operation	Generation Rate/Yr.	Total
Site 10, NTC Rifle Range	NTC Rifle Range	Lead, brass, ordnance	1942-1985	390,000 rounds	unknown
Site 11, BE/E School Gyro Compass Room	BE/E Gyro Compass School	Mercury	spilled about 1972	2-foot-diameter	removed pool
Site 12, Harbor Dredge Spoil Area	All shops, residents, and off-base industry	Dredge spoils, PCB, oils, heavy metals	unknown	5,000 cubic yds.	unknown
Site 13, Demolition Debris Disposal Areas	Demolition	Demolition debris	Early in activity history to present	unknown	unknown
Site 14, Former Coal Storage Areas		Coal	N/A	unknown	unknown

* mostly incinerated

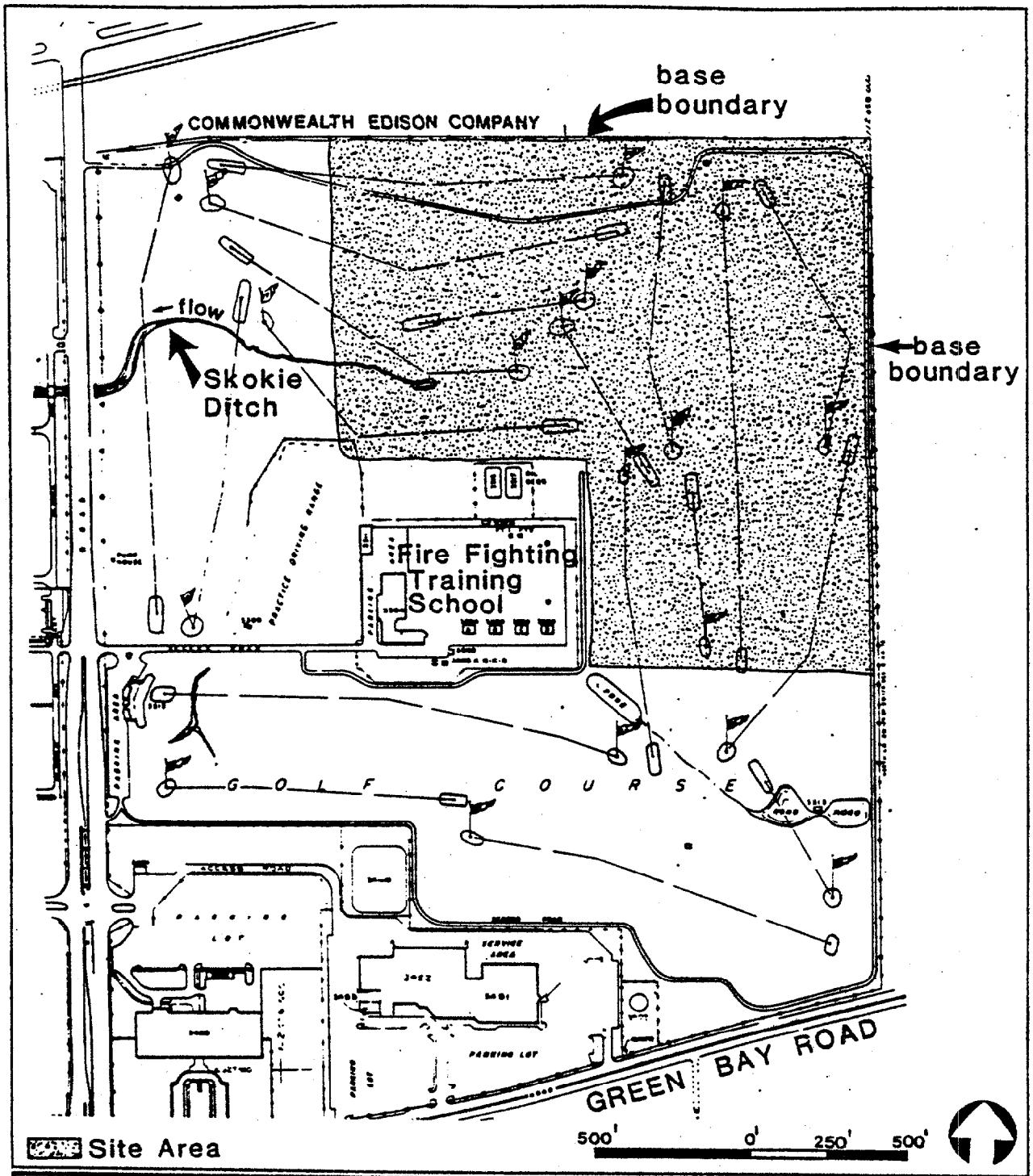


Figure 8-1

Site 1, Golf Course
Landfill

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Wastes known to have been disposed of at Site 1 include general refuse from classroom and administrative activities, oils (including transformer oils), coal ash, and residential trash from activity housing units. It was explicitly stated from several sources that metallic scrap was kept to a minimum; such scrap always went to the Defense Reutilization and Marketing Office (DRMO), formerly the Defense Property Disposal Office (DPDO), for disposal. Specific chemicals disposed of there included perchloroethylene (PCE) from dry cleaning, polychlorinated biphenyls (PCB's) from transformer oil disposal, solvents, including carbon tetrachloride and Solvent 144, and motor crankcase oil.

Most refuse material disposed in the Golf Course Landfill would have decomposed immediately as it was being burned in the trenches. However, some material may not have burned if it was lying in water in the bottom of the trench or if the combustion was not complete. After the residue filled a substantial portion of each trench, the trench was filled and a new one was started.

An ash layer was used for final cover of the site. Reportedly, it is difficult to get shrubbery, trees, and the more desirable grass species to grow in those areas of the Golf Course where the coal ash was disposed of. At Site 1, ash was encountered within the first several feet when holes were dug for trees within the disposal area. If the depth of these holes averaged 1.5 feet, a low-end estimate of the volume of coal ash disposed of at the Golf Course Landfill would be 118,000 cubic yards.

There is evidence that some of the waste is still decomposing. In the area of the 5th and 15th tees, the ground has settled and continues to settle as the landfill material decomposes and compacts. Some of the settled areas approach 2 to 3 feet in depth and 6 to 10 feet in length. They provide an interesting natural hazard for golfers.

8.2 SITE 2, FORRESTAL LANDFILL. After controls were placed upon the disposal of waste by the NC Great Lakes Commander, the Forrestal Landfill (Figure 8-2) was the first disposal area used by NC Great Lakes. This area is located between Superior Street and Skokie Ditch, south of Virginia Court (General Development Map Coordinates EE10). The site occupies approximately 4 acres.

The site was operated from 1967 to 1969 as a trench-type landfill with no burning. This disposal method represented the transition from the largely uncontrolled operation at the Golf Course Landfill (Site 1) to a fully controlled operation. A guard shack was constructed and access to the site was limited to a gate located on Superior Street. Activity housing units on Virginia Court had not been constructed at the time that the landfill was operating.

The site is presently an open field, elevated above Skokie Ditch and the land west of Superior Street. Several pieces of recreational equipment are positioned on the filled area. The southern boundary of the disposal area is a wooded area. Access to the site from Supplyside is limited by a chain link fence. Open access to Forrestal Village is by way of Virginia Court.

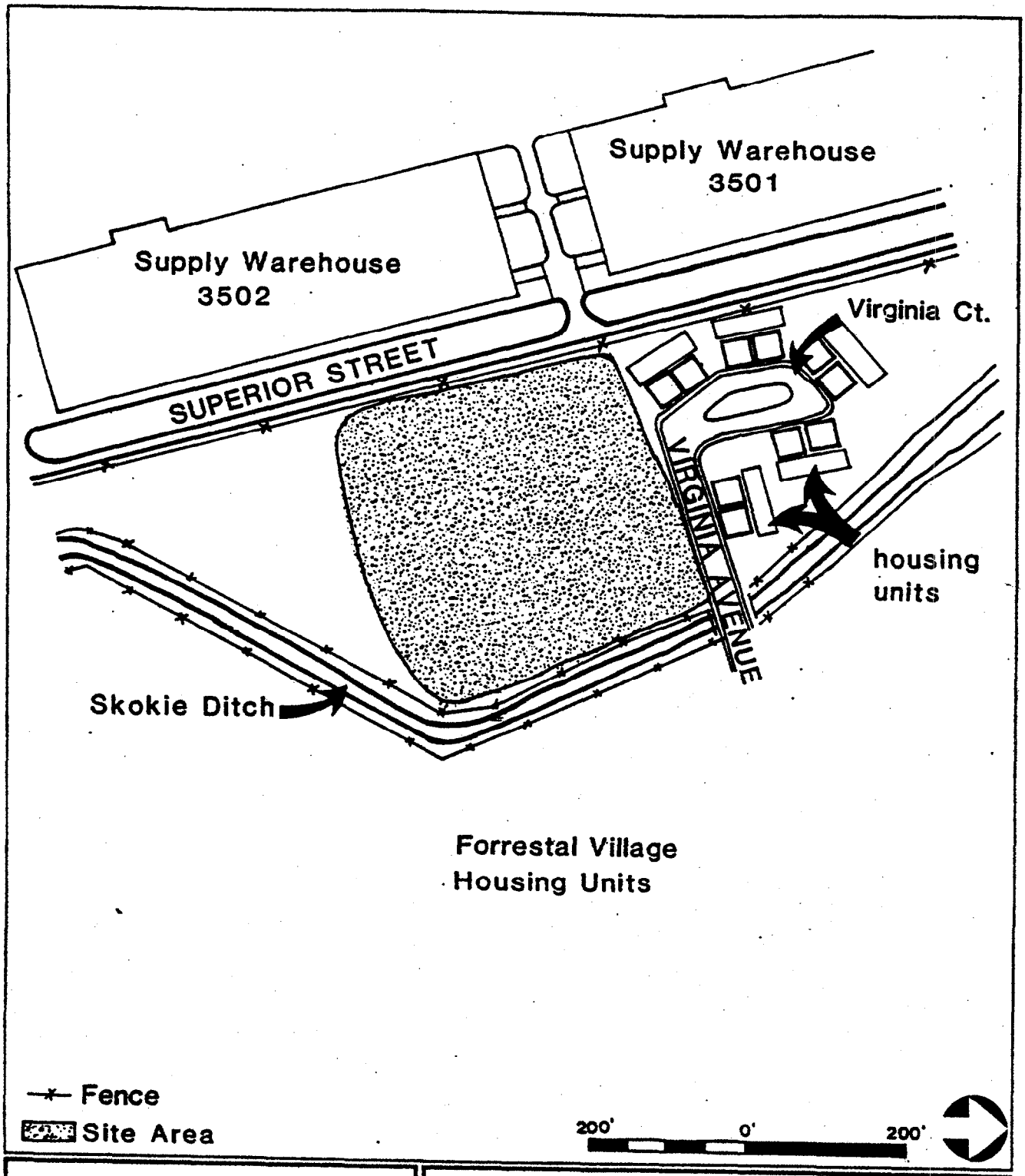

Figure 8-2

Site 2, Forrestal Landfill

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The total volume of material disposed of in the Forrestal Landfill was limited by the size of the parcel involved, and the fact that the disposed material was not burned. In addition, the period during which the site was operated coincided with a period during which responsibility for waste collection from most activity housing switched from Navy personnel to private contractors, with disposal off Navy property. With these considerations in mind, the total volume disposed of in the Forrestal Landfill site is estimated to be 276,000 cubic yards (280 tons/week for 78 weeks times 3.5 cubic yards per ton of uncompacted trash).

The waste disposed of in the Forrestal Landfill was primarily mixed office waste generated by the Administrative Command at NC Great Lakes and the various training schools. Shop waste, notably that from the Public Works Center shops, was also disposed of there. The disposal of liquids like motor crankcase oil and transformer oils at this site was reportedly prohibited. Metals were disposed of through DRMO (then DPDO), as was the case both before and after the operation of this disposal area.

Specific chemicals disposed of included less-than-reportable quantities of solvents, paint, and thinners (residue on rags and building materials). Residential waste from Navy housing was not a major component of the material disposed of since off-base disposal of this waste began during the period of operation of this landfill.

8.3 SITE 3, SUPPLYSIDE LANDFILL. Supplyside Landfill (Figure 8-3) is the disposal area shown in the General Development Map in the southwest corner of NC Great Lakes and labeled "Closed Sanitary Landfill Area." It is adjacent to the activity boundary and south of the last of the Supply Department warehouses (Building 3503), and extends almost to the westward extension of Alabama Avenue. A railroad spur serving the Supply Department warehouses crosses the southeastern third of the landfill. The landfill occupies approximately 7 acres. Its coordinates on the General Development Map are EE6.

Supplyside Landfill was regraded in 1985 with final cover, which was to be seeded for the first time during the 1985 growing season. The grading was performed by Naval Construction Batallion Unit 401, a tenant command on the activity. The landfill surface rises 15 to 20 feet above the surrounding grade on the east and the west. Skokie Ditch drains the surface water from the area and lies adjacent to the landfill to the east. To the west, an area of poorly drained land begins at the fence marking the activity boundary that adjoins the Commonwealth Edison Company right-of-way. This area drains into Skokie Ditch.

This landfill was operated from 1969 to 1983, when it was closed and all refuse was sent off-base for the first time. The period of operation was concurrent with the institution of additional controls and monitoring of landfill operations; in fact, a surface and ground water monitoring program is in effect at the site of this former landfill. The landfill was operated as a trench-type landfill with no burning. There are four parallel trenches on this site. Landfilling was conducted on both sides of the railroad spur.

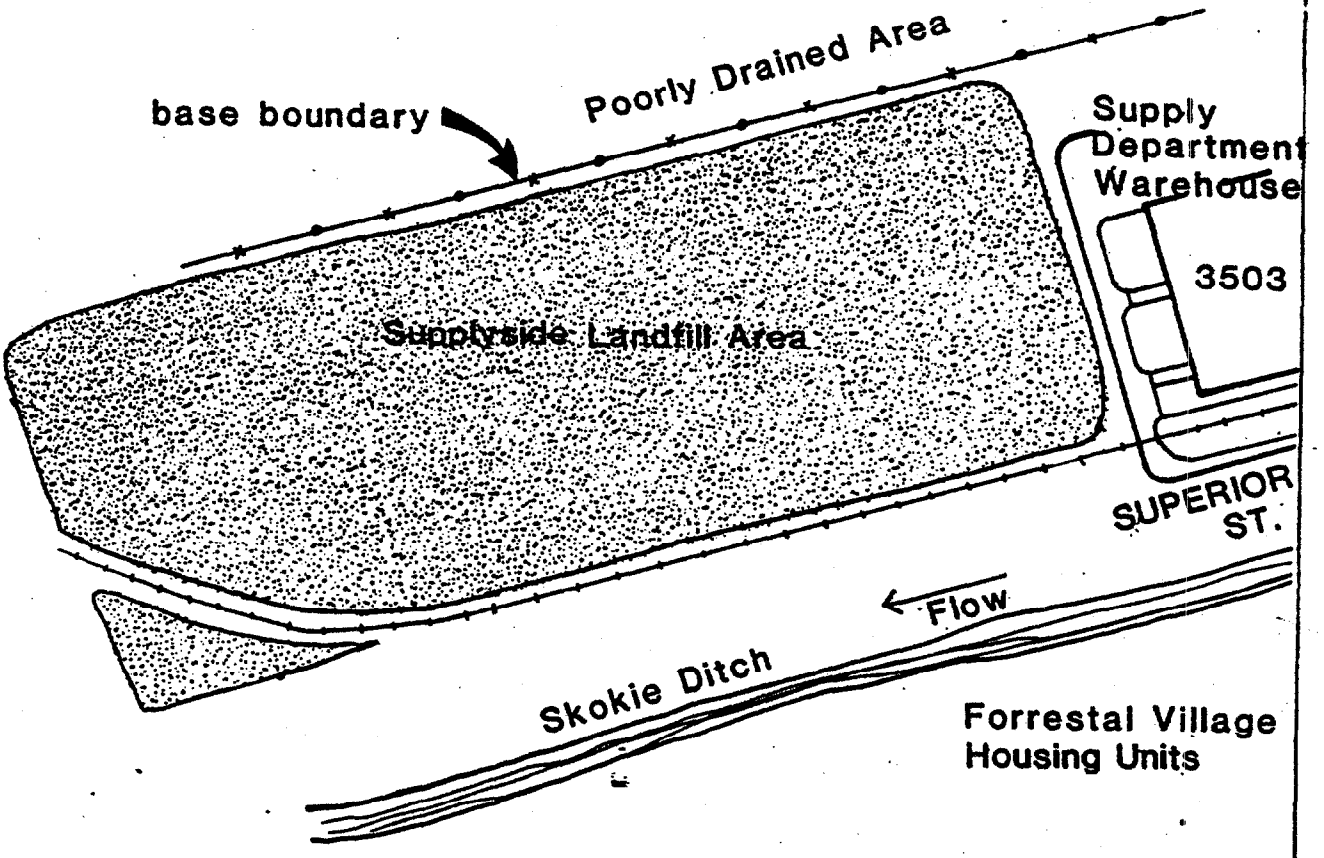

Figure 8-3

Site 3, Supplyside Landfill

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The main component of disposed material at the Supplyside Landfill site was general office waste. All household wastes were disposed of off-base by contract collectors/haulers. No liquids, metals, or sanitary wastes were accepted for disposal at the Supplyside Landfill.

Specific chemical wastes likely to have been disposed of in the landfill are less-than-reportable quantities of spent chemical cleaners, solvents, and oils on waste building materials or rags used for cleanup. Other wastes typical of an office source like typewriter ribbons, paper, and ink are thought to be major constituents of the landfill waste.

8.4 SITE 4, FIRE FIGHTING TRAINING AREA. The Fire Fighting Training Area (Figure 8-4) occupies about 10 acres, located at FF23 on the General Development Map. This area has been in constant use as a training facility since 1942. All recruits are trained by allowing them to fight practice fires in open steel tanks and in smoke practice buildings. These fires are set with #2 fuel oil which is floated on water and ignited by burning gasoline. In the training exercises, instructors and recruits extinguish the fires as soon as possible using Aqueous Film Forming Foam (AFFF) and other agents (like dry chemical extinguishers).

The entire training area is drained by an underground plumbing system which leads the water, oil, and emulsions to one of two lagoons located west of the training area. A centrifugal oil/water separator was installed in the waste line between the training area and the lagoons in 1979. The separator effluent is directed to one of the two lagoons. Any residual oil still found in the effluent is allowed to separate by gravity; recruits remove this oil from the top of the lagoons manually. Water is decanted from the bottom of the lagoons to prevent contamination of Skokie Ditch; a pipeline carries effluent water decanted from the lagoons to the headwaters of Skokie Ditch, located on the Golf Course.

From 1942 to 1979, the Fire Fighting Training Area stored and burned waste POL's and solvents from shops (such as the Carpentry Shop and the Transportation Shop) on the activity. Some of this material was burned in the training exercises on an as-available basis. The remainder, stored in 55-gallon drums, was allowed to accumulate in the area. In addition, oil that had been removed from the oil/water separator and that had been skimmed manually from the lagoons was drummed and stored in this area. These drums were stored along the western fence line of the training area.

The practice of accepting waste materials from other shops on the activity was discontinued in 1979, about the same time that the oil/water separator was installed. However, by 1982 approximately 300 drums of waste solvents, oil, and oil/water emulsions had accumulated in the area. The first of a series of contracts for the off-base disposal of these liquid wastes was let in 1983. All the drums had been emptied by spring of 1985, and the empty drums were awaiting disposal by DRMO. Oil that is skimmed from the lagoons and removed from the separator is taken away regularly and is not allowed to accumulate.

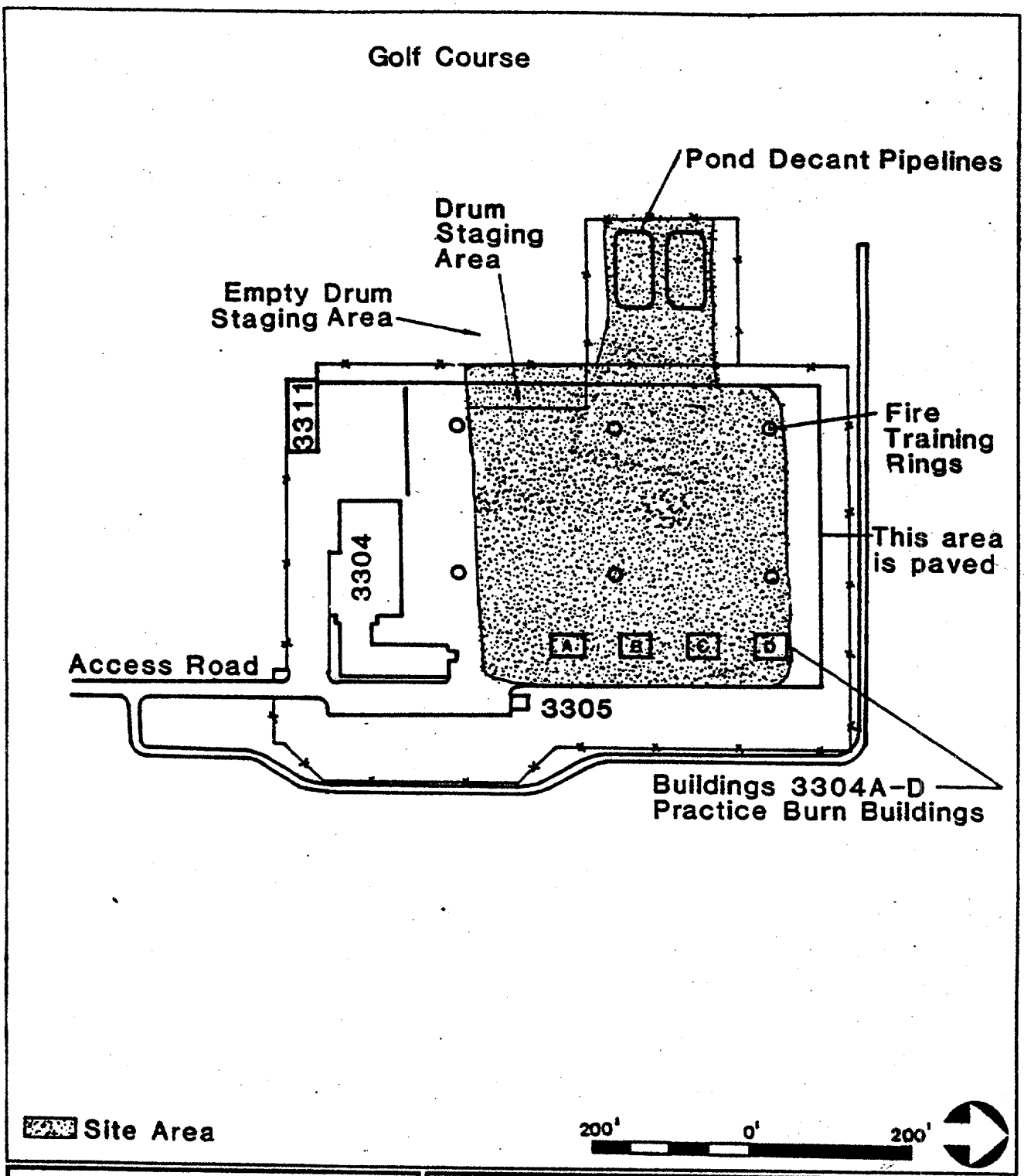

Figure 8-4

Site 4, Fire Fighting Training Area

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The area where the 300 drums were stored is underlain by soil which is soaked with residual oil from spillage. The area is not diked, and runoff could reach the Skokie Ditch during an extremely heavy rainfall. It is estimated that approximately 1 percent of the material stored, or about 165 gallons of water, solvent, oil, and oil/water emulsions, has leaked onto the soil.

Specific chemicals which may have been stored in the drums include Solvent 144, turpentine, gasoline, #2 diesel fuel, crankcase motor oil, and antifreeze. Some of these materials were likely to have degraded before they entered the soil. Limited evaporation of the more volatile components of gasoline and solvent before they got below the top 6 inches of soil is also likely to have occurred.

8.5 SITE 5, TRANSFORMER STORAGE "BONEYARD". Located in the northern end of Camp Moffett (R24 on the General Development Map), the Transformer Storage "Boneyard" area occupies 2 acres southwest of Building 1517, east of the Elgin, Joliet & Eastern Railroad right-of-way. From 1945 to 1985, this site was the primary storage area for out-of-service transformers, including those filled with PCB oils. In 1985, PCB-filled devices were transferred to a new building specially designed to hold them. This building (Building 1405) is located about 250 feet north-northeast of Building 1517.

Prior to 1985, transformers were moved about within the area outlined in Figure 8-5. At one time or another, the actual location of the transformers could have been anywhere within the outline. In 1985, there were about 40 devices in storage in the area, none labeled as containing PCB's. Seven PCB-labeled devices were in storage in Building 1405.

Wastes found in the soils of the Transformer Storage "Boneyard" may include transformer oils, PCB transformer oils, and lead insulation from high voltage cables. The wastes are mostly tied up in the upper layers of the soils.

Transformer Storage "Boneyard" area surface drainage crosses the site from west to east, and is picked up by storm sewers which discharge into Pettibone Creek. Several samples were collected by PWC in 1984 for PCB testing. The results shown in Table 8-2 indicate that the ground is in need of cleanup. Since the samples were collected at random locations with no documentation, and since the location of PCB transformers was not limited to the corner of the indicated area, a more thorough investigation is needed.

8.6 SITE 6, MAINSIDE TRANSFORMER STORAGE AREA. Between 1979 and 1981, at least six transformers reportedly containing PCB oils were stored on the basement-floor level of Building 226 (M-25 on the General Development Map). This building has since been razed. In 1981, while these transformers were stored there, vandals removed the tops from six of them, spilled the contents onto the ground, and stripped out the copper cores. The entire contents of the transformers (a total of approximately 132 gallons of oil) was lost into the soil of this 100-square-foot area. No cleanup attempts were made. The vegetation in this area appears to be stressed, but it is not clear whether the stress is caused by PCB's or other factors.

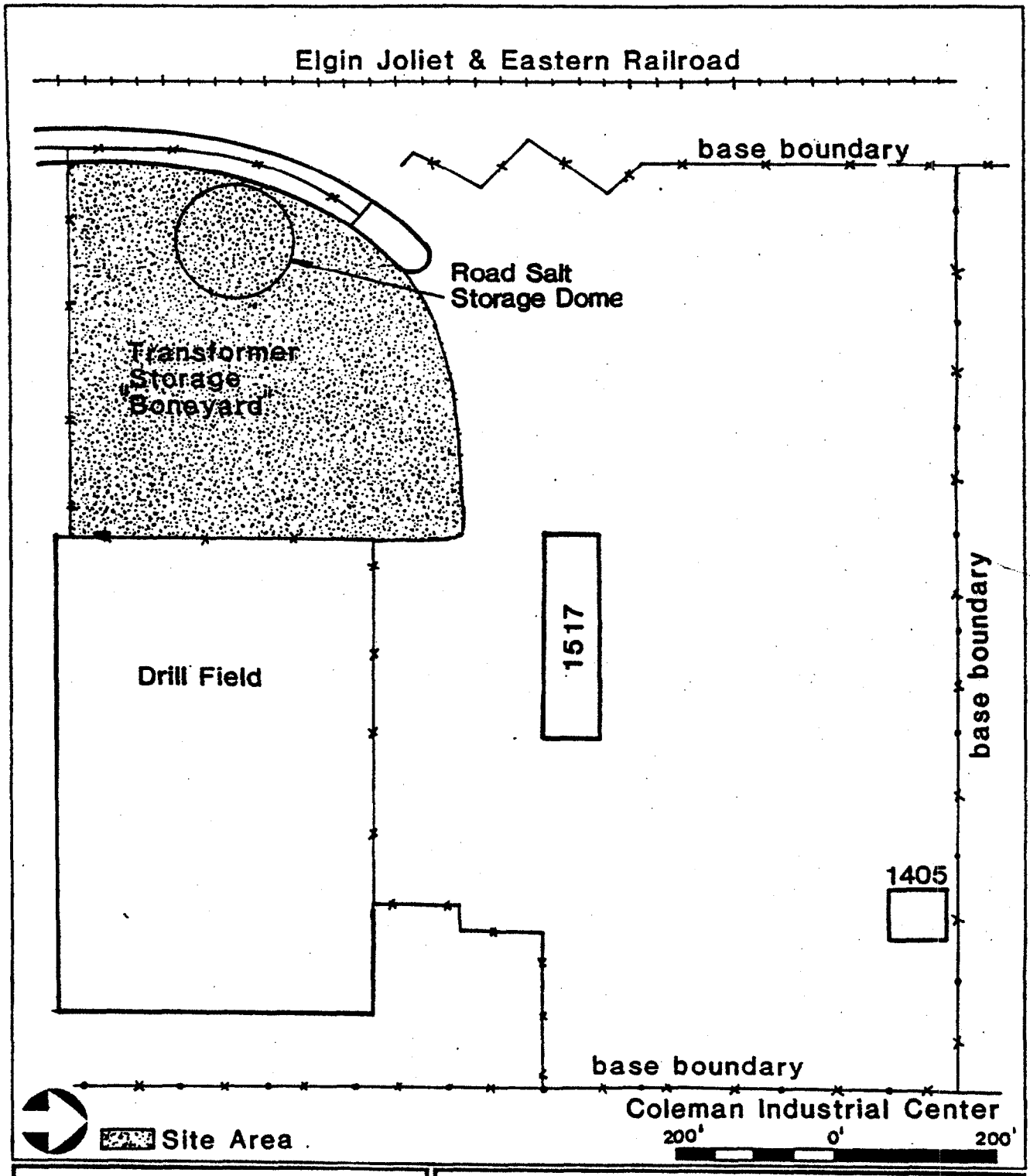

Figure 8-5

Site 5, Transformer Storage "Boneyard"

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Table 8-2

Soil Samples Analyzed for PCB Content,
Transformer Storage "Boneyard," NC Great Lakes

Sample Number	PCB Content
1	45 ppm
2	60 ppm
3	100 ppm
4	50 ppm

During the on-site visit, a tour was made of the disposal site (Figure 8-6). The southeast corner of the foundation wall was examined, and some of the soil in the area was found to have a slight oily stain. This was also the only area of the foundation without a thick stand of weeds. It was not possible to determine whether the lack of weeds is related to the PCB oils or to some other cause.

8.7 SITE 7, RTC SILK-SCREENING SHOP. The RTC Silk-Screening Shop (Figure 8-7) is located in the RTC Training Aids Branch in Building 1212. This shop has been in its present location since at least 1965. The various flags and banners used by the recruits during parades, graduations, etc., are made in the shop. The screens are painted or dyed with ink during their preparation. Upon completion, the finished silk screens are washed in a booth located in the northeast corner of the building. This practice has been in effect since at least 1972. The ground surrounding the outlet was very obviously stained for an area of approximately 3 feet by 15 feet at the time of the research team's visit (June 1985). Upon closer examination it was seen that the staining continued for many more feet into the dirt road behind the building where, reportedly, the effluent often formed pools during periods of heavy discharge.

The shop uses a variety of inks, dyes, paints, and thinners in preparing the finished silk screens. Included are water- and oil-based lacquers and enamels, mineral spirits (T-125), acetone (T-948), thinners (T-460, T-900, and T-910), direct photo emulsion, and various ink products. Reportedly, the ink products and solvents handled by the Silk-Screening Shop have changed over the years.

Various combinations of the thinners are used at the rate of 3 gallons per week during heavy work periods. Virtually all of this material leaves the building via the wash booth drain. Photo emulsion is used at the rate of approximately 5 gallons per year, all of which is also washed out the booth drain. Specific quantities of paints and inks used are unknown; reportedly, however, during busy periods approximately 200 gallons per week of wash wastes are flushed out of this drain onto the ground. This practice ended in August 1985. Wastes are now disposed of through DRMO.

8.8 SITE 8, EXCHANGE SERVICE STATION. In 1983 a major gasoline spill occurred at the Navy Exchange service station (Building 144) on the Mainside area of the activity (Figure 8-8). Approximately 3,000 gallons of gasoline were spilled when a line leading to the underground storage tanks ruptured. Product recovery wells were installed in order to pump out the contaminated gasoline. The recovered fuel was delivered to the Fire Fighting Training Area for disposal. After the recoverable gasoline was removed from the ground, contaminated soil was also removed for off-base disposal. A 24-hour fire watch was put in effect, and the area was monitored by the Fire Department for a month following the spill.

Despite the thorough cleanup at the spill site, the odor of gasoline can still be detected in the basement of the nearby Post Office (Building 112) after heavy rain. Apparently, residual gasoline remaining in the subsurface gets displaced by percolating rainwater and enters the lowest levels of the building.

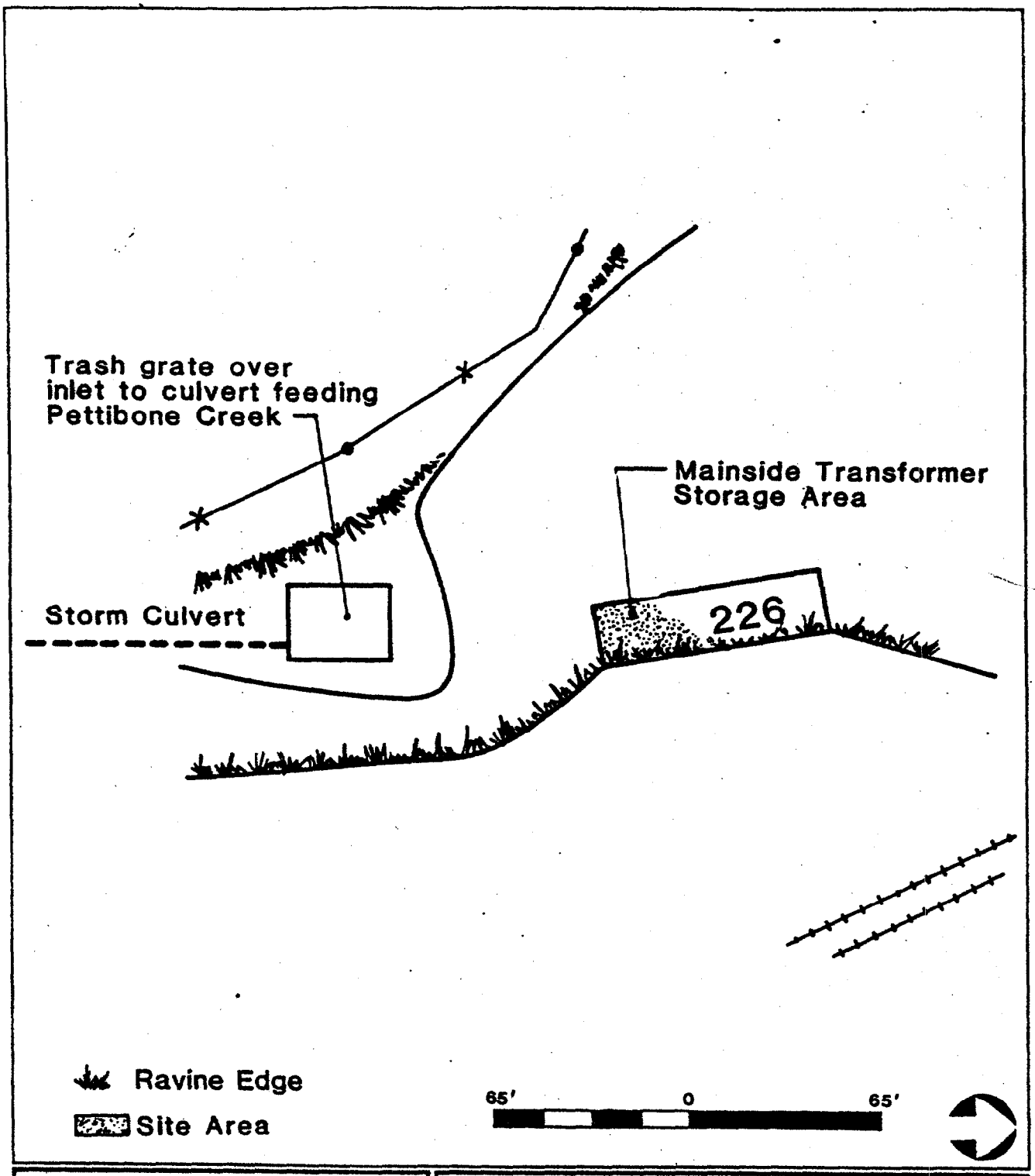

Figure 8-6

Site 6, Mainside Transformer Storage Area

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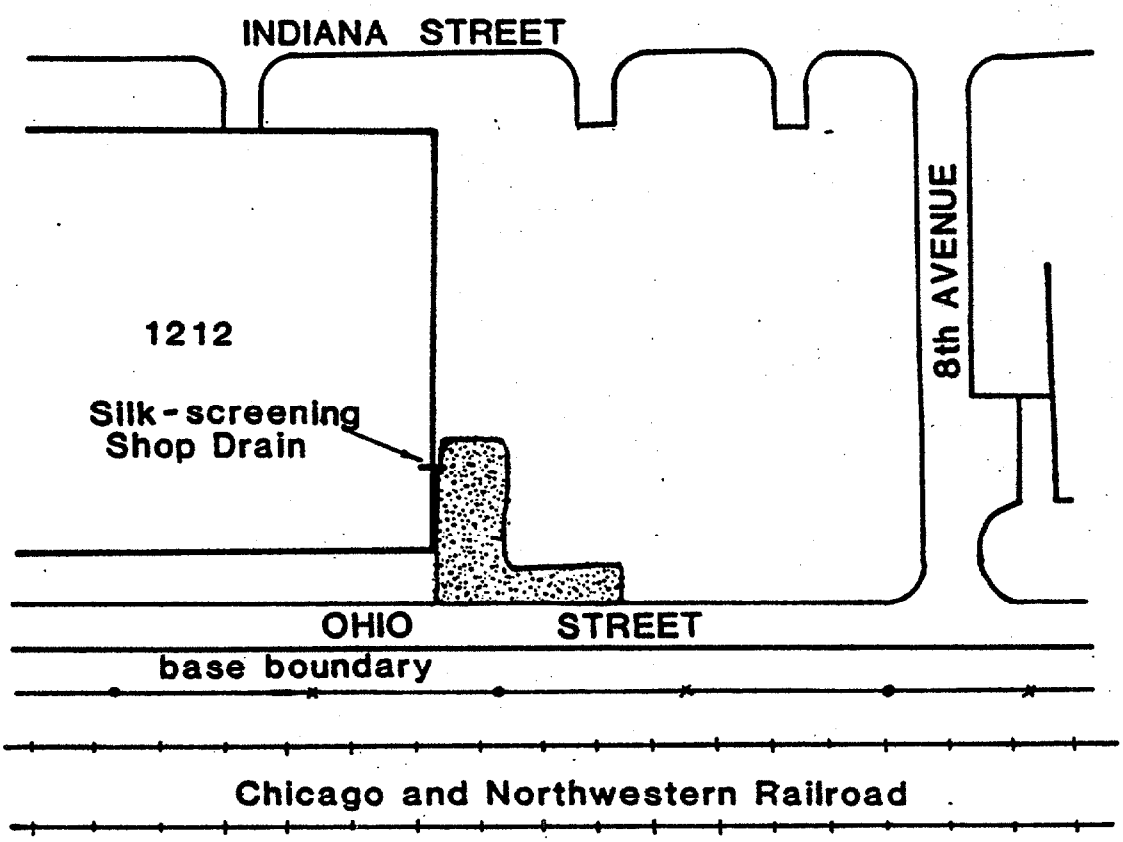

Site Area

100' 0' 100'

Figure 8-7

Site 7, RTC
Silk-Screening Shop

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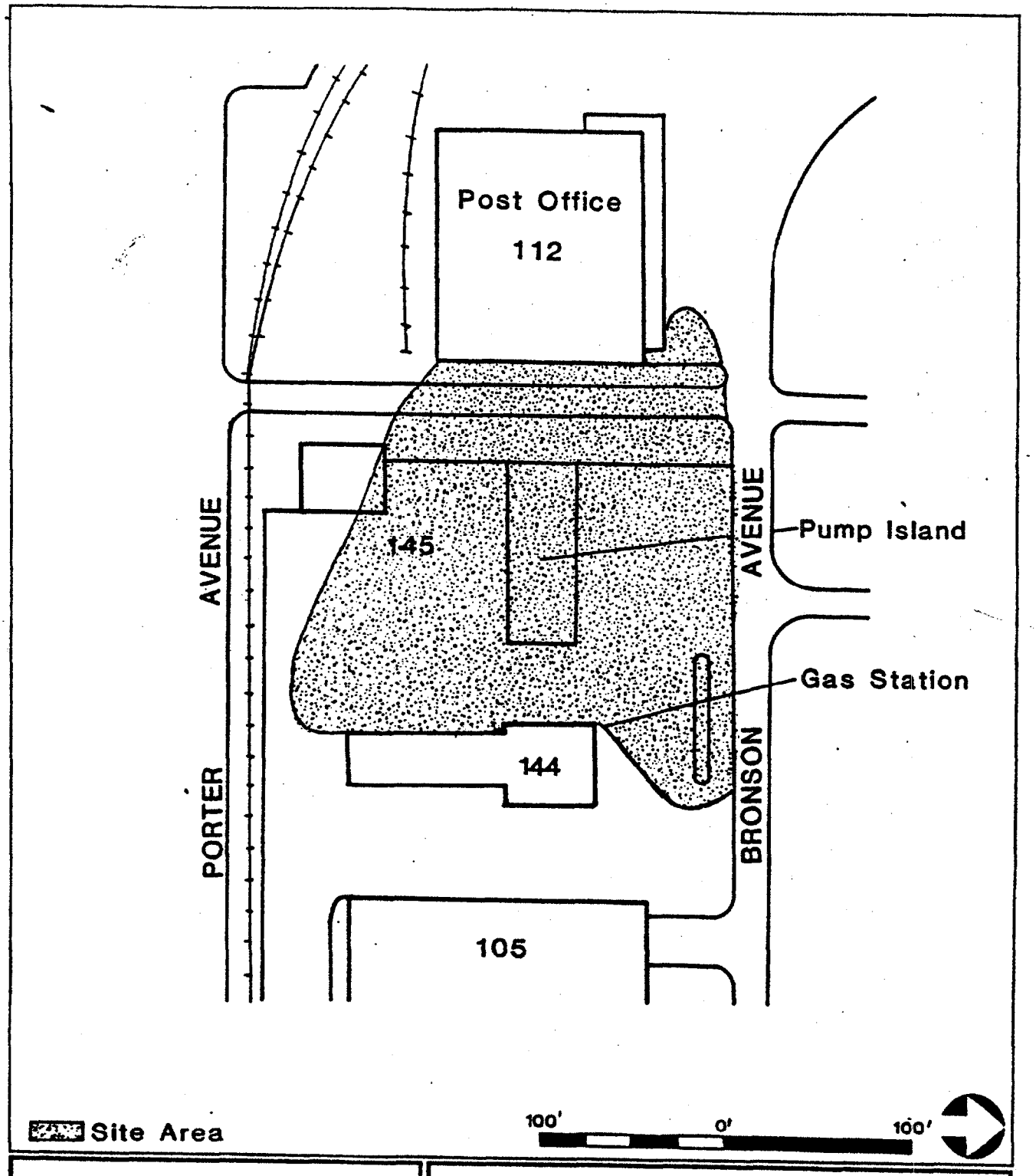

Figure 8-8

Site 8, Exchange Service Station

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8.9 SITE 9, CAMP MOFFETT DISPOSAL AREA. A 1980 excavation to repair a portion of the roadway in Camp Moffett which had collapsed uncovered a variety of galley-type wastes. These wastes included stainless steel serving trays and food wastes. The excavation went to the limit of reach of the backhoe which was available (approximately 8 feet below the surface) and did not reach the bottom of the fill. No effort was made to determine the lateral extent of the fill; however, examination of older aerial photographs and topographic maps of the area suggests that the area was formerly a narrow, V-shaped ravine, a former tributary of Pettibone Creek (Figure 8-9). No other information is available about the Camp Moffett Disposal Area.

8.10 SITE 10, NTC RIFLE RANGE. The NTC Rifle Range (Figure 8-10) is located on a 14.2-acre plot at the extreme northeastern corner of NC Great Lakes. The Rifle Range has been located in this particular area since the land was purchased in 1918. It is currently being used by the Department of Justice, Federal Bureau of Investigation as a training and practice facility.

In August 1984, the Northern Division, Naval Facilities Engineering Command (NORTHNAVFACENGCOM) conducted a preliminary site investigation to determine the amount of environmental contamination at the site. Unfired rounds of old ammunition and other ordnance items were found regularly in the uppermost soil layer throughout the site. It appeared that these items had been buried in the soil and surfaced due to erosion. Investigators concluded that a serious safety hazard would exist were the Navy to change the land use of this property without sweeping the entire site for ordnance.

The site also has a high contamination potential for lead, due to the presence of almost 70 years worth of lead accumulation in the soil. Investigators concluded that the lead had a high potential for contaminating ground and surface waters due to its exposure to a variety of weather and environmental conditions. The cost for demilitarizing the site has been estimated at approximately $554,000, which is close to the fair market value of the site (NORTHNAVFACENGCOM ESR #21-696-250, September, 1984).

8.11 SITE 11, BE/E SCHOOL GYRO COMPASS ROOM. Building 2B (rooms 329, 330, 330A, and 330B) housed 15 gyro compasses from 1942 until 1976 (Figure 8-11). Each mechanism contained 10 to 15 pounds of elemental mercury. Reserve mercury was stored in a locker located in room 330C, on the third floor of Building 2B. The gyromechanisms were dismantled in 1976 and sent via Supply to DRMO (then DPDO).

A large (more than 3 feet in diameter) puddle of mercury was discovered under the storage locker in room 330C in 1979 during conversion of the rooms from laboratories into classrooms. Further investigation revealed the presence of mercury in between the floor tiles and the baseboard edging in the room. The other rooms were monitored for mercury vapor. Mercury vapor levels were reportedly negligible and these other rooms were not cleaned further. School personnel called PWC, which contacted Preventative Medicine and the Fire Department. Personnel from all three groups were present while

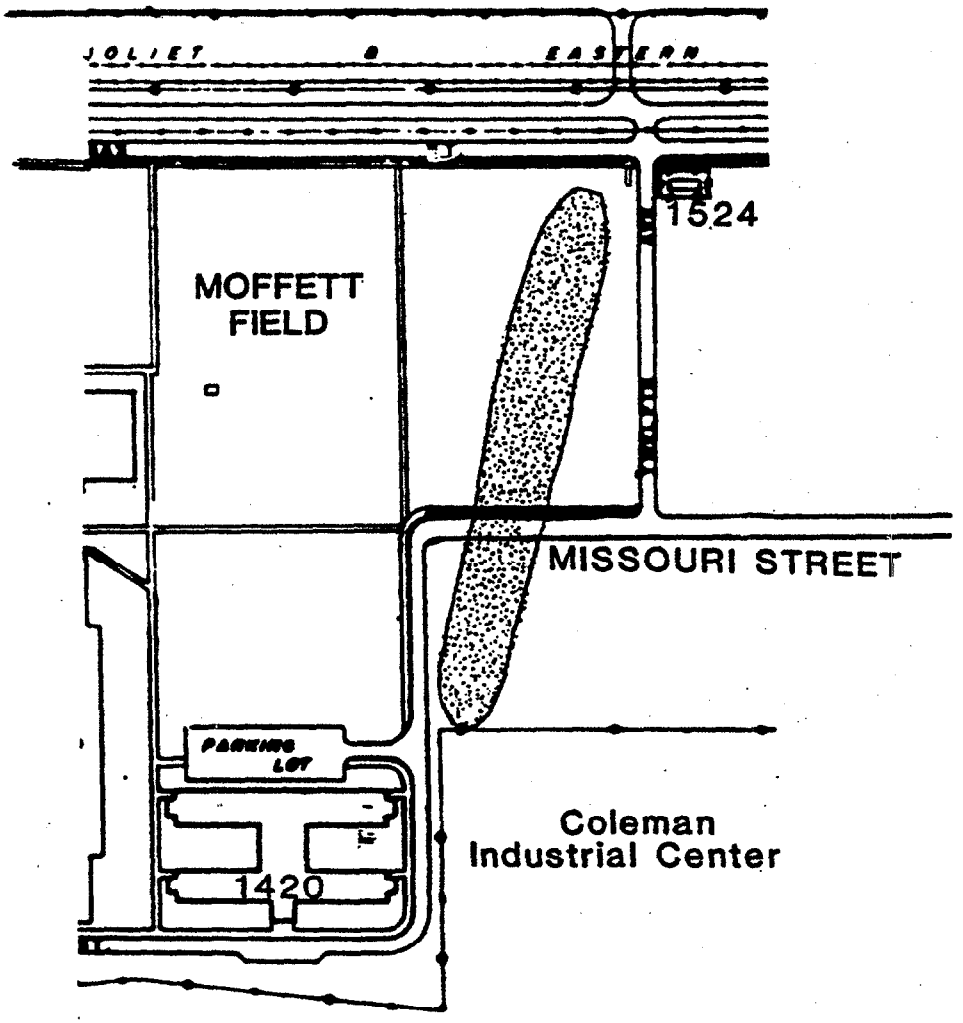

Figure 8-9

Site 9, Camp Moffett
Disposal Area

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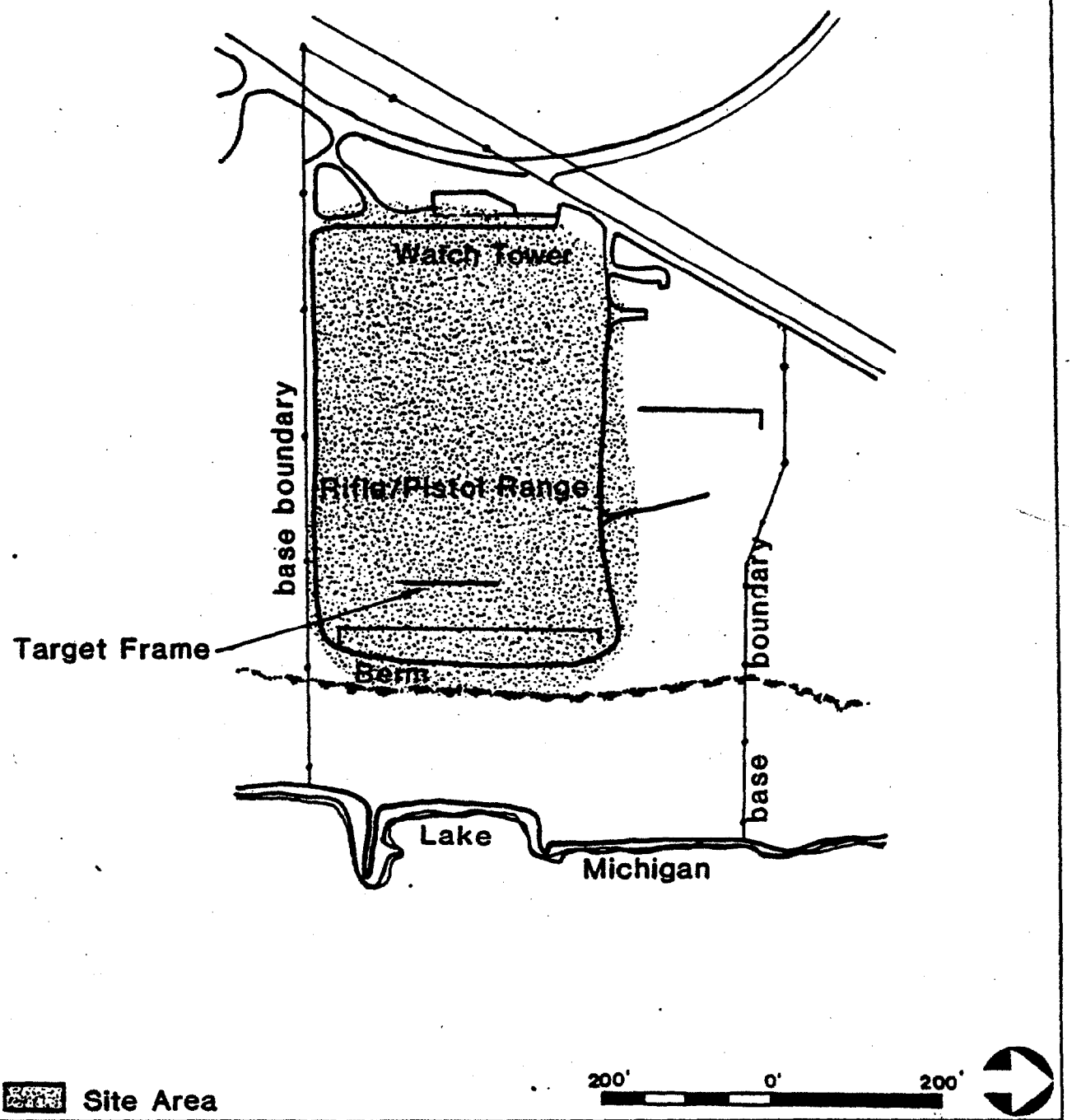

Figure 8-10

Site 10, NTC Rifle Range

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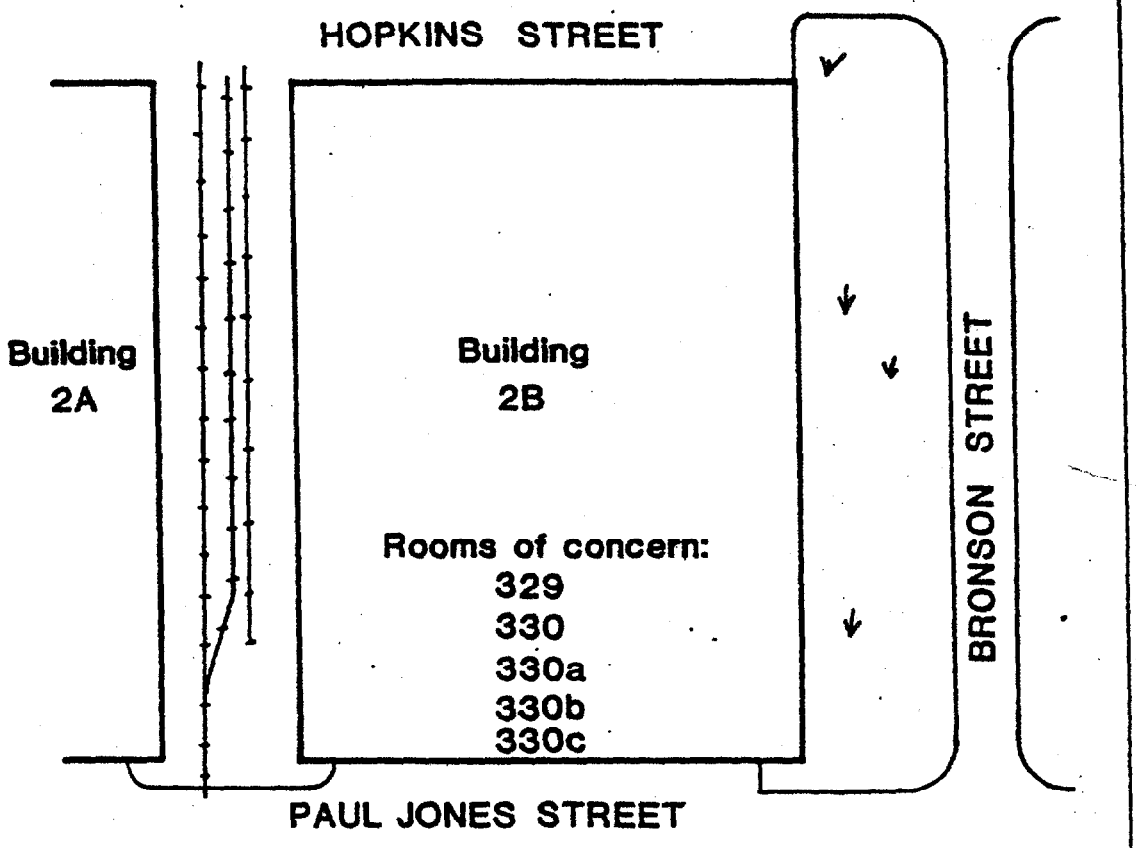

Figure 8-11

Site 11, BE/E School Gyro Compass Room

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Preventative Medicine vacuumed the area for mercury. Reportedly, there have been no problems with mercury since 1979. The rooms have been used as classrooms since 1979.

8.12 SITE 12, HARBOR DREDGE SPOIL AREA. The harbor area (Figure 8-12) has experienced siltation since the original breakwaters were installed. With the construction of the outer breakwater the siltation problems became worse, since wave energy entering the area decreased even further. From 1952 to 1970, the boat slip area was dredged twice. The dredge spoil was placed on the 3-acre area at the base of the outer harbor breakwater (G17 on the General Development Map), where the jetty meets the southern boundary of the activity. The spoil has created a wide flat area where other materials are sometimes marshaled, but no other disposal takes place there.

The harbor area receives the runoff from Pettibone Creek, which on several occasions has conveyed contaminants that were generated off-base. These contaminants may sink to the bottom when they reach the larger Lake Michigan, or they may adsorb onto the surface of fine-grained sediments which collect in the sheltered waters of a harbor.

The NC Great Lakes Master Plan cites contamination of the inner harbor sediments with heavy metals, oils, and PCB's. The source of these contaminants was apparently the off-base industries upstream of NC Great Lakes, some of which are identified in the section on adjacent land uses in Chapter 4 of this report. Spoils dredged from the Inner Harbor and deposited at Site 12 could also contain this contamination. The Inner Harbor is not Navy property; the waters are under the jurisdiction of the State of Illinois. Site 12, however, is definitely Navy property.

A proposal to place dredge spoils into the foundation of former NC Great Lakes Building 112 was approved by the U. S. Army Corps of Engineers in the early 1980's. No further dredging had occurred as of 1985, however, and it is presumed that the proposed disposal of Inner Harbor spoils into that foundation did not occur.

8.13 SITE 13, DEMOLITION DEBRIS DISPOSAL AREAS. During the course of the on-site visit by the IAS team, several areas which were used for the disposal of inert demolition debris were discovered (Figures 8-13a and 8-13b). As a result of the findings regarding other past disposal practices, the judgment of the IAS team is that the material disposed of in these areas included only inert material, even though documentation of the disposal practices, including dates and volumes, was unavailable. The primary reason for this conclusion is that the methods used to dispose of office waste, putrescible waste, and industrial materials at NC Great Lakes are well known. Each of the demolition debris areas discovered is described in this section.

Demolition debris disposal sites 13A, 13B, and 13C are located along the shoreline of Lake Michigan. The sites include the entire shoreline, exclusive of the immediate vicinity of the Inner Harbor and Boat Basin. Areas behind and in front of bulkheads and piers constructed to protect the bluffs from coastal erosion were filled. Most of this fill material was

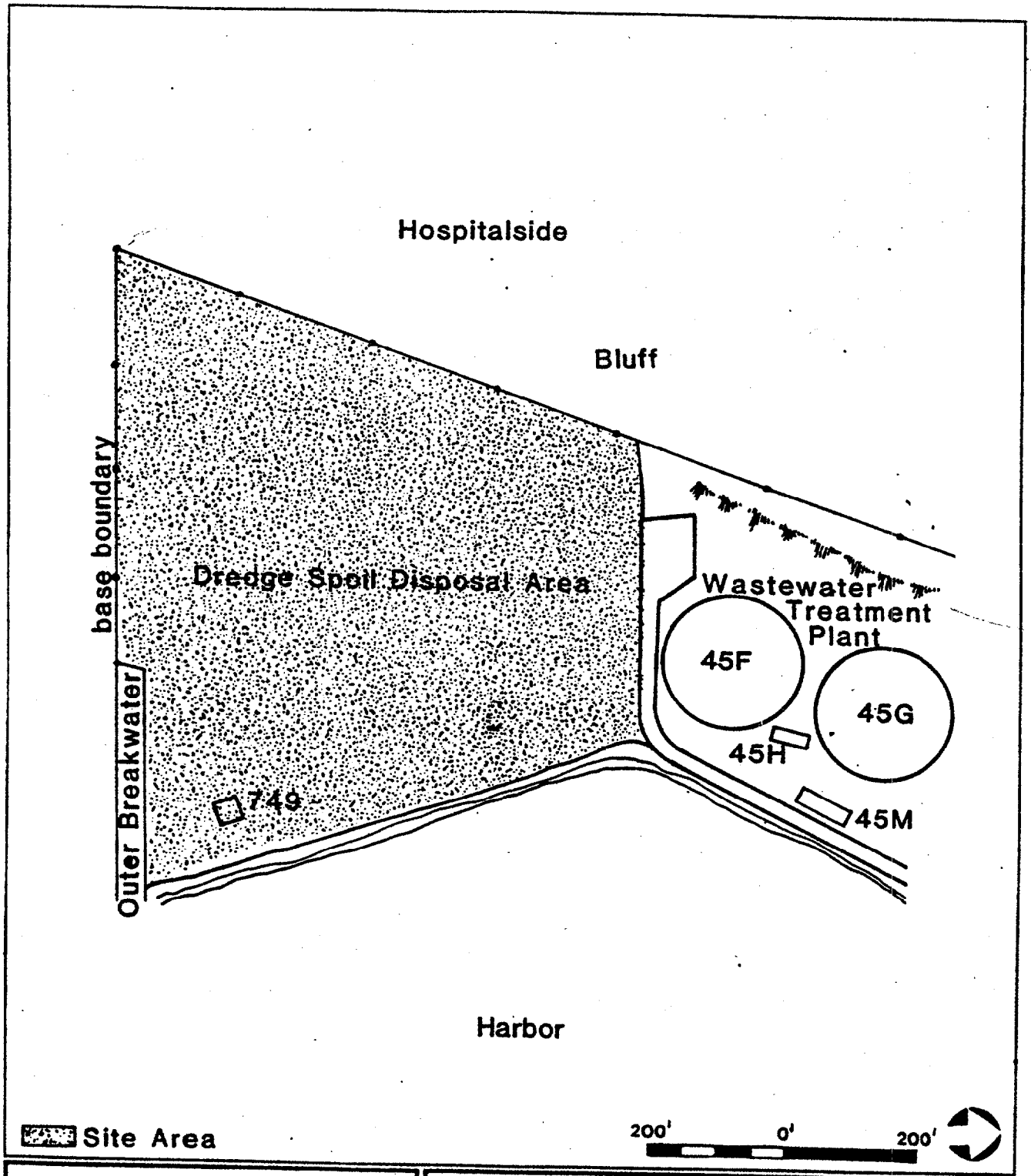

Figure 8-12

Site 12, Harbor Dredge Spoil Area

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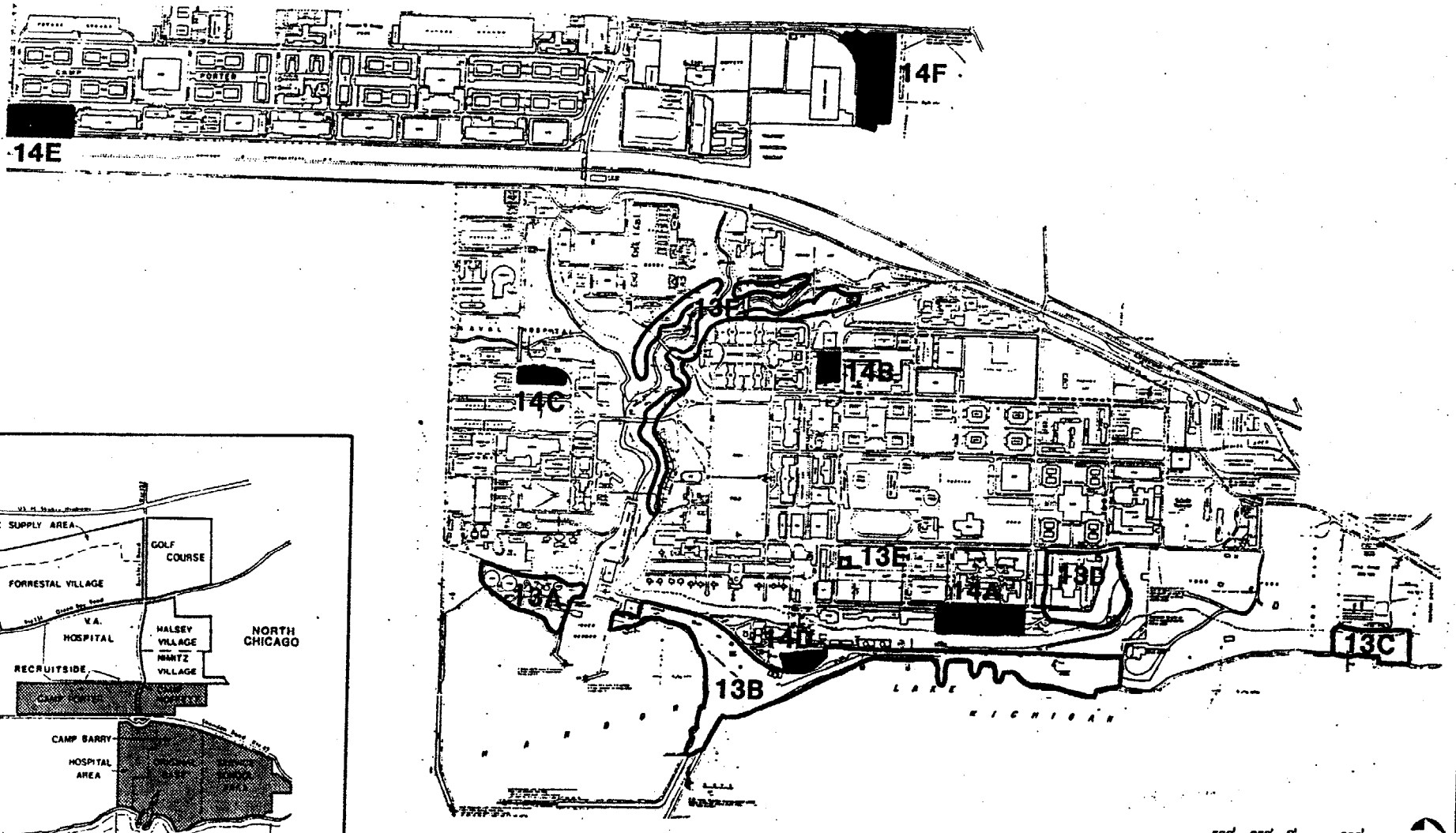

Former Demolition Debris Disposal Areas

Former Coal Storage Areas

Figure 8-13a

Site 13, Demolition Debris Disposal Areas, and Site 14, Former Coal Storage Areas

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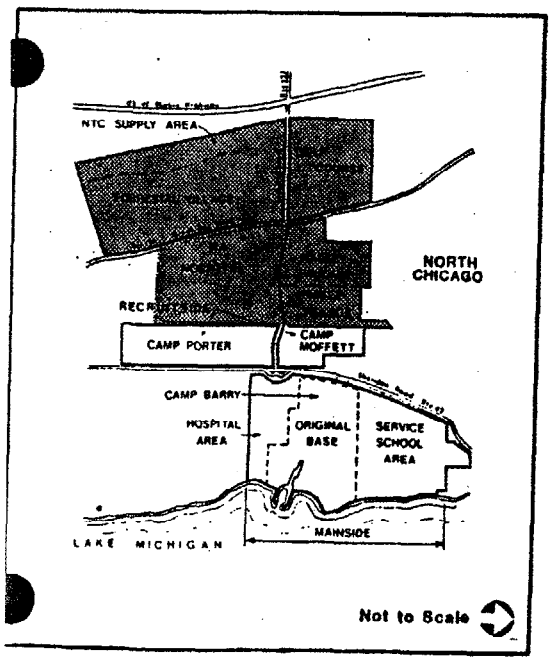

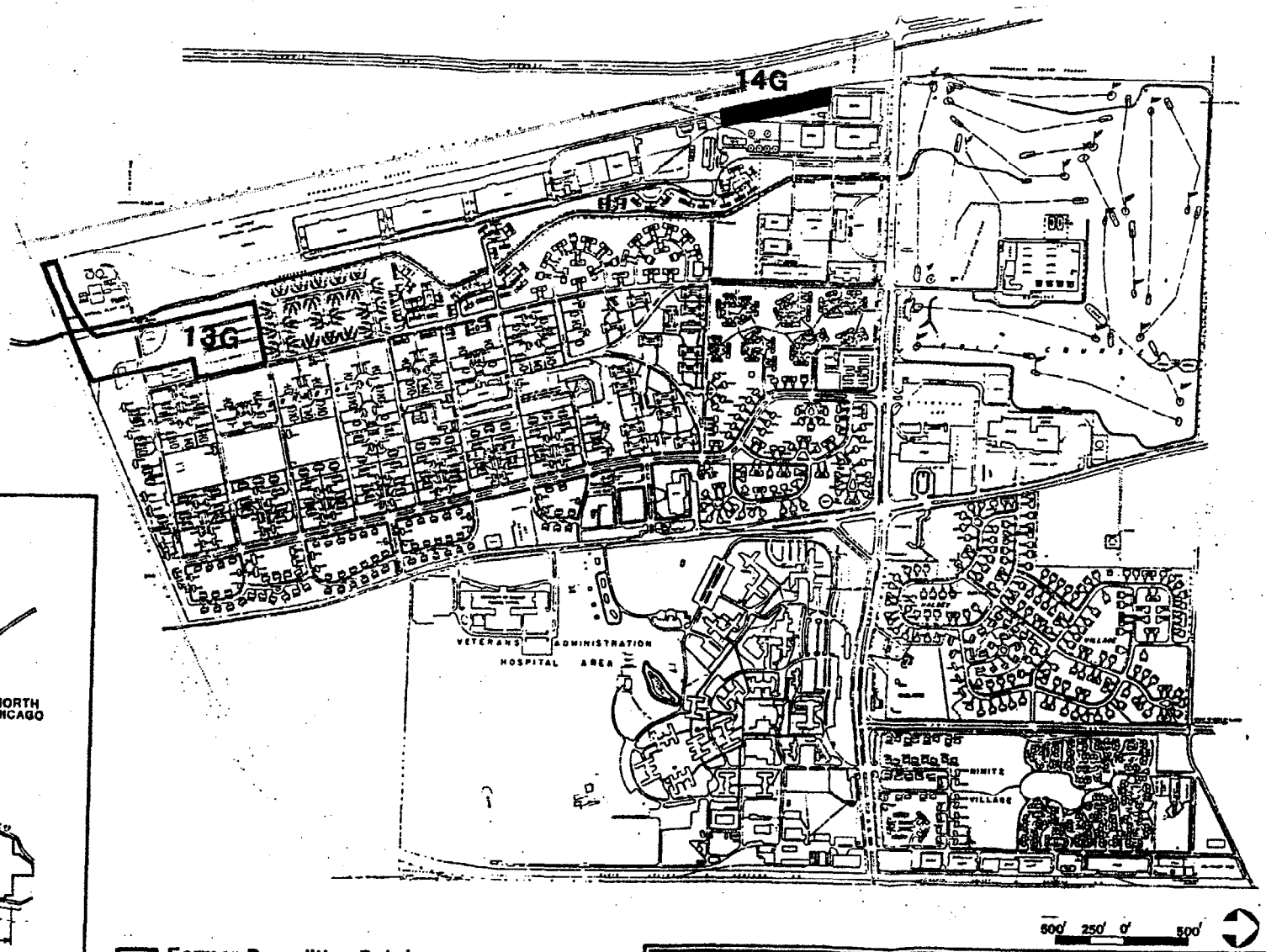

Former Demolition Debris Disposal Areas

Former Coal Storage Areas

Figure 8-13b

Site 13, Demolition Debris Disposal Areas, and Site 14, Former Coal Storage Areas

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composed of bricks, concrete, and other building materials large enough to provide protection for the receding shoreline. These materials may be examined in the actual shore zone, and especially in the vicinity of the Skeet Range, Building 743, where large blocks of concrete are visible amidst typical building demolition debris material. On-ground inspection did not reveal any materials which are not inert that may have been disposed of there. Some of the material had been placed by the Naval Construction Batallion Unit 401, some by the Public Works Center, and some by contractors working on the activity. Between 1981 and 1984, Naval Construction Batallion Unit 401 placed fill at the NTC Rifle Range shoreline (Site 13C) to restore the bluff after particularly severe erosion. No active disposal was evidenced during the on-site visit.

Site 13D included the area along the western and southern sides of Zeigemeier Street as it rises from the shoreline onto the Mainside campus. The disposal site is bounded by the bluff to the east, Zeigemeier Street on the north, and Paul Jones Street on the west, and ends north of Cluverius Street. Disposal there ended prior to the development and construction of Building 621, the ET "A-School," in 1969. PWC personnel also noted problems with installing portable building anchor systems in the area east of Building 621, on top of the bluff. The present appearance of the area provides no clue to the existence of the demolition debris and no seepage was observed on the bluff.

Site 13E was a former swimming pool facility located on the north side of Bronson Avenue, opposite Building 122. The facility was out of service due to leakage of the concrete walls and was filled in the period 1984 to 1985 by the Naval Construction Battalion Unit 401. Completion of this project preceded the 1985 on-site visit by the IAS team by several weeks.

Site 13F is along the banks of Pettibone Creek. Based upon examination of topographic maps, archive photographs, and general development maps, the location of the top of these banks has moved up to 100 feet toward the stream bed. This is consistent with the observations of many activity personnel who related that coal ash had been disposed of almost anywhere on the activity where fill was required for grading purposes.

The final demolition debris disposal site (Site 13G) is in the area of the present Auto Hobby Shop (Building 2110). Prior to the construction of the new trailer court area along Great Lakes Drive, Arkansas Road, and Georgia Road, the area was used for demolition debris disposal. Disposal of this inert material proceeded south from Delaware Avenue, around Building 2110, and across Alabama Avenue to the southern activity boundary. The area along the southern activity boundary and south of Sewage Disposal Plant No. 2 was filled along a 50- to 100-foot swath from the vicinity of Building 2262 to the southwest corner of the activity. Some of the evidence supporting this observation includes the difficulty experienced by the PWC personnel in installing tiedown facilities in the trailer court area, the general lay of the land in that area, and the surface appearance of the grounds in the playing fields south of Alabama Avenue. No sign of material other than demolition debris was encountered in these areas. No outcroppings of these materials were found in Skokie Ditch.

8.14 SITE 14, FORMER COAL STORAGE AREAS. Coal was used as the primary source of fuel for space heating and power at NC Great Lakes from its inception until the early 1970's, when coal was phased out in favor of oil at the Mainside power station. Coal was stored at various locations throughout the activity during the time it was used as the primary fuel (Figures 8-13a and 8-13b). These locations are identified in this section because of the potential for leachates developing from coal residues which may remain at these locations.

From 1911 through at least 1930, the Mainside and Hospitalside portions of NC Great Lakes formed the majority of the activity. The only Navy-owned facilities west of Sheridan Road included a water tank and pipeline right-of-way. As shown in Figures 8-13a and 8-13b, Site 14A on the lakefront bluffs (the present location of Buildings 616 and 617), Site 14B along Bronson Avenue (the present location of Building 144 and its parking apron), and Site 14C opposite the Hospitalside steam plant (presently an open area opposite Building 58-H) were the primary locations where coal was stored. A trestle existed at the Mainside power plant on the lakefront. No coal storage was noted on the June 30, 1930, Map of the Station. Coal was moved from these storage piles to the points of use either with trucks or on an activity-operated narrow gauge railway.

Site 14A was noted to have a concrete pad beneath the coal pile. Residues, if any, were most likely removed during construction of the new buildings (616 and 617) in 1954 and 1955. Site 14B residues, if any, are presently covered under an impermeable surface of asphalt paving. Site 14C has been redeveloped several times. There is presently no vegetative stress in this landscaped area.

By 1943, the activity had expanded west of both Sheridan and Green Bay Roads, and with that expansion, the need for additional heating plants also led to the need for additional coal storage piles. The three maps of NC Great Lakes dated June 30, 1943, show that Site 14A was still in use on the Mainside portion of the activity. Site 14B was replaced with a laundry in Building 105 and an office building (Building 95). Site 14C, on Hospitalside, was replaced with a recreation building (Building 82) and athletic fields. Site 14D was a new coal storage pile on the lakefront behind an extension of the harbor seawall. The railway trestle was extended to serve this new storage area. This area is presently the site of the fluidized bed combustion power plant. Heating plants were fitted with indoor storage to eliminate the need for some of these piles.

With the expansion of the activity facilities west of Sheridan Road, coal piles were established at the southeastern corner of Camp Porter (south of Building 800 in Recruitside, Site 14E) and at the northern end of Camp Moffett, north of Building 1517 (Site 14F). These facilities were both located along existing railroad rights-of-way. Site 14E is presently a recreational area with two baseball diamonds. Site 14F is paved with loose ash and possibly some remaining coal residue.

Also by 1943, the area between Green Bay Road and the Public Service Company of Northern Illinois was developed by the Navy. A coal storage pile (Site

14G) was established along the western boundary of the activity, south of Buckley Road and behind Building 3212 (present site of the DRMO warehouse). Site 14G is presently the DRMO open storage area and is unpaved.

The only remaining coal on the activity is located at Site 14D, where some fine-grained high sulfur coal used to fire the fluidized bed combustion unit is still stored. According to NORTHNAVFACENGCOM personnel, a contract is soon to be let to have an off-base contractor remove the coal which remains there.

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APPENDICES

Appendix A

AGENCIES CONTACTED FOR IAS

Naval Energy and Environmental Support Activity, Port Hueneme, CA 93043

Ordnance Environmental Support Office (OESO), Indian Head, MD 20640

Naval Historical Center, Operational Archives, Building 57, Washington Navy Yard, Washington, D.C. 20374

National Archives (Cartographic Branch), Washington, D.C. 20408

Federal Archives and Records, Region 5, Chicago, IL 60629

Naval Facilities Engineering Command Historian, NCBC Port Hueneme, CA 93043

Naval Facilities Engineering Command Historian, NCBC Port Hueneme, CA 93043

Naval Facilities Engineering Command, Northern Field Division, Philadelphia, PA 19112

Naval Sea Systems Command, Crystal City, Alexandria, VA

DOD Explosives Safety Board, Hoffman Building I, Room 856-C, 2461 Eisenhower Avenue, Alexandria, VA 22331

Illinois Department of Conservation, Springfield, Illinois.

Illinois Department of Public Health, Consumer Health Protection, Springfield, IL 62761

Appendix B

ENDANGERED SPECIES

STATE OF ILLINOIS
DEPARTMENT OF CONSERVATION
Administrative Order 1978

ARTICLE CXXXVIII - ILLINOIS LIST OF ENDANGERED AND THREATENED VERTEBRATE SPECIES ISSUED IN ACCORDANCE WITH PROVISIONS OF SECTION 337 OF THE ILLINOIS ENDANGERED SPECIES PROTECTION ACT.

The following list has been adopted by the Ilinois Endangered Species Protection Board as the Official List of Endangered and Threatened Vertebrate Species of Illinois.

To be in compliance with the Federal and State Endangered Species Acts, the following definitions apply:

FEDERALLY ENDANGERED SPECIES — Any species which is in danger of extinction throughout all or a significant portion of its range. (Denoted by two asterisks (**) on abandoned list).

FEDERALLY THREATENED SPECIES — Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. (Denoted by a single asterisk (*) on adopted list).

STATE ENDANGERED SPECIES — Any species which is in danger of extinction as a breeding species in Illinois.

STATE THREATENED SPECIES — Any breeding species which is likely to become a state endangered species within the foreseeable future in Illinois.

Endangered Fishes of Illinois

Bigeye Chub	Hybopsis amblops
Bluebreast Darter	Ethcostoma camurum
Bluehead Shiner	Notropsis sp. (undescribed)
Harlequin Darcer	Etheostoma histrio
Longjaw Cisco**	Coregonus alpenae

Threatened Fishes of Illinois

Cisco	Coregonus artedii
Longnose Sucker	Catostomus catostomus
Alligator Gar	Lepisosteus spatula
Pugnose Shiner	Notropis anogenus
Blacknose Shiner	Notropis heterolepus
Bantam Sunfish	Lepomis symmetricus
Lake Whitefish	Coregonus clupeaformis
Lake Sturgeon	Acipenser fulvescens

Endangered Amphibians and Reptiles of Illinois

Dusky Salamander	Desmognathus fuscus
Silvery Salamander	Ambystome platineum
Spotted Turtle	Clemmys guttata
Slider	Pseudemys floridana x concinna
Illinois Mud Turtle	Kinosternon flavescens
Broad-banded Watersnake	Nerodia fasciata
Eastern Ribbon Snake	Thamnophis sauritus

Threatened Amphibians and Reptiles of Illinois

Illinois Chorus Frog	Pseudacris streckeri
Western Hog-nosed Snake	Heterodon nasicus
Whip Snake	Masticophis flagellum
Great Plains Rat Snake	Elaphe guttata

Endangered Birds of Illinois

Double-crested Cormorant	Phalacrocorax auritus
Snowy Egret	Egretta thula
Great Egret	Casmerodius albus
Little Blue Heron	Florida caerulea
American Bittern	Botaurus lentiginosus
Black-browned Night Heron	Nycticorax nycticorax
Mississippi Kite	Ictinia mississippiensis
Cooper's Hawk	Accipiter cooperii
Red-shouldered Hawk	Buteo lineatus
Swainson's Hawk	Buteo swainsoni
Bald Eagle	Haliaeetus leucocephalus
Osprey	Pandion haliaetus
Marsh Hawk	Circus cyaneus
Peregrine Falcon**	Falco peregrinus
Greater Prairie Chicken	Tympanuchus cupido
Yellow Rail	Coturnicops noveboracensis
Black Rail	Laterallus jamacensis
Purple Gallinule	Porphyrula martinica
Piping Plover	Charadrius melodus
Eskimo Curlew**	Numenius borealis
Upland Sandpiper	Bartramia longicauda
Wilson's Phalarope	Steganopus tricolor
Forster's Tern	Sterna forsteri
Common Tern	Sterna hirundo
Least Tern	Sterna albifrons
Plack Tern	Chlidonias niger
Barn Owl	Tyto alba
Long-eared Owl	Asio otus
Short-eared Owl	Asio flammeus
Brown Creeper	Certhia familiarus
Bachman's Warbler**	Vermivora bachmanii
Yellow-headed Blackbird	Xanthocephalus xanthocephalus
Bachman's Sparrow	Aimophila aestivalis

Threatened Birds of Illinois

Common Gallinule	Gallinula chloropus
Bewick's Wren	Thryomanes bewickii
Veery	Catharus fuscescens
Loggerhead Shrike	Lanius ludovicianus
Swainson's Warbler	Limnothlypis swainsonii
Brewer's Blackbird	Euphagus cyanocephalus
Henslow's Sparrow	Ammodramus henslowii

Endangered Mammals of Illinois

Gray Bat**	Myotis grisescens
Indiana Bat**	Myotis sodalis
Eastern Wood Rat	Neotoma floridana
White-tailed Jackrabbit	Lepus townsendii

Threatened Mammals of Illinois

River Otter	Lutra canadensis
Bobcat	Lynx rufus
Golden Mouse	Ochrotomys nuttalli
Rice Rat	Oryzomys palustris

Source: State of Illinois, Dept. of Conservation

Appendix C

ACRONYMS

AFFF	Aqueous Film Forming Foam
ADCOM	Administrative Command
ADPL	Average Daily Patient Loading
AIMD	Aircraft Intermediate Maintenance Department
BA	Borrow Areas
BE/E	Basic Electricity and Electronics
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CB	Construction Battalion
CNO	Chief of Naval Operations
CO	Commanding Officer
CSRS	Confirmation Study Ranking System
DOD	Department of Defense
DPDO	Defense Property Disposal Office
DRMO	Defense Reutilization and Marketing Office
EFD	Engineering Field Division
EM/IC	Electricians Mate/Interior Communications Technician
EPA	Environmental Protection Agency
ET	Electronics Technician,
FT/OM/IC	Fire Control Technician, Opticalman, and Instrument Control
$HgNO_3$	Mercuric Nitrate
HVAC	Heating, Ventilation, and Air-Conditioning
IAS	Initial Assessment Study
IEPA	Illinois Environmental Protection Agency
ISGS	Illinois State Geological Survey
IT	Instructor Training
MGD	million gallons per day
ML	Madeland
MUSE	Mobile Utilities Support Equipment
NACIP	Naval Assessment and Control of Installation Pollutants
NAVFACENGCOM	Naval Facilities Engineering Command
NAVHOSP	Naval Hospital
NC	Naval Complex (Great Lakes)
NEESA	Naval Energy and Environmental Support Activity
NEPSS	Naval Environmental Protection Support Service
NOAA	National Oceanographic and Atmospheric Administration
NORTHNAVFACENGCOM	Northern Division, Naval Facilities Engineering Command
NPPSO	Naval Publication and Printing Service Office
NRDC	Naval Regional Dental Center
NSSD	North Shore Sanitary District
PCB's	Polychlorinated Biphenyls
PCE	Perchloroethylene
POL's	Petroleum, Oils, and Lubricants
PPM	parts per million
PWC	Public Works Center

RTC	Recruit Training Center
TCE	Trichloroethylene
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
USDA	United States Department of Agriculture
VA	Veterans' Administration