December 1986

INITIAL ASSESSMENT STUDY OF NWIRP BETHPAGE, NY AND NWIRP CALVERTON, NY

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Port Hueneme, California 93043

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INITIAL ASSESSMENT STUDY

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE AND CALVERTON, NEW YORK

UIC: N96095/N90845

Prepared by:

Rogers, Golden & Halpern
1216 Arch Street
Philadelphia, Pennsylvania 19107

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

Jack A. Halpern, Principal-in-Charge
Roger D. Moose, Project Manager/Hydrogeologist
Robert W. Pierson, Ph.D., Biochemist and Planner
Paul M. Nikituk, Biologist
Sandy Dechert, Technical Writer
Kevin Murray, Environmental Specialist
Thomas Roginski, Ph.D., Chemical Engineer
Eric Rose, Geologist
Robert H. Zeiders, Geologist

Naval Energy and Environmental Support Activity

Bud Sturtzer, Project Manager

Prepared for:

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

December 1986

EXECUTIVE SUMMARY

This report presents the results of an Initial Assessment Study (IAS) conducted at the Naval Weapons Industrial Reserve Plants (NWIRP), Bethpage and Calverton, New York. These activities together comprise a government-owned, contractor-operated (GOCO) aircraft fabrication, assembly, and flight test facility which has been active since 1942. Both facilities are operated by the Grumman Aerospace Corporation.

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 nine potentially contaminated sites were identified, three at NWIRP Bethpage and six at NWIRP Calverton. Each of the sites was evaluated with respect to contamination characteristics, migration pathways, and pollutant receptors. The initial IAS survey was conducted in June, 1985.

There are no streams or rivers in the NWIRP Bethpage area that could serve as pathways for the migration of contaminants. Thus the only potential migration pathway is the movement of groundwater through the highly permeable glacial outwash deposits that underlie the entire activity. Both the glacial outwash and the underlying Cretaceous Magothy Formation, common to both NWIRP Bethpage and NWIRP Calverton, are major sources of potable groundwater for Long Island. Thus, potential contaminants from NWIRP Bethpage could possibly enter groundwater systems developed as water supplies for human use and consumption.

At NWIRP Calverton, both surface water and groundwater are potential contaminant migration pathways. Surface water drains east from the swamp area in the southern, developed part of the activity, in the Peconic River, and empties into Great Peconic Bay. These surface waters are the discharge for precipitation, and for the groundwater that flows under NWIRP Calverton into swampy areas south of the activity. Receptors of potential contaminants from NWIRP Calverton are groundwater users and endangered wildlife inhabiting wetlands fed by surface and groundwater flowing from the activity. Endangered wildlife includes Abystoma tigrinum, the tiger salamander (NYDEC, no date).

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:

NWIRP Calverton:

- Site 1, Northeast Pond Disposal Area
- Site 2, Fire Rescue Training Area
- Site 4, Picnic Grounds Disposal Area

- Site 6, Fuel Calibration/Engine Run-up Area

NWIRP Bethpage:

- Site 7, Former Drum Marshaling Areas
- Site 8, Recharge Basins
- Site 9, Salvage Storage Area

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

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 Weapons Industrial Reserve Plants (NWIRP) at Bethpage and Calverton, New York

Confirmation Studies under the NACIP program were recommended for seven sites at NWIRP Bethpage and Calverton. Northern Division, Naval Facilities Engineering Command (NORTHNAVFACENGCOM) will assist NWIRP Bethpage and Calverton in implementing the recommendations.

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 rther 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

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- Mr. George P. Turney, General Manager
  Facilities Maintenance Department, Grumman Aerospace Corp.
- Mr. John Ohlmann, Assistant Director Environmental Engineering
  Facilities Engineering Department, Grumman Aerospace Corp.
- Mr. Barry Andres, Assistant Manager Environment and Grounds,
  Facilities Maintenance Department, Grumman Aerospace Corp.
- Mr. Abe Kern, NAVPRO
- Mr. David Smith, Environmental Engineer, NORTHNAVFACENGCOM

NOTE TO READER

After publication of the final report, new information was discovered that resulted in modifications of the final report. The modifications were incorporated by the Naval Energy and Environmental Support Activity (NEESA). Changes and additions written by NEESA are identified by a vertical bar in the text margin.

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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 potentially hazardous pollutants into the soil and groundwater. 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 the 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 and 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 Naval Weapons Industrial Reserve Plants Bethpage and Calverton, New York, for an IAS is contained in CNO letter ser 451/4U383534 of 26 March 1984.

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 non-hazardous 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 E 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. Figure 1-1 shows the locations of NWIRP Bethpage and NWIRP Calverton.

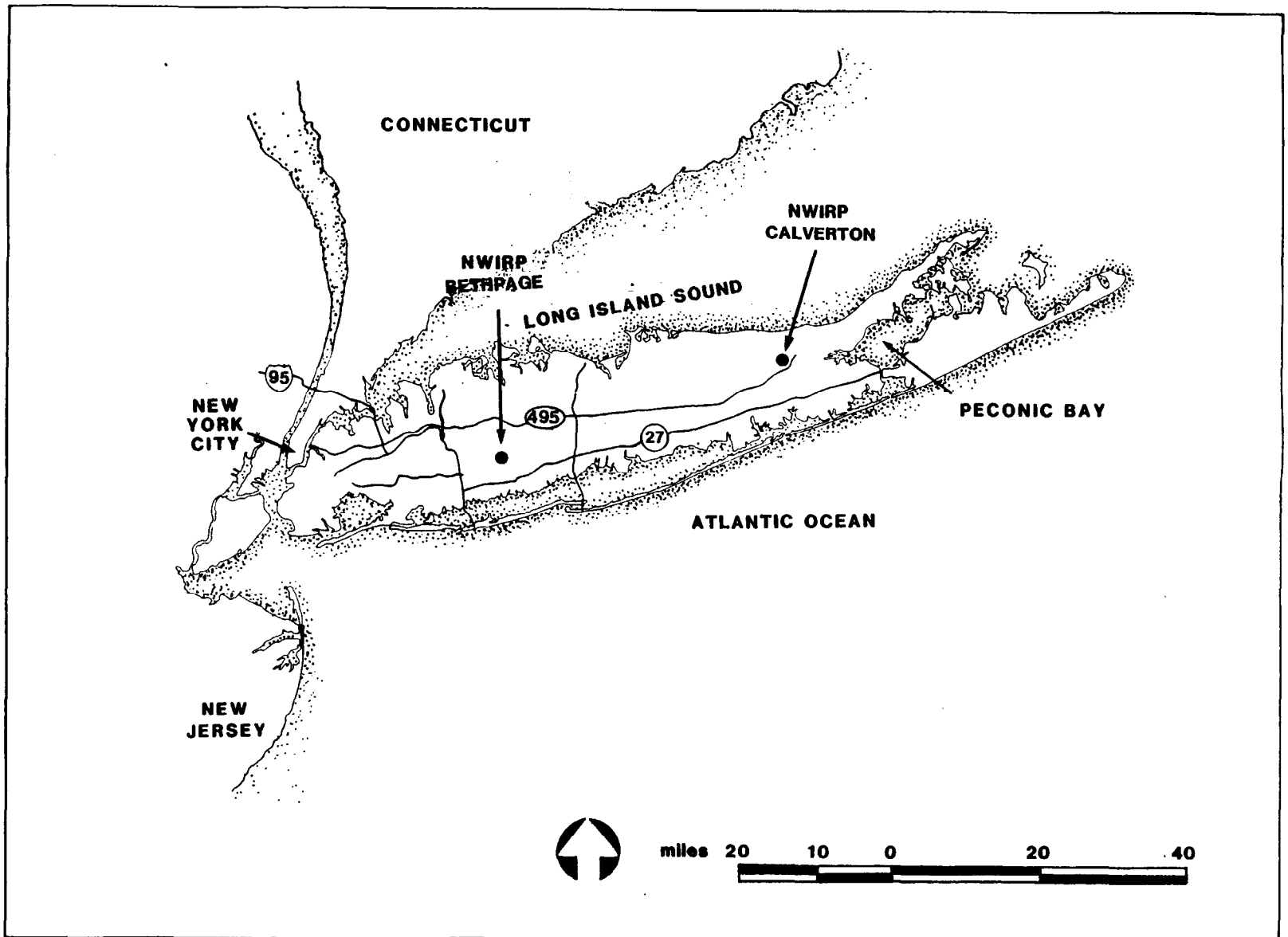

Figure 1-1

General Location Map,
NWIRP Bethpage, New York and
NWIRP Calverton, New York

Initial Assessment Study
Naval Weapons Industrial
Reserve Plant
Bethpage and Calverton
Long Island, New York

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 NWIRP Bethpage and NWIRP Calverton, New York. First, aspects of the local geology, surface drainage, and hydrogeology are discussed with regard to potential contaminant migration pathways. Potential receptors of contamination are identified. Then, conditions at each of the sites recommended for Confirmation Studies are summarized. Figure 2-1 shows the six sites at NWIRP Calverton; Figure 2-2 shows the three sites at NWIRP Bethpage.

At NWIRP Bethpage and NWIRP Calverton, hazardous and industrial chemicals are generated primarily as a result of aircraft production. Additionally, aircraft refurbishing activities require the use of solvent paint strippers at NWIRP Calverton. Waste generation from both activities depends on production workloads; workloads have been inconsistent in the past. For example, it is estimated that the waste generation rate at NWIRP Calverton from 1952 to 1957 was approximately 10 percent of the present rate. In 1957, the rate stepped up to approximately 20 percent of the present rate, and remained at that level until 1980, when it once again increased, this time to its present rate. A complete description of the waste generation rates is presented in Chapter 5 of this report.

2.2 HYDROGEOLOGY AND MIGRATION POTENTIAL. Long Island consists of glacial Pleistocene sediments, unconsolidated Pleiocene and Cretaceous sediments, and a crystalline and metamorphic igneous bedrock. Chapter 4 discusses in detail the geologic and hydrogeologic characteristics of the formations of Long Island.

The following generalizations may be stated regarding the hydrogeology of Long Island. The surficial Pleistocene sediments are porous and coarse-grained, and are consequently highly conducive to rainwater infiltration and to groundwater flow. Concomitantly, the surface sediments are viable sources of groundwater, but are also vulnerable to the infiltration of water-soluble contaminants. The layers of unconsolidated sediments are generally referred to as the Upper Glacial Aquifer. Flow rates and directions in the surface sediments are influenced strongly by topography.

In addition to the Pleistocene surface material, there are two deeper aquifers on Long Island: these are the Magothy and Lloyd aquifers. Generally, these aquifers recharge from the Upper Glacial Aquifer on the northern (Long Island Sound) side of the island. The direction of groundwater flow is predominantly southeast toward the Atlantic Ocean. The Magothy Aquifer is exploited widely as a source of groundwater; the Lloyd, however, is practically inaccessible because of its extreme depth, and is not used.

Long Island's groundwater has long been recognized as a resource requiring management. Thus, the large recharge basins like those found at NWIRP Bethpage and NWIRP Calverton have been a portion of the landscape since the late 1930s. The sensitivity of the aquifers underlying Long Island

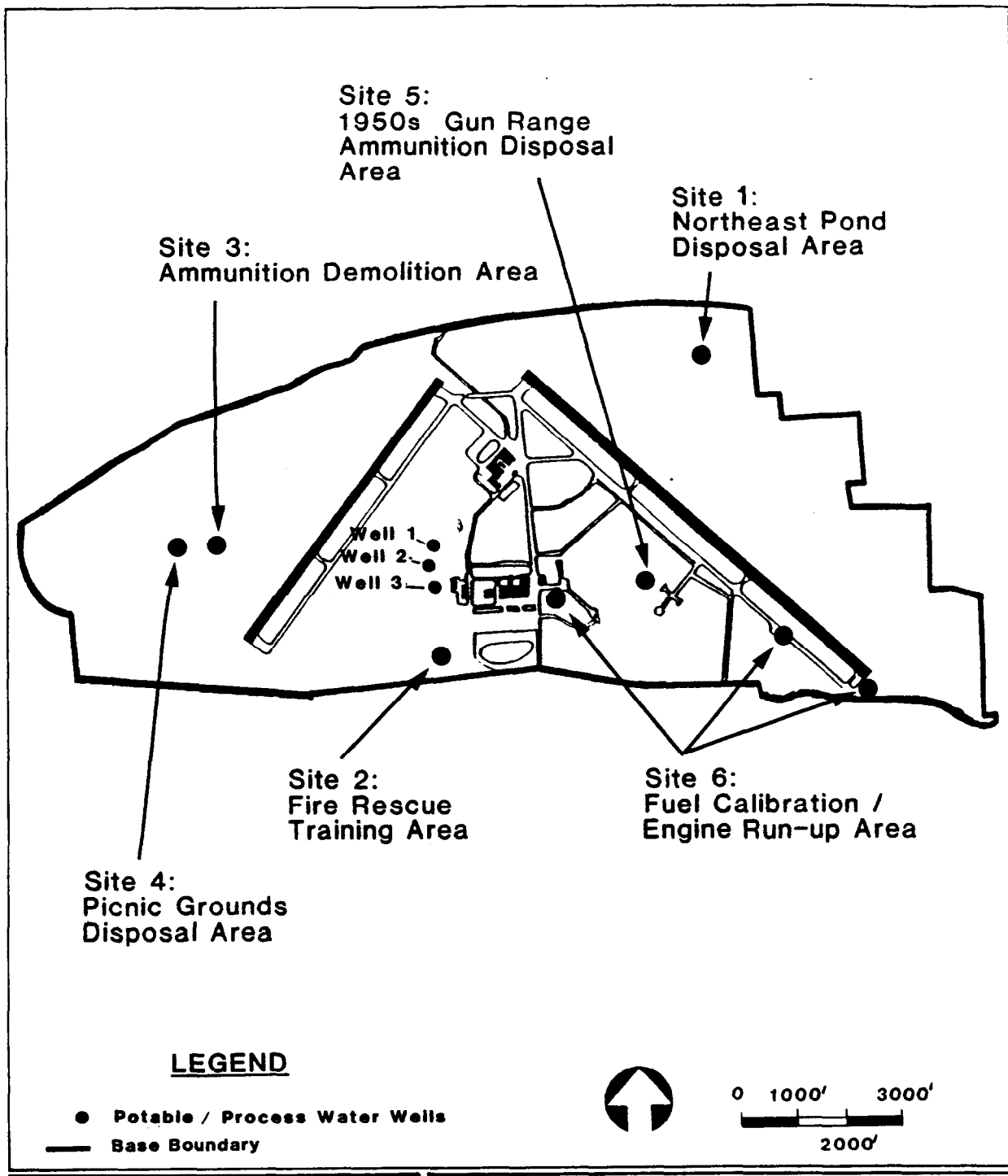

Figure 2-1

Six Potentially Contaminated Disposal Sites, NWIRP Calverton, New York

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Long Island, New York

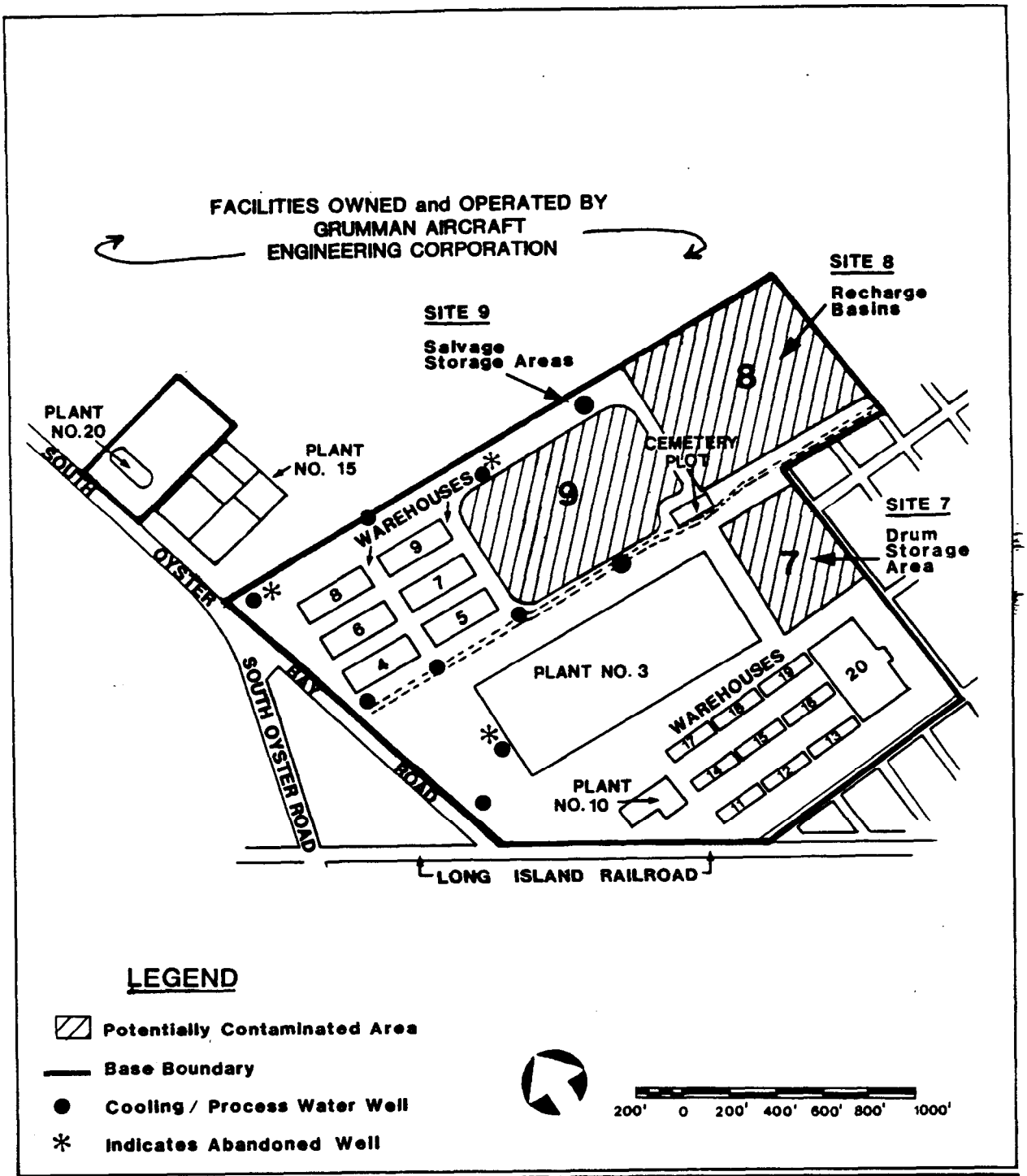

Figure 2-2

Three Potentially Contaminated Disposal Sites, NWIRP Bethpage, New York

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has also been addressed in national legislation; these aquifers have been accorded Sole Source Aquifer status, as provided for in the Safe Drinking Water Act (Public Law 93-523).

2.2.1 **Hydrogeology of NWIRP Calverton.** NWIRP Calverton is underlain by five geologic units. These are the Upper Glacial Aquifer, the Magothy Aquifer, the Raritan clay, the Lloyd Aquifer, and the Precambrian crystalline bedrock. The Upper Glacial Aquifer immediately underlies the activity and extends 280 feet to the (unconfined) Magothy Aquifer. The Magothy extends roughly 560 feet below the Upper Glacial Aquifer; the Raritan clay extends about 170 feet below the Magothy, and the Lloyd Aquifer continues 400 feet below the Raritan clay to the bedrock. See Chapter 4 for details.

The uppermost two units, the Upper Glacial Aquifer and the Magothy Aquifer, are of primary concern because they are widely used as sources of water. Hydraulic conductivity in these units is usually high (Jensen, 1974), so the units are highly conducive to the migration of water-soluble contaminants. The deeper units are of less importance, largely because they are inaccessible as potential sources of water. (The hydraulic conductivity of a water-bearing unit is a description of the potential speed of a given liquid to flow through the unit; it derives from the physical properties of the material comprising the water-bearing unit, and the liquid migrating through the unit. The actual velocity of the liquid flowing in the unit depends on gradient, as well as hydraulic conductivity.)

Surface soils in the vicinity of the activity are new and poorly developed, and do not hinder infiltration into the Upper Glacial Aquifer. Similarly, no distinctive confining clay units lie between the Upper Glacial Aquifer and the Magothy Aquifer; consequently, groundwater migration from the Upper Glacial Aquifer to the Magothy Aquifer is impeded only by clay stringers and till layers in the Upper Glacial Aquifer.

Groundwater in the portion of the Upper Glacial Aquifer that underlies the activity flows primarily south, although the undeveloped northernmost part of the activity has a northerly groundwater flow direction. Groundwater underlying the developed portion of the activity discharges in the vicinity of Swan Pond, 1,000 feet south of Navy-owned property. Eventually, it enters the Peconic River drainage system and flows to the Great Peconic Bay. The ponds and swampy areas around Swan Pond are directly linked with groundwater flow; they infiltrate into the Upper Glacial Aquifer during dry periods, and receive water from the aquifer during periods of heavy groundwater flow.

The ponds in the northeast corner of NWIRP Calverton do not show any surface drainage either, and infiltrate downward into the Upper Glacial Aquifer.

Hydraulic conductivities in the Upper Glacial Aquifer are very high: up to 200 feet per day, or 7.05 X 10 to the minus 2 centimeters per second (Jensen, 1974). Therefore, groundwater migration across the activity is rapid. Water-soluble contaminants entering the aquifer have a high migration potential, and are expected to migrate rapidly. For the most

part, the migration of contaminants entering the Upper Glacial Aquifer water system underlying NWIRP Calverton will conform to the movement of water in the shallow groundwater system; that is, contaminants will migrate south toward Swan Pond, and eventually discharge to the Peconic River system. Additionally, the vertical migration of contaminants into deeper areas of the Upper Glacial Aquifer, and into the underlying Magothy Aquifer, is a probability, if the contaminants are present.

A possible impediment to contaminant migration at the activity is the muck soils that have formed in the swamp areas around Swan Pond. These soils may have significant ion exchange and adsorption capacity that would slow local contaminant migration.

2.2.1.1 Potential Contaminant Receptors. The New York Department of Environmental Conservation (NYDEC) has determined that no Federal or state endangered or threatened species have been reported on Navy property (NYDEC, no date). NYDEC did indicate that significant habitats south of NWIRP Calverton are known to support the tiger salamander (endangered) and the mud turtle (threatened) as well as several species on the state's special concerns list. (The tiger salamander and the mud turtle are listed only on the state endangered species list, not on the Federal List of Threatened and Endangered Species.) The area around Swan Pond is a natural habitat for the mud turtle and the tiger salamander, and therefore these animals are considered potential receptors of contaminants migrating from NWIRP Calverton. Other potential receptors include aquatic life in Swan Pond, the Peconic River, and the Peconic Bay. Humans who consume waterfowl and/or fish from these areas must also be considered potential receptors. Additionally, humans who drink from wells downgradient from the activity must be considered potential contaminant receptors.

At NWIRP Calverton, all potable and process water is supplied by three 12-inch-diameter, 145-foot-deep wells; these are located on-activity, northeast of the Steam Plant (Figure 2-1). Although none of the wells appear to be directly downgradient of any sites identified at the activity, the possibility of contaminants entering these wells from the identified sites exists if pumping from these wells reverses the natural hydraulic gradient. Hence, activity personnel must also be considered potential receptors.

2.2.2 Hydrogeology and Migration Potential at NWIRP Bethpage. NWIRP Bethpage is underlain by Pleistocene outwash sediments (Upper Glacial Aquifer) that range in thickness from 40 to 130 feet. The Magothy Aquifer begins immediately beneath the Upper Glacial Aquifer. The Upper Glacial and Magothy aquifers are the aquifers of concern at this activity; additional information about the geology of NWIRP Bethpage and Long Island in general can be found in Chapter 4.

As a result of extensive urban development, the natural physical features of NWIRP Bethpage are much less varied than those at NWIRP Calverton. There are no surface drainage features, no ponds, and the topography is flat; additionally, soils are almost universally disturbed. According to the Nassau County Department of Public Health, Bureau of Potable Water Supply, there are between 25 and 30 municipal water wells within 1 mile

downgradient of the activity (Nassau County Department of Public Health, personal communication, 1986).

The hydrogeology of NWIRP Bethpage is very similar to that of NWIRP Calverton. Hydraulic conductivity in the Upper Glacial Aquifer is about 200 feet per day (Jensen, 1974). Horizontal migration rates, however, are about 50 to 70 feet per day (Jensen, 1974) due to the shallow dip of the land; migration rates at the northwest end of the activity are about 70 feet per day. It is anticipated that rates at the southeast portion of the activity are lower due to lower gradients, as inferred from the low topographic relief in the area. The direction of groundwater migration in the Upper Glacial Aquifer, and in the Magothy Aquifer in the vicinity of NWIRP Bethpage, is south and east toward the Atlantic Ocean.

A member of the Upper Glacial Aquifer, the Mannetto gravel, comprises the surface geology at the activity. This member consists chiefly of a "highly permeable", porous quartz gravel with "excellent infiltration characteristics" (Isbister, 1966). The Mannetto unit is above the groundwater table (Jensen, 1974) and promotes very rapid infiltration.

No natural impediments that would be expected to impede infiltration rates such as soils, clay layers, or tills are in evidence at NWIRP Bethpage. However, extensively paved areas at the activity will reduce migration potential by creating an impermeable barrier to the groundwater system. Nevertheless, the hydrogeology of NWIRP Bethpage is generally very conducive to groundwater migration, and to the migration of water-soluble contaminants.

2.2.2.1 Potential Contaminant Receptors. Because the Upper Glacial and Magothy aquifers are widely used as sources of groundwater on Long Island, and because of the high migration potential of water-soluble contaminants entering the groundwater system, any humans drinking from wells downgradient from NWIRP Bethpage must be considered potential contaminant receptors.

2.2.2.1.1 Water Sources at NWIRP Bethpage. At NWIRP Bethpage, seven active wells on Navy property supply cooling and process water to the activity. Additionally, there are three deactivated wells on Navy property. The deactivated wells were abandoned due to low delivery rates, screen clogging, and other mechanical problems (NAVPRO, 1986). Figure 2-2 shows the locations of these wells.

2.3 WASTE DISPOSAL AND POTENTIALLY CONTAMINATED SITES.

2.3.1 NWIRP Calverton Sites.

2.3.1.1 Site 1, Northeast Pond Disposal Area. This site is located in the northeastern portion of NWIRP Calverton (Figure 2-3). It lies within the perimeter fence of the activity, at a remote location with respect to

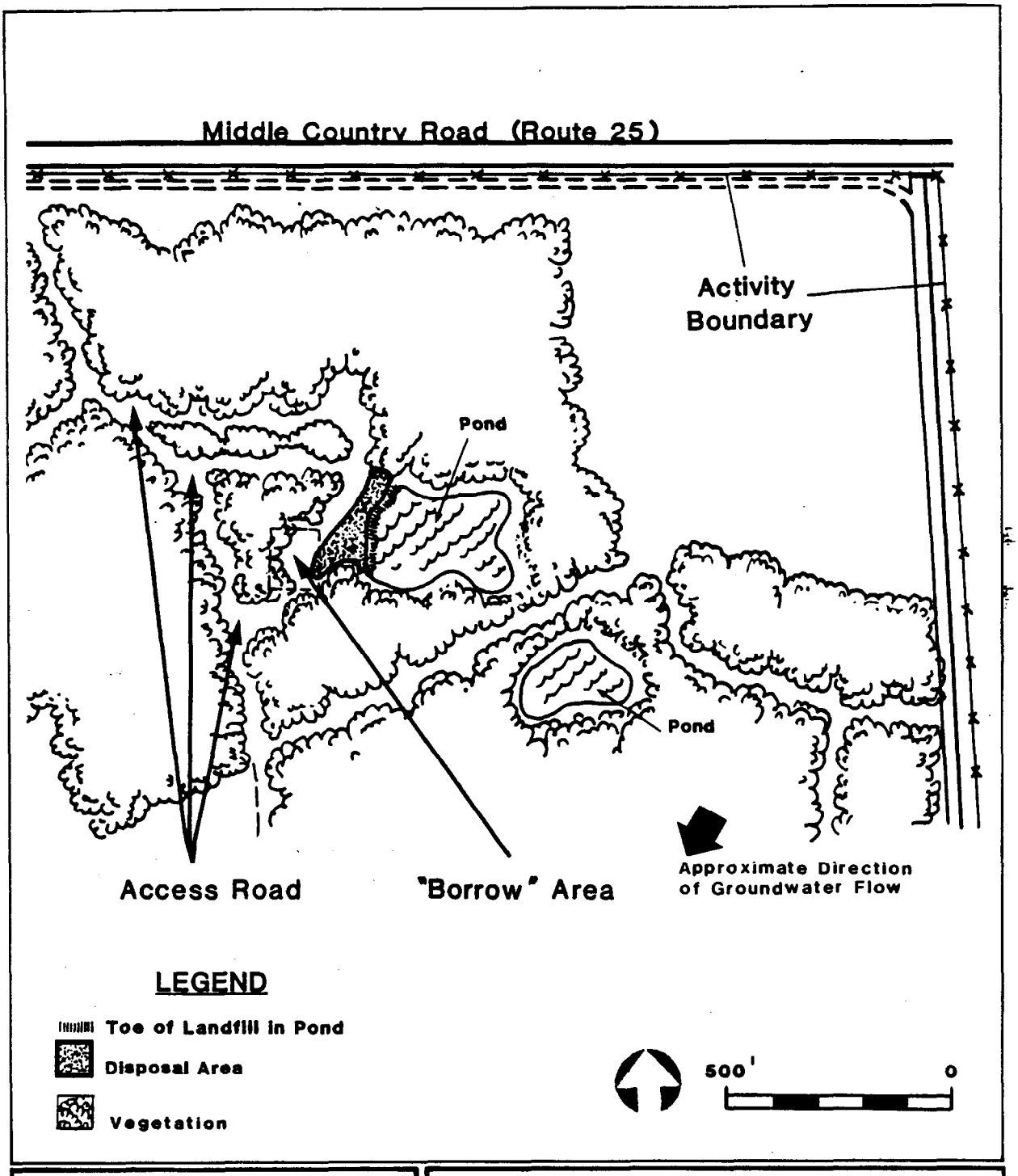

Figure 2-3

Site 1, NWIRP Calverton
Northeast Pond Disposal Area

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the industrial areas of the activity. This disposal area has been active intermittently since before Navy acquisition of the land in 1947. Aerial photos taken in 1947 show surficial disturbance. The area was in use up until about 1984. An estimated 7,500 cubic yards of debris and fill is present. This includes metal and wood fabrications, office materials and furniture, concrete, brick, paint pails, wood and other discarded material. A wrecked aircraft (a DC-4) is incorporated in the fill.

The IAS team observed two empty 55-gallon drums during the aerial reconnaissance. No source of information such as reports, personnel interviews, or labels on the drums is available to indicate the original contents or purpose of the drums. Based upon past waste generation at the activity, it is possible that any of the following wastes are present at this site: petroleum, oils, and lubricants (POL's), including asphalt paving material, halogenated and non-halogenated solvents, and paint sludges. During the on-site visit, the IAS team observed paint cans containing paint residue at the site.

Site 1 is located near two ponds that have internal drainage to the Upper Glacial Aquifer. The site is adjacent to one pond, and is located approximately 500 feet northwest of the second pond (Figure 2-3). This internal drainage is the dominant drainage pattern in the immediate vicinity; internally drained waters infiltrate into and recharge the Upper Glacial Aquifer. Surface water runoff toward other areas is minimal.

The most likely receptors of potential contaminants migrating from the site are human consumers of the groundwater; no other receptors can be anticipated because groundwater migration is primarily downward into the Upper Glacial Aquifer.

The IAS team recommends a Confirmation Study for Site 1, NWIRP Calverton Northeast Pond Disposal Area, for the following reasons. Disposal of hazardous wastes is suspected to have occurred there from early in the activity's history until 1984. Since there is potential for the migration of hazardous wastes to the Upper Glacial Aquifer, and the possibility of human consumption of contaminants exists, the site warrants further study.

2.3.1.2 Site 2, Fire Rescue Training Area. The Fire Rescue Training Area is located approximately 2,000 feet west of the Main Gate (Figure 2-4). Fire rescue teams on the activity used the facility from 1955 through the present. In 1982, the facility was refurbished after oils and solvents used in the training exercises spilled at the site (a maximum of 6,000 gallons).

Prior to 1982, personnel conducted training exercises by creating an earthen berm, filling it partially with water, and floating a layer of fuel oil, waste solvents, and other flammable material on the water. Occasionally, an aircraft fuselage section was used to simulate conditions of a crash. Aqueous Fire Fighting Foam (AFFF), Halon 1301 (a gas), and dry chemical extinguishers were used to extinguish the flames. An estimated 250 to 300 gallons of fuel were consumed during each of the seven training exercises conducted each year. An additional 450 gallons

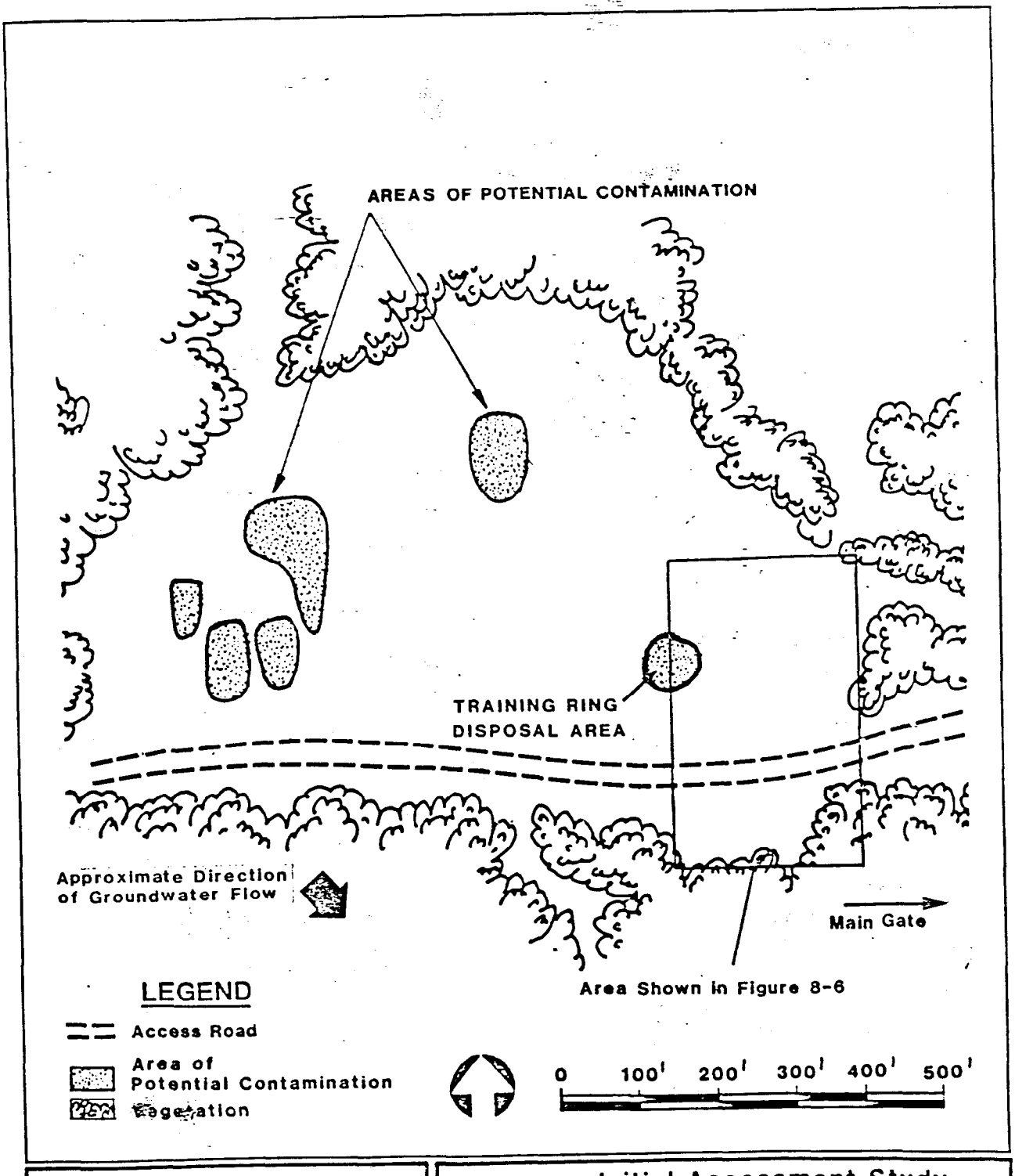

Figure 2-4

Site 2, NWIRP Calverton Fire Rescue Training Area

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of spent solvents were included in the oil burned in the exercises each year. Small quantities of the fuel and extinguishing agents may have escaped containment during the exercises, having overflowed the burn pit and seeped into the ground.

The 1982 spill, however, is considered to be the major source of any contaminants present. A contractor installed four wells in 1982 to monitor the groundwater. These wells are all shallow monitoring wells designed to evaluate floating product on the water table. A Grumman memorandum from 1982 indicates that floating product was found in two of the four wells installed in that year.

Reportedly, a second spill occurred on-site in 1983. The spill occurred from another storage tank maintained at the Fire Rescue Training Area. A reported 30 gallons of #2 fuel oil spilled onto unpaved ground, and seven monitoring wells were installed to monitor the spill effects. Available data does not indicate contaminant migration.

In additon to the reported spills at the Fire Rescue Training Area, analysis of aerial photographs suggests the potential presence of contaminants at the site. This second area of potential contamination is indicated by the large area shown northwest of the Training Ring Disposal Area in Figure 2-4. Photographs taken from 1957 through 1980 indicate a history of fill and excavation. Section 8.1.2 and Appendix A contain detailed discussions of the area.

Hazardous wastes potentially present at Site 2 include POL's, toluene, methylethyl ketone, and lacquer thinner, from the fire training exercises. Halon 1301, used to extinguish the fires, is a gaseous material that is kept at high pressure, and would not be expected to be present at the site.

Groundwater migration from the site to the shallow aquifer is expected to be in a southeasterly direction, toward Swan Pond. Potential receptors of contaminants from this site include waterfowl and the state-listed tiger salamander (endangered) and mud turtle (endangered), which may inhabit the pond and its associated marshy areas. None of the water supply wells for the activity are located downgradient of the areas of suspected contamination. However, humans who consume the fish and waterfowl from the pond are also considered to be potential receptors. Site 2, NWIRP Calverton Fire Rescue Training Area, is thus recommended for a Confirmation Study.

2.3.1.3 Site 3, Ammunition Demolition Area. This area is located to the northwest of the activity's runways and industrial areas (Figure 2-5). It was the site of controlled demolition of excess or off-specification ammunition (mostly aircraft cannon rounds) from 1957 to 1985. Reportedly, personnel performed thorough post-operation clean-up and disposal after each demolition exercise. The practice of disposing of ammunition in this manner ended in 1985, when personnel decided to construct a more controlled facility.

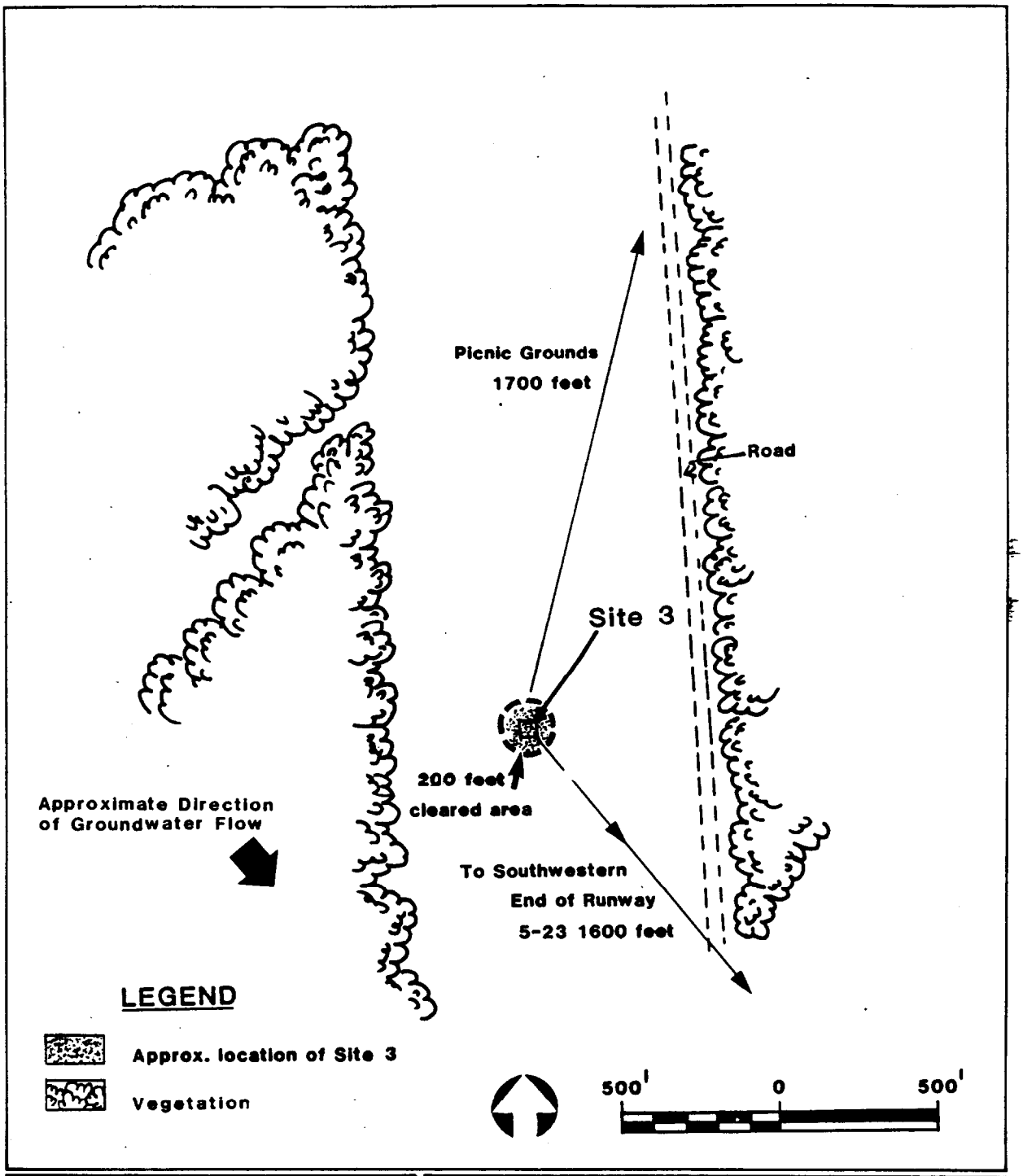

Figure 2-5

Site 3, NWIRP Calverton
Ammunition
Demolition Area

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Personnel destroyed the ammunition by setting fire to 5 to 10 gallons of various types of waste fuel (JP-4, JP-5) in a 55-gallon drum placed in an unlined pit. The ammunition was released in a controlled fashion into the fire. Personnel removed remaining shell casings and projectiles after each exercise. In 1985, personnel destroyed an estimated 1,700 rounds of ammunition and signal flares at the site. Reportedly, this quantity is considered representative of the quantity destroyed each year from 1957 to 1985.

The quantities of ammunition destroyed in this fashion are comparatively limited, and thorough post-operation clean-ups were reportedly performed. Therefore, ammunition is not considered to be a contaminant of concern at this site. POL's used to incinerate the ammunition were also used in small quantities, and were reportedly incinerated during the exercises. Therefore, Site 3, NWIRP Calverton Ammunition Disposal Area is not recommended for a Confirmation Study.

2.3.1.4 Site 4, Picnic Grounds Disposal Area. The NWIRP Calverton Picnic Grounds Disposal Area is located approximately 500 feet west of Site 3, NWIRP Calverton Ammunition Demolition Area (Figure 2-6). It consists of a single trench-type landfill, approximately 60 feet long by 40 feet wide. It was active from 1947 (prior to Navy acquisition) until the early 1980s. According to Navy and Grumman representatives, the area is not an authorized, active disposal site; personnel could provide no information regarding past disposal operations at this site.

The estimated maximum volume of material disposed of there is 500 cubic yards; disposed material consists of picnic tables, metal fabrications, old fences, demolition debris, foam, plastic, carpeting, and plywood. The site topography is flat with no nearby streams, so migration of potentially present contaminants in surface water is not of concern. Groundwater is the primary mode of potential contaminant transport from the site.

As stated, no shops or personnel at the activity could provide information regarding past or current disposal operations at this site. Records apparently do not exist documenting operations at this site over the years. In light of the long operational life of the disposal area, the strong possibility that hazardous wastes may have been disposed of at the site during a period when awareness of the dangers of hazardous waste was lower, and the immediate proximity of the Upper Glacial Aquifer, the IAS team deems it prudent to perform investigatory work at this site. Therefore Site 4, NWIRP Calverton Picnic Grounds Disposal Area, is recommended for a Confirmation Study.

2.3.1.5 Site 5, 1950s Gun Range Ammunition Disposal Area. The first area at NWIRP Calverton used for the testing of aircraft cannons was located between the present Radio Noise Check Area and the Engine Run-Up Area (Figure 2-7). In the early 1950s, guns and airborne cannons were tested before they were installed in aircraft. In 1957, testing at the Gun Butt Facility replaced this earlier testing procedure. During operation of the first gun range prior to 1957, ammunition that failed to fire during testing may have been disposed of in an intermittent stream and swamp area.

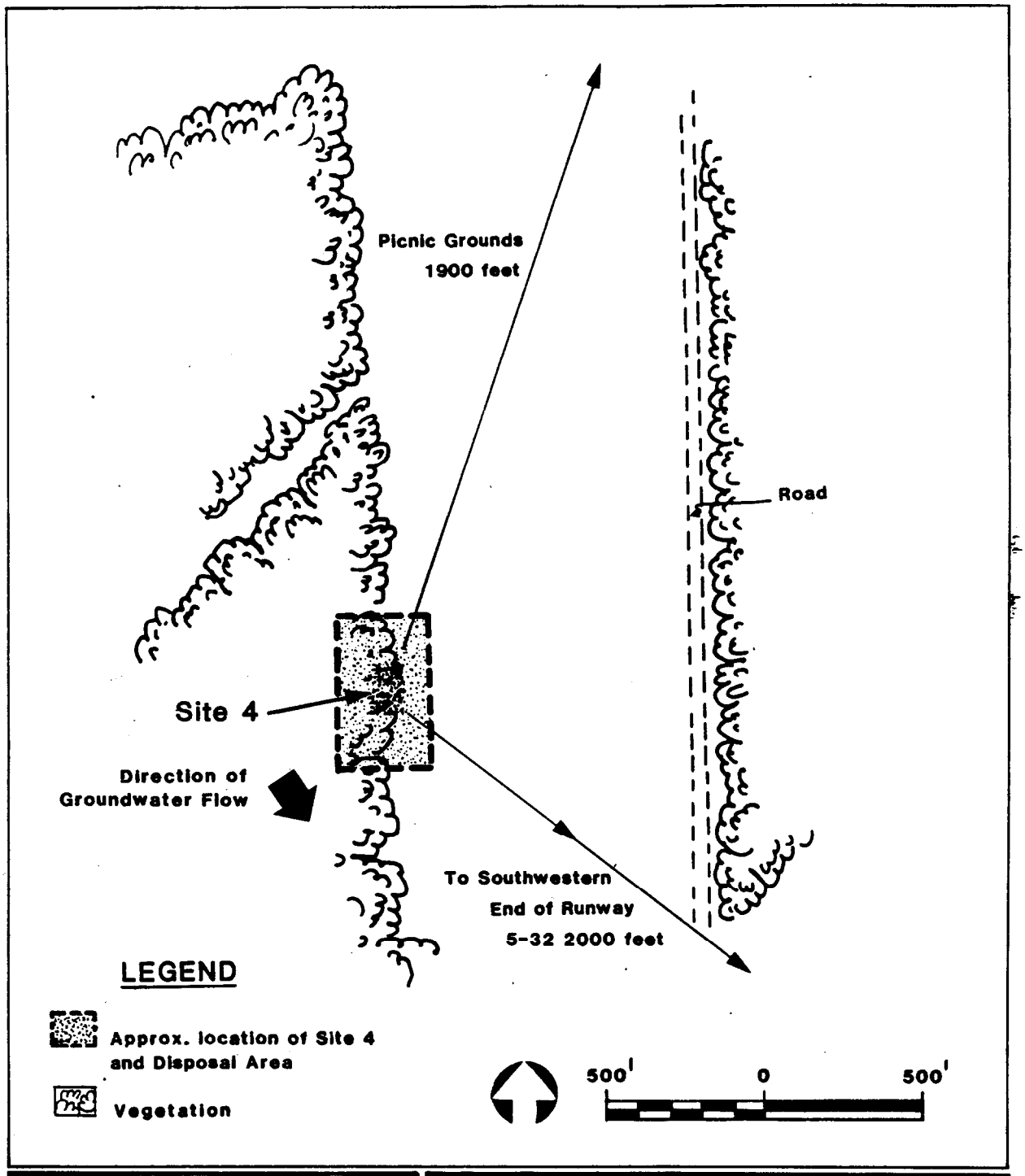

Figure 2-6

Site 4, NWIRP Calverton Picnic Grounds Disposal Area

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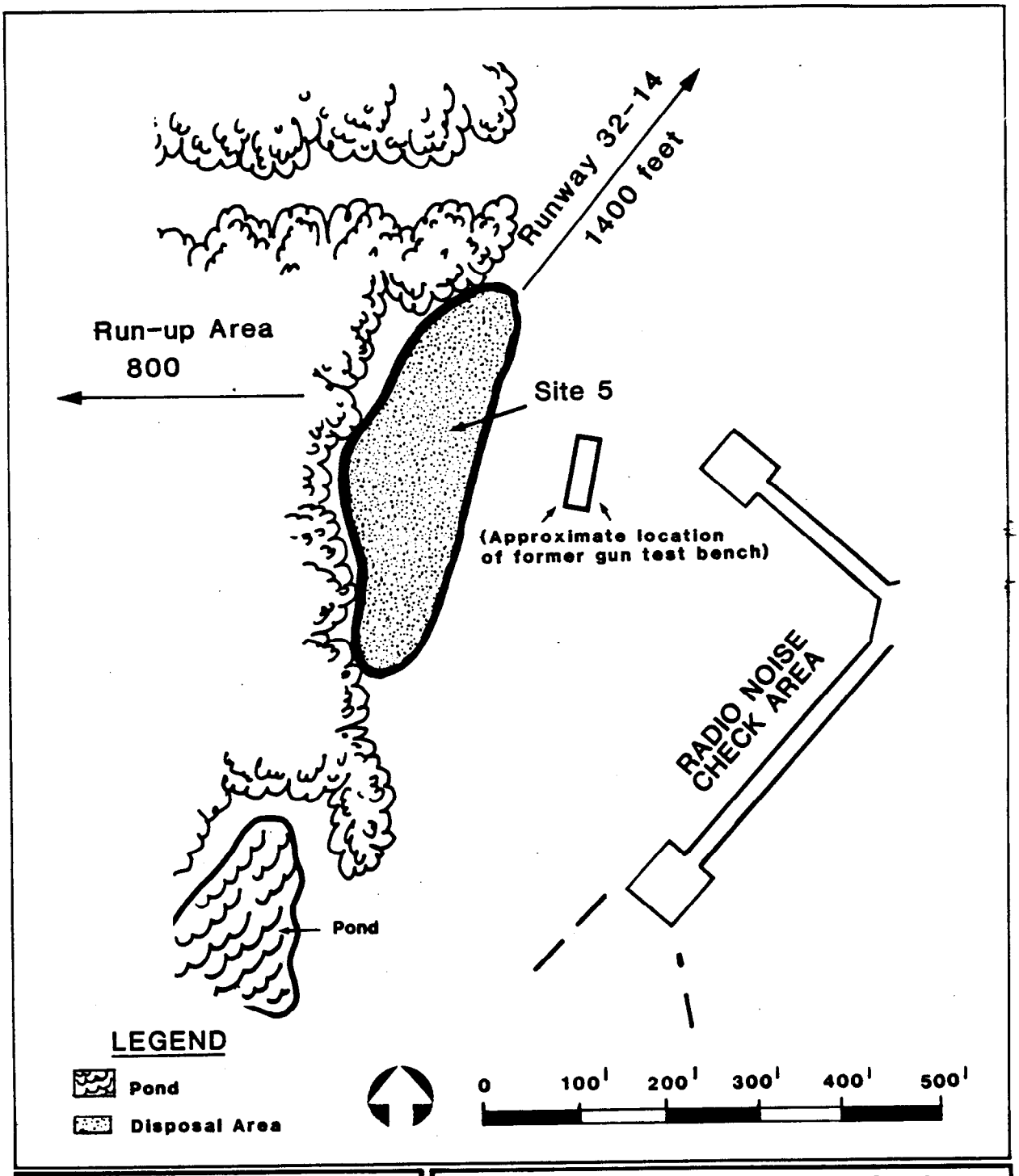

Figure 2-7

Site 5, NWIRP Calverton
1950s Gun Range
Ammunition Disposal Area

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Reportedly, the range operated for 1 to 1-1/2 years, until about 1953, when other facilities were built. Presently, no buildings, earthen ramparts, or other structures at the site suggest the range's existence.

In January and May of 1986, the original gunfiring test site was scanned with a metal detector. No ammunition items were detected (Grumman memorandum, July 1986). Therefore, Site 5, NWIRP Calverton 1950s Gun Range Ammunition Disposal Area, is not recommended for a Confirmation Study.

2.3.1.6 Site 6, Fuel Calibration/Engine Run-Up/Fuel Depot Areas. Prior to flight testing, engine and fuel systems are checked at NWIRP Calverton to ensure that these systems are airworthy. Sometimes, when the fuel system of an aircraft is first pressurized, fuel leaks from fittings and tubing.

There are five areas where chronic fuel spillage may have occurred at NWIRP Calverton (Figure 2-8). Three are in the industrialized area: one at the location of the Old Fuel Calibration Pad, southeast of the present aircraft shelters; one at the Engine Run-Up Area; and another at the Engine Test House. The other locations are the Run-Up Area along Runway 32-14 and the taxiway at the southeast end of Runway 32, where aircraft were prepared for their initial flights. All locations are outdoors.

Records indicate that 230 gallons of fuel has spilled at these sites since base operations began. Remedial actions were carried out for each occurrence.

Surface runoff and the shallow groundwater could transport fuel spilled at any of these areas to the area south of the activity, which NYDEC has identified as a habitat for the endangered tiger salamander and the mud turtle.

Since records of spills at Engine Run-Up Areas at NWIRP Calverton were not kept until 1981, available records for spills are considered representative of past occurrences. All recorded spills were cleaned up.. However, the proximity of a habitat that supports endangered species, and the likelihood that fuel spilled at the Engine Run-Up and Calibration Areas would enter and contaminate these habitats, require that Site 6, NWIRP Calvedrton Fuel Calibration/Engine Run-Up Areas, be recommended for a Confirmation Study.

2.3.2 NWIRP Bethpage Sites.

2.3.2.1 Site 7, Former Drum Marshaling Areas. Starting in 1969, hazardous waste management practices for Grumman facilities on Long Island included marshaling of drummed wastes on the Navy property at NWIRP Bethpage. Such storage first took place on a cinder-covered surface over the cesspool field east of Plant 03, (Area 2, Figure 2-9). From the early 1950s through about 1978, drums containing liquid cadmium waste were stored here. In 1978, the collection and marshaling point was moved a few yards south of the original unpaved site, to an area on a 100 by 100-foot concrete pad (Area 1, Figure 2-9). This pad had no cover, nor did it have

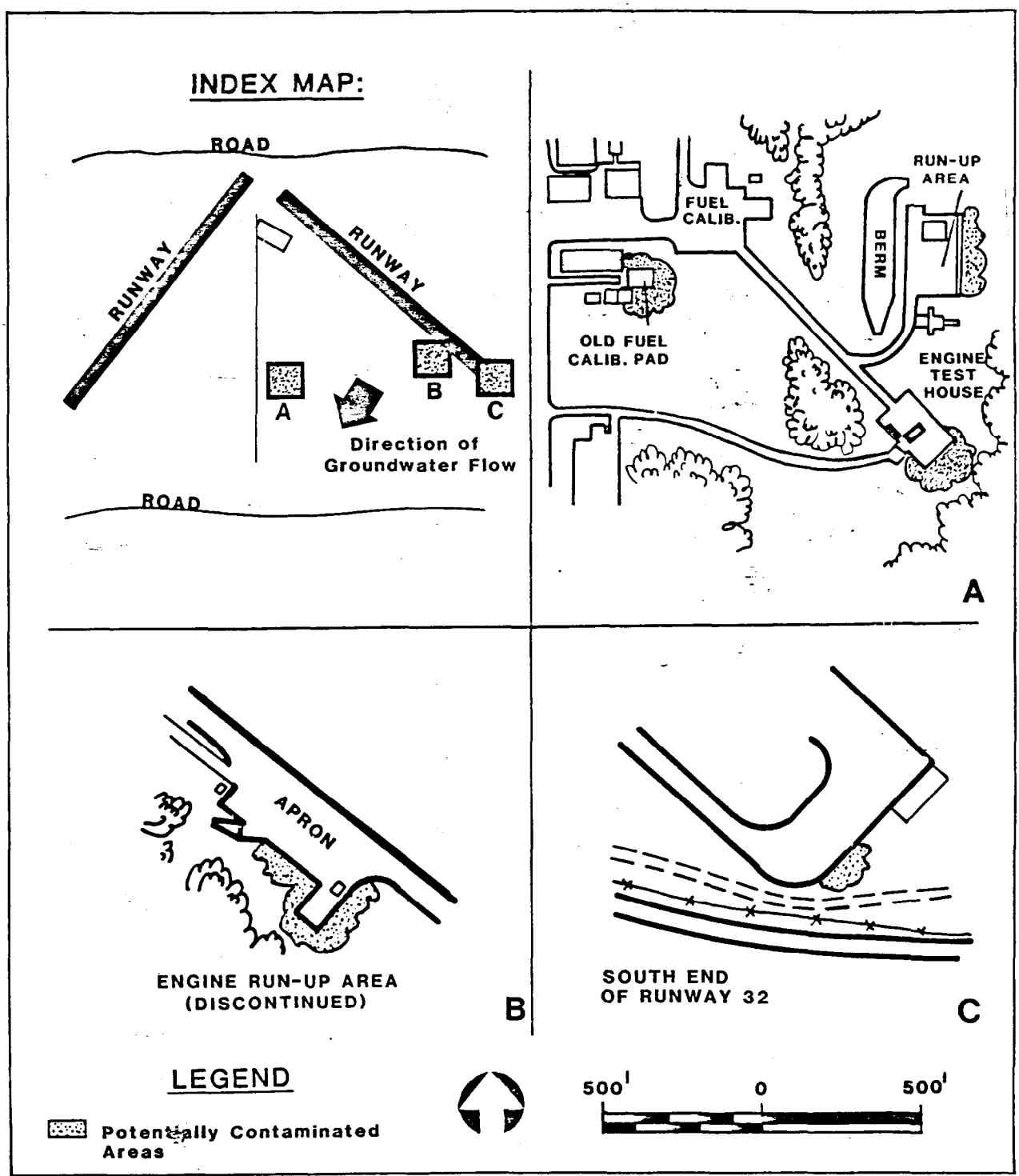

Figure 2-8

Site 6, NWIRP Calverton
Fuel Calibration/Engine
Run-Up Areas

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berms for containment of spills. In 1982, drummed waste storage was transferred to the present Drum Marshaling facility, located in the Salvage Storage Area (Site 9); a cover was added in 1983.

Reportedly, all drums of waste marshaled at the Former Drum Marshaling Areas were taken off-activity by a private contractor for treatment or disposal. There are no reports of leaks or spills of drum contents.

Materials stored at the Former Drum Marshaling Areas included waste halogenated and non-halogenated solvents. Cadmium and cyanide were also stored in Area 2 from the early 1950s through 1974. Reportedly, 200 to 300 drums were stored at each area at any one time.

The Mannetto gravel and the Upper Glacial and the Magothy aquifers underlying the site have a high migration potential for contaminants. Additionally, large volumes of hazardous wastes were stored at the site from the early 1950s to 1978, and the site operated without comprehensive containment safeguards.

Reportedly, there is no direct evidence of hazardous waste spills at the site; nevertheless, the IAS team deems it wise to investigate the site, and therefore recommends Site 7, NWIRP Bethpage Former Drum Marshaling Areas, for a Confirmation Study.

2.3.2.2 Site 8, Recharge Basins. Surface water drainage on Long Island is for the most part locally controlled, with numerous recharge basins used to channel this resource back to the groundwater. There are several such recharge basins located at NWIRP Bethpage (Figure 2-10).

Prior to 1984, some Plant 03 production line rinse waters were discharged to the recharge basins. The Environmental/Energy Survey of the activity, published in 1976, states that 1.85 million gallons per week were discharged to the recharge beds. These waters were directly exposed to chemicals used in industrail processes (involving the rinsing of manufactured parts). Reportedly, these discharges of dilute rinsewaters did not contain chromates.

Since about 1977, the discharge rate has been 1.4 million gallons per week of non-contact cooling water. All discharge presently goes to the Industrial Wastewater Treatment Plant.

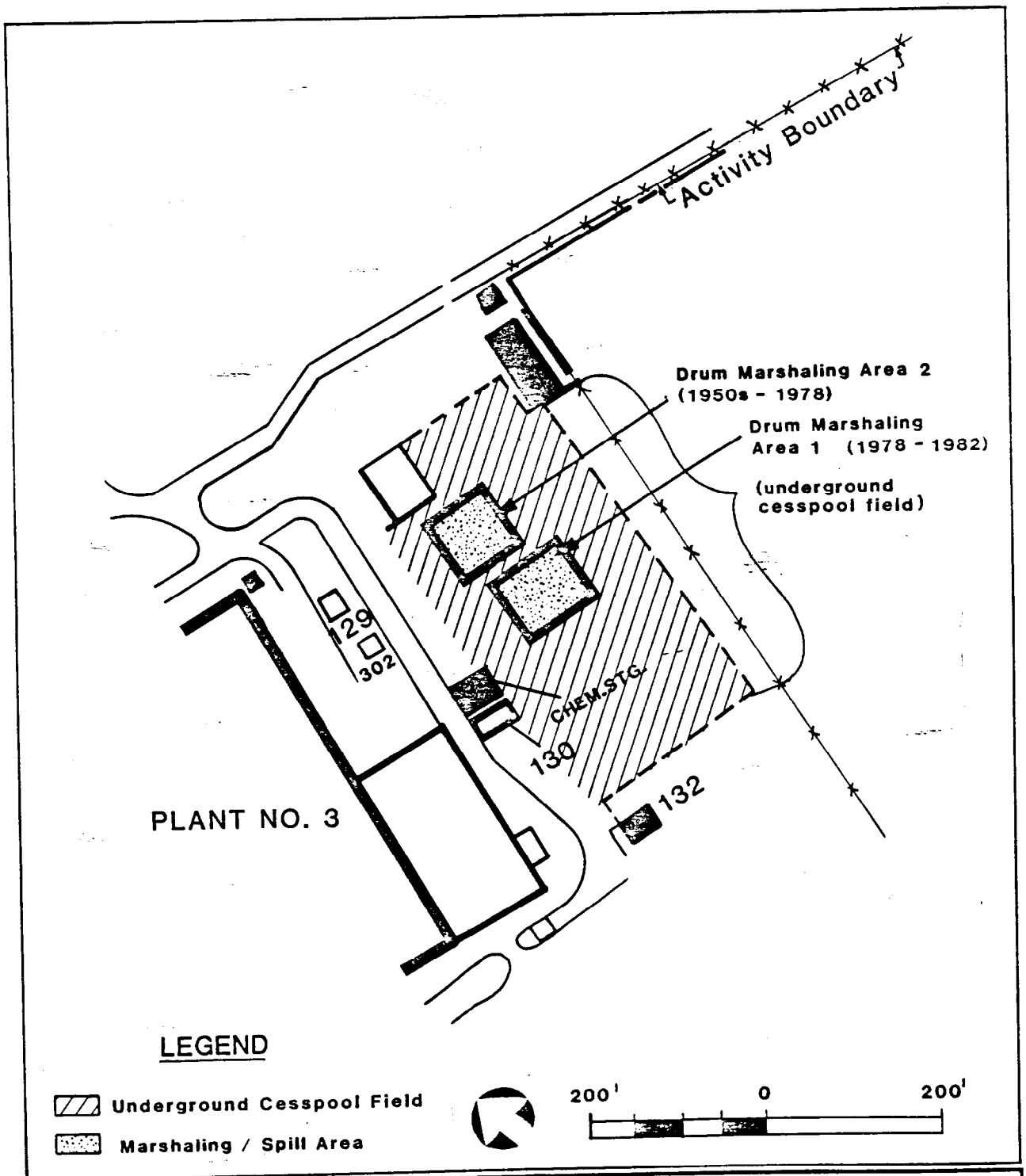

Figure 2-9

Site 7, NWIRP Bethpage Former
Drum Marshaling Areas

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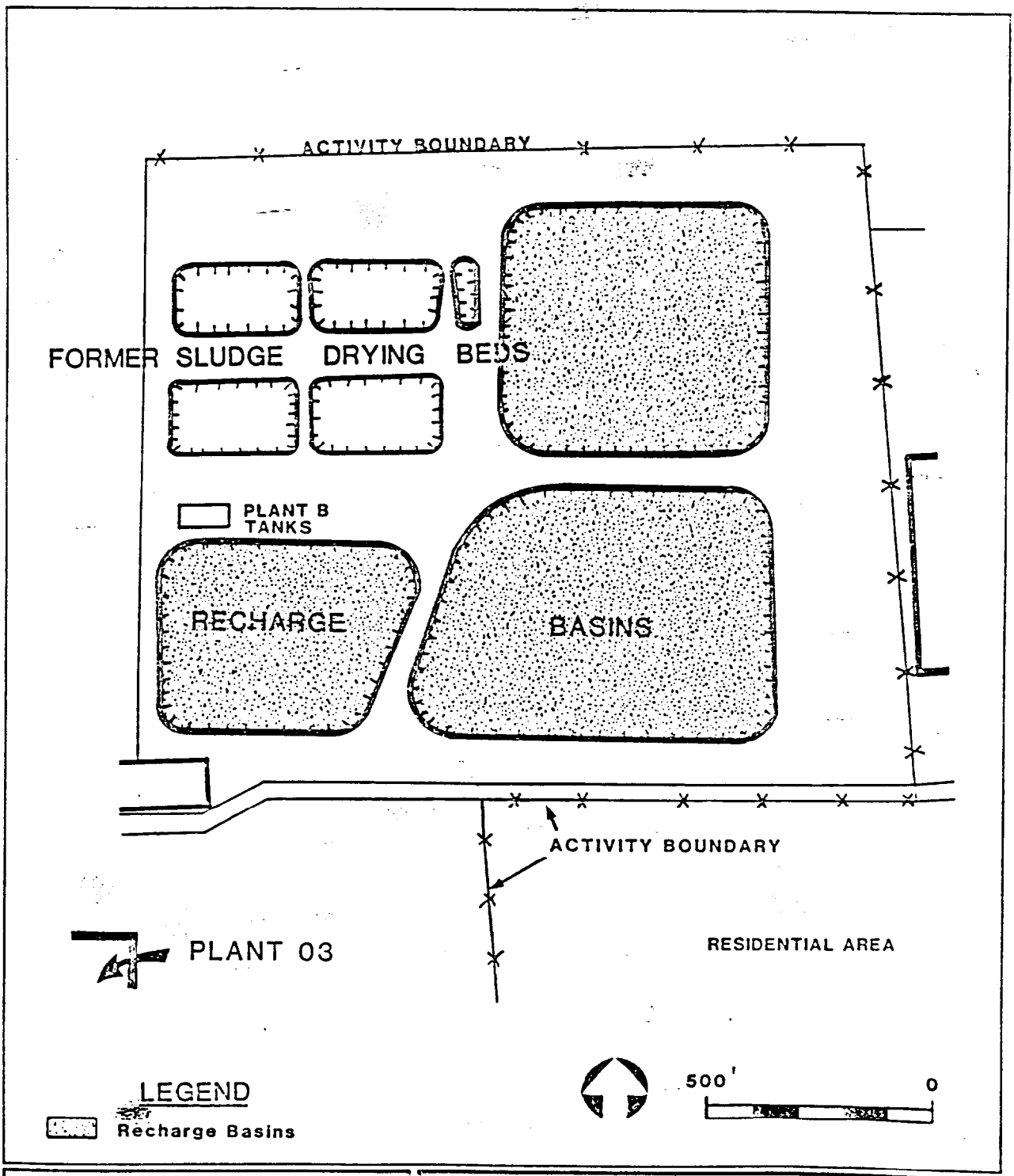

Figure 2-10

Site 8, NWIRP Bethpage
Recharge Basins

Initial Assessment Study
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Also, adjacent to the recharge basins are the former sludge drying beds. Sludge from the Plant 02 Industrial Waste Treatment Facility was dewatered in the drying beds before off-site disposal.

On at least one occasion, sampling performed by the Nassau County Department of Health detected levels of hexavalent chromium in excess of allowable limits (see Appendix C). Grumman was notified of this noncompliance and asked to perform remedial actions necessary to eliminate the problem. Reportedly, Grumman complied with the request.

Contaminants of concern include the hexavalent (and other valence) chromium, aluminum, nitric acid, and sulfuric acid.

Because direct evidence of past hazardous waste disposal has been collected regarding the recharge basins, Site 9, NWIRP Bethpage Recharge Basins, is recommended for a Confirmation Study.

2.3.2.3 Site 9, Salvage Storage Area. The NWIRP Bethpage Salvage Storage Area is located north of Plant 03 (Figure 2-11). Fixtures, tools, and metallic wastes were stored here prior to recycling from the early 1950's through 1969.

Stored materials included aluminum and titanium scraps and shavings. While in storage, cutting oils dripped from some of this metal. During the 1985 visit, IAS team members observed oil-stained ground at the site. However, soil tests performed by Grumman in 1984 revealed that oil stains were superficial; oil residues were not detected below the top several inches of soil material in the Salvage Storage Area at the locations tested (NAVPRO, 1986).

Around 1960, the Salvage Storage Area was reduced in size to accommodate parking. Around 1970, it was reduced again for the same reason. Consequently, storage facility locations at this site have been periodically moved to accommodate changes in storage area size.

In addition to salvage storage, a 100 by 100-foot area within the boundary of the Salvage Storage area was used for the marshaling of drummed waste. The area was paved with coal ash cinders. Drum marshaling continued here from the early 1950s to 1969. Wastes marshaled throughout the area included waste oils, and waste halogenated and non-halogenated solvents.

Potential contaminants of concern at Site 9 (from both drum marshaling and salvage storage) include cutting oils, aluminum, titanium, and halogenated and non-halogenated solvents. Because of the proximity of aquifers used for potable and process waters, the high migration potential of these aquifers, and the reported storage (without containment safeguards) of hazardous wastes at the site, the IAS team deems it prudent to further investigate the possiblity of hazardous waste contamination at this site, and recommends Site 9, NWIRP Bethpage Salvage Storage Area, for a Confirmation Study.

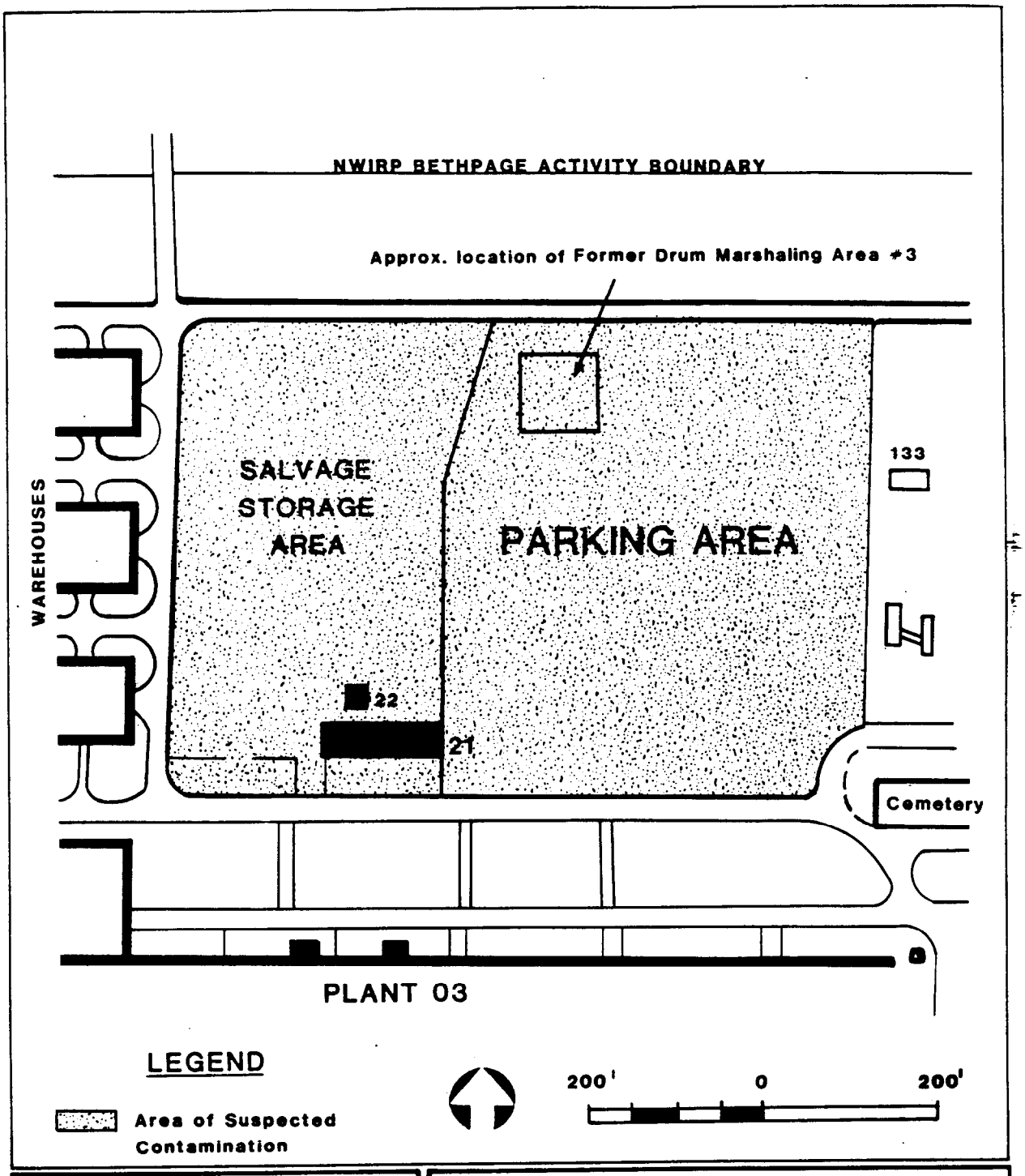

Figure 2-11

Site 9, NWIRP Bethpage Salvage Storage Area

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CHAPTER 3. RECOMMENDATIONS

3.1 INTRODUCTION. Recommended courses of action are provided in this chapter for the disposal and spill sites identified during the Initial Assessment Study (IAS) at NWIRP Bethpage and NWIRP Calverton. Nine potentially contaminated sites were identified at these activities. Three of the potentially contaminated sites are located at NWIRP Bethpage, and six are located at NWIRP Calverton.

The Confirmation Study Ranking System (CSRS) has been used to systematically evaluate the severity of potential problems at each of these sites. Based on the results of the CSRS model, the IAS team has concluded that seven of the nine potentially contaminated sites require further study.

3.2 CONFIRMATION STUDY RECOMMENDATIONS. This section presents the recommendations for the Confirmation Study phase of the investigation and addresses possible studies at seven sites (recommendations are summarized in Table 3-1):

NWIRP Calverton Sites:

- Site 1, Northeast Pond Disposal Area
- Site 2, Fire Rescue Training Area
- Site 4, Picnic Grounds Disposal Area
- Site 6, Fuel Calibration/Engine Run-Up Areas

NWIRP Bethpage Sites:

- Site 7, Former Drum Marshaling Areas
- Site 8, Recharge Basins
- Site 9, Salvage Storage Area

3.2.1 NWIRP Calverton Sites.

3.2.1.1 Site 1, Northeast Pond Disposal Area. (Figure 3-1)

Groundwater monitoring wells: Install 3 well nests (6 wells) at locations shown in Figure 3-1.

Types of samples:

Groundwater: One sample taken quarterly from each well, 24 samples annually.

Soil cores every 2 feet during drilling.

Surface water: One sample quarterly from sampling points in ponds shown in Figure 3-1, 20 samples annually.

Sediment: One sample from each location shown in Figure 3-1.

Table 3-1

Summary of Confirmation Study Recommendations, NWIRP Bethpage and NWIRP Calverton, New York

Site No.	Site Name	CSRS Score	Number of Wells	and Type of Samples	Frequency of Sampling	Parameters
1	Calverton Northeast Pond Disposal Area	20	6	Water: 24 Surface Water: 5	6 quarterly 24 annually 20 annually	Volatile organics. Heavy Metals.
2	Calverton Fire Rescue Training Area	12	13. 11 existing	Water: 52 Soil: see text	13 quarterly 52 annually	Volatile organics; soluble lead; methylethyl ketone; POLs.
4	Calverton Picnic Grounds Disposal Area	9	6	Water: 24 Soil: 3	6 quarterly 24 annually one time	Volatile organics; soluble lead; cadmium, chromium.
6	Calverton Fuel Calibration/Engine Run-up Areas	10	10	Water: 40	10 quarterly 40 annually	Benzene, toluene, xylene (BTX); POLs.
7	Bethpage Former Drum Marshaling ARea	12	6	Water: 24 Soil: 10	6 quarterly 24 annually one time	Volatile organics; cadmium; cyanide.
8	Bethpage Recharge Basins	12	5	Water: 20 Sediment: 6	5 quarterly 20 annually one time	Chromium; aluminum.
9	Bethpage Salvage Storage ARea	8	5	Water: 20	5 quarterly 20 annually	Volatile organics; POLs.

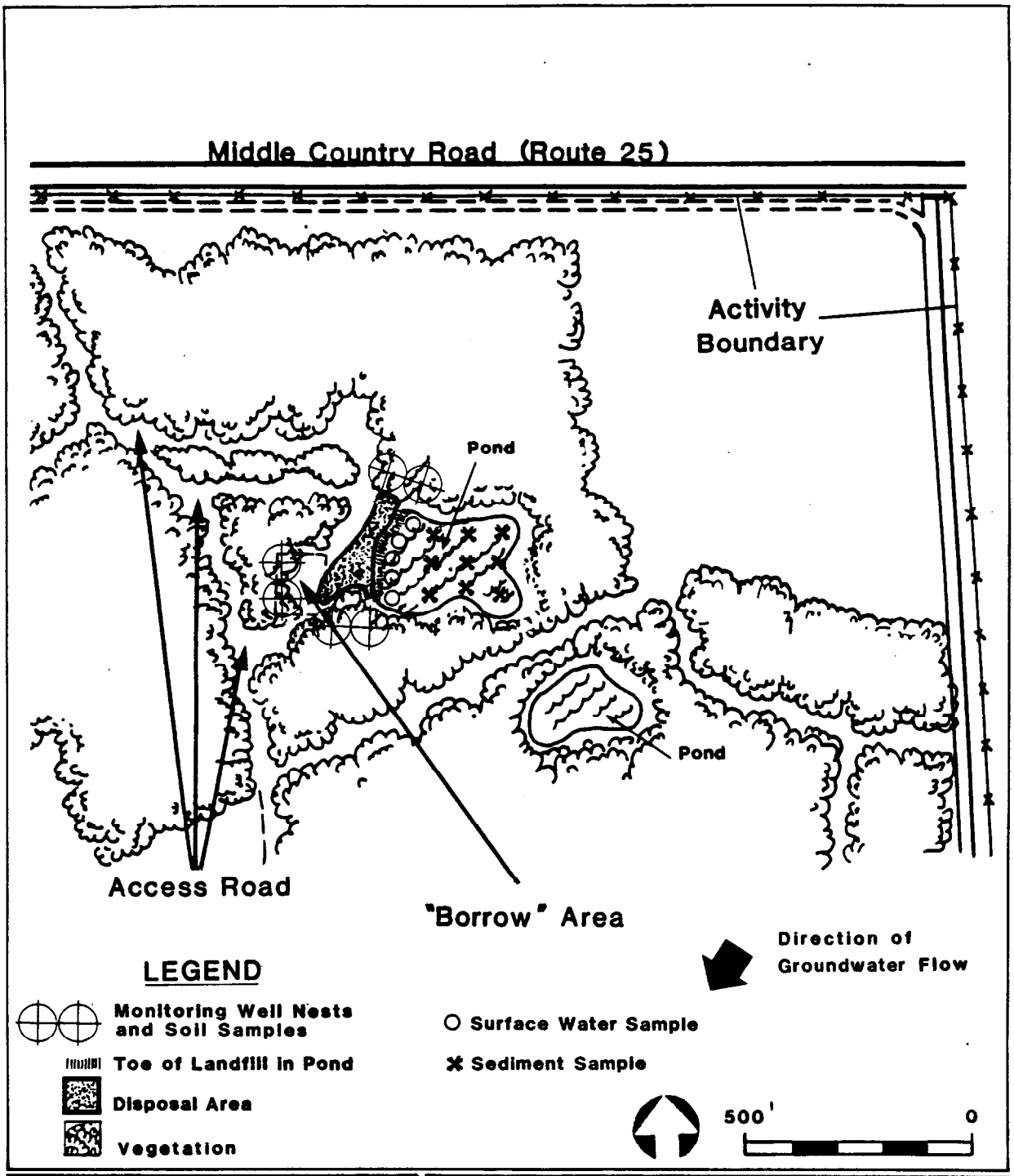

Figure 3-1

Site 1, Northeast Pond Disposal Area Monitoring Well and Sampling Locations NWIRP Calverton, New York

Initial Assessment Study
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Test parameters: Volatile organics; phenols; EPA Priority Pollutant Metals.

Remarks: Well nests consist of two wells, one shallow and one deep. Some suspected volatile organics have lower densities than water, and will consequently be found at the top of the water table; screen shallow monitoring wells at top of water table. Other volatile organics such as TCE have higher densities than water, and will therefore migrate through the saturated zone to the first impermeable layer; screen deep monitoring wells at top of first impermeable (clay) layer to pick up TCE and phenols. Perform no test for phenols or low-boiling-point chlorinated hydrocarbons in shallow groundwater samples.

3.2.1.2 Site 2, Fire Rescue Training Area. (Figure 3-2)

Groundwater monitoring wells: Install 5 deep wells in locations shown in Figure 3-2; 11 shallow groundwater wells are already in place at the site (see Figure 8-6).

Types of samples: Soil samples every 2 feet when installing wells; groundwater samples.

Number of samples: Soil samples: dependent on final well depths.

Groundwater: one sample from each well quarterly, 64 samples annually.

Test parameters: Volatile organics (VOA);
soluble lead;
petroleum, oil, and lubricants (POLs).

Remarks: Screen deep monitoring wells at top of first clay layer in glacial till.

3.2.1.3 Site 4, Picnic Grounds Disposal Area. (Figure 3-3)

Groundwater monitoring wells: Install 3 well nests (6 wells) as shown in Figure 3-3.

Types of samples: Soil samples: 3.

Groundwater samples: one sample from each well quarterly, 24 samples annually.

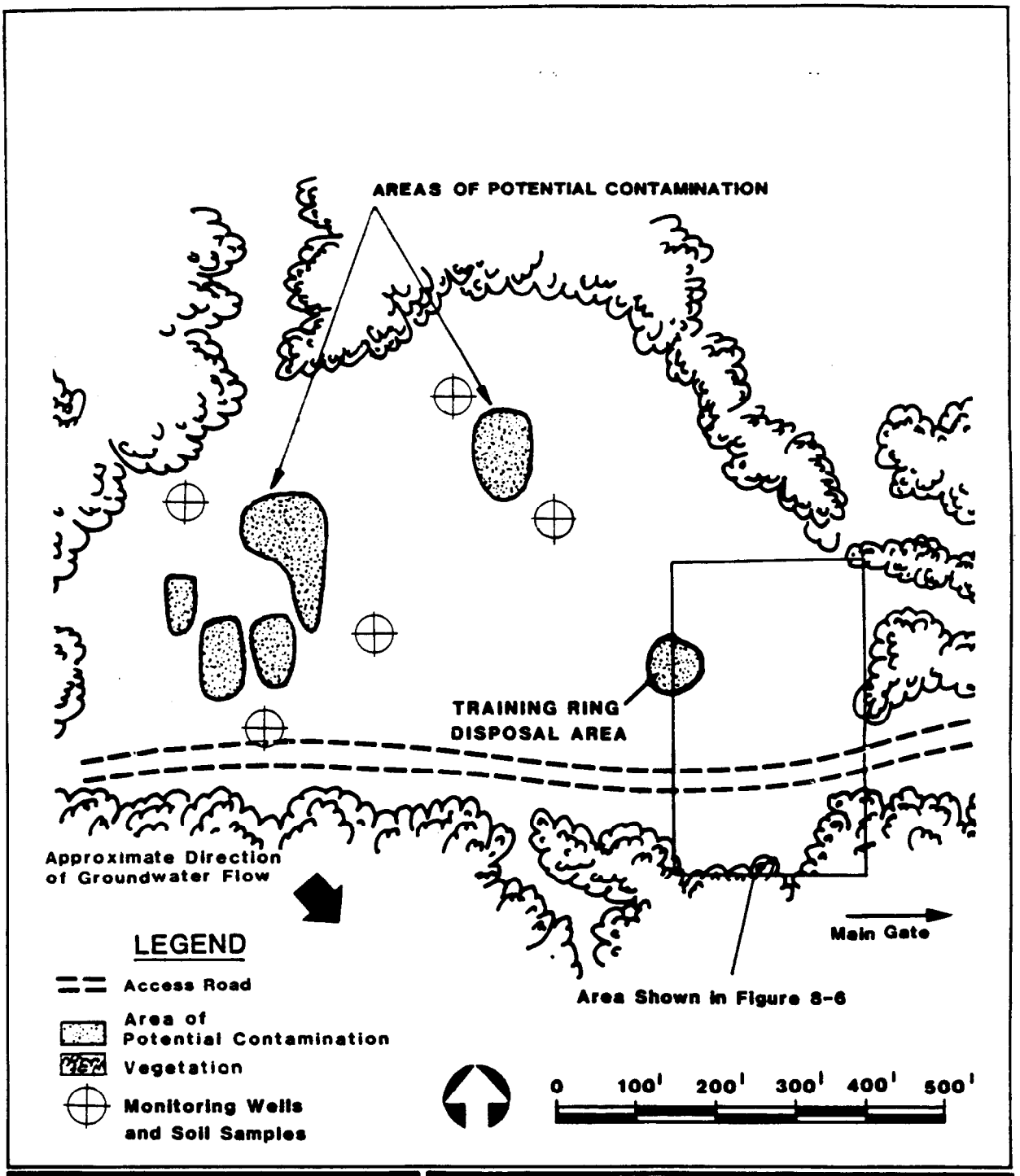

Figure 3-2

Site 2, Fire Rescue Training Area Monitoring Wells and Sampling Locations, NWIRP Calverton, New York

Initial Assessment Study
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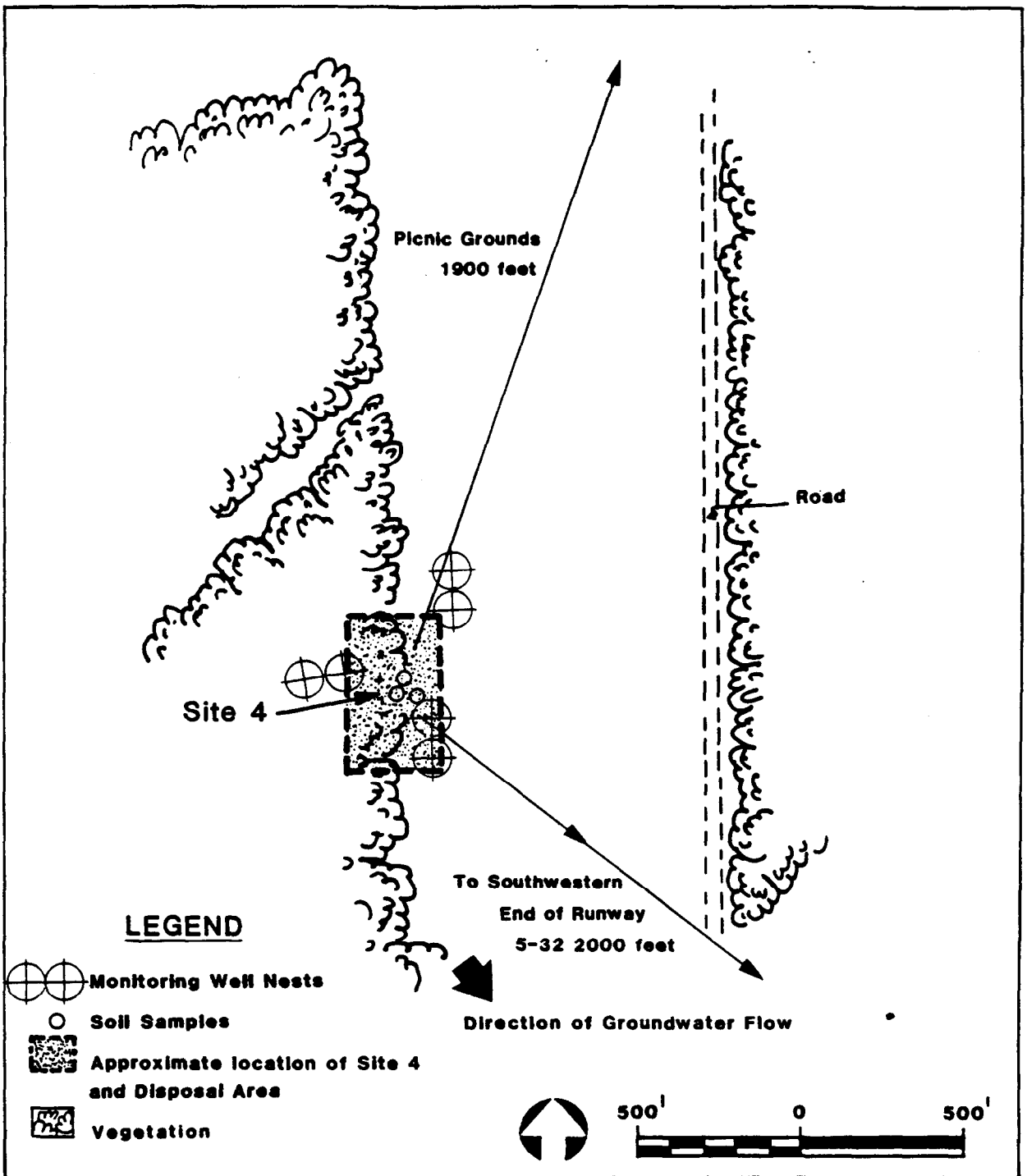

Figure 3-3

Site 4, Picnic Grounds Disposal Area Monitoring Wells and Sampling Locations, NWIRP Calverton, New York

Initial Assessment Study
Naval Weapons Industrial Reserve Plant
Bethpage and Calverton
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Test parameters: VOA; EPA Priority Pollutant metals; phenols.

Remarks: Screen shallow monitoring wells at top of water table. Screen deep monitoring wells above first impermeable clay layer.

3.2.1.4 Site 6, Fuel Calibration/Engine Run-Up Areas. (Figure 3-4)

Groundwater monitoring wells: Install 5 well nests (10 wells) as shown in Figure 3-4.

Types of samples: Groundwater: one sample taken quarterly from each well, 40 samples annually.

Test parameters: Benzene, toluene and xylene (BTX); POLs; soluble lead

Remarks: Screen shallow monitoring wells at top of water table. Screen deep wells above first impermeable layer, or at discretionary point selected by supervising hydrogeologist.

3.2.2 NWIRP Bethpage Sites.

3.2.2.1 Site 7, Former Drum Marshaling Areas. (Figure 3-5)

Groundwater monitoring wells: Install 16 wells as shown in Figure 3-5.

Types of samples: Groundwater: one sample from each well quarterly, 64 samples annually.

Soil samples: 10.

Test parameters: EPA Priority Pollutnat Metals; volatile organics; cyanide.

Remarks: Soil samples should be representative of first 12 to 15 inches of soil. Well nests installed to evaluate possible presence of both floating and sinking products.

3.2.2.2 Site 8, Recharge Basins. (Figure 3-6)

Groundwater monitoring wells: Install 5 wells as shown in Figure 3-6.

Types of samples: Groundwater: one sample from each well quarterly, 20 samples annually.

Sediment samples: 6, taken from recharge basins.

Test parameters: Hexavalent chromium; aluminum.

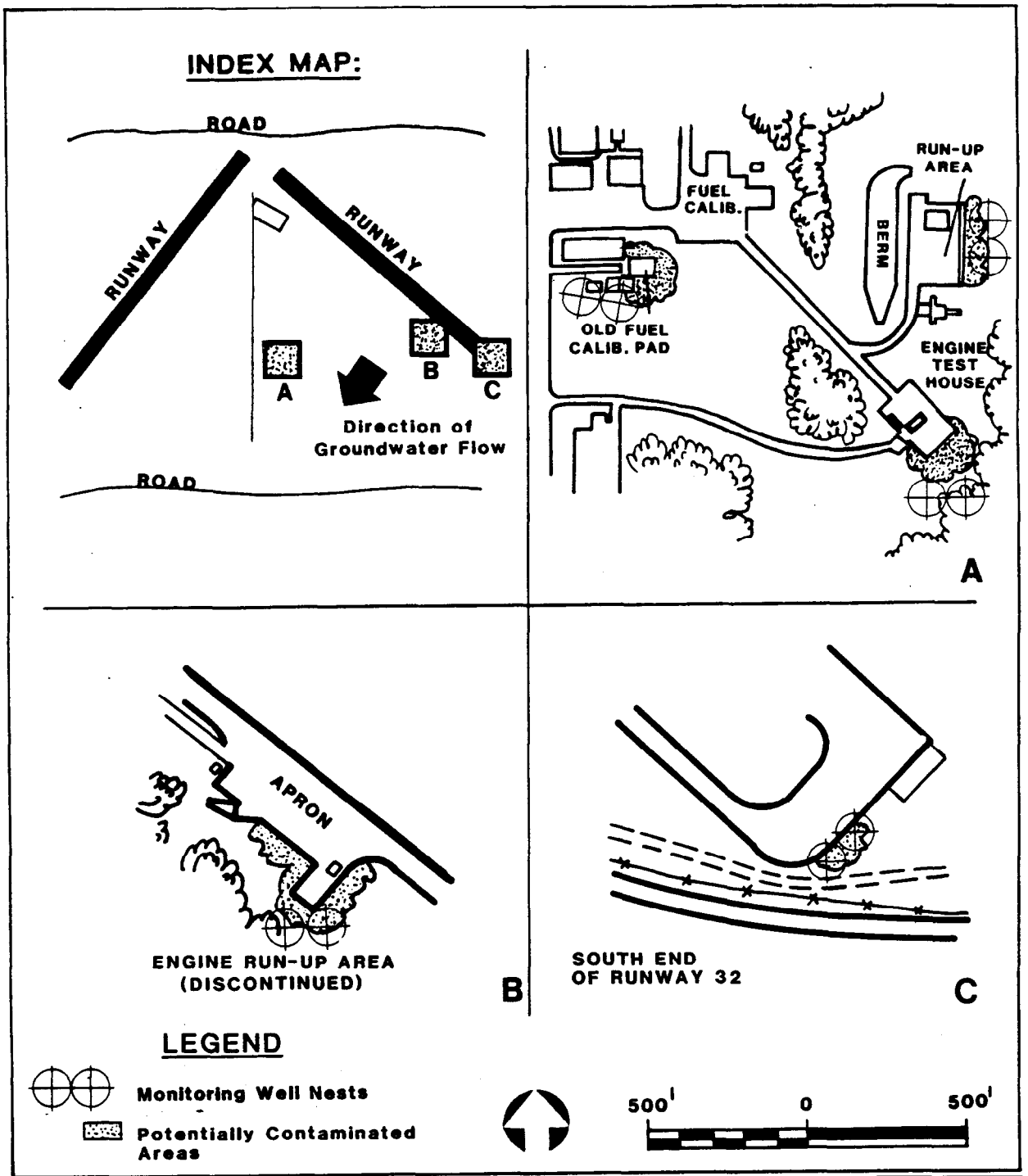

Figure 3-4

Site 6, Fuel Calibration/ Engine Run-Up Area Monitoring Well Locations, NWIRP Calverton, New York

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Naval Weapons Industrial Reserve Plant
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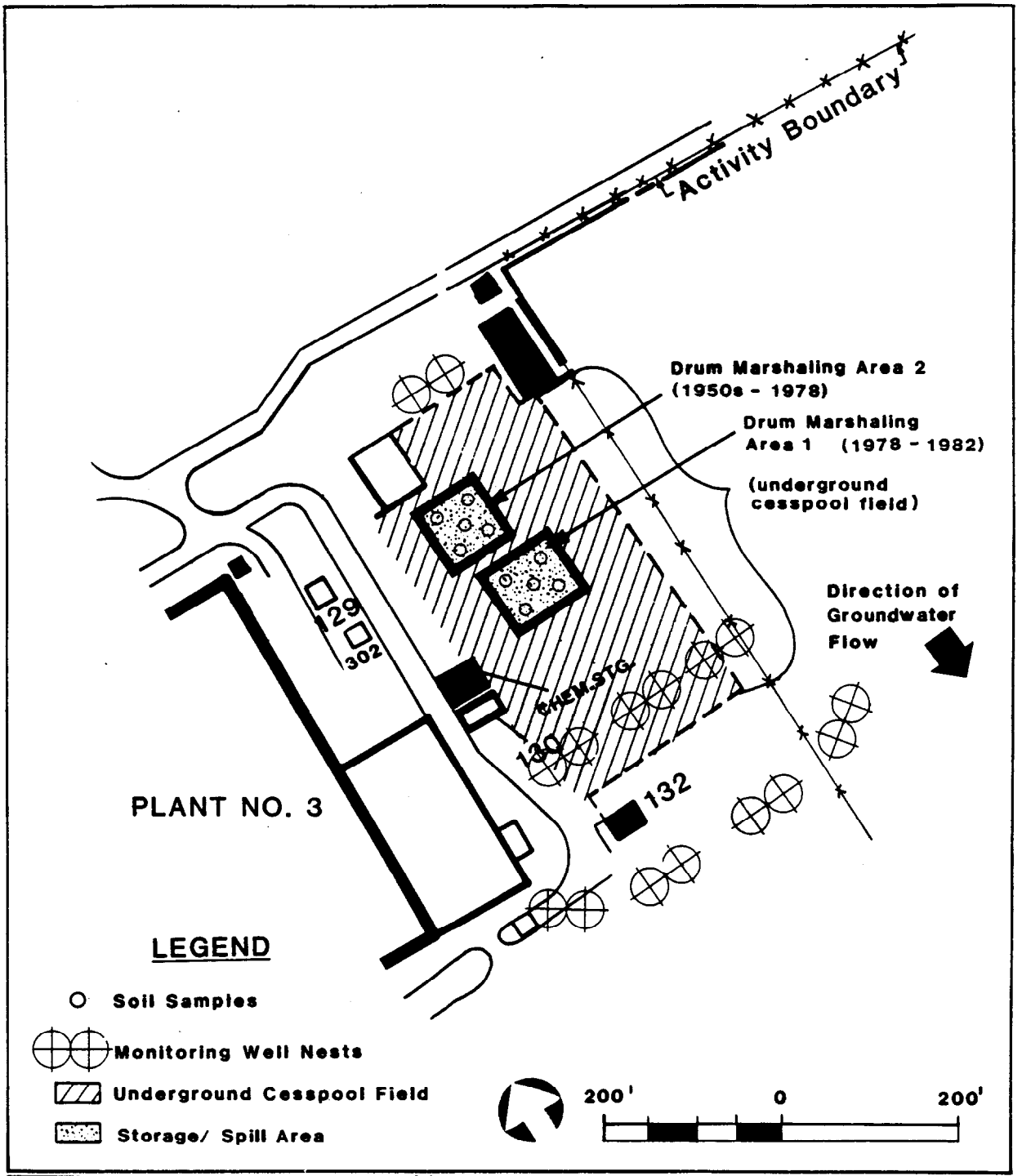

Figure 3-5

Site 7, Former Drum Marshaling Areas' Monitoring Well and Sampling Locations, NWIRP Bethpage, New York

Initial Assessment Study
Naval Weapons Industrial Reserve Plant
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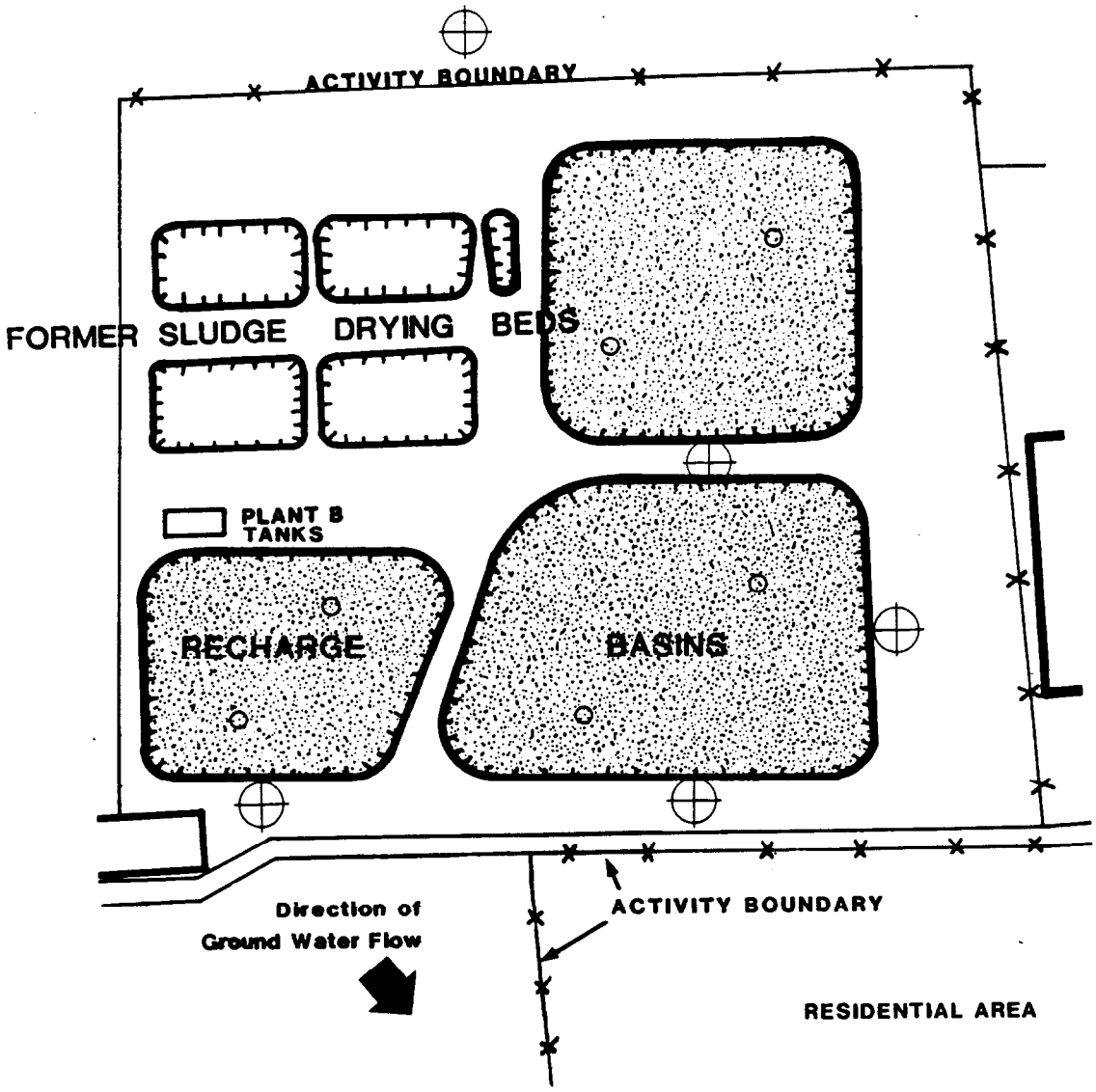

Figure 3-6

Site 8, Recharge Basins' Monitoring Well and Sampling Locations, NWIRP Bethpage, New York

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3.2.2.3 Site 9, Salvage Storage Area. (Figure 3-7)

Groundwater monitoring wells:	Install 9 in the location shown in Figure 3-7.
Types of samples:	Groundwater: one sample from each well quarterly, 36 samples annually.
	Soil samples: 5.
Test parameters:	Volatile organics; POLs.

Remarks: Screen deep monitoring wells at top of first impermeable layer.

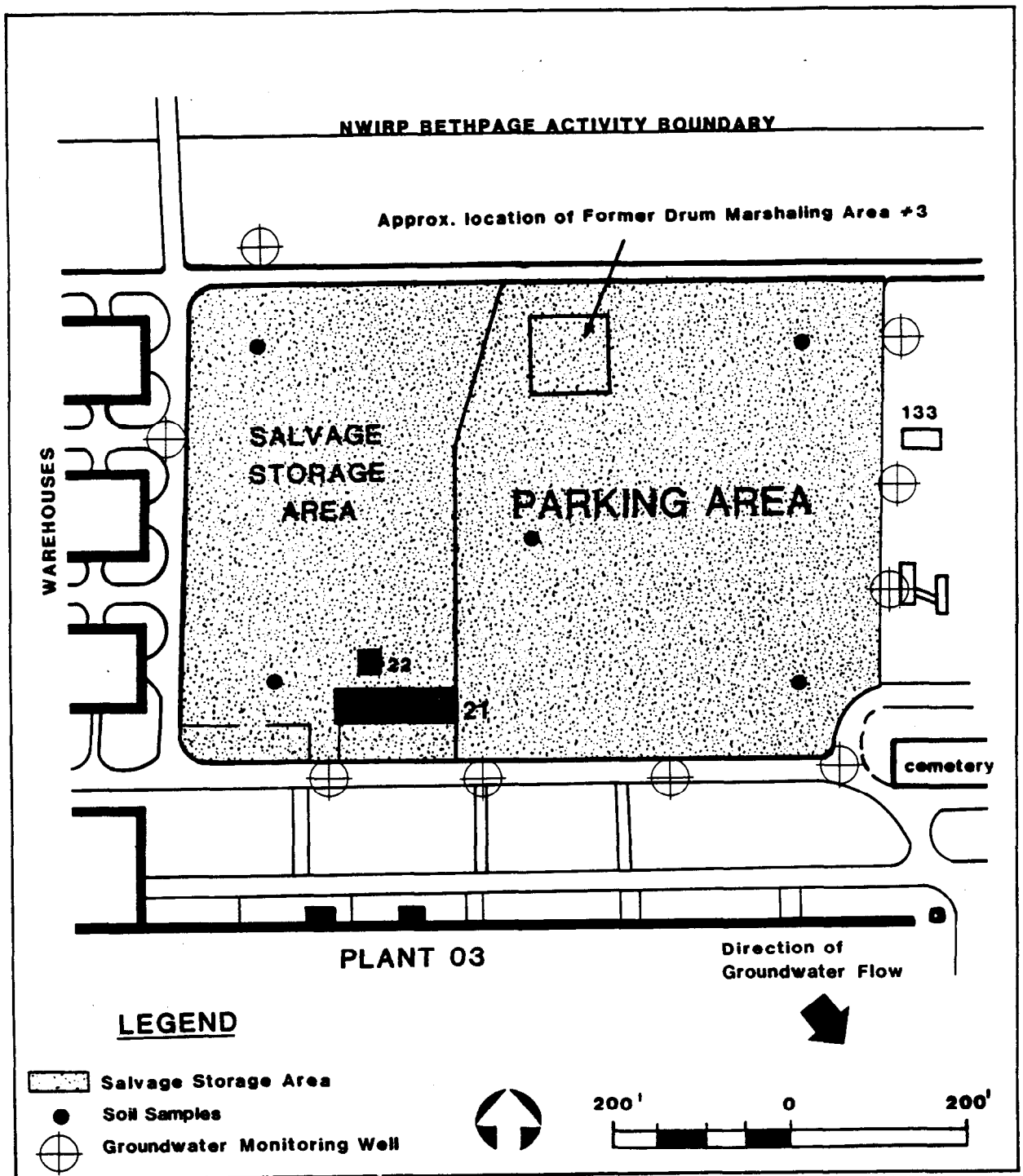

Figure 3-7

Site 9, Salvage Storage Area Monitoring Well and Sampling Locations, NWIRP Bethpage, New York

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CHAPTER 4. BACKGROUND

4.1 NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK.

4.1.1 General. The Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage is located in Nassau County, New York, near the geographic center of Long Island (Figure 4-1).

NWIRP Bethpage conducts research prototyping, testing, design engineering, fabrication, and primary assembly of various military aircraft. Secondary assembly of components manufactured at NWIRP Bethpage occurs at NWIRP Calverton, located in Suffolk County on Long Island; section 4.2 of this report discusses NWIRP Calverton and its mission in greater detail.

Recent projects at NWIRP Bethpage have included the F-14 (Tomcat), E-2C (Hawkeye), A-6, EA-6B, EF-111A, C-2A, and others. Manufacturing processes performed at NWIRP Bethpage include chemical milling and treating, heat treatment, and mechanical manufacturing processes dealing with aluminum, titanium, honeycombing, plastics, and other components. The plant is government-owned, contractor-operated (GOCO); the company that operates the activity is Grumman Aerospace Corporation.

The facilities at NWIRP Bethpage include four plants (Plants 03, 05 and 20, for assembly and prototype testing, and Plant 10, an integrated group of quality control laboratories), two warehouses (north and south), a Salvage Storage Area, an Industrial Waste Treatment Plant and several artificial recharge basins, and other smaller support buildings (Grumman, no date).

Adjoining the Navy's NWIRP at Bethpage are the corporate headquarters of Grumman Aerospace, the company's principal engineering and manufacturing facilities, Grumman research and development centers, and a major warehousing complex.

In all, Grumman's property covers approximately 605 acres (ManTech, December 1976) extending from Stewart Avenue on the northeast, to Broadway-Hicksville-Massapequa Road on the southwest. The property is bisected by the Long Island Railroad. South Oyster Bay Road and New South Road roughly form the western boundary, and 11th Street and Stewart Avenue mark the eastern boundary (Bethpage Facilities Department, Storm drainage systems, 1979; and Grumman Corporation, Facilities, no date).

Within this Grumman complex lies the 108-acre area owned by the Navy. The major parcel is bordered by South Oyster Bay Road, the Long Island Railroad, Thomas Avenue, 11th Street, the road to the north of Sycamore Avenue, groundwater recharge basins and wooded areas, the hydraulics lab, and the Plant 15 parking area. The other parcel consists of one plant (Plant 20) and its parking area (Bethpage Facilities Department, Storm drainage systems, December 1979; and Grumman Corporation, Facilities, no date).

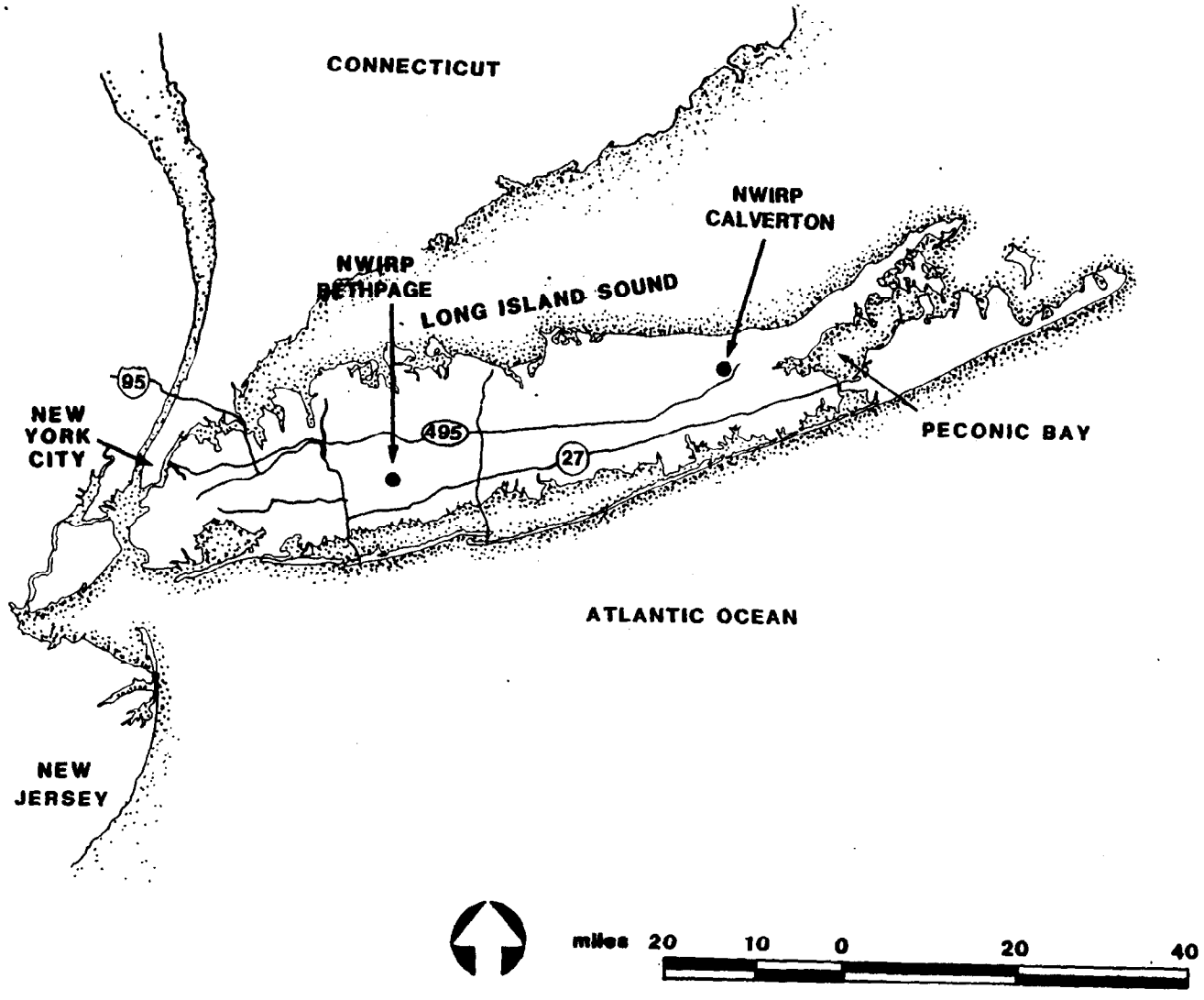

Figure 4-1

General Location Map,
NWIRP Bethpage and
NWIRP Calverton,
New York

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4.1.2 Adjacent Land Uses. Navy-owned land at Bethpage is completely surrounded by the large Grumman complex of research and development centers, manufacturing and assembly plants, test facilities, and corporate headquarters. The industrial complex also has several athletic fields and wooded areas.

When the Navy first came to Bethpage, much of the surrounding land was agricultural; most of it was developed in the late 1950s and early 1960s. At present, suburban housing surrounds most of the Grumman land. Besides the town of Bethpage, these densely populated communities include Levittown, Hicksville, and Plainedge.

Some commercial and light industrial operations flank the railroad to the west of the activity and lie just south of Broadway-Hicksville-Massapequa Road. Route 135, the Seaford-Oyster Bay Expressway, lies one mile east of the activity. Bethpage State Park, with its extensive golf courses, abuts the expressway on the opposite side.

4.1.3 History. NWIRP Bethpage was established in 1933. Throughout the last 50 years, its mission has remained largely the same: to design prototypes, to test Navy aircraft, and to perform primary assembly of various naval aircraft.

From its early days, NWIRP Bethpage was staffed and run mainly by civilian experts and technicians, mostly Grumman personnel. The military oversaw and coordinated these operations.

In the 1930s a series of Navy carrier aircraft and amphibious vehicles were developed at the activity. World War II brought the development of the Wildcat and Hellcat fighters and the Avenger torpedo/bomber/attack plane.

This era also marked a period of very fast growth at NWIRP Bethpage. Most of the currently existing buildings at the activity were constructed for wartime use. This period also marked an employment peak for Grumman; the workforce reached 25,527 in September 1943. Plants 03, 05, 10, 17, and 20 are among those built during the war.

As dramatic as the growth of NWIRP Bethpage was during the war years, so was the slump that followed there after the war. It proved temporary, however, as the jet age and the Korean War once again revived the activity.

For a brief period in the late 1950s, Grumman was not under contract with the Navy to develop and manufacture fighters. However, in 1960 the National Aeronautics and Space Administration (NASA) contracted with NWIRP Bethpage and Grumman to develop the Orbiting Astronomical Observatory (OAO); NASA also contracted for the Echo II satellite and the lunar module that placed Americans on the moon six times.

In 1969, as the first lunar landing took place (from a NWIRP Bethpage lunar module), the activity assumed responsibility for producing the F-14A, the Navy's next-generation fighter plane. The last lunar modules and OAO flight units were delivered in 1971. The first F-14 deliveries, and beginning work on the EA6B, A6E, and E2C aircraft, also began at this time.

In the latter half of the 1970s, modifications to Navy planes were made at NWIRP Bethpage. In May 1975, the first of six sets of wing substructures for the space shuttle was delivered to the Navy. Other new aircraft also being worked on included the F-214, the TC-4C, and the EF-111A.

In the early 1980's NWIRP Bethpage broke ground for a major construction project, a $6.3 million Industrial Wastewater Treatment Plant to process chemical effluents from the activity's manufacturing operations. Also at this time, a modern computer and crypto system replaced the activity's antiquated teletype machinery. A new Joint Safety Review Board was created to oversee Bethpage/Calverton operations; production of the new Super Tomcat was also started at this time.

4.1.3.1 Historical Areas. There are no areas of cultural or historic significiance at NWIRP Bethpage.

4.1.4 Legal Actions. On 6 December 1983, a "Letter of Claim" was filed against Grumman Aerospace Corporation by the New York State Department of Environmetnal Conservation. The claim, filed pursuant to section 112(d) of the Comprehensive Environmetal Response, Compensation and Liability Act (CERCLA), is intended to cover any potential damage to the State's natural resources attributed to Grumman Aerospace's sludge drying beds. The sludge drying beds are located on site 8 adjacent to the ground water recharge basins. Site 8 is recommended for Confirmation Study.

4.1.5 Biological Features.

4.1.5.1 Ecosystems. The Navy property at NWIRP Bethpage is nearly completely developed. Over 90 percent of the facility is covered by buildings, impermeable parking areas, roadways, and other development. Likewise, the land which lies adjacent to Navy property is also urbanized. The biological communities are therefore highly urbanized and no natural habitat exists with the exception of a narrow tree line along part of the northern boundary and scattered, maintained lawn areas around several of the smaller buildings. No natural aquatic habitat exists on the activity.

The urban habitat that is present would only support wildlife species that adjust well in developed surroundings. These species include cottontail rabbit (genus Sylvilagus), squirrel (family Sciuridae), racking (Procyon lotor), field mice (genus Microtus), Norway rat (Rattus norvegicus), and domestic dogs and cats. Similarly, the avifauna include species common in an urban setting. Typical species would include the robin (Turdus migratorius), blue jay (Cyanocitta cristata), starling (Sturnus vulgaris), house sparrow (Passer domesticus), mourning dove (Zenaidura macroura carolinensis), and pigeons (family Columbidae). A small group of Canada geese (Branta canadensis) were observed on some of the larger grassy areas during the site visit during the summer of 1985.

4.1.5.2 Endangered, Threatened, and Rare Species. Endangered and threatened species are animals or plants whose populations have dwindled or whose native habitat has been reduced. The federal government has developed a list of endangered and threatened wildlife and plant species (Federal Register, July 27, 1983) which have been designated by the Department of the Interior to receive protection under the Endangered Species Act of 1973 (Federal Register, 1979).

Through consultations with the New York State Department of Environmental Conservation (NYDEC) Wildlife Resources Center concerning endangered and threatened species at NWIRP Bethpage property, the IAS team has determined that no federal or state endangered and threatened species have been reported at the activity. Likewise, no critical habitat for endangered and threatened species exists at this activity.

4.1.6 Physical Features.

4.1.6.1 NWIRP Bethpage Climatology. The combined influence of prevailing westerly winds and the proximity of the Atlantic Ocean produces a modified continental climate on Long Island. Temperature extremes are mitigated by the Atlantic Ocean and by Long Island Sound. The climate is fairly humid (Isbister, 1966).

Data from Garden City, located 6 miles south and west of NWIRP Bethpage, show that the mean annual precipitation is 45 inches, and there are 20 to 30 thunderstorms each year. Evapotranspiration in Nassau County ranges from 19 to 26 inches, and the mean is about 22 inches. The highest mean temperature is 74.9 degrees F. and occurs in July. The lowest mean temperature is 31.4 degrees and occurs in January (Isbister, 1966).

4.1.6.2 Geology of Long Island. The Bethpage and Calverton activities are located on Long Island, New York. Long Island is roughly 118 miles in length from west to east and averages 20 miles in width from north to south. The island consists of Pleistocene sediments, unconsolidated Pleiocene and Cretaceous sediments, and crystalline metamorphic and igneous Precambrian bedrock (Jensen, 1974; Isbister, 1966; et. al.).

The bedrock is composed of impermeable schist, gneiss, and granite. It is nearly horizontal, although it dips in a southerly direction about one-half of a degree. The bedrock varies in depth from 400 to 2,200 feet below sea level under Long Island (Isbister, 1966; Jensen, 1974 et. al.).

The Cretaceous Raritan Formation overlies the bedrock, and consists of clay and sand members that range in thickness from 100 to 300 feet. The sand member rests directly on the bedrock and is moderately permeable, yielding up to 2,000 gallons per minute (gpm) to individual wells. The clay member of the Raritan Formation rests on the sand member; it is comparatively impermeable and retards, but does not prevent, groundwater movement (Isbister, 1966; Jensen, 1974 et. al.).

The Cretaceous Magothy Formation occurs above the Raritan. The Magothy ranges from 30 to 1,000 feet in thickness. It is moderately to highly permeable, and is the principle source of water on Long Island. Individual wells may yield over 2,000 gpm. The Magothy begins 40 to 350 feet beneath the land surface of Long Island (Jensen, 1974).

Pleistocene sediments on Long Island overlie the Cretaceous units and are all of glacial origin. The glacial deposits are primarily tills comprised of unsorted clays, sand, and boulders (Flint, 1971; Jensen, 1974).

Generally, the glacial deposits have low permeability, leading to perched water tables and slow rates of groundwater migration (Jensen, 1974). The deepest glacial deposit in Nassau County is the James gravel, a glacial outwash deposit that is a significant source of groundwater (Jensen, 1974). Other glacial tills on Long Island may have local unconfined or confined aquifers that provide good quality water for a variety of uses (Jensen, 1974; Isbister, 1966).

Pleistocene epoch glaciation and the concomitant processes of glacial melting and the outwashing of glacially transported materials are largely responsible for the present surface geology and topography of Long Island (Flint, 1971, et. al.).

The Pleistocene epoch is divided into four major glacial stages: the Nebraskan, the Kansan, the Illinoian, and the Wisconsin. Long Island Sound, along with most topographic features on Long Island, was produced by the most recent glacial stage, the Wisconsin (Flint, 1971, et. al.).

There is evidence of two periods of Wisconsin stage advance and retreat on Long Island. During the earlier phase, a glacial ice sheet moved to the middle of Suffolk County and deposited a terminal glacial moraine called the Ronkonkoma Terminal Moraine. The glacier retreated north, then readvanced, this time stopping along Long Island's northern shore; here it deposited the material that forms another series of hilly glacial moraines, the Harbor Hill End Moraine (Flint, 1971, et. al.).

As the ice sheet melted, streams flowing from the glaciers transported large volumes of sand, gravel, and silt to the south. The outwash material was deposited in a flat plain that slopes gently south toward the Atlantic. The outwash plain comprises the flat southern section of Long Island, and an intermorainal area between the Harbor Hill and Ronkonkoma terminal morainal ridges (Flint, 1971).

Recent sediments consisting of salt marsh deposits, stream alluvium, shore deposits, and artificial fill overlie the glacial material. These sediments range in thickness from 0 to 50 feet. Recent clays and silts compose the substrate beneath Long Island Sound and its harbors, retard salt water encroachment into the underlying glacial materials, and confine fresh water in these same materials (Flint, 1971).

4.1.6.2.1 NWIRP Bethpage Geology. NWIRP Bethpage is underlain by Pleistocene glacial outwash material that ranges from 40 to 130 feet in thickness. The Magothy Formation begins immediately beneath the Pleistocene deposits and continues 600 feet to a depth of about 700 feet. The clay member of the Raritan Formation begins at 700 feet and continues to a depth of 860 feet. The Raritan sand member continues to a depth of 1,070 feet. Precambrian bedrock begins at 1,070 feet and continues downward (Jensen, 1974) (Figure 4-2).

4.1.6.3 Topography of NWIRP Bethpage. Northeastern Suffolk County has six major morphologic areas. See Figure 4-2. These are 1) the Headlands, 2) the Harbor Hill End Moraine, 3) an intermorainal pitted

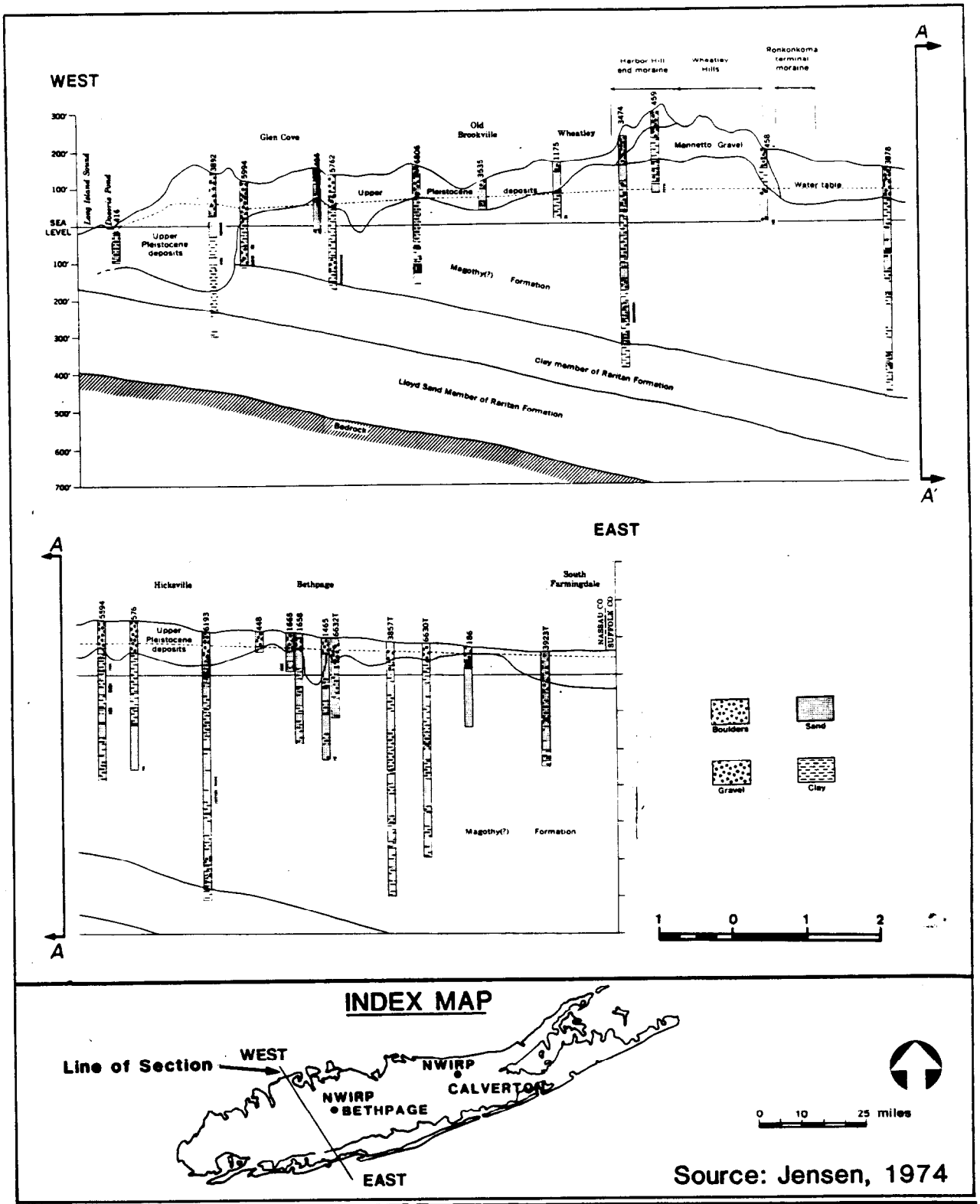

Figure 4-2

Geologic Cross Section and Topography, Vicinity of NWIRP Bethpage, New York

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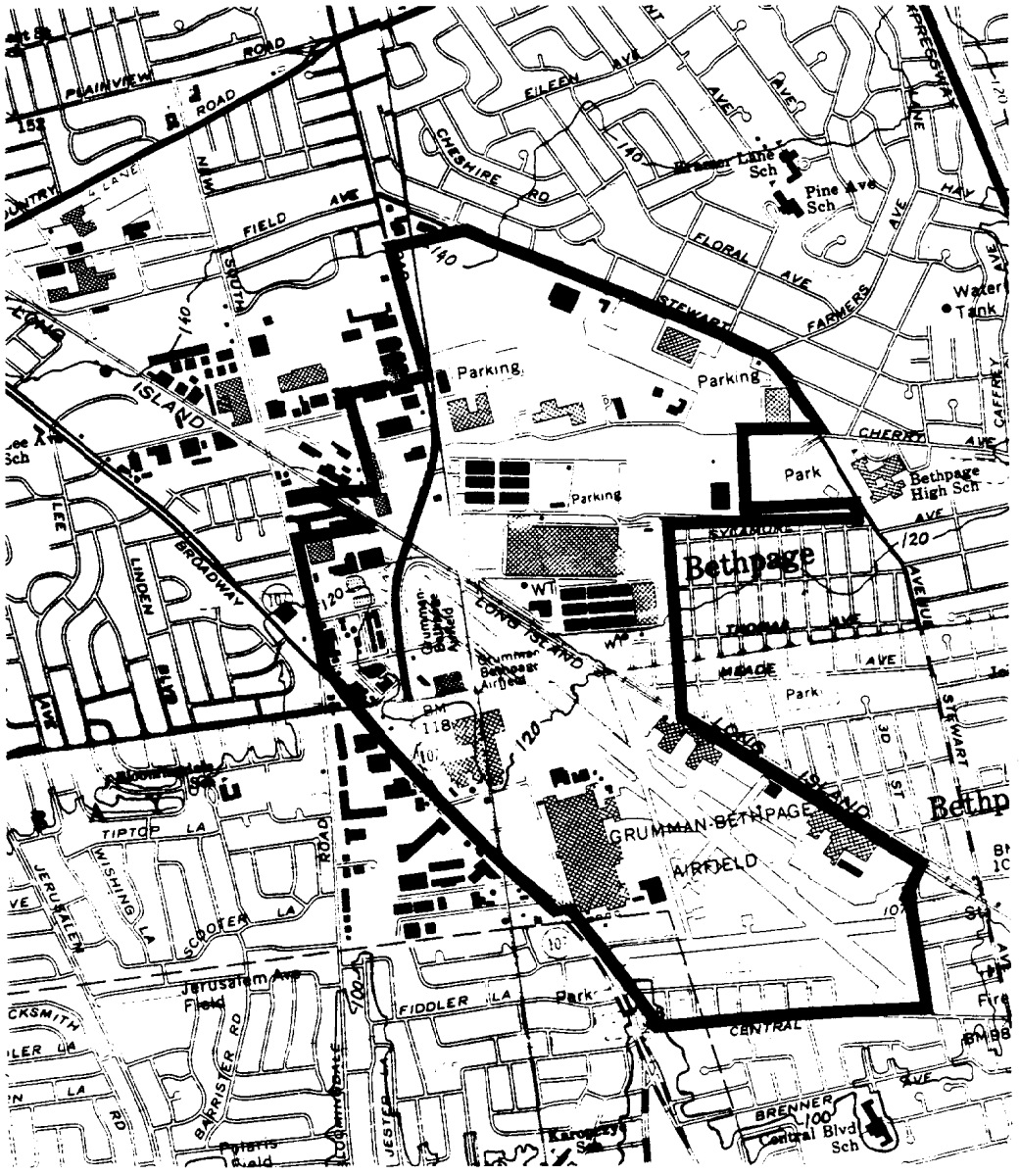

LEGEND

Base Boundary

Not to scale

Figure 4-3

Topographic Map,
NWIRP Bethpage, New York

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Reserve Plant
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outwash plain, 4) the Ronkonkoma Terminal Moraine, 5) the Wheatley and Mannetto hills, and 6) the glacial outwash plain (Flint, 1971). The topography of the immediate vicinity of NWIRP Bethpage is shown in Figure 4-3.

The Headlands originate in steep bluffs, which abruptly rise from Long Island Sound to a maximum height of 100 feet. As one proceeds south from the Sound, the land surface becomes increasingly irregular, and it rises to an elevation of about 200 feet near the towns of Jericho and Muttentown.

The Harbor Hill End Moraine consists of hills that trend northeast. These hills reach elevations of 300 feet in the vicinity of Westbury and Wheatley.

The Harbor Hill End Moraine and the Ronkonkoma Terminal Moraine comprise long linear hills that run along the length of Long Island (Figure 4-4). The Harbor Hill End Moraine rises from, and parallels, Long Island Sound. The Ronkonkoma Terminal Moraine runs approximately east-west through the center of Long Island.

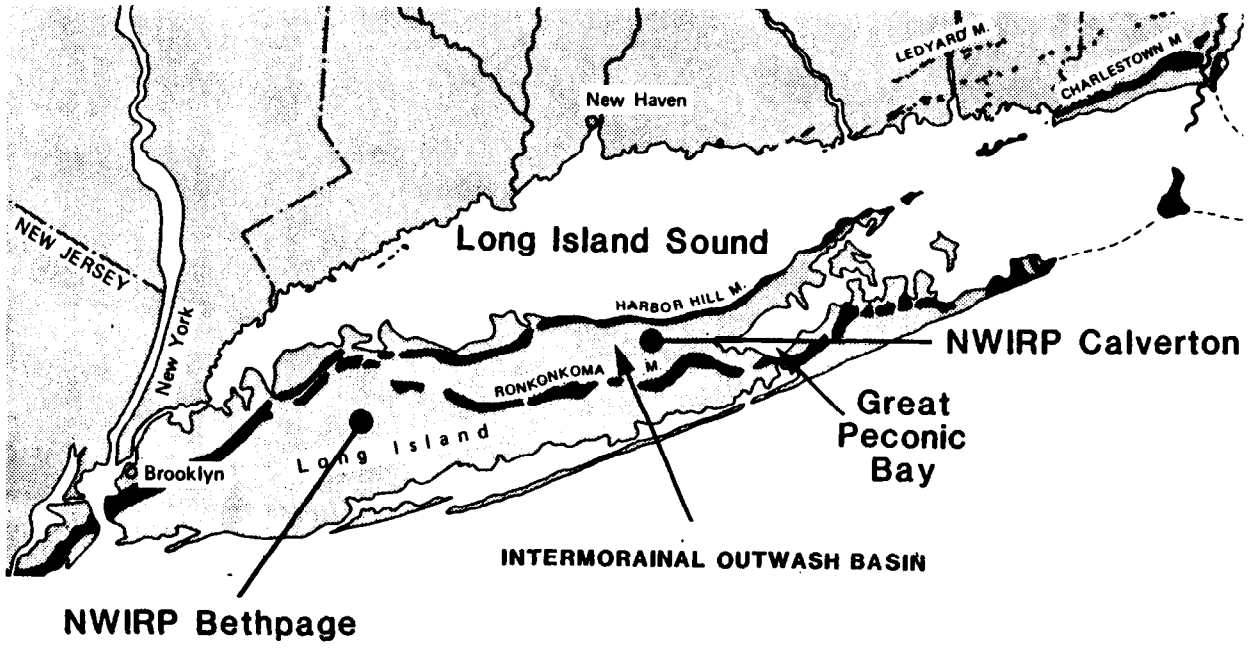
Between the two moraines is an intermorainal outwash plain. The plain is pitted with numerous small kames and kettleholes. Its surface is as high as 250 feet above sea level.

A second featureless glacial outwash plain slopes gently from the south edge of the Ronkonkoma Terminal Moraine to the Atlantic Ocean. It ranges from 140 feet above sea level in the north to sea level at the point where it meets the Atlantic Ocean. In the vicinity of NWIRP Bethpage, the elevation is 120 feet.

The Wheatley and Manetto hills rise to about 300 feet above mean sea level in the vicinity of the town of Wheatley, and may be remnants of extensive glacial stream deposits.

In the vicinity of NWIRP Bethpage, all natural physical features such as hills, depressions, and ditches have been reshaped or destroyed because of the high degree of urbanization that the area has experienced. The northwest corner of the activity has the highest elevation, 140-plus feet. The southeast corner of the activity, about 2 miles from the northwest corner, is the lowest part of the activity, with an elevation of under 110 feet. The slope across the activity from northwest to southeast is very regular with no breaks in grade and no topographic features (Figure 4-4).

NWIRP Bethpage is completely surrounded by residential communities, and the effect of the extensive development on groundwater and surface water drainage has been significant. Before widespread development, the naturally occurring, permeable soils allowed rapid infiltration of rainwater. Since this is no longer the case, groundwater recharge is facilitated by recharge basins incorporated into the storm sewer drainage system. The basins allow rainwater to percolate into the ground rather than drain into the local streams (Seaburn and Aronson, 1974). NWIRP Bethpage contains numerous recharge basins, as do the surrounding residential areas.



Source: after Flint, 1971

0 30 MILES

Figure 4-4

Harbor Hill and
Ronkonkoma Moraines,
Long Island, New York

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Reserve Plant
Bethpage and Calverton
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4.1.6.4 Soils at NWIRP Bethpage. The most recent soil information available for NWIRP Bethpage is a soil survey conducted in 1928. According to this report, seven soil types covered the region that is presently overlain by NWIRP Bethpage. The seven are the Sassafras sandy loam, the Hempstead loam, the Plymouth sandy loam, the Haven loam, the Sassafras loam, the Babylon sand, and the Dukes loamy sand. These soils are mostly sand or silty loam, and are characterized by high permeability.

Since the publication of the soil survey report, however, the area of study has been extensively developed and graded. It is unlikely that any of the original soil types remain on the activity. Rather, all the soil under the activity could be better classified as reworked Madeland, or as Cut and Fill material.

4.1.6.5 Hydrogeology of NWIRP Bethpage. As mentioned, northeastern Nassau County is underlain by unconsolidated coastal plain deposits of Pleistocene, Cretaceous, and Quaternary age. The deeper lying Cretaceous sediments, the Raritan and Magothy formations, have members that serve as confined aquifers. Moreover, the glacial Quaternary deposits comprise an important aquifer in the county. According to the Nassau County Department of Public Health, Bureau of Public Water Supply, there are approximately 25 to 30 municipal water supply wells within 1 mile downgradient of NWIRP Bethpage. These wells are typically screened in the Magothy Aquifer (Nassau Department of Public Health, 1986).

Groundwater infiltrates the Upper Glacial Aquifer (that is, the glacial Quaternary deposits) in the high morainal hills on the northern side of Long Island. This same area is also the predominant area of recharge for the deeper aquifers. Flow in the Upper Glacial Aquifer, and in the deeper aquifers, is south and east across Long Island toward the Atlantic.

The Lloyd Aquifer, a member of the Cretaceous Raritan Formation, is too deep to be useful as a source of groundwater. The Cretaceous Magothy Formation, however, provides about half of the groundwater used in northeastern Nassau County. This aquifer is predominantly unconfined on Long Island, although locally occurring clay stringers do create confined aquifer conditions. Beneath NWIRP Bethpage, the Magothy is unconfined. Where recharge occurs in the Magothy (north of the activity), head values average 10 feet above sea level. Moving southeast from the recharge area, head values in the Magothy increase, and attain a maximum of 90 feet above sea level in the vicinity of the towns of Jericho and Hicksville. Continuing southeast toward the town of Bethpage, head values decrease; the hydraulic head value at Bethpage is 70 feet above mean sea level (Isbister, 1966). Figure 4-5 illustrates hydraulic head values in the Magothy Aquifer.

The composition of the Magothy Aquifer varies considerably; the aquifer consists of coarse sand with interstitial clay, lignite, stringers of silt and clay, and thin beds of lignite and pyrite. As a result of this varied composition, hydraulic conductivity in the Magothy varies widely. However, it is estimated that the average conductivity in the Magothy is 70 feet per day (2.47 X 10 to the minus 2 cm/s) (Jensen, 1974). In brief summation, then, groundwater in the Magothy in the area of NWIRP Bethpage moves

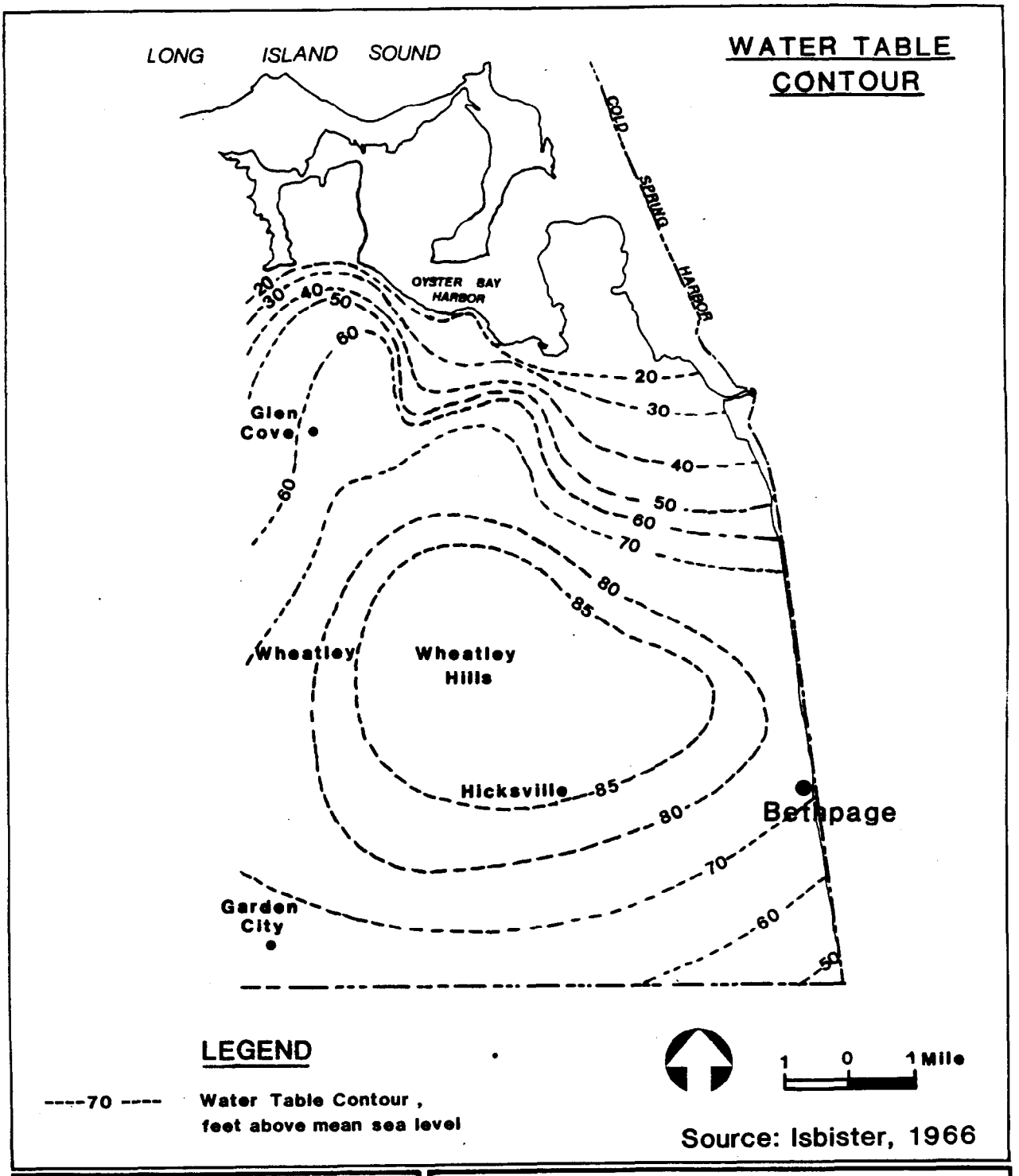

Figure 4-5

Hydraulic Head Values in Magothy Aquifer, Vicinity of NWIRP Bethpage, New York

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southeast with an average speed of 70 feet per day, and head values are 70 feet above mean sea level. The Magothy lies about 200 feet below land surface at NWIRP Bethpage, and extends about 700 feet to a depth of 900 feet.

The aquifer of principal interest with regard to NWIRP Bethpage occurs close to the surface in glacial outwash deposits. The outwash deposit aquifer provides some of the groundwater used in Nassau County, and could serve as a pathway for the migration of contaminants as a result of its high permeability.

The region of NWIRP Bethpage is completely underlain by glacial outwash deposits (United States Geological Survey (USGS), 1966). Beneath NWIRP Bethpage, the glacial deposits are about 200 feet thick. Interspersed throughout these deposits are laminar deposits of silt and clay; these deposits impede the downward vertical movement of groundwater and thereby create perched water tables. Water in the outwash deposits exists under water table conditions.

Generally, the outwash deposits beneath NWIRP Bethpage are highly permeable. Porosity is 30 to 40 percent, and permeability in the area ranges from 1,000 gallons per day per square foot (gpd/sq. ft.) to 1,600 gpd/sq. ft. (Jensen, 1974). The average permeability of the outwash deposits is 1,300 gpd/sq. ft. (Jensen, 1974). The hydraulic conductivity of these deposits is high, at 200 feet per day (1.17 X 10 to the minus 2 centimeters per second) (Jensen, 1974). The high porosity of certain areas of outwash material is further demonstrated by the tendency of streams originating in the highlands north of the activity to disappear as they flow south into the flat areas of outwash. Groundwater movement in the outwash deposits is to the southeast in the vicinity of NWIRP Bethpage.

The high porosity of the outwash deposits accounts for the absence of perennial streams in the vicinity of NWIRP Bethpage, and implies that virtually all area water movement occurs through groundwater migration. Close to 100 percent of the water that falls on the area as precipitation infiltrates the ground, and there is practically no runoff, except in periods of very heavy, extended rain. Because the water table in most of Nassau County is below the root zone, evapotranspiration is low, and ranges from 19 to 26 inches in the county, with a mean of 22 inches. Hence, half the 45 inches of precipitation that fall on Nassau County become part of the groundwater system.

Hydraulic gradients beneath NWIRP Bethpage are 10 feet per mile to the south and southeast; in some areas, gradients may increase to 50 feet per mile.

4.1.6.6 Migration Pathways at NWIRP Bethpage. Characteristically, two potential pathways exist for the migration of contaminants. These pathways are through the groundwater and surface waters in an area. In the vicinity of NWIRP Bethpage, however, groundwater alone represents the potential pathway for the migration of contaminants.

As noted in earlier sections of this report, the surface geology in the vicinity of NWIRP Bethpage consists of the highly permeable Manetto gravel. Beneath the gravel lie the Upper Glacial Aquifer and the Magothy Formation. Each of these are highly permeable, and have high hydraulic conductivities (Jensen, 1974). Section 4.1.6.5 lists specific conductivity values for these formations.

Considering the high permeability of the natural surface layers, and the high permeability of the sand and gravel-containing formations immediately underlying the surface layers, there is a very high potential for contaminant migration from the vicinity of NWIRP Bethpage. Contaminants dumped or spilled on the ground surface would infiltrate rapidly, and migrate southeast, the predominant direction of groundwater flow.

4.1.6.7 Potential Receptors. Between NWIRP Bethpage and the Atlantic Ocean, located roughly 6 miles south of the activity, there are no large surface water bodies to which groundwater discharges. Consequently, the potential receptors of contaminants moving through the groundwater system are humans using water from wells located south and east of the activity.

4.2 NAVAL WEAPONS INDUSTRIAL RESERVE PLANT CALVERTON, NEW YORK.

4.2.1 General. The Naval Weapons Industrial Reserve Plant (NWIRP) Calverton is located at the eastern end of Long Island, in Suffolk County, New York (Figure 4-1). NWIRP Calverton covers about 6,000 acres, most of which is in the town of Riverhead. The remaining part of the activity is in Brookhaven.

Like NWIRP Bethpage, NWIRP Calverton is a GOCO activity operated by the Grumman Aerospace Corporation. In total, the facility covers 11 square miles, most of which is owned by the Navy. Plant 08 (an avionics test building) and its guard booth are the only structures situated on land owned by Grumman (General Plan, March 1985).

The mission of NWIRP Calverton is to assemble, develop, and flight-test aircraft for the U.S. military. (NWIRP Bethpage manufactures many of the components assembled and tested at NWIRP Calverton.)

NWIRP Calverton houses 78,000 feet of hangar space, an automated telemetry station, several assembly plants (06, 07, and 08), an anechoic chamber, a test fuel house, a fuel systems lab, a lunar test site, an explosives test facility, a paint shop, a central steam plant, a sewage treatment plant, and other facilities. There are two runways: one is 7,000 feet long, and the other is 10,000 feet long; thus, the activity can accommodate the largest aircraft.

The activity is roughly rectangular in shape. On the north; it is bounded by Route 25 (Middle Country Road). Wading River and Manor Road border the activity to the west, and River Road and Grumman Boulevard border it to the south. A spur of the Long Island Railroad runs inside the central third of the activity's southern perimeter and up into the center of the activity above the main gate. East of the activity is agricultural land.

4.2.2 Adjacent Land Uses. NWIRP Calverton was originally sited in an area that was about two-thirds open space and one-third farmland (aerial photographs, 1947). The undeveloped portion of this land was forested, and featured small streams, wetlands, and several ponds.

Land use has not changed since 1947. Several isolated residential areas were slowly developed north of Middle Country Road from the early 1960s through the mid-1970s. In the late 1960s, a highway was built to the south that has attracted residential construction on the opposite side of the highway from NWIRP Calverton.

Within the past decade, a cemetery was constructed just northwest of the activity, across Middle Country Road. A golf course is located due south of the main gate, three racing ovals are found to the southwest of this gate, and three facilities and a few houses are clustered around the pond to the southwest, which is flanked by Line Road. The area remains largely rural (aerial photographs, 1980), although a number of housing developments are being planned for the area (ManTech, 1976).

4.2.3 History. NWIRP Calverton was built during the Korean War; construction was completed in 1954. Its mission was, and remains, to assemble, test, flight-test, refit, and retrofit Naval aircraft. Civilian experts and technicians employed by Grumman staff and operate NWIRP Calverton; their work is overseen by the military.

Production started at NWIRP Calverton in the era of military fighter jets such as the Cougar, Panther, Jaguar, and Tiger. Amphibious aircraft and anti-submarine aircraft were also produced at the activity. For a brief period during the late 1950s, Grumman was not under contract with the Navy to develop and manufacture fighters. However, during that time Grumman did work on other military projects, developing torpedo bombers, and attack jets of the Intruder series and the Hawkeye family of early warning craft.

In the late 1960s, testing of the lunar module used in all of the U.S. landings on the moon began at NWIRP Calverton. A special outdoor testing facility was constructed to simulate lunar conditions for this testing.

Work on the EA6B, A6E, E2C, and other aircraft continued, including testing of target recognition and multisensor equipment on the A6 and anti-jamming provisions for the ALQ-99.

In 1974, a modernization plan for NWIRP Calverton was submitted to the Navy. A hold was placed on development of the buffer zone north of the activity because of the urgent need for a new 1,000-acre national cemetery to replace the one at Farmingdale, New York, which was full. At the same time a Nike rocket installation was transferred from the Navy to NWIRP Calverton.

In the latter half of the 1970s, additional modifications to Navy aircraft were performed at NWIRP Calverton facilities. New aircraft worked on during this period included the F-214, TC-4C, and EF-111A. In the early 1980s, a

new Joint Safety Review Board was created to oversee NWIRP Bethpage/NWIRP Calverton operations; the board consisted of contractors operating the facilities. Production of the new Super Tomcat and the X-29A forward swept wing aircraft was also begun.

4.2.3.1 Historical Areas. There are no areas of cultural or historical significance at NWIRP Calverton.

4.2.4 Legal Actions. There have been no legal actions taken against NWIRP Calverton for unsafe or illegal waste generation or waste disposal practices, or for violations of environmental law.

4.2.5 Biological Features.

4.2.5.1 Ecosystems. The dominant natural habitat at NWIRP Calverton can be classified as coastal pine-oak or pinelands, much like that found in the New Jersey Pine Barrens. Aquatic habitat is infrequent and the largest system (McKay Lake) is manmade. Several small ponds are scattered around the activity, and are located just west of Runway 32-14.

The vegetative associations found in this ecologic setting are governed by physical parameters that affect the reproductive success and colonization capabilities of plant species. These factors include sandy, acidic, and infertile soils, varying amounts of moisture, and frequent fires. Given the plant association's capabilities to succeed under these physical stresses, the vegetation is also drought-resistant.

A well-defined canopy, an overstory of saplings and shrubs, and sparse ground cover exist in the typical pine-oak forest. Pitch pine, black oak, scarlet oak, and white oak make up the canopy layer while tall huckleberry, northern bayberry, pitch pine, oaks, and bracken fern are common understory shrubs. Pennsylvania sedge, low blueberry, oak, and pine seedlings are common ground cover. A thick litter layer is common. In xeric, acidic soils, decomposition is slow and growth of ground cover is most successful where a thin litter layer is found (Grucci DEIS, 1984).

The variety of animal species found in the typical pine-oak association is limited. Diversity is not reported to increase significantly even in conjunction with floral subassociations such as mesic, wet, and aquatic habitats. The general vicinity of NWIRP Calverton features a relatively low number of herbs, which may be attributed to grazing and browsing by deer in addition to other factors such as dominance of the canopy during the growing season, low soil water, and crowding and inhibition by litter. Table 4-1 lists major vascular flora identified from a site near NWIRP Calverton with similar vegetative associations as those found on the activity.

The fauna of the area are expected to be those typical of a pine-oak habitat plus those species normally associated with expansive cut fields like the maintained fields adjacent to the activity's runways. Table 4-2 lists resident and breeding wildlife species observed at a nearby site that was also dominated by a pine-oak association. Not on the list but very common (based on visual observations by IAS team members) was the woodchuck

Table 4-1

Species Composition of Plants
in the Vicinity of NWIRP Calverton, New York

Scientific Name	Common Name
TREES:	
Pinus rigida	Pitch pine
Quercus alba	White oak
Q. coccinea	Scarlet oak
Q. velutina	Black oak
Sassafras albidum	Sassafras
SHRUBS:	
Comptonia peregrina	Sweetfern
Gaylussacia baccata	Tall huckleberry
Myrica pensylvanica	Northern bayberry
Lyonia ligustrina	Maleberry
Quercus ilicifolia	Bear oak
FERNS:	
Pteridium aquilinum	Bracken
SUBSHRUBS:	
Vaccinium vacillans	Early low blueberry
V. angustifolium	Late low blueberry
WOODY GROUNDCOVER:	
Chimaphila maculatum	Spotted wintergreen
Epigea repens	Trailing arbutus
HERBS:	
Aralia nudum	Wild sarsaparilla
Baptisia tinctoria	Wild indigo
Helianthemum canadensis	Common frostweed
H. propinguum	Frostweed
Monotropa uniflora	Indian pipe
Polygonella articulata	Jointweed
Solidago caesia	Blue-stem goldenrod
S. rugosa	Rough-stem goldenrod
GRASSES, SEDGES:	
Agrostis scabra	Bent
Andropogon scoparius	Little bluestem
Carex pensylvanica	Sedge
C. swanii	Sedge
Panicum columbianum	Panic grass

Source: Grucci DEIS, 1984.

Table 4-2

Resident and Breeding Wildlife Species Reported in the Vicinity of NWIRP Calverton, New York

Scientific Name	Common Name
AMPHIBIANS:	
Bufo fowleri	Fowler's toad
REPTILES:	
Coluber constrictor	Black racer
Heterodon platyrhinos	Eastern hognose snake
Lampropeltis triangulum	Eastern milk snake
Terrapene carolina	Box turtle
Thamnophis sirtalis	Eastern garter snake
BIRDS:	
Bonasa umbellus	Ruffed grouse
Camprimulgus vociferus	Whipporwill
Catharus guttatus	Hermit thrush
Corus brachyrhynchos	Common crow
Cyanocitta cristata	Blue jay
Dendroica discolor	Prairie warbler
D. pinus	Pine warbler
Molothrus ater	Brown-headed cowbird
Otus asio	Screech owl
Parus atricapillus	Black-capped chickadee
Picoides pubescens	Downy woodpecker
Pipilio erythrophthalmus	Rufous-sided towhee
Sitta carolinensis	White-breasted nuthatch
Toxostoma rufum	Brown thrasher
MAMMALS:	
Blarina brevicauda	Short-tailed shrew
Didelphis virginiana	Opposum
Glaucomys volans	Southern flying squirrel
Microtus pennsylvanica	Meadow mouse
Mustelus frenata	Long-tailed weasel
Myotis lucifugus	Little brown myotis
Odocoileus virginianus	White-tailed deer
Peromyscus leucopus	White-footed mouse
Pitimys pinetorum	Pine mole
Procyon lotor	Raccoon
Scalopus aquaticus	Eastern mole
Sciurus carolinensis	Gray squirrel
Sorex cinereus	Masked shrew
Sylvilagus floridanus	Eastern cottontail
Tamias sciurus	Eastern chipmunk
Vulpes vulpes	Red fox

Source: Grucci DEIS, 1984.

(Marmota monax). Up to 20 of these burrowing mammals were observed at one time in fields adjacent to some of the activity's buildings. It is likely that they also can be found in the fields adjacent to the runways since the habitat is the same. Fauna requiring wet habitat such as red-backed salamanders (Plethodon cinereus), mole salamanders (Ambystoma talpoideum) and milk snakes would probably be restricted to areas with moister habitat in the wetland areas.

The study team observed large numbers of white-tailed deer within the fenced property at NWIRP Calverton. Navy estimates indicate a population of around 800 to 850 individuals in 1984. Though a herd this large presents a potential problem for aircraft takeoffs and landings should some wander onto the runways, those observed during the summer 1985 site visit did not appear stunted in growth nor did vegetation appear to be over-grazed. Overgrazing, however, would be most apparent during the winter season.

The most typical birds breeding in the more xeric pine barren habitats on Long Island are the whipporwill, ruffed grouse, rufous-sided towhee, blue jay, common crow, pine warbler, prairie warbler, hermit thrush, blackcapped chickadee, cowbird, and brown thrasher (Grucci DEIS, 1984). Other common species include the white breasted nuthatch, downy woodpecker, and red-tailed hawks (Buteo jamaicensis borealis). Breeding bird composition here is probably more diverse than that which is common in more xeric dwarf pine plains and less diverse than in more mesic pine-oak forests.

The ruffed grouse, gray squirrel, cottontail rabbit, and white-tailed deer are popular game species in this area of Long Island, while raccoon and red fox are occasionally trapped as well.

The limited aquatic habitat is comprised of several intermittent streams, about 10 small ponds, and the manmade McKay Lake. Wetland vegetation--largely emergent varieties like cattail and grasses--and scrub-shrub type vegetation are associated with aquatic systems where conditions are suitable, usually in areas adjacent to the aquatic habitat. However, both aquatic and wetland communities comprise a very small part of the Navy-owned acreage.

The acidic (often in the pH range of 5.0 and below) and infertile soil and water are factors which limit the types of wildlife in the area. Although the water may sometimes appear tea-colored, the quality is usually good; however, few species of fish or amphibians can tolerate such high acidity. The most common aquatic organisms are likely to be several species of sunfish and aquatic insects.

McKay Lake is a manmade impoundment about 8.6 acres in area. It supports a significant fish population. However, since it serves as a receiving water impoundment, it was designed to minimize the invasion of submerged and emergent vegetation and lacks pinelands-type aquatic vegetation. The fish population has been monitored by NYDEC for the last 5 years. During that time biologists have conducted fish surveys in order to determine the types of fish present and estimate populations. Specimens collected have been tagged and released in other nearby ponds (not on Navy property) or

re-released to McKay Lake for size and growth analyses and mark/recapture population estimates.

During October 1984, state biologists collected 702 largemouth bass and 16 sunfish from McKay Lake for distribution to five nearby ponds. The bass population has been estimated at around 3,100 by NYDEC biologists. Other fish species that have been collected from McKay Lake include bluegill (Lepomis machrochirus), pumpkinseed (Lepomis gibbosus), brown bullhead (Ameirus nebulosus), and yellow perch (Perca flavescens).

4.2.5.2 Endangered, Threatened, and Rare Species. Endangered and threatened species are animals or plants whose populations have dwindled or whose native habitat has been reduced. The federal government has developed a list of endangered and threatened wildlife and plant species (Federal Register, July 27, 1983) which have been designated by the Department of the Interior to receive protection under the Endangered Species Act of 1973 (Federal Register, 1979).

Through consultations with the NYDEC Wildlife Resources Center concerning endangered and threatened species at NWIRP Calverton, the IAS team has determined that no federal or state endangered and threatened species have been reported at the activity with the exception of the tiger salamander (Ambystoma tigrinum). The tiger salamander, listed as endangered, has been observed in ponds. The ponds are referred to as runway ponds, and are located to the east and northeast of McKay Lake. The ponds are apparently groundwater-fed and are surrounded by paved runways, taxiways, and roads. Adult salamanders have to cross pavement to get to their breeding sites. The ponds and upland areas immediately adjacent to the ponds (within 1,000 to 2,000 feet) are important habitat components.

Care should be taken not to alter these habitats. NYDEC indicated that there are also several significant habitats south of the Grumman Peconic River Airport in the vicinity of Swan Pond (57 acres) and Linus Pond that are known to support populations of the tiger salamander, the mud turtle (threatened), and several other species on the state's special concerns list. The tiger salamander and mud turtle are listed only on the state's endangered species list, but not on the Federal List of Threatened and Endangered Species (NYDEC, no date).

4.2.6 Physical Features.

4.2.6.1 NWIRP Calverton Climatology. The climate of Suffolk County is classified as "humid-continental" (United States Department of Agriculture (USDA), 1975); it is dominated by continental influences, but is also affected by the Atlantic Ocean and Long Island Sound. The effect of the Atlantic and Long Island Sound is to reduce the range of daily and annual temperature fluctuations.

The county's exposure to maritime influences makes winter precipitation heavy compared to summer precipitation (USDA, 1975). Winter lasts about 3 months in Suffolk County. The temperature is 0 degrees F. or colder 1 or 2 days during the winter, and minimum temperatures of -10 degrees F. are not

uncommon. The average seasonal snowfall is 26 to 32 inches, with accumulations of 40 inches occurring occasionally.

Summers are mild to warm due to the warming effect of the ocean. Temperatures of 90 degrees F. or higher occur about 15 days a year in the central part of Suffolk County, but decrease to a frequency of 4 to 6 days a year along the shore areas.

Precipitation is heaviest in the western and central parts of Suffolk County, which receive 50 to 52 inches a year. Other areas receive 43 to 46 inches. Table 4-3 contains climatological data for Suffolk County.

4.2.6.2 Geology of NWIRP Calverton. NWIRP Calverton is underlain by five geologic units. These are, in order of increasing age: an upper layer of glacial material, referred to in the geologic literature as the Upper Glacial Aquifer; the Magothy Aquifer; the Raritan clay; the Lloyd Aquifer; and finally, the Precambrian crystalline bedrock.

The Upper Glacial Aquifer is about 280 feet thick where it underlies NWIRP Calverton. It is frequently used as a source of potable water (USGS, 1974), and will be discussed later in some detail. The Magothy Formation is 520 feet thick where it underlies NWIRP Calverton. It consists of stratified fine to coarse sand and gravel, has a generally high hydraulic conductivity of up to 200 feet per day (Jensen, 1974), and is widely used as a source of water.

The Cretaceous Raritan clay extends roughly 170 feet below the Magothy Formation. It consists of clay and silty clay; its hydraulic conductivity is low, and it acts as a confining unit above the Lloyd Aquifer. The Lloyd Aquifer (Upper Cretaceous) is 400 feet thick. It consists of fine to coarse sand and gravel. Hydraulic conductivities are moderate in the Lloyd Aquifer (USGS, 1974), although the unit has not been developed as a source of water because of its depth and the proximity of shallower aquifers. Conductivities are estimated to range from 20 to 70 feet per day in the Lloyd Aquifer (7.1 X 10 to the minus 3 to 2.47 X 10 to the minus 2 centimeters per second). The Precambrian bedrock is gneiss and schist of low conductivity. It delineates the bottom of the groundwater reservoir.

The Upper Glacial Aquifer was deposited by Pleistocene glaciers (Wisconsin stage). The aquifer has been subdivided into three smaller units in Suffolk County. These are, in order of increasing age: a till layer; a layer of glacio-lacustrine silts and clays; and a layer of glacial outwash deposits.

In the vicinity of NWIRP Calverton, the lacustrine sediments do not appear, as these sediments are isolated in the so-called Smithtown region of Suffolk County, located to the west of the activity.

Table 4-3

Climatological Data, Suffolk County, New York
(USDA, 1975)

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	7 years in 10 will have—		Average monthly total	3 years in 10 will have—		Snowfall	
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		More than—	Less than—	Average monthly total	4 years in 10 will have more than—
	°F.	°F.	°F.	°F.	In.	In.	In.	In.	In.
January	38	24	52	11	3.6	3.8	2.9	7	6
February	39	25	51	13	3.3	3.9	2.4	7	7
March	46	31	61	21	4.2	5.0	3.0	6	5
April	58	39	74	30	3.6	4.2	2.9	(1)	(2)2
May	69	49	81	39	3.5	4.6	2.0	0	----------
June	78	58	90	47	2.7	3.5	1.9	0	----------
July	83	64	90	55	3.3	4.0	2.1	0	----------
August	81	64	87	53	4.3	4.8	2.4	0	----------
September	75	57	84	44	3.1	3.7	1.6	0	----------
October	65	48	79	35	3.1	4.0	2.3	0	(1 2)
November	54	38	66	26	4.5	5.8	3.1	(1)	(2)1
December	42	28	57	14	4.2	5.5	2.9	6	7
Year	61	44	92	7	43.4	46.5	40.6	26	28

[1] Trace.
[2] One year in 10 will have more.

The till layer of the Upper Glacial Aquifer includes terminal-, ground-, and ablation-moraine deposits; that is, moraines deposited at the leading edge of, and beneath, the advancing glacier. The till layer in Suffolk County ranges from 0 to 150 feet in thickness. As a rule, the till layer is unsorted and unstratified, although restricted local sorting does occur. The till layer of the Upper Glacial Aquifer in Suffolk County usually lies above the water table. However, some parts of the till with high clay contents may serve as local aquitards, and produce perched water tables. The till layer is not an important source of groundwater in Suffolk County (USGS, 1974).

Glacial outwash materials of the Upper Glacial Aquifer on Long Island were deposited before, during, and after the peak periods of Wisconsin glaciation. Melt waters from the glacier carried silt, clay, sand, and gravel south, away from the receding ice sheet. The flat, low-lying regions of southern and central Long Island are made up of these outwash materials. The outwash materials of chief interest lie beneath the till layer, and comprise an aquifer of importance for agricultural, industrial, and domestic uses.

4.2.6.3 Suffolk County Topography. NWIRP Calverton is situated on eastern Long Island in Suffolk County. The elevation in Suffolk County ranges from almost 400 feet to sea level. The most prominent landforms in the county are two glacially formed ridges. One, the Harbor Hill End Moraine, runs east-west and abuts Long Island Sound. The Ronkonkoma Terminal Moraine runs east-west through the center of Long Island. Flat plains of sand and gravel occur between the two ridges, and to the south of the Ronkonkoma ridge between the ridge and the Atlantic Ocean (Figure 4-4).

There are few perennial streams that drain the county. The largest is the Peconic River, which provides drainage for an area of about 75 square miles. The Peconic River, and most other streams on Long Island, are estuarine, and are therefore subject to tidal fluctuations.

4.2.6.3.1 Topography of NWIRP Calverton. The northern part of NWIRP Calverton consists of undeveloped, vegetated hills and valleys; the hills are made up of glacial till. The undeveloped northern part of the activity has a peak elevation of just over 110 feet. The topography has been highly influenced by erosion. Water drains in a southerly direction from the northern section of the activity into a series of valleys that progressively widen as they move southward.

The central part of NWIRP Calverton contains the Grumman Peconic River Airport. The area has been leveled to provide room for the airport runways; the elevation varies from 50 to 60 feet.

South of the runways is a flat, poorly drained area of cranberry bogs, swamps, and ponds. The area is part of the headwater discharge basin for the Peconic River. The elevation varies from 40 to 50 feet. Figure 4-6 shows the topography of NWIRP Calverton.

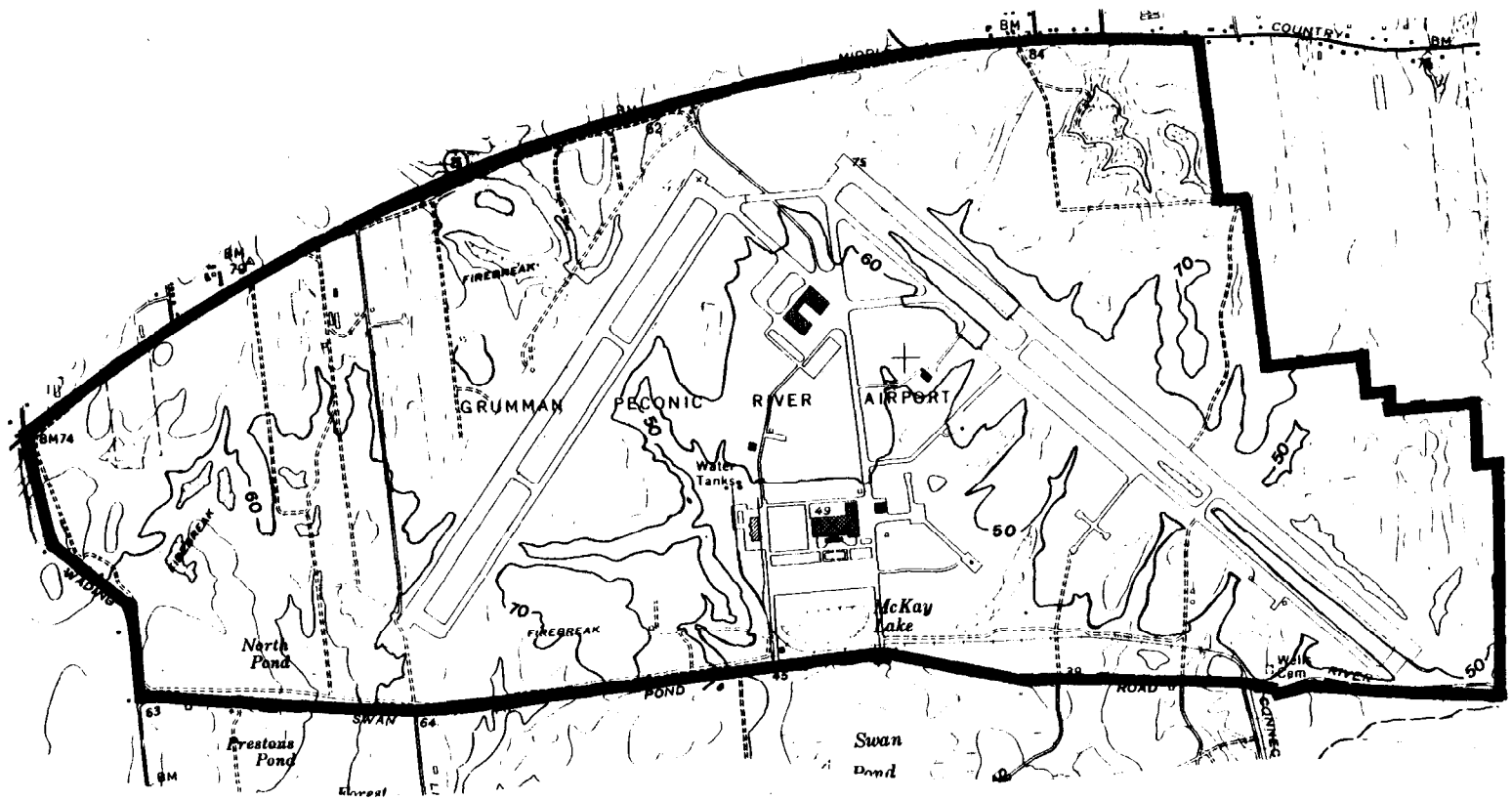

Figure 4-6

Topographic Map,
NWIRP Calverton, New York

Initial Assessment Study
Naval Weapons Industrial
Reserve Plant
Bethpage and Calverton
Long Island, New York

The Navy also owns a peninsula of land to the south and east of the Peconic River discharge basin. This undeveloped land has the highest elevations found at the activity. It rests atop the northern part of the Ronkonkoma ridge, and has peak elevations of 250 feet. Elevations to the north and east of the ridge decrease sharply, and water consequently drains north and west into the Peconic River from this undeveloped peninsula.

4.2.6.4 Soils at NWIRP Calverton. Soils in Suffolk County are affected by five major factors: parent material; climate; relief, or lay of the land; plants and animals, particularly vegetation; and the time that these factors have affected soil development.

Most soils in Suffolk County are formed of mineral materials deposited during Wisconsin age glaciation. These materials include glacial outwash consisting of sorted sands and gravels, glacial till, and glacial-lacustrine sediments consisting of silts and clays. The latter sediment type constitutes only a small percentage of the soils in Suffolk County.

Geologically, the soils of Suffolk County are young. The last glacier receded from the area some 11,000 years ago. Soils have since developed in all glacial deposits. More recent deposits such as sand dunes and organic deposits do not exhibit recognizable soil types. The following discussion enumerates the specific soil types found at NWIRP Calverton and their characteristics. Figure 4-7 shows the location of these soils.

Alsion Sand (Al) is a level, poorly drained soil that occurs near ponds and creeks. Limitations for sewage disposal and construction are moderate to severe, and derive from seasonal high water table levels.

Berryland mucky sand (Bd) is a wet soil occurring along margins of tidal marshes. The very high water table limits it for most uses.

Plymouth and Carver sands (CpC), 3 percent to 15 percent slopes, and Plymouth and Carver sands, 15 percent to 35 percent slopes, consist of deep, excessively drained, coarse-textured soils. Limitations for construction and sewage disposal are slight.

Cut and Fill land (CuB, CuC) consists of land that has been altered by grading and construction. Generally, cuts in the soil are so deep, or fills so thick, that identification of the original soil type is impossible.

Gravel pits (Gp) are excavated for the purpose of mining sand or gravel. They range from 8 to 10 to more than 100 feet in depth.

Haven soils (HaA, HaB) consist of deep well-drained, medium texture soils that formed in a loamy or silty cover over coarse sand and gravel. These soils are located on glacial outwash plains. They pose only slight limitations to sewage disposal and construction.

Muck (Mu) is a poorly drained organic soil that formed in partly to completely decomposed plant material. The water table in mucky deposits is at or near the surface; mucks may be submerged during wet seasons. Muck

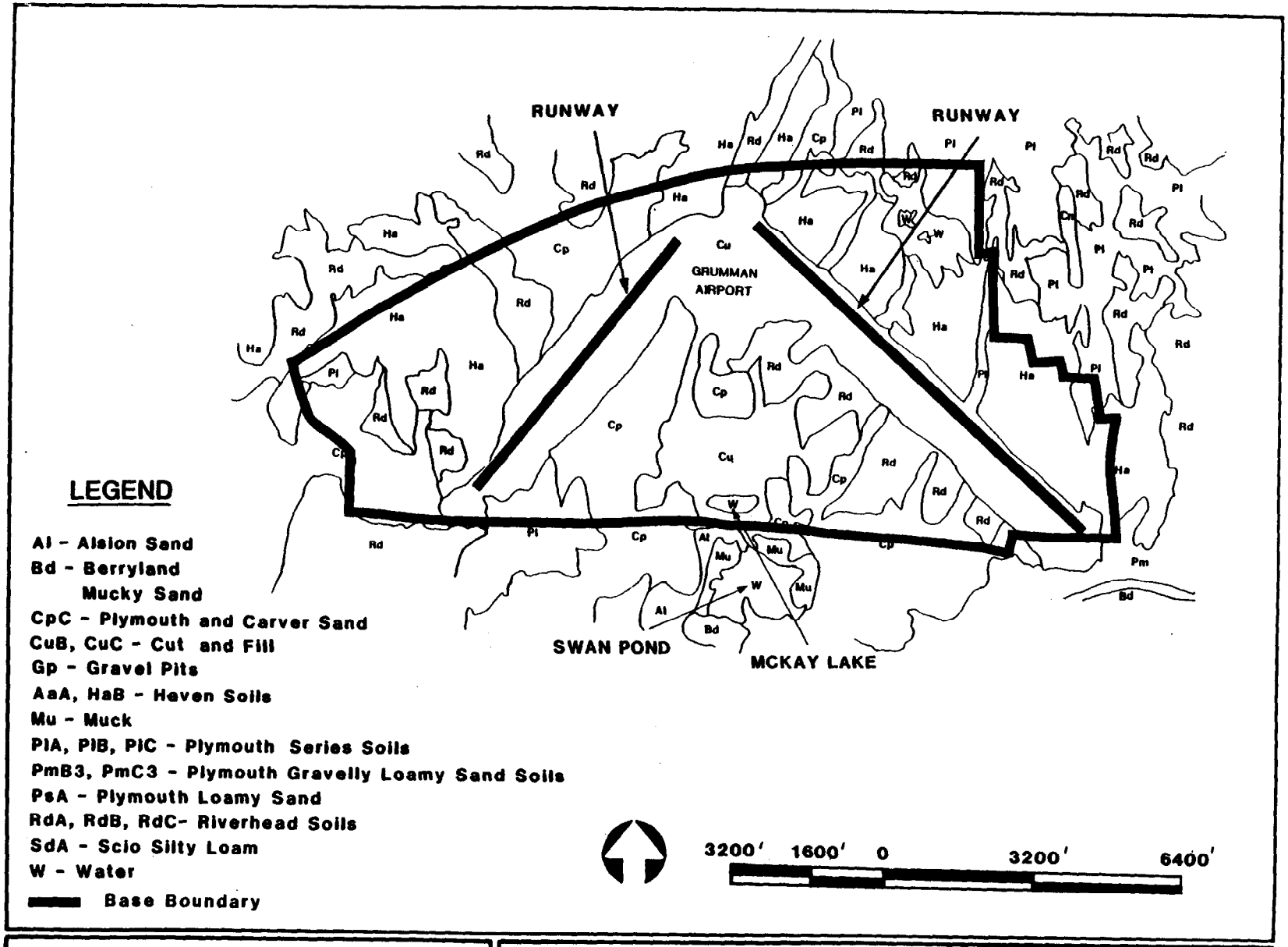

Figure 4-7

Soils Map, Vicinity of
NWIRP Calverton, New York

Initial Assessment Study
Naval Weapons Industrial
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poses severe limitations to all types of development, except for certain kinds of agricultural development. In Suffolk County, however, mucky soils are not extensive enough to warrant farming.

Plymouth series soils (PlA, PlB, PlC) consist of deep, well-drained, medium texture soils that formed in layers of loamy sand over thick layers of sand and gravel. Plymouth soils pose slight limitations to sewage disposal and construction. Plymouth soils are not suitable for agriculture because of their high sand content.

Plymouth gravelly, loamy sand soils (PmB3, PmC3) are similar to the Plymouth soils described above, except that they are shallower, and generally much of the original surface soil has been removed by erosion. Hence, the soil is often little more than a residue of gravel. Agricultural limitations are severe; sewage disposal and construction limitations are moderate.

Plymouth loamy sand, silty substratum (PsA) occurs on low-lying glacial outwash plains. Consequently, it is often in the proximity of water, which may supply moisture to deep-rooted crops. Limitations for sewage disposal and construction are moderate.

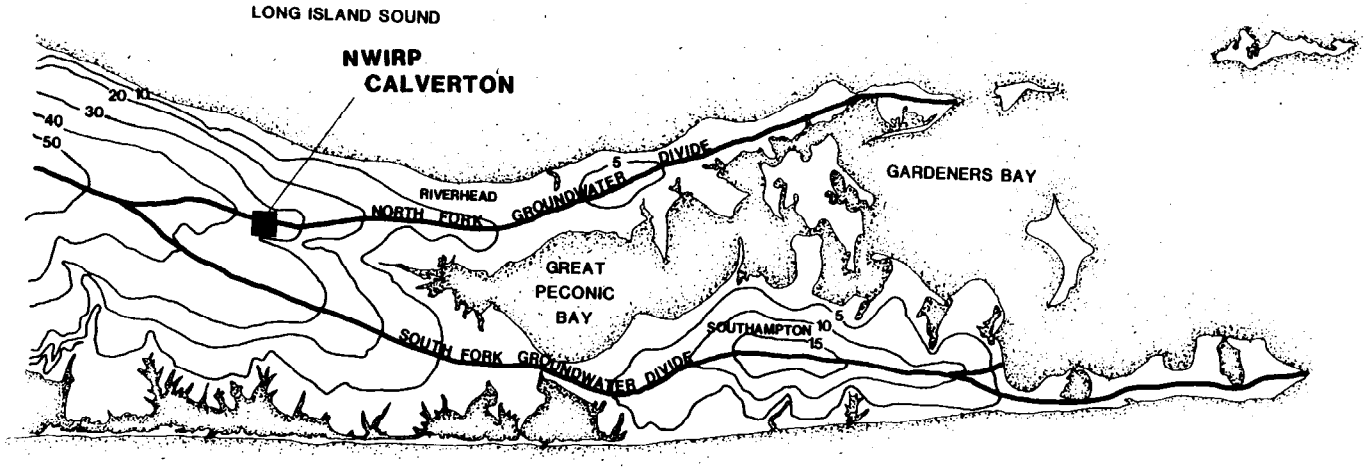
Riverhead soils (RdA, RdB, RdC) consist of deep, well-drained, coarse-textured soils that formed in layers of sandy loam over coarse sand and gravel. Riverhead soils have moderate to high available moisture capacity. Drainage is good. Limitations to sewage disposal, construction, and agriculture are slight.

Scio silt loam, sandy substratum (SdA) has slopes of 0 percent to 2 percent. The soils occur in all low-lying wet areas of glacial outwash plains. Limitations to sewage disposal and construction are moderate, because the soil is generally soft and wet. Agricultural limitations are slight.

4.2.6.5 Hydrogeology of NWIRP Calverton. Three principal geologic units found beneath NWIRP Calverton serve as regional aquifers in Suffolk County. These are the Pleistocene outwash deposits (the Upper Glacial Aquifer), the Upper Cretaceous Magothy Aquifer, and the Lloyd Sand Aquifer. As stated, the Lloyd Aquifer has not been developed as a source of water because of its depth.

Knowledge of the glacial outwash deposit is of primary importance because this aquifer is utilized as a source of groundwater, and because it could act as a pathway for the migration of contaminants. Flow characteristics in the glacial outwash deposit are discussed in the following paragraph.

Groundwater in the outwash deposits beneath NWIRP Calverton occurs at various depths ranging from 30 to 40 feet beneath the land surface. There are two principal groundwater divides in the aquifer in the vicinity of NWIRP Calverton (Figure 4-8), which create three separate regions of groundwater movement. The regions are, approximately, from the Ronkonkoma ridge south to the Atlantic; from the ridge to the region at the north end



LEGEND:

—20— APPROXIMATE WATER TABLE CONTOUR
(feet above mean sea level)

SCALE 0 2 4 8 16 miles

Source: Pluhowski, 1972

Figure 4-8

Groundwater Drainage
Divides, Vicinity of
NWIRP Calverton, New York

Initial Assessment Study
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Reserve Plant
Bethpage and Calverton
Long Island, New York

of NWIRP Calverton; and from the north end of the activity to Long Island Sound. Water that infiltrates the ground in the middle region migrates toward the Peconic River and Great Peconic Bay area (Figure 4-8).

NWIRP Calverton straddles the northernmost groundwater divide on eastern Long Island. Hence, precipitation falling on the northern part of the activity moves toward Long Island Sound, while precipitation that infiltrates on the southern half of the activity will migrate toward the Great Peconic Bay.

Below the Upper Glacial Aquifer lies the Magothy Aquifer. The Magothy is used extensively as a source of groundwater. Hydraulic conductivities in the Magothy are high (2.47 X 10 to the minus 2 centimeters per second). Maps of the geological structure in the vicinity of NWIRP Calverton indicate that the Upper Glacial Aquifer and the Magothy Formation are hydrologically connected (Jensen, 1974).

Below the Magothy lies the Raritan clay, a thick layer of clay and silt that confines water in the underlying Lloyd Aquifer. The Raritan effectively prevents groundwater migration from the Magothy Aquifer to the Lloyd Aquifer.

4.2.6.6 Migration Potential at NWIRP Calverton. Two potential pathways for the migration of contaminants exist at NWIRP Calverton. These pathways are through the groundwater and through the surface waters, which lie to the south of the activity.

Surface water flows east from the swampy area in the southern part of the activity to the Peconic River, and then to the Great Peconic Bay. These surface waters are fed by precipitation, and by groundwater that discharges from the ground under NWIRP Calverton into the swampy areas.

As mentioned, the northern part of NWIRP Calverton rests on a groundwater drainage divide. Precipitation infiltrating the ground in the northern part of the activity will therefore migrate north toward Long Island Sound; the Navy property that rests on the north-flowing part of the divide is completely undeveloped and there is no reported history of waste disposal associated with the area. Therefore, contaminant migration from this area is unlikely.

Precipitation that falls on the south side of the divide infiltrates the ground and migrates south toward the swampy Peconic River headwater region. This groundwater migrates beneath the developed part of NWIRP Calverton, and may therefore serve as a pathway for the migration of contaminants. Ultimately this water discharges into the Peconic River.

Precipitation that falls on the southeasternmost part of Navy property will migrate either north toward the Peconic River or south toward the Atlantic Ocean, as the southeastern section of Navy property straddles a second groundwater divide. This parcel of land is not developed, and has no reported history of waste disposal. Therefore, the migration of contaminants from the area is unlikely.

potential migration of contaminants by food chain transfer in the vicinity of NWIRP Calverton does not appear to be significant. The most evident route by which contaminants could affect humans might be the potential contamination of McKay Lake. Hydrocarbon or metals contamination in sublethal concentrations can be passed to fish in the water directly by absorption/adsorption or indirectly via food chain transfer. Pollutants could then be passed to the human level through consumption of contaminated fish taken from McKay Lake.

Another route (but one unlikely to affect man) could be the contamination of organisms at the landfill adjacent to the pond in the north/northeast corner of the activity. Contamination of plankton and invertebrates could possibly be transferred by the food chain to predatory reptiles (i.e., snakes) or to mammals such as raccoons, weasels, or red foxes that may feed on frogs, insects, or invertebrates from the pond.

Since McKay Lake flows to the south into the Swan Pond area, the potential exists for pollutants to impact the quality of habitat for the tiger salamander and mud turtle, both of which are on New York State's Endangered and Threatened Species List.

4.2.6.7 Receptors. Receptors of contaminants originating at NWIRP Calverton include aquatic organisms that live and breed in the swampy area of ponds and bogs south of the developed part of NWIRP Calverton; that is, the headwater region of the Peconic River. The highest concentration of contaminants would be likely to appear in McKay Lake, since this provides the discharge area closest to the activity. If contaminants do in fact reach the lake, then man must be included among the list of potential receptors due to sport fishing and subsequent consumption of fish taken from the lake.

CHAPTER 5. WASTE GENERATION

5.1 GENERAL. The Naval Weapons Industrial Reserve Plants (NWIRPs) at Bethpage and Calverton, New York, generate waste from the production of aircraft, spacecraft, and related components, as well as from functions supporting this production. Grumman Aerospace Corporation operates the plants at both locations. There are four departments, all based at NWIRP Bethpage, that are responsible for servicing the production lines and supporting the operations of both activities. In this section, these departments and their roles will be described to provide background before the discussion of the individual waste-generating shops at NWIRP Bethpage and NWIRP Calverton.

5.1.1 Manufacturing and Materials Engineering Department. This department determines which chemical batches should be replenished and which ones should be disposed of. The department does not generate any waste.

5.1.2 Facilities Engineering Department. Facilities Engineering is responsible for the evaluation, selection, design and layout of buildings, grounds, utilities, equipment and all other installations required for operation of the facility. They have in-house capability and also use the services of consultants. Facilities Engineering is concerned with contract coordination, security, and safety assurance of private contractors working at the activities. Contractors must submit chemical data sheets for all material used on the job. Waste disposition by the contractor is reviewed by Facilities Engineering for proper disposal by the contractor or by Grumman.

Since 1983, Facilities Engineering has enforced the following rules with respect to construction and maintenance contractor actions that generate construction debris:

- Contractors must use their own dumpsters and take their wastes off-activity;
- Contractors must stockpile fill used on a job at the work site;
- Contractors must take all unused materials off-activity after a job is inspected and approved by the department.

Contractor requirements prior to 1983 were not available. The Facilities Engineering Department generates only paper and assorted office waste.

5.1.3. Environmental Operations. This department does the actual work of replenishing chemicals in tanks, or removing contents of tanks and transporting them to the Industrial Wastewater Treatment Plant (IWTP) or to the Drum Marshaling Area (Site 9). The department has had these responsibilities since the early 1950s. Department personnel also operate a spill response truck, which is present at all bulk liquid transfer operations at NWIRP Bethpage; this truck responds to any accidental spills at NWIRP Bethpage, NWIRP Calverton, or Great River, a third Grumman facility on Long

Island. Cleanup materials from any spills are taken to the main Drum Marshaling Area (Site 9) at NWIRP Bethpage for off-activity disposal by private contractors. (For a more detailed discussion of the various Drum Marshaling Areas that have been used over the years at NWIRP Bethpage, see sections 6.3 and 6.3.1).

5.1.4 Facilities Maintenance Department. The Facilities Maintenance Department is responsible for building, grounds, equipment, and utility maintenance, renovation of office and shop space within existing buildings, and activity security. The department also has prime responsibility for the pickup and storage of waste materials generated by the various shops and assembly lines. The department assigns a superintendent to each of the plants at NWIRP Bethpage and NWIRP Calverton. The Facilities Maintenance Department also has supervisors in charge of various tradesmen and craftsmen who perform maintenance work around the activities. Wastes generated by these groups are discussed in section 5.2.

The Environmental Operations Center is part of the Facilities Maintenance Department. The prime responsibility of the Environmental Operations Center is (in the event of an accident or spill) to secure affected areas as quickly as possible.

5.2 NWIRP BETHPAGE, NAVY PROPERTY.

5.2.1 Plant 03, Production Lines. There are several production lines located in Plant 03, at NWIRP Bethpage. All of the production lines located in this plant are used for a variety of aircraft metal treatment and finishing procedures, including chemical surface preparation, electroplating, chemical milling, alodine treatment, and process inspection. The production lines and the specific chemical baths used in each line currently located in this building are listed in Table 5-1. There are two quality control components in the production lines: the Inspection Station and the Zyglo Line. In the latter, aircraft components are submerged in an ultra-violet (UV) visible dye (Zyglo), rinsed, and inspected under UV light for defects into which the dye has penetrated.

A summary of chemical usages for the most recent year for which data was available, and estimates of long-term quantities requiring disposal are listed in Table 5-2. Concentrated waste sodium hydroxide, nitric acid, hydrofluoric acid, chromic acid, and nitric deoxidizer from the production lines are piped to nearby waste concentrate transfer tanks before being transferred to trucks for in-house treatment, or for removal off-activity by a contractor. Dewatered sludges from the IWTP are stored in a rolloff dumpster at the Waste Treatment Plant.

Other concentrated wastes have always been placed in drums for truck transfer to the Drum Marshaling Area (Site 9). Halogenated solvents and non-halogenated solvents are stored in separate containers before pickup. Reportedly, all drums of concentrated wastes have always been removed from the various Drum Marshaling Areas by contractors for reclamation or disposal.

Figure 5-1 is a sketch of Plant 03 showing the locations of the major production lines in the late 1970s. It is noted that the large indoor area

Table 5-1

Inventory of 1985 Production Lines
and Associated Chemical Baths
in Plant 03, NWIRP Bethpage,
New York

Production Line	Chemical Baths Used
Chromic Acid Anodize Line*	Alkaline cleaners Alkaline etch Deoxidize (nitric/chromic acids) Chromic acid (Anodize)
Chem Milling Line*	Alkaline cleaners Deoxidize (nitric/chromic acids) Flo-coat (masking) Alkaline etch (aluminum parts) HF Etch (titanium parts) Desmut (nitric acid)
Sulfuric Acid Anodize Line*	Alkaline cleaners Deoxidize (nitric/chromic acids) Sulfuric acid (anodize) Seal Coat
Old Plating Line*	Cd vacuum deposition Nitric acid cleaning bath
Inspection Station*	Sodium hydroxide Acid etch Hydrochloric and nitric acids Chromic acid
Alodine Line*	Alkaline cleaner Deoxidize (nitric/chromic acids) Alodine Conversion Coating
Zyglo Line (quality control)*	Zyglo Dip Tank Emulsion water rinse Developing Tank

* See Table 5-2, Chemical Usage in Plant 03, NWIRP, Bethpage, for additional information.

Table 5-2

Chemical Usage in Plant 03,
NWIRP Bethpage

Chemical Used	Annual Quantity	Total Annual Amount Disposed **
Chromic Acid Anodize Line (1981-1985)		
Ridoline-57	1,500 lbs.	6,100 gal.
Aluminetch #3	20,000 lbs.	none*
Amchem-17	4,000 lbs.	
Nitric acid	3,000 gals.	18,400 gal. Nitric acid, Buzz
Buzz Deox-70	3,000 lbs.	Deox-70, Buzz Deox-170, and
Amchem-7	3,000 lbs.	Amchem 7 combined.
Buzz Deox-170	300 lbs.	
Chromic Acid	4,370 lbs.	none
Chem Milling Line (1965-1985)		
Sodium hydroxide	90,000 gals.	388,000 gal. Sodium hydroxide,
Sodium sulfide	30,000 lbs.	Sodium sulfide, and Sodium
Sodium gluconate	8,900 lbs.	gluconate combined
Nitric acid	13,000 gals.	17,300 gal.
Hydrofluoric acid	14,000 gals.	55,200 gals.
Sulfuric Acid Anodize Line (1969-1985)		
Ridoline-57	400 gals	none
Amchem-17	9,000 lbs.	12,000 gal Amchem-17, Amchem-7,
Nitric acid	5,000 gals.	Nitric acid, Buzz Deox-70, and
Buzz Deox-70	3,000 lbs.	Buzz Deox-170 combined.
Amchem-7	3,000 lbs.	
Buzz Deox-170	600 lbs.	
Sulfuric acid	1,300 gals.	7,000 gal.
Sodium dichromate	2,500 lbs.	6,000 gal. Sodium hydroxide and
Sodium hydroxide	30 lbs.	Sodium dichromate combined.
Zyglo Inspection Station (1970-1985)		
W8-117	4,000 lbs.	8,000 gal.
Alodine Line (1941-1985)		
Ridoline-57	400 lbs.	none
Sodium sulfate	10 lbs.	none
Alodine 600	300 lbs.	none
Alodine Toner #22	2 gals.	none
Nitric acid	4,000 gals.	5,000 gals, Nitric acid and
Amchem 17	12,000 lbs.	Amchem-17 combined.

(*none = no quantity disposed of; annual quantity used, consumed and/or lost drag out.

** Does not include Drag Out (treated rinse waters.)

Note that Total Amounts are considered to represent total quantities of diluted chemicals, accounting for discrepancy between Annual Quantity used and Total Amount Disposed.

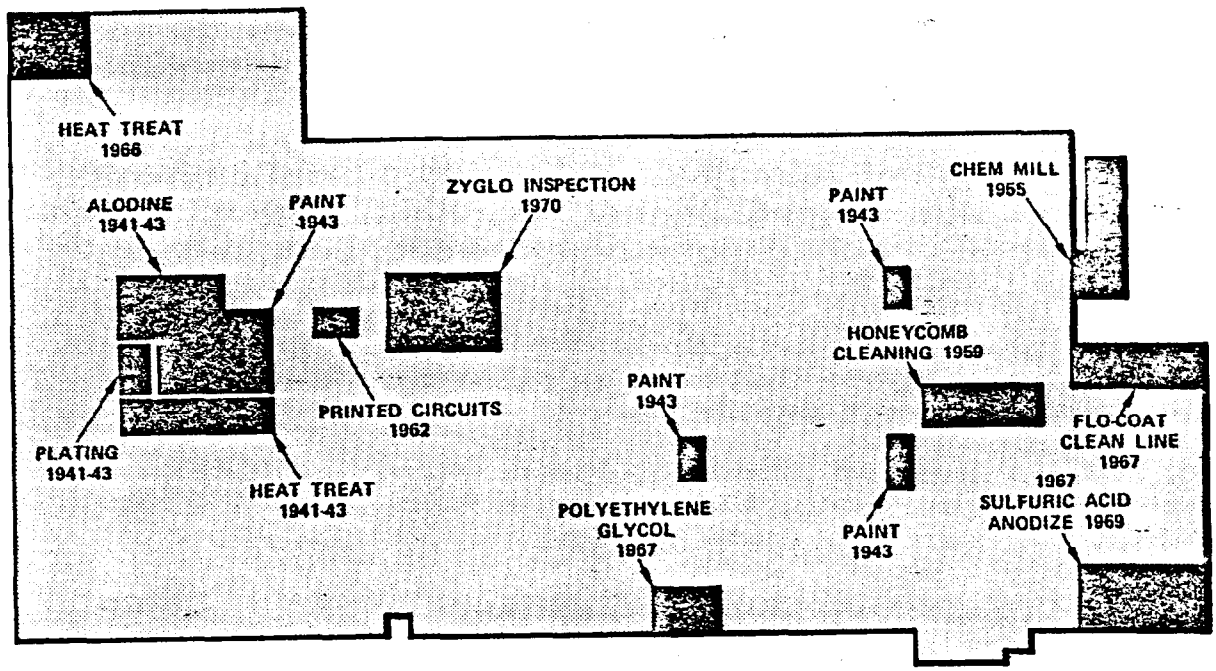

Figure 5-1

Major Production Lines,
Plant 03,
NWIRP Bethpage, New York
Prior to 1980

Initial Assessment Study
Naval Weapons Industrial
Reserve Plant
Bethpage and Calverton
Long Island, New York

provided by Plant 03 permitted production lines to be introduced, relocated, and eliminated as production processes and needs changed over the years.

Reportedly, the production processes listed in Tables 5-1 and 5-2 have operated in a fairly constant manner over recent years. Indicated current waste generation rates can be considered a reasonable approximation of average annual chemical usage from the time the production lines began operation until the present. Prior to 1984, dilute rinse waters from these production lines were transported by tank truck to the old Industrial Wastewater Treatment Plant off Navy property in Grumman Plant 02. Since 1984, these rinse waters have been piped direclty to the new Industrial Wastewater Treatment Plant (IWTP) adjacent to Plant 03.

A reclamation system for concentrated chromic acid is located in Plant 03; it serves the Chromic Acid Anodize Process Line. Prior to 1984, rinse waters containing chromates were processed by ion exchange to remove chromates from the recirculating rinse waters. Regeneration wastes from these ion exchanges were treated in the IWTPs.

In addition to the current production lines, the following production lines were located in this building in past years: cadmium plating (1950-1974), honeycomb pretreatment (1960-1983), tank weld cleaning (1950-1970), and chem milling (1956-1980). The latter was relocated in 1980 between the sulfuric acid anodine and Flo-coat Cleanline.

The past usage of chemicals for the honeycomb pretreatment and tank weld cleaning lines is given in Table 5-3. Wastes were pumped to holding tanks for transportation to IWTP for treatment.

Records for the cadmium plating line, which used cyanide salts, are not available. However, cyanide wastes reportedly were treated on the activity and then transported to the Plant 02 IWTP for off-activity disposal.

5.2.2 Plant 10, Quality Assurance Laboratory. The Quality Assurance Laboratory is located in Plant 10, just south of Plant 03. It was constructed and began operation in 1952. The laboratory tests paints and other chemicals used in component production and also evaluates the characteristics of the completed components. The laboratory also performs routine testing of waste streams, and currently employs 35 people.

Solvents used are obtained from the warehouse; other chemicals are ordered by purchase order from the vendor. The quantities of oil, solvent, paint, alkaline, acid, and cyanide wastes currently generated by the lab are listed in Table 5-4. It is estimated that the current waste generation rates have been constant since 1965, but that between 1952 and 1965 the average generation rate was 50 percent of current rates. All wastes except cyanide wastes have always been placed in marked barrels and picked up by the Facilities Maintenance Department for transport to the various Drum Marshaling Areas, where they await off-activity removal. Cyanide wastes are removed directly from the laboratory by Grumman for concentration and subsequent vendor disposal.

Table 5-3

Chemical Usage of Former Production Operations,
Plant 03, NWIRP Bethpage

Chemical Used	Estimated Annual Quantity
Honeycomb Pretreatment (1960-1983)	
Pasa Jell 107M (contains 20% nitric acid, 2.5% chromic acid, and 8% fluorides)	60 gals.
Trichloroethylene	13,000 gals.
Oakite 164	5,000 lbs.
Sulfuric acid	500 gals.
Sodium dichromate	700 lbs.
Sodium hydroxide	150 gals.
Tank Weld Cleaning Line (1950-1970)	
Nitric acid	1,000 gals.
Sodium sulfate	4,000 lbs.
Ridolene 53	400 lbs.

Table 5-4

Quality Assurance Laboratory Waste Generation,
NWIRP Bethpage, New York *

Chemical	Current Generation Rate Gallons/Year	Gallon Total 1952-1985 (1,000's of Gallons)
Oil/water mix	200	6
Methyl ethyl ketone	100	3
1,1,1-trichloroethane	200	6
Paint wastes	100	3
Alkaline wastes (calcium, potassium, sodium, ammonium hydroxides and salts)	300	7
Acid wastes (chromate VI, fluoride, nitrate, sulfate)	1000	30
Cyanide wastes	15	.4

* Total generation rates are calculated assuming current generation rates apply to the period between 1965 and 1985, and that rates between 1952 and 1965 averaged 50 percent of current generation rates. These assumptions are based on the general level of production at the activity; more specific estimates are not available. All wastes represented in this table were placed in barrels, picked up by Facilities Maintenance, and temporarily stored on-activity prior to off-activity disposal.

5.2.3 Facilities Maintenance Department, NWIRP Bethpage.

5.2.3.1 Buildings and Utilities. This division of the Facilities Maintenance Department is responsible for renovation of office and shop space, and includes all trades. The solid waste generated by this work consists of construction debris, which is hauled off-activity by contracted waste disposal personnel. The division's machine shop uses about 20 gallons per year of cutting oil, most of which evaporates. About 1 gallon of cutting oil per year is recovered from the drip tray for reuse as cutting oil by Facilities Maintenance Department personnel. Metal chips are taken to the Salvage Storage Area (Site 9). These current operations are considered to be representative past operations.

5.2.3.2 Maintenance of Plants 03, 10, and 17. Tradesmen including millwrights, electricians, plumbers, welders, painters, and custodians perform maintenance, repair, and refurbishing activities in Plants 03, 10, and 17. The wastes generated by their efforts are listed in Table 5-5 but cannot be matched to the particular plants at which work was done. Wastes are picked up by the Facilities Maintenance Department and temporarily stored at the Main Drum Marshaling Area before being removed from the activity by contractors; this on-going method of operation is considered to be representative of past operating procedures. It is assumed that current waste generation rates apply to the period between 1965 and 1985, and that between 1952 and 1965, waste generation rates averaged 50 percent of current rates.

5.2.3.3 Preventive Maintenance Services. The Preventive Maintenance Services division is responsible for preventive maintenance of plant machinery. Every 12 weeks crews overhaul machinery used in manufacturing processes. Daily machine maintenance is the responsibility of a separate crew working at each plant.

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The materials used for machinery maintenance include hydraulic oils, cutting oils, coolants, detergent cleaners, lubrication oils, and assorted rags and cleaning apparatus. These materials are used by the activity maintenance crew and the plant crew. They are stored at each plant in a designated area. Reportedly, the materials used have not changed over the years, and neither have generation rates changed over the years. Waste materials are picked up by Facilities Maintenance Department personnel and taken to the Hazardous Waste Storage Facility to await off-activity removal. Practices in operation at the time of the IAS on-site are considered to be representative of the past.

5.2.3.4 High Voltage Operations. The High Voltage Operations division has responsibility for the day-to-day operation and repair of transformers at both NWIRP Bethpage and NWIRP Calverton facilities. Materials used and handled are mineral oils, rags, trichloroethane, polychlorinated biphenyls (PCB's), and old cables. All waste oils and chemicals, other than PCB's, are handled in one of two ways. Either the crew delivers the waste material to the Facilities Maintenance Department, or Facilities Maintenance personnel collect it. Collection and disposal of PCB's are handled under contract by private vendors. Old cables are cut up and taken to the Salvage Storage Area at NWIRP Bethpage.

Table 5-5

Waste Generated by Maintenance Work Done
at Plants 03, 10, and 17, NWIRP Bethpage, New York.

Waste Type	Generation Rate (Gallons/Year) as of June, 1985	Total Generation 1952-1985 (1000's of Gallons)
1,1,1-Trichloroethane	200	6
POL	300	9
Trichloroethylene	40 (tons/yr)	2 (1000 tons)
Marvel Mystic Oil (tool lubricant)	60	1.5
DTT 24 hydraulic oil	1500	40
DTT 25 hydraulic oil	7000	200
26 hydraulic oil	1400	40
Vactra fluids #2	160	4
Vactra fluids #4	2000	50
Gulf Dexron hydr. oil	100	3
Van Stratton coolant	2000	60
Cutmax cutting oil	800	20
Anticep Soluble	400	10

There are two PCB-containing electrical transformers on the activity that contain a total of 865 gallons. These transformers are positioned on undiked concrete or crushed stone pads. Reportedly, they were both retrofilled in 1978 and the material was incinerated at a permitted facility. Existing PCB concentrations in the two transformers are reportedly 30,000 and 37,000 parts per million.

5.2.3.6 Pesticide Shop. Prior to 1970, the application of lawn care chemicals at NWIRP Bethpage was subcontracted to local vendors. Since then, Grumman has been responsible for the application of various herbicides and pesticides to control unwanted weeds and lawn-damaging insects. A listing of the chemicals used in 1983 (presented as a typical year) is provided in Table 5-6. Pesticides are stored in Building 34 and Building 300 and have also been stored at an unlabeled pad between Buildings 34 and 29. These locations have been used as storage facilities for pesticides since about 1970. Formulations were mixed in a spray truck from 1981-1985.

From 1970 to 1981, the chemicals were mixed at the area where they were applied. During this time, there were several minor spills, each less than 3 gallons; however, no specific spill sites could be identified. From 1970 to 1981, empty pesticide containers were taken to the old Industrial Wastewater Treatment Plant where they were rinsed three times prior to disposal. Rinse water was treated at the IWTP with the other wastewater. Rinsed containers were sent to the Salvage Storage Area (Site 9).

Since 1981, lawn care chemicals have been applied using a spray truck. Dispensing equipment includes a 600-gallon high pressure gun and boom and a 150-gallon, low volume, low-pressure turf sprayer. The truck has a large storage tank, and the chemicals are mixed in the tank at the Pesticide Shop to concentrations in accordance with manufacturer's recommendations. Any unused mixture is left in the tank and used with the next scheduled application. Since 1981, the Facilities Maintenance Department at NWIRP Bethpage has been responsible for carrying empty chemical containers to the Salvage Storage Area (Site 9) before being taken off-activity by a private contractor.

5.2.3.7 Transportation Shop. The Transportation Shop operates out of Building 20 at NWIRP Bethpage. Shop personnel are responsible for pickup and delivery services as well as for the maintenance of the vehicles. The Grumman fleet totals about 600 units (trucks, cars, and trailers). About 450 units are stationed at NWIRP Bethpage and the remaining 150 are at NWIRP Calverton.

Waste oils generated from vehicle maintenance have always been taken to a 500-gallon underground tank in the vicinity of Building 20. About 100 gallons of waste oil are generated each week. A waste material dealer is called (generally once a month) to remove the contents of the waste oil tank for off-activity processing. This practice is considered to be representative of past operations.

Waste antifreeze goes into drums that are picked up by Facilities Maintenance Department personnel for eventual off-activity disposal. Waste volumes total about 30 drums per year. This procedure and reported volumes have been about the same since 1955. Before 1955 radiators were drained directly onto the ground in the yard area.

Table 5-6

Summary of Pesticides Used in 1983,
NWIRP Bethpage, New York

Pesticide	Pounds Formulated	Active Ingredients (lbs)	Type Areas Treated
Baygon (insecticide)	30	<1	Industrial
Bensulide (herbicide)	200	<1	Open grass
Dursban (insecticide)	20	<1	Utility
Other herbicide	10,000	1	Open grass
Prome tone (herbicide)	1,800	<1	Open grass
Pyrethrum (insecticide)	8	<1	Office
Silica Aerogel (insecticide)	3	<1	Office

Junk vehicles are sent to the Salvage Storage Area (Site 9). About 100 to 150 drained waste batteries are also sent there on an annual basis. Battery acid is delivered to the current Drum Marshaling Area hazardous waste storage facility, where it awaits off-activity disposal. Waste oil filters have been disposed of in the trash dumpsters at the Transportation Shop. The total inventory of 1985 vehicles (600) is about 100 more than in 1984. Before 1984 the total vehicle inventory varied. These current practices are considered to be representative of past operating procedures.

5.3 GRUMMAN PROPERTY, BETHPAGE. Certain wastes generated on Grumman property at the Bethpage facility are taken onto Navy property (NWIRP Bethpage) for treatment or storage in drums before being removed from Navy property by private waste haulers. This current practice is considered representative of practices dating from the early 1950s. Halogenated and non-halogenated solvents are stored on Navy property at the current Drum Marshaling Area (Site 9). Solvents have been stored in the current Drum Marshalling Area since 1982; solvents were stored at previous Drum Marshalling Areas (Site 7) prior to this date (see section 2.3.2.1). Halogenated wastes consist of methylene chloride, 1,1,1-trichloroethane, and freon. The non-halogenated wastes contain ketones and paint pigments.

Reportedly, the quantity of waste from the other plants on Grumman property at Bethpage adds little to the total quantity of waste stored on Navy property at Bethpage.

5.4 FACILITIES MAINTENANCE DEPARTMENT, NWIRP CALVERTON. The Calverton Facilities Maintenance Department is responsible for the management and maintenance of all Grumman and Navy-owned property. This includes the upkeep of grounds and buildings, the disposal of all waste products, and the containment of any chemical material that is spilled.

Wastes generated or collected by the department include lubricating oils, fuels, rags, absorbents, and mixed solvents. The liquid wastes are placed in aboveground tanks and collected by Facilities Maintenance Department personnel. Other materials such as rags and spill absorbents are held in drums and removed by department personnel.

New materials used in daily departmental operations are stored inside and outside the respective departments. The material outside has been stored on an asphalt pad since 1971.

5.4.1 Fire Rescue Training Area. From 1952 to 1983, some waste solvents and fuel were stored and disposed of at the Fire Rescue Training Area (Site 2). Since 1984, waste oil and fuel have been stored in the waste storage area adjacent to the Sanitary Wastewater Treatment Plant. Fire rescue teams used the training area from 1952 to 1982. The teams created an earthen berm believed to be about 20 feet in diameter and one foot deep, filled the area with water, and floated waste oil on the water. Then the teams ignited the oil and extinguished the blaze.

In 1982 and 1983 two spills of waste oil were reported at the Fire Rescue Training Area. As a result of the 1982 spill, the entire Fire Rescue Training Area was upgraded. Concrete berms were installed to contain the oil and water used in the training exercises. Piping in the area was modified to prevent spills.

5.4.2 Paint Shops and Stripping Shops. The old Paint Shop (Building G-23) was built in 1953 and served as the paint and stripping shop until 1981, when the new Paint Shop (Building 318) was built. The old Paint Shop prepares and paints the surfaces of minor aircraft subassemblies and detailed parts. Estimates of paint and stripping wastes are listed in Table 5-7. Waste solvent volume estimates are presented in Table 5-8.

Before 1978, stripping and washing chemicals and paint residues entering the floor drains of the old Paint Shop drained to holding tanks, which were emptied into trucks which transported the wastes to NWIRP Bethpage for treatment and disposal at Plant 02 IWTP. In 1978, Calverton's IWTP was constructed. The Paint Shop floor drains were then connected directly to the IWTP. The new Paint Shop does surface preparation, and paints completed aircraft and major subassemblies. The stripping function and some painting functions remained in the old Paint Shop until 1984, when the new Stripping Shop (Building 319) was built. Stripping Shop water-based wastes are directed to the IWTP by floor drains. Sludges of paint scrapings are placed in barrels, labeled, and picked up by Facilities Maintenance Department personnel for transport to NWIRP Bethpage, for storage there, and subsequent off-activity removal.

Waste solvents from the paint shops have been placed in barrels and shipped to NWIRP Bethpage for storage and off-activity removal since 1975. Prior to 1975, solvents were combined with waste oil and burned in the Fire Rescue Training Area (Site 2) at NWIRP Calverton.

5.4.3 NWIRP Calverton Steam Plant. The Steam Plant has been in use since the inception of NWIRP Calverton in 1954. The plant used coal from 1954 to 1970, when it was converted to the use of #6 fuel oil. The facility serves Plants 06 and 07, the maintenance shop, the fuel lab, and the Paint Shop. All other buildings have their own boilers. Waste chemical generation by the Steam Plant is listed in Table 5-9, and is representative of waste generation in the past.

Waste oil and degreaser are collected in 55-gallon barrels and picked up by maintenance personnel for off-activity disposal. This practice dates from 1970. Other buildings at NWIRP Calverton having boilers are the PROM Buildings, Plant 08, the Anechoic Chamber, the Guard House, and the IWTP. These boilers use #2, 4, and 6 fuel oil and generate no waste.

The Navy shack, the Flight Emergency Center, the Gun Butt Building, the Wings Shop, and the Chemical Treatment Plant all use forced air heating systems, which generate no wastes.

Table 5-7

Paint and Stripping Shop Wastes,
NWIRP Calverton, New York

	long term average (gallons/yr)
Old Paint Shop (1953-1980)	
Epoxy primers (1953-1970)	50
Lacquer (MILSPEC 81352; 1953-1970)	120
Polyurethane top coat (1971-1980)	160
Alodine (concentrate)	1.4
Lacquer primers (1953-1970)	50
Wash primers (1953-1970)	50
Zinc chromate primer (1953-1965)	50
New Paint Shop and Old Paint Shop (1981-1985)	
Epoxy primers	30
Acrylic lacquer	50
Polyurethane	300
Alodine (concentrate)	20
Stripping Shop (1984-1985) and Old Paint Shop (1953-1983)	
Turco 5469 stripper	11,000
Omega 21294 (with CH_2Cl_2) 1983-85	550
Paint scrapings (1983-1985)	800

Wastes from NWIRP Calverton were trucked to NWIRP Bethpage for temporary storage at the Former Drum Marshaling Areas (Site 7) before being removed from the activity by private contractor(1953-1977).

Table 5-8

Generation Rate and Disposal of Waste Solvents,
NWIRP Calverton, New York

	Burned in Fire Fighting Training Area 1953-1975: gallons/yr	Trucked to Bethpage 1976-1985*: gallons/yr
Methyl ethyl ketone	300	2,000
Acrylic lacquer thinner	14	7
Toluene	130	70

* Wastes trucked to NWIRP Bethpage were stored temporarily at the various Drum Marshaling Areas (Sites 7 and 9) before being hauled off-activity by private contractor.

Table 5-9

Waste Chemical Generation by the
NWIRP Calverton Steam Plant, New York.

Substance	Annual Waste Generation Rate	Disposal
Dearborne 66 (phosphate)	200 lbs	sanitary sewer
Dearborne 203	300 lbs	sanitary sewer
Superfilameen 14	60 gal	sanitary sewer
Lubrication oil	10 gal	Facilities Maintenance pickup*
Varsol degreaser	70 gal	Facilities Maintenance pickup

* drummed wastes taken to NWIRP Bethpage for temporary storage before being hauled off the activity.

5.4.4 **Gun Butt and Ammunition Storage and Demolition Areas.** Aircraft and facilities at NWIRP Calverton are equipped with various cartridges, initiators, and flares that are generally classified as explosives. These materials have, for the purpose of reliability, defined life expectancies within which they must be used or discarded. Over age, damaged, or otherwise unusable materials therefore are periodically destroyed. This practice has continued since about 1957. In 1985, personnel constructed a new demolition area, more controlled than the original area.

The original area consisted of a hole in the ground about 5 feet deep and four feet in diameter, into which a used metal 55-gallon drum was placed. The current facility consists of a 5 foot deep hole that is four feet square, and lined with concrete blocks and steel plates; a 55-gallon drum is placed vertically over a 2 foot square steel pan that is 3 inches deep.

In 1982, a year taken as typical, the following ordnance components were destroyed at NWIRP Calverton: initiators - 400, squibs - 400, cartridges - 50, lines - 3,000, mode select - 150, connectors - 1,500, flares - 40, and miscellaneous items - 800 (safe/arms, gas generators, manifolds, tranfers, pin pullers, signals, cutters, igniters, rocket motors, and breakwires).

Personnel destroy the ammunition in the following manner. The explosive material is taken to the Ammunition Demolition Area (Site 3) centrally located between Route 25, Line Road, Swan Pond Road, and Wading River Manor Road. About 1 to 2 gallons of waste fuel are released into the pan and ignited. Fuel is subsequently forced into the pan to maintain the fire. The explosives are then rolled down the pipe into the drum, and the heat from the fire detonates the material. It typically requires about 2 days to destroy a year's worth of waste explosives. The debris in the bottom of the hole, when cooled, is examined piece by piece to make sure that no "live" explosives remain. The debris then goes to the Salvage Storage Area (Site 9). Operations have remained unchanged over the years, excepting construction of the upgraded ammunition demolition facility in 1985.

Waste solvents (1,1,1-trichloroethane) and lubricants (silicone grease) are generated at the firing range. The waste is stored in 55-gallon drums which are removed about once a month by Facilities Maintenance Department personnel. Personnel transport the solvents to NWIRP Bethpage for temporary storage at the current Drum Marshaling Area, before contractor removal from the activity. These 1985 practices are considered to be representative of past operating procedures.

Waste ammunition was generated for a period of 1 to 1-1/2 years in 1953 when aircraft guns were being tested near the Compass Calibration Pads. Occasionally, live rounds of 20mm double-base propellant ammunition were tossed into a nearby pond area (Site 5, Ammunition Disposal Area) after testing. The volume of ammunition disposed of is unknown but considered to be less than 100 rounds. The ammunition was encased in brass cases with steel and zinc heads, which probably sank in the soft mud of the pond over the years. According to a Grumman memorandum from July of 1985, the area was surveyed with a metal detector, and no ammunition items were found.

5.4.5 Transportation Division. The Transportation Division at NWIRP Calverton is responsible for industrial equipment maintenance, aircraft towing, vehicle repair, and the operation of fuel facilities. Materials used in these processes include jet fuel, engine oil, hydraulic equipment oil, transmission oil, and gasoline.

Until about 1984, jet fuel was stored in 15,000 and 50,000 gallon underground tanks. A new one million gallon facility consisting of two 500,000 gallon above ground tanks was installed for additional jet fuel storage. In August 1986, tanks were tested for stability and leakage, and all 15,000 gallon underground tanks were taken out of service.

Waste oil was both transported in a bowser and hauled via truck to the Fire Fighting Training Area (Site 2), and stored for burning or vendor removal. Following the discontinuation of this practice, waste oils were stored in a 5,000 gallon tank for vendor disposal. This tank is located adjacent to the Sanitary Treatment Plant.

New oil is stored at the Transportation Division garages in 55-gallon drums. There is a 500 gallon underground fiberglass tank for waste fuel. Gasoline is stored in the same area in 10,000-gallon underground tanks.

All water and oil from the washbay of the maintenance facility goes to an underground oil/water separation tank. Previously, all wash water went into an outside ditch located on the north side of the facility.

5.5 **GREAT RIVER, GRUMMAN PROPERTY.** Fifty-five-gallon drums of solvents are shipped in Grumman trucks from Grumman's Great River property to the current Drum Marshaling Area adjacent to Plant 03 at NWIRP Bethpage for storage prior to disposal. Process waste waters are shipped by tank truck for treatment at the Industrial Wastewater Treatment Plants located at Plant 02.

Wastes have been shipped from Great River to the current Drum Marshaling Area at NWIRP Bethpage (Site 9) since Great River's start-up in the early 1970s. Wastes include halogenated solvents and non-halogenated solvents, oil, methyl ethyl ketone, methyl isobutyl ketone, paint thinners, isopropyl alcohol, and 1,1,1-trichloroethane. Drum wastes shipped to NWIRP Bethpage from Great River are taken off-activity by private contractors. The quantities of wastes shipped to NWIRP Bethpage from Great River are insignificant compared to those generated at Bethpage itself.

CHAPTER 6. MATERIAL HANDLING: STORAGE AND TRANSPORTATION

6.1 NEW MATERIALS - NWIRP BETHPAGE.

6.1.1 Supply Storage. The NWIRP Bethpage warehouse orders materials based on a plant's purchase order, then stores the bulk order either in one of the warehouses or in the Barrel Storage Yard south of Buildings 15 and 20 when it arrives. Materials stored in the warehouses are trucked from there to shops upon request. The warehouses in the north complex (Numbers 4 to 9) were constructed in the 1940s. All of these buildings are used as warehouses except Number 6, which is used for subassembly manufacturing, and Number 9, which is used to cut sheet stock and to make extrusions. All buildings in the south complex (Numbers 11-19) are used for storage except for one section in which first cuts in round and square metal stock are made.

6.1.2 Chemical and Hazardous Material Storage. New chemicals have been stored at NWIRP Bethpage in the Barrel Storage Yard and at Warehouse 8 since the early 1950s. New liquid chemicals are stored in their original containers on wooden pallets that rest on the Barrel Storage Yard's uncurbed asphalt surface. Paints in drums and 5 gallon cans are stored in Plant 03 in the mixing area prior to distribution to Paint Shops. The Barrel Storage Yard was surfaced in the early 1980s. Previously, the barrels were stored on pallets resting on a soil surface at the same location. Reportedly, there have been no instances of spills or leaks of chemicals from the storage area.

New solvents, degreasers, acids, bases, metal conditioners, and stripping and cleaning agents for the Process Lines in Plant 03 have been stored in tanks located principally in or around Plant 03. According to the Environmental/Energy Survey of NWIRP Bethpage (NESO, 1976), the tanks are "extraordinarily reinforced." Underground tanks are diked at the transfer point; aboveground tanks are structurally reinforced. Tanks range in size from 500 to 10,000 gallons. The IAS team found no records of spills for the tanks located east of Plant 03, and personnel interviewed by the IAS team had no knowledge of leaks or spills from the tanks.

6.1.3 Petroleum, Oils, and Lubricants (POL's) Storage. Fuel oil and gasoline at NWIRP Bethpage are stored in underground and aboveground tanks located at various points on the activity. Tank characteristics are presented in Table 6-1.

6.1.4 Pesticide Shop. The pesticides and herbicides listed in Table 6-2 were stored at the Pesticide Shop during the IAS on-site visit. The shop is a wood-frame and metal structure used only for storage. All mixing is done in an outside mixing area. There are no drains in the mixing area. Spill equipment is located nearby. The volumes listed in Table 6-2 are about 20 percent larger than the amounts that were stored in 1971, the year Grumman personnel first began applying the chemicals themselves. Prior to 1970, the application of lawn care chemicals was subcontracted to local vendors. Since 1971, quantities of pesticides applied each year have remained about the same. New containers are transported by truck and are unloaded at the Pesticide Shop. Empty containers are removed from the Pesticide Shop by Facilities Maintenance Department personnel.

Table 6-1.

Petroleum, Oils, and Lubricants Storage
As of 1985, at NWIRP Bethpage, New York

Location	Fuel	No. of Tanks	Capacity (gals. total)	Fuel Use
South of Plant 03	#2 oil	1	8,000	emergency power
Plant 03	Diesel	1 (A)*	300	power generation
South of Plant 03	diesel	1	600	emergency power
Plant 03 Fire Pump	diesel	1 (A)*	300	power generation
Fire Pump House	#2 oil	1	3,000	
East of Plant 17	#4 oil	1	20,000	
East of Plant 03	diesel	2	600	
Near Scrap Sort Building	#2 oil	1	2,000	heating
Near Scrap Sort Building	#2 oil	2 (A)*	600	heating
Plant 10	diesel	1	600	
Plant 20	gasoline	series	10,000	pre-1970 vehicle fuel
			20,000	post-1970 veh. fuel
East of Plant 20	#4 oil	1	5,000	
West of Plant 03	diesel	1	600	fuel for well 9 pump
West of Plant 03	diesel	1	2,000	equipment fuel
IWTP	diesel	1	600	generator
IWTP	#2 oil	1	2,000	boiler

* A - aboveground; all other tanks are underground.

Table 6-2

Pesticides Currently Stored at Pesticide Shop, NWIRP Bethpage, New York.

Chemical	Percentage of Final Formula	Formulation	Amount
MCPP, 2, 4-D Dicamba	25	Emulsifiable Concentrate	104 gal.
Betasan 2E	20	Emulsifiable Concentrate	46 gal.
Amitrol	N/A	Emulsifiable Concentrate	42 oz.
Offanol	N/A	Granular	1,475 lbs.
Prometone	25	Emulsifiable Concentrate	671 gal.
Orthene	N/A	Wetable Powder	81 lbs.
Malathion	1	Emulsifiable Concentrate	2 gal.
Captan	1	Wetable Powder	11.7 lbs
Carbaryl	1	Wetable Powder	7.8 lbs.

N/A = Data not available.

6.1.5 Coal Storage. Coal was stored in a large open pile covering about 1/2 acre immediately north of Plant 10. Coal was brought onto the activity by train via a siding of the Long Island Railroad and was used to fuel boilers at Plants 02-05 in the period between 1942 and 1967. There was a cinder storage area just to the west of the coal pile. The coal storage yard has not been used since the start-up of the Steam Plant in 1967. (The coal storage yard is not considered a site because fuel-grade coal generally contains little soluble sulfur or other impurities that can enter solution and subsequently contaminate groundwater.)

6.2 NEW MATERIALS - NWIRP CALVERTON

6.2.1 Petroleum, Oils, and Lubricants Storage. At NWIRP Calverton, fuel is received and dispensed at the Fuel Depot. Since 1981, there are reports of 16 spills of POL's at NWIRP Calverton. Reportedly, information pertaining to spills that may have occurred prior to 1981 is unavailable, because spill records were not kept. According to Grumman memoranda, effective corrective action was taken regarding all of these spills.

6.2.2 Pesticide Shop. The pesticides (insecticides and herbicides) currently stored at NWIRP Calverton are listed, including volumes, in Table 6-3. They are stored in a wood-frame and metal shop with drains in the mixing area. Spill cleanup equipment is located nearby.

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The volumes listed in Table 6-3 are about 20 percent greater than the amounts that were stored in 1971, the year Grumman personnel first began applying the chemicals themselves. Prior to 1971, pesticides were applied by a private contractor.

New containers are transported to the area by truck and are unloaded at the Pesticide Shop. Empty containers are removed from the storage area by Facilities Maintenance Department personnel.

6.2.3 Gun Butt and Ammunition Storage and Demolition. The materials categorized as explosives (for example, cartridges and initiators) are stored in several locations at NWIRP Calverton; magazines at Buildings S-36 and 184 are used to store cartridges. Emergency kits and dye markers are stored at Building 165. Buildings 295, 293, and 294 are used to store escape systems, ammunition, and class B rocket motors, respectively. These materials have been stored at these locations as long as current personnel could recall. These materials are transported using the activity's explosives vehicle.

Table 6-3

Pesticides Currently Stored at Pesticide Shop,
NWIRP Calverton, New York

Chemical	Percentage of Final Formula	Formulation	Amount
Oftanol	N/A	Granular	780 lbs.
MCPP, 2.4-D Dicamba	25	Emulsifiable Concentrate	52 gals
Orthene	N/A	Wetable Powder	31 lbs.
Prometone	25	Emulsibiable Concentrate	195 gals.
Malathion	1	Emulsifiale Concentrate	3 gals.

N/A = Data not available.

Waste materials categorized as explosives are stored at the same facilities as new explosives (see section 6.2.3). The explosives are considered waste when their useful date has expired. Over-age explosives remain in the storage area until they are removed and taken to be destroyed. These materials are transported in the NWIRP Calverton explosives vehicle. Waste 1,1,1-trichloroethane and silicone grease are stored in a 55-gallon drum at the firing range. Facilities Maintenance Department personnel are responsible for transporting the drum from the firing range when it is full.

From 1957 to 1985, ammunition-related wastes were disposed of at Site 3, Ammunition Demolition Area. Wastes were destroyed by dumping them into a kettle fire, which caused them to detonate.

6.3 WASTE MATERIALS - NWIRP BETHPAGE. As of June 1985, the Facilities Maintenance Department has been responsible for pickup and storage of barreled wastes from production lines and production support functions. Collection stations for waste halogenated solvents are located at Plants 03 and 10. Waste solvents accumulate at these locations in drums marked for trichloroethylene, methylene chloride, trichloroethane, and freon. Filled drums are moved to the main Drum Marshaling Area. (The main Drum Marshaling Area is located inside a building in the Salvage Storage Area, Site 9, and has been located there since 1982; however, since this is a current operation, it is not considered part of Site 9.) The Drum Marshaling Area discussed here has been in operation since 1982; construction on the Drum Marshaling Area was initiated in 1981, it became an active facility in 1982, and in 1983 construction ended when a roof was installed. Prior to 1982, three other Drum Marshaling Areas were used as waste collection points at the activity; these are discussed in greater detail in section 6.3.1.

At present, there are six collection stations for non-halogenated solvents, all of them around Plant 03. Non-halogenated solvent wastes consist mainly of ketones containing paint pigments. They are transported and stored on the activity in the same way as the halogenated solvents, and are sold to solvent reclamation firms for use as fuel. Prior to collection by the vendor, these wastes are stored at the main Drum Marshaling Area. Reportedly, there are no reported leaks or spills of wastes from the main Drum Marshaling Area.

Waste quantities passing through the main Drum Marshaling Area are listed in Table 6-4.

Waste concentrates from various processes are pumped directly from the process tanks to waste concentrate transfer tanks, where they are held for up to 3 days. The wastes are then pumped into trucks for treatment by Grumman for off-activity removal by industrial waste reclaimers. At NWIRP Bethpage, there are six waste concentrate transfer tanks of about 10,000-gallon capacity, and two additional tanks of 5,000-gallon capacity. The tanks are both aboveground and underground. All tanks are dedicated to Plant 03. Individual tanks may contain nitric deoxidizer, chromic acid, sodium hydroxide, nitric, sulfuric, or hydrofluoric acid, and alkaline cleaners and alodine solvents.

Table 6-4

Annual Quantities of Wastes Handled by the Main Drum Marshaling Area, NWIRP Bethpage, New York, 1982-1985

Waste Type	Constituents	Waste Quantities Handled (Gallons per Year
Type 1	motor oils*, greases hydraulic oils, mineral oils, kerosene, naptha, gasoline, alcohols, MIL-C-38736 cleaner, Ultrasene PC-63, Penetone TPC, toluene, xylene, Varsol	80,000
Type 2	methylethyl ketone, acetone methyl isobutyl ketone	4,000
Type 3	crystal cut	1,000
Type 4	trichloroethane, methylene chloride, perchloroethylene, trichloroethylene, all freons	20,000
Type 5	brush alodine, chemicals from photo labs, x-ray developers and duplicators	1,000
Type 6	CEE BEE C-50, dirty paint thinners	9,000

*Major constituents

6.3.1 Former Drum Marshaling Areas. There are three former outdoor Drum Marshaling Areas at NWIRP Bethpage. Areas 1 and 2 are located east of Plant 03, and comprise Site 7; see section 2.3.2.1. The third area, located north of Plant 03 in the Salvage Storage Area, is part of Site 9; see section 2.3.2.3.

Each of the three areas is 100 feet by 100 feet and has a capacity of 200 to 300 barrels. The locations, bottom material on which the barrels rested, and dates of operation of each of the Drum Marshaling Areas are listed in Table 6-5. The IAS team's visual inspection revealed no evidence of leakage at any of the three former Drum Marshalling Areas. However, aerial photographs taken during dates of operation reveal disturbed and stained soils at all three areas.

Waste materials stored at each area included halogenated and non-halogenated solvents, oils, and small quantities of cadmium rinse waters. From the early 1950s to 1974, cadmium wastes containing cyanide were stored at Drum Marshaling Area 2.

6.3.2 Salvage Storage Area. The Salvage Storage Area at NWIRP Bethpage has been located just to the north of Plant 03 since the early 1950s. The area is under the supervision of warehouse operations personnel. The Salvage Storage Area, along with Drum Marshaling Area 3, comprises Site 9.

Since 1966, the Salvage Storage Area has been located to the north of the area east of the warehouses; it occupied the entire area east of the warehouses and south to the Salvage Warehouse (Building 21) prior to 1966. The area that is no longer part of the Salvage Storage Area is now paved and is used as a parking lot; paving occurred prior to 1966, and reportedly no cleanup was performed prior to paving.

At the time of the IAS site visit in 1985, the north end of the Salvage Storage Area contained large aircraft components. Retired vehicles and stationary equipment, including small, non-PCB transformers and batteries awaiting sale to off-activity scrap or used equipment dealers, are stored south of this aircraft scrap. There is no evidence that these transformers and batteries were emptied of their contents during storage. During the IAS on-site visit, the area at the north end of the Salvage Storage Area was stained with dark spots of various sizes, indicating numerous oil spills. The spots ranged from 2 to 10 feet in diameter. Reportedly, results of soil sample tests performed by Grumman in 1984 showed that oil stains were superficial.

Areas along the south fence are dedicated to storage of scrap metal. Each month, the activity generates 60,000 pounds of aluminum scrap, 120,000 pounds of light iron, 200,000 pounds of heavy iron, and 25,000 pounds of kirksite (a lead-based material used for dies, shims, and filler). All of this scrap metal is brought to the Salvage Storage Area before being sold to an off-activity contractor. The yard also has a titanium turnings shed, a covered three-sided structure where titanium turnings are stored. The turnings, about 5,300 pounds per month, are also sold to an off-activity contractor. Cutting oil dripping from the turnings drains from the cutting

Table 6-5

Active Years of Former Drum Marshaling Areas
at NWIRP Bethpage, New York

Area	Location	Base Material	Years Active
1*	east of Plant 03	concrete pad	1978-1982
2*	east of Plant 03	cinder pad	1969-1978
3 **	north edge of Salvage Storage Yard	cinder pad	early 1950s - 1969

* These two former Drum Marshaling Areas comprise Site 7.

** This former Drum Marshaling Area comprises part of Site 9.

baskets and runs across the concrete floor to a grated drain connected to a catch tank. Facilities Maintenance Department personnel periodically empty the catch tank and prepare the oil for off-activity disposal. Reportedly, this has been the case for as long as personnel can remember.

A major change that has occurred in Salvage Storage Area operations since early in the activity's history is the extensive paving of the area east of Building 21. Otherwise, salvage operations have apparently continued with little change.

Mixed scrap metal is brought to the Scrap Sorting Building (a small covered structure located just west of Building 21) for sorting prior to being stored in the Salvage Storage Area. The Scrap Sorting Building served as the construction shack for Plant 03 in 1942 before it was converted to its present use.

6.3.3 Solid Waste. Solid waste at NWIRP Bethpage is separated for recycling purposes. The non-recyclable, burnable wastes are hauled off-activity. Non-recyclable, non-burnable wastes are also hauled off-activity. Garbage in barrel or dumpster units is also hauled away by private contractor. Materials sold for recycling include aluminum, iron and steel, titanium, plastic, X-ray film, wire, and computer cards. These practices have continued unchanged since early in the activity's history.

6.3.4 Waste Oil Storage. Waste oil at NWIRP Bethpage Plant 03 is stored in two underground tanks. A 2,500-gallon tank installed in 1980 is located in Plant 03 and stores waste cutting oil. The other tank is located at the Industrial Wastewater Treatment Plant, also at Plant 03; it has a 4,000-gallon capacity and was installed in 1982. Transportation Plant 20 has three buried waste tanks (550-gallon capacity) and one 1,000-gallon buried waste tank. The tanks are emptied on an as-required basis by a private contractor.

6.4 WASTE MATERIALS - NWIRP CALVERTON.

6.4.1. NWIRP Calverton Hazardous Waste Storage. Since 1975, waste solvents generated at NWIRP Calverton have been placed in containers for shipment to NWIRP Bethpage. Prior to 1975, waste solvents were mixed with waste oil and fuel and placed in waste oil tanks located around the activity. Tanks currently used for the storage of waste oil and fuel are listed in Table 6-6. Apparently, no records regarding the fate of these materials prior to 1975 were maintained, and personnel were unaware of past hazardous waste disposal practices.

About 1,000 to 2,000 gallons per month of oil are used in fire rescue exercises held at Site 2, Fire Rescue Training Area. Fire training exercises have continued since early in the activity's history; present quantities of fuel burned during these exercises are considered representative of quantities used in the past. The remaining volume of waste oil is trucked off the activity by private vendors.

Table 6-6
Characteristics and Locations of Waste Oil Storage Tanks
at NWIRP Calverton, New York

Tank No.	Location	Oil Type	Capacity (gallons)	Above or Below Ground	Year Installed
06-1	Rescue training	Waste Oil	1,000	above	1984
06-11-5	E-Fuel Test Lab.	Waste Oil	550	below	1983
06-11-7	G-Fuel Test Lab.	Waste JP5	550	above	1978
06-11-8	H-Fuel Test Lab.	Waste Oil	2,000	below	1980
06-16-7	G-Fuel Calibration	Waste 1010	5,000	below	1980
06-16-8	H-Fuel Calibration	Waste Oil	1,500	above	1980
06-42-1	Transportation	Waste Oil	550	below	1980
06-43-3	C-STP-C	Waste Oil	6,000	above	1984
06-74-1	Machine Shop	Waste Oil	550	below	1983
20-01-7	Fuel Depot	Misc. Oil	550	below	1968
20-01-8	Fuel Depot	Misc. Oil	550	below	1968
20-01-9	Fuel Depot	Misc. Oil	550	below	1968

Fifty-five-gallon drums of other waste material (which may include methyl ethyl ketone, paints, phenolics, and 1,1,1-trichloroethane) are placed in barrels on the concrete aprons immediately outside generating shops to await pickup by Facilities Maintenance Department personnel. This practice has been in effect since at least 1980. Personnel carry the drummed waste to an uncurbed area just north of Building G23 for storage prior to removal by a contractor. The waste storage area was blacktopped in 1980. Reportedly, there have been no reported instances of spills or leaks from the hazardous waste storage areas.

CHAPTER 7. WASTE PROCESSING

7.1 NWIRP BETHPAGE.

7.1.1 Plant 03 Industrial Wastewater Treatment Plant. The Industrial Wastewater Treatment Plant (IWTP) at Plant 03 was completed in 1984. It is designed to treat up to 250,000 gallons per day of waste rinse waters containing metals, hexavalent chromium, and phenols. The facility is also designed to treat concentrates from the metal-finishing baths containing hydrofluoric acid, sulfuric acid, nitric acid, phosphoric acid, high-concentration hexavalent chromium solutions, and alkaline cleaners. Wastewaters are pumped directly to the IWTP from Plant 03; they are also transferred by tank truck from Plant 03. IWTP includes a fluoride and metal precipitation process, a chromate treatment process, and a neutralization process. The treatment process for Plant 03 includes an ion exchange recovery process for concentrated chromic acid. This process produces usable chromic acid from the chromic acid anodize bath at the expense of producing some additional acidic waste.

Sludges produced from waste treatment are conditioned with lime and polymers before vacuum dewatering. The dewatered sludge is collected in a dumpster for removal by an outside contractor.

Treated wastewater from Plant 03's IWTP is discharged to the Nassau County sewer system.

Prior to hookup with the new IWTP, Plant 03 sent concentrated industrial waste (17,000 gallons/week) derived from wastewater to a licensed vendor for disposal. Dilute rinse waters (1,850,000 gallons per week) were discharged to groundwater recharge beds. Remaining wastewater (an estimated 100,000 gallons/week), such as zyglo waste, and metal-finishing chemicals were transferred off-activity by Grumman for chromate treatment. These operations continued from the early 1950s to 1984. Only non-contact cooling waters are now discharged to the groundwater recharge basins.

Plant 03's domestic waste is discharged to the Nassau County sewerage system.

7.1.2 Sludge Drying Beds for Plant 02 IWTP. Plant 02 is not on Navy property. However, sludge from the Plant 02 IWTP was dried in Sludge Drying Beds located on Navy property at NWIRP Bethpage prior to 1980.

The sludge from Plant 02 is handled in the same manner as the Plant 03 sludge. It is conditioned, dewatered, and dried. This sludge is subsequently stored at the IWTP in Plant 02 prior to off-activity removal. The Plant 02 IWTP is not located on Navy-owned property. However, the Sludge Drying Beds comprise part of the area of Site 8, and are on Navy property at NWIRP Bethpage.

7.1.3 Sanitary Wastes. Sanitary wastes are accepted by Nassau County sewage system interceptors, or are directed to septic systems near certain buildings. Table 7-1 lists which plants are served by these alternatives. Prior to hookup with Nassau County sewage interceptors, Plant 03 and Plant 21 sanitary wastes were treated in septic systems located east of Plant 03, in the area of Site 7. Sanitary wastes from Plants 10, 18, and 20 were also served by septic systems prior to tie-in with the Nassau County sewer system.

7.1.4 Solid Waste. All solid wastes at NWIRP Bethpage are separated for recycling purposes. Any non-recyclable, burnable wastes are removed off-activity. Similarly, all non-recyclable, non-burnable wastes are removed off-activity. Garbage disposed of in barrels and dumpsters is also hauled off-activity by a private contractor.

Materials separated and sold for recycling include aluminum, steel, iron, titanium, plastic, film, and wire.

These current solid waste disposal practices are considered representative of practices dating from the early 1950s. However, the reported recovery of film for recycling did not begin until about 1967.

7.2 NWIRP CALVERTON.

7.2.1 Industrial Waste Treatment Plant. The Industrial Waste Treatment Plant (IWTP) went into operation as a prototype facility in 1978, and became fully operative in mid-1979. Prior to this date, all industrial waste water generated at NWIRP Calverton was shipped to NWIRP Bethpage for treatment.

The IWTP provides pretreatment for about 2,000 to 3,000 gpd of industrial wastewaters before release to the sewage treatment plant (STP). The wastes treated at IWTP are generated by the paint shops, paint stripping shop, and the photo lab. The treatment process consists of phenol destruction and chrome reduction, floculation with lime and precipitation of the floc with Nalco polymer. Prior to release to the STP, the IWTP effluent is tested for concentrations of cadmium, phenols, chromium (total and hexavalent), silver, cyanide, lead, zinc, fluoride, pH, and total organic carbon.

Before the IWTP went into service, wastes from the paint shops and paint stripping shop were trucked to NWIRP Bethpage. Reportedly, paint sludges have always been trucked to NWIRP Bethpage.

7.2.2 Waste Oil and Solvent Recovery. Waste oil and fuels including crankcase oil, hydraulic fluids, and aviation fuels (JP-5 and JP-4) are put into various waste oil storage tanks to await either pickup and off-activity removal by a private contractor or portage to the fire tank at the Fire Rescue Training Area (Site 2).

Table 7-1

Sanitary Sewage Treatment at NWIRP Bethpage, New York

Plant or Building	Date of Tie-in to Nassau STP*	Septic System
Plant 03	1983	-
Building 4	1978	-
Building 5	na.	+
Building 6	1976	-
Building 7	1982	-
Building 8	1980	-
Building 9	1976	-
Plant 10	1975	-
Building 12	na.	+
Building 13	na.	+
Building 14	1975	-
Building 18	ca. 1980	-
Building 19	na.	+
Building 20	1980	-
Plant 20	1976	-
Building 21	1983	-

\+ Indicates that wastes from this Plant or Building are treated at the septic system

\- Indicates that sanitary wastes are not treated in septic systems

na. Indicates that this Plant or Building is not hooked into the Nassau County sewage treatment facilities, and is served by a septic system

*STP - Sewage Treatment Plant

About 1,000 to 2,000 gallons of waste oil per year are brought to the fire tank at the Fire Training Area in bowsers and a truck for fire training exercises. The 1,000-gallon fire tank that stores oil for the exercises was constructed in 1984 with a concrete base and bermed perimeter. It replaced a 6,000-gallon tank located near the Fire Rescue Training Area.

Since 1980, waste oil and solvent recovery procedures at NWIRP Calverton have included the following: recycling and off-activity removal by private vendors, incineration at the Fire Rescue Training Area, and removal to NWIRP Bethpage. Prior to 1980, some solvents were mixed with the oil wastes; but these mixtures were also disposed through incinerator at the Fire Rescue Training Area, or off-activity. Since 1980, oils and solvents have been managed separately and taken to NWIRP Bethpage.

7.2.3 Sewage Treatment Plant. The Sewage Treatment Plant (STP) at NWIRP Calverton is designed to treat 62,000 gallons per day of domestic sewage, boiler blowdown water, and pretreated industrial wastewater. The STP began operations in 1970; before 1970, wastes were treated by septic systems. The plant treats sewage by extended aeration and activated sludge process with no primary settling. The treated effluent is discharged to McKay Lake, which drains off the activity. About 20,000 gallons per month of sludge from the STP and septic tank cleanout are trucked to a municipal landfill.

The STP serves all plants at NWIRP Calverton except the following: Plant 08; the guard house; the noise check building; the flight emergency building; the Navy shack; the flight shack; the engine run-up area; the training building; the picnic area; gun buts; and the anechoic chamber. These are still served by septic systems or cesspools. The septic tanks and cesspools are pumped and the sludge is trucked to the Riverhead Landfill.

CHAPTER 8. DISPOSAL SITES AND POTENTIALLY CONTAMINATED AREAS

A total of nine potentially contaminated disposal sites have been discovered at NWIRP Calverton and NWIRP Bethpage, New York. Six disposal sites are located at NWIRP Calverton (Figure 8-1); three are located at NWIRP Bethpage (Figure 8-2). These sites were found through inspections of the activities, including aerial photos (see Appendix A) and ground reconnaissance, and through interviews with Navy and Grumman personnel.

8.1 NWIRP CALVERTON SITES

8.1.1 Site 1, Northeast Pond Disposal Area. The NWIRP Calverton Northeast Pond Disposal Area (Figure 8-3) is located in the northeastern portion of the activity at coordinates K20 on the General Plan. The Northeast Pond Disposal Area is marked as "Spoil Area" in the wooded area 1,000 feet south of Middle Country Road (Route 25) and 5,000 feet east of the north gate of the activity.

Review of aerial photographs taken in 1947 indicated that the disturbance associated with the disposal area predates Navy acquisition of the land in 1952, and subsequent development of the activity. The photographs also show that the area was active more or less continuously from 1947 through about 1984.

The top surface of the NWIRP Calverton Northeast Pond Disposal Area is a terrace, elevated about midway up the slope of a small hill of unconsolidated sand and gravel. A small pond (approximately 1-1/4 acres) lies at the base of the hill. There is no surface water outlet for the pond. The toe of the face of the land disposal area lies in the pond. From the terrace level, the unconsolidated sand and gravel deposits of the small hill had been excavated, presumably for cover material for the land disposal site and also possibly for borrow material for other locations on the activity. The borrow activities were not extensive, based upon the remaining topographic patterns. A through-going entrance road had been established to provide access to the disposal site. This roadway had been carefully graded, suggesting more than casual use of the site in the past. Vehicular access to the site is presently limited by tree-trunk pole barriers across the access roadway. "NO DUMPING" signs are posted at the main access point.

In plan view, the disposal area skirts the side of the small hill of sand and gravel, forming the base for approximately one-half of the width of the terrace (50 feet). Additionally, a single lobe extends southeasterly into the western portion of the small pond. This lobe is approximately 175 feet across and extends about 200 feet into the area of the small pond.

The surface of the terrace was approximately 15 to 20 feet above the water elevation at the time of the on-site visit. The water depth was estimated to be approximately 2 feet, suggesting that the thickness of the disposed material is approximately 20 feet. With a total acreage of approximately

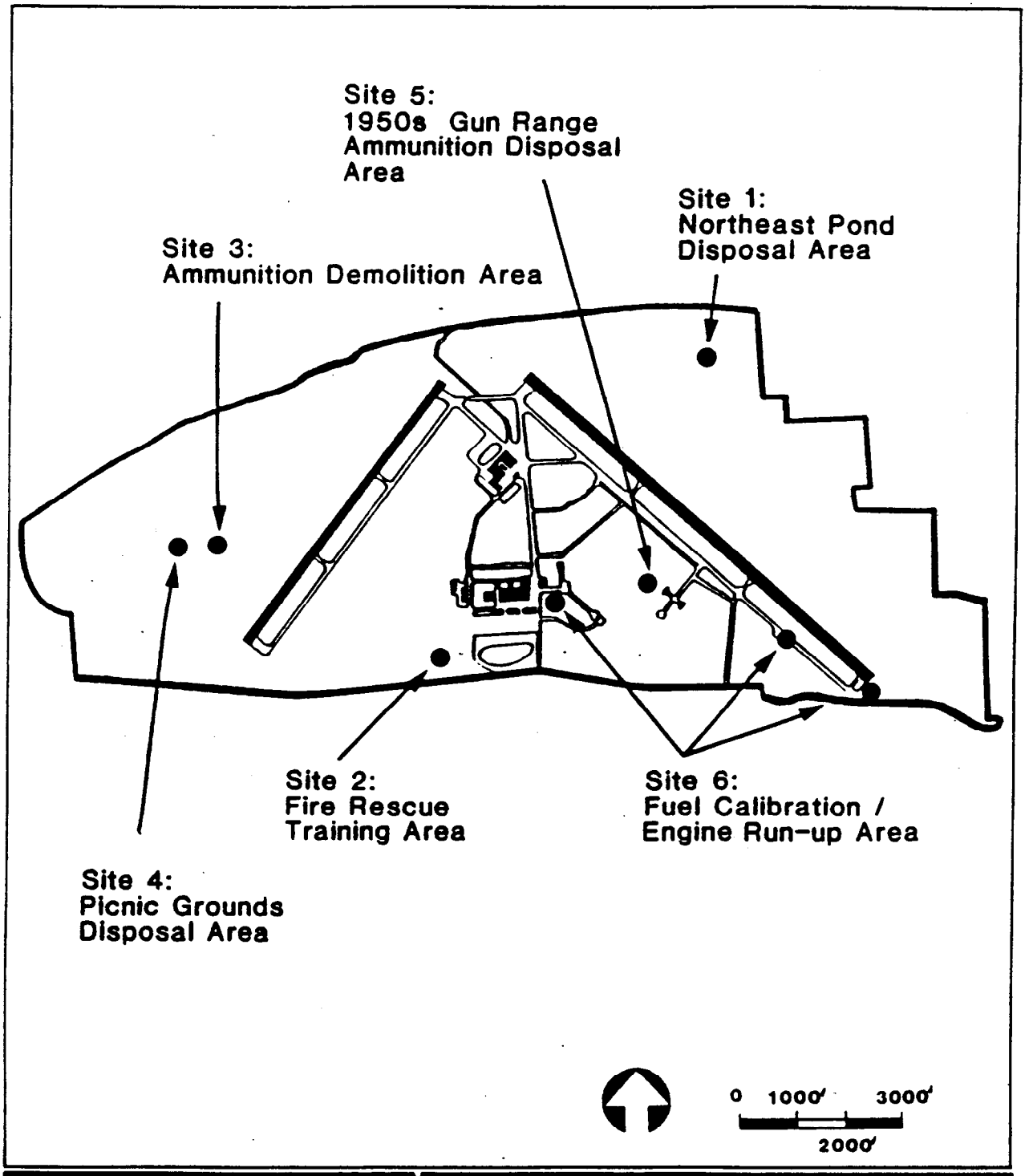

Figure 8-1

Six Potentially Contaminated Disposal Sites, NWIRP Calverton, New York

Initial Assessment Study
Naval Weapons Industrial Reserve Plant
Bethpage and Calverton
Long Island, New York

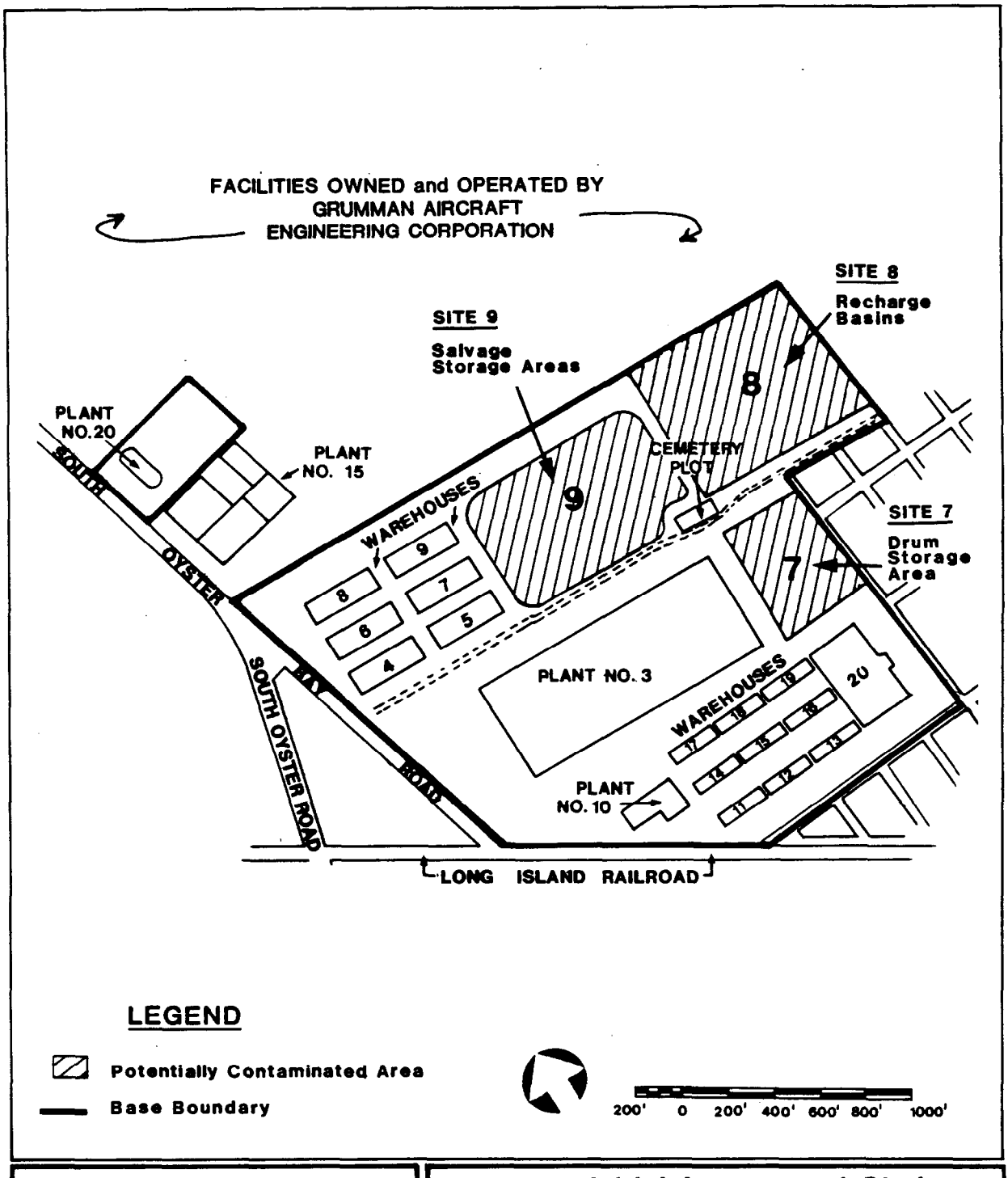

Figure 8-2

Three Potentially Contaminated Disposal Sites, NWIRP Bethpage, New York

Initial Assessment Study
Naval Weapons Industrial Reserve Plant
Bethpage and Calverton
Long Island, New York

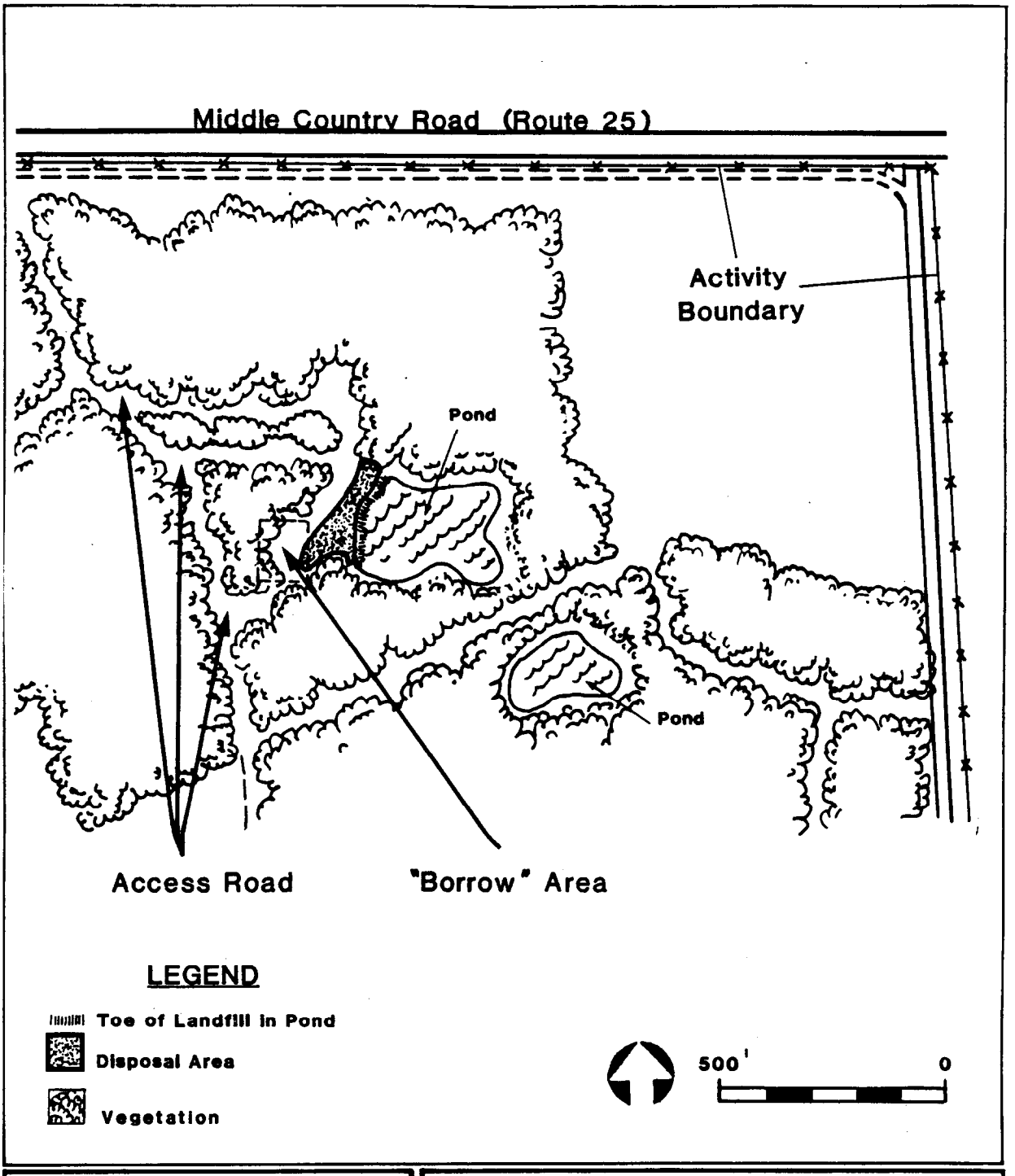

Figure 8-3

Site 1, Northeast
Pond Disposal Area, NWIRP
Calverton, New York

Initial Assessment Study
Naval Weapons Industrial
Reserve Plant
Bethpage and Calverton
Long Island, New York

1/4 acre, the estimated volume of the site is 7,500 cubic yards of debris and cover material.

The site lies in a remote location on the activity, on the northern side of the runways. Most industrial activity is concentrated south of the runways. The Electronic Counter Measures (ECM) building is located near the disposal site.

Additional roadways providing vehicular access to the disposal site were completed by 1957. By 1961, the disturbed area had expanded significantly, and disposal included a lobe-like extension into the pond, on the southern end of the disposal area. This expansion occurred on the western side of the pond. By 1963, the disposal area extended into the pond along the entire western side. Excavation into the sand bank continued along with the westward expansion of the disposal (disturbed) area.

According to the aerial photos taken in 1966, a large number of debris piles of approximately dump truck size were found in the southwest corner of the pond. The water level in these photos appears to be very low and there is evidence of fresh disposal of dark-colored materials on the face of the western shoreline slope. Judging by the level of disturbance of the area, the site was active, and still expanding.

Continued evidence of disturbance (and implied activity) in this area is seen in the 1969, 1971, and 1974 photographs. By 1974, the disposal area was notably larger than it had been in the past. Lack of vegetation supports the interpretation of continued activity in this area. In 1980 photographs, the disposal area is significantly larger than it was in 1974. The large lobe of waste on the western side of the pond was developed by this date. The total area disturbed at this time is the largest seen in any of the photographs.

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During the IAS on-site helicopter overflight on June 1, 1985, the IAS team observed at least two 55-gallon drums. They were situated in the pond, at the face of the disposal area. After the on-site IAS visit, these two drums were retrieved by a NWIRP Calverton contractor in the presence of a representative of the NAVPRO office and found to be empty. Several samples of the surface water in the pond were subsequently collected; none of the samples indicated the presence of significant concentrations of tested parameters (Appendix B, J. Ohlmann, personal communication, 1985).

None of the shops interviewed during the IAS visit used the NWIRP Calverton Northeast Pond Disposal Area. Its existence was not previously known by corporate environmental personnel. Therefore, it is difficult to determine the types of materials which may have been disposed of there.

The following types of disposed materials were observed during the IAS on-site visit: a cockpit portion of an aircraft fuselage fabricated primarily of aluminum and metal components; a large number of concrete columns; piles of asphalt macadam, plywood, and framing lumber; scraps of rusting metal parts. Most of the visible terrace surface was covered with

partially vegetated fill. Small and large gulleys were eroded into the surface near the face of the disposal area, revealing the debris which lay underneath the surface. Some debris lay partially submerged in the pond water (Figure 8-4).

Examination of the slopes along the northeastern entrance road to the site revealed the hulks of several 5-gallon pails and numerous 1-gallon paint pails, some with portions of the labels intact. Some cans contained small amounts of paint residue. Other debris included asphalt debris from roadway paving, concrete debris, quart-sized cans of indeterminate purpose, tires, and wooden pallets. Most items were in an advanced state of decay.

8.1.2 Site 2, Fire Rescue Training Area. The NWIRP Calverton Fire Rescue Training Area (Figure 8-5; coordinates M18 on the General Plan), has been used exclusively by the fire fighters at NWIRP Calverton since creation of the activity in 1952. Reportedly, the Fire Rescue Training Area was originally formed by the banking of site soils into a bermed training ring; this method of construction suggests that the training ring was unlined. Prior to the IAS team's on-site visit, the original fire fighting ring had been destroyed. Other fire training rings at Navy activities are characteristically 20 feet in diameter and about 1 foot deep.

For training exercises, this ring was partially filled with water and a layer of fuel was floated on top of the water. This fuel layer was ignited to provide fire fighting practice. An estimated 450 gallons per year of solvent (including toluene, methylethyl ketone, and lacquer thinner) were disposed of in this manner from 1953 to 1975. An estimated 1,500 to 2,000 gallons per year of waste fuel oils were mixed with the disposed solvents and burned at the site. Since 1975, all solvents have been disposed of off-activity by a contracted waste disposer, and have therefore not been used for fire training exercises. Reportedly, since 1975 personnel have burned only clean (unmixed) fuel, from the defueling of aircraft, in fire training exercises.

At times, sections of derelict aircraft or other simulations of aircraft cockpits were used to train fire fighters in rescue procedures. Fire fighting materials used at the NWIRP Calverton Fire Rescue Training Area included "light water" or Aqueous Fire Fighting Foam (AFFF), Halon 1301 (a gas), water, and dry chemical extinguishers.

Reportedly, at the end of each exercise period, any fuel remaining in the training ring would be burned off.

In 1982, a valve was left open on a 6,000-gallon underground oil supply tank at the Fire Rescue Training Area. An unknown amount of the oil used for the training exercises was discharged to the environment during this accident. The tank was not believed to be full to capacity at the time of the spill.

Figure 8-4

Debris at Exposed Face
of Site 1,
Northeast Pond Disposal Area,
NWIRP Calverton, New York

Initial Assessment Study
Naval Weapons Industrial
Reserve Plant
Bethpage and Calverton
Long Island, New York

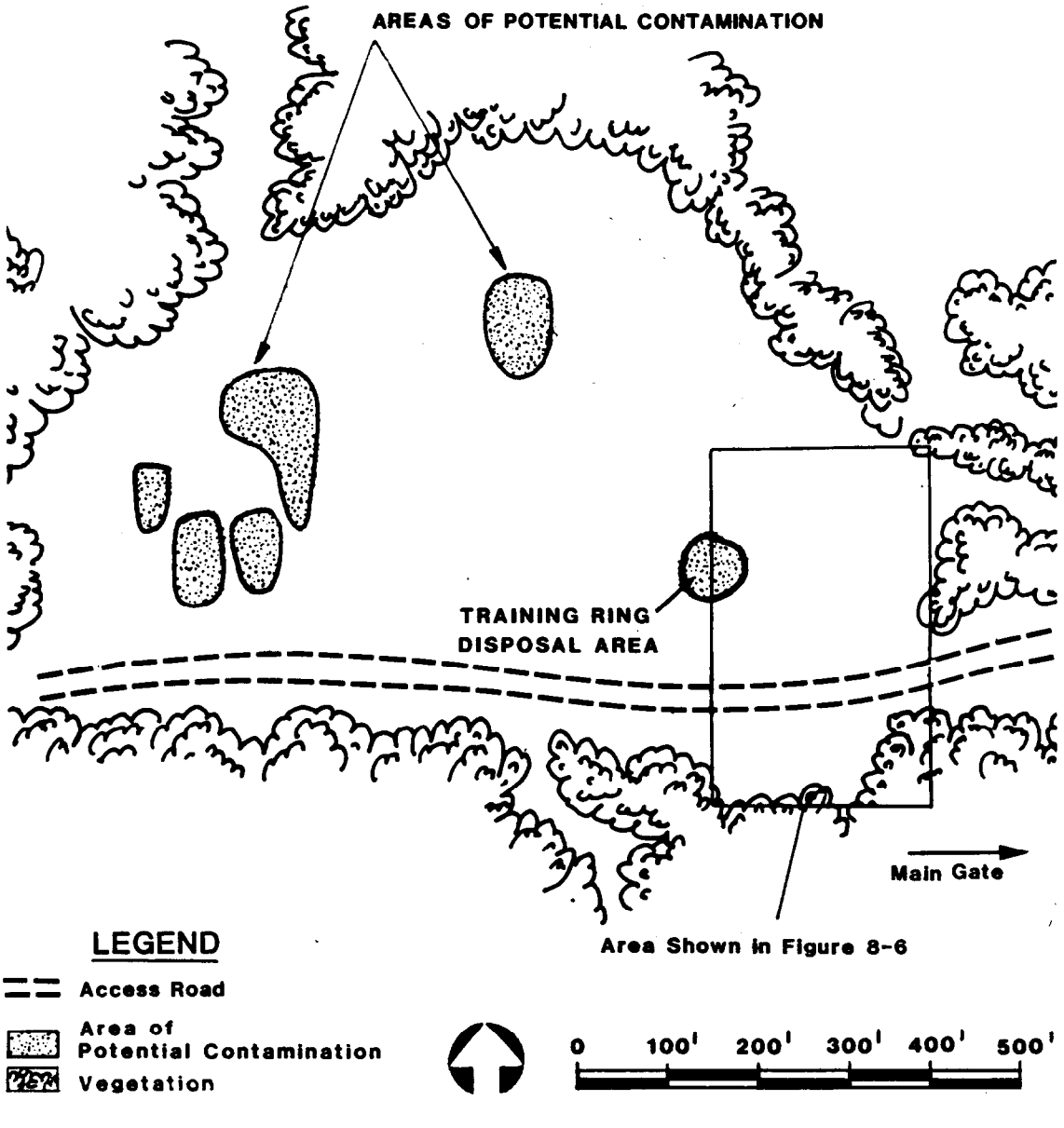

Figure 8-5

Site 2, Fire Rescue
Training Area
NWIRP Calverton, New York

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The same year, four monitoring wells were constructed to determine the effects of the spill, and fire rescue training was discontinued for a period of 2 years. The memorandum also states that the four wells installed in 1982 were tested, and that two of them showed signs of contamination.

As a result of the 1982 spill, the entire Fire Rescue Training Area was upgraded. Concrete berms were installed to contain the oil and water used in the training exercises. The piping was modified to prevent spills and a direct line was installed between the storage tank and the training area. It was during this time that the underground 6,000-gallon tank was removed and replaced by the aboveground 1,000-gallon tank. Training resumed in May of 1982.

In 1983, seven additional monitoring wells were installed at the Fire Rescue Training Area (Figure 8-6) to evaluate the environmental effects of a spill from another storage tank maintained at the Fire Rescue Training Area. Malfunction of a valve resulted in the spillage of approximately 300 gallons of #2 fuel oil from this tank. The spill occurred in 1983.

The following observations summarize the analysis of aerial photographs of Site 2. In 1957 photographs, the area 300 feet north of the present Fire Rescue Training Area had recently received a large volume of fill, possibly from the excavation of McKay Lake. In 1963 photographs, the area northwest of the Fire Training Area had been disturbed and cleared of vegetation, exposing unvegetated sand. At least one large item (an aircraft fuselage) was located in this area. Several large unidentifiable items and two rectangular areas are seen in the 1966 photographs. The rectangular areas may have been training pits, as they appear to contain fluids. The area had a similar appearance in photos taken in 1967 and 1969. In 1971 photos, several square impoundments filled with very dark liquids appeared. Several other small rainwater impoundments were also seen at the site. The 1974 photographs illustrate a similar situation. In the last set of photographs, taken in 1980, the recent improvements to the training ring can be observed. In the same set of photos, a dark soil stain is evident 200 feet to the west of the training ring. The circular stain appears to be approximately 40 feet in diameter.

Throughout the series of aerial photographs examined, activity continued along the western boundary of the area which had been filled in the 1957 photographs. Part of the area northwest of the filled area may have also received debris for disposal.

Grumman Aerospace Corporation has made inert demolition debris from NWIRP Calverton available to shoreline communities for use as shorefront riprap in the past. Some of this material was stored at the western end of the Fire Rescue Training Area in the past. Some inert demolition debris is presently stored there. Hazardous wastes potentially present at the site include POL's, toluene, and methylethyl ketone and soluble leads from gasoline burned during the exercises.

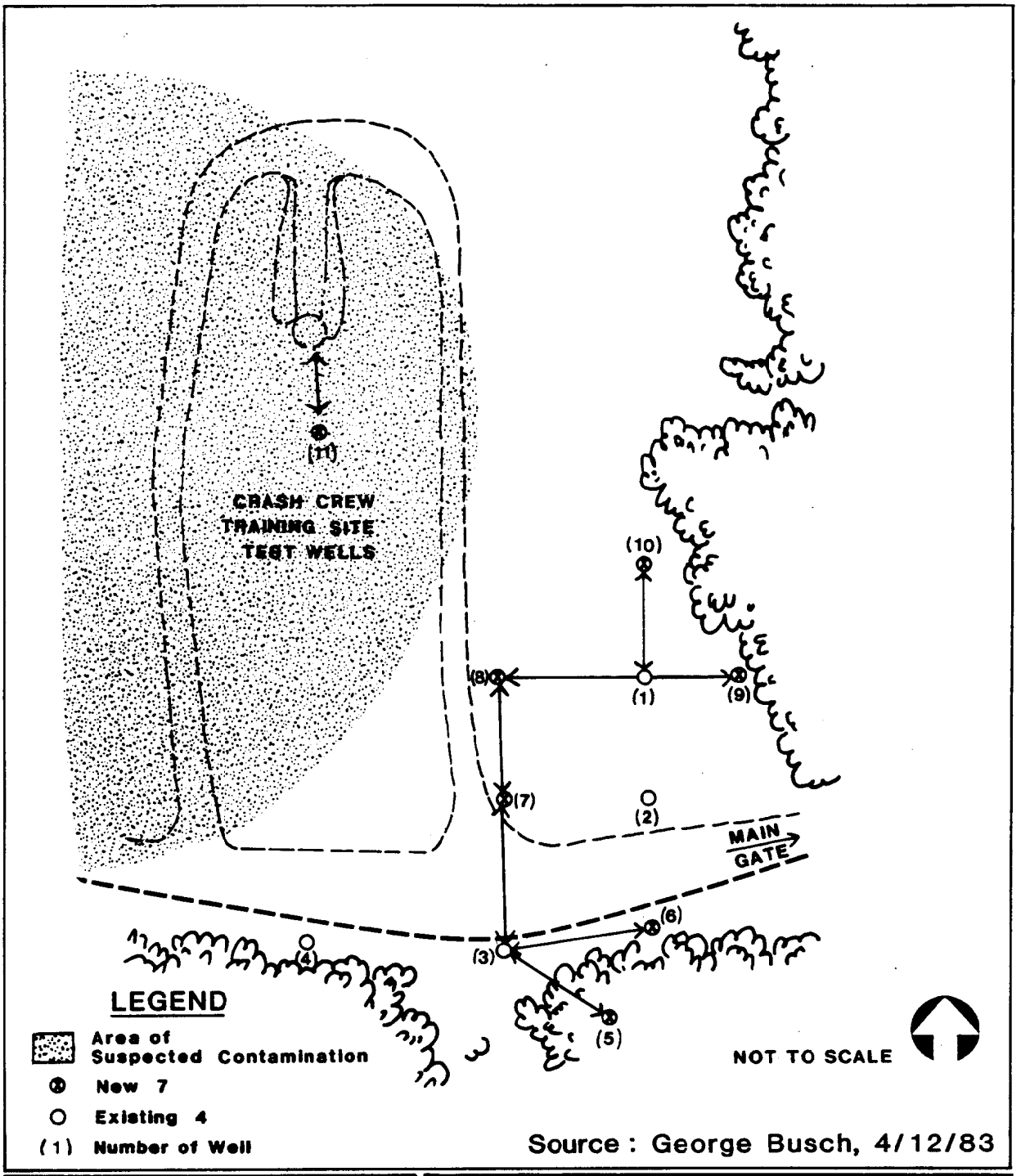

Figure 8-6

Seven Additional Monitoring Wells, Site 2, Fire Rescue Training Area, NWIRP Calverton, New York

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8.1.3 Site 3, Ammunition Demolition Area. Demolition of ammunition-related wastes (misfired rounds of explosive components from the Gun Butt) was conducted at NWIRP Calverton from 1957-1985. This work was carried out in a relatively remote section of the activity 1,600 feet northwest of Runway 5-23, and 1,700 feet southwest of the picnic grounds (Figure 8-7).

Following is a description of the process used to destroy these ammunition-related waste.

A 4-foot-square pit approximately 5 feet in depth was excavated in the sandy soils, with a chute leading into it from above. This chute led from a protected structure which would be manned by the personnel performing the demolition. A steel pan was used to contain a fire in the bottom of the pit and to support a 55-gallon drum used as a receptacle for the metal debris that resulted from the controlled detonation of the ammunition, which was fed into the chute and down into the fire, where it exploded.

A clear area approximately 200 feet in diameter was constructed by scraping the surface soils and vegetation from the area surrounding the demolition pit. These soils were stockpiled at the site. They are currently stored in 3-foot-high windrows along the southern and western borders of the area.

Solid wastes generated at this location were examined after destruction and removed for off-activity disposal. These wastes included the spent shell casings and metal portions of other rounds and items which were handled at this site. In 1985, approximately 1,700 explosive components and signal flares were disposed of at NWIRP Calverton; this number is considered representative of ordnance disposal rates for the past 3 years.

Some residues of the fuel oil (JP-4 and JP-5) used to destroy the explosive components, and some residues of the explosive and combustible portions of the items treated, may not have been removed. This material may remain in the soil of the site. Chemicals of concern would include the fuel and/or solvents used to support the combustion process and chemicals associated with the propellants, pyrotechnics, and explosives contained in the explosive components. These chemicals characteristically include TNT residues, phenolics, hydrazine, mercury, or lead.

The first aerial photographs in which the NWIRP Calverton Ammunition Demolition Area appears were taken in 1971. This is the first time the extensive ground clearing is seen in this area. Photos taken in 1969 (the most recent taken before 1971) show no evidence of the demolition area. The area appears approximately the same in 1974 photographs, with a small structure also apparent. By 1980, the area appeared much the same as before, with some light vegetation growing in the formerly cleared areas. Two rectangular areas north of the demolition area also show up for the first time in the 1980 photographs. There is no demonstrated connection between these latter rectangular areas and the demolition area.

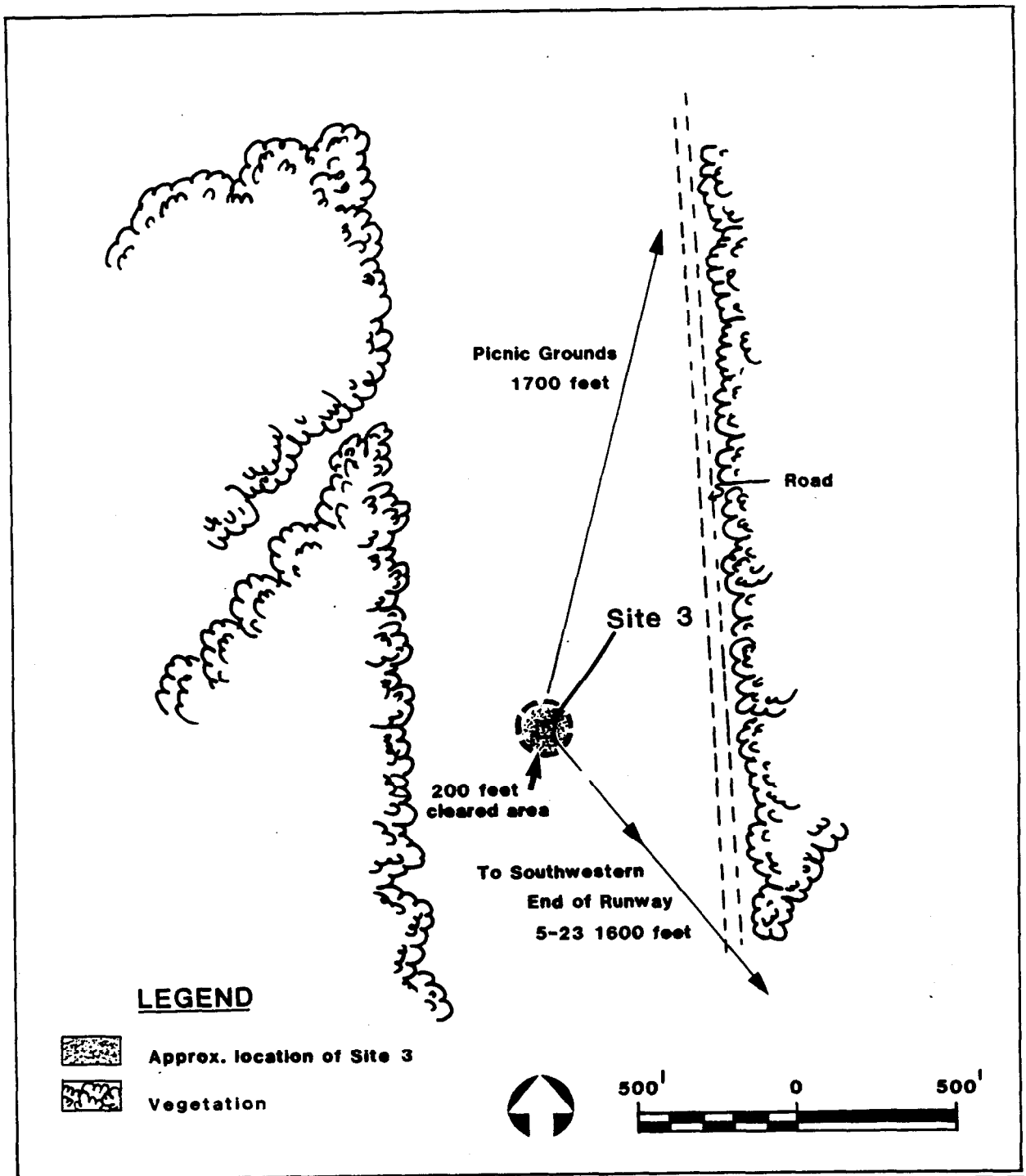

Figure 8-7

Site 3, Ammunition Demolition Area, NWIRP Calverton, New York

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The NWIRP Calverton Ammunition Demolition Area was a low-volume facility; an estimated 1,700 rounds per year of ammunition were disposed of there by activity personnel. The waste load disposed of at this site was limited to the waste generated at the Gun Butt facility (including Buildings 208 and 209). No ordnance items from outside the activity were accepted for processing. The waste load handled at this site was dependent upon the rate at which rejects were generated and was somewhat dependent upon the production schedule at the activity (both the rate of production and the mix of aircraft).

8.1.4 Site 4, Picnic Grounds Disposal Area. The NWIRP Calverton Picnic Grounds Disposal Area is located north and west of the runways and about 500 feet west of Site 3, Ammunition Demolition Area (Figure 8-8). It is secluded from the rest of the activity, and is accessible only by a road which passes the picnic grounds and continues across the field containing the Ammunition Demolition Area. The site is a single trench, about 60 feet long and 40 feet wide, which is cut into the edge of a heavily wooded area. During the IAS on-site visit, there was some disposed material in the trench that was clean of rust and weathering effects. This suggests that recent disposal had occurred during the period 1984 - 1985. Examination of aerial photographs indicates that the area has been an active disposal site since 1947, which was prior to Navy acquisition of the property. The maximum volume of material believed to have been disposed of at this site is approximately 500 cubic yards, assuming that the average depth of buried material is 8 feet.

None of the shops at NWIRP Calverton indicated that they had ever disposed of materials at the Picnic Grounds Disposal Area. It is isolated from public access. Examination of aerial photographs of the site shows that the period of disturbance of that area dates to the mid-1950s. The freshness of the topmost materials and lack of weathering effects on those materials, however, suggests that the disposal occurred within the last year (period 1984-1985).

The NWIRP Calverton Picnic Grounds Disposal Area is located on the edge of a wooded parcel which extends roughly 2,500 feet west of this remote site to the activity boundary. In 1947 aerial photographs, the area is visible as a small clearing on the edge of the woods, near a five-unit group of what appear to be residences (which were subsequently removed). The area was located at the junction of a road which skirted the woods and the road which served the residences. By 1961, this area was enlarged and the buildings had been removed. The area remained unvegetated and about the same size through 1974, at which time photographs show it to have been slightly enlarged again. Photographs taken in 1980 indicate little change from the 1974 dimensions, including little or no vegetation added. The conclusion is that the area was active throughout the Navy ownership of the property.

Materials disposed of included framing lumber (painted like the rides and shelters found at the picnic grounds), snow fencing, steel wall studs such as those used in commercial construction, steel stairways and ladders like those used to service aircraft, tubular towbars, tubular steel supports,

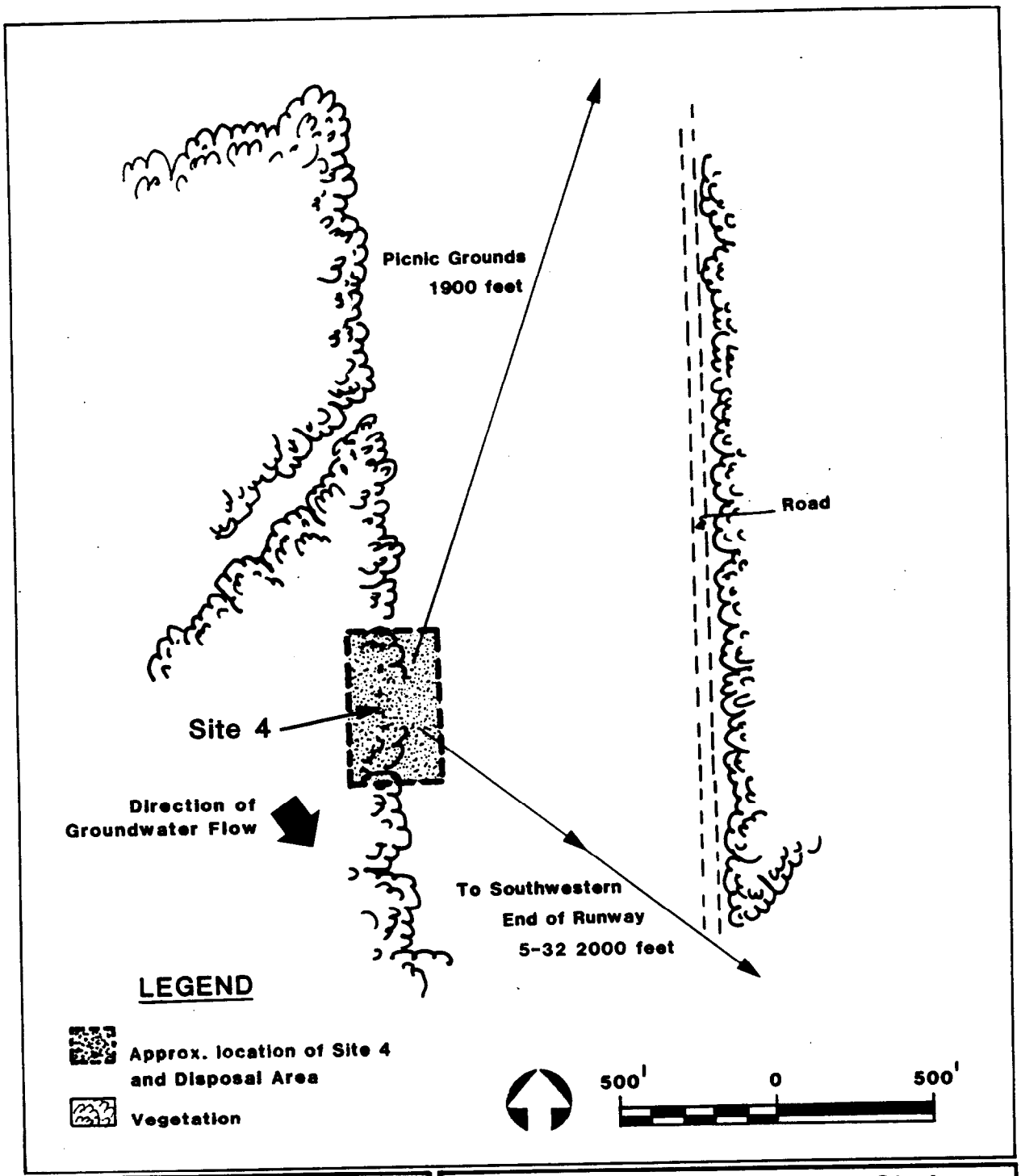

Figure 8-8

Site 4, Picnic Grounds Disposal Area, NWIRP Calverton, New York

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Naval Weapons Industrial Reserve Plant
Bethpage and Calverton
Long Island, New York

foam billets, a plastic nosecone, a card table, stainless steel fabrications, wall panels sections, plywood, concrete demolition material, carpeting, cardboard, and picnic table leg sets. Most of this material was found at a "face" of the disposal site, which suggested that other material may have been buried there earlier. No cans, barrels, or other containers which may have held liquid wastes were observed at the site during the IAS on-site visit. Reportedly, no records of shop usage exist for this site.

No specific chemical contaminants have been identified at this site, a finding based solely upon the materials which have been observed at the surface. Unknown and unseen chemical disposal which may have occurred at this uncontrolled disposal site may contribute contaminants to the the subsurface.

All of the area where material may already have been buried was supporting at least one season's growth of vegetation at the time of the on-site visit. Several piles of apparently clean fill material were also present at this site.

8.1.5 Site 5, 1950s Gun Range Ammunition Disposal Area. The earliest operations at NWIRP Calverton included testing of aircraft armament. In the early 1950s, the guns and airborne cannon were tested before installation into the production aircraft. An informal testing range was thus established east of the main industrial complex. Reportedly, 20-millimeter ammunition was the predominant type tests.

The test area is located between the present Radio Noise Check Area and the Engine Run-Up Area and the Engine Test House (Figure 8-9). The area is presently wooded and contains several ponds. During the operation of the 1950s Gun Range Ammunition Disposal Area, a small stream and pond existed in this area. Aerial photographs taken in 1957 show that the drainageway had filled, apparently naturally.

Reportedly, personnel used the range for 1 to 1-1/2 years, until about 1953, when other facilities were built. Presently, no buildings, earthen ramparts, or other structures suggest the range's existence; extensive grading of the area also obscures the exact location of this operation.

Reportedly, some of the ammunition which was used during the testing of the guns and cannon did not fire. Some of this ammunition was disposed of in a drainage area immediately west of the test range. In January and May of 1986, the area was scanned with a metal detector; no ammunition items were detected.

8.1.6 Site 6, Fuel Calibration/Engine Run-Up Areas. Aircraft produced or refurbished at NWIRP Calverton receive pre-flight testing at the activity. This testing includes testing of the fuel delivery system and of the engine at operating speeds for a period long enough to ensure that these systems are airworthy. Sometimes when the fuel systems are first pressurized, fuel leakage occurs from fittings and tubing aboard the aircraft.

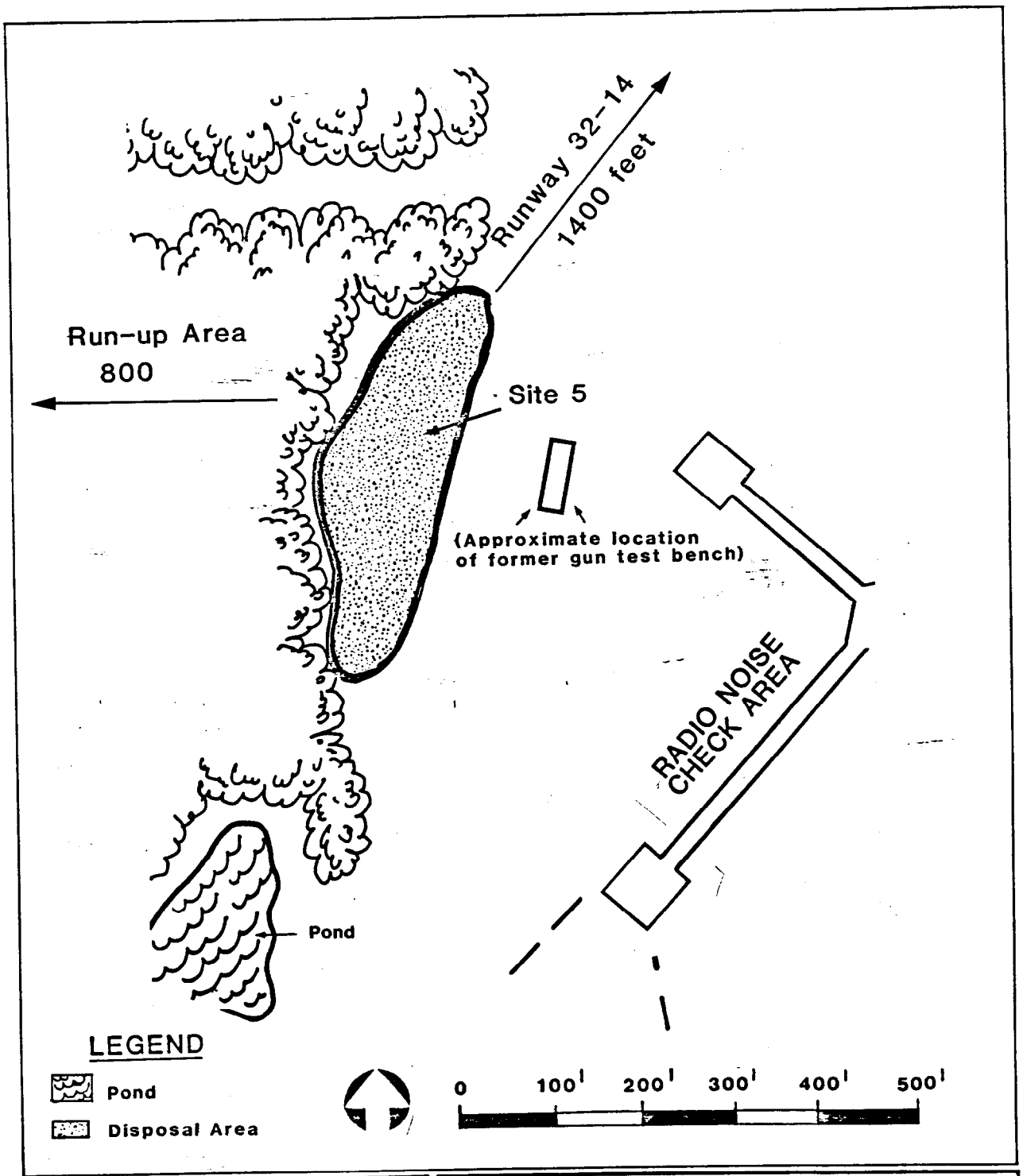

Figure 8-9

Site 5, 1950s
Gun Range Ammunition
Disposal Area, NWIRP
Calverton, New York

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Recent records indicate that three spills have occurred at the Fuel Calibration/Engine Run-Up Areas. On February 24, 1983, about 30 gallons of JP-5 fuel washed onto the ground at the Engine Run-Up Area. On February 9, 1982, roughly 200 gallons of JP-4 fuel spilled at the Engine Test House. On November 28, 1984, an unknown quantity of an oil-water mixture spilled at the Fuel Calibration Area. In each of the above instances, the contaminated soil was removed, and, in the case of the February 1982 spill, an absorbent was also used to contain the spill. Only records of recent spills are available, because prior to 1981 spill records were apparently not kept.

There are five areas (Figure 8-10) at NWIRP Calverton where personnel have performed pre-flight testing and which may be, or may have been, subject to fuel spillage. Three of the areas are in the industrialized section of the activity: one at the Engine Test House, one at the Engine Run-Up Area, and another at the Old Fuel Calibration Pad. The other locations include the discontinued engine run-up apron area along Runway 32-14 and the taxiway at the southeast end of Runway 32, where aircraft were prepared for their initial flights. All of these locations are outdoors.

Aerial photographs taken through 1980 of the Engine Test House and the end-of-runway locations indicate vegetative stress. The stress patterns coincide with aircraft queuing and engine run up areas. There is no conclusive evidence that the vegetative stress was caused by anything but aircraft exhaust.

8.2 NWIRP BETHPAGE SITES

8.2.1 Site 7, Former Drum Marshaling Areas. Waste management at the Grumman Corporation facilities on Long Island (Bethpage, Calverton, and an electronics plant at Great River) included marshaling wastes at the Navy-owned portion of NWIRP Bethpage for eventual removal off-activity by contractors.

Two former Drum Marshaling Areas are identified in this area, according to an earlier report filed by Grumman with the Solid Waste Branch of the United States Environmental Protection Agency (USEPA) (Ohlmann, 1985). From 1969 to 1978, the drums collected by Grumman from its three facilities were stored on an approximately 100 by 100-foot area of the cinder surface immediately east of Plant 03 (Figure 8-11). In the report mentioned above, this area is referred to as Drum Storage Area No. 2. Storage of 200 to 300 drums at a time is acknowledged. It was also noted that from the early

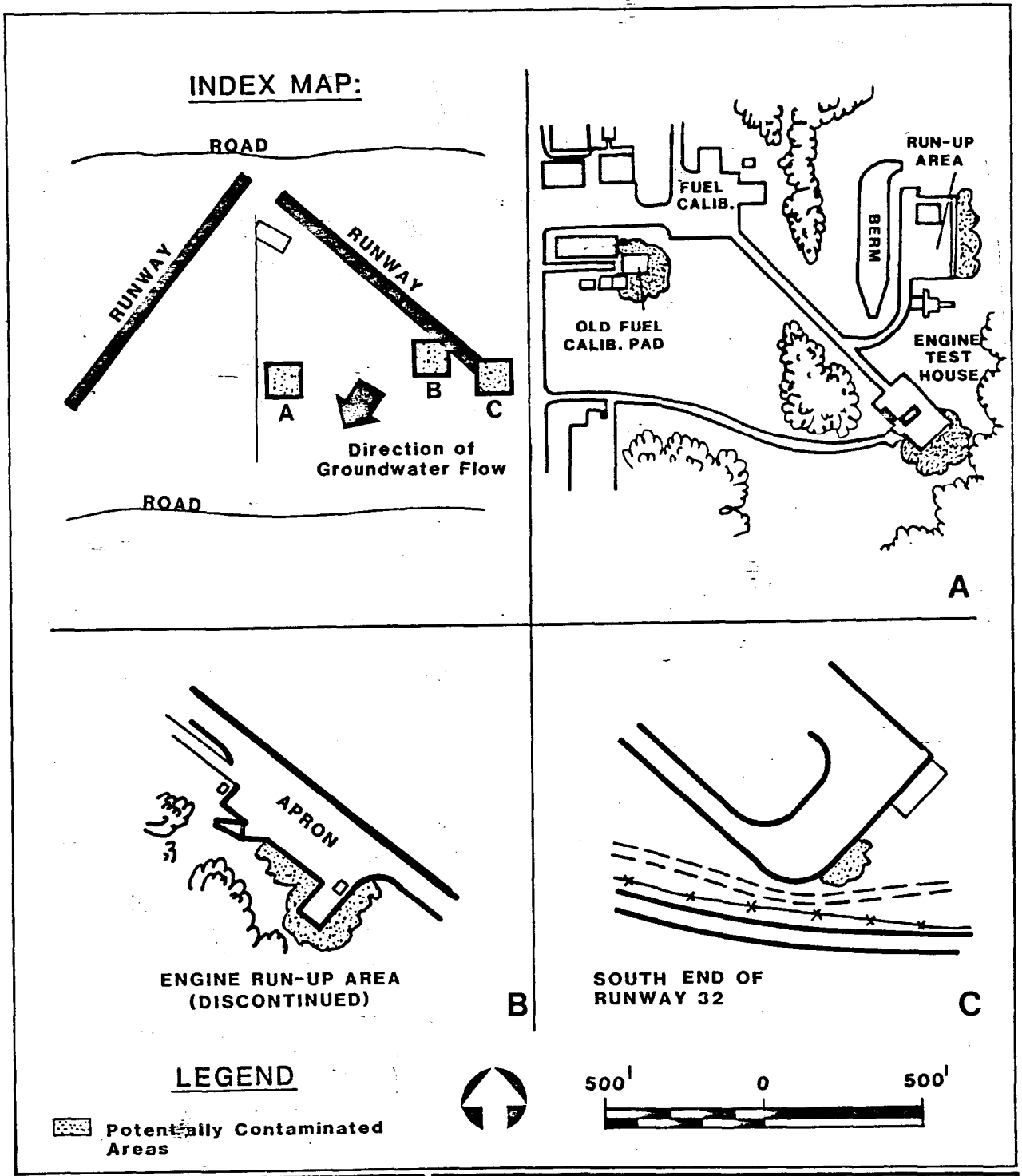

Figure 8-10

Site 6, Fuel Calibration/Engine Run-Up Areas, NWIRP Calverton, New York

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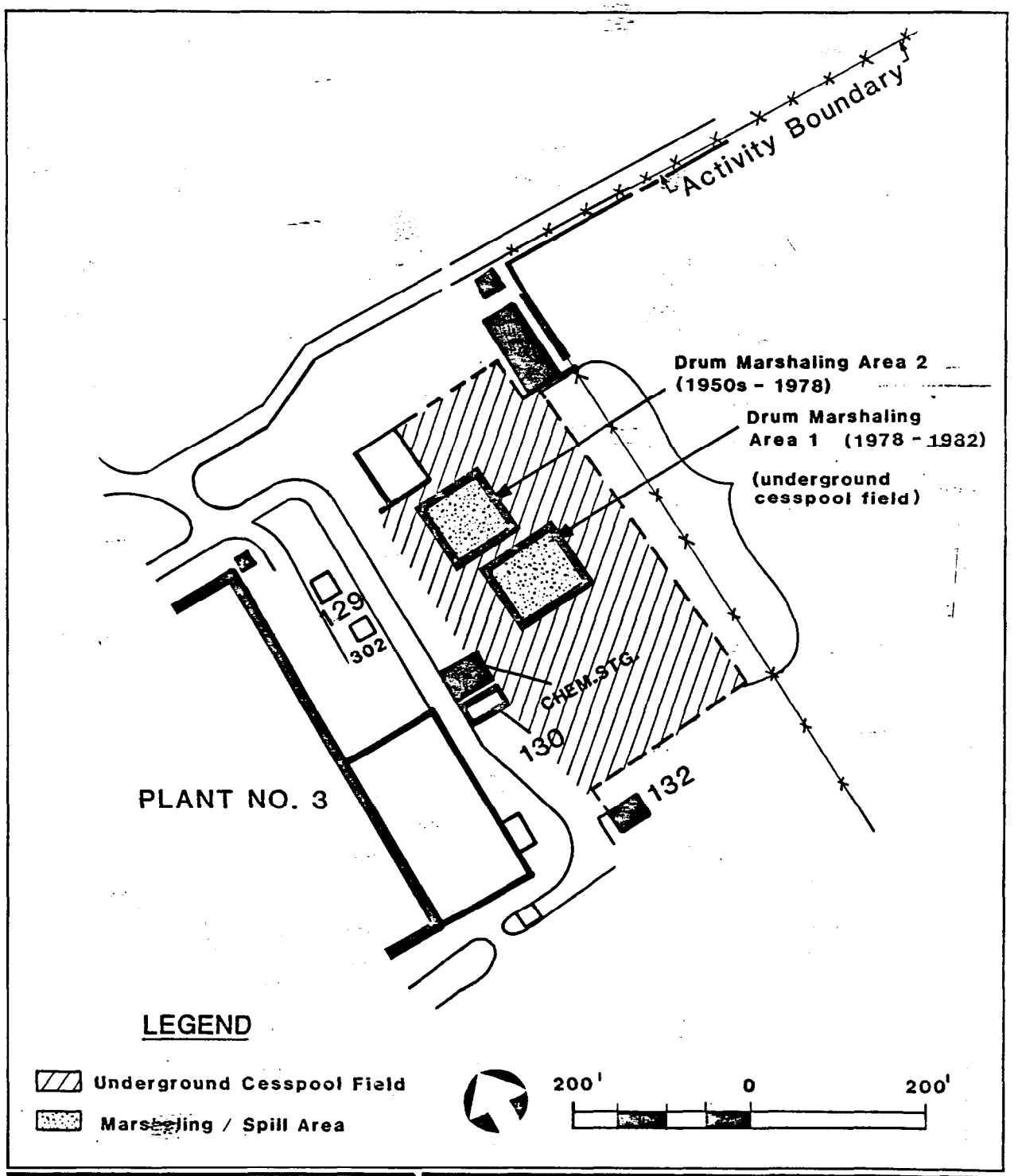

Figure 8-11

Site 7, Former
Drum Marshaling Areas,
NWIRP Bethpage, New York

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1950s to about 1978, this area was used for storage of drums containing liquid cadmium waste prior to treatment. Cyanide-containing wastes were also stored in drums at the site during these years.

An adjacent area (Figure 8-11) was surfaced with a concrete pad in 1978 (Drum Storage Area No. 1, Ohlmann, 1985). This pad had no berms along its edges and was not covered. Some 200 to 300 drums at a time were stored on this pad. Use of this pad continued until late 1981 or early 1982.

Hazardous waste stored at Drum Marshaling Areas Numbers 1 and 2 included the following: waste halogenated solvents, waste non-halogenated solvents, and liquid cadmium waste. Table 6-4 describes the classes of drummed wastes generated and collected at the Grumman facilities.

8.2.2 Site 8, Recharge Basins. Two recharge basins existed at NWIRP Bethpage by 1953. As indicated by aerial photographs, a third basin located north of these was under construction by 1966. Figure 8-12 shows the site.

The following two paragraphs describe recent (prior to 1984) discharges to the recharge basins. Reportedly, prior to the construction and operation of the Industrial Wastewater Treatment Plant (IWTP) near Plant 03 in January 1984, non-chromated rinse waters from industrial processes were dishcarged to the recharge basins. These waters were contact rinse waters; that is, they came in direct contact with the chemicals used in the industrial processes during rinsing of the fabricated parts. Chemicals potentially present in the rinse waters include aluminum, nitric acid, phosphoric acid, and sulfuric acid. Rinse waters were reportedly discharged in accordance with a state discharge permit.

Some of the Plant 03 production lines which were discharged into the recharge basins on Navy property included: heat treatment quench waters, sulfuric acid anodize rinse waters, alkaline cleaner (phosphate silicate), rinse waters, and Desmut (nitric acid) rinse waters. Prior to 1974, when these rinse waters were dishcarged to the basins, the rinse water flows were perhaps five to seven times the present rate of 1.4 million gallons per week, resulting in significantly higher dilution rates. Reportedly, chemicals potentially present in the rinse waters include aluminum, nitric acid, phosphoric acid and sulfuric acid. Reportedly, no process tanks were ever discharged directly to the recharge basins.

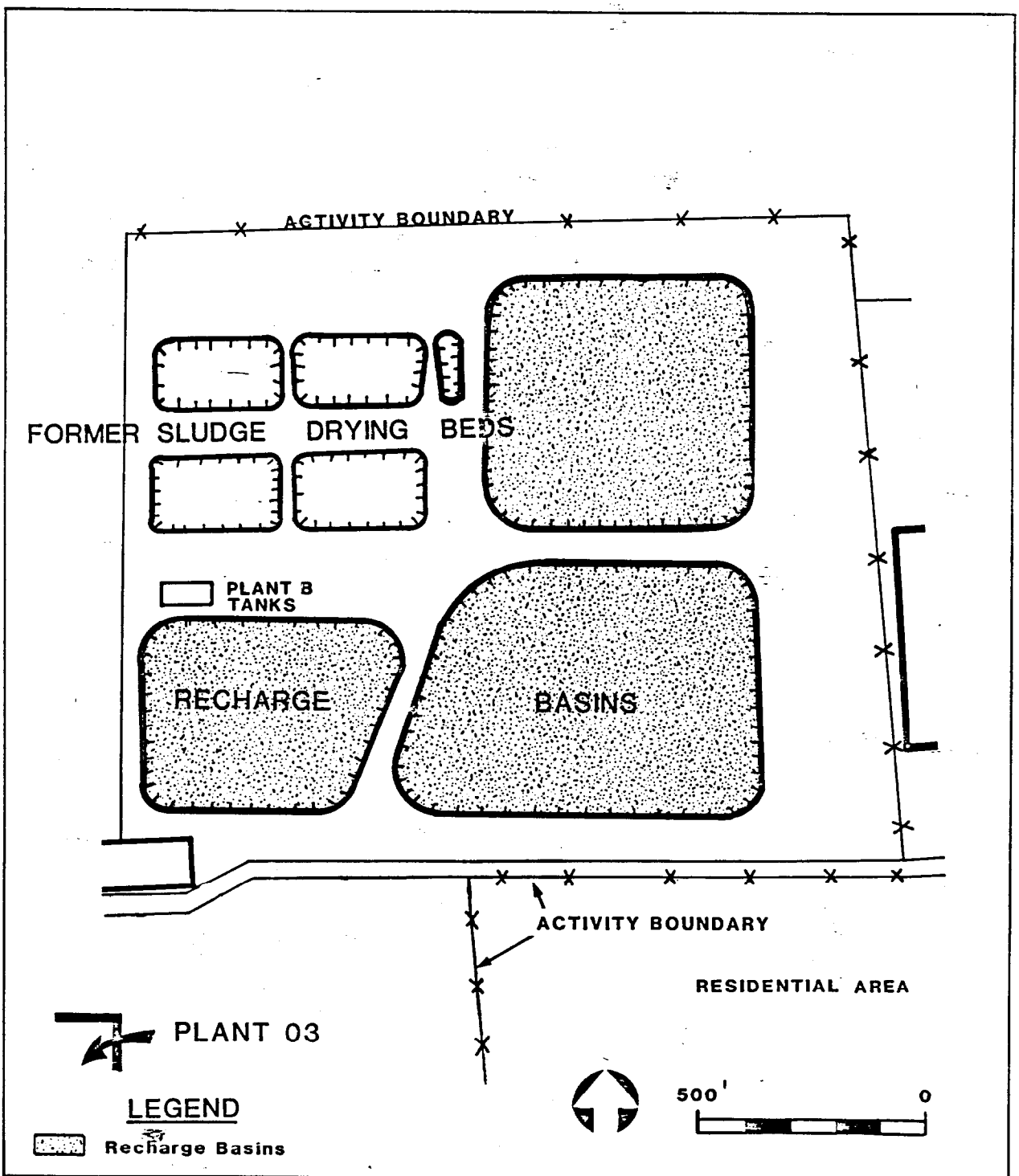

Figure 8-12

Site 8, Recharge Basins, NWIRP Bethpage, New York

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Prior to 1980 sludge from plant 02 and plant 03 was dried in sludge drying beds located adjacent to the groundwater recharge basins. Sludge from plant 02 is similar to the sludge from plant 03. Before being placed in the drying beds, the sludge from plant 02 and 03 were conditioned and dewatered. In 1980 the sludge drying beds were reportedly cleaned out.

At times in the past, chromium and cadmium waste streams entered the recharge basins, causing the Nassau County Department of Health to remark about concentrations in excess of allowable limits for hexavalent chromium (McCabe, 1956; see also Appendix C).

Since the completion of the Industrial Wasteswater Treatment Plant near Plant 03, all treatment effluents from Plant 03 have been discharged off-activity to the Nassau County wastewater treatment system. Since 1985, the only discharges from NWIRP Bethpage to the recharge basins are non-contact cooling water and runoff from paved parking lots and roadways. (Non-contact cooling water does not come in contact with chemicals used in industrial processes.)

8.2.3 Site 9, Salvage Storage Area. Since the early 1950's, personnel have stored aluminum and titanium metal scrap and shavings at the Salvage Storage Area prior to off-activity recycling. The scrap metals, along with cutting oil from the sumps from which the metals are collected, are carried to the area in porous-bottom containers by forklift. While the scrap metals are in storage, the oil may drip from the metal or be washed off by rainfall. Presently, a provision exists to collect the oil from the titanium cuttings. Cutting oil dripping from the turnings drains from the cutting baskets and runs across the concrete floor of the shed to a grated drain connected to a catch tank maintained by the Facilities Maintenance Deparmtent. Results of Grumman soil sample tests performed in 1984 reportedly showed no oil contamination at the site (NAVPRO, 1986). During the IAS on-site visit in 1985, small areas of oil drippings were observed. These were apparently also of a superficial nature and did not indicate site contamination.

Between 1953 and 1966, the Salvage Storage Area was reduced in area to accommodate parking. But between 1966 and 1974, additional storage area, north of the Salvage Storage Area and adjacent to the parking lot, was incorporated into the Salvage Storage Area.

In addition to the Salvage Storage Area, a Drum Marshaling Area (Drum Marshaling Area Number 3) existed in this area (see Figure 8-13). The area was approximately 100 by 100 feet in size, and its surface was covered with coal ash (cinders). Approximately 200 to 300 drums were stored in this area at one time. The area operated form the early 1950s through 1969.

Waste stored at Drum Marshaling Area Number 3 include paint waste halogenated solvents, and waste non-halogenated solvents.

Thus, the storage of wastes and recyclable materials at the Salvage Storage Area and at the Drum Marshaling Area Number 3 causes strong reason to believe that the following contaminants occur at Site 9: halogenated and non-halogenated solvents, oil, aluminum and titanium.

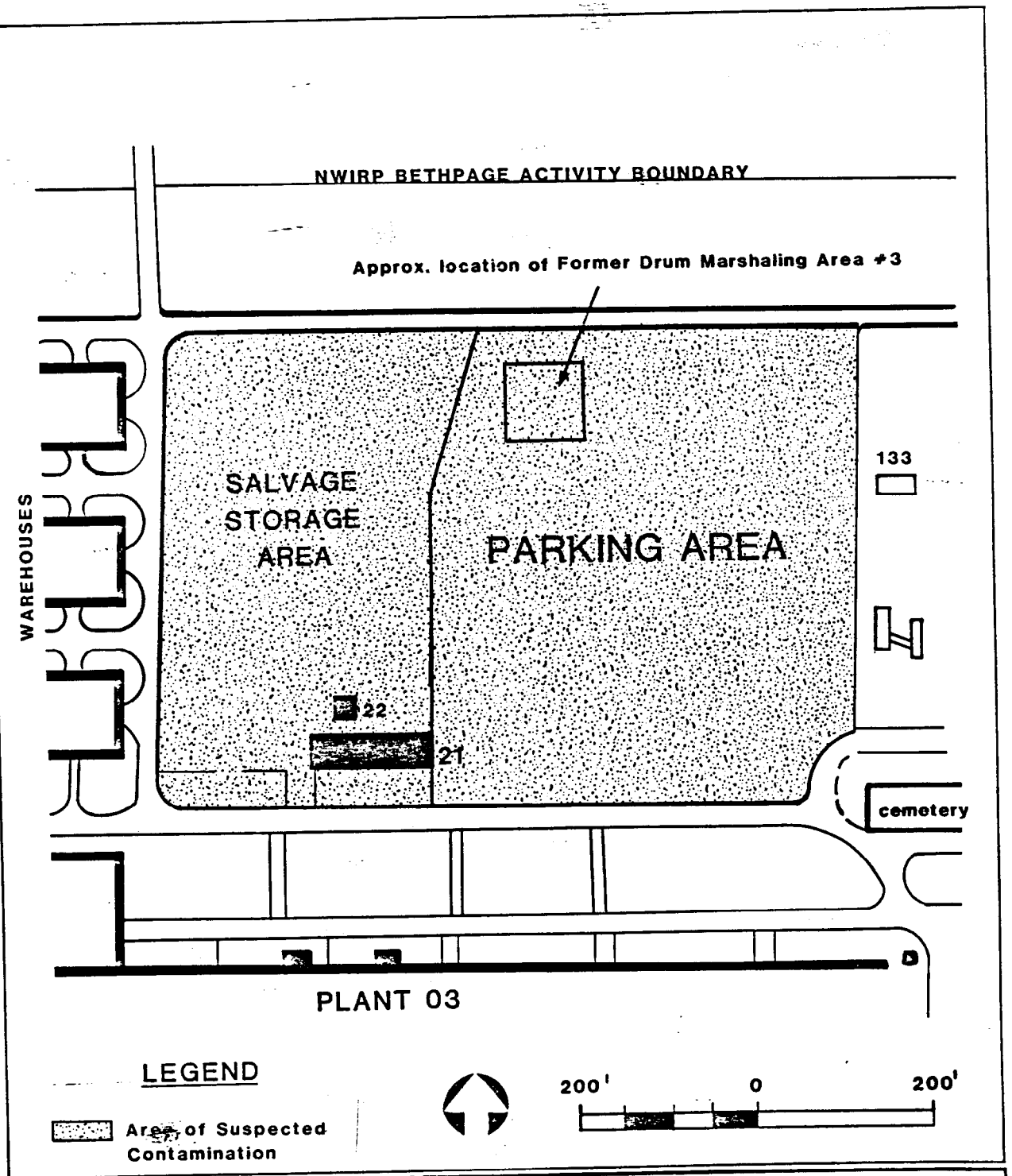

Figure 8-13

Site 9, Salvage Storage Area, NWIRP Bethpage, New York

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Appendix A

Aerial Photographs

149
150

Aerial Photographs

NWIRP Bethpage

12-2-1953 2 sheets
2 baseball diamonds and an all-purpose athletic field in the triangle between South Oyster Bay Road Extension and the old South Oyster Bay Road alignment. Surface disturbed on northwestern side of intersection of old South Oyster Bay road and RR tracks, several cars parked there. Coal pile located between present site of Plant 10 and Water Tank, open storage. Open drum storage area in present drum storage yard, north of Warehouses, E-W dimension equal to that of the warehouses. Salvage storage area north of Plant 3, includes all of salvage storage area on 4-13-82 revisions to base map and also extending east covering northern 1/3 of parking area (including well 15 area). Infiltration tanks area east of Plant 3--can see pattern of tanks, some trees, vegetation, no storage there. Off-base housing east of this area includes only 3 homes, only 1 close to the Infiltration area. 2 Recharge Basins NE of Plant 3.
Plant 20 Area-looks like oiled parking lot possible discharges at center of eastern boundary and center of northern boundary--not confirmable by photography. Ball diamond south of plant 20 boundary.

11-3-1959 4 sheets
Photos do not include NWIRP Bethpage.

3-29-1966 5 sheets
Ball diamonds and coal pile as in 1953. Now, lots of storage over Infiltration Tanks area. Parking lot north of Plant 3 expanded to 1982 boundaries. Storage of airframes on east end of this parking lot (between parking lots and sewage treatment plant. Third Recharge basin under construction in this area, NE of the former two. Four sludge drying beds in place. Civilian area east of Plant 3 now built out. Area around Plant 20 now all developed.

?-??-1974? 2 sheets
Ball diamonds as in 1953. Coal pile removed. Storage over Infiltration tank area.

NWIRP Calverton

9-23-1947 6 sheets
This photography predates the Navy's acquisition of the base. The majority of the base is in woodlands and scrub vegetation, with the remainder in farming uses. The small pond in the northeast portion of the base was present with open water. Soils disturbances on the northeast corner of the pond and the western shoreline are evident. No evidence of disposal operations is present.

10-2-1957 7 sheets
Area north of the Crash Rescue Training Area apparently received the material removed from the Recharge Basin. Roadways in area of the small pond in the northeast portion of the base were changed, with the roadway now going through the disturbed area on the western shoreline of the pond. The road to the northeast corner was disused or abandoned. Several jet aircraft in the engine runup area off the runway. More on the parking apron. The western portion of the base was not represented in these photos. There is no other evidence of disposal on the base, although there is extensive grading all over the base.

Facilities which had been constructed at this time include: the two major runways, and taxiways; buildings 165 (Plant 7), 166 (Plant 6), 167 (heating plant), 168 (paint shop), 169 (General Warehouse), 170 (Guard House), 171 (Guard House, north), 172 & 173 (Check Booths), Wells 174,5,6 , 230 Under Construction (Fuel System Test Lab), 179 (Fueling Facility), 208 (Firing Range control building),

5-17-1961 6 sheets
Sheets cover all of base. Retention pond is present in the northwest corner of the base, evidence of recent construction. Activity in the vicinity of the ammunition demolition area and the picnic grounds disposal area, west of the ammunition demolition area. Dark ground stains at fire rescue training area (oil?). Jigs and fixtures now being stored in southeast corner of base, south of the runway. Area of disturbance around west end of the pond in the northeast corner of the base has at least 4 access roadways now, and some heavy vegetative (weeds?) cover on the disposal area. No sign of any disposal in the area of the gun test area (now calibration pads).

4-06-1963 6 sheets
Sheets do not cover western portion of the base. Most of the facilities had been constructed by this date. Western shore of the pond is still disturbed. Another possible disposal area is located west of the north gate, in the woods. We did not field check this. Northeast pond disposal site active. At least three roads go to it.

3-29-1966 6 sheets
Very dark stains around the fire rescue training area. May be evidence of the oil spill there. No structural facilities there. Enlarged fixture storage area west of the first area. Ammunition Demolition grounds and picnic grounds disposal area both active. Coal pile larger than previous. Pond in northeast has active disposal area. Lunar test site active.

5-30-1967 2 sheets
Ponds between compass test area and engine runup continue to dwindle. These were formerly wet almost up to the runways, but have progressively dried. The fire rescue training area continues to have patterns of dark staining, but now there is one distinctly circular area which appears to have free liquids on it. Two disturbed areas, one in the woods west of the north base gate and opposite the end of Runway 23 and the other south of the rifle/pistol range have been disturbed throughout this series of pictures. Disturbance at the northeast pond is larger, with four roads leading to it. The western edge of the base, including the ammunition demolition area and the picnic grounds disposal area are not on these images. Grid type pattern of woods clearing in the woods adjacent to the fuel farm first seen here. Lunar test area active.

10-6-1969 6 sheets
very high altitude photos. Four outlying disturbed areas (picnic grounds disposal, rifle/pistol range, north gate, and northeast pond) are still disturbed. Two distinct roads to the northeast pond. Cutting grid at fuel farm finished. Path into woods at northwest pond.

6-04-1971 3 sheets

9-15-1974 4 sheets
Only one small dark area at the fire rescue training area. Most of the area is still disturbed. Little debris west of the frta, but notably some large items in the trees north of the frta. Ammo area active and the picnic grounds disposal area is also. The northeast pond has large trees in the area which formerly had open water. The disturbed western boundary is now larger than it appeared in any of the previous photographs. Areas at the rifle/pistol range and west of the north gate are still active and open.

9-09-1980 6 sheets
The northeast pond area is larger than in 1974. The large lobate area seen from the air is being developed at this time. The total area disturbed is also at a maximum, but less than at present. The area west of the north gate is inactive and somewhat overgrown. The area at the rifle/pistol range is still open as are the picnic area disposal area and the ammunition area disposal area.

OVERALL OBSERVATIONS BY LOCATION

Calverton Northeast Pond Disposal Area (Site 1).
Existed on 1947 aerial photographs as a disturbed area prior to Navy acquisition of the base. This disturbance coincided with a general grading of a gentle slope immediately east of the borrow area on the northwest side of the pond. The general grading is still evident east of the disposal area. It reaches into the pond and may have represented an attempt to create a picnic grove/swimming beach. Additional roadway connection was completed by 1957, but the disposal area did not spread substantially at this time. By 1961, the center of the pond was filled with low vegetation, and there was open water only around the perimeter of the pond. The disturbed area was expanded significantly, and a dark-colored area ended with a lobate extension into the pond, on the southern end of the western side of the pond. By 1963, the disposal area extended into the pond along the entire western side. Excavation into the sand bank continued the westward expansion of the disturbance. In 1966, a large number of piles of approximately dump truck size was observed in the southwest corner of the pond. The water level appears to be very low and there is evidence of fresh disposal of dark colored materials on the face of the western shoreline slope. Judging by the level of disturbance of the area, the site was active, and still expanding. Continued evidence of disturbance (and implied activity) of this area is seen in the 1969, 1971 and 1974 photographs. By 1974, the disposal area was notably larger than it had been in the past. Lack of vegetation is assumed to indicate continued activity of this area. In 1980 photographs, the disposal area is significantly larger than it was in 1974. The large lobe of waste in the western side is developed by this date. The total area disturbed at this time is the largest seen on any of the photographs. In 1985, during the aerial reconnaissance of the base, at least two 55-gallon drums were seen from the air. They were situated in the pond, at the face of the disposal area.

Calverton Crash Rescue Training Area (Site 2).
By 1957, the area north of the present Calverton Crash Rescue Training Area had recently received a large volume of fill, possibly from the excavation of the Recharge Basin. Ground stains are apparent in this ares, but there is no distinguishable structural control for rescue training. There may

have been aircraft parts in this area in 1957, like those used in the training exercizes elsewhere. In 1963, the area had been disturbed and cleared of vegetation. At least one large (aircraft body?) item was located in this area. Several large items (aircraft bodies?) and two rectangular areas are seen in the 1966 photographs. The rectangular areas may have been training pits, as they appear to contain fluids. The area had a similar appearance through 1967 and 1969. In 1971, there were several square impoundments with very dark liquids appearing in them. Several other small (rainwater?) impoundments were also seen at the site. The 1974 photographs illustrate a similar situation. In the last photograph, 1980, some of the recent structural improvements are seen, including the oil ring and fuel tanks. These are the ones which were very recently removed and improved. A dark soil stain is evident to the southwest of the oil ring.

Throughout the series of aerial photographs examined, activity continued along the western boundary of the area which was noted as filled in the 1957 photographs. Part of the area northwest of the filled area may have also received debris for disposal.

Calverton Ammunition Demolition Area (Site 3).
The first aerial photography on which the ammunition demolition area appears is in 1971. This is the first time the extensive ground clearing is seen in this area. The closest prior imagery is 1969, in which no evidence of the demolition area is apparent. The area appears approximately the same in 1974 photography, with a small structure also apparent. By 1980, the area appeared much the same as before, with some light vegetation growing in the formerly cleared areas. Two rectangular areas north of the demolition area also show up for the first time in the 1980 photography. There is no demonstrated connection between these latter rectangular areas and the demolition area.

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Calverton Picnic Grounds Disposal Area (Site 4).
The picnic grounds disposal area is located due west of site 3. It is located on the edge of a wooded parcel which extends hundreds of feet west of this remote site. In 1947 photography, the area is identified as a small clearing in the edge of the woods, near 5 residential-looking buildings which were subsequently removed. The area was located at the junction of a road which skirted the woods and the road which served the residences. By 1961, this area was enlarged significantly and the buildings had been removed. The area remained unvegetated and about the same size through 1974 when it was enlarged slightly again. 1980 photography indicated little change from the 1974 dimensions, including little or no vegetation added. The conclusion is that the area was active throughout the Navy ownership of the property.

Calverton 1950's Gun Range Ammunition Disposal Area (Site 5).
By 1957, the Gun Butt had been constructed and the use of the Gun Range Ammunition Disposal Area had been discontinued. No sign of the limited volume disposal operation is apparent on the photography through 1980. Some of the drainage ways in this area had filled (apparently naturally). Extensive grading of the area obscures detection of the exact location of this operation.

Calverton Fuel Calibration/ Engine Runup Areas (Site 6).
There are four areas which could have received fuel spillage on a chronic

basis as the fuel systems of new aircraft were pressurized for the first time. Three are in the industrialized area, one at the location of the former fuel calibration site, one at the run-up area, and another at the engine test house. The other locations include the parking apron, and the run-up area along Runway 32-14, and the taxiway at the southeast end of Runway 32, where aircraft prepared for their initial flights. All of these locations are out of doors. In 1957, the pad at the engine test house and the end of runway locations were in use. Grading around the engine test house obscures any sign of spillage. Vegetative stress at the end of runway location may be due to either fuel spillage or burning from jet exhaust. In 1961, vegetative stress is suggested by the patterns seen at the engine test house pad and at the edges of the apron near where the paint shops are now. The pattern at the end of Runway 32 coincides with a location where a prop aircraft was parked in queue to use the runway. The parking apron and run-up area along Runway 32-14 were also in use. As they aged, obvious signs of exhaust and possible spillage of fuel become more apparent. these conditions continued as seen on the photography through 1980. The new Run-up area in the industrialized area of the activity was added between 1974 and 1980.

Bethpage Former Drum Marshalling Area (Site 7).
Imagery for NWIRP Bethpage is limited. 1953 Imagery shows almost no storage on the cesspool field. The locations of each of the infiltration rings is clearly visible. Disturbed soils are light in color. Some materials (vehicles, etc.) are stored nearby the sewage treatment plant and on the southern portion of the area with the cesspools. By 1966, the area was covered with storage of various indistinguishable items. Many are large. There is no sign of drum storage visible at this scale. Disturbed soils are dark in color in this area, while disturbed soils elsewhere are light. Conditions during 1974 photography are similar.

Bethpage Recharge Basins (Site 8).
The two southern recharge basins existed at NWIRP Bethpage by 1953. The last of these basins were under construction by 1966 and still existed in 1974 photography.

Bethpage Salvage Storage Area (Site 9).
Between 1953 and 1966, the salvage storage area was reduced in area to accomodate additional parking. This coincided with the interval during which storage over the cesspool area began. Between 1966and 1974, additional storage area was taken, north of the salvage storage area adjacent to the parking lot. Soils on all of these salvage storage areas is consistently dark in color.

Appendix B

Test Results, Northeast Pond Disposal Area,
NWIRP Calverton

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Grumman Aerospace Corporation
Bethpage, New York 11714

September 24, 1985
FDP-182-985

Rogers, Golden & Halpern
1427 Vine Street
Philadelphia, PA 19102

Attention: Roger Moose

Subject: Results of Test of Pond at Northeast Spoil Area, Calverton

Enclosures: (1) Test Results, Samples Taken on 7/31/85
(2) Map with Sample Locations

Dear Roger:

As discussed, please find test results of samples taken from the pond at the Northeast Spoil Area and a map of sample locations.

If you have any questions, please call me at (516) 575-2385.

Very truly yours,

GRUMMAN AEROSPACE CORPORATION

J. Ohlmann, Asst. Director
Facilities Engineering Dept.
Mail Stop: B08/30

JO:gms
Encls.

Grumman Aerospace Corporation
Bethpage New York 11714

J. OHLMANN

LAB WORK REQUEST NUMBER: 30065 AU-1851

DATE: 8/1/85

REQUEST TO QUALITY CONTROL LABORATORY

DIRECTED TO

☐ CHEMISTRY LABORATORY ☐ METALLURGY LABORATORY ☐ RADIOGRAPHY LABORATORY ☐ SPECTROSCOPY LABORATORY ☐ NDT LABORATORY

1-SW
2-SW
3-NW
4-NE
5-SE

ENVIRONMENTAL OPERATION – CALVERTON

PART NAME: NORTHEAST POND, 5 SAMPLE (DATE: 7/31/85)

PART NUMBER

TYPE OF MATERIAL

RECEIVING REPORT NO	PURCHASE ORDER NUMBER	ROUTE CARD NO	JOB NUMBER	QUANTITY	BATCH/HEAT NO
			83081-800		WS-161

IOS NUMBER	SPECIFICATION	SERIAL NUMBER	BIN NUMBER

SELLER OR DEPARTMENT

TYPE OF TEST OR ANALYSIS REQUIRED

REMARKS: AS PER ATTACHED
(ALL QUANTITIES REQUIRED)
(ALL PRESERVATIVES ADDED)

REQUESTED BY	DEPARTMENT	MAIL STA NO-PLANT NO	EXT	QC LAB APPROVAL
H. KEANEY	309	A03-12	5069.5	

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FINDINGS OR RESULTS

~~THE ABOVE WORK IS ☐ SATISFACTORY ☐ UNSATISFACTORY~~ Info only

REMARKS

See attached sheet for test results

Facilities Eng. Dept.
SEP 5 1985

APPROVED

REFERENCE NO

No. 231477

LABORATORY

L RESULTS REPORTED IN MG/L (PPM) UNLESS OTHERWISE NOTED

COMPONENT	SAMPLE	1-SW	2-W	3-NW	4-NE	5-SE
ALUMINUM	(Al)					
ARSENIC	(As)					
BARIUM	(Ba)					
BERYLLIUM	(Be)					
BORON	(B)					
CADMIUM	(Cd)					
CALCIUM	(Ca)					
CHROMIUM, HEXAVALENT		<0.01	<0.01	<0.01	<0.01	<0.01
CHROMIUM, TOTAL	(Cr)					
COPPER	(Cu)					
GOLD	(Au)					
IRON	(Fe)					
LEAD	(Pb)					
MAGNESIUM	(Mg)					
MANGANESE	(Mn)					
MERCURY	(Hg)					
MOLYBDENUM	(Mo)					
NICKEL	(Ni)					
POTASSIUM	(K)					
SELENIUM	(Se)					
SILICON	(Si)					
SILVER	(Ag)					
SODIUM	(Na)					
TIN	(Sn)					
T.O.S.	(Ti)	206	1421	315	266	245
VANADIUM Alkalinity	(V)	56.8	255	112	55.4	53.9
conductivity (micro mho/cm)		178.1	121.0	350.0	220.0	210.0
AMMONIA		<0.05	<0.05	<0.05	<0.05	<0.05
CHLORIDE		5.3	24.1	4.4	6.2	5.0
FLUORIDE		<0.2	0.21	<0.2	<0.2	<0.2
CYANIDE simple / complex		0.06 / 0.04	0.05 / 0.03	0.06 / 0.04	<0.02 / <0.02	0.02 / <0.02
Phenol		6.7 ppb	5.6 ppb	2.6 ppb	8.2 ppb	8.2 ppb
MBAS		<0.1	<0.1	<0.1	<0.1	<0.1
NITRATE		0.46	0.45	0.44	0.44	0.43
NITRITE		<0.05	<0.05	<0.05	<0.05	<0.05
PHOSPHATE		<0.1	<0.1	<0.1	<0.1	<0.1
SULFATE		31.0	387	40.9	48.0	48.7
Oil & Grease		2.0	7.3	8.4	6.8	8.0
HARDNESS		75.2	611.2	136.4	91.2	96.2
pH		7.0	7.1	6.9	6.8	6.8

NASSAU COUNTY DEPARTMENT OF HEALTH

1033 FRANKLIN AVENUE
GARDEN CITY, N. Y.

January 13, 1956

Grumman Aircraft Corp.
Bethpage
New York

Att: Mr. John Wichmann

Dear Sir:

The results of our recent sampling from your recharge basins are as follows:

	Hexivalent Chromium	Cadmium
Plant #1	0.09 ppm	less than 0.02
Plant #2 basin 1	0.13 ppm	0.17
Plant #2 basin 2	0.01 ppm	0.13
Plant #3	0.24 ppm	0.04
Plant #6	0.03 ppm	less than 0.02

All of the above numbers which are more than 0.05 ppm are above the maximum allowable concentrations for an industrial wastes in Nassau County.

We are sure that you will do all you can to decrease the concentrations of these toxic materials of your wastes and we will resample in the near future to determine the efficacy of your endeavor.

Very truly yours,

John S. McCabe
Asst. Public Health Engr.
Division of Sanitation

JSMcC:MC

Appendix C

Test Results, Recharge Basins, NWIRP Bethpage

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NASSAU COUNTY DEPARTMENT OF HEALTH

1033 FRANKLIN AVENUE
GARDEN CITY, N. Y.

January 15, 1956

Grumman Aircraft Corp.
Bethpage
New York

Att: Mr. John Wichmann

Dear Sir:

The results of our recent sampling from your recharge basins are as follows:

	Hexivalent Chromium	Cadmium
Plant #1	0.09 ppm	less than 0.02
Plant #2 basin 1	0.13 ppm	0.17
Plant #2 basin 2	0.01 ppm	0.13
Plant #3	0.24 ppm	0.04
Plant #6	0.03 ppm	less than 0.02

All of the above numbers which are more than 0.05 ppm are above the maximum allowable concentrations for an industrial wastes in Nassau County.

We are sure that you will do all you can to decrease the concentrations of these toxic materials of your wastes and we will resample in the near future to determine the efficacy of your endeavor.

Very truly yours,

John S. McCabe
Asst. Public Health Engr.
Division of Sanitation

JSMcC:MC

APPENDIX D

Acronyms

AFFF	Aqueous Film Forming Foam
BTX	Benzene, Toluene, Xylene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CNO	Chief of Naval Operations
CSRS	Confirmation Study Ranking System
DOD	Department of Defense
ECM	Electronic Counter Measures
EFD	Engineering Field Division
EOD	Explosives Ordinance Demolition
gpd	gallons per day
gpm	gallons per minute
GOCO	Government-Owned, Contractor-Operated
IAS	Initial Assessment Study
IWTP	Industrial Wastewater Treatment Plant
MEK	Methyl Ethyl Ketone
MIBK	Methyl Isobutyl Ketone
NACIP	Naval Assessment and Control of Installation Pollutants
NASA	National Aeronautical and Space Administration
NAVFACENGCOM	Naval Facilities Engineering Command
NEESA	Naval Energy and Environmental Support Activity
NEPSS	Naval Environmental Protection Support Service
NWIRP	Naval Weapons Industrial Reserve Plant
NYDEC	New York Department of Environmental Conservation
OAO	Orbiting Astronomical Observatory
PCB	Polychlorinated Biphenyl
POL	Petroleum, Oils, and Lubricant
STP	Sewage Treatment Plant
TNT	Trinitrotoluene
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

APPENDIX E. SUMMARY OF SOURCES UTILIZED DURING THE RECORD SEARCH TASK OF IAS AT THE NWIRPS AT BETHPAGE AND CALVERTON, NEW YORK

Naval Facilities and Engineering Command:	
NEESA, CBC	Port Hueneme, CA
Command Historian, CBC	Port Hueneme, CA
Administrative Microfiche File, CBC	Port Hueneme, CA
Real Estate Branch	Alexandria, VA
Command Headquarters	Alexandria, VA
Northern Division (Phila. Naval Base)	Philadelphia, PA
Environmental Engineering	
Environmental Planning	
Applied Biology	
Real Estate	
Contract Plans Microfiche Files	
National Archives	Washington, D.C.
National Archives, Cartographic Branch	Alexandria, VA
Naval Historical Center	Washington, DC
Ordnance Environmental Support Office	Indian Head, MD
DOD, Explosives Safety Branch	Alexandria, VA
Naval Weapons Industrial Reserve Plant (NWIRP) Calverton	Calverton, NY
Facilities and Maintenance Department	
Naval Weapons Industrial Reserve Plant Bethpage	Bethpage, NY
Chemical Engineering Department	
Facilities Engineering Department	
Environmental Engineering Department	
Facilities Maintenance Department	
United States Geological Survey	Malvern, PA
U.S. Department of Agriculture, Soil Conservation Service	Washington, DC
Grumman Aerospace Corporation	Bethpage, NY
Grumman Aerospace Corporation	Calverton, NY

REFERENCE NO. 2

TAD # 02.8811.31

FH 12/12/88

NWIRP/CALVERTON

Lat: 40°54'57"N Long: 72°47'48"W

List of Dataset: NYGN Number of Records = 6 Group = 1

REC #	POP	HOUSE	DISTANCE	SECTOR
1	0	0	0.400000	1
2	0	0	0.810000	1
3	89	37	1.60000	1
4	807	227	3.20000	1
5	891	381	4.80000	1
6	8029	3006	6.40000	1

DISTANCE (MILES)	TOTAL POPULATION	TOTAL HOUSES
1	89	37
2	896	264
3	1787	645
4	9816	3451

REFERENCE NO. 3

Uncontrolled Hazardous Waste Site Ranking System

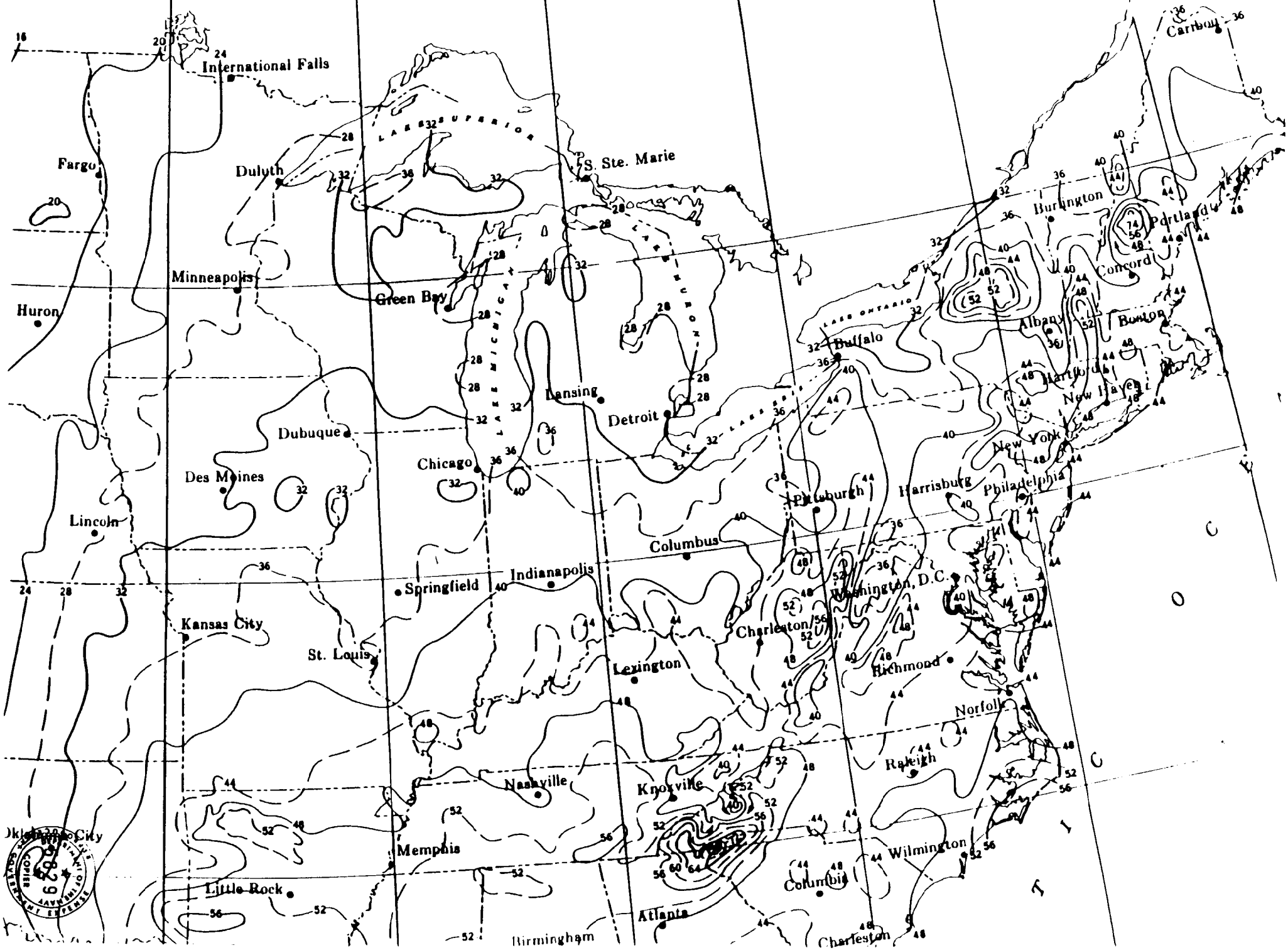
A Users Manual
(HW-10)

Originally Published in
the July 16, 1982, *Federal Register*

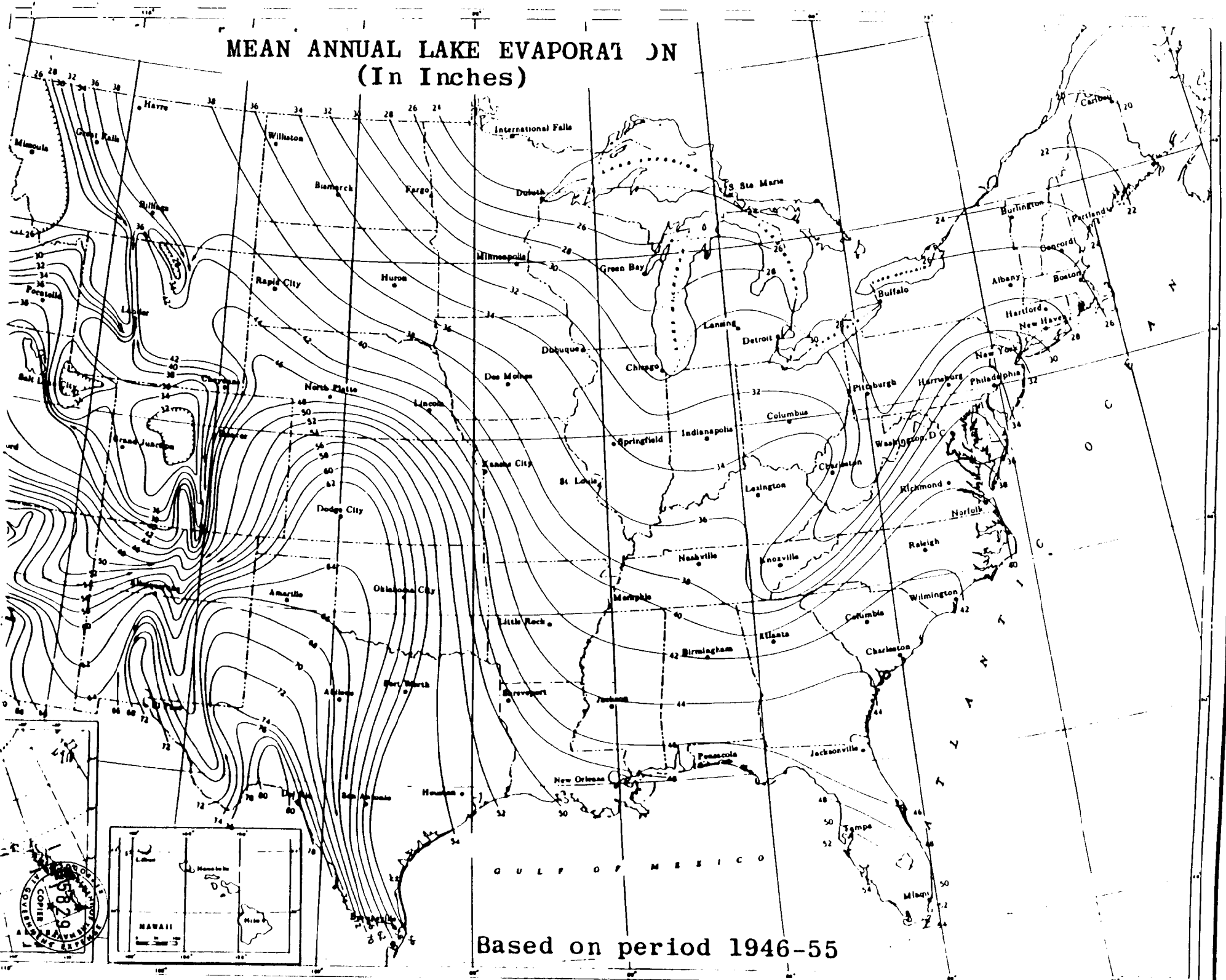
United States
Environmental Protection
Agency

1984

NORMAL ANNUAL TOTAL PRECIPITATION (inches)



MEAN ANNUAL LAKE EVAPORATION
(In Inches)



Based on period 1946-55

TABLE 2

PERMEABILITY OF GEOLOGIC MATERIALS*

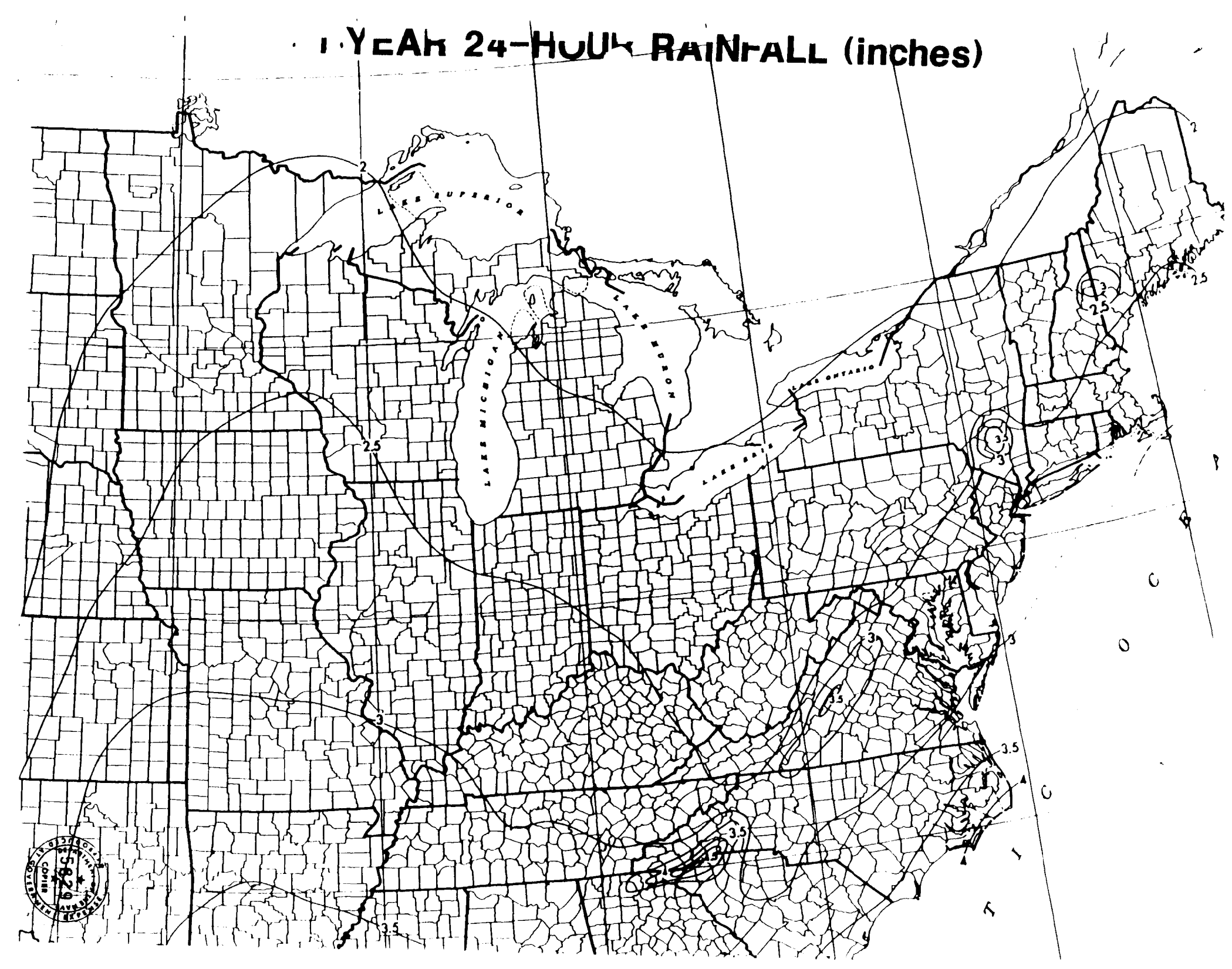
Type of Material	Approximate Range of Hydraulic Conductivity	Assigned Value
Clay, compact till, shale; unfractured metamorphic and igneous rocks	$<10^{-7}$ cm/sec	0
Silt, loess, silty clays, silty loams, clay loams; less permeable limestone, dolomites, and sandstone; moderately permeable till	$10^{-5} - 10^{-7}$ cm/sec	1
Fine sand and silty sand; sandy loams; loamy sands; moderately permeable limestone, dolomites, and sandstone (no karst); moderately fractured igneous and metamorphic rocks, some coarse till	$10^{-3} - 10^{-5}$ cm/sec	2
Gravel, sand; highly fractured igneous and metamorphic rocks; permeable basalt and lavas; karst limestone and dolomite	$>10^{-3}$ cm/sec	3

*Derived from:

Davis, S. N., Porosity and Permeability of Natural Materials in Flow-Through Porous Media, R.J.M. DeWest ed., Academic Press, New York, 1969

Freeze, R.A. and J.A. Cherry, Groundwater, Prentice-Hall, Inc., New York, 1979

1-YEAR 24-HOUR RAINFALL (inches)



REFERENCE NO. 4

NUS CORPORATION
SUPERFUND DIVISION

PROJECT NOTES

TO: NAVAL WEAPONS INDUSTRIAL RESERVE PLANT/CALVERTON - FILE TDD # 02-8811-31 DATE: 12/14/88

FROM: E. LEONARD COPIES:

SUBJECT: CALCULATION OF DISTANCES: SURFACE WATER MIGRATION PATH

REFERENCE: NAVAL WEAPONS INDUSTRIAL RESERVE PLANT/CALVERTON

POC = FIRE RESCUE TRAINING AREA (FRTA)

PDE = SOUTH OF MCKAY LAKE ALONG SUNN POND ROAD

FACILITY SLOPE

FIRE RESCUE TRAINING AREA APPEARS TO BE RELATIVELY FLAT. THEREFORE, FACILITY SLOPE < 1%.

SLOPE INTERVENING TERRAIN

FRTA ELEV. = 60 FT. (MSL)

PDE ELEV. = 40 FT. (MSL)

DISTANCE ≅ 2100 FT

$$\frac{60\ \text{FT MSL} - 40\ \text{FT MSL}}{2100\ \text{FT}} \times 100 = 0.95\%$$

POPULATION SERVED BY IRRIGATED ACRES

58 ACRES × 1.5 PEOPLE/ACRE

= 87 PEOPLE

DISTANCE TO WETLAND FROM FRTA ≅ 2200 FEET

DISTANCE TO CRANBERRY BOG FROM FRTA ≅ 4600 FEET

DISTANCE TO CRANBERRY BOG FROM PDE ≅ 2500 FEET

E. Leonard 12/14/88