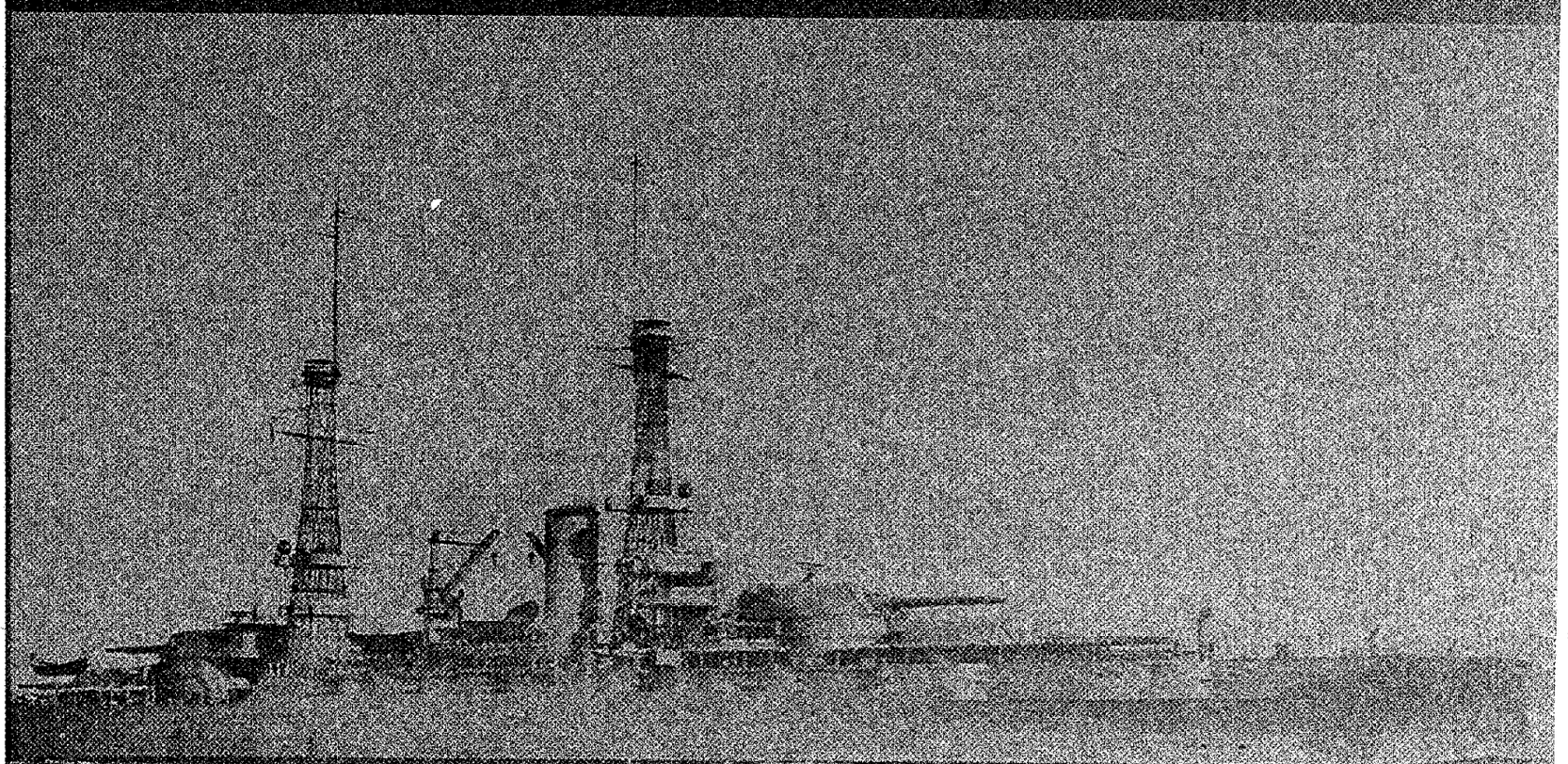
FINAL

Water Area Munitions Study
Naval Station Great Lakes, Illinois
Trap, Skeet and Archery Ranges

April 2005



MALCOLM PIRNIE

MALCOLM PIRNIE, INC.
INDEPENDENT ENVIRONMENTAL ENGINEERS, SCIENTISTS & CONSULTANTS

April 25, 2005

J. Blayne Kirsch
Department Head
Environmental Department
201 Decatur Avenue
Great Lakes, IL 60088

Re: Final Water Munitions Area Study Addendum – TSA Ranges

Dear Mr. Kirsch:

Malcolm Pirnie, Inc. is pleased to provide Recommendations for the Trap, Skeet, and Archery (TSA) Ranges at Naval Station Great Lakes, Illinois:

The recommendations were prepared using data presented in the April, 2005 Final Water Area Munitions Study (WAMS) for Naval Station Great Lakes by Malcolm Pirnie, Inc.

Recommendations for the TSA Ranges are provided as Enclosure 1

Please call me at (614) 888-4953 if you have any questions or comments.

Very truly yours,

MALCOLM PIRNIE, INC.

Michael C. Garnes
Team Leader

Enclosure
c: A. Robinson, EFD South

0474-096

FINAL
WATER AREA MUNITIONS STUDY
TRAP, SKEET AND ARCHERY RANGES
NAVAL STATION GREAT LAKES, ILLINOIS

April 2005

Prepared for:

Naval Station Great Lakes
Commander, Naval Training Center
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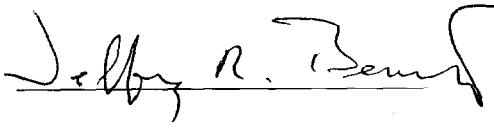
FINAL
WATER AREA MUNITIONS STUDY
TRAP, SKEET AND ARCHERY RANGES
NAVAL STATION GREAT LAKES, ILLINOIS

DoD Contract Number: N62472-02-D-1300

Reviewed and Approved by:



Jeffrey R. Bennett, P.E., DEE
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Malcolm Pirnie, Inc. prepared this report at the direction of Engineering Field Activity Northeast. This document should be used only with the approval of the Engineering Field Activity Northeast. This report is based, in part, on information provided in other documents and is subject to the limitations and qualifications presented in the referenced documents.

April 2005

Table of Contents

Table of Contents (Continued)

APPENDICES

MAPS

FIGURES

Table of Contents (Continued)

TABLES

ACRONYMS

AA	Anti-aircraft
BRAC	Base Realignment and Closure
CSM	Conceptual Site Model
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
EFANE	Engineering Field Activity, Northeast
EOD	Explosive Ordnance Disposal
FUDS	Formerly Used Defense Site
LANTDIV	Atlantic Division
MEC	Munitions and Explosives of Concern
MC	Munitions Constituents
MRP	Munitions Response Program
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Command
NTC	Naval Training Center
OE	Ordnance and Explosives
POC	Point of Contact
PWD	Public Works Department
RG	Record Groups
RPM	Restoration Project Manager
RV	Recreational Vehicle
TSA	Trap, Skeet and Archery
U.S.	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
UXO	Unexploded Ordnance
WAMS	Water Area Munitions Study
WWI	World War I
WWII	World War II

GLOSSARY OF TERMS

Base Realignment and Closure (BRAC) – A Department of Defense (DoD) program that focuses on compliance and cleanup efforts at military installations undergoing closure or re-alignment, as authorized by Congress in four rounds of base closures for 1988, 1991, 1993, and 1995. (DERP Management Guidance, September, 2001)

Closed Range – A range that has been taken out of service as a range and that either has been put to new uses that are incompatible with range activities or is not considered by the military to be a potential range area. A closed range is still under the control of a DoD component. (DERP Management Guidance, September, 2001)

Defense Site – All locations that are or were owned by, leased to, or otherwise possessed or used by the DoD. The term does not include any operational range, operating storage or manufacturing facility, or facility that is used or was permitted for the treatment or disposal of military munitions. (10 U.S.C. 2710(e)(1))

Explosive Ordnance Disposal (EOD) – The detection, identification, field evaluation, rendering-safe, recovery, and final disposal of unexploded explosive ordnance (UXO). It may also include the rendering-safe and/or disposal of EO (explosive ordnance) which has become hazardous by damage or deterioration, when disposal of such EO requires techniques, procedures, or equipment which exceed the normal requirements for routine disposal. (OPNAVINST 8027.1G, 14 Feb 92)

Explosives Safety – A condition where operational capability and readiness, personnel, property, and the environment are protected from the unacceptable effects of an ammunition or explosives mishap. (DoD Directive 6055.9 July 1996)

Formerly Used Defense Site (FUDS) – Real property that was formerly owned by, leased by, possessed by, or otherwise under the jurisdiction of the Secretary of Defense or the Components (including governmental entities that are the legal predecessors of DoD or the Components) and those real properties where accountability rested with DoD but where activities at the property

were conducted by contractors (i.e., government-owned, contractor-operated (GOCO) properties) that were transferred from DoD control prior to October 17, 1986. The status of a site as a FUDS is irrespective of current ownership or current responsibility within the federal government. (DERP Management Guidance, September, 2001)

Munitions Constituents (MC) – Any materials originating from unexploded ordnance, discarded military munitions or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions. (10 U.S.C. 2710 (e)(4))

Munitions and Explosives of Concern (MEC) – This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks, means: unexploded ordnance, discarded military munitions or munitions constituents (e.g., TNT, RDX) present in high enough concentrations to pose an explosive hazard. (OUSD(AT&L) 18 December 2003)

Operational Range – A range that is under the jurisdiction, custody, or control of the Secretary of Defense and that is used for range activities, or although not currently being used for range activities, that is still considered by the Secretary to be a range and has not been put to a new use that is incompatible with range activities. (10 U.S.C. 101 (e)(3))

Other than Operational Range – Encompasses closed, transferred and transferring ranges.

Range – A designated land or water area set aside, managed, and used for range activities of the DoD. Ranges include firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, impact areas, electronic scoring sites, buffer zones with restricted access and exclusionary areas, and airspace areas designated for military use in accordance with regulations and procedures prescribed by the Administrator of the Federal Aviation Administration. (10 U.S.C. 101 (e)(3))

Transferred Range – A property formerly used as a military range that is no longer under military control and had been leased by the DoD, transferred, or returned from the DoD to another entity, including federal entities. This includes a range that is no longer under military control but was used under the terms of a withdrawal, executive order, special-use permit or

authorization, right-of-way, public land order, or other instrument issued by the federal land manager. (DERP Management Guidance, September, 2001)

Transferring Range – A range that is proposed to be transferred or returned from the DoD to another entity, including federal entities. This includes a range that is used under the terms of a withdrawal, executive order, act of Congress, special-use permit or authorization, right-of-way, public land order, or other instrument issued by the federal land manager or property owner. An operational or closed range will not be considered a "transferring range" until the transfer is imminent. (DERP Management Guidance, September, 2001)

Unexploded Ordnance – Military munitions that have been primed, fused, armed, or otherwise prepared for action; have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and remain unexploded either by malfunction, design, or any other cause. (10 U.S.C. 101(e)(5))

EXECUTIVE SUMMARY

The Department of Defense (DoD) has established the Munitions Response Program under the Defense Environmental Restoration Program (DERP) to address munitions and explosives of concern (MEC) (including unexploded ordnance (UXO)) and munitions constituents (MC) at other than operational military ranges and other sites. Closed, transferred, and transferring military ranges and sites not located on an operational range are considered other than operational. This report addresses other than operational ranges and sites at an active installation. It may include transferring and/or transferred ranges and munition disposal sites associated with an active installation if they are not included in BRAC or FUDS.

However, by definition, munitions related sites located in water are not addressed under the MRP. For example, deep-sea sites including former munitions disposal areas and ranges are not addressed under the MRP. In order to document the history of these areas in a standard format, a Water Area Munitions Study (WAMS) report is compiled. This report represents the WAMS for the Trap, Skeet and Archery (TSA) Ranges associated with the Naval Station Great Lakes.

Currently, Naval Station Great Lakes is home to the United States Navy and provides training facilities and housing for personnel and their dependants. However, based on review of the archival records from 1911 (formal opening of Naval Station Great Lakes) to the present, the installation has stored and used many different types of ordnance (e.g., small arms and anti-aircraft (AA) munitions).

Personnel stationed at the Naval station originally used the trap range for moving target orientation training in conjunction with the AA training center, currently identified as the NTC Lakefront. The addition of the skeet and archery ranges in 1968 provided Navy personnel with more training activities at the site. The TSA Ranges consisted of the two skeet buildings, the firing arch, the trap house and archery target area.

Based on the data collected from the site, the only remaining physical evidence of the TSA Ranges is the redeveloped shoreline where the Skeet Range was put in place. Evidence of the former site has been limited due to the construction of the existing Recreational Vehicle Park, which is located within the former site's boundaries.

The TSA Ranges site was primarily a small arms site, with the exception of the archery range. As a result, the site area is not suspected to contain MEC. In addition, the possibility of identifying MC at the site is not likely due to targeting area and proximity to the lake. The potential MC contaminants include lead, nickel, antimony, copper and polycyclic aromatic hydrocarbons from pitch tar used in clay pigeons. The site is a water range, identified as containing a water body target zone, so contaminants are likely to be identified in the lake. For the land portion of the site there is little likelihood of chemical/munition contamination in the soil.

1. INTRODUCTION

The Department of Defense (DoD) has established the Munitions Response Program under the Defense Environmental Restoration Program (DERP) to address munitions and explosives of concern (MEC) (including unexploded ordnance (UXO)) and munitions constituents (MC) at other than operational military ranges and other sites. Closed, transferred, and transferring military ranges and sites not located on an operational range are considered other than operational. This report addresses other than operational ranges and sites at an active installation. It may include transferring and/or transferred ranges and munition disposal sites associated with an active installation if they are not included in BRAC or FUDS.

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This WAMS is organized into the following sections:

- Section 1 – Introduction
- Section 2 – Installation Background
- Section 3 – Physical and Environmental Characteristics
- Section 4 – Summary of Data Collection Effort
- Section 5 – Site Characteristics

The following supporting information is appended to this WAMS:

- References (Appendix A)
- Project Source Data – General (Appendix B)
- Project Source Data – Site Specific (Appendix C)
- Ordnance Technical Data Sheets (Appendix D)

1.1.Purpose

This WAMS summarizes the history of munitions use for the TSA Ranges at Naval Station Great Lakes and provides an assessment of the current conditions with respect to MEC and MC. The WAMS provides the necessary information for Navy and regulatory decision-makers to develop a Conceptual Site Model (CSM) for the site. The CSM presents information regarding: 1) MEC and/or MC known or suspected to be at the site; 2) current and future reasonably anticipated or proposed uses of the real property; and 3) actual, potentially complete, or incomplete exposure pathways that link them. The CSM is the basis for the risk evaluation, prioritization, and remediation cost estimate.

1.2.Project Management

This WAMS is being coordinated and managed by the Navy Engineering Field Activity Northeast (EFANE), a component of the Atlantic Division (LANTDIV) of the Naval Facilities Engineering Command (NAVFAC). The EFANE performs engineering functions for Navy installations throughout the northeast United States (U.S.) and is the Program Manager for this WAMS. Malcolm Pirnie, Inc. has been contracted to prepare this WAMS. The Navy Remedial Project Manager (RPM) from NAVFAC Southern Division (SOUTHDIV) and the installation points of contact (POC) for Naval Station Great Lakes provided valuable information and assistance throughout the WAMS data collection process. The Navy RPM is the responsible party for this WAMS.

1.3.Water Area Munitions Study Approach

The WAMS process for the TSA Ranges involved collecting and reviewing existing and available information about the site; data collection activities included off-site and on-site research and interviews. The Malcolm Pirnie data collection team conducted the on-site portion of the data collection and visual survey on March 17 through 21, 2003. A summary of the data collection process for TSA Ranges is presented in Section 4.

This WAMS is inclusive and makes use of all available data relating to munitions use at the TSA Ranges, including historical records, field data, anecdotal evidence, interviews with site personnel, and professional knowledge and experience. It is based, in part, on information provided in documents referenced in Appendix A and is subject to the limitations and qualifications presented in the referenced documents.

2. INSTALLATION BACKGROUND

The following sections provide general information about Naval Station Great Lakes, including its location and setting; a brief history of the installation; its missions over time; and a history of munitions related training, storage, and usage.

Naval Station Great Lakes sits on approximately 1,628 acres in Great Lakes Illinois. It is the largest, active duty DoD Naval training center remaining in the U.S. Naval Station Great Lakes is home to enlisted men training and officer accession training. The installation is one of Illinois' largest employers with over 25,000 military and civilian personnel. The Great Lakes Naval Hospital trains 4,000 Navy Corpsmen annually and is the Navy Regional Processing Site for several hundred reservists.

Naval Station Great Lakes provides support for the Navy through the intense training and specialized itinerary for enlisted men preparing for the fleet. Major commands at Naval Station Great Lakes include NAVSTA, a shore activity reporting command; the Recruit Training Command, which trains sailors; and the Service School Command (SSC), which provides initial technical training. The SSC can also be broken down into combat systems schools, engineering systems schools, and a training department.

2.1.Location and Setting

Naval Station Great Lakes is located in Great Lakes; Lake County, Illinois, approximately 20 miles north of Chicago (see Figure 2-1). The installation is located along the western shores of Lake Michigan just east of U.S. Route 41 and south of adjacent town, North Chicago. The other population center in the vicinity is the town of Waukegan, approximately eight miles

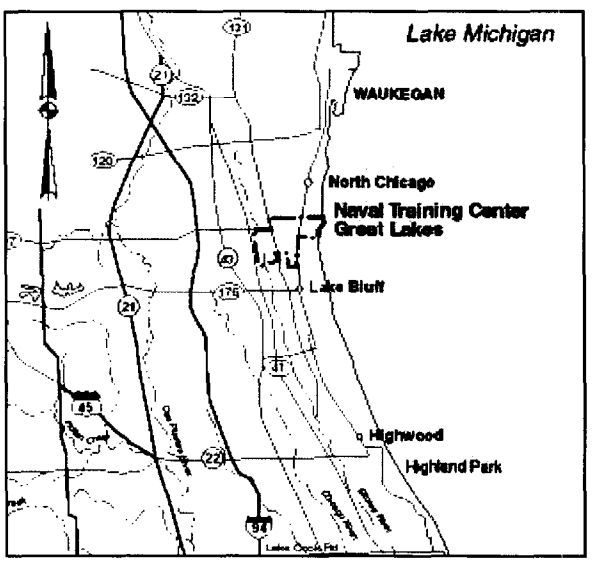


Figure 2-1: Site Location

north on Route 43. Naval Station Great Lakes is bound by Lake Michigan to the east and Skokie Highway (Route 43) to the west. The Shore Acres Country Club is the southern border of Great

Lakes. Map 2-1 provides a diagram of the Naval Station Great Lakes installation, with the location of the MEC sites depicted.

2.2.Installation History

Naval Station Great Lakes was one of the first training centers for men enlisted in the Navy. President Theodore Roosevelt supported the construction of an inland Naval base. In 1905, the citizens of Chicago sold 172 acres of land to the Navy for the cost of a single dollar. The new training center was designed to prepare enlisted men for their duties as sailors, rather than the traditional method of "learn-as-you-go". Just over ten years later the station served as a backbone to the Naval efforts for the Great War, better known now as World War I (WWI).

Following WWI was a time of peace and considerable cutbacks on military spending. At that time, Great Lakes had an air base and radio school. In 1933 Great Lakes nearly locked its gates because of the Great Depression and the base started to deteriorate. The air base was short lived, moving to nearby Glenview, Illinois in 1936. By the late thirties, the Navy decided to rebuild its forces as a result of the new conflict in Europe, World War II (WWII).

The start of the forties brought masses of sailors to Great Lakes for the basics of technical training. Great Lakes went into business with Ford Motor Company and recruits received advanced training in River Rouge, Michigan by experienced technicians. The base grew overpopulated; and soon modifications and building took place to accommodate the numbers of sailors and their families. Experienced gunners were in high demand and Great Lakes provided the training for anti-aircraft (AA) munitions at the NTC Lakefront. Approximately 1,350 sailors a day were instructed on 20- and 40-(mm) guns along the lakefront, shooting thousands of shells at cable-drawn targets in the sky over Lake Michigan.

In the fifties, Naval Station Great Lakes served as a center for training of recruits and a refresher for veterans. Schools for fire control, interior communications technician, opticalmen, instrumentation, gunnery, and Women Accepted for Volunteer Emergency Services (WAVES) recruit training kept the base alive and running.

The mid-sixties saw the Vietnam War and Great Lakes continued to accept recruits into its service schools. The Naval Hospital received hundreds of injured servicemen from war. The Navy SEALs tested recruiting at Great Lakes with the first graduating class of 37 recruits. Naval Station Great Lakes, as shown in Figure 2-2, consists of an approximately 600-acre parcel of land.

Today, Naval Station Great Lakes provides the majority of surface technical training to approximately 43,000 students annually in combat system schools, engineering systems schools and the training department.

Figure 2-2: View of Naval Station Great Lakes

2.3.Munitions Related Training / Storage / Usage

Throughout its history, Naval Station Great Lakes stored, trained with and used all types of Naval munitions including AA munitions, small arms and pyrotechnics. A listing of known ammunition storage and firing locations at Great Lakes, released by Mr. Ken Endress of the Naval Station Public Works Department, is provided in Appendix B and lists the following:

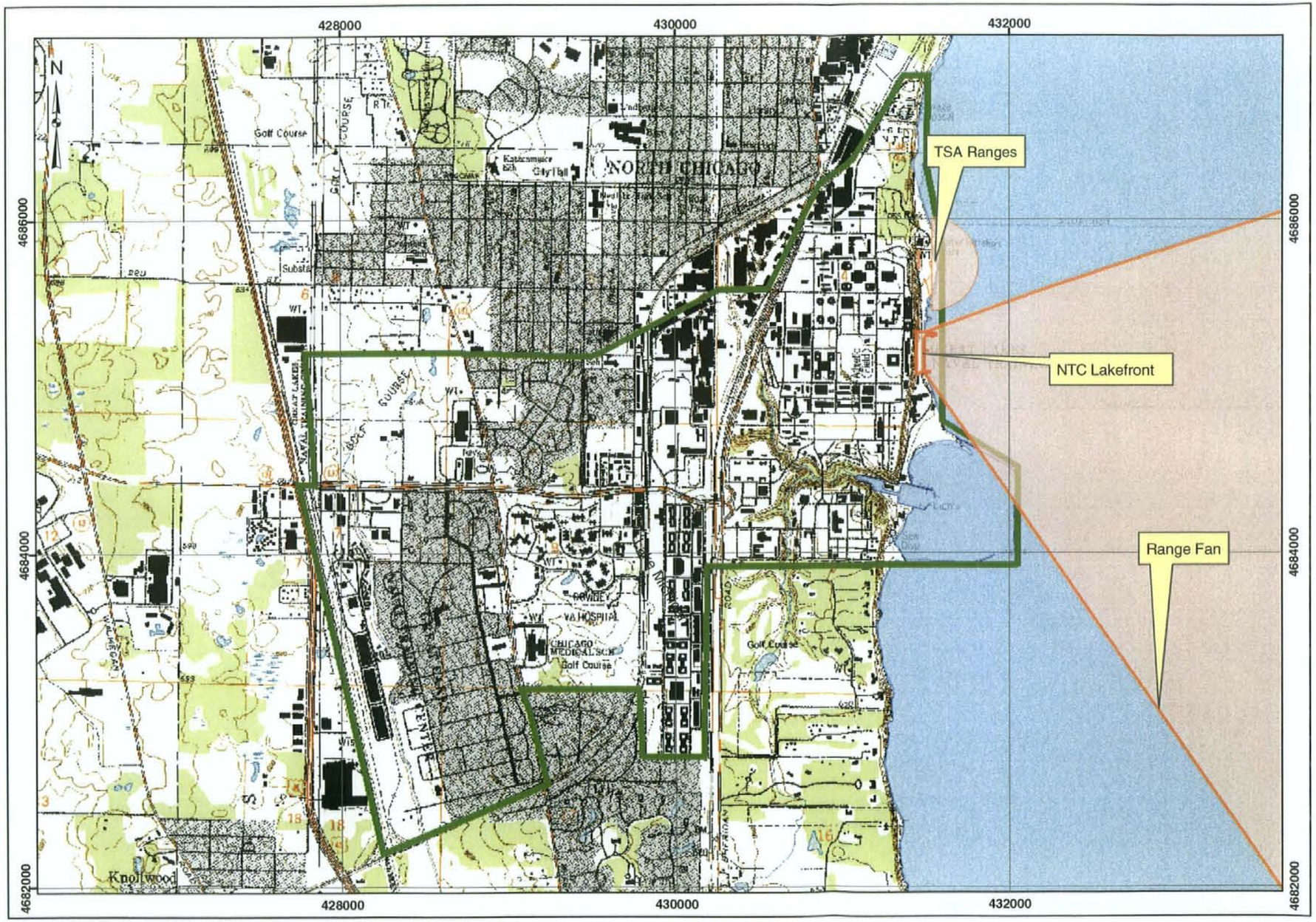
- 6 ammunition bunkers (small arms)
- 3 armory buildings
- 1 TSA Ranges magazine and firing location
- 4 indoor rifle range buildings
- 1 Naval rifle range (outdoor)
- 1 gas chamber (one of many at Great Lakes)
- 1 skeet range on lakefront of Lake Michigan

Based upon archival research and the Navy range inventory, the following land and water ranges were known to have been associated with the installation over the years:

- **TSA Ranges** - This eight-acre range was originally used to prepare Navy personnel for the training program at the Anti Aircraft Training Center and included a trap range. The addition of a skeet range and archery range came after WWII. The trap and skeet ranges fired over Lake Michigan. The site totaled to approximately one quarter of an acre of land; and the remaining acreage was the safety zone for the artillery fan. The ranges (with the exception of the archery range) utilized small caliber weapons (small arms), to train enlisted men for the targeting of moving objects, allowing them to gain proficiency before adapting these principles to the AA range, the former NTC Lakefront. This range is the focus of this draft WAMS.

These ranges are not covered in this Water Area Munitions Study and are not the focus of this study. A study was performed for the NTC Lakefront; however, the Moving Target Range and Pistol Butts were not evaluated per decision of the Navy.

- **NTC Lakefront** - This one-acre range was used to train enlisted men of the Armed Guard on AA artillery from 1943 until October 15, 1945, the disestablishment date as directed by the Secretary of the Navy. Twenty-five gun mounts were located on the beachfront. The targets were flown over Lake Michigan according to historical documents. Therefore, the site has been divided into two portions: the land located behind the firing line (which includes all structures) and the water portion (which include the beach east of the firing points and the lake). The range is composed of approximately a one-quarter acre portion of land and an approximate 72 square mile safety fan within Lake Michigan in which artillery had the potential to fall.
- **Moving Target Range** - This range was used for the training of Naval personnel on small arms of .50-caliber or less. The date of use and specific location of this course are unclear; however, there are documents that support evidence of the range being used by the Navy during the early years of the Naval station. Targets over the harbor were fired upon from the land; therefore, this range qualifies as a water range, containing a land-based firing location and the lake as a impact area.
- **Pistol Butts** - This range, located south of the harbor near the bluff, may have been used by the Navy for small arms training during the early years of the Naval station. The dates of use of this course are not known.



Water Area Munitions Study
Naval Station Great Lakes, Illinois

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Map 2-1
Area Location Map

Legend

- Installation Boundary
- Range Boundary
- Waterbodies

250 0 250 500 750 Meters

Data Source: USGS 7.5 Minute Topographic Series Map
Waukegan Quadrangle, Illinois

Coordinate System: UTM Zone 16
Datum: NAD 83
Units: meters

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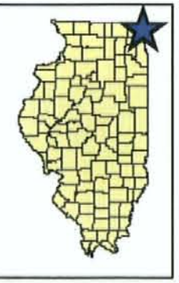
Naval Station
Great Lakes, Illinois



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3. PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

The following sections provide general information for Naval Station Great Lakes, including its climate; topography; geology; soil and vegetation types; hydrology; hydrogeology; cultural and natural resources; and endangered species.

3.1. Climate

The climate at Naval Station Great Lakes is strongly influenced by its proximity to Lake Michigan and by the southerly Gulf Stream winds from the Gulf of Mexico. Information obtained from the National Weather Service of the National Oceanic and Atmospheric Administration station in Champaign, Illinois (the Midwest Climate Center) provides representative climatic data for the area in which Naval Station Great Lakes is located.

Average temperatures range from 20.3°F in January to 71.5°F in July, with an annual average of 47.3°F. Mean daily maximum and minimum temperatures are 81.7°F in July and 12.0°F in January, respectively. In January, the mean daily maximum is 28.5°F. During extreme conditions, a daily maximum of 107°F in July and a daily minimum of –27°F in January have been recorded. There are, on average, approximately 52 days with a maximum temperature of 32°F or below and approximately 142 days with a minimum temperature of 32°F or below. In addition, there are, on average, approximately 15 days of zero or subzero temperatures a year.

The annual average precipitation recorded is 34.09 inches, with monthly average peaks as high as 4.22 inches in October and as low as 1.40 inches in February. The annual average relative humidity is approximately 65%. The mean seasonal snowfall is 37.9 inches. Because of the proximity to Lake Michigan, winter precipitation in the Chicagoland area is often in the form of wet snow.

Prevailing winds are from the northwest, but during the summer months they become more southerly. The average annual wind speed is eight to 12 miles per hour; however, winds may reach 50 to 60 miles per hour or higher in severe thunderstorms, tornadoes, or general winter storms.

3.2.Topography

Lakeshore bluffs rise from 20 to 75 feet in height above Lake Michigan and continue this trend through the west coast until reaching north shores that mainly consist of gentle rolling hills and large sand dunes as found in Illinois Beach State Park. The topography of Naval Station Great Lakes appears unchanged, having buildings built along the bluff, ravines and beachfront (see Figure 3-1).

Figure 3-1: Ridge behind the TSA Ranges and NTC Lakefront

3.3.Geology

The Wheaton Morainal Complex characterizes the geology of the area around Naval Station Great Lakes. The Great Lakes section of the Central Lowland Providence is divided into three sub-complexes: the Beach-Dune Complex, the Bluff-Ravine Complex and the Upland-Moraine Complex. Naval Station Great Lakes is listed as part of the Bluff-Ravine Complex due to the flat land cut by ravines and edged on the east with the bluff overlooking Lake Michigan. Pettibone Creek ravine runs perpendicular to the shoreline of Lake Michigan dividing Naval Station Great Lakes. This land formation is the result of Pleistocene continental glaciation deposits that released unconsolidated glacial drift along the bedrock.

The glacial till is composed of different proportions of clay, sand, silt, pebbles and boulders along the surface. The till ranges from 40 to 200 feet in thickness as a result of the numerous glacial events that took place to form the makeup of this surface geology. The lakeshore presents the sandy phase of this formation. Underneath the glacial till are layers of dolomites, sand stones, and shale from sea deposits. The bedrock is Precambrian granite that is relatively horizontal.

3.4.Soil and Vegetation Types

The soils predominately found in the area of Great Lakes are located on the tops of morainic ridges. Silt deposits overlay a calcareous glacial till of a silty sandy clay soil, which have moderate to poor draining capacity. Soils of the first five feet in depth are relatively uniform in grain size distribution, liquid limit and plasticity. The shoreline at Naval Station Great Lakes has eroded over the centuries; however, fill material was placed to extend the shoreline in the early 1940s. The lakefront area composed of fill material includes soil and other various materials, such as concrete and consolidated material serving as a foundation for the sandy beach and adjacent structures on-site including Ziegemeir Street.

The land acquired by Naval Station Great Lakes was cleared for buildings to accommodate housing and classroom needs; however, some native woodland remains. Terrestrial vegetation in the undeveloped sections of Naval Station Great Lakes consists predominately of woodland species. The individual stand compositions are the result of a combination of natural seeding, forest management, and planting. The majority of trees in the area are oak, maple, hickory and other hardwoods. Native shrubbery consists of blackberry, black oak, blueberry, huckleberry, maple, osier, sassafras and willow. Beach-grass, Kentucky bluegrass, Canada bluegrass, creeping red fescue, sheep fescue, tall fescue and clover are all turf vegetation found in this location.

3.5.Hydrology

Lake County has a surplus of water available from the surface waters of Lake Michigan. Communities near Lake Michigan, including Great Lakes utilize this source for potable water rather than groundwater aquifers. Municipal water supply in the Chicago Metropolitan Area is mostly from Lake Michigan. Naval Station Great Lakes consumes this lake water due to its proximity.

Naval Station Great Lakes has two drainage basins: Skokie Ditch and Pettibone Creek ravine. Water from these sources is not potable and previously has violated Illinois water quality standards. Downstream readings for Skokie Ditch of ammonia-nitrogen, fecal coliforms and dissolved oxygen were not meeting water quality standards; however, it was unlikely Naval Station Great Lakes was a significant contributor. Great Lakes' only point source to Skokie Ditch is storm sewer discharge from Forrestal Village, a residential area of the base. Pettibone Creek

receives runoff from the main area of the installation. This water discharges into Lake Michigan from the inner harbor location of the installation. In the past, Pettibone Creek had the highest violation incident rate of water quality standards and the highest number of separate violations of the Lake Michigan North Drainage System. Industry located just off base has reportedly been the source of water quality problems. According to the Illinois Environmental Protection Agency, studies performed subsequent to the violation report have resulted in no reported contamination issues of Pettibone Creek or Skokie Ditch with the exception of high turbidity.

Lake Michigan is the primary source for potable water in the Chicagoland area. Water consumed from the lake is discharged to the Mississippi River Basin. An International Treaty with Canada governs the rate of diversion of Great Lake Waters. Other surface water sources are not reliable resources for development of potable water due to slow recharge, low water volume and other obstacles.

3.6.Hydrogeology

Groundwater in the Lake County area consists of four aquifers: the Glacial Drift Aquifer, the Gilurian Dolomite formation, the Cambrian-Ordovician Aquifer and the Mount Simon Sandstone. The Glacial Drift and Gilurian Dolomite are shallow aquifers reaching depths of 150 to 500 feet. The shallow aquifer located at the range has a depth to groundwater between two and five feet due to the proximity to the lake. This water is not potable and is not utilized at Naval Station Great Lakes. The shallow aquifer system recharges from local rainfall infiltration, while the deep aquifer system receives sources from areas of central Wisconsin.

3.7.Cultural and Natural Resources

The National Register of Historical Places added Naval Station Great Lakes to the register in 1986. This includes 1,932 acres of land, 43 buildings, 14 structures and six objects of architectural/engineering significance. A Phase I Cultural Resource Investigation is provided in Appendix B, which outlines the properties examined. Based on discussions with environmental personnel, studies that would provide information pertaining to natural resources have not been released at this time.

3.8.Endangered and Special Status Species

The Navy performed an Integrated Natural Resources Management Plan for Naval Station Great Lakes in 2001. Specifically, the survey's objectives were to determine the presence and relative abundance of rare species on Naval Station Great Lakes and to locate and identify habitats critical to rare species.

During the study, mammalian, bird, amphibian, reptile, and insect surveys were completed; however, no mammals, reptiles or amphibians were identified as a result of the survey. Additionally, all state, federally listed and candidate plant species were surveyed. Finally, all additional plant species listed by the United States Fish and Wildlife Service and all plant species likely to be included on a proposed state list were surveyed.

Protected species that are known to or have the potential to inhabit Naval Station Great Lakes are listed in Table 3-1:

Table 3-1: Summary of Known or Potential Protected Species

Ecological Receptors	Species
Listed Fauna Species	American Bittern (Botaurus lentiginosus)
	Black-crowned Night Heron (Nycticorax nycticorax)
	Black & White Warbler (Mniotilta varia)
	Brown creeper (Certhia americana)
	Cerulean warbler (Dendriica cerulea)
	Common Snipe (Capella gallinago)
	American Bittern (Botaurus lentiginosus) Common Tern (Sterna hirundo)
	Double Crested Commorant (Phakacrocorax auritus)
	Forester's Tern (Sterna forsteri)
	Least Tern (Sterna antillarum)
	Peregrine Falcon (Falco peregrinus)
	Pied-billed grebe (Podilymbus podiceps)

	Piping Plover (Charadrius melodus)
	Short-Eared Owl (Asio flammeus)
	Sora (Porzana carolina)
	Veery (Catharus fuscescens)
Listed Flora Species	Forked Aster (Aster furcatus)
	Green yellow sedge (Carex viridula)
	Marram grass (Ammophila breviligulata)
	Sea Rocket (Cakile edentula)
	Seaside spurge (Chanaesyce polygonifolia)
Lake County Listed Species	Karner blue butterfly (Lycaeides Melissa samuelis)
	Eastern prairie fringed orchid (Platanthera leucophaea)

4. SUMMARY OF DATA COLLECTION EFFORT

Five primary sources of information were researched as part of the data collection effort for the WAMS. The sources of data included:

1) Historical archives;
2) Personal interviews;
3) Installation data repositories;
4) Visual survey; and
5) Off-site data sources and repositories.

These five sources of data are discussed below, along with their relative application to this WAMS.

4.1. Historical Archive Repositories (off-site)

The data collection team reviewed archival records located at the National Archives in College Park, Maryland and Suitland Park, Maryland. The data collection team researched the following records and record groups (RG) for documents relating to munitions usage at Naval Station Great Lakes:

Textual Records

RG 71, Bureau of Yards and Docks

- Naval Property Case Files, Boxes 428*, 429*, 430-432, 433*, 434*, 435*

RG 72, Bureau of Aeronautics: [KP15, NC113-7, NE8, NM3, NM29-8]

- Entry 62-B, General Correspondence, 1943-45, Boxes 2320, 2930, 2938, 2946, 2977, 2982, 3000, 3009, 3010, 3066*, 3077*, 3385*, 3464
- Entry 67, Confidential General Correspondence, 1922-1944, Box 977, 1203
- Entry 67, Confidential General Correspondence, 1922-1944, Box 1162*
- Entry 67-A, Confidential General Correspondence, 1945, Box 273, 286, 304
- Entry 75-A, Secret Correspondence, 1939-1947, Box 59

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* *Aerials from the Photo Archives, Command Histories 1949-1973 from the Operational Archives and the Command Histories 1946-1979 from the Aviation Branch have been denoted with an asterisk.*

RG 74, Bureau of Ordnance

- General Correspondence, 1926-1944, Box 789*
- Entry 1001, General Correspondence, 1907-1949, Boxes 8, 10, 11, 13, 14, 25, 26, 35-37, 51, 61, 62, 70, 88, 101, 105, 106
- Entry 1003 A-B, General Correspondence, 1948-1959, boxes 584, 587

RG 77, Chief of Engineers

- Entry 391, Construction Completion Reports, 1917-1943, (Ft. Sheridan), Boxes 291*, 292*, 293*
- Historical Record of Buildings, 1905-1942, (Ft. Sheridan), Boxes 240*, 241

Cartographic Records

RG 71, Bureau of Yards and Docks

- Maps for facility 905 and 906, codes 1, 2, 3, 15, 16, 32, 34, 42, 44-48
- Series I microfilm, Reels 1000*, 1001-1004

RG 385, Naval Facilities Engineering Command, 1917-1989

- Architectural and Engineering Plans,
- Great Lakes, Boxes 197-202, 207-222, 223*, 224, 225*, 226*
- Glenview, Boxes 191*, 192, 193*, 194

General correspondence and ordnance allowance requests provided detailed information about the munition types and quantities used at the installation. Target types, equipment malfunctions and conclusions from testing new ammunition are discussed in these reports and lead to further knowledge of MC and the potential for MEC containment.

4.2.Personal Interviews

The data collection team visited the following offices located on Naval Station Great Lakes to interview representatives and research records related to the training that was conducted at the TSA Ranges site:

- Environmental Office

- Explosive Ordnance Disposal (EOD)
- Fire Department
- Public Works Department (PWD)
- Safety Office
- Security Office

Historical aerial photos and reports were provided by those interviewed. A summary of the personnel interviewed and general information obtained from each is presented below. Interview forms are included in Appendix B.

- **Environmental Office** – The data collection team interviewed the former Installation Restoration Program manager and POC, Mr. Dan Fleming, and Mr. Carlo Luciano who had prepared for the Navy range inventory. Mr. Luciano has worked in the Environmental Office for seven years. He provided information on modifications made on-site, the assessment reports and other various documents for Naval Station Great Lakes. In addition, Mr. Luciano escorted team members to the TSA Ranges location.
- **Explosive Ordnance Disposal** – The data collection team interviewed the 88th EOD located at Fort McCoy, Wisconsin. The EOD did not provide any relevant information to the data collection team.
- **Fire Department** – The data collection team interviewed the Fire Chief of NAVSTA, Mr. David Biondi. He stated that the base fire department is not trained or equipped to handle ordnance response activities.
- **Public Works Department** – The data collection team interviewed Mr. Ken Endress of PWD-Real Property for the installation. Mr. Endress has 24 years of experience working for the PWD. Mr. Endress had very little knowledge of munition training activity; however he provided geotechnical background information and framed aerial photographs of the installation.
- **Safety Office** – The data collection team interviewed the Safety Officer, Mr. Joseph McCloud. Mr. McCloud has been employed on the installation for 24 years, of which he has been involved with the safety office for 16 years. He did not have any knowledge of previous munitions related training activities being conducted at TSA Ranges.

- **Security Department** – The data collection team interviewed the Security Officer, Mr. Jim Trimble. Mr. Trimble has 35 years of experience at Naval Station Great Lakes. He also currently is the Fire Arms Senior Instructor in addition to heading Security Department. Mr. Trimble had very little specific information or records relating to munitions training at the site location. However, he did indicate that a small arms range north of Foss Park (approximately 1.25 miles from the site) changed ownership and that Navy personnel have used the site with a number of small arms and possibly with other artillery. Access to the area is restricted because the Federal Bureau Investigation currently occupies the area.

4.3.On-Site Data Repositories

Naval Station Great Lakes Environmental and PWD offices have an extensive collection of drawings dating back to the early days of the installation. Previous environmental studies were copied for reference material for soil characteristics, groundwater depths, and other pertinent data. The installation maintains a local museum on-site that provides historical insight on the role of Naval Station Great Lakes throughout nearly a century of existence. The data collection team received newspaper archives that discuss the first expansion of the Naval base during WWI and the role of the ordnance department. The reports obtained from on-site data repositories are listed in Appendix A.

4.4.Visual Survey

The data collection team conducted a visual survey on March 17 through 21, 2003 of the TSA Ranges as part of the data collection effort for the WAMS. The purpose of the visual survey was to identify any MEC ordnance related materials (e.g., expended rounds, fragmentation, range debris, old targets), any evidence of MC (such as ground scarring, stressed vegetation, or chemical residue) and/or surface features that could provide additional information to aid in the characterization of the site. The visual survey was also used to enhance, augment, or confirm the archival data and, in some cases, provide new data to the team.

The type of range or weapon known or suspected to have been used on the range drives the features or materials that the data collection team looks for during the visual survey. Because the site was a small arms training area, features that the data collection team specifically looked for

during the visual survey included shell casings, expended munitions, old firing positions and targets, and visual evidence of the buildings where the ammunition was stored. No evidence of these items was observed during the survey. The visual survey was limited to the land portion of this range.

Personnel conducting the site walk were Mr. Dan Hains, UXO Safety; Mr. Stephen Rice, Geographical Information System; and Mr. Al Larkins, UXO of Malcolm Pirnie. The visual survey was limited to the land portion of this range. The site was inspected by a walk around the perimeter of the range followed by a modified "W" type pattern to visually inspect approximately 50 percent of the location. The former firing points and target houses had been cleared and turned into a RV park for the installation. Ziegemeir Street sits adjacent to the former firing point locations. Presently, a shower and bathroom facility is located in the approximate location of the former trap/skeet houses.

4.5.Off-Site Data Sources

The data collection team visited the North Chicago Library to acquire archived newspaper articles and environmental reports provided by the Navy as required for public notification of remedial activities at the installation. Limited information was available and data relevant to the site was not obtained as a result of the visit to the North Chicago Library. The team was referred to the Lake County Museum. The Lake County Museum holds a large archive of photographs and a number of newspaper articles. The photographs depicted training sessions, which included small arms ranges; however, information was not found for the TSA Ranges. No relevant data was acquired from the Ordnance Environmental Support Office. Data collected is in Appendix B.

5. SITE CHARACTERISTICS

The following sections provide site-specific information about the TSA Ranges at Naval Station Great Lakes, including history and site description; visual survey observation and results; munitions characterization; contaminant migration routes; receptors; land use; access controls and restrictions; and the conceptual site model.

5.1. History and Site Description

The land portion of the TSA Ranges is a small area (approximately one-quarter of an acre) located east of the bluff on the beachfront of Lake Michigan. The location for the site was placed with fill material to extend the shoreline for the addition of the skeet range to the installation. The water portion of this site, where munitions were fired, covers a fan area of approximately eight acres. The site was originally used in conjunction with the NTC Lakefront for Navy personnel to first experience targeting a moving object before handling the large caliber AA guns. The use of the trap range in conjunction with the AA training center ended with the closing of the AA training center; however, the trap range was likely used for enthusiasts afterward, as it was common practice to allow enthusiasts to enjoy these ranges to offset costs for maintenance. The skeet and archery ranges were added to the site in 1968, based on the construction drawings for the site, and were probably used for recreational purposes. Potential UXO and MC issues associated with the site focus on its former use as a small arms training area. Map 5-1 illustrates the TSA Ranges site and the surrounding area.

Figure 5-1: Current view directed south toward the TSA Ranges site location

The area is bordered by Lake Michigan to the east, Foss Acres Park and the North Chicago Pumping Station to the north, the bluff to the west, and the former AA training site the (NTC Lakefront) to the south. The site is accessible via Ziegemier Street, as shown in Figure 5-1.

The TSA Ranges are identified on a 1968 drawing for the addition of the archery and skeet ranges to the trap range. Although no maps specified a trap range prior to the construction drawing for the TSA Ranges, many reference documents elude to the use of a trap range for moving target training as part of the AA Training Center course agenda. The Anti-Aircraft Training Center was constructed in 1942 to meet Navy needs for educated personnel during the initial phase of American involvement in WWII. Therefore, the trap range was established around this time.

The need for small arms and AA training after WWII slowly diminished, limiting the demand for such ranges. The range remained active and may have also had a recreational value that allowed Navy personnel to target practice on the ranges. The skeet and archery ranges were constructed in 1968, clearly after WWII; however, installation personnel required to carry arms while on base (e.g. gate guards and security) are required to participate in regular practice sessions shooting targets.

Over the years, the equipment storage building and trap/skeet houses were demolished, and the ranges were decommissioned. Construction began on the recreational vehicle (RV) park in July 2000 within the TSA Ranges site to provide a recreational draw to the installation, offering a beach area and other amenities. Thus, no visible signs of the ranges or the equipment building exist today. The current location of Ziegemier Street shows no evidence of the former range locations.

Figure 5-2: Construction of the RV Park

5.1.1. Topography

The topography of the TSA Ranges greatly changes from the bluff to the lake. The bluff is steeply sloped and is the western boundary of the site. The former location of the TSA Ranges firing points is presently paved over with concrete and asphalt and is generally flat. Receptors may enter the site from the lake; however, the bluff may restrict access from the western side of the site.

5.1.2. Geology

The geology of the site varies from the bluff to the beachfront, but generally the geology is classified as poorly sorted, unstratified sediments of the Wodsworth formation underlain by Silurian dolomite bedrock.

5.1.3. Soil and Vegetation Types

The soil is characterized as silt deposits above a silty sandy clay soil forming the bluffs and ravines. The soil is poorly to moderately drained nearly level to steep, and course textured. The lakefront area was extended eastward to create the land space for the skeet range using a fill material base.

5.1.4. Hydrology

The TSA Ranges are adjacent to Lake Michigan with no streams or surface water controls in place. Surface water runoff moves across the site west to east in sheet flow emptying into the lake.

5.1.5. Hydrogeology

Groundwater at the site is at a depth between two and five feet and is not used as a drinking water source for the installation. Any MC in groundwater discharging into the lake are expected to be very diluted and not to be a concern to the potable water use of the lake. Groundwater generally travels east/northeast toward the lake.

5.1.6. Cultural and Natural Resources

There are no known cultural or natural resources sited on the TSA Ranges location.

5.1.7. Endangered and Special Status Species

There are no known endangered or special status species sited at the TSA Ranges location.

5.2. Visual Survey Observations and Results

The survey team found no physical evidence of the TSA Ranges during the visual survey of the land portion of the site. Signs of the firing points were no longer visible due to the construction of the RV Park. The locations of the former TSA ranges are as shown in Figure 5-1. No evidence remains of the former structures or the targets used for training purposes.

The TSA Ranges location was originally filled in to extend the edge of the jetty out further east for the construction of the skeet range. Lake Michigan provides the eastern border of the site. Approximately 350 feet west of the TSA Ranges is a tall bluff on which quarters and garages for Navy personnel are located. The site appears well maintained with little debris and a manicured recreational area. Several trees between five and ten inches in diameter are around the borders of the site and on the bluff.

A visual survey of the land portion of the range did not indicate any evidence of UXO, MEC or MC. The land was cleared for the construction of the RV Park in July 2000 for 20 RV sites, ten tent sites and one group camping site. A visual survey of the water portion of the range was not conducted.

A visual depiction of the site reconnaissance is provided on Map 5-1 located at the end of Section 5. Additional range/site details are illustrated on Map 5-2 also located at the end of Section 5.

5.3. Munitions and Munitions Related Materials Associated with the Site

This section describes the munitions or munitions related materials known or suspected to be at the site. This includes both MEC and non-hazardous munitions related scrap (e.g., fragmentation, base plates, inert mortar fins).

The data collection team was able to locate specific records of the different types and quantities of ammunition used at the installation. Reviewing archive data for ammunition orders from the 1940s and 1950s created a list of potential types of ordnance used at the range. The following ammunition may have been used at the site.

- Shot guns, 12-gauge with slide repeating action and modified choke, 26" or 28' barrel
- Shells, shotgun, 12-gauge, No. 7 ½ shot
- Targets, clay pigeon

There were no visual findings of ammunition or other ordnance during the survey. The investigation was non-intrusive; further investigation may lead to findings in the subsurface of the soil. The site location has been constructed upon for the use as a RV Park for the needs of the installation. Construction plans of the RV Park were not available to identify grading of the soil.

The cartridge for a 12-gauge shotgun, No 00, is 64.3 mm (2.53 inches) in length and weighs 0.736 grains; and the filler can have various weight. The 12-gauge shotgun was primarily used for riot control and target practice at small arms ranges, in particular, the trap and skeet ranges. Technical information about the cartridge for a 12-gauge shotgun is included in Appendix D.

Trap and skeet targets have an outer diameter of six to ten centimeters and weigh anywhere between 30 and 100 grams. The clays are made of a marble dust bound by vegetable pitch. The Material Safety Data Sheet for the clay pigeon is included in Appendix D.

Based on the information obtained during the data collection process, no special consideration munitions are known or suspected to have been used at the site; therefore, the TSA Ranges site is not suspected to contain chemical warfare material filled munitions, electrically-fuzed munitions or depleted uranium associated munitions.

5.4. MEC Presence

The entire site has been subdivided and categorized into one of three levels of MEC presence including: Known MEC Areas, Suspect MEC Areas, and Areas where No Evidence exists to indicate that MEC is known or is suspected to be at the site. The MEC presence is discussed below. Map 5-3 illustrates the munitions characterization of the TSA Ranges and is provided at the end of Section 5.

5.4.1. Known MEC Areas

There are no known MEC areas associated with the site.

5.4.2. Suspected MEC Areas

There are no suspected MEC areas associated with the site because only small arms were utilized at the ranges at this location.

5.4.3. Areas Not Suspected to Contain MEC

Based upon observations made and data collected during the WAMS process, the approximate one-quarter of an acre land area of the TSA Ranges is not suspected to contain MEC. The TSA Ranges location was dedicated to the use of small arms, which are not MEC and therefore dismiss any suspicion of MEC.

5.5. Ordnance Penetration Estimates

The depth to which munitions penetrate below the ground surface depends on many factors, including the type of soil, the angle of impact, the size of the munition, the velocity at impact, and site-specific environmental conditions. Over the years, the DoD has studied and modeled munitions penetration depths and has issued various guidance and technical documents on the subject. For the purposes of the WAMS, maximum probable penetration depths are estimated following guidance listed in the latest draft (July 2002) of the DoD Directive on Explosives Safety issued by the DoD Explosives Safety Board (*DoD Directive 6055.9* [*DoD Ammunition and Explosives Safety Standards*]). The Directive refers to *TM 5.855.1* and *NAVFAC P-1080.*

Skeet range artillery does not have a calculated penetration depth since the buckshot is not fired into a berm, but rather at a target within the horizon of the firing point. The targets were projected over Lake Michigan; therefore, the potential for the projectiles to impact the land area was very low. The impacts below the lake surface are variable and unknown due to lake dynamics, such as lake inversion.

5.6. Munitions Constituents

Historical documents confirm the firing of small arms ammunition over Lake Michigan for training exercises at the TSA Ranges. The potential for MC exists in the estimated fan area of Lake Michigan where munitions were fired. The primary MC of concern include lead and polycyclic aromatic hydrocarbons (PAHs). Other associated MC less likely to be of concern

include: antimony (increases hardness), arsenic (present in lead), nickel (coating on some shot), and lead styphnate/lead azide (primer mixture). It is unlikely that any MC would exist in the land portion of the range. There is a potential for MC to be present in the lake, although the lake water volume would considerably lower contaminant mass concentrations in the water (by mass of solute, [the contaminant], over the mass of the solution, [the lake]).

5.7. Contaminant Migration Routes

Contaminants at the land portion of TSA Ranges (although unlikely to be present) may potentially migrate to the surface water and groundwater. Contaminants at the TSA Ranges would likely migrate horizontally within the highly permeable soil located along the lakefront, which is primarily composed of sand. Although the upper portions of the surficial deposits do contain water, this supply is not used as a source of water at Naval Station Great Lakes. The primary route of contaminant migration in groundwater would be through the perched shallow water-bearing zone present in the surficial deposits. Any potential contaminants entering the shallow water bearing zones would be expected to move laterally towards Lake Michigan, the lowest hydraulic point in the area. Therefore, no leaching of contaminants into the deeper groundwater aquifer would be expected. The TSA Ranges site is located at the bottom of a bluff with an elevation close to that of the lake. All surface water run-off would discharge to Lake Michigan. Therefore, contaminant migration to surface water is possible from the TSA Ranges.

Migration of MC is expected for the target area of the range. Ordnance was targeted over Lake Michigan from the lakeshore position. The extent of contamination and the release of MC in the lake have not been determined. Lake Michigan has a large water volume and the concentration of potential contaminants is offset by that large volume of water, producing potential water concentrations of these contaminants at low levels.

5.8. Receptors

There are three groups of potential contaminant receptors (Navy personnel, Navy-escorted visitors and trespassers) and one group of potential biota receptors at Naval Station Great Lakes. Shallow groundwater from the TSA Ranges is expected to discharge to Lake Michigan. Surface water run-off from the area under study in this report eventually discharges to Lake Michigan. Therefore, receptors of groundwater and surface water will be the same. Fish from Lake

Michigan are caught and consumed by recreational and commercial fishermen and used as a primary food source by waterfowl. According to the Illinois Department of Natural Resources, Lake Michigan is a major fishery with over 22,000 square miles of both commercial and recreational fishing adjacent to Naval Station Great Lakes.

The surface soil has an unlikely potential for receptor interaction of MC since the area of the TSA Ranges was used as a firing point and the targets were projected over Lake Michigan. Potential receptors of surface soil include current and future Navy personnel and families, fauna and flora, future grounds workers and trespassers/outdoor enthusiasts. The maintenance of the RV Park may expose contractors and grounds workers to dust with elevated lead concentrations. Navy personnel and visitors of the installation have the potential of coming into contact with contaminants while staying at the RV Park or campgrounds on the site through dermal, indigestion and inhalation exposure routes. Lastly, exposure to contaminants as a result of fishing Lake Michigan is another possible exposure route. These are examples of exposure routes; a complete pathway is unlikely because munitions were fired over Lake Michigan.

Although dilution of contaminants within Lake Michigan likely provide no impact upon a drinking water supply from Lake Michigan, the potential for contamination within the surface waters of Lake Michigan is possible. The status of MC within the lake is unknown; and potential impacts upon aquatic species are possible although the likelihood is low.

5.8.1. Nearby Populations

A mixture of residential and commercial land surrounds Naval Station Great Lakes. Presently, residential zoning is predominantly low-density single-family housing. According to a demographics poll, considerable increases in the construction of residential areas in Lake County along with the villages adjacent to Naval Station Great Lakes, have provided much growth to the county population. The county's population of 293,656 in 1960 represented an increase of 65 percent over that in 1950. Currently, the population within Lake County is approximately 645,000 people.

5.8.2. Buildings Near/Within Site

Numerous buildings are located on the western side of the TSA Ranges. The closest building is Building 59, which is located about 350 feet from the former range. The building is used as quarters for Navy personnel in training and is owned and operated by the Navy. The bluff runs behind Building 59 down to the northern lakefront property of the installation where the site is located. The former NTC Lakefront is approximately 1,500 feet from the former location of the TSA Ranges.

5.8.3. Utilities On/Near Site

The RV Park is equipped with electricity, running water and sewer. An electrical line runs along the road north and south to supply power to the lakefront area of the installation. Underground utilities for water and sewer service the RV Park facilities. No reported incidents of the uncovering of UXO have been recorded as a result of the construction of underground utility services. According to the Illinois Environmental Protection Agency, the North Chicago Pumping Station has two intakes that provide drinking water to the surrounding area and raw water to nearby industry for the use as process water. This intake is located approximately 200 feet from the site; however, no recorded incidents of contamination as a result of the TSA Ranges or the installation were provided to the data collection team.

5.9. Land and Water Use

The TSA Ranges site is currently a location for a RV park. The former structures no longer exist on the site. The site, an approximate one-quarter of an acre plot of land, is located within the northern beachfront area of the complex. The reasonably anticipated future land use is for the site to remain as a RV Park to support the needs of the installation.

The water portion of the range extends out into Lake Michigan, as targets were released over the water to prevent the need for an exclusion zone on land. The water reaches approximately 35 feet in depth within the fan of the trap/skeet ranges and has a surface area of approximately eight acres. Today, the lake is utilized for many purposes, such as a transport route for shipped goods, a source of fresh water for numerous communities, and a recreational location for outdoor enthusiasts.

5.10. Access Controls / Restrictions

A perimeter fence to the lake and guarded entrance gates limit access to Naval Station Great Lakes. Access is granted to authorized Navy personnel and civilians that either work within the base or have been permitted access. The Navy uses the installation for military purposes, including training facilities, barracks and other support activities. The beach side of the installation off Lake Michigan does not limit access to the entire east side of the installation. Access to the TSA Ranges is not restricted once a person gets through the main installation gates. Thus, any Navy personnel or authorized visitor who has access through the main installation gates can access the site without restriction.

5.11. Conceptual Site Model

This Conceptual Site Model (CSM) was developed following guidance documents issued by the USEPA for hazardous waste sites and the U.S. Army Corps of Engineers (USACE) for ordnance and explosives (OE) sites. Guidance documents included the USEPA's Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA/540/G-89/004) and the USACE CSM Guidance Development of Integrated Conceptual Site Models for Environmental Ordnance and Explosives (OE) Sites, which was final as of February 2003.

The CSM describes the site and its environmental setting. The CSM presents information regarding: 1) MEC and/or MC known or suspected to be at the site; 2) current and future reasonably anticipated or proposed uses of the real property; and 3) actual, potentially complete, or incomplete exposure pathways that link them. The CSM is the basis for the risk evaluation, prioritization, and remediation cost estimate.

The CSM is presented in a series of information profiles that presents information about the site. The information profiles are included in Table 5-1 below.

Table 5-1: Conceptual Site Model Information Profiles – TSA Ranges		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
Range/Site Profile	Installation Name	Naval Station Great Lakes
	Installation Location	Great Lakes, Lake County, Illinois
	Range/Site Name	TSA Ranges
	Range/Site Location	The site is located on the eastern side of Naval Station Great Lakes, north of the NTC Lakefront.
	Range/Site History	The site was built as a training and recreational tool for servicemen to be proficient at leading, timing and firing on flying targets. The ranges were built in 1968 and closed at an undetermined date. There is no documentation of any remedial efforts for the closure of the ranges or of the dates of construction of the RV Park and amenities.
	Range/Site Area and Layout	The site, consisting of approximately one-quarter acre of land, is divided into three ranges consisting of the trap, skeet and archery ranges. The trap and skeet ranges are both water ranges.
	Range/Site Structures	The trap range consisted of shooting stations and a pull house for the target thrower. The skeet range had low and high houses to dispense the projectiles and shooting stations. The archery range had no structures. Currently a RV Park with bathroom facilities is located at the site.
	Range/Site Boundaries	N: Foss Acres Forest Preserve S: NTC Lakefront E: Lake Michigan W: Ridge and Ziegemeir Street
	Range/Site Security	The TSA Ranges are located within the installation, which is patrolled by base security; however there are no waterside access controls.
Munitions/ Release Profile	Munitions Types	Small arms
	Maximum Probability Penetration Depth	Maximum penetration depth of zero to six inches (surface) for small arms.
	MEC Density	None
	MEC Scrap/Fragments	None

Table 5-1: Conceptual Site Model Information Profiles – TSA Ranges		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
	Associated Munitions Constituents	Primary MC of concern include lead and polycyclic aromatic hydrocarbons (PAHs). Other associated MC less likely to be of concern may include: antimony (increases hardness), arsenic (present in lead), nickel (coating on some shot), and lead styphnate/lead azide (primer mixture).
	Migration Routes/Release Mechanisms	Natural routes: erosion, surface runoff, frost heave; Human intervention: construction, excavation, and surface soil or vegetation removal.
Physical Profile	Climate	Lakefront strongly influenced by Lake Michigan and Gulf Stream southerly winds.
	Topography	Bluffs and ravines surround range on lakefront beach location. See range map.
	Geology	Poorly sorted, unstratified sediments of the Wodsworth formation underlain by Silurian dolomite bedrock
	Soil	Silt deposits above a silty, sandy, clay soil forming the bluffs and ravines; poorly to moderately drained, nearly level to steep, and course textured.
	Hydrogeology	Depth to groundwater averages two to 5 feet. Groundwater flow direction is generally to the east by northeast toward Lake Michigan. Groundwater is not used as a drinking water source for the installation. Any MC in groundwater discharging into the lake is expected to be very diluted and not to be a concern to the potable water use of the lake.
	Hydrology	Lake Michigan watershed – various drainage basins and groundwater are not potable water resources; however, lake water supplies the Chicagoland communities as a potable water source.
	Vegetation	Predominantly grasses with some woodland species.
Land Use and Exposure Profile	Current Land Use	RV Park
	Current Human Receptors	Receptors include Navy personnel, Navy families, visitors, trespassers, and contractors.

Table 5-1: Conceptual Site Model Information Profiles – TSA Ranges		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
	Current Activities (frequency, nature of activity)	Activities on-site are moderate in frequency and include grounds maintenance, recreational activities (e.g., fishing), and camping at the RV Park.
	Potential Future Land Use	Continued use as a RV Park and campground location for Navy personnel and visitors; no plans for use external to Navy.
	Potential Future Human Receptors	Future receptors include Navy personnel, Navy families, visitors, trespassers, and contractors.
	Potential Future Land Use-Related Activities:	Grounds maintenance and potential construction for recreational activities
	Zoning/Land Use Restrictions	No known formal land use restrictions. Area is used as a RV Park.
	Demographics/Zoning	Lake County population density is approximately 1,300 persons per square mile, while NTC Great Lakes employs approximately 25,000 military and civilian personnel.
	Beneficial Resources	Lake Michigan is the source of the municipal water supply, commercial industry and recreational activities.
Ecological Profile	Habitat Type	Grassland species at the range location with forested habitats in the bluff and forest preserve adjacent to the site.
	Degree of Disturbance	Moderate – Activities at the site include moderate disturbance (e.g., mowing and infrequent use for vehicle storage/placement for personnel with RV as housing/transportation.
	Ecological Receptors	
	Federal Endangered Species:	None
	Federal Threatened Species:	None
	State Endangered Species:	None
	State Threatened Species:	None
	Other Ecological Receptors:	None other than common fauna/flora such as large mammals (e.g., deer) and small mammals (e.g., raccoon, possum, red fox)

Table 5-1: Conceptual Site Model Information Profiles – TSA Ranges		
Profile Type	**Information Needs**	**Preliminary Assessment Findings**
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	Ecological receptors may come into direct contact with MC (in soil/surface waters). Receptors may come into contact with MC that has been incorporated into the food chain (bioaccumulated in plants and animals).

A key element of the CSM is the exposure pathway analysis. For MEC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MEC are expected to be found); 2) access (e.g., controlled or uncontrolled access, items on the surface or within the subsurface); 3) an activity (e.g., non-intrusive grounds maintenance or intrusive construction); and 4) receptors (e.g., Navy personnel, construction workers, recreational users or authorized visitors). It is important to recognize that environmental mechanisms (e.g., erosion) and/or human intervention may result in the repositioning of MEC.

For MC, a complete or potentially complete exposure pathway must include the following components: 1) a source (e.g., locations where MC are expected to be found); 2) an exposure medium (e.g., surface soil); 3) an exposure route (e.g., dermal contact); and 4) receptors (e.g., Navy personnel, construction workers, recreational users or authorized visitors). If the point of exposure is not at the same location as the source, the pathway may also include a release mechanism (e.g., volatilization) and a transport medium (e.g., air).

The potential interactions between the source and receptors are assessed differently between MEC and MC. For MC, interaction between the source and receptors involves a release mechanism for the MC, an exposure medium that contains the MC, and an exposure route that places the receptor into contact with the contaminated medium. For MEC, interaction between the potential receptors and an MEC source has two components. The receptor must have access to the source and must engage in some activity that results in contact with individual MEC items within the source area. The Exposure Pathway Analysis figures provide a summary of complete or incomplete exposure pathways for MEC and MC.

Figure 5-3: MEC Exposure Pathway Analysis

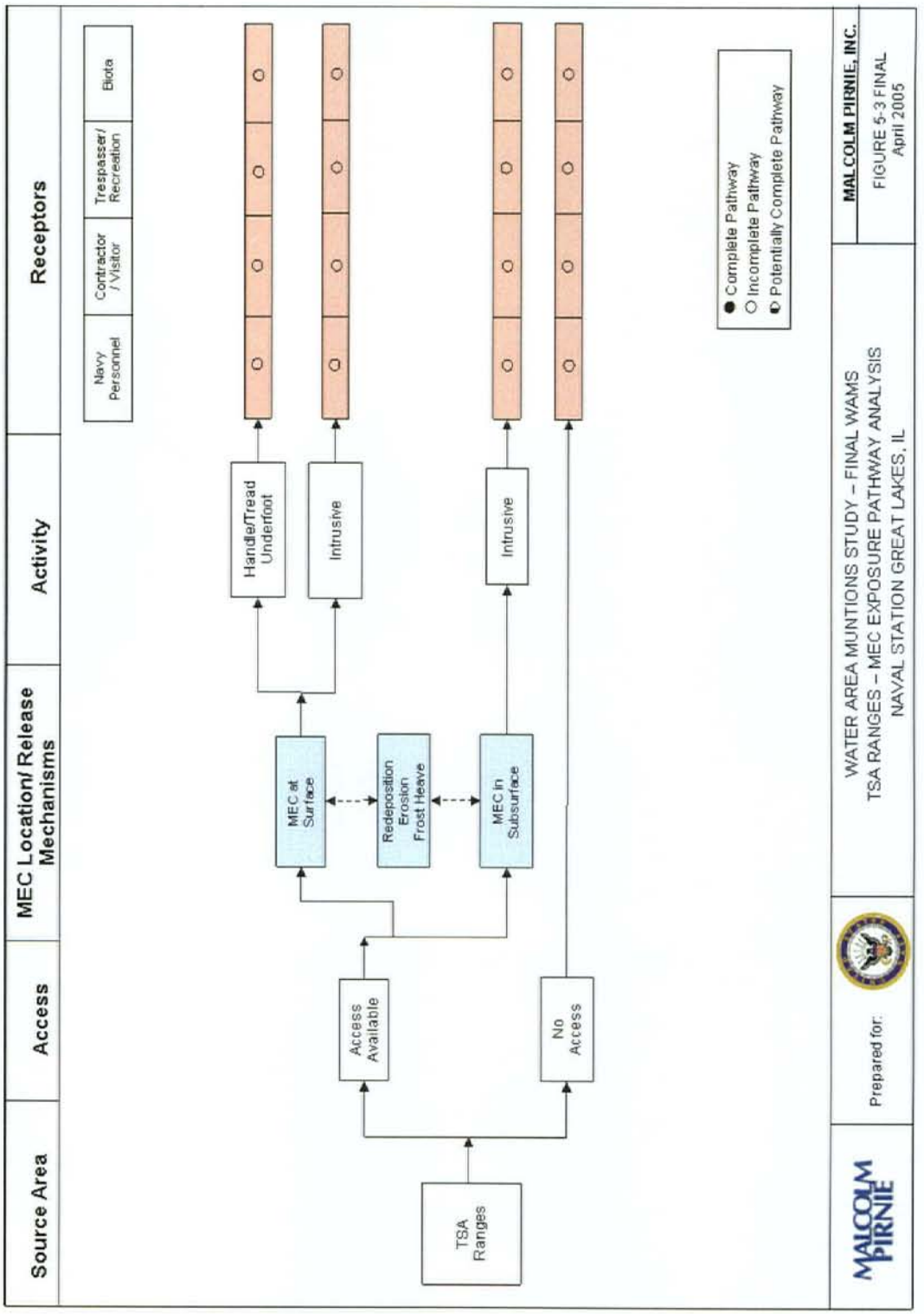
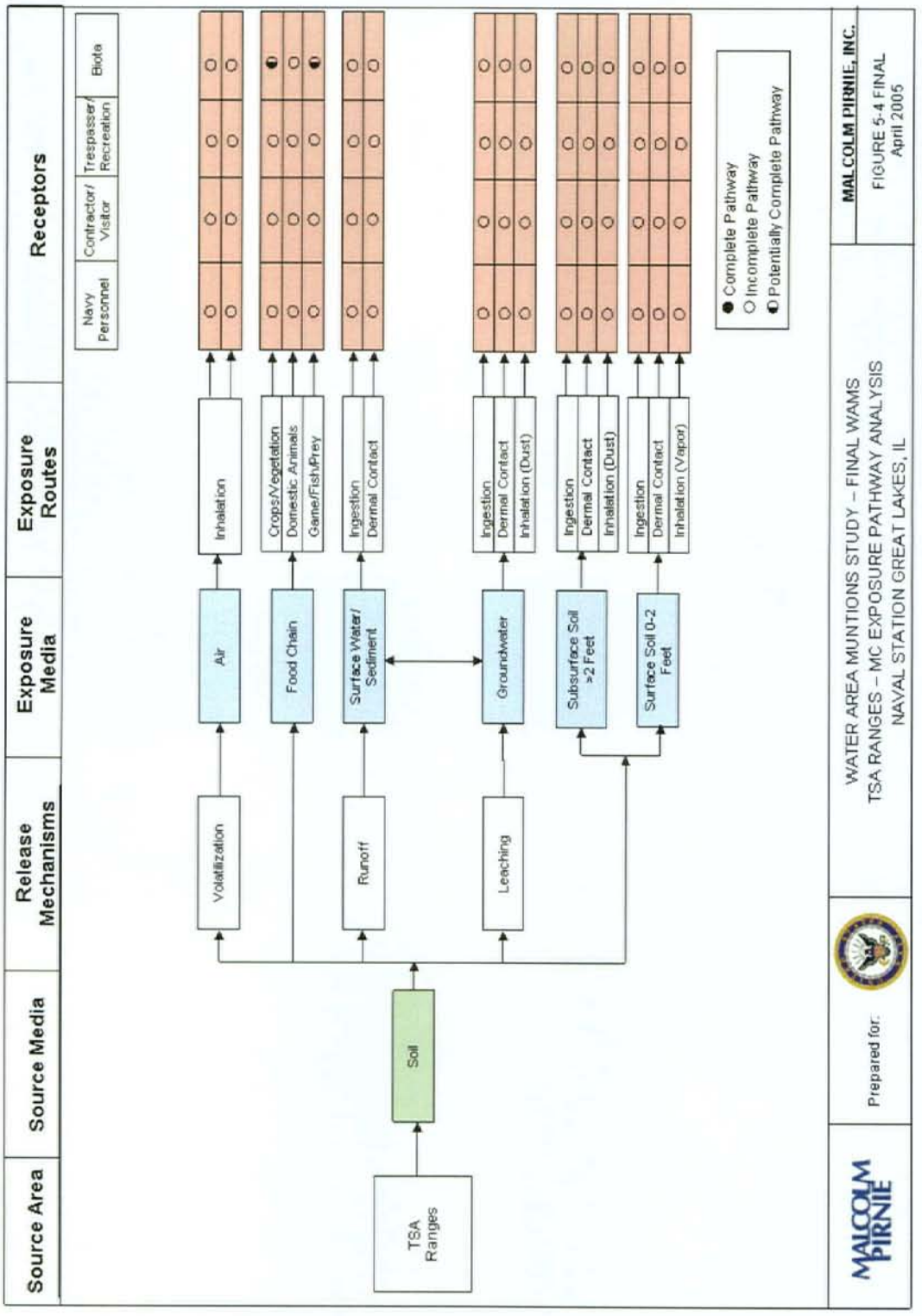


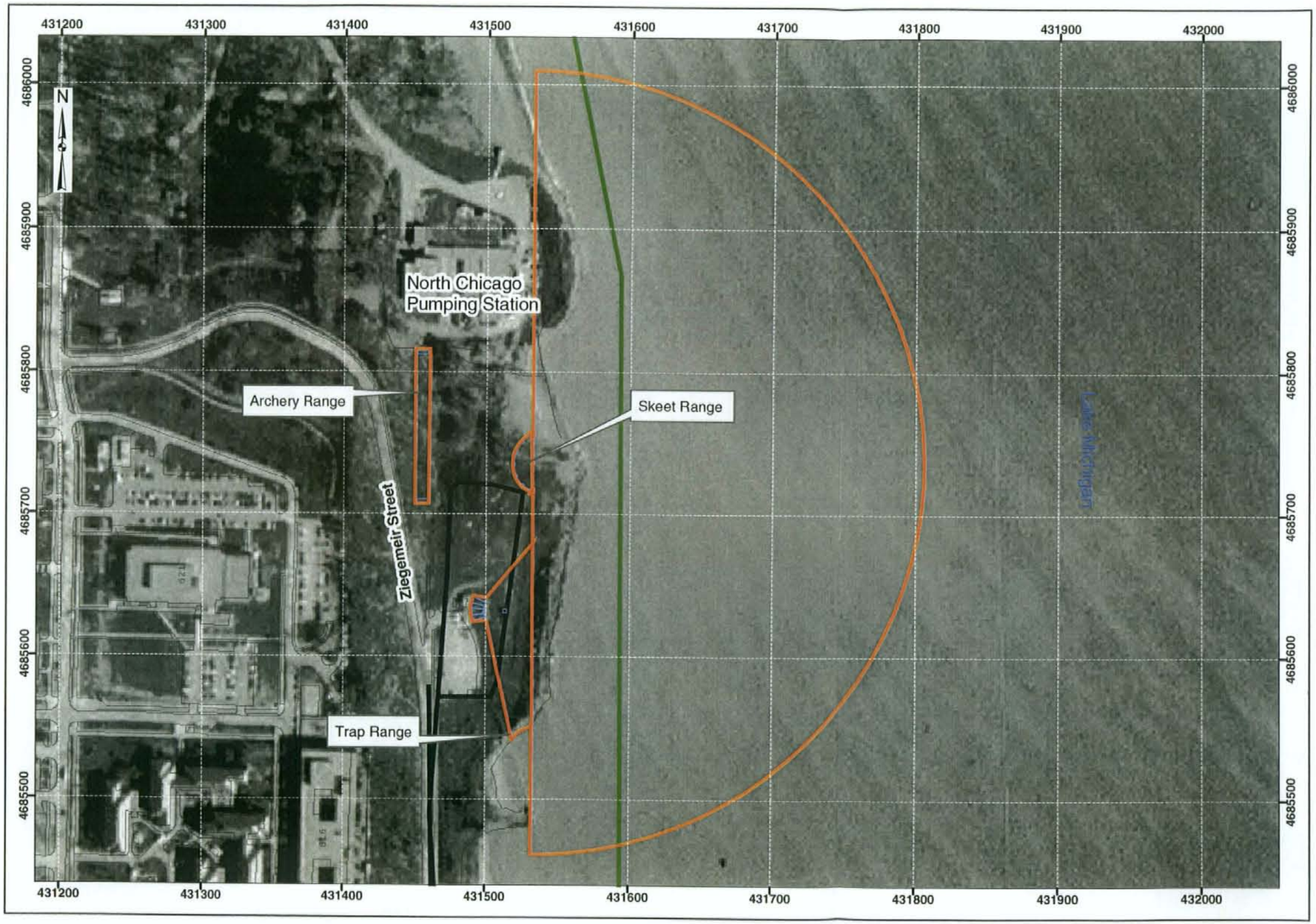
Figure 5-4: MC Exposure Pathway Analysis



5.12. Summary of Findings

The TSA Ranges provided Navy personnel training in the principles of leading, timing and firing on flying targets. In addition, these ranges offered competition in marksmanship and may have offered recreation as well. Historical documentation and interviewed Naval Station Great Lakes personnel have indicated that no explosives or munitions were used at the site. The TSA Ranges possess a land portion (e.g., firing arches and storage) and a water portion (extension of fan area for munitions).

The one-quarter of an acre land portion of the TSA Ranges is currently redeveloped as a RV Park; no visible evidence remains of the former use of the site as a TSA Range area. Change is not anticipated for the site location at this time. Potential receptors to the site include visitors of the RV Park, Navy and authorized personnel who work near the site and trespassers/outdoor enthusiasts who may have entered the area.



Water Area Munitions Study
Naval Station Great Lakes, Illinois

MALCOLM PIRNIE

Map 5-1
Visual Survey
Trap, Skeet & Archery Ranges

Legend

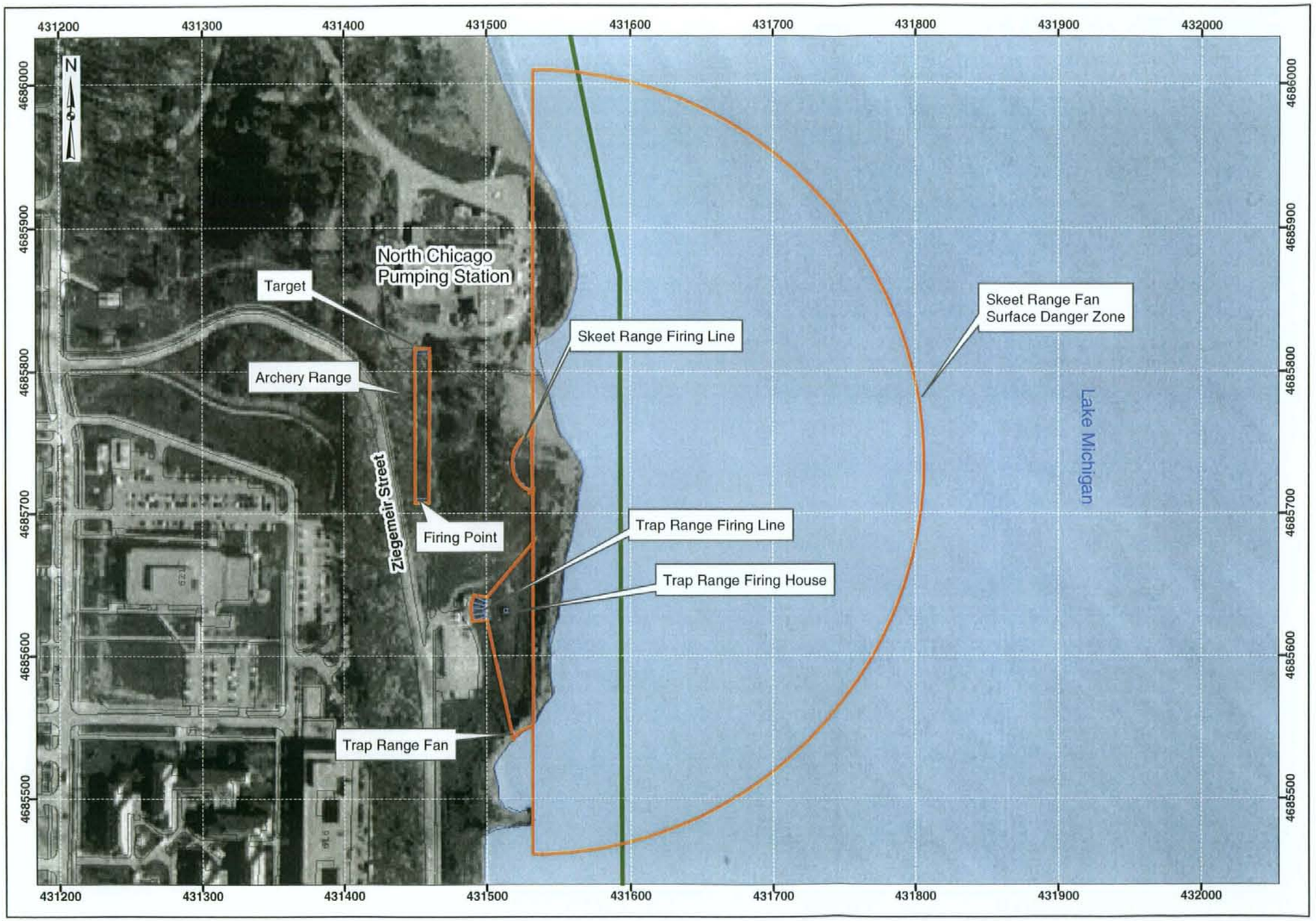
- Installation Boundary
- Site Boundary
- Site Features
- Site Reconnaissance

0 75 150 300 450 600 Feet

Coordinate System: UTM Zone 16
Datum: NAD 83
Units: meters

Contract: N62472-02-D-1300
Edition: Final Water Area Munition Study
Date: April 2005

000176FB06Y



Water Area Munitions Study
Naval Station Great Lakes, Illinois

MALCOLM PIRNIE

Map 5-2
Range/Site Details
Trap, Skeet & Archery Ranges

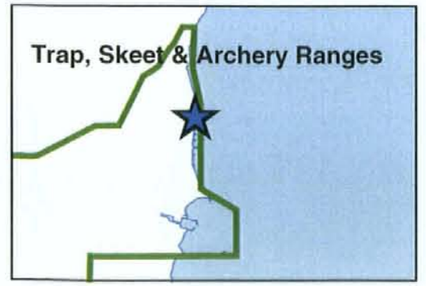
Legend

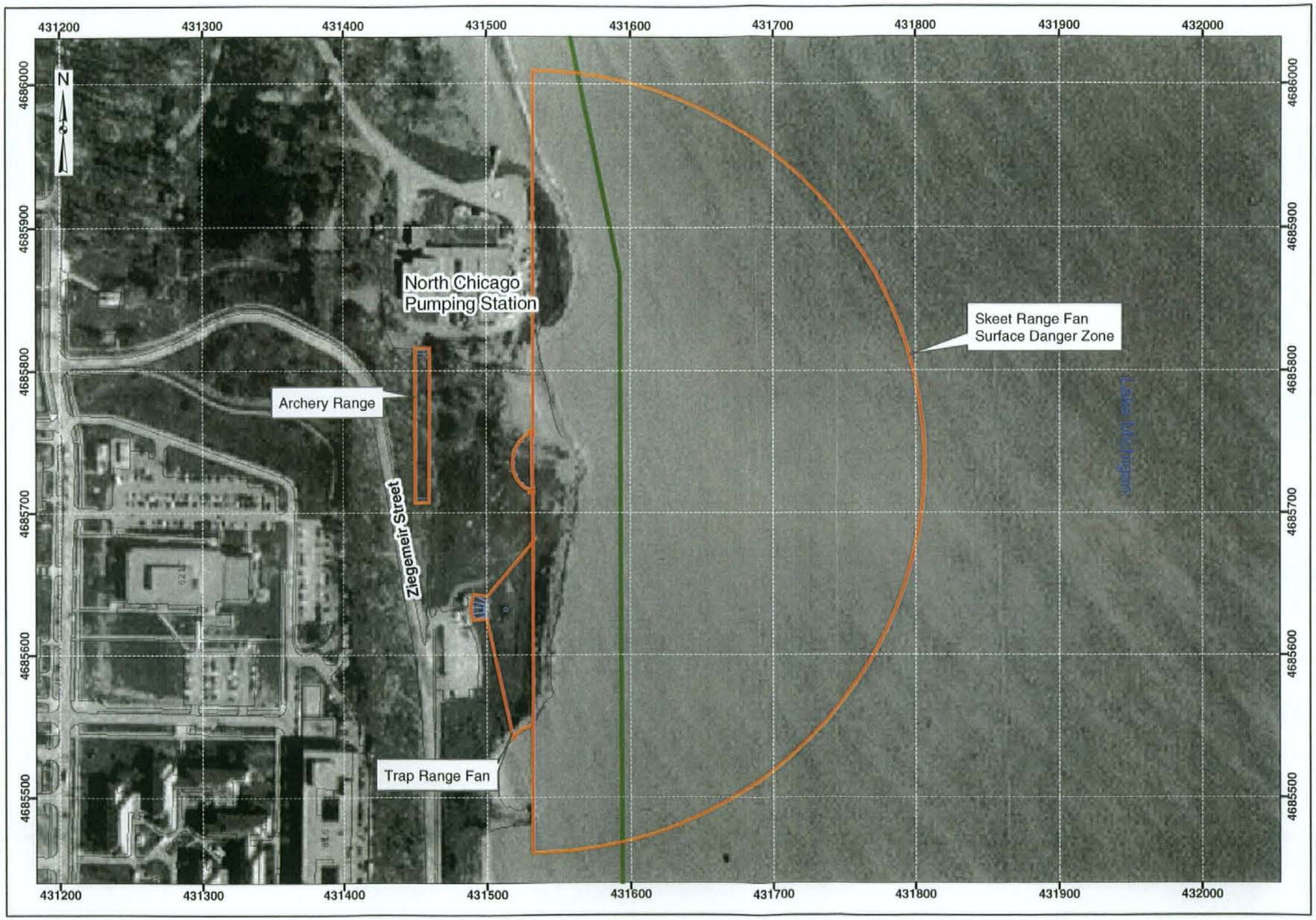
- Installation Boundary
- Site Boundary
- Site Features
- Contours
- Streams
- Wetlands
- Waterbodies

0 75 150 300 450 600 Feet

Coordinate System: UTM Zone 16
Datum: NAD 83
Units: meters

Contract: N62472-02-D-1300
Edition: Final Water Area Munition Study
Date: April 2005





Water Area Munitions Study
Naval Station Great Lakes, Illinois

MALCOLM PIRNIE

Map 5-3
Munitions Characterization
Trap, Skeet & Archery Ranges

Legend

- Installation Boundary
- Site Boundary
- Site Features

MEC Presence *

- Known
- Suspect

*There is no evidence of MEC presence as determined through historical documentation, interviews, and visual survey.

0 75 150 300 450 600 Feet

Coordinate System: UTM Zone 16
Datum: NAD 83
Units: meters

Contract: N62472-02-D-1300
Edition: Final Water Area Munition Study
Date: April 2005

Appendix A: References

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Maps

Area East of Sheridan Road Showing Conditions On January 1, 1945

Base Map, Areas A-E, October 1995

General Plan, September 1909

General Plan, December 21, 1918

Improvements To June 30, 1928

Improvements To June 30, 1931

Improvements To June 30, 1949

Improvements To June 30, 1950

Master Shore Station Development Plan, May 3, 1954

Plot Plan 1950

Proposed Anti-Aircraft Training Center, August 8, 1942

Trap-Skeet-Archery Ranges, June 3, 1968

Real Estate Summary Map, Area A-E, July 1993

Appendix B: Project Source Data – General

PHASE I CULTURAL RESOURCE INVESTIGATION

VOLUME II

OCTOBER 5, 2000

PHASE I CULTURAL RESOURCE INVESTIGATION
GREAT LAKES NAVAL TRAINING CENTER
NORTH CHICAGO, LAKE COUNTY, ILLINOIS

VOLUME II
ABOVE GROUND RESOURCES

October 5, 2000

Table of Contents

TABLE OF CONTENTS

2.1 Historic Overview

2.1.1 Pre-U.S. Navy History of the Area

The first European exploration of this region occurred when the French explorer Marquette traveled through this area in 1673. The French established extensive trade with the local Native American population, and a French trading post was established near what is now the City of Waukegan. Green Bay Road was developed as an Indian trail and was used by early French explorers. Green Bay Road would continue to be an important transportation artery through the nineteenth century.[1]

The Pottowamie Indians dominated the area in the early nineteenth century. A treaty made at Chicago in September 1833 specified that the Pottawattamies were to leave the territory now known as Lake County, Illinois as soon as the treaty was ratified. However, the treaty was not proclaimed until February 1835, and there was a Native American presence in the area through 1836. The Lake County lands, by act of Congress, were designated as part of the Northeast Land District of the State of Illinois. The lands were divided into townships starting in August 1835, and sale of the land commenced. However, some settlers had already slipped into the area as early as 1834.[2]

Settlement was underway in the area around Great Lakes Naval Training Center by 1836. The land currently occupied by Great Lakes Naval Training Center was also settled early in the area's history. The land occupied by the original Main Station and Naval Hospital areas of the base was located in the north half of Section 9 and the south half of Section 4 of Swain Township, Lake County, Illinois. In 1837, Benjamin and Polly Swain settled on this land and built a sawmill at the mouth of Pine Creek, now known as Pettibone Creek. This mill was reportedly the first industry in the area. Historical accounts state that Swain sold his land to Durkin and Howard between 1842 and 1844, and left the area.[3]

An 1861 real estate atlas of Lake County (Figure 2.1.1) shows the south half of Section 4 divided into three tracts. John Durkin owned the lion's share of the tract, while the lakeshore portion belonged to W.S. Buell. The north half of Section 9 was divided into six tracts. The Pettibone family owned the southwest portion of the area, while John Durkin owned a 20-acre tract directly north of the Pettibone property. The western portion of the area was divided into four parcels. The southeast quarter of this area belonged to William Tinsler, while the southwest portion and most of the north half was owned by G.A Fellows. A.B. Cotes owned a small tract in the northwest corner of this area.[4]

A United States Geographical Survey topographical map dated November 1902 (Figure 2.1.2) delineates most of Section 9. This map covers the entire Naval Hospital area of the base, and the southern portion of the Main Station, up to the southern edge of the

parade ground in front of the Administration Building (Building 1). The map includes a fairly detailed delineation of two farmsteads. One farmstead was located east of the present Camp Barry area. The USGS map shows a dwelling, a barn, and 2-3 smaller outbuildings at this farmstead, which was located on the G.A. Fellows tract. A second farmstead was located to the east, near the present-day site of Building 81H at the Naval Hospital. This farmstead consisted of a dwelling, an L-shaped barn, and 2-3 outbuildings, and was situated on the William Tinsler tract. Farm fields or woods occupied the rest of the land surrounding these buildings. Most of the farm buildings were retained when the U.S. Navy occupied the area. Both farm dwellings were being used as officers' quarters as late as 1941. Some of the barns and other outbuildings were utilized as stables and storage facilities during World War I, but had been demolished by the mid-1930s.

The U.S. Government acquired land that now comprises the Mainside portion of Great Lakes Naval Training Station in 1905. The land included the 122-acre Joseph Downey Farm, and a 50-acre parcel owned by William H. Murphy. Construction of buildings for Great Lakes Naval Training Station began shortly after federal acquisition of the land. The Navy did not occupy other areas of the base until World War I or World War II.

The RTC area remained largely undeveloped until the base's World War I expansion. In 1861, the north portion of the RTC property was divided into two tracts, one owned by William Dwyer, and the second owned by Henry Neal. The southern half of RTC was owned by Thomas Masterson. One pre-World War I farmstead on the Masterson property was retained by the Navy. This farmstead sat in what is now a grassy area north of the Bachelor Officers' Quarters (Building 913). The farmstead was composed of a single dwelling and two small outbuildings.[5] The dwelling appears to have been utilized as officers' quarters and is visible on maps as late as 1945.

Halsey Village and Nimitz Village stand on lands acquired by the government during World War I for expansion of Great Lakes Naval Training Station. However, much of this land was left undeveloped during World War I. Maps of the early 1920s indicate that land now occupied by Nimitz Village contained a farmstead with a dwelling, a barn, and a series of small outbuildings including garages and poultry houses. Other farmsteads existed on what is now land occupied Halsey Village and the V.A. Hospital.[6]

The U.S. Government condemned the area now occupied by Forrestal Village in 1942. This area was originally farmland, but was platted as a series of residential subdivisions, most likely during the real estate boom of the 1920s. However, because of the decline in new house construction associated with the Great Depression, the residential development of this tract was never successful. By the time the Navy investigated the property in 1942, the area had only a handful of houses, and much of the land was empty.[7]

In general, Great Lakes Naval Training Station is located in an area marked by low-density agricultural settlement that began in the mid-1830s. The agricultural development of the area continued through the remainder of the nineteenth century, with a small concentration of development at the area known as "Five Points." In spite of the northward expansion of Chicago in the late nineteenth and early twentieth century, and the development of North Chicago and Waukegan as urban communities, the area now occupied by the base never became a of dense residential development. The area now occupied by Forrestal Village was platted out for dense residential development, and a small number of private dwellings were built in this area. However, the economic troubles of the Great Depression appear to have thwarted any attempts to turn this tract into a high-density private housing development.

2.1.2 History of the Great Lakes Naval Training Center

2.1.2.1 Origins and Early History of the Great Lakes Naval Training Center

The concept of the Great Lakes Naval Training Center originated in the years after the Spanish-American War. A series of impressive victories against the Spanish focused America's attention on the U.S. Navy, contributed to the war's quick conclusion, and led to U.S. acquisition of Cuba and the Philippines. This war is often seen as the event that established the United States as a major world power.

It was estimated that as much as 60% of the naval personnel that served in this war came from the Midwestern United States.[8] In 1898, there were no naval training bases in close proximity to the Midwest. The U.S. Navy training base nearest to the Midwest was Coasters Island Harbor, established in 1881 near Newport, Rhode Island, as the Navy's first major training base.[9]

In 1902, the 10th Illinois U.S. Congressional District was represented by George Edmund Foss (1863-1936), who also chaired the House Committee on Naval Affairs. Foss was able to include site selection funding for a Great Lakes naval training base in the Naval Appropriations Act of July 1, 1902.[10] An inland midwestern naval training base struck many east coast residents as a useless pork barrel project, but Foss pushed the concept forward. Soon, the site selection was narrowed down to five locations scattered through Michigan, Illinois, and Indiana. A site at Lake Bluff, Illinois, north of Chicago, was recommended as the best location, but the land was considered prohibitively expensive.[11] The Lake Bluff site was favored for its good rail connections to Milwaukee and Chicago, excellent harbor, and its location on southern half of Lake Michigan. The land was also situated in a pleasant, park-like setting.[12]

After a broader site study in 1904, Lake Bluff remained the preferred location, but the cost of the land, at approximately $1,000 per acre, still remained prohibitive. Foss lobbied commercial interests in Chicago to raise money for purchase of the Lake Bluff lands. The Chicago Commercial Club, railroad interests, and other business organizations stepped forward and raised $175,000 for purchase of the Lake Bluff land. At the final meeting of the site selection committee in November 1904, a final recommendation was made in favor of the Lake Bluff site. President Theodore Roosevelt announced the selection of the site on November 24, 1904.[13]

The Navy officially took possession of the site in July 1905. Construction of the facility was financed by various naval appropriation bills, and had a total cost of almost $3,500,000. The initial $250,000 appropriation in 1904 was used for land acquisition and site-related work. In 1906, $750,000 was allotted for building construction, and in 1907, an additional $700,000 was expended on building construction and utilities. In 1908, over $1,000,000 was appropriated for building completion, utilities, and construction of a naval hospital. Additional appropriations were made in 1909 and 1910 for completion of the project.[14]

When completed in 1910-1911, the base had 39 buildings and could accommodate a total of 1,500 men. The base's substantial red brick and brown terra-cotta buildings were designed by Jarvis Hunt, an eminent New York architect best known as the nephew of renowned late Victorian architect Richard Morris Hunt. The buildings are designed in an imposing style that combined elegant French Renaissance Revival details with massive fortress-like elements. The resulting buildings have the refinement of turn of the century public buildings, while the massive arches and battered walls suggest the facility's military function. Naval motifs such as oars, ship's prows and turrets also heighten the nautical character of the buildings.

The base was located on a series of bluffs divided by a ravine carved into the site by Pettibone Creek. At the point where the creek emptied into Lake Michigan, a harbor was established for the base. North of the ravine sat officers' houses and the base's main parade ground. Buildings on the north, east, and west surrounded this parade ground, while the south side was left open to the Pettibone Creek ravine. Dormitories, mess halls, drill halls, classrooms and the administration building were grouped around the parade ground (Figure 2.1.3). Receiving facilities for new recruits were positioned southeast of the main parade ground. The U.S. Naval Hospital was located south of the main parade ground and the Pettibone Creek ravine. The layout of the base was the result of collaboration between Jarvis Hunt's office and U.S. Navy engineer George McKay. The base as constructed could accommodate 1,500 men, but the original master plan for the base anticipated additional construction that would expand the base to accommodate 3,000 men.[15]

The base's first commandant was Captain Albert Ross, who oversaw construction of the base for the Navy. The base was originally known as Great Lakes Naval Training Station (the name was changed to "Training Center" during World War II). It was formally commissioned in July 1911, and began accepting recruits at that time. Captain Ross remained in command long enough for the first class of recruits to graduate from the facility on October 28 of that same year.[16] Between 1911 and 1916, the base received an average of 220 recruits per month for training.[17]

2.1.2.2 World War I Expansion

The entry of the United States into World War I in 1917 brought about extensive changes at Great Lakes Naval Training Station. The base was suddenly called upon to handle much larger numbers of recruits. At the time the United States entered the war in April 1917, the facility was already overcrowded with a population of approximately 2,500 men fit into a base designed to handle 1,500.[18] Between the U.S declaration of war in 1917 and the end of the war in November 1918, over 125,000 recruits were accepted at the base.[19]

The responsibility for handling this massive increase in population was dealt with by the base commandant, Captain William A. Moffett. At first, expansion was dealt with by cramming more recruits into already overcrowded buildings, and by housing recruits in tents that were raised in every area of available space. In spring 1917 Moffett traveled to Washington D.C. seeking approval of his wartime construction plan for the base. Moffett had devised a system in which the Great Lakes Training Station was expanded through the construction of self-contained "camps" that were smaller, temporary versions of the main base. Each camp was to contain barracks, drill halls, administrative and recreational facilities, mess halls, officer quarters, dispensaries, and other necessary facilities. The plan was immediately approved and construction began.

By July 1917, the base had expanded considerably (Figure 2.1.4). A large number of frame buildings had been built just north of the Naval Hospital, and were known as the "Hospital Group." North of the Hospital Group was Camp Ross, which appears to have been composed largely of barracks and other small buildings. To the west of Camp Ross were Camps Decatur, Farragut, and Barry. These camps, also composed of small buildings, were positioned on opposite sides of the Pettibone Creek ravine.[20]

The base also had expanded onto the land north of Sheridan Road. In 1917, two camps were located in this area. Camp Dewey sat to the north, and consisted of a series of H-shaped barracks, a few additional I-shaped wood frame buildings, and a large one-story wood frame drill hall. To the south, Camp Perry was essentially a larger version of Camp Dewey. In addition to the H-shaped barracks and other small buildings, the facility contained four large mess halls and two large drill halls.[21]

Numerous construction photographs clearly document the construction of the base's World War I facilities. The smaller buildings were constructed with wood balloon frame construction methods regularly used in civilian housing (Figure 2.1.5). The buildings generally had gabled roofs, horizontal flush wood cladding, and multi-pane wood sash windows. The drill halls were one-story structures built with wood frame side walls that supported a series of segmental arched latticework trusses.

The base continued to expand throughout World War I. A June 1920 map of the base (Figure 2.1.6) shows the full extent of the expansion. In addition to the development of Camps Ross, Decatur, Farragut, Perry and Dewey and expansion of the Hospital Group in 1917, the base had expanded further to the north and west. To the west of the main station, the base had an airfield and an aviation mechanic's school. To the south of the airfield was Camp Paul Jones, composed of H-shaped barracks and larger drill hall and mess hall buildings. To the northwest of the airfield, Camp Luce had been built as an additional training facility. An officer housing area sat north of Camp Luce. West of Sheridan Road, a hospital corpsmen's school had been established north of Camp Dewey. The corpsman's school was composed of only a few buildings, but larger facilities had been developed on its western edge. To the southwest of the corpsman's school, an auxiliary reserve school had been constructed with a series of small wood frame structures and two larger drill hall/mess hall buildings.

To the northwest of the corpsman's school, Camp Lawrence had a layout similar to the auxiliary school, with small barrack buildings and two larger drill/mess halls on its eastern edge. The 1920 map also indicates that the base owned a large tract of undeveloped property west of Camp Lawrence. At the end of World War I, this property still contained a series of scattered dwellings and barns, and what appears to be at least one concentration of farm buildings.[22]

Some have pointed to the World War I construction effort at Great Lakes as the origin of the Navy's Seabees. Before World War I, private contractors constructed buildings at Great Lakes. During the war, mobilization decreased the number of workmen available to private building contractors. As a result, finding a contractor for construction projects at Great Lakes became difficult. Eventually, Captain Moffett began identifying recruits with construction skills, and put them to work building new facilities. These men were organized into the 12th Battalion, also known as the construction battalion. Historians have traced the origins of the Navy's construction wing, the Seabees, to the 12th Battalion at Great Lakes.[23]

The mission of Great Lakes Naval Training Station also expanded during World War I. At the beginning of the war, Great Lakes mainly handled basic training of new recruits, and had only two advanced training schools, one for hospital work and one for signal and radio training. During World War I, a large number of additional schools were added for specialists like coxswains, gunners, aviation officers, and machinist's mates.

2.1.2.3 Great Lakes NTC Between the Wars

The end of the war led to major changes at Great Lakes Naval Training Station. The transition was a time that saw thousands of men mustered out of service. Surplus weapons and equipment needed to be disposed of, and 1920 maps of the base indicate that a "reclamation yard" had been set up. In the early 1920s, the base was involved in a massive demolition project in which most of the World War I wood frame camp buildings were destroyed. Large areas of land west of Sheridan Road that were part of the base during World War I were turned over to the Veterans' Administration by presidential executive order on April 17, 1924.[24] Between 1918 and 1927, the base was reduced from 1,200 acres to 459 acres, and the number of buildings was pared down to 63. For a brief period in 1922, recruit training was halted at the base, leaving only two small service schools in operation with a total of about 480 men. A number of Chicago and North Chicago civic and business organizations then banded together to lobby for the base to return to its pre-World War I status. Congress eventually passed legislation that re-established a recruit population of 1,500 at Great Lakes, returning the base to its pre-war level of recruit training.[25]

Despite numerous Naval budget cuts in the mid- to late-1920s, Great Lakes maintained its population level at 1,500. The number of buildings at the base increased to 102 as a moderate construction campaign was carried out.[26] The base reached another low point in the early years of the Great Depression. The Hoover administration cut funding for the U.S. Navy in an effort to economize. The smaller Navy that resulted had sharply reduced manpower needs, to the point that naval recruiting ground to a halt. With no new recruits to train, Great Lakes Naval Training Station closed and was placed on "maintenance" status in 1933. At one point the base was slated to serve as a reforestation headquarters for the Civilian Conservation Corps, but this operation was instead established at nearby Fort Sheridan.[27] In 1935, after aggressive lobbying by the Chicago community, Great Lakes NTS was re-opened.[28]

When the base was re-opened, its commander, Admiral John Downes, reported that Great Lakes was in extremely poor condition. The facilities had deteriorated during the years of "inactive" status.[29] Historic photographs show that the Works Progress Administration (WPA) sent in workers to paint, remodel, and recondition buildings on base during the late 1930s.

2.1.2.4 World War II Expansion

With the beginning of World War II in Europe, President Roosevelt declared a limited national emergency in September 1939. Work began to build up the United States Navy, and as a result, the number of recruits received at Great Lakes increased.[30] To speed the flow of recruits into active service, the period of recruit training was reduced from 12 weeks to eight weeks. By June 1940, Congress had authorized $4 billion in funding to establish a larger two-ocean navy. The increased need for recruits meant

expanded operations at Great Lakes. The duration of recruit training was further reduced to six weeks in 1940, and in the same year, contracts were released for the construction of over 20 new buildings, including barracks and a new galley. The capacity of Great Lakes was increased to accommodate 14,000 people.[31]

Within 24 hours of the attack on Pearl Harbor, the staff of Great Lakes put together plans to construct approximately 36 buildings. Land at Great Lakes owned by the Veterans' Administration was made available for Navy use by an executive order of December 29, 1941. This land was spare property associated with the VA's Downey Hospital, and totaled 375 acres.[32] Additional land was seized from private owners through takings proceedings in October 1942.[33] By 1942, the capacity of the base had been increased to 44,000 persons at a cost of about $36,000,000. On the portion of the base east of Sheridan Road, Camps Paul Jones and Luce were rebuilt on their World War I sites, and new barracks were constructed on the sites of World War I camps Decatur and Farragut. The old site of the Aviation Mechanics' School was re-developed as Camp Bronson.

On the former Veterans' Administration lands west of Sheridan Road, the base constructed an extensive array of camps during World War II. The old sites of World War I camps Perry and Dewey were re-developed in World War II as camps Porter, Downes, and Dewey. To the north, the area of the World War I hospital corpsmen's school was re-developed as Camp Moffett and the Wave Hospital Corps School. West of Camp Moffett, Camp Lawrence was revived on its World War I site and Camp McIntire was developed on the site of the old Auxiliary Reserve School.[34] To the north of Camp Lawrence, the base developed Camp Robert Smalls. To the southwest of Camp Robert Smalls, Camps Dahlgren, Decatur, Hull, MacDonough, Mahan, and Maury were established on lands west of Green Bay Road seized by the government from private owners in the early years of World War II.

Captain Moffett's World War I era concept of expanding the base through construction of multiple, self-contained training camps was used again during World War II. The World War II mobilization camps typically consisted of a series of H-shaped barracks, one large drill hall/administration building, and one or more subsistence buildings, storage structures, dispensaries/clinics, and at least one heating plant (Figure 2.1.7). In addition, some camps included rifle ranges, service schools, and recreation centers. The design of each camp varied slightly depending on the needs of the base and the shape of the available plot of land.[35] The camps were, in most cases, designed to accommodate 4,500 recruits.[36] By the end of 1942, the capacity of the base had been raised to 68,000, and this capacity was increased to 100,000 later in the war. The enlisted population of the base peaked in March 1944 at 100,156. It has been calculated that 965,259 recruits were trained at Great Lakes during the time that the U.S. was directly involved in World War II.[37]

African-Americans were first admitted for training at Great Lakes during World War II. From 1922 to 1938, African-Americans were not accepted for enlistment in the Navy. In 1938, African-American men were allowed to enlist, but only as mess attendants. On June 1, 1942, enlistment for general service in the Navy was opened to African-American men, and the first black recruit arrived on base on June 5 of that year. As a result, training camps for African-Americans were opened at the Great Lakes Naval Training Station. As late as 1944, these camps were the only facilities of their kind in the United States.[38]

Following a pattern of racial segregation, black personnel were concentrated in specific areas of the base during most of World War II. In June 1942 there was only one company of African-American recruits on base. Camp Robert Smalls was constructed in late 1942, and was occupied by the African-American 18th Regiment on January 1, 1943. This regiment consisted of recruits, service school trainees, and a unit of servicemen who were awaiting their discharges. By April 1944, all black recruits were removed from Camp Robert Smalls so that exclusively African-American service school trainees and men who had completed their service could occupy it.[39]

In May 1943, the 16th regiment, an African-American all-recruit unit, was established at Camp Lawrence, and a second black, all-recruit unit, the 14th regiment, was formed and occupied Camp Moffett in August 1943.[40] By June 1944, African-American trainees on the base numbered 8,500 recruits and 900 service school students. In addition, there were 1,250 African-Americans employed by the base, serving in the Administrative Command, Hospital Command, Recruit Training Command and Service Schools Command. Many of these staff members were employed as cooks, although blacks also worked in the base's post office and security operations.[41]

In general, an atmosphere of racial tension existed at the base throughout World War II. Many African-American recruits and service school trainees disliked the base's policy of segregation. African-American service school students were only allowed to go into nine out of the thirteen areas of specialization, and some service school courses were open only to white students. In addition, separate discipline policies, testing standards and other important regulations were set up for African-American recruits. Many African-American recruits objected to this policy and advocated equal treatment for all recruits, regardless of race.[42]

Conditions for African-Americans at Great Lakes did improve during World War II. One of the most notable instances was graduation of the Navy's first class of 13 African-American commissioned officers in 1944. Also in 1944, an "experiment" in integrating black and white students at the service schools was carried out, and led to the desegregation of these facilities. On June 11, 1945, the Bureau of Naval Personnel issued a directive requiring racial integration in all U.S. Navy training programs. The era of racially segregated camps at Great Lakes came to a close near the end of World War II.[43]

2.1.2.5 World War II De-Mobilization and the Early Cold War

World War II had been a period of tremendous growth for Great lakes Naval Training Station. In April 1944, the base had been re-designated Great Lakes Naval Training Center in recognition of the importance of the facility to the Navy. The end of World War II brought equally significant changes to the base. A demobilization center was established at Great Lakes Naval Training Center on August 27, 1945. A number of the base's large drill halls were remodeled into separation centers to process the large numbers of service men and women who were being discharged from the Navy. A huge number of service men and women were discharged at Great Lakes, including a record of 27,118 men and women in one week during December 1945. A separation center at Toledo, Ohio, was also closed in February 1946, and its operations were moved to Great Lakes. In the end, approximately 450,000 recruits were released to inactive duty status at Great Lakes before the demobilization center closed in 1946.[44]

In the late 1940s, continued operation of Great Lakes Naval Training Center was threatened, much as it had been in the early 1920s after World War I. The number of recruits at the base dropped to 10,000 by December 1945. The Bureau of Naval Personnel announced in 1946 that it planned to end recruit training at Great Lakes in favor of transferring all training functions to Norfolk, Virginia, and San Diego, California. Government officials, including the commandant of the Ninth Naval District and the governor of Illinois, protested the decision. The Navy abandoned plans to close Great Lakes, and instead closed the naval training center in Bainbridge, Maryland. The recruit training functions of the Bainbridge facility were subsequently re-activated, but the facility was eventually permanently closed, and its activities re-allocated to Great Lakes.[45]

The number of recruits at the Great Lakes Naval Training Center fluctuated greatly in the late 1940s. The base's population declined sharply in 1946, to the point that some buildings at Great Lakes were loaned to other government agencies for use. In August 1947, all recruits were cleared out of Camps Downes, Dewey, and Porter and were re-located to Camp Paul Jones. Plans were to keep the level of recruits at the base around a maximum of 8,400. By July 1948 there were 19,657 recruits on base, Camps Downes, Dewey, and Porter had been revived, and the Navy temporarily halted recruiting to ease the pressure. Because of the young age of most post-World War II recruits, the recruit-training period was increased to ten weeks, and in 1950 a naval reserve recruit-training program was started at Great Lakes.[46]

One postwar problem experienced at many military installations was the lack of family housing. Most service men and women lived away from their families during World War II. During the early Cold War, it became common for men and women to live with their families while serving in the military. As the military grew during the early Cold War, thousands of military families crowded into private sector housing around

major military bases. This situation led, in many cases, to extremely high rents, overcrowding, and unsanitary housing conditions. There was a clear need for family housing for military personnel. Lack of adequate housing was cited as a major reason that many military personnel did not re-enlist when their term of duty was up.[47]

Because of previous military housing policies, there were few family housing units at Great Lakes Naval Training Center at the end of World War II. Like many military installations, Great Lakes Naval Training Center had serious shortages of family housing in the late 1940s. At first, a number of temporary solutions were devised to ease the shortage. In 1946, the base loaned 44 buildings, including all structures in camps Maury and Mahan, to the Lake County Housing Authority. These buildings were converted into 351 family housing units for veterans, although active duty personnel of Great Lakes Naval Training Center occupied about half of the units.[48] The barracks of Camp Robert Smalls were converted to a housing complex for families of petty officers in October 1947. Three trailer camps were also established between 1947 and 1950 to increase the amount of available housing. Despite these efforts, the housing shortage at Great Lakes NTC continued into the 1950s.

2.1.2.6 Redevelopment and Expansion in the 1950s and 1960s.

Recruit training at Great Lakes accelerated with the beginning of the Korean War in 1950. The number of recruits at the facility fell steeply in 1952, and fluctuated during the remainder of the 1950s.[49] However, because of the increasingly technical nature of Navy operations, the number of students at the Great Lakes service schools steadily increased during the 1950s.[50]

As the base continued to grow, the lack of family housing on or near the base continued to be a major problem. The housing problems of the late 1940s had been remedied through temporary solutions like the conversion of World War II wood frame barracks into family housing, and the construction of trailer parks. However, the old wood frame buildings were deteriorating quickly and many required a high level of maintenance. A more permanent solution was needed.

Congressional housing acts provided a partial remedy to the problems at Great Lakes NTC. The Wherry Housing Act of 1949 allowed private developers to construct housing units on land leased from the military. The housing was to be built according to FHA standards, rent levels were controlled, and military families were given first priority in renting the units. The developers retained ownership of the Wherry housing units and were responsible for operating and maintaining the properties.

A $10 million, 1000-unit Wherry housing development was initiated at Great Lakes NTC early in the history of the Wherry program. Construction of Wherry housing at Great Lakes NTC was underway by December 1950, the first tenants moved in by

October 1951, and the final units were completed in February 1953. The housing units were constructed on the sites of World War II Camps McDonough, Decatur, Hull, and Dahlgren. The developer responsible for the Wherry housing development at Great Lakes NTC was a partnership between the Corbetta Construction Company of Chicago and the Price Construction Company. The architectural firm for the project was Shaw, Metz, and Dolio of Chicago. The buildings were a mixture of two story apartment units accommodating 4-5 families, small one-story duplexes and single-family dwellings, and a series of larger 14-unit apartment buildings.

The new rental units were open to commissioned and non-commissioned officers. The complex was named Forrestal Village in honor of James V. Forrestal, who served first as Secretary of the Navy and later as Secretary of Defense. Forrestal Village provided 1000 housing units, but some sources reported that even with Forrestal in place, the base still had a long waiting list for housing.[51] The Wherry apartments were small, and the buildings were constructed in a high-density pattern. These units were not appropriate for higher-ranking officers who expected higher quality accommodations. Despite the shortcomings of Wherry housing, military bases began acquiring these units from developers in the late 1950s and 1960s. Great Lakes NTC acquired and took over operation of the Forrestal Wherrys in spring 1959, and has owned and operated these housing units since that time.

The era of family housing construction at Great Lakes NTC was far from over with completion of the Wherry units. In 1959 construction bids were opened for a $25 million housing project developed under provision of the Capehart Housing Amendment.[52] Ground was broken in May 1959, and construction continued into 1960. These dwellings were larger and more spacious than the Wherry units. Most of the units were single-family homes or duplexes, rather than larger multi-family apartment buildings. These buildings provided more private, comfortable accommodations than the Wherrys. A large numbers of Capehart housing units were constructed in the northern portion of Forrestal Village, mostly duplexes and 4-plexes. However, the largest number of Capehart units were constructed in Halsey Village, a housing area composed almost exclusively of Capehart units.

The mid-1960s brought increased U.S. involvement in Vietnam, and a corresponding expansion of all branches of the armed forces. A high demand for new recruits and trained specialists in the U.S. Navy assured that the population of Great Lakes NTC would continue to grow. This continued growth fueled the need for additional family housing on the base. After the Capehart housing legislation was discontinued at the end of 1962, Great Lakes NTC continued to build additional units of family housing through the mid-1970s under the Congressional Military Construction Bills. The majority of these housing units were constructed at Forrestal Village and, beginning in 1969, at Nimitz Village, the former site of World War II Camps Lawrence and McIntire. Capehart-like duplexes were built at Forrestal Village in 1966, and a series of attached single-family dwellings was built in Nimitz Village in 1968-1969 (Figure

2.1.8). However, the majority of housing units built from 1968-1975 at Great Lakes were multi-family apartment buildings or town house structures.

New construction at Great Lakes NTC in the 1950s and 1960s was not limited to housing. In 1957, a plan to rebuild camps Dewey, Downes, and Porter as a center for recruit training was announced. When completed, the project converted the ramshackle World War II camps into a modern, state of the art recruit training facility. The initial group of structures, Buildings 920-923, was built beginning in 1958 on the site of World War II Camp Porter. When completed, the new Camp Porter consisted of seven barracks, a classroom structure (Building 927), and a galley (Building 928). Major World War II buildings retained at Camp Porter were a drill hall, laundry, gunnery range, and brig. Seven additional barracks were constructed between 1962-1966 north of Camp Porter, on the sites of Camps Dewey and Downes. Two buildings with enlisted men's quarters, a galley, a classroom building, and a dental clinic were also completed by 1964. The facility as completed in 1966 accommodated the entire recruit training command (Figure 2.1.9). The facilities were divided into two camps, each capable of accommodating 5,000 recruits. A 2,500-man receiving camp was also constructed on the north side of Buckley Road at Camp Moffett.

2.1.2.7 Recent History

The Great Lakes Naval Training Center continued to play an important role in the operation of the United States Navy during the 1980s and 1990s. Limited amounts of isolated new construction took place at RTC during the 1980s. No major developments of family or officer housing were constructed on the base after completion of a series of town houses at Forrestal Village in 1975-1976.

With the closure of recruit training bases in Norfolk and San Diego, Great Lakes RTC is now the Navy's only center for recruit training. The base's service schools also provide valuable technical training to thousands of Navy personnel each year. Current plans call for privatization and modernization of family housing on the base, and an ambitious program of new construction and modernization at RTC.

For nearly a century, the Great Lakes Naval Training Center has served as the Navy's largest training facility. The Recruit Training Command has sent thousands of recruits on to successful careers in the Navy, while the service schools have provided vital technical training in a number of areas of specialization.

The 1990s saw renewed construction efforts at RTC, including the completion of new training facilities as well as a new chapel, infirmary, visitors' center, and retail store. Current development plans call for construction of a new RTC gunnery range in the immediate future, followed by a major re-development and expansion of RTC, including construction of new barracks and training facilities. This construction program will result in the demolition of most of the existing structures at RTC. The

resulting facility will be a fully modern recruit training center that will allow Great Lakes NTC to better prepare incoming recruits for service in today's Navy. The Navy's major investment in the expansion and redevelopment of is proof of the vital role that Great Lakes NTC continues to play in operation of the United States Navy.

2.1.3 Notes

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5. Bureau of Yards and Docks. "Map of United States Naval Training Station, Great Lakes, Illinois." June 1919. Ninth Naval District Public Works Office.

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13. Hasbrouck-Peterson Associates, p. 10.

THE GREAT LAKES NAVAL TRAINING STATION

A HISTORY

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BY

FRANCIS BUZZELL

Wartime Editor of "The Great Lakes Recruit" and Historian of the Ninth, Tenth and Eleventh Naval Districts

ILLUSTRATED FROM PHOTOGRAPHS

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THE ORDNANCE DEPARTMENT

Upon the declaration of war, the Ordnance Department was equipped to provide ordnance material for approximately one thousand men, but preparations had been made and a request sent to the Bureau of Ordnance to increase equipment and ordnance material of various descriptions to provide for the training of about 15,000 men.

When war was declared all the 3-inch 6-pounder and 3-pounder guns available at Great Lakes were ordered shipped to the eastern coast to be used for the arming of merchant vessels. However, when the Naval Militia Organizations of the Ninth, Tenth and Eleventh Naval Districts were mobilized, a considerable amount of ordnance material was left in the armories located in the various states. Every effort was made to obtain this ordnance material, and as a result Great Lakes was quickly provided with a couple of thousand additional rifles and drill guns, a number of pistols, and several 3-inch field pieces. In the meantime the Bureau of Ordnance sent to Great Lakes about 10,000 rifles of the older models, 1000 Springfield rifles, and 1000 drill rifles patterned after the Springfield model. This brought the grand total to about 16,000 rifles and 400 pistols, with all the necessary equipment.

At the outbreak of the war Great Lakes had only one armory, and that was partly used by the Medical Department as a sick bay. Just before the war closed, the Station had sixteen regimental armories equipped in all respects for properly taking care of all ordnance ma-

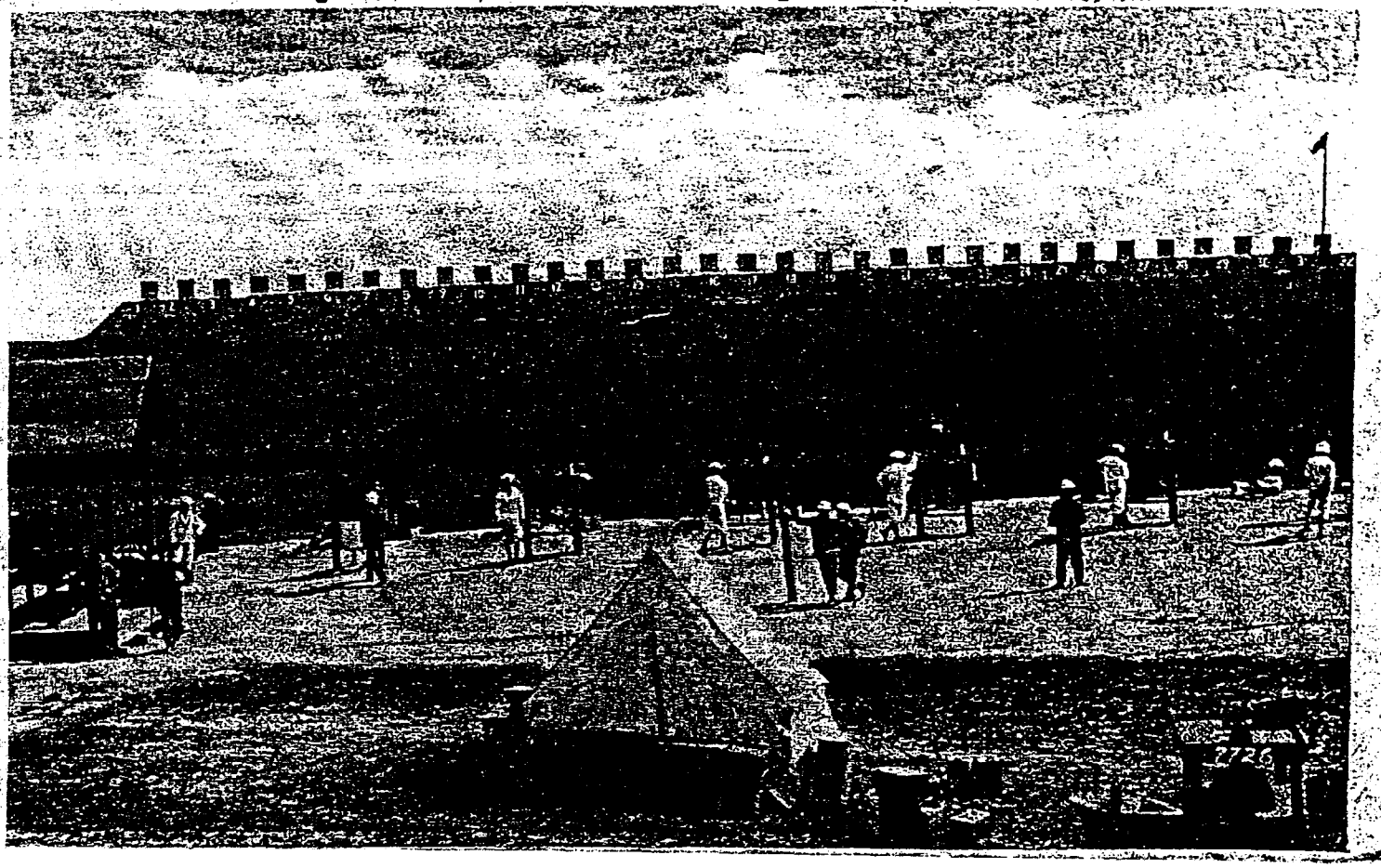
terial. These armories were also fitted up for the repairing of ordnance material.

The facilities for carrying on small arm target practice prior to the war consisted of three Ellis type, self-scoring targets located on the harbor breakwater. Immediately steps were taken to construct a 40-target small arms range. This range was put into commission the early part of July, 1917, and was constantly in use from that time on. In the autumn of 1917 the Navy Department acquired the Illinois State Target Range known as Camp Logan, about eighteen miles distant from Great Lakes, and during 1918 thousands of men from Great Lakes were given small arms practice there. The Camp Logan range was equipped with two hundred targets.

When the Gunners' Mates and Armed Guard schools were established in August, 1917, the facilities for carrying out the prescribed courses of training were hardly adequate. Immediate steps were taken to obtain the required ordnance material, which included guns, mines, torpedoes and machine guns of various kinds. None of the warships making up the Great Lakes' Training Squadron mounted guns of the type used to arm the merchant marine. Therefore a battery of 3-inch, 50-caliber guns was mounted in a gun shed on the lake shore, and submarine targets were towed at varying distances out into the lake for the men to shoot at. The students of the Armed Guard School practiced firing with these guns both day and night with excellent results. The gun shed was provided with two great searchlights for night work.

During the winter of 1917–18, approximately 1000 men attached to the Public Works Department were put

Target Practice, U. S. Naval Training Station, Great Lakes, Ill.



Target Practice with Self Scoring Targets.
U. S. Naval Training Station, Great Lakes, Ill.

NAVY LIFE DEPICTED AT WAR EXPOSITION

By Ens. Frank Reuthmer.

SAILORS, most of them from the Great Lakes Naval Training Station, and their comrades in khaki, collaborated in depicting the parts they will play in the great conflict, at the United States War Exposition held at Grant Park, Chicago, September 2nd to 15th.

It was a spectacle that drew hundreds of thousands. It was a close replica of the war that the "army at home" has ever witnessed. They came from all over the middle west to this "war theater."

Aeroplanes darted through the skies like huge, alarmed birds. Shrapnel burst and trench mortars banged in a simulated plot of ground representing No Man's Land. Spectators sat close to it all, staring and blinking with each explosion.

Daily a sham battle was held. From the start of the trench raid to the capture of the "German" forces with the cold steel, the action was as near to the real thing as possible.

But Navy life was not neglected at the Exposition. It was shown to the visitor comprehensively. There were exhibitions from nearly every school on this station. The buzz of the ticker attracted many to the exhibits of the Radio School. The Hospital School sent a corps of men to Grant Park to show the modern ways of naval surgery.

The aviation exhibit from the Great Lakes Naval Training Station was always the center of attraction. Set on stationary stands were several of the latest types of engines. Behind each stood a few Bluejackets who demonstrated their power. With the swinging of the propellers and the start of the engines the noise was terrific. Great crowds rushed to the water's edge to view the new engines in action.

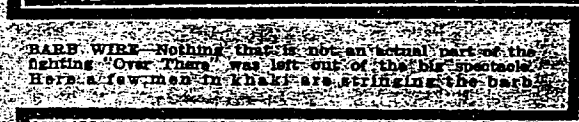
But there were other features offered to the sight-seeing thousands by officers in command of this station. Several divers, in deep sea garb, men from the Gunners' Mates School were lowered to the bottom of the lake. One man was beneath the water two hours and one half. The Ordnance Department sent machine guns as well as pieces of larger caliber to the exhibition. They shot at floating targets. Curious civilians surrounded the steel weapons and asked questions of the Bluejackets who were detailed for this work.

Each day there were thrills a-plenty. "Battles" were fought in the air by skilled veteran aviators. They performed daring circus stunts. There were birdmen from Rantoul, Ill., and of the American-British "flying circus." All the planes of the International Circus were fitted for military purposes, being armed with machine guns and bombs.

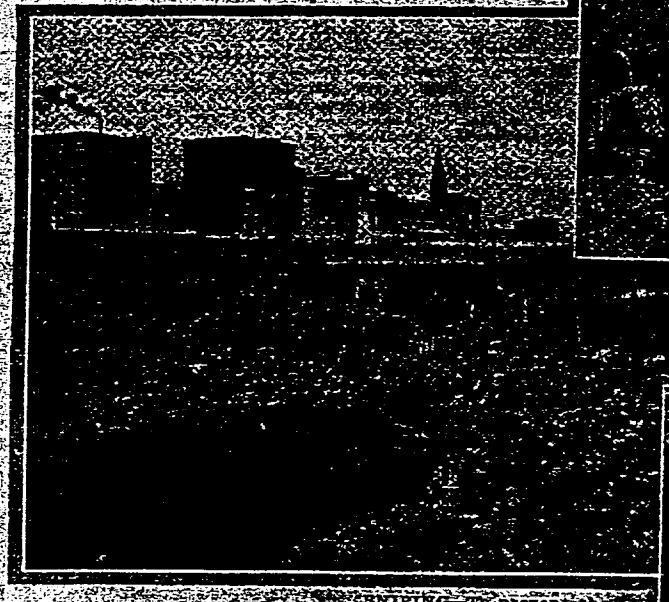
The gates to the gigantic martial spectacle were thrown open promptly at ten o'clock each morning. Each day there were hundreds of people awaiting admission. Numerous exhibits were placed promiscuously about the large field. Most of this paraphernalia was captured from the Germans. A long black barreled German naval gun of large caliber, probably pieced together in the Krupp factory, stood in a prominent place. Here and there rested ominous trench mortars, captured loot from the Hun, which at one time were turned on Yankee trenches. Aeroplanes, tattered and soiled, the work of the Allied birdmen, lay crushed and helpless, no longer able to aid in

VIEWS *of the* WAR EXPOSITION WHERE

READY, FIRE!—Bluejackets with guns of heavy caliber took a prominent part in the Exposition. Here is a gun crew firing promiscuously at the hypothetical Hun.

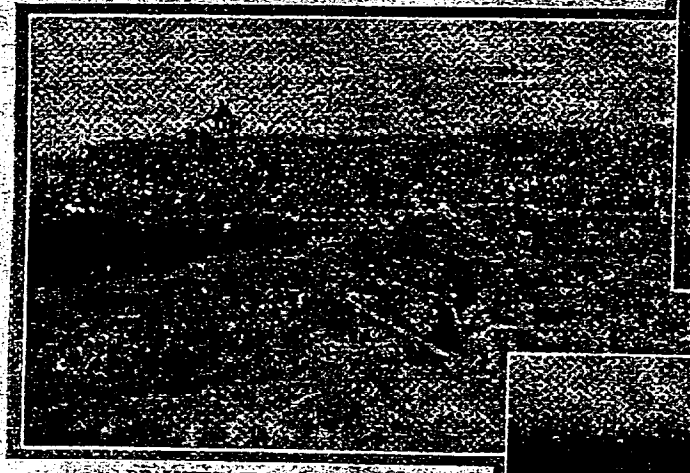


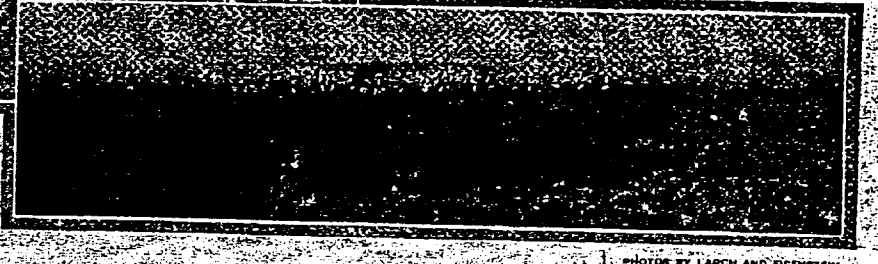
BARB WIRE—Nothing that is not an actual part of the fighting "Over There" was left out of the big spectacle. Here a few men in khaki are stringing the barb.



ZERO HOUR—After the barrage the ground swelled the Zero Hour when the [illegible] with bayonets were to attack the [illegible]

SNIPING—To prevent the enemy from observing them with field glass took shots from "No Man's Land." The men are standing on the fire step.





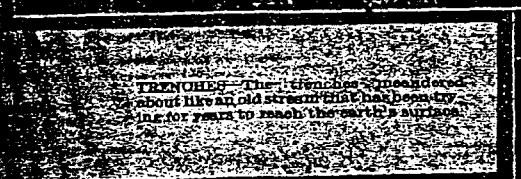
REALISTIC—Thousands of spectators saw the realistic battles. OVER THE TOP—The biggest moment in the life of the soldier. In the battle at the Exposition the Bluejackets took a big part in the grand finale, the charge over. They are shown here, with bayonets unsheathed, about to rout the "Germans."

PHOTOS BY LARCH AND EISENSTEIN

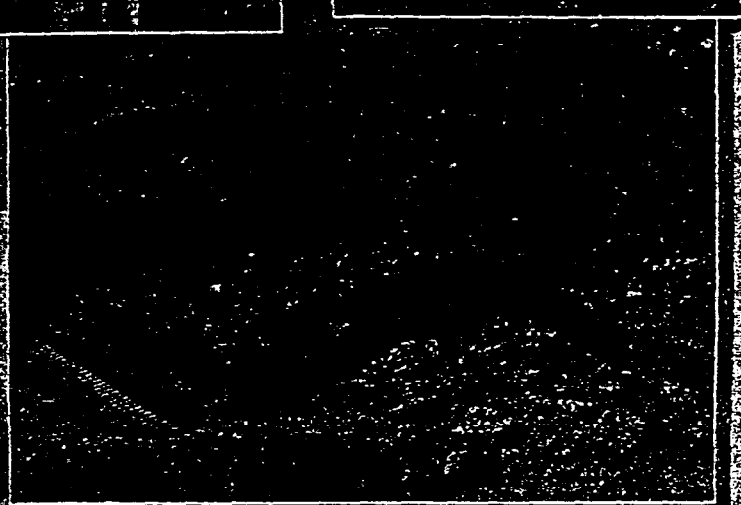
TWO SHAM BATTLES WERE FOUGHT DAILY

THE TANK—Spitting fire and smoke, this tank moved across No Man's Land.

A DUGOUT—The terrain that formed the battlefield at Grant Park was an exact replica of certain portions of the Western Front. Dugouts, shown here, were scattered about.

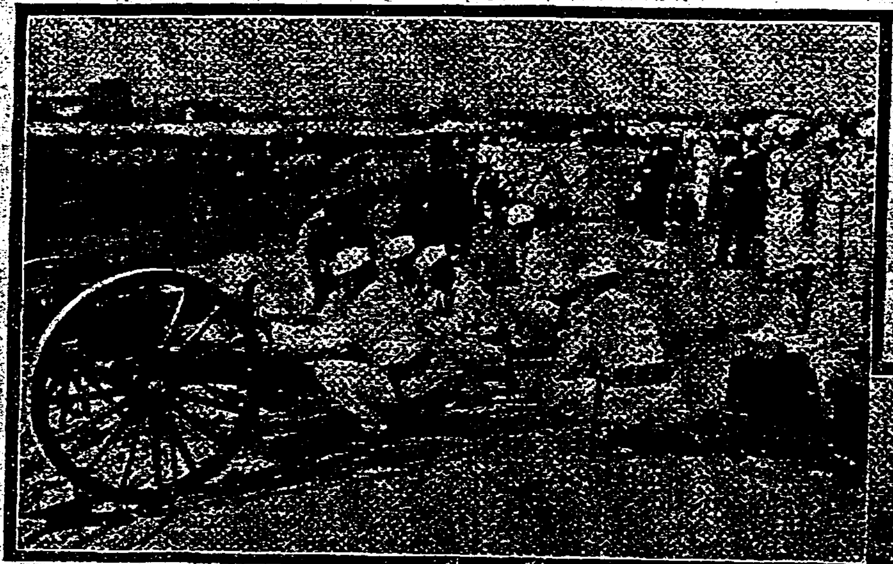


TRENCHES—The trenches meandered about like an old stream that has been trying for years to reach the earth's surface.



SHRAPNEL, BOMB AND GRENADE—All these explosives were breaking with a fury while this picture was being snapped.

ON EDGE—Khaki-clad men were in position to shoot for some time before the battle proper started. If there was to be an attack they were going to be prepared.

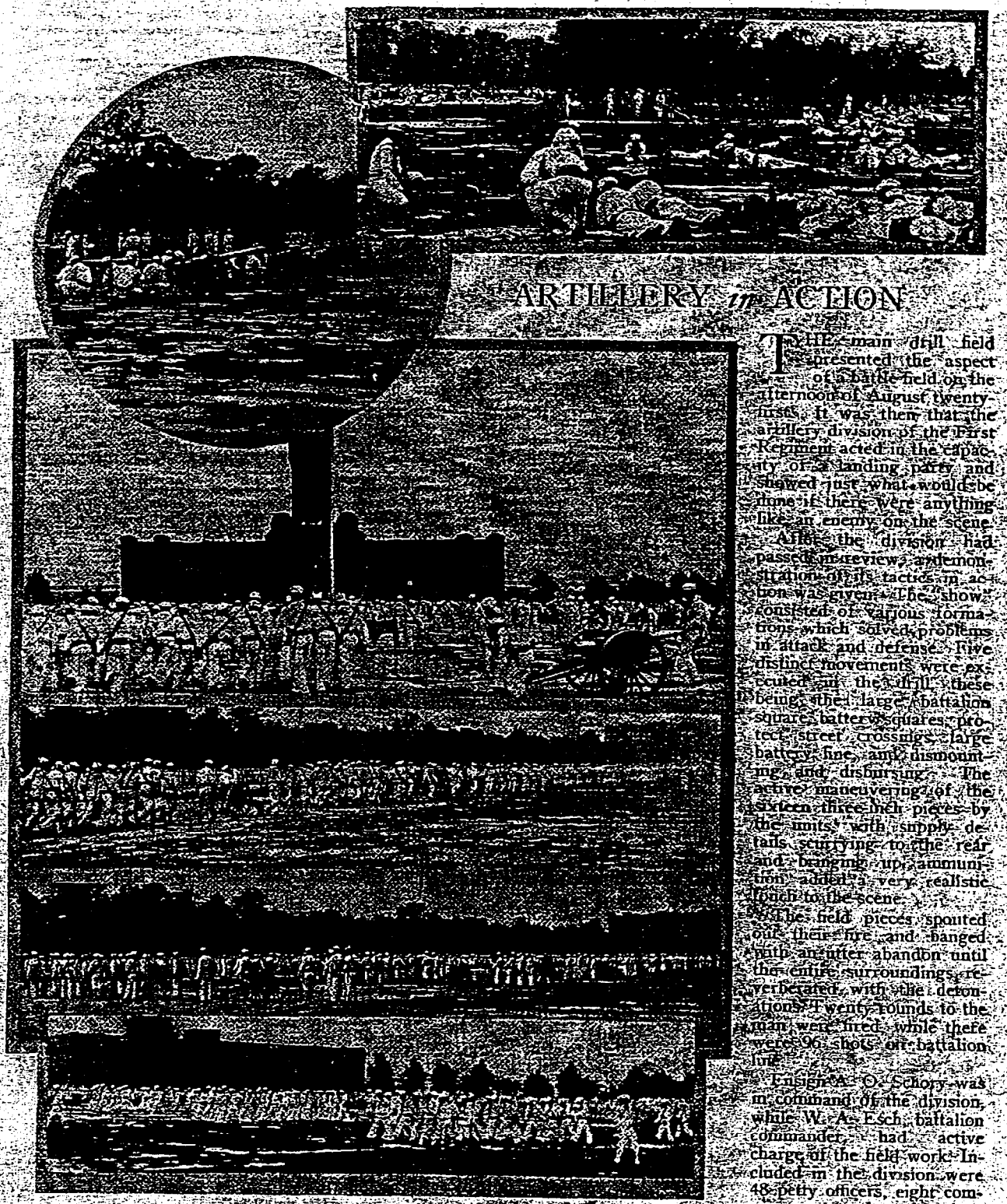


ALL SET—Members of a gun crew waiting the signal to fire. These guns played a prominent part in the martial activity. They banged away continuously and hammered in enemy trenches, grinding the parapet away and inflicting "casualties."

WAR TROPHY—One of the many trophies of war. This was formerly German property, but in their haste to get back to the Old Hindenburg line they left it behind. Although it is badly smashed it afforded the visitors at the Exposition an idea of the types of motors used to pull heavy ammunition carts.

OUR SCHOOLS' PART—Almost every school at the Great Lakes offered a part of their work to be exhibited. There was one long row of sheds containing the display. The shops were filled all day and evening with many sightseers.

SHOT DOWN—Almost every day the papers tell us how many planes were hit by anti-aircraft guns and missiles. At the Exposition one could get the second chapter of the story. The plane after the fatal dive. This was also "Made in Germany."



The First Regiment artillery division is recognized as one of the most efficacious ones on the Station. The street units demonstrated their ability before thousands of people at the War Bazaar at Grant Park early in the month.

ARTILLERY *in* ACTION

THE main drill field presented the aspect of a battle field on the afternoon of August twenty-first. It was then that the artillery division of the First Regiment acted in the capacity of a landing party and showed just what would be done if there were anything like an enemy on the scene.

After the division had passed in review a demonstration of its tactics in action was given. The "show" consisted of various formations which solved problems in attack and defense. Five distinct movements were executed on the drill, these being the large battalion square, battery squares, protect street crossing, large battery line, and dismounting and disbursing. The active maneuvering of the sixteen three inch pieces by the units with supply details scurrying to the rear and bringing up ammunition added a very realistic touch to the scene.

The field pieces spouted out their fire and banged with an utter abandon until the entire surroundings reverberated with the detonations. Twenty rounds to the man were fired, while there were 96 shots on battalion line.

Ensign A. O. Schory was in command of the division, while W. A. Esch, battalion commander, had active charge of the field work. Included in the division were 48 petty officers, eight company commanders, four battery chiefs, and one battalion commander.

Following the movements, the landing force tore down the pieces and then to show their mechanical efficacy, they built them up again. The demonstration closed with a grand and glorious triumphal march.

HITTING *the* BULL'S-EYE *at* CAMP LOGAN RIFLE RANGE

SCARCELY six months ago the Camp Logan Rifle Range was in its period of infancy, but during that time some noteworthy things have been done at that institution, and there is apparently no end to the good work. With a constantly changing population of between three and four thousand men, the greater number of whom are being received direct from recruiting stations, the camp is being operated at top speed and complete proficiency in marksmanship is taught in less time than it takes to tell it.

This, in a word, tells of another plan of our Commandant, Captain Wm. A. Moffett, for the making of hundred-per cent bluejackets from Great Lakes Naval Station, for it was he who conceived the idea of navy rifle ranges and who, with the good assistance of Major William P. Hatflee, Marine Corps, instigated the Navy Small Arms Circuit of which Wakefield, Mass., Peekskill, N. Y., Virginia Beach, Va., and Mt. Pleasant, S. C., are the most important.

Under the very able direction of Ensign S. M. Abrams the business of hitting the bull's eye progresses with the usual accuracy and dispatch of Great Lakes' mammoth war machinery and from early morning until sun-down there is a continual pepper-ing away of the little steel jacketed imps of death into the very bowels of the imaginary Hun. About a half million rounds of ammunition are consumed weekly and from the appearance of the targets, there are but few misses. The amount of ammunition on hand at all times is 2,500,000 rounds. After being trained as sharpshooters the men are sent out in drafts to the other ranges of the Small Arms Circuit. In addition to the three or four thousand men who constitute the constantly changing population of Camp Logan, Great Lakes is sending 1,600 men there every two weeks for small arms practice.

The Camp is divided into the following ranges: 1,000 yards, 600 yards, 500 yards, 300 yards, 200 yards and the pistol and revolver ranges of 50, 25 and 15 yards each.

Beginners practice on the 200 and 300 yard ranges, 20 rounds, slow fire.

The Marksman courses consist of slow and rapid fire, 20 rounds of each on the 200 yard range.

The course for Sharpshooters covers a period of from ten to twelve weeks. It consists of 20 rounds slow fire, five rounds each on the 200, 300 and 500 yard ranges, also 20 rounds of rapid fire, known as the skirmish run. In the daytime the students in this course is given instruction in the use of the machine gun, pistol and revolver and at night courses of instruction in dismounting and reassembling all small arms, lectures on the various firing positions; rules for firing and handling the rifle; proper management of firing lines and butts; the various corrections on a rifle for light, heat and winds.

In the Expert Rifleman's division the course is shot on the 500 yard range and is the highest qualification course of instruction. It consists of 20 rounds slow fire and twenty rounds changing position, prone, kneel, squat, standing.

Team competition is divided in the following manner:

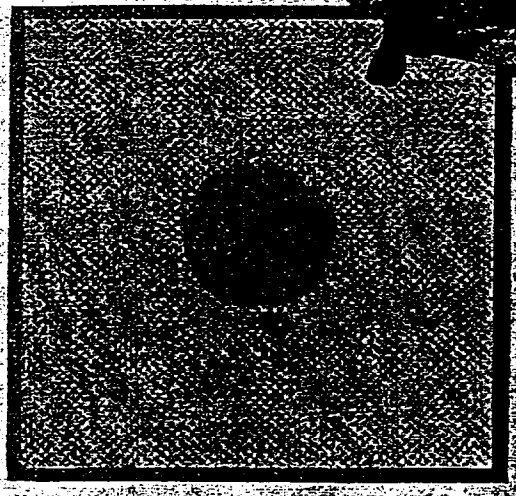
Primary Team Competition—four men to a team from division or company.

Collective Fire Competition—

Each shooter is taught the cleaning and preservation of the gun. The sailor at the phone is in direct communication with the targets and records the hits and misses. Every man shooting has his own scorer.

Proper form in handling the rifle is one of the chief requisites in the making of an expert marksman. Presenting to the left the kneeling position

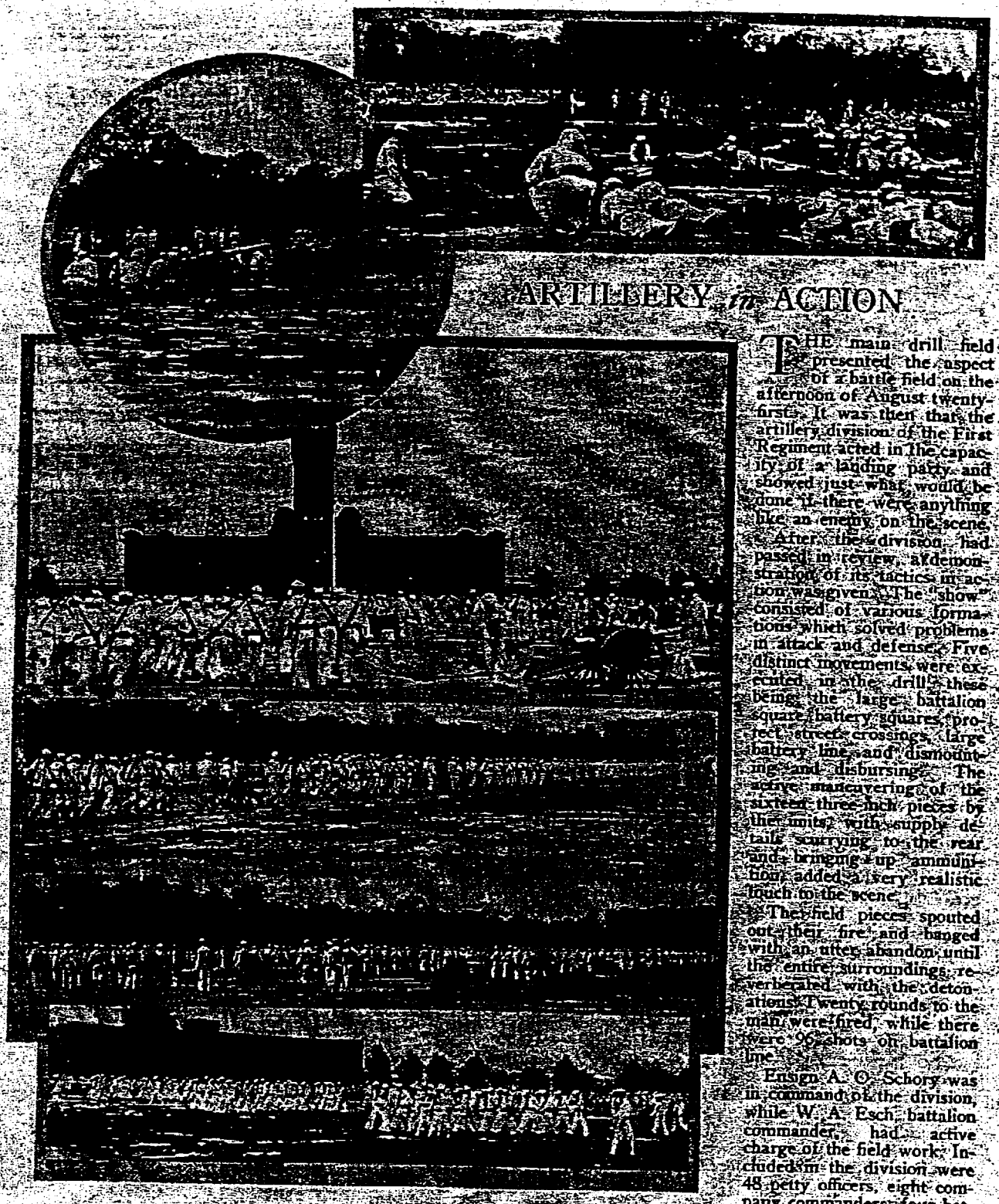
The inset picture shows the squatting position: a trifle unsteady perhaps, but nevertheless essential



One of the most comfortable positions of all is the standing, in which much of the weight of the gun rests on the hip

Above is shown the bull's eye or target. It is kept clear and unmarked by means of little stickers which are pasted over the "hits"

Shooting from a prone position is all right providing the sailor is wearing dungarees, but whites for this position are all out of order. Left, the sitting position



The First Regiment artillery division is recognized as one of the most efficacious units on the Station. The fifteen units demonstrated their ability before thousands of people at the War Games at Grant Park early in the month.

ARTILLERY *in* ACTION

THE main drill field presented the aspect of a battle field on the afternoon of August twenty-first. It was then that the artillery division of the First Regiment acted in the capacity of a landing party and showed just what would be done if there were anything like an enemy on the scene.

After the division had passed in review, a demonstration of its tactics in action was given. The "show" consisted of various formations which solved problems in attack and defense. Five distinct movements were executed in the drill, these being: the large battalion square, battery squares, project, streets crossings, large battery line, and dismounting and disbursing. The active maneuvering of the sixteen three-inch pieces by their units, with supply details scurrying to the rear and bringing up ammunition, added a very realistic touch to the scene.

The field pieces spouted out their fire and banged with an utter abandon until the entire surroundings reverberated with the detonations. Twenty rounds to the main were fired, while there were 96 shots on battalion line.

Ensign A. O. Schory was in command of the division, while W. A. Esch, battalion commander, had active charge of the field work. Included in the division were 48 petty officers, eight company commanders, four battery chiefs, and one battalion commander.

Following the movements, the "landing force" tore down the pieces and then to show their mechanical efficacy, they built them up again. The demonstration closed with a grand and glorious triumphal march.

HITTING THE BULL'S EYE

(*Continued from page 48*)

contemplating entering the Armed Guard branch of the service is the course at Camp Logan where the facilities for the teaching of crack marksmanship are afforded. These trusty sentries on board the merchant ships take hold of their work with zest, for they realize that upon their ability to "hit the bull's eye" depends thousands of lives and countless dollars.

And so goes the work of one of America's finest navy rifle ranges which is daily producing fighting bluejackets who are destined to be especially adept in the art of picking off the Hun by means of the rifle.

SUICIDE CLUB—Men who at the outbreak of the war joined the machine gun companies and battalions were called members of the Suicide Club. At the Great Lakes each man in the armed seamen branch is taught the mechanism and nomenclature of the machine gun. In this picture the man in the foreground, prone, is firing a Lewis machine gun

REAL SHOOTING—While the photographer was taking this picture three machine guns were shooting at the rate of five hundred shots per minute. The noise was deafening

THE COLT—Another machine gun that sailors at the Great Lakes are taught how to use

PHOTOS BY LEWIS

SHELLS—"Empties" strew the ground about the piece after the gun has been exploded. It doesn't take long for them to pile up, either

AT WORK. This is a general view of the Great Lakes Rifle Range. In the foreground of the picture are the death-dealing guns shattering the air and tearing to shreds the canvas targets two hundred yards away. A bit further away are the pigmy shooting the Springfields. A group of men always stand by, ready to take their turn with the rifle.

MACHINE GUNS SPUTTER *on* GREAT LAKES RANGE

THREE machine guns—two Lewis and a Colt—and nearly fifty rifles were blazing away savagely. Two hundred yards away, on the border of the lake, targets were being lowered and raised. The armed men bore bluejackets. Lying prone, they hovered the trigger for minutes and then discreetly fired. All day the racket of exploding pieces echoed through the lofty trees, shrubbery, greenery, and beauty of nature in general for which the north shore is noted.

The salient that forms the Great Lakes Rifle Range is directly to the east of North Chicago. Each day five hundred men take to this range prepared for a big day. The seaman must be as well versed with the rifle as in famous nautical endeavors. He must be versatile for times of warfare. The men in the various armed service branches benefit mostly in the range work.

Let us proceed on the terrain that forms the range. There at the extreme south end one instructor was a bit enthusiastic. He talked. "It's quite remarkable the way some of the men shoot," he said. "Why, this fellow never had anything besides a squirt gun in his hand and today he is beating the man back in the pits busy marking up bull's eyes." Then he kneeled before the novice and gave a bit of advice.

"Now then," he started, "don't jerk that trigger, squeeze it. Just get a bit of air in your lungs—not too much—and as you get ready to shoot, exhale. Get your eye on the sight. Steady—now!" There was a report. The target was lowered. Soon it was raised again. "Bull's eye," said the elated rookie, with the fire piece still resting in the fleshy part of his shoulder. "Yuh can't beat that stuff," chimed in the instructor, a second class gunner's mate.

Of course this doesn't happen all the time, but seldom is the red flag waved wildly across the target indicative of a complete miss. It seems to be instinctive with these "regular fellows" to shoot a rifle well. They are living up to the traditions of the pioneer American of the Revolutionary days who "blunder-bussed" to liberty.

It was an ideal day for target practice, though a bit windy. The trees that formed a border on both sides were swishing back and forth, never resting. About twenty-five feet of the lake was discernible. It was a deep blue, the color artists like to paint, or the poets rave about. Blossoms—perhaps the last of the season—bloomed in the sector that formed the range. Incompatibly, missiles of steel flew directly over the petals, at times severing the white or yellow blossoms from the stem. Two cinder paths, one on either side led to the pits.

"You'd better not take that path to the pits," said a man in dungarees. The leads were flying and whizzing through the air wrathfully. The visitor thanked the informant. So he waded through weeds, probably uncut for years, twenty feet to the left. Despite the "strategic" maneuver, bullets seemed to whizz past uncomfortably close.

THE TARGETS—The canvas targets are peppered relentlessly all day. Some are being lowered; however, they will soon be raised in place again and the hit registered.

AN AIRCRAFT GUN—This is a Lewis machine gun placed on an aeroplane mount. This gun, same as the navy is mounted in seaplanes. The gunsight is so that it can be turned in any direction. It is used to combat enemy craft.

THE PITS—The men in the pits are a busy crew. Their work consists of keeping the canvas targets in condition and registering the hits.

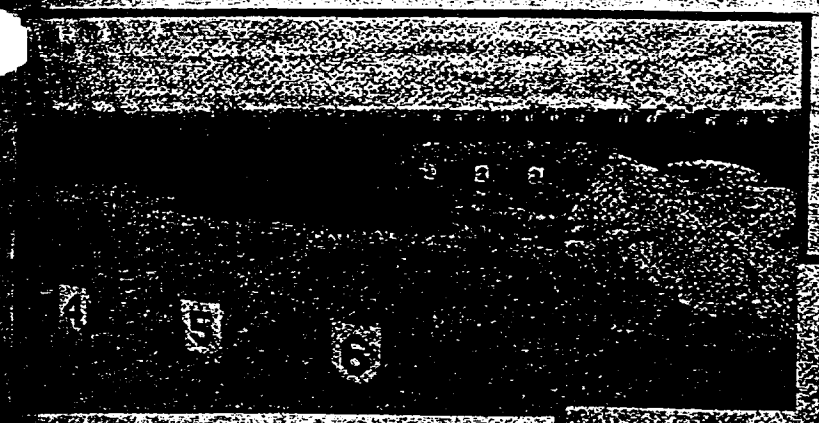
BULL'S-EYE—A close-up of a target. This "sand rat," as the men in the pits are called, is marking a perfect shot.

It was an animated scene in the pits. About two score men were at work. Targets were being lowered and raised almost every minute. A man with a megaphone and an ear piece was shouting continuously. "Re-examine number five," he said at one time. "Then rest number twelve." He, of course, was referring to the targets that were being lacerated. A wild shot ricocheted. Sand and dirt fell promiscuously about. The men worked on despite the debris. They are accustomed to it. It was easy to distinguish the difference between the fire of the rifles and the machine guns. The latter shoot over five hundred shots to the minute. Such havoc did they work on the canvas targets that in a room adjoining the pits a man worked a bit complainingly. "Those machine guns tear the canvas to pieces," he said. He was reclaiming one that was tattered from the constant play of the guns.

The walk back to the range was uneventful. Even the photographer, whose eyes were closed to the beauty of the scene, turned on his heel to remark how pretty the range looked against the blue waters of the lake. Without orders he raised his tripod, attached camera, and regretfully used his last plate.

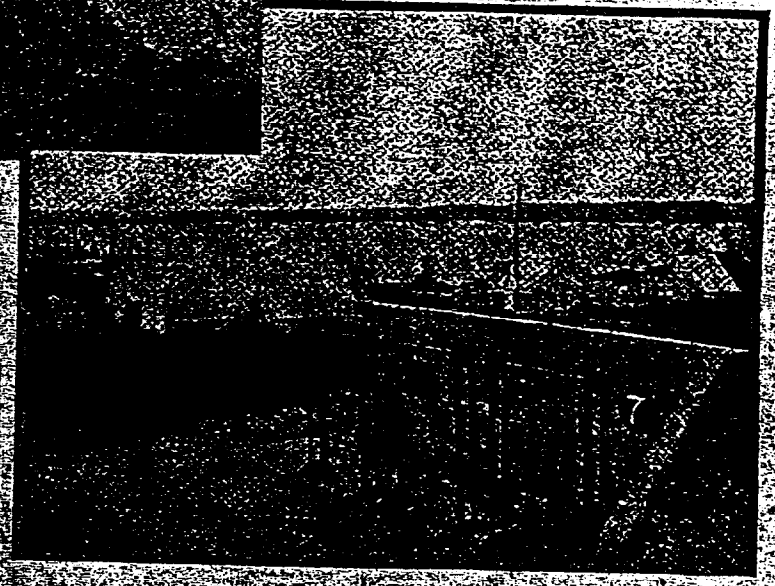
But the beauty of the scene is secondary. It is the actual work that counts. The work of training the men to shoot is the essential thing. That this is accomplished was proven at a recent meeting of riflemen from all states. Under Ensign J. S. Wierzbowski, who is in command of this range, the team sent by the Great Lakes did admirably.

They upheld the honors of this Station and verified that oft repeated statement which calls this the greatest of its kind in the world.

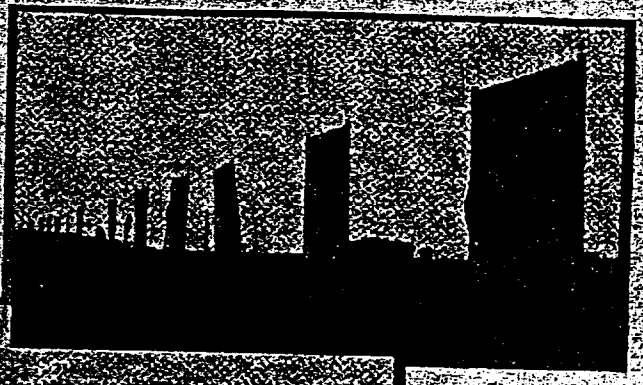


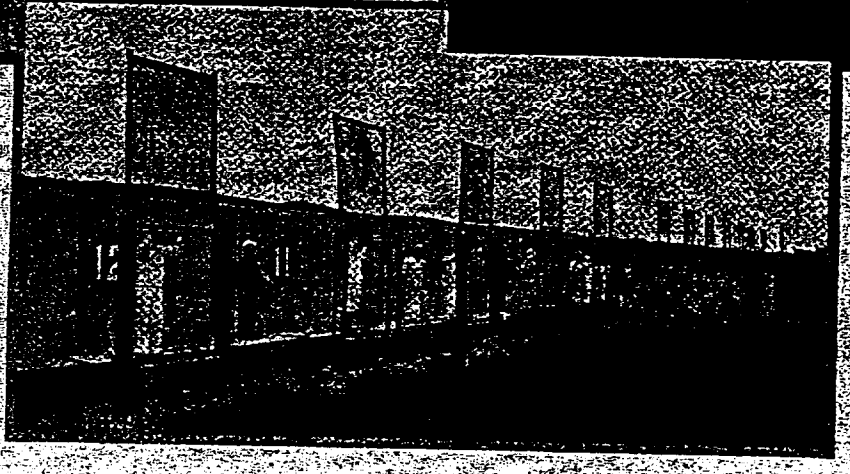
With 3700 yards of firing line as straight as an arrow, butts ranging from 15 yards to 1000 yards, the Camp Logan range is a model of construction.

The Alkan Standard Target, modified in every way, is used. To the right is presented a portion of Camp Logan "homes."



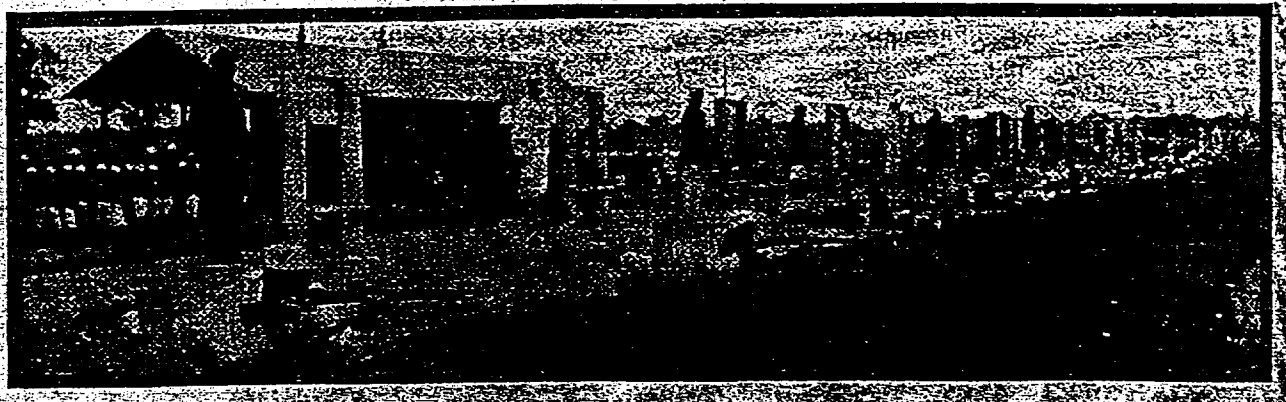
Besides receiving intensive instruction on the firing line, the rifleman is required to possess a working knowledge of manipulation in the butts.





Location of the "hit" is indicated by the man in the butts who covers that portion of the target with the marker.

...ers in the ...butts is a most ...healthful recre... ...ation, but woe ...unto "Jack" ...Rabbit" attempts ...to steal a look ...over the top."



eight men from a company or division firing at same target.

Division Team Competition—eight men from a division.

Ship's Team Competition—eight men from a ship's complement.

Camp Logan, with its continuous growth in every department, is fast taking its place among the leading navy rifle ranges of the country and its products are numbered among the keenest shots in the service. Replete with first class quarters, splendid shooting ranges, canteen, barber shop, electric plant, water works, provisions for plenty of athletics, and many other accommodations, Camp Logan is one of the most valuable adjuncts of Great Lakes. It has an excellent spirit that predominates at Camp Logan where the men of the blue go about pursuing their brief but valued instruction in the handling of the rifle. Ensign Abrams goes out for results and gets them. To a certain extent there is a disregard for strict regulations in order that the men may be given the greatest amount of training possible in the short time allotted. Such things as "uniform of the day," bag inspection and hammock scrubbings are matters that are not followed out to the letter, for it is necessary that every man take advantage of as much time as possible on the firing line.

The novice shooter is taken into the life of the camp immediately upon entering as no time is lost in familiarizing him with the course of instruction. Competent tutors, selected from the service at large because of their proficiency in ordnance, are detailed to initiate him into the intricacies of the rifle. Machine guns and automatics are taken apart and their functions explained in detail. Next the recruit is shown all positions in firing, how to set sights, when to pull the trigger and plenty of other inside dope that he grasps quickly on his anxiety to get on the firing line. Four positions—kneeling, standing, squatting, and prone—are prescribed in the Small Arms Firing Regulations for target practice. And sorry are "whites" after a day of wallowing in the dirt.

The range is kept spick and span at all times and it is a sight worth seeing when one stands upon the 15 yard pistol butts and views the entire course. With precision and regulation the men take their places on the firing line and the training processes in clock-like formation.

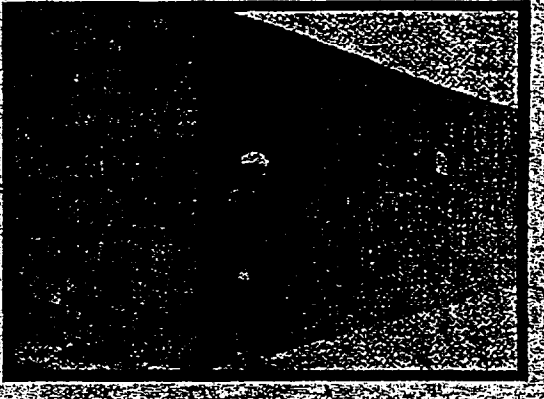
Camp Logan is divided into four sections:

Office and Mess Section;

Range Division;

Construction and Maintenance Section;

Available Section—large working parties and materials.



500 rounds of ammunition are on hand at all times.

The staff in charge is composed of Ensign S. M. Abrams, Commanding Officer; Ensign H. P. Pelham, Executive Officer; Assistant Surgeon R. S. Wood, Medical Officer; E. S. Bates and C. H. Mason, Gunners' Mates.

Men in training at Great Lakes are happy of the opportunity to spend two weeks at Camp Logan. They are convinced that the training received there is absolutely essential to the highest standard navy man and the requests for places on drafts to the shooting grounds are not a few.

In this connection comes the casual inquiry: "But why teach a sailor to use a rifle when he is on board a ship most of the time?"

"Yes, he is aboard ship most of the time, but perhaps once, and only once in his cruise the occasion demands that some disturbance be quelled ashore."

"Yes, yes; go on."

"Well, what's the use of running back home for an army when the sailors have guns and can use them?"

Particularly essential to the men in training who are

(Continued on page 105)

The firing line from the revolver butts to the 1000 yard range.

THE GREAT LAKES TRAINING STATION

GREAT LAKES ADMINISTRATION

V. Flory, Pay Clerk L. H. Ludwig, and Carpenter J. E. Willis.

THE ORDNANCE DEPARTMENT

Upon the declaration of war, the Ordnance Department was equipped to provide ordnance material for approximately one thousand men, but preparations had been made and a request sent to the Bureau of Ordnance to increase equipment and ordnance material of various descriptions to provide for the training of about 15,000 men.

When war was declared all the 3-inch, 6-pounder and 1-pounder guns available at Great Lakes were ordered shipped to the eastern coast to be used for the arming of merchant vessels. However, when the Naval Militia Organizations of the Ninth, Tenth and Eleventh Naval Districts were mobilized, a considerable amount of ordnance material was left in the armories located in the various states. Every effort was made to obtain this ordnance material, and as a result Great Lakes was quickly provided with a couple of thousand additional rifles and drill guns, a number of pistols, and several 3-inch field pieces. In the meantime the Bureau of Ordnance sent to Great Lakes about 10,000 rifles of the older models, 1000 Springfield rifles, and 1000 drill rifles patterned after the Springfield model. This brought the grand total to about 16,000 rifles and 400 pistols, with all the necessary equipment.

At the outbreak of the war Great Lakes had only one armory, and that was partly used by the Medical Department as a sick bay. Just before the war closed, the Station had sixteen regimental armories equipped in all respects for properly taking care of all ordnance material. These armories were also fitted up for the repairing of ordnance material.

The facilities for carrying on small arm target practice prior to the war consisted of three Ellis type, self-scoring targets located on the harbor breakwater. Immediately steps were taken to construct a 40-target small arms range. This range was put into commission the early part of July, 1917, and was constantly in use from that time on. In the autumn of 1917 the Navy Department acquired the Illinois State Target Range known as Camp Logan, about eighteen miles distant from Great Lakes, and during 1918 thousands of men from Great Lakes were given small arms practice there. The Camp Logan range was equipped with two hundred targets.

When the Gunners' Mates and Armed Guard schools were established in August, 1917, the facilities for carrying out the prescribed courses of training were hardly adequate. Immediate steps were taken to obtain the required ordnance material, which included guns, mines, torpedoes and machine guns of various kinds. None of the warships making up the Great Lakes' Training Squadron mounted guns of the type used to arm the merchant marine. Therefore a battery of 3-inch, 50-caliber guns was mounted in a gun shed on the lake shore, and submarine targets were towed at varying distances out into the lake for the men to shoot at. The students of the Armed Guard School practiced firing with these guns both day and night with excellent results. The gun shed was provided with two great searchlights for night work.

During the winter of 1917–18, approximately 1000 men attached to the Public Works Department were put

through an intensive course of instruction in Ordnance and Gunnery in order to fit them for duty with the large battery of 14-inch naval guns that was later used so effectively on the western front in France.

Among the thousands of men who were trained at Great Lakes it was only natural that a considerable number of inventors should have declared themselves. One of the duties of the Ordnance Department was to investigate and report on all inventions submitted to the Commandant. All of the following inventions were investigated, given careful consideration, and forwarded to the Navy Consulting Board for further investigation and consideration: A submarine lamp for diving purposes; a new type of diving apparatus; a method of using poison gas in sea warfare; a double-pointed projectile; an attachment that would allow a diver to be taken aboard while a submarine was under water; a new type of range-finder attachment for small arms and for larger caliber guns and telescopes; a new type of submarine life preserver; a new type of torpedo net to be carried by merchant ships; a new type of automatic releasing hook for life boats; a shield for preventing submarine attacks; a gasoline gun; a monocular range finder; a two-piece projectile; a salvaging apparatus for merchant vessels; a diamond microscope; a mine-laying device for battle tanks; a depth bomb and magnetically controlled torpedo; a steel aeroplane propeller; a relay projectile containing three projectiles in one and claimed to travel one hundred miles; an automatic boat-releasing hook; a non-ricochetting shell; a device for sealing hatches on merchant vessels after being torpedoed; a smoke and steam screen for aircraft defense for large

cities like London, Paris and New York; a submarine trailer; an anti-aircraft projectile with chain attached; and a small arms automatic distance indicator.

THE BOATSWAINS' DEPARTMENT

The rigging lofts, boat house, inner and outer harbor basins, and all floating craft, such as steamers, motor boats, cutters, sailing launches and whaleboats, came directly under the supervision of this department, of which Lieutenant W. C. Carpenter was the head.

At the beginning of the war the Station had just one rigging loft, located in the top of the Main Instruction Building. The number of rigging lofts constantly increased, however, as each of the regimental units constructed for general training purposes was provided with one for instruction purposes.

Tackles and purchases of all descriptions, wire pennants, heavy straps for the handling of weights, and such rigging as was required on the Station were manufactured in the rigging loft and handled by the rigging crew without difficulty.

From September 1, 1917, to October 31, 1918, the forces of the rigging loft manufactured 246,105 clews, 193,309 hammock lashings, 242,361 foot lashings, and 79,412 jackstays, thus providing the Station with an abundance of these necessary articles.

During the winter months, the season of closed navigation on the Great Lakes, there was no opportunity for boat instruction in the water. During the greater part of 1917 and 1918, however, the different schools on the Station used the boats every day, except when a gale was blowing, for teaching the rudiments of small-boat

Works Department of Great Lakes. Camp Dewey had the largest drill hall ever erected up to that time—600 feet by 102 feet. It was soon discovered that there were many enlisted men who were capable of expediting the construction work, and so with their aid Camp Paul Jones was next finished. From then on new buildings grew like mushrooms, until Great Lakes attained its colossal proportions of 1918.

The largest aviation unit was occupied by the middle of July 1918. It comprised eleven double-decked two-story H-shaped barracks, and five double-decked I-shaped barracks, a machine shop and an instruction building, each 100 by 500 feet long. In addition it had its own armory, garage, machine-gun and rifle range.

The 35 barracks in Camp Barry were finished in one week, and the credit went to the labor of the enlisted men, who not only did the carpentry, plumbing, electrical wiring, but furnished the maintenance labor after the construction was completed. In this use of personnel, Captain Moffett was one of several who anticipated the Seabees of World War II.

On the beach of Lake Michigan was set up a unique range for three-inch, 50 caliber guns which were set up in sheds along the shore. Targets were placed at varying distances out in the lake, and the Armed Guard School was taught marksmanship, day and night, night firing being accompanied by powerful searchlights which played on the targets. There was also Camp Logan, eighteen miles to the north, where 200 targets afforded small-arms practice to thousands of men.

Another emergency construction was that of a hospital unit which was adequate to the size of the Station. It contained 2,800 beds besides the regimental dispensaries, and was manned by eighty medical officers and one hundred and sixty-five qualified Navy nurses. The total cost of the hospital buildings and equipment was $1,800,000. During the war, 15,900 patients were treated, including the hundreds who were victims of the influenza epidemic of 1917–1918. Of course, every enlisted man received his three injections during his incoming detention period of 21 days.

The colossal undertaking involved in this Station is partially revealed by the commissary report for November 1917, when 400,000 pounds of potatoes, 300,000 pounds of beef, 229,000 pounds of fruits, 40,000 pounds of cabbages, 30,000 pounds of butter, 30,000 dozen eggs, 25,000 pounds of pork, 25,000 pounds of onions, and 15,000 pounds of turkey were consumed.

FROM FRIGATES TO FLAT-TOPS, THE STORY OF THE LIFE AND ACHIEVEMENTS OF REAR ADMIRAL WILLIAM ADGER MOFFETT

1953

FROM FRIGATES -

THE STORY OF THE LIFE & ACHIEVEMENTS OF
REAR ADMIRAL WILLIAM ROGER MOFFETT, U.S.N.
OCT. 31, 1869 – APR 4, 1933

BY EDWARD McPEE – 1953

A number of submarines built in the District visited the Station briefly, the first one on 1 April 1943. These visits were arranged by the District Training Officer, and each visit afforded an opportunity for a few hundred recruits, as well as other personnel, to inspect the vessel.

Many of the personnel associated with training at Great Lakes felt that the program would have been benefited by the addition of shipboard training, which would have been possible on Lake Michigan.[21]

Ordnance and Gunnery instruction was handicapped to some extent by inadequate facilities and training aids. Regiments were not equally provided with indoor ranges. There were five indoor ranges: two for six Green Bay regiments; one in the 8th regiment; one in 18th; and one on the Main Side near the Outgoing Unit. Instruction varied as a result. In September 1944, for example, recruits in the three Annex camps, Porter, Downes and Dewey were getting two indoor sessions while those in Green Bay were getting only one "because of the greater number of recruits in Green Bay."[22] Edgar believed that ideally each regiment should have its own indoor range.[23]

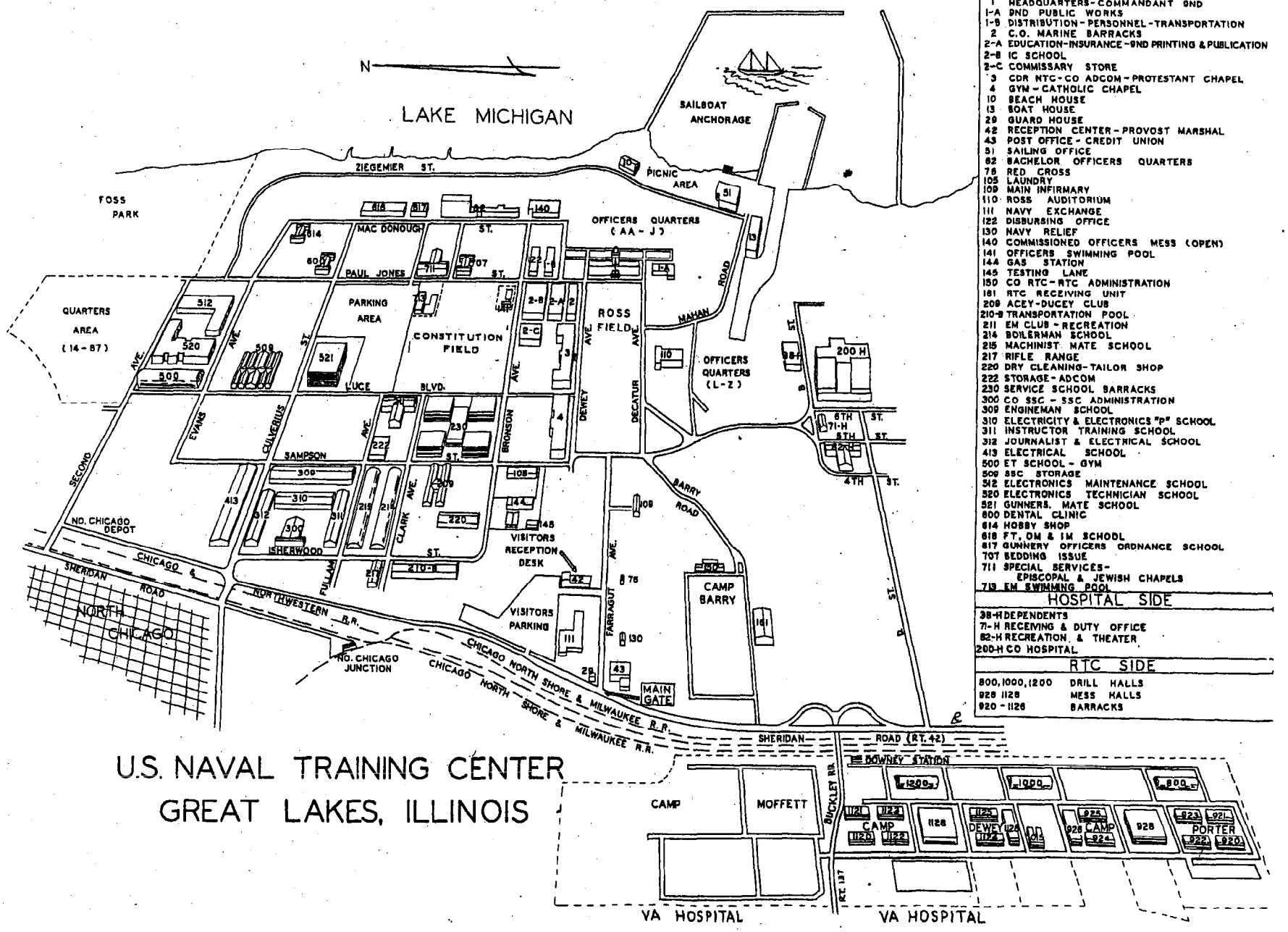
There were two outdoor ranges, neither one conveniently located. Throughout the war the recruits used the Illinois State Guard range at Camp Logan, about fifteen miles north of the Station. This range, made available in 1940, was equipped with 60 six-foot muslin targets hoisted mechanically and scored from seven-foot cement-lined trenches.[24] The second and small out-door range was at Foss Park, North Chicago, just

north of the Center, but two to four miles from recruit camps. Recruits marched to Foss Park, while busses carried them to Camp Logan. On an average day, April-October, 500 recruits received instruction at Camp Logan, 200 at Foss Park, and 2,000 on indoor ranges.

Local improvisation filled the gap when 9400 .30 caliber Springfield rifles were collected from the Station for use of the forces afloat between April and October 1942. A dummy drill rifle was designed and orders for it placed with an Iowa toy manufacturer.. The first shipment of 2,004 such rifles was received at the Station in December 1942.[25]

Some gunnery instruction was made possible by ten five-inch loading machines, which Turek had made in Great Lakes Service Schools. They resembled the old model 1911 five-inch loading machine. These machines, however, were not used very much because they made so much noise that their operation interfered with other instruction near their location. In February 1945, subsequent to a Bureau inquiry, Turek asked for forty-five 5"/38 and forty-five 3"/50 loading machines. Each regiment, said Turek, should have five of each type.[26]

Training facilities for Lookout-Recognition training evolved with the development of the curriculum. In 1942 some Recognition was taught informally with Coca Cola Company Cards. In June 1942 the U.S. Office of Education was asked for scale model aircraft--two sets of each of nine planes.

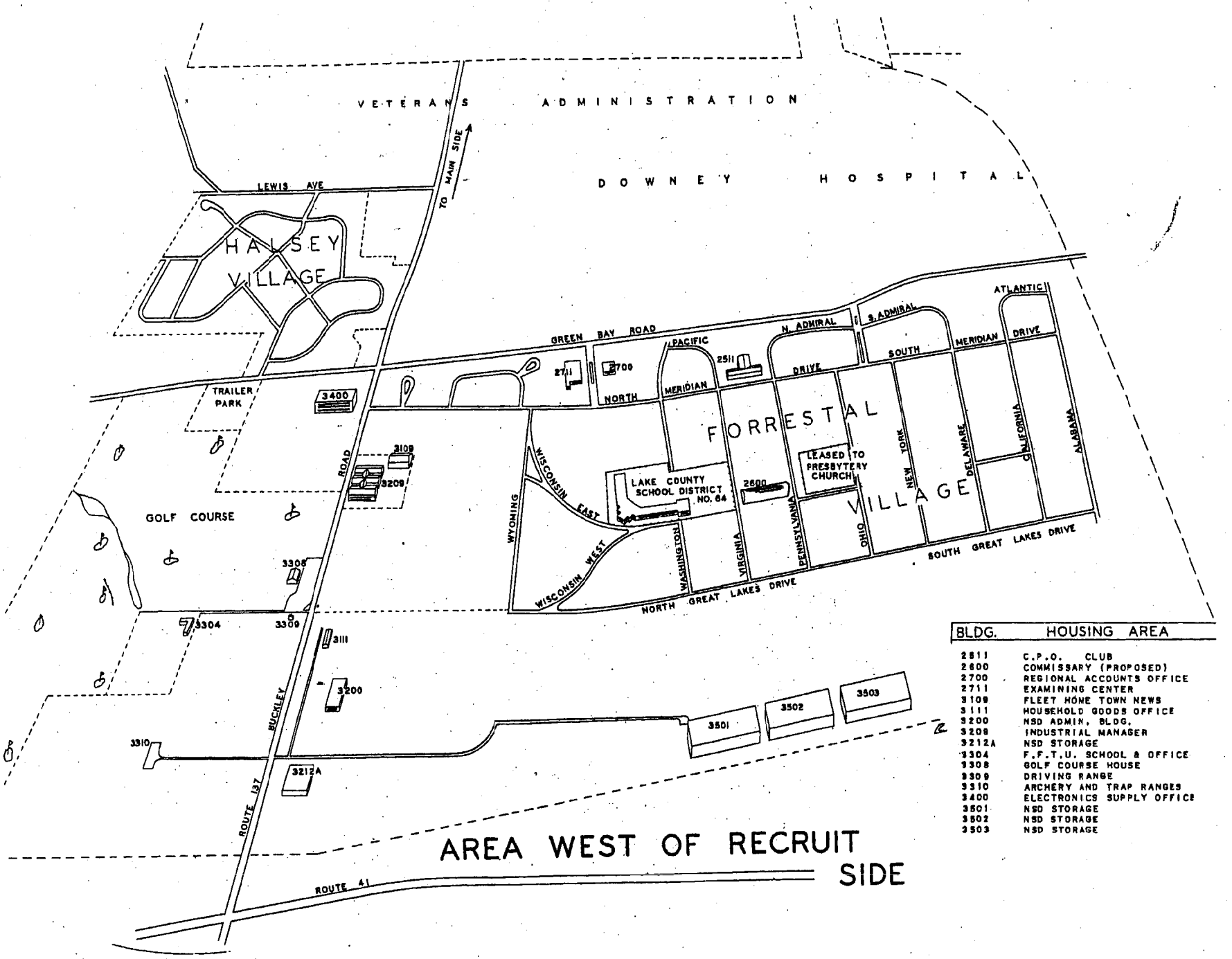


U.S. NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS

BLDG.	MAIN SIDE
1	HEADQUARTERS-COMMANDANT 9ND
1-A	9ND PUBLIC WORKS
1-B	DISTRIBUTION-PERSONNEL-TRANSPORTATION
2	C.O. MARINE BARRACKS
2-A	EDUCATION-INSURANCE-9ND PRINTING & PUBLICATION
2-B	IC SCHOOL
2-C	COMMISSARY STORE
3	CDR NTC-CO ADCOM-PROTESTANT CHAPEL
4	GYM-CATHOLIC CHAPEL
10	BEACH HOUSE
13	BOAT HOUSE
29	GUARD HOUSE
42	RECEPTION CENTER-PROVOST MARSHAL
43	POST OFFICE-CREDIT UNION
51	SAILING OFFICE
82	BACHELOR OFFICERS QUARTERS
78	RED CROSS
105	LAUNDRY
109	MAIN INFIRMARY
110	ROSS AUDITORIUM
111	NAVY EXCHANGE
122	DISBURSING OFFICE
130	NAVY RELIEF
140	COMMISSIONED OFFICERS MESS (OPEN)
141	OFFICERS SWIMMING POOL
144	GAS STATION
145	TESTING LANE
150	CO RTC-RTC ADMINISTRATION
181	RTC RECEIVING UNIT
209	ACEY-DUCEY CLUB
210-B	TRANSPORTATION POOL
211	EM CLUB-RECREATION
214	BOILERMAN SCHOOL
215	MACHINIST MATE SCHOOL
217	RIFLE RANGE
220	DRY CLEANING-TAILOR SHOP
222	STORAGE-ADCOM
230	SERVICE SCHOOL BARRACKS
300	CO SSC-SSC ADMINISTRATION
309	ENGINEMAN SCHOOL
310	ELECTRICITY & ELECTRONICS "P" SCHOOL
311	INSTRUCTOR TRAINING SCHOOL
312	JOURNALIST & ELECTRICAL SCHOOL
413	ELECTRICAL SCHOOL
500	ET SCHOOL-GYM
509	SSC STORAGE
512	ELECTRONICS MAINTENANCE SCHOOL
520	ELECTRONICS TECHNICIAN SCHOOL
521	GUNNERS MATE SCHOOL
800	DENTAL CLINIC
814	HOBBY SHOP
818	FT, DM & IM SCHOOL
817	GUNNERY OFFICERS ORDNANCE SCHOOL
707	BEDDING ISSUE
711	SPECIAL SERVICES-EPISCOPAL & JEWISH CHAPELS
713	EM SWIMMING POOL

HOSPITAL SIDE	
38-H	DEPENDENTS
71-H	RECEIVING & DUTY OFFICE
82-H	RECREATION & THEATER
200-H	CO HOSPITAL

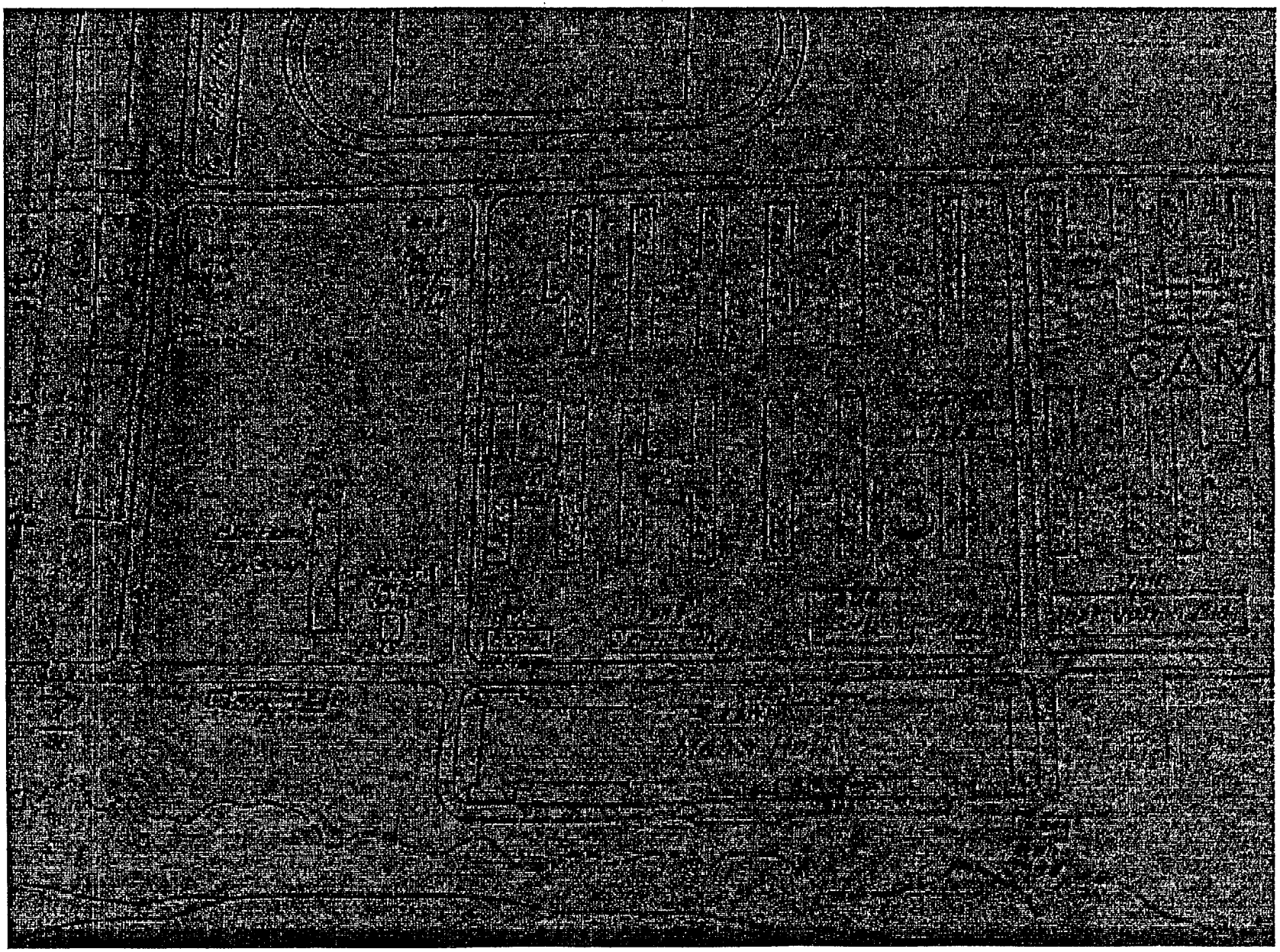
RTC SIDE	
800, 1000, 1200	DRILL HALLS
928 1128	MESS HALLS
920 - 1126	BARRACKS

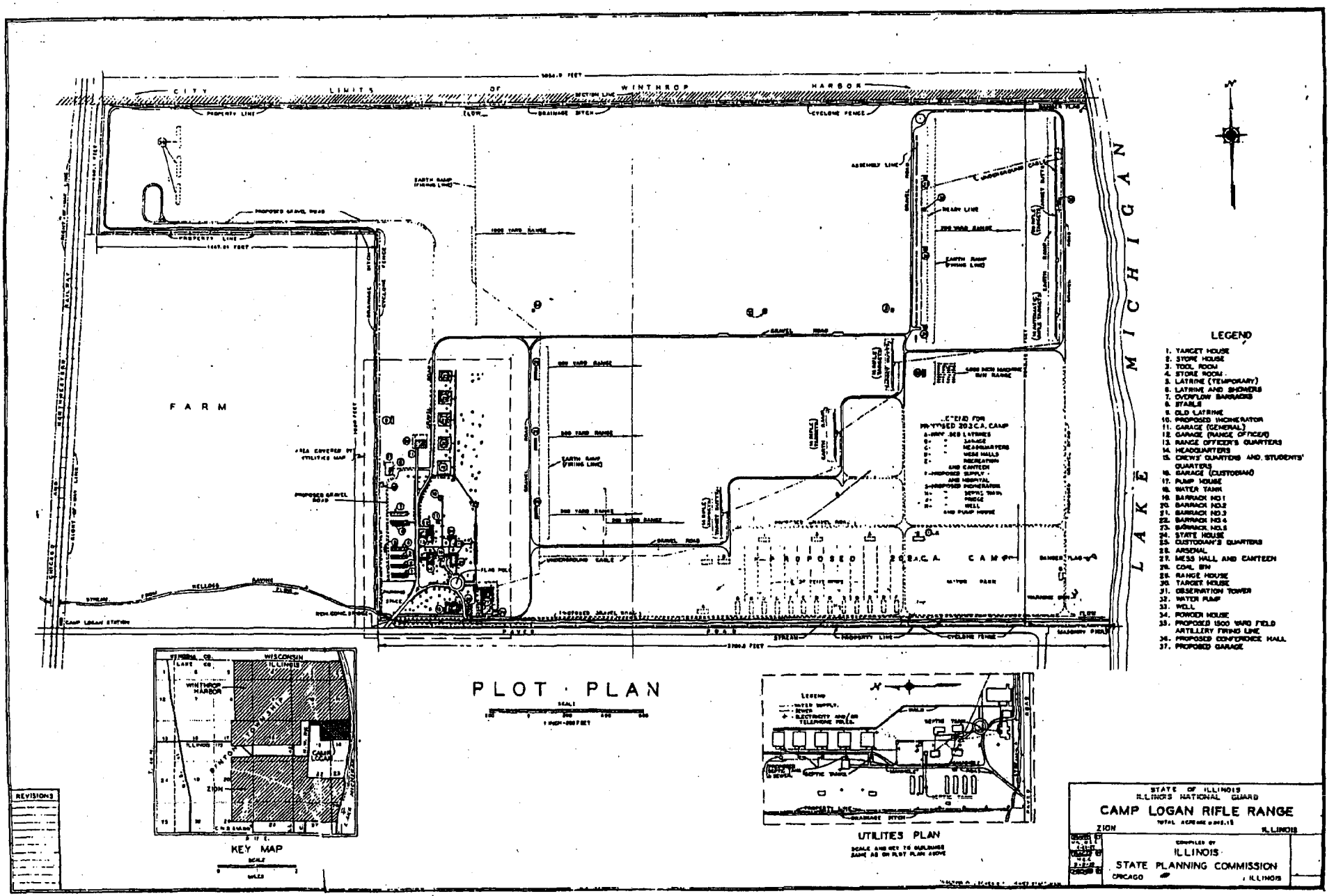


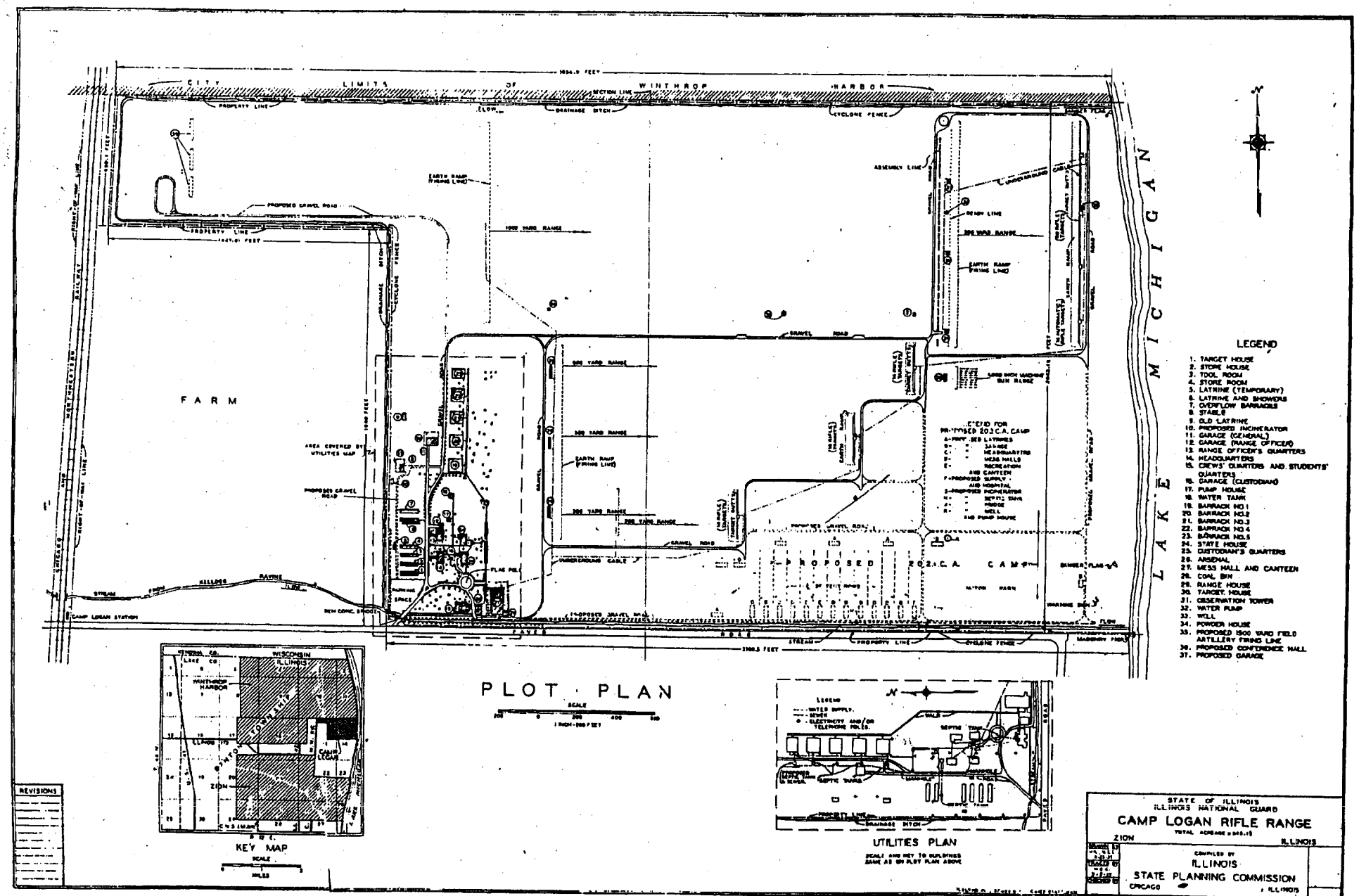
AREA WEST OF RECRUIT SIDE

BLDG.	HOUSING AREA
2811	C.P.O. CLUB
2600	COMMISSARY (PROPOSED)
2700	REGIONAL ACCOUNTS OFFICE
2711	EXAMINING CENTER
3109	FLEET HOME TOWN NEWS
3111	HOUSEHOLD GOODS OFFICE
3200	NSD ADMIN. BLDG.
3208	INDUSTRIAL MANAGER
3212A	NSD STORAGE
3304	F.F.T.U. SCHOOL & OFFICE
3308	GOLF COURSE HOUSE
3309	DRIVING RANGE
3310	ARCHERY AND TRAP RANGES
3400	ELECTRONICS SUPPLY OFFICE
3501	NSD STORAGE
3502	NSD STORAGE
3503	NSD STORAGE

From U.S. Naval Training Center "Welcome to Great Lakes"
Publication # 9ND-GEN-P 545011 August 1960




CITY LIMITS OF WINTHROP HARBOR
LAKE MICHIGAN
FARM
PROPOSED 20 B.C.A. CAMP
LEGEND
1. TARGET HOUSE
2. STORE HOUSE
3. TOOL ROOM
4. STORE ROOM
5. LATRINE (TEMPORARY)
6. LATRINE AND SHOWERS
7. OVERFLOW BARRACKS
8. STABLE
9. OLD LATRINE
10. PROPOSED INCINERATOR
11. GARAGE (GENERAL)
12. GARAGE (RANGE OFFICER)
13. RANGE OFFICER'S QUARTERS
14. HEADQUARTERS
15. CREWS' QUARTERS AND STUDENTS' QUARTERS
16. GARAGE (CUSTODIAN)
17. PUMP HOUSE
18. WATER TANK
19. BARRACK NO.1
20. BARRACK NO.2
21. BARRACK NO.3
22. BARRACK NO.4
23. BARRACK NO.5
24. STATE HOUSE
25. CUSTODIAN'S QUARTERS
26. ARSENAL
27. MESS HALL AND CANTEEN
28. COAL BIN
29. RANGE HOUSE
30. TARGET HOUSE
31. OBSERVATION TOWER
32. WATER PUMP
33. WELL
34. POWDER HOUSE
35. PROPOSED 1500 YARD F'IELD ARTILLERY FIRING LINE
36. PROPOSED CONFERENCE HALL
37. PROPOSED GARAGE
PLOT · PLAN
KEY MAP
UTILITIES PLAN
REVISIONS
STATE OF ILLINOIS
ILLINOIS NATIONAL GUARD
CAMP LOGAN RIFLE RANGE
ZION ILLINOIS
COMPILED BY
ILLINOIS STATE PLANNING COMMISSION
CHICAGO ILLINOIS



PLOT PLAN

SCALE

1 INCH = 200 FEET

KEY MAP

SCALE

MILES

UTILITIES PLAN

SCALE AND KEY TO BUILDINGS SAME AS ON PLOT PLAN ABOVE

REVISIONS

STATE OF ILLINOIS
ILLINOIS NATIONAL GUARD

CAMP LOGAN RIFLE RANGE

TOTAL ACREAGE = 240.11

ZION ILLINOIS

COMPILED BY
ILLINOIS
STATE PLANNING COMMISSION
CHICAGO ILLINOIS

BACKGROUND INFORMATION

FOR

NAVAL STATION GREAT LAKES

Send

Received From Ken Endress on 3/17/03
CWO
Naval Station - Public Works

Listing of Known Ammunition Storage and Firing Locations at Great Lakes, IL

17 March 2003

24	AMMO Bunkers along Pettibone Creek, vacant?
24A	", vacant?
24B	", vacant?
24C	", but now a Dog Kennel
24D	", vacant?
24E	", vacant?
118	Armory - Demo
120	Present lake front magazine
217	Rifle Range Bldg - Demo

Naval Rifle Range (outdoor) pre-1945, now Dept of Treasury, FBI Range

910	Rifle Range Bldg - Demo
1910	Rifle Range Bldg - Demo
3110	Rifle Range Bldg – Child Development Center (Cleaned recently for lead)
3109	Armory - Demo
1413	Armory - Demo
1600A	Gas Chamber (one of many at GLakes) - Demo

Weapon (Canons and small arms) firings were on Ross Field and in the Pettibone Creek ravines

Skeet Range along the Lake Michigan

Source:
1. NAVDOCKS P-164, Public Works of the Navy Data Book, Vol 1, July 1945 Edition
2. Personal information from Ken Endress, NAVSTA Great Lakes, Code 412, 201 Decatur Ave, Building 1A, Great Lakes, IL 60088-2801. 847-688-4211 x112

Cooperation and coordination between these various governmental entities, and their agencies, is at times extremely difficult. The six county northeast Illinois region often finds itself at odds with the remainder of the State during legislative debates. This does not imply that the northeast region presents a unified front; more often than not there are regional differences as well. Usually the suburbs are aligned against the City of Chicago, or the five surrounding "collar" counties against Cook County. At times the rural counties of Kane and McHenry are aligned against the more suburban counties of DuPage, Lake, Will, and, occasionally, suburban Cook County. These varying alignments produce legislative policies which are not advantageous to the region as a whole.

In the immediate vicinity of the Training Center governments having jurisdiction include the Federal Government, the State of Illinois, Lake County, Shields Township, the City of North Chicago, the Village of Lake Bluff, School Districts #64 (North Chicago elementary schools), #65 (Lake Bluff elementary schools), #111 (Highwood/Highland Park elementary schools), #123 (North Chicago high school), the Lake County Forest Preserve District, Foss Park District, and the North Shore Sanitary District.

3. HISTORY[2]

The City of Chicago and its growth as a metropolis was influenced by the landscape formed by receding glaciers. The juncture of Lake Michigan and the tributary water routes of the Mississippi River, although separated by a low ridge eight miles inland, provided the incentive for development at the mouth of the Chicago River.

In the 1600's French exploration, trapping and trading dominated. In 1763 the area passed to British control as part of the settlement of the Seven Years' War. When the United States secured its independence, authority over the region passed to the new republic. More importantly in 1795 by the Treaty of Greenville, the indians ceded six square miles of land at the mouth of the Chicago River and in 1803 Fort Dearborn was constructed to protect this important transportation link. In 1816, the Sacs and Fox Indians ceded a strip of land that ran from Chicago to beyond the juncture of the Illinois, Des Plaines and Kankakee Rivers, including the Chicago Portage between the Chicago River and the Des Plaines River. This acquisition assured the future of Chicago as a center for transportation and commerce.

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[2]Mayer, Harold M. and Richard C. Wade, *Chicago: Growth of a Metropolis*, was the primary source of historic information contained herein.

In 1829, the Illinois Legislature took the first steps to construct a canal to link the Chicago River to the Des Plaines River, thus opening a continuous water route between the Great Lakes and the Mississippi River. Construction of the Illinois and Michigan Canal began in 1836, and opened to traffic a decade later. Population grew from 50 settlers in 1830 to over 4,000 by the end of the decade. The first city charter was granted in 1837.

The next major impetus to the growth of the region came during the late 1840's and early 1850's. During this period the railroads expanded westward. Chicago became the hub for the movement of goods and people from the east to the frontiers of the west. By 1856, Chicago was the focus of ten trunk-lines with nearly 3,000 miles of tracks serving 58 passenger and 38 freight trains a day. The first railroad through Waukegan was constructed in 1855, and the City of Waukegan was incorporated in 1859.

During this time Lake County was developing primarily as an agricultural area serving the needs of Chicago. Two notable exceptions were Waukegan and Lake Forest. Both are along the lake shore and provided the early template for today's pattern of development. Waukegan (first settled in 1834) did not begin its rapid growth until after 1889 when the South Western Railroad, now the Elgin, Joliet and Eastern Railway, began operation as a freight carrier into the City. In 1891 the City's first manufacturing plant, Washburn-Moen Manufacturing Company, opened. From that point on, Waukegan and northeast Lake County developed as the major industrial area north of the City of Chicago. About 10 miles south of the City of Waukegan, Lake Forest was developing as Chicago's most exclusive suburb. In 1856, Lake Forest was laid out with curved drives and expansive lots. The City was incorporated in 1861. Many of Chicago's elite of commerce built mansions along the ravines and bluffs of Lake Forest. This early development has characterized much of present day southeastern Lake County. The western three-fourths of the County continued in its agricultural development.

The most significant event of the late 1800's influencing the Chicago of today was the Great Chicago Fire of October 8-10, 1871. The fire destroyed nearly 1700 acres of the central city. Damage exceeded $200 million. Despite the destruction and loss of life, Chicago began to rebuild immediately. Within a week of the fire over 5,000 temporary structures had been erected and 200 permanent buildings were under construction. Within five years most of the central area was rebuilt and the City had regained its vitality. During the 1880's Chicago grew from the ashes of the fire and made great achievements in architectural designs, known as the "Chicago School". The City showed off its achievements in 1893 with the World's Columbian Exposition.

The rapid growth of population, commerce and industry created many health problems. One significant problem was the fact that the sewage discharged into the Chicago River ultimately flowed into the Lake, from which potable water was drawn. Chicago's solution to this problem was the construction of the Chicago Sanitary and Ship Canal across the drainage divide between the Lake Michigan Basin and the Mississippi River Basin, thus reversing the flow of the Chicago River. Construction began in 1894 and the canal opened in January 1900.

The final blueprint for the growth of Chicago was a plan commissioned by the Merchant's Club of Chicago in 1906. It took Daniel H. Burnham three years to develop the now famous Chicago Plan of 1909. Over the next 50 years the plan helped shape the pattern of development of the City.

Post World War II suburban expansion has not diluted the prominence of Chicago as the midwestern center of commerce and industry. Although there was a reduction of emphasis on rail movement, Chicago retained its status as a transportation hub, with five interstate routes forming a juncture at Chicago. Also, the development of O'Hare Airport further enhanced Chicago's status as air travel became the primary inter-city mode of transport.

In Lake County, during the 1950's and 1960's rapid suburban development occurred in the south and east following the pattern of development started in the late 1800's. By 1980 the county was 35% developed. Today there are only about 75,000 acres of cultivated agricultural land remaining in the west and central part of the county.

4. REGIONAL POPULATION

The population in Northeastern Illinois has grown 37 percent since 1950 to the current population of 7,103,624 people.[3] The population of Lake County has grown to more than 400,000, reflecting a growth of 146 percent from 1950 through 1980. More importantly, the county's share of the region's population has increased from 3.5 percent in 1950 to 6.2 percent in 1980, while population in the City of Chicago has dropped to 3 million (17 percent) during this same period.[4]

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[3] U.S. Department of Commerce, Census Bureau, *1980 Census of Population.*

[4] Northeastern Illinois Planning Commission, *Economic Factbook for Northeastern Illinois 1985 Update, p. 4.*

Population forecasts by the Northeastern Illinois Planning Commission (NIPC) project that total population growth the in region during the 25 year period from 1980 to 2005 will only be 13.7 percent, resulting in a regional population of about 8 million people. The Planning Commission further predicts that the loss of population from the City of Chicago will stabilize, and that all regional growth will occur in the suburbs. The growth in Lake County will also slow to 37.5 percent during the same period, to a projected 2005 population of 605,500 people. The NIPC also made population projections for townships in northeastern Illinois. The projected growth in Shields Township, which includes the Training Center, will be 9 percent, from a 1980 population of 45,152 to 49,234 in the year 2005. Given that the Training Center is the primary population center of the township, it is reasonable to assume that the majority of the 4,000 person increase will be Navy personnel and their dependents.

5. REGIONAL ECONOMY

The economy, like the region, is diverse, and because of its diversity, is surviving. Overall employment from 1970 through 1980 has grown from 2.9 million to 3.2 million workers in the non-agricultural sector, reflecting an employment growth rate of over ten percent. Although manufacturing represents the largest employment category, it accounts for only 26 percent of those employed in the region. The "service" industry represents the second largest sector at 19 percent. Other large employment sectors are retail trade (16 percent), government including education (11 percent), and wholesale trade (5 percent), thus illustrating the diversity and balance of the employment opportunities of the region. Almost 73 percent of the employment opportunities of the region are in Cook County, with nearly one third in the City of Chicago proper.[5]

Lake County's share of the total regional employment is approximately 6 percent. The county's work force has expanded by about 8 percent since 1977, to 207,000. Total employment grew by about 6 percent, or 192,500 total employed workers. Employment by industry within the Lake County follows the regional percentage with two exceptions: within Lake County a larger percentage of the work force is engaged in Agriculture, Mining and Construction, while a smaller percent work in the Transportation, Communications and Utilities industries. Despite these shifts, the largest employment category (27.5 percent) remains Manufacturing. In the vicinity of the Training Center the largest employers in

[5]Illinois Bureau of Employment Security, *Annual Planning Reports, (Chicago SMSA)*

the Manufacturing category are Abbott Laboratories and Johnson Outboard Marine Corporation.

The Lake County Framework Plan identifies the Waukegan-North Chicago Shoreline as an economic development area with special potential because of the exceptional availability of rail transport, the Waukegan Harbor, and the proposed Lakefront Highway. Retail Trade, representing the second largest employment category (16.5 percent), is concentrated at the Lakehurst Shopping Center, approximately 5 miles from the Center. Smaller shopping districts are found in North Chicago immediately north of NTC, in central Waukegan to the north and central Lake Forest to the south. Federal employees represents approximately three percent of the overall work force in Lake County, and the Great Lakes Naval Training Center accounts for 60 percent of that total.

The downside of employment is unemployment. Statistics for the Chicago SMSA indicate a 1980 unemployment rate of 7.8 percent out of a regional work force of 3.2 million. Lake County fared better with an unemployment rate of only 6.9 percent in 1980. Unfortunately the trend of unemployment in the county has been increasing since 1977 when Lake County unemployment was just 4.9 percent.

Another measure of economic health is household income. The median household income for Northeastern Illinois was $20,728.[6] Lake County median income was running above this at $25,212. Median income in zip code 60088, representing Great Lakes, was $14,852. This value is skewed downward by the large recruit population. The percentage below the poverty level in Northeastern Illinois was 11.3 percent, and 5.25 percent in Lake County.

Although, the Chicago area shares some of the ills of other cities in the "rust belt" such as high labor costs, high energy costs and deteriorating infra-structure, it has one very strong "plus" going for it, the region's diversity. Unlike some other northern cities, the region is not totally reliant on a single industry such as steel or autos, nor is it, like Seattle, totally dependent on one company -- Boeing. No one industry in Northeastern Illinois accounts for more than a quarter of the employment base. Total employment is growing, and per capita income is up from 1970. Although the region is not in "great shape" the prognosis is for continued strength and expansion of the regional economy.

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[6]These statistics are compiled from the 1980 Census, Summary Tape File 3, as reported in the Northeastern Illinois Planning Commission, Data Bulletin 82-1, Income and Poverty in Northeastern Illinois by County, Township, and Municipality, 1979.

6. TRANSPORTATION

The regional highway network is well developed and provides excellent access to and from central Chicago. Metropolitan Chicago is the juncture of three east-west interstate highways (I-80, I-90 and I-94) and the terminus of two north-south interstate highways (I-55 and I-57). The Naval Training Center is within three miles of the Tri-State Tollway (I-94), the major north-south link from Indiana to Wisconsin. Access to both Milwaukee and Chicago is via US Route 41, a four lane divided, limited access highway along the western boundary of the Center.

Four state highways provide major arterial links to the Center. North-south access is via Sheridan Road and Green Bay Road. Sheridan Road, IL Route 42, separates Mainside from Camp Porter and Camp Moffett. Green Bay Road, IL Route 131, separates Forrestal Village and the Golf Course from the VA Hospital and Halsey Village. East-west access is by Rockland Road and Buckley Road. Rockland Road, IL Route 176, is south of the Center. Buckley Road, IL Route 137, provides access to the center of Mainside, splitting the Golf Course from Forrestal Village, Halsey Village and Nimitz Village from the VA Hospital, and Camp Moffett from Camp Porter.

In addition to the highway network, access to the base is provided by the Chicago and Northwestern Railroad (C&NW) Commuter Rail North Line Service, with regularly scheduled service between Chicago and Milwaukee. There is a Great Lakes commuter station located in the vicinity of Gates 4 and 5 at the intersection of Main Street and Nimitz Avenue. The C&NW schedule favors commuter service to and from the Chicago Loop. By taking the C&NW to its Chicago terminal, inter-regional passenger rail service (Amtrak) is less than a mile walk to Union Station. Further, both Greyhound and Trailways inter-city bus terminals are within an easy walk of the C&NW Station in Chicago. Limited Amtrak and inter-city bus service is available from Waukegan.

The Naval Training Center is less than an hour by automobile from O'Hare International Airport. O'Hare Airport is served by regional, national, and international air carriers. Also, approximately an hour drive to the north is Mitchell Field in Milwaukee, which provides regional and (limited) national air service.

Waterborne commerce at the Port of Chicago may not be as great as that in the vicinity of other naval installations, but the port does handle a significant percentage of Great Lakes shipping. From 1974 through 1984 waterborne freight on the Great Lakes has declined by 33 percent to just under 150 million tons per year. However, the Port of Chicago over this period has maintained its average 19 percent share of the total Great Lakes shipping.

The freight handled by the Port of Chicago is down from 46 million tons in 1974 to 24 million tons in 1984. The port facility at Waukegan handled nearly 200,000 tons (104 shipments) during 1983.[7]

Considering the limited role shipping plays in delivering freight to the region, other more conventional modes must be used such as the trucking of freight via the five interstate routes serving the area, as discussed above. Also, as noted in the subsection on history of the region, Chicago has historically been the rail hub of the midwest and the country. The availability of rail freight is still a major economic factor in the region. Great Lakes is served by two major rail freight handlers, the Chicago and Northwestern Railroad and the Elgin, Joliet and Eastern Railway.

The Illinois Department of Transportation (IDOT) is planning a road project which, as currently structured, will have a substantial impact on the Naval Training Center. The proposed project is known as the Lakefront Highway (FAP-437). The project was initially proposed in the early 1970's. More recently, in early 1983, the IDOT prepared a Draft Environmental Impact Statement (DEIS) and held requisite public hearings in February 1983. The Navy has expressed serious concern regarding potential impacts that the various proposed alignments will have on the Center.[8]

The IDOT "preferred" alignment is a four-lane arterial/freeway, aligned easterly with Buckley Road, starting at the Tri-State Tollway (I-94) and running to the C&NW Railroad (near Sheridan Road), then proceeding northward along the C&NW Railroad and Sheridan Road to a juncture with the existing expressway at Grand Avenue. This northward leg is to be a controlled access four-lane highway with full access from the Tri-State Tollway at Buckley Road. Major negative impacts envisioned as a result of the proposed alignment include:

- significant and unacceptable division of the training complex;
- land locking of the southeast corner of Camp Moffett, thus precluding facility expansion in this area;

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[7]Department of the Army, Corps of Engineers, *Waterborne Commerce of the United States, Calendar Year 1983, Part 3 Waterways and Harbors, Great Lakes*, May 1985.

[8]Ltr to IDOT District 1 from J. L. Clearwater, CAPT, CEC, USN, CO NORTHNAVFACENGCOM of 9 Mar 1983.

- destruction of the Camp Porter main gate, and major reduction of parking capacity at the Recruit Visitor Reception Center;

- diversion of Downey Road traffic through a proposed intersection at Illinois Street with a significant increase in base traffic;

- increase in the ambient noise levels at the Recruit In-processing Center within Camp Moffett; and

- reduction of the aesthetic quality of the Center.

IDOT has indicated in the DEIS that the proposed highway will improve access to Great Lakes. Conversely, a traffic engineering study conducted in June 1979 by the Traffic Engineering Division of the Military Traffic Management Command concludes that ease of access to the Mainside of the Training Center will be significantly impaired and that the proposed alignment will require more changes to the Training Center road network and will decrease the level of service because of the number of at grade intersections along the route.[9]

The Navy and IDOT have completed negotiations on mitigation of adverse effects from the proposed highway. The necessary easement documents are being prepared. It is expected that the easements will be granted and construction begun during 1986.

7. HOUSING

To discuss housing on a regional, Northeastern Illinois, basis will not provide an accurate picture of off-Center housing opportunities. The physical size of the six county region, coupled with the fact that the Training Center is located in the extreme northeast corner of the region, reduces significantly the access to housing opportunities located in the southern or western suburbs of Chicago. Despite the fact that DuPage County, a western suburban county, is one of the fastest growing counties in the nation (92,500 new housing units between 1970 and 1980), it is too distant a commute to feasibly provide housing for Center personnel.

Lake County housing has also expanded significantly during the 1970's. In 1970 there were 108,156 housing units in the county; by 1980 there were 150,496 housing units, nearly a 40 percent

[9]Military Traffic Management Command, Report TE 79-9-53 of January 1983, pp. 41-57.

increase.[10] But even the county represents too large an area for a meaningful analysis of housing opportunities for Great Lakes' personnel. In Shields Township, where Great Lakes accounts for almost 60 percent of the labor pool, the mean travel time to work is just under 14 minutes. This would require a travel distance on the order of five miles. This service area encompasses the communities of North Chicago, Green Oaks, Lake Bluff, Park City, southern parts of Waukegan and Gurnee, western part of Libertyville, the north half of Lake Forest, and unincorporated portions of western Libertyville Township.

PLATE V-7

SELECT HOUSING DATA
LAKE COUNTY, IL

COMMUNITY	HOUSING UNITS OCCUPIED OWNER	RENTER	TOTAL	MEDIAN VALUE	RENT	VACANCY RATE	HOUSE-HOLD SIZE	BUILDING PERMITS 1979 THRU 1983 SF	MF
GREEN OAKS	376	22	410	$121,300	$450	2.93	3.56	118	0
GURNEE	1995	675	2979	$73,400	$311	10.37	2.69	251	713
LAKE BLUFF	1352	159	1567	$118,100	$306	3.57	2.91	79	11
LAKE FOREST	3970	851	5115	$180,900	$321	5.75	2.93	212	34
LIBERTYVILLE	4035	1272	5539	$104,500	$282	4.19	3.09	198	110
NO. CHICAGO	2768	4231	7462	$45,200	$219	6.20	3.14	34	28
PARK CITY	1219	407	1724	$50,600	$216	5.68	2.26	52	0
WAUKEGAN	13264	10870	25671	$50,400	$226	5.99	2.73	136	138

SOURCE: Northeastern Illinois Planning Commission,
Economic Factbook for Northeastern Illinois, 1985 Update

In the Table above the median value and the rent costs are based upon 1980 Census data, and 1986 costs will be higher due to inflation. As indicated in the Table above four of the eight communities are likely to be beyond the means of most Navy personnel with mean housing values in excess of $100,000, and a fifth only marginally affordable ($73,400). However, the remaining three communities, North Chicago, Park City and Waukegan, provide a viable housing market with vacancy rates of 6 percent.

The Lake County Framework Plan projects that the County's housing market will support an additional 80,000 plus households through the Year 2000. Nearly 90 percent of the demand will be for single family detached units. However, in Lake County 32 percent of the housing starts between 1970 and 1979 were for multi-family

[10]Northeastern Illinois Planning Commission, *Economic Factbook for Northeastern Illinois, 1985 Update*, p. 17.

units. Nearly 50 percent of the building permits between 1979 and 1983 were for multi-family housing in the eight communities around the Training Center. This trend is favorable to the needs of Navy personnel who tend to have smaller families, require less expensive housing, prefer low maintenance housing, and have a relatively short duration of occupancy.

8. RECREATION FACILITIES

A wide variety of recreational opportunities are available to Navy personnel with off-base privileges. These opportunities range from the cultural to the "out-doors". The metropolitan area of Chicago provides access to cultural activities such as museums, theaters, fine dining, and musical concerts. Year round sports activities, both spectator and participant, are available throughout the region. Out-door activities are available in the extensive county forest preserve and municipal park systems of Lake and Cook Counties. There are more than 30 miles of public beaches for sun-bathing, swimming, and sailing along the Lake Michigan shore, and at the numerous small inland lakes within Lake County. Additionally, in southern Wisconsin there are numerous opportunities for camping, sailing, and canoeing during summer, and limited downhill and extensive cross-country skiing in winter.

9. EDUCATION

At the end of the school year 1985/86, the Naval Training Center military dependent elementary school enrollment was 3,605 students (approximately 58 percent of district enrollment) and secondary school enrollment was 1,370 students (38 percent of high school population). These students attended North Chicago School District No. 64 and North Chicago High School District No. 123, respectively.

Public Law 81-874 was enacted to compensate local school districts for the financial burden of educating military dependents in local schools, which is estimated to cost $750 per pupil per year. Total Public Law 81-874 entitlement to the districts providing education for Training Center dependents for the school year 1985/86 was estimated at $2,268,000 for District No. 64, and $746,000 for District No. 123.

Additional educational opportunities beyond secondary school are available through the Lake County Community College System. Continuing adult education courses are offered by most colleges and universities in the Chicago area, including Northwestern University, University of Chicago, University of Illinois, University of Wisconsin, Loyola University, DePaul University,

- 64 percent of respondents to the industrial retention survey indicated expectations for employment increases;

- site acquisition cost and proximity to labor force were primary assets; and

- taxes, labor costs, and lack of public transportation were listed as drawbacks.

Overall, the prospects for economic growth in Lake County are good, and the County Board has established growth goals as outlined within the Lake County Framework Plan. The Framework Plan allocates 17 percent of developable land for non-residential development. In order to achieve this goal, the County and its municipalities will need to actively market the County's assets to attract new commercial/industrial growth.

The Framework Plan projects the addition of 83,749 new households through the Year 2000, and therefore has set aside nearly 45,000 acres of land for development of residential uses. During the 1970's, 32 percent of housing starts in the County were multi-family dwellings. Utilizing straight line projections of 1970-1979 building permit activity (averaging 3,246 dwelling units per year) results in a projected housing shortfall of nearly 19,000 units by the Year 2000. To try and meet this shortfall the County Board has adopted policies to allow greater residential development flexibility, to streamline pre-development review processes, and to encourage communities to permit smaller single family housing unit size.

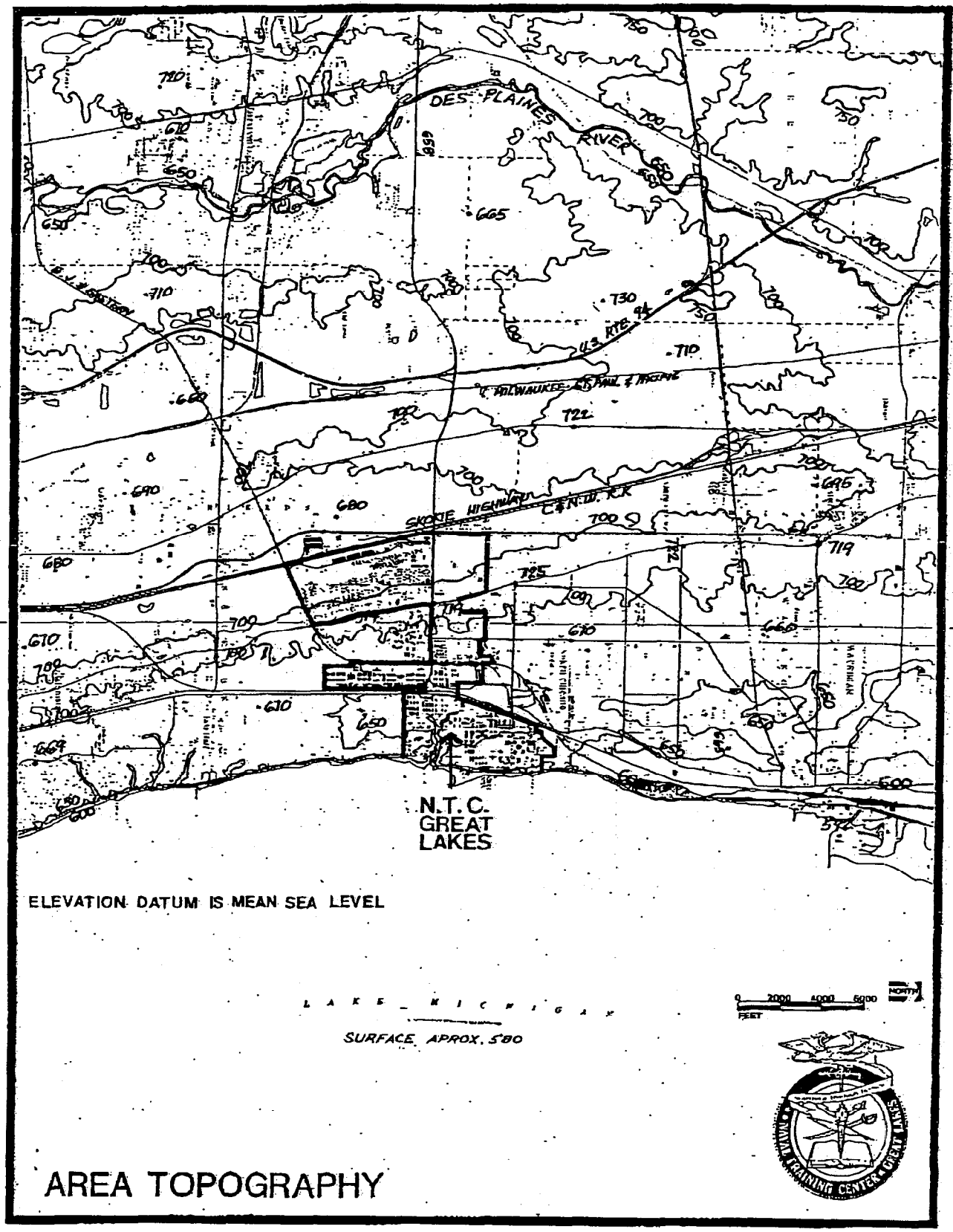
12. TOPOGRAPHY

The terrain of Lake County rises westward from the western shore of Lake Michigan. In southern Lake County the transition is abrupt, with bluffs twenty to seventy-five feet high. Farther north, the transition is more gentle through the sand dunes of the Illinois Beach State Park. Beyond these lake shore transition areas the County is relatively flat.

Historically, the surface of Lake Michigan has maintained an annual average level of 578 feet above sea level (USGS 1943 datum). During the past year the Lake level has been at record elevations in the range of 581 feet. Ground elevations within Lake County vary from 600 to 800 feet above sea level.

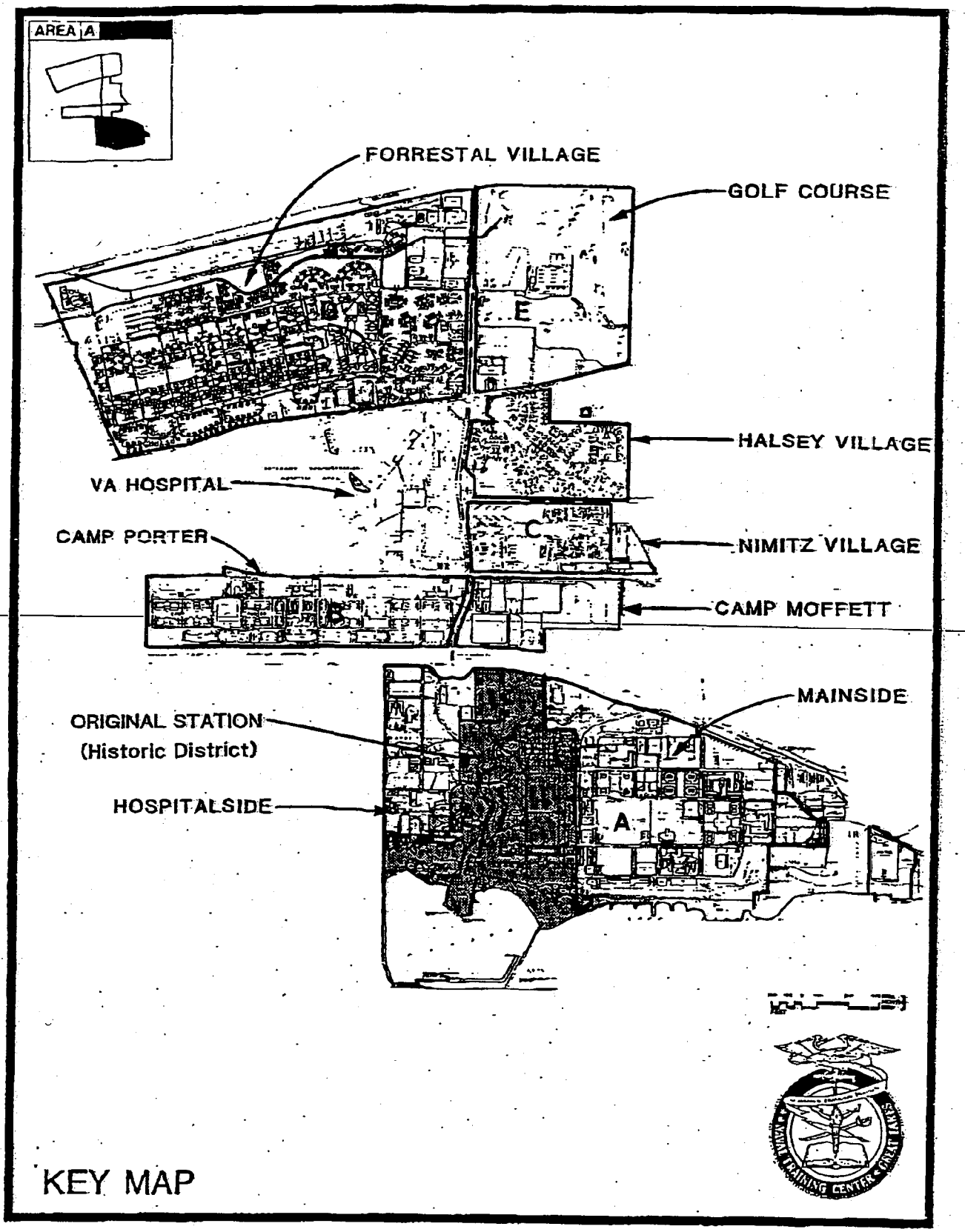
The major drainage divide between Lake Michigan and the multiple smaller riverine drainage areas of the Mississippi River Basin follows the ridge of Green Bay Road at an elevation of approximately 710 feet above sea level in the vicinity of the Training Center. Two rivers which flow southerly through the County are

PLATE V-8



AREA TOPOGRAPHY

PLATE V-10


AREA A
FORRESTAL VILLAGE
GOLF COURSE
HALSEY VILLAGE
VA HOSPITAL
CAMP PORTER
NIMITZ VILLAGE
CAMP MOFFETT
MAINSIDE
ORIGINAL STATION
(Historic District)
HOSPITALSIDE
A
B
C
D
E
KEY MAP

the Des Plaines River in the eastern part of the County, and the Fox River in the west. As the Fox River transverses the northwestern corner of the County it disperses into a number of small lakes which, as a group, are known as the Chain-O-Lakes.

13. GEOLOGY

Lake County is located in the Wheaton Morainal Complex of the Great Lakes section of the Central Lowland Province. This morainal area is divided into three sub-complexes: the Beach-Dune Complex; the Bluff-Ravine Complex; and the Upland-Moraine Complex. The Great Lakes Naval Training Center is a part of the Bluff-Ravine Complex, characterized by level table lands bordered by steep lake-facing bluffs and a network of interior ravines.

The surfacial geologic material in Lake County is glacial till laid down by the action of several glacial episodes during the last 600,000 years. The till is made up of varying proportions of silt, clay, sand, pebbles, and boulders in an unsorted sediment. The till ranges in thickness from 40 feet to over 200 feet. Surface expression of the till is morainic--low ridge sand hills interspersed with depressions and lakes (particularly west of the Des Plaines River). The sandy phase crops out along the lake shore at the foot of the bluffs along Lake Michigan.

Below the unconsolidated glacial deposits are layers of older dolomites, sand stones, and shale, the result of ancient sea deposits that periodically covered the Illinois area. Precambrian granite forms the lower most basement rock supporting all of the above. In general, the bedrock is horizontal, sloping gently eastward.

There are no known mineral resources being mined in Lake County, or in the Northeastern Illinois Region. However, in some areas "mining" of clay for brick making, and limestone quarries for construction material have, in the past, been economically feasible. These operations, where still active, are of minor economic consequence in Lake County.

14. HYDROLOGY[12]

Northeastern Illinois is often considered a water rich area when compared to other regions of the country. There are two major sources of water for the region: ground water and Lake Michigan water.

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[12]Schicht, Richard J., J. Rodger Adams, and James B. Stall. *Water Resources Availability, Quality, and Cost in Northeastern Illinois.*

Ground water has been the traditional source of potable water for non-lake front communities. There are four basic aquifers in the Lake County ground water system:

- Glacial Drift Aquifers;
- Gilurian Dolomite formation;
- Cambrian-ordovician Aquifer composed of the Glenwood-St. Peter Sandstone formation and the Ironton-Galesville Sandstone formation; and
- Mount Simon Sandstone.

The first two of these are known as the shallow aquifers at depths of 150 to 500 feet. The later sandstone aquifers are known as the deep aquifer system at depths of 900 to 1,900 feet below the surface. The shallow aquifer systems recharge by percolation of rainfall in northern Illinois and southern Wisconsin. The deep aquifers are recharged from areas in central Wisconsin.

Lake Michigan is a major potable water source for the Chicago metropolitan area. Because the water taken from the Lake is discharged to the Mississippi River Basin, the rate of diversion is governed by International Treaty with Canada and United States Supreme Court rulings. The current diversion limit is set at 3,200 cubic feet per second (approximately 2 billion gallons per day). Lake County users have been allocated 6.3 percent of this diversion by the State of Illinois.

Other surface waters within Lake County are not suitable for development as water use sources. With the possible exception of the Fox River, no river or stream within the County contains adequate flow rates to serve as a sole potable water source. Further, the poor water quality in local lakes, rivers, and streams precludes the economic utilization of these surface waters for potable use.

15. SOILS

The native soils of the area have been generally classified into the Morley-Beecher-Hennepin Association, a group of soil types which commonly occur together in a characteristic pattern in the landscape. These soils generally occur in upland areas, are gently sloping, and have moderate to poor drainage.

The sides of the ravines and bluff faces are where Hennepin and Grays soil types are often found. These soils may be subject to severe erosion on slopes of 30 to 60 percent.

Common limitations of these soils, regarding development potential, are poor percolation rates and excessive shrink-swell. The former requires sewered development and the latter limits flat slab roadway construction (frost penetration depth is 40 inches). In urban areas, these limitations are dealt with by constructing foundations with a minimum depth of 4 feet (to overcome shrink-swell) and by utilizing engineered fill as roadway and utility subgrades.

16. VEGETATION

During pre-settlement times, much of Lake County was forested with stands of oak, hickory, maple and other hardwood trees. Low-lying areas of peat supported Tamarack (or Larch) trees. By 1958 only 21,773 acres of native woodland remained. In 1980, only eight percent of the County's land was held as open space in State parks and County forest preserves.

In northern Lake County the Illinois Beach State Park is a preserve for the shore line plant-community normally associated with sand dunes. This state preserve encompasses over 2,500 acres.

Turf area plant life found throughout Lake County includes beachgrass (in foredune areas), Kentucky bluegrass, Canada bluegrass, creeping red fescue, sheep fescue, tall fescue and clover. Outside the turf areas hedges, tall reed grass and other herbaceous species grow. Shrubbery growth consists of blueberry, huckleberry, blackberry, willow, osier, sassafras, black oak, and maple.

The Endangered Species Act of 1973, and amendments, requires all Federal agencies to carry out programs for the conservation of endangered and threatened species, and to insure that actions taken by the agencies do not jeopardize the existence of such species. To date no endangered plant species native to the Great Lakes area are listed in the Federal Register.

17. WILDLIFE

Due to increased development pressures and pollution, the wildlife population native to eastern Lake County has been displaced, or has decreased significantly. Animals still common in the county include white-tailed deer, skunk, raccoon, mink, muskrat, gray and fox squirrels, red and gray fox, opossum, weasel, woodchuck, and cottontail rabbit. Game birds include ring-necked pheasant, dove, woodcock, and a small population of Hungarian

partridge. Waterfowl include Canadian geese, mallard ducks, wood ducks, coots and small populations of others.

Lake Michigan game fishing has greatly improved with the introduction of Coho and Chinook salmon, and the destruction of the predatory Lamprey eel. Notable game fish in the county consist of large mouth bass, bluegill, northern pike, white bass, croppies, and walleyed pike.

The Endangered Species Act of 1973, and amendments, requires all Federal agencies to carry out programs for the conservation of endangered and threatened species, and to insure that actions taken by the agencies do not jeopardize the existence of such species. To date no endangered animal species native to the Great Lakes area are listed in the Federal Register.

18. CLIMATE

The climate type is continental, with warm summers and cold winters. Prolonged warm spells and major droughts are infrequent, but long spells of dry weather may occur during the growing season. The region is characterized by frequent changes in temperature, humidity, cloudiness, and wind direction.

The main variation in the local climate pattern is caused by Lake Michigan. The slow temperature change of such a large body of water exerts a moderating influence on near-shore areas, but its effects, which rarely extend more than a few miles inland, are too infrequent to be considered a major climate factor.

Precipitation averages slightly less than 32 inches per year. Over half of this precipitation falls during the 155 day growing season from May through September. Thunderstorms are frequent from May to early July, and are occasionally accompanied by high winds and hail (or even tornados). Rainstorms average 35 per year, with the majority occurring during June. Average snowfall is 40 inches per year, most of which falls in the period from December to March.

The prevailing wind direction has a westerly component in all months except May, when the prevailing wind shifts to north-northeasterly.

Seasonal variations in climate conditions have a direct relationship on the bluff recession rate, a continuing problem in many lake shore areas. The most severe recession occurs during the late winter (February - March). During this period there are many freeze-thaw days, precipitation is higher, and there is a higher frequency of onshore wave attacks.

4.0 Physical Characteristics of the Site

4.1 Geology/physiography

The Fort Sheridan site is located in the Eastern Lake section of the Central Lowland physiographic province. The present land surface in the "North Shore" district is largely the result of Pleistocene continental glaciation that deposited a veneer of unconsolidated glacial drift on the bedrock surface until as recently as 10,000 years ago. The topography is formed by a variety of depositional and erosional features in the Highland Park Lake Border Moraine. The moraine is generally 50 to 100 feet thick, and is parallel to the lake shore.

Six deep ravines run perpendicular to the shoreline of Lake Michigan. In the past, these ravines were used as waste disposal sites. Wells Ravine is now a capped landfill. Branches of Janes, Bartlett and Hutchinson Ravines have also been used for landfill sites (to dispose of waste materials and to create additional usable land). Fort Sheridan's storm sewer system discharges into Lake Michigan either through direct pipeline to culverts or through these natural drainage pathways. The ravines extending to Lake Michigan is a consequence of the lake bluff having been cut by waves of Lake Michigan after the ridge of drift (Highland Park Moraine) was deposited. The shoreline has been subject to severe erosion caused by drainage of groundwater and wind and wave action from Lake Michigan. This problem has also been accelerated by a significant rise in the lake level during the last 15 years. Groins and revetments have been installed as erosion control, and riprap has been placed along several areas between the bottom of the bluffs and the beach.

Consolidated sedimentary rocks beneath the moraine range in age from Precambrian to Cretaceous, cropping out from oldest to youngest in generally concentric circular patterns away from two major arches to the west of the site. The bedrock in the site vicinity is Silurian. The configuration of the basement surface shows strongly downwarped characteristics of the structural basins.

The Nature Preserve/Janes Ravine area at the northern border of Fort Sheridan is of statewide significance due to it being the finest example of a ravine system along Lake Michigan remaining in Illinois. Several species of endangered or threatened plants live in Janes Ravine and along the bluff bordering Lake Michigan. The bluff that lies between Bartlett and Van Horne Ravine is also of statewide significance because it is the largest and best of its type remaining in Illinois. See Section 4.6 on page 4-5 for a listing of endangered/threatened species that inhabit the ravine system and other areas on Fort Sheridan.

4.2 Soils

The predominant soil in the Fort Sheridan site is generally found on the tops of morainic ridges. This soil was formed in thin silty deposits and the underlying calcareous glacial till of silty clayey structure.

The surface layer is 4 inches of very dark gray, silty sandy clay. The 25-inch thick subsoil consists of brown to dark-brown, firm, silty sandy clay and silty clay in the upper part and calcareous silty clay in the lower part. The underlying material is brown, mottled, compact, firm, calcareous, silty sandy clay. A typical profile of this soil is given in TABLE 4-1, below:

TABLE 4-1. Soil Profile

DEPTH (in)	SOIL DESCRIPTION	PERCENTAGE PASSING SIEVE NUMBER			LIQUID LIMIT	PLASTICITY INDEX
		#4	#40	#200		
0-9	silty sandy clay	95-100	90-100	75-95	25-40	5-15
9-28	silty clay	95-100	85-95	80-90	40-60	15-35
28-42	silty clay	95-100	85-95	80-90	30-60	15-35
42-60	silty sandy clay and silty clay	95-100	85-95	80-90	30-50	15-30

Table modified from Soil Survey of Lake County, IL.

Large areas of the site are considered 'made land'. These areas are composed of cuts and fills or areas that are covered almost entirely with roads and buildings. Some of the fills have been made with various materials, including some that are not soil material.

4.3 Hydrology

Fort Sheridan is situated along Lake Michigan with Highland Park to the south, Lake Forest to the north and Highwood to the west. Fort Sheridan and the surrounding communities lie within the 34,100 acre Lake Michigan Basin-North drainage area. Natural runoff from Fort Sheridan is aided by six ravines which run perpendicular to Lake Michigan. Surface runoff flows into the nearest ravine or an inlet to the base storm sewer system, which would then empty into Lake Michigan.

INTERVIEW RECORDS

FROM

SITE RECONNAISSANCE

Interview Record

Installation/Range or Sites: NTC Lakefront

Date/Time: March 21, 2003 at 11:00 AM

Persons Conducting the Interview/Title/Organization: Jim Snider and Rhonda Stone, Malcolm Pirnie

Person Being Interviewed/Title/Organization: Mr. David Biondi, Fire Chief, NAVSTA

Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.): Mr. Biondi is a Fire Chief who would have handled any responses to UXO discoveries or any incidents involving UXO's.

Interview Notes: Mr. Biondi could not recall any incidents involving UXO at the NTC Lakefront.

Interview Record

Installation/Range or Sites: NTC Lakefront

Date/Time: March 19, 2003 at 10:30 AM

Persons Conducting the Interview/Title/Organization: Milind Pradhan, Michael Garnes, Rhonda Stone and Jim Snider, Malcolm Pirnie

Person Being Interviewed/Title/Organization: Mr. Ken Endress, Public Works Department – Real Property

Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.): Mr. Endress was familiar with the historical background of the site.

Interview Notes: Mr. Endress provided information as to the location of the gun mount roundels and the former location of buildings within NTC Lakefront. Aerial photography was provided of the NTC Great Lakes to show time progression.

Interview Record

Installation/Range or Sites: NTC Lakefront

Date/Time: March 17, 2003 at 9:00 AM

Persons Conducting the Interview/Title/Organization: Milind Pradhan, Michael Garnes, Rhonda Stone and Jim Snider, Malcolm Pirnie

Person Being Interviewed/Title/Organization: Mr. Dan Fleming, Installation Restoration Program Manager/ POC

Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.): Mr. Fleming is a primary contact at the Environmental Office.

Interview Notes: Mr. Fleming is the POC and Environmental Protection Specialist for NTC Great Lakes. Mr. Fleming provided a large number of documents to aid in research efforts made by the Malcolm Pirnie field team.

Interview Record

Installation/Range or Sites: NTC Lakefront

Date/Time: March 17, 2003 at 9:00 AM

Persons Conducting the Interview/Title/Organization: Milind Pradhan, Michael Garnes, Rhonda Stone and Jim Snider, Malcolm Pirnie

Person Being Interviewed/Title/Organization: Mr. Carlos Luciano, POC at the site.

Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.): Mr. Luciano is the longest employed and most experienced person in the Environmental Department as well as being very knowledgeable of the history of the site.

Interview Notes: Mr. Luciano is a POC and an Environmental Engineer for NTC Great Lakes. Mr. Luciano provided a large number of documents to aid in research efforts made by the Malcolm Pirnie field team.

Interview Record

Installation/Range or Sites: NTC Lakefront

Date/Time: March 19, 2003 at 2:00 PM

Persons Conducting the Interview/Title/Organization: Milind Pradhan, Michael Garnes, Rhonda Stone and Jim Snider, Malcolm Pirnie

Person Being Interviewed/Title/Organization: Mr. Joseph McCloud, Safety Officer

Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.): Mr. McCloud serves as the Safety Officer of the NTC Lakefront.

Interview Notes: Mr. McCloud could not recall any incidents involving UXO at the NTC Lakefront.

Interview Record

Installation/Range or Sites: NTC Lakefront

Date/Time: March 18, 2003 at 9:00 AM

Persons Conducting the Interview/Title/Organization: Michael Garnes and Rhonda Stone, Malcolm Pirnie

Person Being Interviewed/Title/Organization: Mr. Jim Trimble, Security Officer

Reason for Selecting Person to Interview (i.e., Years at Installation, Position, Previous History, etc.): Mr. Trimble serves as the Security Officer of the NTC Lakefront.

Interview Notes: Mr. Trimble was very informative, providing information about the skeet range near Foss Park and the history of the present operational FBI Training Facility. Mr. Trimble provided historical backgrounds of the naval station as well as history on the ranges there as well. Mr. Trimble could not recall any UXO incidents at the NTC Lakefront.

Appendix C: Project Source Data – Site Specific

In Reply Please
Refer To: NM3/A2-11/EN6/QT
(15912)

U. S. NAVAL TRAINING STATION
GREAT LAKES, ILLINOIS

63/rt

April 5, 1940

From: Commanding Officer.
To: The Chief of the Bureau of Ordnance.

Subject: Change of Ordnance Allowance - Request for.

References: (a) BuOrd Circular Letter No. A-255 of 5 December 1938 .
(b) BuOrd Circular Letter No. A-275 of 5 February 1940.

1. It is requested that the Ordnance Allowance of this station be changed to include the following:

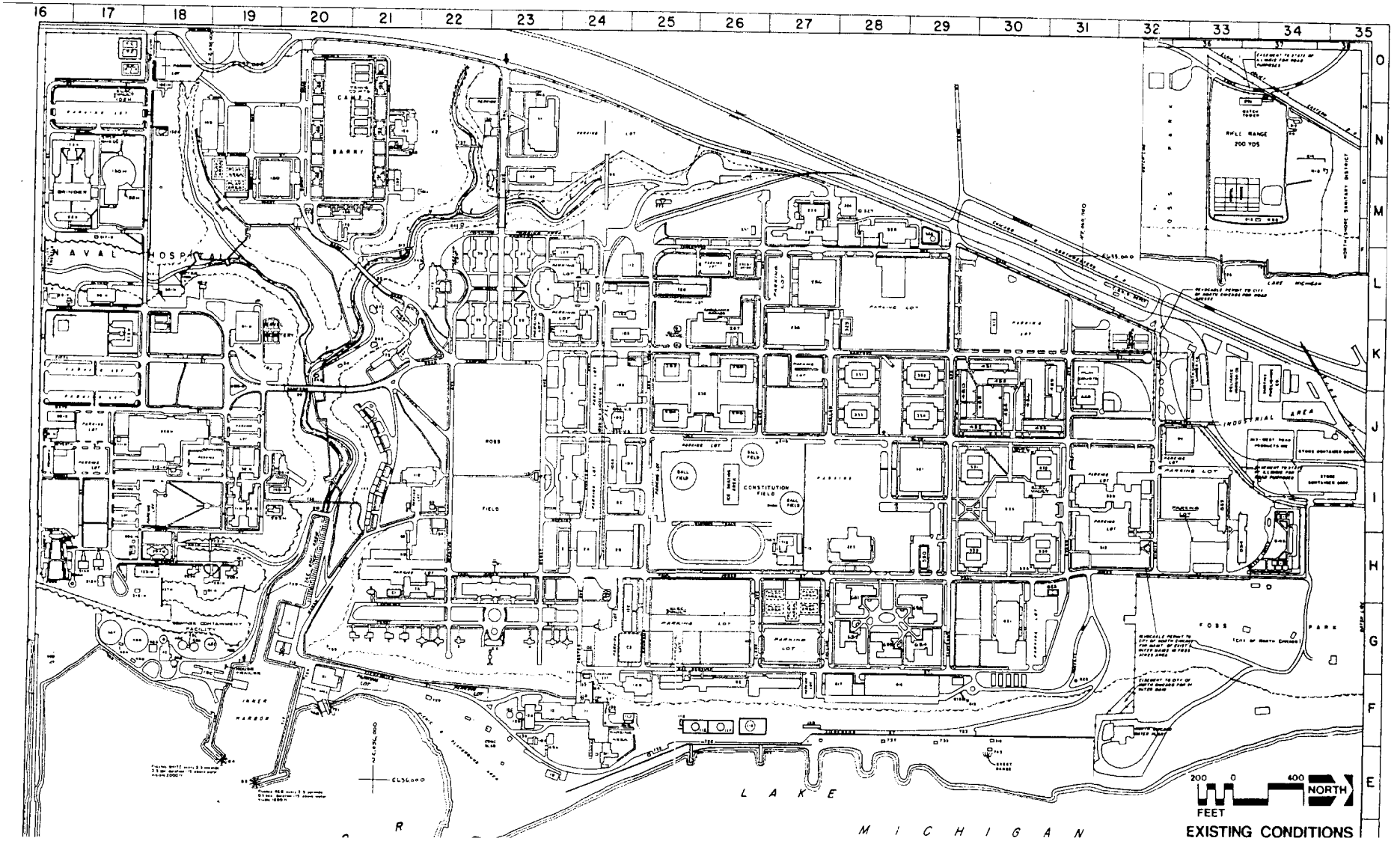
	NUMBER
Shot guns, 12 gauge, with slide repeating action and modified choke, 26" or 28" barrel	4
Shells, shot gun, 12 gauge, No. 7½ shot	5400
Targets, clay pigeon	5460

2. The foregoing change of allowance is requested for instruction purposes, target training for officers attached to the Naval Training Station, Great Lakes.

3. There is a trap shooting range, with trap, installed at this station. There are fifty-four officers attached to the training station.

C. P. Cecil

C. P. CECIL,
By direction.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BARRY
ROSS FIELD
CONSTITUTION FIELD
BALL FIELD
PARKING LOT
INDUSTRIAL AREA
RIFLE RANGE 200 YDS
FOSS PARK
INNER HARBOR
LAKE MICHIGAN
200 0 400
FEET
NORTH
EXISTING CONDITIONS

January 1, 1945

[illegible]

[illegible] TRAINING CENTER

[illegible]

[illegible]

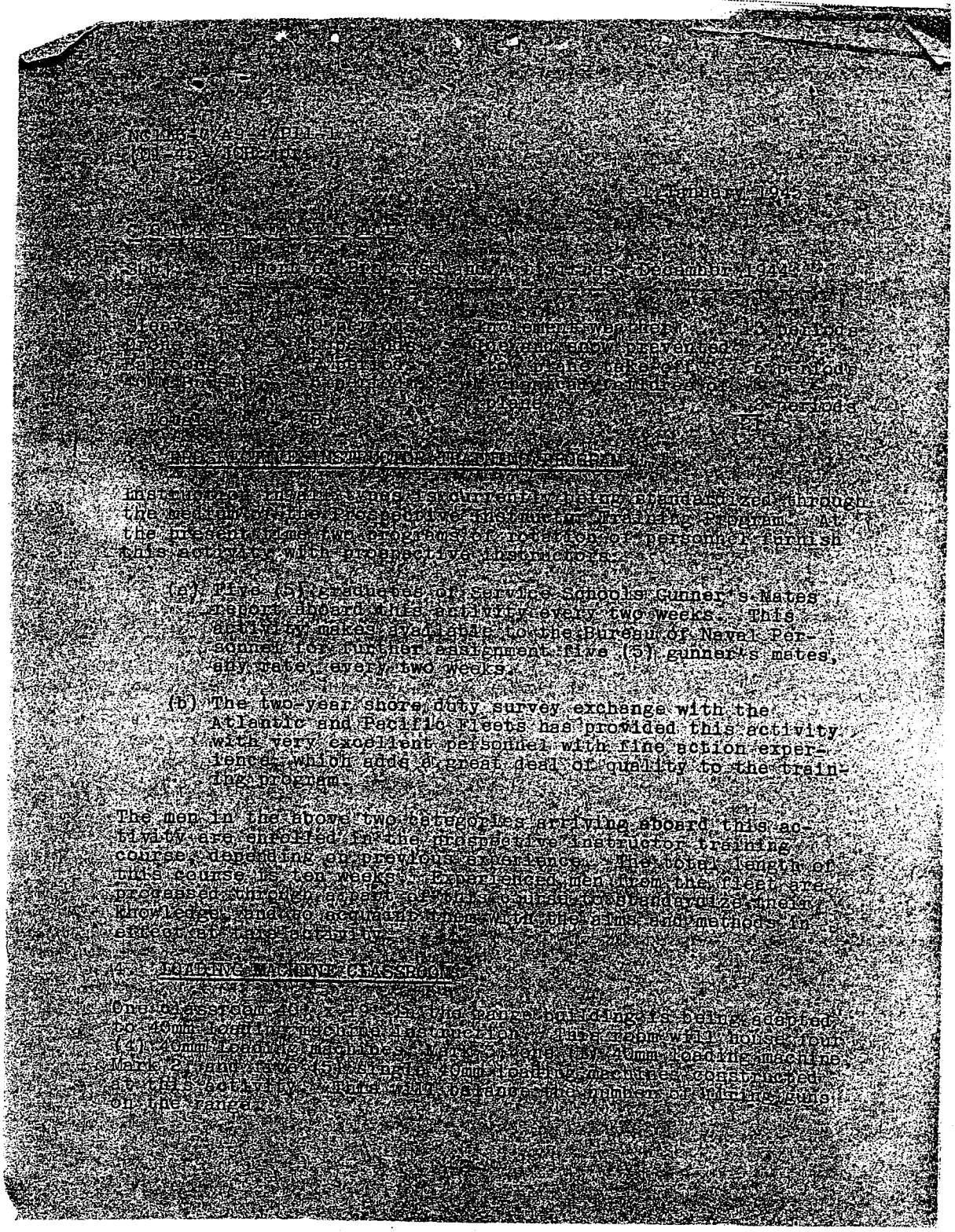
The number of [illegible] during the period [illegible] is presented [illegible]:

GUN	OFFICERS	MEN
20MM	126	11138
40MM	126	12148
[illegible] CALIBER	10	[illegible]
.30 CALIBER	12	6
MARK 14 SIGHT	126	13138
MARK 51 DIRECTOR	27	69
SMALL ARMS	45	10
	472	36509
		472
Total instructed in all types		36981
Total number of different officers and men instructed during December 1944		13392
Total instructed in all types since commissioning		326217

2. FIRING PERIODS

Gunnery [illegible] were conducted [illegible] during the period [illegible].

FIRING PERIODS	SCHEDULED	COMPLETED	CANCELLED
Morning	[illegible]	[illegible]	[illegible]
Afternoon	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]



C O N F I D E N T I A L

AMMUNITION RECEIVED AND EXPENDED DURING THE MONTH OF DECEMBER 1944

	ON HAND 1 DEC.	RECEIVED	EXPENDED	ON HAND 31 DEC.
.30 Carbine	4,850	6,400	2,000	9,250
.30 Caliber	287,510		570	286,930
.45 Caliber	13,050	14,400	7,600	19,850
.50 Caliber	56,870	13,300		70,170
20mm	438,640	338,901	627,241	150,300
40mm	6,960	59,040	49,824	16,176
1"1	18,346			18,346

210845 40025

C O N F I D E N T I A L

MATERIAL RECEIVED DURING THE MONTH OF DECEMBER 1944

1 Dec - 15-20mm AA Guns, Mark 4 complete with spare parts and tools.

1 Dec - 10-20mm AA Gun Cyclic Rate Control, Mark 2 Mod 1
Wagenor Co.
Fort Wayne, Ind.

23 Dec - 2-40mm Loading Machines, Serial No.2199 and 2200
Craft Steel Prod.
Jamestown, N.Y.

29 Dec - 2-40mm Mk AA Guns and Mounts, Gun No.34026 and 34142.
Mount No. 8844 and 8845

APPENDIX IV-I

A2E REPORT FOR DECEMBER 1944

C O N F I D E N T I A L

1. During the period covered by this report, 26 November 1944 through 27 December 1944, there were 597,141 rounds of 20mm and 46,792 rounds of 40mm ammunition fired.

2. The 20mm ammunition fired and major failures were:

(a) HE - 57,420 rounds, 2 misfires.
(b) HET - 407,521 rounds, 9 misfires, 2 hangfires.
(c) HEI - 132,200 rounds, 1 misfire.
(d) Total 592,141 rounds, 12 misfires - ratio of 1 misfire per each 38,605 rounds fired excluding ship-returns and 8 barrel prematures, ratio of 1 per each 74,400 rounds fired including ship-returns.

3. 133,881 HET rounds were ship-returns of which 180 were not useable being empty cases, misfires etc. About 3,000 rounds of ship-returns arrived pre-greased but apparently some had been wiped off.

4. The ruptured or constricted rounds reported apparently resulted from worn hammer plates. This is similar to trouble reported by AATC, Port Hueneme, California, and is under consideration by the Bureau. Apparently the correct nomenclature would be type #1 hangfire.

5. The blown primers in the NFH HET lots occurred with the old type face piece during the old type vs new type face piece test. The results of this test will be forwarded to the Bureau of Ordnance

6. The following is the barrel premature report for the period covered in this report:

(a) Nov. 27th Rifling eaten away 8" forward of breech end of barrel, not discovered until end of firing period. Barrel No. 711742, ESR-7,200 rds., Gun No. 101103, ESR-58,060 rds., Ammunition lots NFCh 26H and WC 199S. (This premature was also reported in last months report).

(b) Nov. 28th Slight bulge 17" forward of breech end of barrel. Barrel No. 198310, ESR 10,650 rds., Gun No. 49931 ESR 95,750 rds., Ammunition lots NFCh 270, 27E and 26H, WC 199S.

(c) Nov. 28th Barrel slightly bulged 2" forward of chamber - could not be removed from gun. Barrel No. 196029, ESR 3,500 rds., Gun No. 10136, ESR 8,400 rds., Ammunition lots NFCh 27D, WC 199S, TPC 946L, 2c-104-NFM-43.

C O N F I D E N T I A L

Barrel Prematures (Cont'd)

(d) Dec. 1. Barrel slightly bulged 4" forward of chamber. Barrel No. TB326, ESR 6,200, Gun No. 101011, ESR 59,070, Ammunition lots NFCh 27D and 26H, WC 199S and 199N.

(e) Dec. 3. Barrel slightly bulged 1" forward of chamber. Barrel No. 713002, ESR 3,150, Gun No. 46434, ESR 86,690, Ammunition lots WC 199S, NFCh 27D, 2B-696-NFH-44.

(f) Dec. 4. Barrel slightly bulged just forward of chamber. Barrel No. 714026, ESR 2,650, Gun No. 101483, ESR 45,750, Ammunition lots mixed from ship-returns.

(g) Dec.15 Barrel slightly bulged just forward of chamber. Barrel No. 714857, ESR 2,650, Gun No. 49431, ESR 102,850, Ammunition lots 2C-399 and 401-WC-44, ZB-695-NFH-44.

(h) Dec.19 Barrel slightly bulged just forward of chamber. Barrel No. 710541, ESR 3,800, Gun No. 101226, ESR 46,650, Ammunition lots, mixed ship-returns.

7. Of the 40mm rounds fired there were 39,288 rounds HET SD with 15 misfires, 14 of which occurred with 4,868 rounds of lot UB-1109-TEI-44. The rest of this lot will be returned as unsafe to fire. All HET SD rounds fired were steel case. There were 9,504 rounds of HEP rounds (22 samples of 432 rounds each). In only one lot were there malfunctions, 2 misfires.

8. The following abbreviations have been used in this report:

MF	Misfires
SR	Short Recoil: Type (a) round tried to rechamber Type (b) round caught between face piece and breech casing. Type (c) Gun failed to cock after last round.
SC	Split case
PP	Pierced primer
BP	Blown Primer not causing a jam
BPj	Blown Primer causing a jam

C O N F I D E N T I A L

9. 20mmm HE

Lot	Rds Fired	Miscellaneous	MT	SR a	SR b	SR c	SC	PP	PB	BP
WC 199N	48,240	1 faulty crimp (tore case at crimp).	1	1	16	15				
WC 199S	9,180		1	1	18	5				
Total	57,420		2							

10. 40mm HET

NFCh 27D	22,500	1 faulty crimp	2	2	23	1	4			
NFB 54F	2,520	N O N E								
ZB-627-NFC-44	720				1					
ZB-651-NFC-44	720				1					
ZB-655-NFC-44	720				1					
ZB-658-NFC-44	720				1					
ZB-684-NFC-44	720			1	2					
ZB-695-NFC-44	720				1					
ZB-696-NFC-44	720				2					
ZB-703-NFC-44	720				3					
ZB-704-NFC-44	720				1					
ZB-712-NFC-44	720				1					
ZB-716-NFC-44	720				2					
ZB-695-NFH-44	41,220	86 Ruptured or constricted cases	3	41	2	24				
ZB-696-NFH	37,620		4	42	2	43	7			
ZB-704-NFH	39,420	1 hangfire (10 sec.) 53 ruptured or constricted cases.	8	50	9	33	5			
ZB-734-NFH	8,680			1		1				
NFH-1362	3,960			21				4	1	
1363	5,760	32 ruptured or constricted cases.		21				25		
1366	1,620		1	5		1				
1407	15,300		2	60				12		
1481	10,800		1	3	88		1	5		
1673	32,940	1 no flash hole, 75 ruptured or constricted cases.	4	2	114		2	9		
1675	180			1	2					
Mixed Ship-Returns	133,881	1 hangfire								
Mixed new production	43,200	No malfunctions								
Total	407,521		11							

C O N F I D E N T I A L

10. Con't.

The mixed new production consisted of 720 rounds of each of the following 2B (as listed) NFC-44 lots:

628	657	670	682	699
629	659	671	683	700
630	660	672	687	701
631	661	673	688	702
643	662	674	689	705
648	663	675	690	706
649	664	676	691	707
650	665	677	692	708
652	666	678	693	711
653	667	679	694	713
654	668	680	697	714
656	669	681	698	715

11. 20mm HEI rounds

Lot	Rds Fired	Miscellaneous	MF	SR a	SR b	SR c	SC	PP	BP
MFB-43-I	15,120		1		5	2			1
2C-54-NFH-43	21,720			1	2			1	2
2C-346-WC-44	1,800				1				
356	180				1				
361	1,800				1				
363	1,980				1	1			
381	540				1				
383	1,800				1				
386	1,800				2				
387	1,620				1				
403	1,800				2				
406	1,800				1				
416	1,800				1				
417	1,800				1				
421	1,800				2				
423	1,800				1	1			
Mixed new production	73,040	No malfunctions							
Total	132,200		1						

C O N F I D E N T I A L

The mixed new production consisted of the following ZC-(as listed)-ZC-44 lots:

Lot	Rounds	Lot	Rounds	Lot	Rounds	Lot	Rounds
343	1,800	360	1,800	378	720	400	1,800
345	1,800	362	1,800	382	1,800	401	1,800
347	1,800	364	1,800	384	1,980	402	1,800
348	720	365	1,080	385	720	404	1,800
351	1,800	366	540	388	1,800	405	1,800
352	1,080	367	900	389	1,800	407	1,800
353	720	368	1,800	390	1,800	408	1,800
354	1,800	371	720	391	1,460	410	1,800
355	1,800	373	720	393	1,080	411	1,800
357	1,800	374	540	396	900	412	1,800
358	1,800	376	900	397	900	418	1,800
359	1,800	377	1,080	377	1,020	420	1,800
						422	1,800

12. 40mm HET-SD

Lot	Rds Fired	Malfunctions
UB-980-TEI-44	11,808	None
UB-1042-TEI-44	2,304	None
UB-1088-TEI-44	8,500	None
UB-1093-TEI-44	11,808	Several short tracers, 1 MF fired 2nd attempt.
UB-11-9-TEI-44	4,868	14 MF's of which 5 fired 2nd attempt.
Total	39,288	15 MF's of which 6 fired 2nd attempt.

13. 40mm HEP

UA-10-McA-44	432	2 misfired, 1 of which fired 2nd attempt
Other McA lots	432	No malfunctions (432 rds. fired per lot)
Total	9,504	

The other McA lots were:

UA-2-McA-44	UA-18-McA-44	UA-32-McA-44
UA-4-McA-44	UA-20-McA-44	UA-34-McA-44
UA-6-McA-44	UA-22-McA-44	UA-36-McA-44
UA-8-McA-44	UA-24-McA-44	UA-38-McA-44
UA-12-McA-44	UA-26-McA-44	UA-40-McA-44
UA-14-McA-44	UA-28-McA-44	UA-42-McA-44
UA-16-McA-44	UA-30-McA-44	UA-44-McA-44

MONTHLY OPERATIONAL AND STATUS REPORT
TDD TARGET AIRPLANES

CONFIDENTIAL (OPERATIONAL)

Flight No.	Date	Nature of Flight	Hours Flown	Firing Activity	No. and Type Runs	Disposition of Target
I	12-1-44	Firing practice	.3	Hit	2 runs * Crossing diving	no damage
II	12-4-44	"	.8	"	13 runs Crossing diving	Hit - can not be repaired
III	12-5-44	"	.3	"	2 runs Crossing diving	No recovery Bad zero weather Poor visibility
IV	12-8-44	"	.6	"	12 runs Crossing diving	Hit - plane recovered badly damaged. Used for salvage
V	12-8-44	"	.5	"	5 runs Crossing diving	Hit - popped recovered with minor damage
VI	12-15-44	"	.3	"	3 runs Crossing diving	Zero weather and poor visibility prevented recovery
VII	12-15-44	"	0	"	No runs	Plane was wing heavy
VIII	12-15-44	"	.2	"	2 runs Crossing diving	Hit-recovered used for salvage
Total	8		3			4 Expended 2 Damaged but repairable

* All slightly diving and crossing runs.

1. No. of targets on hand 36
2. No. of targets ready 31
3. No. of targets expended last month . . . 4

SPARE PARTS TABULATION

Complete spare engines	3
Spare props	45
Spare coils	14
Spare back plates	4
Spare crank case	1
Spare cylinders	3
Spare gas tanks	3
Spare solinoid	2

January 26, 1945

RECRUIT TRAINING COMMAND
U. S. NAVAL TRAINING CENTER
GREAT LAKES, ILLINOIS

NM3-2/9N3/HIM
N12-2/ejh

26 January 1945.

From: Lt.(jg) H. I. Melcer, D-L, USNR.
To: District Supply Officer.
Via: Commanding Officer.
Subj: Statement in connection with Headquarters, Ninth Naval District Survey No. 381-45 dated 10 January 1945 - Request for.

1. Spanish Revolver .38 calibre #21867 was issued by this department previous to my relieving the former Rifle Range Officer, and while I was assigned to another rifle range.

2. Lt. J. T. Kelley, former Rifle Range Officer, received orders which required his immediate departure, and in the time alloted, it was impossible to conduct an actual physical inventory of all the Ordnance equipment which had been placed in his custody, and over which I had to assume responsibility.

3. During the time in which I was relieving Lt. Kelley, an officers' pistol class was in progress. At the conclusion of the Pistol Class, the Spanish Revolvers that had been issued for dry-firing practice were recalled and it was then discovered that one of the revolvers had been issued to an officer in the Pistol Class and no record had been made at this office.

4. Every effort has been made to locate the pistol, but a great percentage of the class have already received their orders and have since been detached.

H. I. MELCER

RG 74, BuOrd
Constr. + Proc. 1945
Box 1284, NM 3

C O N F I D E N T I A L

AMMUNITION RECEIVED AND EXPENDED DURING THE MONTH OF JANUARY 1945

	ON HAND 1 JAN.	RECEIVED	EXPENDED	ON HAND 31 JAN.
.30 Carbine	9,250		650	8,600
.30 Caliber	286,930		200	286,730
.45 Caliber	19,850		5,300	14,550
.50 Caliber	70,170			70,170
20mm	150,300	842,400	561,560	431,140
40mm	16,176	57,728	**46,320	27,584
1.1"	18,346			18,346

** Figure includes 6,244 rounds of 40mm ammunition returned to N.A.D. Crane as unfit for firing at this activity.

APPENDIX III-I

C O N F I D E N T I A L

MATERIAL RECEIVED DURING THE MONTH OF JANUARY 1945

8 Jan 5-20mm AA Guns, Mark 4.
5-20mm Mounts (2 Mark 6, 1 Mark 10, 2 Mark 4)
Service School, Grt. Lks., Ill.

8 Jan 4-20mm Sights (Mark 4 Mod 1)
1-20mm Sight (Mark 5)
Service School, Grt. Lks., Ill.

12 Jan 10-20mm AA Guns, Mark 4 complete with spare parts, tools and magazines.
Naval Ammunition Depot, Crane, Indiana.

26 Jan 25-M1 Helmets, complete with liners, head bands and neck straps.
45-Mk2, Talker-Type, Helmets.
Naval Supply Depot, Norfolk, Va.

MONTHLY OPERATIONAL AND STATUS REPORT
TDD TARGET AIRPLANES
(OPERATIONAL)

CONFIDENTIAL

Flight No.	Date	Nature of Flight	Hours Flown	Firing Activity	No. and Type Runs	Disposition of Target
I	1-16-45	Firing Practice	.30	AATC Grv.Lks. Ill.	*2 runs	Plane slightly damaged in water landing. Parachute Lost.
II	1-16-45	"	.24	"	*16 runs	Plane badly damaged due to water landing in ice. Parachute Lost.
Total 2			1.1			2 Damaged but repairable

* All slightly diving and crossing runs.

1. No. of targets on hand 37
2. No. of targets ready 34
3. No. of targets expended during past month. . . 0
4. Tabulation of all spare parts peculiar to the TDD target, catapult, and transmitting equipment expended during past month:

Parachutes	2	Wings	2
Props	1	Coils	2
Servos	1		
Engines	1		

July 11, 1945

NC113-7
Re a
LS

NC113-7/S78-1
Serial: 032

ANTI-AIRCRAFT TRAINING CENTER
GREAT LAKES, ILLINOIS

AFS/vfb

C-O-N-F-I-D-E-N-T-I-A-L

FILED

11 July 1945.

From: Commanding Officer.
To: Chief of the Bureau of Ordnance (Re2a).

Subj: Ammunition, 40mm with Special Night Tracers - Report on.

Ref: (a) BuOrd Conf. ltr. S78(40mm)(Re2a) dated 2 May 1945.

1. In compliance with reference (a), the subject ammunition has been fired. It is believed that the information requested in paragraph 4(c) of reference (a), as reported in this letter, may be of questionable value due to the moon, which was about half-full, and to the proximity of this activity to the Naval Training Center, Great Lakes, Ill. Said Center was brilliantly lighted during the testing, with the result that aerial observation of any less illumination of the firing line caused by the 40mm bursts may have been inaccurate.

2. The results of observations requested by reference (a) are as follows:

(a) Performance of ammunition as described in paragraph 2 of reference (a).

(1) Dark Tracers (UK) lots - The average time to self-destruction was approximately 9.5 seconds with an average maximum deviation of plus or minus 0.3 seconds and a maximum deviation of plus 1.5 seconds and minus 0.9 seconds. Tracer ignition was approximately 100 per cent. Self-destruction was approximately 96 per cent.

(2) Dark Ignition Tracers (UM) lots - The average time of self-destruction was approximately 11.6 seconds. The average deviation was plus or minus 0.3 seconds and the maximum deviation was plus or minus 0.8 seconds. The tracer ignition and self-destruction was approximately 100 per cent.

RECORDED Book 2072

(b) Extent of illumination when firing from all guns on the firing line.

(1) Observers were stationed 500 yds. on either flank behind the firing line and in the fire control tower. Fifteen (15) barrels were firing, averaging from new to badly worn. Muzzle flashes were of low intensity

071745 1186

071745 1186

RG 74, BuOrd
Constr. + Proc., 1945
Box 1256, NC 113-7

NC113-7/S78-1
Serial: 032

ANTI-AIRCRAFT TRAINING CENTER
GREAT LAKES, ILLINOIS

AFS/vfb

C-O-N-F-I-D-E-N-T-I-A-L

11 July 1945.

Subj: Ammunition, 40mm with Special Night Tracers - Report on.

- -

and appeared to be about the same for both types of ammunition. Tracer illumination was negligible for both types of ammunition.

(c) Effectiveness of concealment of mounts from aerial observers during firing.

(1) Two (2) officer observers were stationed in the tail of a B-26 tow plane and one (1) in an SNV. Observations were made on firing runs conducted on the lighted sleeve towed at 2,000 ft. from elevations of 3,000, 4,000, 6,000 and 7,500 ft. At no time were the range or firing guns revealed to the observers due to the flash of the 40mm self-destruction bursts. The muzzle flashes could be picked out at various altitudes up to 7,500 ft. and appeared as very small pin-points of light. These conditions were identical for both types of ammunition.

(2) The tracers of the UM ammunition were clearly discernable after ignition at about 500 yds. and could be clearly traced to the target. In the opinion of the aerial observers these tracers could easily have been followed down to their origin, thereby compromising the safety of the firing ship by revealing its position.

(d) Comparison of ease of tracking by director operators and accuracy of fire.

(1) Dark Tracers - No difficulty was experienced by director operators in tracking the illuminated target or by range setters throughout the firing run.

(2) Dark Ignition Tracers - All director operators were agreed in their opinions that UM ammunition was unsatisfactory for tracking the target. The target was soon lost after opening fire due to the brilliant illumination at the sleeve. The range setters were unable to distinguish between the tracers from their own guns and those fired from adjacent guns.

NC113-7/S78-1
Serial: 032

ANTI-AIRCRAFT TRAINING CENTER
GREAT LAKES, ILLINOIS

AFS/vfb

C-O-N-F-I-D-E-N-T-I-A-L

11 July 1945.

Subj: Ammunition, 40mm with Special Night Tracers - Report on.

- -

(e) Acceptability to the service of HE-I-T (D1)-SD ammunition.

(1) This ammunition was not found to be acceptable for service use for the following reason:

(a) Director operators and range setters could not track the target or set ranges properly.

3. It is recommended that:

(a) UK ammunition be used for night firing with director-operated guns.

(b) That action be taken to eliminate the large number of self-destroying failures in UK ammunition.

(c) That the tracer of UK ammunition be given a longer burning time, thereby increasing the effective range.

(d) That a flashless propellant be adopted.

John C. Hickman

JOHN C. HICKMAN.

cc: CominCh (Readiness)
ComServLant
ComServPac
COTCLant
COTCPac
CO, NAD, St. Julien's Creek, Va.
CO, NAD, Hingham, Mass.
CO, NAD, New Orleans, La.
CO, NAD, Crane, Ind.
CO, NAD, Puget Sound, Bremerton, Wash.
CO, NAD, Mare Island, Cal.
CO, NAD, Fall Brook, Cal.
NIO, Charlotte, N.C.

071745 1186

Appendix D: Ordnance Technical Data Sheets

Small Arms Range
Fact Sheets

1. **Reference(s)**

(a) **NAVAER 00-100-504** USN Aeronautical Shore Facilities Programming Guide
(b) **OPNAVINST 3591.1C CH-1** Small Arms Training and Qualifications
(c) **MCO 3570.1B** Range Safety
(d) **ITRC 1/2003** Characterization and Remediation of Soils at Closed Small Arms Firing Ranges
(e) **MSDS** Remington Arms Co. Inc.

2. **Range** –
A geo-physically defined parcel of space (i.e. land, water, air) that is delineated by specific geographic coordinates, i.e. 12 acres located at 000.00'00" by 000.00' 00" etc.

3. **Surface Danger Zone – SDZ** *(may or may not encompass entire range)*
The ground and airspace designated within the training complex (to include associated safety areas) for vertical and lateral containment of fragments, debris, and components resulting from the firing, launching, or detonation of weapon systems to include ammunition, explosives, and demolition explosives.

4. **Small Arms Range.** *(as stated in NAVAER 00-100-504 dtd. 3/1958)*

A small arms range is an area either indoor (for the purpose of this fact sheet only outdoor ranges will be addressed) or outdoor for practice firing of small arms, particularly the .38 or .45 caliber pistol and the .22 or .30 caliber rifles.

The use of year round range facilities is required to provide effective defense and security of Navy and Marine Corps stations, to meet and maintain proficiency requirements in marksmanship.

3. **Munitions Constituents – MC**

The following guidance is to be used when listing MC at small arms ranges. Lead is the primary MC of concern on small arms ranges as lead accounts for more than 85% of the weight of a projectile. PAHs are also primary MC of concern where clay targets were used. While lead is the MC most likely to be found in the environment and is of greatest environmental concern, we want to acknowledge that there are other MC associated with lead shot, shotgun shells, bullets, and/or the gunpowder used to propel the shells and bullets or gunpowder residue. Therefore, unless there is strong evidence to the contrary, please use the following

lists of MC for small arms ranges. For a range where it is known that only shotgun (skeet and/or trap range) were used the first list of MC can be presented. For small arms ranges (.50 caliber and under) please use the second MC list. If evidence suggests that clay targets and shotguns were used at a small arms range where .50 caliber and under were also used, make the list all-inclusive (i.e., add PAHs and nickel to the second list).

Range Type	List of MC
Skeet and/or Trap – Shotgun only	**Primary MC of concern includes lead and polycyclic aromatic hydrocarbons (PAHs).** Other associated MC less likely to be of concern may include: Antimony (increases hardness), arsenic (present in lead), nickel (coating on some shot), lead azide (MC associated with gunpowder).
Small arms (.50 caliber and under)	**Primary MC of concern is lead.** Other associated MC less likely to be of concern may include: Antimony (increases hardness), arsenic (present in lead), copper (bullet core alloy), tin (increases hardness), copper and zinc (jacket alloy metals), iron (tips of penetrator rounds), copper, zinc, strontium, and magnesium (present in tracer munitions), lead azide (MC associated with gunpowder).

References:

Interstate Technology Regulatory Council. January 2003. Technical/Regulatory Guidelines – Characterization and Remediation of Soils at Closed Small Arms Firing Ranges.

U.S. Environmental Protection Agency. March 2003. TRW Recommendations for Performing Human Health Risk Analysis on Small Arms Shooting Ranges. OSWER #9285.7-37. Office of Solid Waste and Emergency Response, Washington, DC.

Constituent	Comment
Lead	Primary constituent of a projectile
Lead Styphnate/Lead Azide	Primary constituent
Antimony	Increases hardness
Arsenic	Present in lead. A small amount is necessary in the production of small shot since it increases the surface tension of dropped lead, thereby improving lead shot roundness.
Copper bullet core alloy	Increases hardness
Tin	Increases hardness
Copper	Jacket alloy metal
Zinc	Jacket alloy metal
Iron	Iron tips on penetrator rounds
PAHs (Polycyclic Aromatic Hydrocarbons)	Concentration of PAHs in clay targets varies from one manufacturer to the next but may be as high as 1000mg/kg. Existing studies show that PAHs are bound within the limestone matrix of the target and are, therefore, not bioavailable.

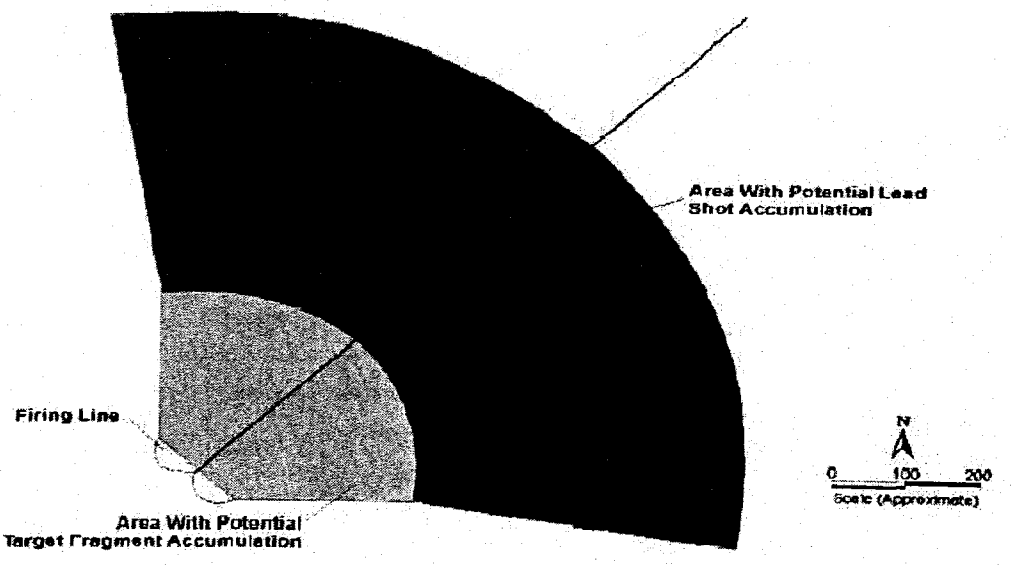
Contaminants Potentially Found at Small Arms Firing Ranges
(Information obtained from Tables 2-1 & 2-2 in NFESC, 1997)

4. Penetration Depths – PD (standard blurb)

The depth to which munitions penetrate below the ground surface depends on many factors, including the type of soil, the angle of impact, the size of the munition, the velocity at impact, and site-specific environmental conditions. Over the years, the DoD has studied and modeled munitions penetration depths and has issued various guidance and technical documents on the subject. For the purposes of the PA, maximum probable penetration depths are estimated following guidance listed in the latest draft (July 2002) of the DoD Directive on Explosives Safety issued by the DoD Explosives Safety Board. DoD Directive 6055.9 (DoD Ammunition and Explosives Safety Standards). The Directive refers to TM 5.855.1 and NAVFAC P-1080.

(a) Skeet & Trap Range – *(generic statement maybe modified as needed)*

However, the technical documents apply to air dropped and indirect fire weapons and do not apply to skeet/trap ranges. By design, skeet/trap ammunition is dispersed as pellets over a small area in the direction of fire. According to the Programming Guide from 1958, the minimum safe range from a skeet/trap range is 900 feet. Pellets dispersed from a shotgun would be deposited on the ground surface and not penetrate the ground unless disturbed.



Cross Section and Plan View of Shotgun Range Layout and General Shortfall Zone

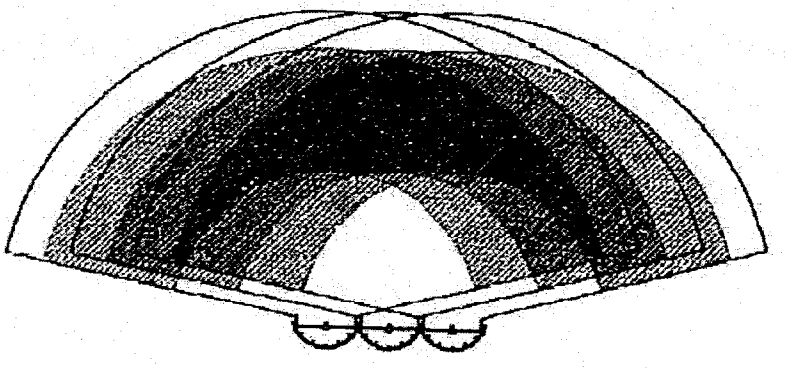
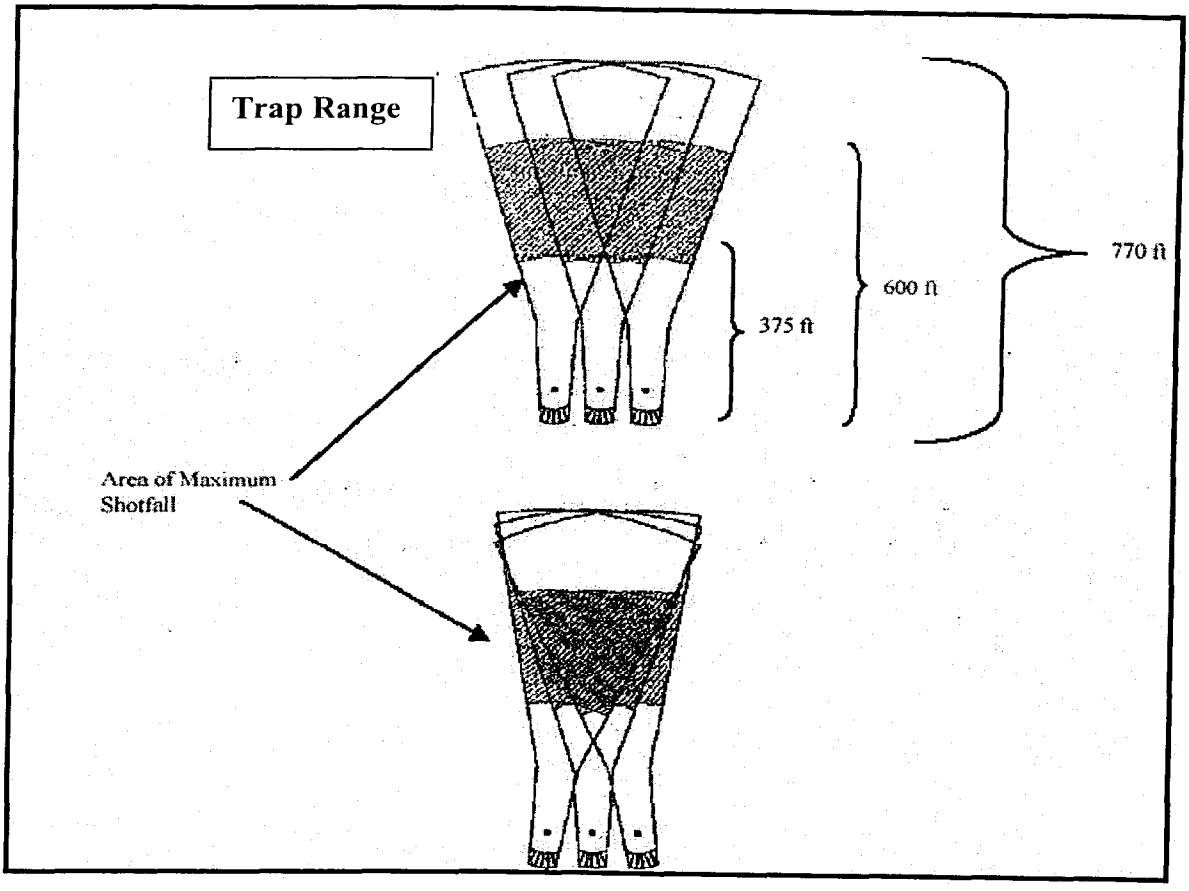
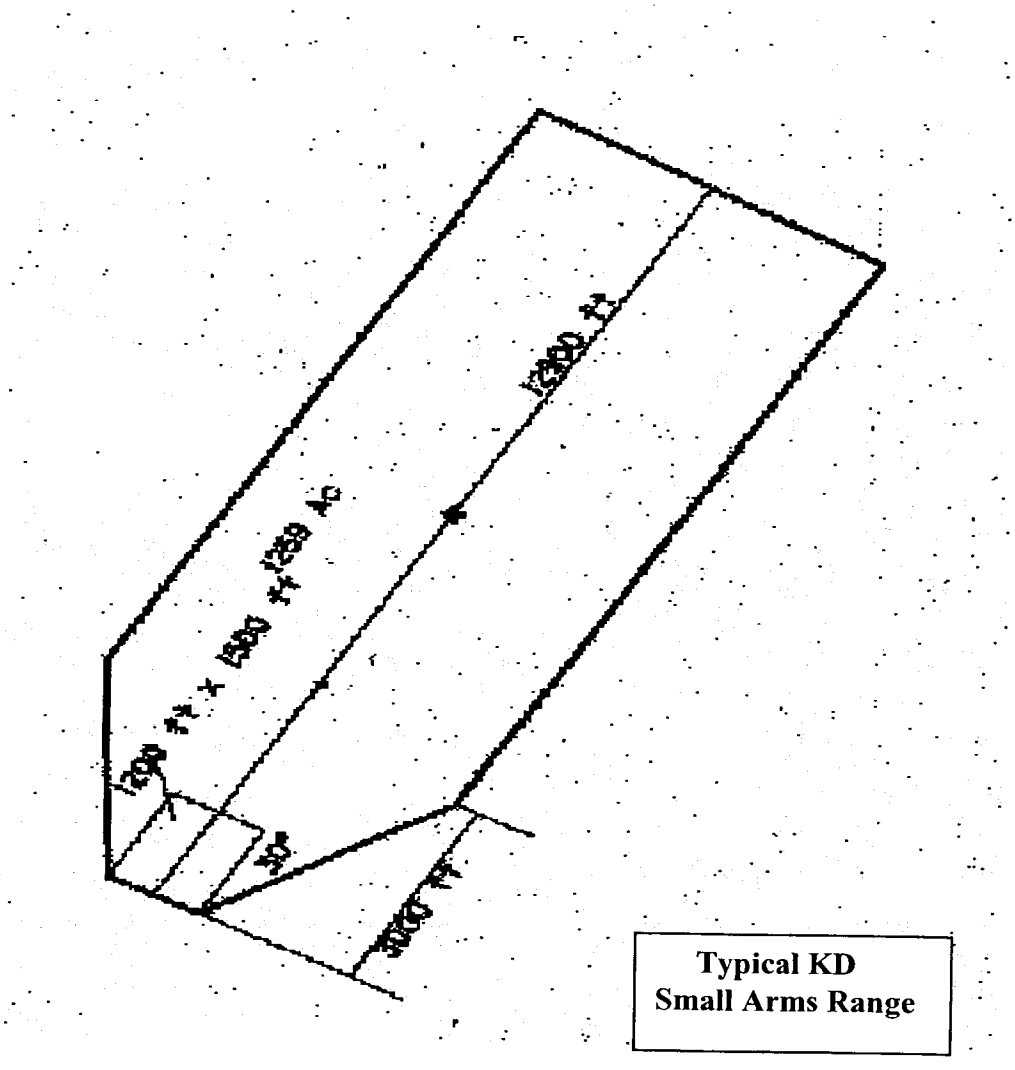


Figure 2-4. Schematic Drawing of Skeet Range Layout
(NSSF, 1997)



(b) **Small Arms Range** – *(generic statement maybe modified as needed)*

However, the technical documents apply to air dropped and indirect fire weapons and do not apply to small arms ranges. By design a small arms range is a directed fire training range and normally has a backstop (impact) berm located behind the target area which receives/contains the vast majority of projectiles (bullets) expended on a small arms range. Depending on soil (berm) composition the penetration depths range from surface to 12+ inches.



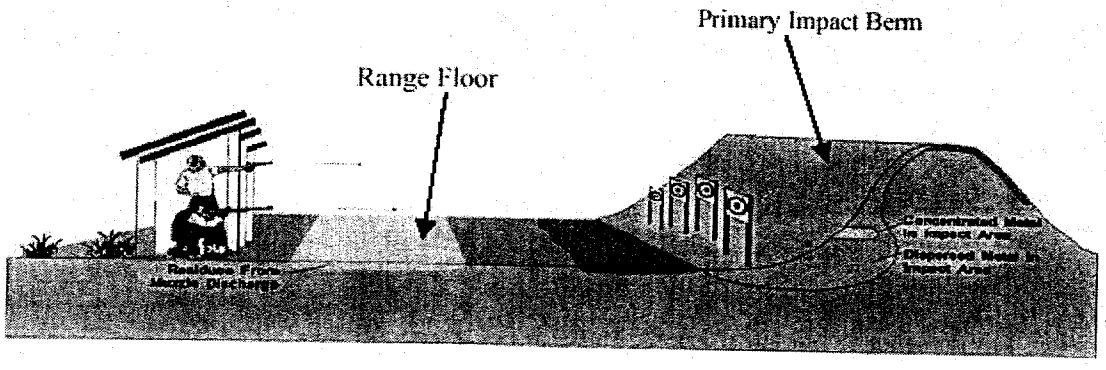


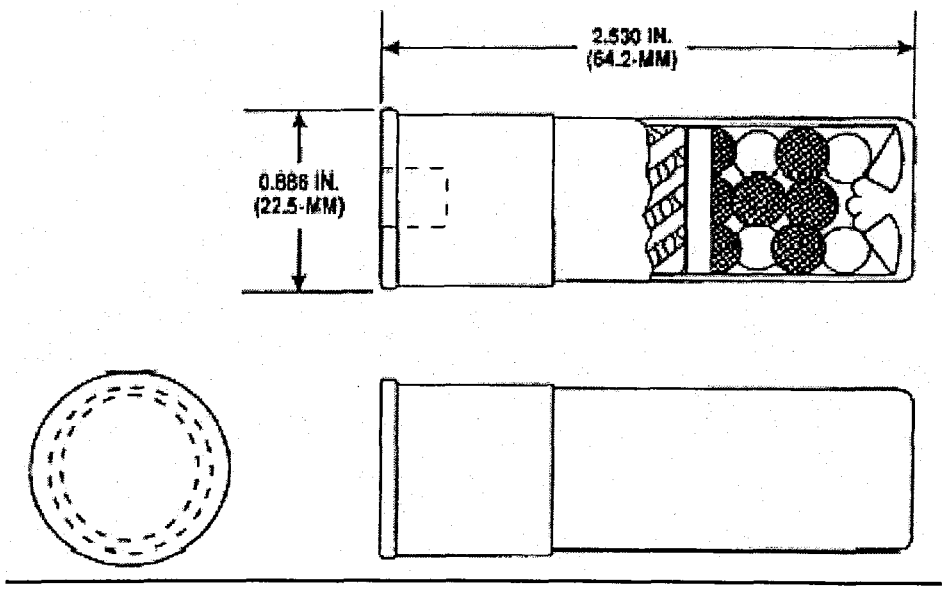
Figure 2-1. Cross Section of a Typical Static Rifle and Handgun Range
(Modified from Figure 1.1 in AFCEE, 2000)

Appendix (A)

Ordnance Data Sheets

Ordnance Technical Data Sheet

Cartridge, 12 Gage, Shotgun, No. M247



Nomenclature:	12 Gage, Shotgun, No. M247
Ordnance Family:	Small Arms
DODIC:	1305-A011
Filler:	Smokeless Powder
Filler weight:	Not provided
Item weight:	740 gr (
Diameter:	22.5 mm (.886 in)
Length:	64.2 mm (2.530 in)
Maximum Range:	823 m (900 yds)
Fuze:	Percussion

Usage: Military issue, riot-type shotgun, 20-in barrel cylinder bore. The cartridge is intended for use against small game and for riot control weapons.

Description: The cartridge case may be paper or plastic, and is loaded with smokeless powder and No. 4 hard chilled shot.

Reference: TM43-0001-27

Appendix B

Material Safety Data Sheets

MATERIAL SAFETY DATA SHEET

MATERIAL IDENTIFICATION: "BLUE ROCK" TRAP AND SKEET TARGETS

"BLUE ROCK" IS A REGISTERED TRADEMARK OF REMINGTON ARMS CO., INC.

REVISION DATE: 27-APRIL-94
DATE PRINTED: 20-SEPT.-91

MANUFACTURER / DISTRIBUTOR:
REMINGTON ARMS CO., INC.
P. O. BOX 390
FINDLAY, OHIO 45840

PHONE NUMBERS:
PRODUCT INFORMATION: 1-(419) 422-2664
TRANSPORT EMERGENCY: CHEMTREC: 1-800-424-9300
ENVIRONMENTAL INFORMATION: (501) 676-4111

TRADE NAMES / SYNONYMS: CLAY TARGETS
CLAY PIGEONS

PRODUCT TYPE: P
STATUS INDICATOR: F
NFPA RATINGS: Health: 0 Flammability: 0 Reactivity: 0
NPCA-HMIS RATINGS: Health: 0 Flammability: 0 Reactivity: 0

Personal Protection:

COMPONENTS

MATERIAL	CAS NUMBER	%
AROMATIC PETROLEUM PITCHES	68334-31-6 / 68187-58-6	32
DOLOMITIC LIMESTONE	16389-88-1	67
FLUORESCENT AQUEOUS PAINT, or		1
LATEX PAINT - WHITE		1

POLYNUCLEAR AROMATIC HYDROCARBONS (0.1% OF TOTAL WEIGHT)
** 0.1% OF TOTAL WEIGHT LATEX PAINT

PHYSICAL DATA

WATER SOLUBILITY: LOW
FORM: SOLID, DISKS
COLOR: BLACK WITH FLUORESCENT ORANGE OR WHITE PAINTED TOP

HAZARDOUS REACTIVITY

INSTABILITY:	STABLE
INCOMPATIBILITY:	NONE REASONABLY FORESEEABLE
DECOMPOSITION:	DECOMPOSITION WILL NOT OCCUR
POLYMERIZATION:	POLYMERIZATION WILL NOT OCCUR

FIRE AND EXPLOSION DATA

NOT A FIRE AND EXPLOSION HAZARD.

FIRE AND EXPLOSION HAZARDS: NONE

EXTINGUISHING MEDIA: USE MEDIA APPROPRIATE FOR SURROUNDING MATERIAL.

SPECIAL FIRE FIGHTING INSTRUCTIONS: KEEP PERSONNEL REMOVED AND UPWIND OF FIRE. WEAR SELF-CONTAINED BREATHING APPARATUS. WEAR FULL PROTECTIVE EQUIPMENT.

HEALTH HAZARD INFORMATION

COMMENT: This toxicity summary refers to targets contalning approximately 32% petroleum pitches (CAS 68334-31-6), (68187-58-6) and 67% dolomitic limestone (CAS 16389-88-1).

CARCINOGENICITY LISTING: Petroleum pitch contains polynuclear aromatic hydro- carbons, some of which are classified as carcinogens by IARC, NTP and ACGIH.

Exposure to dust or particulates from shattered or crushed clay pigeons may irritate the skin, eyes or lungs. Ingestion may cause gastrointestinal irritation with nausea, vomiting and diarrhea.

ANIMAL DATA:

Skin absorption ALD for PETROLEUM PITCH: > 5000 mg/kg in rabbits.

PETROLEUM PITCH is a slight irritant.

PETROLEUM PITCH contains polynuclear aromatic hydrocarbons, some of which have caused skin an internal organ cancer in laboratory animals.

REMINGTON ARMS COMPANY, INC.

MATERIAL SAFETY DATA SHEET

HEALTH HAZARD INFORMATION (Continued)

Mouse skin painting studies using petroleum distillates similar to ingredients in PETROLEUM PITCH caused skin tumors; however, these data should be interpreted cautiously since these studies used repeated exposure of shaved skin which was never washed free of test material. The skin damage resulting from such repeated exposures may play a role in the tumorigenic response.

HUMAN HEALTH EFFECTS:

Handling of the intact painted product is not expected to be hazardous. Exposure to dust or particulates from shattered or crushed product may cause irritation to the skin, eyes, or lungs after prolonged or repeated contact; this material may cause an allergy in some individuals. Due to the presence of petroleum pitch, crushed product may cause gastrointestinal irritation, nausea, vomiting and diarrhea if swallowed. Petroleum pitch on the skin causes an increased sensitivity to sunlight, and may, in combination with sun exposure, cause increased possibility for sunburn.

This material contains polynuclear aromatic hydrocarbons, some of which are classified as carcinogens.

CARCINOGENICITY:

The following components are listed by IARC, NTP, OSHA, or ACGIH as carcinogens. A "P" indicates a Proposed Carcinogen.

MATERIAL	IARC	NTP	OSHA	ACGIH
AROMATIC PETROLEUM PITCHES	x	x		

EXPOSURE LIMITS: "BLUE ROCK" TRAP AND SKEET TARGETS

TLV (ACGIH): NONE ESTABLISHED
PEL (OSHA): PARTICULATES NOT OTHERWISE REGULATED
15 mg/m3 - 8 Hr. TWA - Total Dust
5 mg/m3 - 8 Hr. TWA - Respirable Dust

OTHER APPLICABLE EXPOSURE LIMITS

AROMATIC PETROLEUM PITCHES

TLV (ACGIH): 0.2 mg/m3, A1 - 8 Hr. TWA
PEL (OSHA): 0.2 mg/m3 - 8 Hr. TWA

REMINGTON ARMS COMPANY, INC.

MATERIAL SAFETY DATA SHEETS

HEALTH HAZARD INFORMATION (Continued)

DOLOMITIC LIMESTONE

TLV (ACGIH): 10 mg/m3 - The value is for total dust containing no asbestos and < 1% crystalline silica - 8 Hr. TWA

PEL (OSHA): NONE ESTABLISHED

SAFETY PRECAUTIONS: Avoid breathing dust. Wash thoroughly after handling.

FIRST AID

INHALATION: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician. INHALATION OF DUST FROM THE CRUSHED PRODUCT.

SKIN CONTACT: The compound is not likely to be hazardous by skin contact, but cleansing the skin after use is advisable. SKIN CONTACT WITH DUST FROM THE CRUSHED PRODUCT.

EYE CONTACT: In case of contact, immediately flush eyes with plenty of water for at lease 15 minutes. Call a physician. EYE CONTACT WITH DUST FROM THE CRUSHED PRODUCT.

INGESTION: If swallowed, immediately give 2 glasses of water and induce vomiting. Never give anything by mouth to an unconscious person. Call a physician. INGESTION OF DUST FROM THE CRUSHED PRODUCT.

PROTECTION INFORMATION

GENERALLY APPLICABLE CONTROL MEASURES AND PRECAUTIONS

Avoid dust generation.

PERSONAL PROTECTIVE EQUIPMENT

Wear protective gloves made of canvas or leather to prevent cuts from sharp edges.

DISPOSAL INFORMATION

AQUATIC TOXICITY

CRUSHED CLAY PIGEONS (<5 mm), 96 hour LC50, fathead minnows: > 66.7 g/L).

REMINGTON ARMS CO., INC.

MATERIAL SAFETY DATA SHEET

DISPOSAL INFORMATION (Continued)

SPILL, LEAK, OR RELEASE

NOTE: Review FIRE AND EXPLOSION HAZARDS AND SAFETY PRECAUTIONS before proceeding with clean up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean up.

Shovel or sweep up.

WASTE DISPOSAL

Treatment, storage, transportation and disposal must be in accordance with applicable Federal, State/Provincial, and Local regulations. Remove nonusable solid material and/or contaminated soil, for disposal in an approved and permitted landfill.

SHIPPING INFORMATION

D.O.T. PROPER SHIPPING NAME: CLAY TARGETS
HAZARD CLASS: NOT REGULATION

TITLE III HAZARD CLASSIFICATIONS

ACUTE:	NO
CHRONIC:	NO
FIRE:	NO
REACTIVITY:	NO
PRESSURE:	NO

THE DATA IN THIS MATERIAL SAFETY DATA SHEET RELATES ONLY TO THE SPECIFIC MATERIAL DESIGNATED HEREIN AND DOES NOT RELATE TO USE IN COMBINATION WITH ANY OTHER MATERIAL OR IN ANY PROCESS.

RESPONSIBILITY FOR MSDS: CHARLES S. KNOTT,
REMINGTON ARMS COMPANY, INC.
I-40 AND HIGHWAY 15
LONOKE, ARKANSAS 72086