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FINAL PRELIMINARY ASSESSMENT FOR NAS SAUFLEY FIELD FL

8/1/2009

MALCOLM PIRNIE, INC.

FINAL
PRELIMINARY ASSESSMENT
SAUFLEY FIELD – NAVAL AIR STATION PENSACOLA, FLORIDA

August 2009

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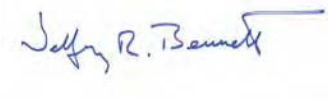
FINAL
PRELIMINARY ASSESSMENT
SAUFLEY FIELD – NAVAL AIR STATION PENSACOLA, FLORIDA

DoD Contract Number: N62472-02-D-1300

Reviewed and Approved by:



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Malcolm Pirnie, Inc. prepared this report at the direction of Naval Facilities Engineering Command Atlantic. This document should be used only with the approval of the Naval Facilities Engineering Command Atlantic. 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.

August 2009

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Acronyms

AIPD1	Airfield Influence Planning District 1
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
CD	Compact Disc
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSM	Conceptual Site Model
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
EO	Explosive Ordnance
FAS	Florida Aquifer System
FGS	Florida Geological Survey
ft^2/day	square feet per day
FY	Fiscal Year
GMD	Growth Management Department
gpm	gallons per minute
IAS	Intermediate Aquifer System
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resources Management Plan
JLUS	Joint Land Use Study
lb	pound
Malcolm Pirnie	Malcolm Pirnie, Inc.
MC	Munitions Constituents
MEC	Munitions and Explosives of Concern
mg/L	milligrams per liter
MRP	Munitions Response Program
msl	Mean sea level
NAAS	Naval Auxiliary Air Station
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Command
NAVFAC SE	Naval Facilities Engineering Command Southeast
Navy	United States Navy

NEESA	Naval Energy and Environmental Support Activity
NETPDTC	Naval Education and Training Professional Development and Technical Center
NFWMD	Northwest Florida Water Management District
NTTC	Naval Technical Training Center
OE	Ordnance and Explosives
OLF	Outlying Landing Field
PA	Preliminary Assessment
PAH	polycyclic aromatic hydrocarbon
RG	Record Group
SAR	Site Assessment Report
SARA	Superfund Amendments and Reauthorization Act
SDZ	Surface Danger Zone
WWI	World War I
WWII	World War II
U.S.	United States
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
°F	Degrees Fahrenheit

GLOSSARY OF TERMS

Base Realignment and Closure – 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. (Defense Environmental Restoration Program [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 United States Code [U.S.C]. 2710(e)(1))

Discarded Military Munitions – Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed consistent with applicable environmental laws and regulations. (10 U.S.C. 2710(e)(2))

Explosive Ordnance Disposal – The detection, identification, field evaluation, rendering-safe, recovery, and final disposal of unexploded explosive ordnance. It may also include the rendering-safe and/or disposal of explosive ordnance (EO) that has become hazardous by damage or deterioration, when disposal of such EO requires techniques, procedures, or equipment that exceeds the normal requirements for routine disposal. (Office of the Chief of Naval Operations Instruction [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 the DoD or the components) and those real properties where accountability rested with the DoD, but where activities at the property were conducted by contractors (i.e., government-owned, contractor-operated 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 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., trinitrotoluene, hexogen) present in high enough concentrations to pose an explosive hazard. (Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics [OUSD (AT&L)], 18 December 2003)

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)(3))

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 – This term 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 Military Munitions Response Program under the Defense Environmental Restoration Program to address munitions and explosives of concern (MEC) (including unexploded ordnance and discarded military munitions) 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 the Base Realignment and Closure or Formerly Used Defense Sites programs.

This report represents a Preliminary Assessment (PA) for Saufley Field, a tenant of Naval Air Station (NAS) Pensacola, located in Escambia County, Florida. The DoD, United States Navy, and United States Environmental Protection Agency guidance for conducting and documenting PAs were followed and tailored, where appropriate, to address the unique aspects of MEC and MC.

NAS Pensacola is located in the northwest portion of the Florida Panhandle, approximately 13 miles south of Interstate 10 and five miles west of the city of Pensacola. Constructed in 1826, it was the world's first NAS and is known as the "Cradle of Naval Aviation." The NAS Pensacola complex covers 8,423 acres, including NAS Pensacola, Outlying Landing Field Bronson, Naval Technical Training Center Corry Station, Saufley Field, and Lexington Terrace Housing. The installation's mission is to "fully support the operational and training missions of tenants assigned; enhancing the readiness of the U.S. Navy, its sister armed services and other customers."

Saufley Field is located approximately ten miles north of NAS Pensacola in Escambia County, Florida. It was acquired by the United States Navy (Navy) in 1940 and was named in honor of Lieutenant Richard C. Saufley, a pioneer in naval aviation. Saufley Field was used primarily for naval aviation training throughout its history and has been commissioned as a Naval Auxiliary Air Station, NAS, and Naval Outlying Landing Field (OLF). Presently, the 866-acre field contains two 4,000-foot runways and three aircraft hangars which serve as an OLF. Additionally, 63 buildings house various tenants and a population of over 1,000. The host tenant of Saufley

Field is the Naval Education and Training Program Development Technology Center, and other tenants include the Defense Activity for Non-traditional Education Support, Defense Finance and Accounting Service Financial Systems Activity, Naval Reserve Center, and Bureau of Prisons.

In 2007, a PA was performed for the Saufley Field Small Arms Range (Malcolm Pirnie, Inc., 2007). As a result of the 2007 PA, two additional former ranges were identified at Saufley Field: the Saufley Field Skeet Range and the Saufley Field Bombing Targets. These two ranges are the subject of this PA.

The Saufley Field Skeet Range was located approximately 650 feet west of the northwest tip of Runway 14. The range is shown on maps dated 1943 and 1946 through 1949. A 1945 information booklet describes the skeet range as "two 100-foot by 100-foot areas with five stations each" (Navy, 1945). The two firing arcs and the Skeet Range House are visible in aerial photographs dated 1943 and 1945. Typical munitions used at a skeet range include 12-gauge, 16-gauge, and 20-gauge shotgun ammunition and .410-caliber ammunition. Multiple caps to 12-gauge shotgun casings, one casing from an expended .38-caliber bullet, and fragments of clay targets were observed at the skeet range during the 29 November 2007 visual survey conducted for this PA. The concrete foundation of the former Skeet Range House and four concrete firing pads remain at the site. Because the site was used only for small arms training and there is no historical or current evidence of explosives use at the site, there is no evidence of MEC. No soil sampling has been conducted at the Saufley Field Skeet Range; therefore, it is unknown if MC are present at the site. The site and surrounding area are undeveloped and currently are not used.

The Saufley Field Bombing Targets were located approximately 500 feet north of the intersection of Runway 14 and Runway 23 at Saufley Field. The Bombing Targets are illustrated on maps dated 1943 and 1946 through 1949, and they are shown as two circular targets with diameters of approximately 200 feet each. The targets are also visible on aerial photographs dated 1943 and 1945. No MEC or munitions debris were observed during the 29 November 2007 visual survey conducted for this PA. Documentation of specific ordnance types used at the range was not identified; however, due to the proximity to the runways, ammunition used at the bombing targets likely included various sizes of inert practice bombs with spotting charges. These spotting charges are considered to be MEC; therefore, there is a potential for MEC at the site. No soil sampling has been conducted at the Saufley Field Bombing Targets; therefore, it is unknown if MC are present at the site. The site and surrounding area are currently used as an OLF.

1. INTRODUCTION

The Department of Defense (DoD) has established the Military Munitions Response Program under the Defense Environmental Restoration Program (DERP) to address munitions and explosives of concern (MEC) (including unexploded ordnance and discarded military munitions) 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 the Base Realignment and Closure or Formerly Used Defense Sites programs.

The DoD and the United States (U.S.) Navy (Navy) are currently establishing policy and guidance for munitions response actions under the Navy Munitions Response Program (MRP). However, key program drivers developed to date conclude that munitions response actions will be conducted under the process outlined in the National Contingency Plan (40 Code of Federal Regulations 300), as authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 United States Code (U.S.C.) 9605, and amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), Pub. L. 99-499 (hereinafter CERCLA). This report represents a Preliminary Assessment (PA) for Saufley Field, located in Escambia County, Florida. The DoD, Navy, and U.S. Environmental Protection Agency (USEPA) guidance for conducting and documenting PAs were followed and tailored, where appropriate, to address the unique aspects of MEC and MC.

This PA report 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 PA report:

- References (Appendix A)

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

Two interactive compact discs (CDs) are included with this report. The first CD includes electronic files of the report text, tables, and figures; appendices; and project source data. The second CD includes interactive Geographical Information System maps of the installation and sites.

1.1. Purpose

This PA summarizes the history of munitions use for the following former ranges at Saufley Field: Saufley Field Skeet Range and Saufley Field Bombing Targets. The PA provides an assessment of the current conditions with respect to MEC and MC. The PA provides the necessary information for Navy and regulatory decision-makers to: 1) eliminate from further consideration those MEC sites that pose minimal or no threat to public health or the environment; 2) differentiate MEC sites that may not require further munitions response actions from those that will require further investigation and/or munitions response actions; 3) determine if an imminent explosives safety hazard from MEC is present that warrants an accelerated response action; and 4) determine if an imminent hazard from MC to human health or the environment is present and warrants an accelerated response action.

1.2. Programmatic Framework

The regulatory structure for managing Navy MRP sites is guided by a complex mixture of federal, state, and local laws, as well as DoD and Navy regulations and guidance, and provides the necessary information for Navy decision-makers. The key legislation, policy, and guidance directing the program includes, but is not limited to, the following:

Management Guidance for the Defense Environmental Restoration Program (DERP) - (September 2001)

The DERP Management Guidance establishes an MRP element for MEC and MC defense sites. The history of DERP dates back to the SARA of 1986[1]. The scope of the DERP is defined in 10 U.S.C. §2701(b), which states that the:

> Goals of the program shall include the following: … (1) The identification, investigation, research and development, and cleanup of contamination from hazardous substances, and pollutants and contaminants. (2) Correction of other environmental damage (such as detection and disposal of unexploded ordnance) which creates an imminent and substantial endangerment to the public health or welfare or to the environment …

National Defense Authorization Act (Fiscal Year (FY) 02) (Sections 311-312)

Sections 311-312 of the National Defense Authorization Act of FY02 reinforced the DoD's 2001 DERP Management Guidance by tasking the DoD to develop and maintain an inventory of defense sites that are known or suspected to contain MEC and MC. Section 311 requires the DoD to develop a protocol for prioritizing defense sites for response activities in consultation with the states and tribes. Section 312 requires the DoD to create a separate program element to ensure that the DoD can identify and track munitions response funding.

The September 2001 Management Guidance for the DERP and the 2002 National Defense Authorization Act, described above, established the MRP. The DoD provides program guidance and methods for conducting a baseline inventory of defense sites containing, or potentially containing, MEC and/or MC. The Navy baseline inventory of sites was completed in FY02 and was used to establish the sites where PAs are needed to further evaluate the potential for MEC and MC.

1.3. Project Management

This PA has been coordinated and managed by Naval Facilities Engineering Command (NAVFAC) Atlantic. NAVFAC Atlantic performs engineering functions for Navy installations throughout the United States and is the program manager for this PA. Malcolm Pirnie, Inc. (Malcolm Pirnie) has been contracted to prepare this PA. NAVFAC Southeast (NAVFAC SE)

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[1] *SARA was signed into law on October 17, 1986, and amended the CERCLA of 1980, 42 U.S.C. §9601 et seq. Related sections in Title 10 of the U.S.C. (10 U.S.C. §§2702-2710 and §§2810-2811) further define the program.*

provides technical guidance and management for environmental projects at NAS Pensacola, including Saufley Field. The Navy Remedial Project Manager from NAVFAC SE and the installation point of contact for NAS Pensacola provided valuable information and assistance throughout the PA data collection process.

1.4. PA Approach

The CERCLA implementing guidance, which was prepared for sites contaminated with hazardous substances, describes the PA as a limited-scope investigation based upon existing and available data. However, the guidance also states that the PA process developed under CERCLA is not equally applicable to all sites and all contaminants and that variation from the guidance may be necessary. Sites containing MEC are prime examples of sites where the generic CERCLA process is incomplete. Unique explosives safety issues associated with MEC cannot be assessed solely with the parameters developed for chemical and hazardous waste contaminants. While this PA generally follows CERCLA guidance, certain elements of the report have been tailored to address the unique explosives safety aspects of MEC.

The PA process for each of the sites involves collecting and reviewing existing and available information about the site. Data collection activities include off-site and on-site research and interviews. The process also includes a visual survey to assess physical evidence that might indicate the presence of MEC (e.g., discarded munitions items, ordnance penetration holes, scarred trees) and MC (e.g., ground scarring, stressed vegetation, chemical residue) at the site. The Malcolm Pirnie data collection team conducted the on-site portion of the data collection and the visual survey for Saufley Field on 29 November 2007.

This PA is inclusive and makes use of all available data relating to munitions use at Saufley Field, 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 Saufley Field, 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.

2.1. Location and Setting

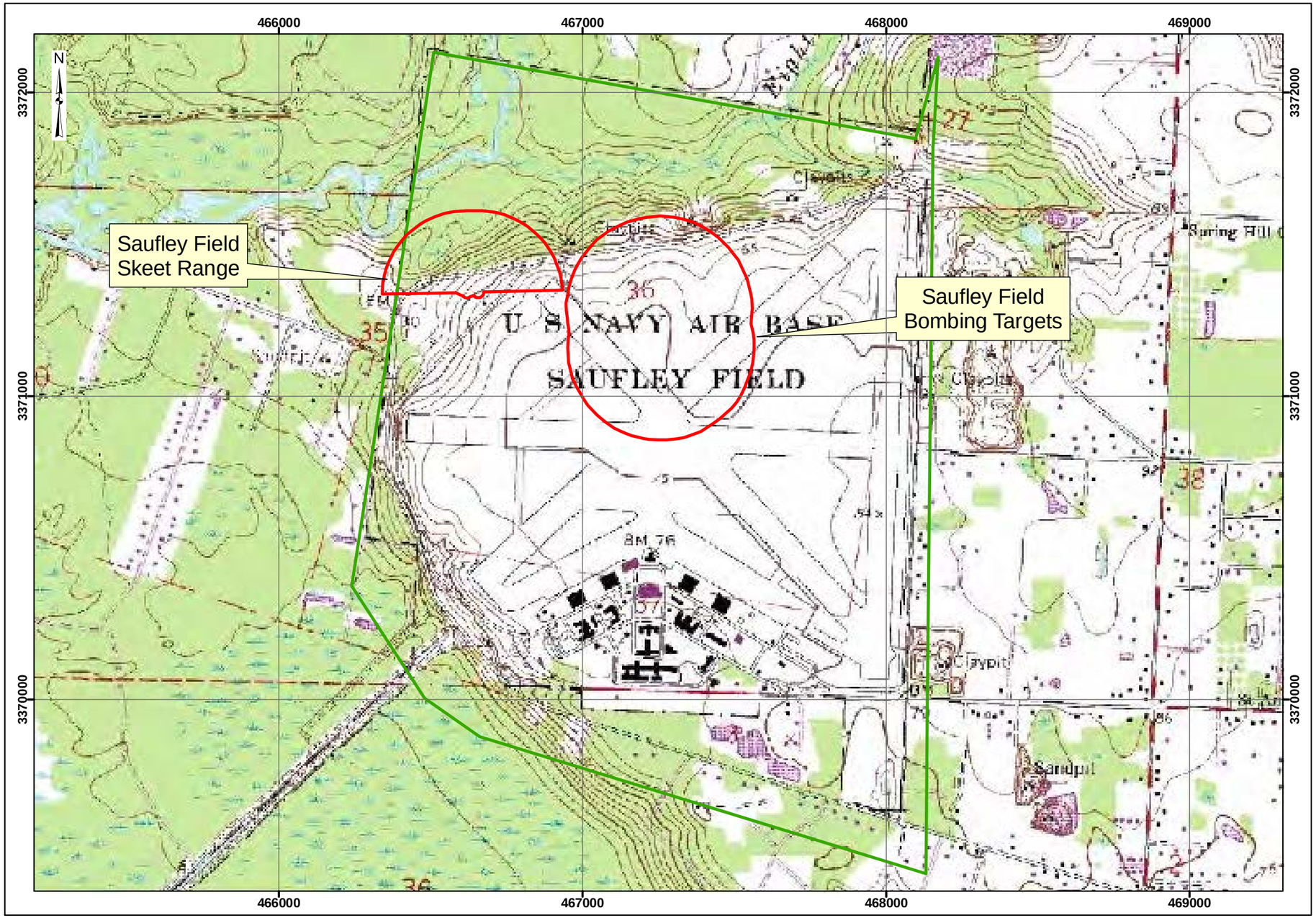
NAS Pensacola is located in the northwest panhandle of Florida in Escambia County, 13 miles south of Interstate 10 and five miles west of the city of Pensacola. The NAS Pensacola complex covers 8,423 acres total, 5,800 acres of which are used for the main installation. The remaining 2,623 acres are used for areas that include Outlying Landing Field (OLF) Bronson, Naval Technical Training Center (NTTC) Corry Station, Saufley Field, and Lexington Terrace Housing (Growth Management Department [GMD], 2003). The NAS Pensacola complex is bordered by Perdido Bay to the north and west, Big Lagoon to the southwest, and Pensacola Bay to the south and east (see Figure 2.1-1). Bayou Grande intersects the complex in the southeast portion, directly to the north of Sherman Field and Chevalier Field.

Figure 2.1-1: Aerial Photograph of the NAS Pensacola Complex, (Map of Pensacola, FL, 2008)

Saufley Field is located approximately ten miles north of NAS Pensacola. It covers 866 acres, 209 of which include undeveloped land and wetlands (GlobalSecurity.org, Saufley Field). Perdido Bay is located one mile to the southeast, and Eight Mile Creek and Eleven Mile Creek run along the northern boundary of Saufley Field. The immediate area surrounding the field is characterized by sparsely populated residential structures (Navy Public Works Center [PWC], 1998).

Figure 2.1-2: Aerial Photograph of Saufley Field

Map 2.1-1 provides a topographic map that shows the general layout of the installation, as well as the locations of the sites discussed in this PA report.



Preliminary Assessment
Naval Air Station Pensacola, Florida

Map 2.1-1
Area Location Map
Saufley Field

Legend

Installation Boundary

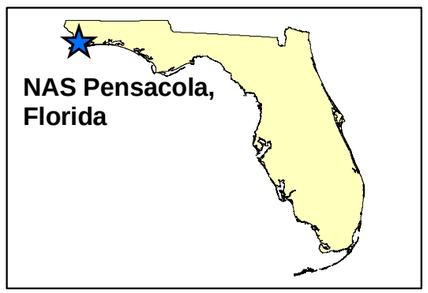
Site Boundary

0 275 550 Meters

Data Source: USGS, 7.5 Minute Series Topographic Survey, Terraserver, 2007

Coordinate System: UTM Zone 16N
Datum: NAD83
Units: meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: August 2009



2.2. Installation History

The establishment of an aviation training station in Pensacola was recommended to the Secretary of the Navy in 1913, and NAS Pensacola was subsequently constructed in 1914. The installation was the first NAS in the world and is now considered the "Cradle of Naval Aviation." The primary mission of NAS Pensacola is the training of student aviators, as well as to "fully support the operational and training missions of tenants assigned; enhancing the readiness of the U.S. Navy, its sister armed services, and other customers" (U.S. Navy).

While NAS Pensacola became the hub of air training activities through World War I (WWI) and World War II (WWII), its growing aviation program required the additions of the following OLFs: Naval Auxiliary Air Station (NAAS) Saufley Field in 1940, NAAS Ellyson Field in 1941, NAAS Barin Field and NAAS Bronson Field in 1942, and NAAS Corry Field in 1943. NAAS Barin Field was partially decommissioned in 1962 and currently belongs to the NAS Whiting Field complex of OLFs. NAAS Ellyson Field became a NAS in 1968; however, it was decommissioned in 1973 and subsequently claimed by the Naval Education and Training Professional Development and Technical Center (NETPDTC). Once the NETPDTC moved to Saufley Field in 1979, NAS Ellyson Field was quickly declared excess and fully decommissioned. The remaining auxiliary airfields currently remain part of the NAS Pensacola complex of OLFs.

Saufley Field was commissioned on 26 August 1940 and was named in honor of Lieutenant Richard Caswell Saufley, designated Naval Aviator No. 14, who lost his life in 1916 while attempting to set an endurance flight record. Saufley Field was originally home to an instrument flying school and was the base for the first primary training squadron. The student population increased with the outbreak of WWI. Consequently, Saufley Field was commissioned as NAAS Saufley Field in 1943, and gunnery staffs were set up to give fundamental gunnery instruction to pilots. In 1960, the mission of Saufley Field was revised to provide support for training squadrons VT-1 and VT-5. NAAS Saufley was commissioned as NAS Saufley Field in 1968; however, the on-site training squadrons were decommissioned in late 1976, and the field was then decommissioned to OLF Saufley Field. In 1979, Saufley Field was reactivated as a Naval Education and Training Program Development Center, and the field's name was officially changed to NETPDTC Saufley in 1996. Its current mission is to support Training Air Wings 5 and 6 and to serve as home for several DoD and other U.S. Government organizations as a joint

use facility. The host tenant is the NETPDTC, and other tenants include the Defense Activity for Non-traditional Education Support, Defense Finance and Accounting Service Financial Systems Activity, Naval Reserve Center, and Bureau of Prisons. Saufley Field has four runways, two of which are currently active. Three hangars provide over 34,000 square feet of hangar space and 63 buildings are utilized by a population of over 1,000 at Saufley Field. Table 2.2-1 provides a timeline of the significant historical events that occurred at NAS Pensacola and Saufley Field.

Table 2.2-1: NAS Pensacola and Saufley Field Timeline of Significant Events

Time Period	Significant Events
1826	Construction of the U.S. Navy Yard and Station begins. Activities at the U.S. Navy Yard and Station primarily focus on suppression of the slave trade and piracy in the Gulf of Mexico and the Caribbean Sea.
1862	Confederate troops occupy the U.S. Navy Yard and Station during the Civil War. Fearing capture by Union forces, Confederate troops retreat from the U.S. Navy Yard and Station and destroy most of the facilities.
1906	Many of the structures that were rebuilt at the U.S. Navy Yard and Station following the Civil War are destroyed by a hurricane and tidal wave.
1911	The U.S. Navy Yard and Station is decommissioned.
1913	Establishment of an aviation training station in Pensacola is recommended to Secretary of the Navy Josephus Daniels.
1914	NAS Pensacola is established at the abandoned U.S. Navy Yard and Station.
1940	Saufley Field is commissioned 26 August1940 Named after Richard J. Saufley, Naval Aviator No. 14 Home to an instrument flying school and base to the first primary training squadron.
1943	Commissioned as NAAS Saufley
1968	Commissioned as NAS Saufley on 31 July 1968
1976	Decommissioned as NAS Saufley on 1 December 1976
1979	Reactivated as Naval Education and Training Program Development Center Became an outlying field for NAS Whiting Field pilot training
1996 - 2008	Renamed NETPDTC Saufley in 1996 Airfield is utilized as a Naval Outlying Field for Training Air Wing 5 and

Table 2.2-1: NAS Pensacola and Saufley Field Timeline of Significant Events	
Time Period	**Significant Events**
	Training Air Wing 6 Supports ten major Department of Defense and Navy tenants and supports a base population over 1,000

2.3. Munitions Related Training/Storage/Usage

Based on information from the 2007 PA, which addressed the Saufley Field Small Arms Range (Malcolm Pirnie, 2007), information obtained from archival records, and data collected during the site visit, the following other than operational ranges/sites were associated with Saufley Field to support the installation mission of NAS Pensacola:

The **Saufley Field Skeet Range** is a 31.6-acre site located in the northwestern portion of Saufley Field, just west of the northwest tip of Runway 14. The Saufley Field Skeet Range, which is not listed in the Navy Range Inventory Database, was identified during review of documents, maps, and still photographs obtained from the National Archives during the 2007 PA of NAS Pensacola (Malcolm Pirnie, Inc., 2007). Three concrete building foundations, including the foundation of the former Skeet Range House, and four concrete firing pads remain visible at the site. The Skeet Range is shown on maps dated 1943 and 1946 through 1949. It is also visible on aerial photographs dated 1943 and 1945. A 1945 information booklet describes the Skeet Range as "two 100-foot by 100-foot areas with five stations each" (U.S. Navy, 1945). The exact time period in which the range was operational is unknown. Munitions use may have included 12-gauge, 16-gauge, 20-gauge, and .410-caliber shotgun ammunition, which are typical of skeet range usage.

The site and surrounding area are currently undeveloped and unused. The southwest corner of the site overlaps the Saufley Field Small Arms Range, which was assessed during the 2007 PA of NAS Pensacola (Malcolm Pirnie, Inc., 2007). Munitions usage at the Small Arms Range may have include .22-caliber, .30-caliber, .38-caliber, and .45-caliber pistol and rifle ammunition; however, no munitions debris was observed at the Small Arms Range during the 2007 PA. During the visual survey of the Saufley Field Skeet Range conducted for this PA, multiple caps to

12-gauge shotgun casings, one casing from an expended .38-caliber bullet, and fragments of clay targets were observed within the site boundaries of the former range.

The **Saufley Field Bombing Targets** is a 91.6-acre site located in the northwestern portion of Saufley Field, just north of the intersection of Runway 14 and Runway 23. The Saufley Field Bombing Targets, which are not listed in the Navy Range Inventory Database, were identified during reviews of documents, maps, and still photographs obtained from the National Archives during the 2007 PA (Malcolm Pirnie, Inc., 2007). The Bombing Targets are depicted as two 200-foot diameter circles on maps dated 1943 and 1946 through 1949. The circles are visible on aerial photographs dated 1943 and 1945. The exact time period in which the range was operational is unknown. Due to the close proximity to the runways, munitions use may have included various sizes of inert practice bombs with spotting charges. The site is located within the northern portion of the airfield. No MEC or munitions debris were observed during the visual survey of the Saufley Field Bombing Targets.

3. PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

The following sections provide general information for Saufley Field, including its climate, topography, geology, soil and vegetation types, hydrology, hydrogeology, cultural and natural resources, and endangered species.

3.1. Climate

The climate at Saufley Field is humid, sub-tropical, and characterized by short, mild winters and long, warm-temperature summers. The average monthly temperature in the wintertime is 54 degrees Fahrenheit (°F), while the average monthly temperature in the summertime is 80°F. The average annual temperature is 68°F (NEESA, 1992). There is an average of nine freezes per year, but temperatures in the area rarely fall below 15°F to 20°F. Winds are controlled by the Atlantic Bermuda High Pressure area and ocean-land heating differentials. Southerly winds from the Bermuda High warm the land during summer days, resulting in amplified sea breezes. As land masses cool, the sea breeze reverses to a land breeze. The net effect is a clockwise rotation of surface wind every 24 hours during the summer season. During the winter season, the influence of the Bermuda High is negligible, and northerly winds prevail (Naval Energy and Environmental Support Activity [NEESA], 1983).

The average annual precipitation totals approximately 62 inches or less, with the wettest month being July, which has an average precipitation of 7.2 inches. The driest month is November, which has an average precipitation of 3.4 inches. Snowfall rarely occurs, and hailstorms infrequently occur in very restricted areas. Rainfall is well-distributed but peaks during the months of April through September when 55 percent (%) of the annual rainfall occurs. Summer rain occurs in near-daily showers and thunderstorms over small areas, followed by broader areas of light rains in the winter. Infrequent rain events with moderate to high precipitation occur during the spring and fall seasons. Severe weather includes thunderstorms, tornadoes, tropical storms, and hurricanes. Hurricane season is June through November, but the greatest frequency of hurricanes in the Gulf of Mexico occurs between August and October. The Florida Panhandle averages one hurricane every 17 years and is impacted by fringe effects of hurricanes every five years. The last hurricanes to affect the Pensacola area were Hurricanes Erin and Opal in 1995, Hurricane Ivan in 2004, and hurricanes Dennis and Katrina in 2005.

3.2. Topography

Saufley Field lies on a low ridge approximately 85 feet above mean sea level (msl). The ridge gently slopes to 25 feet above msl to the north of Eight Mile Creek, and it slopes to 10 feet above msl southward to the edge of Perdido Bay (Integrated Natural Resources Management Plan [INRMP], 2001). According to a 1998 Site Assessment Report (SAR) of Saufley Field, topography is level to gently sloping with less than 8% slope, with a few exceptions to the northern boundary of the property (Navy PWC, 1998). Drainage flows north towards Eight Mile Creek and Eleven Mile Creek, which drain southwest towards Perdido Bay. Ponds with surface areas less than 300 square meters have been observed in pits just east of the Saufley Field property line (Navy PWC, 1998).

3.3. Geology

Saufley Field is located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated terrace deposits and the Citronelle Formation of Pleistocene age (Florida Geological Survey [FGS], 1994). These Pleistocene units are found at depths ranging from 50 feet to 55 feet below ground surface (bgs) and are approximately 400 feet thick. The units consist of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).

According to the 1983 Initial Assessment Study of NAS Pensacola, 10 formations lie below the main installation (NEESA, 1983). Because of its close proximity to NAS Pensacola, the geology of Saufley Field is assumed to follow the same sequence of geologic formations. Table 3.3-1 describes each formation in ascending order.

Table 3.3-1: Geologic Formations Beneath NAS Pensacola

Geologic Formation	Description
Hatchetigbee	Located 1,270-2,730 feet below msl; 220-420 feet thick

Table 3.3-1: Geologic Formations Beneath NAS Pensacola	
Geologic Formation	**Description**
Formation	Is characterized by predominantly gray to dark gray, silty micacceous clay that is fossiliferous and calcareous with little pyrite.
Tallahatta Formation	Located 1,040-2,230 feet below msl; 170-foot minimum thickness below Pensacola Is characterized by predominantly hard, light gray, calcareous shale and siltstone with interbeds of gray limestone and fine to pebbly sand.
Lisbon Equivalent	Located 510-2,090 feet below msl; 345-600 feet thick Is characterized by shaley limestone with colors from dark gray to very light-grayish cream. Lower shale zone consisting of a 60- to 90-foot thick bed of shale lies below NAS Pensacola.
Ocala Group	Located 290-1,940 feet below msl; 90-235 feet thick Upper portion changes downward from a light gray to a chalky white limestone, but all limestone in the NAS Pensacola area may be white. Consists mostly of large foraminifers and other fossils.
Bucatunna clay member, Byram Formation	Located 200-1,760 feet below msl; 45-215 feet thick Escambia County well samples are characterized by dark gray, soft, calcareous, silty to sandy clay with occasional flecks of carbonized wood and little pyrite.
Chickasawhay Limestone	Thickness of 30-130 feet Is characterized by gray to light gray, hard, highly porous limestone and dolomitic limestone. Is interbedded with light brown, hard, dolomitic limestone with porosity varying from vesicular to compact. Also is interbedded with dolomite with a distinctive sugary texture.
Tampa Formation	Maximum thickness of 270 feet Is characterized by hard, light gray to grayish-white beds of clay
Pensacola Clay	Located 135-1,000 feet below msl; 380-1,000 feet thick Is characterized by tough, dark to light-gray clay, which grades into a clayey siltstone in the NAS Pensacola area. Upper formation contains mollusk shells and thick shell beds in southern Escambia County.
Miocene Coarse Clastics	Thickness of 70 to 500 feet Is characterized by light brown to light gray, poorly sorted, fine to very coarse sand and granules of small pebbles of quarts. Distinctive feature is the large portion of shell beds of minute mollusks that comprise a large portion of the formation.
Citronelle Formation	Combines with terrace deposits to form a layer 30-790 feet thick. Is comprised of quartz sand containing lenses, beds, and stringers of clay and gravel. Distinctive feature is limonite-cemented sandstone (“hardpan”), which occurs throughout.

3.4. Soil and Vegetation Types

According to the 2000-2010 INRMP, NAS Pensacola has a 30-inch to 40-inch surface of sand or loamy sand that is underlain by sandy loam to sandy clay substrata. Surface soils are strongly acidic and range from somewhat-drained to excessively-drained. According to the 2004 Soil Survey for Escambia County, soils within the vicinity of Saufley Field and northeast of the field are generally well-drained sandy and loamy soils. The areas to the south, southwest, and northwest of the airfield are characterized by poorly-drained sandy soils and muck (USDA, 2004).

Table 3.4-1 presents the sedimentary depositional environments that are found at the NAS Pensacola complex, as discussed in the 1983 Initial Assessment Study (NEESA, 1983).

Table 3.4-1: Depositional Environments Found at NAS Pensacola Complex

Soil Complex	Description
Alluvial	Silty loam to sand textures; gray to black depending on amount of organic matter; variable internal drainage; very slow surface runoff
Tidal Marsh	Coastal areas often covered by saltwater or brackish water at high tide; includes tidal flats that are barren due to salt; includes mixed sand, silt, clay, and various quantities of organic matter
Coastal Beach	Comprised of sand deposited along the coast by wave action; very thin layers of organic matter present in locations where ponding occurs for months at a time (i.e., depressions)
Swamp	Mixture of soils and materials varying in color, texture, composition, and thickness of layers; organic matter of varying thickness

Soils within the vicinity of the airfield and northeast of the field are generally well-drained sandy and loamy soils. The areas to the south, southwest, and northwest of the airfield are characterized by poorly drained sandy soils and muck. Surface sediments at Saufley Field have been classified with the Pickney Sand, Croatan and Pickney Soils, Poarch Sandy Loam, Grady Loam, Troup Sand, and Bonifay Loamy Sand soil complexes (U.S. Department of Agriculture [USDA], 2004). Table 3.4-2 describes the consequent surface soil complexes found at Saufley Field, as outlined in the 2004 Escambia County Soil Survey (USDA, 2004).

Table 3.4-2: Surface Soil Complexes Found at Saufley Field	
Soil Complex	**Description**
Pickney Sand	Very deep, very poorly-drained sandy soil found in coastal lowlands; rapid permeability and low water yield capacity; black sand
Croatan and Pickney Soils	Consists of very deep, very poorly-drained Croatan and Pickney soils found in depressions of coastal lowlands; complex has permeability that ranges from moderate with very high water yield capacity (Croatan) to rapid with low water yield capacity (Pickney); black muck (Croatan) or black sand (Pickney)
Poarch Sandy Loam (0% to 8% slopes)	Very deep, well-drained soil found in nearly-level summits of broad ridges; moderately-slow permeability and moderate water yield capacity; very dark grayish-brown sandy loam
Grady Loam	Very deep, poorly-drained soil found in shallow depressions of summits in broad ridges; slow permeability and high water yield capacity; very dark grayish-brown loam
Troup Sands (0% to 5% slopes)	Very deep, somewhat excessively-drained soil found in nearly-level summits and shoulder slopes of ridges; rapid permeability and low water yield capacity; dark grayish-brown sand
Troup Sands (8% to 12% slopes)	Very deep, somewhat excessively-drained sandy soil found in strongly-sloping side slopes of ridges; rapid permeability and low water yield capacity; dark grayish-brown sand
Bonifay Loam Sand (0% to 5% slopes)	Very deep, well-drained soil found in nearly-level summits and shoulder slopes of ridges; rapid permeability and low water yield capacity; dark grayish-brown loamy sand

Vegetation at Saufley Field includes unique longleaf and mixed pine forests, floodplain forests, swampy lowlands associated with Eleven Mile Creek and Eight Mile Creek, and over 100 acres of wetlands (GMD, 2003). The developed portions of Saufley Field are vegetated with regularly mowed turf grass and landscaped areas.

3.5. Hydrology

Saufley Field is located in the Escambia River Basin on the west side of the river where the basin is characterized by long, fairly straight, parallel channels that trend southeastward, reminiscent of trellis drainage (NEESA, 1992). Eleven Mile Creek and Eight Mile Creek are located along the northern boundary of Saufley Field and drain southwest into Perdido Bay, which is located one

mile southwest of Saufley Field. A 100-year floodplain follows each creek, but neither floodplain encroaches upon developed areas (NEESA, 1992). Over 100 acres of wetlands are present at Saufley Field, most of which are associated with the Eleven Mile Creek and Eight Mile Creek floodplains (GMD, 2003).

3.6. Hydrogeology

The NAS Pensacola complex is directly underlain by the Sand-and-Gravel Aquifer, which is primarily composed of fine- to coarse-grained sands and gravels with varying percentages of clay. In Florida, it is the primary source of water for Santa Rosa and Escambia counties. Over 99% of potable, agricultural, and industrial water in the region is obtained from the Sand-and-Gravel Aquifer. The main source of potable water for Saufley Field is a well field located at NTTC Corry Station, which is located about 1.5 miles west of Pensacola and 2.5 miles north of NAS Pensacola. The well withdraws water from the Sand-and-Gravel Aquifer (Agency for Toxic Substances and Disease Registry [ATSDR], 2006).

The Sand-and-Gravel Aquifer thickens across the Florida panhandle from east to west, and extends from the ground surface (water table) to depths ranging from approximately 200 to 330 feet bgs (Northwest Florida Water Management District [NFWMD], 2001; ATSDR, 2006). The Sand-and-Gravel Aquifer is primarily composed of interbedded layers of sand and gravel; however, clay beds and lenses are also common throughout the aquifer and form local semi-confining units (U.S. Geological Survey [USGS], 1990). Water in the aquifer is under unconfined conditions where the clay beds are thin or absent, and is under artesian conditions where such beds are thick. Recharge to the Sand-and-Gravel aquifer occurs from percolation and infiltration of local precipitation, which generally moves downward for primary discharge to streams, bays, sounds, or the coastlines (USGS, 1990). Because of surficial recharge to the aquifer, its susceptibility to contamination is high, particularly in the surficial zone. An example of contamination to the surficial zone is a site near Pensacola, where creosote waste products from a wood-preserving plant have been detected in large portions of the zone (USGS, 1990).

The Sand-and-Gravel Aquifer is informally subdivided into the surficial zone, the low permeability zone, and the main producing zone. The low permeability zone acts as a semi-confining layer that restricts the vertical flow of groundwater between the surficial zone and the main producing zone, which is used as the main source of drinking water throughout the area

(NFWMD, 2001). Yields of up to 1,000 gallons per minute (gpm) have been reported for wells completed in the surficial zone, and aquifer test data have shown transmissivities of 11,000 square feet per day (ft^2/day). For the main producing zone, yields of more than 1,000 gpm are commonly reported for wells completed in this zone, and results of aquifer tests have shown transmissivities of as much as 20,000 ft^2/day.

Potable water is found throughout the Sand-and-Gravel Aquifer, as its virtually insoluble, quartz-rich composition results in total dissolved solid concentrations below 50 milligrams per liter (mg/L). Chloride concentrations are generally less than 50 mg/L; however, in some coastal regions it is as high as 1,000 mg/L. Dissolved iron concentrations vary locally, with some areas having concentrations up to 4,300 micrograms per liter.

The Sand-and-Gravel Aquifer overlies a sequence of predominately fine-grained sediments representing the Intermediate Aquifer System (IAS), which overlies Florida's largest producing aquifer, the Floridan Aquifer System (FAS). The confining nature of the IAS serves to restrict the exchange of water between the Sand-and-Gravel Aquifer and the FAS; therefore, only the Sand-and-Gravel Aquifer will be discussed in this PA (NFWMD, 2001).

Shallow, intermediate, and deep site monitoring wells were installed during a Site Assessment of Underground Storage Tank (UST) Site 2406, Saufley Field. Addendum 2 of the 2003 Site Assessment Report (SAR) for UST Site 2406 shows that deep groundwater flow is to the southwest, intermediate groundwater flow is west and southwest, and shallow groundwater flow is to the northwest and northeast at Saufley Field. The estimated groundwater velocity was 0.336 feet per day in the shallow zone and 4.8 feet per day in the deeper zone. Water level elevations were recorded between 75.42 feet and 100.60 feet; however, depths to groundwater were not reported (Tetra Tech NUS, Inc., 2005).

3.7. Cultural and Natural Resources

No cultural resources have been identified at Saufley Field. According to the *Final Integrated Cultural Resources Management Plan, NAS Pensacola* dated February 2004, a Phase I archaeological survey was conducted on over 200 undisturbed acres in 1996, and a limited reconnaissance was conducted in 2003. Neither study identified cultural resources at Saufley

Field (HHM Inc., 2004). Natural resources include over 100 acres of wetlands located in the vicinities of Eleven Mile Creek and Eight Mile Creek (GMD, 2003).

3.8. Endangered and Special Status Species

No threatened or endangered species are known to inhabit Saufley Field. The Gopher tortoise (*Gopherus polyphemus*) and Alligator snapping turtle (*Macroclemys temminckii*) are Species of Special Concern in the state of Florida, and the 2000-2010 INRMP reports both species have been observed at Saufley Field. The Gopher tortoise is generally found in remnant sand dunes and pine plantations. The Alligator snapping turtle is generally found in Blackwater streams, which cover approximately 10.6 acres at Saufley Field (INRMP, 2001).

4. SUMMARY OF DATA COLLECTION EFFORT

Five primary sources of information were researched as part of the data collection effort for this PA. The sources of data include:

1) Historical archives
2) Personal interviews
3) Installation data repositories
4) Visual survey observations
5) Off-site data sources and repositories, such as local libraries and museums

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

4.1. Historical Archive Repositories (Off-Site)

The data collection team reviewed archival records located at the National Archives in College Park, Maryland, and Washington D.C., as well as records located at the Naval Historical Center in Washington, D.C., and regional archives in Pensacola, Florida. The data collection team researched the following records and record groups (RGs) for documents relating to munitions usage at Saufley Field. An asterisk (*) indicates the material was photocopied.

Textual Records

RG 18, Army Air Forces

- Entry 168 (NM53), Central Decimal Files, 1917-38, Boxes 2319*, 2320
- Entry 292 (NM53), Unclassified Decimal Files, 1942-44, Box 1488
- Entry 294, Bulky Files, 1942-44, Boxes 839, 931
- Entry 295, Project Files, Camps and Forts, 1939-42, Box 1017*

RG 38, Chief of Naval Operations

- Entry 1 (NM63), Name and Subject Index, 1942-43, Boxes 34, 42
- Entry 1(NM63), Name and Subject Index, 1943-44, Boxes 77, 78, 86, 87
- Entry 2 (NM63), General Correspondence, 1942-43, Box 132
- Entry 2 (NM63), General Correspondence, 1943-44, Boxes 256*, 277
- Entry 2 (NM63), General Correspondence, 1944-45, Boxes 702, 713, 719, 743

RG 51, Bureau of the Budget

- Entry 149-A, War Projects Unit, General Records, Boxes 30, 42, 45, 46, 59-61

- Entry149-B, Inspection Reports, Boxes 45, 232*, 233*, 427

RG 71, Bureau of Yards and Docks

- Entry 24-A (UD), Unprocessed Naval Property Case Files, Box 19
- Entry 1001, Naval Property Case Files, Boxes 300, 301*, 302*, 303*, 304, 305, 306*, 307*, 308, 309, 310*, 311, 312*, 313, 314*, 315*, 316*, 317*, 318*, 319*, 320*
- Entry1016, Land Acquisition Receipt, 1940-43, Box 1
- Entry1017, Land Purchase Progress Reports, 1942-45, Box 1
- Entry1019, Miscellaneous Reports Land Investigations, Boxes 1-4
- Entry 1030, Army Facilities Acquired, 1944-45, Box 1
- Entry 1037, Lease Files, Boxes 1*, 2-33

RG 72, Bureau of Aeronautics:

- Entry 17-A, Confidential General Correspondence, 1922-44, Box 1158*
- Entry 62B,(NM52), General Correspondence, 1943-45, Boxes 3378*, 3379*, 3450, 3461
- Entry 62B (NM52), General Correspondence, 1946, Boxes 424, 489
- Entry 62B (NM52), General Correspondences, 1947, Boxes 382, 383*, 384, 385
- Entry 67 (NM52), Confidential Correspondence, 1922-24, Box 1202*
- Entry 67 (NM52), Confidential Correspondence, 1945-47, Boxes 285, 300, 653, 654
- Entry 1001-A, Unclassified General Correspondence, 1948-49, Boxes 384*, 385*, 386, 387, 388*, 389*
- Entry 1001-B, Unclassified General Correspondence, 1950, Boxes 204*, 205*, 206
- Entry 1001-C, Unclassified General Correspondence, 1951, Boxes 169*, 170*, 171
- Entry 1001-E, Unclassified General Correspondence, 1953, Boxes 248*, 249*
- Entry 1001-F, Unclassified General Correspondence, 1954, Boxes 184*, 202, 209*, 210*
- Entry 1001-G, Unclassified General Correspondence, 1955, Boxes 225*, 226*
- Entry 1001-H, Unclassified General Correspondence, 1956, Boxes 214*, 215*
- Entry 1001-I, Unclassified General Correspondence, 1957, Boxes 217, 218
- Entry 1001-J, Unclassified General Correspondence, 1958, Boxes 154, 168, 169*
- Entry 1001-K, Unclassified General Correspondence, 1959, Boxes 145, 156*, 157

RG 74, Bureau of Ordnance:

- Entry 25-I, General Correspondence, 1942, Confidential, Boxes 200, 201*, 209

- Entry 25-J, General Correspondence, 1942, Restricted, Boxes 429*, 430*, 449, 455
- Entry 25-M, General Correspondence, 1943, Confidential, Boxes 364, 375, 386
- Entry 25-O, General Correspondence, 1943, Restricted, Boxes 461*, 514
- Entry 25-U, General Correspondence, 1944, Confidential, Boxes 500, 527, 549
- Entry 25-V, General Correspondence, 1944, Restricted, Boxes 821*, 871, 911, 912
- Entry 1002A (1529), Construction and Procurement Subject Files, 1945, Boxes 1195*, 1282
- Entry 1002B (4444), Construction and Procurement Subject Files, 1946, Boxes 253, 278, 286
- Entry 1002C (5595), Construction and Procurement Subject Files, 1947, Boxes 189*, 203, 208
- Entry 1003A (A1), General Correspondence, Unclassified and Confidential, 1948, Boxes 572*, 586
- Entry 1003A (A1), General Correspondence, Unclassified and Confidential, 1949, Box 572

RG 80, General Records of Department of Navy, 1798-1947

- Entry 156 MM (A-1), Name and Subject Index 1944-1945, Boxes 1-20
- Entry 255 (PC31), Reports from Shore Establishments, Boxes 33, 47, 154, 170, 182, 192
- Entry 256 (PC-31), Index to Reports from Shore Establishments, 1943-1944, Boxes 1-3

RG 121, Public Buildings Service

- Entry 13, Real Property, Box 2*

RG 127, USMC

- Entry 37 (UD-WW), Correspondence, 1975, Box 22
- Entry 50 (UD-UP), Real Estate Legal Correspondence File, 1918-76, Boxes 1-12
- Entry 62 (UD-WW), Correspondence, 1967, Box 27
- Entry 83 (UD-WW), Fleet Marine Correspondence, 1957-58, Box 1
- Entry 86 (UD-WW), Fleet Marine Correspondence, 1957, Box 1
- Entry 93, Facilities and Services, 1938-75, Boxes 1-3
- Entry 102 (UD-WW), General Correspondence, 1950-58, Boxes 267-271

RG 165, War Department General and Special Staffs

- Entry 310, Historical Files, 1900-41, Boxes 1, 354

RG 225, Joint Army and Navy Boards and Committees

- Entry 6, Army/Navy Munitions Board, 1942, Boxes 1-4

- Entry 7, Army-Navy Munitions Board Correspondence, 1943-45, Boxes 1-5

RG 269, General Services Administration
- Entry 5(UD), Administrator's General Subject File, 1962-64, Box 19

RG 270, War Assets Administration
- Entry 3, Office of Information, 1946-49, Boxes 87*, 88
- Entry 9, Subject File, Central Office of Real Property, 1946-49, Boxes 67-70, 86

RG 291, Federal Property Resources Service
- Entry 1 (UD-WW), Real Property Disposal Case Files, Boxes 72*, 74, 75, 80, 81
- Entry 5 (A1), Real Property Disposal Case Files, 1949-62, Boxes 46*, 47, 48, 51-53
- Entry 6, (UD-WW), 1970-71, Box 9

RG 330, Office of Secretary of Defense
- Entry 5, 1995 BRAC Commission, Boxes 10*, 35, 87, 112*, 179, 188*, 192, 193, 217, 255-257
- Entry 7, 2005-2006 BRAC Commission, Box 32

RG 334, Records of Interservice Agencies
- Entry 15, Armed Services Explosives Safety Board, Explosion Reports, 1939-48, Boxes 1, 4, 18, 19

RG 384, Office of Navy Material
- Entry 9 (UD-UP), Historical Files 1968-1976, Box 1
- Entry 42 (UD-UP), Naval Shore Establishments 1951-1957, Box 2
- Entry 53 (UD-UP), Alphabetical Subject Files, Boxes 1-3
- Entry 54, Subject Files 1952-1953, Boxes 1-6

RG 428, General Records of Department of Navy 1947
- Entry 1, Confidential Correspondence, Naval Operations, 1948, Box 1117
- Entry 2, Formerly Classified General Correspondence of Deputy Chief of Naval Operations 1948-1951, Boxes 539, 575, 604, 967, 971
- Entry 234, Central Subject Files, Office of Information, 1940-58, Boxes 4, 33
- Entry 240 (UD-WW), Industrial Relations Subject File, 1947, Boxes 4, 8
- Entry 272 (UD-WW), Industrial Relations subject File, 1948, Boxes 3-5, 7

RG 429, Federal Property Council
- Entry 12, Central Real Property Surveys, Boxes 65-A*, 68*, 69*, 72*
- Entry 16, Central Subject File, Boxes 21*, 23-25

Cartographic Records:

RG 23, Coast and Geodetic Survey

- Folders for Charts 1265*

RG 37, Hydrographic Office
- Hydrographic Charts

RG 38, Chief of Naval Operations
- Plans of Major Navy Yards

RG 57, USGS
- 7.5 Minute Quads: Ft. Barrancas*, Gulf Breeze, Pensacola, West Pensacola, Oriole Beach

RG 71, Bureau of Yards and Docks
- Maps for facilities 800*, 805
- Series II microfilm, Reels 621*, 622*, 629*, 631*, 634*, 1385*

RG 77, Chief of Engineers
- AMS, V-747:3544*; V-847: 3544*
- Fortification Map Files, Drawers, 77, 78*, 80*, 128, 254
- War Department Map Collection, 33-Florida
- Real Estate Division, Ft. Pickens (Pensacola)*

RG 92, Quartermaster General
- Blueprint File, Ft. Barrancas*
- General Bound Volumes of Plans, U.S., 1904-05, Ft. Pickens*

RG 94, National Defense Board
- Enclosures to Report 418*

RG 385, Naval Facilities Engineering Command, 1917-1989
- Restricted Access, Architectural and Engineering Plans, Boxes S-6, S-7, S-8, S-22, S-44, S-45, S-46, S-49, S-53*

Aerial Photos:

RG 145, ASCS
- Cans 1284*, 1286, ON30457, ON30458, ON37513*, ON37514, ON37516*, ON37517*

Still Photos:

RG 71, General Records of Bureau of Yards and Docks
- Entry 71-CA
- Entry 71-CB
- Entry 71-CF
- Entry 71-CP

- Entry 71-GS

RG 80-CF, General Records of Department of Navy
- Boxes 96*, 97*

RG 80-G, General Records of Department of Navy
- Boxes 114*, 171*, 198*, 264, 268, 270, 283, 411*, 485, 530*, 691*, 1110, 1203*, 1896*, 1900*, 1910*, 1930, 1943*, 1954*, 1971*, 1972, 1973, 1974*, 1976*, 1989*, 1995*, 2380, 2624

RG 428, General Records of Department of Navy
- Entry 428-GX
- Entry 428-GXA

The archive data search produced one document (*History Naval Air Bases Gunnery Department, 1941-1944*) that describes munitions related activities at Saufley Field, but the document does not specifically include the Saufley Field Skeet Range or Saufley Field Bombing Targets. Archival maps provided information about the areas of the installation where the sites are located, including the general layout, location, and number of structures and improvements in these areas over time.

4.2. Personal Interviews

Malcolm Pirnie's data collection team interviewed the following personnel for information relating to munitions use and history of the ranges at Saufley Field. The interviews were conducted during the initial PA site visit in January 2007 as well as the site visit for this PA conducted in November 2007.

Ms. Pamela Boudreaux, Cultural Resource Manager, NAVFAC SE PWC Pensacola (interviewed during both site visits) **–** Ms. Boudreaux has been employed by NAS Pensacola for 11 years and has been the Cultural Resource Manager for four years. Ms. Boudreaux indicated that there are no known archaeological sites at Saufley Field. Ms. Boudreaux provided the data collection team with a copy of the Integrated Cultural Resources Management Plan (ICRMP).

Mr. Chuck Brevik, Real Property Management, NAVFAC SE PWC Pensacola (interviewed during January 2007 site visit) **–** Mr. Brevik has been employed at NAS Pensacola for three years and was previously employed at NAS Whiting Field for three years. Mr. Brevik provided the data collection team with information regarding property acquisition dates and property boundaries.

Mr. Gregory Campbell, Environmental Engineer, NAS Pensacola Environmental Department (interviewed during both site visits) **–** Mr. Campbell is the primary point of contact at NAS Pensacola. Mr. Campbell provided the data collection team with access to various documents and coordinated the site visits and interviews.

Mr. Mark Gibson, Natural Resource Manager, NAS Pensacola Environmental Department (interviewed during January 2007 site visit) **–** Mr. Gibson has been employed by NAS Pensacola since 1985. Mr. Gibson provided natural resource information related to Saufley Field.

Mr. Harry White, NASP Public Affairs Officer (interviewed during January 2007 site visit) – Mr. White has been employed at NAS Pensacola since 1989. Mr. White provided the data collection team with contact information for former NAS Pensacola personnel who may be able to provide information on munitions use at the installation.

Mr. Jim Kane, Deputy Public Works Officer (interviewed during November 2007 site visit) – Mr. Kane provided general information regarding NAS Pensacola.

Mr. Steve Ward, Real Property Management (interviewed during November 2007 site visit) – Mr. Ward provided the data collection team with real property information for NAS Pensacola, including maps showing historical land parcel transfers for NAS Pensacola.

Mr. Rick Kensell, Map Repository Manager, Del-Jen, Inc. (interviewed during November 2007 site visit) – Mr. Kensell assisted the data collection team with finding historical maps of NAS Pensacola.

4.3. On-Site Data Repositories

Several environmental reports and related documents were available from the PWC. The ICRMP was also available. Installation-specific information obtained during the records search was helpful in developing general physical profiles regarding the areas where the sites are located. The documents, as well as interviews with installation personnel and observations made during the visual survey, served as the primary sources of site-specific information for this PA.

4.4. Visual Survey

The data collection team conducted a visual survey of each site/range as part of the data collection effort for the PA. The purpose of the visual survey was to identify MEC and ordnance related materials (e.g., expended rounds, fragmentation, range debris, old targets), evidence of MC (e.g., ground scarring, stressed vegetation, chemical residue), and/or surface features (e.g., firing points, targets, buildings) 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. A description of the areas surveyed and the results of the survey are provided in Section 5.

The type of range and weapons known or suspected to have been used on the site drives the materials and/or features that the data collection team looked for during the visual survey. For the Saufley Field Skeet Range, the data collection team looked for evidence of former firing pads, range structures, clay target fragments, and expended small arms ammunition (i.e., bullets and bullet fragments). For the Saufley Field Bombing Targets, the data collection team looked for evidence of MEC and ground scarring associated with former range activities. A handheld Global Positioning System receiver was used to track and capture location data. Photographs were taken to document observations made. Because of the thick vegetation and presence of the airfield security fence across the center of the Skeet Range, the data collection team was able to walk approximately 15% of the site and visually observe at least 30% of the site from the path walked. The Bombing Targets site is located in an open, flat area. Approximately 50% of the site (the entire area where munitions were expected to have been concentrated) was walked, and 100% of this portion of the site was visible from the path walked.

4.5. Off-Site Data Sources

The data collection team visited the National Museum of Naval Aviation at NAS Pensacola to obtain additional historical information regarding the installation and the MRP ranges/sites. Several historical documents were examined. One document pertinent to the Saufley Field Bombing Targets was identified. This document was a historical aerial photograph from the early 1940s, showing that the ground in the vicinity of the targets was disturbed.

5. SITE CHARACTERISTICS

The following sections provide site-specific information about the two PA sites located at Saufley Field that are the focus of this PA report, including history and site description, land use, access controls and restrictions, visual survey observations and results, contaminant migration routes, and potential receptors.

5.1. Saufley Field Skeet Range

5.1.1. History and Site Description

The Saufley Field Skeet Range was located approximately 650 feet west of the northwest tip of Runway 14 at Saufley Field. The range first appears on a map of NAAS Saufley dated 30 June 1943 (Figure 5.1-1) and is also illustrated on maps dated 1946 through 1949. The Skeet Range House labeled "Building 852" and two structures labeled "Well and Pump House at Skeet Range" are also illustrated on the historical maps. An information booklet dated 1945 describes the skeet range as "two 100-foot by 100-foot areas with five stations each" (U.S. Navy, 1945). In April through June of 1945, a specialized training syllabus was given to 962 pilots who were waiting for suitable flying weather at Saufley Field. The syllabus included a requirement for each student to fire 150 rounds of shotgun firing and 150 rounds of .38-caliber pistol firing; however, this document did not specify whether this firing occurred at the Skeet Range (Division of Administrative Staffs of Naval Air Training Bases Pensacola, Unknown).

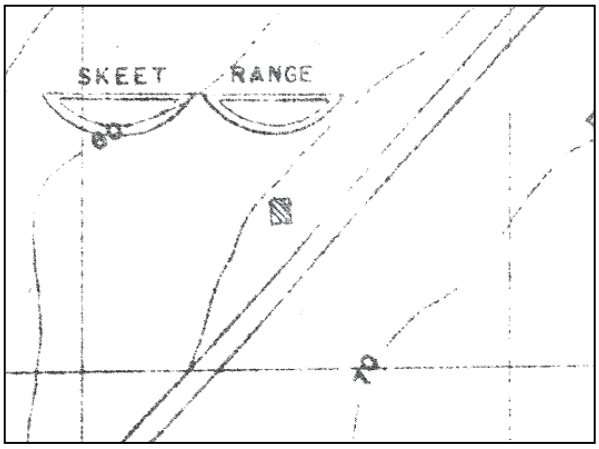


Figure 5.1-1: Skeet Range and Skeet Range House as shown on 1943 map of NAAS Saufley

The Skeet Range site is primarily undeveloped and unused. The airfield fence line crosses the center of the site, as shown on Map 5.1-1. The area north of the fence is characterized by undeveloped forest and wetlands. The area south of the fence is vegetated with thick wooded areas to the west, and it is vegetated with regularly mowed turf grass to the east, where the former firing area was located. An asphalt jogging trail and the tip of Runway 14 are located in the

southeast portion of the site boundary. The southwest portion of the site overlaps the northern portion of the Saufley Field Small Arms Range, which was assessed during the 2007 PA of NAS Pensacola. Munitions usage at the Small Arms Range likely included .22-caliber, .30-caliber, .38-caliber, and .45-caliber pistol and rifle ammunition; however, no munitions debris was observed at the Small Arms Range during the 2007 PA.

Based on a review of historical documents, aerial photographs, and observations made during the visual survey, the Saufley Field Skeet Range was constructed and used as a double-field skeet range. According to Army Technical Manuals (referenced as AR 750-10 and TM 9-855) and the Navy Programming Guide (1958), the shooting field (i.e., firing arc) for a single-field skeet range was laid out as a 63-foot radius semi-circle with concrete/asphalt walkways. The surface danger zone (SDZ), which includes the down-range hazard area and safety fan, consisted of a semi-circle with a 900-foot radius that utilized the same apex as the shooting field (see Figure 5.1-2). For a single-field skeet range, the acreage of the SDZ would be approximately 30 acres. The Saufley Field Skeet Range covers approximately 31.6 acres, which encompasses the SDZ associated with both firing arcs.

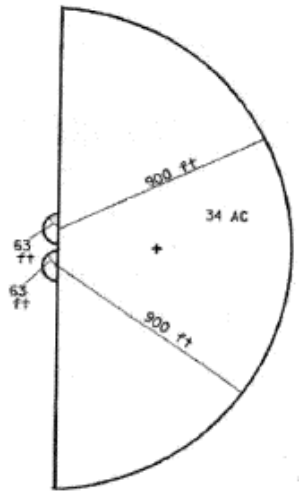


Figure 5.1-2: Typical Surface Danger Zone of a Double-field Skeet Range (AR 750-10 and TM 9-855)

5.1.1.1. Topography

The topography of Saufley Field is discussed in Section 3.2. The topography of the Skeet Range is relatively flat. Surface drainage flows north towards Eight Mile Creek and Eleven Mile Creek, which flow southwest toward Perdido Bay.

5.1.1.2. Geology

The geology of Saufley Field is discussed in Section 3.3. The Saufley Field Skeet Range is located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated

terrace deposits and the Citronelle Formation of Pleistocene age (FGS, 1994). These Pleistocene units are found at depths ranging from 50 feet to 55 feet bgs, and are approximately 400 feet in thickness. They consist of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).

5.1.1.3. Soil and Vegetation Types

The soil and vegetation types associated with Saufley Field are discussed in Section 3.4. Soils within the vicinity of the airfield are generally well-drained sandy and loamy soils. The areas northwest of the airfield are characterized by poorly drained sandy soils and muck. Surface sediments at Saufley Field have been classified with the Pickney Sand, Croatan and Pickney Soils, Poarch Sandy Loam, Grady Loam, Troup Sand, and Bonifay Loamy Sand soil complexes (USDA, 2004).

During the visual survey of Skeet Range, the accessible portions along the southwest corner of the site were vegetated with thick brush, low lying shrubs, and mature trees (pine and oak). The eastern portion of the site, south of the airfield fence line, is vegetated with regularly mowed grass. The portion of the Skeet Range north of the fence is inaccessible from the airfield, and aerial photography indicates this portion of the site is covered with thick forestland and wetland vegetation that may reduce accessibility from surrounding areas.

5.1.1.4. Hydrology

The hydrology of Saufley Field is discussed in Section 3.5. Aerial photography indicates the portion of the site north of the airfield fence line primarily contains wetlands. No surface water features are located on portions of the Skeet Range south of the fence.

5.1.1.5. Hydrogeology

The hydrogeology of Saufley Field is discussed in Section 3.6. Water level elevations were recorded at UST Site 2406, located over 2,000 feet south of the range. Water elevations were recorded between 75.42 feet and 100.60 feet; however, depths to groundwater were not reported. Deep groundwater flows southeast, intermediate groundwater flows west and southwest, and

shallow groundwater flows northwest and northeast at Saufley Field (Tetra Tech NUS, Inc., 2005). No monitoring wells or groundwater information exists for the Skeet Range site.

5.1.1.6. Cultural and Natural Resources

No cultural resources were identified for the Skeet Range. Natural resources at Saufley Field include the wetlands located on the northern portion of the site and the floodplains for Eight Mile Creek and Eleven Mile Creek. Cultural and natural resources associated with Saufley Field are discussed in Section 3.7.

5.1.1.7. Endangered and Special Status Species

Threatened, endangered, and special status species for Saufley Field are discussed in Section 3.8. Currently, there are no known threatened or endangered species on the Skeet Range. The Gopher tortoise and Alligator snapping turtle are Species of Special Concern in the state of Florida and have been observed at Saufley Field (INRMP, 2001). Natural habitats for the Gopher tortoise include remnant sand dunes and pine plantations. Although these are not characteristic habitats at Saufley Field, the southwest portion of the Skeet Range site provides similar habitats. The Alligator snapping turtle resides in blackwater stream habitats, which may be present on the undeveloped portion of the Skeet Range located north of the airfield fence line.

5.1.2. Visual Survey Observations and Results

Malcolm Pirnie team members (Ms. Susan Burtnett, Ms. Angela Nolan, and Mr. Dan Hains) conducted a visual survey of the Saufley Field Skeet Range on 29 November 2007. The airfield fence line runs east to west across the Skeet Range and restricted access to the northern portion of the site. During the visual survey, the team used a meandering path to walk around the accessible portions of the site and vicinity. The former firing area is located in an open, grassy area which is bordered by thick brush and mature trees (see Figure 5.1-3). An asphalt jogging trail is located south of the southern range boundary. Three concrete building foundations were observed south of the firing arcs, along the jogging trail (see Figure 5.1-4). The foundations are likely the remnants of the Skeet Range House, Well House, and Pump House. Four firing pads were easily discernible along the western firing line in the shape of an arc. No structures are located in the vicinity of the range, and the area remains undeveloped and vegetated.

Figure 5.1-3: Saufley Field Skeet Range, facing north (November 2007)

Figure 5.1-4: Saufley Field Skeet Range House Foundation (November 2007)

Fragments of clay targets were observed northwest and northeast of the firing lines, as well as along the western firing line. The highest densities of fragments were observed in the vicinity of the firing lines. Munitions debris was observed inside a wooded area approximately 250 feet northwest of the firing arc. The debris included multiple metal bases to 12-gauge shotgun shells and one casing from an expended .38-caliber bullet. Based on the density of the observed munitions debris, this area was likely a disposal area for small arms ammunition. No MEC were observed during the visual survey.

A visual depiction of the site reconnaissance is provided on Map 5.1-1 located at the end of Section 5.1. Additional range/site details are illustrated on Map 5.1-2, also located at the end of Section 5.1.

5.1.3. 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, including the types and estimated maximum penetration depths. This includes both MEC and nonhazardous munitions related scrap (e.g., fragmentation, base plates, inert mortar fins). Potential ordnance concentration areas are presented, along with a discussion on the presence of special consideration ordnance.

Munitions use at the Skeet Range, which was used as a double-field skeet range, was likely limited to 12-gauge, 16-gauge, 20-gauge, and .410-caliber shotgun ammunition. The exact quantity of shotgun ammunition deployed or fired at the range is unknown. Firing records were not available, and there is no defensible method of determining the amount of ammunition potentially fired at the range. The southwest portion of the site overlaps the northern portion of the Saufley Field Small Arms Range, which was assessed during the 2007 PA of NAS Pensacola (Malcolm Pirnie, Inc., 2007). Munitions usage at the Small Arms Range likely included .22-caliber, .30-caliber, .38-caliber, and .45-caliber pistol and rifle ammunition; however, no munitions debris was observed at the Small Arms Range during the 2007 PA.

Ordnance technical data sheets for the various ammunition listed above are included in Appendix D. Based on the information obtained during the data collection process, other munitions types, including special consideration munitions (i.e., chemical warfare material filled munitions, electrically fuzed munitions, and/or depleted uranium associated munitions), are not known nor suspected to have been used at the site.

5.1.4. MEC Presence

The entire site has been subdivided and categorized into one of three levels of MEC presence, including: Known MEC Areas, Suspected MEC Areas, and Areas Not Expected to Contain MEC to indicate that MEC are known or are suspected to be at the site. The MEC presence is discussed below. Map 5.1-3 illustrates the munitions characterization of the Saufley Field Skeet Range and is provided at the end of Section 5.1.

5.1.4.1. Known MEC Areas

Because the site was used only for small arms training and there is no historical or known evidence of explosives used at the site, there is no evidence of MEC. As such, there are no known MEC areas associated with the Saufley Field Skeet Range.

5.1.4.2. Suspected MEC Areas

There are no suspected MEC areas associated with the Saufley Field Skeet Range.

5.1.4.3. Areas Not Suspected to Contain MEC

Based on observations made and data collected during the PA process, the entire 31.6-acre Skeet Range site is not suspected to contain MEC.

5.1.5. 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. The technical documents, however, apply to air dropped and indirect fire weapons and do not apply to skeet ranges. By design, skeet ammunition is dispersed as pellets over a small area in the direction of fire. According to the 1958 Navy Programming Guide, the minimum SDZ for a skeet range is 900 feet (Navy Bureau of Aeronautics, 1958). Pellets dispersed from a shotgun would be deposited on the ground surface well within this zone and would not penetrate the ground surface unless disturbed.

5.1.6. MC

The primary MC of concern associated with shotgun ammunition is lead. Metallic lead is insoluble in water, but in the geochemical environment of most ranges it may slowly convert to other oxidized forms. Depending on the environment (e.g., soil characteristics, pH, organic matter present), oxidation products can become mobile. However, lead mobility is effectively controlled by adsorption under the majority of conditions found on small arms ranges. In general, an exponential decline in lead concentrations has been observed in very short vertical distances due to adsorption or exchange reactions with clays, metal oxides, or organic matter in the soil. As such, lead mobility is not likely to be an issue at most ranges.

Other MC may include antimony, arsenic, copper, nickel, zinc, and constituents associated with black or smokeless powder. However, these constituents are less likely to be of concern since they are either present in the ammunition item in only minor amounts/concentrations or typically consumed when the shotgun round is fired. Because clay targets were identified at the former range, polycyclic aromatic hydrocarbons (PAHs) associated with the targets may be present at the

site. However, PAHs present in clay targets tend to be tightly bound in the petroleum pitch and limestone matrix of the target and are not readily available to the environment. In addition, the clay targets contain low solubility, high molecular weight PAHs that are not likely to effectively leach into the surrounding soils.

For skeet ranges, the area where the clay targets and lead shot typically accumulated during the active life of the range extended from the firing arc to approximately 600 feet in the general direction of fire. Clay targets typically would be found within the first 300 feet, and lead shot would be found from 300 feet to 600 feet from the firing arcs. This is where the majority of associated MC, if present, would be expected to be present at the site.

Based on discussions with installation personnel, surface soil sampling at the Skeet Range has not been conducted. No monitoring wells exist on the site, but groundwater monitoring wells currently are being used over 2,000 feet south of the former range at UST Site 2406.

5.1.7. Contaminant Migration Routes

Migration of MC from the Saufley Field Skeet Range may occur naturally due to soil erosion, surface runoff, infiltration and leaching, or plant/animal uptake. Human activities, including maintenance (e.g., mowing) and grading, can cause MC migration. Maintenance and construction activities that have taken place at the site may have resulted in deposition of lead shot and clay target pieces in the top one to two feet of surface soil at the former range. Future construction, excavation, or other site work could also serve as a migration/release mechanism. The main source of potable water for Saufley Field is a well field located at NTTC Corry Station, north of Bayou Grande. No activities are conducted at the Skeet Range that would result in contact with groundwater; therefore, contaminant migration to groundwater is not expected. Air migration of contaminants could occur if soil particles become airborne. The thick vegetation and high precipitation in the area minimizes the mobility of soil; therefore, air migration of contaminants is not expected.

5.1.8. Receptors

Potential receptors at the Skeet Range include human and ecological receptors possibly contacting and disturbing or removing soil impacted by the lead bullets, bullet fragments, and/or

clay target fragments at the site. Potential human receptors include Navy personnel, contractors, and trespassers/visitors. Terrestrial ecological receptors may include mammals (e.g., foxes, bears, squirrels), reptiles (e.g., tortoises), terrestrial plants, and a variety of bird species. Aquatic ecological receptors in nearby surface water may include various species of fish, amphibians, and aquatic/wetland vegetation. Currently, there are no known threatened or endangered species on the Skeet Range. The Gopher tortoise and Alligator snapping turtle have special species status in the state of Florida, and both species have been observed at Saufley Field (INRMP, 2001).

Human receptors may come into direct contact with MC while performing environmental studies, ecological studies, or maintenance activities (Navy personnel and contractors) or while hiking (trespassers and visitors). Ecological receptors may come into direct contact with MC in surface soil while foraging or burrowing. Ecological receptors may also come into contact with MC that have been incorporated into the food chain (bioaccumulated in plants and small animals).

5.1.8.1. Nearby Populations

Saufley Field is located in Escambia County, Florida. According to the 2003 Joint Land Use Study (JLUS) for Escambia County, approximately three-quarters of the land within a 1-mile radius of Saufley Field is vacant. The remaining land contains mostly single-family housing (GMD, 2003). According to 2000 U.S. Census Bureau statistics, the population of Escambia County is 294,410, with a population density of 444.7 people per square mile. Pensacola is the nearest city and has a population of approximately 56,255 (Fact Sheet, Escambia County, Florida). Saufley Field maintains a population over 1,000 (GlobalSecurity.org, Saufley Field).

5.1.8.2. Buildings Near/Within Site

There are no buildings on or near the Saufley Field Skeet Range. The concrete building foundations of the former Skeet Range House, Well House, and Pump House are located just south of the site. Four square, concrete firing pads form an arc along the former western firing line. The airfield fence line crosses the center of the site, and the tip of Runway 14 and an asphalt jogging trail are located on the southeast portion of the site. No other structures exist at the site or in the immediate vicinity.

5.1.8.3. Utilities On/Near Site

No utilities are located on the Skeet Range, and none were observed in the immediate vicinity of the site. The active runways are located east of the site, and buried utility lines may exist in the vicinity of the airfield.

5.1.9. Land Use

According to the 2003 JLUS of Escambia County, approximately 75% of the land within a one-mile radius of Saufley Field is vacant, and the remaining area primarily supports single-family housing. The Skeet Range is currently closed and unused. Because of its proximity to the active airfield, the entire site falls within the Saufley Noise Contours, and portions of the site are in designated Clear Zones and Accident Potential Zones (GMD, 2003). The entire site is generally designated for future public use; however, the JLUS recommended creating an Airfield Influence Planning District 1 (AIPD1) to place future development restrictions on areas within Clear Zones and Accident Potential Zones.

All of Saufley Field, including the Skeet Range, is designated as AIPD1 by the 2003 JLUS. Areas designated AIPD1 contain airfield Clear Zones and Accident Potential Zones. The JLUS recommended limiting future development in AIPD1 to one single-family dwelling unit per 2.5 acres. Schools, churches, hospitals, multifamily residential units, and other buildings that concentrate people in compact areas were also recommended to be prohibited in AIPD1.

5.1.10. Access Controls/Restrictions

The portion of the Skeet Range north of the airfield fence line cannot be accessed from the airfield, and dense vegetation and wetlands may pose natural access restrictions to this portion of the site from surrounding areas. Access to Saufley Field is limited by a security checkpoint; however, the portion of the Skeet Range south of the fence is easily accessible from within the installation.

5.1.11. 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 include the USEPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (USEPA, 1988) and the *Final USACE CSM Guidance Development of Integrated Conceptual Site Models for Environmental Ordnance and Explosives Sites* (USACE, 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 linking them. The CSM is the basis for the prioritization and remediation cost estimate.

The CSM is presented in a series of information profiles that provide information about the site. The information profiles are included in Table 5.1-1.

Table 5.1-1: CSM Information Profiles – Saufley Field Skeet Range

Profile Type	Information Needs	PA Findings
Range/Site Profile	Installation Name	Saufley Field
	Installation Location	NAS Pensacola, Escambia County, Florida
	Range/Site Name	Saufley Field Skeet Range
	Range/Site Location	The Saufley Field Skeet Range is located in the northwestern corner of Saufley Field. The center of the site is located approximately 650 feet west of the northwestern tip of Runway 14, and the SDZ extends northwards past the fence line of the airfield.
	Range/Site History	The Skeet Range is shown on maps dated 1943 and 1946 through 1949. The Skeet Range House is visible on aerial photographs of Saufley Field dated 1943 and 1945, as well as on historical maps. An information booklet dated 1945 describes the Skeet Range as two 100-foot by 100-foot areas with five stations each (U.S. Navy, 1945). No other information regarding the history of the range was identified.

Table 5.1-1: CSM Information Profiles – Saufley Field Skeet Range		
Profile Type	**Information Needs**	**PA Findings**
	Range/Site Area and Layout	The Skeet Range is a 31.6-acre site located in the northwestern portion of Saufley Field. The site consisted of one double-field skeet range with two, adjacent 100-foot firing areas. The firing arcs were centered approximately 650 feet west of the northwest tip of Runway 14, and fire was directed northwards. The site boundary encompasses the two firing areas and the SDZs associated with them. A fence line runs across the center of the site, and the area north of the fence is comprised of undeveloped forestland and wetlands. The firing areas are located in a regularly mowed, grassy area south of the fence. Four square, concrete firing pads form an arc along the western firing line, and three concrete building foundations are located south of the firing arcs along an asphalt jogging trail. A small portion of the Saufley Field Small Arms Range, a 1.2-acre site addressed during a 2007 PA, overlaps the southwest portion of the Skeet Range.
	Range/Site Structures	The foundations of the former Skeet Range House, Well House, and Pump House are located just south of the Skeet Range Boundary. Four square, concrete firing pads are located on the former western firing arc. An asphalt jogging trail and the tip of Runway 14 are located on the southeast portion of the site. The airfield fence line runs east-west through the center of the site.
	Range/Site Boundaries	N: Undeveloped forestland and wetlands, Eleven Mile Creek and Eight Mile Creek S: Airfield, Saufley Field Small Arms Range W: Undeveloped forestland, Saufley Field property boundary E: Airfield, developed areas
	Range/Site Security	A security check point must be passed to gain access to Saufley Field. A fence surrounds the airfield; however, access to the site within the boundaries of Saufley Field is not directly restricted from within the check point. Access to the site north of the fence is restricted from the airfield, and thick forestland and wetland vegetation north of the fence may prohibit access from surrounding areas.

Table 5.1-1: CSM Information Profiles – Saufley Field Skeet Range		
Profile Type	**Information Needs**	**PA Findings**
Munitions/ Release Profile	Munitions Types	Documentation on specific ordnance types used at the range was not identified; however, typical munitions used at Skeet Ranges include 12-gauge, 16-gauge, and 20-gauge, and .410-caliber shotgun ammunition. The Saufley Field Small Arms Range boundary overlaps the southwestern portion of the Skeet Range. Munitions usage associated with the Small Arms Range includes .22-caliber, .30-caliber, .38-caliber, and .45-caliber ammunition; however, no munitions debris was observed at the Small Arms Range during the 2007 PA site visit. Munitions debris observed at the Skeet Range included 12-gauge shotgun debris and one casing for an expended .38-caliber bullet.
	Maximum Probability Penetration Depth	Ammunition is expected to have penetrated the surface only. By design, skeet ammunition is dispersed as pellets over a small area in the direction of fire. Demolition of former ranges and site structures and construction and grading of former range areas may have resulted in deposition of lead shot and broken clay targets in the top one to two feet of soil at the site.
	MEC Density	Based on historical documentation, the Saufley Field Skeet Range was used for small arms training only. MEC or non-hazardous munitions-related scrap are not known or suspected to have been present at the site.
	MEC Scrap/Fragments	Based on historical documentation, the Saufley Field Skeet Range was used for small arms training only. MEC or non-hazardous munitions-related scrap are not known or suspected to have been present at the site. Munitions debris was concentrated in a wooded area 250 feet northwest of the firing arcs. It included multiple bases to 12-gauge shotgun casings and one casing from an expended .38-caliber bullet. Fragments of clay targets were also observed at the site.

Table 5.1-1: CSM Information Profiles – Saufley Field Skeet Range		
Profile Type	**Information Needs**	**PA Findings**
	Associated MC	The primary MC associated with small arms ammunition is lead. Other MC may include antimony, arsenic, copper, nickel, zinc and constituents associated with black and/or smokeless powder; however, these constituents are less likely to be of concern as they are either present in only minor concentrations or are typically consumed when the small arms ammunition is fired. PAHs may be present from the broken clay targets. Surface soil sampling at the range has not been conducted. Shallow, intermediate, and deep site monitoring wells were installed during a Site Assessment of UST Site 2406, located over 2,000 feet south of the site; however, no sampling for MC has been conducted at the Skeet Range. No groundwater supply wells are located in the vicinity of the site.
	Migration Routes/Release Mechanisms	Migration of MC from the Saufley Field Small Arms Range may occur naturally due to soil erosion, surface runoff, infiltration and leaching, or through plant/animal uptake. Human activities, including maintenance (e.g. mowing) and grading, can cause MC migration. Future construction, excavation, or other site work could also serve as a migration/release mechanism.
Physical Profile	Climate	The climate at Saufley Field is humid, sub-tropical and is characterized by short, mild winters and long, warm summers. The average monthly temperature in the wintertime is 54°F, while the average monthly temperature in the summertime is 80°F. The average annual temperature is 68°F. There is an average of nine freezes per year; however, temperatures in the area rarely fall below 15°F - 20°F. The average annual precipitation totals around 62 inches or less, with the wettest month being July, which has an average precipitation of 7.2 inches, and the driest month being November, which has an average precipitation of 3.4 inches. Severe weather includes thunderstorms, tornadoes, tropical storms, and hurricanes. Hurricane season is June through November. The last hurricanes to affect the Pensacola area were Hurricanes Erin and Opal in 1995, Hurricane Ivan in 2004, and Hurricanes Dennis and Katrina in 2005.

Table 5.1-1: CSM Information Profiles – Saufley Field Skeet Range		
Profile Type	**Information Needs**	**PA Findings**
	Topography	Saufley Field lies on a low ridge approximately 85 feet above msl. It gently slopes to 25 feet above msl to the north of Eight Mile Creek, and it slopes to 10 feet above msl southward to the edge of Perdido Bay. The topography of the Skeet Range is relatively flat.
	Geology	The Saufley Field Skeet Range is located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated terrace deposits and the Citronelle Formation of Pleistocene age (FGS, 1994). These Pleistocene units are found at depths ranging from 50 to 55 feet bgs, and are approximately 400 feet in thickness, consisting of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).
	Soil	Soils within the vicinity of the airfield are generally well-drained sandy and loamy soils. The areas to the northwest of the airfield are characterized by poorly drained sandy soils and muck. Surface sediments at Saufley Field have been classified with the Pickney Sand, Croatan and Pickney Soils, Poarch Sandy Loam, Grady Loam, Troup Sand, and Bonifay Loamy Sand soil complexes (USDA, 2004).
	Hydrogeology	No monitoring wells or groundwater information exists for the Skeet Range. According to Addendum 2 of the Site Assessment Report for UST Site 2406 at Saufley Field, deep groundwater flows southeast, intermediate groundwater flows west and southwest, and shallow groundwater flows northwest and northeast at Saufley Field (Tetra Tech NUS, Inc., 2005). Depths to groundwater were not provided in the report.

Table 5.1-1: CSM Information Profiles – Saufley Field Skeet Range		
Profile Type	**Information Needs**	**PA Findings**
	Hydrology	Wetlands exist on the portion of the Skeet Range north of the airfield fence line. No surface water bodies exist on the Skeet Range south of the fence. Surface water runoff drains north along the site through the wetlands and towards Eight Mile Creek and Eleven Mile Creek. The creeks flow southwest from Saufley Field towards Perdido Bay.
	Vegetation	The southeastern portion of the range is an open, grassy field. The western and northeastern portions of the site are vegetated with thick brush, low lying shrubs, and mature trees (pine and oak). The northern and northwestern portions of the site consist of wetlands and forestland.
Land Use and Exposure Profile	Current Land Use	The Skeet Range is currently closed and has no designated or future planned land use. Two active runways at Saufley Field are located southeast of the range, the closest runway being located on the southeast corner of the site. NAS Whiting Field pilots use two of the airstrips for touch and go landing exercises.
	Current Human Receptors	Current human receptors include Navy personnel, contractors, and trespassers/visitors. Navy personnel and contractors may access the site to perform environmental or ecological studies or maintenance activities. Trespassers/visitors may include hikers or naturalists who can access the site from Saufley Field.
	Current Activities (frequency, nature of activity)	Current activities include infrequent environmental/ecological investigations by Navy personnel and/or contractors, and hiking by trespassers/visitors.
	Potential Future Land Use	The potential future land use remains the same as the current land use, as no change in land use is planned.
	Potential Future Human Receptors	Potential future human receptors remain the same as the current receptors, as no change in land use is planned.
	Potential Future Land Use Related Activities	Potential future land use related activities remain the same as current land use related activities, as no change in land use is planned.

Table 5.1-1: CSM Information Profiles – Saufley Field Skeet Range		
Profile Type	**Information Needs**	**PA Findings**
	Zoning/Land Use Restrictions	The Skeet Range is designated as AIPD1 by the 2003 JLUS, which recommended limiting future development in AIPD1 to one single-family dwelling unit per 2.5 acres. Schools, churches, hospitals, multifamily residential units, and other buildings that concentrate people in compact areas are also recommended to be prohibited in AIPD1 (GMD, 2003).
	Demographics/Zoning	The population density for Escambia County is 444.7 people/square mile (Fact Sheet, Escambia County, Florida). Approximately 1,356 personnel were employed at Saufley Field in Fiscal Year 2003 (GMD, 2003).
	Beneficial Resources	There are no beneficial resources identified at the Saufley Field Skeet Range. Over 100 acres of wetlands are located at Saufley Field, some of which cover the northern portion of the Skeet Range (GMD, 2003).
Ecological Profile	Habitat Type	According to the 2003 Escambia County JLUS, the Skeet Range is located in an area containing floodplain forests and unique longleaf and mixed pine forests. The Skeet Range also contains wetlands to the north and open, grassy fields to the south.
	Degree of Disturbance	The current and future land uses of the Skeet Range result in a low degree of disturbance to the habitat or ecological receptors.
	Ecological Receptors and Species of Special Concern	Terrestrial ecological receptors may include mammals (e.g., foxes, bears, and squirrels), reptiles (e.g., tortoises), terrestrial plants, and a variety of bird species. Aquatic ecological receptors in nearby surface water may include various species of fish, amphibians, and aquatic/wetland vegetation. Currently, there are no known threatened or endangered species on the Skeet Range. The Gopher tortoise and Alligator snapping are Species of Special Concern in the State of Florida and have been observed at Saufley Field (INRMP, 2001).

Table 5.1-1: CSM Information Profiles – Saufley Field Skeet Range		
Profile Type	**Information Needs**	**PA Findings**
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	Flora may bioaccumulate MC in surface and/or subsurface soil, via plant uptake. Fauna may be exposed to MC in surface soil through ingestion, dermal contact, and inhalation, or by ingesting vegetation or prey organisms that may bioaccumulate MC.

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., nonintrusive grounds maintenance, intrusive construction); and 4) receptors (e.g., Navy personnel, construction workers, recreational users, 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, 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., erosion) and a transport medium (e.g., surface water).

The potential interactions between the source and receptors are assessed differently for MEC and MC. 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. 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.

Figure 5.1-5, included at the end of this section, provides a graphical representation of the current understanding of the Saufley Field Skeet Range and identifies the exposure pathways where site receptors could come in contact with, or be impacted by, MC and/or MEC. Based on the

information obtained during the site visit, including observations made during the visual survey and data collected during the site visit, the potential for MEC does not exist at the site. No complete exposure pathways exist for MEC; therefore, an Exposure Pathway Analysis Figure for MEC was not created. However, information obtained and visual observations indicate that the potential for MC exists.

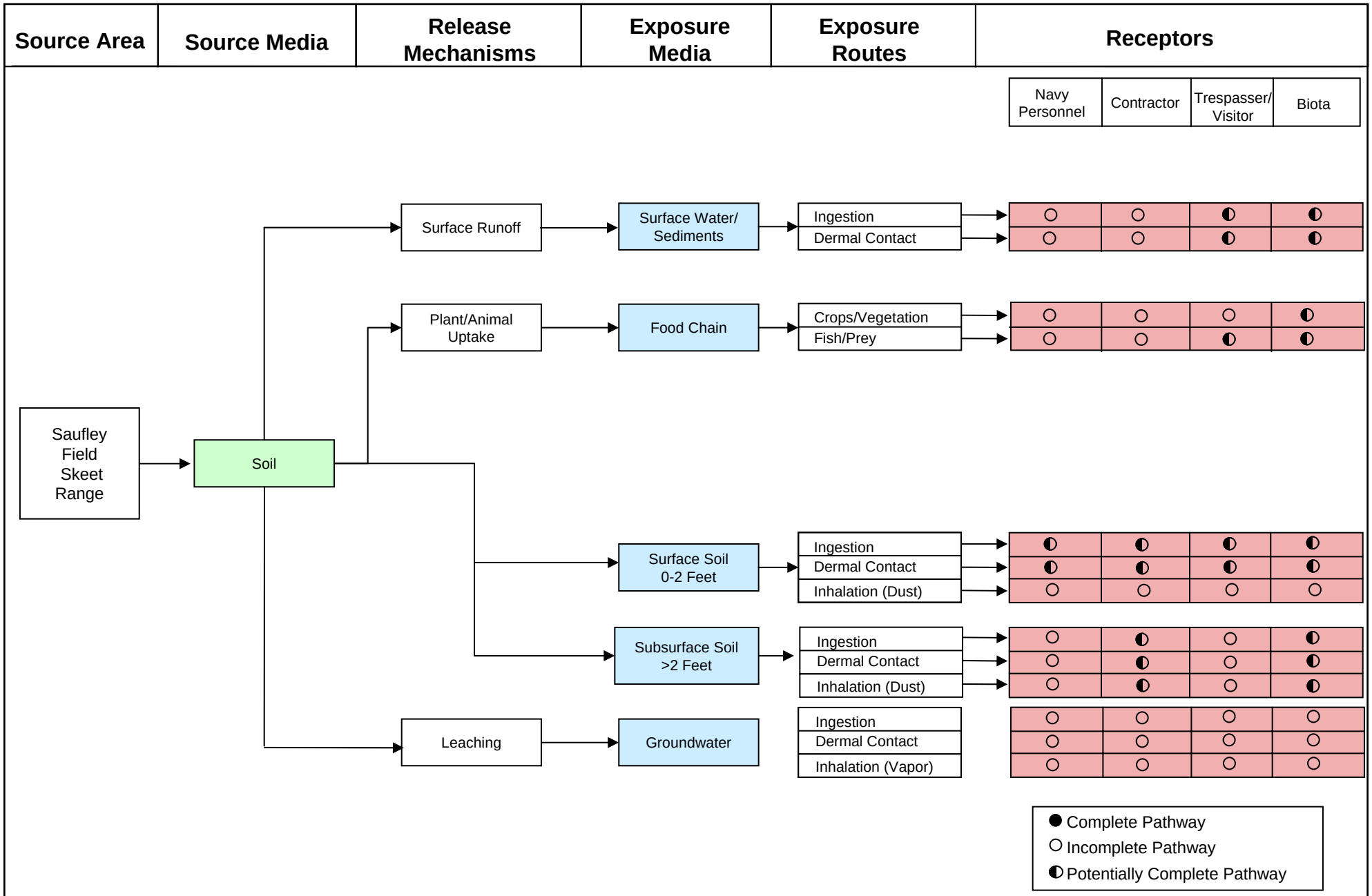
Surface soil contaminated by MC represents a potential source medium, as illustrated in the MC Exposure Pathway Analysis Figure (Figure 5.1-5). Potential human receptors include Navy personnel and contractors conducting environmental or ecological studies on the range and trespassers/visitors (e.g., naturalists and hikers). Potential ecological receptors include terrestrial receptors (e.g. mammals, reptiles, terrestrial plants) that may construct burrows or forage on the former range and aquatic receptors (e.g., fish, amphibians, aquatic/wetland vegetation) in nearby surface water. Potentially complete exposure pathways exist for surface soil through ingestion and dermal contact for both human and ecological receptors. Due to the thick vegetation and high precipitation in the area, dust and wind is minimized, and inhalation of MC in dust in unlikely. Thus, MC exposure pathways via inhalation of surface soil are considered incomplete for all receptors.

MC may also be present in subsurface soil due to migration from the overlying surface soil via leaching mechanisms. A potentially complete exposure pathway exists for contractors/visitors who may be exposed to MC in the subsurface soil during future construction or environmental investigations that include intrusive activities (e.g., subsurface drilling, soil excavation). Potentially complete exposure pathways exist for biota via ingestion, dermal contact, and inhalation during intrusive activities such as burrowing. Subsurface soil exposure pathways for Navy personnel and trespassers/visitors are considered incomplete because they are not expected to conduct intrusive activities at the former range.

Soil also represents a source medium when considering release mechanisms such as groundwater contamination via leaching and plant/animal uptake. MC contamination of groundwater via leaching mechanisms may occur; however, the main source of potable water for Saufley Field is a well field located at NTTC Corry Station. No activities are conducted at the site that would result in contact with groundwater; therefore, groundwater exposure pathways are considered incomplete for all receptors.

MC may migrate from soil to surface water/sediment through surface water runoff to Eight Mile and Eleven Mile Creeks located north of the site. Additionally, groundwater from the site may discharge into the wetlands and creeks as surface water. Potential receptors include trespassers/visitors exploring the area and aquatic and terrestrial biota that forage in the sediment and/or ingest surface water. Potentially complete exposure pathways exist for these receptors via incidental ingestion and dermal contact. Navy personnel and contractors working in the area are unlikely to be exposed to the surface water and associated wetlands which are off-site or beyond the perimeter of the airfield.

MC in soil may be bioaccumulated by plants or consumed by animals foraging on the range. Predation of prey and/or consumption of vegetation on the range may result in bioaccumulation of MC. Potentially complete exposure pathways exist for biota that may be exposed to MC through the food chain, and for trespassers/visitors who may fish in the nearby creeks.



MALCOLM PIRNIE

Prepared for:

FINAL PRELIMINARY ASSESSMENT
SAUFLEY FIELD SKEET RANGE – MC EXPOSURE PATHWAY ANALYSIS
NAVAL AIR STATION PENSACOLA, FLORIDA

MALCOLM PIRNIE, INC.

FIGURE 5.1-5
August 2009

5.1.12. Summary

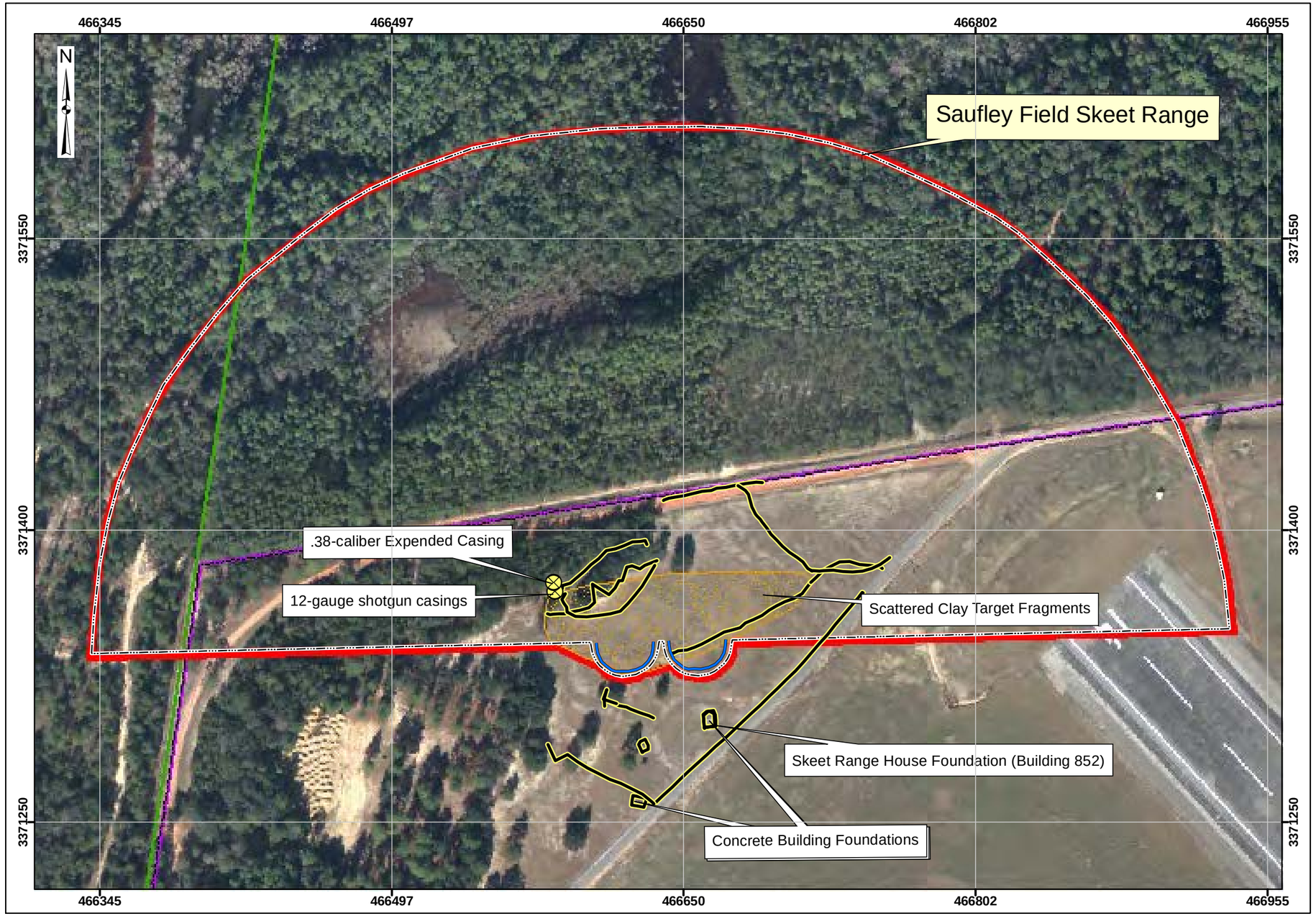
The Saufley Field Skeet Range consists of 31.6 acres located on the northwest portion of Saufley Field. The former firing area of the Skeet Range is located in an open, regularly mowed grass area which is bordered to the north and west by thick brush and mature trees. The airfield fence line crosses the center of the site, and the portion of the site north of the fence is comprised of forestland and wetlands. Four concrete firing pads remain along the former western firing arc, and the concrete foundations of the Skeet Range House, Well House, and Pump House are located just south of the range boundary. With the exception of an asphalt jogging trail and the tip of Runway 14 on the southeast portion of the site, the range area is undeveloped and unused.

Based on information collected from NAS Pensacola, Saufley Field was used for giving fundamental gunnery instruction to pilots as early as 1943. The Skeet Range is shown as a double-field skeet range on maps dated 1943 and 1946 through 1949, and a 1945 information booklet describes the range as having two 100-foot by 100-foot firing areas with five stations each (U.S. Navy, 1945). The site boundary includes the SDZ associated with both firing arcs. The exact usage and period of operation of the range are unknown, and specific ordnance types used at the range were not documented. Munitions used at skeet range typically included 12-gauge, 16-gauge, and 20-gauge, and .410-caliber shotgun ammunition. The southwest portion of the Skeet Range overlaps the Saufley Field Small Arms Range, which was assessed during a separate 2007 PA (Malcolm Pirnie, Inc. 2007). Munitions use associated with the Small Arms Range included .22-caliber, .30-caliber, .38-caliber, and .45-caliber pistol and rifle ammunition; however, no munitions or munitions debris were observed during the 2007 PA.

Fragments of clay targets were observed at the Skeet Range along the western firing line, as well as northwest and northeast of the firing lines. The highest densities of fragments were observed approximately 325 feet northeast and 250 feet northwest of the firing lines. Munitions debris was observed inside a wooded area approximately 250 feet northwest of the firing arc. Munitions debris included multiple metal bases to 12-gauge shotgun shells and one casing from an expended .38-caliber bullet. Based on the density of the observed munitions debris, this area was likely a disposal area for small arms ammunition.

Information obtained during the site visit and observations made during the visual survey provided no evidence of MEC. The potential for MC exists at the site. The primary MC of

concern are lead and PAHs. MC, if present, would likely be located in surface soils north of the firing arcs. For skeet ranges, the area where the clay targets and lead shot typically accumulated during the active life of the range extended from the firing arc to approximately 600 feet in the general direction of fire. Clay targets typically would be found within the first 300 feet, and lead shot would be found from 300 feet to 600 feet from the firing arcs. The highest densities of clay fragments were observed approximately 325 feet northeast and 250 feet northwest of the firing lines. Based on information obtained from the installation, surface soil sampling at the range has not been conducted.



Preliminary Assessment
Naval Air Station Pensacola, Florida

Map 5.1-1
Visual Survey
Saufley Field Skeet Range

Legend

- Installation Boundary
- Range Boundary
- Site Boundary
- Clay Fragments
- Firing Line
- Fenceline
- Site Reconnaissance
- Munitions Debris

0 25 50 100 Meters

Data Source: NAS Pensacola, GIS Data, 2007
Map of Saufley Field, Naval Auxiliary Air Station, Pensacola, FL, Showing Conditions on June 30, 1946

Coordinate System: UTM Zone 16N
Datum: NAD83
Units: meters

Contract: N62472-02-D-1300
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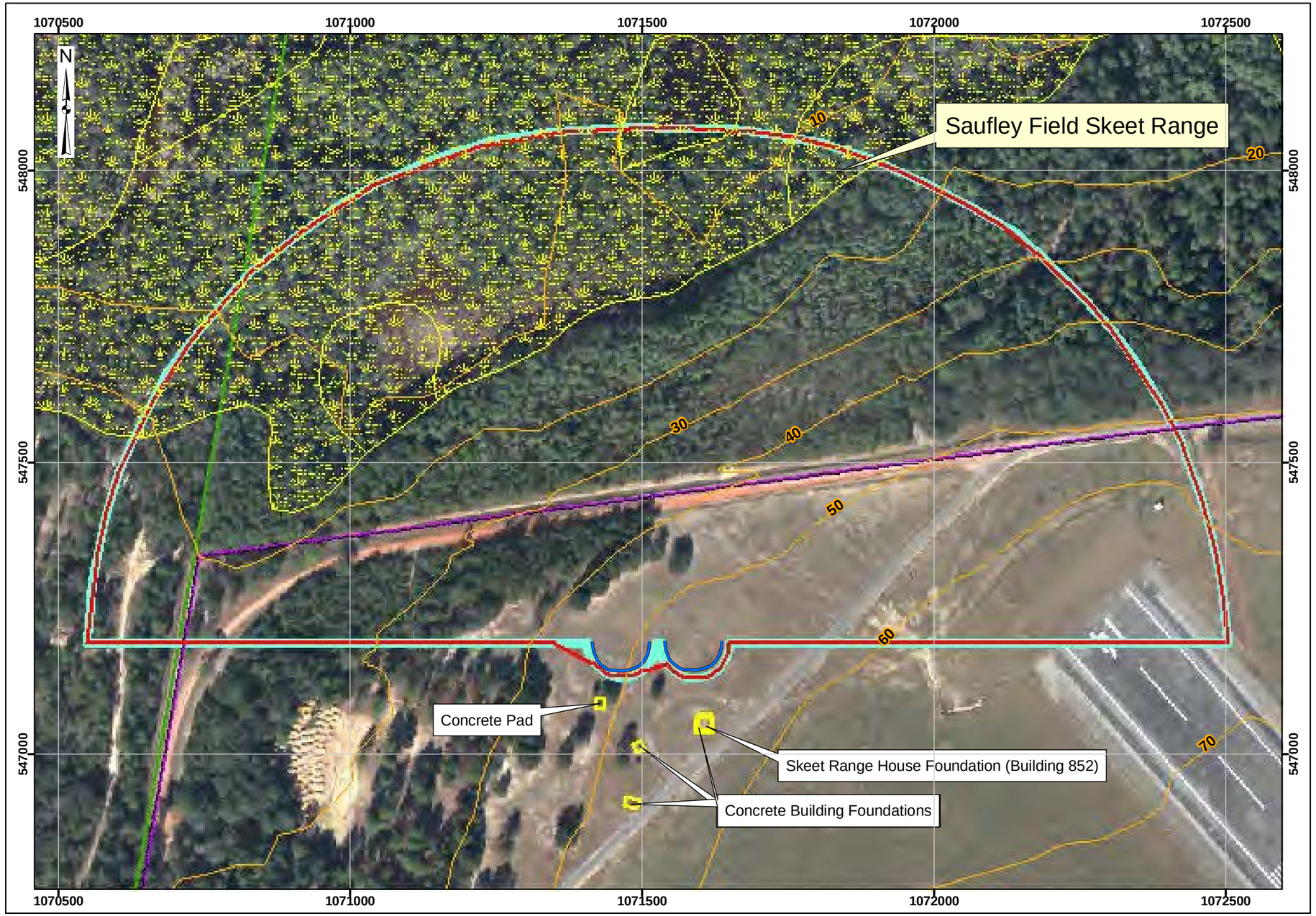

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Map 5.1-2
Range/Site Details
Saufley Field Skeet Range

Legend

- Installation Boundary
- Site Boundary
- Surface Danger Zone
- Elevation Contour (10-ft interval)
- Historical Site Features
- Fenceline
- Firing Line
- Streams
- Wetlands

0 20 40 80 Meters

Data Source: NAS Pensacola, GIS Data, 2007
Map of Saufley Field, Naval Auxiliary Air Station, Pensacola, FL, Showing Conditions on June 30, 1946

Coordinate System: UTM Zone 16N
Datum: NAD83
Units: meters

Contract: N62472-02-D-1300
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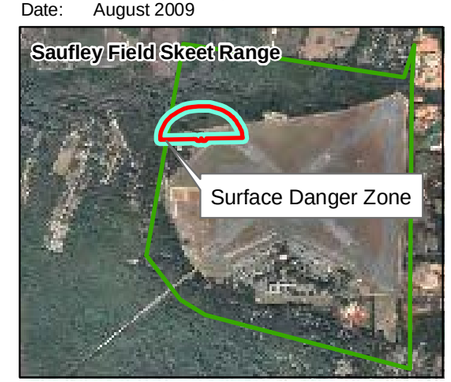

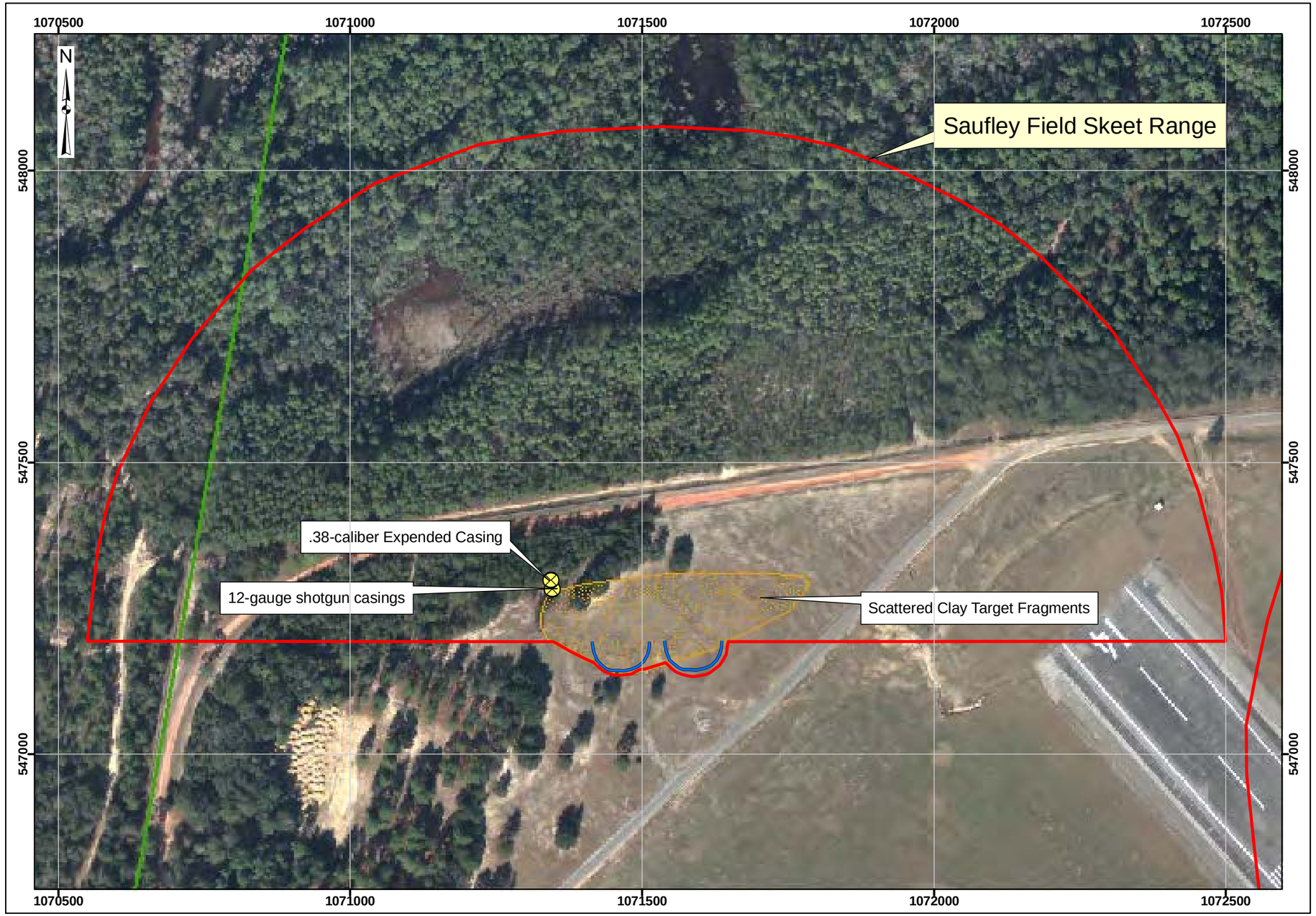

Preliminary Assessment
Naval Air Station Pensacola, Florida

Map 5.1-3
Munitions Characterization
Saufley Field Skeet Range

Legend

- Installation Boundary
- Site Boundary
- Clay Fragments
- Firing Line
- Munitions Debris

MEC Presence*

- Known
- Suspect

*There is no evidence of MEC presence as determined through historical documentation, interviews, and visual survey. Visual observations and/or historical documentation indicate that MC may be present at the site, but MC presence has not been confirmed by sampling or other means.

0 25 50 100 Meters

Data Source: NAS Pensacola, GIS Data, 2007
Map of Saufley Field, Naval Auxiliary Air Station, Pensacola, FL, Showing Conditions on June 30, 1946

Coordinate System: UTM Zone 16N
Datum: NAD83
Units: meters

Contract: N62472-02-D-1300
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5.2. Saufley Field Bombing Targets

5.2.1. History and Site Description

The Saufley Field Bombing Targets site is located just north of the center of the intersection of Runway 14 and Runway 23 at Saufley Field. The Bombing Targets site consisted of two circular targets with diameters of approximately 200 feet each. The two targets appear on maps of NAAS Saufley Field dated 1943 and 1946 (see Figure 5.2-1) through 1949. They are also visible on aerial photographs of Saufley Field dated 1943 and 1945 (see Figure 5.2-2). No other records of the bombing targets have been found.

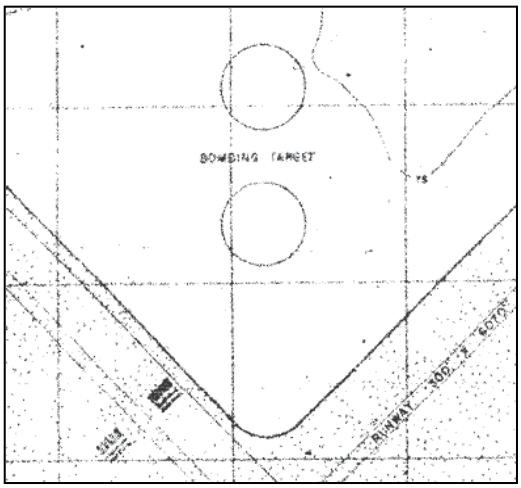


Figure 5.2-1: Saufley Field Bombing Targets, 1946 Map of NAAS Saufley

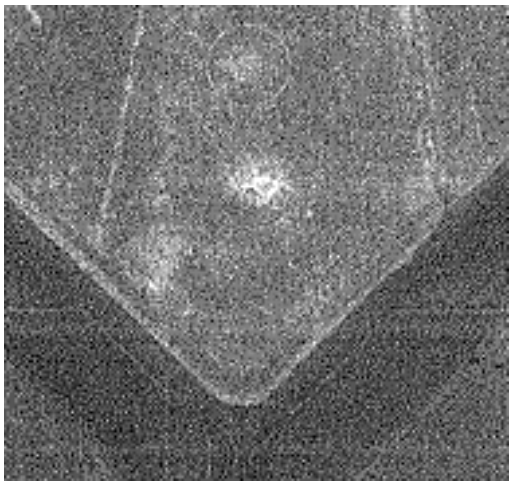


Figure 5.2-2: Saufley Field Bombing Targets, 1945 Aerial Photograph

Due to the close proximity to the runways, inert practice bombs were likely used at the Bombing Targets. Typical munitions usage at practice bombing targets historically included, but was not limited to, 100-pound (lb) practice bombs and M1A1 spotting charges (U.S. Army, 2001). Target scoring arcs have been historically used at bomb targets to facilitate scoring. Scoring arcs generally included 100-foot, 200-foot, and 500-foot circles that were constructed of crushed rock or dirt sprayed with a contrasting color to the surrounding soil (U.S. Army, 2001). A typical 500-foot scoring arc was applied to each bomb target at the site and represents the area where the majority of munitions would have landed. A 1,000-foot radius SDZ was also applied to each target (see Figure 5.2-3). The resultant site boundary of the Saufley Field Bombing Targets encompasses 91.6 acres, which includes the area within the SDZ for each target.

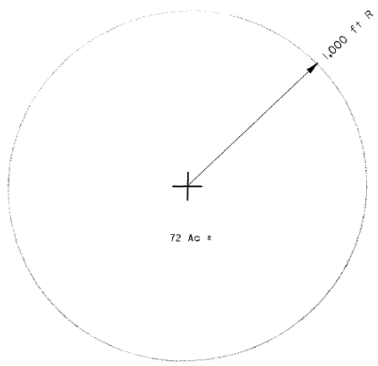


Figure 5.2-3: Typical Practice Bomb Target Surface Danger Zone (U.S. Army 2001)

The Bombing Targets site primarily covers the northern portion of the Saufley Field airfield, including Runway 14 and Runway 23. The site boundary extends northward past the airfield fence line. Based on current aerial photography, two unidentified structures and a densely wooded area are located on this portion of the site.

5.2.1.1. Topography

The topography of Saufley Field is discussed in Section 3.2. The topography at the Bombing Targets is relatively flat. Drainage flows north towards the wetlands associated with Eight Mile Creek and Eleven Mile Creek, which are located north of Saufley Field.

5.2.1.2. Geology

The geology of Saufley Field is discussed in Section 3.3. The Bombing Targets are located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated terrace deposits and the Citronelle Formation of Pleistocene age (FGS, 1994). These Pleistocene units are found at depths ranging from 50 feet to 55 feet bgs, and are approximately 400 feet in thickness. They consist of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).

5.2.1.3. Soil and Vegetation Types

The soil and vegetation types associated with Saufley Field are discussed in Section 3.4. Soils within the vicinity of and northeast of the airfield, where the Bombing Targets are located, are generally well-drained sandy and loamy soils. The areas to the northwest of the airfield are characterized by poorly-drained sandy soils and muck. Surface sediments at Saufley Field have been classified with the Pickney Sand, Croatan and Pickney Soils, Poarch Sandy Loam, Grady Loam, Troup Sand, and Bonifay Loamy Sand soil complexes (USDA, 2004).

The Bombing Targets site is primarily located within the landscape of the airfield and is vegetated with regularly maintained turf grass. A small portion of the site, just north of the airfield fence line, is vegetated with dense forestland.

5.2.1.4. Hydrology

The hydrology of Saufley Field is discussed in Section 3.5. No surface water features are located at the Bombing Targets site. Wetlands associated with the floodplains of Eight Mile Creek and Eleven Mile Creek are located north of the site boundary.

5.2.1.5. Hydrogeology

The hydrogeology of Saufley Field is discussed in Section 3.6. No monitoring wells or groundwater information exists for the Bombing Targets site. Water level elevations at UST Site 2406, over 2,000 feet south of the Bombing Targets, were recorded between 75.42 feet and 100.60 feet. Depths to groundwater were not reported.

5.2.1.6. Cultural and Natural Resources

No cultural resources or natural resources were identified at the Bombing Targets site. Cultural and natural resources associated with Saufley Field are discussed in Section 3.7.

5.2.1.7. Endangered and Special Status Species

Threatened, endangered, and special status species for Saufley Field are discussed in Section 3.8. Due to the proximity of the active runways, the Bombing Targets site does not provide suitable habitat for threatened, endangered, or special status species.

5.2.2. Visual Survey Observations and Results

A visual survey of the Saufley Field Bombing Targets site was conducted on 29 November 2007. Malcolm Pirnie team members Ms. Burtnett, Ms. Nolan, and Mr. Hains were present. During the visual survey, the team used a meandering path to walk around the two bombing targets and the portions of the site within the 500-foot target scoring arcs, where the majority of impacts from range activities would have occurred. No MEC, munitions debris, ground scarring, or evidence of former range activities was observed during the visual survey. The site is located in a cleared, grassy area on the northern side of the airfield, and the entire site within the scoring arcs was visible. Runway 14 and Runway 23 are the only structures located within the 500-foot target scoring arcs associated with the Bombing Targets site.

A visual depiction of the site reconnaissance is provided on Map 5.2-1 located at the end of Section 5.2. Additional range/site details are illustrated on Map 5.2-2, also located at the end of Section 5.2.

5.2.3. 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, including the types and estimated maximum penetration depths. This includes both MEC and nonhazardous munitions related scrap (e.g., fragmentation, base plates, inert mortar fins). Potential ordnance concentration areas are presented, along with a discussion on the presence of special consideration ordnance.

Documentation on specific ordnance types used at the Bombing Targets site was not identified; however, due to the proximity to the runways, ammunition used at the former range likely included various sizes of inert practice bombs with spotting charges used for visualization

purposes. The area comprising the Bombing Targets site appears disturbed in historical aerial photographs, but no evidence of craters was observed in the photos or during the site walk.

Ordnance technical data sheets representative of the various ammunition listed above are included in Appendix D. Based on the information obtained during the data collection process, other munitions types, including special consideration munitions (i.e., chemical warfare material filled munitions, electrically fuzed munitions, and/or depleted uranium associated munitions), are not known nor suspected to have been used at the site.

5.2.4. MEC Presence

The entire site has been subdivided and categorized into one of three levels of MEC presence, including: Known MEC Areas, Suspected MEC Areas, and Areas Not Expected to Contain MEC to indicate that MEC are known or are suspected to be at the site. The MEC presence is discussed below. Map 5.2-3 illustrates the munitions characterization of the Bombing Targets site and is provided at the end of Section 5.2.

5.2.4.1. Known MEC Areas

The spotting charges associated with inert bombs qualify as MEC; however, there is no evidence indicating MEC are present at the Bombing Targets site. No evidence of craters or subsurface disturbance was observed in historical aerial photographs or during the visual survey of the site. The entire site is regularly mowed, and there have been no reported findings of MEC. There are no known MEC Areas associated with the Bombing Targets site.

5.2.4.2. Suspected MEC Areas

The majority of munitions used at the Bombing Targets site are expected to have been concentrated within the targets (U.S. Army, 2001). There have been no reported findings of MEC, and no MEC were observed during the visual survey of the surface of the site. No craters or evidence of subsurface disturbance were observed in historical aerial photographs or during the visual survey of the site. No subsurface investigations have been conducted to confirm the absence of subsurface MEC. Soils at the site are sandy and loamy; therefore, there is a possibility that practice bombs containing unexploded spotting charges may be buried beneath the ground

surface. Based on this, the 25.7-acre area within the 500-foot scoring arcs is a Suspected MEC Area.

5.2.4.3. Areas Not Suspected to Contain MEC

The 65.9-acre area outside of the 500-foot scoring arcs is not suspected to contain MEC.

5.2.5. Ordnance Penetration Estimates

As noted in Section 5.1.5, for the purposes of this PA, maximum probable penetration depths are estimated following guidance listed in the latest draft (July 2002) of DoD Directive 6055.9 (*DoD Ammunition and Explosives Safety Standards*). 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. Typical ordnance penetration depths for loamy soils range from 3.51 feet for 3-pound (lb) bombs to 7.12 feet for 25-lb bombs (USACE, Unknown). No evidence of surface craters or subsurface disturbance was observed in aerial photos or during the site walk of the Bombing Targets site.

5.2.6. MC

Due to the proximity to the active airfield, practice bombs were likely used at the Bombing Targets site. Inert fillers in typical practice bombs included water and/or sand. Spotting charges may have been used and potentially contained trace quantities of MC including titanium tetrachloride, red phosphorous, and pyrotechnics. Potential MC would be concentrated in the area within the 500-foot scoring arcs where the majority of munitions would have landed. No sampling for MC has been conducted at the Bombing Targets site.

5.2.7. Contaminant Migration Routes

Migration of MEC may occur due to soil erosion; however, the grounds at the Bombing Targets site are relatively flat, vegetated with turf grass, and are regularly maintained. Migration of MEC from subsurface soil to surface soil is therefore not expected.

Migration of MC from the Bombing Targets site may occur naturally due to soil erosion, surface runoff, infiltration and leaching, or through plant/animal uptake. Human activities, including maintenance (e.g. mowing) and grading, can cause MC migration. Future construction, excavation, or other site work could also serve as a migration/release mechanism. The main source of potable water for Saufley Field is a well field located at NTTC Corry Station. No activities are conducted at the Bombing Targets site that would result in contact with groundwater; therefore, contaminant migration to groundwater is not expected. The thick vegetation and high precipitation in the area minimizes the mobility of soil; therefore, air migration of contaminants is not expected.

5.2.8. Receptors

Potential receptors at the Bombing Targets site include human and ecological receptors possibly contacting and disturbing or removing soil impacted by MEC and/or MC at the site. Potential human receptors include Navy personnel, contractors, and trespassers/visitors. Terrestrial ecological receptors may include terrestrial plants, as well as mammals (e.g., foxes, bears, and squirrels) and a variety of bird species passing through the area. The close proximity to the active runways and periodic grounds maintenance create an unsuitable habitat for ecological receptors. The Gopher tortoise is a state-listed threatened species in the State of Florida and the species has been observed at Saufley Field, based upon the 2000-2010 Integrated Natural Resource Management Plan (INRMP, 2001).

Human receptors may come into direct contact with MC while performing environmental or ecological studies (Navy personnel and contractors) or while hiking (trespassers/visitors). Human and ecological receptors may come into direct contact with MEC and/or MC in subsurface soil while foraging or burrowing. Ecological receptors may also come into contact with MC that have been incorporated into the food chain (bioaccumulated in plants and small animals).

5.2.8.1. Nearby Populations

Saufley Field is located in Escambia County, Florida. According to the 2003 JLUS for Escambia County, approximately three-quarters of the land within a one-mile radius of Saufley Field is vacant and the remaining contains mostly single-family housing (GMD, 2003). According to 2000 U.S. Census Bureau statistics, the population of Escambia County is 294,410 with a

population density of 444.7 people/square mile (Fact Sheet, Escambia County, Florida). Approximately 1,356 personnel were employed at Saufley Field in Fiscal Year 2003 (GMD, 2003).

5.2.8.2. Buildings Near/Within Site

There are no buildings on or near the portion of the Bombing Targets site within the airfield fence line. The northern sections of Runway 14 and Runway 23 are located within this portion of the site. Based on aerial photography of the site north of the fence, two unidentifiable structures are located on the northern edge of the site boundary.

5.2.8.3. Utilities On/Near Site

No utilities were observed at the Bombing Targets site or within the vicinity. Buried utility lines may be present at the site near the airfield.

5.2.9. Land Use

The Bombing Targets site is located on the northern portion of the airfield. NAS Whiting Field pilots use two of the airstrips for touch and go landing exercises. The entire site falls within the Saufley Noise Contours, and portions of the site are in designated Clear Zones and Accident Potential Zones (GMD, 2003). The entire site is designated for future public use; however, the JLUS recommended creating an AIPD1 to place future development restrictions on areas within AIPD1.

5.2.10. Access Controls/Restrictions

A security checkpoint must be passed to gain entry to Saufley Field; however, the Bombing Targets site is easily accessible from within the checkpoint. Thick forestland vegetation restricts access to the portions of the site north of the airfield fence line.

5.2.11. Conceptual Site Model

This CSM was developed following guidance documents issued by the USEPA for hazardous waste sites and the USACE for OE sites. Guidance documents include the USEPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (USEPA, 1988) and the USACE *CSM Guidance Development of Integrated Conceptual Site Models for Environmental Ordnance and Explosives Sites*, finalized in 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 linking them. The CSM is the basis for the prioritization and remediation cost estimate.

The CSM for the Saufley Field Bombing Targets site considers only the acreage within the 500-foot scoring arcs where the majority of munitions would have landed. The CSM is presented in a series of information profiles that present information about the site. The information profiles are included in Table 5.2-1.

Table 5.2-1: CSM Information Profiles – Saufley Field Bombing Targets

Profile Type	Information Needs	PA Findings
Range/Site Profile	Installation Name	Saufley Field
	Installation Location	NAS Pensacola, Escambia County, Florida
	Range/Site Name	Saufley Field Bombing Targets
	Range/Site Location	The Bombing Targets site is located just north of the intersection of Runway 14 and Runway 23 at Saufley Field.
	Range/Site History	The Bombing Targets are depicted on maps dated 1943 and 1946 through 1949. They are also visible in aerial photography dated 1943 and 1945. No other information regarding the range history was available.

Table 5.2-1: CSM Information Profiles – Saufley Field Bombing Targets		
Profile Type	**Information Needs**	**PA Findings**
	Range/Site Area and Layout	The Bombing Targets are two 200-foot diameter circular targets located just north of the intersection of Runway 14 and Runway 23 at Saufley Field. Typical 500-foot target scoring arcs were applied to each target and represent the area where the majority of munitions would have landed. A 1,000-foot radius SDZ was applied to each target and represents the area in which munitions could have landed. The resultant 91.6-acre site includes the area within the SDZ for the bombing targets.
	Range/Site Structures	The site is adjacent to the Saufley Field runways. No other structures exist at the site or in the immediate vicinity of the 500-foot scoring arcs.
	Range/Site Boundaries	N: Grassy field; asphalt jogging trail/road; airfield fence line; two unidentifiable structures; vegetated area S: Runways; active airfield E: Runways; active airfield W: Active airfield; open, grassy area; Saufley Field Skeet Range; Saufley Field Small Arms Range
	Range/Site Security	A security check point must be passed to gain access to Saufley Field. Access to the site is not directly restricted from within the checkpoint.
Munitions/ Release Profile	Munitions Types	Documentation on specific ordnance types used at the range was not identified; however, due to the proximity to the runways, ammunition used at the bombing targets likely included various sizes of inert practice bombs with spotting charges.
	Maximum Probability Penetration Depth	Typical ordnance penetration depths for loamy soils range from 3.51 feet for 3-lb bombs to 7.12 feet for 25-lb bombs. No evidence of surface craters was observed in aerial photos or during the site walk of the Bombing Targets site.

Table 5.2-1: CSM Information Profiles – Saufley Field Bombing Targets		
Profile Type	**Information Needs**	**PA Findings**
	MEC Density	Munitions usage at the Bombing Targets site was likely limited to inert practice bombs; however, the spotting charges associated with inert bombs qualify as MEC. The density of MEC is unknown due to lack of information regarding the frequency and quantity of munitions usage at the site. No evidence of ground scarring is visible in historic aerial photographs of the bombing targets. The grounds are regularly maintained and there have been no reported findings of MEC. Although no MEC were observed during the visual surveys conducted in January 2007 and November 2007, no subsurface investigations have been conducted to verify the presence or absence of MEC in subsurface soil.
	MEC Scrap/Fragments	No evidence of MEC or munitions debris was identified during the visual survey.
	Associated MC	Due to their proximity to the airfield, practice bombs were likely used at the Bombing Targets site. Inert fillers in typical practice bombs included water and/or sand. Spotting charges that potentially contained trace quantities of MC including titanium tetrachloride, red phosphorous, and pyrotechnics may also have been used. No sampling for MC has been conducted at the Bombing Targets site.
	Migration Routes/Release Mechanisms	MEC migration may occur due to soil erosion; however, the grounds at the Bombing Targets site are relatively flat, vegetated with thick grass, and are regularly maintained. Migration of MEC from subsurface soil to surface soil is therefore not expected. Migration of MC from the Saufley Field Bombing Targets site may occur naturally due to soil erosion, surface runoff, infiltration and leaching, or through plant/animal uptake. Human activities, including maintenance (e.g. mowing) and grading, can cause MC migration. Future construction, excavation, or other site work could also serve as a migration/release mechanism.

Table 5.2-1: CSM Information Profiles – Saufley Field Bombing Targets		
Profile Type	**Information Needs**	**PA Findings**
Physical Profile	Climate	The climate at Saufley Field is humid, sub-tropical and is characterized by short, mild winters and long, warm summers. The average monthly temperature in the wintertime is 54 °F, while the average monthly temperature in the summertime is 80°F. The average annual temperature is 68°F. There is an average of nine freezes per year; however, temperatures in the area rarely fall below 15°F - 20°F. The average annual precipitation totals around 62 inches or less, with the wettest month being July, which has an average precipitation of 7.2 inches, and the driest month being November, which has an average precipitation of 3.4 inches. Severe weather includes thunderstorms, tornadoes, tropical storms, and hurricanes. Hurricane season is June through November. The last hurricanes to affect the Pensacola area were Hurricanes Erin and Opal in 1995, Hurricane Ivan in 2004, and Hurricanes Dennis and Katrina in 2005.
	Topography	The topography at the Bombing Targets site is relatively flat.
	Geology	The Bombing Targets site is located in the Gulf Coastal Lowlands physiographic region, which is predominantly composed of unconsolidated sands, silts, and clays. Unconsolidated sands with minor amounts of clay and organics comprise the surface deposits in the region, which are underlain by undifferentiated terrace deposits and the Citronelle Formation of Pleistocene age (FGS, 1994). These Pleistocene units are found at depths ranging from 50 to 55 feet bgs, and are approximately 400 feet in thickness, consisting of fine- to coarse-grained sand with lenses of clay and gravel (FGS, 1994). Underlying the undifferentiated terrace deposits and Citronelle Formation are Miocene coarse clastics comprised of fossiliferous sands with lenses of gravel and clay, having a thickness of approximately 500 feet (FGS, 1994).

Table 5.2-1: CSM Information Profiles – Saufley Field Bombing Targets		
Profile Type	**Information Needs**	**PA Findings**
	Soil	Soils within the vicinity of the airfield and northeast of the field are generally well-drained sandy and loamy soils. The areas to the south, southwest, and northwest of the airfield are characterized by poorly-drained sandy soils and muck. Surface sediments at Saufley Field have been classified with the Pickney Sand, Croatan and Pickney Soils, Poarch Sandy Loam, Grady Loam, Troup Sand, and Bonifay Loamy Sand soil complexes (USDA, 2004).
	Hydrogeology	No monitoring wells or groundwater information exists for the Bombing Targets site. According to Addendum 2 of the Site Assessment Report for UST Site 2406 at Saufley Field, deep groundwater flows southeast, intermediate groundwater flows west and southwest, and shallow groundwater flows northwest and northeast at Saufley Field (Tetra Tech NUS, Inc., 2005). No depths to groundwater were provided in the report.
	Hydrology	The Bombing Targets site is located near an active airfield, and no surface water features are located in the vicinity of the targets. No drainage or stormwater collection systems were observed in the vicinity of the Bombing Targets site during the PA site visit.
	Vegetation	The entire site is vegetated with turf grass that is regularly mowed.
Land Use and Exposure Profile	Current Land Use	The Bombing Targets site has no designated land use, but it is adjacent to the runways at the airfield. NAS Whiting Field pilots use two of the airstrips for touch and go landing exercises.
	Current Human Receptors	Current human receptors include Navy personnel, contractors, and trespassers/visitors. Navy personnel may access the site to conduct maintenance (i.e. mowing), and contractors may access the site to perform maintenance (e.g. maintenance on underground utilities). Trespassers/visitors may include hikers or naturalists who can access the site from Saufley Field.
	Current Activities (frequency, nature of activity)	Current activities include infrequent environmental/ecological investigations by Navy personnel and/or contractors, grounds maintenance by Navy personnel and/or contractors, and hiking by trespassers/visitors.

Table 5.2-1: CSM Information Profiles – Saufley Field Bombing Targets		
Profile Type	**Information Needs**	**PA Findings**
	Potential Future Land Use	The potential future land use remains the same as the current land use, as no change in land use is planned.
	Potential Future Human Receptors	Potential future human receptors consist of the current receptors, as no change in land use is planned.
	Potential Future Land Use Related Activities	Potential future land use related activities remain the same as the current land use related activities, as no change in land use is planned.
	Zoning/Land Use Restrictions	The Bombing Targets site is located within AIPD1, and falls under future development restrictions for areas within noise contours.
	Demographics/Zoning	The population density for Escambia County is 444.7 people/square mile (2000 Census). Approximately 1,356 personnel were employed at Saufley Field in Fiscal Year 2003 (GMD, 2003).
	Beneficial Resources	There are no beneficial resources identified at the Saufley Field Bombing Targets site.
Ecological Profile	Habitat Type	The Bombing Targets site is vegetated with turf grass that is periodically mowed.
	Degree of Disturbance	The current and future land uses of the Bombing Targets site and adjacent airfield result in a high degree of disturbance to the habitat and ecological receptors.
	Ecological Receptors and Species of Special Concern	Terrestrial ecological receptors may include terrestrial plants, as well as mammals (e.g., foxes, squirrels) and a variety of bird species passing through the area. The close proximity to the active runways and periodic grounds maintenance create an unsuitable habitat for ecological receptors, as well as threatened, endangered, and special status species.
	Relationship of MEC/MC Sources to Habitat and Potential Receptors	Human receptors can come into contact with MEC in subsurface soil while conducting intrusive activities (e.g. maintenance on underground utilities). Flora may bioaccumulate MC in surface and/or subsurface soil, via plant uptake. Fauna may be exposed to MC in surface soil through ingestion, dermal contact, and inhalation, or by ingesting vegetation or prey organisms that may bioaccumulate MC.

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., nonintrusive grounds maintenance, intrusive construction); and 4) receptors (e.g., Navy personnel, construction workers, recreational users, 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, 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., erosion) and a transport medium (e.g., surface water).

The potential interactions between the source and receptors are assessed differently for MEC and MC. 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. 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.

Figure 5.2-4 and Figure 5.2-5 included at the end of this section, provide a graphical representation of the current understanding of the Saufley Field Bombing Targets site and identifies the exposure pathways where site receptors could come in contact with, or be impacted by, MEC and/or MC. Based on the information obtained during the site visit, including observations made during the visual survey, MEC does not exist at the surface of the site. Although it is possible for subsurface MEC to migrate to the surface by erosion, the level topography and regular maintenance of the turf at the site limit the ability for erosion to occur. Pathways to surface MEC are therefore incomplete for all receptors. MEC may be present in the subsurface soil at the site. Exposure pathways are potentially complete for Navy personnel and contractors who may be exposed to subsurface MEC during intrusive activities such as underground utilities maintenance or intrusive environmental investigations. Visitors/trespassers and ecological receptors are not expected to participate in intrusive activities at the site, therefore pathways to subsurface MEC are incomplete for these receptors.

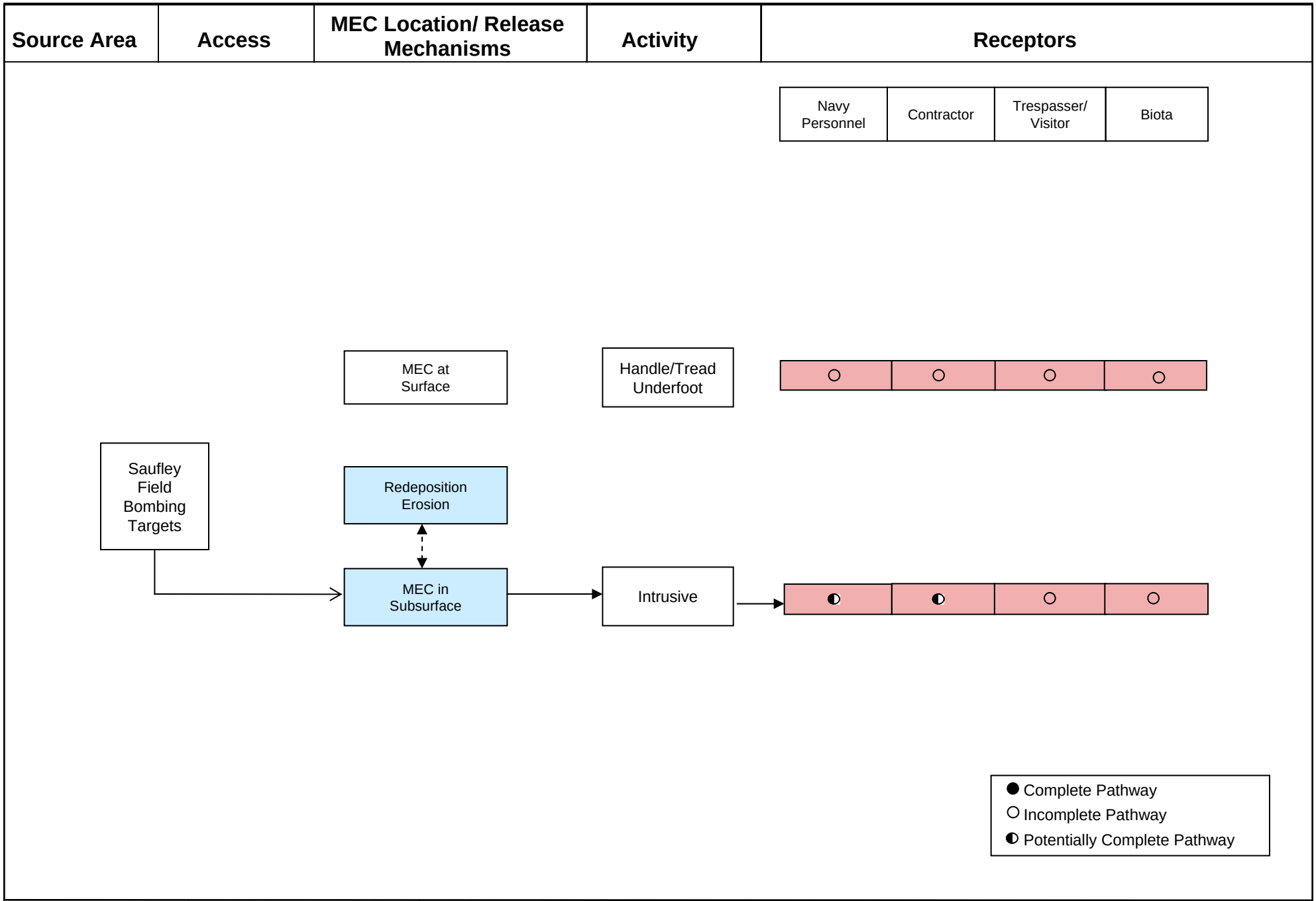
MC-contaminated soil at the site represents a potential source medium, as illustrated in the MC Exposure Pathway Analysis Figure (Figure 5.2-5). Potential human receptors include Navy personnel and contractors who access the site to perform maintenance or environmental/ecological studies and trespassers/visitors (i.e. hikers, naturalists) that access the site from Saufley Field. Potential ecological receptors include terrestrial receptors (e.g. birds, squirrels) that may forage on the former range. Potentially complete exposure pathways exist for surface soil through ingestion and dermal contact for both human and ecological receptors. Due to the thick vegetation and high precipitation in the area, dust and wind is minimized, and inhalation of MC in dust is unlikely. Thus, MC exposure pathways via inhalation of surface soil are considered incomplete for all receptors.

MC may also be present in subsurface soil due to migration from the overlying surface soil via leaching mechanisms. A potentially complete exposure pathway exists for contractors who may be exposed to MC in the subsurface soil during maintenance (e.g. maintenance on underground utilities) or intrusive activities (e.g. soil excavation). Potentially complete exposure pathways therefore exist for these receptors via incidental ingestion, dermal contact, and inhalation of dust caused by subsurface drilling or soil excavation. Ecological receptors, Navy personnel, and trespassers/visitors are unlikely to come in contact with MC in the subsurface soil, since no intrusive activities at the range would be conducted by these groups. Therefore, exposure pathways are incomplete for these receptors.

Soil also represents a source medium when considering release mechanisms such as groundwater contamination via leaching and plant/animal uptake. MC contamination of groundwater via leaching mechanisms may occur; however, no activities are conducted at the site that would result in contact with groundwater. The main source of potable water for Saufley Field is a well field located at NTTC Corry Station. Groundwater exposure pathways are therefore considered incomplete for all receptors.

There is no surface water on the site or in the immediate vicinity. The site is vegetated with turf grass. Any surface water on the site would likely infiltrate into the ground before running off the site. Surface water and sediment are not considered to be source media for MC.

MC in soil may be bioaccumulated by plants or consumed by animals foraging on the range. Potentially complete exposure pathways exist for biota that may be exposed to MC through the food chain.

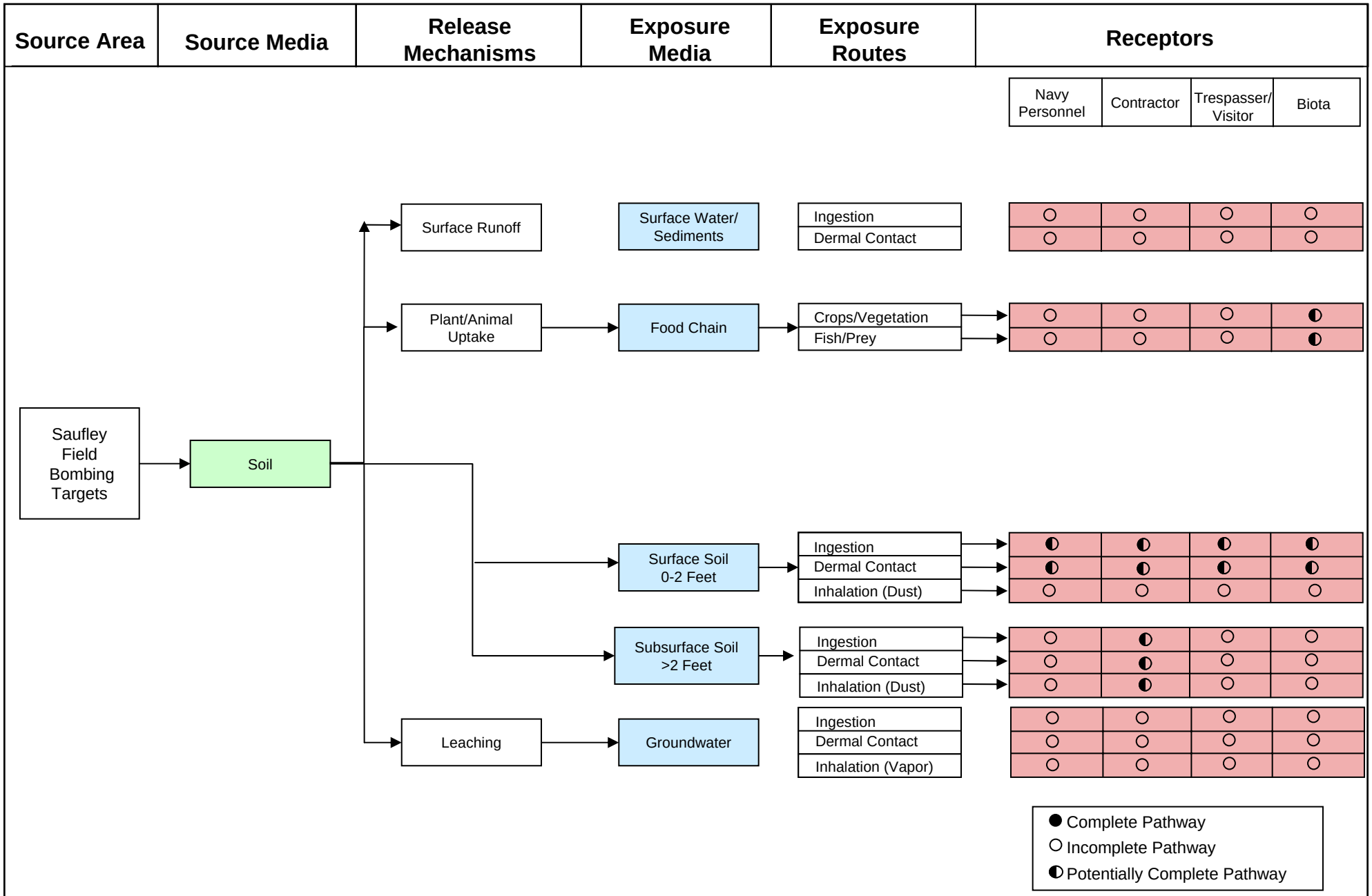


Prepared for:

FINAL PRELIMINARY ASSESSMENT – CONCEPTUAL SITE MODEL
SAUFLEY FIELD BOMBING TARGETS – MEC EXPOSURE PATHWAY ANALYSIS
NAVAL AIR STATION PENSACOLA, FLORIDA

MALCOLM PIRNIE, INC.

FIGURE 5.2- 4
August 2009



MALCOLM PIRNIE

Prepared for:

FINAL PRELIMINARY ASSESSMENT – CONCEPTUAL SITE MODEL
SAUFLEY FIELD BOMBING TARGETS – MC EXPOSURE PATHWAY ANALYSIS
NAVAL AIR STATION PENSACOLA, FLORIDA

MALCOLM PIRNIE, INC.

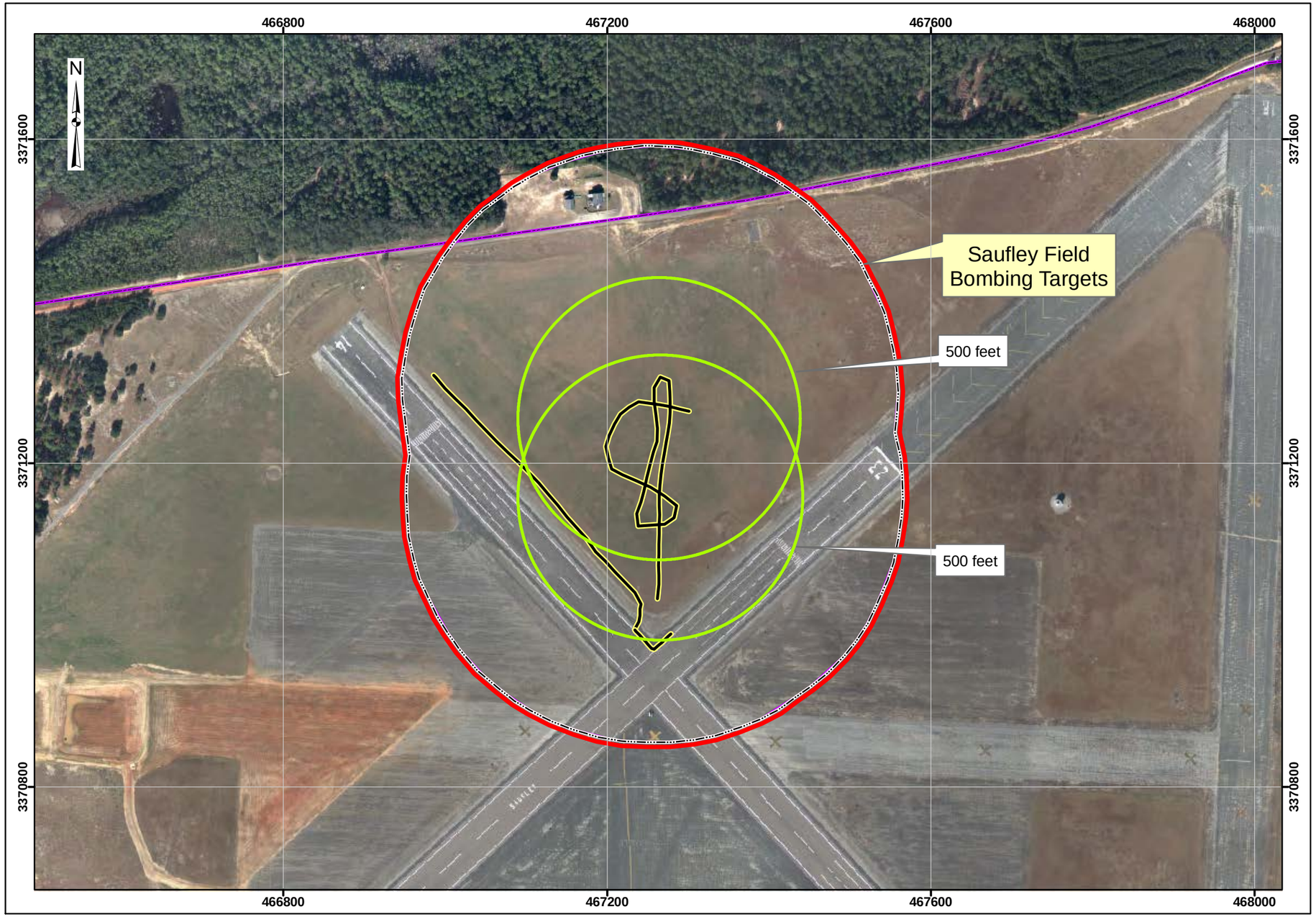
FIGURE 5.2-5
August 2009

5.2.12. Summary

The Saufley Field Bombing Targets site is a 91.6-acre site that is centered just north of the intersection of Runway 14 and Runway 23 at Saufley Field. The site boundary includes two 200-foot diameter bombing targets and the SDZ associated with each. The Bombing Targets site boundary overlaps the northern portions of Runway 14 and Runway 23, and the site boundary extends just north of the airfield fence line. The majority of the site is on the active airfield and is vegetated with regularly maintained turf grass. Based on current aerial photography, the portion of the site north of the fence line contains two unidentified structures and dense trees and vegetation.

Saufley Field was used for giving fundamental gunnery instruction to pilots as early as 1943, and the Bombing Targets are shown on maps dated 1943 and 1946 through 1949. They are also visible on aerial photography of Saufley Field dated 1943 and 1945. The exact usage and period of operation of the range are unknown. Based on their close proximity to the active airfield, ammunition likely included various practice bombs with inert fillers and spotting charges. There have been no documented findings of munitions or munitions debris at the site.

Information obtained during the site visit and observations made during the visual survey provided no evidence of MEC or munitions debris on the surface of the Bombing Targets site. No evidence of craters or subsurface disturbance was observed; however, MEC may be present in the subsurface, as no subsurface investigations have been conducted to verify the absence of MEC. Spotting charges associated with practice bombs potentially contained trace quantities of MC including titanium tetrachloride, red phosphorous, and pyrotechnics. MC, if present, would likely be concentrated within the 500-foot target scoring arcs surrounding each target. Based on information obtained from the installation, surface soil sampling has not been conducted at the Bombing Targets site.



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Naval Air Station Pensacola, Florida

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Map 5.2-1
Visual Survey
Saufley Field Bombing Targets

Legend

- Installation Boundary
- Range Boundary
- Site Boundary
- Site Reconnaissance
- Fenceline
- Scoring Arcs

0 75 150 300 Meters

Data Source: NAS Pensacola, GIS Data, 2007
Map of Saufley Field, Naval Auxiliary Air Station, Pensacola, FL, Showing Conditions on June 30, 1946

Coordinate System: UTM Zone 16N
Datum: NAD83
Units: meters

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Edition: Final Preliminary Assessment
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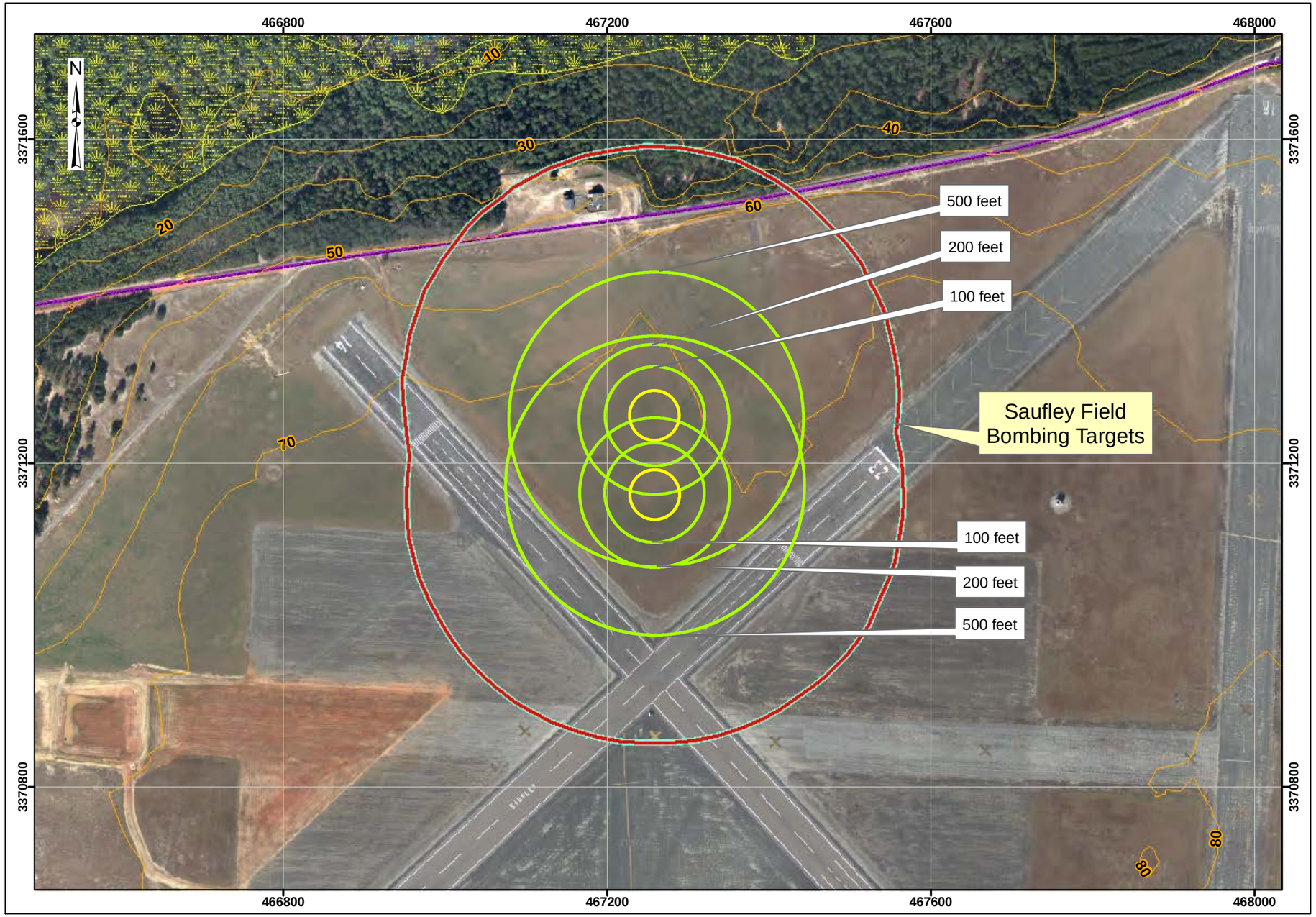
Map 5.2-2
Range/Site Details
Saufley Field Bombing Targets



Legend

- Installation Boundary
- Site Boundary
- Surface Danger Zone
- Historical Site Features
- Scoring Arcs
- Elevation Contour (10-ft interval)
- Streams
- Fenceline
- Wetlands

0 75 150 300 Meters

Data Source: NAS Pensacola, GIS Data, 2007
Map of Saufley Field, Naval Auxiliary Air Station, Pensacola, FL, Showing Conditions on June 30, 1946

Coordinate System: UTM Zone 16N
Datum: NAD83
Units: meters

Contract: N62472-02-D-1300
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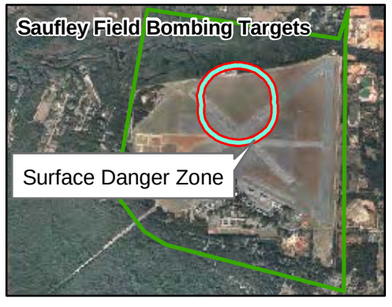

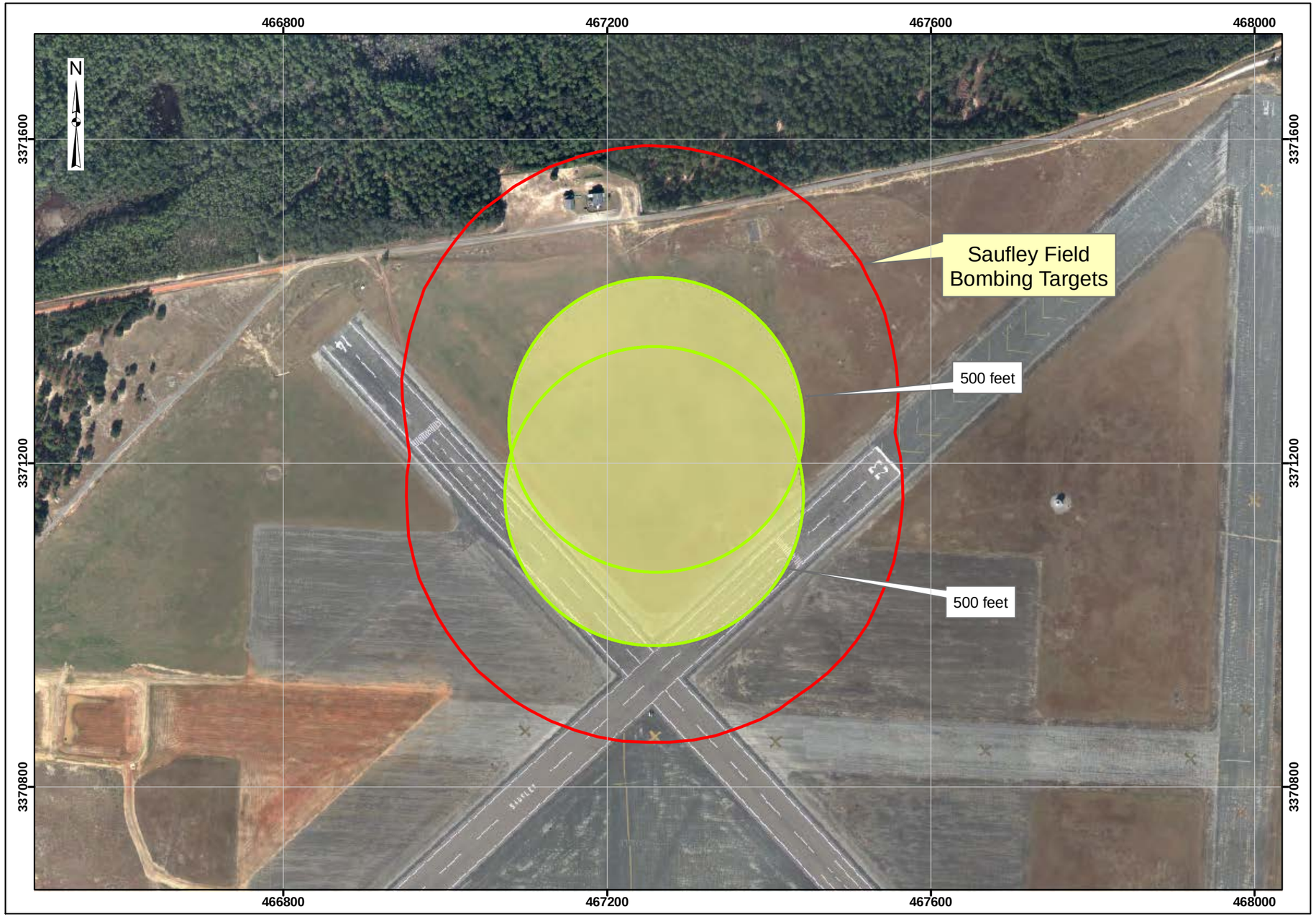

Preliminary Assessment
Naval Air Station Pensacola, Florida

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Map 5.2-3
Munitions Characterization
Saufley Field Bombing Targets

Legend

Installation Boundary
Site Boundary
Scoring Arcs

MEC Presence*

Known
Suspect

*MEC presence was determined through review of historical documentation, interviews, and visual survey.

0 75 150 300 Meters

Data Source: NAS Pensacola, GIS Data, 2007
Map of Saufley Field, Naval Auxiliary Air Station, Pensacola, FL, Showing Conditions on June 30, 1946

Coordinate System: UTM Zone 16N
Datum: NAD83
Units: meters

Contract: N62472-02-D-1300
Edition: Final Preliminary Assessment
Date: August 2009

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Appendix B: Project Source Data – General

(SOURCE DATA PROVIDED ON COMPACT DISC)

June 1983

INITIAL ASSESSMENT STUDY OF NAVAL AIR STATION, PENSACOLA PENSACOLA, FLORIDA

NEESA 13-015

NAVAL ENERGY AND ENVIRONMENTAL SUPPORT ACTIVITY

Port Hueneme, California 93043

RELEASE OF THIS DOCUMENT REQUIRES PRIOR NOTIFICATION
OF THE CHIEF OFFICIAL OF THE STUDIED ACTIVITY

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5.3 PHYSICAL FEATURES

5.3.1 General. Naval Air Station (NAS) Pensacola, located in the extreme southeastern portion of Escambia County, Florida, lies within the Coastal Plain Province of the United States. This major physiographic division extends from New York southward and westward into Texas. It consists principally of unconsolidated sands, silts, and clays deposited before the shoreline of the continental mainland reached its present position. The province is subdivided, and NAS Pensacola is located within the Coastal Lowland: a series of broad, nearly level, marine terraces that extend several miles in from the coast and merge with the narrow terraces along the Escambia and Perdido Rivers. The highest terraces in the lowland have an elevation of about 100 feet, but nowhere does NAS Pensacola achieve this elevation. Because of the smooth topograhy and the fairly short time since it was under the sea, the Coastal Lowland has little dissection, and its drainage system is weakly developed (Carlisle, 1960). Figure 5-2 (Naval Facilities Engineering Command, Southern Division, 1980) shows the general setting of NAS Pensacola, and Figure 5-3 (U.S. Geological Survey, 1957) presents a broader view of the geographical setting.

5.3.2 Climatology. NAS Pensacola is situated in a humid, warm-temperature climate. The summers are long and warm, and winters are short and mild. The average summer temperature at Pensacola is slightly more than 80°F, but temperatures reach 90°F or more approximately 19 days in the period June through August. The average winter temperature is 55°F, and on the average, there are nine freezes. The cold spells are short, and temperatures rarely go as low as 15°F or 20°F (Carlisle, 1960, Marsh, 1966, and Flood and Associates, et al, 1978).

The annual rainfall is fairly high, nearly 62 inches on the average. Rainfall is well distributed, with a peak in July and August. Snow rarely falls, but snowfalls measuring two to three inches have been recorded. Hailstorms are infrequent and cover very restricted areas. Table 5-1 contains temperature and precipitation data for Pensacola, Florida (Carlisle, 1960). Average monthly rainfall statistics do not reflect a great variation in rainfall amounts. However, the character and duration of rainfall changes a great deal with the season. The broad maximum during the summer months results from scattered consecutive showers and thunderstorms which are present nearly every day, but which may not provide precipitation at a given measurement site. During the transitional spring and fall seasons, monthly rainfall amounts are both half of the summer maximum, but the number of days with rain and total time of rainfall stands in sharp contrast to the summer figures. Rainfall during these periods results from infrequent frontal passages which supply a general area of rainfall in moderate-to-heavy amounts. During the winter months, fronts pass through the area more frequently and are associated with broader areas of light rain--in addition to the moderate to heavy rains which may occur with the actual frontal passage (Flood and Associates, et al, 1980).

Thunderstorms of high intensity are common, with as much as three or four inches of rainfall during an hour period (Marsh, 1966). Figure 5-4 shows the seasonal variation in rainfall (Hughes, Hampton, and Tucker, 1971).

The prevailing winds blow from the north and northwest during fall and winter and from the south and southwest in spring and summer. Summer days are often

sultry, but most of the nights are cooled by breezes. Wind velocities are moderate except during thundersqualls (Carlisle, 1960). The winds are largely a function of the intensity of the Atlantic Burmuda High Pressure area and the local sea breeze circulation produced by the ocean-land heating differential. These effects are reflected by the prevailing southerly winds in the summer when the Bermuda High is most dominant and the land is warmer than the ocean. As the land becomes warmer on hot summer days, the sea breeze amplifies accordingly. At night when the land mass starts to cool, the sea breeze weakens and usually reverses into a land-breeze. This daily change in the local wind circulation tends to produce a complete clockwise rotation of the surface wind direction every 24 hours. In the winter time, when the influence of the Bermuda High is negligible and the land is cooler than the ocean, northerly winds prevail (Flood and Associates, et al, 1980). Table 5-2 reflects the wind-rose for NAS Pensacola.

Severe weather, which includes thunderstorms, tornadoes, tropical storms, and hurricanes occur so infrequently that precise statistics are often meaningless.

Records from 1885 to 1974 incidate a six year average between hurricanes, but the last 18 years of that period produced no hurricane damage at NAS Pensacola (Flood and Associates, et al, 1980). Hurricane Frederick reminded NAS Pensacola that the threat is very real. Tornadoes with wind speeds of 150 to 300 miles per hour can cause extensive damage, and winds of 60 miles per hour associated with thunderstorms moving 30 to 50 miles per hour are a threat to planes, boats, antennae, and construction in progress (Flood and Associates, et al, 1980).

5.3.3 Topography. The surface of NAS Pensacola is gently sloping terrain, ranging in elevation from sea level to approximately 40 feet above mean sea level. Moderately incised, 5- to 10-feet, natural and man-made drainages channel the surface water from NAS Pensacola to either Bayou Grande to the north, or Pensacola Bay to the south. Extensive grading and improvements in the vicinities of Forrest Sherman and Chevalier Field have resulted in large, nearly level planar areas. The western end of NAS Pensacola contains some marsh areas and several shallow pits which are the results of sand borrowing activities to obtain construction material. Several construction activities, target butts, Fort Redoubt, and Fort Barrancas have resulted in isolated areas of anomalous topographic highs. Figure 5-5 shows the topography of NAS Pensacola (U.S. Geological Survey, 1970) and Figure 5-6 shows this topography in a more generalized form (Naval Facilities Engineering Command, Southern Division, 1980).

5.3.4 Geology. The geological literature applicable to NAS Pensacola consisted of studies for the preparation of a report on Escambia and Santa Road Counties (Marsh, 1966). Primary sources examined by Marsh included Sellards and Gunter, 1912; Matson and Sandford 1913; Jacob and Cooper, 1940; Applin and Applin, 1944; Cooke, 1945; Calvern, 1949; NacNeil, 1949; Carlston, 1950; Heath and Clark, 1951; Puri and Vernon, 1959; Carlisle, 1960; Marsh, 1962; Musgrove, Barraclough, and Grantham, 1965; and Barraclough and Marsh, 1965. Numerous other peripheral references were also used by Marsh in preparation of Marsh's 1966 report. This report is probably the most definitive work on Escambia and Santa Rosa Counties and, hence, NAS Pensacola. The following descriptions and figures, unless otherwise noted, are derived from these accounts.

The formations considered and described, from oldest to youngest, are Hatchetigbee Formation, Tallahatta Formation, Lisbon Equivalent, Ocala Group, Bucatunna Clay Member (Bryam Formation), Chickasawhay Limestone, Tampa Formation, Pensacola Clay, Miocene Coarse Clastics and Citronelle Formation. Figure 5-7 shows the generalized geologic column for the western Florida Panhandle.

The Hatchetigbee Formation underlies western-most Florida at depths ranging from 1,270 feet below sea level in northeast Santa Rosa County, to 2,730 feet below sea level in southern Escambia County and NAS Pensacola. The thickness of the formation ranges from 220 feet in northwestern Santa Rosa County to 420 feet just east of Pensacola. The Hatchetigbee Formation consists predominantly of gray to dark gray, silty micaceous clay. The clay is fossiliferous and calcareous and contains a little pyrite. Beds of gray to light-gray, hard glauconitic shale siltstone, and shaly limestone are present in lesser amounts.

The Tallahatta Formation lies at depths ranging from 1,040 feet below sea level in northeast Escambia County to 2,230 feet below sea level in southern Escambia County, and its minimum thickness of 170 feet is at Pensacola. The formation consists predominantly of hard, light-gray, calcareous shale and siltstone with numerous interbeds of gray limestone and fine to very coarse, pebbly sand. A little gray or brown clay is present, and pyrite was noted in a few samples.

The Lisbon Equivalent underlies Santa Rosa and Escambia Counties at depths ranging from 510 feet below sea level in the northeast corner of the area to 2,090 feet in the southwest corner of the area. The formation ranges in thickness from 345 feet in northern Escambia County to 600 feet in east-central Santa Rosa County. The Lisbon Equivalent consists chiefly of shaley limestone whose color ranges from dark-gray to brownish-gray to very light-grayish cream. The rock is more massive and compact than the overlying Ocala Group and breaks into hard, blocky fragments speckled with glauconite. The Lisbon Equivalent contains a number of shale zones. The upper shale zone, present in the northern part of the area, lies 120 to 170 feet below the top of the Lisbon Equivalent, and the zone is quite variable. At some places it consists of from one to four thin beds occupying an interval of 10 to 80 feet; elsewhere only a single bed, locally as thick as 70 feet, is present. The lower zone, present in the southern part of the area which includes NAS Pensacola, occurs close to the base of the formation and consists of a single bed of shale 60 to 90 feet thick. The material making up the shaley zones ranges from a silty shale to shaley siltstone which is generally hard, light-grayish tan to light-gray, clacareous, and galuconitic. The Lisbon Equivalent also contains some gray clay, and, in southern Escambia County, a concentration of glauconite and/or phosphate occurs at the base of the unit.

The Ocala Group underlies the western Florida Panhandle at depths ranging from 290 feet below sea level in the northeast corner of Santa Rosa County to 1,940 feet below sea level at the southern end of Escambia County. The Ocala thickness ranges from 90 feet just east of Pensacola to 235 feet in northeastern Santa Rosa County. In western-most Florida, the Ocala is typically a light-gray or grayish-cream limestone near the upper contact, changing downward to chalky white limestone. Locally, all limestone in the

Ocala may be white. The Ocala Group consists mostly of large foraminifers and other fossils. Commonly, the limestone is somewhat glauconitic, with local replacement of fossils by glauconite in a few places. At some localities, as much as five percent of some samples consisted of shiny, brownish-gold, rounded pellets that may be phosphate. A small amount of light-gray clay was noted in some samples, and some cuttings of Ocala from a water well in northern Santa Rosa County contained a few fragments of fossil wood.

The Bucatunna clay member of the Byram Formation underlies the entire western Panhandle of Florida and, in Santa Rosa and Escambia Counties occurs at depths below sea level ranging from about 200 feet in northeastern Santa Rosa County to about 1,760 feet in southern Escambia County. Its thickness ranges from 45 feet in northeastern Santa Rosa County to 215 feet in southwestern Santa Rosa County. The Bucatunna generally thickens toward the Gulf of Mexico. In western Florida the Bucatunna consists of fossiliferous, calcareous clay, dark lignitic clay, laminated fine sand and clay, and laminated argillaceous fine sand with some beds of coarser sand. Samples of the Bucatunna contained from five to 40 percent fine, quartz sand, but this clastic material probably does not occur as discrete interbeds but is disseminated throughout the clay as a gritty admixture. Most well samples of the Bucatunna from Escambia and Santa Rosa Counties consist of dark-gray, soft, calcareous, silty to sandy clay which contains occasional flecks of carbonized wood and a little pyrite.

The Chickasawhay Limestone underlies all of Escambia and Santa Rosa Counties, thickening gulfward from 30 to 40 feet along the northern border of the area to as much as 130 feet along the margin of the gulf. The formation consists of gray to light-gray, hard, highly porous or vesicular limestone and dolomitic limestone; interbedded with light brown, hard, vesicular to compact dolomitic limestone; or dolomite that has a distinctive sugary texture. Fragments of the Chickasawhay Limestone have a knobby, rough surface that gives the impression of a microcoquina of obscure fossil fragments, although few can actually be distinguished as such.

The Tampa Formation, removed by erosion in the northern parts of Santa Rosa and Escambia Counties, reaches its maximum thickness of about 270 feet in southern Escambia County and is present beneath NAS Pensacola. The formation is hard, light-gray to grayish-white, although in places it contains several beds of clay, especially in the upper part, and it is hypothesized (Barraclough and Marsh, 1962) that the decreased effective porosity of the limestone resulting from the presence of so much clay has been an important factor in the drastic decline of water levels, amounting to more than 125 feet since 1936, in the Fort Walton Beach, Florida, area.

The Pensacola Clay underlies the area at depths ranging from 135 feet below sea level in central Santa Rosa County to 1,000 feet below sea level in the southwest corner of Escambia County. The total thickness of the formation ranges from 380 feet in the area four miles northwest of Pensacola to more than 1,000 feet at Mobile Bay. The upper member ranges in thickness from 240 feet about 10 miles east of Pensacola to 680 feet two miles southwest of Pensacola. The lower member ranges in thickness from 150 feet at the easterm edge of Santa Rosa County on Santa Rosa Island to 330 feet at Fort Walton Beach, Florida. The Escambia Sand Member thickens southwestward from a minimum of 20 feet about six miles north of the mouth of the Escambia River to a maximum of 160 feet in the area 4.5 miles west of the mouth of the Perdido

River. Figure 5-8 is an isopachous map of the Pensacola Clay and Figure 5-9 shows the contours on tops of the Pensacola Clay. The upper and lower members of the Pensacola Clay consists of tough, dark to light-gray clay, but at a few localities it is brownish-gray. The clay is typically silty and contains variable amounts of very fine to very coarse quartz sand. Bits of carbonized wood and plant remains, such as leaves and reeds, are present throughout the formation. The clay is micaceous and slightly calcareous with some pyrite present. Locally, the formation grades into a clayey siltstone. Mollusk shells and foraminifers are abundant throughout the Pensacola Clay. The former are especially abundant in the upper part of the upper member in west-central and southern Escabmia County, where thick beds consisting almost entirely of shells are found near the top of the upper member. The Escambia Sand Member consists predominantly of light-gray to brownish-gray, fine-to-coarse sand and quartz granules in the lower part and peasize gravel in the upper part. In southern Santa Rosa County, the Escambia Sand Member contains some carbonaceous material and abundance of black grains, possibly phosphate, in the lower five feet.

The Miocene Coarse Clastics are present everywhere in the western Panhandle except in an area between central Escambia County and southwestern Santa Rosa County, where the Citronelle Formation lies unconformably upon the upper member of the Pensacola Clay, and in area east of Fort Walton Beach, Florida, where the Citronelle lies unconformably upon the lower member of the Pensacola Clay. The thickness of the Miocene Coarse Clastics is variable, generally ranging from about 70 feet in north-central Escambia County to as much as 500 feet in west-central Santa Rosa County. The Miocene Coarse Clastics consists chiefly of light-brown to light-gray, poorly sorted, fine to very coarse sand and granules and small pebbles of quartz. Muscovite is abundant throughout, and at several places in both the northern and southern parts of the area the sand contains abundant fragments of carbonized wood. Light to dark-gray, carbonaceous clay and siltstone that are somewhat calcareous occur throughout the unit as lenses up to 180 feet thick. In northeastern Santa Rosa County, about 60 feet of pea-sized gravel is present near the top of the coarse clastics. Locally, a few black phosphatic pebbles, fragments of limonite, and pieces of hardpan (sand cemented with iron oxides) were noted. The most distinctive feature of the Miocene Coarse Clastics is the numerous shell beds that occur throughout. These beds consist mostly of minute mollusks that commonly make up five to 50 percent of some well samples. In a well just north of Pensacola, the upper three-quarters of the Miocene Coarse Clastics contains so many shell beds that half of the rock material from this interval (300 feet in thickness) consists of shells. Figure 5-10 shows the contours on top of the Miocene section in the west Florida Panhandle.

The Citronelle Formation underlies all of Santa Rosa and Escambia Counties and is overlain in most places by Pleistocene terrace deposits. The thicknesses of the individual units are usually not apparent because it is virtually impossible to differentiate Pleistocene sand and gravel of the marine terrace from the Citronelle sand and gravel (Carlston, 1950). However, the terrace deposits are relatively thin, and therefore their inclusion would not greatly alter the general thickness figures. Together, the Citronelle and terrace deposits range in thickness from about 30 feet at the southern border of Santa Rosa County to about 790 feet in northwestern Escambia County. The combined thickness of these two units in Escambia and Santa Rosa Counties, is quite variable for two reasons; (1) the base of the Citronelle appears to be an

Survey, 1930) show scarp traces along Bayou Grande which are at 8 to 10 feet above mean sea level and seem to coincide with the Silver Bluff Shoreline of MacNeil (Figure 5-14). These probably have been nearly obliterated by construction activities since then, and it would require detailed field exploration to ascertain the validity of the Silver Bluff Shoreline hypothesis.

Appendix A contains the logs of deep borings (>100 feet) on and near NAS Pensacola. Boring Nos. W-3324, W-4091, W-4150, and W-4597 are from Marsh, 1966; NAS 1, 2, and 3 are from Naval Facilities Engineering Command, Southern Division; Drawing Nos. 22081 and 1304669, TH-11, and TH-23 are from Trapp, 1972; W-222-1/2 from Missimer and Associates, Inc., 1981b, and the Pensacola Development Well No. 1 is from the files of Mr. Joe Ladner, Public Works Center, NAS Pensacola, Florida. Figures 5-11, 5-17, and 5-18 show the locations of all wells except the Pensacola Development Well No. 1 which is unlocated.

5.3.5 Soils: The soils of Escambia County were described by Carlisle, 1966, and portions of that report applicable to NAS Pensacola were extracted and are presented in the following paragraphs.

The parent material of the soils consists of marine and stream deposits. Sand and gravel formation of the Pleistocene Series cover most of the county, and under these are sand, gravel, and clay of the Citronelle Formation.

The climate of Escambia County gives rise to red-yellow podzolic and reddish-brown lateritic soils. Red-yellow podzolic soils are a group of well developed, well drained, acid soils that have thin organic and organic-mineral horizons over a light-colored, bleached horizon which, in turn, overlies a red, yellowish-red, or yellow, more clayey horizon. The parent materials are all more or less siliceous. Coarse reticulate streaks or mottles of red, yellow, brown, and light gray are characteristic in deep horizons of the red-yellow poszolic soils where parent materials are thick (Thorp and Smith 1949). The reddish-brown lateritic soils are a zonal group of soils having a dark reddish-brown, granular surface soil; a red, friable clay horizon; and red or reticulately mottled lateritic parent material.

The general soil association map of Escambia County shows NAS Pensacola to be covered by five types; one belonging to a group of nearly level to gently sloping soils on uplands, and the remainder belonging to a group of nearly level soils on river terraces, depressions, and lowlands. The upland unit is composed of light-gray sands; sandy subsoils; excessively drained or somewhat excessively drained soils of the Lakewood-Lakeland series.

The Lakewood Series developed from thick beds of loose sand materials. These soils have a light gray surface soil that contains small amounts of organic matter, which gives it a salt and pepper appearance. They are associated with soils of the Leon and Lakeland Series. Between the surface soil and the brownish-yellow sub-layers, which began at 14 to 20 inches, is a layer of white sand. The Lakewood soils are acid throughout the profile, extremely low in fertility, contain little organic matter, and are excessively drained.

The soils of the Lakeland Series have formed from moderately thick beds of unconsolidated acid sands and loamy sands, which are on sediments of finer

texture that begin at depths greater than 30 inches. The Lakeland soils are acid throughout, low in fertility and organic matter, and somewhat excessively drained.

The nearly level soils of river terraces, depressions, and lowlands include the Klej-Leon series of gray sandy soils on lowlands which are somewhat poorly drained and have a moderately high water table; the Plummer-Rutlege Series of gray or very-dark-gray fine sands which are poorly drained; the undifferential coastal soils (coastal dune land and beach-tidal marsh) bordering salt water; and undifferentiated poorly drained flood plains and swamps of mixed alluvial land and fresh water swamp. The Klej Series have developed from thick beds of sands and loamy sands, under the influence of a high water table. These soils have a dark-gray to black surface soil and yellowish-brown to brownish-yellow subsoil. They are associated with the Rutlege, Plummer, and Leon Soils. Klej soils are acid throughout, low in natural fertility and organic matter, and somewhat poorly drained.

The Leon soils developed from thick beds of unconsolidated sands under the influence of a high water table. These soils have a hardpan layer at depths of less than 30 inches. Leon soils are acid throughout the profile and low in natural fertility. They are associated with the Plummer, Rutledge, and Klej soils.

The Plummer soils developed under conditions of poor drainange from thick beds of acid sand and loamy sand and are associated with the Rutlege, Leon, Klej, Portsmouth, and Lynchburg soils. The Plummer soils are acid throughout the profile, have little natural fertility, contain little organic matter, and are poorly drained.

The Rutlege soils formed under poor drainage conditions in thick beds of acid, sandy materials. They are associated with the Plummer, Portsmouth, Leon, and Klej soils. The Rutlege surface soils contain much organic matter. The soils are acid in reaction throughout the profile and are poorly and very poorly drained, primarily because of a high water table.

The coastal dune land and beach is sand deposited by wave action along the coast. Some of it was reworked by winds that drifted it back some distance from the shore and formed a range of low sand dunes. The coastal dune land and beach occurs as long, narrow strips along bays, lagoons, and the Gulf of Mexico. Santa Rosa Island and similar larger areas contain many small depressions and ponded areas where water covers the surface many months of the year. In contrast to the white sand that occurs throughout the entire profile of the more typical areas, these depressions accumulate a very thin layer of organic matter. Many areas are barren. Those areas not washed by waves have a sparse growth of plants that are tolerant of salt and a scattering of pine and scrub oak grown along the inner dunes.

Tidal marsh consists of areas along the coast that are often covered by salt water or brackish water at high tide. It lies adjacent to bays and lagoons in the southwestern part of Escambia County. These flat or nearly level areas are associated with coastal dune land and beach; they are only a few feet above sea level. Included with this land are a few tidal flats that are almost barren because they are so salty.

The mixed alluvial land, poorly drained, represents a mixture of dissimilar materials that border the streams throughout the county and make up a very large total acreage. This land is a result of soil material accumulation rather than soil development. The materials vary so greatly in color, texture, and consistency that any attempt to map the soils separately would be impractical. The land is subject to frequent overflow; in many places it lies only a few inches above the water level of adjacent streams. The characteristics of this miscellaneous land type change from time to time as new material is deposited or removed with each overflow. The texture of this land varies greatly, depending on the source of the material and the condition of the stream when the material was deposited. Locally, texture varies from silt loam to sand. The color ranges from gray to black according to the amount of organic matter in it. The land is mostly level to nearly level, internal drainage is variable, and surface runoff is very slow.

Fresh water swamp consists of naturally wooded areas, all or most of which are covered with water or are saturated throughout the year. The areas contain a mixture of soils and soil materials that vary in color, texture, composition, and thickness of layers. The soil material consist of stratified deposits recently washed from adjacent uplands and so intricately mixed that separation is not feasible. In some places the surface materials resemble those of Rutledge and Plummer sand. In many places organic matter of a varying thickness accumulates in the surface soil. The largest and most typical areas of fresh water swamps are in the southwestern part of the county and extend across the western edge of NAS Pensacola.

Figure 5-19 shows that portion of the general soil map of Escambia County which covers NAS Pensacola. A more detailed soil map for NAS Pensacola is presented in the Pensacola Naval Complex Master Plans (Naval Facilities Engineering Command, Southern Division, 1975 and 1980). Figure 5-20 is a correlation of that map with the USDA description (Carlisle, 1960). The Master Plan delimited 17 surface types at NAS Pensacola:

1. Alluvial
2. Tidal Marsh
3. Coastal Beach
4. Swamp
5. Lakeland (0-5% slope)
6. Lakeland (5-8% slope)
7. Leon (0-2% slope)
8. Klej (0-5% slope)
9. Rutlege (0-2% slope)
10. St. Lucie (0-5% slope)
11. Lakewood (0-5% slope)
12. Lakewood (5-12% slope)
13. Plummer (0-2% slope)
14. Sandy Fill
15. Mines, Pits, etc.
16. Stripped Land (0-5% slope)
17. Paved Areas

Direct correlations were not possible with all units, but the extrapolations discussed below are generally applicable and the discussions are valid for all general situations.

The USDA report (Carlisle, 1960) described a Lakeland loamy fine sand, loamy sand, and sand, each with slopes of 0-2, 2-5, 5-8, and 8-12 percent. The loamy fine sand has a grayish-brown surface soil that merges with the brownish-yellow fine sand of the subsoil. The surface soil varies from dark grayish-brown to brown in color and from two to five inches in thickness. This soil is underlain by materials of finer texture below 42 inches and in most places within 72 inches. The loamy sand contains a greater amount of

the bottom of the pit. The soil then became medium dense to dense to just above the clay where it became very loose or soft in the clay or clayey sand mixture at the bottom of the boring."

Boring Group No. 6. These borings at the FRS Instructional Building showed "in general, the site was covered with roughly 3 inches of light topsoil which was underlain by tan to gray or white sand to a depth of 25 feet in Boring #1 and to 26 feet which was the bottom of the boring in Boring #2. A brown sand with organics was present from 25 to 26 feet in Boring #1. The soil was loose near the surface to a depth of roughly seven feet, where it became medium dense to the bottom of the borings."

Boring Group No. 7. A boring near Building 3557 "indicated 12 inches of concrete underlain by loose fine sand (SP) to a depth of 10 feet. From 10 feet to 17.5 feet sand was present with appreciable wood in the sand; from 17.5 to 50 feet below existing grade the soil was a clean sand (SP). The sand was medium dense to a depth of roughly 31-34 feet where it became dense to the bottom of the boring.".

Boring Group No. 8. Four foundation borings were drilled at the Petty Officers Mess (NFEC-SD, 1975), and penetrated 17 to 24 feet of tan, white, or gray sand before entering a brown to dark brown sand with organic stains. Below this was gray to brown sand to the depth penetrated (41 feet).

The logs of 15 borings in the vicinity of the Industrial Wastewater Treatment Plant (IWTP), (NFEC-SD), 1972, 1978a, and 1978b) and one of these (Boring #7) is summarized in later work on the IWTP surge pond (Missimer and Associates, Inc., 1981a). These logs, generally show brown, loose to dense, fine to medium sand the three deeper borings (No. 5, 6, and 7) show a soft to firm, sandy, blue-gray marine clay between 40 and 55 to 60 feet deep. The locations of these borings are shown on Figure 5-23, and the boring logs are presented in Appendix B.

The surficial soils at NAS Pensacola, as indicated by the borings which were examined, are sands and silty sands. These are underlain by fine to medium sand to the depth penetrated in most exploratory borings. At the IWTP and at the Aircraft Refinishing Hangar, Chevalier Field, a blue-gray sandy marine clay layer was encountered at a depth of 40-50 feet. This layer was underlain by fine to medium, white to gray sand to the maximum depth (66 feet) penetrated in the exploratory borings.

5.3.6 Hydrology.

5.3.6.1 Surface Water. NAS Pensacola is bordered on the south by Big Lagoon and Pensacola Bay, on the east by Pensacola Bay, and on the north by Bayou Grande. Only a very small portion of the western end of NAS is farther than a mile from one of these bodies of water. Swampy areas exist on or near the western portion of NAS Pensacola. Man-made drainage ways and storm drains feed into the short intermittent streams emptying into the bays and the

bayou. No perennial streams enter or exit the air station, but the marshy areas and three small lakes retain water throughout the year. Figure 5-24 and 5-25 show the surface drainage and the storm and former wastewater outfalls, respectively, for NAS Pensacola (U.S. Geological Survey, 1970 and Naval Air Station, no date). Table 5-5 presents data for the outfalls (J. B. Converse & Co., Inc., 1976).

5.3.6.2 Groundwater. The groundwater of southwestern Florida has been the subject of numerous investigations (Barraclough, Jack T., 1967; Baraclough, Jack T. and Marsh, Owen T., 1962; Causey, L. V. and Leve, G. W., 1976; Cooper, H. H. and Stringfield, V. T., 1950; Dysart, J. E., et al, 1977; Feth J. H., et al, 1965; Flood and Associates, Inc., et al, 1978; Healy, H G., 1974, 1975a, 1975b, 1977; Hyde, L. W., 1965 and 1975; Jacobs, C. E., Cooper, H. H., Jr., and Stubbs, S. A., 1940; Klein Howard, 1971 (revised 1975); Matson, G. C. and Sanford, S., 1913; Musgrove, Rufus H., Barraclough, Jack T., and Grantham, Rodney G., 1965a, 1965b, and 1966; Musgrove, Rufus H., Barraclough, Jack T., and Marsh, Owen T., 1961; Rosenau, J. C. and Meadows, P. E., 1977; Shampine, W. J., 1975a and 1975b; Stewart, J. W., et al, 1971; Stringfield, V. T. 1964; Trapp, Henry, Jr., 1972, 1973, 1975, 1977, 1978, and 1979; and Vernon, Robert O., 1973). These investigations were concentrated on the shallow sand and gravel aquifer, but most all touched on the Floridan Aquifers as well. Figures 5-26 and 5-27 (Barraclough, Jack T., and Marsh, Owen T., 1962) show the statigraphic relationship of these aquifers and various aquitards.

The aquifers are described in several of the reports and no major differences in the descriptions were noted. The following aquifer descriptions were taken primarily from Musgrove, Barraclough, and Grantham, 1965.

Virtually all groundwater that is withdrawn in Escambia and Santa Rosa Counties comes from the sand and gravel aquifer. Although composed predominantly of sand, numerous lenses and layers of clay and gravel that are as much as 60 feet thick occur throughout the aquifer, and abrupt changes of facies are characteristic of the aquifer. The uppermost 5- to 20-foot section of the aquifer consists of light tan, fine to coarse sand that is soft and loose in contrast to the hard, reddish brown, pebbly sand that underlies it. The aquifer consists predominantly of quartz sand, ranging from white to light brown or reddish brown. Although some beds are moderately well sorted, the unit as a whole is generally rather poorly sorted. The associated stringers and lenses of gravel are made up chiefly of pea-sized pebbles. Small stringers of white to gray clay are scattered throughout the aquifer in addition to the large lenses of clay. In contrast to the rest of Florida, the groundwater conditions in Escambia and Santa Rosa Counties are complicated by the great lithologic variability of the aquifer. Groundwater is under artesian pressure where lenses and layers of clay, sandy clay, or hardpan overlie a saturated, permeable bed and under non-artesian conditions where such clays and hardpans are absent or where the permeable bed is not completely saturated. The recharge to this aquifer is derived almost entirely from rain falling in the immediate area of concern.

The Floridan aquifer in Escambia and Santa Rosa Counties is separated from the sand and gravel aquifer by a thick section of clay and is subdivided into two parts by an extensive clay bed. The upper limestone of the Floridan Aquifer is typically a brown to light-gray hard dolomitic limestone or dolomite with a distinctive spongy-looking texture and contains abundant shell fragments. The

upper Floridan Aquifer is recharged mainly by water from the sand and gravel aquifer where the two are in contact in northern Escambia and Santa Rosa Counties.

The lower member of the Floridan Aquifer is white to grayish cream, rather soft and chalky limestone, but these appear to be randomly distributed and cannot be correlated from well to well over any great distance. Recharge to the lower aquifer is derived from rain falling on the outcrop area some 10 to 35 miles to the north. The movement of groundwater in both sections of the Floridan Aquifer is generally to the south and southeast.

No comprehensive investigations of the groundwater underlying NAS Pensacola have been conducted, but several site-specific studies are available. These studies were initiated to support limited requirements and, while recommendations were usually made to follow up the work with groundwater movement definition, follow-up work was not always accomplished (or at least not located during this IAS). A large part of this data gap is due to the early concern of defining "pollution" and an unawareness on the part of samplers that water levels can be as important as water analysis.

Groundwater studies or investigations directly applicable to NAS Pensacola include general studies of the sand and gravel aquifer by Trapp, Naval Civil Engineering Laboratory (Crawford, Kent, and Youngberg, 1975 and Boettcher, 1976), sanitary landfill effluent investigations, Potable Water Supply Study by Black, Crow, Eidsness, Wastewater Treatment Studies by Dawkins and Associates, Inc., and Missimer and Associates, Inc., investigation of groundwater contamination from the NAS IWTP.

Trapp, 1972, reported that nine paired (adjacent shallow and deep) observation wells were installed in the Pensacola area. In these wells the water levels in the shallow observation wells were consistently higher than the water levels in adjacent deeper observation wells. In these areas the vertical component of groundwater flow is downward, and at least that part of the groundwater body tapped by the deeper wells is receiving recharge. Thus, all this project's paired observation wells were drilled in areas of recharge and most of the Pensacola area, including NAS Pensacola, probably is a recharge area. One well, test hole No. 11, was located just northwest of NAS Pensacola (Figure 5-18 and Appendix B).

Trapp, 1973, reported on an additional test hole (No. 23) southwest of NAS Pensacola (see Figure 5-18 and Appendix B) and the construction of a regional water table map. The water table map, Figure 5-28, was based on control points obtained from measured or reported water levels in shallow wells, from neutron logs, from elevations along perennial streams, and from estimates derived from well depths and topography. The map is generalized because the control is widely spaced, mostly imprecise, and does not apply to a single point in time. The preparation of the map was also complicated by the problem of distinguishing perched water tables from the regional water table. Water levels in shallow wells and surface water bodies were assumed to represent the regional water table unless direct evidence of a perched water table was available. Perched groundwater bodies are usually of small areal extent, and they probably accounted for some of the irregularities in the configuration of the regional water-table countours, but not on the NAS Pensacola area. The

water-table elevations of 0 to less than 30 feet as shown on Figure 5-28 are probably valid for the historical conditions at NAS Pensacola.

Trapp, 1975, mapped the potentiometric surface for the sand and gravel aquifer zone extending from 100 to 300 feet deep, the most commonly screened inverval. Historical data were used to prepare a predevelopment map, and the spring-summer 1973 data were used to prepare a post-development map. The predevelopment map showed that the potentiometric surface of the sand and gravel aquifer in southern Escambia County was lenticular, paralleling the Escambia River to the east and the Perdido River to the west, and that the gradient was toward both rivers and Gulf of Mexico to the south. The post development map (Spring-Summer, 1973) retains the same general pattern, but numerous depression cones have developed around large production wells. The well field at NAS Pensacola (see Figure 5-18) had a depressed potentiometric surface to 20 feet below sea level as shown on Figure 5-29.

The Black, Crow, and Eidsness Study, 1969, was not based on any new data, and the data included are not precise. They reported on four test wells with data taken in 1953 and one boring in 1969 (see Figure 5-30 and Table 5-6). No historical data were obtained which documented well installation or testing procedures, so the variations in water levels of the different strata in Well No. 3 cannot be explained. The water level in Well No. 1 and Well No. 2 approximate sea level and are probably good data, but Well No. 3 and Well No. 4 exhibit some levels well below sea level and are questionable. In addition, the one boring, at an elevation approximating the elevations of Well No. 3 and Well No. 4 encountered groundwater at depths of six to seven feet which lessens the reliability of the water levels recorded for Well No. 3 and Well No. 4.

The groundwater investigations at NAS Pensacola's sanitary landfill (Crawford, Kent, and Youngberg, 1975 and Boettcher, 1976) were prompted by the leachate emission from the landfill and foreseeable capacity limits of the landfill operation. Crawford, Kent, and Youngberg reported on 11 groundwater monitoring wells in the vicinity of the landfill, and four wells at potential landfill sites (see Figure 5-31). These wells exhibited groundwater elevations ranging from 1.87 feet MSL to 13.76 feet MSL in the vicinity of the landfill with the lower elevations to the north toward Bayou Grande. Potential landfill sites north of Forrest Sherman Field had water table elevations of less than 10 feet MSL and the potential sites south of the fuel farm had water table elevations of slightly less than 19 feet MSL. Figure 5-31 presents the general location of the observation wells (NFECSD, 1975) and Table 5-7 presents their ground water elevation data. These observation wells were lined with 1-1/4" galvanized pipe and were constructed by driving a five-feet pointed screen to a depth such that the point was four feet below the water table. A backhoe was used to remove soil cover prior to driving the well points. An eighteen-inch section of the pipe extended above ground level and was covered by a threaded cap.

Boettcher, 1976, reported that two additional monitoring wells were placed in the vicinity of monitoring Well No. 7 to provide samples representative of groundwater quality approximately 10 feet and 20 feet below the upper elevation of the groundwater, which is sampled by Well No. 7. This report states that during the period of August 1974 through March 1976 the

maintained at NAS Pensacola. Note that no correlation between NAS Pensacola and the city of Pensacola contamination as reported by Trapp is suggested, in fact they are probably unrelated. These are simply facts that must be considered when planning NAS Pensacola activities.

5.4. BIOLOGICAL FEATURES

5.4.1 Life Zones and Ecology.

5.4.1.1 Marine and Estuarine Plant Communities. Two major marine and estuarine plant communities are found in the vicinity of NAS Pensacola--the seagrass communities and the coastal marsh. These are particularly important because of their high productivity and their role in the food chains of many marine organisms.

5.4.1.1.1 Seagrasses. Seagrasses are very important members of the marine subtidal flora. Despite the common name, seagrasses are not members of the grass family. They are vascular monocots with true roots, stems, leaves, flowers, fruits, and seeds. Characteristically, these seagrasses grow completely submerged in the saline waters with only the lowest of tides ever exposing them to air. They serve as protective nursery habitats for a number of economically important fish and shellfish species.

Turtle grass (Thallassia testudinum), shoal grass (Haladule beaudettei), and manatee grass (Cymodocea filiformis) are the most common seagrasses in the Pensacola area. Wideon-grass (Ruppia maritima), although not a true seagrass, invades brackish waters and is often mixed with seagrasses in the Pensacola area. Halophila baillonis and Halophila engelmanii have not been reported from the coastal waters of the area, but research indicates that they probably do occur there at depths of six to ten meters and more. These two species of Halophila are generally considered to be rare.

The three common seagrasses are found in sandy-bottom shallow waters of low-energy seashore sites. They occur in dense stands, called grassbeds, in very close-to-shore depths of usually not more than six feet; although Thalassia has been observed at a depth of 75 feet.

Seagrasses were formerly abundant in Escambia Bay, Pensacola Bay, and East Bay, but have declined in these locations over the last 25 years to such an extent that now only a few scattered beds remain.

Seagrass beds are usually heterogeneous communities, with the three most common seagrasses variously intermixed. Frequently Ruppia maritima occurs with the seagrasses in places of lower salinity. The seagrass beds comprise an extremely important component of the local flora. They exhibit several significant environmental functions including:

(1) Primary production of biomass with resultant carbon fixation and oxygen production.

(2) Stabilization of bottom sediments by acting as sediment traps.

(3) Food supply for numerous animals both directly and through the detrital food webs.

(4) Habitat for certain invertebrates which attach to or burrow into their leaves.

(5) Refuge and protection for the immature stages of numerous seafood organisms including fishes, crabs, shrimps, and bay scallops.

(6) Supply of an important substrate for the attachment of various species of benthic algae.

5.4.1.1.2 Coastal Marsh. Coastal marshes are subject to the gentle daily fluctuations of the tides and are usually associated with the relatively protected bay and estuary habitats. These coastal marshes exhibit a distinct zonation of the most abundant plants in relation to inundation, salinity of the water, elevation of the substrate, and other factors.

Three broadly discernible vegetation zones are found within coastal marshes. The outermost zone is dominated by the grass Spartina alterniflora and extends from about mean sea level up to level of the highest tide. Just landward of the Spartina zone and on slightly higher ground is a zone dominated by Juncus roemerianus, the black needle rush. This zone is the most extensive in the local marshes and is composed of an almost pure strand of Juncus. The third vegetational zone is characterized by the grasses Distichlis spicata and spartina patens. This zone is above the high tide lines and normally is inundated by sea water only during storm conditions.

Distributed throughout the higher areas of the coastal marsh are a number of herbaceous dicots, such as sea lavender (Limonium carolinianum), marsh fleabane (Pluchea purpurascens), and salt-marsh aster (Aster tenuifolius).

Other grasses commonly found here are salt jointgrass (Paspalum veginatum) Virginia dropseed (Sporobolus virginicus), and reedgrass (Phragmites communis). Common in and around the salt barrens of these marshes is glasswort (Salicornia perennis).

Just landward of the marsh is usually located a zone of shrubs that commonly include was myrtle (Myrica cerifera), ground-sel bush (Baccharis halomifolia), marsh elder (Iva frutescens), and yaupon holly (Ilex vomitoria).

5.4.1.2 Terrestrial Plant Communities. Four major terrestrial plant communities are found within southeastern Escambia County. The two forms prevalent at NAS Pensacola are the coastal strand and the scrub communities. In the areas surrounding the NAS Pensacola installation, the flatwoods and sandhill plant communities dominate, although these two communities may occur within the installation boundaries where local environmental conditions favor their occurrence.

The basic vegetative cover at NAS Pensacola consists of grasses (Gramineae sp.) kudzu (Pueraria thunbergiana), and pine (Pinus sp.). Some annual legumes are present throughout the area such as Lespedeza sp. and vetch (Vicia sp.). The golf courses are extensive grassy areas comprising about 135 acres of the 5,161 acres at NAS Pensacola.

5.4.1.2.1 Coastal Strand. The coastal strand is characterized by extensive white-sand beaches and adjacent dune systems. The most noticeable feature of the vegetation is the distinct zonation which is observed as one travels inland from the seashore. Research has shown the primary causal factor for this zonation is the action of salt spray on the vegetation.

The soils here are composed of incoherent sand which make up the famous gleaming white sands of Pensacola beaches. The substrate is extremely infertile due to rapid leaching. Consequently, the plants which occur here have extensive outsized root systems.

The well-known sea oats (Uniuola paniculata) dominate the treeless, primary dunes area just inland from the beach strip, forming a characteristic zone. Associated with sea oats in this zone are the sea rocket (Cakile edentula), beach pennywort (Hydrocotyle bonariensis), seaside evening primrose (Oenothera humifusa), beach morning-glory (Ipomoea stolonifera), and dune mile pea (Calactia microphylla).

Another zone, characterized by shrubs, usually extends inland from the sea oats zone. Here the woody goldenrod (Chrysoma pauciflosculosa), conradina (Conradina canescens), and the unusual dune rosemary (Ceratiola erocoides) can be found. Outstanding in this shrub zone are low dense clumps of twin live oak (Quercus geminata). Here, due to action of the salt spray, this plant, which is usually designated as a tree, is reduced in the form to that of a gnarled shrub. The dune golden aster (Chrysopsis anguina), the dune milkweed (Asclepias humistrata), and jointweeds (Polygonella spp.) are also common in this zone.

Inland from the shrub zone, and far enough from the tide line that spray in minimal, forests of slash pine (Pinus elliottii) and sand pine (Pinus clausa) occur.

In some areas, there may be a secondary dune ridge inland from the primary dune ridge separated from it by an interdunal zone. These are typically low, moist swales that support plants of hydric affinity. The plants typical of these areas are not found elsewhere in the dunes, where conditions are most xeric. Usually occurring in the swales are such plants as redwood (Lacnanthes caroliniana), bladderwort (Utricularia spp.), yelloweyed grasses (Xyris spp.), umbrella grass (Fuirena scripoidea), and bog buttons (Lacnacaulon englerii).

5.4.1.2.1.1 Ecology. Strand communities expend a considerable portion of their energy budget in adapting to the severe stresses of shifting sands, a highly saline environment, and high winds. In some instances, salt spray plays a role similar to fire in other ecosystems by retarding succession indefinitely at a grass or shrub state.

Because these plants are so highly specialized to withstand these natural stresses, they are highly sensitive to stresses not found in their natural environment. The effect of trampling or crushing is severe, and even light use of the vegetated areas may degrade them.

5.4.1.2.1.2 Value. Beaches, dunes, and their associated vegetation are important in absorbing and moderating the influence of waves and wind on coastal areas.

5.4.1.2.1.3 Vulnerability. The coastal strand is a dynamic system, advancing into the sea and receding from it according to the influences of winds, waves, currents, and changes in sea level (sea level has apparently been slowly rising over the last hundred years). These agents transport sand from offshore bar to beach to dune, and back again. They also move it up and down the coast (longshore drift), causing erosion of one beach and accretion of another.

Except for interference with the sand transport system, the sand beach itself is almost immune to man's activities. Foredune plants, however, are extremely sensitive to the effects of four-wheel drive vehicles, motorcycles, and even foot traffic and must be protected from nearly all direct use. Backdunes are not quite so sensitive and will support light use.

5.4.1.2.1.4 Endangerment. The Florida Beach and Shore Preservation Act requires the Department of Natural Resources to establish coastal construction setback lines in all coastal counties, based upon natural processes. The act also requires the department to regulate construction undertaken for shore protection purposes.

5.4.1.2.2 Scrub. The scrub communities occur on sites which were coastal dune formations in former geologic ages. The habitat is xeric, and the soils are very infertile, being generally white sands of the Lakewood type. In general, the plants distinctive of the scrub community are also found on relatively recent coastal dunes. Here, the sand pine (Pinus clausa) is the dominant tree. Three oaks are also common. These are twin live oak (Quercus geminata), myrtle oak (Quercus myrtifolia), and chapman oak (Quercus chapmanii). Rosemary (Ceratiola ericoides) and saw-palmetto (Serenoa repens) are abundant shrubs in the understory.

5.4.1.2.2.1 Ecology. The sand pine scrub is essentially a firebased community. Ground cover is extremely sparse and leaf fall is minimal, thus reducing the chance of the frequent ground fires so important in the sandhill community.

Such fires allow for regeneration of the sand pine community, which would otherwise pass into a xeric hammock. This type of fire regeneration usually results in even-aged stands of trees. The Ocala variety of sand pine (dominant in the peninsula) is so adapted to fire regeneration that heat (as from a fire) is needed to open its cones.

5.4.1.2.2.2 Value. This community, with its deep, loose sand, is typically a valuable aquifer recharge area. It is of considerable scientific value because of its endemic species of wildlife, its unique ecology, and the example it presents of ecosystem response to heat stress.

5.4.1.2.2.3 Vulnerability. The scrub is vulnerable to erosion and root damage caused by foot and mechanized traffic. The most important consideration, however, is proper management by maintenance of the fire schedule or other means such as clear cutting.

5.4.1.2.2.4 Endangerment. Scrub communities are rapidly being lost to real estate development because of their ideal, well-drained upland situation. Scrub communities should be considered highly endangered.

5.4.1.2.3 Flatwoods. Flatwoods vegetation occupies areas which were ocean bottoms in past geologic ages. The terrain of the flatwoods is generally level with no appreciable contours of elevation. The appearance is that of a flat expanse of forested land, with the longleaf pine (Pinus palustis) being the dominant tree. Subdominant species in these forests are the slash pine (Pinus elliottii) and the saw-palmetto (Serenoa repens) which grows in prominent thickets in the understory. Such flatwoods comprise a major part of the southern pine forests of the United States.

The flatwoods soils contain little organic matter and are quite sandy in composition. The flatwoods are characterized by a very shallow water table and generally poor drainage. In places, the soil is almost continuously moist and there are frequently areas that have shallow standing water throughout the year.

The low swampy depressions of the flatwoods are usually inhabited by strands of pond cypress (Taxodium ascendens), an interesting deciduous conifer closely related to the bald cypress. Usually associated there with the pond cypress are the buckwheat tree (Cliftonia monophylla), swamp cyrilla (Cyrilla recemiflora), and other hydric species. The latter two trees, together with other usually riparian species, are found also along the many small creeks and dainage courses which are typical of such flatwoods.

Open savannah-like areas also occur in the flatwoods habitats. In these moist, acid sites, a number of interesting herbaceous plants occur. Of particular note among these are the following insectivorous plant: butterworts (Pinguicula spp.), pitcher-plants (Sarracenai spp), sundews (Drosera spp.), and bladderworts (Uticularia spp.). Also characteristic of these sites are the golden crest (Lophiola americana), the rush featherline (Pleea tenuifolia), false blazing star (Carphephorus pseudo-liatris), and various milkworts (Polygala spp.).

5.4.1.2.3.1 Ecology. Fire and water are the two main determinants in the ecology of flatwoods. Fire is instrumental in reducing competition from hardwoods, but it generally does not occur often enough to kill the young, fire-sensitive slash pines.

The longleaf pine is particularly well adapted to fire and is immune to ground fires at almost all stages of growth. In fact, successful natural regeneration of longleaf pine is dependent on fire to provide a suitable seedbed for germination and to control brown spot disease, which causes heavy seedling mortality.

5.4.1.2.3.2 Value. The naturally high net productivity of flatwoods, particularly slash pine flatwoods, is conducive to lumber production and is a significant source of wood for man's use.

5.4.1.2.3.3 Vulnerability. Flatwoods and fairly resilient ecosystems, but alternation of fire or water patterns can drastically change their species composition. Removal of fire results in succession to different types of hardwood communities, depending on the water stresses of a particular site.

5.4.1.2.3.4 Endangerment. Because of the vast area they cover (30 to 50 percent of the state), their natural resiliency, and their desirability as a renewable source of wood, their endangerment is not high when compared with other systems.

5.4.1.2.4 Sandhill. In general, the sandhill community is the most abundant vegetation type of South Escambia and Santa Rosa Counties. Soils are dry, slightly lower in fertility than the flatwoods soils, and contain a considerable amount of grayish sand.

Sandhill vegetation is dominated by the longleaf pine (Pinus palustris). Next in abundance is the turkey oak (Quercus laevis). This common tree displays the uncommon property of holding its leaves in such a way that the blade surfaces are perpendicular to the ground, a characteristic which produces a distinctive ragged appearance. Bluejack oak (Quercus marilandica), post oak (Quercus stellata), and southern red oak (Quercus falcata) are also typical inhabitants of sandhill communities. Laurel oak (Quercus hemisphaerica) and live oak (Quercus virginiana) may also be found here. However, these two species do not achieve their maximum stature nor fullest development in the sandhill environment.

The wild persimmon (Diospyros virginiana) and the Pensacola hawthorn (Crataegus lacrimata) are common on the sandhill and are good indicators of this community. Low-growing clumps of saw-palmetto (Serenoa repens) are also common in the sandhill pine forests.

Of the many herbaceous plants found in the sandhill community, two are particularly noteworthy. These are the bracken fern (Pteridium aquilinum) and wire grass (Aristida stricta). The bracken fern is the most abundant fern in the area and is particularly resistant to fire. It is one of the pioneer plants to reappear when a sandhill forest has been burned.

Wire grass is so named because of its long, narrow, wiry leaves. This perennial species is particularly abundant in the longleaf pine forests and is also remarkably resistant to fire. In fact, it is dependent upon periodic burning for optimum growth. This grass seldom produces seeds; it reproduces rarely and has a life span of several hundred years.

5.4.1.2.4.1 Ecology. Fire is the dominant factor in the ecology of this community. The interrelationships of the sandhill vegetation, particularly the longleaf pine-wiregrass relationship, are dependent on frequent (every two to five years) ground fires. Longleaf pine is very sensitive to hardwood competition. Wiregrass plays a role in preventing the germination of hardwood seeds and in ensuring that there is sufficient fuel buildup on the floor of the community to carry a fire over large areas.

After fire, heat and drought are the dominant influences on the sandhill community, with many plants expending considerable portions of their energy budget to adapt to these factors.

FINAL
Integrated Cultural Resources Management Plan
Naval Air Station Pensacola
Escambia County, Florida

Volume I

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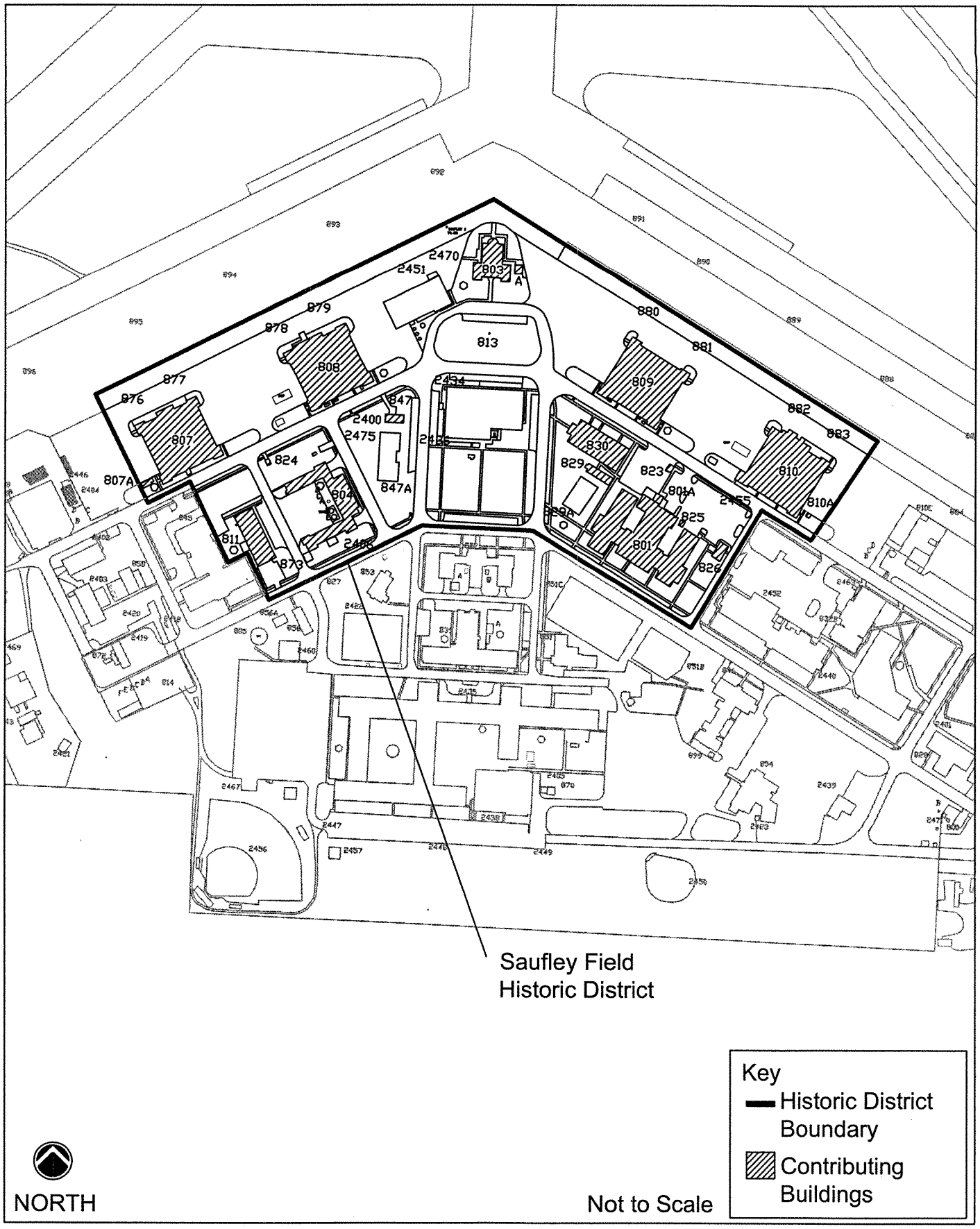


Figure 9-9. Location map showing Saufley Field Historic District. Source: NAS Pensacola Facilities Management

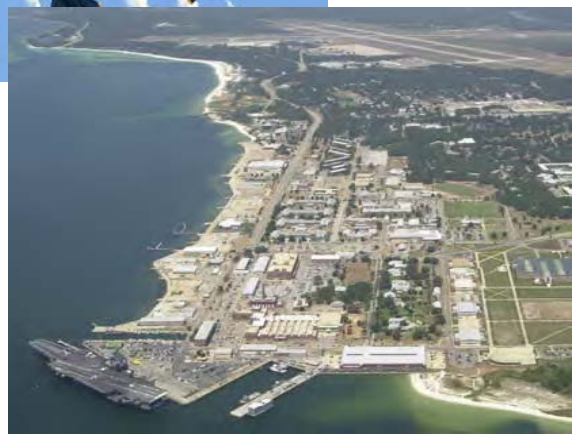
CORRY STATION

In 1997, Thomason & Associates prepared an Integrated Cultural Resources Management Plan for Naval Technical Training Center (NTTC) Corry Station. As part of the ICRMP, Garrow & Associates completed a Phase I archaeological survey. Ten areas were identified as undeveloped and designated for systematic testing. According to the report, no new or previously recorded archaeological sites were identified for this project area, and no cultural materials were observed or collected. In early 2003, the HHM staff archaeologist revisited the area. No additional archaeological information was recovered during this visit, and no further action was recommended. The field assessments were performed in accordance with the Florida state guidelines for cultural resource studies, under the direction of NAVFAC EFD SOUTH and NAS Pensacola personnel.

SAUFLEY FIELD

In 1997, Thomason & Associates prepared an Integrated Cultural Resources Management Plan for The Navy Education and Training Professional Development and Technology Center (NETPDTC), Saufley Field. A Phase I archaeological survey was conducted in 1996 over an area of approximately 200 undisturbed acres. The survey resulted in the documentation of four isolated artifacts and a modern trash dump area. According to the National Register assessment recommendations, these resources were ineligible for the NRHP and not subject to any further study. Early in 2003, the HHM staff archaeologist conducted a limited reconnaissance and pedestrian inspection. No NRHP-eligible archaeological resources were identified within the portion of the previously surveyed area that was accessible at that time. The survey was conducted in accordance with the Florida state guidelines for cultural resource studies, under the direction of NAVFAC EFD SOUTH and NAS Pensacola personnel.

ESCAMBIA COUNTY
JOINT LAND USE STUDY



Escambia County, Florida
Growth Management Department

United States Navy

United States Department of Defense

Naval Air Station Pensacola

Navy Outlying Landing Field Saufley

Navy Outlying Landing Field Site 8

September 2003

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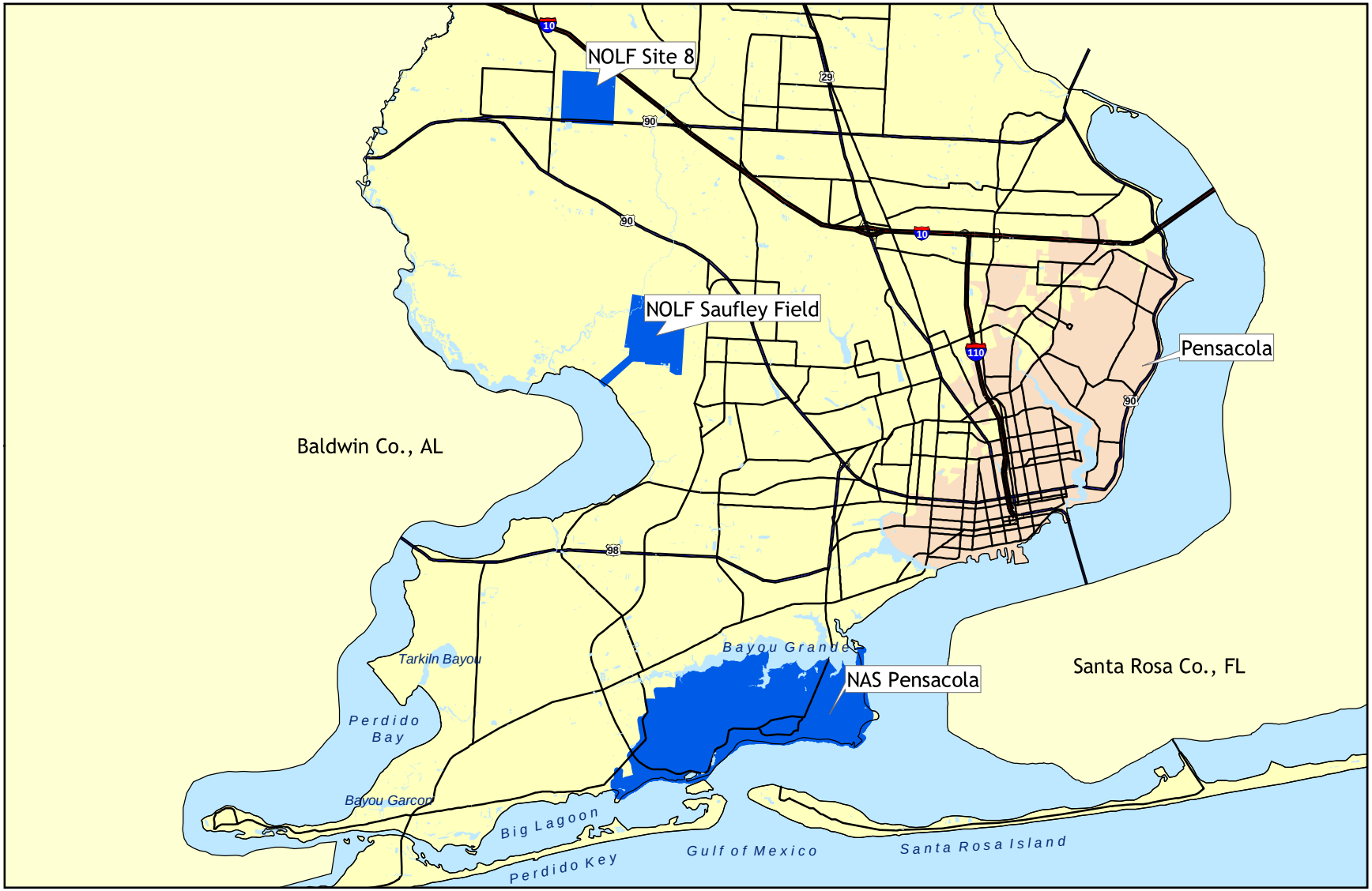
Figure 1. General Location Map



Military Facility Boundaries
Water Body
County Boundary
City Boundary

Interstate
U.S. Highway
State/County/Local

N
W
E
S

0 0.5 1 2 3 Miles

responsibilities in recruit training for specialized skills, officers, warfare specialty, and fleet individual and team training.

NAS Whiting Field (NOLF Saufley and NOLF Site 8)

On July 16, 1943, the Navy officially commissioned Naval Auxiliary Air Station Whiting Field. In January 1972, Whiting Field became the home of Training Air Wing FIVE and added helicopter training the following year. Since then, all graduates of Navy helicopter training receive their Wings of Gold at Whiting Field.

In 1977, NAS Whiting Field began use of the T-34C Turbo Mentor as the primary aircraft trainer. Whiting Field today hosts a fleet of 145 T-34Cs and 119 TH-57s at its main airfield and 14 Navy Outlying Landing Fields (NOLFs).

Saufley Field began in 1943 as a Naval Auxiliary Air Station training Squadron 3-B. In 1976, Saufley Field became a NOLF to support training for student aviators from Training Air Wing FIVE (TRAWING-FIVE). NOLF Saufley also hosts the Naval Education & Training Program Development & Technology Center (NETPDTC), a subordinate command of the Naval Education & Training Command (NETC).

NOLF Site 8 supports helicopter training from NAS Whiting Field, as well as aviation and ground fuel support services.

3.4 Current and Future Military Operations

NAS Pensacola

NAS Pensacola covers approximately 8,423 acres of land--5,800 acres at the main installation (NAS) in southern Escambia County and 2,623 acres at other sites. The installation features two parallel runways (7/25) 8002 feet x 200 feet and a single North/South runway 7,137 feet x 200 feet.

Today, NASP supports a variety of aviation operations, including:

- Training Air Wing SIX (TRAWING SIX), which provides advanced Naval Flight Officer, Air Force Navigator, and International Flight Officer training
- the Blue Angels Navy Flight Demonstration Squadron (NFDS)
- NAS Search and Rescue, which supports the TRAWINGS 5 and 6 operations

Local aircraft based at NASP include:

- T-39 Sabreliners
- T-2C Buckeye, a tandem-seat, carrier-capable, all-purpose jet trainer
- T-1A Jayhawk, a medium-range, twin-engine jet trainer
- T-34C Turbomentor, a two-seat, tandem cockpit low-wing turboprop trainer
- T-6A Texan II, a single-engine, two-seat primary trainer
- F/A-18 Hornets (flown by Blue Angels)
- C1-30 Hercules, transport aircraft
- H-3 SeaKing helicopter (flown by SAR)

will undoubtedly increase both the flight frequency and noise impacts around NAS Pensacola.

NOLF Saufley

NOLF Saufley is an area of approximately 860 acres. The site currently has 63 buildings with about 600,000 square feet of space, two 4,000-foot runways, and three aircraft hangars.

Today, NOLF Saufley is a multi-functional, joint use facility used for practice landings and take-offs ("touch and go's") of T-34C and T-6A single-engine, propeller-driven aircraft. During 2002, NOLF Saufley generated 43,093 flight operations.

According to the NETC Regional Shore Infrastructure Plan (RSIP), NAS Whiting and its outlying fields will see steady rates of aviation training activity through 2020.

T-34 Aircraft

NOLF Site 8

Today, Site 8 operates as a 640-acre outlying landing field used to practice tactical training landings and take-offs ("touch and go's") of the TH-57 Sea Ranger, training helicopter. Site 8 produced 43,354 flight operations in 2002.

TH-57 Sea Ranger landing at NOLF Site 8

3.5 County Demographics and Growth Trends

Figure 6 shows basic demographic data combined to show the total of all of the U.S. Census Tracts that are adjacent to the three military airfields. Overall nearly, 50,000 residents in over 18,000 homes live in a census tract next to one of the bases.

Figure 6. Surrounding Census Tract Demographics, 2000

	Total
Population	49,637
Households	15,461
Avg. HH Size	2.67
Housing Units	18,610
Vacant	3,149
Owner Occupied	11,111
Renter Occupied	4,350

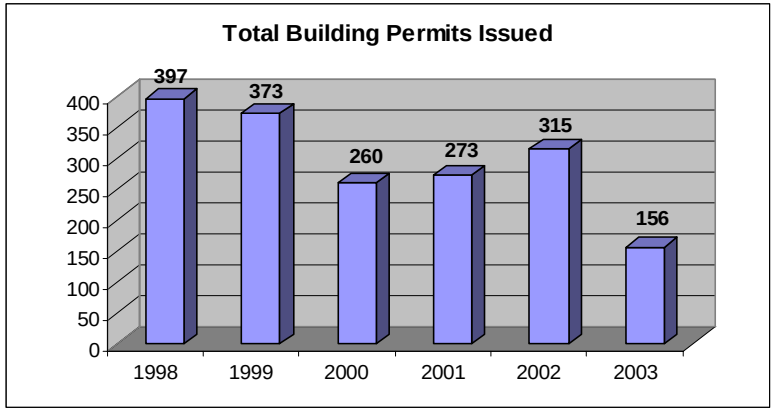
Source: U.S. Census 2000

Encroachment (or the moving of civilian development closer to a military airfield) will continue to be a major issue in Escambia County in the years to come. Population projections from the West Florida Regional Planning Council indicate that Escambia County will grow by about 16 percent over the next decade. Since the western portions of the county still contain a considerable supply of vacant land relative to built up areas around the City of Pensacola, land near the military airfields is at risk to absorb a significant share of this expected growth.

NAS Pensacola

Data collected from the Escambia County Growth Management Department indicate relatively steady development pressure around NASP. The county issued 1,774 building permits over the last five years with 90 percent of the permits for single family dwelling units.

Figure 7. Building Permits Issued near NAS Pensacola, 1998 to May 2003



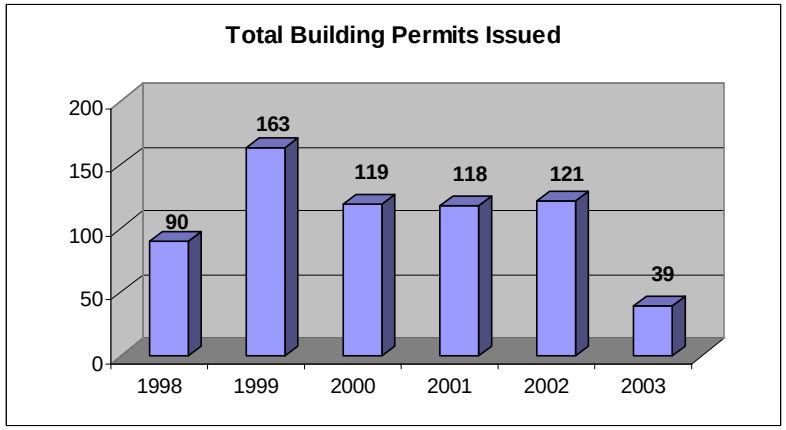
Source: Escambia County Growth Management Department, 2003

The Escambia County Utilities Authority (ECUA) has programmed 11 wastewater infrastructure improvement projects as part of its FY 2004-2008 Capital Improvement Program. The projects are primarily geared toward the expansion of ECUA's sewer collection system into neighborhoods dependent upon septic tanks for sewage disposal. The projects focus mostly in residential areas along Gulf Beach Highway and north of Bayou Grande.

NOLF Saufley

A five year trend around NOLF Saufley shows 650 building permits issued, 84 percent of which were for single family dwelling units.

Figure 8. Building Permits Issued near NOLF Saufley, 1998 to May 2003



Source: Escambia County Growth Management Department, 2003

Currently, the public has access to the Bayou Grande Nature Trail and Trout Point Nature Trail at NASP, along with limited use of the jogging/fitness trail and the Bayou Grande primitive camping areas.

NOLF Saufley

The majority of land use at NOLF Saufley consists of active runways and other paved surfaces. Buildings and facilities cluster in the southern portion of the installation, south of the runways. The northern portion of the installation, near Eleven Mile and Eight Mile Creeks, contains floodplain forests and remains relatively natural.

According to the INRMP for NAS Whiting Field, the Navy designates the south and central portions of NOLF Saufley as an Operational Protected Area due to intensive airfield and support activities. The area north along Eight Mile and Eleven Mile Creeks encompasses Protected Areas with unique longleaf and mixed pine forests and floodplain forests. The Saufley Field Nature Trail winds through the forests and swampy lowlands of this area.

A 1997 study delineated approximately 100 acres of wetlands at NOLF Saufley. A majority of the wetlands are part of floodplain areas near Eleven Mile and Eight Mile Creeks in the northern portion of the installation. Other wetlands on the installation are associated with an unnamed swamp forest adjacent to Perdido Bay, at the southwest corner of the installation.

NOLF Saufley has four high quality natural communities: blackwater stream, depression marsh, floodplain swamp, and seepage slope areas. The FNAI also identified four rare vertebrate species and six rare plant species at NOLF Saufley.

Currently, the public has access to the Saufley Field Nature Trail and the Saufley Field primitive camping areas.

NOLF Site 8

The INRMP identifies most of NOLF Site 8 as an Operational Protected Area due to its intensive use and maintenance as a helicopter landing field. The installation also has four distinct environmentally Protected Areas. Two areas to the north consist of forested wetlands. One protected portion to the east contains longleaf, slash, and loblolly pine stands, and a high quality baygall community. The protected southwest corner has pine and mixed pine-hardwood forest stands mixed with wetlands.

NOLF Site 8 has approximately 46 acres of wetlands. The installation also has Gopher tortoises, a rare vertebrate species, and a total of ten rare plant species.

Wetlands

As shown in Figures 10, 11 and 12 significant wetlands systems surround all three of the military airfield sites. Wetlands are particularly intensive to the west of NASP and NOLF Saufley.

This section assesses how the growth trends, operational and land resources identified in the previous section interact.

4.1 AICUZ

NASP first conducted an Air Installation Compatible Use Zones (AICUZ) study in 1976 followed by updates in 1988 and 1990. As one of the actions leading up to the JLUS process, the county and Navy collaborated to refine the accuracy of the AICUZ boundaries using the latest Geographic Information Systems Technology.

The purpose of the AICUZ program is to promote compatible land use patterns around air installations. The AICUZ recommendations include height and obstruction criteria for flight safety, as well as recommended land uses for areas exposed to noise and accident risk.

The AICUZ process identifies areas that are exposed to noise using a computerized simulation of aircraft activity at the installation. The exposure varies based on site-specific operational data; e.g., flight tracks, type and mix of aircraft, aircraft profiles (airspeed, altitude, power settings), and frequency and times of operations.

The AICUZ expresses noise around the military airfield using a Day-Night Average Sound concept (DNL). The L_{dn} descriptor indicates average decibels (dB) as measured over a 24-hour time period with an extra penalty for nighttime noise.

For land use planning purposes, the noise environment around the military airfield consists of three zones. Noise Zone 1 has an exposure of less than 65 L_{dn}. In general, noise levels of less than 65 L_{dn} are thought to be consistent with some residential uses. Noise Zone 2 exposes people to noise between 65 and 75 L_{dn}. Some land use controls are therefore appropriate for this area. With noise in excess of 75 L_{dn}, Noise Zone 3 is the most severely affected area around the airfield and should be subject to the most restrictive land use controls. In addition to these zones, the AICUZ may identify areas of concern where noise levels do not exceed 65 L_{dn}, but operational characteristics, such as repetitive flying motions, may be objectionable. Noise exposure appears on AICUZ maps as contours that spread outward from the runways.

In addition to noise, the AICUZ describes the risk of accident in areas near the military airfield. The determined accident potential is based on historical accident data.

Areas at risk for accident consist of three zones:

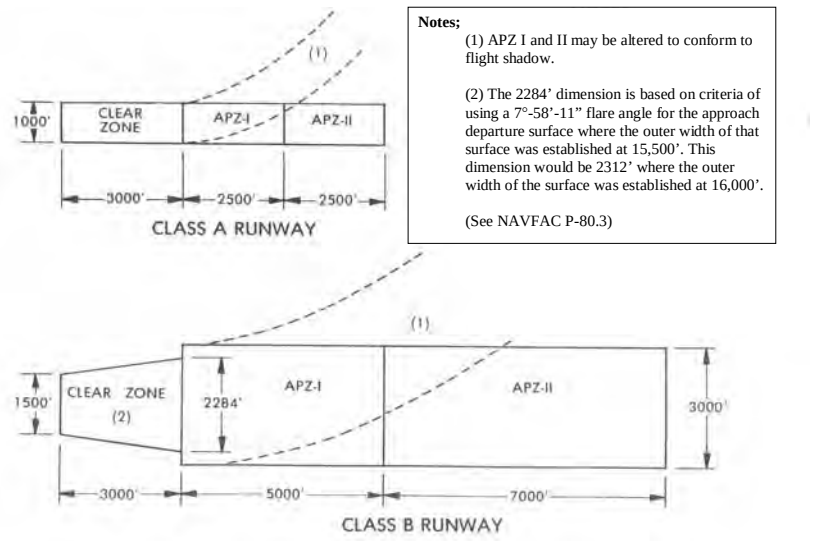
The *clear zone* is the area immediately beyond the runway and has the highest statistical risk for aircraft accidents.

Accident Potential Zone I (APZ-I) is the area beyond the clear zone, but still possesses a significant potential for accidents.

Accident Potential Zone II (APZ-2) is an area beyond APZ-I which displays a measurable risk for aircraft accidents.

The shape of the APZ reflects the takeoff and landing patterns of the aircraft. The dimensions of APZ vary to accommodate the operational characteristics of the aircraft flown at the installation. NASP features a Class B runway and NOLF Saufley a Class A runway. See Figure 13.

Figure 13. Fixed Wing Accident Potential Zones



Source: OPNAV INSTRUCTION 11010.36B, December 2002

The Department of Defense sets specific recommendations for land uses within the various noise and accident potential zones identified in the AICUZ Program. The Technical Appendix of the JLUS document contains the full guidance as developed in OPNAV INSTRUCTION 11010.36B, a document used across the nation to set compatibility standards around military installations.

In general, OPNAV guidance does not recommend residential uses for Noise Zones 1 and 2 where exposure is in excess of 65 L_{dn}. These noise zones, however, may support a variety of compatible manufacturing, transportation, trade, and service activities. The OPNAV standards recommend against the presence of any structures in the clear zone, and residential structures in APZ1. OPNAV suggests low density residential uses of 1 to 2 dwelling units per acre in APZ2. As with noise zones, a variety of other commercial, industrial, and service uses can exist safely within APZs.

Figures 14, 15 and 16 show the existing AICUZ boundaries, including noise contours and Accident Potential Zones where appropriate, for each of the three installations.

NOLF Saufley

Figure 26 shows generalized future land uses near NOLF Saufley. Possible incompatibilities exist to the east of the site where future mixed use activities are shown.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Public Health Assessment for

NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA
EPA FACILITY ID: FL9170024567
MARCH 14, 2006

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

Agency for Toxic Substances & Disease Registry ..... Julie L. Gerberding, M.D., M.P.H., Administrator
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Division of Health Assessment and Consultation.... ..... William Cibulas, Jr., Ph.D., Director
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Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or the U.S. Department of Health and Human Services.

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or
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PUBLIC HEALTH ASSESSMENT

NAVAL AIR STATION PENSACOLA

PENSACOLA, FLORIDA

EPA FACILITY ID: FL9170024567

Prepared by:

Federal Facilities Assessment Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry
U.S. Department of Health and Human Services

Foreword

The Agency for Toxic Substances and Disease Registry, ATSDR, is an agency of the U.S. Public Health Service. Congress established this agency in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as the Superfund law. This law set up a fund to identify and clean up our country's hazardous waste areas. The U.S. Environmental Protection Agency (EPA) and the individual states regulate the investigation and clean up of the areas.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the areas on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. (The legal definition of a health assessment is included on the inside front cover.) If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at an area, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data. Instead, it reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists then evaluate whether or not there will be any harmful effects from these exposures. The report focuses on public health, or the health impact on the community as a whole, rather than on individual risks. Again, ATSDR generally makes use of existing scientific information, which can include the results of medical, toxicologic, and epidemiologic studies and the data collected in disease registries. The science of environmental health is still developing, and occasionally scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further research studies are needed.

Conclusions: The report presents conclusions about the level of health threat, if any, posed by an area. In its public health action plan, the report recommends ways to stop or reduce exposure. ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory to warn people of the danger. ATSDR can also authorize health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies, or research on specific hazardous substances.

Community: ATSDR also needs to learn what people in the area know about the area and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near an area, including residents of the area, civic leaders, health professionals, and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for comment. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us. Letters should be addressed as follows:

Attention: Aaron Borrelli
Manager, ATSDR Records Center
Agency for Toxic Substances and Disease Registry
1600 Clifton Rd. (E-60)
Atlanta, GA 30333

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List of Abbreviations

ATSDR	Agency for Toxic Substances and Disease Registry
BEQ	benzo(a)pyrene equivalent
BTEX	benzene, toluene, ethylbenzene, and xylenes
CDC	Centers for Disease Control and Prevention
CEL	cancer effect level
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
CREG	cancer risk evaluation guide (ATSDR)
CSF	cancer slope factor
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DHHS	U.S. Department of Health and Human Services
EMEG	environmental media evaluation guide (ATSDR)
EPA	U.S. Environmental Protection Agency
FDEP	Florida Department of Environmental Protection
FS	Feasibility Study
HAZMART	Hazardous Material Control Center
IARC	International Agency for Research on Cancer
IRP	Installation Restoration Program
IWTP	Industrial Wastewater Treatment Plant
kg	kilogram
LOAEL	lowest-observed-adverse-effect level
MCL	maximum contaminant level (EPA)
mg/L	milligrams per liter (same as ppm)
mg/kg	milligrams per kilogram (same as ppm)
mg/kg/day	milligrams per kilogram per day
MRL	minimal risk level (ATSDR)
NAAQS	National Ambient Air Quality Standards
NASP	Naval Air Station Pensacola
NEESA	Naval Energy and Environmental Support Activity
NFA	no further action
NOAA	National Oceanic Atmospheric Administration
NOAEL	no-observed-adverse-effects level
OU	operable unit
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethylene
ppb	parts per billion
ppm	parts per million
POL	petroleum, oil, and lubricant
RBC	risk-based concentration (EPA)
RCRA	Resource Conservation and Recovery Act

List of Abbreviations

RfD	reference dose (EPA)
RI	Remedial Investigation
RMEG	reference media evaluation guide (ATSDR)
ROD	Record of Decision
SI	Screening Investigation
SVOC	semi-volatile organic compound
SWMU	Solid Waste Management Units
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCE	trichloroethylene
TEF	toxic equivalency factor
TEQ	toxic equivalent
UST	underground storage tank
VOC	volatile organic compound

Summary

Naval Air Station Pensacola (NASP) is located approximately 5 miles southwest of the city of Pensacola on a peninsula in the Florida panhandle. Naval operations began on Pensacola Bay in 1825, and expanded between 1828 and 1835. However, after several natural disasters in the early 1900s, the Navy Yard was forced into maintenance status for a three-year period. In 1914, the first U.S. Naval Air Station was established and became the primary training base for naval aviators. NASP is known as the "Cradle of Naval Aviation" because it is where every Naval Aviator, Naval Flight Officer, and enlisted air crewman begins flight training. It is also the Navy's premier location for enlisted aviation technical training.

ATSDR is required by law to conduct a public health assessment at each of the sites on the National Priorities List. U.S. Environmental Protection Agency (EPA) placed NASP on the National Priorities List in November 1989. Through the Installation Restoration Program, the Navy identified 46 sites as potential sources of contamination at NASP. ATSDR evaluated the potential for exposure to occur at each of these sites, and identified the following potential exposure situations for further discussion:

- *Surface water in Pensacola Bay and Bayou Grande.* The concentrations of environmental contaminants that were present throughout the bay and the bayou were too low to be of health concern for anyone incidentally ingesting surface water. Therefore, incidental exposure to surface water is not expected to result in harmful health effects.

- *Sediments in Pensacola Bay and Bayou Grande.* The concentrations that were present throughout the bay and the bayou were too low to be of health concern for anyone incidentally ingesting or contacting sediment. Therefore, incidental exposure to sediment is not expected to result in harmful health effects.

- *Fish in Bayou Grande.* The concentrations in game fish were too low to be of health concern for anyone eating up to 3.5 meals of fish a month. However, because the sampling is limited, it would be a prudent public health practice for people, particularly children and pregnant women, to follow the Florida Fish Consumption Advisories.

- *Blue crabs in Pensacola Bay and Bayou Grande.* The concentrations detected in edible blue crab samples were too low to be of health concern for anyone eating up to 3.5 meals of blue crab a month. Therefore, eating blue crab from Pensacola Bay and Bayou Grande is not expected to result in harmful health effects.

  However, because the blue crab hepatopancreas, or "mustard," samples contained higher concentrations of several chemicals and some of the estimated exposures approach levels of health concern, it would be a prudent public health practice to limit consumption of crab hepatopancreas to two meals per month. If you eat 3.5 meals of blue crab per month, you should not eat any additional meals of crab hepatopancreas.

- *Oysters in Bayou Grande.* The oyster sampling near NASP is limited—only one sample was collected in Bayou Grande. The results of that one sample do not indicate that eating oysters

would be a health concern. The concentrations present in oysters collected from 22 additional locations throughout the Pensacola Bay area were also too low to be of health concern for anyone eating up to 3.5 meals of oyster a month. Therefore, eating oysters is not expected to result in harmful health effects.

With the exception of East Bay and Escambia Bay, the Pensacola Bay system, including Bayou Grande, is not classified for shellfish propagating and harvesting (EnSafe 1998a; FDACS 2005; FDEP 2004).

Background

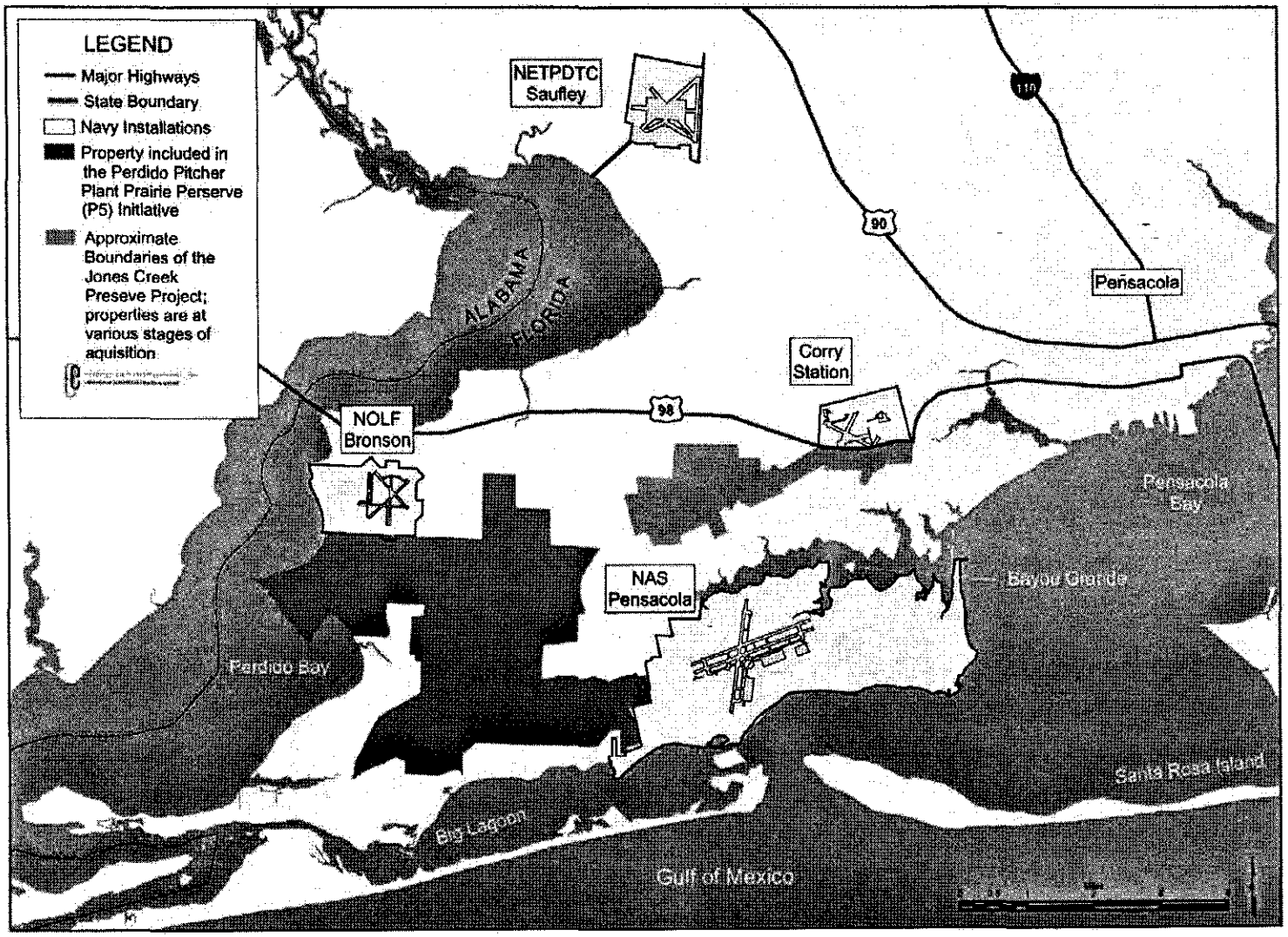
Site Description and Operational History

Naval Air Station Pensacola (NASP) is located on 5,800 acres on a peninsula in the Florida panhandle. The site is approximately 5 miles southwest of the city of Pensacola in southern Escambia County. NASP is surrounded by water on three sides—Bayou Grande to the north, Pensacola Bay to the east, and Big Lagoon and Pensacola Bay to the south (see Figure 1) (NASP 2001; Tetra Tech 2003).

Naval operations began on Pensacola Bay in 1825, when President John Quincy Adams and Secretary of the Navy, Samuel Southard, established "one of the best equipped naval stations in the country" (NASP 2001). As operations expanded between 1828 and 1835, the Navy acquired approximately 2,300 acres. After several natural disasters in the early 1900s, the Navy Yard was forced into maintenance status for a three-year period. In 1914, the first U.S. Naval Air Station (NAS) was established and became the primary training base for naval aviators (Tetra Tech 2003). NASP is known as the "Cradle of Naval Aviation" because it is where every Naval Aviator, Naval Flight Officer, and enlisted air crewman begins flight training. It is also the Navy's premier location for enlisted aviation technical training. About 40,000 students are trained at NASP each year, with about 9,000 students located at the station at a time (P. Nichols, NASP Public Affairs Department, personal communication, February 2006).

The Pensacola Naval Complex is comprised of NASP, the Naval Technical Training Center Corry Station, Outlying Landing Field Saufley, Outlying Landing Field Bronson, and Naval Air Station Whiting Field. Of these, NASP and Naval Air Station Whiting Field are listed on the U.S. Environmental Protection Agency's (EPA) National Priorities List. This public health assessment addresses potential human exposure to environmental contamination at NASP. The Agency for Toxic Substances and Disease Registry (ATSDR) completed a public health assessment for Naval Air Station Whiting Field in September 2000, which is available at: http://www.atsdr.cdc.gov/HAC/PHA/whiting/whi_toc.html.

Figure 1. Location of Naval Air Station Pensacola



Source: NASP 2001

Remedial and Regulatory History

Since Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in 1980, the Navy has actively investigated potential contamination that may have resulted from former practices at their installations (Tetra Tech 2003). EPA placed NASP on the National Priorities List in November 1989 (EPA 2005a). To identify and control environmental contamination, the Navy established the Navy Assessment and Control of Installation Pollutants, which later became part of the Navy's Installation Restoration Program (IRP). Through these programs, 46 sites at NASP were identified as potential sources of contamination (see Figure 2 and Appendix B for additional information about each site) (Navy 2004a).

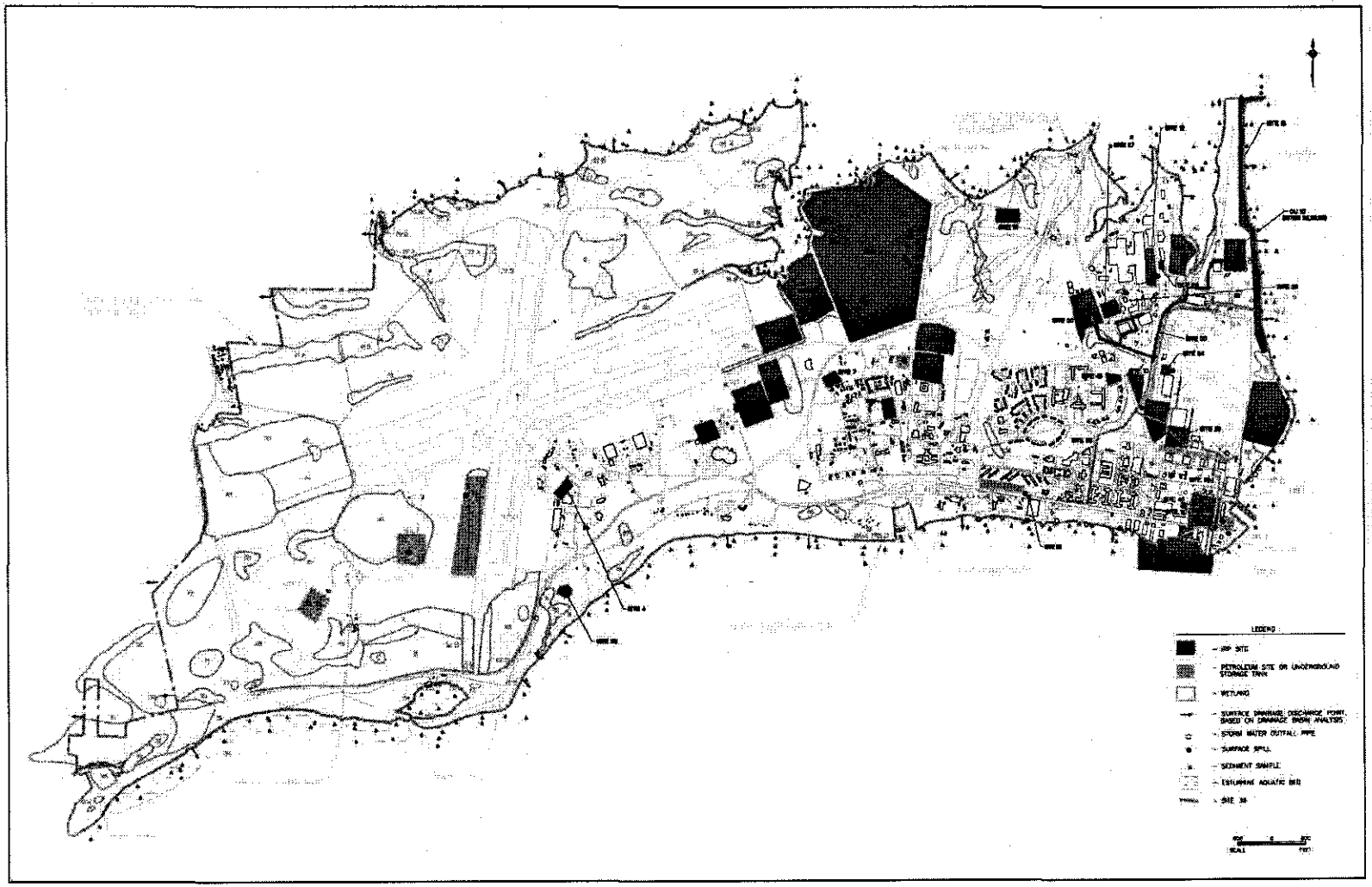
- Records of Decision were submitted for 14 sites.
- Site Characterization Reports were submitted for 12 sites.
- Sixteen (16) sites have obtained "no further action" status, and six (6) additional sites are recommended for or are pending no further action.
- Nineteen (19) sites are being investigated and remediated under the State of Florida Petroleum Program. Seven of these sites originated in the IRP, but were transferred when only petroleum-related contamination was found.

The 46 sites were divided into two categories—22 sites requiring Remedial Investigations/ Feasibility Studies and 24 sites requiring screening reports. The 22 sites requiring Remedial Investigations/Feasibility Studies were grouped into 14 Operable Units (Navy 2004a).

In addition to the IRP, NASP also initiated the following Resource Conservation and Recovery Act (RCRA) and environmental programs (Tetra Tech 2003):

- *Groundwater Recovery System.* A groundwater recovery system was installed in 1991, to replace the use of industrial wastewater treatment surface holding ponds. This system was permanently shutdown in 2003, because of suspected interference with natural attenuation processes.
- *Hazardous Waste Storage.* NASP constructed an area for safe, controlled storage of hazardous waste material (e.g., used oils, industrial cleaners, and paints).
- *Hazardous Waste Minimization Program.* This program was initiated to reduce the amount of hazardous waste generated at the base by streamlining operations and increasing the efficient use of resources.
- *Hazardous Material Control Center (HAZMART).* HAZMART established procedures for purchasing, receiving, issuing, monitoring, and retrieving hazardous material—in a manner that is protective of both the environment and personnel.

Figure 2. Installation Restoration Program Sites at Naval Air Station Pensacola



Source: EnSafe 1999a

- *Natural Resources Conservation Program.* This program includes forestry, land, and fish and wildlife management programs. The goal of the program is to stabilize and beautify the natural environment and provide outdoor recreation opportunities for base personnel.

- *Petroleum Program.* This program was developed to comply with the State of Florida petroleum regulations. Under this program, NASP removed or replaced 219 underground storage tanks. The four remaining underground storage tanks were installed in 1991, in accordance with secondary containment standards.

ATSDR Involvement

ATSDR is required by law to conduct a public health assessment at each of the sites on the National Priorities List. As part of the public health assessment process, ATSDR conducted an initial site visit to NASP in February 1991. The visit's purpose was to collect information necessary to rank the site according to the potential public health hazard it represented and to identify public health issues related to environmental contamination. During the visit, ATSDR staff met base representatives, toured the installation and surrounding areas, and collected community health concerns. At that time, ATSDR identified past, current, and future exposure pathways and determined that no immediate or long-term public health hazards existed.

In January 2005, ATSDR revisited NASP to obtain updated information about ongoing environmental activities. Again, ATSDR met with base personnel and toured the site. Discussions, the site visit, and data reviews once again led ATSDR to conclude that there was little opportunity for public contact with site contaminants and no immediate threats to public health. ATSDR did, however, identify three potential exposure pathways for additional evaluation in this public health assessment:

- Exposure to site-related contaminants in Pensacola Bay and Bayou Grande surface water.
- Contact with site-related contaminants in Pensacola Bay and Bayou Grande sediment.
- Exposure from eating fish and shellfish caught in Pensacola Bay and Bayou Grande.

Demographics and Land Use

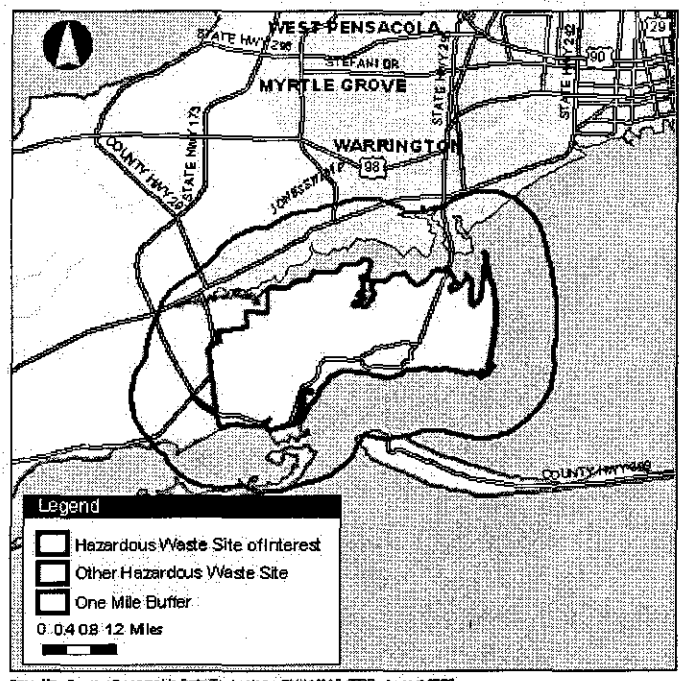
ATSDR examines demographic and land use data to identify sensitive populations, such as young children, the elderly, and women of childbearing age, and to determine whether these sensitive populations are exposed to any potential health risks. Demographics also provide details on population mobility and residential history in a particular area. This information helps ATSDR evaluate how long residents might have been exposed to contaminants.

NASP is located in southern Escambia County, which occupies about 661 square miles and has a population of about 294,000 (Bureau of the Census 2000). Pensacola is the county seat and the largest city in the county. According to the 2000 census, Pensacola is home to approximately 56,000 people—5.7 percent of whom are under the age of 5 years, 40 percent are women of childbearing age, and 17.2 percent are over 65 years. Figure 3 shows the demographics within one mile of NASP.

Figure 3. Demographics Within 1 Mile of Naval Air Station Pensacola

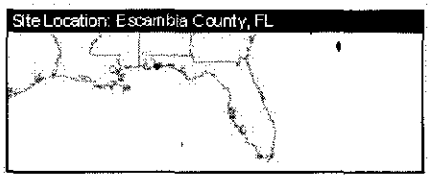
Pensacola Naval Air Station
Pensacola, FL
EPA Facility ID: FL9170024567

ATSDR CDC



Base Map Source: Geographic Data Technology (DYNAMAP 2000), August 2002
Site Boundary Data Source: ATSDR Public Health GIS Program, August 2002
Coordinate System (All Panels): NAD 1983 UTM Zone 16N

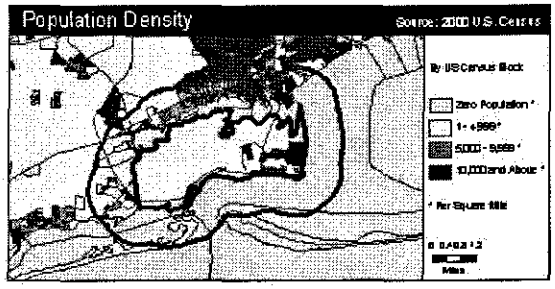
Site Location: Escambia County, FL

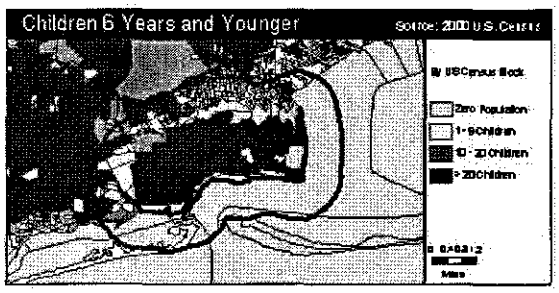


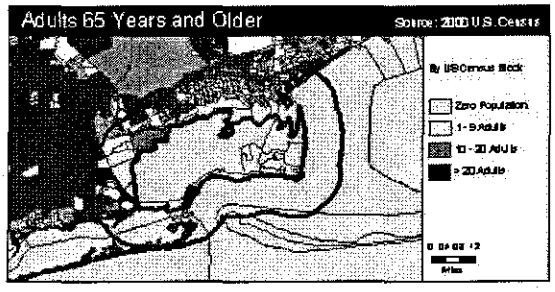
Demographic Statistics
Within One Mile of Site*

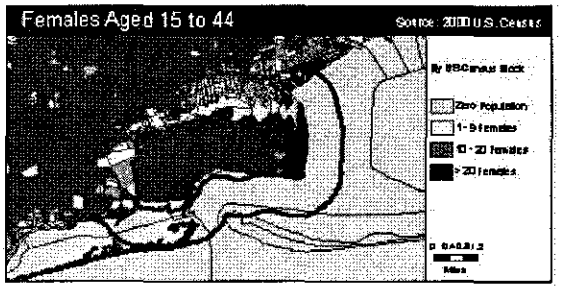
Total Population	18,889
White Alone	15,102
Black Alone	2,052
Am. Indian & Alaska Native Alone	215
Asian Alone	420
Native Hawaiian & Other Pacific Islander Alone	40
Some Other Race Alone	564
Two or More Races	475
Hispanic or Latino**	1,301
Children Aged 6 and Younger	1,106
Adults Aged 65 and Older	1,280
Females Aged 15 to 44	3,101
Total Housing Units	4,720

Demographics Statistics Source: 2000 U.S. Census
* Calculated using area-proportion spatial analysis technique
** People who identify their origin as Hispanic or Latino may be of any race.









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Approximately 23,000 military and civilian personnel live and/or work at NASP and contribute more than $1 billion annually to the local economy (Tetra Tech 2003). The Housing Department estimates that about 1,400 people currently live in the 577 housing units located at NASP. The average length of residence is two years, with a maximum of three years for enlisted employees (G. Wooten, NASP Housing Department, personal communication, January 2005). More than 25,000 military retirees and families live near NASP and contribute almost $500 million annually to the local economy. The local economy is comprised of large and small industry, agriculture, retail, and tourism (Tetra Tech 2003).

Various housing, training, and support facilities are located on NASP. Forrest Sherman Field occupies a large portion of the western end of the peninsula. Most industrial operations occurred on the eastern end (EnSafe 1995c; Tetra Tech 2003). Housing is located on the southern portion of the eastern end of NASP, in areas independent from the contaminated IRP sites. The Consolidated Training School was built along the bay on the eastern end of the peninsula.

Climate

The climate at NASP is mild, subtropical with an average annual temperature ranging from 50.5° Fahrenheit in the winter to 82° Fahrenheit in the summer. The average rainfall is approximately 60-63 inches per year, with the highest amount of rain falling in July and August. Moderate winds tend to prevail from the north during the winter and from the south during the summer (EnSafe 1999a; NASP 2001).

Even though Santa Rosa Island and Perdido Key protect NASP from direct hurricane hits, flooding and high wind velocities can cause severe damage during hurricanes (NASP 2001). In September 2004, Hurricane Ivan made landfall as a Category III hurricane about 30 miles west of NASP, and inflicted heavy damage to the station. Much of the destruction to the natural topography and buildings was still apparent when ATSDR visited the site in January 2005.

Quality Assurance and Quality Control

In preparing this public health assessment, ATSDR reviewed and evaluated information provided in the referenced documents. Documents prepared for the CERCLA program must meet standards for quality assurance and control measures for chain-of-custody, laboratory procedures, and data reporting. The environmental data presented in this public health assessment come from site characterization and remedial investigation reports prepared by NASP and its contractors under CERCLA and RCRA. ATSDR has found that the quality of environmental data available for NASP is adequate for making public health decisions.

Evaluation of Environmental Contamination and Potential Exposure Situations

Introduction

What is meant by exposure?

ATSDR's public health assessments are driven by exposure to, or contact with, environmental contaminants. Contaminants released into the environment have the potential to cause harmful health effects. Nevertheless, *a release does not always result in exposure.* People can only be exposed to a contaminant if they come into contact with that contaminant—if they breathe, eat, drink, or come into skin contact with a substance containing the contaminant. If no one comes into contact with a contaminant, then no exposure occurs, and thus no health effects could occur. Often the general public does not have access to the source area of contamination or areas where contaminants are moving through the environment. This lack of access to these areas becomes important in determining whether people could come into contact with the contaminants.

> An exposure pathway has five elements: (1) a source of contamination, (2) an environmental media, (3) a point of exposure, (4) a route of human exposure, and (5) a receptor population. The source is the place where the chemical or radioactive material was released. The environmental media (such as groundwater, soil, surface water, or air) transport the contaminants. The point of exposure is the place where people come into contact with the contaminated media. The route of exposure (for example, ingestion, inhalation, or dermal contact) is the way the contaminant enters the body. The people actually exposed are the receptor population.

The route of a contaminant's movement is the pathway. ATSDR identifies and evaluates exposure pathways by considering how people might come into contact with a contaminant. An exposure pathway could involve air, surface water, groundwater, soil, dust, or even plants and animals. Exposure can occur by breathing, eating, drinking, or by skin contact with a substance containing the chemical contaminant.

How does ATSDR determine which exposure situations to evaluate?

ATSDR scientists evaluate site conditions to determine if people could have been, are, or could be exposed (i.e., exposed in a past scenario, a current scenario, or a future scenario) to site-related contaminants. When evaluating exposure pathways, ATSDR identifies whether exposure to contaminated media (soil, sediment, water, air, or biota) has occurred, is occurring, or will occur through ingestion, dermal (skin) contact, or inhalation.

If exposure was, is, or could be possible, ATSDR scientists consider whether contamination is present at levels that might affect public health. ATSDR scientists select contaminants for further evaluation by comparing them to health-based comparison values. These are developed by ATSDR from available scientific literature related to exposure and health effects. Comparison values are derived for each of the different media and reflect an estimated contaminant concentration that is *not likely* to cause adverse health effects for a given chemical, assuming a standard daily contact rate (e.g., an amount of water or soil consumed or an amount of air breathed) and body weight.

Comparison values are not thresholds for adverse health effects. ATSDR comparison values establish contaminant concentrations many times lower than levels at which no effects were observed in experimental animals or human epidemiologic studies. If contaminant concentrations are above comparison values, ATSDR further analyzes exposure variables (for example, duration and frequency of exposure), the toxicology of the contaminant, other epidemiology studies, and the weight of evidence for health effects.

Some of the comparison values used by ATSDR scientists include ATSDR's environmental media evaluation guides (EMEGs), reference dose media evaluation guides (RMEGs), and cancer risk evaluation guides (CREGs) and EPA's maximum contaminant levels (MCLs). EMEGs, RMEGs, and CREGs are non-enforceable, health-based comparison values developed by ATSDR for screening environmental contamination for further evaluation. MCLs are enforceable drinking water regulations developed to protect public health.

You can find out more about the ATSDR evaluation process by consulting Appendix C, contacting ATSDR at 1-888-42ATSDR, or reading ATSDR's Public Health Assessment Guidance Manual at http://www.atsdr.cdc.gov/HAC/PHAManual/.

If someone is exposed, will they get sick?

Exposure does not always result in harmful health effects. The type and severity of health effects a person can experience because of contact with a contaminant depend on the exposure concentration (how much), the frequency (how often) and/or duration of exposure (how long), the route or pathway of exposure (breathing, eating, drinking, or skin contact), and the multiplicity of exposure (combination of contaminants). Once exposure occurs, characteristics such as age, sex, nutritional status, genetics, lifestyle, and health status of the exposed individual influence how the individual absorbs, distributes, metabolizes, and excretes the contaminant. Together, these factors and characteristics determine the health effects that may occur.

In almost any situation, there is considerable uncertainty about the true level of exposure to environmental contamination. To account for this uncertainty and to be protective of public health, ATSDR scientists typically use worst-case exposure level estimates as the basis for determining whether adverse health effects are possible. These estimated exposure levels usually are much higher than the levels that people are really exposed to. If the exposure levels indicate that adverse health effects are possible, ATSDR performs a more detailed review of exposure and consult the toxicologic and epidemiologic literature for scientific information about the health effects from exposure to hazardous substances.

What potential exposure situations were evaluated for NASP?

Access to natural resource management areas at NASP for recreational purposes is limited to active duty and reserve military personnel, their dependents and guests; federal civilian employees, their dependents and guests; and military retirees. However, the general public is allowed access to several designated natural and cultural resource areas, such as National Park Service areas, the Pensacola Lighthouse, and the Bayou Grande Nature Trail.

Pensacola Bay and Bayou Grande are classified as Class II and Class III waters, meaning they are designated to support shellfish propagation and recreational and wildlife use (NASP 2001). Because of the warm climate and easy access to Pensacola Bay and Bayou Grande, outdoor recreational activities such as fishing, canoeing, sailing, and boating occur year-round (NASP 2001). However, due to the seasonal water temperatures, swimming is generally limited to May through September (EnSafe 1999a). Sherman Cove Marina offers many motorized and non-motorized boating opportunities. In addition, freshwater fishing is popular in Lake Frederic, a small 1.2-acre pond near Sherman Cove Marina that is stocked with catfish, sunshine bass, and bluegill (NPS 1999). Fishing in Lake Frederic was not considered a completed exposure pathway because no sources of contamination are near the small pond.

ATSDR identified the following three potential exposure situations for further evaluation:

1. Exposure to site-related contaminants in Pensacola Bay and Bayou Grande surface water.
2. Contact with site-related contaminants in Pensacola Bay and Bayou Grande sediment.
3. Exposure from eating fish and shellfish caught in Pensacola Bay and Bayou Grande.

Table 1 provides a summary of potential exposure situations evaluated in this public health assessment.

Table 1. Potential Exposure Pathways Evaluated at Naval Air Station Pensacola

Pathway	*Exposure Pathway Elements*					*Comments*
	Potential Sources of Contamination	*Environmental Media*	*Point of Exposure*	*Route of Exposure*	*Exposed Population*	
Surface Water	**Pensacola Bay** IRP sites 2, 3, 4, 13, 14, 17, 18, 28, 32, 33, 35, 36, 38, and 39 **Bayou Grande** IRP sites 1, 3, 9, 10, 11, 12, 15, 16, 29, 30, 32, 33, 35, 34, 36, and 38	▪ Surface Water	▪ Mustin Beach ▪ Bayou Grande Family Picnic Area ▪ Sailing Facility	▪ Incidental Ingestion	Recreational adults and children	Recreational exposures to Pensacola Bay and Bayou Grande surface water and sediment are not expected to cause harmful health effects.
Sediment		▪ Sediment		▪ Incidental Ingestion ▪ Dermal Contact	Recreational adults and children	
Fish and Shellfish		▪ Fish ▪ Blue crab ▪ Oysters	▪ Throughout Pensacola Bay and Bayou Grande	▪ Ingestion	Recreational fishers	People should follow the Florida Department of Health's Fish Consumption Advisories, and also limit consumption of crab hepatopancreas.

Sources: EnSafe 1995c, 1997b, 1998a

Site Description and Use

Pensacola Bay

Pensacola Bay is a 54-square mile estuarine water body with a mean depth of 19.5 feet (NASP 2001). About 10 miles of the bay border NASP property where the mean water depth is 10 feet (EnSafe 1998a). Near the station, it is considered a "lower estuarine environment" with regular tidal flushing though the Pensacola Pass into the Intercoastal Waterway (EnSafe 1997b). Pensacola Bay is protected from the Gulf of Mexico by two barrier islands, Santa Rosa Island and Perdido Key. The U.S. Army Corps of Engineers periodically dredges Pensacola Bay to maintain a navigable channel for naval and commercial shipping (EnSafe 1995c).

Both the Navy and the Coast Guard monitor activity and boat traffic in Pensacola Bay. Fishing and crabbing occur on a daily basis in portions of the Pensacola Bay system—East Bay and Escambia Bay are conditionally classified for shellfish propagating and harvesting (EnSafe 1998a; FDACS 2005; FDEP 2004). Swimming near NASP is only allowed at Mustin Beach, which is west of the Coast Guard Station, and the swift currents of the shipping channel limit swimming in the bay. The only other swim activity occurs when students at the Rescue Training School participate in one activity in the bay during a single class (EnSafe 1997b, 1998a). Even though trespassing at NASP is possible, the occasional trespasser would likely be arrested (EnSafe 1998a).

> Since September 11, 2001, NASP and the Coast Guard enforce a 500-foot restricted area along the shoreline adjacent to NASP, which prohibits fishing in this area (EnSafe 2003). The area is marked with permanently stationed buoys that warn unauthorized boats to stay out of the "waterborne security zone" (EnSafe 2005b).

Bayou Grande

Bayou Grande is a 1.7-square mile estuarine water body with a mean water depth of 6 feet (EnSafe 1999a; NASP 2001). It has approximately 20 miles of coastline, with about 8.5 miles bordering NASP property. The majority of the land along the shore is residential property.

Neither commercial nor subsistence fishing occurs in Bayou Grande, and the area is not classified for shellfish harvesting (FDACS 2005; FDEP 2004). The Florida Marine Patrol Office reports that approximately 10 boats per day fish in the bayou from April through September and only one or two boats per day fish in the bayou from October through March (EnSafe 1999a, 2003). Most boats are reported to catch only one redfish or one trout per day. The general public can only access Bayou Grande by boat because NASP restricts access to the south, and private residents own the land on the west and north sides. Swimming is allowed at the Bayou Grande Family Picnic Area and at the Sailing Facility (EnSafe 1999a).

Environmental Sampling and Results

Pensacola Bay

The Pensacola Bay watershed has been impacted by both non-point source pollution (e.g., urban stormwater runoff and agricultural runoff) and point source pollution (e.g., wastewater treatments plants and industrial plants) (NASP 2001). Fourteen IRP sites (2, 3, 4, 13, 14, 17, 18, 28, 32, 33, 35, 36, 38, and 39) have been identified as potentially discharging or having previously discharged contaminants in Pensacola Bay (EnSafe 1995c). Three general areas of contaminant discharge are the southwest sewer discharge area, the eastern shore of Magazine Point and Chevalier Field, and Sherman Inlet and Sherman Cove (EnSafe 1995c).

In 1993, surface water samples were collected from five locations near Site 2 in Pensacola Bay. The samples were analyzed for metals, pesticides, polychlorinated biphenyls (PCBs), and organic compounds. Four metals and 12 semi-volatile organic compounds (SVOCs) were detected in the surface water. No pesticides, PCBs, or volatile organic compounds (VOCs) were detected in any of the surface water samples (EnSafe 1996e). In 1993, sediment samples were collected from 52 locations near Site 2 in Pensacola Bay. The samples were analyzed for metals, pesticides, PCBs, and organic compounds. Nine metals, two pesticides, two PCBs, and eight SVOCs were detected in the sediment. VOCs were not detected in the sediment samples (EnSafe 1996e). In 1994, 12–14 blue crabs were collected from each of six locations—five near Site 2 and one near the Coast Guard Station. The edible portion was analyzed for metals, pesticides, and organic compounds. Nine metals and seven pesticides were detected in the crab samples. No SVOCs or VOCs were detected in any of the samples (EnSafe 1996e).

The Navy sampled sediment from 141 locations along NASP property from October 1995 to January 1996 (see Figure 2) (EnSafe 1997b). Because surface water was not considered a significant route of exposure and seawater chemistry does not encourage the solution of contaminants, no surface water samples were collected (EnSafe 1998a). The sediment samples were analyzed for metals, pesticides, PCBs, and organic compounds. Twenty-three metals, 18 pesticides, 3 PCBs, 23 SVOCs, and 9 VOCs were detected in the sediment samples (EnSafe 1998a). The marine environment encourages the assimilation of these contaminants into sediment, which is transported by currents and deposited in areas unaffected by currents (EnSafe 1998a). Areas with the greatest level of contamination are the barge loading dock, Coast Guard Station, concrete seawall and quay, and the Industrial Wastewater Treatment Plant (EnSafe 1997b, 1998a). The sediment samples collected from Mustin Beach were lower in concentration than other areas, due to the strong surf and tidal currents in the area (EnSafe 1997b).

Bayou Grande

NASP is the primary industrial influence in Bayou Grande. Sixteen IRP sites (1, 3, 9, 10, 11, 12, 15, 16, 29, 30, 32, 33, 34, 35, 36, and 38) have been identified as potentially contributing or having contributed to contamination in Bayou Grande (EnSafe 1995c). Contaminants migrate to the bayou primarily through sediment migration and redistribution within the bayou, surface water drainage, and groundwater discharge (EnSafe 1999a). Two general areas of contaminant

discharge are the yacht basin west of Magazine Point and the southcentral portion of Bayou Grande (EnSafe 1995c).

The Navy sampled sediment, surface water, and fish from Bayou Grande from 1995 to 1997 (see Figure 2) (EnSafe 1999a). Sediment was sampled from 143 locations along the NASP coastline. Only submerged sediment samples were collected because shoreline sediments "do not represent an environment conducive to deposition" (EnSafe 1999a). The shoreline sediments are chemically inert due to the grain size and are continually winnowed by wind and water. Surface water was collected from three locations. Two composite samples of prey fish (minnows) were collected from one location. The Navy then estimated concentrations of contaminants in game fish (e.g., red drum) from the concentrations detected in the prey fish samples (EnSafe 2003). Sediment, surface water, and fish tissue samples were analyzed for metals, pesticides, PCBs, and organic compounds (EnSafe 1999a). Twenty-three metals, 19 pesticides, three PCBs, 31 SVOCs, and five VOCs were detected in the sediment samples (EnSafe 1999a). One VOC, two pesticides, and 14 metals were detected in the surface water samples. No SVOCs or PCBs were detected in surface water (EnSafe 1999a). One metal, six pesticides, and 1 PCB were detected in the prey fish samples (EnSafe 1999a, 2003). Because mercury was not analyzed in the prey fish due to a sampling error, the Navy used a model to predict mercury concentrations in red drum from the mercury levels detected in the sediment in Bayou Grande (EnSafe 2003).

In 2003 and 2004, as part of an environmental health study of northwest Florida, the University of West Florida collected blue crabs and oysters from the bays and bayous in the Pensacola area, including locations in Bayou Grande (Karouna-Renier et al. 2005). One composite oyster sample comprised of at least 10 oysters was collected and two blue crab samples composited from at least seven crabs were collected from Bayou Grande. Oysters were collected from 22 additional locations throughout the Pensacola Bay area. The tissues were analyzed for metals, dioxin-like PCBs, and dioxins/furan compounds, which were all detected in the samples. The University of West Florida also recently sampled mullet fillets from Bayou Grande (N. Karouna-Renier, University of West Florida, personal communication, May 2005). Arsenic, mercury, PCBs, and dioxin/furan compounds were detected in the fillet samples.

Public Health Implications

Introduction

ATSDR evaluated recreational exposures to surface water and sediment in Pensacola Bay and Bayou Grande. In addition, ATSDR determined whether the fish and shellfish from the bay and bayou are safe to eat. To do so, ATSDR evaluated available data to determine whether contaminants were above ATSDR's comparison values. Comparison values are derived, for each environmental media (water, soil, fish) and reflect an estimated contaminant concentration that is not expected to cause harmful health effects, assuming a standard daily contact rate (for example, the amount of water or soil consumed) and representative body weight. For chemicals above comparison values, ATSDR derived exposure doses (see text box for definition) and compared them against health-based guidelines. Health guidelines are estimates of daily human exposure to substances that are not expected to result in health effects over a specified duration. They have built in "uncertainty" or "safety" factors that make them much lower than levels at which health effects have been observed. ATSDR also reviewed relevant toxicologic data to obtain information about the toxicity of the chemicals of interest.

> An exposure dose is the amount of chemical a person is exposed to over time.

Issue 1. Exposure to site-related contaminants in Pensacola Bay and Bayou Grande surface water

ATSDR evaluated whether incidentally ingesting surface water while engaged in recreational activities, such as swimming, in Pensacola Bay and Bayou Grande could result in harmful health effects. The concentrations that were present throughout the bay and the bayou were too low to be of health concern for anyone incidentally ingesting surface water. Therefore, incidental exposure to surface water is not expected to result in harmful health effects.

Of the 16 metals, 12 SVOCs, one VOC, and two pesticides detected in Pensacola Bay and Bayou Grande surface water, only three metals and one SVOC had maximum concentrations higher than comparison values (see Table 2). However, one of the metals (arsenic) and the one SVOC (pentachlorophenol) were only detected in one of 24 samples. ATSDR further evaluated the potential exposure to the chemicals frequently detected above comparison values by calculating exposure doses and comparing the doses to protective health guideline values. ATSDR assumed that adults and children swam at the designated swimming areas in the bay and bayou 150 days of the year (May through September; EnSafe 1999a). All adult and child exposure doses were below health effect levels reported in the scientific literature. Therefore, ATSDR does not expect that incidentally ingesting surface water while engaging in recreational activities in Pensacola Bay or Bayou Grande would cause harmful health effects. Please see Appendix C for more details on the methods and assumptions ATSDR used to estimate human exposure doses and determine health effects.

Table 2. Chemicals with Maximum Concentrations Exceeding Comparison Values in Pensacola Bay and Bayou Grande Surface Water

Chemical	*Number of Detections*	*Range of Detected Concentrations (ppb)*	*Comparison Value (ppb)*	*Comparison Value Type*
Metals				
Antimony	20/24	95.8–180	4	RMEG
Silver	18/24	6.3–144	50	RMEG

Sources: EnSafe 1996e, 1999a

ppb = parts per billion
RMEG = reference media evaluation guide

Issue 2. Contact with site-related contaminants in Pensacola Bay and Bayou Grande sediment

ATSDR evaluated whether incidentally ingesting or dermally contacting sediments while engaged in recreational activities in Pensacola Bay and Bayou Grande could result in harmful health effects. The concentrations that were present throughout the bay and the bayou were too low to be of health concern for anyone incidentally ingesting or dermally contacting sediment. Therefore, incidental exposure to sediment is not expected to result in harmful health effects.

Of the 23 metals, 20 pesticides, three PCBs, 32 SVOCs, and nine VOCs detected in Pensacola Bay and Bayou Grande sediment, only four metals, five SVOCs, and one pesticide had maximum concentrations higher than comparison values (see Table 3). ATSDR further evaluated the potential exposure for these chemicals by calculating exposure doses and comparing the doses to protective health guideline values. ATSDR assumed that adults and children engage in recreational activities in the bay and bayou 150 days of the year (May through September; EnSafe 1999a). ATSDR also qualitatively evaluated the potential for dermal exposures to result in adverse health effects. All adult and child exposure doses were below health effect levels reported in the scientific literature. Therefore, ATSDR does not expect that incidentally ingesting or dermally contacting sediment while engaging in recreational activities in Pensacola Bay or Bayou Grande would cause harmful health effects. Please see Appendix C for more details on the methods and assumptions ATSDR used to estimate human exposure doses and determine health effects.

Table 3. Chemicals with Maximum Concentrations Exceeding Comparison Values in Pensacola Bay and Bayou Grande Sediment

Chemical	*Number of Detections*	*Range of Detected Concentrations (ppm)*	*Comparison Value (ppm)*	*Comparison Value Type*
Metals				
Arsenic	250/336	0.12–22.3	0.5	CREG
Cadmium	68/336	0.2–24	10	Chronic EMEG
Chromium	256/336	0.39–238	200	RMEG (CrVI)
Iron	332/336	19.3–38,000	23,000	Residential RBC
Semi-volatile Organic Compounds				
Benzo(a)anthracene	77/336	0.021–44	0.87	Residential RBC
Benzo(a)pyrene	73/336	0.021–21	0.1	CREG
Benzo(b)fluoranthene	107/336	0.022–19	0.87	Residential RBC
Benzo(k)fluoranthene	62/336	0.021–16	8.7	Residential RBC
Indeno(1,2,3-cd)pyrene	46/336	0.021–7.5	0.87	Residential RBC
Pesticide				
Dieldrin	37/333	0.00011–0.099	0.04	CREG

Sources: EnSafe 1996e, 1997b, 1998a, 1999a

CrVI = hexavalent chromium
CREG = cancer risk evaluation guide
EMEG = environmental media evaluation guide
ppm = parts per million
RBC = risk-based concentration
RMEG = reference media evaluation guide

Issue 3. Exposure from eating fish and shellfish caught in Pensacola Bay and Bayou Grande

ATSDR evaluated whether eating fish caught in Bayou Grande could result in harmful health effects. The concentrations that were detected and estimated in game fish were too low to be of health concern for anyone eating up to 3.5 meals of fish a month. Therefore, eating fish from Bayou Grande is not expected to result in harmful health effects. However, because the sampling results were limited, it would be a prudent public health practice for people, particularly children and pregnant women, to follow the Florida Department of Health Fish Consumption Advisories.

ATSDR also evaluated whether eating blue crabs and oysters from Pensacola Bay and Bayou Grande could result in harmful health effects. The concentrations detected in edible blue crab samples were too low to be of health concern for anyone eating up to 3.5 meals of blue crab a month. Therefore, eating blue crab from Pensacola Bay and Bayou Grande is not expected to result in harmful health effects. Because the blue crab hepatopancreas, or "mustard," samples contained higher concentrations of several chemicals and some of the estimated exposures

approach levels of health concern, it would be a prudent public health practice to limit consumption of crab hepatopancreas to two meals per month. The oyster sampling near NASP is limited; however, the concentrations found in oysters throughout the Pensacola Bay area do not indicate that eating oysters would be a health concern.

The available fish data is very limited. Only two composite samples of prey fish and one mullet sample were collected from Bayou Grande. No fish samples were collected from Pensacola Bay. Using the levels detected in the prey fish, the Navy estimated concentrations in game fish. The Navy also estimated the level of mercury in game fish using detected sediment concentrations. Eight of the detected contaminants (two metals, three pesticides, two PCBs, and dioxins) were found at concentrations higher or were estimated to be at concentrations higher than comparison values (see Table 4). ATSDR further evaluated the potential exposure for these chemicals by calculating exposure doses and comparing the doses to protective health guideline values. Based on the recreational patterns observed by the Florida Marine Patrol Office (EnSafe 1999a, 2003), ATSDR assumed that people ate about 3.5 meals of fish each month (a meal was defined as 8 ounces for adults and 4 ounces for children). All adult and child exposure doses were below health effect levels reported in the scientific literature. Please see Appendix C for more details on the methods and assumptions ATSDR used to estimate human exposure doses and determine health effects. Based on the available data, ATSDR does not expect that eating fish from Bayou Grande would cause harmful health effects. However, given that the fish sampling is limited, it would be a prudent public health practice for people to follow the Florida Department of Health Fish Consumption Advisories, which can be found at http://www.doh.state.fl.us/environment/community/fishconsumptionadvisories/ and are provided in Appendix D. Pregnant women and children should be particularly cautious because fetuses and young children are more sensitive to certain contaminants.

Table 4. Chemicals with Maximum Concentrations Exceeding Comparison Values in Fish Caught in Bayou Grande

Chemical	*Maximum Concentration in Prey Fish (ppm)*	*Maximum Concentration in Game Fish (ppm)*	*Comparison Value (ppm)*	*Comparison Value Type*
Metals				
Arsenic	Not sampled	0.61 (measured)	0.0021	RBC
Mercury	Not sampled	0.26 (estimated)	0.14	RBC (MeHg)
Pesticides				
Aldrin	0.00066	0.00066 (estimated)	0.00019	RBC
DDE	0.012	0.043 (estimated)	0.0093	RBC
Dieldrin	0.0013	0.0014 (estimated)	0.0002	RBC
PCBs				
Aroclor-1260	0.1	0.37 (estimated)	0.0016	RBC
Total PCBs	Not sampled	0.0147 (measured)	0.0016	RBC
Dioxins				
Total dioxin TEQ	Not sampled	0.000001 (measured)	0.000000021	RBC

Sources: EnSafe 1999a, 2003; N. Karouna-Renier, University of West Florida, personal communication, May 2005

DDE = dichlorodiphenyldichloroethylene
MeHg = methylmercury
PCB = polychlorinated biphenyl
ppm = parts per million
RBC = risk-based concentration
TEQ = toxic equivalency quotient

Blue crabs were collected from six locations in Pensacola Bay and two locations in Bayou Grande. Seven of the detected contaminants were higher than comparison values (see Table 5). Oysters were collected from one location in Bayou Grande and 22 additional locations throughout the Pensacola Bay area. Four of the detected contaminants were higher than comparison values (see Table 5). ATSDR further evaluated the potential exposure for these chemicals by calculating exposure doses and comparing the doses to protective health guideline values. Based on the recreational patterns observed by the Florida Marine Patrol Office (EnSafe 1999a, 2003), ATSDR assumed that people ate about 3.5 meals of crab or oyster each month (a meal was defined as 8 ounces for adults and 4 ounces for children). All adult and child exposure doses were below health effect levels reported in the scientific literature. Please see Appendix C for more details on the methods and assumptions ATSDR used to estimate human exposure doses and determine health effects. Based on the available data, ATSDR does not expect that eating the muscle/tissue portions of crab and oysters from Pensacola Bay and Bayou Grande[1] would cause harmful health effects.

[1] Bayou Grande is not classified for shellfish propagating and harvesting (FDACS 2005; FDEP 2004).

Blue crab hepatopancreas from Bayou Grande were also analyzed. They contained higher concentrations of arsenic, cadmium, copper, and dioxins than the muscle/tissue samples (see Table 5). When assuming the same consumption rate (3.5 meals of crab hepatopancreas a month), some of the exposure doses approach levels of concern. Because contaminants tend to deposit in the hepatopancreas, it would be a prudent public health practice to limit consumption of crab hepatopancreas to two meals per month. If you eat 3.5 meals of blue crab per month, you should not eat any additional meals of crab hepatopancreas.

Table 5. Chemicals with Maximum Concentrations Exceeding Comparison Values in Shellfish Caught in Pensacola Bay and Bayou Grande

Chemical	*Maximum Concentration in Edible Portion of Crab* (ppm)*	*Maximum Concentration in Crab Hepatopancreas (ppm)*	*Maximum Concentration in Oyster Tissue§ (ppm)*	*Comparison Value (ppm)*	*Comparison Value Type*
Metals					
Arsenic	**1.85**	**3.8**	**1.8**	0.0021	RBC
Inorganic arsenic	**0.024**	**0.076**	**0.018**	0.0021	RBC
Cadmium	0.76	**4.6**	0.61	1.4	RBC
Copper	15.25	**58**	**56**	54	RBC
Mercury	0.21	0.14	0.017	0.14	RBC (MeHg)
Pesticides					
Aldrin	**0.00093**	Not sampled	Not sampled	0.00019	RBC
DDT	**0.0096**	Not sampled	Not sampled	0.0093	RBC
Heptachlor epoxide	**0.0025**	Not sampled	Not sampled	0.00035	RBC
Dioxins					
Total dioxin TEQ	**0.0000047**	**0.000028**	**0.0000042**	0.000000021	RBC

Sources: EnSafe 1996e; Karouna-Renier et al. 2005

*Edible portion of crab includes either the crab muscle alone or crab muscle with a portion of the hepatopancreas (calculated as 15% of the total edible mass; Karouna-Renier et al. 2005).
§Collected from the one location in Bayou Grande near NASP.
Bold text indicates that the maximum concentration exceeded the comparison value for that chemical.
DDT = dichlorodiphenyltrichloroethane
MeHg = methylmercury
ppm = parts per million
RBC = risk-based concentration
TEQ = toxic equivalency quotient

Community Health Concerns

The Navy has kept the community informed about activities at NASP throughout the site's history (EnSafe 1998a). A Technical Review Committee with representatives from the Navy, EPA, the Florida Department of Environmental Protection (FDEP), and the community was established in 1989, to review recommendations for, and monitor progress of, the investigation and remedial activities at NASP. In 1995, a Restoration Advisory Board was formed to establish a forum for communication between the decision makers and the community (EnSafe 1998a). In addition, the NASP Public Affairs office established and maintained a mailing list of interested community members and organizations.

In 1990, the Navy conducted a series of interviews with "a variety of individuals representing diverse personal and institutional concerns and interests" (Tetra Tech 2003). Individuals interviewed included elected and appointed officials; local, county, and state representatives; businesspeople; people historically affiliated with the station; and local residents. The key concerns raised during the interviews were:

- Drinking water supplies
- Wetland protection
- Hazardous waste minimization
- Scout camping near an inactive landfill (Site 1)
- Air quality
- Health of Bayou Grande and Pensacola Bay

Drinking Water Supplies

NASP receives its potable water from wells at Corry Station, which is located about 1.5 miles west of Pensacola and 2.5 miles north of NASP. Potable groundwater in the Pensacola area is generally drawn from the sand-and-gravel aquifer (NASP 2001). The sand-and-gravel aquifer occurs from the ground surface to about 220 to 330 feet below ground surface, and is informally subdivided into the surficial zone, the low permeability zone, and the main producing zone (NFWMD 1995). The low permeability zone acts as a semiconfining layer that restricts the vertical flow of groundwater between the surficial zone and the main producing zone. The main producing zone is the main source of groundwater throughout the area (NFWMD 1995).

The current drinking water supply is safe. According to the 2003 Annual Drinking Water Quality Report, the drinking water meets all federal and state requirements. NASP routinely monitors for contaminants to supply a "safe and dependable supply of drinking water" (NASP 2003). Water from the wells at Corry Station is treated with chlorine for disinfection, sodium hydroxide for pH stabilization, aeration for carbon dioxide removal, zinc orthophosphate for corrosion control, granular activated carbon units for dieldrin removal, and fluoride for dental health purposes.

There were some issues with groundwater contamination affecting the Corry Station potable water wells in the past. In 1993, the Northwest Florida Water Management District conducted a

site investigation to characterize the extent of the contamination and identify the source. Pesticides (dieldrin, chlordane, and heptachlor epoxide) and VOCs (mainly benzene, toluene, ethylbenzene, and xylenes [BTEX] and tetrachloroethylene [PCE]) were detected in the Corry Station wells (NFWMD 1995). ATSDR evaluated the contaminant concentrations detected during this investigation, and determined that exposure to the low levels found would not have resulted in harmful health effects for people drinking water from the Corry Station wells. Please see Appendix C for more details on the methods and assumptions ATSDR used to estimate human exposure doses and determine health effects.

Wetland Protection

Formal wetland delineations were performed in 1997. A large portion—about 250 acres—of NASP consists of wetlands (NASP 2001). Including all freshwater and brackish ponds and drainage ditches, 81 wetland areas were identified (Tetra Tech 2003). Two-thirds are located on the west side of the base where few IRP sites are located. About one-third of the wetlands are located east of Sherman Field, where most of the IRP sites are located. Ten drainage ditches and 12 wetlands are associated with IRP sites. Elevated levels of metals, pesticides, and polynuclear aromatic hydrocarbons (PAHs) have been detected in sediment; and elevated levels of metals have been detected in surface water. In 2005, the Navy finalized a Remedial Investigation for the site wetlands and concluded that only four needed further action (see EnSafe 2005b).

NASP has an "aggressive resource conservation program that includes protection of the wetlands as a major goal" (Tetra Tech 2003). In 2001, NASP established an Integrated Natural Resources Management Plan. One of the primary objectives is to: "Continue existing, and establish new programs and procedures to monitor, maintain, and enhance wetlands and water quality" (NASP 2001).

The Navy has a policy of "no net loss" of wetlands. Part of the long-term management plan is to develop vegetative buffers around wetland areas, discourage pedestrian and pet access, plant vegetated filter strips to intercept the flow of runoff, and manage the use of pesticides and herbicides (NASP 2001).

Hazardous Waste Minimization

NASP established a Hazardous Waste Minimization Program to reduce the amount of hazardous waste generated at the base by streamlining operations and increasing the efficient use of resources. Some examples include:

- Modified the Industrial Wastewater Treatment Plant from industrial wastewater to domestic wastewater in January 1996.
- Established hazardous waste training programs.
- Established a pollution prevention program.

According to the Navy, the program has "significantly reduced the amount of hazardous materials" generated at NASP (Tetra Tech 2003).

Scout Camping Near an Inactive Landfill (Site 1)

A primitive camping area used by visiting Boy and Girl Scout troops is located near an inactive landfill that was used from the early 1950s until 1976, for disposal of solid and industrial wastes (Tetra Tech 2003). Access to the landfill is restricted to authorized personnel; however, the site is not fenced to prevent trespassing (EnSafe 1998b).

The Navy performed a human health risk assessment for a potential child trespasser scenario. The risks and/or hazards were within EPA and FDEP's generally acceptable ranges. Therefore, they concluded that there was little risk posed from contact with the surface soil (EnSafe 1998b). ATSDR reviewed the Navy's risk assessment and performed our own health evaluation. ATSDR concurs that the contaminant levels found in the landfill surface soil are too low to be of health concern for scouts camping near the landfill. Please see Appendix C for more details on the methods and assumptions ATSDR used to estimate human exposure doses and determine health effects. NASP is monitoring the conditions at the landfill and will notify area scout leaders if the adjacent area becomes unsuitable for camping (Tetra Tech 2003).

Air Quality

Air pollutant emissions at NASP are generated from surface coating, fuel storage and handling, fire-fighting training facilities, miscellaneous small stationary combustion sources, aircraft, motor vehicles, and ground support equipment (NASP 2001). Military aircraft operations are the largest source of air emissions at NASP. Prescribed burning can also contribute to high levels of particulate matter in the air. However, to avoid potential impacts on the regional air quality, NASP coordinates with Florida's Division of Forestry to stay within the guidelines for conducting prescribed burns (NASP 2001).

The Clean Air Act established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants—respirable particulate matter, carbon monoxide, sulfur dioxide, nitrogen dioxide, lead, and ozone. The state of Florida adopted these standards into its air quality regulations to protect public health and welfare. EPA classifies the area around NASP as "in attainment" for all six NAAQS criteria pollutants (NASP 2001). None of the counties near NASP have air pollution levels that persistently exceed national air quality standards established by the Clean Air Act (EPA 2005b).

Health of Pensacola Bay and Bayou Grande

ATSDR evaluated whether incidentally ingesting the surface water or contacting the sediment while engaged in recreational activities, such as swimming, in Pensacola Bay and Bayou Grande would result in harmful health effects. The concentrations that were present throughout the bay and the bayou were too low to be of health concern. ATSDR also evaluated whether eating fish, crabs, and oysters from Pensacola Bay and Bayou Grande would be expected to result in harmful health effects. The concentrations found in the fish, crab muscle/tissue, and the oyster samples were too low to be of health concern for anyone eating up to 3.5 meals a month (a recreational fishing scenario). However, because the sampling is limited, it would be a prudent public health practice to follow the Florida Department of Health Fish Consumption Advisories. In addition,

the crab hepatopancreas samples contained higher concentrations of several chemicals and some of the estimated exposures approach levels of health concern, therefore, it would also be a prudent public health practice to limit consumption of crab hepatopancreas.

ATSDR does not evaluate ecological health. However, the Navy's ecological assessment is described below.

The Navy performed baseline risk assessments for Pensacola Bay and Bayou Grande to evaluate the potential health hazard and/or cancer risk to people and the environment from contamination at NASP (see EnSafe 1997b, 1999a). The objectives of the baseline risk assessment were to:

- Characterize the source media and determine chemicals of potential concern.
- Identify potential ecological and human receptors and quantify potential exposures.
- Evaluate the adverse effects associated with site-specific contaminants of potential concern.

The Navy determined that, in general, there is limited, low risk to ecological receptors in Pensacola Bay. However, the sediment sampled near the barge loading dock and Coast Guard Station presents a moderate risk to ecological receptors (EnSafe 1997b). No ecological risk was determined for Bayou Grande (EnSafe 1999a). There were some differences in benthic species diversity; however, the toxicity tests showed no effects from exposure to Bayou Grande sediment. Further, species indicative of a healthy environment were found. Surface water concentrations did not indicate that there would be impacts to the fish, and the fish concentrations were not at levels predicted to pose a risk to fish-eating birds. However, a model predicted that there could be a risk to upper trophic level fish.

The Navy concluded that no measurable risk could be attributed to eating crab from Pensacola Bay, the only complete exposure pathway identified (EnSafe 1997b). A human health risk was determined for subsistence fishers in Bayou Grande (EnSafe 1999a). However, this is an unrealistic exposure scenario. Neither commercial nor subsistence fishing occurs in Bayou Grande. The Florida Marine Patrol Office reported that prior to September 11, 2001, approximately 10 boats per day fished in the bayou from April through September and only one or two boats per day fished in the bayou from October through March. Most boats caught only one redfish or one trout per day (EnSafe 1999a, 2003). Since September 11, 2001, NASP and the Coast Guard enforce a 500-foot restricted area along the shoreline adjacent to NASP, which prohibits fishing in this area (EnSafe 2003).

Child Health Considerations

ATSDR recognizes that infants and children may be more sensitive to exposures than adults in communities with contamination in water, soil, air, or food. This sensitivity is the result of a number of factors. Children are more likely to be exposed because they play outdoors and they often bring food outside. Children are shorter than adults, which means they breathe dust, soil, and heavy vapors close to the ground. Children are also smaller, potentially resulting in higher doses of chemical exposure per unit body weight. The developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages. Most importantly, children depend completely on adults for risk identification and management decisions, housing decisions, and access to medical care. Therefore, ATSDR is committed to evaluating their special interests at sites such as NASP as part of the ATSDR Child Health Initiative.

According to the 2000 census, Pensacola is home to approximately 14,000 children (up to 19 years old), 6,700 who are under the age of 10 years (Bureau of the Census 2000). In addition, families with children live in on-site quarters at NASP. The maximum length of residency is three years (G. Wooten, NASP Housing Department, personal communication, January 2005). Housing is located on the southern portion of the eastern end of NASP, and many areas have playgrounds. A youth center and child care center are located near Duncan and Moffett Roads adjacent to the Cabaniss Crescent officer quarters and Area H townhouse enlisted quarters. None of these areas are co-located with contaminated IRP sites. Children who live on NASP attend school off base.

> In 1993, NASP initiated a blood lead monitoring program as part of the wellness physical. The majority of the pediatric blood lead levels were below the Centers for Disease Control and Prevention's (CDC) effects level of 10 micrograms per deciliter (µg/dl). Because a few of the exposures were above 10 µg/dl, NASP completely abated lead from housing units in 1998.
>
> (S. Forester, Industrial Hygiene Department, personal communication, January 2005)

Children could be exposed to site contamination while participating in recreational activities in Pensacola Bay or Bayou Grande. To evaluate whether children may experience adverse health effects from this exposure, ATSDR estimated potential doses specifically for children. To estimate these doses, ATSDR used protective assumptions that overestimate the levels of actual exposure. *ATSDR concluded that exposure to site contamination at NASP does not pose unique health hazards for children.* The level of contamination found in surface water and sediment collected from Pensacola Bay and Bayou Grande was too low to be of health concern for children exposed through recreational activities. Based on the available data, ATSDR does not expect that eating fish, the edible portion of crab, and oysters from Pensacola Bay and Bayou Grande would cause harmful health effects for children. However, given that the fish sampling is limited, it would be a prudent public health practice for children and pregnant women to be particularly cautious and follow the Florida Department of Health Fish Consumption Advisories, which can be found at http://www.doh.state.fl.us/environment/community/fishconsumptionadvisories/ and are provided in Appendix D. Due to the higher concentrations of contaminants found in the crab hepatopancreas, it would also be a prudent public health practice for children and pregnant women to avoid eating that portion of the crab.

Conclusions

On the basis of its evaluation of available environmental information, ATSDR has categorized exposures to contamination at NASP as *no apparent public health hazard.* This means that people may be exposed to environmental contamination, but not at levels which are expected to cause harmful health effects.

- ATSDR evaluated whether incidentally ingesting surface water while engaged in recreational activities in Pensacola Bay and Bayou Grande could result in harmful health effects. The concentrations that were present throughout the bay and the bayou were too low to be of health concern for anyone incidentally ingesting surface water. Therefore, incidental exposure to surface water is not expected to result in harmful health effects.

- ATSDR evaluated whether incidentally ingesting or contacting sediments while engaged in recreational activities in Pensacola Bay and Bayou Grande could result in harmful health effects. The concentrations that were present throughout the bay and the bayou were too low to be of health concern for anyone incidentally ingesting or contacting sediment. Therefore, incidental exposure to sediment is not expected to result in harmful health effects.

- ATSDR evaluated whether eating fish caught in Bayou Grande could result in harmful health effects. The concentrations in game fish were too low to be of health concern for anyone eating up to 3.5 meals of fish a month. However, because the sampling is limited, it would be a prudent public health practice for people, particularly children and pregnant women, to follow the Florida Department of Health Fish Consumption Advisories.

  ATSDR also evaluated whether eating blue crabs from Pensacola Bay and Bayou Grande could result in harmful health effects. The concentrations detected in edible blue crab samples were too low to be of health concern for anyone eating up to 3.5 meals of blue crab a month. Therefore, eating blue crab from Pensacola Bay and Bayou Grande is not expected to result in harmful health effects. However, because the blue crab hepatopancreas, or "mustard," samples contained higher concentrations of several chemicals and some of the estimated exposures approach levels of health concern, it would be a prudent public health practice to limit consumption of crab hepatopancreas to two meals per month. If you eat 3.5 meals of blue crab per month, you should not eat any additional meals of crab hepatopancreas.

  ATSDR evaluated whether eating oysters from Bayou Grande could result in harmful health effects. The oyster sampling near NASP is limited—only one sample was collected. The results of that one sample do not indicate that eating oysters would be a health concern. The concentrations present in oysters collected from 22 additional locations throughout the Pensacola area were also too low to be of health concern for anyone eating up to 3.5 meals of oysters a month. Therefore, eating oysters is not expected to result in harmful health effects.

Recommendations

Because the fish sampling is limited, it would be a prudent public health practice for people, particularly children and pregnant women, to follow the Florida Fish Consumption Advisories (available at http://www.doh.state.fl.us/environment/community/fishconsumptionadvisories/ and provided in Appendix D). In addition, due to the higher concentrations of contaminants found in the crab hepatopancreas, it would be a prudent public health practice for children and pregnant women to avoid eating that portion of the crab.

Public Health Action Plan

The Public Health Action Plan (PHAP) for NASP contains a description of actions taken and to be taken by ATSDR and the Navy subsequent to the completion of this public health assessment. The purpose of the PHAP is to ensure that this public health assessment not only identifies potential and ongoing public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. The public health actions that are completed, ongoing, or planned are listed below.

Completed Actions

- The Navy established the IRP and identified 46 sites at NASP as potential sources of contamination. Records of Decision were submitted for 14 sites. Site Characterization Reports were submitted for 12 sites. Sixteen sites have obtained "no further action" status, and six additional sites are recommended for or are pending no further action. Nineteen sites are being investigated and remediated under the State of Florida Petroleum Program. Seven of these sites originated in the IRP, but were transferred when only petroleum-related contamination was found.

- The Navy also initiated the following RCRA and environmental programs: Groundwater Recovery System, Hazardous Waste Storage, Hazardous Waste Minimization, HAZMART, Natural Resources Conservation, and the Petroleum Program.

- The Navy has kept the community informed about activities at NASP throughout the site's history. In 1989, a Technical Review Committee was established, and in 1995, a Restoration Advisory Board was formed. In addition, the NASP Public Affairs office established and maintained a mailing list of interested community members and organizations.

- In February 1991, ATSDR conducted an initial site visit to NASP. In January 2005, ATSDR revisited NASP to obtain updated information about ongoing environmental activities.

Ongoing Actions

- The Navy is continuing to conduct IRP activities (such as collecting additional environmental sampling data and monitoring) at sites that have not obtained "no further action" status.

- A Remedial Investigation is ongoing at Site 2.

- The Navy is finalizing an Optimization Study Report for Site 1 and a Remedial Investigation Addendum for Operable Unit 2.

Planned Actions

- The Navy plans to conduct site investigations for IRP Sites 44, 45, and 46.

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Results of the ECUA Beulah Constant Rate Aquifer Test
Sand-and-Gravel Aquifer, Escambia County Florida

December 2001

Christopher J. Richards
Northwest Florida Water Management District

INTRODUCTION

Escambia County Utilities Authority (ECUA) provides water and wastewater services for most of southern Escambia County. In 1995, ECUA provided 87 percent of public supply withdrawals for the county. ECUA's average daily withdrawal for 1995 totaled approximately 33 Mgal/d. The ECUA and other water utilities throughout Escambia County rely exclusively on the Sand-and-Gravel Aquifer for potable water supply.

In order to provide for increasing potable water demands, ECUA constructed a test well near the Beulah Community (Figure 1). The Beulah Test Well was completed during the summer of 2001. During construction of the test well, staff at the Northwest Florida Water Management District (District) identified two existing ground water monitoring wells in the vicinity of the test well. These monitoring wells were completed in the same zone of the Sand-and-Gravel Aquifer as the test well. The presence of these monitor wells in the vicinity of the test well provided an opportunity to obtain valuable hydraulic information regarding the Sand-and-Gravel Aquifer.

With the cooperation of ECUA staff, District personnel recorded water levels in the two nearby monitor wells, while ECUA pumped the Beulah Test Well. The purpose of this effort was to establish values of aquifer transmissivity, storativity, leakance and perhaps anisotropy. These values could then be used to aid in the assessment of local ground water availability. They could also be used to further validate the existing Escambia County ground water flow and contaminant transport model (Roaza et al. 1991, 1993). The flow and transport model was developed by the District in 1993, in cooperation with ECUA and other water supply utilities in Escambia County.

HYDROGEOLOGY

The Sand-and-Gravel Aquifer consists primarily of fine to medium quartz sand interbedded with varying amounts of clay. Throughout much of southern Escambia County, the Sand-and-Gravel Aquifer can be subdivided into three distinct zones based on hydraulic characteristics. The Surficial Zone is the uppermost portion of the Sand-and-Gravel Aquifer and consists of moderately well-sorted, medium sand. Ground water within this zone typically exists under unconfined conditions. Underlying the Surficial Zone is the Low Permeability Zone which consists of poorly sorted sand and clay. The permeability of the Low Permeability Zone is less than that of the overlying and underlying portions of the aquifer. It forms a leaky confining unit which serves to restrict the vertical movement of water within the aquifer. The lowermost zone within the aquifer is referred to as the Main Producing Zone. This unit consists of moderate to well-sorted medium sand with minor amounts of interbedded clay. This is the most productive unit in the Sand-and-Gravel Aquifer and is the unit tapped by the major supply wells. Underlying the Sand-and-Gravel Aquifer is the Intermediate System which is a regionally extensive confining unit.

Natural gamma ray and normal electric logs run were run on the ECUA Beulah Test Well boring and are shown in Figure 2. The logs show the base of the Sand-and-Gravel Aquifer at 365 ft below land surface datum (lsd). At the Beulah test site the Main Producing Zone is approximately 220 ft thick, extending from 145 ft to 365 ft below lsd. The Low Permeability Zone consists of the sandy clay interval from 119 ft to 145 ft below lsd. The Surficial Zone comprises the saturated sediments above the Low Permeability Zone. The total depth of the test boring and geophysical log data are 435 ft. The elevation of the well site is approximately 118 ft above mean sea level (msl).

AQUIFER TEST

ECUA completed a 10-inch diameter test well in the lower half of the Main Producing Zone. The test well was screened from 285 ft to 365 ft below lsd. Static water level was 86 ft below lsd just prior to the start of the test. Two observation wells were also available for the test. The NWFWMD Beulah Fire Department well is a 2-inch diameter monitor well constructed by the District in 1984. It is screened from 145 ft to 155 ft below lsd and is located 440 feet from the ECUA test well. Static water level for this well was 86.42 ft below lsd just prior to the start of the test. The second observation well, USGS 032-724-1A, was constructed in 1959. It is a 4-inch diameter well screened from 165 ft to 170 ft below lsd and is located 3,666 feet west of the ECUA Beulah Test well. Static water level in the USGS monitor well was 95.95 ft below lsd just prior to the test.

Land surface elevations for the ECUA Beulah Test well and the NWFWMD Beulah Fire Dept well are very similar. Based on a USGS 1:24,000 scale topographic map, the elevations are estimated to be 118 ft and 117 ft respectively. The land surface elevation at the USGS monitor well is 123.43 ft as surveyed by the USGS. The location of all three wells and the radial distances between the wells are based on differentially corrected GPS. Figure 2 shows the relative radial distance and screened intervals for these wells.

The aquifer performance test was initiated on November 5, 2001. ECUA's contractor (Layne-Central) monitored discharge and maintained a constant rate of 1,999 gal/min for the duration of the test. Layne-Central personnel also measured drawdown in the test well using an air line. District personnel measured the water levels in the two observation wells using steel tapes.

Ground water was discharged to a borrow pit approximately 450 ft north of the ECUA test well. The duration of the constant discharge test was 69 hours (4,140 minutes). At the conclusion of the test the ECUA test well showed 87 ft of drawdown. Drawdown in the NWFWMD Beulah Fire Dept well was 8.92 ft and drawdown in the USGS well was 3.10 ft.

TEST ANALYSIS

The aquifer test data were analyzed using AquiferWin32 propriety software which was developed by Environmental Simulations, Inc. Drawdown data from the observation wells were compared to a variety of type curves generated by analytical models which were reasonably consistent with the test procedures and the conceptualization of the Sand-and-Gravel Aquifer as a leaky confined aquifer. Type curves were generated for numerous combinations of parameters in order to assess and obtain the combination of parameters which provided the best match with the observed data.

The USGS observation well was analyzed using the Hantush (1964) analytical model. The Hantush (1964) solution simulates the response to pumping an aquifer overlain by a leaky confining unit which is in turn overlain by a constant head source bed. The model also incorporates the effect of partially

penetrating wells and various vertical to horizontal anisotropy ratios (K_z/K_r). In addition, the model assumes:

- -well discharge is constant
- -well is of infinitesimal diameter
- -no release of water from storage in the confining bed
- -flow of water through the confining unit is vertical
- -the initial potentiometric surface of the aquifer and the water table are horizontal and extend infinitely in the radial direction

This analytical model is consistent with the conceptualization of the Sand-and-Gravel Aquifer as a leaky confined aquifer and is consistent with the wells and procedures utilized in the test. Figure 3 shows the Hantush (1964) type curve which best represents the drawdown response of the aquifer as recorded in the USGS observation well. Due to the relatively large radial distance of the USGS observation well as compared to the thickness and anisotropy of the aquifer, the type curve was insensitive to the affect of partial penetration. Type curves for various anisotropy ratios are indistinguishable from each other, therefore the anisotropy ratio could not be determined from the response of this well. Based on the response of the USGS observation wells, the following hydraulic parameters were estimated:

Transmissivity (ft^2/d)	9,100
Storativity (dimensionless)	0.0013
r/B (dimensionless)	0.8
Aquitard leakance (k'/b') (1/d)	0.00043

Assuming the thickness of the Main Producing Zone is 220 ft, the horizontal hydraulic conductivity is 41 ft/d.

The response of the NWFWMD Beulah Fire Dept well was compared to Hantush (1964) type curves. Hantush (1964) type curves were generated for a variety of r/B values (where B is the leakage factor) and anisotropy ratios. The response of the well to pumping did not compare favorably to the type curves generated by the Hantush (1964) model. The well response was also compared to type curves generated by the Hantush (1960) analytical model. Hantush (1960) assumes fully penetrating wells, constant head source bed and incorporates storage in the confining unit. This method is generally applicable to early time data only. The well response did not compare favorably to Hantush (1960) type curves.

The response of the Main Producing Zone to pumping can generally be analyzed and predicted using leaky aquifer analytical models. The observed response of the NWFWMD Beulah Fire Dept well does not appear consistent with the types of analytical models considered, therefore, no estimates of hydraulic properties were derived from the response of this well. Based on the observed response of the NWFWMD observation well, the assumptions on which the above analytical models are based appear to have been violated. This could be the result of faulty conceptualization of the Sand-and-Gravel Aquifer, local heterogeneity within the aquifer or attempting to analyze drawdown data which is not representative of the aquifer unit which was pumped. The most likely explanation is either the observation well (drawdown data) is not representative of the aquifer's response, or local heterogeneities are present. In this case there is evidence the well may not be representative of the aquifer when a local stress is applied. The depth of the screened interval (145 ft to 155 ft below lsd) is considered to be the top of the Main Producing Zone, however, the geophysical logs and the drillers lithologic log show this well to be in a somewhat clayey transition zone just above the cleaner, most-productive sands in which the ECUA test well is completed. The response of this observation well may actually be representative of drawdown within the overlying semiconfining unit.

CONCLUSIONS

The response of the USGS observation well to pumping was analyzed and provided estimates of transmissivity (9,100 ft^2/d), storativity (0.0013) and r/B (0.8). Based on these estimates, the leakance of the Low Permeability Zone (semi-confining unit) of the Sand-and-Gravel aquifer was calculated and estimated to be 0.00043 1/d. These estimates of hydraulic properties are within the range of expected values. In addition, the results of the aquifer performance test further validate the calibration of the Escambia County ground water flow and contaminant transport model. The estimates of the hydraulic properties compare favorably with hydraulic properties assigned to the ground water model in the vicinity of the Beulah Community.

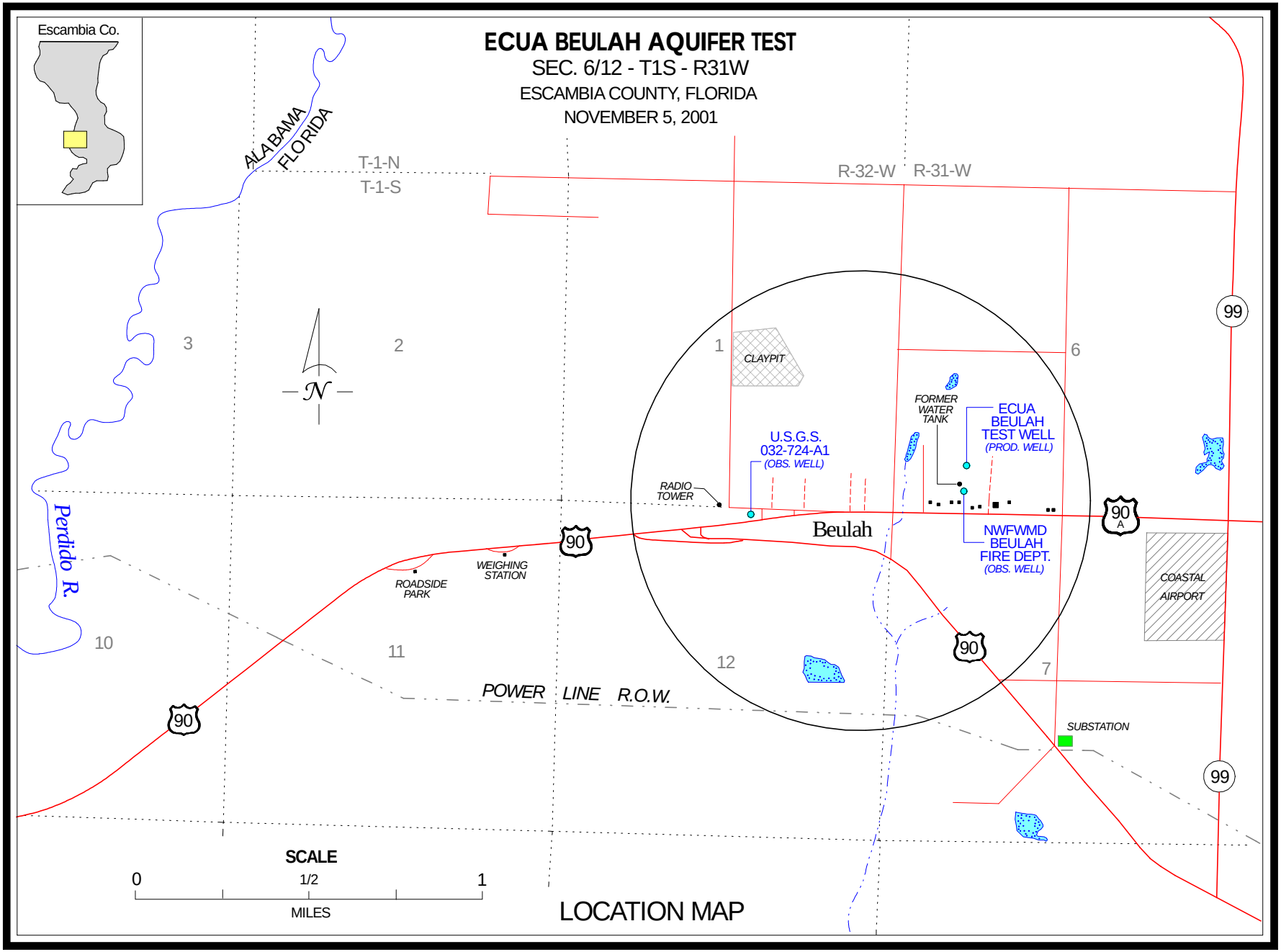

FIGURE 1. MAP SHOWING THE LOCATION OF WELLS USED IN THE AQUIFER PERFORMANCE TEST.

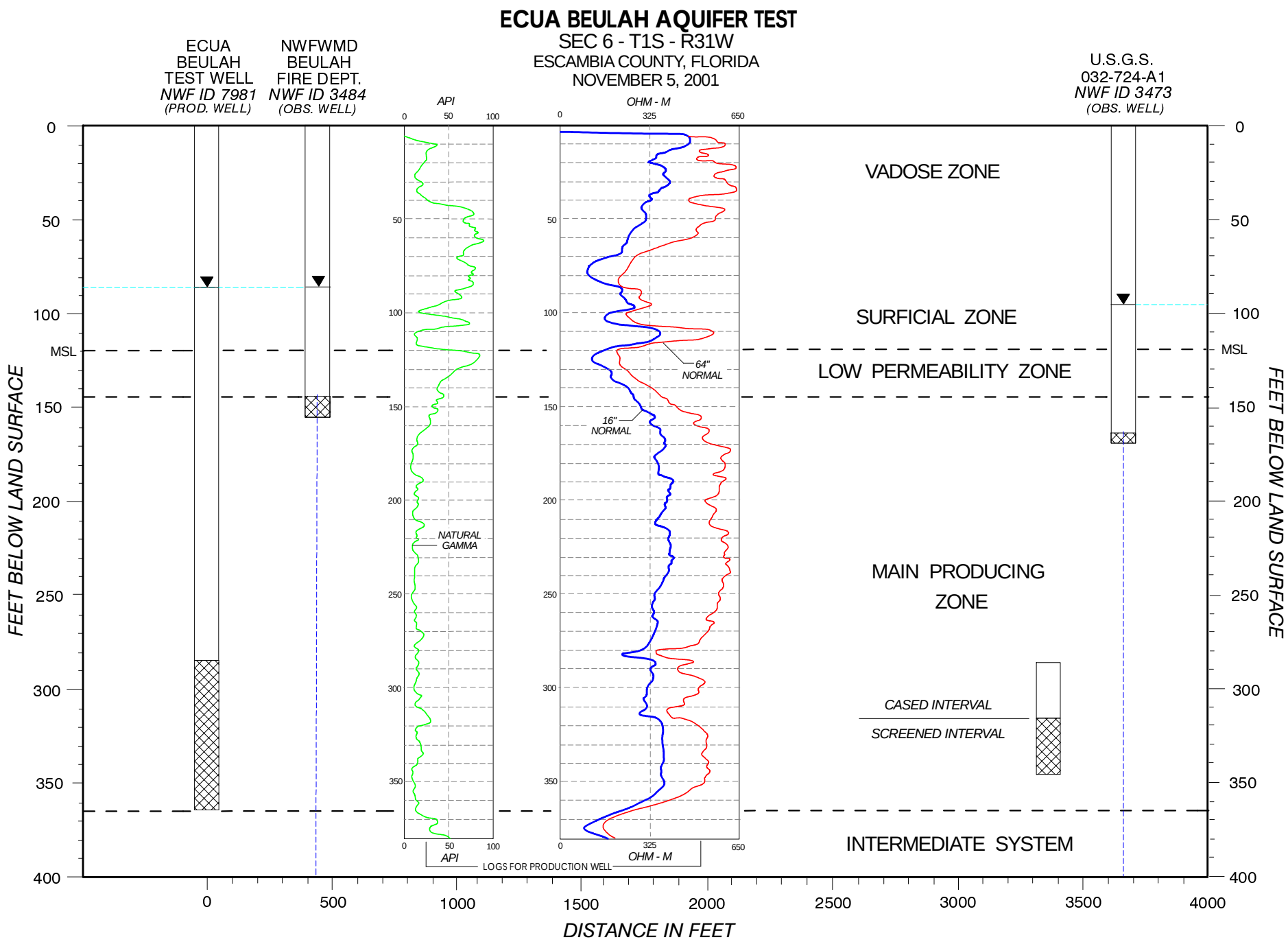

FIGURE 2. WELL CONSTRUCTION AND GENERALIZED HYDROSTRATIGRAPHY AT THE AQUIFER TEST SITE.

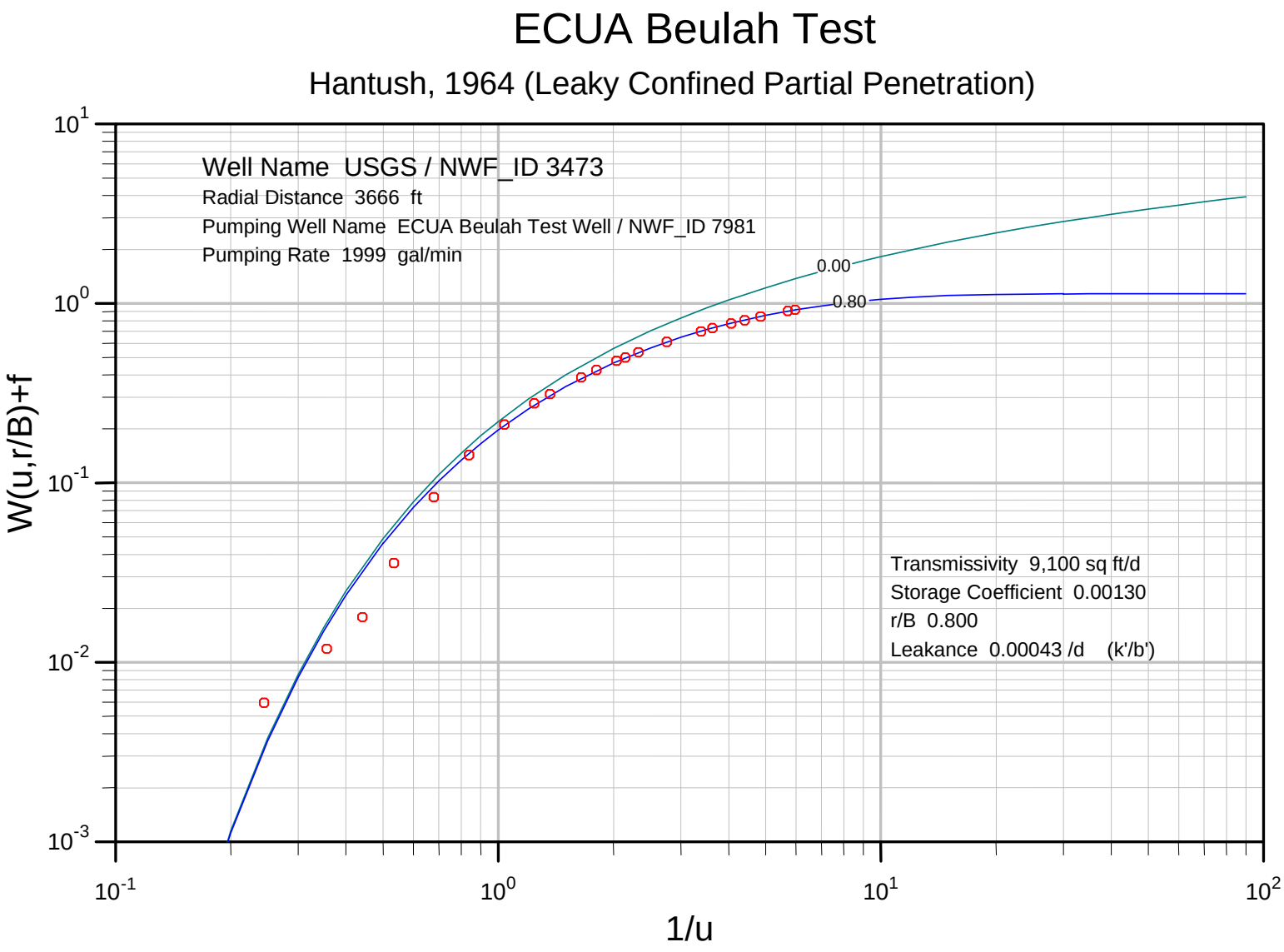

FIGURE 3. AQUIFER RESPONSE AND TYPE CURVE FOR THE USGS OBSERVATION WELL.

Beulah Fire Department / NWF_ID 3484

time (min)	drawdown
3	0.01
4	0.05
5	0.11
6	0.17
7	0.23
8	0.29
9	0.35
10	0.41
11	0.46
12	0.51
13	0.57
14	0.62
15	0.65
16	0.71
17	0.76
18	0.80
19	0.85
20	0.89
21	0.93
22	0.96
24	1.05
26	1.13
28	1.19
30	1.26
32	1.33
34	1.39
36	1.46
38	1.52
40	1.57
42	1.63
44	1.69
46	1.74
48	1.79
50	1.84
52	1.89
54	1.94
56	1.98
58	2.03
60	2.08

time (min)	drawdown
65	2.18
70	2.30
75	2.38
80	2.52
85.5	2.58
90	2.65
95.25	2.74
100	2.81
105	2.87
110	2.98
128.5	3.22
142	3.41
160	3.60
180.5	3.82
200	4.00
215	4.08
230	4.24
255	4.44
287	4.66
342	5.02
399	5.28
479	5.63
588	6.02
727	6.41
866	6.71
966	6.91
1088	7.12
1259	7.36
1415	7.53
1498	7.62
1611	7.74
1915	8.00
2348	8.29
2510	8.38
2807	8.50
3044	8.60
3350	8.72
3946	8.92

USGS / NWF_ID 3473

time (min)	drawdown
168	0.02
245	0.04
304	0.06
367	0.12
467	0.28
577	0.48
715	0.71
855	0.93
940	1.05
1134	1.30
1244	1.43
1404	1.61
1480	1.68
1600	1.80
1900	2.05
2335	2.35
2498	2.45
2796	2.60
3035	2.71
3340	2.84
3937	3.05
4110	3.10

ECUA Beulah Test Well / NWF_ID 7981

data collected by Layne Central using an airline and orifice

time (min)	drawdown	gal/min
1	60	1,999
2	63	1,999
3	65	1,999
4	66	1,999
5	67	1,999
7	69	1,999
9	70	1,999
11	71	1,999
13	71	1,999
15	72	1,999
20	72	1,999
25	73	1,999
30	73	1,999
35	74	1,999
40	75	1,999
45	75	1,999
60	75	1,999
75	75	1,999
90	76	1,999
105	76	1,999
130	77	1,999
160	77	1,999
190	77	1,999
220	78	1,999
250	78	1,999
280	78	1,999
310	79	1,999
340	79	1,999
370	79	1,999
400	79	1,999
430	79	1,999
460	79	1,999
490	79	1,999
520	79	1,999
550	79	1,999
580	79	1,999
600	79	1,999
640	79	1,999
670	79	1,999
700	79	1,999
730	79	1,999
760	79	1,999

time (min)	drawdown	gal/min
790	79	1,999
820	79	1,999
850	79	1,999
880	80	1,999
910	80	1,999
940	80	1,999
970	80	1,999
1000	80	1,999
1060	81	1,999
1120	82	1,999
1180	83	1,999
1240	83	1,999
1300	85	1,999
1360	85	1,999
1420	85	1,999
1480	84	1,999
1540	83	1,999
1600	83	1,999
1660	83	1,999
1720	82	1,999
1780	82	1,999
1840	82	1,999
1900	82	1,999
1960	82	1,999
2020	82	1,999
2080	82	1,999
2140	82	1,999
2200	82	1,999
2260	82	1,999
2320	82	1,999
2380	82	1,999
2440	82	1,999
2500	82	1,999
2560	83	1,999
2620	85	1,999
2680	86	1,999
2740	86	1,999
2800	87	1,999
2860	87	1,999
2920	87	1,999
2980	85	1,999
3040	84	1,999

time (min)	drawdown	gal/min
3100	83	1,999
3160	83	1,999
3220	83	1,999
3280	83	1,999
3340	83	1,999
3400	83	1,999
3460	83	1,999
3520	83	1,999
3580	83	1,999
3640	82	1,999
3700	82	1,999
3760	82	1,999
3820	82	1,999
3880	83	1,999
3940	83	1,999
4000	84	1,999
4060	85	1,999
4120	86	1,999
4140	87	1,999

SITE_SCHEDULE

NWFWMD Well Inventory Database System
Site Schedule

Printed:November 7, 2002 10:46

Site Id	**303208087241101**	Site Type	**G**	NWF ID	**3473**
Well Name	**USGS 032-724-1A**			State ID	
Owner	**USGS**				
Contact Person				Phone	
Street					
City	**TALLAHASSEE**	State **FL**	Zip	County	**Escambia**
Latitude	**303208.872**	Longitude **872418.579**	Datum **WGS84**	Loc Method	**Global Positioning Satellite (GPS)**
Land Net	**S012T01SR32W**	Loc Accuracy **0.3 < 3 meters**		Loc Source	**NWFWMD**
Elevation	**123.43**	Datum **NGVD29**		Method	**Survey**
Accuracy	**< 0.1 feet**	Source **Other Government**			
Location Map	**SEMINOLE (ALA-FL)**	GW Region **Western Panhandle Embayment Region**			

Site Use	**Monitor / OBS**	Water Use	
Depth Of Well	**170**	Depth Of Casing	**165**
MP Distance From LSD	**2.9**	Diameter	**4**
Construction Data Source	**Other Government**	Casing Material	**Galvanized Steel**
Finish	**Screen**	Driller License Number	**9038**
Date of Construction	**23/06/1959**	Construction Method	
Screen Length	**5**		
Screened Intervals	**165 / 170**		
Water Level	**-93.4**	Measure Date	**08/07/1959**
WL Source	**Other Government**	WL Method	**Steel Tape**
Hydrogeologic Units	**Main Producing Zone (S&G)**		
Lift	**No Pump**	Power	
Horsepower		Pump Intake	
Normal Yield		Spcap Discharge	
Spcap Source		Spcap Discharge Method	
Spcap Static Level		Spcap Pumping Level	
Spcap Drawdown		Hours Pumped	
Spcap			
Field Water Quality		Date of Sample	**25/06/1959**
Temperature	**22**	pH	
Specific Conductance		Chloride	**8**
Consumptive Use Permit		Construction Permit	
FL Geological Survey #	**W 5009**	Abandonment Permit	
DEP Public Supply #			
Project #'s	**74 32 33 36 40 5 42 46 47**		
Geophysical Log #	**172**	Depth Logged	**649**
Available LOG Data	**Gamma Neutron Driller Electric**		
Visited By	**BARRACLOUG**	Date Visited	**05/12/1966**
Data Entered By	**C_RICHARDS**	Date Entered	**22/04/1991**
Last Updated By	**C_RICHARDS**	Last Updated	**19/12/2001**
Ambient Network	**WL**		

Remarks: **MP described as-Plug hole @ T.O. steel casing ; LSD-to-MP =+2.90 ft. MP = TOP OF STEEL PLUG = 126.33;(c.richards,dec 19,2001; lsd elevation surveyed by USGS = 123.43,ngvd 1929)**

SITE_SCHEDULE

NWFWMD Well Inventory Database System
Site Schedule

Printed: November 7, 2002 10:46

Site Id	**303212087234001**	Site Type	**G**	NWF ID	**3484**
Well Name	**BEULAH FIRE DEPT**			State ID	**AAA6725**
Owner	**NWFWMD**				
Contact Person				Phone	**850-487-1770**
Street	**RT 1 BOX 3100**				
City	**HAVANA**	State **FL**	Zip **32333**	County	**Escambia**
Latitude	**303212.822**	Longitude **872338.776**	Datum **NAD83**	Loc Method	**Global Positioning Satellite (GPS)**
Land Net	**DCCS006T01SR31W**	Loc Accuracy **0.3 < 3 meters**		Loc Source	**NWFWMD**
Elevation	**117**	Datum **NGVD29**		Method	**Topo Map**
Accuracy	**>= 5 feet**	Source **NWFWMD**			
Location Map	**SEMINOLE**	GW Region **Western Panhandle Embayment Region**			

Site Use	**Monitor / OBS**	Water Use	**Monitor**
Depth Of Well	**155**	Depth Of Casing	**145**
MP Distance From LSD	**-.27**	Diameter	**2**
Construction Data Source	**NWFWMD**	Casing Material	**PVC**
Finish	**Screen**	Driller License Number	**2126**
Date of Construction	**03/12/1983**	Construction Method	**Hydraulic Rotary**
Screen Length	**10**		
Screened Intervals	**145 / 155**		
Water Level	**-77.7**	Measure Date	**15/08/1984**
WL Source	**NWFWMD**	WL Method	**Steel Tape**
Hydrogeologic Units	**Main Producing Zone (S&G)**		
Lift	**No Pump**	Power	
Horsepower		Pump Intake	
Normal Yield		Spcap Discharge	
Spcap Source		Spcap Discharge Method	
Spcap Static Level		Spcap Pumping Level	
Spcap Drawdown		Hours Pumped	
Spcap			
Field Water Quality		Date of Sample	
Temperature		pH	
Specific Conductance		Chloride	
Consumptive Use Permit		Construction Permit	**T198400556**
FL Geological Survey #		Abandonment Permit	
DEP Public Supply #			
Project #'s	**74 3 4 7 21 36 40 42 46**		
Geophysical Log #	**40**	Depth Logged	**395**
Available LOG Data	**Electric Geologist Gamma Neutron**		
Visited By	**WILKINS**	Date Visited	**20/12/1983**
Data Entered By	**B_WILLIAMS**	Date Entered	**21/09/1990**
Last Updated By	**C_RICHARDS**	Last Updated	**19/11/2001**
Ambient Network	**UN ABK**		

Remarks: **K-58, GPS DATA ENTERED 2/95 FOR AMBIENT PROGRAM; MP=T.O. 2'' PVC CSG.=116.74 ; T.O. 3'' STEEL PROTECTIVE CSG.= 116.71 Unique well Id tagged 6/96 entered by DAH.**

SITE_SCHEDULE

NWFWMD Well Inventory Database System
Site Schedule

Printed: November 7, 2002 10:46

Site Id	**303218087233901**	Site Type	**G**	NWF ID	**7981**
Well Name	**ECUA BEULAH TEST**			State ID	
Owner	**ECUA**				
Contact Person				Phone	
Street					
City		State	Zip	County	**Escambia**
Latitude	**303217.088**	Longitude	**872337.728**	Datum **NAD83**	Loc Method **Global Positioning Satellite (GPS)**
Land Net	**CCS006T01SR31W**	Loc Accuracy	**0.3 < 3 meters**	Loc Source	**NWFWMD**
Elevation	**118**	Datum	**NGVD29**	Method	**Topo Map**
Accuracy	**1 < 5 feet**	Source	**NWFWMD**		
Location Map	**SEMINOLE**	GW Region	**Western Panhandle Embayment Region**		

Site Use	**Test**	Water Use	**Test**
Depth Of Well	**365**	Depth Of Casing	**285**
MP Distance From LSD	**2**	Diameter	**10**
Construction Data Source	**Driller**	Casing Material	**Steel**
Finish	**Screen**	Driller License Number	**2459**
Date of Construction	**21/06/2001**	Construction Method	**Hydraulic Rotary**
Screen Length	**80**		
Screened Intervals	**285 / 365**		
Water Level	**-86**	Measure Date	**05/11/2001**
WL Source	**Driller**	WL Method	**Airline**
Hydrogeologic Units	**Main Producing Zone (S&G)**		
Lift	**Submersible**	Power	**Electric**
Horsepower	**150**	Pump Intake	
Normal Yield		Spcap Discharge	**1999**
Spcap Source	**Driller**	Spcap Discharge Method	**Orifice**
Spcap Static Level	**-86**	Spcap Pumping Level	**-173**
Spcap Drawdown	**87**	Hours Pumped	**69**
Spcap	**22.98**		
Field Water Quality		Date of Sample	
Temperature		pH	
Specific Conductance		Chloride	
Consumptive Use Permit		Construction Permit	**T200102049**
FL Geological Survey #		Abandonment Permit	
DEP Public Supply #			
Project #'s			
Geophysical Log #	**247**	Depth Logged	**435**
Available LOG Data	**Gamma SP Electric**		
Visited By	**C_RICHARDS**	Date Visited	**05/11/2001**
Data Entered By	**J_GODIN**	Date Entered	**02/11/2001**
Last Updated By	**C_RICHARDS**	Last Updated	**18/12/2001**
Ambient Network			

Remarks: **(c.richards,nov 8, 2001) temp test well for ecua;;; (edit by TRP,) airline length = 183 ft for temporary test well.**

NAVAL AIR STATION PENSACOLA COMPLEX
PENSACOLA, FLORIDA
INTEGRATED NATURAL
RESOURCES MANAGEMENT PLAN
2000 - 2010

This Integrated Natural Resources Management Plan (INRMP) supersedes previous Natural Resources Plans. The Sikes Act Improvements Act of 1997 require that the proposed INRMP be prepared in cooperation with the U.S. Fish & Wildlife Service and the State Fish & Wildlife Agency and that the management of fish and wildlife in this INRMP reflect mutual agreement of the parties. Mutual agreement is required only with respect to those elements of this Plan that are subject to the otherwise applicable legal authority (i.e., authority derived from a source other than the Sikes Act, such as the Endangered Species Act) of the U. S. Fish & Wildlife Service and the State Fish & Wildlife Agency to conserve, protect, and manage fish and wildlife resources.

To the extent that resources permit, the U.S. Fish & Wildlife Service, Florida Fish and Wildlife Conservation Commission, and Naval Air Station Pensacola Complex, Pensacola (NASP Complex) by signature of their agency representative, do hereby agree to enter a cooperative program for the conservation, protection and management of fish and wildlife resources on NASP Complex. The intention of this agreement is to develop functioning, sustainable ecological communities on NASP Complex that integrates the interests and mission of the agencies charged with conservation, protection, and management of national heritage in the public interest. This agreement may be modified and amended by mutual agreement of the authorized representatives of the three agencies. The agreement will become effective upon the date subscribed by the last signatory and shall continue in full force for a period of ten years or until terminated by written notice to the other parties, in whole or in part, by any of the parties signing this agreement.

By their signatures below, or an enclosed letter of concurrence, all parties grant their concurrence and acceptance of the following document.

Approving Officials:

Installation Commanding Officer	15 Nov 01 (Date)
Mark W. Gibson Installation Natural Resources Manager	13 Nov 2001 (Date)
Major Claimant of Installation	20 DEC 2001 (Date)
Regional Engineer	13 Nov 2001 (Date)
W. C. Grandy Natural Resources Manager – Southern Division	11/7/01 (Date)
H. Dale Hall U. S. Fish & Wildlife Service	11/7/01 (Date)
Florida Fish and Wildlife Conservation Commission	11-06-01 (Date)

2 History and Organization

The NASP Complex, approximately 8,423 acres of land area, is comprised of the following eight components, all controlled by the NASP CO:

- NASP, 5,800 acres;
- NOLF Bronson, 1,098 acres;
- Naval Technical Training Center (NTTC) Corry, 432 acres;
- U.S. Navy Hospital Corry, 43 acres;
- Navy Housing Corry, 88 acres;
- Navy Exchange Mall Corry, 47 acres;
- Naval Education and Training Professional Development and Technology Center (NETPDTC) Saufley, 878 acres; and
- Lexington Terrace Housing, 37 acres.

For the purposes of this INRMP, NTTC Corry, U.S. Navy Hospital Corry, Navy Housing Corry, and Navy Exchange Mall Corry will be collectively referred to as Corry Station.

2.1 Location, History, and Military Mission

2.1.1 Naval Air Station Pensacola (NASP)

NASP is located in the panhandle of Northwest Florida near Pensacola Bay. The Installation is situated on a peninsula, approximately 5 miles west of the City of Pensacola (see Figure 2-1). NASP is bordered to the south by Big Lagoon and Pensacola Bay, to the east by Pensacola Bay, and to the north by Bayou Grande.

facility consists of an 8-story, 60-bed, ambulatory care medical and surgical hospital and provides comprehensive inpatient and outpatient services to more than 72,000 active duty and retired military personnel and dependents residing in Northwest Florida and Alabama.

The assigned mission of the Naval Hospital includes the following primary functions:

- Provide a comprehensive range of emergency, outpatient, and inpatient health care services to active duty Navy and Marine Corps personnel and active duty members of other Federal Uniformed Services;
- Provide, as directed, health care services in support of the operation of the Navy and Marine Corps shore activities and units of the Operating Forces; and
- Participate as an integral element of the Navy and Tri-Service Regional Health Care Systems.

2.1.5 Navy Housing Corry

Navy Housing Corry is situated on 88 acres on the southeastern portion of Corry Station. The housing area consists of 200 duplex units that were built in 1972 and renovated in 1996. The housing is for enlisted personnel and their families. A recreational area is located in the southeastern portion of Navy Housing Corry. The family housing program is managed by the Navy Regional Family Housing Department.

2.1.6 Navy Exchange Mall Corry

The Navy Exchange Mall Corry uses 47 acres on Corry Station. The mall is located to the west and north of Navy Housing Corry. The mall was established in 1979 and provides numerous conveniences such as: retail stores; automotive services; food service facilities; a mini-mart and package store; laundry facilities; video rental; personalized services (i.e. hair dresser, optical shop, barber shop, jewelry store); and others. Use of the mall is restricted to active duty and reserve military personnel assigned to the Installation, their dependents and accompanied guests; federal civilian employees, their dependents and accompanied guests; and military retirees.

2.1.7 Naval Education and Training Professional Development and Technology Center (NETPDTC) Saufley

Saufley Field, which is located approximately 9 miles northwest of NASP on State Highway 173 (see Figure 2-1), has been used by the military since the early 1940's. Presently, it is home to NETPDTC. Saufley Field was acquired by the U.S. Government in 1939 and first opened for flight

purposes in 1940, when it became an Auxiliary Airfield under NASP. In 1943, Saufley Field became a full-fledged NAAS under NASP. Saufley Field continued to train naval aviators in tactics until 1957, when its mission changed to basic training of naval aviators. In 1968, Saufley Field was designated as a Naval Air Station (NAS), and in 1976 it was disestablished and placed under caretaker status. Saufley Field was reactivated in 1980, however, when it became home to the Naval Education and Training Professional Development Center (NETPDC) and an NOLF for NAS Whiting Field. The NETPDTC was formed in 1996 after the disestablishment of NETPDC. Today, the Navy uses two of the original runways and several buildings on the south side of the airfield for training development.

The tenants at Saufley Field include: Naval Reserve Center; United States Coast Guard (USCG) Reserve, 8th Coast Guard District; FAA; Defense Activity for Non-Traditional Educational Support (DANTES); Naval Air Warfare Center Training Support Division (NAWCTSD); and others. A U.S. Department of Justice Federal Prison Camp (FPC) is also located at Saufley Field. There are approximately 890 military and civilian personnel assigned to Saufley Field (NASP 2000).

The NETPDTC Saufley's primary mission is to create and provide innovative education and training products and services that contribute to the development of the professional warrior. NETPDTC Saufley also provides information systems support, administers the Navy Reserve Officer Training Candidate (NROTC) and the Navy Junior Reserve Officer Training Candidate (NJROTC) programs, manages the Navy's Volunteer Education Program, including all CAMPUS offices throughout the world, oversees the Navy's General Library Program, and designs and delivers training programs for the Chaplains' Corps.

2.1.8 Lexington Terrace Housing

Lexington Terrace Housing is located 2 miles from NASP and Corry Station. Housing at Lexington Terrace is for enlisted personnel and their families. The housing area, situated on 37 acres, consists of 198 duplex units which are designated as substandard due to their limited square footage. Lexington Terrace Housing was built in 1941, and was acquired by the DoN in the late 1960's. Currently, there are plans to excess this property in 2000. All current residents will be relocated.

2.2 Organization and Structure

The mission of the NASP Complex is to provide quality support to naval air training, tenants, and other customers through continuous improvement in quality of life, workforce, environment, and public image. The recent regionalization, which took effect October 1, 1999, resulted in

Some operational buildings remain on the property near the entrance to BARP. In addition, a portion of the Perdido Bay shoreline consists of former sea plane ramps and concrete aprons which are presently used by BARP.

Corry Station

Corry Station is shared among the NTTC, Navy Housing, Navy Exchange Mall, and U.S. Navy Hospital. With the exception of the buildings that have been constructed to meet current mission requirements, the present Station still closely resembles the former Corry Station air facility. Corry Station is a mix of land uses and architecture. The main road, Entrance Road, divides the station into two areas. North of Entrance Road is the majority of troop housing, training facilities, and administrative services; to the south is community services and the majority of recreational areas. The majority of the training activities are in buildings that were once used for aviation operations. Planted slash pine forest stands occur throughout Corry Station in former aviation approaches and clear zones; however, no natural communities remain on site.

Saufley Field

The northern portion of the Installation, near Elevenmile and Eightmile creeks, contains floodplain forests and is relatively natural, while the southern three-quarters of the site is highly developed. The majority of land use in the developed portion of Saufley Field consists of runways and other paved surfaces. Buildings and facilities are primarily clustered in the southern portion of the Installation, south of the runways.

3.4 Coastal Resources and Issues

The NASP Complex is located within the State of Florida, Perdido Bay and Pensacola Bay Ecosystem Management Areas. The NASP Complex has approximately 17 miles of shoreline within this system on Bayou Grande, Pensacola Bay, Perdido Bay, and the Intracoastal Waterway at the entrance to the Gulf of Mexico.

The Coastal Zone Management Act (CZMA) requires federal facilities to carry out activities in a manner consistent with the State's coastal zone management program. The Florida Coastal Management Program (FCMP) was approved by the National Oceanic and Atmospheric Administration (NOAA) in 1981. The FCMP compiles 23 Florida Statutes, which are administered by 11 state agencies and four of the five state water management districts. The

FCMP is designed to: ensure the wise use and protection of the State's water, cultural, historical and biological resources; to minimize the State's vulnerability to coastal hazards; to ensure compliance with the State's growth management laws; to protect the State's transportation system; and to protect the State's proprietary interest as the owner of sovereign submerged lands (Florida Department of Community Affairs [DCA] 1999). The INRMP and associated Environmental Assessment (EA) will be reviewed by the State of Florida for Coastal Zone Consistency in compliance with the Federal CZMA.

Coastal zones are also regulated by FDEP under the Florida Coastal Zone Protection Act (1985). Under this program, permits are required for any erosion control devices, excavations, or erection of structures within the coastal construction control line (CCCL). The CCCL occurs only on mainland or barrier island coasts bordering the Gulf of Mexico or the Atlantic Ocean. The actual CCCL is determined separately for each county in Florida. Construction in the Coastal Building Zone is also subject to stricter requirements than structures built farther inland. The Coastal Building Zone extends 1,500 feet landward of the CCCL for mainland coasts and 5,000 feet (or the entire island, whichever is less) for barrier islands. Properties of the NASP Complex are not affected by the CCCL or the Coastal Building Zone because they are not on a barrier island or directly adjacent to the Gulf of Mexico.

3.5 Geology, Topography, and Soils

The NASP Complex is located within the Gulf Coastal Lowlands physiographic region, which has a surface geology characterized by three types of sediments: limestones, organics, and clastics (silt, clay, sand, gravel; Wolfe *et al.* 1988). The Pensacola region is underlain, in descending order, by the Sand and Gravel Aquifer, the Intermediate System (a regional confining unit), and the Floridan Aquifer. These hydrostratigraphic units are discussed in more detail in Section 3.6. The Gulf Coastal Lowlands are characterized by nearly level, poorly drained land extending about 12 miles inland from the coast. Ground elevations in the Pensacola region range from sea level to over 50 feet above mean sea level (MSL).

The topography at NASP is basically flat, ranging from sea level to approximately 40 feet above MSL. The principal soils at NASP are strongly acidic, well to somewhat excessively drained, and sandy textured. The sand or loamy sand surface is 30 to 42 inches thick and underlain by sandy loam to sandy clay substrata. The topography at NOLF Bronson is generally flat, with elevations ranging from sea level to 30 feet above MSL. Soils at NOLF Bronson range from upland sandy soils in the northern portions of the site to hydric soils in the southern portions of the site. The topography at Corry Station is basically flat, with an elevation of 20 to 30 feet

above MSL. Soils are primarily light-colored and well-drained. Saufley Field is located along a low ridge with an elevation of approximately 85 feet MSL. The ridge drops off to 25 feet MSL on the north side of Eightmile Creek, and 10 feet MSL at the edge of Perdido Bay, to the south. Soils at Saufley Field range from well-drained sandy and loamy soils, in the vicinity of the field and northeast of the field, to poorly drained sandy and muck soils on the south, southwest, and northwest sides of the field. Current soils data for Escambia County can be obtained electronically through the Soil Survey Geographic (SSURGO) database (http://www.agnic.org/agdb/ssurgo.html). NASP soils are mapped on Figure 3-1; NOLF Bronson soils on Figure 3-2; Corry Station soils on Figure 3-3; and soils at Saufley Field on Figure 3-4.

3.6 Hydrology and Water Quality

3.6.1 Watersheds and Surface Waters

The NASP Complex is located within the Perdido-Escambia River Basin, which drains directly into the Pensacola Bay and Perdido Bay systems (See Figure 2-1). The Escambia River, the largest stream in the area, flows southward from Alabama; it divides Escambia County from Santa Rosa County and empties into Escambia Bay, which becomes Pensacola Bay to the south. The Perdido River flows into Perdido Bay, which empties into various, relatively small, inland bays and bayous, and ultimately the Gulf of Mexico. Perdido Bay is connected to the Pensacola Bay System via the Intracoastal Waterway and Big Lagoon.

3.6.2 Freshwater Streams and Ponds

Due to its relatively level topography and young geologic age, the drainage system of the Coastal Lowlands is weakly developed and has little dissection (USDA 1960). A small number of streams and ponds occur on the NASP Complex; several of these are associated with the golf course and are unnamed. A small, unnamed stream and a beaver pond occur in the southeastern portion of NOLF Bronson. At Corry Station, no streams or ponds exist except for a small unnamed drainage that flows east along the northeastern portion of the station. Elevenmile and Eightmile creeks flow southwest through the northwest portion of the Saufley Field property. No surface waters occur on the Lexington Terrace Housing property, although a tributary to Jones Swamp is adjacent to the northern boundary of the property.

3.6.3 Estuarine and Marine Waters

Estuaries are semi-enclosed coastal bodies of water in which the ocean water is significantly diluted by fresh water from land runoff. Marine waters are tidally influenced with increased salinity (Thurman 1988). NASP has 17 miles of shoreline within the Perdido and Pensacola Bay systems. Marine and estuarine waters in close proximity to the NASP Complex include Pensacola Bay, Bayou Grande, Big Lagoon, Perdido Bay, and a portion of the Intracoastal Waterway (see Figure 2-1). Pensacola Bay, which forms the eastern and southern borders of NASP, has a surface area of approximately 54 square miles with a mean depth of 19.5 feet. Pensacola Bay is a saline bay with a 0.5-mile-wide pass (Caucaus Channel) to the Gulf of Mexico. The Bay is the receiving body of water for Escambia and East bays, and bayous Texar, Chico and Grande (FDEP 1998). Bayou Grande, an estuary that drains into Pensacola Bay, forms the northern border of NASP. Bayou Grande is approximately 1.7 square miles. Big Lagoon is primarily a saline body of water located directly southwest of NASP between the mainland and Perdido Key. Perdido Bay is a semi-enclosed estuary located west of NOLF Bronson. It is connected to the Gulf of Mexico via Perdido Pass, and to Big Lagoon via the Intracoastal Waterway. Perdido Bay has a surface area of approximately 33 square miles. Perdido Bay is partially fed by the Perdido River and Elevenmile and Eightmile creeks.
The Pensacola Bay and Perdido Bay watersheds have been impacted by non-point source pollution such as urban stormwater runoff and agricultural runoff, and point source pollution such as effluents from municipal-private domestic wastewater treatment plants and industrial plants. As a result, the Pensacola Bay System does not have the natural biodiversity and productivity of a system with its complexity (http//www.dep.state.fl.us/nwd/ecosys/waterquality/pensacolabay.htm). Under the Unified Watershed Assessment and priority list for Florida, Pensacola Bay and Perdido Bay are considered Category I basins (Watersheds in Need of Restoration; see Section 1.6.3).

Pensacola Bay, Perdido Bay, and Bayou Grande are classified as Class II and Class III waters, and are thus designated to support shellfish propagation and recreational and wildlife use. Section 303(d) of the CWA requires that states develop a list of waters not meeting water quality standards or not supporting their designated uses. Pensacola Bay (near the pass), Perdido Bay, and Bayou Grande are each on the 1998 303(d) list for water segments in Florida not meeting their designated uses. Parameters of concern included: coliform and dissolved oxygen for Bayou Grande; metals, biological oxygen demand, nutrients, turbidity, and total suspended solids for Pensacola Bay; and dissolved oxygen and nutrients for Perdido Bay (http//www.dep.state.fl.us/water/division/tmdl/303d.htm).

3.6.4 Groundwater

The Pensacola area is underlain by three principal hydrogeologic units: the Sand-and-Gravel Aquifer; the Intermediate System; and the Floridan Aquifer System. The Sand-and-Gravel Aquifer occurs from the ground surface to a depth of approximately 220 to 330 feet below ground surface (BGS), in southern Escambia County. It consists of a complex sequence of unconsolidated to poorly indurated sand, gravel, silt, and clay (Roaza *et al.* 1991). The surficial zone is contiguous with the ground surface, and contains groundwater under water table, or perched water table conditions. Below this aquifer is the Intermediate System, a regionally extensive and vertically persistent hydrogeologic unit of low permeability. The Intermediate System in southern Escambia County is approximately 550 to 1,200 feet thick (Roaza *et al.* 1993). The Floridan Aquifer System, which is composed of limestone formations, underlies the Intermediate System and occurs at depths between approximately 1,100 and 1,500 feet BGS, in southern Escambia County (Scott *et al.* 1991). The Sand-and-Gravel Aquifer and the Floridan Aquifer are used for groundwater by this region, while the Intermediate System acts as a confining unit.

Aquifer systems in the region provide an abundant supply of fresh water. Potable groundwater in Escambia County is generally withdrawn from the Sand and Gravel Aquifer; the Floridan Aquifer is highly productive in other parts of the region, but it is too mineralized to be a potable water source in the Pensacola area. The high annual rainfall for this region provides ample water to recharge the groundwater and surface water systems of this area. Regionally, contamination from polychlorinated ethylene (PCE), a dry cleaning chemical, has been a concern, but granular activated carbon filters on the affected wells have been used to treat the contaminated water. At NASP, shallow groundwater, associated with several IRP sites, has been contaminated. Because of this situation, potable water is supplied to NASP from wells at Corry Station.

3.6.5 Floodplains

Floodplains are defined as low and relatively flat areas adjoining inland and coastal waters and include flood-prone areas of offshore islands. The Federal Emergency Management Agency (FEMA) defines these areas as being subject to a one percent or greater chance of flooding in any given year. According to FEMA 100-year Flood Insurance Rate Maps (FIRM), portions of NASP, NOLF Bronson, and Saufley Field lie within the 100-year floodplain (see figures 3-1, 3-2, and 3-4). In addition, because of NASP's proximity to the Gulf of Mexico and

Pensacola Bay, it is susceptible to coastal flooding during hurricanes and other strong storm events. The 100-year tidal flood elevation at NASP is approximately 9 feet above MSL.

There are no areas on Corry Station, including the U.S Navy Hospital, Navy Housing Corry, or the Navy Exchange Mall Corry, that are within the 25 or 100-year floodplains. Additionally, Lexington Terrace Housing does not fall within 25 or 100-year floodplains.

3.7 Wetlands and Submerged Aquatic Vegetation

3.7.1 Wetlands

Wetlands are generally considered to be transitional zones between the terrestrial and aquatic environment. These areas are characterized by physical, chemical, and biological features indicative of hydrological conditions. Currently, wetlands are regulated by the U.S. Army Corps of Engineers (USACE) under Section 404 of the CWA of 1972. Wetlands are defined by the USACE as "…*those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.*"

Wetland jurisdictional lines at NASP, NOLF Bronson, Saufley Field, and Corry Station were delineated using the USACE 1987 Wetland Delineation Manual. Approximately 1,000 acres of wetlands were identified within the NASP Complex. No wetlands were identified in association with the U.S. Navy Hospital Corry, the Navy Housing Corry, the Navy Exchange Mall Corry, or Lexington Terrace Housing. Wetland quality has not been assessed at the NASP Complex to date, but wetland quality assessments will be implemented in the future.

NASP

In September 1997, a formal delineation of the wetland jurisdictional boundaries on NASP was completed. A total of 99 wetlands were identified, comprising a total of approximately 650 acres (see Figure 3-1). Wetlands included a mixture of palustrine wetlands, such as forested, scrub/shrub, and emergent. Some of the wetlands along the coastline of Pensacola Bay are tidally influenced and considered estuarine emergent and estuarine aquatic bed (seagrasses). Major wetland complexes are located along the southern and western edges of the Installation. Along the northern and eastern edges of the Installation, wetlands tend to be smaller and more isolated from one another (Water and Air Research, Inc. 1998a).

NOLF Bronson

In May of 1991, a wetland inventory and classification was conducted for NOLF Bronson (see Figure 3-2). A total of approximately 250 acres of wetlands was identified, including a mixture of forested, scrub/shrub, and emergent wetlands. Although the Installation is along the shore of Perdido Bay, there were no estuarine wetlands identified. A majority of the wetland acreage is concentrated along the southern and eastern boundaries of NOLF Bronson. The wetlands in the interior of the Installation are isolated and small relative to the periphery wetlands (EPA 1992).

NTTC Corry

In April of 1997, a formal delineation of the jurisdictional wetland boundaries was conducted on NTTC Corry. Two forested wetlands, approximately 0.5 acres, occur on Corry Station (see Figure 3-3; Water and Air Research, Inc. 1998b). Both are isolated wetlands, but one is hydrologically connected to Jones Swamp via a ditch under U.S. Highway 98.

Saufley Field

In August of 1997, a formal delineation of the jurisdictional wetland boundaries on Saufley Field was completed. A total of approximately 100 acres of wetlands occur at Saufley Field (see Figure 3-4). A majority of the wetland acreage is associated with the floodplain areas of Elevenmile and Eightmile creeks in the northern portion of the Installation. Other wetlands on the Installation are associated with an unnamed swamp forest adjacent to Perdido Bay, at the southwest corner of the Installation.

Wetland Permits and Mitigation

The Complex occasionally undertakes activities to maintain or renovate existing facilities, such as marine-related facilities and structures at NASP. These activities may require state and/or federal permits, such as Wetland Resource Permits (FDEP) or CWA Section 404/Rivers and Harbors Act Section 10 permits (USACE). The Florida Wetland Resources Permit Program, administered by the FDEP, regulates dredging, filling, or construction in, on, or over waters and wetlands that are connected, either naturally or artificially, to “named waters” (FDEP 2000b). Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) prohibits the obstruction or alteration of navigable waters of the United States without a permit from the USACE. Section 404 of the CWA (33 U.S.C. 1344) prohibits the discharge of dredged or fill

material into waters of the United States without a permit from the USACE. If it is determined that wetland impacts are unavoidable, mitigation in the form of the creation of wetlands, or the restoration or enhancement of previously degraded ones, may be required under state and/or federal permits. Wetland banking is allowed in Florida and will be considered if needed.

At NASP, maintenance activities periodically occur at Sherman Cove Marina and the sea wall at the USCG Facility (responsibility of the Coast Guard), and periodic dredging of the shipping channel and entrance to Bayou Grande are also conducted. These activities may require state and/or federal permits. Any activity that could potentially affect wetlands or waterbodies should be reviewed by the NRM for permit requirement determination.

3.7.2 Submerged Aquatic Vegetation

Seagrasses, a type of submerged aquatic vegetation (SAV), are marine angiosperms that generally grow in the unconsolidated sediments of shallow, subtidal or intertidal estuarine and marine waters. Seagrass beds provide numerous critical functions to coastal environments, such as serving as a sediment trap and stabilizer of bottom sediments, providing primary productivity to the sea, serving as a food source, and providing substrate and habitat for various species (Wolf *et al.* 1988). Seagrasses occur intermittently in shallow waters along the southern and eastern shores of NASP; in particular the area from Sherman Cove westward to Trout Point, along the shoreline of Big Lagoon, a high-use recreational boating area. This vegetation is susceptible to environmental impacts, such as nutrient loading, due to their high light requirements (Wolfe *et al.* 1988).

3.8 Vegetation and Wildlife

The biological environment of the NASP Complex was considerably different prior to colonization and development. Historically, the area was dominated by natural communities that are, today, found only scattered throughout the Complex. The natural communities at NASP include: estuarine tidal marsh; scrub; mesic flatwoods; scrubby flatwoods; wet flatwoods; beach dune; and baygall. These natural communities exist throughout the Installation, but are primarily located in the southwest and north segments (FNAI 1997a). NOLF Bronson contains wet prairie natural communities in the northeastern and southeastern portions of the site (FNAI 1997a). Four high quality natural communities occur at Saufley Field; they are blackwater stream, depression marsh, floodplain swamp, and seepage slope areas (FNAI 1997c).

Ecosystems at the NASP Complex have been affected by development to varying degrees. Areas that have been highly developed by the DoN (i.e. Corry Station, eastern portion of NASP

and Forrest Sherman Field, southern portion of Saufley Field) contain little or no natural vegetation or wildlife associated with previous ecosystems. Although approximately 41% of the land area within the NASP Complex remains relatively natural, only approximately 7.5% of land area remains as natural communities. The NASP Complex has taken measures, such as planting forest stands in previously cleared areas, to enhance the biological environment throughout the Complex. In addition, the NASP Complex uses prescribed burning and thinning to develop a natural structure in its managed forest stands. Natural resources management seeks to improve ecosystems and return them to previous ecosystem quality to the extent practicable within the constraints of military mission requirements.

3.8.1 Natural Vegetated Communities and Wildlife

FNAI defines a natural community as "a distinct and reoccurring assemblage of populations of plants, animals, fungi, and microorganisms naturally associated with each other and their physical environment." In conjunction with rare plant and vertebrate surveys in 1996 and 1997, FNAI conducted surveys for natural communities at NASP, NTTC Corry, NOLF Bronson, and NETPDTC Saufley. Twenty-eight high quality natural communities representing 12 community types were identified within the NASP Complex (see Table 3-3). Due to development, no natural communities occur at Lexington Terrace Housing, U.S. Navy Hospital Corry, Navy Housing Corry, or the Navy Shopping Mall. Natural community locations, acreages, and descriptions, which were taken from FNAI and the Florida Department of Natural Resource (FDNR 1990), are provided in Table 3-3. Table 3-3 also lists wildlife species that are typical of the natural communities found at the NASP Complex.

3.8.2 Rare, Threatened and Endangered Species

The NASP Complex is within, or approached by, the range of at least 67 rare vertebrate taxa and 83 rare plant taxa. In 1996 and 1997, FNAI conducted surveys to determine the endangered, threatened, and rare plant and vertebrate species occurring at NASP, NTTC Corry, NOLF Bronson, BARP, and NETPDTC Saufley. Two federally listed species and 21 state listed species were identified within the NASP Complex. Eighteen rare vertebrate species and 10 rare plant species were identified at NASP; six rare vertebrate species and eight rare plant species were identified at NOLF Bronson (including BARP); and four rare vertebrate species and six rare plant species were identified at Saufley Field. In addition, a great blue heron rookery in the beaver pond was documented at NOLF Bronson. No federally or state listed threatened or endangered species are expected to occur at Lexington Terrace Housing, U.S. Navy Hospital

STATE AND FEDERAL THREATENED, ENDANGERED, AND OTHER SPECIES OF CONCERN
LIKELY TO OCCUR IN ESCAMBIA COUNTY FLORIDA
Compiled by U.S. Fish and Wildlife Service April 2007

Common Name	Scientific Name	Status State	Status FWS	Natural Communities
FISH:				
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	SSC	T CH	ESTUARINE: various MARINE: various habitats RIVERINE: alluvial and blackwater streams
Crystal darter	*Ammocrypta asprella*	T	ce	RIVERINE: alluvial stream
Harlequin darter	*Etheostoma histrio*	SSC		RIVERINE: alluvial stream
Saltmarsh topminnow	*Fundulus jenkinsi*	SSC		ESTUARINE: estuarine tidal marsh
Bluenose shiner	*Pteronotropis welaka*	SSC		RIVERINE: blackwater, alluvial, and spring-run streams
AMPHIBIANS & REPTILES:				
Loggerhead turtle	*Caretta caretta*	T	T	TERRESTRIAL: sandy beaches; nesting
Green turtle	*Chelonia mydas*	E	E	TERRESTRIAL: sandy beaches; nesting
Leatherback turtle	*Dermochelys coriacea*	E	E	TERRESTRIAL: sandy beaches; nesting
Eastern indigo snake	*Drymarchon corais couperi*	T	T	ESTUARINE: tidal swamp PALUSTRINE: hydric hammock, wet flatwoods TERRESTRIAL: mesic flatwoods, upland pine forest, sandhills, scrub, scrubby flatwoods, rockland hammock, ruderal
Hawksbill turtle	*Eretmochelys imbricata imbricata*	E	E	MARINE: open water; no nesting
Gopher tortoise	*Gopherus polyphemus*	SSC	ce	TERRESTRIAL: sandhills, scrub, scrubby flatwoods, xeric hammocks, coastal strand, ruderal
Pine barrens treefrog	*Hyla andersonii*	SSC		PALUSTRINE: seepage slope, baygall RIVERINE: seepage stream
Kemp's Ridley turtle	*Lepidochelys kempii*	E	E	TERRESTRIAL: sandy beaches; nesting
Alligator snapping turtle	*Macroclemys temminckii*	SSC	ce	ESTUARINE: tidal marsh LACUSTRINE: river floodplain lake, swamp lake RIVERINE: alluvial stream, blackwater stream
Gulf salt marsh snake	*Nerodia clarkii clarkii*		ce	ESTUARINE: tidal marsh, tidal swamp MARINE: tidal marsh, tidal swamp
Florida pine snake	*Pituophis melanoleucus mugitus*	SSC	ce	LACUSTRINE: ruderal, sandhill upland lake TERRESTRIAL: sandhill, scrubby flatwoods, xeric hammock, ruderal
BIRDS:				
Bachman's sparrow	*Aimophila aestivalis*		ce	TERRESTRIAL: various, ruderal
Southeastern snowy plover	*Charadrius alexandrinus tenuirostris*	T	ce	ESTUARINE: exposed unconsolidated substrate MARINE: exposed unconsolidated substrate TERRESTRIAL: dunes, sandy beaches, and inlet areas

E=endangered, T=threatened, P=proposed, C=candidate, s/a=similar appearance, SSC=species of special concern, ce=consideration encouraged, CH=Critical Habitat

This is not an exhaustive list of where species do occur, but a guide to indicate areas that might require surveys if appropriate habitat exists. Please contact Florida Natural Areas Inventory (850-224-8207) for additional species location information.

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Common Name	Scientific Name	Status State	Status FWS	Natural Communities
Piping plover	*Charadrius melodus*	T	T CH	ESTUARINE: exposed unconsolidated substrate MARINE: exposed unconsolidated substrate TERRESTRIAL: dunes, sandy beaches, and inlet areas. Mostly wintering and migrants.
Stoddard's yellow-throated warbler	*Dendroica dominica stoddardi*		ce	TERRESTRIAL: wooded habitats with spanish moss, various
Little blue heron	*Egretta caerulea*	SSC		ESTUARINE: marshes, shoreline PALUSTRINE: floodplains, swamps RIVERINE: shoreline
Snowy egret	*Egretta thula*	SSC		ESTUARINE: marshes, tidal swamps, shoreline LACUSTRINE: lake edges PALUSTRINE: swamp, floodplain, ruderal RIVERINE: shoreline
Tricolored heron	*Egretta tricolor*	SSC		ESTUARINE: marshes, tidal swamps, shoreline LACUSTRINE: lake edges PALUSTRINE: swamp, floodplain, ruderal RIVERINE: shoreline
Arctic peregrine falcon	*Falco peregrinus tundrius*	E	ce	ESTUARINE: winters along coasts LACUSTRINE: various PALUSTRINE: various TERRESTRIAL: various, ruderal
Southeastern kestrel	*Falco sparverius paulus*	T	ce	ESTUARINE: various habitats PALUSTRINE: various habitats TERRESTRIAL: open pine forests, clearings, ruderal, various
American oystercatcher	*Haematopus palliatus*	SSC		ESTUARINE: exposed unconsolidated substrate, exposed mollusk reef MARINE: exposed unconsolidated substrate, exposed mollusk reef TERRESTRIAL: beaches, ruderal areas
Bald eagle	*Haliaeetus leucocephalus*	T	T	ESTUARINE: marsh edges, tidal swamp, open water LACUSTRINE: swamp lakes, edges PALUSTRINE: swamp, floodplain RIVERINE: shoreline, open water TERRESTRIAL: pine and hardwood forests, clearings
Wood stork	*Mycteria americana*	E	E	ESTUARINE: marshes LACUSTRINE: floodplain lakes, marshes (feeding), various PALUSTRINE: marshes, swamps, various
Brown pelican	*Pelecanus occidentalis*	SSC		ESTUARINE: islands for nesting, open water MARINE: open water
Red-cockaded woodpecker	*Picoides borealis*	SSC	E	TERRESTRIAL: mature pine forests

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Common Name	Scientific Name	Status State	Status FWS	Natural Communities
Black Skimmer	*Rynchops niger*	SSC		ESTUARINE: various LACUSTRINE: various RIVERINE: various TERRESTRIAL: ocean beaches, beach dune, ruderal. Nests common on rooftops.
Least tern	*Sterna antillarum*	T		ESTUARINE: various LACUSTRINE: various RIVERINE: various TERRESTRIAL: beach dune, ruderal. Nests common on rooftops.
MAMMALS:				
Santa Rosa beach mouse	*Peromyscus polionotus leucocephalus*		ce	TERRESTRIAL: beach dune, coastal scrub
Perdido Key beach mouse	*Peromyscus polionotus trissyllepsis*	E	E CH	TERRESTRIAL: beach dune, coastal scrub. Sites: Perdido Key State Rec. Area (CH), Gulf Islands National Seashore (CH).
Southeastern big-eared bat	*Plecotus rafinesquii*		ce	PALUSTRINE: various, floodplains TERRESTRIAL: pine and hardwood forests, ruderal, various
Eastern chipmunk	*Tamias striatus*	SSC		TERRESTRIAL: slope forest, upland hardwood forest, upland pine forest
West Indian manatee	*Trichechus manatus latirostris*	E	E	ESTUARINE: submerged vegetation, open water MARINE: open water, submerged vegetation RIVERINE: alluvial stream, blackwater stream, spring-run stream
Florida black bear	*Ursus americanus floridanus*	T	ce	PALUSTRINE: titi swamps, floodplains TERRESTRIAL: pine and hardwood forests
INVERTEBRATES:				
Narrow pigtoe	*Fusconaia escambia*		C (E)	Riverine: small to medium-sized creeks and rivers with slow to moderate current over gravel, and gravel mixed with sand or some silt. Endemic to the Escambia and Yellow River drainages of Alabama and Florida
Round ebonyshell	*Fusconaia rotulata*		C (E)	Riverine: Endemic and restricted to the main channel of the Conecuh River AL, and Escambia River, FL
Fuzzy pigtoe	*Pleurobema strodeanum*		C (E)	Riverine: small to medium-sized creeks and rivers with slow to moderate currents in sand and sand with some silt. Endemic to the Escambia, Yellow, and Choctawhatchee River drainages of Alabama and Florida.
Choctaw bean	*Villosa choctawensis*		C (E)	Riverine: Small to large creeks and rivers with moderate current over sand to silty-sand substrates. Endemic to the Escambia, Yellow, and Choctawhatchee River drainages of Alabama and Florida.

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Common Name	Scientific Name	Status State	Status FWS	Natural Communities
Downy rainbow (mussel)	*Villosa villosa*		ce	RIVERINE: small streams to large rivers in sand or muddy sand substrates (Panhandle watersheds: Apalachicola, Chipola, Escambia, Choctawhatchee, Ochlockonee, Suwannee)
PLANTS:				
Aster	*Aster hemisphericus*	E	ce	TERRESTRIAL: upland mixed forest, on sandstone outcrop
Buckthorn	*Bumelia thornei*	E	ce	PALUSTRINE: hydric hammock, floodplain swamp
Curtiss' sandgrass	*Calamovilfa curtissii*	T	ce	PALUSTRINE: mesic and wet flatwoods, wet prairie, depression marsh TERRESTRIAL: mesic flatwoods
Sweet shrub	*Calycanthus floridus*	E		TERRESTRIAL: upland hardwood forest, slope forest, bluffs PALUSTRINE: bottomland forest, stream banks, floodplains
Baltzell's sedge	*Carex baltzellii*	T	ce	TERRESTRIAL: slope forest, moist sandy loam; moist sandy loam
Cruise's golden-aster	*Chrysopsis gossypina cruiseana*	E	ce	TERRESTRIAL: coastal dunes, coastal strand, coastal grassland; openings and blowouts
Spoon-leaved sundew	*Drosera intermedia*	T		LACUSTRINE: sinkhole lake edges PALUSTRINE: seepage slope, wet flatwoods, depression marsh RIVERINE: seepage stream banks, drainage ditches
Trailing arbutus	*Epigaea repens*	E		TERRESTRIAL: bluff, slope forest, mixed hardwood forest
Heartleaf	*Hexastylis arifolia*	T		RIVERINE: seepage stream bank TERRESTRIAL: slope forest
Florida anise	*Illicium floridanum*	T		PALUSTRINE: floodplain forest, baygall RIVERINE: seepage stream bank TERRESTRIAL: slope forest, seepage slope
Mountain laurel	*Kalmia latifolia*	T		RIVERINE: seepage stream bank TERRESTRIAL: slope forest, seepage stream banks
Southern red lily	*Lilium catesbaei*	T		PALUSTRINE: wet prairie, wet flatwoods, seepage slope TERRESTRIAL: mesic flatwoods, seepage slope; usually with grasses
Panhandle lily	*Lilium iridollae*	E	ce	PALUSTRINE: baygall, dome swamp edges, mucky soil, seepage slope, edges of titi bogs, RIVERINE: blackwater stream banks
Gulf coast lupine	*Lupinus westianus*	T	ce	TERRESTRIAL: beach dune, scrub, disturbed areas, roadsides, blowouts in dunes

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Common Name	Scientific Name	Status State	Status FWS	Natural Communities
Hummingbird flower	*Macranthera flammea*	E		PALUSTRINE: seepage slope, dome swamp edges, floodplain swamps RIVERINE: seepage stream banks TERRESTRIAL: seepage slopes
Chapman's butterwort	*Pinguicula planifolia*	T	ce	PALUSTRINE: wet flatwoods, seepage slopes, bog, dome swamp, ditches; in water
Primrose-flower butterwort	*Pinguicula primulifolia*	E		PALUSTRINE: bogs, pond margins, margins of spring runs
Yellow fringed orchid	*Platanthera ciliaris*	T		PALUSTRINE: bogs, wet flatwoods TERRESTRIAL: Bluff
Yellow fringeless orchid	*Platanthera integra*	E	ce	PALUSTRINE: wet prairie, seepage slope TERRESTRIAL: mesic flatwoods
Large-leaved jointweed	*Polygonella macrophylla*	T	ce	TERRESTRIAL: scrub, sand pine/oak scrub ridges
Florida pondweed	*Potamogeton floridanus*		ce	RIVERINE: blackwater stream
Orange azalea	*Rhododendron austrinum*	E		PALUSTRINE: bottomland forest RIVERINE: seepage stream bank TERRESTRIAL: slope forest, upland mixed forest
White-top pitcher plant	*Sarracenia leucophylla*	E	ce	PALUSTRINE: wet prairie, seepage slope, baygall edges, ditches
Parrot pitcher plant	*Sarracenia psittacina*	T		PALUSTRINE: wet flatwoods, wet prairie, seepage slope
Decumbant pitcher plant	*Sarracenia purpurea*	T		PALUSTRINE: Bogs
Red-flowered pitcher plant	*Sarracenia rubra*	T		PALUSTRINE: bog, wet prairie, seepage slope, wet flatwoods RIVERINE: seepage stream banks
Silky camellia	*Stewartia malacodendron*	E		PALUSTRINE: baygall PALUSTRINE: slope forest, upland mixed forest, TERRESTRIAL: slope forest, upland mixed forest; acid soils
Drummond's yellow-eyed grass	*Xyris drummondii*		ce	PALUSTRINE: wet flatwoods, bog, seepage slopes, ditches
Harper's yellow-eyed grass	*Xyris scabrifolia*	T	ce	PALUSTRINE: seepage slope, wet prairie, bogs

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CHAPTER 1

ROCKS and GEOLOGIC TIME

The Anastasia Formation, of Pleistocene and Recent age, occurring along Florida's east coast, is a coquina made of cemented marine fossil debris and sand. X1 (Rupert, 1989).

ROCKS

ED LANE PG 141

The Earth's crust is not uniform. Its surface and interior are made of an almost endless variety of rocks, each having its own distinctive characteristics, such as minerals, color, density, porosity, and hardness. Geologists classify rocks according to their origin.

IGNEOUS ROCKS

Igneous rocks (from the Latin word for "fire") are rocks that are formed deep within the Earth's molten interior. Sometimes they are forced out of the Earth's interior through volcanoes and appear on the surface as lava. Examples of igneous rocks are granites, basalts, obsidian (volcanic glass), and pumice (the porous, bubble-filled lava that floats on water). There are no igneous rocks exposed at the surface in Florida, although they have been found several thousand feet below the land surface in deep oil wells.

METAMORPHIC ROCKS

Metamorphic rocks (from the Greek words for "changed in form") are formed deep beneath the Earth's surface. Originally, they were igneous or sedimentary rocks that were transformed by the tremendous heat, pressure, and chemically active fluids to which they were subjected after burial in the Earth. Examples of metamorphic rocks are slate (metamorphosed shale), marble (metamorphosed limestone), and quartzite (metamorphosed sandstone). There are no metamorphic rocks exposed at the surface in Florida, although some have been found in wells at depths of several thousand feet.

SEDIMENTARY ROCKS

Sedimentary rocks are those that were formed at the Earth's surface, either by accumulation and cementation of fragments of rocks, minerals, and organisms, or as **precipitates** from sea water, surface water or ground water. Debris from erosion and weathering commonly form sedimentary rocks. For example, a sandstone and a conglomerate are rocks that are the cemented counterparts of loose sand or gravel deposits, respectively. One group of sedimentary rocks found throughout Florida are limestones, which are predominantly derived from the calcium carbonate **tests** of **marine** organisms and algae. A common feature of these rocks which indicates their marine origin is the presence of fossils of marine organisms. Some limestones, called coquina, are composed almost entirely of shells of marine animals that became cemented together after the animals died. Many of the sand and clay deposits that cover Florida were transported and deposited into sea water by streams. Some were then reworked by coastal and marine processes, such as shoreline erosion and accretion.

GEOLOGIC TIME and DATING TECHNIQUES

The Earth is very old—over four and a half billion years—4,500,000,000 years. This length of time is nearly impossible to comprehend in terms of human events or even lifetimes. How earth scientists determine geologic time forms the basis for many of the key principles that have helped to explain the mysteries of our planet's and Florida's geologic histories.

The secrets of Earth's age are hidden in its rocks. Interpretation of these secrets may be difficult because rocks can, and often do, vary greatly in age from place to place; and sometimes there are gaps in the rock-record, with layers missing.

Geologic time is measured in two ways: a *relative* time scale, based on the sequence of layering of rocks; and an *absolute* (or *atomic*) time scale, based on the rate of radioactive decay of certain elements in rocks.

One fundamental principle of relative age dating is the *Law of Superposition*, which states that: in any sequence of sedimentary strata that has not been disturbed by folding or overturning since accumulation, the youngest stratum is at the top and the oldest is at the bottom. Relative age dating also is done by using a second basic principle of geological correlation; namely, that distinctive marker fossils are found only in rocks of certain ages. *Chronologic correlation*, as used by geologists, means the determination of the approximate equivalence in geologic age and stratigraphic position of two rock strata that occur in different areas of the world (Figure 1).

CORRELATION OF ROCKS

Paleontological studies of fossils around the world have shown that, throughout geological time, countless species of animals and plants have appeared, flourished for millions of years and, then, either died out (became extinct) or slowly changed (evolved) into significantly different plants or animals. In geological terms, this life-span of a distinctive species is its age *range*.

Another important aspect of studying fossils is the determination of their *geographic distribution*; in other words, "Where in the world did they live?" As is true with plants and animals today, some fossil species have been found to have had worldwide distribution, while others have only been found in restricted areas or regions. This can best be illustrated by considering the relationship of any animal or plant to its environment. The physical characteristics of every plant or animal requires that it live in certain and often restricted, environments. Oysters, for example, are restricted to living on the bottom of bodies of brackish water. Therefore, if one found accumulations of fossil oyster shells in a stratum of rock, it could reasonably be assumed that the rock's constituents had been deposited in a body of brackish water.

These two principles have enabled geologists to identify rocks of the same general age wherever they are found. The actual age of the rocks, in terms of years, however, was not known. The rock units could only be placed in a *relative* sequence—either older or younger than other adjacent rocks. On the basis of such relative age dating in Europe, the *standard geologic column* was constructed during the 1800s (Figure 2). Figure 3 is a geologic map and a geologic column for Florida showing rocks that occur at or near the land surface. Also given on the standard geologic column in Figure 2 are approximate ages that are derived from radioactivity studies, summarized in Figure 4.

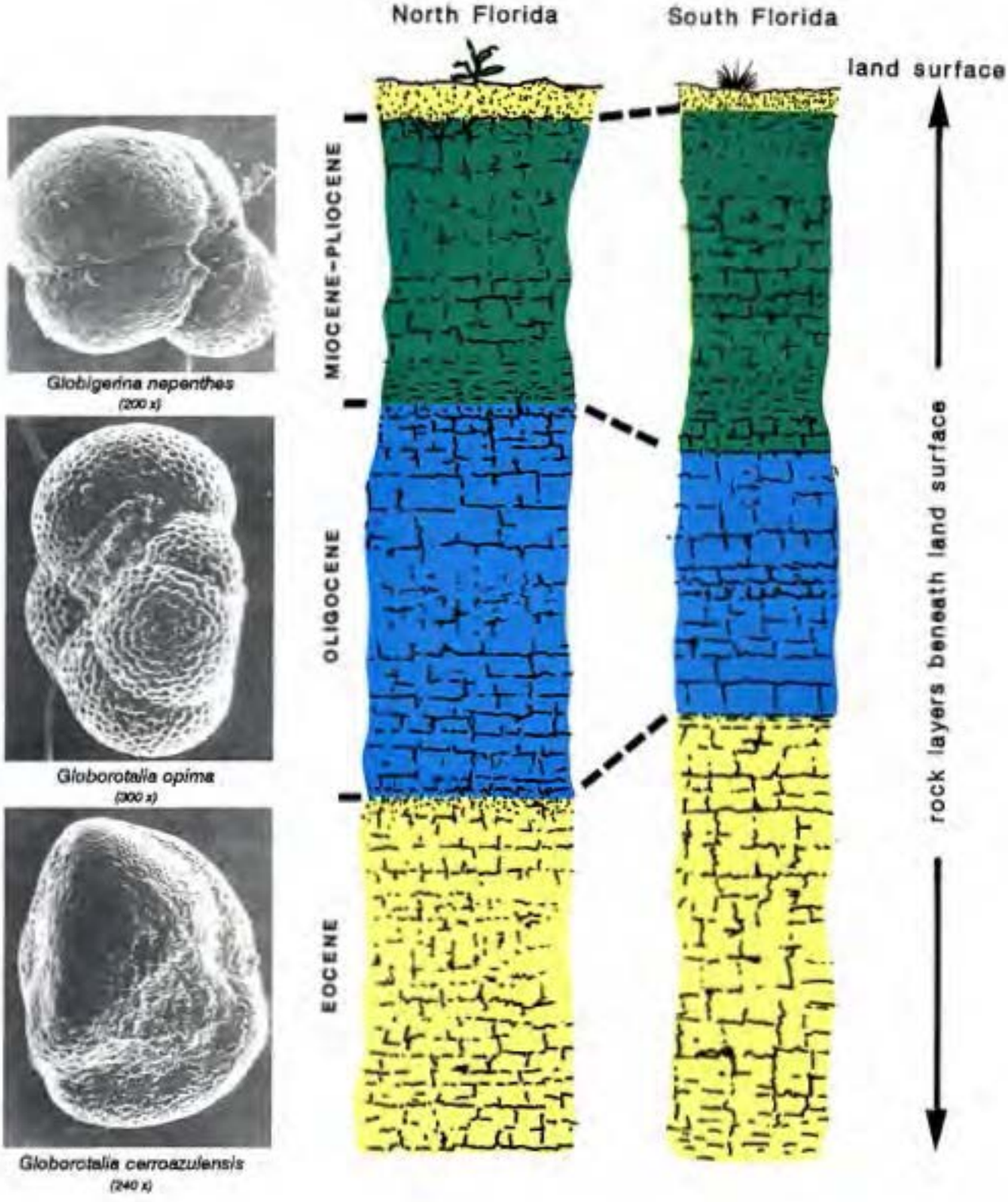


Figure 1. Relative age dating and correlation between rock units using fossils. The three species of microscopic animals, called foraminifera, occur in Florida rocks of different ages. Their occurrence in rocks throughout the state indicate the relative ages of the strata in which they are found. Photographs by Frank R. Rupert.

ERA	PERIOD			million years ago (mya)	EVENTS
CENOZOIC	QUATERNARY		HOLOCENE (Recent)	.01	Evolution of man
			PLEISTOCENE	1.8	Ice ages
	TERTIARY	NEOGENE	PLIOCENE		Proliferation of mammals
			MIOCENE	24	
		PALEOGENE	OLIGOCENE		
			EOCENE		
			PALEOCENE	65	
MESOZOIC	CRETACEOUS			141	Last dinosaurs First primates First flowering plants
	JURASSIC			195	Dinosaurs dominant First birds
	TRIASSIC			230	First dinosaurs First mammals
PALEOZOIC	PERMIAN			280	Major extinctions of many marine forms of life
	PENNSYLVANIAN			320	First reptiles
	MISSISSIPPIAN			345	Scale trees, seed ferns
	DEVONIAN			395	First amphibians Jawed fishes
	SILURIAN			435	First vascular land plants
	ORDOVICIAN			500	Burst of diversification of soft-bodied animals
	CAMBRIAN			570	First fish First chordates
PRECAMBRIAN				4,500	First skeletal forms (clams, trilobites) First soft-bodied animals (sponges, jellyfish) Simple, one-celled life

Florida drifts to present position

Figure 2. Standard geologic column and time scale. The systemic divisions are applicable the world over. The notation mya, here and throughout the text, means: million years ago.

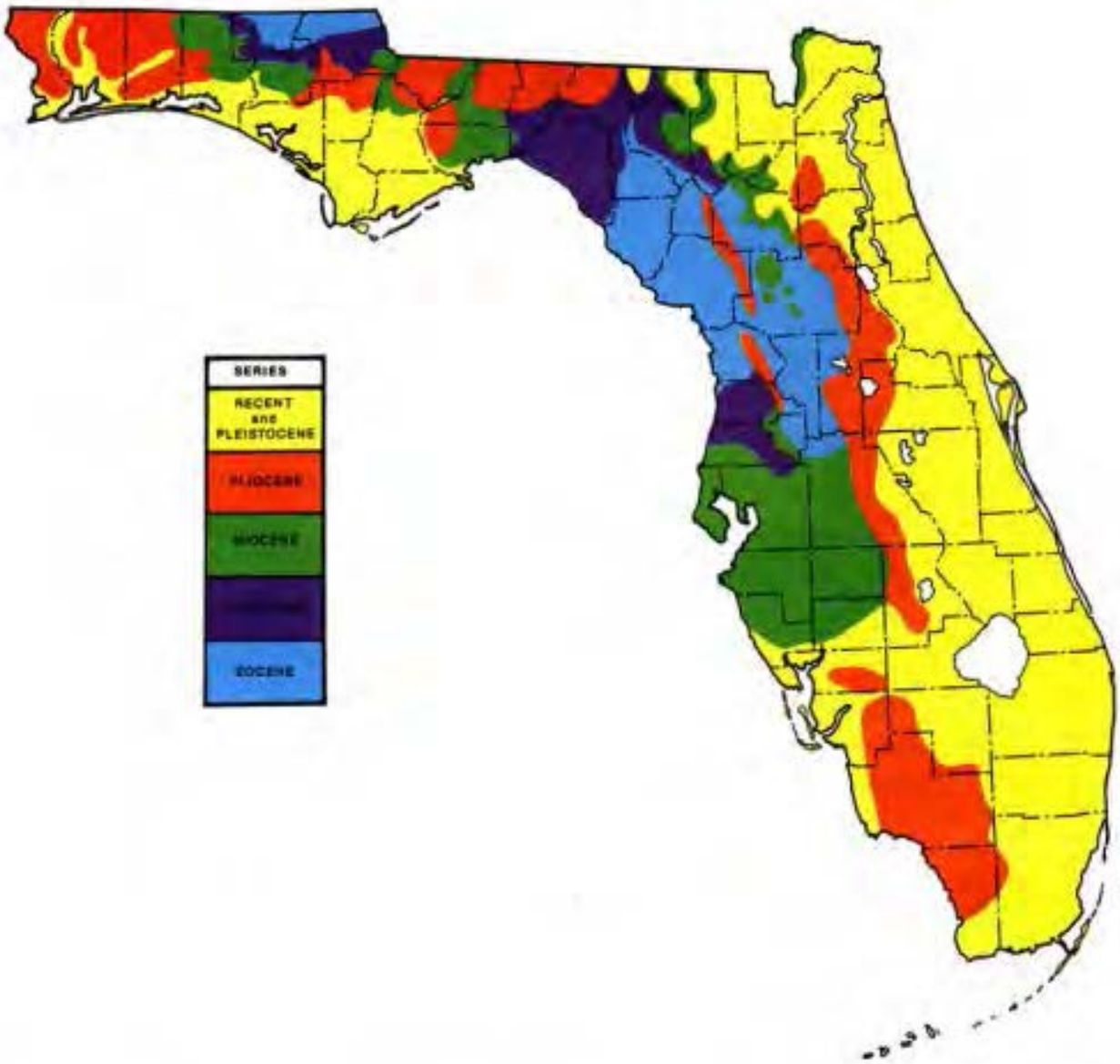


Figure 3. Geologic map of Florida showing the locations of rocks that occur at or near the surface (after Rupert, 1989). See Figure 9 for detailed stratigraphic column.

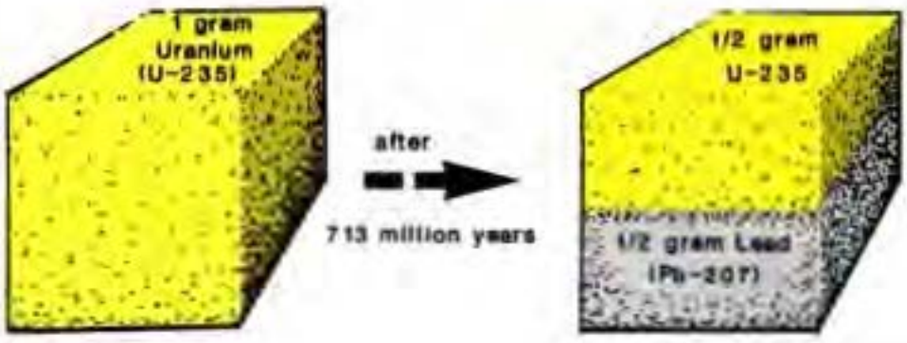
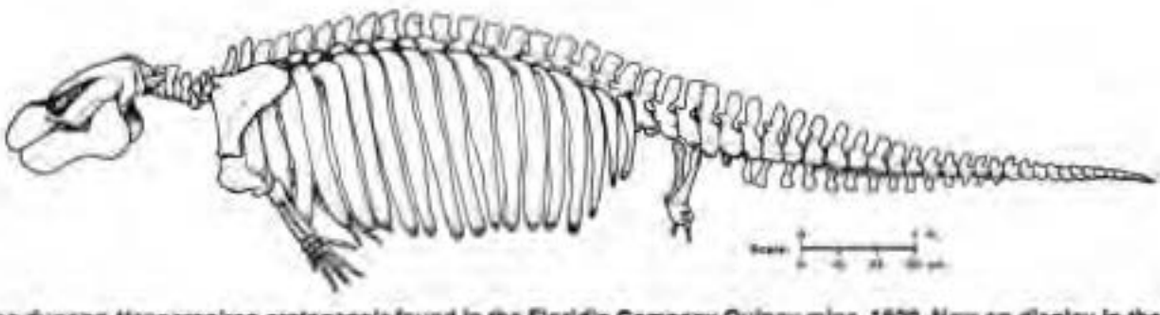


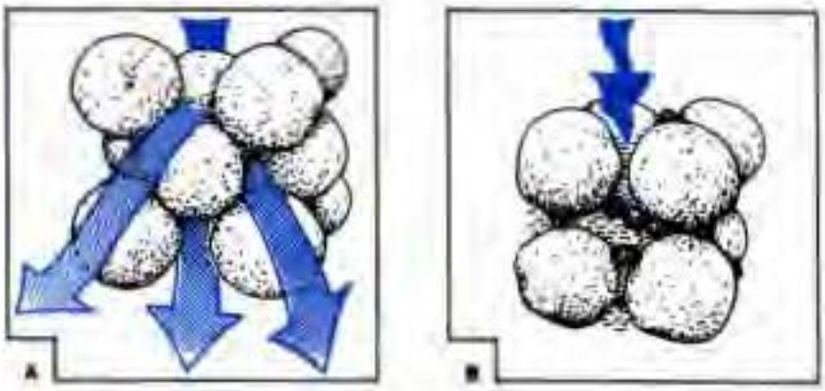
Figure 4. Radioactive age dating and the age of the earth. Radioactive elements, such as thorium and uranium, spontaneously disintegrate to form new elements. The rate at which each radioactive element disintegrates is unique to that element, and each element's decay rate has been determined by scientists. Decay rates are given in terms of half-life, in years. This is the time required for one-half of the radioactive atoms initially present in an element to disintegrate and change into a new element. For example, uranium-235, with a half-life of 713 million years, decays to form the stable element lead-207. By carefully measuring the amounts of radioactive elements in rocks, geologists can calculate the ages of the rocks. With the results of studies of radioactive elements in minerals from rocks all over the world, geologists have been able to assign absolute ages, in years, to the standard geologic column in Figure 2. Based on radioactive dating techniques scientists calculate the earth is about 4.5 billion years old.



Miocene dugong *Hesperosiren crataegensis* found in the Floridin Company Quincy mine, 1929. Now on display in the lobby of the Florida Geological Survey building, Tallahassee. From Rupert, 1990.

CHAPTER 6

WATER RESOURCES



Porosity and permeability as shown by two examples of well sorted granular material, such as sand. "A" is porous and permeable with clean, open and interconnected voids, allowing water to move freely. The porous sand in "B" is impermeable to water flow due to retarding effect of fine material in pores, such as clay (Lane, 1986b).

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and
Ed Lane PG 141

The continuous movement of water in all its phases on the Earth's surface is called the hydrologic cycle (Figure 29). The hydrologic cycle begins with the evaporation of sea water by the sun. Evaporated water is transported through the atmosphere by convective currents. Condensation of water vapor forms clouds, which produce precipitation as rain, snow, or hail. Once precipitation reaches the land surface it takes one of two paths depending on terrain slope, soil **permeability** (or lack of permeability), soil moisture content and vegetation cover. Steep slopes, low permeability and soil saturation increases the quantity of water which runs off into lakes, streams and rivers. Conversely, shallow slopes, permeable surficial and near-surface materials and vegetative cover increase the quantity of water which infiltrates into the surficial material. Some of the precipitation returns to the atmosphere because of evaporation from land and open bodies of water, such as lakes and streams, and by **transpiration** of plants. Some of the water which infiltrates into the ground flows to lower levels into streams and lakes. Some of the ground water recharges the regional **aquifer** system. Depending on local geologic conditions and the relative levels of the water, water in lakes and streams may either recharge the aquifer or the aquifer may discharge into the lakes and streams as springs. Eventually the water is returned to the ocean.

The majority of the **potable water** used in Florida is obtained from subsurface rock units called aquifers (Figure 30). An aquifer must be both porous and permeable (*i.e.*, contain interconnected pores), so that water may move freely within it.

The Cenozoic sediments in Florida form the several ground-water aquifer systems that provide the vast majority of the state's water supplies. The Paleogene carbonate rocks, for the most part, make up the Floridan aquifer system, which is one of the world's most productive aquifers. A variable series of highly permeable rocks separated by low permeability rocks comprise the Floridan aquifer system. The base of the aquifer occurs where the evaporite minerals fill the pores in the Paleocene to Early Eocene rocks. The early Neogene siliciclastic sediments form the top of the aquifer system by providing a relatively impermeable cap. Where these sediments are present, the Floridan aquifer system is under confined conditions and acts as an artesian aquifer. In areas where the overlying confining beds are absent, the system is unconfined.

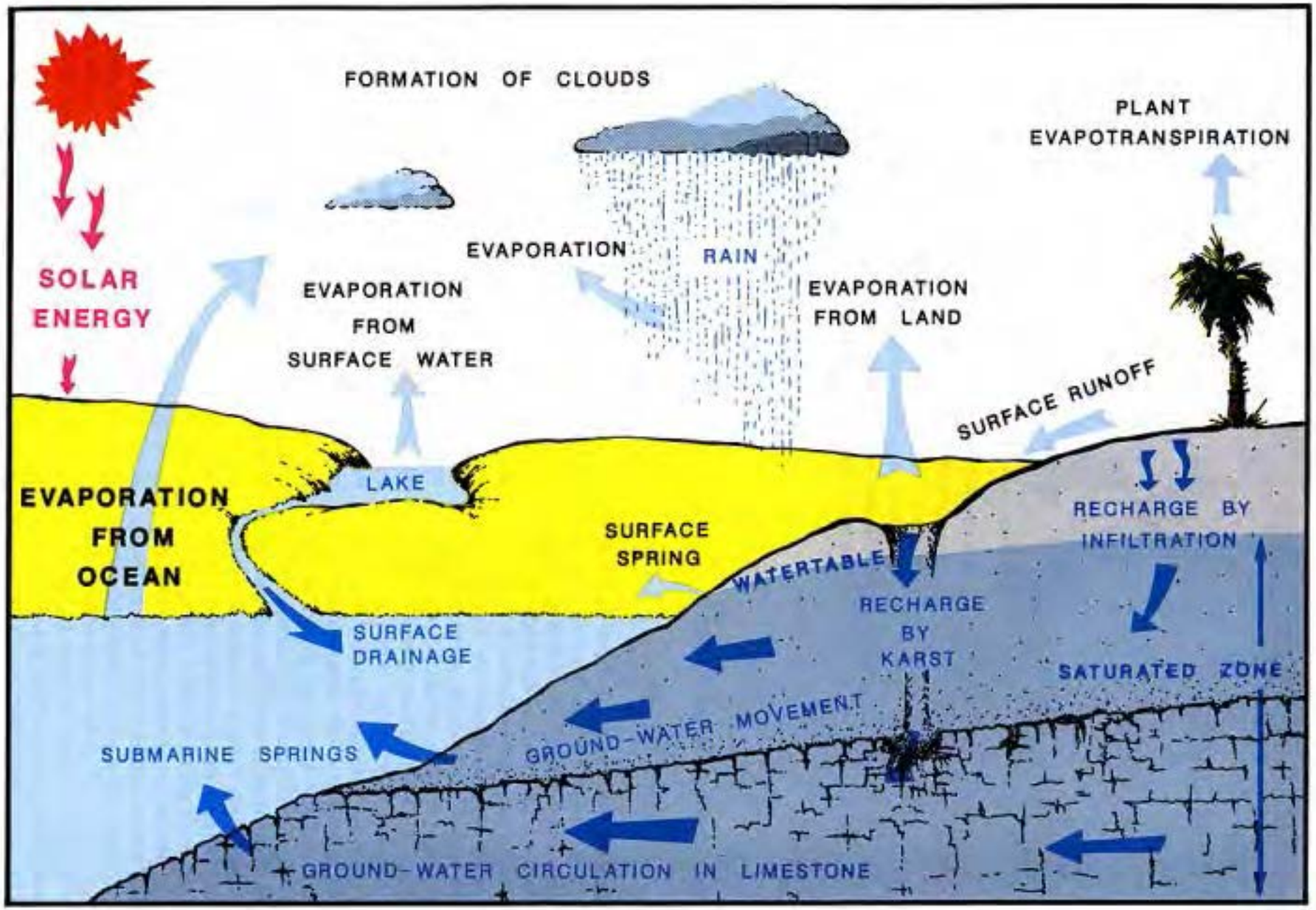

Figure 29. Hydrologic cycle: the constant movement of ground water, surface, and atmospheric waters. The diagram is highly simplified (Lane, 1986b).

In southern Florida, an extremely permeable and porous zone occurs in the lower part of the Floridan aquifer system. This zone, referred to as the "Boulder Zone," is thought to be the result of dissolution of the carbonate rocks by ground water. Cavities formed by the dissolution are interconnected allowing vast amounts of water to flow easily through this zone. The term "Boulder Zone" arises from the drilling characteristics of this unit. When drilling operations encounter this zone, pieces of rock ("boulders") break from the ceiling of the cavities, fall to the cavities' floors and, when the drill bit encounters them on the bottom, cause the bit to bounce around, impeding drilling. This zone contains highly saline water and is often used for the subsurface disposal of waste water.

The intermediate aquifer system or intermediate confining unit, where they occur, lie above and are separated from the Floridan aquifer system by beds having lower permeability, such as clay, which retard the exchange of water between the two units. Often the intermediate aquifer system consists of interbedded carbonate and clastic rocks, some of which are permeable enough to provide water to wells. Water within this system is under **confined** conditions. The base of the intermediate aquifer system (or intermediate confining unit) is the same as the top of the Floridan aquifer system (Figure 30).

The surficial aquifer system is at or near land surface and is generally composed of loose sediments, such as sand or gravel. The surficial aquifer system contains the **water table**, and water is generally unconfined.

Potable water sources are a vitally important natural resource and are extremely vulnerable to pollution due to the shallow and unconfined nature of many of the aquifers in the state. Even the confined aquifers at deeper depths are vulnerable due to recharge from point source situations, such as poorly constructed wells and from sinkholes which breach confining layers.

SYSTEM	SERIES	PANHANDLE FLORIDA: LITHOSTATIGRAPHIC UNIT	PANHANDLE FLORIDA: HYDROSTRATIGRAPHIC UNIT	NORTH FLORIDA: LITHOSTRATIGRAPHIC UNIT	NORTH FLORIDA: HYDROSTRATIGRAPHIC UNIT	SOUTH FLORIDA: LITHOSTATIGRAPHIC UNIT	SOUTH FLORIDA: HYDROSTRATIGRAPHIC UNIT
QUATERNARY	HOLOCENE	UNDIFFERENTIATED PLEISTOCENE-HOLOCENE SEDIMENTS	SURFICIAL AQUIFER SYSTEM	UNDIFFERENTIATED PLEISTOCENE-HOLOCENE SEDIMENTS	SURFICIAL AQUIFER SYSTEM	UNDIFFERENTIATED PLEISTOCENE-HOLOCENE SEDIMENTS	SURFICIAL AQUIFER SYSTEM
	PLEISTOCENE						
TERTIARY	PLIOCENE	CITRONELLE FORMATION MICCOSUKEE FORMATION COARSE CLASTICS		MICCOSUKEE FORMATION CYPRESSHEAD FORMATION NASHUA FORMATION		MIAMI LIMESTONE KEY LARGO LIMESTONE ANASTASIA FORMATION FORT THOMPSON FORMATION CALOOSAHATCHEE FM. TAMIAMI FORMATION	
	MIOCENE	ALUM BLUFF GROUP PENSACOLA CLAY INTRACOASTAL FORMATION HAWTHORN GROUP BRUCE CREEK LIMESTONE ST.MARKS FORMATION CHATTAHOOCHEE FORMATION	INTERMEDIATE CONFINING UNIT	HAWTHORN GROUP STATENVILLE FORMATION COOSAWHATCHIE FM. MARKSHEAD FORMATION PENNEY FARMS FORMATION ST. MARKS FORMATION	INTERMEDIATE AQUIFER SYSTEM OR CONFINING UNIT	HAWTHORN GROUP PEACE RIVER FORMATION BONE VALLEY MEMBER ARCADIA FORMATION TAMPA-NOCATEE MEMBERS	INTERMEDIATE AQUIFER SYSTEM OR CONFINING UNIT
	OLIGOCENE	CHICKASAWHAY LIMESTONE SUWANNEE LIMESTONE MARIANNA LIMESTONE BUCATUNNA CLAY	FLORIDAN AQUIFER SYSTEM	SUWANNEE LIMESTONE	FLORIDAN AQUIFER SYSTEM	SUWANNEE LIMESTONE	FLORIDAN AQUIFER SYSTEM
	EOCENE	OCALA LIMESTONE CLAIBORNE GROUP UNDIFFERENTIATED SEDIMENTS	SUB-FLORIDAN CONFINING UNIT	OCALA LIMESTONE AVON PARK FORMATION OLDSMAR FORMATION		OCALA LIMESTONE AVON PARK FORMATION OLDSMAR FORMATION	
	PALEOCENE	UNDIFFERENTIATED PALEOCENE ROCKS		CEDAR KEYS FORMATION	SUB-FLORIDAN CONFINING UNIT	CEDAR KEYS FORMATION	SUB-FLORIDAN CONFINING UNIT
CRETACEOUS AND OLDER		UNDIFFERENTIATED		UNDIFFERENTIATED		UNDIFFERENTIATED	

Figure 30. Correlation chart showing the relationships of regional hydrogeological units (aquifers and confining units) to major stratigraphic units in Florida. This is a generalized composite and all units may not be present at any given location (Scott et al., 1991; modified from: Southeastern Geological Society, 1986).

U.S. Geological Survey

GROUND WATER ATLAS of the UNITED STATES
Alabama, Florida, Georgia, and South Carolina

HA 730-G

by James A. Miller

Contents of HA 730-G, published in 1990

- Regional summary
- Surficial aquifer system
- Sand and gravel aquifer
- Biscayne aquifer
- Intermediate aquifer system
- Floridan aquifer system
- Southeastern Coastal Plain aquifer system
- Piedmont and Blue Ridge aquifers
- Valley and Ridge aquifers
- Appalachian Plateaus and Interior Low Plateaus aquifers
- References

The text is available online with links to each figure, and as a downloadable ascii file.
Illustrations are available online as screen-viewable JPEGs, and as downloadable tiff files suitable for printing and editing.
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The Atlas publication is intended for use as an introduction to the Nation's ground water resources, and as a teaching tool. For more information on how to purchase a copy of the printed Atlas please refer to the order form. ordering the print product.

Pertinent references are listed for each described aquifer to assist those needing additional information. Appropriate map scale is indicated by the representative fraction appearing over the scale bars. Interpretations concerning the appropriate use of these illustrations may be obtained from the Office of Ground Water, U.S. Geological Survey, 12201 Sunrise Valley Dr., Reston, VA, 20192.

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GROUND WATER ATLAS of the UNITED STATES
Alabama, Florida, Georgia, South Carolina
HA 730-G

Preview and download Sand and gravel aquifer figures--(20 thru 25)

Download the text (This is the text for all of HA 730-G in ascii format, no links, no page formatting) G-text.ascii--(164k)

SAND AND GRAVEL AQUIFER

INTRODUCTION

The sand and gravel aquifer underlies an area of about 6,500 square miles in southwestern Alabama and the westernmost part of panhandle Florida (fig. 20). The aquifer is presently (1990) called the Miocene-Pliocene aquifer in Alabama; in the past, it has been called the Citronelle or Citronelle-Miocene aquifer in that State by some authors. In Mississippi, the sand and gravel aquifer grades laterally into part of the Coastal lowlands aquifer system that extends westward into southern Texas. The sand and gravel aquifer is the primary source of water in Baldwin, Washington, and western Escambia Counties, Ala., and in Santa Rosa and Escambia Counties, Fla. The aquifer also supplies most of the water used by small communities in the rural parts of Mobile County, Ala.; the city of Mobile in that county, however, is supplied by surface water. About 150 million gallons per day was withdrawn from the sand and gravel aquifer for all uses during 1985. About 80 percent was withdrawn in the Pensacola, Fla. area, and the majority of the remaining 20 percent was withdrawn in Mobile County, Ala.

As its name indicates, the sand and gravel aquifer consists largely of interbedded layers of sand and gravel. Clay beds and lenses are common in the aquifer and form local confining beds. Water in the aquifer is under unconfined conditions where the clay beds are thin or absent, and is under artesian conditions where such beds are thick. Movement of ground water is generally coastward.

GEOLOGY

The sand and gravel aquifer consists of rocks ranging in age from middle Miocene to Holocene that were mostly deposited in a deltaic environment. In Alabama, Miocene rocks are all included in the undifferentiated Catahoula Sandstone, a thick, predominantly nonmarine sequence of sand and clay beds. The Miocene units shown in figure 21 are overlain by the Citronelle Formation of Pliocene age. The Citronelle is mostly fine- to coarse-grained sand that is locally gravelly, and is the most important water-yielding formation in the upper part of the sand and gravel aquifer. The Citronelle locally contains layers of hardpan, or cemented iron oxide, that retard ground-water movement. The principal geologic units that comprise the aquifer in the westernmost part of the Florida panhandle are shown in figure 21. The Alum Bluff Group and the Choctawatchee Formation, which were deposited in a more marine environment, are most easily recognizable near the coast. Northward, these beds grade into undifferentiated coarse sand and gravel, which comprise the major water-yielding unit of the lower part of the sand and gravel aquifer.

THICKNESS

The sand and gravel aquifer is approximately wedge-shaped and thickens southwestward from a feather edge at its northern and eastern limit to about 1,400 feet in southwestern Alabama (fig. 22). Throughout the southern two-thirds of the area underlain by the aquifer, the confining unit forming the base of the aquifer consists of either the upper or lower clay members of the Pensacola Clay (fig. 23). Analysis of aquifer-test data, supplemented by the results of laboratory testing of cores from the Pensacola Clay, indicates that the permeability of this confining unit is so small that practically no water passes across it. To the northeast, the clay beds are absent and the sand and gravel aquifer is in direct contact with the Upper Floridan aquifer.

HYDROGEOLOGIC UNITS

In most places, the sand and gravel aquifer can be divided into two high-permeability zones, the upper surficial and lower main producing zones, separated by a less permeable sand and clay unit. The upper, or surficial, zone is mostly fine- to medium-grained sand, with gravel beds and lenses, and contains water that is mostly under unconfined conditions. This zone is recharged directly by precipitation, and ground-water flow in it is mostly lateral along short flowpaths to discharge points along small streams. Some of the water percolates downward and recharges the lower high-permeability zone. The upper zone consists mostly of the Citronelle Formation combined with stream-valley alluvium and terrace deposits. Along major streams, such as the Mobile River, alluvial deposits are as much as 150 feet thick and wells completed in them yield as much as 850 gallons per minute. The upper zone contains clay and hardpan layers that create local perched water tables or, in places, artesian conditions. The upper zone is mostly used for water supply in southern Mobile, southern Baldwin, and southwestern Escambia Counties, Ala., because the lower zone contains much clay in these counties, and, accordingly, yields less water. The hydraulic characteristics of the upper zone are extremely variable. Yields of as much as 1,000 gallons per minute are reported for wells completed in the upper zone, and a transmissivity of 11,000 feet squared per day was reported for the zone based on results of an aquifer test conducted in Escambia County, Ala.

In the westernmost part of panhandle Florida, the lower of the two high-permeability zones is called the "main producing zone" because most of the ground water used in Santa Rosa and Escambia Counties is withdrawn from this zone. This zone also is the main source of water supply for Washington, northern Mobile, northern Baldwin, and eastern Escambia Counties, Ala. The zone consists mostly of coarse sand and gravel beds, all of Miocene age. Water in this zone is confined everywhere. Recharge to the zone is by downward leakage from the upper zone; discharge is to major streams, bays, sounds, and the Gulf of Mexico. Yields of more than 1,000 gallons per minute are commonly reported for wells completed in this zone, and results of aquifer tests have indicated that the transmissivity of the zone is as much as 20,000 feet squared per day.

GROUND-WATER FLOW

Water enters the sand and gravel aquifer as recharge from precipitation, and moves generally downward and then either discharges to streams or moves coastward in the aquifer. Discharge is primarily to streams, bays, and sounds. Small volumes of water leak upward to the Gulf of Mexico and still smaller volumes are discharged by wells. Most of the well discharge is in Mobile County, Ala., and Escambia and Santa Rosa Counties, Fla.

Water movement in the upper zone of the aquifer is complex because this zone contains numerous discontinuous clay layers and some layers of iron oxide (hardpan). Because of the low permeability of the hardpan and the clay, and the confined conditions they produce, perched water-table conditions, artesian conditions, and true water-table conditions can all exist in one area. Such conditions prohibit drawing a representative map of the potentiometric surface of the aquifer, except for local areas. Where hardpan or clay beds are near the land surface, ponds may be perched on them or springs may issue at the top of such beds where they are exposed in small stream valleys. Some water percolates downward across all these confining beds to recharge deeper permeable zones in the aquifer. Water levels generally decrease with depth in the aquifer, a condition that allows downward leakage almost everywhere.

The saturated thickness of the aquifer is everywhere less than its total thickness because the water table ranges from a few feet to about 50 feet below land surface. The water table is just below land surface in low-lying areas and is deepest under hills and ridges.

The general coastward movement of water in the main producing zone of the sand and gravel aquifer is shown by the potentiometric contours in figure 24. The arrows show that the water is moving mostly toward Choctawatchee Bay from recharge areas where water levels are highest. The contours are smooth and evenly spaced because the water in this zone is confined. A similar map for the surficial zone of the aquifer would show the same general seaward movement of water, but the contours would be convoluted because of the effects of topography and streams.

GROUND-WATER QUALITY

Water in the sand and gravel aquifer is suitable for drinking practically everywhere. The quartz-rich sediments that comprise the aquifer are practically insoluble; accordingly, water in the aquifer has concentrations of dissolved solids that ordinarily are less than 50 milligrams per liter. Chloride concentrations also are ordinarily less than 50 milligrams per liter everywhere except in a few locations near the coast and adjacent to large bays and sounds where there is a transition zone of freshwater and saltwater; there, chloride concentrations greater than 1,000 milligrams per liter are reported in water from some wells. Water in the aquifer is usually slightly acidic, with a pH of about 6.0; locally, the water is more acidic (pH 4.5). Dissolved-iron concentrations may locally be objectionable; concentrations as large as 4,300 micrograms per liter have been reported.

The sand and gravel aquifer, like other shallow aquifers, is readily susceptible to contamination. Contamination of the upper zone has occurred at several places in the three westernmost counties of Florida. One such place is a site near Pensacola where creosote waste products from a wood-preserving plant have been detected in a large part of the upper zone of the aquifer.

FRESH GROUND-WATER WITHDRAWALS

Withdrawals of freshwater from the sand and gravel aquifer totaled 150 million gallons per day during 1985. About 44 percent, or about 66 million gallons per day, was withdrawn for public supply (fig. 25). About 9 million gallons per day was withdrawn for domestic and commercial uses, and about 18 million gallons per day was withdrawn for agricultural uses. About 57 million gallons per day was withdrawn for industrial, mining, and thermoelectric-power uses.

Move to next section Biscayne aquifer
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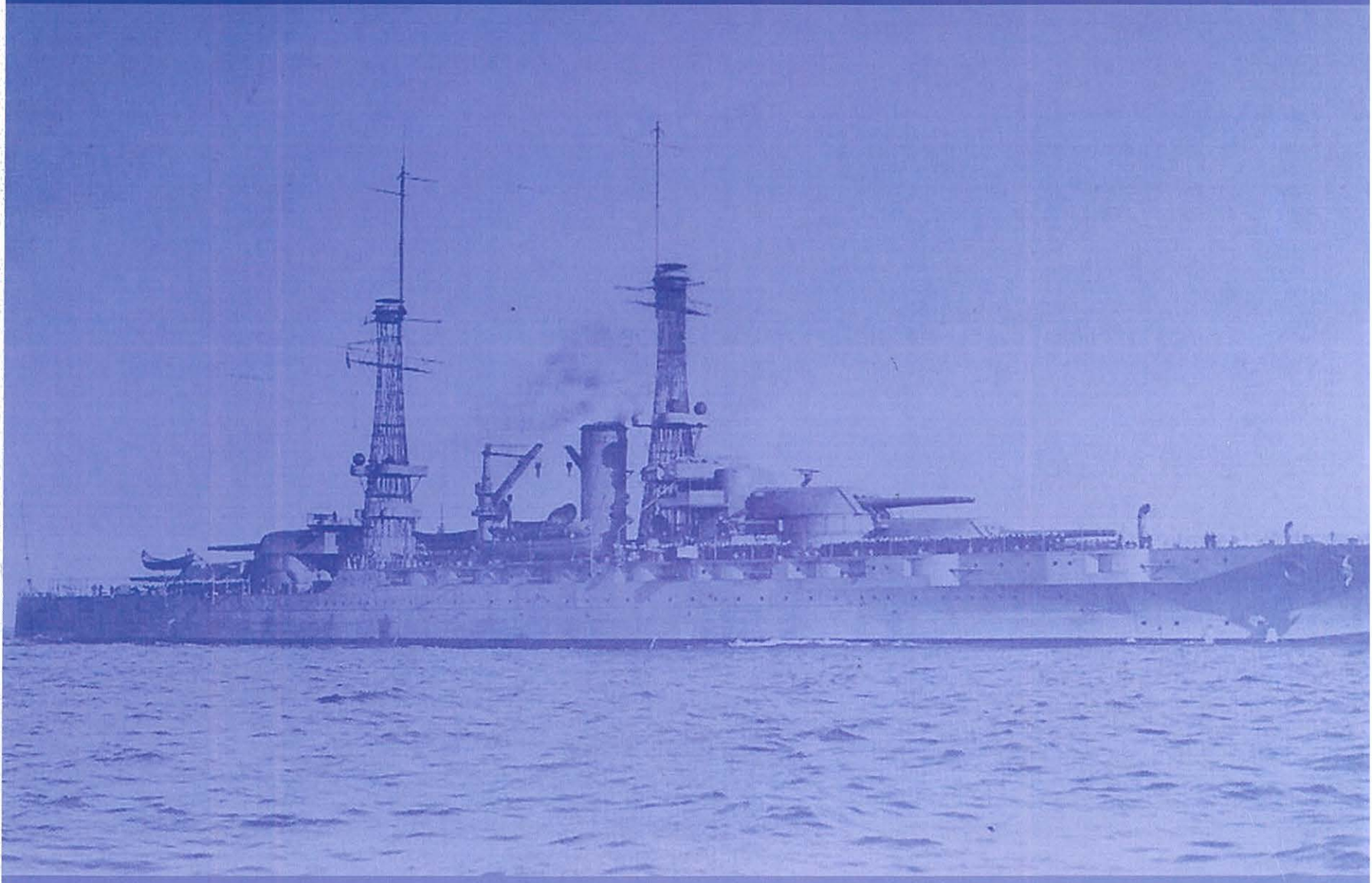
FINAL

Preliminary Assessment

Naval Air Station Pensacola, Florida

August 2007



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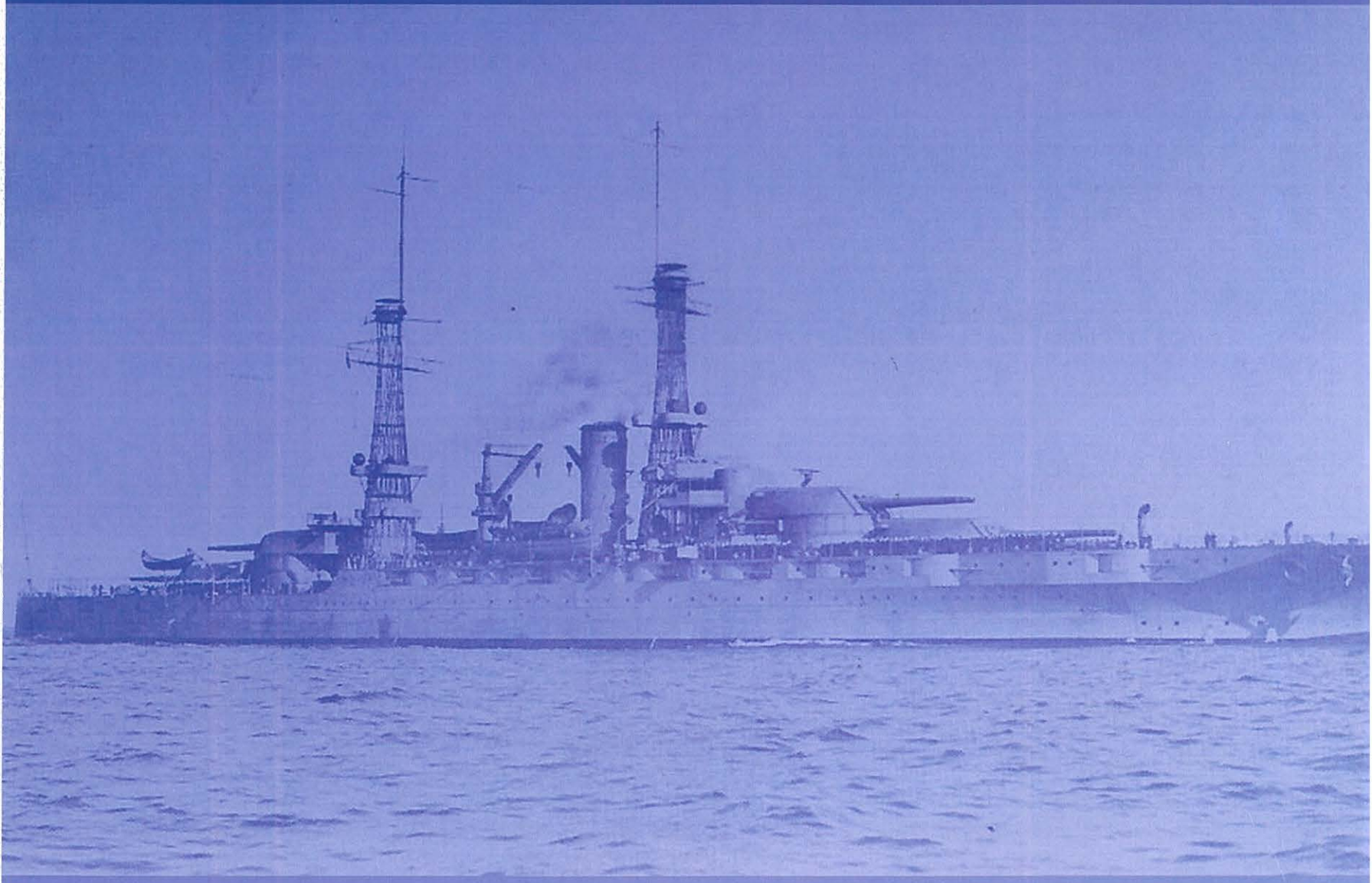

2. INSTALLATION BACKGROUND

The following sections provide general information about NASP, 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.

2.1. Location and Setting

NASP is located in the northwest panhandle of Florida in Escambia County, 13 miles south of Interstate 10 and 5 miles west of the city of Pensacola. The NASP complex covers 8,423 acres and includes NASP, Bronson Field, Corry Station, Saufley Field, and Lexington Terrace Housing. The installation is bordered by Bayou Grande to the north and Big Lagoon to the south. Pensacola Bay surrounds NASP to the south and east. According to the 2003 Escambia County Joint Land Use Study (JLUS), which included 12,043 acres of land surrounding NASP, 65% of the land is vacant, while 25% is used for single-family housing. The remaining land uses include multifamily housing, churches, mixed use, and commercial use. Map 2.1-1 provides a topographic map that shows the general layout of the installation, as well as the location of the site discussed in this PA report.

2.2. Installation History

In 1826, a Navy Yard was constructed on Pensacola Bay in the southern tip of Escambia County. Activities at the Navy Yard focused primarily on suppressing the slave trade and dealing with piracy in the Gulf of Mexico and the Caribbean Sea. During the Civil War, Confederate troops occupied the yard and eventually destroyed and abandoned it in an effort to prevent it from being captured by Union troops. It was rebuilt after the war, but a 1906 hurricane and tidal wave destroyed many of the rebuilt structures. The Navy Yard was decommissioned in 1911.

The establishment of an aviation training station in Pensacola was recommended to the Secretary of the Navy in 1913, and NASP was constructed at the abandoned Navy Yard. The installation was the first Naval Air Station (NAS) in the world and is now considered the "Cradle of Naval Aviation." NASP became the hub of air training activities through World War I (WWI) and World War II. The growing aviation program required the additions of Saufley Field in 1940 and Elysson Field in 1941. Naval Auxiliary Air Station (NAAS) Barin Field and NAAS Bronson Field were commissioned in 1942, and NAS Whiting Field was commissioned in 1943. Barin Field was partially decommissioned in 1962 and currently belongs to the NAS Whiting Field complex of OLFs. The remaining auxiliary airfields currently remain part of the NASP complex. Table 2.2-1 provides a summary of the significant events in NASP's history.

The primary mission of NASP is the training of student aviators, and its mission is also to "fully support the operational and training missions of tenants assigned; enhancing the readiness of the U.S. Navy, its sister armed services and other customers." Tenant commands at NASP include: the Naval Education and Training Command; the Naval Air Technical Training Center; the Naval Operational Medicine Institute; and the Fleet Area Control and Surveillance Facility, which controls over 18,000 square miles of airspace.

Table 2.2-1: NAS Pensacola Timeline of Significant Events

Time Period	Significant Events
1825	President John Quincy Adams and Secretary of the Navy Samuel Southard make arrangements to build a Navy Yard in Escambia County, Florida.
1826	Construction of the Navy Yard begins April 1826. Activities at the Navy Yard primarily focus on suppression of the slave trade and piracy in the Gulf of Mexico and the Caribbean Sea.

Table 2.2-1: NAS Pensacola Timeline of Significant Events	
Time Period	**Significant Events**
1862	Confederate troops occupy the Navy Yard during the Civil War. Fearing capture by Union forces, Confederate troops retreat from the Navy Yard and destroy most of the facilities.
1906	Many of the structures that were rebuilt after the Civil War are destroyed by a hurricane and tidal wave.
1911	The Navy Yard is decommissioned.
1913	Establishment of an aviation training station in Pensacola is recommended to Secretary of the Navy Josephus Daniels.
1914	NASP is established at the abandoned Navy Yard.
1916	NASP is the only NAS in the world and enters into WWI. Aviation training increases throughout the war.
1922	Corry Field is established and is the first auxiliary airfield to support flight training operations at Pensacola Flight School.
1927	Corry Field is closed and renamed Old Corry Field. Corry Station opens 3 miles north of NASP.
1940	The Navy acquires 867 acres northwest of NASP and opens Saufley Field.
1941	Ellyson Field, named after Lieutenant T.G. Ellyson, is commissioned.
1942	The Navy acquires 640 acres plus 26 adjoining acres on Perdido Bay and commissions NAAS Bronson Field, 12 miles west of NASP.
1942	The Navy acquires an airport in Foley, Alabama, plus 650 acres of adjoining property and commissions NAAS Barin Field, 23 miles west of NASP.
1943	The Navy acquires 2,960 acres and commissions Whiting Field, 6 miles north of Milton, Florida.
1946	NAAS Bronson Field is decommissioned to NOLF Bronson.
1962	Barin Field is sold to a private owner, and the airport is returned to the City of Foley.
1971	NASP is chosen as the Chief of Naval Education and Training headquarters.
2007	The NASP complex includes NASP, Bronson Field, Corry Station, Saufley Field, and Lexington Terrace Housing.

2.3. Munitions Related Training/Storage/Usage

Based on information included in the Navy Range Inventory Database, information obtained from archival records, and data collected during the site visit, the following other than operational ranges/sites were associated with NASP to support the installation mission:

The **Saufley Field Small Arms Range** is a 1.2-acre area containing a clay berm approximately 100 feet long, 30 feet wide, and 20 feet high. It is located 800 to 1,000 feet north and west of the operational runways at Saufley Field. The Small Arms Range is labeled as a pistol range on maps dated 1946 through 1949. Historical documents indicate Saufley Field was used for giving gunnery instruction to pilots as early as 1943. The exact time period during which the former range was operational is unknown. Munitions use may have included .38- and .45- caliber pistol ammunition and .22- and .30-caliber rifle ammunition, which are typical of small arms range usage. The site and surrounding area currently are undeveloped and unused. Spent bullets were observed in and scattered around the berm during the 1991 PA of Saufley Field. The bullets included lead bullets, some having steel or copper jackets. No bullets were observed during Malcolm Pirnie's visual survey of the Small Arms Range.

The **Bronson Field Firing Range** is a former machine gun boresight range located approximately 800 feet east of the taxiway at Bronson Field. The machine gun butt, comprised of a 100-foot-long, 30-foot-wide, 30-foot-high mound, is located on the former range. Aircraft mechanics would fire .30- and .50- caliber bullets at the machine gun butt to test and align aircraft gun sites. The former range is shown on maps dated 1943 and 1948. Previous assessments of the former range have been conducted and include a 1992 PA, a 1997 Phase I Environmental Site Assessment, and a 2001 Site Characterization Report Investigation. Analysis of soil and groundwater samples included volatile organic compounds, semivolatile organic compounds, pesticides, polychlorinated biphenyls, and metals. All tested parameters for the samples were below Florida Department of Environmental Protection (FDEP) standards, with the exception of aluminum and iron concentrations in groundwater. A letter dated 13 April 2001 from FDEP states, "Since the site was never used for its intended purpose and aluminum and iron do not exceed any health based Groundwater Cleanup target Levels, the FDEP concurs with the recommendation for no further action." The PA has been completed for the site and a No Further Action (NFA) concurrence has been received; therefore, the Bronson Field Firing Range is not discussed further.

Areas of Interest:

During the data collection effort, additional munitions and range related records, documents, and information sources were found. As a result, the following 26 additional areas of interest associated with NASP were identified:

The **Saufley Field Skeet Range** is located approximately 800 feet northeast of the Saufley Field Small Arms Range. It is denoted on maps dated 1943 and 1946 through 1949. The maps include structures that appear to be trap houses, but there are no trap ranges labeled. Remnants of former buildings (e.g., concrete pads) and clay target fragments in varying densities along the ground surface were observed during Malcolm Pirnie's limited visual survey of the former range area. The site is currently unused.

The **Saufley Field Bombing Targets** were located in the grassy area between Saufley Field runways 13 and 22. They are shown on maps dated 1943 and 1946 through 1949. Physical evidence of the bombing targets was not observed during Malcolm Pirnie's limited visual site survey.

The **Bronson Field Skeet Range** is denoted on maps dated 1943 1946 through 1949. The maps also show a skeet range house labeled Building 1145. During Malcolm Pirnie's limited visual survey of the former range area, clay target fragments were observed in varying densities along the ground surface of the wooded area southeast of runways 4 and 36 at Bronson Field. No evidence of Building 1145 was observed.

The **Bronson Field Berm** is labeled as a "butt" on maps dated 1943, 1944, 1946, 1948, and 1949. It is located east of the Bronson Field Firing Range. Four pintel mounts were observed south of the berm during Malcolm Pirnie's limited visual site survey. The area currently is overgrown and unused.

The **Corry Station Skeet Range** is denoted on historical maps dated 1947 through 1949 and 1951. It is also shown on an undated map obtained from the National Archives. The Naval Hospital at Corry Station was constructed above the skeet range in 1975. NASP personnel are unaware of any records of the former range being addressed during construction activities.

SITE ASSESSMENT REPORT
FDEP REGISTERED NUMBER 178628753

SAUFLEY FIELD, SITE 2406
NAVAL EDUCATION AND TRAINING PROFESSIONAL DEVELOPMENT AND TECHNICAL CENTER (NETPDTC) PENSACOLA, FLORIDA

PREPARED BY:

NAVY PUBLIC WORKS CENTER
BUILDING 458
PENSACOLA, FLORIDA 32508-6500

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MARCH 1998

PREPARED FOR:

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BYAS GLOVER, CODE 18410, ENGINEER-IN-CHARGE

1.0 INTRODUCTION

1.1 PURPOSE

The Navy Public Works Center, Naval Air Station, Pensacola, Florida, was retained by Southern Division Navy Facilities Engineering Command (SOUTHNAVFACENGCOM) to conduct a Site Assessment and Remediation Plan (if warranted) at Saufley Field, Naval Education & Training Professional Development & Technical Center (NETPDTC), Site 2406, Pensacola Naval Air Station, Pensacola, Florida.

The Navy Public Works Center, Naval Air Station, Pensacola, Florida received a Warning Letter from the Department of Environmental Protection (DEP) on July 7, 1994. The Warning Letter stated that on May 24, 1994 public drinking water results from Southern Analytical Laboratories, Inc. documented contamination due to a discharge of petroleum or petroleum product at the US Navy-Supply Department Saufley Field (DEP #1786-28753). The DEP directed action be taken to further define the nature and extent of the contamination. The DEP directed PWC to initiate a Contamination Assessment (CA) within 30 days of discovery of contamination and that within six months after the CA initiation, two copies of the Contamination Assessment Report (CAR) be filed with the Federal Facilities Coordinator.

The findings and conclusions of the field investigation for the Site Assessment for Saufley Field, Site 2406 are presented herein.

1.2 SITE LOCATION AND AREA OF INVESTIGATION

Site 2406 is located within the confines of Saufley Field, Naval Educational and Training Professional Development and Technical Center (NETPDTC). Saufley Field is located in northwest Florida, and more specifically, Escambia County. The base is between Highway 10 and Perdido Bay approximately five miles northwest of Pensacola (Figure 1-1). Saufley Field consists of four airstrips, two of which are active. The base also has a small number of support buildings and a Federal Prison which are located south of the airfield (Figure 1-2). Saufley Field covers 866 acres of land, the majority of which is covered by the airstrips and wooded areas.

Escambia County is Florida's westernmost county and lies between the State of Alabama to the west and Santa Rosa County. The State of Alabama also forms the northern boundaries of both counties, and is approximately 50 miles north of their southern limits at the Gulf of Mexico shoreline. Pensacola is the county seat of Escambia County and is the largest city in both land area and population as well as the leading industrial center for eastern Florida.

The immediate area surrounding Saufley Field is characterized by sparsely populated residential structures. Estimated population within five miles of Saufley Field is 60,970, with an average density of 776 persons per square mile.

Specifically, Site 2406 is located at latitude 30^0 27' 49", longitude 87^0 20' 35". The site is located at the former location of potable water well #4 which was located at the southwest corner

of Building 2406. A site location map is included in Figure 1-3 to show locations of buildings and facility boundaries.

1.3 SITE HISTORY AND OPERATIONS

The U.S. Government purchased 866 acres of farmland in 1939 to develop the airfield which was named after Richard C. Saufley, a pioneer in naval aviation. The Air Field opened in 1940 as Naval Auxiliary Air Station (NAAS) Saufley. NAAS Saufley was used to train U.S. and allied pilots during World War II and the Korean Conflict. In 1957, the mission at Saufley Field was changed to basic training for naval aviators. Figure 1-2 shows a general map of the base.

NAAS Saufley was redesignated as a Naval Air Station (NAS) in 1968 and retained that status until 1976 when NAS Saufley was disestablished and placed in caretaker status. Between 1976 and 1979 Saufley Field was used as an Outlying Landing Field (OLF) for NAS Whiting Field. In 1979 Saufley Field was reactivated as Naval Educational and Training Program Management Support Activity (NETPMSA). Saufley Field was renamed the Naval Education and Training Professional Development and Technical Center (NETPDTC) in 1996.

Saufley Field is now used primarily to train and educate Naval personnel and to house federal prisoners. NAS Whiting Field pilots use two of the airstrips for touch and go landing exercises.

On August 24, 1993, the Public Works Center potable water treatment system at Saufley Field consisted of two (2) active raw water wells. Potable water well #3 had an operating capacity of 641 GPM @ 14 psi and potable water well #4 had an operating capacity of 506 GPM @ 22 psi. The distribution system consisted of four (4) to twelve (12) inch diameter water mains. The storage tank/reservoir consisted of one (1) one hundred fifty thousand (150,000) gallon elevated storage tank (Structure No 805) and one (1) fifty thousand (50,000) gallon ground storage reservoir (Structure No. 812). The chemical treatment systems contain a caustic feed system, phosphate feed system, and a chlorine feed system. The pump house at Building 804 included three (3) high service pumps (HSP), two (2) at 300 GPM and one (1) at 600 GPM; one (1) electric powered fire pump; one (1) steam powered fire pump; one (1) diesel engine powered emergency/fire pump; and one (1) 150 KW generator set. The water treatment facility layout is presented in Figure 1-4.

On May 9, 1994, water samples from potable water well #3 and potable water well #4 effluent indicated benzene contamination levels of 0.032 mg/l in potable water well #4 which exceeded the DEP enforceable drinking water standard for benzene of 0.001 mg/l. No benzene contamination was detected in potable water well #3 effluent. Potable water well #4 was taken off line and only potable water well #3 remained in production. Potable water well #4 remained on quarterly sampling for one year for observation and corrective action to remove the contamination. Potable water wells #3 and #4 were abandoned in-place on April 1996.

Mr. J. B. Hollingshead, Environmental Specialist II, HRS, performed a field investigation of potable water well #4 on June 1, 1994. Mr. Hollingshead's Inter Office Memorandum dated June 8, 1994 reported that he found potable water well #4 shut down. He also found two (2) 20,000

gallon vertical tanks inside the dike at the back lot behind the water plant and four (4) old USTs under the slab for the dike which were abandoned in place. The tank sizes were noted as 7,800 gallons each and were filled in place in November 1988. They were used to store fuel oil. The tanks were bare steel tanks installed in 1945. Next to the well inside the dike, he found a 300-gallon diesel tank with a small copper fuel line going inside the generator room. The line was not in contact with the soil. The old USTs were upgradient from the well (groundwater flow is southeast) and approximately 300' northeast of the well. It was noted during the Environmental Audit there were six (6) 20,000 gallon tanks providing the landing field with AV gas or Jet fuel. There was a 10" product line north of potable water well #3 which distributed fuel to the landing area tanks. The 10" line was more than two (2) miles long and there is a question about whether or not the line was purged prior to abandonment.

Mr. J. B. Hollingshead noted two possible sources of contamination in his Inter Office Memorandum:

(1) Four abandoned USTs [804C-F]
(2) The 10" product line suppling the old refueling pits (Figure 1-5)

1.4 INITIAL REMEDIAL ACTION

No remedial action was performed at the site.

1.5 RESULTS OF PREVIOUS INVESTIGATIONS

Laboratory analysis performed at the Saufley Field Water Treatment Plant for benzene on December 30, 1992 indicated no benzene contamination. A composite water analysis performed by Public Works Center at the Saufley Field Water Treatment Plant on March 25, 1994 indicated benzene contamination levels of 2.9 ppb. Laboratory analysis on drinking water collected from Building 804 (building nearest to potable water well #4) by Navy Public Works Center Environmental Laboratory on April 26, 1994 indicated potable water well #4 had benzene contamination levels of 2.6 ppb (Inside Tap) and 2.5 ppb (Outside Tap). A raw water analysis performed on potable water well #3 and potable water well #4 at Saufley Field by Law Environmental National Labs on May 9, 1994 indicated potable water well #4 had benzene contamination levels of 3.4 ppb which exceeds the FDEP regulatory limits of 1.0 ppb. No benzene contamination was detected in potable water well #3. Public Works Center took potable water well #4 off line on May 10, 1994 after reviewing the laboratory reports of the raw water analysis performed May 9, 1994.

A follow-up analysis on potable water well #4 on May 18, 1994 indicated benzene contamination levels of 3.6 ppb. The May 18, 1994 analysis substantiated the March 25, April 26, and May 9, 1994 laboratory analyses which detected benzene levels in potable water well #4 above the FDEP regulatory limits of 1 ppb.

Public Works Center performed additional water sampling on potable water well #4 on June 30, 1994 which revealed benzene contamination levels of 4.0 ppb. Table 1-1 is a summary of benzene analyses performed at the Saufley Field Waste Water Treatment Plant and potable water

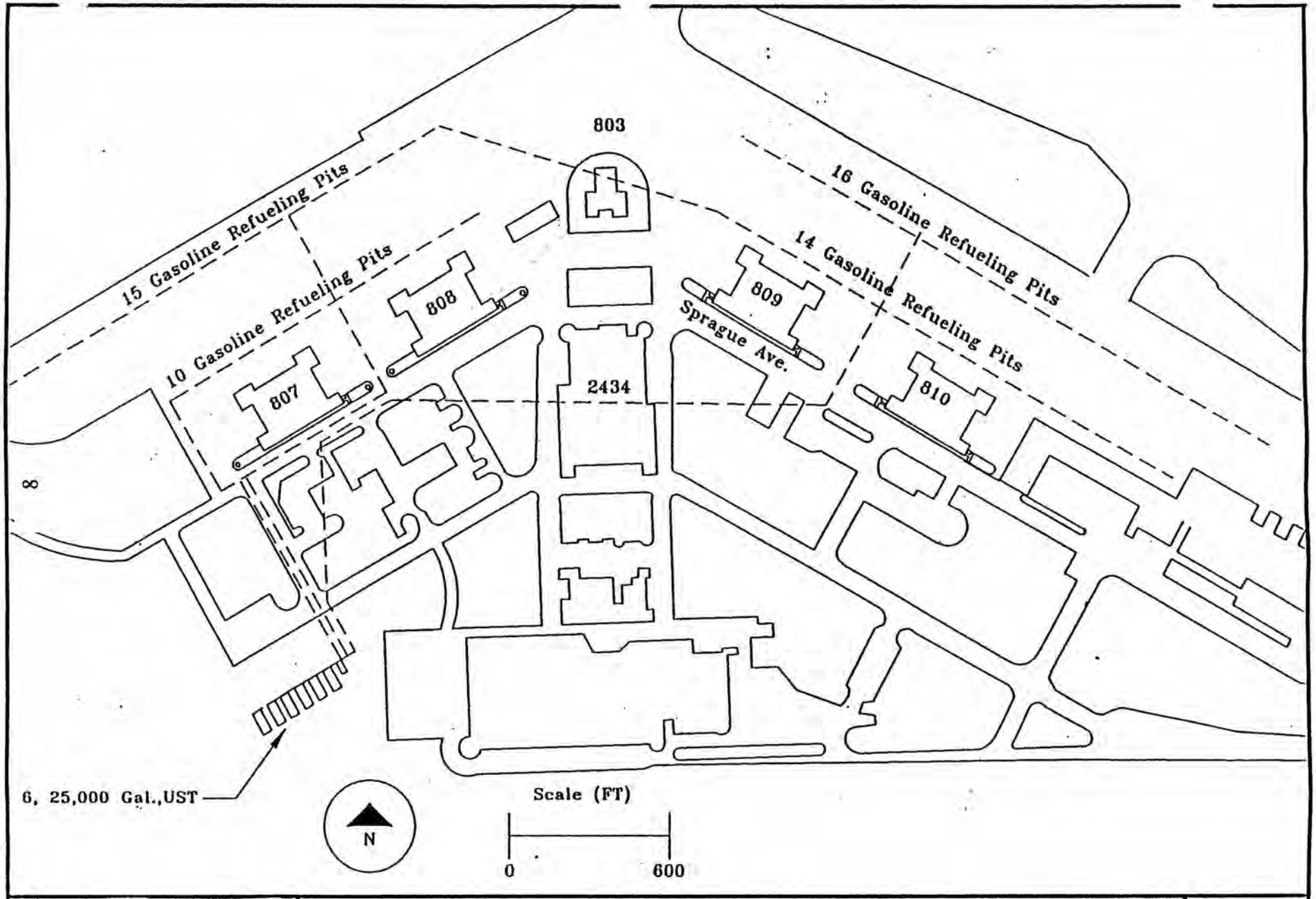


FIGURE 1-5
NETPDTC SAUFLEY FIELD

Gasoline Refueling Lines
Gasoline Refueling Lines - - - - - - -

well #3 and potable water well #4 from March 25, 1994 to October 7, 1994. Laboratory reports are included in Appendix D.

1.6 REGIONAL GEOLOGY AND HYDROGEOLOGY

NETPDTC Saufley Field resides in the Coastal Lowland topographic division of the Coastal Plain physiographic division of the United States. The Coastal Lowlands consist of relatively undissected nearly level plains lying less than 100 feet above sea level.

Topography of NETPDTC Saufley Field ranges in elevation from 80 to 85 feet along the eastern central portion of the property to less than 5 feet along the northwestern portion of the property (Figure 1-6). With a few exceptions to the northern boundary of the property, topography is level to gently sloping (less than 8% slope).

For most of the property, runoff is toward the southwest through a network of culverts that leads to Perdido Bay approximately one mile away. In the northern portion of the property, runoff is toward Eight Mile Creek and Eleven Mile Creek, which also drain toward Perdido Bay. Small ponds (less than 300 square meters in surface area) have been observed in pits located just east of Saufley Field property line.

The drainage basin of concern consists of a well-developed network of waterways which drains Escambia and Santa Rose Counties (Figure 1-7). The Perdido River forms the Florida-Alabama border along the west margin of the Panhandle and flows southward into Perdido Bay. The Perdido River Basin consists of 925 square miles (236 in Escambia and Santa Rosa counties) (Musgrove et. al., 1965). Average flow from the basin is 1,120 million gallons per day (284 mgd from Escambia and Santa Rosa counties). Escambia River, the largest stream in the area, flows southward from Alabama on the north, dividing Escambia County from Santa Rosa County, and empties into Escambia Bay approximately 10 miles from NETPDTC Saufley Field. The Escambia River Basin consists of 4,233 square miles (410 in Escambia and Santa Rosa counties) of area (Musgrove et. al., 1965). Average flow from the basin is 4540 mgd (556 mgd from Escambia and Santa Rosa counties). Streams on the east side of the Escambia River (north of Molino) are relatively short with a random dendritic pattern. The streams on the west side (where Saufley Field is located) are many times longer and have fairly straight, parallel channels that trend southeastward, reminiscent of trellis drainage. Hundreds of small ponds dot Escambia and Santa Rosa counties. These ponds are apparently accumulation of rainwater held up by underlying clay or iron-cemented sandstone ("hardpan").

Approximate average annual runoff, in inches, from areas within Escambia and Santa Rosa counties is presented in Figure 1-8. Saufley Field is affected by two 100-year flood plains which follow Eight Mile Creek and Eleven Mile Creek. The flood plains do not encroach upon the developed areas of the facility. These flood prone areas are illustrated in Figure 1-9 (Southern Division 1988).

The surface waters of Escambia and Santa Rosa counties are of excellent quality, except in the coastal reaches where tides bring salt water up the streams. The Escambia River coming out of

Alabama brings water of higher mineral content (approximately 100 ppm). However, this mineralization is diluted somewhat by the lower minerals-content waters of the Florida tributaries (Musgrove et. al., 1965).

Only a small part of the surface water of the Escambia and Santa Rosa County areas are presently being used. Most uses of surface water are within the southern half of the area. Principal among these are recreation and shipping. Eleven Mile Creek (which straddles the northeast corner of Saufley Field) has been used for disposal of industrial wastes (Musgrove et. al., 1965). No known drinking water uses of surface water have been identified.

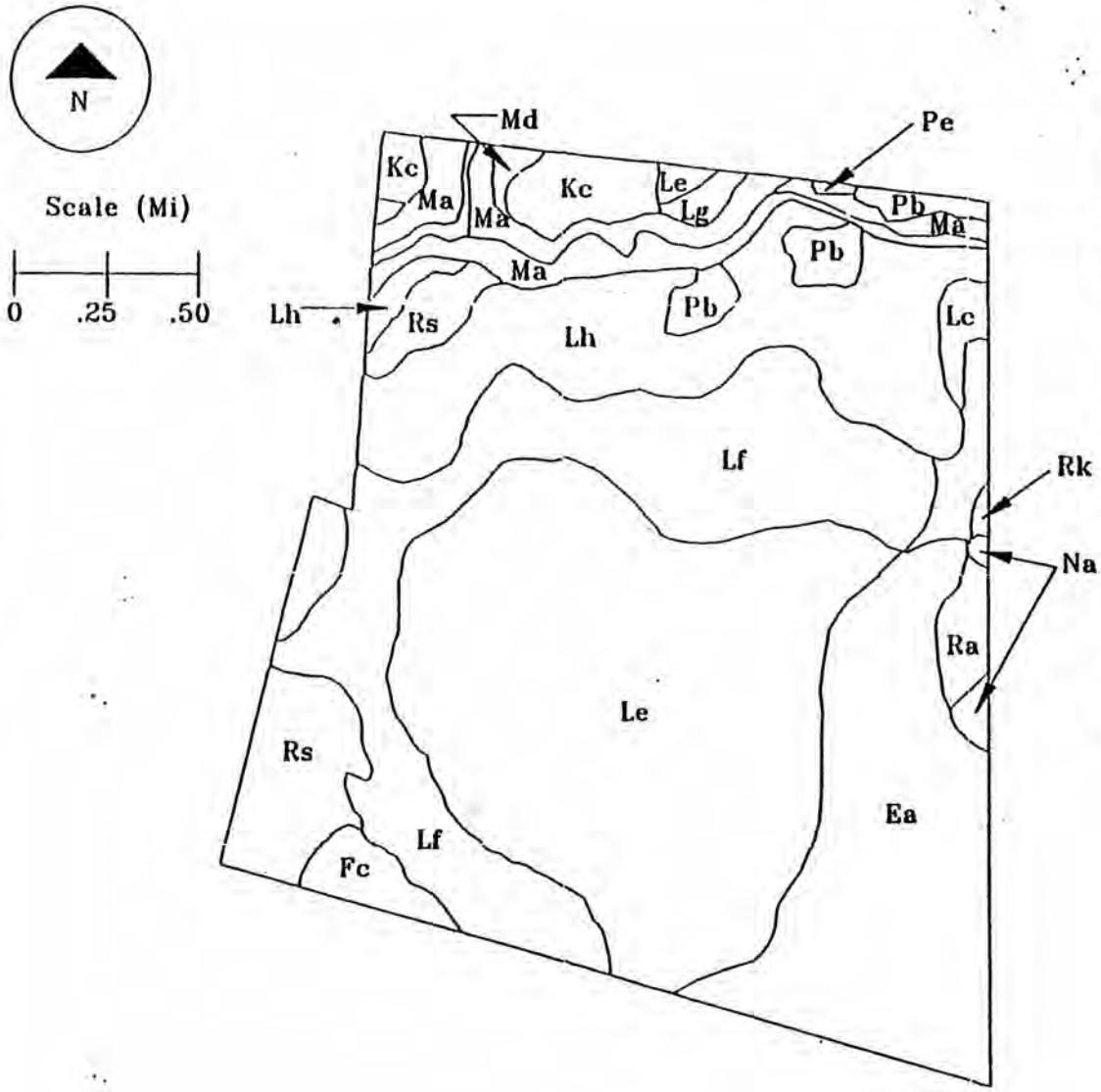
Surface sediments in the Saufley Field area are classified with the Eustis; Fresh Water Swamp; Klej; Lakeland: Mixed Alluvial Land; Myatt; Norfolk: pits, Dumps and Made Land; Plummer; Red Bay; and Rutlege associations (Figure 1-10).

NETPDTC Saufley Field resides along the western edge of the Florida Panhandle with the Coastal Plain Province. The Coastal Plain, a major physiographic division of the United States, extends eastward from Texas and northward as far as New York. It consists of Cretaceous to recent age beds of sand, silt, limestone and clay that dip gently seaward. Most of these sediments were deposited during higher stands of the sea as the Mississippi River system transported eroded debris southward. The Gulf Coast region of the United States is the landward side of the most active geosyncline in North America. The formations which make up the landward side of the geosyncline are all wedge-shaped, thickening rapidly from the outcrop gulfward to the south.

More precisely, Saufley Field resides with the Coastal Lowland topographic subdivision of the Coastal Plain which consists of relatively undissected, nearly level plains lying less than 100 feet above sea level (Marsh, 1966). It is situated along the north flank of the Mississippi Embayment, which accounts for the characteristic southwestward dip of Cretaceous and younger strata (Figure 1-11 thru Figure 1-14).

Figure 1-15 describes the geologic sequence by a representative log of an oil test well near Pensacola, For the region of study, a tick sequence of sand, gravel, and clay extends from the surface to as much as 1,000 feet deep. Nearly all wells in this area tap permeable sediments within this sequence, collectively referred to as the Sand and Gravel Aquifer (Musgrove et. al., 1965). In the northern half of Escambia County, the Sand and Gravel Aquifer lies on the upper limestone of the Floridan Aquifer, but in the southern part (where Saufley Field resides), the two aquifers are separated by a thick clay unit of Miocene Age, which serves to confine the water that is present in the upper limestone of the Floridan Aquifer (Figure 1-16). An extensive clay bed, the Bucatunna clay Member of the Byram Formation, underlies the upper limestone of the Floridan Aquifer and forms an aquiclude throughout the area. The lower limestone of the Floridan Aquifer underlies the Bucatunna and rests upon relatively impermeable clay and shale. Within the area, no freshwater aquifers occur below the lower limestone of the Floridan Aquifer.

More than 99 percent of groundwater utilized for drinking and industrial purposes in the region is obtained from the Sand and Gravel Aquifer and it is separated from the Floridan Aquifer by a relatively impermeable clay. Parts of the Sand and Gravel Aquifer have a rather high average



Ea–Eustis Loamy Sand, Level Phase
Fc–Fresh Water Swamp
Kc–Klej Loamy Sand, Level Phase
Lc–Lakeland Loamy Fine Sand, Gently Sloping Phase
Le–Lakeland Loamy Sand, Level Phase
Lf–Lakeland Loamy Sand, Very Gently Sloping Phase
Lg–Lakeland Loamy Sand, Gently Sloping Phase
Lh–Lakeland Loamy Sand, Sloping Phase
Ma–Mixed Alluvial Land, Poorly Drained
Md–Myatt Very Fine Sandy Loam, Level Phase
Na–Norfolk Fine Sandy Loam, Level Phase
Pb–Pits, Dumps and Made Land
PE–Plummer Loamy Sand, Very Gently Sloping Phase
Ra–Red Bay Fine Sandy Loam, Level Phase
Rs–Rutlege Sand

FIGURE 1-10
NETPDTC SAUFLEY FIELD

Soil Map
(Modified After U.S.D.A, 1960)

porosity and permeability and are thus excellent reservoirs for ground water. The aquifer primarily consists of relatively insoluble quartz grains which accounts for the low mineral content and softness of this water. The ground water conditions are complicated by great lithologic variability due to facies changes during deposition. Ground water is under artesian pressure where lenses and layers of clay, sandy clay, or hardpan overlie a saturated permeable bed. Ground water is under non-artesian conditions where such clays or hardpan are absent or where the porous media is not completely saturated. It is common for a well to tap both artesian and non-artesian sources. Ground water in the Sand and Gravel Aquifer is derived almost entirely from rain falling in the area. Recharge is greatest where land is relatively flat. The aquifer is discharged by pumping, evapotranspiration, and seepage into streams, swaps, bays, and the Gulf of Mexico (Trapp, 1972).

The gradient along the piezometric surface in the shallow beds of the Sand and Gravel Aquifer generally indicates movement of ground water toward nearby streams.

The artesian pressure head of water in the lower permeable beds of the Sand and Gravel Aquifer does not conform to the topography of the land as much as the water table. The artesian pressure head of water from the lower beds indicates a general movement of water to the south (Musgrove et. al., 1965).

Pumping tests on nearby wells screened within the Sand and Gravel Aquifer indicate specific capacity values that range from 30 to 80 gallons per minute per foot of drawdown (Musgrove et. al. 1965). Aquifer tests performed on wells penetrating the Sand and Gravel Aquifer owned by the City of Pensacola, the U.S. Navy (at Corry Field), and Newport Industries indicate transmissivities ranging from 58,800 to 94,000 gallons per day per foot. Using an average transmissivity of 75,000 gpd/ft, a thickness of 120 feet of water-bearing material, a porosity of 0.30, and the natural hydraulic gradient, Jacob and Cooper estimate the ground water velocity at Corry Station (approximately 10 miles from Saufley Field) to be 77 feet per year (Oak Ridge National Laboratory, 1989). This value does not consider higher hydraulic gradients induced by pumping.

With few exceptions, the sum of the mineral constituents in the ground water of the Sand and Gravel Aquifer is very low, ranging from 12 to 36 ppm (Barraclough and Marsh, 1962). Water in this aquifer is exceptionally soft, generally containing 4 to 30 ppm of calcium and magnesium carbonates. The fluoride content of this water is usually less than 0.2 ppm. Iron content of water from this aquifer ranges from 0.06 ppm to 4.9 ppm, although it is generally less than 0.25 ppm. Copious amounts of carbon dioxide render much of the water acidic. Some even contains hydrogen sulfide in solution. Carbon dioxide measurements in waters beneath NAS Pensacola have been as high as 100 pg/l (Trapp, 1972). However, elsewhere in the area, carbon dioxide concentrations are generally less than 30 mg/l. In Saufley Field ground water reserves, chloride is the major anion and is generally accompanied by a predominant sodium cation (Musgrove etc. al., 1965).

Permeability tests and aquifer tests were performed at the Pioneer Sand site, 400 yards to the east of Saufley Field. Pioneer Sand core permeability tests based on grain size distribution

measurements for a sample retrieved 80 to 82 feet below land surface indicate an average permeability of 3 x 10 (-7) cm/sec (FDER, 1985). Slug injection tests performed on the two production zones in question (one shallow and one deep) indicate transmissivities of 12,075 gpd/ft for the shallow zone (0 to 80 feet deep) and 3,570 gpd/ft for the deeper zone (greater than 85 feet deep). Calculations using Darcy's equation suggest that the velocity in the shallow producing zone is 1.69 ft/day to the south and 0.42 ft/day toward the west in the deeper producing zone.

Two distinct hydrogeologic units limit the leakage between the shallow and deep aquifer units (FDER, 1985). The first unit, immediately underlying the shallow aquifer, is described as a fine to medium grained clayey sand grading downward to a fine sand clay ranging in thickness from 14 to 20 feet across the Pioneer Sand site. Immediately underlying this unit is a stiff plastic kaolinitic clay ranging in thickness from nearly nonexistent to 8 feet.

1.7 WELL SURVEY

Public Works Center, Naval Air Station, Pensacola, Florida operated two drinking water wells, potable water well #3 and potable water well #4, at Saufley Field, Pensacola, Florida until May 1994. Construction details of potable water well #3 and potable water well #4 is included in Table 1-2. In May 1994, potable water well #4 was closed because raw water samples collected from potable water well #4 indicated benzene contamination levels of 3.2 ppb which exceeded the FDEP regulatory limits of 1 ppb for benzene. Monthly analysis performed on potable water well #4 continued to indicated benzene levels above the FDEP regulatory limits. The decision was made to have ECUA provide Saufley Field with potable water and on November 10, 1994 ECUA began supplying potable water to Saufley Field. Potable water wells #3 and #4 were officially abandoned in-place on April 1996.

2.0 SITE ASSESSMENT

2.1 SOIL BORING AND MONITORING WELL CONSTRUCTION DETAILS

Shallow monitoring wells MW-1 thru MW-5 were installed at Site 2406 by W.E.S., Inc. on April 29 and 30, 1996. Shallow monitoring wells MW-6 thru MW-8 were installed at the site on May 13 and 14, 1996 and MW-9 was installed May 27, 1997. Vertical extent monitoring well DMW-10 was completed at the site on May 27, 1996. Soil samples were collected from each of the boreholes during the installation of groundwater monitoring wells at 1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, and 39 feet BLS. Each soil sample collected was analyzed for volatile organic vapors using an organic vapor analyzer (OVA) with a flame ionization detector. Monitoring well locations are shown in Figure 2-1. Construction diagrams for monitoring wells MW-1 thru DMW-10 are shown in Appendix A. Lithological Logs for monitoring wells MW-1 thru DMW-10 are shown in Appendix C.

The shallow monitoring wells consist of a 2-inch diameter by 10.0 feet of 0.010-inch slotted schedule 40 PVC pipe, threaded to 37 feet of solid PVC riser. The wells were completed in approximately 8-inch diameter boreholes approximately 47 feet using the hollow stem auger

drilling method. A sand pack consisted of course silica sand (sand pack mesh size 20-30) and extended approximately one foot above the top of the well screen. A one foot bentonite seal was placed above the sand pack. The annular space above the bentonite seal was backfilled with clean native sand to approximately one foot BLS and the remaining annular space was filled with neat cement grout. The PVC casing was brought up to 0.2' below ground level. A flush-mounted steel manhole cover was placed in borehole around the PVC riser and set with neat cement. An 8-inch diameter steel manhole cover was placed over the manhole. A 2 foot by 2 foot concrete pad was installed around the outside of the manhole cover at the top of the land surface.

Vertical extent monitoring well, designated DMW-10, was completed by W.E.S., Inc., on May 27, 1996. The monitoring well was set at 67 feet BLS with 5 feet of 2-inch diameter 0.010-inch slotted schedule 40 PVC screen, threaded to 62 feet of solid schedule 40 PVC riser casing. The PVC casing was extended to 0.2 feet below ground level. A steel manhole casing (8-inches diameter x 4-inches deep) was placed in the borehole around the PVC riser and set with neat cement grout. An 8-inch diameter steel manhole cover was placed over the manhole. A 6-inch thick concrete encasement (4,000 psi) was installed around the outside of the manhole and flush to the land surface. A sand pack consisting of course silica sand (sand pack mesh size 20-30) was filled from the bottom to one foot above the screen, followed by a one foot fine sand seal above the sand filter pack, followed by neat cement grout from the top of the fine sand seal to the surface.

2.2 GROUNDWATER FLOW DIRECTION

The top of casing (TOC) elevations for shallow monitoring wells MW-1 thru DMW-10 were surveyed by Charlotte Engineering and Surveying, Inc. on June 3, 1997. The benchmark is assumed at an elevation of 30.00 ft., at the NW Flange Hex-Nut on Fire Hydrant ID'd as C4-5, located approximately 75' NW'ly from the intersection of Raby Ave. & Pou Street.

Groundwater elevations for the groundwater level measurements taken on monitoring wells MW-1 thru DMW-10 on September 16, 1997 are shown in Table 2-1. A groundwater flow direction map for the groundwater level measurements taken on September 16, 1997 is shown in Figure 2-2. The groundwater flow direction map indicates the groundwater flow at the site is to the south toward Perdido Bay.

2.3 GROUNDWATER FLOW RATE

The horizontal groundwater flow velocity was calculated using the equation V=Ki/n. The horizontal hydraulic conductivity was calculated by taking the average of the hydraulic conductivities determined from slug tests performed during the preparation of three previous CARs performed at NAS Pensacola. The average horizontal conductivity of the three sites at NAS Pensacola was determined to be 48.3 feet/day (Campbell, 1995). A hydraulic gradient was calculated from the groundwater elevation data collected from groundwater monitoring wells MW-3 and MW-4 on September 16, 1997 which are parallel to the groundwater flow direction. The hydraulic gradient was determined to be 0.01160 ft/ft. The effective pore velocity of the site

was assumed to be 25%. The average linear groundwater flow velocity at the site was determined to be 2.241 ft/day. The groundwater flow velocity assumptions and calculations are shown in Appendix B.

2.4 SOIL ASSESSMENT

The extent of soil contamination at the site was determined by OVA screening. Soil samples were collected from the boreholes during the installation of monitoring wells MW-1 thru DMW-10 at 1', 4', 7', 10', 13', 16', 19', 22', 25', 28', 31', 34', 37', and 39' intervals BLS and analyzed with an OVA with a flame ionization detector for volatile organic vapors (see Figure 2-1 for locations). The soil boring designations and their respective OVA screening results are shown in Table 2-2 and a Soil Contamination Distribution Map is included as Figure 2-3. The groundwater table at the site was generally encountered at 40 feet BLS. No VOCs were detected in the soil samples collected from monitoring wells MW-1, MW-2, MW-5, MW-6, MW-7, MW-8, or MW-9. However, VOCs were detected in soil samples collected from MW-3 @ 22', 25', 28', 31', 34', 37', and 39' in excess of 1,000 ppm; from MW-4 @ 25' (3 ppm), 28' (2 ppm), 31' (4 ppm), 34' (1 ppm), and 39' (6ppm); and from DMW-10 @ 22', 25', 28', 31', 34', 37', and 39' in excess of 1,000 ppm. VOCs detected in MW-3 (@ 22', 25', 28', 31', 34', 37', and 39') and DMW-10 (@ 22', 25', 28', 31', 34', 37', and 39') exceeded the 50 ppm level for soil considered to be excessively contaminated from the kerosene analytical group.

2.5 SITE SPECIFIC GEOLOGY AND HYDROGEOLOGY

The principal aquifer of concern at the site is the surficial zone of the Sand-and-Gravel Aquifer. The surficial zone was penetrated to a depth of 67 feet during this investigation. The lithology at monitoring wells MW-1 thru DMW-10 was generally composed of: (1) dark brown, silty, fine sand w/humus (exception MW-5 thru MW-8 pavement, road bed & MW-9 with 6" concrete and 6" sub-base), from 0 to 1 foot BLS; (2) reddish brown, silty fine sand w/trace of clay, from 1 to 13 feet BLS; (3) orange brown, silty fine sand, greater % clay, from 13 to 31 feet BLS; (4) tan brown, silty fine to medium, clayey sand, from 31 to 39 feet BLS; (4) light tan, brown fine to medium clayey sand, from 39 to 53 feet BLS; (5) lense of sandy clay cohesive, differential, 70% clay, from 53 to 58 feet BLS; and (6) reddish brown, medium to coarse, clayey sand, from 58 to 67 feet BLS. The groundwater table at the site was encountered at approximately 40 feet BLS. Lithological logs describing the soils encountered at various depth, the approximate groundwater level, and OVA screening results for the soil borings installed during the monitoring well installation are shown in Appendix C.

2.6 SURFACE WATER ASSESSMENT

No surface water was observed at the site and therefore no surface water assessment was performed for this report. There are two surface water bodies, Eight Mile Creek and Eleven Mile Creek, which run along the southern border of Saufley Field and empty into Perdido Bay which is located approximately one mile northeast of Saufley Field.

2.7 GROUNDWATER QUALITY ASSESSMENT

Groundwater samples were extracted from shallow groundwater monitoring wells MW-1 thru MW-9 and vertical extent monitoring well DMW-10 by W.E.S., Inc. using the methods and procedures outlined in W.E.S., Inc. Comprehensive Quality Assurance Plan No. 900465G. Monitoring wells MW-1 thru MW-5 were sampled on May 1, 1997; MW-6 thru MW-8 were sampled on May 20, 1997; and MW-9 and DMW-10 were sampled May 19, 1997. All monitoring wells were analyzed for the kerosene analytical group (with the exception of lead) outlined in FDEP Rule 62-770. The kerosene analytical group included analysis of groundwater samples for volatile organic aromatics (VOAs), polynuclear aromatic hydrocarbons (PAHs), ethylene dibromide (EDB), and total petroleum hydrocarbons (TPHs) utilizing EPA Methods 8260, 8270A, 504, and FLPRO, respectively. Analytical results for groundwater samples collected from monitoring wells MW-1 thru DMW-10 are included in Appendix D.

Groundwater samples were collected from each monitoring well using the quiescent sampling technique by Navy Public Works Center (PWC) Pensacola laboratory personnel on September 25 and 26, 1997. The groundwater sampling was conducted in accordance with the methods and procedures outlined in PWC's Comprehensive Quality Assurance Plan (CompQAP No. 920121G). The groundwater samples were analyzed for total lead using EPA method 239.2. A copy of the laboratory analysis is provided in Appendix D.

No kerosene analytical group parameters were detected in the groundwater samples collected from monitoring wells MW-1 thru MW-2 or MW-4 thru DMW-10.

Ethylbenzene (32 ppb), toluene (63 ppb), and xylenes (1900 ppb) were detected in the groundwater sample collected from monitoring well MW-3. Levels of ethylbenzene, toluene, and total xylenes in MW-3 exceeded the FDEP target level for ethylbenzene, toluene, and total xylenes of 30 ppb, 40 ppb, and 20 ppb, respectfully. No VOAs were detected in the groundwater samples collected from the other shallow monitoring wells or the deep vertical extent monitoring well located at Site 2406. A summary of the analytical results is included in Table 2-3.

Naphthalene (180 ppb), 1-methylnaphthalene (81 ppb), and 2-methylnaphthalene (130 ppb) were detected in the groundwater sample collected from monitoring well MW-3 on May 1, 1996. The level of naphthalene in MW-3 exceeds the FDEP groundwater cleanup target level of 20 ppb for naphthalene. No PAHs were detected in groundwater samples collected from the other shallow monitoring wells or the deep vertical extent monitoring well located at Site 2406. A summary of the analytical results is included in Table 2-4.

Total petroleum hydrocarbons (TPHs) at a concentration level of 13000 ppb were detected in the groundwater sample collected from monitoring well MW-3 on May 1, 1997. The level of TPHs in MW-3 exceeds the FDEP allowable limits of 5000 ppb for TPH. Total lead at a concentration level of 155 ppb was detected in the groundwater sample collected from monitoring well MW-3 using the quiescent sampling method on September 25 and 26, 1997. The level of total lead in MW-3 exceeds the FDEP groundwater cleanup target level of 15 ppb for total lead. EDB was detected in the groundwater samples collected from monitoring well MW-3 on May 1, 1997 at a

concentration level of 2.6 ppb which exceeds the FDEP regulatory limits of 0.02 ppb for EDBs. No TPHs, Total Lead, or EDBs were detected in the groundwater samples collected from the other shallow monitoring wells or the deep vertical extent monitoring well at Site 2406. A summary of the analytical results is included in Table 2-5.

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

- The source and quantity of the discharge are unknown.

- OVA screenings were performed on 10 soil borings, at varying depths in order to delineate the extent of contaminated soils. Soil samples collected from the soil borings were analyzed for volatile organic vapors using an OVA. Soil samples from monitoring well MW-3 (22', 25', 28', 31', 34', 37', and 39' BLS) and DMW-10 (22', 25', 28', 31', 34', 37', and 39' BLS) were found to be above the FDEP excessively contaminated soil level of 50 ppm for the kerosene analytical group.

- Nine shallow groundwater monitoring wells (MW-1 thru MW-9) and one deep vertical extent groundwater monitoring well (DMW-10) were installed at the site and groundwater samples were collected from each well and analyzed for the kerosene analytical group listed in FDEP Rule 62-770.600(8)(b).

- No free-phase petroleum hydrocarbons were detected in any of the monitoring wells.

- Groundwater depths measured in monitoring wells MW-1 thru MW-9 on September 16, 1997 indicates the groundwater flows toward the south.

- Monitoring well MW-3 was the only well at Site 2406 which detected and exceeded FDEP groundwater cleanup target levels for ethylbenzene, toluene, total xylenes, naphthalene, TPH, Lead, and EDB. However, the contaminated levels are not exceptionally high.

- The average estimated horizontal hydraulic conductivity at the site is 48.3 ft/day.

- The average estimated linear velocity at the site is 2.241ft/day.

- The areal extent of the soil and groundwater contamination at the site appears to be limited to a small area and the levels of contamination are somewhat significant.

3.2 RECOMMENDATIONS

PWC Pensacola recommends, based upon the findings and conclusions contained in this report, that a "Remedial Action Plan" be prepared for the soil contamination and a "Monitoring Only Plan" be implemented for the groundwater at Site 2406 located at Saufley Field, NETPDTC, Pensacola, Florida. PWC Pensacola recommends the "Monitoring Only Plan" (MOP) be implemented as follows:

(1) Groundwater samples be collected from MW-3, MW-4, and MW-7 semiannually for two years and analyzed for VOAs and PAHs using EPA methods 8260 and 8270A, respectfully. Monitoring well MW-3 shall be considered the "source" monitoring well and monitoring wells MW-4 and MW-7 the downgradient and upgradient monitoring wells, respectfully.

Rev. 0
06/06/05

From NASP

SITE ASSESSMENT REPORT ADDENDUM NO. 2
FOR
UNDERGROUND STORAGE TANK
SITE 2406
OUTLYING LANDING FIELD SAUFLEY

NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

Submitted by:
Tetra Tech NUS, Inc.
661 Andersen Drive
Foster Plaza 7
Pittsburgh, Pennsylvania 15220

CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0274

MAY 2005

PREPARED UNDER THE SUPERVISION OF:

GERALD WALKER, P.G.
TASK ORDER MANAGER
TETRA TECH NUS, INC.
TALLAHASSEE, FLORIDA

APPROVED FOR SUBMITTAL BY:

DEBRA M. HUMBERT
PROGRAM MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA

TABLE 4-2
GROUNDWATER ELEVATION SUMMARY
UST SITE 2406 - July 28, 2004

SITE ASSESSMENT REPORT ADDENDUM NO. 2
OUTLYING LANDING FIELD SAUFLEY
PENSACOLA, FLORIDA

Well ID	TOC Elevation (ft)*	Depth of Well (ft BTOC)	Screened Interval (ft BTOC)	Depth to Water (ft BTOC)	Depth to Free Product (ft BTOC)	Free Product Thickness (ft)	Water Level Elevation (ft)
SHALLOW							
OLFS-2406-MW01	127.71	47.01	37 - 47	40.85	ND	NA	86.86
OLFS-2406-MW02	128.54	46.74	37 - 47	41.49	ND	NA	87.05
OLFS-2406-MW03	128.45	47.6	37 - 47	41.88	ND	NA	86.57
OLFS-2406-MW05	127.69	46.39	37 - 47	40.98	ND	NA	86.71
OLFS-2406-MW06	128.68	45.57	37 - 47	40.59	ND	NA	88.09
OLFS-2406-MW07	128.67	46.18	37 - 47	42.38	ND	NA	86.29
OLFS-2406-MW08	128.12	45.9	37 - 47	42.39	ND	NA	85.73
OLFS-2406-MW09	128.79	45.8	37 - 47	N/A	ND	NA	N/A
OLFS-2406-MW11	128.7	47.00	37 - 47	41.94	ND	NA	86.76
OLFS-2406-MW17**	129.93	53.90	39.5 - 54.5	39.33	38.65	0.68	90.06
OLFS-2406-MW18**	129.60	55.00	39.5 - 54.5	38.34	38.28	0.06	91.21
OLFS-2406-MW19	130.29	55.63	39.5 - 54.5	40.93	ND	ND	89.36
OLFS-2406-MW20**	129.63	55.74	39.5 - 54.5	39.76	39.75	0.01	89.86
OLFS-2406-MW21	129.46	55.85	39.5 - 54.5	40.02	ND	ND	89.44
OLFS-2406-MW22**	130.28	54.80	39.5 - 54.5	40.89	40.08	0.81	88.74
OLFS-2406-MW38	131.20	56.00	39 - 56	41.22	ND	NA	89.98
OLFS-2406-MW39	129.65	56.00	39 - 56	36.02	ND	NA	93.63
OLFS-2406-MW40	130.06	56.00	41 - 56	41.15	ND	NA	88.91
OLFS-2406-MW41	128.47	56.00	42 - 57	40.30	ND	NA	88.17
OLFS-2406-MW42S	127.36	56.00	39 - 56	33.77	ND	NA	93.59
OLFS-2406-MW43S	119.40	56.00	35 - 50	18.80	ND	NA	100.60
OLFS-2406-MW44S	109.01	56.00	41 - 56	29.04	ND	NA	79.97
OLFS-2406-MW45	128.79	45.00	31 - 46	35.95	ND	NA	92.84
OLFS-2406-MW46	NA	52.05	42 - 52	NA	ND	NA	NA
OLFS-2406-MW47	NA	56.69	46 - 56	NA	ND	NA	NA
INTERMEDIATE							
OLFS-2406-MW04	127.94	71.42	37 - 47	40.98	ND	NA	86.96
OLFS-2406-MW10D	128.54	67.00	62 - 67	42.36	ND	NA	86.18
OLFS-2406-MW12D	128.71	69.88	60 - 69	42.37	ND	NA	86.34
OLFS-2406-MW14D	128.12	72.00	65 - 70	41.66	ND	NA	86.46
OLFS-2406-MW15D	128.73	70.09	65 - 70	42.17	ND	NA	86.56
OLFS-2406-MW16D	128.9	70.49	65 - 70	42.37	ND	NA	86.53
OLFS-2406-MW23D	129.24	81.18	74.5 - 79.5	47.71	ND	NA	81.53
OLFS-2406-MW24D	127.85	81.25	74.5 - 79.5	41.17	ND	NA	86.68
OLFS-2406-MW25D	120.92	81.23	74.5 - 79.5	45.5	ND	NA	75.42
OLFS-2406-MW26D	130.07	65.85	59.5 - 64.5	43.91	ND	NA	86.16
OLFS-2406-MW27D	129.29	66.44	59.5 - 64.5	38.98	ND	NA	90.31
OLFS-2406-MW28D	128.44	80.13	74.5 - 79.5	46.14	ND	NA	82.30
OLFS-2406-MW29D	119.42	80.40	74.5 - 79.5	38.37	ND	NA	81.05
OLFS-2406-MW30D	120.00	81.80	74.5 - 79.5	38.73	ND	NA	81.27
OLFS-2406-MW31D	108.32	79.35	74.5 - 79.5	27.73	ND	NA	80.59
OLFS-2406-MW33D	119.56	80.25	74.5 - 79.5	N/A	ND	NA	N/A
OLFS-2406-MW34DR	125.32	77.90	74.5 - 79.5	27.2	ND	NA	98.12
OLFS-2406-MW35D	130.11	81.12	74.5 - 79.5	45.2	ND	NA	84.91
OLFS-2406-MW36D	128.47	79.12	74.5 - 79.5	44.94	ND	NA	83.53
DEEP							
OLFS-2406-MW13D	128.28	142.00	137 - 142	43.73	ND	NA	84.55
OLFS-2406-MW32D	108.50	135.70	130 - 135	28.13	ND	NA	80.37
OLFS-2406-MW37D	129.93	135.80	130 - 135	47.09	ND	NA	82.84
OLFS-2406-MW42D	127.68	130.00	125 - 130	45.14	ND	NA	82.54
OLFS-2406-MW43D	119.24	133.20	120 - 130	37.6	ND	NA	81.64
OLFS-2406-MW44D	108.92	130.00	125 - 130	28.89	ND	NA	80.03

Notes:

TOC = Top Of Casing
ft BTOC = feet below top of casing
* = Benchmark is arbitrary at 127.94 ft. at OLFS-2406-MW4
from the intersection of Raby Avenue and Pou Street
** = corrected for free product thickness assuming a free product specific gravity of 0.8
ND = Free Product not detected
NA = Not Applicable

The depth to water measurement data and the relative elevations from the well TOC survey were used to determine relative groundwater elevations at each monitoring well.

For monitoring wells designated as the shallow flow zone depth to water measurements ranged from 18.80 feet below top of casing (BTOC) in OLFS-2406-MW43S to 42.39 feet BTOC in OLFS-2406-MW08. The relative groundwater elevations in the shallow wells ranged from 79.97 feet in OLFS-2406-MW44S to 100.60 feet in OLFS-2406-MW43S. Although free product was present in four monitoring wells (OLFS-2406-MW17, -MW18, -MW20, and –MW22), the water levels from these wells were corrected for density differences of free product using an assumed free product specific gravity of 0.8. As indicated on Figure 4-1, groundwater flow for the shallow (45 to 56 feet bls) screened groundwater interval is in radial direction with the high point located the former fuel farm area. Based on the current data it is unclear if this pattern is consistent in the area south of the fuel tank area.

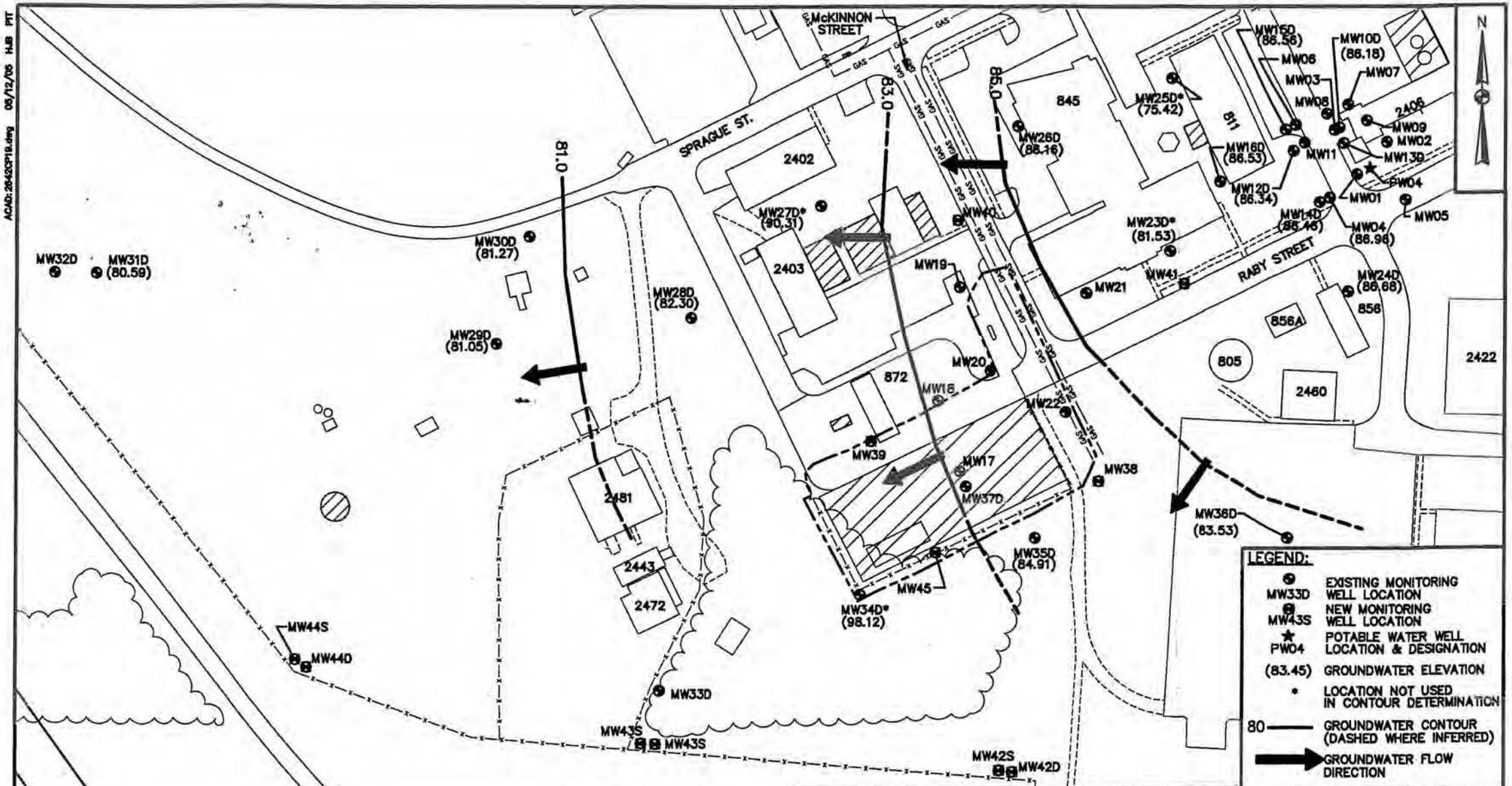
The water level measurements in the intermediate wells ranged from 27.20 feet BTOC in OLFS-2406-MW34D to 47.71 feet BTOC in OLFS-2406-MW23D. The relative groundwater elevations in the intermediate wells ranged from 75.42 feet. in OLFS-2406-MW25D to 98.12 feet. in OLFS-2406-MW34D. As indicated on Figure 4-2, groundwater flow for the intermediate (65 to 81 feet bls) screened groundwater interval is generally in a radial direction near the former fuel farm area and to the west southwest near production well PW04. Because of the flow patterns there appears to be a north northwest to south southeast trending trough located beneath Building 845.

The depth to water measurements in the deep wells ranged from 28.13 feet BTOC in OLFS-2406-MW32D to 47.09 feet BTOC in OLFS-2406-MW37D. The relative groundwater elevation in the deep wells ranged from 80.03 feet in OLFS-2406-MW44D to 84.55 feet in OLFS-2406-MW-13D. As indicated on Figure 4-3, groundwater flow on the deep (130 to 142 feet bls) screened groundwater interval is toward the west southwest.

4.2.2 Free Product Measurement Determination

Free product thickness measurements were recorded from site monitoring wells in July 2004. Four of the monitoring wells at the site contained measurable thickness of free product. Free product measurements ranged from a 0.01 feet to 0.81 feet in thickness. Figure 4-4 presents the free product thickness measurements from the July 2004 measurement event.

A determination of free product contaminant mass was completed for the site based on the July 2004. The determination was completed using the formula:



DRAWN BY	DATE
DM	11/18/04
CHECKED BY	DATE
REVISED BY	DATE
SCALE AS NOTED	

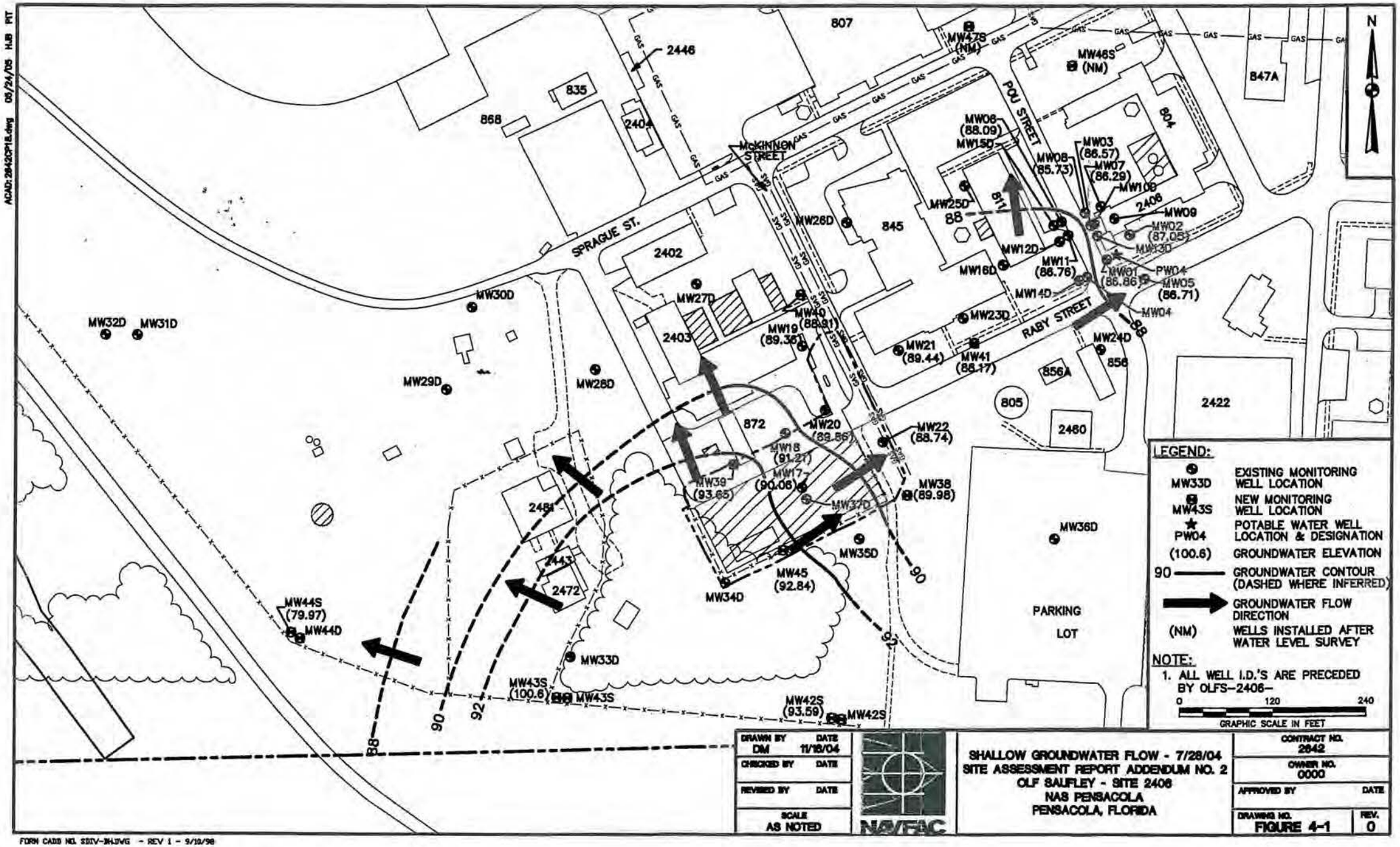
NAVFAC

INTERMEDIATE GROUNDWATER FLOW - 7/28/04
SITE ASSESSMENT REPORT ADDENDUM NO. 2
OLF SAUFLEY - SITE 2406
NAS PENSACOLA
PENSACOLA, FLORIDA

CONTRACT NO.	
2842	
OWNER NO. 0000	
APPROVED BY	DATE
DRAWING NO. FIGURE 4-2	REV. 0

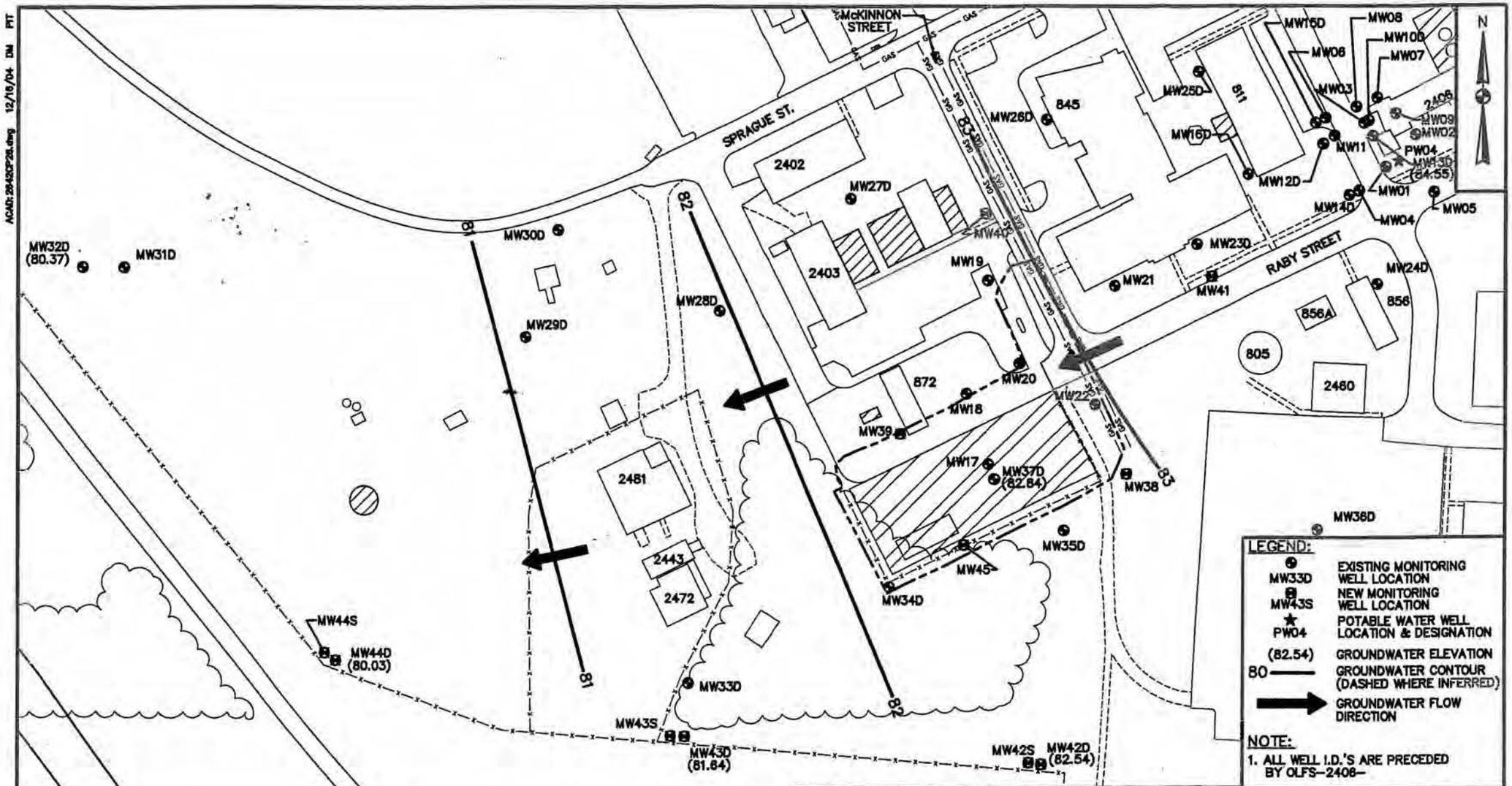
ACAD: 2842CP18.dwg 05/12/05 HJB PIT

FORM CADD NO. SDIV-BHJDWG - REV 1 - 9/10/98



ACAD: 2642CP18.dwg 05/24/05 HJB PIT

FORM CADD NO. SDIV-INJ.DWG - REV 1 - 9/10/98



DRAWN BY DM	DATE 11/18/04	DEEP GROUNDWATER FLOW - 7/28/04 SITE ASSESSMENT REPORT ADDENDUM NO. 2 OLF SAUFLEY - SITE 2406 NAS PENSACOLA PENSACOLA, FLORIDA	CONTRACT NO. 2642
CHECKED BY	DATE		OWNER NO. 0000
REVISED BY	DATE		APPROVED BY / DATE
SCALE AS NOTED		NAVFAC	DRAWING NO. FIGURE 4-3 / REV. 0

FORM CADD NO. SDIV-3M.DWG - REV 1 - 9/10/98

ACAD:2642GF26.dwg 12/18/04 DM FIT

PRELIMINARY ASSESSMENT REPORT

NAVAL EDUCATIONAL AND TRAINING PROGRAM
MANAGEMENT SUPPORT ACTIVITY (NETPMSA)
SAUFLEY FIELD
ESCAMBIA COUNTY, FLORIDA

EPA IDENTIFICATION: FL170024473
NEESA 13-227
MAY 1992

OMB Approval Number: 2050-009
Approved for Use Through: 1/9

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
	State: FL	CERCLIS Number: FL170024473
	CERCLIS Discovery Date: 7/20/91	

1. General Site Information

Name:		Street Address:			
NETPMSA SAUFLEY FIELD		Code 100P			
City: PENSACOLA	State: FL	Zip Code: 32509-5000	County: ESCAMBIA	Co. Code:	Cong. Dist:
Latitude: 30° 20' 0.0" Longitude: 87° 27' 50.0"	Approx. Area of Site: 866 acres		Status of Site: Active		

2. Owner/Operator Information

Owner:			Operator:		
NETPMSA SAUFLEY FIELD			Same		
Street Address: Code 100P			Street Address: Same		
City: PENSACOLA			City: Same		
State: FL	Zip Code: 32509-5000	Telephone: 904-452-1322	State: FL	Zip Code: Same	Telephone: Same
Type of Ownership: Federal Agency DOD			How Initially Identified: RCRA/CERCLA Notification		

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
	State: FL	CERCLIS Number: FL170024473
	CERCLIS Discovery Date: 7/20/91	

3. Site Evaluator Information

Name of Evaluator:	Agency/Organization:	Date Prepared:
SCOTT L. HORWITZ	NEESA	4/92

Street Address:	City:	State:
CODE 112E3	PORT HUENEME	CA

Name of EPA or State Agency Contact:	Telephone:
REGION IV	404-347-4727

Street Address:	City:	State:
345 COURTLAND STREET NE	ATLANTA	GA

4. Site Disposition (for EPA use only)

Emergency Response/Removal Assessment Recommendation: No	CERCLIS Recommendation: Higher Priority SI	Signature:
Date: 1/92	Date: 1/92	Name: SCOTT L. HORWITZ Position: ENVIRONMENTAL ENGINEER

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
	State: FL	CERCLIS Number: FL170024473
	CERCLIS Discovery Date: 7/20/91	

5. General Site Characteristics

Predominant Land Uses Within 1 Mile of Site:	Site Setting:	Years of Operation:
Commercial Residential Forest/Fields	Suburban	Beginning Year: 1940 Ending Year: 1991

Type of Site Operations:	
DOD RCRA Treatment, Storage, or Disposal Small Quantity Generator	Waste Generated: Onsite Waste Deposition Authorized By: Present Owner Waste Accessible to the Public No Distance to Nearest Dwelling, School, or Workplace: 500 Feet

6. Waste Characteristics Information

Source Type	Quantity	Tier
Surface impoundment	2.00e+05 lbs	W
Drums	3.50e+01 drums	V
Pile	6.00e+04 cu ft	V
Non-drum containers	6.58e+04 gals	V

General Types of Waste:
- Metals
- Paints/Pigments
- Oily Waste

Physical State of Waste as Deposited
- Solid
- Liquid

Tier Legend
C = Constituent W = Wastestream
V = Volume A = Area

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
	State: FL	CERCLIS Number: FL170024473
	CERCLIS Discovery Date: 7/20/91	

7. Ground Water Pathway

Is Ground Water Used for Drinking Water Within 4 Miles: Yes	Is There a Suspected Release to Ground Water: Yes	List Secondary Target Population Served by Ground Water Withdrawn From:
Type of Ground Water Wells Within 4 Miles: Municipal	Have Primary Target Drinking Water Wells Been Identified: Yes Primary Target Population: 862	0 - 1/4 Mile 0 >1/4 - 1/2 Mile 0 >1/2 - 1 Mile 0 >1 - 2 Miles 0 >2 - 3 Miles 0 >3 - 4 Miles 0 Total 0
Depth to Shallowest Aquifer: 3 Feet		
Karst Terrain/Aquifer Present: No	Nearest Designated Wellhead Protection Area: Underlies Site	

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
	State: FL	CERCLIS Number: FL170024473
	CERCLIS Discovery Date: 7/20/91	

8. Surface Water Pathway — Part 1 of 4

Type of Surface Water Draining Site and 15 Miles Downstream:	Shortest Overland Distance From Any Source to Surface Water: 5000 Feet 0.9 Miles
Is there a Suspected Release to Surface Water: Yes	Site is Located in: >10 yr - 100 yr floodplai

8. Surface Water Pathway — Part 2 of 4

Drinking Water Intakes Along the Surface Water Migration Path: No

Have Primary Target Drinking Water Intakes Been Identified: No

Secondary Target Drinking Water Intakes:
None

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
	State: FL	CERCLIS Number: FL170024473
	CERCLIS Discovery Date: 7/20/91	

8. Surface Water Pathway — Part 3 of 4

Fisheries Located Along the Surface Water Migration Path: No

Have Primary Target Fisheries Been Identified: No

Secondary Target Fisheries:
None

8. Surface Water Pathway — Part 4 of 4

Wetlands Located Along the Surface Water Migration Path? (y/n) No

Have Primary Target Wetlands Been Identified? (y/n) No

Secondary Target Wetlands:
None

Other Sensitive Environments Along the Surface Water Migration Path: No

Have Primary Target Sensitive Environments Been Identified: No

Secondary Target Sensitive Environments:
None

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM	IDENTIFICATION	
	State: FL	CERCLIS Number: FL170024473
	CERCLIS Discovery Date: 7/20/91	

9. Soil Exposure Pathway

Are People Occupying Residences or Attending School or Daycare on or Within 200 Feet of Areas of Known or Suspected Contamination: No	Number of Workers Onsite: None

Have Terrestrial Sensitive Environments Been Identified on or Within 200 Feet of Areas of Known or Suspected Contamination: No

10. Air Pathway

Total Population on or Within:	
Onsite	0
0 - 1/4 Mile	0
>1/4 - 1/2 Mile	0
>1/2 - 1 Mile	0
>1 - 2 Miles	0
>2 - 3 Miles	0
>3 - 4 Miles	0
Total	0

Is There a Suspected Release to Air: No

Wetlands Located Within 4 Miles of the Site: No

Other Sensitive Environments Located Within 4 Miles of the Site: No

Sensitive Environments Within 1/2 Mile of the Site:
None

PRELIMINARY ASSESSMENT REPORT

Activity Name: NETPMSA Saufley Field

Address: Escambia County, Florida

UIC: N68322

EPA Region: 4

EPA Identification: FL170024473

Latitude: 30° 20' 00" N Longitude: 87° 27' 50" W

Preliminary Assessment Team Members

Scott Horwitz, Environmental Engineer
Joseph Vogel, P.E.
Mark Kram, Hydrogeologist

Prepared by:

Naval Energy and Environmental Support Activity
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EXECUTIVE SUMMARY

A NEESA team visited NETPMSA Saufley Field from 9 to 19, July 1991 to collect information for the Preliminary Assessment (PA). The investigation showed four areas of environmental concern which are strongly recommended for a Site Inspection (SI).

Between Runways 9 and 13 is the location where 30 to 40 steel bottles containing nuclear wash down liquid, and old shop equipment were reportedly buried.

Saufley's fire department conducted practice burns north of Runways 9 and 13. The exact details of the fire fighting drills are unknown. It is assumed that fire fighting drills were conducted while the airfield was in operation.

The pistol range is situated on a large clay hill approximately 100 feet in length, 30 feet wide and 20 feet high. Large amounts of spent bullets are scattered about the area and lodged in the hill. Many of the bullets are lead with some having steel jackets, and others having copper jackets.

During aerial operations between 1942 and 1977; NAAS Saufley had 14 underground and two above ground storage tanks in operation. The aerial refueling system consisted of six 25,000 gallon (tanks 814A-F), and one 15,000 gallon (tank 814) underground storage tanks (UST). Tanks 814A-F and 814 contained aviation gasoline and jet fuel (JP-4) respectively. These tanks were connected by over two miles of 10" and 8" diameter steel fuel lines to 52 refueling pits located on the aircraft parking platform.

During the PA investigation two off base environmental sources were discovered that could potentially contaminate base property. These threats may not fall under the IR program but samples should be taken to protect the base's property.

Source 1. Eleven Mile Creek was cited in a 1965 report (Musgrove et. al., 1965) as a disposal site for industrial waste. The creek is topographically lower than the fire fighter training area, the pistol range, and the reported burial ground near Perimeter Road. There are no reports that the Navy disposed of any waste in Eleven Mile Creek, and only a small section of the creek is on Navy property.

Source 2. A county landfill is situated just east of the eastern fence line and north of the main gate. The landfill is an old clay pit which was excavated approximately 40 feet below ground level. Reportedly, no hazardous waste is disposed of in the landfill, but it is possible that small quantities of hazardous waste from residential sources could migrate to Navy property. The bottom of the clay pit is below the local groundwater table so the pit may disrupt local groundwater flow. Regional groundwater flow in the area is towards

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1.0 INTRODUCTION.

Being on the federal docket requires that NETPMSA Saufley Field have a PA conducted following the guidelines listed in CERCLA.

NEESA was requested to prepare the PA and the Hazard Ranking System (HRS) II Scoring by the Engineering Field Division in Southern Division. A NEESA team visited NETPMSA Saufley Field from 9 to 19 July 1991 to collect information for the report. All data presented here are current as of those dates.

The report is composed of physical, historical, and site specific information. Information for the report has been collected from state agencies, base personnel, and texts.

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2.0 AUTHORITY AND SCOPE.

Section 211 of the Superfund Amendments and Reauthorization Act of 1986 (SARA 211) provides continued authority for the Department of Defense Environmental Restoration Program (DERP) and the Defense Environmental Restoration Account (DERA). The Navy Installation Restoration (IR) program is authorized by Chief of Naval Operations instruction (OPNAVINST) 5090.1 of Aug 1990. Naval Facilities Engineering Command (NAVFACENGCOM) manages the Navy program. NAVFACENGCOM tasked the Naval Energy and Environmental Support Activity (NEESA) to conduct a preliminary assessment (PA) for each Navy and Marine Corps facility listed on the Federal Facilities Hazardous Waste Compliance Docket as required by SARA 120.

PAs are conducted in accordance with the Guidance for Performing Preliminary Assessments Under CERCLA, U.S Environmental Protection Agency, September 1991; and recommendations are consistent with the National Contingency Plan.

The PA begins with investigation and review of available records at NEESA and the cognizant NAVFACENGCOM Engineering Field Division. After the record search, the PA team visits the activity to complete documentation of past and present operations and disposal practices. With the assistance of the activity point of contact, the team tours the activity and interviews long term employees. If a potential threat to human health or the environment is present, further action is recommended.

3.0 ACTIVITY DESCRIPTION

3.1 Activity Location. The Naval Educational and Training Program Management Support Activity (NETPMSA) Saufley Field, is located in northwest Florida. The base is between Highway 10 and Perdido Bay approximately five miles northwest of Pensacola (Figure 1). Saufley field consists of four airstrips, two of which are active. The base also has a small number of support buildings which are located south of the airfield (Figure 2). NETPMSA Saufley covers 866 acres of land, the majority of which is covered by the airstrips and wooded areas (Southern Division 1989).

3.2 Activity Mission and History. The U.S. Government purchased 866 acres of farmland in 1939 to develop the air field which was named after Richard C. Saufley, a pioneer in naval aviation. The Air Field opened in 1940 as Naval Auxiliary Air Station (NAAS) Saufley. NAAS Saufley was used to train U.S. and allied pilots during World War II and the Korean Conflict. In 1957, the mission at Saufley was changed to basic training for naval aviators. Figure 2 shows a general map of the base (Southern Division 1989).

NAAS Saufley was redesignated as Naval Air Station (NAS) in 1968 and retained that status until 1976 when NAS Saufley was disestablished and placed in caretaker status. Between 1976 and 1979 Saufley Field was used as an Outlying Landing Field (OLF) for NAS Whiting Field. In 1979 Saufley was reactivated as NETPMSA Saufley Field (Southern Division 1989).

Saufley is now used primarily to train and educate Naval personnel and to house federal prisoners. The Department of Immigration (DOI) utilizes a hangar to house patrol aircraft. NAS Whiting Field pilots use two of the airstrips for touch and go landing exercises.

3.3 Surrounding Area. Escambia County is Florida's westernmost county and lies between the State of Alabama to the west and Santa Rosa County. The State of Alabama also forms the northern boundaries of both counties, and is approximately 50 miles north of their southern limits at the Gulf of Mexico shoreline. Pensacola is the county seat of Escambia County and is the largest city in both land area and population as well as the leading industrial center for western Florida.

Commercial and industrial development is concentrated in downtown Pensacola, but strip commercial developments and outlying centers, generally at major highway intersections or in neighborhood service clusters, provide a dispersed pattern of retail commercial land uses.

The immediate area surrounding Saufley is characterized by sparsely populated residential structures. Estimated population within five

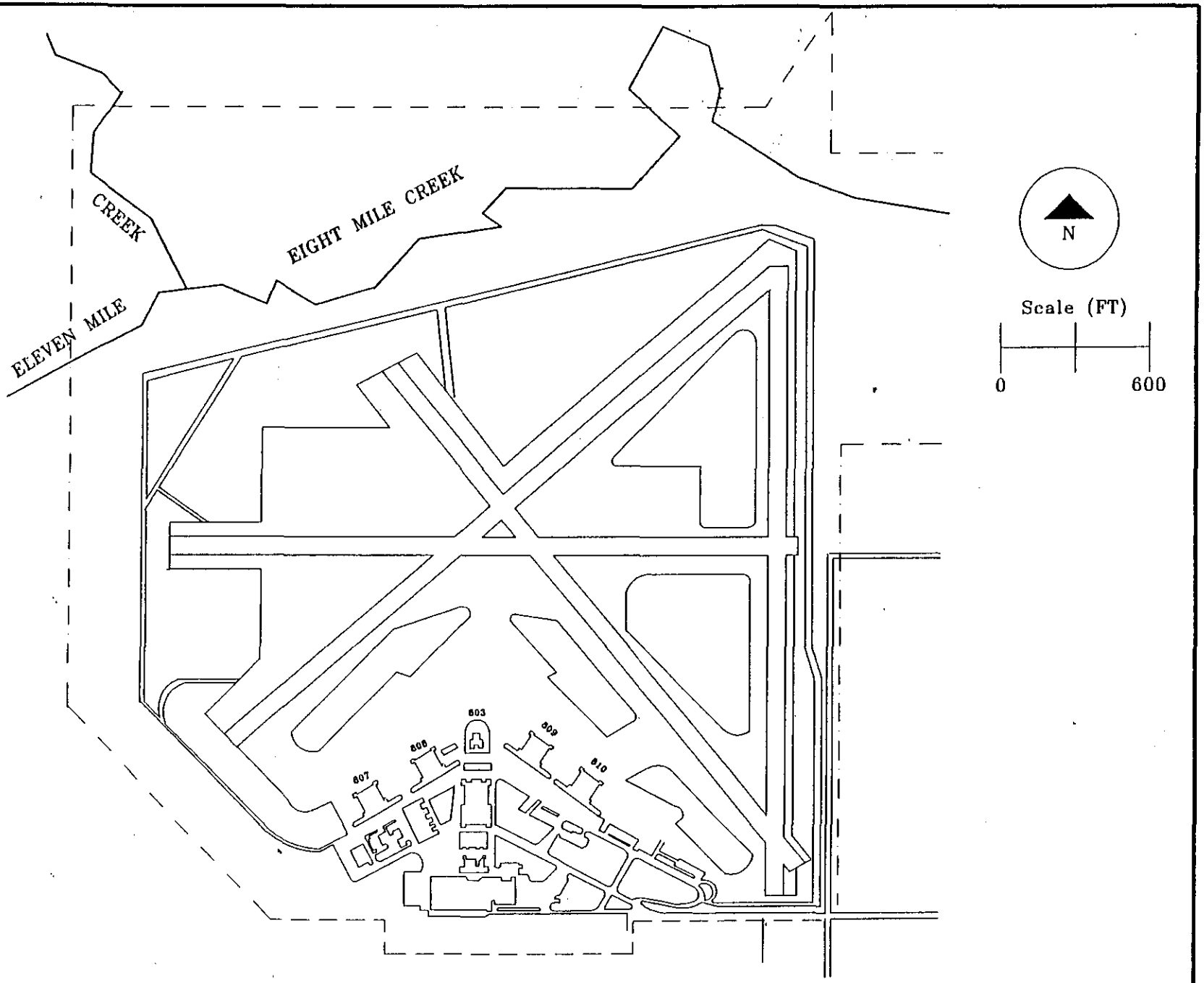

Figure 2
NETPMSA Saufley Field

Generalized Map of NETPMSA Saufley

- - - - - - Base Boundray

TABLE 1

Endangered and Threatened Species

Plants

Scientific Name	Common Name
Drosera intermedia	Water Sundew
Epigaea repens	Trailing Arbutus
Hexasstylis arifolia	Heartleaf
Kalmia latifolia	Mountain Laurel
Lilium iridollaej	Panhandle Lilly
Polygonella macrophylla	Large-Leaved Jointweed
Rhodoendron austrinum	Orange Azalea
Sarracenia luecophylla	White-Top Pitcher Plant
Sarracenia rubra	Red-Flowered Pithcer Plant
Stewatia malacodendron	Silky Camellia

Endangered Fish

Fundulus jenkinsi	Saltmarsh Topninnow

Amphibians and Reptiles

Alligator mississippiensis	American Alligator
Drymarchon corias coupperi	Eastern Indigo Snake
Gopherus polyphemus	Gopher Tortoise
Rana areolata aseopus	Florida Gopher Frog
Macroclemys temminki	Alligator Snapping Turtle

Mammals

Ursus americanus floridanus	Florida Black Bear

Birds

Dendroida dominica stoddardi	Stoddard's Yellow-throated Warbler
Egretta thula	Snowy Egret
Falco peregrinus tundrius	Artic Peregrine Falcon
Falco sparverius paulus	Southeastern Kestrel

The drainage basin of concern consists of a well-developed network of waterways which drains Escambia and Santa Rosa Counties (Figure 4). The Perdido River forms the Florida-Alabama border along the west margin of the Panhandle and flows southward into Perdido Bay. The Perdido River Basin consists of 925 square miles (236 in Escambia and Santa Rosa counties) (Musgrove et. al., 1965). Average flow from the basin is 1,120 million gallons per day (284 mgd from Escambia and Santa Rosa counties). Escambia River, the largest stream in the area, flows southward from Alabama on the north, dividing Escambia County from Santa Rosa County, and empties into Escambia Bay approximately 10 miles from NETPMSA Saufley Field. The Escambia River Basin consists of 4,233 square miles (410 in Escambia and Santa Rosa counties) of area (Musgrove et. al., 1965). Average flow from the basin is 4540 mgd (556 mgd from Escambia and Santa Rosa counties). Streams on the east side of the Escambia River (north of Molino) are relatively short with a random dendritic pattern. The streams on the west side (where Saufley Field is located) are many times longer and have fairly straight, parallel channels that trend southeastward, reminiscent of trellis drainage. Hundreds of small ponds dot Escambia and Santa Rosa counties. These ponds are apparently accumulations of rainwater held up by underlying clay or iron-cemented sandstone ("hardpan").

Approximate average annual runoff, in inches, from areas within Escambia and Santa Rosa counties is presented in Figure 5. Saufley Field is affected by two 100 - year flood plains which follow Eight Mile Creek and Eleven Mile Creek. The flood plains do not encroach upon the developed areas of the facility. These flood prone areas are illustrated in Figure 6 (Southern Division 1988). The flood plains do not encroach upon the developed areas of the facility.

The surface waters of Escambia and Santa Rosa counties are of excellent quality, except in the coastal reaches where tides bring salt water up the streams. The Escambia River coming out of Alabama brings water of higher mineral content (approximately 100 ppm). However, this mineralization is diluted somewhat by the lower minerals-content waters of the Florida tributaries (Musgrove et. al., 1965).

Only a small part of the surface water of the Escambia and Santa Rosa County areas are presently being used. Recreation, shipping, cooling, and waste disposal are the major uses at present (Musgrove et. al., 1965). These uses are nonconsumptive in that no water is permanently removed from the water body. Water used for cooling is removed from a stream and returned with only a slight rise in temperature. There are no known major consumptive uses within the area, and the full
potential of the surface waters is far from being realized.

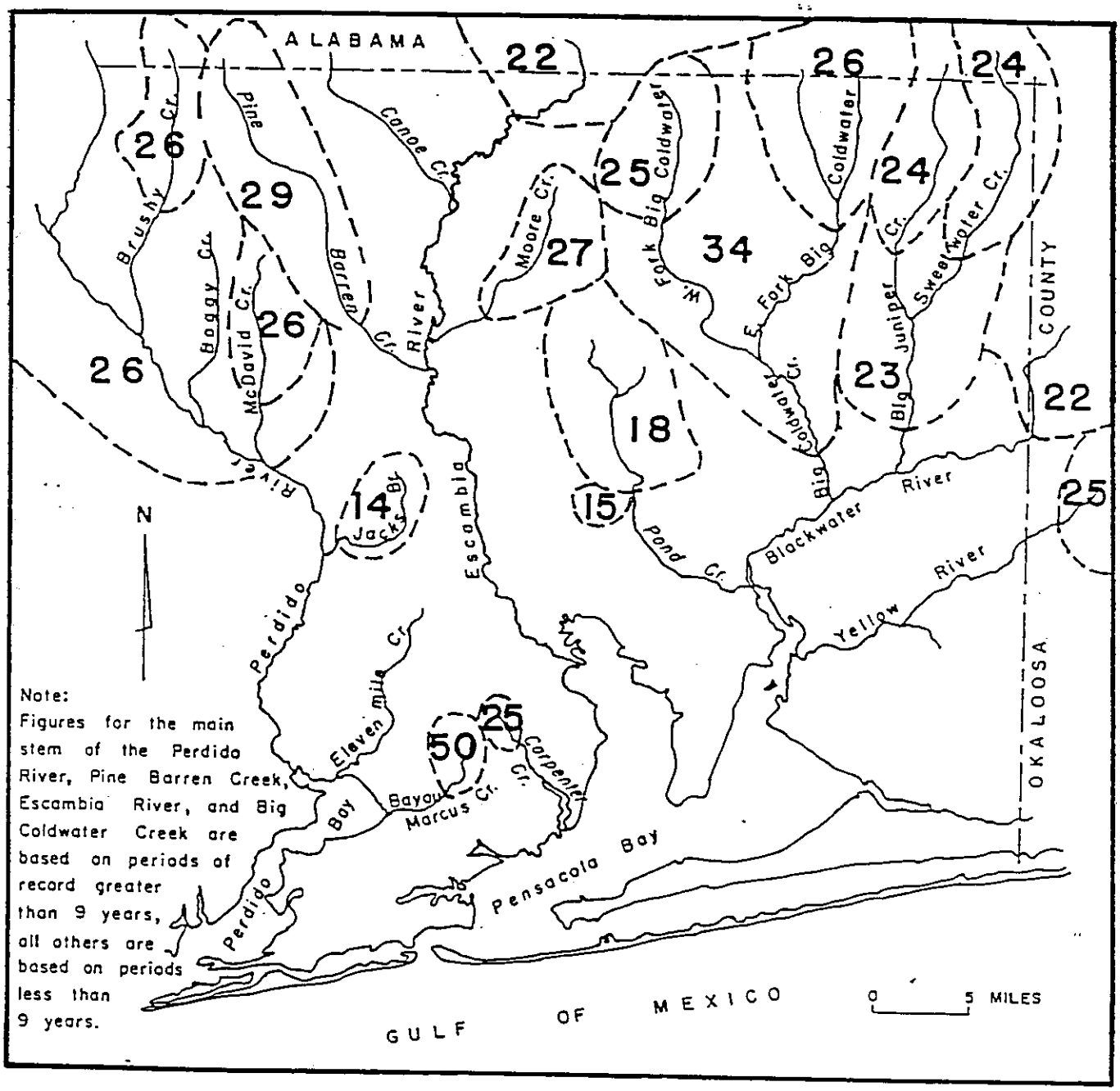

Figure 5
NETPMSA Saufley Field

Key: Approximate Average Annual Runoff (Inches) From Areas Within Escambia & Santa Rosa Counties (Modified After Musgrove 1965).

Most uses of surface water are within the southern half of the area. Principal among these are recreation and shipping. Eleven Mile Creek (which strattles the northwest corner of Saufley Field) has been used for disposal of industrial wastes (Musgrove et. al., 1965). No known drinking water uses of surface waters have been identified.

3.8 Soils. The majority of the following soil information was obtained from the 1960 U.S. Department of Agriculture soil survey of Escambia County, Florida. Figure 7 displays the soil configuration map as of 1960. Surface sediments in the Saufley Field area are classified with the Eustis; Fresh Water Swamp; Klej; Lakeland; Mixed Alluvial Land; Myatt; Norfolk; Pits, Dumps and Made Land; Plummer; Red Bay; and Rutlege associations.

Eustis loamy fine sand, level phase (Ea) has a 0 to 2 percent slope. This soil has a dark-brown to dark grayish-brown surface soil that grades to reddish-yellow loamy fine sand in the subsoil. Drainage is classified as somewhat excessive. The surface soil varies from 3 to 6 inches in thickness. Below a depth of 42 inches, and generally within a depth of 72 inches, the soil is underlain by materials of finer texture. The profile description is as follows:

- 0 to 4 inches - dark grayish-brown loamy fine sand; very friable; contains small amounts of organic matter; permeability of 10+ inches per hour; pH of 5.0 to 6.0.
- 4 to 12 inches - yellowish-brown loamy fine sand; very friable; permeability of 10+ inches per hour; pH of 5.0 to 6.0.
- 12 to 42 inches plus - reddish-yellow loamy fine sand; very friable; permeability of 10+ inches per hour; pH of 5.0 to 6.0.

Fresh water swamp (Fc) has a 0 to 1 percent slope and consists of naturally wooded areas, all of which are covered with water or are saturated throughout the year. The areas contain a mixture of soils and soil materials that vary in color, texture, composition, and thickness of layers. The soil material consists of stratified deposits recently washed from adjacent uplands and so intricately mixed that separation is not feasible. In many places, organic matter of varying thickness accumulates in the surface soil. Drainage is classified as very poor.

Klej loamy sand, level phase (Kc) has a 0 to 2 percent slope. The surface soil varies from dark gray to black in color and from 3 to 6 inches in thickness. Drainage is classified as somewhat poor. The subsoil layers range from brownish-yellow to yellow-brown loamy sands and contain various amounts of yellowish-red, strong brown, and yellow mottling. The profile description is as follows:

0 to 4 inches - very dark gray loamy sand; very friable; weak fine crumb structure; permeability of 5 to 10 inches per hour; pH of 4.5 to 5.5.
4 to 12 inches - dark grayish-brown loamy sand; very friable; weak crumb structure; permeability of 5 to 10 inches per hour; pH of 4.5 to 5.5.
12 to 28 inches - pale-yellow loamy sand faintly mottled with a few medium areas of olive yellow, brownish-yellow,and white; very friable; weak fine crumb structure; permeability of 10+ inches per hour; pH of 4.5 to 5.0.

Lakeland loamy fine sand, gently sloping phase (Lc) has a 5 to 8 percent slope. This soil has a grayish-brown surface soil that merges with the brownish-yellow loamy fine sand of the subsoil. Drainage is classified as somewhat excessive. The surface soil varies from dark grayish brown to brown in color and from 2 to 5 inches in thickness. This soil is underlain by materials of finer texture below 42 inches and, in most places, within 72 inches. The profile description is as follows:

0 to 4 inches - dark grayish-brown loamy fine sand; very friable; weak fine crumb structure; contains small amounts of organic matter; permeability of 10+ inches per hour; pH of 5.0 to 6.0.
4 to 16 inches - yellowish-brown loamy fine sand; very friable; weak fine crumb structure; permeability of 10+ inches per hour; pH of 5.0 to 6.0.
16 to 42 inches - brownish-yellow loamy fine sand; very friable; weak fine crumb structure; permeability of 10+ inches per hour; pH of 5.0.

Lakeland loamy sand, level phase (Le) has a 0 to 2 percent slope. This soil differs from the Lakeland loamy fine sand, gently sloping phase, primarily because it contains a greater amount of medium and course sand grains throughout the profile. Drainage is classified as somewhat excessive. The surface soil varies from dark grayish brown to brown in color and from 2 to 5 inches in thickness. The second layer may be yellowish-brown or brownish-yellow, and the rest of the profile is brownish-yellow. This soil contains materials of finer texture at depths between 42 and 73 inches.

Lakeland loamy sand, very gently sloping phase (Lf) has a 2 to 5 percent slope. The profile of this soil is similar to that of Lakeland loamy sand, level phase. Runoff is more rapid because of the slightly stronger slopes. Drainage is classified as somewhat excessive. Some areas are affected by sheet erosion and gully erosion.

Lakeland loamy sand, gently sloping phase (Lg) has a 5 to 8 percent slope. This soil has a profile similar to that of Lakeland loamy sand, level phase, but has stronger slopes. It is well drained to

permeability is 0.2 to 0.8 inches of water per hour; pH is 4.5 to 5.0.

Norfolk fine sandy loam, level phase (Na) has a 0 to 2 percent slope. The surface soil varies from very dark gray to grayish-brown in color and from 4 to 7 inches in thickness. Drainage is classified as good. The subsoil, ranging from yellow to brownish-yellow, is a friable fine sandy clay loam, and in most areas it has faint mottlings in the lower part. The profile description is as follows:

0 to 5 inches - grayish-brown fine sandy loam; friable; weak fine crumb structure; permeability of 2.5 to 5 inches of water per hour; pH is 5.0 to 5.5.
5 to 12 inches - yellowish-brown fine sandy loam; friable; weak fine crumb structure; permeability of 2.5 to 5 inches of water per hour; pH of 5.0 to 5.5.
12 to 18 inches - brownish-yellow fine sandy clay loam; friable; weak medium subangular blocky structure; permeability of 5 to 10 inches of water per hour; pH of 4.5 to 5.0.
18 to 32 inches - brownish-yellow fine sandy clay loam; friable; moderate medium subangular blocky structure; permeability of 5 to 10 inches of water per hour; pH of 4.5 to 5.0.
32 to 42 inches - brownish-yellow fine sandy clay loam with common, medium, faint mottles of reddish yellow in the lower part; friable; moderate medium subangular blocky structure; permeability of 5 to 10 inches of water per hour; pH of 4.5 to 5.0.

Pits, Dumps and Made Land (Pb) consists mostly of open excavations from which gravel has been removed, uneven areas of sand, waste materials that remain after the gravel is mined, and areas that man has filled in with several feet of materials. Slopes are variable.

Plummer loamy sand, very gently sloping phase (Pe) has a 2 to 5 percent slope. The surface soil varies from gray to very dark gray in color and from 4 to 7 inches in thickness. Drainage is classified as poor. The subsoil, ranging from a light gray to grayish-brown, is a loamy sand that, in many places, contains strong-brown and brownish-yellow mottles. Variations are common. The texture of the surface soil generally ranges from loamy fine sand to loamy sand, but in places is a light sandy loam. In some places materials of fine texture occur at shallow depths. The profile description is as follows:

0 to 4 inches - dark-gray loamy sand; very friable; weak fine crumb structure; permeability of 10+ inches of water per hour; pH of 4.5 to 5.5.
4 to 24 inches - gray loamy sand mottled with strong brown and light gray; very friable; weak fine crumb structure; permeability of 5 to 10 inches of water per hour; pH of 4.5 to 5.5.
24 to 42 inches - light-gray loamy sand mottled with strong

in North America. The formations which make up the landward side of the geosyncline are all wedge-shaped, thickening rapidly from the outcrop gulfward to the south.

More precisely, Saufley Field resides within the Coastal Lowlands topographic subdivision of the Coastal Plain which consists of relatively undissected, nearly level plains lying less than 100 feet above sea level (Marsh, 1966). It is situated along the north flank of the Mississippi Embayment, which accounts for the characteristic southwestward dip of Cretaceous and younger strata (Figure 8, Figure 9, Figure 10, and Figure 11).

Figure 12 describes the geologic sequence by a representative log of an oil test well near Pensacola. For the region of study, a thick sequence of sand, gravel, and clay extends from the surface to as much as 1,000 feet deep. Nearly all wells in this area tap permeable sediments within this sequence, collectively referred to as the Sand and Gravel Aquifer (Musgrove et. al., 1965). In the northern half of Escambia County, the Sand and Gravel Aquifer lies on the upper limestone of the Floridan Aquifer, but in the southern part (where Saufley Field resides), the two aquifers are separated by a thick clay unit of Miocene age, which serves to confine the water that is present in the upper limestone of the Floridan Aquifer (Figure 13). An extensive clay bed, the Bucatunna Clay Member of the Byram Formation, underlies the upper limestone of the Floridan Aquifer and forms an aquiclude throughout the area. The lower limestone of the Floridan Aquifer underlies the Bucatunna and rests upon relatively impermeable clay and shale. Within the area, no fresh-water aquifers occur below the lower limestone of the Floridan Aquifer.

Since more than 99 percent of ground water utilized for drinking and industrial purposes in the region is obtained from the Sand and Gravel Aquifer and it is separated from the Floridan Aquifer by a relatively impermeable clay, most of the remaining discussion will focus on the characteristics of this important reservoir. For a detailed discussion of Floridan Aquifer characteristics, see Musgrove et. al., 1965.

Parts of the Sand and Gravel Aquifer have a rather high average porosity and permeability and are thus excellent reservoirs for ground water. The aquifer primarily consists of relatively insoluble quartz grains which accounts for the low mineral content and softness of this water. The ground water conditions are complicated by great lithologic variability due to facies changes during deposition. Ground water is under artesian pressure where lenses and layers of clay, sandy clay, or hardpan overlie a saturated permeable bed. Ground water is under non-artesian conditions where such clays or hardpan are absent or where the porous media is not completely saturated. It is not uncommon for a well to tap both artesian and

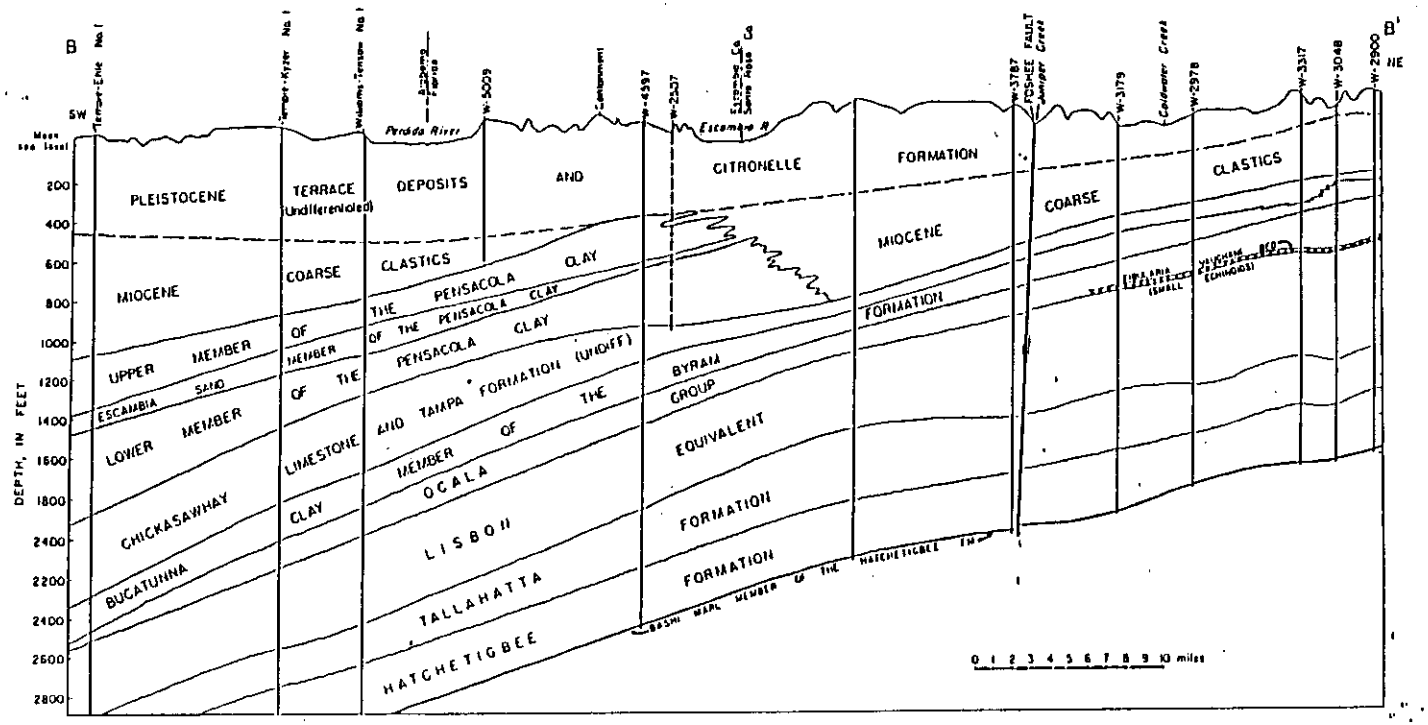

Figure 9
NETPMSA Saufley Field

Key: Geologic Cross Section B–B' Across Escambia and Santa Rosa Counties (Modified After Marsh 1966). Section Parallels the Regional Dip.

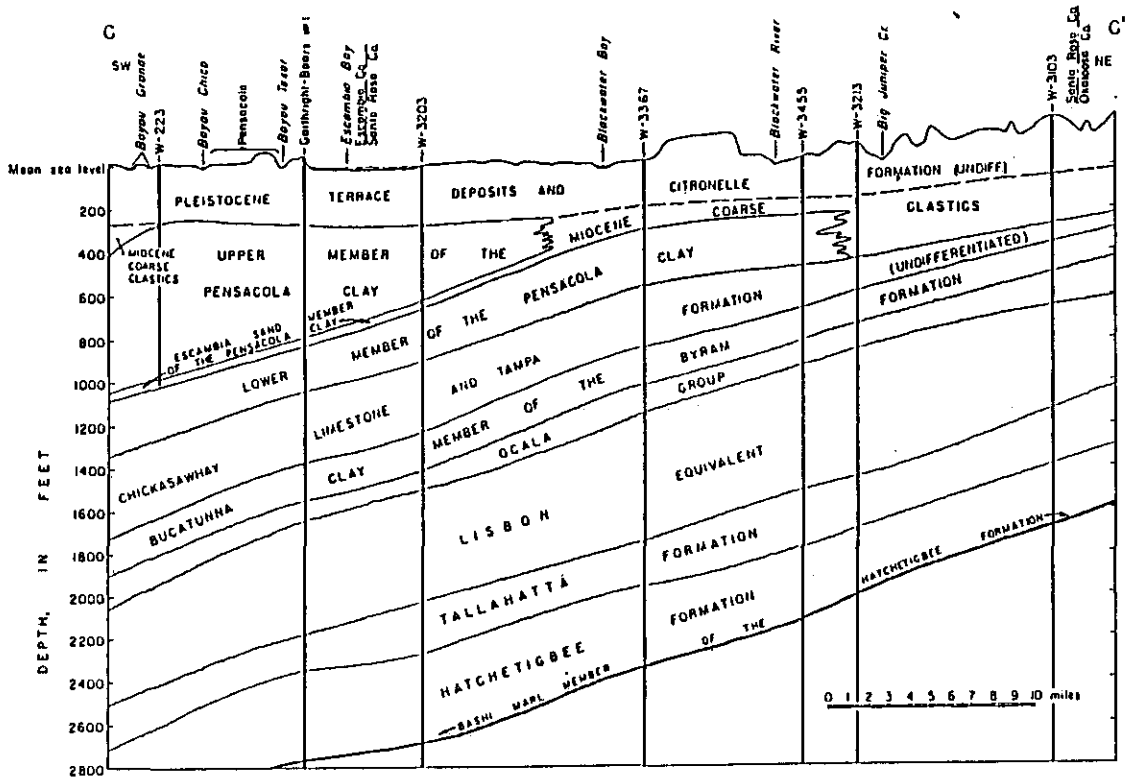

Figure 11
NETPMSA Saufley Field

Key: Geologic Section C–C' Across Escambia and Santa Rosa Counties (Modified After Marsh, 1966). Section is Parallel to Regional Dip.

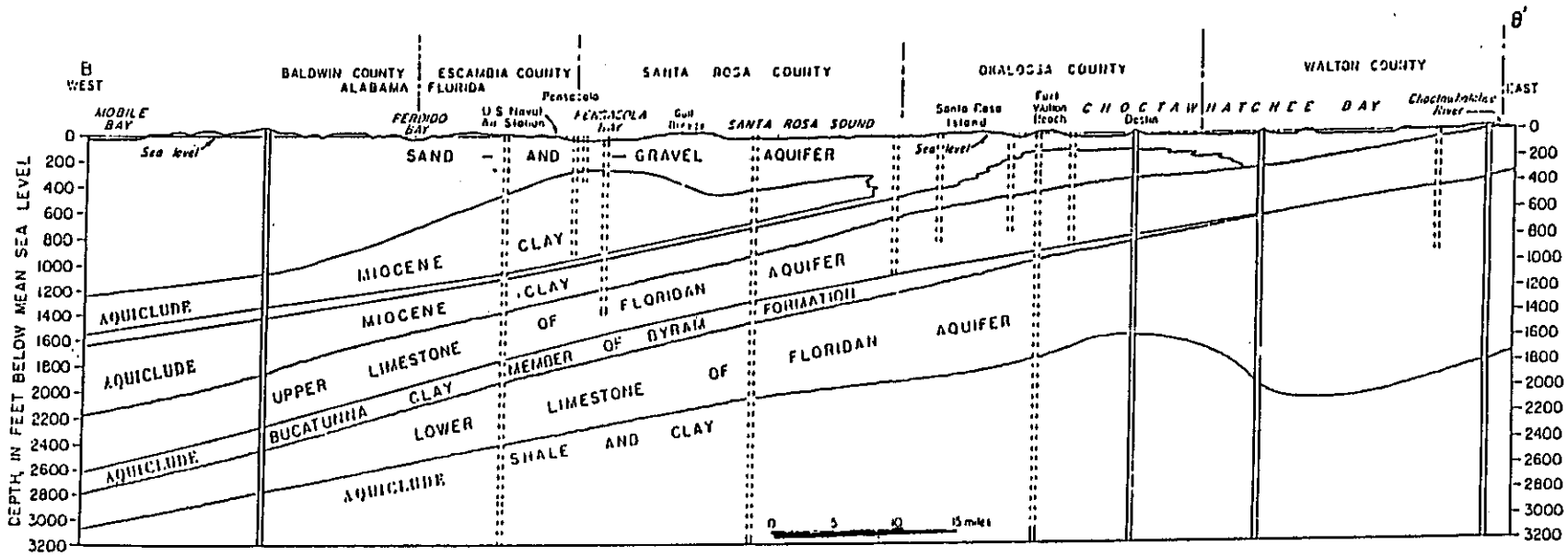

Figure 13
NETPMSA Saufley Field

Key: Geologic Section Across Escambia and Santa Rosa Counites Showing Aquifers & Aquicludes Along Section B–B' in figure 8 (Modified After Musgrove ET. AL., 1965).

12 to 36 ppm (Barraclough and Marsh, 1962). Water in this aquifer is exceptionally soft, generally containing 4 to 30 ppm of calcium and magnesium carbonates. The fluoride content of this water is usually less than 0.2 ppm. Iron content of water from this aquifer ranges from 0.06 to 4.9 ppm, although it is generally less than 0.25 ppm. Copious amounts of carbon dioxide render much of the water acidic. Some even contains hydrogen sulfide in solution. Carbon dioxide measurements in waters beneath NAS Pensacola have been as high as 100 mg/l (Trapp, 1972). However, elsewhere in the area, carbon dioxide concentrations are generally less than 30 mg/l. In Saufley Field ground water reserves, chloride is the major anion and is generally accompanied by a predominant sodium cation (Musgrove etc. al., 1965).

As of 1965, military operations used approximately 7 million gallons of ground water per day (mgd) in Escambia and Santa Rosa counties. NAS Pensacola had been using 5 mgd from 8 wells (200 to 250 feet deep) located at Corry Field. NAS Pensacola has 4 other wells on a standby basis. Saufley Field, Ellyson Field, Bronson Field, and Eglin Field used a total of 1 mgd.

Saufley Field presently has two active wells (#3 and #4) and one well used on a part time basis. Except for local pumping activities, ground water flow beneath Saufley Field is towards Perdido Bay in a southwest direction.

Specific aquifer parameters for Saufley Field had not been provided to the investigators by the time this report was generated. However, permeability tests and aquifer tests were performed at the Pioneer Sand site, 400 yards to the east of Saufley Field. Pioneer Sand core permeability tests based on grain size distribution measurements for a sample retrieved 80 to 82 feet below land surface indicate an average permeability of 3 x 10 (-7) cm/sec (FDER, 1985). Slug injection tests performed on the two production zones in question (one shallow and one deep) indicate transmissivities of 12,075 gpd/ft for the shallow zone (0 to 80 feet deep) and 3,570 gpd/ft for the deeper zone (greater than 85 feet deep). Calculations using Darcy's equation suggest that the velocity in the shallow producing zone is 1.69 ft/day to the south and 0.42 ft/day towards the west in the deeper producing zone.

Two distinct hydrogeologic units limit the leakage between the shallow and deep aquifer units (FDER, 1985). The first unit, immediately underlying the shallow aquifer, is described as a fine to medium grained clayey sand grading downward to a fine sandy clay ranging in thickness from 14 to 20 feet across the Pioneer Sand site. Immediately underlying this unit is a stiff plastic kaolinitic clay ranging in thickness from nearly non-existent to 8 feet. Permeability coefficients from laboratory triaxial tests of the lower clay unit (approximately 80 to 85 feet in depth) indicate flow rates to be in the order of 3.5 X 10 (-7)cm/sec. Some recharge appears to be taking place to the lower aquifer in the southeast corner of the Pioneer Sand site.

4.0 FINDINGS.

4.1 General Findings. A NEESA team visited NETPMSA Saufley Field from 9 to 19 July 1991 to collect information for the Preliminary Assessment (PA). All data presented here are current as of those dates.

A PA was conducted to determine whether there are any sources of potential contamination present at NETPMSA Saufley. During the PA site survey no confirmed sources of contamination were discovered. However several potential areas were identified.

4.2 Previous Hazardous Waste Generation, Storage, and Disposal.

Between 1942 and 1976 numerous types of solvents, oils, and fuels were used at Saufley to support air operations. By volume, more high octane aviation gasoline was used more than any other hazardous material. Used solvent and waste oils were the majority of hazardous wastes generated. Toluene, Carbon Tetrachloride, and Trichloroethane were just a few of the solvents used by maintenance personnel.

Pesticides and herbicides were used at numerous locations around the base. The amounts and types of pesticides and herbicides used are unknown.

Training aircraft required oil changes every 40 hours of flying time. Waste oils were placed in tanks 807B and 810B. The tanks were 2000 gallon waste oil tanks located at Hangar 807 and 810. The usage rates of fuels, oils, and solvents at Saufley are unknown. It is possible that waste solvents were also put in these tanks. When the tanks were full, waste oils were pumped out and transported off base or burned by the base fire department at the fire fighting training pit.

4.2.1 Fire Fighter Training Area. Saufley's fire department conducted practice burns north of the runways. The exact details of the fire fighting drills are unknown. It is assumed that fire fighting drills were conducted while the airfield was in operation. Most Naval fire departments conduct fire fighter training exercises once a month and burn between 300 and 1000 gallons of flammable liquids per exercise. The last exercise in the area was conducted approximately 15 years ago. Figure 14 shows the approximate location of the area.

4.3 Underground Storage Tanks.

4.3.1 Previous Underground Storage Tanks. During aerial operations between 1942 and 1977; NAAS Saufley had 14 underground and two above ground storage tanks in operation. The aerial refueling system consisted of six 25,000 gallon (tanks 814A-F), and one 15,000 gallon (tank 814) underground storage tank (UST). Tanks 814A-F, and 814 contained aviation gasoline and jet fuel (JP-4) respectively. These tanks

were connected by over two miles of 10" and 8" diameter steel fuel lines to 52 refueling pits located on the aircraft parking platform.

In late 1950, lightning ignited a row of refueling pits in front of Hangars 807 and 808. The resulting fire and explosion from the lightning reportedly caused minor damage to the refueling pits that were involved in the episode. It is not known whether any damage was done to the fuel lines connecting the pits.

The refueling pits were removed in early 1980. It is not known whether the underground piping associated with the fuel pits was removed as well.

In addition to the aircraft refueling system, the base utilized a number of UST. Most of the tanks were removed in late 1980. Visible contamination was removed by the contractor. Table 2 lists the size and contents of the storage tanks that have been removed.

Table 2
Tanks that have been removed at NETPMSA Saufley

Tank Number	Size Gallons	Contents
807-B	2000	Used Oil
807-C	1000	Kerosene
807-D	1000	Gasoline
819-B	2000	Used Oil
819-C	1000	Kerosene
819-D	1000	Gasoline
814	15000	Jet Fuel
814-A	25000	Aviation Gasoline
814-B	25000	Aviation Gasoline
814-C	25000	Aviation Gasoline
814-D	25000	Aviation Gasoline
814-E	25000	Aviation Gasoline
814-F	25000	Aviation Gasoline
828-A	10000	Gasoline
828-B	10000	Gasoline

OLF Saufley General Development Map
Southern Division

4.3.2 Current Underground Storage Tanks. Presently there are eight active fuel tanks located at NETPMSA Saufley. Five of the tanks are underground fuel tanks and three are above ground fuel tanks. Three underground fuel tanks and one waste oil steel UST are located at Building 2439, the Navy exchange gas station. One unleaded fuel tank is located at Building 2419, the government vehicle gas station.

Two abandoned underground tanks are located adjacent to the runways. There is no information available as to when these tanks were used and what they were used for.

The Department of Immigration operates a new above ground aviation gasoline tank located west of Hanger 807. Two large aboveground heating oil tanks are located behind the power plant, Building 804. All three above ground tanks have secondary containment walls.

4.4 Solid Waste Disposal. Personnel who worked at Saufley between 1942 and 1976 reported that all wastes, both hazardous and nonhazardous, generated by Saufley were disposed of at one of the local private landfills. There are three active landfills within one mile of the base.

Pioneer Sands, a superfund site which was a county landfill, is located approximately 400 yards from the base towards the east. Reportedly wastes from Saufley and other nearby Naval facilities were disposed of at Pioneer Sands. Consequently, Saufley was named as a Potentially Responsible Party (PRP) at Pioneer Sands. At present, the site has gone through the final stages of clean-up operations.

4.4.1 Burial of Metallic Objects. In early 1960, it was reported that 30 to 40 steel bottles containing nuclear wash down liquid were buried near the pistol range. The bottles were reportedly buried in a trench nine feet in depth and 60 feet in length. Also in this area there are reports that shop equipment may have been buried in late 1960 when the base was planned to be closed. Figure 14 shows the approximate location of the area.

In 1990, environmental personnel from NAS Pensacola surveyed the area with a magnetometer. The personnel were unable to locate any metallic objects. However, the scope and extent of their survey is unknown.

5.0 **AREA SPECIFIC INFORMATION**

5.1 Area 1, Burial of Metallic Objects

Northwest of Perimeter Road, between Runways 9 and 13, is the location where 30 to 40 steel bottles containing nuclear wash down liquid and old shop equipment were reportedly buried. Air photos from 1967 showed trees lining the southeast side of the road, so if materials were buried they would likely have been buried on the northwest side of the road, due to the fact that a bull dozer would not have been able to excavate without clearing the trees. Figure 14 shows the approximate location of the area.

The steel bottles were reportedly buried at an approximate depth of nine feet and in a trench about 60 feet in length. No information is known pertaining to the depth or amounts of shop equipment reportedly buried.

5.1.1 Potential Migration Pathways.

Surface Water Migration Pathways. Eight and Eleven Mile Creeks are located north of the facility, while Perdido Bay is located approximately 1000 yards to the west. Suspected hazardous wastes are buried below the surface, thus contamination via surface run-off would be unlikely.

Air Migration Pathway. Suspected hazardous wastes are located below the surface. It is not thought to pose a threat to the atmosphere.

Ground Water Migration Pathway. The suspected hazardous wastes located near Perimeter Road could possibly contain low levels of radioactive materials and petroleum waste products. If the hazardous materials escaped from the containment bottles then they could pose a threat to the local ground water.

5.1.2 Recommendations. Radiological Affairs Support Office (RASO) should be contacted to investigate the possible presence of radiological wastes. A geophysical survey should be conducted in the area to determine if and where metallic items may have been buried.

5.2 Area 2, Fire Fighter Training Area. The Fire Fighter Training area is located about 400 feet southwest of Runway 13. The fire fighter training area is a 60 foot diameter concrete pad surrounded by soil. The concrete pad and surrounding soil is charred. Figure 14 shows the approximate location of the area.

The exact details of the fire fighting drills are unknown. A typical burn by the Naval Crash Crew consisted of burning between 300 and 1000 gallons of flammable liquids per exercise. Burn exercises were typically conducted about once a month. The majority of flammable

5.3 AREA 3, Pistol Range. The pistol range is a clay hill about 100 feet in length, 30 feet wide, and 20 feet high. Large amounts of spent bullets are scattered about the pistol range and lodged in it. Many of the bullets are lead, some are lead with steel jackets, and others have copper jackets. The pistol range and all nearby soil is clay or clay and silt intermixed. It is not known whether the metals are leaching from the area. Figure 14 shows the approximate location of the area.

The pistol range is at an elevation of about 40 feet above sea level. Run-off from the pistol range would flow north into Eleven Mile Creek, located approximately 1000 feet to the north.

5.3.3 Potential Migration Pathways.

Surface Water Migration Pathways. Surface water run-off from the Pistol Range drains north towards Eleven Mile Creek. Heavy metals tend to bind to clay particles in sediments and are generally not very mobile. Erosion of top soil from the Pistol Range may allow small amounts of heavy metals to reach Eleven Mile Creek.

Air Migration Pathways. The pistol range is not believed to pose a threat to local air quality.

Ground Water Migration Pathways. Underlying ground water may discharge into the creeks north of the base and/or into Perdido Bay. There are no known potable water wells down gradient from the Pistol Range. Metals from the Range are not expected to migrate. Thus, the Pistol Range is not believed to be a threat to local ground water.

5.3 Recommendations. It is recommended that soil samples be gathered at six separate locations and analyzed for metals. Three samples could be taken at each location; one at the surface, one at two feet, and the third at five feet in depth.

The Naval Civil Engineering Laboratory (NCEL) at Port Hueneme, CA is developing a system to recycle and recover metals found at target ranges. Even if no contamination is found migrating from the Pistol Range, all spent bullets could be recycled. The soil could be washed to remove residual metals.

5.4 Area 4, Abandoned Fueling Facility and Area near Hangars.

Large amounts of fuels, solvents, oils, and aircraft cleaners were used at and around the four hangars and the fuel pits, as described in Section 4.2. Station personnel who worked at NAAS Saufley in 1940 through 1950 reported that aircraft parts were degreased with solvents both inside and outside the hangars. The hangars and aircraft parking areas are adjacent to grassy areas. Liquid materials spilled or placed on the concrete next to the hangars may have been washed

5.5 Possible off-site contamination. During the PA investigation, two off-base environmental sources were discovered that could potentially contaminate base property. These threats may not fall under the IR program but samples should be taken to protect the base's property.

Source 1. Eleven Mile Creek was cited in a 1965 report (Musgrove et. al., 1965) as a disposal site for industrial waste. The creek is topographically lower than the fire fighter training area, the pistol range, and the reported burial ground near Perimeter Road. There are no reports that the Navy disposed of any waste in Eleven Mile Creek, and only a small section of the creek is on Navy property.

Recommendations. Prior to any sampling, all literature on sampling or environmental studies on Eleven Mile Creek should be obtained. Sediment samples should be taken in Eleven Mile Creek to see if any contamination is migrating from or to Navy property. Samples should be taken where the creek first enters and leaves Navy property. Sediments should be analyzed for metals and semi-volatiles.

Source 2. A county landfill is situated just east of the eastern fence line and north of the main gate. The landfill is an old clay pit which was excavated approximately 40 feet below ground level. Reportedly, no hazardous waste is disposed of in the landfill, but it is possible that small quantities of hazardous waste from residential sources could migrate to Navy property. The bottom of the clay pit is below the local ground water table so the pit may disrupt local ground water flow. Regional ground water flow in the area is towards the west. The landfill could be a potential threat to potable water wells located at Saufley.

Recommendations. Ground water wells should be installed between the base and the landfill. This will help determine the groundwater gradients and detect for possible contamination migrating onto the Navy's property.

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APPENDIX

Population Densities for NETPMSA Saufley Field

Track	Population	Area(sq mile)	Density
27	6333	12	528
28	11806	7	1687
30	6849	5	1370
32.01	4751	9	528
32.02	4652	8.5	547
33.01	1883	4	471
33.02	6841	7	977
33.03	9657	10	966
36.03	8198	20	410

TOTAL: 60970 persons in a five mile radius of NETPMSA Saufley Field.

CALCULATIONS FOR THE POPULATION DENSITIES:

Area= R^2 (π) where, R= 5 miles.

Area=(5 miles)^2 (π)

Area=78.54 mile^2

Therefore, the population density for NETPMSA Saufley Field is:

Density= Population/Area

Density=60970 people/78.54 mile^2

Density=776.

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NAS PENSACOLA

"The Cradle of Naval Aviation"

HISTORY: Naval Air Station Pensacola is a Regional Navy command that consists of all property and services at NAS Pensacola, Saufley Field, Corry Station, Blue Angel Park and selected Quality of Life storefronts at NAS Whiting Field.

In 1825 Congress authorized the construction of a Naval Yard in Pensacola. The Yard became the world's first Naval Air Station in 1914 and became known as the "Cradle of Naval Aviation".

MISSION: The mission of NAS Pensacola is to provide superior training support and a quality environment to our tenants, military and civilian personnel and their families. Department of Defense related tenant commands number over 90 and include the Chief of Naval Education and Training, Commander Training Air Wing SIX, Naval Aviation Schools Command, Naval Air Technical Training Center (NATTC), Naval Operational Medical Institute, Navy Public Works Center and the Blue Angels located onboard NAS Pensacola. Naval Education and Training Professional Development and Training Center, Saufley Field and Center for Cryptology Corry Station are tenants not located onboard NAS Pensacola. Support is also provided to 27 non-defense related agencies located on Navy property including the National Park Service, U.S. Coast Guard Station, Barrancas National Cemetery (Veterans Administration), and the National Museum of Naval Aviation.

FACILITY: NAS Pensacola is located in Escambia County in the panhandle of Northwest Florida. The installation occupies 8,423 acres of land - 5,800 acres at the main installation (NAS), and 2,623 acres at other area locations including Corry Station, Saufley Field and Outlying Landing Field Bronson.

NAS Pensacola contains Forrest Sherman Field which consists of two parallel runways (7/25) 8002'x 200 and a single North/South runway 7,137' x 200'. Sherman Field is the home of VT-4, VT-10, VT-86, CTW-6 (flying Navy T-2, T-34, Air Force T-1 aircraft) Blue Angels NFDS, (flying F/A-18 Hornets) 2nd German Air Force Training Squadron and the NAS SAR detachment flying UH-3H aircraft. A total of 131 aircraft operate out of Forrest Sherman Field generating 110,000 flight operations each year. The NAS Pensacola FACSFAC controls over 18,000 square miles of airspace including W-155/ Eagle Zulu ATCAA and 23 IR/VR Low Level TR routes.

NAS Pensacola is also the home to a world-class ship pier facility capable of berthing all Navy and Coast Guard ships up to Forrestal Class size CV. NAS Pensacola Port Operations support Two Yard Patrol (YP) boats, and 17 other small boats and craft.

MILITARY/CIVILIAN EMPLOYEES: NAS Pensacola has a total military population of 16,100 with 5,000 Federal civilian employees and about 1,000 Non-appropriated federal (NAF) employees. Total military student annual flow includes over 25,000 Sailors and Marines each year through NATTC and Corry and 1,300 Officer Candidates through OCS.

ECONOMIC IMPACT: NAS Pensacola Region Current Plant Value, (CPV) is $1.91 billion and includes 1,585 buildings. Total economic impact including salaries and contracts was valued at $1.12 billion in 1998.

Marine Aviation Training Support Group (MATSG) - The MATSG–21 Pensacola, Florida, provides administrative support to assigned personnel in addition to other tasks as directed by the commandant. This support is directed primarily towards personnel in the Naval Air Training Command with support to seven ancillary activities. The core of the MATSG personnel is derived from 175 officer instructors and 550 student naval aviators/naval flight officers. While the MATSG mission is administrative in nature, the Command monitors the flow of students through the Naval Air Training Command, provides Marine Corps discipline and Marine Corps peculiar training.

Naval Education and Training Command (NETC) - The headquarters of NETC, one of the largest Navy shore commands, is located on board NAS Pensacola. The command is headed by a Vice Admiral who is the senior ranking officer in the area, reporting directly to the Chief of Naval Operations. NETC is responsible for training and education of all Navy and Marine Corps personnel worldwide. The training includes recruit, technical skill, precommissioning for officers, warfare specialty, on and off-duty education programs, and foreign students from many nations.

Naval Aviation Schools Command (NASC) prepares officer candidates for commissioned status and provides both indoctrination and ground training for all warfare designator student officers, officer candidates, aviation ordnance officers, aviation maintenance officer, and naval air crewman trainees. The school also provides specialized indoctrination programs for Limited Duty Officers and Chief Warrant Officers. This command's comprised of four schools: Officer Candidate School, Aviation Training School, Aviation Enlisted Air Crew Training School, and Officer Training School. The command is staffed by approximately 400 officer, enlisted and civilian employees who assist in the training of 13,000 students annually.

Training Air Wing SIX (TW-6) is headquartered at NAS Pensacola's Forrest Sherman Field. TRAWING SIX encompasses primary, intermediate, and advanced Naval Flight Officer, Air Force Navigator, and International Flight Officer training. The Wing's mission is to plan for, supervise, and support the quality training to fulfill the needs of the fleet and operational air forces. TRAWING SIX provides liaison between local operational units and NETC.

Naval Aerospace Medical Research Lab (NAMRL) is one of the premier research facilities for the causes and cures of disorientation sickness. The primary responsibility of the research laboratory is to conduct research, test and evaluate aviation medicine and allied sciences to enhance the health, safety, and readiness of Navy and Marine Corps personnel in the performance of their missions.

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Naval Operational Medical Institute (NOMI) provides professional and technical support and consultant services in operationally related fleet and Fleet Marine Force medical matters worldwide. NOMI is best known for its training programs which lead to designations as a Naval Flight Surgeon, Aerospace Physiologist, Aerospace Experimental Psychologist, Aerospace Medicine Technician, or Aerospace Physiologist Technician.

USAF 17th Training Squadron or Water Survival Training Unit is a joint service effort between the Navy and the Air Force to train air crew in survival techniques for an over-water ejection. The squadron is collocated with Navy Water Survival Training to enhance joint training and seek inherent economies.

Naval Air Technical Training Center (NATTC) is the newest tenant on board NAS Pensacola and relocated from NAS Memphis as part of BRAC 93 approved realignments. NATTC "Campus Complex" is located on the site of the former Naval Aviation Depot which was closed. The center has a staff of approximately 1,600 military and civilian personnel and graduates approximately 18,000 Navy, Marine Corps, and foreign students yearly. The largest part of this student body is comprised of enlisted personnel attending basic schools designed to provide them with the knowledge and skill levels required to perform as technicians at the junior level. Advanced schools provide higher level technical knowledge for senior petty officers.

The **U. S. Navy Flight Demonstration Squadron (Blue Angels)** performs at approximately 70 air shows at 40 locations throughout the United States and abroad. The mission of the Blue Angels is to enhance the Navy recruiting effort as they seek to attract talented and qualified youths to join them in the U.S. Navy and Marine Corps.

U.S. Coast Guard Station, Pensacola moved to NAS in 1987, having been part of Pensacola since 1885 but previously located on Santa Rosa Island. The station includes three Coast Guard Units: Station Pensacola, Aids to Navigation Team, and the Coast Guard Cutter Point Lobos. The facility is 12,000 square feet and employs 45 personnel.

National Museum of Naval Aviation is one of the largest air and space museums in the world, attracting more than half a million visitors annually. The museum houses more than 100 diverse authentic aircraft, including the NC-4 Flying Boat, the TBM Avenger, and Skylab Command Module, and the first F-14 Tomcat. The 130,000 square foot west wing showcases an authentic replica of a World War II independence class carrier island and flight deck. Newly completed construction includes an IMAX theatre in the new entrance.

Allegheny Pier was remodeled and the ship's channel and turning basin deepened to accommodate fleet carriers. The pier's upgraded facilities are appropriate to berth Nimitz class carriers as well as other combinations of naval vessels.

Naval Air Station Pensacola Community Involvement.

For more information visit **NAS Pensacola's** official website.

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NAVAL AIR STATION PENSACOLA

The photograph above shows the original airfield at NAS Pensacola, Chevalier Field, circa 1940's. The view is looking north, with the City of pensacola in the upper right. Note the large blimp hangar on the southeast portion of the field. The four hangars located along the southern edge of the field are still standing. The field itself is now the site of the Naval Air Technical Training Center (NATTC) and is fully populated by buildings.

The Pensacola area is truly the "Cradle of Naval Aviation". The site of the current Naval Air Station (NAS) Pensacola opened as the Navy's first flying school in 1913, only two years after the Navy purchased its first aircraft, the A1 Triad, from Glenn Curtis. The Navy's first presence at Pensacola was in the form of the Pensacola Navy Yard, established in 1826 and closed in 1911 after a devastating hurricane in 1906 followed by a severe Yellow Fever epidemic two years later. After two years of lying fallow, the old Navy Yard location was chosen as the site of the Navy's flying school. The location, lying on the shore of Pensacola Bay, was a nearly perfect fit to the Navy's needs, since early Naval Aviation was devoted almost entirely to seaplanes. The bayshore was lined with

seaplane ramps, some of which remain today. In 1917, in the middle of American involvement in World War I, the Pensacola site was officially designated as a Naval Air Station.

When the Navy's first aircraft carrier, USS Langley (CV1), was commissioned in 1922, the future of Naval Aviation as a sea-based air arm was well established. Training requirements shifted to include land-based aircraft, and an airfield was established and initially called Station Field. In addition, an auxiliary field was established north of Pensacola and later named Corry Field. In 1927, Corry Field was relocated to a site just north of the Naval Air Station, the current site of the Naval Technical Training Center, Corry Station, the Navy's electronic warfare training center.

Training slowed dramatically during the Great Depression, but in 1935 the Navy inaugurated its Aviation Cadet training program. To accommodate the increased training requirements, Station Field was enlarged, its runways paved, and the field itself renamed Chevalier Field in honor of LCDR Godfrey Chevalier, who lost his life in an aircraft accident. Chevalier Field had five asphalt runways, the longest of which was 3100 feet.

In 1938, federal legislation authorized a 3,000 aircraft ceiling for Naval Aviation, which in turn brought additional growth to The Pensacola Naval Air Station. Auxiliary airfields were added in and around Pensacola. Saufley Field was commissioned in 1940, and Ellyson Field in 1941. Three more auxiliary fields were added as the America entered World War II—Bronson and Barin Fields in 1942, and Whiting Field in 1943.

Various types of training took place in Pensacola during World War II in both land-planes and seaplanes. Seaplane instruction was conducted using PBY flying boats and OS2U, SC, and N3N floatplanes. Chevalier field hosted, among other activities, the flight instructor school, which boasted a complement of SNJ's, SNV's, N3N's, and N2S's, together with the Assembly and Repair Department. By this time, actual flight instruction was delivered at the auxiliary airfields. By the end of the war, over 28,000 Naval Aviators were designated by NAS Pensacola and its auxiliary airfields.

Following the war, NAS Pensacola was named the site of the Naval Air Basic Training Command. In 1955, a master jet airfield was opened on the western side of the vast NAS property. This airfield was named Forrest Sherman Field after the late Admiral Forrest P. Sherman, a former Chief of Naval Operations (CNO). Shortly thereafter the Blue Angels Flight Demonstration Team arrived, and it remains stationed there today. Chevalier Field remained opened because of the Overhaul and Repair Department located there.

Today, NAS Pensacola hosts the headquarters of the Chief of Naval Education and Training (CNET), a Vice Admiral responsible for all education and training throughout the Navy. In addition, the Naval Aerospace Research Laboratory and the Naval Aerospace Medical Institute are located there. Training continues there as well, with Training Air Wing Six located at Sherman Field, and the vast Naval Air Technical Training Center (NATTC) located on the former site of Chevalier Field, having moved into newly constructed facilities from its former site in Memphis in 1997.

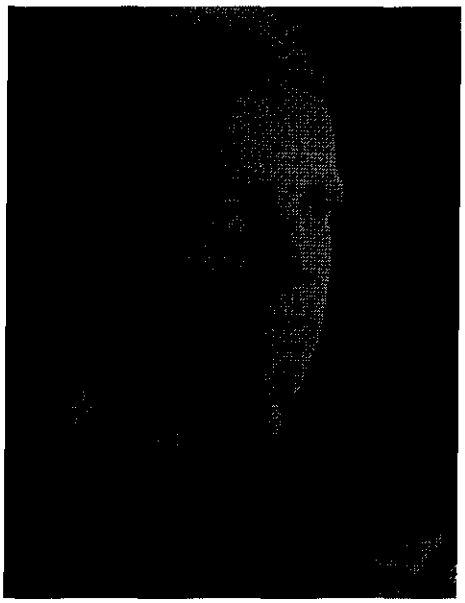
NAS Pensacola also is the site of the National Museum of Naval Aviation, one of the finest air museums in the world. The Barrancas National Cemetery is also located aboard the Air Station, and the National Park Service maintains several historic forts located there.

(Excerpted from *U.S. Naval Air Stations of World War II*, by M. L. Shettle, Jr.).

Click below to Return to the Enter Page.

NAS Pensacola

History



The site now occupied by Naval Air Station Pensacola has a colorful historical background dating back to the 16th century when Spanish explorer Don Tristan de Luna founded a colony here on the bluff where Fort Barrancas is now situated.

Realizing the advantages of the Pensacola harbor and the large timber reserves nearby for shipbuilding, President John Quincy Adams and Secretary of the Navy Samuel Southard, in 1825, made arrangements to build a Navy yard on the Southern tip of Escambia County, where the air station is today. Navy Captains William Bainbridge, Lewis Warrington, and James Biddle selected the site on Pensacola Bay.

Construction began in April 1826, and the Pensacola Navy Yard became one of the best equipped naval stations in the country. In its early years the base dealt mainly with the suppression of slave trade and piracy in the Gulf and Caribbean.

When New Orleans was captured by Union forces in 1862, Confederate troops, fearing attack from the west, retreated from the Navy Yard and reduced most of the facilities to rubble. After the war, the ruins at the yard were cleared away and work was begun to rebuild the base. Many of the present structures on the air station were built during this period, including the stately two and three-story houses on North Avenue. In 1906, many of these newly rebuilt structures were destroyed by a great hurricane and tidal wave.

Meanwhile, great strides were being made in aviation. The Wright Brothers and especially Glenn Curtiss were trying to prove to the Navy that the airplane had a place in the fleet. The first aircraft carrier was built in January 1911, and a few weeks later, the seaplane made its first appearance. Then, civilian pilot Eugene Ely landed a frail craft aboard USS Pennsylvania in San Francisco Bay, and the value of the airplane to the Navy had been demonstrated.

The Navy Dept., now awakened to the possibilities of Naval Aviation through the efforts of Capt. W. I. Chambers, prevailed upon congress to include in the Naval Appropriation Act enacted in 1911-12 a provision for aeronautical development. Chambers was ordered to devote all of his time to naval aviation.

In October 1913, Secretary of the Navy, Josephus Daniels, appointed a board, with Capt. Chambers as chairman, to make a survey of aeronautical needs and to establish a policy to guide future development. One of the board's most important recommendations was the establishment of an aviation training station in Pensacola.

Upon entry into World War I, Pensacola, still the only naval air station, had 38 naval aviators, 163 enlisted men trained in aviation, and 54 airplanes. Two years later, by the signing of the armistice in November 1918, the air station, with 438 officers and 5538 enlisted men, had trained 1,000 naval aviators. At war's end, seaplanes, dirigibles, and free kite balloons were housed in steel and wooden hangars stretching a mile down the air station beach.

In the years following World War I, aviation training slowed down. From the 12-month flight course, an average of 100 pliots were graduating yearly. This was before the day of aviation cadets, and the majority of the students included in the flight training program were Annapolis graduates. A few enlisted men also graduated. Thus, Naval Air Station Pensacola became known as the "Annapolis of the Air."

With the inaugration of 1935 of the cadet training program, activity at Pensacola again expanded. When Pensacola's training facilities could no longer accomodate the ever increasing number of cadets accepted by the Navy, two more naval air stations were created - one in Jacksonville, Florida, and the other in Corpus Christi, Texas. In August 1940, a larger auxiliary base, Saufley Field, named for LT R. C. Saufley, Naval Aviator 14, was added to Pensacola's activities. In October 1941, a third field, named after LT T.G. Allicin, was commissioned.

As the nations of the world moved toward World War II, NAS Pensacola once again became the hub of air training activities. NAS expanded again, training 1,100 cadets a month, 11 times the amount trained annually in the '20s. The growth of NAS from 10 tents to the world's greatest naval aviation center was emphasized by then Senator Owen Brewster's statement:: "The growth of naval aviation during World War II is one of the wonders of the modern world."

War in Korea presented problems as the military was caught in the midst of transition from propellers to jets, and the air station revised its courses and training techniques. Nonetheless, NAS produced 6,000 aviators from 1950 to 1953.

Pilot training requirements shifted upward to meet the demands for the Vietnam War which occupied much of the 1960s and 1970s. Pilot production was as high as 2,552 (1968) and as low as 1,413 (1962).

In 1971, NAS was picked as the headquarters site for CNET, a new command which combined direction and control of all Navy education and training. The Naval Air Basic Training Command was absorbed by the Naval Air Training Command, which moved to Corpus Christi.

Today, the Pensacola Naval Complex in Escambia and Santa Rosa counties employs more than 16,000 military and 7,400 civilian personnel.

supports squadrons having mining missions and capability. Basic characteristics of the range are:

(1) Airspace restricted area over water and generally parallel to an adjacent irregular coastline with readily identifiable landmarks, with a coincident water impact area —3 by 8 miles.

(2) Control tower and spotting huts to provide accurate rake information on mine drops from either high or low altitude (400 to 40,000 ft.).

(3) Two-way air-ground communications.

(4) Adequate shelter for target crews.

(5) Pinpoint water targets, if desired.

The required space is necessary both for training in area mining, including pattern drops by aircraft flying in formation, and to encompass the maneuvers of patrol-type aircraft prior to and following the release of mines. Refer to Code 179 20, NAVAER 00-100-503 (Conf), for technical planning information on ranges, and to NAVAER 00-100-502, *Vol. I, Air Contour Maps,* for airspace utilization requirements. Refer to dwg. SE 179 20.5-1, NAVAER 00-100-505, for range layout and target criteria.

Reference:

OPNAV Letter, 30 October 1956, Serial 0413850, *Naval Air Bombing and Gunnery Targets/Areas.*

179 40.1 SMALL-ARMS RANGE

a. PURPOSE AND FUNCTION. A small arms range is an area, either indoor or outdoor, for practice firing of small arms, particularly the .38 or .45 caliber pistol and the .22 and .30 caliber rifles.

b. REQUIREMENTS. The use of year-round range facilities is required to provide effective defense and security of Navy and Marine Corps air stations, to meet and maintain proficiency requirements in marksmanship, to encourage small-arms competitive matches (a phase of the training program), to provide a recreational activity for military and civilian personnel, and to assist the small-arms training program of community police and National Guard Forces. Determination of the need for programming a small-arms range at a particular shore establishment depends principally on the judgment of the station commander, as supported by the District Commandant. Other military or civilian ranges in the vicinity should be investigated and considered before programming new ranges. These should be utilized if satisfactory firing schedules can be arranged and it is more economically feasible (considering transportation costs, loss of man-hours and rental charges, if any) to use them than to construct new ones. Existing Navy instructions and training schedule requirements, the number of Naval and Emergency Ground Defense Force units, the size of the security detachment and the mission and size of the station are all contributing factors in determining the number of firing points required at each station. The policy of the Navy is to encourage small-arms marksmanship, and pursuant to this policy a billet has been established for one small-arms instructor in each of the naval districts and river commands and at NAS Pensacola, NAS Memphis, NAS Jacksonville, and NAS Corpus Christi. The purpose of these billets is to provide the above commands with expert advice and assistance on small-arm training programs, range technique and equipment, ar competitive matches. After it has been determined th: there are no existing ranges in the vicinity that can b utilized by station forces, the following data can b employed as a guide to determine the number of firin points required.

Indoor ranges	*Installation military strength*	*No. of firin points*
Type A	Up to 2,000	6
Type B	3,500	10
Type C	5,000	13
Type D	7,000	15

Outdoor ranges	*Installation military strength*	*No. of firin points*
Type A	Up to 2,000	6
Type B	3,500	12
Type C	5,000	16
Type D	7,000	20

Outdoor ranges will normally be programmed for Navy and Marine Corps air installations except where inclement weather conditions predominate. Refer to dwgs. SE 179 40.1-1 and SE 179 40.1-2, NAVAER 00-100-505, for design criteria and layout, including the safety requirements of indoor and outdoor ranges.

References:

BUDOCKS TP-PW-7, 15 March 1954, *Training Facilities.*

OPNAVINST 8370.2, 28 January 1954, *Small Arms Allowances for Continental U. S. Naval Stations.*

OPNAVINST 8011.3, 28 February 1955, *Weapons and Ammunition for Civilian Guards.*

OPNAVINST 3573.7A, 3 December 1956, *Rifle and Pistol Marksmanship Training.*

179 40.2 SKEET RANGE

a. PURPOSE AND FUNCTION. A shotgun and skeet range is an outdoor practice facility to train military personnel in the principles of leading, timing, and firing on flying targets. In addition to providing sighting proficiency, it may also serve off-duty recreation purposes.

b. REQUIREMENTS. Air installations conducting operational pilot training may be authorized one shotgun and skeet range. The minimum facility consists of two trap houses and five individual firing stations or positions, ammunition, and a service shed or locker. The range should have a danger zone of fire of 900-ft. radius from the shooting field. The facility will also include a control shelter and storage place for clay pigeons. The trap houses are known as the high and low towers. The structures are normally wood-frame construction. Refer to dwg. SE 179 40.2-1, NAVAER 00-100-505, for criteria for the development of a shotgun and skeet range.

179 60 PARADE AND DRILL FIELD

a. PURPOSE AND FUNCTION. A parade and drill field may be either a turf or paved surfaced area for the purpose of formation drills, parade and review functions,

U.S. Census Bureau
American FactFinder

FACT SHEET

Escambia County, Florida

View a Fact Sheet for a **race, ethnic, or ancestry group**

Census 2000 Demographic Profile Highlights:

General Characteristics - show more >>	Number	Percent	U.S.		
Total population	294,410			map	brief
Male	146,183	49.7	49.1%	map	brief
Female	148,227	50.3	50.9%	map	brief
Median age (years)	35.4	(X)	35.3	map	brief
Under 5 years	17,913	6.1	6.8%	map	
18 years and over	225,139	76.5	74.3%		
65 years and over	39,169	13.3	12.4%	map	brief
One race	288,042	97.8	97.6%		
White	213,008	72.4	75.1%	map	brief
Black or African American	63,010	21.4	12.3%	map	brief
American Indian and Alaska Native	2,660	0.9	0.9%	map	brief
Asian	6,519	2.2	3.6%	map	brief
Native Hawaiian and Other Pacific Islander	339	0.1	0.1%	map	brief
Some other race	2,506	0.9	5.5%	map	
Two or more races	6,368	2.2	2.4%	map	brief
Hispanic or Latino (of any race)	7,935	2.7	12.5%	map	brief
Household population	272,444	92.5	97.2%	map	brief
Group quarters population	21,966	7.5	2.8%	map	
Average household size	2.45	(X)	2.59	map	brief
Average family size	2.98	(X)	3.14	map	
Total housing units	124,647			map	
Occupied housing units	111,049	89.1	91.0%		brief
Owner-occupied housing units	74,687	67.3	66.2%	map	
Renter-occupied housing units	36,362	32.7	33.8%	map	brief
Vacant housing units	13,598	10.9	9.0%	map	

Social Characteristics - show more >>	Number	Percent	U.S.		
Population 25 years and over	189,710				
High school graduate or higher	155,668	82.1	80.4%	map	brief
Bachelor's degree or higher	39,789	21.0	24.4%	map	
Civilian veterans (civilian population 18 years and over)	47,559	22.2	12.7%	map	brief
Disability status (population 5 years and over)	57,340	22.5	19.3%	map	brief
Foreign born	10,821	3.7	11.1%	map	brief
Male, Now married, except separated (population 15 years and over)	60,656	51.9	56.7%		brief
Female, Now married, except separated (population 15 years and over)	57,744	48.1	52.1%		brief
Speak a language other than English at home (population 5 years and over)	18,833	6.8	17.9%	map	brief

Economic Characteristics - show more >>	Number	Percent	U.S.		
In labor force (population 16 years and over)	139,584	59.9	63.9%		brief
Mean travel time to work in minutes (workers 16 years and over)	23.0	(X)	25.5	map	brief
Median household income in 1999 (dollars)	35,234	(X)	41,994	map	
Median family income in 1999 (dollars)	41,708	(X)	50,046	map	
Per capita income in 1999 (dollars)	18,641	(X)	21,587	map	
Families below poverty level	9,021	12.1	9.2%	map	brief
Individuals below poverty level	41,978	15.4	12.4%	map	

Housing Characteristics - show more >>	Number	Percent	U.S.

Single-family owner-occupied homes	63,397				brief
Median value (dollars)	85,700	(X)	119,600	map	brief
Median of selected monthly owner costs	(X)	(X)			brief
With a mortgage (dollars)	811	(X)	1,088	map	
Not mortgaged (dollars)	244	(X)	295		

(X) Not applicable.
Source: U.S. Census Bureau, Summary File 1 (SF 1) and Summary File 3 (SF 3)

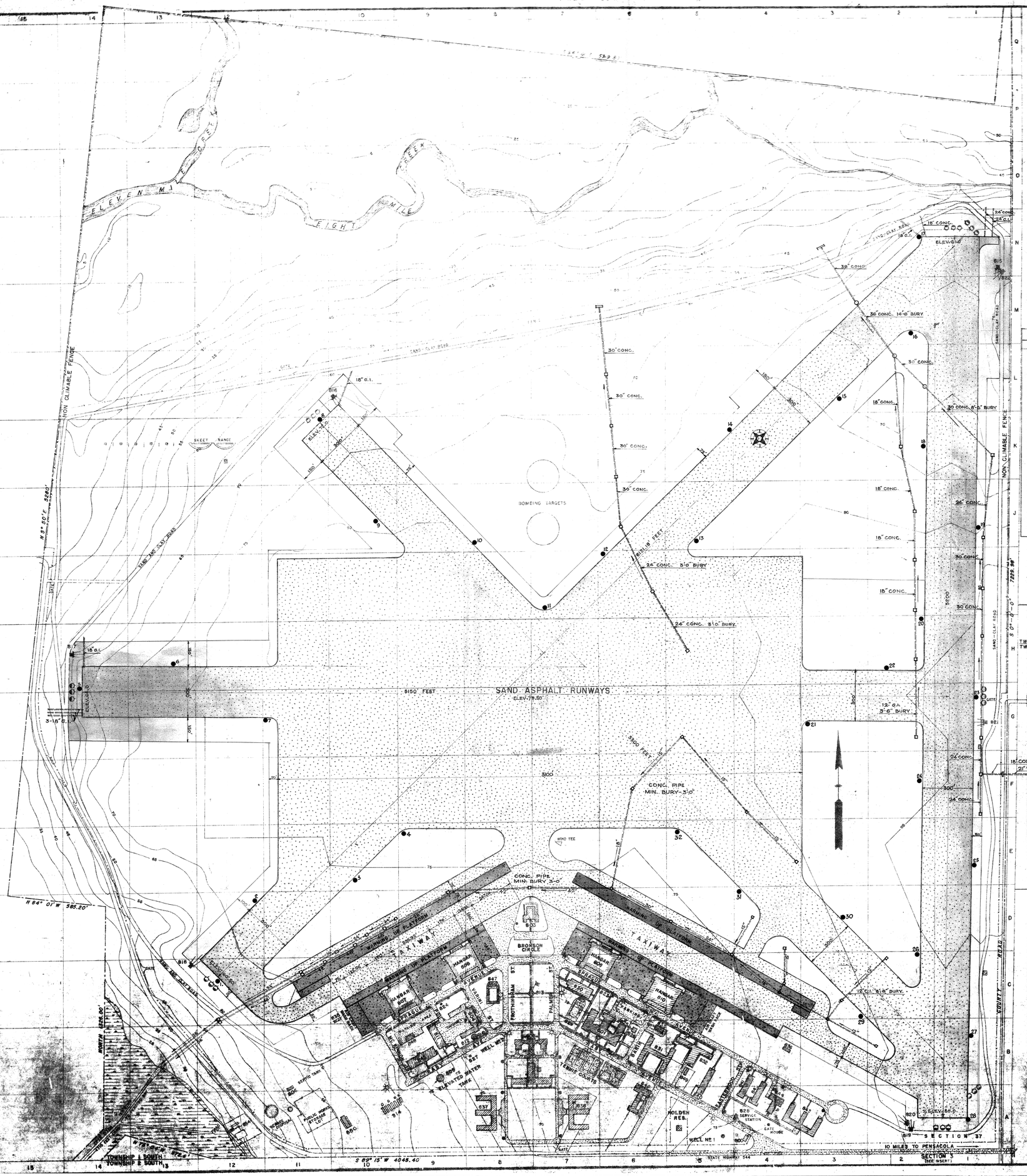
The letters PDF or symbol indicate a document is in the Portable Document Format (PDF). To view the file you will need the Adobe® Acrobat® Reader, which is available for **free** from the Adobe web site.

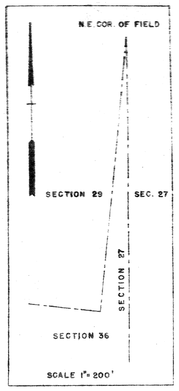
Appendix C: Project Source Data – Site Specific

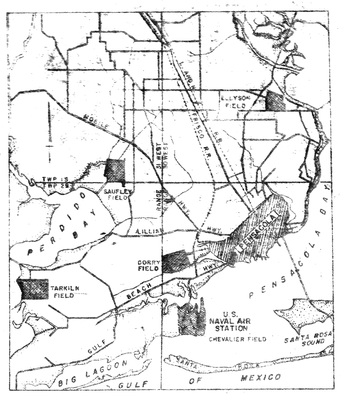
(SOURCE DATA PROVIDED ON COMPACT DISC)

Appendix C-1: Saufley Field Skeet Range

1243



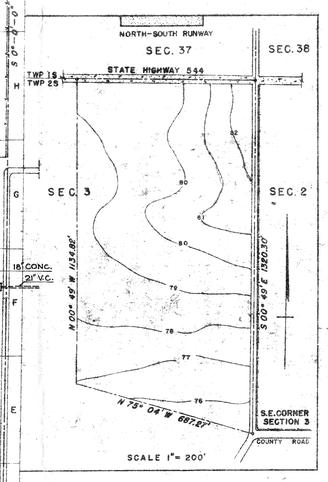




LOCATION PLAN
SCALE 1" = 3 MILES

STRUCTURES

NO	LOC'N	DEPT.	USE	NO	LOC'N	DEPT.	USE
800	A-4	MB	GATE HOUSE	826	B-6	XP	WASH HOUSE
801	B-6	XP.SC	BARRACKS AND MESS HALL	827	B-8	T	MAGAZINE (PYROTECHNIC)
802	B-8	XA	RECREATION BUILDING	828	A-4	SA	AUTOMOBILE SERVICE STATION
803	D-8	T	ADMINISTRATION BUILDING	829	C-7	XA.P	TRAINING TANK AND FILTER HOUSE
804	C-8	P	INDUSTRIAL BUILDING	830	C-7	XA	GYMNASIUM BUILDING
804A	C-8	P	CHIMNEY FOR INDUSTRIAL BUILDING	831	B-6	XP	BARRACKS BUILDING (400 MEN)
805	B-9	P	150,000 GAL. ELEVATED WATER TANK	832	B-5	SC	SUBSISTENCE BUILDING
806	B-11	P	SEPTIC TANK	833	B-6	XE	CLOTHING AND SMALL STORES STORAGE BUILDING.
807	C-9	T	LANDPLANE HANGAR	834	A-12	P	PUMP HOUSE (SEWAGE DISPOSAL PLANT)
808	C-9	T	LANDPLANE HANGAR	814A	A-10	S.A.	UND. GROUND GASO. STORAGE TANK (15,000 GALS.)
809	C-7	T	LANDPLANE HANGAR	814B	A-10	S.A.	UND. GROUND GASO. STORAGE TANK (25,000 GALS.)
810	C-6	T	LANDPLANE HANGAR	814C	A-10	S.A.	UND. GROUND GASO. STORAGE TANK (25,000 GALS.)
811	B-9	P	STORE HOUSE AND PUBLIC WORKS SHOP	814D	A-10	S.A.	UND. GROUND GASO. STORAGE TANK (25,000 GALS.)
812	B-8	P	50,000 GAL. CONC. SERVICE RESERVOIR	814E	A-10	S.A.	UND. GROUND GASO. STORAGE TANK (25,000 GALS.)
813	C-8	P	FLAG POLE	814F	A-10	S.A.	UND. GROUND GASO. STORAGE TANK (25,000 GALS.)
814	A-10	SA	7 GASOLINE STORAGE TANKS (TOTAL 165,000 GALS)	814G	A-10	S.A.	UND. GROUND GASO. STORAGE TANK (25,000 GALS.)
815	N-1	T	FLOODLIGHT GROUP AND VAULT NO.1	835	C-10	T	CREW SHELTER (WEST)
816	L-10	T	FLOODLIGHT GROUP AND VAULT NO.2	836	B-4	T	CREWS SHELTER (EAST)
817	H-14	T	FLOODLIGHT GROUP AND VAULT NO.3	837	A-8	T	CADET OFFICERS QUARTERS (320 MEN)
818	C-13	T	FLOODLIGHT GROUP AND VAULT NO.4	838	A-7	T	CADET OFFICERS QUARTERS (320 MEN)
819	A-2	T	FLOODLIGHT GROUP AND VAULT NO.5	839	B-8	SC	SUBSISTENCE BUILDING
820	A-2	T	FLOODLIGHT GROUP AND VAULT NO.6	840	B-5	XP	ENLISTED MENS BARRACKS
821	G-1	T	FLOODLIGHT GROUP AND VAULT NO.7	841	B-4	XBQ	SENIOR BACHELOR OFFICERS QUARTERS (40 MEN)
822	N-1	T	FLOODLIGHT GROUP AND VAULT NO.8	842	A-4	XBQ	JUNIOR BACHELOR OFFICERS QUARTERS (60 MEN)
823	C-6	P	HOSE REEL HOUSE NO.1	843	A-3	XBQ	BACHELOR OFFICERS QUARTERS (130 MEN)
824	C-9	P	HOSE REEL HOUSE NO.2	844	A-4	XBQ	BACHELOR OFFICERS SUBSISTENCE UNIT (114 MEN)
825	B-6	SC	GARBAGE HOUSE	845	B-9	T	GROUND SCHOOL BUILDING
				846	A-6	M	MEDICAL BUILDING (20 BEDS)
				847	C-8	XA.P	TRAINING TANK AND FILTER HOUSE
				848	B-9	P	GARAGE
				849	B-5	P	STERILIZATION HOUSE
				850	A-10	XSE	DOG KENNEL



LEGEND

- BOUNDARY LINE
- FENCE LINE
- BUILDINGS
- CONCRETE PAVING
- BITUMINOUS SURFACE
- SAND ASPHALT
- SAND CLAY ROADS
- RAILROADS
- FIRE HYDRANT
- TRANSFORMER VAULT
- LOW MARSHY GROUND
- DRAINAGE DITCH
- TOWNSHIP LINE
- INDICATES WORK UNDER CONSTRUCTION
- RANGE LIGHT GROUP
- FLOOD LIGHTS AND TRANSFORMER VAULT

NOTES

COORDINATE LINES 400 FEET EACH WAY.
TOTAL AREA OF RESERVATION 867.61 ACRES.

CONTOUR INTERVALS AS SHOWN.
ELEVATIONS BASED ON U.S.G.S. AND N.A.S. DATUM
EAST SIDE OF FIELD ASSUMED DUE NORTH FOR COMPUTATION OF BEARINGS.
DECLINATION 5°-10' EAST.

LEGEND

- CONCRETE
- BITUMINOUS
- SPRIGGED GRASS AREAS
- NATURAL GRASS AREAS
- 52 BORINGS AND ITS NUMBER

STAR INDICATES RUNWAY MOSTLY USED

SCALE IN FEET
0 100 200 400 600 800 1000
1 INCH = 200 FEET

RG71, Bu Yds + Dks
800-3-421

EXHIBIT "A"

MAP OF SAUFLEY FIELD

NAVAL AUXILIARY AIR STATION PENSACOLA, FLA.

SHOWING CONDITIONS ON
JUNE 30 1943

REVISED AND RESUBMITTED DEC., 1943

RESTRICTED
FOR OFFICIAL USE ONLY

CAPTAIN S.E.C. U.S.N.
PUBLIC WORKS OFFICER

N.A.S. DWG. NO. 2104

RESTRICTED

RESTRICTED

H I S T O R Y

NAVAL AIR TRAINING BASES GUNNERY DEPARTMENT

A Division of
ADMINISTRATIVE STAFF
of the

NAVAL AIR TRAINING BASES, Pensacola, Florida

Period Covered: 7 December 1941 to 1 November 1944

HISTORY
NAVAL AIR TRAINING BASES
PENSACOLA, FLORIDA
VOLUME 2 PART 5

NOT TO BE RELEASED FOR PUBLICATION.
PREPARED FOR OP-38-46.

Source: Naval Historical Center
Aviation History Branch
Naval Yard, Washington
WASHINGTON DC

Pensacola NAS, Gunnery Pt. 5
Box 262
1941-52

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RESTRICTED

RESTRICTED

SECOND QUARTERLY INSTALLMENT

GUNNERY DEPARTMENT

NAVAL AIR TRAINING BASES, PENSACOLA, FLORIDA

Period Covered: From 1 April 1945 to 1 July 1945.

XXxxxxxxxxxxxxxxxxxxxXX
R E S T R I C T E D
XXxxxxxxxxxxxxxxxxxxxXX

Not to be released for publication.

Prepared for Op-33-J-6.

HISTORY
NAVAL AIR TRAINING BASES
PENSACOLA, FLORIDA
VOLUME I PART 5

Flight students who were to receive their flight training at these fields, were no longer processed through the already over-crowded Gunnery Schools on the Naval Air Station, but were given their complete ground and flight training in accordance with prescribed syllabuses at the fields. Concentration on specialized gunnery training for each classification of student and the correlation of flight and ground gunnery instruction led to more proficient training. The revised flight and ground training syllabuses as approved by the Chief of Naval Air Intermediate Training became effective in August 1943-.-13.

The officer instructors assigned to this program had been trained in free gunnery in the Instructor's School at the Naval Air Station, but had not been trained in fixed gunnery and lacked certain information necessary for instructing pilot students. Steps were taken to prepare these instructors for their delegated tasks and to establish a clearer division of function between the free gunnery and fixed gunnery training programs. 13-A

In August 1943, gunnery staffs were set up at the Naval Auxiliary Air Stations on Ellyson and Saufley fields to give fundamental gunnery instruction to pilots received from the primary

- - - - - - - - - - - - - - - - - -

13. Interview 30 November 1944 with Commander W. P. SCHROEDER.
13-A. Interview 29 November 1944 with Lieutenant HENRY.

training command. At this time, students were receiving ~~ver-iatly~~ VIRTUALLY no gunnery training before their arrival at this activity.-14

In September 1943, Lieutenant (jg) (later Lieutenant) Thomas W. RAMSAY, who had just returned from duty in the Pacific with the famed Air Group Ten, relieved Lieutenant KROEGER, as Flight Student Gunnery Officer. Under the supervision of Commander SCHROEDER, he further developed the pilot-student program, improving the quality of the training. He did a great deal of liaison work with the Naval Air Operational Training Command, the Army and the Royal Air Force. He concentrated on standardizing the gunnery training of carrier pilots to meet the requirements of Naval Air Operational Training Command. He began experimenting with the use of gun camera equipment in the training program and took steps to procure the latest fixed-gunnery combat sights and gun camera equipment for all carrier gunnery planes. A number of Gunairstructors (the fixed gunnery training device) were installed to intensify the carrier training program.-15.

In November 1943, requested gunnery facilities were constructed at the new NAAS, Whiting Field, and a gunnery staff was set up there to instruct VB pilot students and to lighten the load at Naval Air Station and to provide better training.-15

- - - - - - - - - - - - - - -

14. Interview 30 November 1944 with Lieutenant HENRY.
15. Interview 30 November 1944 with Commander SCHROEDER.

About February 1944, a modified version of the extensively used Jam Handy 3A-2 Free Gunnery trainer was designed by Lieutenant (jg) N. Douglas, USNR. The Gunnery Department together with the Special Devices Staff perfected a pro-to-type of this device which was later designated as the 3A-35 Free Gunnery trainer.

This modified device eliminated the weaknesses of the 3A-2 device for beam plane attacks and permitted the attacking plane to move through a full 90 degree angle. It gave the following advantages over the 3A-2 device:

a. The beam attacks become far more realistic and require a gunner to track the enemy plane in the same way as would be necessary in the air.

b. It provides an excellent manner for teaching turret manipulation as the gunner must track his target not only in the azimuth but in elevation through the same angles as would be present in a combat situation.

c. The modification is adaptable to training with most types of sights and sighting methods and especially adaptable for teaching position firing.

Four such devices were fabricated locally and installed at the Gunnery Schools to train 3A-2 operators under instruction to operate and instruct with the device.

On June 17, 1944 this device was approved and adopted for use in all Naval Air Gunner's Schools and aircrewman training units. It proved a most valuable advanced Free Gunnery trainer.

In basic gunnery three hundred and twenty-five (325) students were trained at Ellyson Field during April. No flight students were trained in basic gunnery during May and June.

During April, May and June 1945 a specialized syllabus[10] was given to nine hundred and sixty-two (962) students, who had been held over at Saufley Field waiting for suitable flying weather.

During April and May the Fixed Gunnery Instructors' Training Unit had no students[11], and during June only twenty-four (24) students. Training Order No. 8-45 dated 18 June 1945 gives the status of this unit. Flexibility is allowed as to its location. On 18 June 1945 the Fixed Gunnery Instructors' Training Unit was moved to Ellyson Field.

Pre-detachment gunnery training was given to two-hundred and forty-five (245) officers at Squadron 8A, Corry, Bronson and Barin Fields.

FREE GUNNERY TRAINING

On 1 April 1945, 30 officers and a crew of 320, including Waves, had been assigned billets in free gunnery training, and there were 278 students undergoing training. On 1 July 1945 thirty-one (31) officers and 388 enlisted personnel were assigned to these billets and 203 students were undergoing training.

- -

10. Appendix 15, Specialized Syllabus Outline.
11. Appendix 16, Training Order No. 8-45.

Specialized Syllabus for Nine hundred and sixty-two (962) students held over at Saufley waiting for suitable flying weather during April, May and June 1945.

LECTURES

1 hour - Target Force Analysis

1 " - Sighting Review and analysis

1 " - Bombing

1 " - Boresighting Review

1 " - " " Problems

1 " - Attack Problems

FIRING

150 rounds of Shotgun Firing

150 " " 38 Cal. Pistol Firing

- -

No. 45

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

****

NAVAL AIR TRAINING BASES
PENSACOLA, FLORIDA

****

INFORMATION BOOKLET
Containing
MATTERS OF GENERAL INTEREST, LIST OF ACTIVITIES AND FACILITIES

****

June 30, 1945
Revised Sept. 30, 1945
Correct as of 2 Sept. 1945

The data presented herein
conform with "NavAer Form 1792"

Appendix No. 27

Source: Naval Historical Center
Aviation History Branch
Washington Navy Yard
Washington, D.C

Commandant Naval Air Station Pensacola Florida

APPENDIX 27

1. PRESENT USE:

Training aviators in Intermediate CV Sepcialized Training in SBD aircraft.

2. ESTABLISHED:

Commissioned 26 August 1940
as Naval Auxiliary Air Station, Saufley Field"
Buer No. 33310

3. REAL ESTATE SUMMARY:

A. Navy Owned

Area of land 866.7 acres
Average elevation above M. S. L. 85'

B. Leased or Permit

30.3 acres 2 - leases. Limiting date of renewal 30 June 1946.

C. Location

Lat. 30°-28'-11" N.
Long. 87°-20'-29" W.

D. Building

No - 77
Floor area - 343,780 sq. ft.
Type of construction - permanent and frame

E. Initial Construction Costs to Date

Land	$ 39,554.00
Improvements	4,486,451.00
Total	$ 4,526,005.00

4. WEATHER CONDITIONS:

A. Temperature

Winter 11° to 75°
Summer 65° to 101°

(e) Obstruction lights on buildings & structures
(f) Runway marking (Not ANC Standard)
(g) Flashing code beacon (-.)
(h) There is no range directed over Saufley Field.

14. SEAPLANE FACILITIES:

None

15. SHIP DOCKING FACILITIES:

None

16. BOAT FACILITIES:

None

17. ORDNANCE FACILITIES:

A. Shops

None

B. Small Arms Magazines - 1 - 10' x 8'; 720 cu. ft.

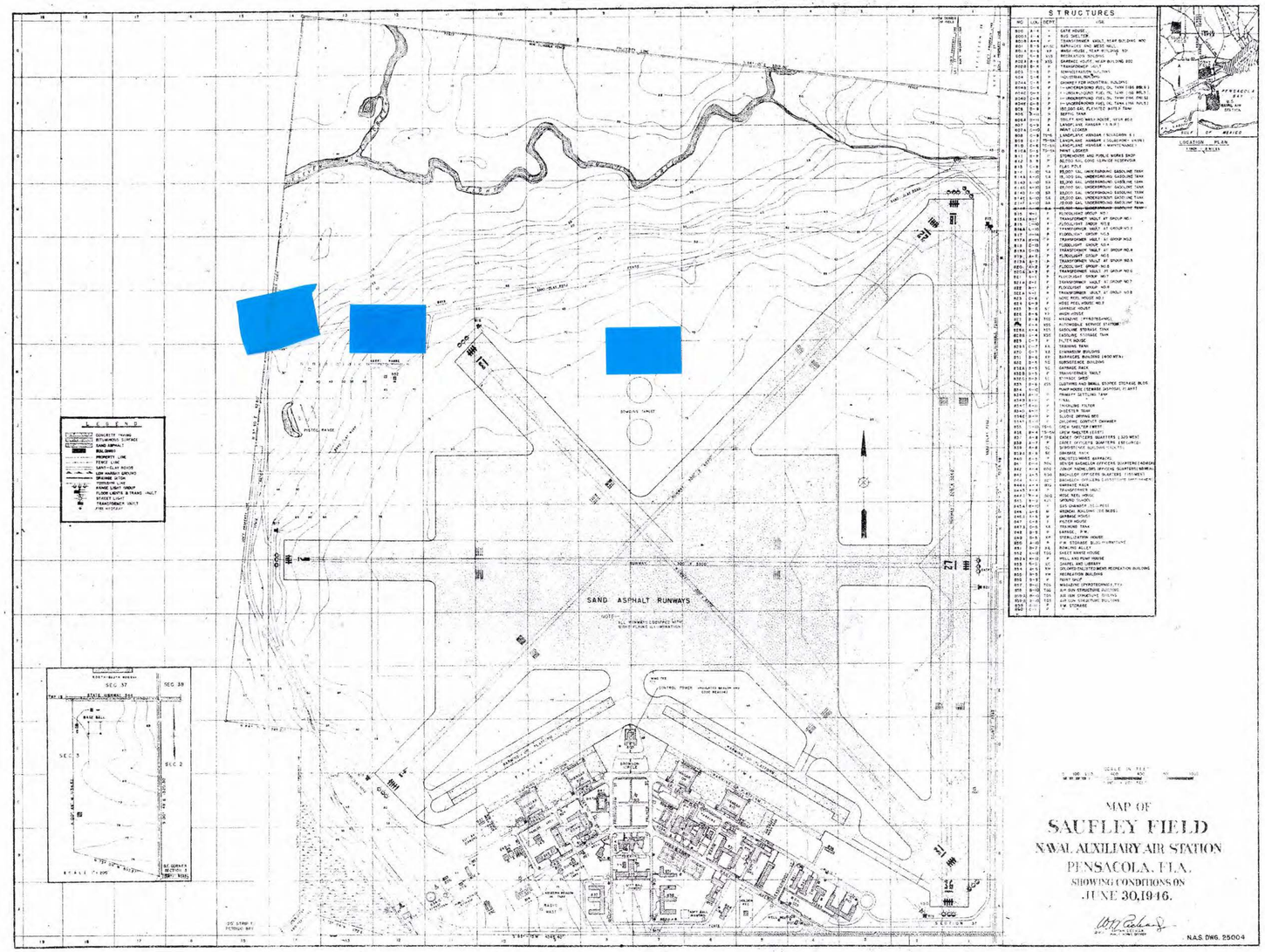
C. Ranges Firing from Ground

(a) Machine Gune Range - 1 - 85' x 200'; 4 stations.

(b) Skeet Range - 2 - 100' x 100'; 5 stations each.

(c) Pistol Ranges - 1 - 75' x 200'; 32 stations.

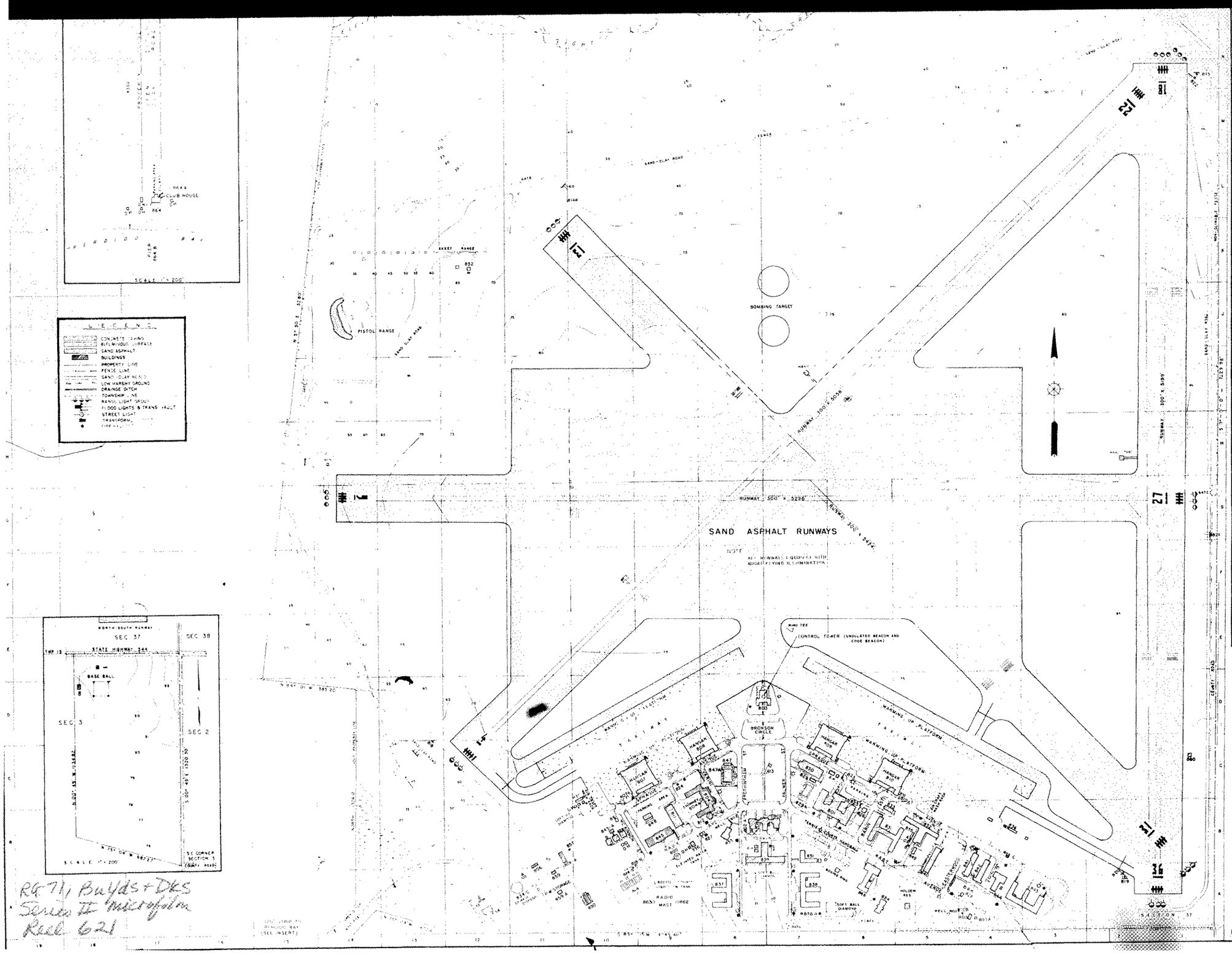
Pensacola 1946



#6232, Panzer
E-1001-A (Unit Hist Rev Com 1946-49
#4368

1947

Pensacola



812A	B-9		WELL AND PUMP HOUSE
813	C-8	P	FLAG POLE
814	A-7	GS	25,000 GAL. UNDERGROUND GASOLINE TANK
814A	A-7	GS	15,000 GAL. UNDERGROUND GASOLINE TANK
814B	A-7	GS	15,000 GAL. UNDERGROUND GASOLINE TANK
814C	A-7	GS	15,000 GAL. UNDERGROUND GASOLINE TANK
814D	A-7	GS	15,000 GAL. UNDERGROUND GASOLINE TANK
814E	A-7	GS	15,000 GAL. UNDERGROUND GASOLINE TANK
814F	A-7	GS	25,000 GAL. UNDERGROUND GASOLINE TANK
815	N-1	P	FLOODLIGHT GROUP NO. 1
815A	N-1	P	TRANSFORMER VAULT AT GROUP NO. 1
816	N-1	P	FLOODLIGHT GROUP NO. 2
816A	N-1	P	TRANSFORMER VAULT AT GROUP NO. 2
817	N-14	P	FLOODLIGHT GROUP NO. 3
817A	N-14	P	TRANSFORMER VAULT AT GROUP NO. 3
818	C-17	P	FLOODLIGHT GROUP NO. 4
818A	C-17	P	TRANSFORMER VAULT AT GROUP NO. 4
819	A-1	P	FLOODLIGHT GROUP NO. 5
819A	A-1	P	TRANSFORMER VAULT AT GROUP NO. 5
820	A-2	P	FLOODLIGHT GROUP NO. 6
820A	A-2	P	TRANSFORMER VAULT AT GROUP NO. 6
821	N-1	P	FLOODLIGHT GROUP NO. 7
821A	N-1	P	TRANSFORMER VAULT AT GROUP NO. 7
822	N-1	P	FLOODLIGHT GROUP NO. 8
822A	N-1	P	TRANSFORMER VAULT AT GROUP NO. 8
823	C-6	P	HOSE REEL HOUSE NO. 1
824	C-9	P	HOSE REEL HOUSE NO. 2
825	B-6	SC	GARBAGE HOUSE
826	B-5	P.P	WASH HOUSE
827	B-8	TGG	GASOLINE (PYROTECHNIC)
828	A-4	XSS	AUTOMOBILE SERVICE STATION
828A	A-4	XSS	GASOLINE STORAGE TANK (10,000 GALLONS)
828B	A-4	XSS	GASOLINE STORAGE TANK (10,000 GALLONS)
829	C-7	P	FILTER HOUSE
829A	C-7	XA	TRAINING TANK
830	C-7	XA	GYMNASIUM BUILDING
831	B-6	CGS	BARRACKS BUILDING (LINK TRAINER)
832	B-5	SC	SUBSISTENCE BUILDING
832A	B-5	SC	GARBAGE RACK
832B	B-5	P	TRANSFORMER VAULT
832C	B-5	SG	STORAGE SHED
833	B-6	KSG	CLOTHING AND SMALL STORES STORAGE BLDG.
834	A-12	P	PUMP HOUSE (SEWAGE DISPOSAL PLANT)
834A	A-11	P	PRIMARY SETTLING TANK
834B	A-11	P	FINAL " "
834C	A-11	P	TRICKLING FILTER
834D	A-11	P	DIGESTER TANK
834E	A-11	P	SLUDGE DRYING BED
834F	A-11	P	CHLORINE CONTACT CHAMBER
835	C-10	S.M	CREW SHELTER (WEST)
836	B-4	S.M	CREW SHELTER (EAST)
837	A-8	P	CADET OFFICERS QUARTERS (SEGURED)
838	A-7	XP	CADET OFFICERS QUARTERS (ENLISTED BARRACKS)
839	B-8	XP.XW	SUBSISTENCE BUILDING (HOBBY SHOP & CPO CLUB)
839A	B-8	SC	GARBAGE RACK
840	B-5	PXWXRS	ENLISTED MENS RECREATION & P.W. STORAGE
841	B-4	BOQ	SENIOR BACHELOR OFFICERS QUARTERS (40 MEN)
842	A-4	BOQ	JUNIOR BACHELORS OFFICERS QUARTERS (60 MEN)
843	A-3	BOQ	BACHELOR OFFICERS QUARTERS (150 MEN)
844	A-4	BOQ	BACHELOR OFFICERS SUBSISTENCE UNIT (4 MEN)
844A	A-4	BUQ	GARBAGE RACK
844B	A-4	P	TRANSFORMER VAULT
844C	B-4	BOQ	HOSE REEL HOUSE
845	B-3	XGS	GROUND SCHOOL
845A	B-10	P	GAS CHAMBER (SECURED)
846	A-6	M	MEDICAL BUILDING (20 BEDS)
846A	A-6	M	GARBAGE HOUSE
847	C-8	P	FILTER HOUSE
847A	C-8	XA	TRAINING TANK
848	B-9	P	GARAGE, P.W.
849	B-5	XP	STERILIZATION HOUSE
850	A-10	P	P.W. STORAGE BLDG (FURNITURE)
851	B-7	XA	BOWLING ALLEY & HOBBY SHOP
852	K-12	TGG	SKEET RANGE HOUSE
852A	K-12	P	WELL AND PUMP HOUSE
853	B-8	XC	CHAPEL AND LIBRARY
854	A-5	XW	COLORED ENLISTED MENS RECREATION BUILDING
855	B-5	XW	STORAGE BUILDING
856	B-9	P	PAINT SHOP
857	B-11	TGG	MAGAZINE (PYROTECHNIC), P.Y.A.
858	B-10	TGG	AIR GUN STRUCTURE BUILDING
858A	B-10	TGG	AIR GUN STRUCTURE BUILDING
858B	B-10	TGG	AIR GUN STRUCTURE BUILDING
859	A-11	P	P.W. STORAGE
859A	A-11	P	P.W. STORAGE
860	C-1	P	P.W. STORAGE
861	B-10	TGG	BATTERY CHARGING SHOP
862	A-9	RC	RADIO MAST (EAST)
863	A-9	RC	RADIO MAST (WEST)
864	L-17	XW	CLUB HOUSE (BEACH)
864A	L-17	P	GENERATOR SHED (BEACH)
865	A-17	KW	CLUB HOUSE WHARF
866	A-10	SA	OFFICE BUILDING
814H	B-10	SA	FIRE EXTINGUISHING SHED
858A	A-7	P	HOSE REEL HOUSE

MAP OF

SAUFLEY FIELD

NAVAL AUXILIARY AIR STATION

PENSACOLA, FLA.

SHOWING CONDITIONS ON

JUNE 30, 1947.

RESTRICTED

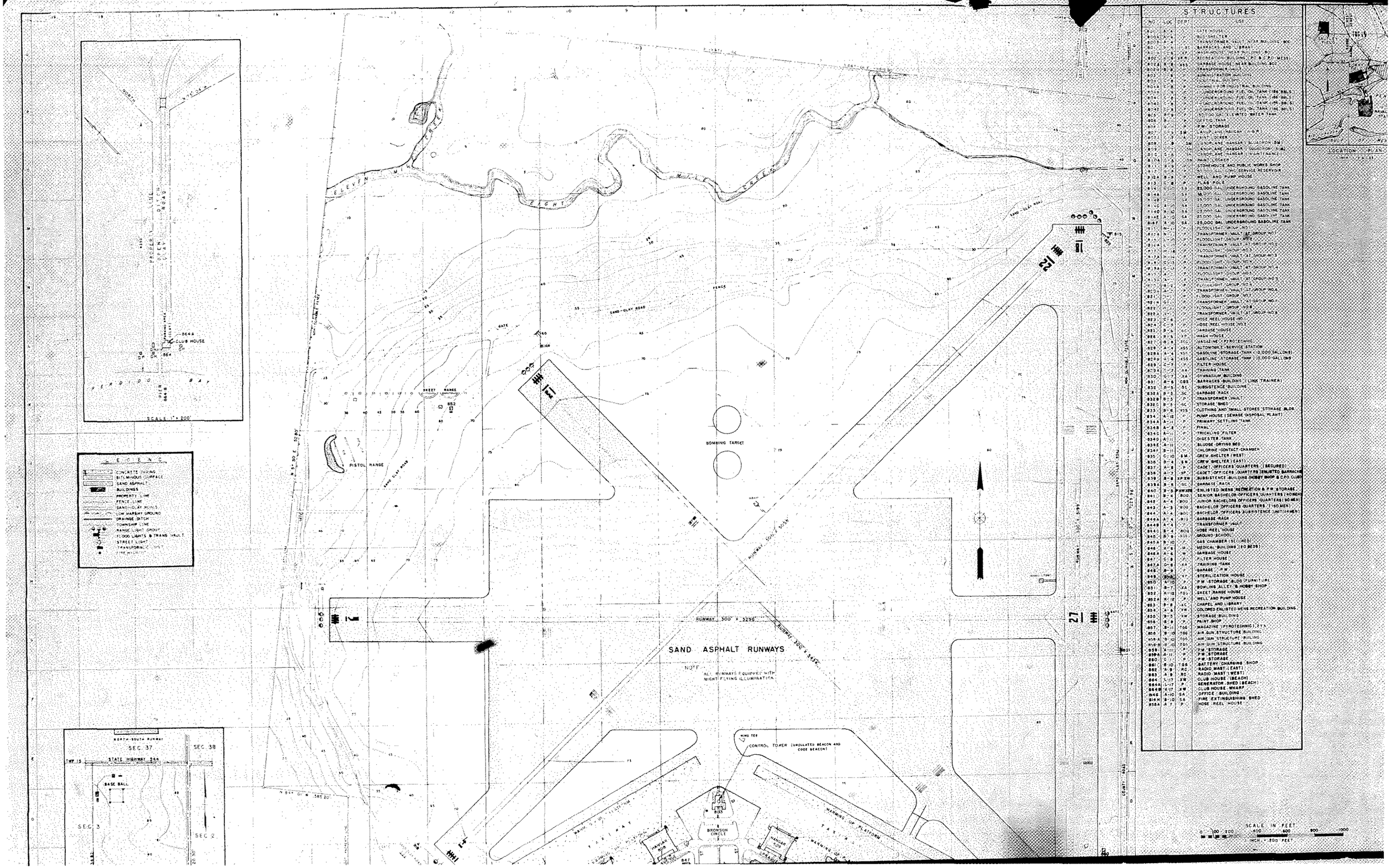
FOR OFFICIAL USE ONLY

C. B. Hoffa Captain
COMMANDER C.E.C. USN
PUBLIC WORKS OFFICER

N.A.S. DWG. 25004

454,768

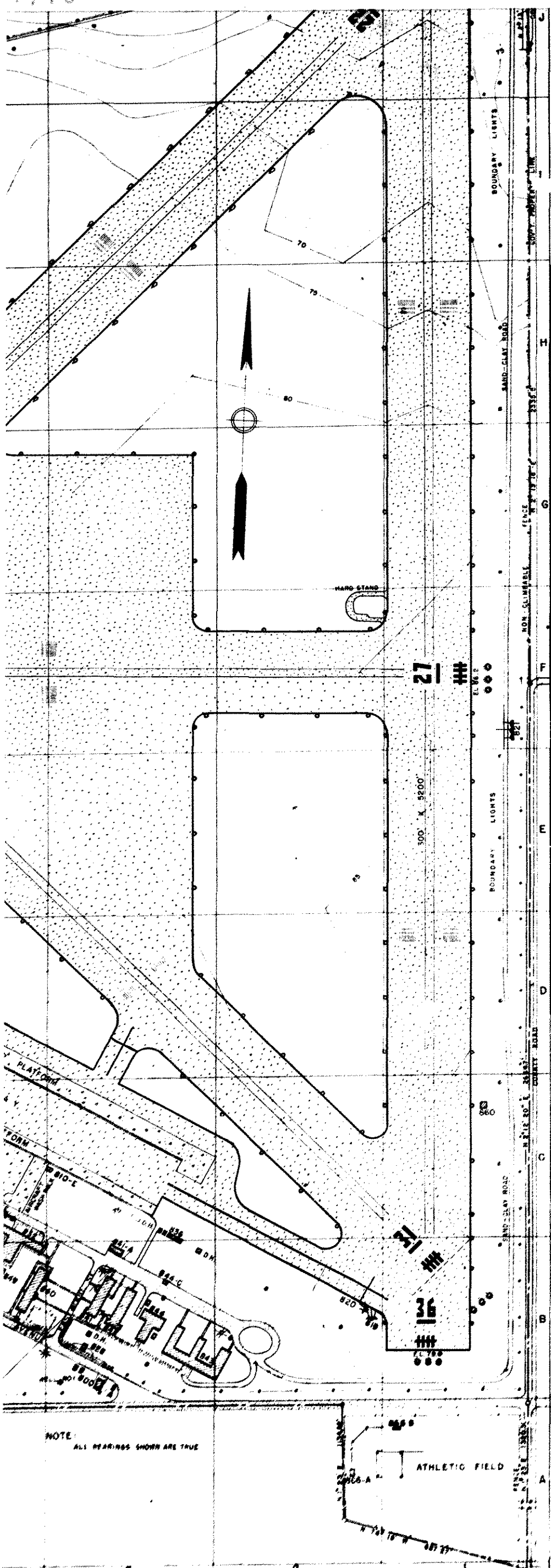
RG 71, Bu Yds + Docs
Series II microfilm
Reel 621

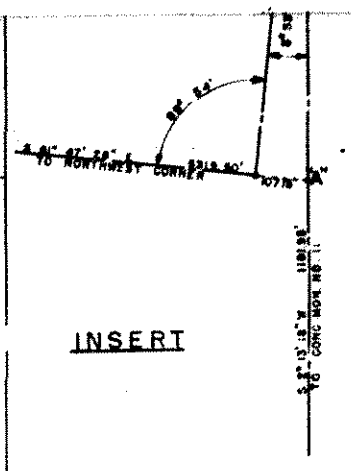


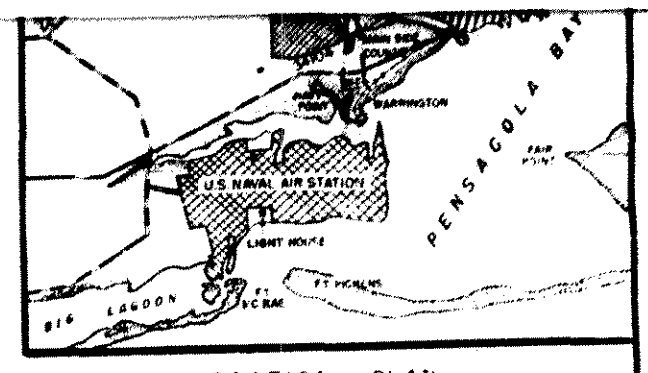
STRUCTURES

NO.	LOC.	DEPT.	USE
800	A-1		GATE HOUSE
800A	A-1		BUS SHELTER
800B	A-1		TRANSFORMER VAULT NEAR BUILDING 800
801	B-5	EC	BARRACKS AND LIBRARY
802	C-6	FP	WASH HOUSE (NEAR BUILDING 8)
802	C-6	FPR	RECREATION BUILDING (P.O. & C.P.O. MESS)
802B	B-6	SSS	GARBAGE HOUSE (NEAR BUILDING 80)
802C	B-6		TRANSFORMER VAULT
803	8	P	ADMINISTRATION BUILDING
804	8	P	INDUSTRIAL BUILDING
804A	C-8	P	PUMPING FOR INDUSTRIAL BUILDING
804B	C-8	P	UNDERGROUND FUEL OIL TANK (186 BBLS)
804C	C-8	P	UNDERGROUND FUEL OIL TANK (186 BBLS)
804D	C-8	P	UNDERGROUND FUEL OIL TANK (186 BBLS)
804E	C-8	P	UNDERGROUND FUEL OIL TANK (186 BBLS)
805	B-8	P	37,700 GAL. ELEVATED WATER TANK
806	B-8	P	SEPTIC TANK
806A	8	P	P.W. STORAGE
807	C-9	SM	LAUNCHING HANGAR (LAGR)
807A	C-9	A	PAINT LOCKER
808	9	SM	SEAPLANE HANGAR (SQUADRON SM)
809	9	SM	SEAPLANE HANGAR (SQUADRON SM)
810	C-9	SM	SEAPLANE HANGAR (MAINTENANCE)
810A	C-9	SM	PAINT LOCKER
811	9-9	P	STOREHOUSE AND PUBLIC WORKS SHOP
812	9-9	P	50,000 GAL. (CM) SERVICE RESERVOIR
812A	9-9	P	WELL AND PUMP HOUSE
813	C-8	P	FLAG POLE
814		SA	25,000 GAL. UNDERGROUND GASOLINE TANK
814A		SA	25,000 GAL. UNDERGROUND GASOLINE TANK
814B		SA	25,000 GAL. UNDERGROUND GASOLINE TANK
814C	A-10	SA	25,000 GAL. UNDERGROUND GASOLINE TANK
814D	A-10	SA	25,000 GAL. UNDERGROUND GASOLINE TANK
814E	A-10	SA	25,000 GAL. UNDERGROUND GASOLINE TANK
814F	A-10	SA	25,000 GAL. UNDERGROUND GASOLINE TANK
815	N-11	P	FLOODLIGHT GROUP NO. 1
815A	N-11	P	TRANSFORMER VAULT AT GROUP NO. 1
816	L-11	P	FLOODLIGHT GROUP NO. 2
816A	L-11	P	TRANSFORMER VAULT AT GROUP NO. 2
817	H-14	P	FLOODLIGHT GROUP NO. 3
817A	H-14	P	TRANSFORMER VAULT AT GROUP NO. 3
818	C-13	P	FLOODLIGHT GROUP NO. 4
818A	C-13	P	TRANSFORMER VAULT AT GROUP NO. 4
819	A-13	P	FLOODLIGHT GROUP NO. 5
819A	A-13	P	TRANSFORMER VAULT AT GROUP NO. 5
820	A-4	P	FLOODLIGHT GROUP NO. 6
820A	A-4	P	TRANSFORMER VAULT AT GROUP NO. 6
821	G-7	P	FLOODLIGHT GROUP NO. 7
821A	G-7	P	TRANSFORMER VAULT AT GROUP NO. 7
822	G-1	P	FLOODLIGHT GROUP NO. 8
822A	G-1	P	TRANSFORMER VAULT AT GROUP NO. 8
823	C-6	P	HOSE REEL HOUSE NO. 1
824	C-6	P	HOSE REEL HOUSE NO. 2
825	B-6	SC	GARBAGE HOUSE
826	B-6	P	WASH HOUSE
827	B-6	TGG	MAGAZINE (PYROTECHNIC)
828	A-4	SSS	AUTOMOBILE SERVICE STATION
828A	A-4	SSS	GASOLINE STORAGE TANK (10,000 GALLONS)
828B	A-4	SSS	GASOLINE STORAGE TANK (10,000 GALLONS)
829	C-7	P	FILTER HOUSE
829A	C-7	SA	TRAINING TANK
830	C-7	GKA	GYMNASIUM BUILDING
831	A-6	GBS	BARRACKS BUILDING (LINK TRAINER)
832	B-5	SC	SUBSISTENCE BUILDING
832A	B-5	SC	GARBAGE RACK
832B	B-5	P	TRANSFORMER VAULT
832C	B-5	SC	STORAGE SHED
833	B-6	SSS	CLOTHING AND SMALL STORES STORAGE BLDG.
834	A-12	P	PUMP HOUSE (SEWAGE DISPOSAL PLANT)
834A	A-11	P	PRIMARY SETTLING TANK
834B	A-11	P	FINAL
834C	A-11	P	TRICKLING FILTER
834D	A-11	P	DIGESTER TANK
834E	A-11	P	SLUDGE DRYING BED
834F	B-11	P	CHLORINE CONTACT CHAMBER
835	C-10	SM	CREW SHELTER (WEST)
836	B-4	SM	CREW SHELTER (EAST)
837	A-8	P	CADET OFFICERS QUARTERS (SECURED)
838	A-7	SP	CADET OFFICERS QUARTERS (ENLISTED BARRACKS)
839	B-8	SP XW	SUBSISTENCE BUILDING (HOBBY SHOP & C.P.O. CLUB)
839A	B-8	SC	GARBAGE RACK
840	B-8	P XW	ENLISTED MENS RECREATION & P.W. STORAGE
841	B-4	BOQ	SENIOR BACHELOR OFFICERS QUARTERS (40 MEN)
842	A-4	BOQ	JUNIOR BACHELORS OFFICERS QUARTERS (30 MEN)
843	A-3	BOQ	BACHELOR OFFICERS QUARTERS (150 MEN)
844	A-3	BOQ	BACHELOR OFFICERS SUBSISTENCE (UNITS 844 & 845)
844A	A-4	BOQ	GARBAGE RACK
844B	A-4	P	TRANSFORMER VAULT
844C	B-4	BOQ	HOSE REEL HOUSE
845	B-4	SSS	GROUND SCHOOL
845A	B-10	P	GAS CHAMBER (SEALED)
846	A-8	M	MEDICAL BUILDING (20 BEDS)
846A	A-8	M	GARBAGE HOUSE
847	C-8	P	FILTER HOUSE
847A	C-8	SA	TRAINING TANK
848	B-9	P	GARAGE & P.W.
849	B-9	XY	STERILIZATION HOUSE
850	A-10	P	P.W. STORAGE BLDG. (FURNITURE)
851	B-7	XA	BOWLING ALLEY & HOBBY SHOP
852	K-12	TGG	SKEET RANGE HOUSE
852A	K-12	P	WELL AND PUMP HOUSE
853	B-8	XC	CHAPEL AND LIBRARY
854	A-6	XW	COLORED ENLISTED MENS RECREATION BUILDING
855	B-5	XW	STORAGE BUILDING
856	B-5	P	PAINT SHOP
857	B-11	TGG	MAGAZINE (PYROTECHNIC)
858	B-10	TGG	AIR GUN STRUCTURE BUILDING
858A	B-10	TGG	AIR GUN STRUCTURE BUILDING
858B	B-10	TGG	AIR GUN STRUCTURE BUILDING
859	A-11	P	P.W. STORAGE
859A	A-11	P	P.W. STORAGE
860	C-11	P	P.W. STORAGE
861	B-10	TGS	BATTERY CHARGING SHOP
862	A-9	RC	RADIO MAST (EAST)
863	A-9	RC	RADIO MAST (WEST)
864	L-17	XW	CLUB HOUSE (BEACH)
864A	L-17	P	GENERATOR SHED (BEACH)
864B	K-17	XW	CLUB HOUSE (WHARF)
865	A-10	SA	OFFICE BUILDING
866	B-10	SA	FIRE EXTINGUISHING SHED
866A	A-7	P	HOSE REEL HOUSE

1948







LOCATION PLAN

ONE INCH = 2 MILES

STRUCTURES

NO	LOCA	DEPT	USE	NO	LOCA	DEPT	USE
800	B-3	Y	GATE HOUSE	834	B-8	P	PUMP HOUSE & CHLOR BLDG (SEWAGE DISPOSAL)
800-A	B-3	P	BUS SHELTER	834-A	B-8	P	PRIMARY SETTLING TANK
800-B	B-3	P	TRANSFORMER VAULT, NEAR BLDG 800	834-B	B-8	P	FINAL SETTLING TANK
801	B-6	XP XC	BARRACKS, MESSHALL AND LIBRARY	834-C	B-8	P	TRICKLING FILTER
801-A	C-6	XP	WASH HOUSE, REAR OF BUILDING 801	834-D	B-8	P	DIGESTER
802	C-5	XP-XSS-RC	RECREATION BUILDING (CPO MESS, S S REST)	834-E	B-8	P	SLUDGE DRYING BEDS
802-A	C-5	XSS	GARBAGE HOUSE NEAR BUILDING 802	834-F	B-8	P	CHLORINE CONTACT CHAMBER
802-B	C-5	P	TRANSFORMER VAULT, NEAR BUILDING 802	835	C-7	SN	CREWS SHELTER (WEST SIDE)
803	D-5	P	ADMINISTRATION BUILDING	836	C-7	SN	CREWS SHELTER (EAST SIDE)
803-A	D-5	CQTU-4	LINE SHACK	837	B-6	P	CADET QTRS (TYPE Q 4 MOD 120 CADETS)
804	C-6	P	INDUSTRIAL BUILDING	837-A	B-6	X A	SOFT BALL DIAMOND
804-A	C-6	P	CHIMNEY FOR INDUSTRIAL	838	B-5	X P	CADET QTRS (TYPE Q 4 MOD 120 CADETS) ENL BKS
804 (B-E)	C-6	P	4-186 BBL FUEL OIL STORAGE TANKS (UNDERGROUND)	838-A	B-5	P	HOSE REEL HOUSE
805	B-4	P	150,000 GAL. ELEVATED WATER TANK	838-B	B-5	X A	SOFT BALL DIAMOND
806	B-6	P	SEPTIC TANK	839	B-5	XP XW	ENL BARRACKS, HOBBY SHOP, CPO CLUB
806-A	B-6	P	TOILET & WASH HOUSE	839-A	B-5	S C	GARBAGE HOUSE NEAR BUILDING 839
807	C-7	BTU-3	LANDPLANE HANGAR	840	D-4	C H	ENLISTED WAVE BARRACKS (LINE MEN APTS)
807-A	C-7	BTU-3	PAINT LOCKER, NEAR BLDG 807	841	E-5	OCCUPANTS	BACHELOR OFFICER QUARTERS (MOQ APTS)
807-B	C-7	BTU-3	2000 GAL USED OIL TANK	841-A	B-5	OCCUPANTS	GARAGE
807-C	C-7	BTU-3	1,000 GAL KEROSENE TANK	842	B-3	B O Q	BACHELOR OFFICERS QUARTERS (BOQ) (OFFICERS)
807-D	C-7	BTU-3	1,000 GAL GASOLINE TANK	843	B-3	B O Q	BACHELOR OFFICERS QTRS (TYPE Q-4 150 OFFS)
808	C-6	BTU-3	LANDPLANE HANGAR	844	B-3	B O Q	BACHELOR OFFICERS SUBSISTENCE BLDG (4 MESS)
809	C-5	CQTU-4	LANDPLANE HANGAR	844-A	B-3	B O Q	GARBAGE HOUSE NEAR BUILDING 844
810	C-4	CQTU-4	LANDPLANE HANGAR	844-B	B-3	P	TRANSFORMER VAULT, NEAR BUILDING 844
810-A	C-4	CQTU-4	PAINT HOUSE, NEAR BUILDING 810	844-C	B-3	B O Q	HOSE REEL HOUSE, NEAR BUILDING 844
810-B	C-4	CQTU-4	2,000 GAL USED OIL TANK	845	B-6	K G S	GROUND SCHOOL BUILDING
810-C	C-4	CQTU-4	1,000 GAL KEROSENE TANK	845-A	B-6	P	GAS CHAMBER, S OF BUILDING 845 (SEALED)
810-D	C-4	CQTU-4	1,000 GAL GASOLINE TANK	846	B-4	M	MEDICAL BUILDING
810-E	C-3	CQTU-4	GARAGE	846-A	B-4	M	GARBAGE HOUSE
811	C-6	P	STOREHOUSE & PUBLIC WORKS SHOP	847	C-6	P	FILTER HOUSE
812	C-6	P	50,000 GAL CONCRETE SERVICE RESERVOIR	847-A	C-6	X A	TRAING TANK
812-A	C-6	P	WELL NO 2 & PUMP HOUSE	848	C-7	P	PUBLIC WORKS GARAGE
813	C-5	P	FLAG POLE	849	B-4	X P	STERILIZATION HOUSE
814	B-7	S A	25,000 GAL GASOLINE STORAGE TANK (UNDGD)	850	B-7	P	FURNITURE STORAGE, PUBLIC WORKS
814-A-F	B-7	S A	6-25,000 GAL GASOLINE STORAGE TANKS (UGD)	851	B-5	XA XW	BOWLING ALLEY & HOBBY SHOP
814-G	B-7	S A	OFFICE	851-A	B-5	X A	HAND BALL COURTS
814-H	B-7	S A	FIRE EXTINGUISHER SHED	851-B	B-5	X A	TENNIS COURTS
815	J-1	P	FLOODLIGHT GROUP NO 1	852	H-8	T G G	SKEET RANGE HOUSE
815-A	J-1	P	TRANSFORMER VAULT	852-A	H-8	P	WELL & PUMP HOUSE AT SKEET RANGE
816	I-7	P	FLOODLIGHT GROUP NO 2	853	B-6	X C	CHAPEL LIBRARY BUILDING
816-A	I-7	P	TRANSFORMER VAULT	854	B-4	X W	COLORED RECREATION BUILDING
817	F-10	P	FLOODLIGHT GROUP NO 3	855	B-4	X W	STORAGE BUILDING, NEAR 837
817-A	F-10	P	TRANSFORMER HOUSE	856	B-6	P	PAINT SHOP
818	D-9	P	FLOODLIGHT GROUP NO 4	857	B-7	T G G	MAGAZINE (PYROTECHNIC) 2 YA
818-A	D-9	P	TRANSFORMER HOUSE	858	B-7	T G G	AIR GUN STRUCTURE (PYROTECHNICS)
819	B-2	P	FLOODLIGHT GROUP NO 5	858-A	B-7	T G G	AIR GUN STRUCTURE (
819-A	B-2	P	TRANSFORMER HOUSE	858-B	B-7	T G G	AIR GUN STRUCTURE (
820	B-2	P	FLOODLIGHT GROUP NO 6	859	B-8	P	PUBLIC WORKS STORAGE
820-A	B-2	P	TRANSFORMER VAULT	859-A	B-7	P	PUBLIC WORKS STORAGE
821	F-1	P	FLOODLIGHT GROUP NO 7	860	C-8	P	PUBLIC WORKS STORAGE
821-A	F-1	P	TRANSFORMER HOUSE	861	C-7	T G G	BATTERY CHARGING SHOP
822	J-1	P	FLOODLIGHT GROUP NO 8	862	B-6	R C	RADIO MAST (EAST)
822-A	J-1	P	TRANSFORMER HOUSE	863	B-6	R C	RADIO MAST (WEST)
823	C-5	P	HOSE REEL HOUSE NO 1	864	D-11	X W	CLUB HOUSE
824	C-6	P	HOSE REEL HOUSE NO 2	864-A	D-11	P	GENERATOR SHED
825	C-4	S C	GARBAGE HOUSE, NEAR 801	864-B	D-11	X W	BHAPE 4 X 300)
826	C-4	X P	WASH HOUSE	865	B-5	X A	SOFT BALL DIAMOND
827	B-6	T G G	MAGAZINE (PYROTECHNIC)	866	A-1	X A	ATHLETIC FIELD
828	B-3	X S S	AUTOMOBILE SERVICE STATION	867	J-6	R C	TRANSMITTER BUILDING
828-A	B-3	X S S	GASOLINE STORAGE TANK (10,000 GAL)	867-A	J-6	R C	RADIO MAST (EAST)
828-B	B-3	X S S	GASOLINE STORAGE TANK (10,000 GAL)	867-B	J-6	R C	RADIO MAST (WEST)
829	C-6	P	FILTER HOUSE	867-C	J-6	R C	RADIO MAST (NORTH)
829-A	C-6	X A	TRAINING TANK	867-D	J-6	P	AIR STATION NO 9
830	C-6	X A	GYMNASIUM BUILDING	868	G-7	R C	HIGH INTENSITY CONTROL (QUIZ VAULT)
831	B-4	C G S	BARRACKS BUILDING (LINK TRAINERS)	869	H-9	R C	RADIO RECEIVER STATION
832	C-4	S C	SUBSISTENCE BUILDING				
832-A	B-4	S C	GARBAGE HOUSE NEAR BUILDING 832				
832-B	B-4	P	TRANSFORMER VAULT, NEAR BUILDING 832				
832-C	B-4	S C	STORAGE SHED				
833	C-4	X S S	CLOTHING & SMALL STORES BUILDING				

SCALE IN FEET

200 100 0 200 400 600 800 1000

ONE INCH = 200 FEET

MAP OF
SAUFLEY FIELD
NAVAL AUXILIARY AIR STATION
PENSACOLA, FLA.
SHOWING CONDITIONS ON
JUNE 30, 1948

468638

RESTRICTED

C.M. Garland
COMMANDER, C.E. U.S.N.
PUBLIC WORKS OFFICER

800-3-376

N.A.S. DWG 26011

RG 71, Bu Yds + Docks, Series II microfilm, Reel 621

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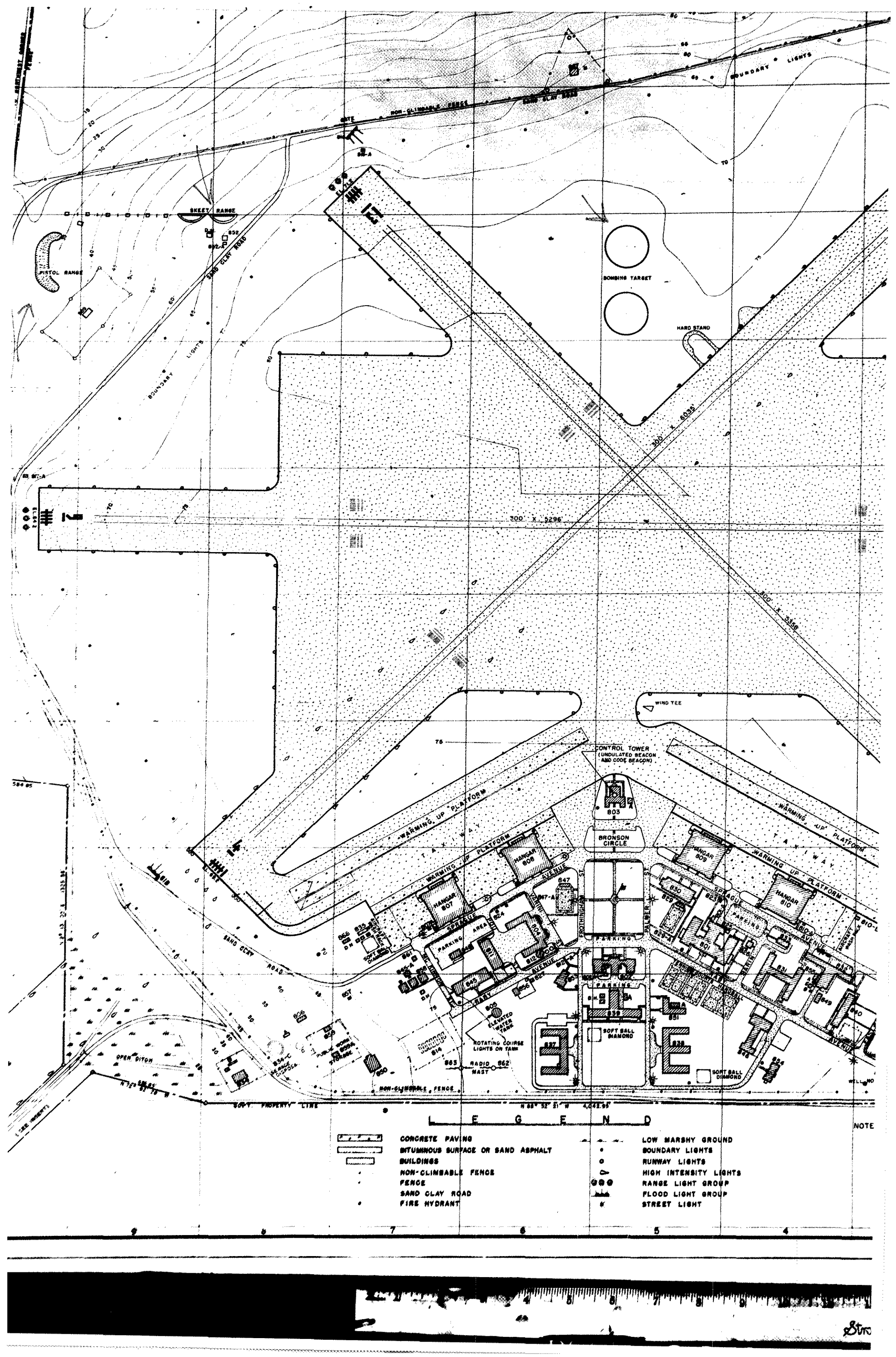
SKEET RANGE
PISTOL RANGE
SAND CLAY ROAD
BOUNDARY LIGHTS
NON-CLIMBABLE FENCE
GATE
BOMBING TARGET
HARD STAND
300' X 6035'
300' X 5296'
300' X 3358'
WIND TEE
CONTROL TOWER
(UNDULATED BEACON AND CODE BEACON)
803
BRONSON CIRCLE
WARMING UP PLATFORM
TAXIWAY
HANGAR 808
HANGAR 807
HANGAR 809
HANGAR 810
SPRAGUE AVENUE
FROTHINGHAM ST.
PALMER ST.
PARKING AREA
SOFT BALL DIAMOND
ELEVATED WATER TANK
ROTATING COURSE LIGHTS ON TANK
RADIO MAST
OPEN DITCH
PUBLIC WORKS STORAGE
AIRCRAFT PARK
LEGEND
CONCRETE PAVING
BITUMINOUS SURFACE OR SAND ASPHALT
BUILDINGS
NON-CLIMBABLE FENCE
FENCE
SAND CLAY ROAD
FIRE HYDRANT
LOW MARSHY GROUND
BOUNDARY LIGHTS
RUNWAY LIGHTS
HIGH INTENSITY LIGHTS
RANGE LIGHT GROUP
FLOOD LIGHT GROUP
STREET LIGHT
NOTE

REPRODUCED AT THE NATIONAL ARCHIVES

Pensacola June 30, 1949

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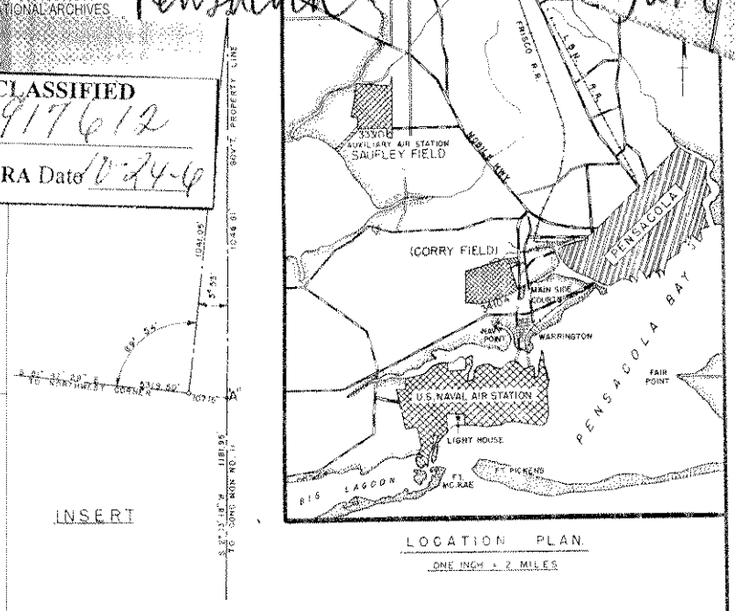
Authority NND 917612
By JE NARA Date 10-24-94



LOCATION PLAN
ONE INCH = 2 MILES

STRUCTURES

NO.	LOCA.	DEPT.	USE	NO.	LOCA.	DEPT.	USE
800	B-3	Y	GATE HOUSE	834	B-8	P	PUMP HOUSE & CHLOR. BLDG. (SEWAGE DISPOSAL)
800-A	B-3	P	BUS SHELTER	834-A	B-8	P	PRIMARY SETTLING TANK
800-B	B-3	P	TRANSFORMER VAULT, NEAR BLDG. 800	834-B	B-8	P	FINAL SETTLING TANK
801	D-6	XP XG	BARRACKS, MESS HALL AND LIBRARY	834-C	B-8	P	TRICKLING FILTER
801-A	D-6	XP	WASH HOUSE, REAR OF BUILDING 801	834-D	B-8	P	DIGESTER
802	C-5	XP XSS REC	RECREATION BUILDING. (CPO MESS, S.S. REST.)	834-E	B-8	P	SLUDGE DRYING BEDS
802-A	C-5	XSS	GARBAGE HOUSE NEAR BUILDING 802.	834-F	B-8	P	CHLORINE CONTACT CHAMBER
802-B	C-5	P	TRANSFORMER VAULT, NEAR BUILDING 802	835	C-7	BTU-3	CREWS SHELTER (WEST SIDE)
803	D-5	P	ADMINISTRATION BUILDING	836	C-3	BTU-3	CREWS SHELTER (EAST SIDE)
803-A	D-5	O P	CRASH SHACK	837	B-6	XP	MIDN. QTRS. (ZERO-CH. MOD. 320 MIDN)
804	C-6	P	INDUSTRIAL BUILDING	837-A	B-6	X.A	SOFT BALL DIAMOND
804-A	C-6	P	CHIMNEY FOR INDUSTRIAL BLDG	839	B-5	XP	MIDN. QTRS TYPE Q-4, MOD 320 MIDN (FEVEL BKS
804 A-B	C-6	P	4-186 BBL. FUEL OIL STORAGE TANKS (UNDERGRD)	838-A	B-5	P	HOSE REEL HOUSE
805	B-5	P	150,000 GAL. ELEVATED WATER TANK.	838-B	B-5	X.A	SOFT BALL DIAMOND
806	B-8	P	SEPTIC TANK.	839	B-5	XP XW	SUBSISTENCE BLDG. (MIDN.)
806-A	B-8	P	PUBLIC WORKS STORAGE	839-A	B-5	S.C.	GARBAGE HOUSE NEAR BUILDING 839
807	C-7	STU-3	LANDPLANE HANGAR	840	B-4	C.H.	8-ENLISTED MENS APARTMENTS
807-A	C-7	BTU-3	PAINT LOCKER, NEAR BLDG. 807	841	B-3	OCCUPANTS	5-MARRIED OFFICERS APARTMENTS
807-B	C-7	BTU-3	2000 GAL. USED OIL TANK	841-A	B-3	OCCUPANTS	GARAGE
807-C	C-7	BTU-3	1,000 GAL. KEROSENE TANK	842	B-3	B.O.Q	BACHELOR OFFICERS QUARTERS (60 JR. OFFICERS)
807-D	C-7	BTU-3	1,000 GAL. GASOLINE TANK	843	B-3	B.O.Q	BACHELOR OFFICERS QTRS (TYPE Q-4 160 OFFICERS)
808	D-6	BTU-3	LANDPLANE HANGAR	844	B-3	B.O.Q	BACHELOR OFFICERS SUBSISTENCE BLDG. (114 OFFICERS)
809	C-5	BTU-3	LANDPLANE HANGAR	844-A	B-3	B.O.Q	GARBAGE HOUSE NEAR BUILDING 844
810	C-4	BTU-3	LANDPLANE HANGAR	844-B	B-3	P	TRANSFORMER VAULT, NEAR BUILDING 844
810-A	C-4	BTU-3	PAINT HOUSE, NEAR BUILDING 810	844-C	B-3	B.O.Q	HOSE REEL HOUSE, NEAR BUILDING 844
810-B	C-4	BTU-3	2,000 GAL. USED OIL TANK	845	B-6	X.O.S	GROUND SCHOOL BUILDING
810-C	C-4	BTU-3	1,000 GAL. KEROSENE TANK	845-A	B-6	P	GAS CHAMBER, S. OF BUILDING 835 (SECURED)
810-D	C-4	BTU-3	1,000 GAL. GASOLINE TANK	846	B-4	M	MEDICAL BUILDING
810-E	C-3	BTU-3	GARAGE	846-A	B-4	M	GARBAGE HOUSE
811	C-6	P	STOREHOUSE & PUBLIC WORKS SHOP	847	C-6	P	FILTER HOUSE
812	C-6	P	50,000 GAL. CONCRETE SERVICE RESERVOIR	847-A	C-6	X.A	TRAING TANK
812-A	C-6	P	WELL NO 1 & PUMP HOUSE	848	C-7	P	PUBLIC WORKS GARAGE
813	C-5	P	FLAG POLE	849	B-4	X.P	STERILIZATION HOUSE
814	B-7	S.A	25,000 GAL. GASOLINE STORAGE TANK (UNDGRD)	850	B-7	P	FURNITURE STORAGE, PUBLIC WORKS
814-A-F	B-7	S.A	6-25,000 GAL. GASOLINE STORAGE TANKS (UGD)	851	B-5	XA-XW	BOWLING ALLEY & HOBBY SHOP
814-G	B-7	S.A	OFFICE	851-A	B-5	X.A	HAND BALL COURTS
814-H	B-7	S.A	FIRE EXTINGUISHER SHED	851-B	B-5	X.A	TENNIS COURTS
815	J-1	P	FLOODLIGHT GROUP NO 1	852	H-9	T.G.G	SKEET RANGE HOUSE
815-A	J-1	P	TRANSFORMER VAULT	852-A	H-8	P	WELL & PUMP HOUSE AT SKEET RANGE
816	J-7	P	FLOODLIGHT GROUP NO 2	853	B-6	X.G	CHAPEL—LIBRARY BUILDING
816-A	J-7	P	TRANSFORMER VAULT	854	B-4	X.W	CPO CLUB
817	F-10	P	FLOODLIGHT GROUP NO 3	855	B-4	X.W	STORAGE BUILDING, NEAR 832
817-A	F-10	P	TRANSFORMER HOUSE	856	B-6	P	PAINT SHOP
818	C-9	P	FLOODLIGHT GROUP NO 4	857	B-7	T.G.G	MAGAZINE (PYROTECHNIC) 2 XX
818-A	C-8	P	TRANSFORMER HOUSE	858	B-7	T.G.G	AIR GUN STRUCTURE (PREFABRICATED)
819	B-2	P	FLOODLIGHT GROUP NO 5	858-A	B-7	T.G.G	AIR GUN STRUCTURE ( )
819-A	B-2	P	TRANSFORMER HOUSE	858-B	B-7	T.G.G	AIR GUN STRUCTURE ( )
820	B-2	P	FLOODLIGHT GROUP NO. 6	859	B-8	P	PUBLIC WORKS STORAGE
820-A	B-2	P	TRANSFORMER VAULT	859-A	B-7	P	PUBLIC WORKS STORAGE
821	F-1	P	FLOODLIGHT GROUP NO. 7	860	C-5	P	PUBLIC WORKS STORAGE
821-A	F-1	P	TRANSFORMER HOUSE	861	C-7	T.G.G	BATTERY CHARGING SHOP
822	J-1	P	FLOODLIGHT GROUP NO 8	862	B-6	R.C	RADIO MAST (EAST)
822-A	J-1	P	TRANSFORMER HOUSE	863	B-6	R.C	RADIO MAST (WEST)
823	C-5	P	HOSE REEL HOUSE NO. 1	864	G-11	X.W	CLUB HOUSE
824	C-6	P	HOSE REEL HOUSE NO 2	864-A	C-11	P	GENERATOR SHED
825	C-4	S.C	GARBAGE HOUSE, NEAR 801	864-B	G-11	X.W	WHARF (4 X 300)
826	C-4	X.P	WASH HOUSE	865	B-5	X.A	SOFT BALL DIAMOND
827	B-6	T.G.G	MAGAZINE (PYROTECHNIC)	866	A-1	X.A	ATHLETIC FIELD
828	B-3	X.S.S	AUTOMOBILE SERVICE STATION	867	J-6	R.C	TRANSMITTER BUILDING
828-A	B-3	X.S.S	GASOLINE STORAGE TANK (10,000 GAL.)	867-A	J-6	R.C	RADIO MAST (EAST)
828-B	B-3	X.S.S	GASOLINE STORAGE TANK (10,000 GAL.)	867-B	J-6	R.C	RADIO MAST (WEST)
829	C-5	P	FILTER HOUSE	867-C	J-6	R.C	RADIO MAST (NORTH)
829-A	C-5	X.A	TRAINING TANK	867-D	J-6	P	SUB-STATION NO. 9
830	C-5	X.A	GYMNASIUM BUILDING	868	G-7	R.O	HIGH INTENSITY CONTROL EQUIP. VAULT
831	B-4	O.S.S	BARRACKS BUILDING	869	H-9	R.C.	RADIO RECEIVER STATION
832	C-4	S.C	SUBSISTENCE BUILDING				
832-A	B-4	S.C	GARBAGE HOUSE NEAR BUILDING 832				
832-B	B-4	P	TRANSFORMER VAULT, NEAR BUILDING 832				
832-C	B-4	S.G	STORAGE SHED				
833	C-4	X.S.S	CLOTHING & SMALL STORES BUILDING				

#. Station Priority

SCALE IN FEET
ONE INCH = 200 FEET

RG72, BuAer
E-1001-B, Uncl. Gen. Corr. 1950
Box 204

MAP OF
SAUFLEY FIELD
NAVAL AUXILIARY AIR STATION
PENSACOLA, FLA.
SHOWING CONDITIONS ON
JUNE 30, 1949

[redacted]

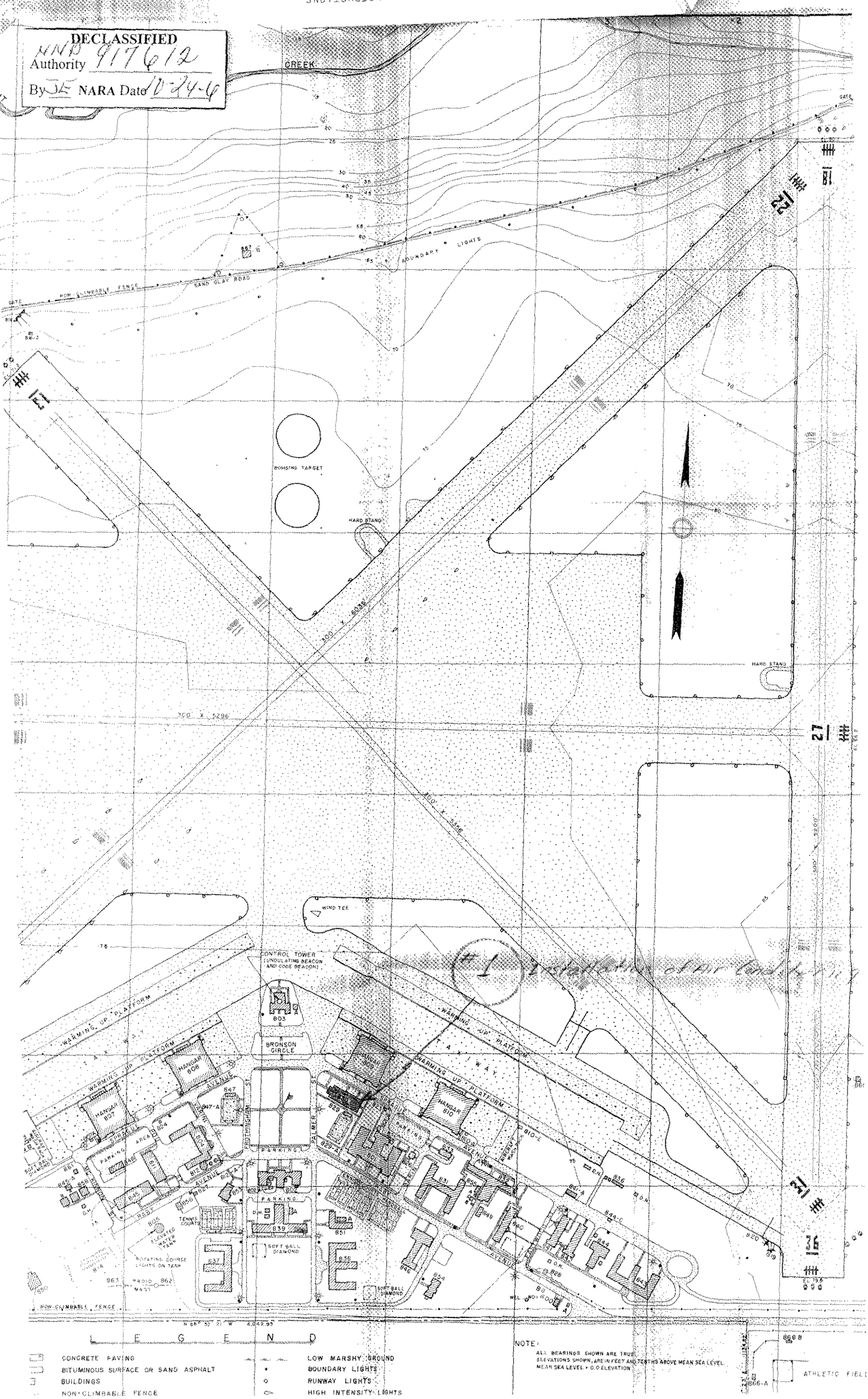
REVISED AND RESUBMITTED

PUBLIC WORKS OFFICER, N.A.B.T.

N.A.B.T. DWG. 26011

REPRODUCED AT THE NATIONAL ARCHIVES

DECLASSIFIED
NND 917612
Authority
By JE NARA Date 10-24-6



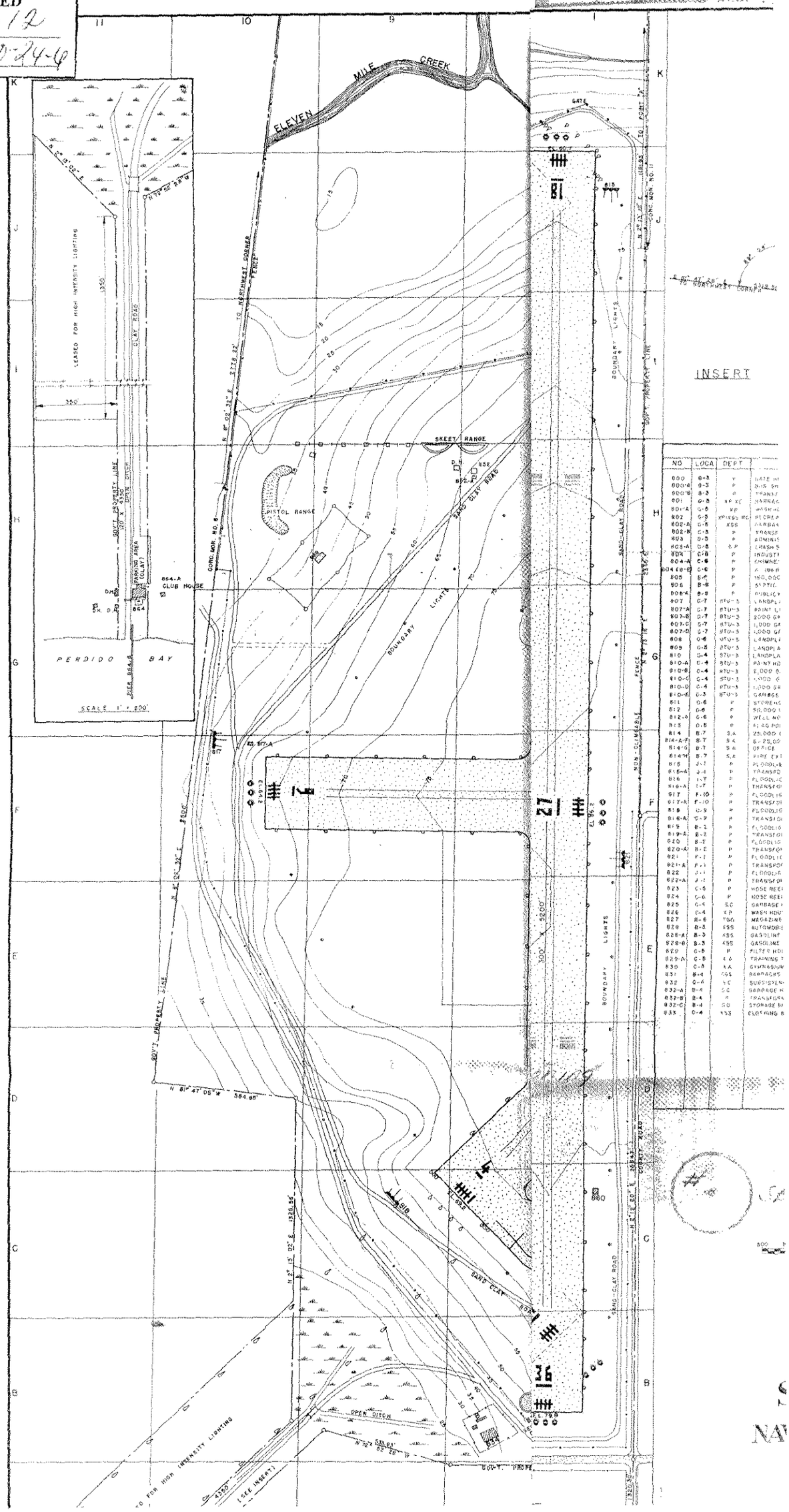
L E G E N D

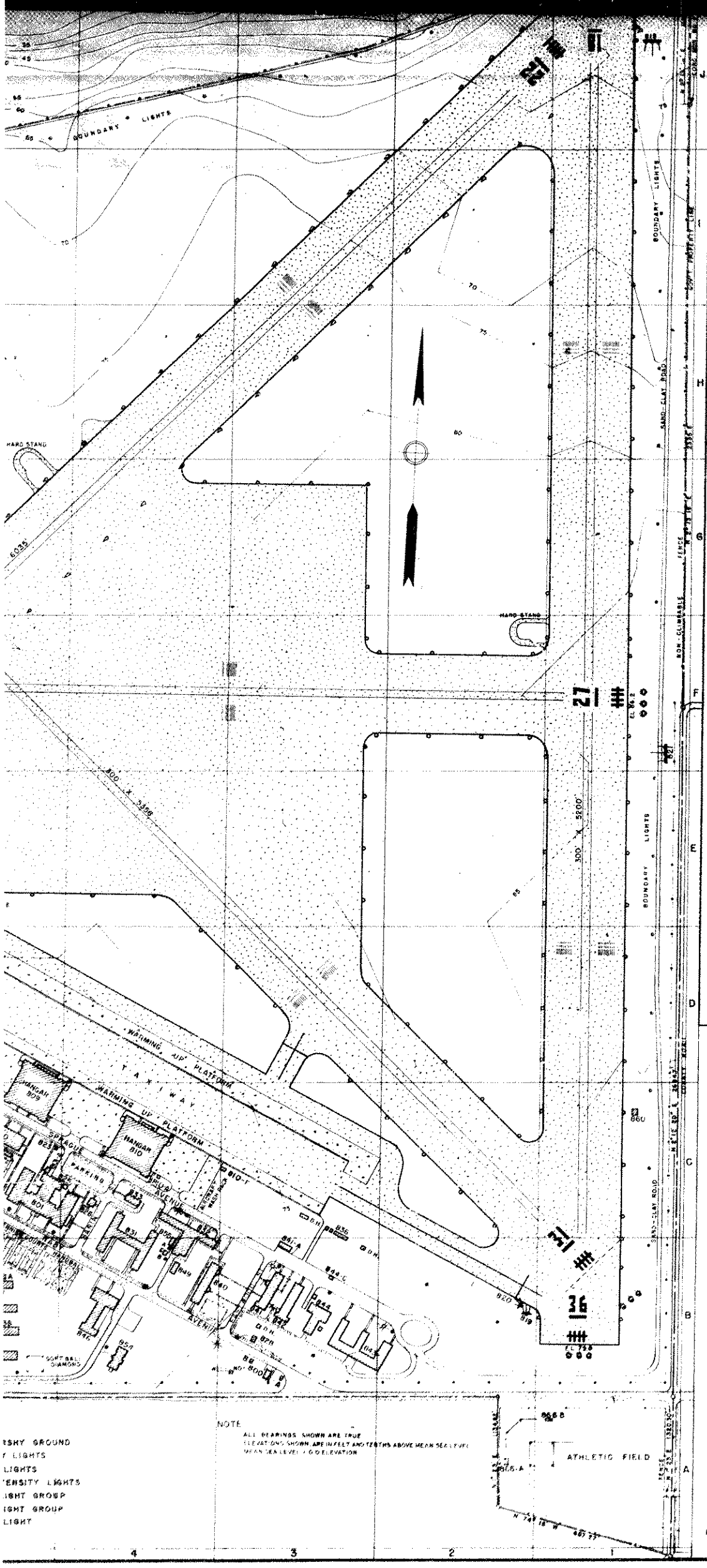
- CONCRETE PAVING
- BITUMINOUS SURFACE OR SAND ASPHALT
- BUILDINGS
- NON-CLIMBABLE FENCE
- LOW MARSHY GROUND
- BOUNDARY LIGHTS
- RUNWAY LIGHTS
- HIGH INTENSITY LIGHTS

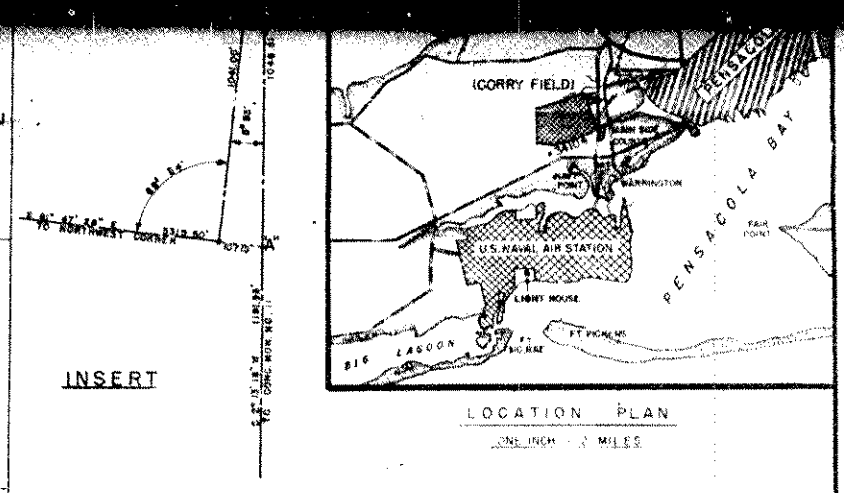
NOTE:
ALL BEARINGS SHOWN ARE TRUE.
ELEVATIONS SHOWN ARE IN FEET AND TENTHS ABOVE MEAN SEA LEVEL.
MEAN SEA LEVEL = 0.0 ELEVATION

REPRODUCED AT THE NATIONAL ARCHIVES

DECLASSIFIED
Authority NND 917612
By JE NARA Date 10-24-4







LOCATION PLAN

ONE INCH = 2 MILES

STRUCTURES

NO.	LOCA.	DEPT.	USE	NO.	LOCA.	DEPT.	USE
800	B-5	Y	GATE HOUSE	834	B-6	P	PUMP HOUSE & CHLOR BLDG (SEWAGE DISPOSAL)
800-A	B-3	P	BUS SHELTER	834-A	B-6	P	PRIMARY SETTLING TANK
800-B	B-3	P	TRANSFORMER VAULT, NEAR BLDG 800	834-B	B-6	P	FINAL SETTLING TANK
801	D-5	XP XC	BARRACKS, MESSHALL AND LIBRARY	834-C	B-6	P	TRICKLING FILTER
801-A	D-5	XP	WASH HOUSE, REAR OF BUILDING 801	834-D	B-6	P	DIGESTER
802	D-5	XP XSS XC	RECREATION BUILDING (CPO MESS, S.S. REST)	834-E	B-6	P	SLUDGE DRYING BEDS
802-A	D-5	XSS	GARBAGE HOUSE NEAR BUILDING 802	834-F	B-6	P	CHLORINE CONTACT CHAMBER
802-B	D-5	P	TRANSFORMER VAULT, NEAR BUILDING 802	835	D-7	BTU-3	CREWS SHELTER (WEST SIDE)
803	D-3	P	ADMINISTRATION BUILDING	836	D-7	BTU-3	CREWS SHELTER (EAST SIDE)
803-A	D-3	O P	CRASH SHACK	837	B-4	KP	MIDN QTR'S (TYPE G-4, MOD 320 MIDN)
804	C-6	P	INDUSTRIAL BUILDING	837-A	B-4	K A	SOFT BALL DIAMOND
804-A	C-6	P	CHIMNEY FOR INDUSTRIAL BLDG	838	B-5	KP	MIDN QTR'S (TYPE G-4, MOD 320 MIDN)
804 EB-E	C-6	P	4-100 BBL. FUEL OIL STORAGE TANKS (UNPROD)	838-A	B-5	P	HOSE REEL HOUSE
805	B-6	P	150,000 GAL. ELEVATED WATER TANK	838-B	B-5	K A	SOFT BALL DIAMOND
806	B-8	P	SEPTIC TANK	839	B-5	XP XW	SUBSISTENCE BLDG (MIDN)
806-A	B-8	P	PUBLIC WORKS STORAGE	839-A	B-5	S C	GARBAGE HOUSE NEAR BUILDING 839
807	C-7	BTU-3	LANDPLANE HANGAR	840	D-4	C N	8 ENLISTED MEN'S APARTMENTS
807-A	C-7	BTU-3	PAINT LOCKER, NEAR BLDG 807	841	B-3	OCCUPANTS	5 MARRIED OFFICERS APARTMENTS
807-B	C-7	BTU-3	8000 GAL. USED OIL TANK	841-A	B-3	OCCUPANTS	GARAGE
807-C	C-7	BTU-3	1,000 GAL. KEROSENE TANK	842	B-3	B O Q	BACHELOR OFFICERS QUARTERS (60 JR OFFICERS)
807-D	C-7	BTU-3	1,000 GAL. GASOLINE TANK	843	B-3	B O Q	BACHELOR OFFICERS QTRS (TYPE D-4 180 OFFS)
808	C-8	BTU-3	LANDPLANE HANGAR	844	B-3	B O Q	BACHELOR OFFICERS SUBSISTENCE BLDG (MESS)
809	C-8	BTU-3	LANDPLANE HANGAR	844-A	B-3	B O Q	GARBAGE HOUSE NEAR BUILDING 844
810	C-4	BTU-3	LANDPLANE HANGAR	844-B	B-3	P	TRANSFORMER VAULT, NEAR BUILDING 844
810-A	C-4	BTU-3	PAINT HOUSE, NEAR BUILDING 810	844-C	B-3	B O Q	HOSE REEL HOUSE, NEAR BUILDING 844
810-B	C-4	BTU-3	8,000 GAL. USED OIL TANK	845	B-6	X G S	GROUND SCHOOL BUILDING
810-C	C-4	BTU-3	1,000 GAL. KEROSENE TANK	845-A	B-6	P	GAS CHAMBER, S OF BUILDING 835 (SECOND)
810-D	C-4	BTU-3	1,000 GAL. GASOLINE TANK	846	B-4	M	MEDICAL BUILDING
810-E	C-3	BTU-3	GARAGE	846-A	B-4	M	GARBAGE HOUSE
811	C-8	P	STOREHOUSE & PUBLIC WORKS SHOP	847	C-6	P	FILTER HOUSE
812	C-8	P	50,000 GAL. CONCRETE SERVICE RESERVOIR	847-A	C-6	X A	TRAING TANK
812-A	C-8	P	WELL NO 2 & PUMP HOUSE	848	C 7	P	PUBLIC WORKS GARAGE
813	C-5	P	FLAG POLE	848	B-4	X P	STERILIZATION HOUSE
814	B-7	S A	25,000 GAL. GASOLINE STORAGE TANK (UNPROD)	850	B-7	P	FURNITURE STORAGE, PUBLIC WORKS
814-A-P	B-7	S A	6-25,000 GAL. GASOLINE STORAGE TANKS (UNPROD)	851	B-5	XA XW	BOWLING ALLEY & HOBBY SHOP
814-B	B-7	S A	OFFICE	851-A	B-5	X A	HAND BALL COURTS
814-H	B-7	S A	FIRE EXTINGUISHER SHED	851-B	B-5	X A	TENNIS COURTS
815	J-1	P	FLOODLIGHT GROUP NO 1	852	H-8	T G O	SKEET RANGE HOUSE
816-A	J-1	P	TRANSFORMER VAULT	852-A	H-8	P	WELL & PUMP HOUSE AT SKEET RANGE
816	I-7	P	FLOODLIGHT GROUP NO 2	853	B-6	X C	CHAPEL (LIBRARY BUILDING)
816-A	I-7	P	TRANSFORMER VAULT	854	B-4	X W	CPO CLUB
817	F-10	P	FLOODLIGHT GROUP NO. 3	855	B-4	X W	STORAGE BUILDING, NEAR 832
817-A	F-10	P	TRANSFORMER HOUSE	856	B-6	P	PAINT SHOP
818	C-8	P	FLOODLIGHT GROUP NO. 4	857	B-7	T G G	MAGAZINE (PYROTECHNIC) 2 YX
818-A	C-8	P	TRANSFORMER HOUSE	858	B-7	T G G	AIR GUN STRUCTURE (PREFABRICATED)
819	B-2	P	FLOODLIGHT GROUP NO 5	858-A	B-7	T G G	AIR GUN STRUCTURE (" ")
819-A	B-2	P	TRANSFORMER HOUSE	858-B	B-7	T G G	AIR GUN STRUCTURE (" ")
820	B-2	P	FLOODLIGHT GROUP NO 6	859	B-8	P	PUBLIC WORKS STORAGE
820-A	B-2	P	TRANSFORMER VAULT	859-A	B-7	P	PUBLIC WORKS STORAGE
821	F-1	P	FLOODLIGHT GROUP NO 7	860	G-1	P	PUBLIC WORKS STORAGE
821-A	F-1	P	TRANSFORMER HOUSE	861	C-7	T G G	BATTERY CHARGING SHOP
822	J-1	P	FLOODLIGHT GROUP NO 8	862	B-8	R C	RADIO MAST (EAST)
822-A	J-1	P	TRANSFORMER HOUSE	863	B-8	R C	RADIO MAST (WEST)
823	C-5	P	HOSE REEL HOUSE NO 1	864	B-11	X W	CLUB HOUSE
824	C-6	P	HOSE REEL HOUSE NO 2	864-A	C-11	P	GENERATOR SHED
825	C-4	S C	GARBAGE HOUSE, NEAR 801	864-B	G-11	X W	WHARF (4 x 500)
826	C-4	X P	WASH HOUSE	865	B-5	X A	SOFT BALL DIAMOND
827	B-6	T G G	MAGAZINE (PYROTECHNIC)	866	A-1	X A	ATHLETIC FIELD
828	B-3	X S S	AUTOMOBILE SERVICE STATION	867	J-6	R C	TRANSMITTER BUILDING
828-A	B-3	X S S	GASOLINE STORAGE TANK (10,000 GAL.)	867-A	J-6	R C	RADIO MAST (EAST)
828-B	B-3	X S S	GASOLINE STORAGE TANK (10,000 GAL.)	867-B	J-6	R C	RADIO MAST (WEST)
829	C-8	P	FILTER HOUSE	867-C	J-6	R C	RADIO MAST (NORTH)
829-A	C-8	X A	TRAINING TANK	867-D	J-6	P	SUB-STATION NO 6
830	C-5	K A	GYMNASIUM BUILDING	868	G-7	R C	HIGH INTENSITY CONTROL EQUIP VAULT
831	B-4	C G S	BARRACKS BUILDING	869	H-9	R C	RADIO RECEIVER STATION
832	C-	S C	SUBSISTENCE BUILDING				
832-A	B-4	S C	GARBAGE HOUSE NEAR BUILDING 832				
832-B	B-4	P	TRANSFORMER VAULT, NEAR BUILDING 832				
832-C	B-4	S C	STORAGE SHED				
833	C-4	X S S	CLOTHING & SMALL STORES BUILDING				

SCALE IN FEET

ONE INCH = 200 FEET

MAP OF SAUFLEY FIELD

NAVAL AUXILIARY AIR STATION

PENSACOLA, FLA.

SHOWING CONDITIONS ON JUNE 30, 1949

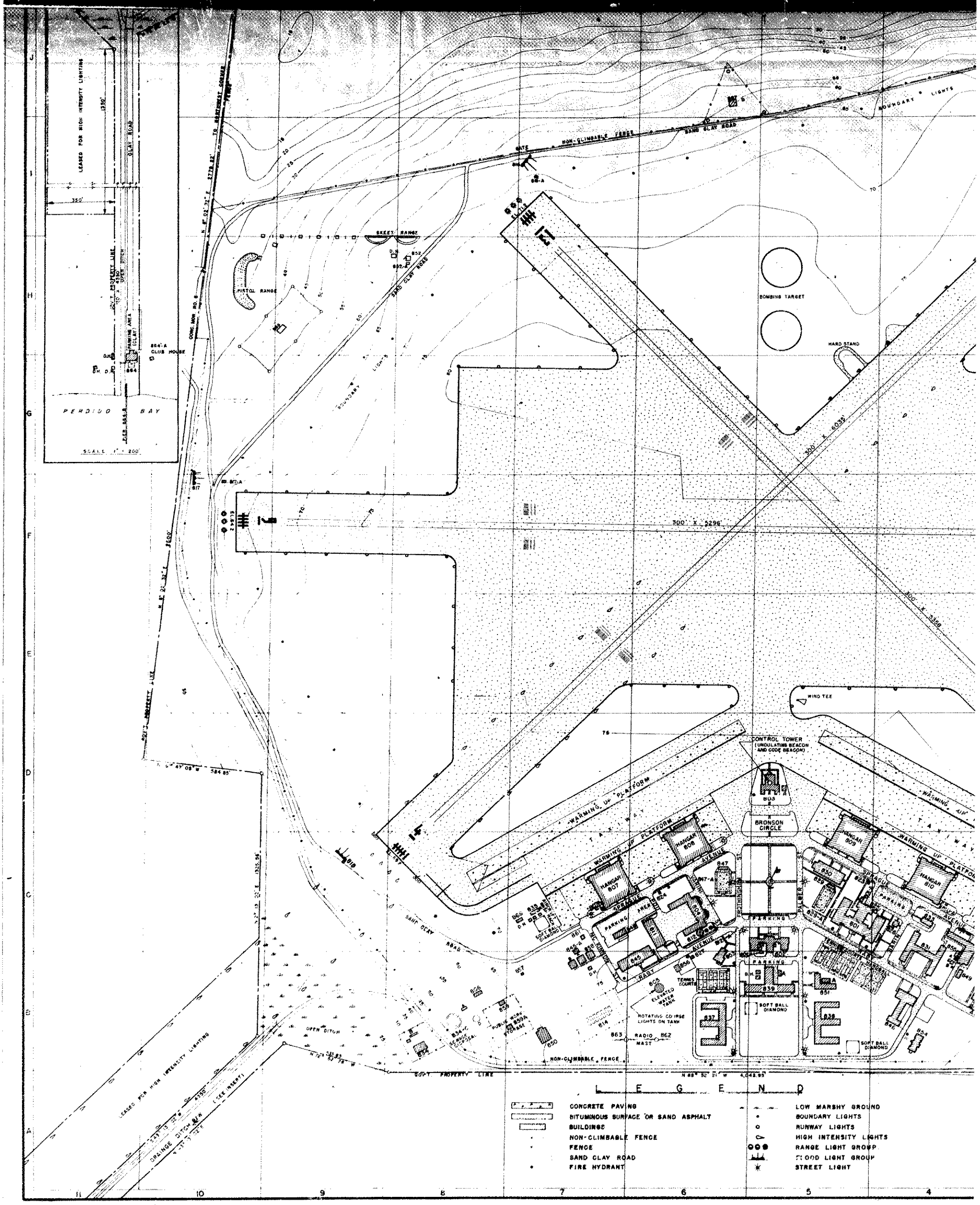
RESTRICTED

REVISED AND RESUBMITTED 200-3-45

N.A.B.T DWG. 26011

RG 71, Bureau of Docks, Series II microfilm, Reel 633

15


PERDIDO BAY
SCALE 1" = 200'
LEASED FOR HIGH INTENSITY LIGHTING
CLAY ROAD
GOV'T PROPERTY LINE
CLUB HOUSE
PARKING AREA
SKEET RANGE
PISTOL RANGE
SAND CLAY ROAD
BOUNDARY LIGHTS
NON-CLIMBABLE FENCE
GATE
BOMBING TARGET
HARD STAND
300' X 6039'
300' X 5296'
300' X 5398'
WIND TEE
CONTROL TOWER (UNDULATING BEACON AND CODE BEACON)
WARMING UP PLATFORM
TAXIWAY
BRONSON CIRCLE
HANGAR 808
HANGAR 807
HANGAR 805
HANGAR 810
AVENUE
PARKING
SOFT BALL DIAMOND
TENNIS COURTS
ELEVATED WATER TANK
ROTATING COURSE LIGHTS ON TANK
RADIO MAST
PUBLIC WORKS STORAGE
OPEN DITCH
DRAINAGE DITCH
LEGEND
CONCRETE PAVING
BITUMINOUS SURFACE OR SAND ASPHALT
BUILDINGS
NON-CLIMBABLE FENCE
FENCE
SAND CLAY ROAD
FIRE HYDRANT
LOW MARSHY GROUND
BOUNDARY LIGHTS
RUNWAY LIGHTS
HIGH INTENSITY LIGHTS
RANGE LIGHT GROUP
FLOOD LIGHT GROUP
STREET LIGHT

POOR COPY

15

Appendix C-2: Saufley Field Bombing Targets

1943

Pensacola

SAND ASPHALT RUNWAYS

CONC. PIPE
MIN. BURY - 3'-0"

TAXIWAY

TAXIWAY

24" CONC. 3'-0" BURY

12" C.I.P.
3'-6" BURY

18" CONC.

24" CONC.

STATE HIGHWAY

SECTION 3

SECTION 37

TO MILES TO PENSACOLA

LEGEND

BOUNDARY LINE
FENCE LINE
BUILDINGS
CONCRETE PAVING
BITUMINOUS SURFACE
SAND ASPHALT
SAND CLAY ROADS
RAILROADS
FIRE HYDRANT
FIRE HYDRANT VALVE
LINE MARKER GROUND
FRAGILE DITCH
TRANSMITTER LINE
INDICATES WORK UNDER CONSTRUCTION
RADIO LIGHT GROUND
FIELD POINTS ARE TRANSFORMER VALVE

NOTES

COORDINATE LINES 4000 FEET EACH WAY
TOTAL AREA OF RESERVATION 5076.61 ACRES
CONTOUR INTERVAL [illegible] AS SHOWN
ELEVATIONS BASED ON [illegible] AND [illegible]
DATUM
EAST SIDE OF FIELD ASSUMED TRUE NORTH
FOR IDENTIFICATION OF BEARINGS
DECLINATION 5° [illegible] EAST

LEGEND

FIELD POINTS
BUILDINGS
SPECIFIED CONC. AREAS
SPECIFIED SAND AREAS
BUILDINGS AND PIER NUMBERS
STATIONS ALONG RUNWAYS, MIDFIELD OFFSETS

SCALE IN FEET
0 100 200 400 600 800 1000
1 INCH = 200 FEET

EXHIBIT "A"

MAP OF

SAUFLEY FIELD

NAVAL AUXILIARY AIR STATION

PENSACOLA, FLA.

SHOWING CONDITIONS

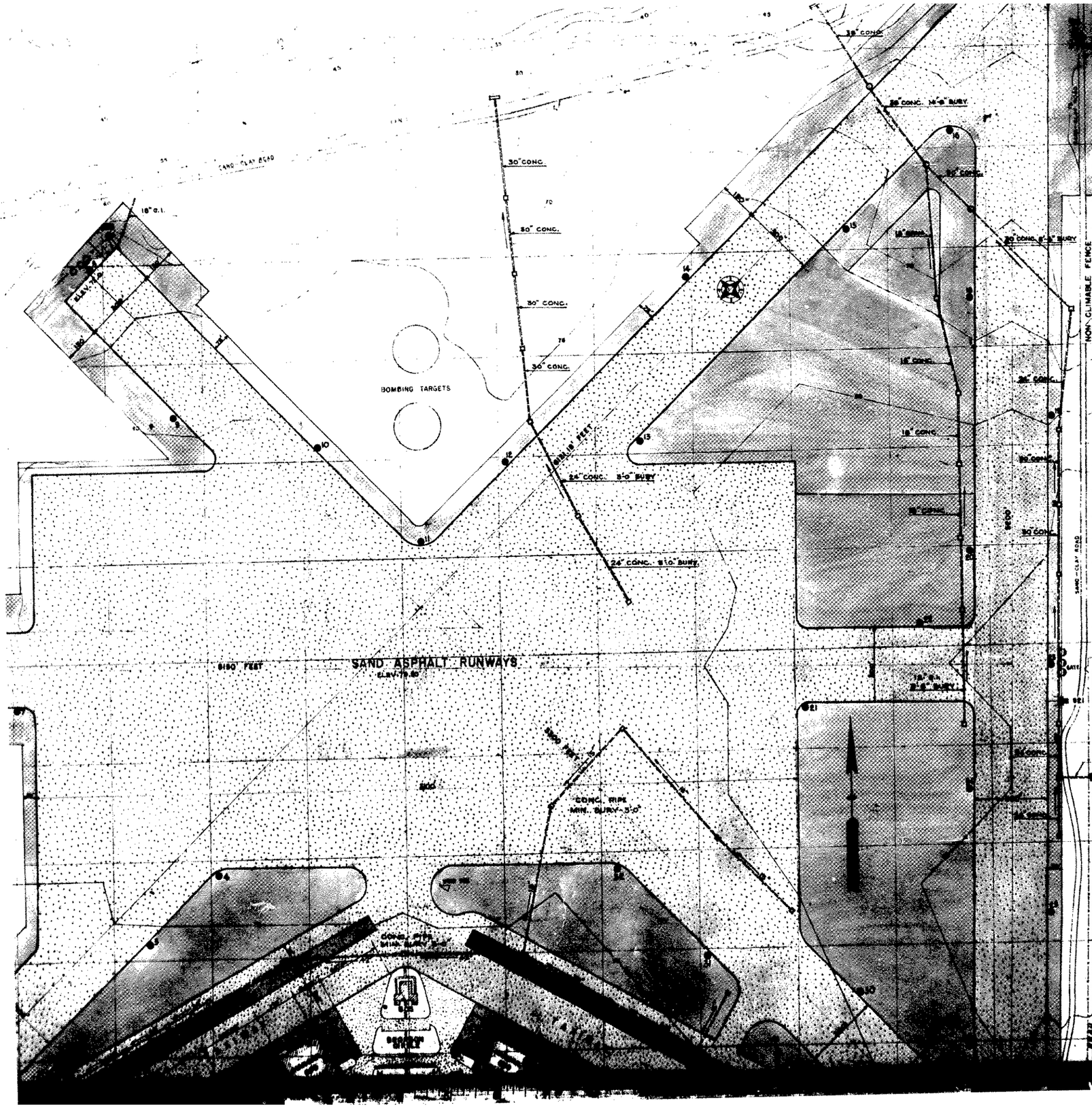
JUNE 30, 1943

REVISED AND RESUBMITTED DEC. 1, 1943

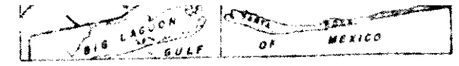
RESTRICTED

FOR OFFICIAL USE ONLY

[illegible] Washington Comm. [illegible] Pool 1295



SCALE 1" = 200'

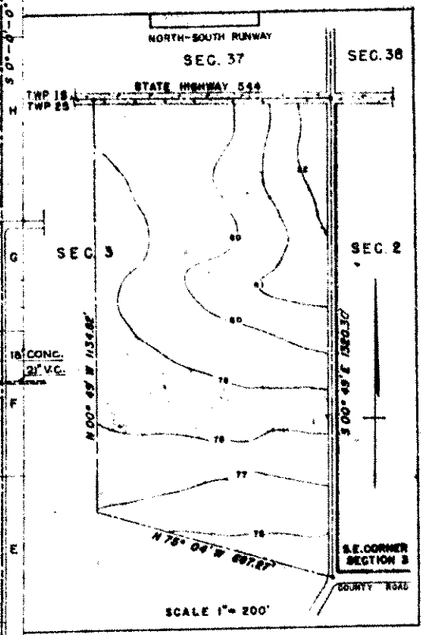


LOCATION PLAN
SCALE 1" = 3 MILES

STRUCTURES

NO	LOC'N	DEPT.	USE
800	A-4	MB	GATE HOUSE
801	B-6	XP SC	BARRACKS AND MESS HALL
802	B-8	XA	RECREATION BUILDING
803	D-8	T	ADMINISTRATION BUILDING
804	C-8	P	INDUSTRIAL BUILDING
804A	C-8	P	CHIMNEY FOR INDUSTRIAL BUILDING
805	B-9	P	150,000 GAL. ELEVATED WATER TANK
806	B-11	P	SEPTIC TANK
807	C-9	T	LANDPLANE HANGAR
808	C-9	T	LANDPLANE HANGAR
809	C-7	T	LANDPLANE HANGAR
810	C-6	T	LANDPLANE HANGAR
811	B-9	P	STORE HOUSE AND PUBLIC WORKS SHOP
812	B-8	P	90,000 GAL. CONC. SERVICE RESERVOIR
813	C-8	P	FLAG POLE
814	A-10	SA	7 GASOLINE STORAGE TANKS (TOTAL 168,000 GALS)
815	N-1	T	FLOODLIGHT GROUP AND VAULT NO.1
816	L-10	T	FLOODLIGHT GROUP AND VAULT NO.2
817	H-14	T	FLOODLIGHT GROUP AND VAULT NO.3
818	C-13	T	FLOODLIGHT GROUP AND VAULT NO.4
819	A-2	T	FLOODLIGHT GROUP AND VAULT NO.5
820	A-2	T	FLOODLIGHT GROUP AND VAULT NO.6
821	G-1	T	FLOODLIGHT GROUP AND VAULT NO.7
822	N-1	T	FLOODLIGHT GROUP AND VAULT NO.8
823	C-6	P	HOSE REEL HOUSE NO.1
824	C-9	P	HOSE REEL HOUSE NO.2
825	B-6	SC	GARBAGE HOUSE

NO	LOC'N	DEPT.	USE
826	B-6	XP	WASH HOUSE
827	B-8	T	MAGAZINE (PYROTECHNIC)
828	A-4	SA	AUTOMOBILE SERVICE STATION
829	C-7	XA P	TRAINING TANK AND FILTER HOUSE
830	C-7	XA	GYMNASIUM BUILDING
831	B-6	XP	BARRACKS BUILDING (400 MEN)
832	B-5	SC	SUBSISTENCE BUILDING
833	B-6	SE	CLOTHING AND SMALL STORES STORAGE BUILDING.
834	A-12	P	PUMP HOUSE (SEWAGE DISPOSAL PLANT)
834A	A-10	SA	UND. GROUND GASO. STORAGE TANK (15,000 GALS)
834B	A-10	SA	UND. GROUND GASO. STORAGE TANK (15,000 GALS)
834C	A-10	SA	UND. GROUND GASO. STORAGE TANK (25,000 GALS)
834D	A-10	S.A.	UND. GROUND GASO. STORAGE TANK (25,000 GALS.)
834E	A-10	S.A.	UND. GROUND GASO. STORAGE TANK (25,000 GALS)
834F	A-10	S.A.	UND. GROUND GASO STORAGE TANK (25,000 GALS)
834G	A-10	S.A.	UND. GROUND GASO STORAGE TANK (25,000 GALS)
835	C-10	T	CREW SHELTER (WEST)
836	B-4	T	CREWS SHELTER (EAST)
837	A-6	T	CADET OFFICERS QUARTERS (520 MEN)
838	A-7	T	CADET OFFICERS QUARTERS (520 MEN)
839	B-8	SC	SUBSISTENCE BUILDING
840	B-5	XP	ENLISTED MENS BARRACKS
841	B-4	XBQ	SENIOR BACHELOR OFFICERS QUARTERS (40 MEN)
842	A-4	XBQ	JUNIOR BACHELOR OFFICERS QUARTERS (80 MEN)
843	A-3	XBQ	BACHELOR OFFICERS QUARTERS (480 MEN)
844	A-4	XBQ	BACHELOR OFFICERS QUARTERS UNIT (144 MEN)
845	B-9	T	GROUND SCHOOL BUILDING
846	A-6	M	MEDICAL BUILDING (20 BEDS)
847	C-8	XA P	TRAINING TANK AND FILTER HOUSE
848	B-9	P	GARAGE
849	B-5	P	STERILIZATION HOUSE
850	A-10	X SE	DOG KENNEL



LEGEND

- BOUNDARY LINE
- FENCE LINE
- BUILDINGS
- CONCRETE PAVING
- BITUMINOUS SURFACE
- SAND ASPHALT
- SAND CLAY ROADS
- RAILROADS
- FIRE HYDRANT
- TRANSFORMER VAULT
- LOW MAINTENANCE HIGHWAY
- DRAINAGE DITCH
- TOWNSHIP LINE
- INDICATES ZONE CHANGE INTERSECTION
- RANGE LIGHT GROUP
- FLOOD LIGHTS AND TRANSFORMER VAULT

NOTES

COORDINATE LINES 400 FEET EACH WAY.
TOTAL AREA OF RESERVATION 867.6 ACRES.

CONTOUR INTERVALS AS SHOWN.
ELEVATIONS BASED ON U.S.G.S. AND N.A.S. DATUM.
EAST SIDE OF FIELD ASSUMED DUE NORTH FOR COMPUTATION OF BEARINGS.
DECLINATION 8°-10' EAST.

LEGEND

- CONCRETE
- BITUMINOUS
- SPRIGGED GRASS AREAS
- NATURAL GRASS AREAS
- 32 BORINGS AND ITS NUMBER

STAR INDICATES RUNWAY MOSTLY USED

SCALE IN FEET
0 100 200 400 600 800 1000

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87759 NEG

NAVAER-452

NUMBER	DATE
Pn 36337	5 July 1943

TAKEN BY:

NAS Pensacola

LOCATION:

SUBJECT:

Vertical of AAS Saufley field, auxiliary of NAS Pensacola, Fla. Alt. 11,000'; F. L. 8.25".

RELEASED FOR PUBLICATION:

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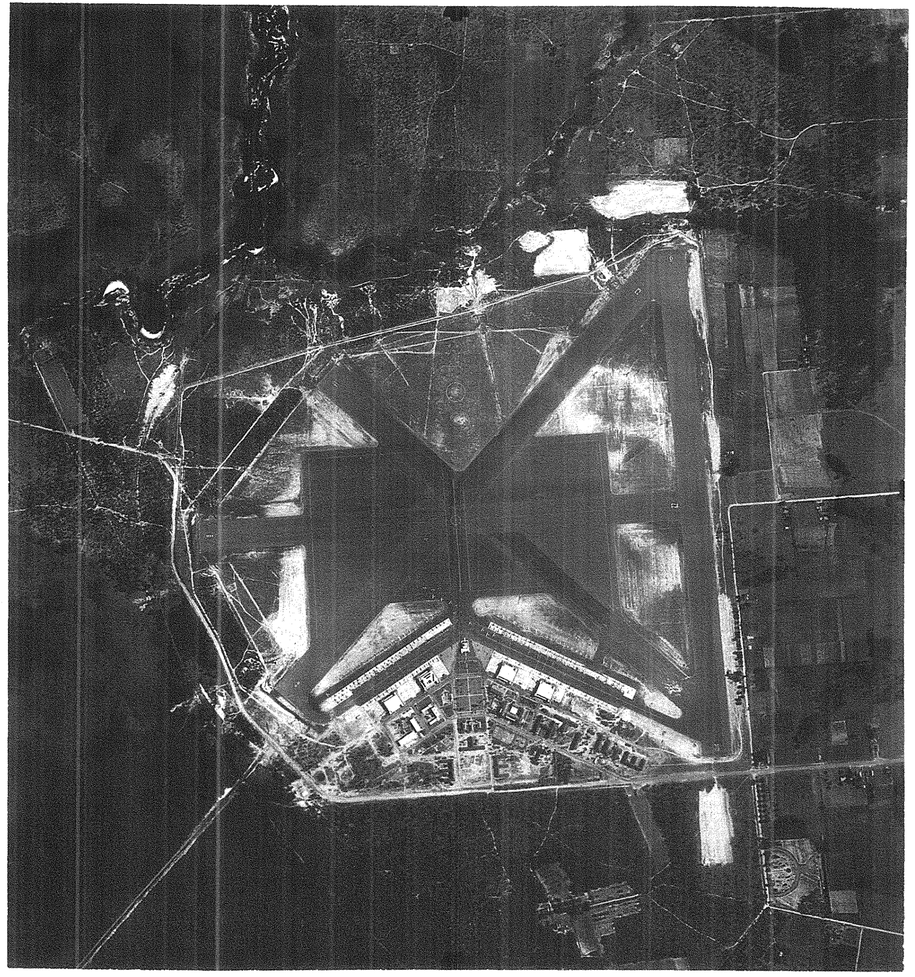
Box 411

Saufley Fld/Pensacola 1943



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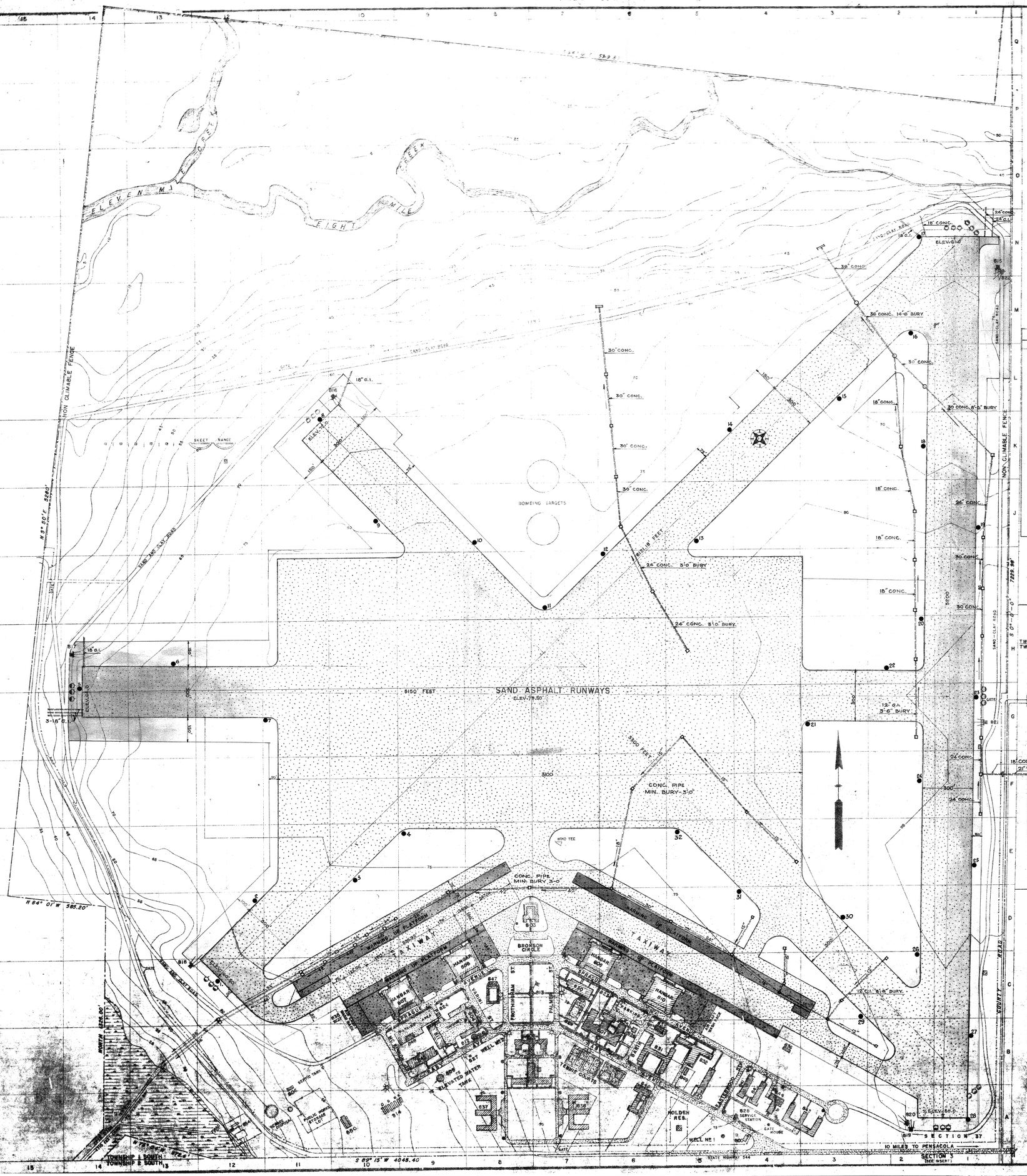
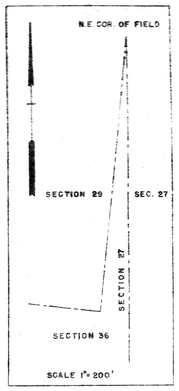
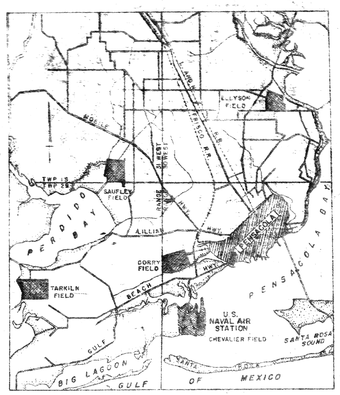


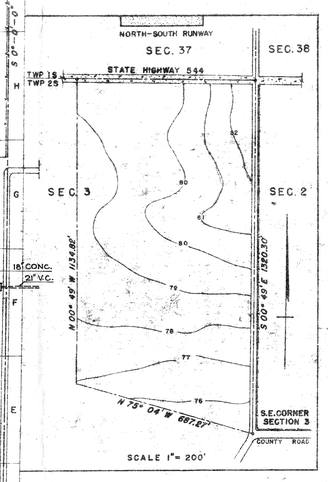




LOCATION PLAN
SCALE 1" = 3 MILES

STRUCTURES

NO	LOC'N	DEPT.	USE	NO	LOC'N	DEPT.	USE
800	A-4	MB	GATE HOUSE	826	B-6	XP	WASH HOUSE
801	B-6	XP.SC	BARRACKS AND MESS HALL	827	B-8	T	MAGAZINE (PYROTECHNIC)
802	B-8	XA	RECREATION BUILDING	828	A-4	SA	AUTOMOBILE SERVICE STATION
803	D-8	T	ADMINISTRATION BUILDING	829	C-7	XA.P	TRAINING TANK AND FILTER HOUSE
804	C-8	P	INDUSTRIAL BUILDING	830	C-7	XA	GYMNASIUM BUILDING
804A	C-8	P	CHIMNEY FOR INDUSTRIAL BUILDING	831	B-6	XP	BARRACKS BUILDING (400 MEN)
805	B-9	P	150,000 GAL. ELEVATED WATER TANK	832	B-5	SC	SUBSISTENCE BUILDING
806	B-11	P	SEPTIC TANK	833	B-6	XE	CLOTHING AND SMALL STORES STORAGE BUILDING.
807	C-9	T	LANDPLANE HANGAR	834	A-12	P	PUMP HOUSE (SEWAGE DISPOSAL PLANT)
808	C-9	T	LANDPLANE HANGAR	814A	A-10	S.A.	UND. GROUND GASO. STORAGE TANK (15,000 GALS.)
809	C-7	T	LANDPLANE HANGAR	814B	A-10	S.A.	UND. GROUND GASO. STORAGE TANK (25,000 GALS.)
810	C-6	T	LANDPLANE HANGAR	814C	A-10	S.A.	UND. GROUND GASO. STORAGE TANK (25,000 GALS.)
811	B-9	P	STORE HOUSE AND PUBLIC WORKS SHOP	814D	A-10	S.A.	UND. GROUND GASO. STORAGE TANK (25,000 GALS.)
812	B-8	P	50,000 GAL. CONC. SERVICE RESERVOIR	814E	A-10	S.A.	UND. GROUND GASO. STORAGE TANK (25,000 GALS.)
813	C-8	P	FLAG POLE	814F	A-10	S.A.	UND. GROUND GASO. STORAGE TANK (25,000 GALS.)
814	A-10	SA	7 GASOLINE STORAGE TANKS (TOTAL 165,000 GALS)	814G	A-10	S.A.	UND. GROUND GASO. STORAGE TANK (25,000 GALS.)
815	N-1	T	FLOODLIGHT GROUP AND VAULT NO.1	835	C-10	T	CREW SHELTER (WEST)
816	L-10	T	FLOODLIGHT GROUP AND VAULT NO.2	836	B-4	T	CREWS SHELTER (EAST)
817	H-14	T	FLOODLIGHT GROUP AND VAULT NO.3	837	A-8	T	CADET OFFICERS QUARTERS (320 MEN)
818	C-13	T	FLOODLIGHT GROUP AND VAULT NO.4	838	A-7	T	CADET OFFICERS QUARTERS (320 MEN)
819	A-2	T	FLOODLIGHT GROUP AND VAULT NO.5	839	B-8	SC	SUBSISTENCE BUILDING
820	A-2	T	FLOODLIGHT GROUP AND VAULT NO.6	840	B-5	XP	ENLISTED MENS BARRACKS
821	G-1	T	FLOODLIGHT GROUP AND VAULT NO.7	841	B-4	XBQ	SENIOR BACHELOR OFFICERS QUARTERS (40 MEN)
822	N-1	T	FLOODLIGHT GROUP AND VAULT NO.8	842	A-4	XBQ	JUNIOR BACHELOR OFFICERS QUARTERS (60 MEN)
823	C-6	P	HOSE REEL HOUSE NO.1	843	A-3	XBQ	BACHELOR OFFICERS QUARTERS (130 MEN)
824	C-9	P	HOSE REEL HOUSE NO.2	844	A-4	XBQ	BACHELOR OFFICERS SUBSISTENCE UNIT (114 MEN)
825	B-6	SC	GARBAGE HOUSE	845	B-9	T	GROUND SCHOOL BUILDING
				846	A-6	M	MEDICAL BUILDING (20 BEDS)
				847	C-8	XA.P	TRAINING TANK AND FILTER HOUSE
				848	B-9	P	GARAGE
				849	B-5	P	STERILIZATION HOUSE
				850	A-10	XSE	DOG KENNEL



LEGEND

- BOUNDARY LINE
- FENCE LINE
- BUILDINGS
- CONCRETE PAVING
- BITUMINOUS SURFACE
- SAND ASPHALT
- SAND CLAY ROADS
- RAILROADS
- FIRE HYDRANT
- TRANSFORMER VAULT
- LOW MARSHY GROUND
- DRAINAGE DITCH
- TOWNSHIP LINE
- INDICATES WORK UNDER CONSTRUCTION
- RANGE LIGHT GROUP
- FLOOD LIGHTS AND TRANSFORMER VAULT

NOTES

COORDINATE LINES 400 FEET EACH WAY.
TOTAL AREA OF RESERVATION 867.61 ACRES.

CONTOUR INTERVALS AS SHOWN.
ELEVATIONS BASED ON U.S.G.S. AND N.A.S. DATUM
EAST SIDE OF FIELD ASSUMED DUE NORTH FOR COMPUTATION OF BEARINGS.
DECLINATION 5°-10' EAST.

LEGEND

- CONCRETE
- BITUMINOUS
- SPRIGGED GRASS AREAS
- NATURAL GRASS AREAS
- 52 BORINGS AND ITS NUMBER

STAR INDICATES RUNWAY MOSTLY USED

SCALE IN FEET
0 100 200 400 600 800 1000
1 INCH = 200 FEET

RG71, Bu Yds + Dks
800-3-421

EXHIBIT "A"

MAP OF SAUFLEY FIELD

NAVAL AUXILIARY AIR STATION PENSACOLA, FLA.

SHOWING CONDITIONS ON
JUNE 30 1943

REVISED AND RESUBMITTED DEC., 1943

RESTRICTED
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CAPTAIN S.E.C. U.S.N.
PUBLIC WORKS OFFICER

N.A.S. DWG. NO. 2104

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NAVAER- 452

NUMBER	DATE
PNX538	19 Feb. 1945

TAKEN BY:

NAS PENSACOLA

LOCATION:

SUBJECT:

Aerial of NAAS Saufley, Fla.

Alt. 12000' F.L.12" scale 1-12000

No Objection
To Publication
For Reasons of Naval Security

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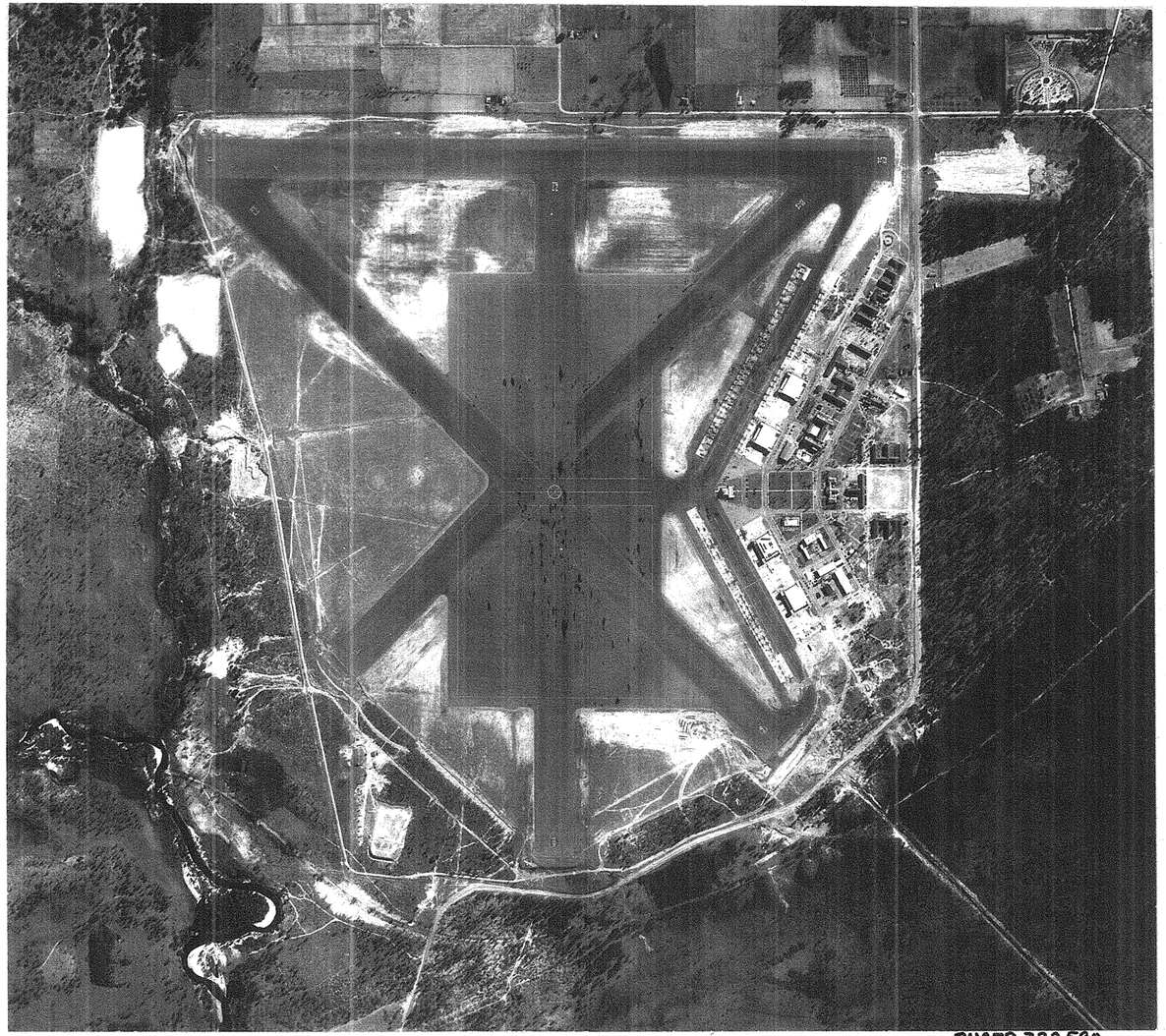

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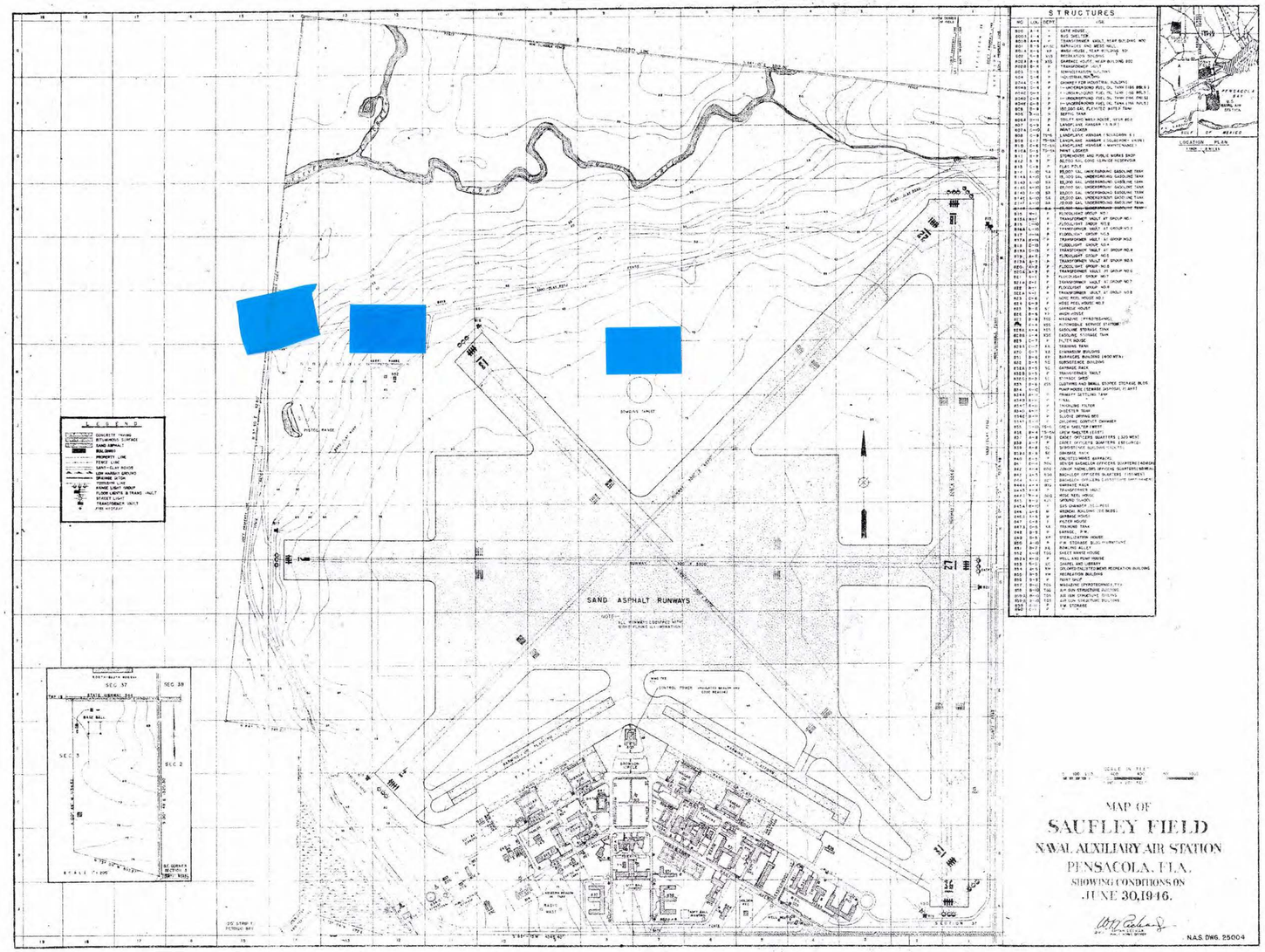
Pensacola 1946



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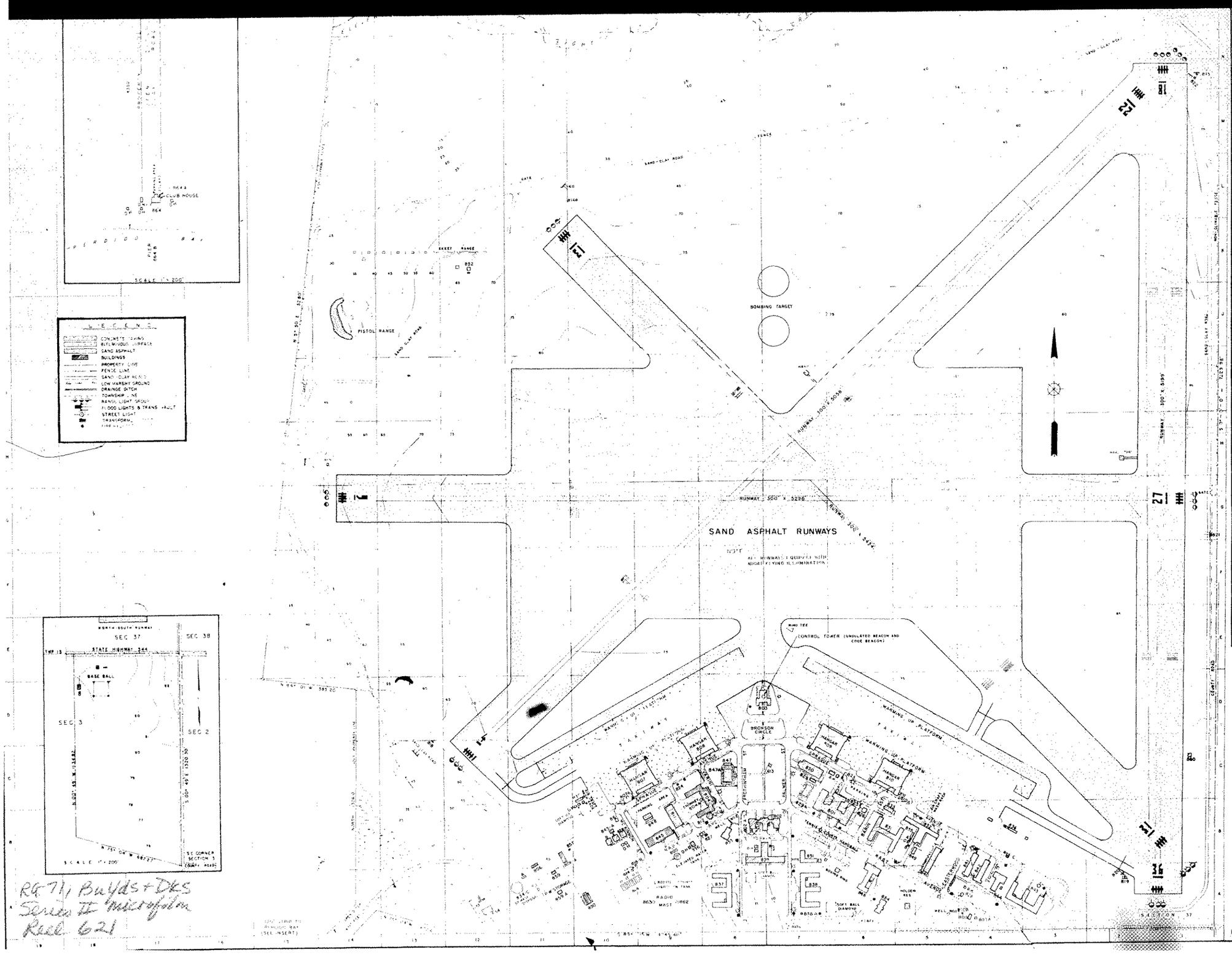
1947

Pensacola



812A	B-9		WELL AND PUMP HOUSE
813	C-8	P	FLAG POLE
814	A-7	GS	25,000 GAL. UNDERGROUND GASOLINE TANK
814A	A-7	GS	15,000 GAL. UNDERGROUND GASOLINE TANK
814B	A-7	GS	15,000 GAL. UNDERGROUND GASOLINE TANK
814C	A-7	GS	15,000 GAL. UNDERGROUND GASOLINE TANK
814D	A-7	GS	15,000 GAL. UNDERGROUND GASOLINE TANK
814E	A-7	GS	15,000 GAL. UNDERGROUND GASOLINE TANK
814F	A-7	GS	25,000 GAL. UNDERGROUND GASOLINE TANK
815	N-1	P	FLOODLIGHT GROUP NO. 1
815A	N-1	P	TRANSFORMER VAULT AT GROUP NO. 1
816	N-1	P	FLOODLIGHT GROUP NO. 2
816A	N-1	P	TRANSFORMER VAULT AT GROUP NO. 2
817	N-14	P	FLOODLIGHT GROUP NO. 3
817A	N-14	P	TRANSFORMER VAULT AT GROUP NO. 3
818	C-17	P	FLOODLIGHT GROUP NO. 4
818A	C-17	P	TRANSFORMER VAULT AT GROUP NO. 4
819	A-1	P	FLOODLIGHT GROUP NO. 5
819A	A-1	P	TRANSFORMER VAULT AT GROUP NO. 5
820	A-2	P	FLOODLIGHT GROUP NO. 6
820A	A-2	P	TRANSFORMER VAULT AT GROUP NO. 6
821	N-1	P	FLOODLIGHT GROUP NO. 7
821A	N-1	P	TRANSFORMER VAULT AT GROUP NO. 7
822	N-1	P	FLOODLIGHT GROUP NO. 8
822A	N-1	P	TRANSFORMER VAULT AT GROUP NO. 8
823	C-6	P	HOSE REEL HOUSE NO. 1
824	C-9	P	HOSE REEL HOUSE NO. 2
825	B-6	SC	GARBAGE HOUSE
826	B-5	P.P	WASH HOUSE
827	B-8	TGG	GASOLINE (PYROTECHNIC)
828	A-4	XSS	AUTOMOBILE SERVICE STATION
828A	A-4	XSS	GASOLINE STORAGE TANK (10,000 GALLONS)
828B	A-4	XSS	GASOLINE STORAGE TANK (10,000 GALLONS)
829	C-7	P	FILTER HOUSE
829A	C-7	XA	TRAINING TANK
830	C-7	XA	GYMNASIUM BUILDING
831	B-6	CGS	BARRACKS BUILDING (LINK TRAINER)
832	B-5	SC	SUBSISTENCE BUILDING
832A	B-5	SC	GARBAGE RACK
832B	B-5	P	TRANSFORMER VAULT
832C	B-5	SG	STORAGE SHED
833	B-6	KSG	CLOTHING AND SMALL STORES STORAGE BLDG.
834	A-12	P	PUMP HOUSE (SEWAGE DISPOSAL PLANT)
834A	A-11	P	PRIMARY SETTLING TANK
834B	A-11	P	FINAL " "
834C	A-11	P	TRICKLING FILTER
834D	A-11	P	DIGESTER TANK
834E	A-11	P	SLUDGE DRYING BED
834F	A-11	P	CHLORINE CONTACT CHAMBER
835	C-10	S.M	CREW SHELTER (WEST)
836	B-4	S.M	CREW SHELTER (EAST)
837	A-8	P	CADET OFFICERS QUARTERS (SEGURED)
838	A-7	XP	CADET OFFICERS QUARTERS (ENLISTED BARRACKS)
839	B-8	XP.XW	SUBSISTENCE BUILDING (HOBBY SHOP & CPO CLUB)
839A	B-8	SC	GARBAGE RACK
840	B-5	PXWXRS	ENLISTED MENS RECREATION & P.W. STORAGE
841	B-4	BOQ	SENIOR BACHELOR OFFICERS QUARTERS (40 MEN)
842	A-4	BOQ	JUNIOR BACHELORS OFFICERS QUARTERS (60 MEN)
843	A-3	BOQ	BACHELOR OFFICERS QUARTERS (150 MEN)
844	A-4	BOQ	BACHELOR OFFICERS SUBSISTENCE UNIT (4 MEN)
844A	A-4	BUQ	GARBAGE RACK
844B	A-4	P	TRANSFORMER VAULT
844C	B-4	BOQ	HOSE REEL HOUSE
845	B-3	XGS	GROUND SCHOOL
845A	B-10	P	GAS CHAMBER (SECURED)
846	A-6	M	MEDICAL BUILDING (20 BEDS)
846A	A-6	M	GARBAGE HOUSE
847	C-8	P	FILTER HOUSE
847A	C-8	XA	TRAINING TANK
848	B-9	P	GARAGE, P.W.
849	B-5	XP	STERILIZATION HOUSE
850	A-10	P	P.W. STORAGE BLDG (FURNITURE)
851	B-7	XA	BOWLING ALLEY & HOBBY SHOP
852	K-12	TGG	SKEET RANGE HOUSE
852A	K-12	P	WELL AND PUMP HOUSE
853	B-8	XC	CHAPEL AND LIBRARY
854	A-5	XW	COLORED ENLISTED MENS RECREATION BUILDING
855	B-5	XW	STORAGE BUILDING
856	B-9	P	PAINT SHOP
857	B-11	TGG	MAGAZINE (PYROTECHNIC), P.Y.A.
858	B-10	TGG	AIR GUN STRUCTURE BUILDING
858A	B-10	TGG	AIR GUN STRUCTURE BUILDING
858B	B-10	TGG	AIR GUN STRUCTURE BUILDING
859	A-11	P	P.W. STORAGE
859A	A-11	P	P.W. STORAGE
860	C-1	P	P.W. STORAGE
861	B-10	TGG	BATTERY CHARGING SHOP
862	A-9	RC	RADIO MAST (EAST)
863	A-9	RC	RADIO MAST (WEST)
864	L-17	XW	CLUB HOUSE (BEACH)
864A	L-17	P	GENERATOR SHED (BEACH)
865	A-17	KW	CLUB HOUSE WHARF
866	A-10	SA	OFFICE BUILDING
814H	B-10	SA	FIRE EXTINGUISHING SHED
858A	A-7	P	HOSE REEL HOUSE

MAP OF

SAUFLEY FIELD

NAVAL AUXILIARY AIR STATION

PENSACOLA, FLA.

SHOWING CONDITIONS ON

JUNE 30, 1947.

RESTRICTED

FOR OFFICIAL USE ONLY

C. B. Hoffa Captain
COMMANDER C.E.C. USN
PUBLIC WORKS OFFICER

N.A.S. DWG. 25004

454,768

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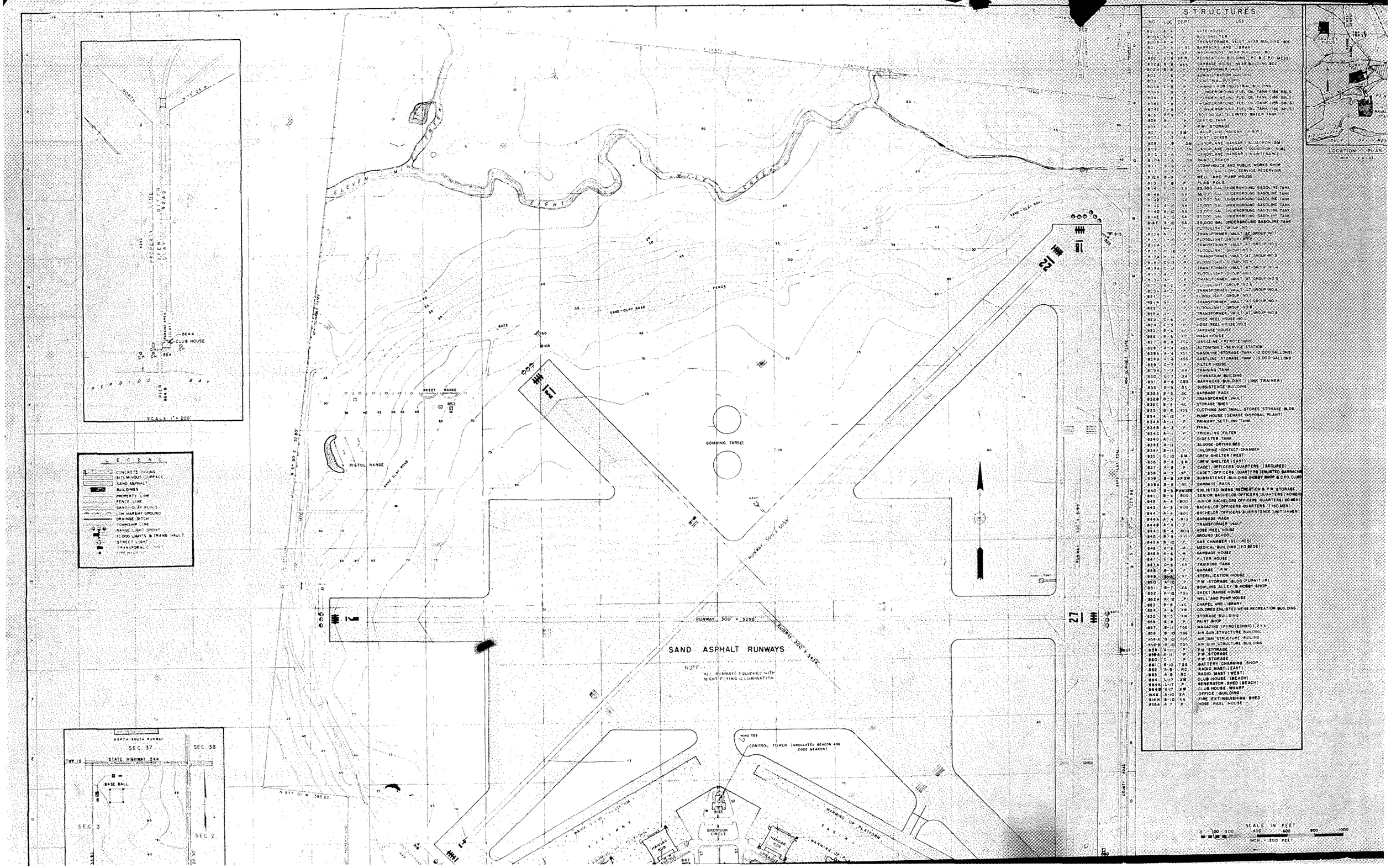
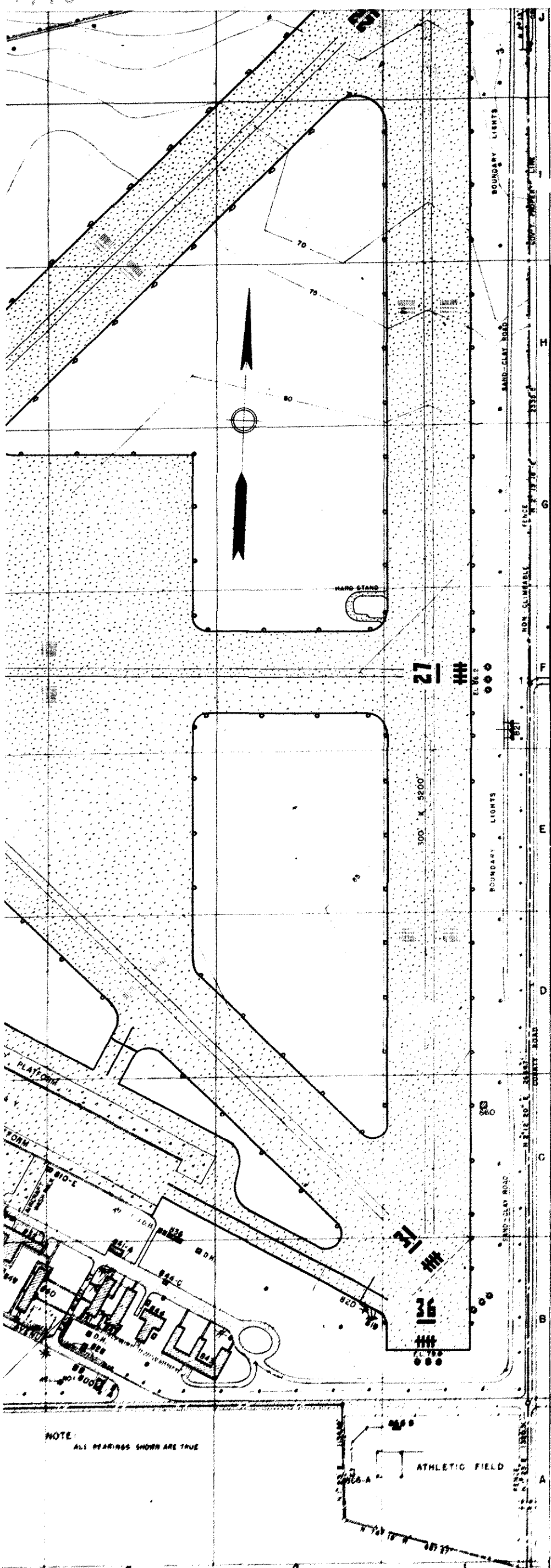
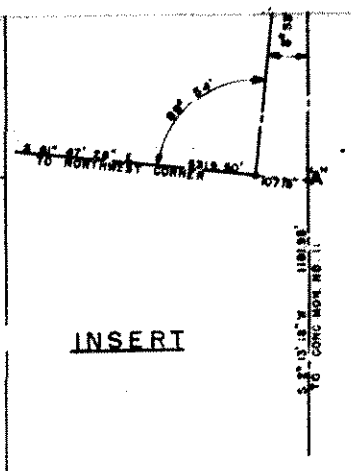


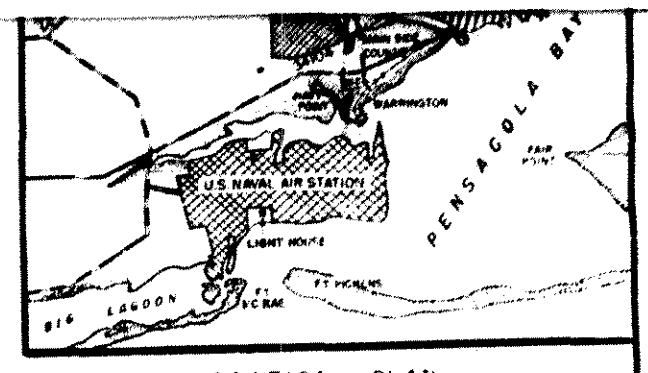
STRUCTURES

NO.	LOC.	DEPT.	USE
800	A-1		GATE HOUSE
800A	A-1		BUS SHELTER
800B	A-1		TRANSFORMER VAULT NEAR BUILDING 800
801	B-5	EC	BARRACKS AND LIBRARY
802	C-6	FP	WASH HOUSE (NEAR BUILDING 8)
802	C-6	FPR	RECREATION BUILDING (P.O. & C.P.O. MESS)
802B	B-6	SSS	GARBAGE HOUSE (NEAR BUILDING 80)
802C	B-6		TRANSFORMER VAULT
803	8	P	ADMINISTRATION BUILDING
804	8	P	INDUSTRIAL BUILDING
804A	C-8	P	PUMPING FOR INDUSTRIAL BUILDING
804B	C-8	P	UNDERGROUND FUEL OIL TANK (186 BBLS)
804C	C-8	P	UNDERGROUND FUEL OIL TANK (186 BBLS)
804D	C-8	P	UNDERGROUND FUEL OIL TANK (186 BBLS)
804E	C-8	P	UNDERGROUND FUEL OIL TANK (186 BBLS)
805	B-8	P	37,700 GAL. ELEVATED WATER TANK
806	B-8	P	SEPTIC TANK
806A	8	P	P.W. STORAGE
807	C-9	SM	LAUNCHING HANGAR (LAGR)
807A	C-9	A	PAINT LOCKER
808	9	SM	SEAPLANE HANGAR (SQUADRON SM)
809	9	SM	SEAPLANE HANGAR (SQUADRON SM)
810	C-9	SM	SEAPLANE HANGAR (MAINTENANCE)
810A	C-9	SM	PAINT LOCKER
811	9-9	P	STOREHOUSE AND PUBLIC WORKS SHOP
812	9-9	P	50,000 GAL. (CM) SERVICE RESERVOIR
812A	9-9	P	WELL AND PUMP HOUSE
813	C-8	P	FLAG POLE
814		SA	25,000 GAL. UNDERGROUND GASOLINE TANK
814A		SA	25,000 GAL. UNDERGROUND GASOLINE TANK
814B		SA	25,000 GAL. UNDERGROUND GASOLINE TANK
814C	A-10	SA	25,000 GAL. UNDERGROUND GASOLINE TANK
814D	A-10	SA	25,000 GAL. UNDERGROUND GASOLINE TANK
814E	A-10	SA	25,000 GAL. UNDERGROUND GASOLINE TANK
814F	A-10	SA	25,000 GAL. UNDERGROUND GASOLINE TANK
815	N-11	P	FLOODLIGHT GROUP NO. 1
815A	N-11	P	TRANSFORMER VAULT AT GROUP NO. 1
816	L-11	P	FLOODLIGHT GROUP NO. 2
816A	L-11	P	TRANSFORMER VAULT AT GROUP NO. 2
817	H-14	P	FLOODLIGHT GROUP NO. 3
817A	H-14	P	TRANSFORMER VAULT AT GROUP NO. 3
818	C-13	P	FLOODLIGHT GROUP NO. 4
818A	C-13	P	TRANSFORMER VAULT AT GROUP NO. 4
819	A-13	P	FLOODLIGHT GROUP NO. 5
819A	A-13	P	TRANSFORMER VAULT AT GROUP NO. 5
820	A-4	P	FLOODLIGHT GROUP NO. 6
820A	A-4	P	TRANSFORMER VAULT AT GROUP NO. 6
821	G-7	P	FLOODLIGHT GROUP NO. 7
821A	G-7	P	TRANSFORMER VAULT AT GROUP NO. 7
822	G-1	P	FLOODLIGHT GROUP NO. 8
822A	G-1	P	TRANSFORMER VAULT AT GROUP NO. 8
823	C-6	P	HOSE REEL HOUSE NO. 1
824	C-6	P	HOSE REEL HOUSE NO. 2
825	B-6	SC	GARBAGE HOUSE
826	B-6	P	WASH HOUSE
827	B-6	TGG	MAGAZINE (PYROTECHNIC)
828	A-4	SSS	AUTOMOBILE SERVICE STATION
828A	A-4	SSS	GASOLINE STORAGE TANK (10,000 GALLONS)
828B	A-4	SSS	GASOLINE STORAGE TANK (10,000 GALLONS)
829	C-7	P	FILTER HOUSE
829A	C-7	SA	TRAINING TANK
830	C-7	GKA	GYMNASIUM BUILDING
831	A-6	GBS	BARRACKS BUILDING (LINK TRAINER)
832	B-5	SC	SUBSISTENCE BUILDING
832A	B-5	SC	GARBAGE RACK
832B	B-5	P	TRANSFORMER VAULT
832C	B-5	SC	STORAGE SHED
833	B-6	SSS	CLOTHING AND SMALL STORES STORAGE BLDG.
834	A-12	P	PUMP HOUSE (SEWAGE DISPOSAL PLANT)
834A	A-11	P	PRIMARY SETTLING TANK
834B	A-11	P	FINAL
834C	A-11	P	TRICKLING FILTER
834D	A-11	P	DIGESTER TANK
834E	A-11	P	SLUDGE DRYING BED
834F	B-11	P	CHLORINE CONTACT CHAMBER
835	C-10	SM	CREW SHELTER (WEST)
836	B-4	SM	CREW SHELTER (EAST)
837	A-8	P	CADET OFFICERS QUARTERS (SECURED)
838	A-7	SP	CADET OFFICERS QUARTERS (ENLISTED BARRACKS)
839	B-8	SP XW	SUBSISTENCE BUILDING (HOBBY SHOP & C.P.O. CLUB)
839A	B-8	SC	GARBAGE RACK
840	B-8	P XW	ENLISTED MENS RECREATION & P.W. STORAGE
841	B-4	BOQ	SENIOR BACHELOR OFFICERS QUARTERS (40 MEN)
842	A-4	BOQ	JUNIOR BACHELORS OFFICERS QUARTERS (30 MEN)
843	A-3	BOQ	BACHELOR OFFICERS QUARTERS (150 MEN)
844	A-3	BOQ	BACHELOR OFFICERS SUBSISTENCE (UNITS 844 & 845)
844A	A-4	BOQ	GARBAGE RACK
844B	A-4	P	TRANSFORMER VAULT
844C	B-4	BOQ	HOSE REEL HOUSE
845	B-4	SSS	GROUND SCHOOL
845A	B-10	P	GAS CHAMBER (SEALED)
846	A-8	M	MEDICAL BUILDING (20 BEDS)
846A	A-8	M	GARBAGE HOUSE
847	C-8	P	FILTER HOUSE
847A	C-8	SA	TRAINING TANK
848	B-9	P	GARAGE & P.W.
849	B-9	XY	STERILIZATION HOUSE
850	A-10	P	P.W. STORAGE BLDG. (FURNITURE)
851	B-7	XA	BOWLING ALLEY & HOBBY SHOP
852	K-12	TGG	SKEET RANGE HOUSE
852A	K-12	P	WELL AND PUMP HOUSE
853	B-8	XC	CHAPEL AND LIBRARY
854	A-6	XW	COLORED ENLISTED MENS RECREATION BUILDING
855	B-5	XW	STORAGE BUILDING
856	B-5	P	PAINT SHOP
857	B-11	TGG	MAGAZINE (PYROTECHNIC)
858	B-10	TGG	AIR GUN STRUCTURE BUILDING
858A	B-10	TGG	AIR GUN STRUCTURE BUILDING
858B	B-10	TGG	AIR GUN STRUCTURE BUILDING
859	A-11	P	P.W. STORAGE
859A	A-11	P	P.W. STORAGE
860	C-11	P	P.W. STORAGE
861	B-10	TGS	BATTERY CHARGING SHOP
862	A-9	RC	RADIO MAST (EAST)
863	A-9	RC	RADIO MAST (WEST)
864	L-17	XW	CLUB HOUSE (BEACH)
864A	L-17	P	GENERATOR SHED (BEACH)
864B	K-17	XW	CLUB HOUSE (WHARF)
865	A-10	SA	OFFICE BUILDING
866	B-10	SA	FIRE EXTINGUISHING SHED
866A	A-7	P	HOSE REEL HOUSE

1948







LOCATION PLAN

ONE INCH = 2 MILES

STRUCTURES

NO	LOCA	DEPT	USE	NO	LOCA	DEPT	USE
800	B-3	Y	GATE HOUSE	834	B-8	P	PUMP HOUSE & CHLOR BLDG (SEWAGE DISPOSAL)
800-A	B-3	P	BUS SHELTER	834-A	B-8	P	PRIMARY SETTLING TANK
800-B	B-3	P	TRANSFORMER VAULT, NEAR BLDG 800	834-B	B-8	P	FINAL SETTLING TANK
801	B-6	XP XC	BARRACKS, MESSHALL AND LIBRARY	834-C	B-8	P	TRICKLING FILTER
801-A	C-6	XP	WASH HOUSE, REAR OF BUILDING 801	834-D	B-8	P	DIGESTER
802	C-5	XP-XSS-RC	RECREATION BUILDING (CPO MESS, S S REST)	834-E	B-8	P	SLUDGE DRYING BEDS
802-A	C-5	XSS	GARBAGE HOUSE NEAR BUILDING 802	834-F	B-8	P	CHLORINE CONTACT CHAMBER
802-B	C-5	P	TRANSFORMER VAULT, NEAR BUILDING 802	835	C-7	SN	CREWS SHELTER (WEST SIDE)
803	D-5	P	ADMINISTRATION BUILDING	836	C-7	SN	CREWS SHELTER (EAST SIDE)
803-A	D-5	CQTU-4	LINE SHACK	837	B-6	P	CADET QTRS (TYPE Q 4 MOD 120 CADETS)
804	C-6	P	INDUSTRIAL BUILDING	837-A	B-6	X A	SOFT BALL DIAMOND
804-A	C-6	P	CHIMNEY FOR INDUSTRIAL	838	B-5	X P	CADET QTRS (TYPE Q 4 MOD 120 CADETS) ENL BKS
804 (B-E)	C-6	P	4-186 BBL FUEL OIL STORAGE TANKS (UNDERGROUND)	838-A	B-5	P	HOSE REEL HOUSE
805	B-4	P	150,000 GAL. ELEVATED WATER TANK	838-B	B-5	X A	SOFT BALL DIAMOND
806	B-6	P	SEPTIC TANK	839	B-5	XP XW	ENL BARRACKS, HOBBY SHOP, CPO CLUB
806-A	B-6	P	TOILET & WASH HOUSE	839-A	B-5	S C	GARBAGE HOUSE NEAR BUILDING 839
807	C-7	BTU-3	LANDPLANE HANGAR	840	D-4	C H	ENLISTED WAVE BARRACKS (LINE MEN APTS)
807-A	C-7	BTU-3	PAINT LOCKER, NEAR BLDG 807	841	E-5	OCCUPANTS	BACHELOR OFFICER QUARTERS (MOQ APTS)
807-B	C-7	BTU-3	2000 GAL USED OIL TANK	841-A	B-5	OCCUPANTS	GARAGE
807-C	C-7	BTU-3	1,000 GAL KEROSENE TANK	842	B-3	B O Q	BACHELOR OFFICERS QUARTERS (BOQ) (OFFICERS)
807-D	C-7	BTU-3	1,000 GAL GASOLINE TANK	843	B-3	B O Q	BACHELOR OFFICERS QTRS (TYPE Q-4 150 OFFS)
808	C-6	BTU-3	LANDPLANE HANGAR	844	B-3	B O Q	BACHELOR OFFICERS SUBSISTENCE BLDG (4 MESS)
809	C-5	CQTU-4	LANDPLANE HANGAR	844-A	B-3	B O Q	GARBAGE HOUSE NEAR BUILDING 844
810	C-4	CQTU-4	LANDPLANE HANGAR	844-B	B-3	P	TRANSFORMER VAULT, NEAR BUILDING 844
810-A	C-4	CQTU-4	PAINT HOUSE, NEAR BUILDING 810	844-C	B-3	B O Q	HOSE REEL HOUSE, NEAR BUILDING 844
810-B	C-4	CQTU-4	2,000 GAL USED OIL TANK	845	B-6	K G S	GROUND SCHOOL BUILDING
810-C	C-4	CQTU-4	1,000 GAL KEROSENE TANK	845-A	B-6	P	GAS CHAMBER, S OF BUILDING 845 (SEALED)
810-D	C-4	CQTU-4	1,000 GAL GASOLINE TANK	846	B-4	M	MEDICAL BUILDING
810-E	C-3	CQTU-4	GARAGE	846-A	B-4	M	GARBAGE HOUSE
811	C-6	P	STOREHOUSE & PUBLIC WORKS SHOP	847	C-6	P	FILTER HOUSE
812	C-6	P	50,000 GAL CONCRETE SERVICE RESERVOIR	847-A	C-6	X A	TRAING TANK
812-A	C-6	P	WELL NO 2 & PUMP HOUSE	848	C-7	P	PUBLIC WORKS GARAGE
813	C-5	P	FLAG POLE	849	B-4	X P	STERILIZATION HOUSE
814	B-7	S A	25,000 GAL GASOLINE STORAGE TANK (UNDGD)	850	B-7	P	FURNITURE STORAGE, PUBLIC WORKS
814-A-F	B-7	S A	6-25,000 GAL GASOLINE STORAGE TANKS (UGD)	851	B-5	XA XW	BOWLING ALLEY & HOBBY SHOP
814-G	B-7	S A	OFFICE	851-A	B-5	X A	HAND BALL COURTS
814-H	B-7	S A	FIRE EXTINGUISHER SHED	851-B	B-5	X A	TENNIS COURTS
815	J-1	P	FLOODLIGHT GROUP NO 1	852	H-8	T G G	SKEET RANGE HOUSE
815-A	J-1	P	TRANSFORMER VAULT	852-A	H-8	P	WELL & PUMP HOUSE AT SKEET RANGE
816	I-7	P	FLOODLIGHT GROUP NO 2	853	B-6	X C	CHAPEL LIBRARY BUILDING
816-A	I-7	P	TRANSFORMER VAULT	854	B-4	X W	COLORED RECREATION BUILDING
817	F-10	P	FLOODLIGHT GROUP NO 3	855	B-4	X W	STORAGE BUILDING, NEAR 837
817-A	F-10	P	TRANSFORMER HOUSE	856	B-6	P	PAINT SHOP
818	D-9	P	FLOODLIGHT GROUP NO 4	857	B-7	T G G	MAGAZINE (PYROTECHNIC) 2 YA
818-A	D-9	P	TRANSFORMER HOUSE	858	B-7	T G G	AIR GUN STRUCTURE (PYROTECHNICS)
819	B-2	P	FLOODLIGHT GROUP NO 5	858-A	B-7	T G G	AIR GUN STRUCTURE (
819-A	B-2	P	TRANSFORMER HOUSE	858-B	B-7	T G G	AIR GUN STRUCTURE (
820	B-2	P	FLOODLIGHT GROUP NO 6	859	B-8	P	PUBLIC WORKS STORAGE
820-A	B-2	P	TRANSFORMER VAULT	859-A	B-7	P	PUBLIC WORKS STORAGE
821	F-1	P	FLOODLIGHT GROUP NO 7	860	C-8	P	PUBLIC WORKS STORAGE
821-A	F-1	P	TRANSFORMER HOUSE	861	C-7	T G G	BATTERY CHARGING SHOP
822	J-1	P	FLOODLIGHT GROUP NO 8	862	B-6	R C	RADIO MAST (EAST)
822-A	J-1	P	TRANSFORMER HOUSE	863	B-6	R C	RADIO MAST (WEST)
823	C-5	P	HOSE REEL HOUSE NO 1	864	D-11	X W	CLUB HOUSE
824	C-6	P	HOSE REEL HOUSE NO 2	864-A	D-11	P	GENERATOR SHED
825	C-4	S C	GARBAGE HOUSE, NEAR 801	864-B	D-11	X W	BHAPE 4 X 300)
826	C-4	X P	WASH HOUSE	865	B-5	X A	SOFT BALL DIAMOND
827	B-6	T G G	MAGAZINE (PYROTECHNIC)	866	A-1	X A	ATHLETIC FIELD
828	B-3	X S S	AUTOMOBILE SERVICE STATION	867	J-6	R C	TRANSMITTER BUILDING
828-A	B-3	X S S	GASOLINE STORAGE TANK (10,000 GAL)	867-A	J-6	R C	RADIO MAST (EAST)
828-B	B-3	X S S	GASOLINE STORAGE TANK (10,000 GAL)	867-B	J-6	R C	RADIO MAST (WEST)
829	C-6	P	FILTER HOUSE	867-C	J-6	R C	RADIO MAST (NORTH)
829-A	C-6	X A	TRAINING TANK	867-D	J-6	P	AIR STATION NO 9
830	C-6	X A	GYMNASIUM BUILDING	868	G-7	R C	HIGH INTENSITY CONTROL (QUIZ VAULT)
831	B-4	C G S	BARRACKS BUILDING (LINK TRAINERS)	869	H-9	R C	RADIO RECEIVER STATION
832	C-4	S C	SUBSISTENCE BUILDING				
832-A	B-4	S C	GARBAGE HOUSE NEAR BUILDING 832				
832-B	B-4	P	TRANSFORMER VAULT, NEAR BUILDING 832				
832-C	B-4	S C	STORAGE SHED				
833	C-4	X S S	CLOTHING & SMALL STORES BUILDING				

SCALE IN FEET

200 100 0 200 400 600 800 1000

ONE INCH = 200 FEET

MAP OF
SAUFLEY FIELD
NAVAL AUXILIARY AIR STATION
PENSACOLA, FLA.
SHOWING CONDITIONS ON
JUNE 30, 1948

468638

RESTRICTED

C.M. Garland
COMMANDER, C.E. U.S.N.
PUBLIC WORKS OFFICER

800-3-376

N.A.S. DWG 26011

RG 71, Bu Yds + Docks, Series II microfilm, Reel 621

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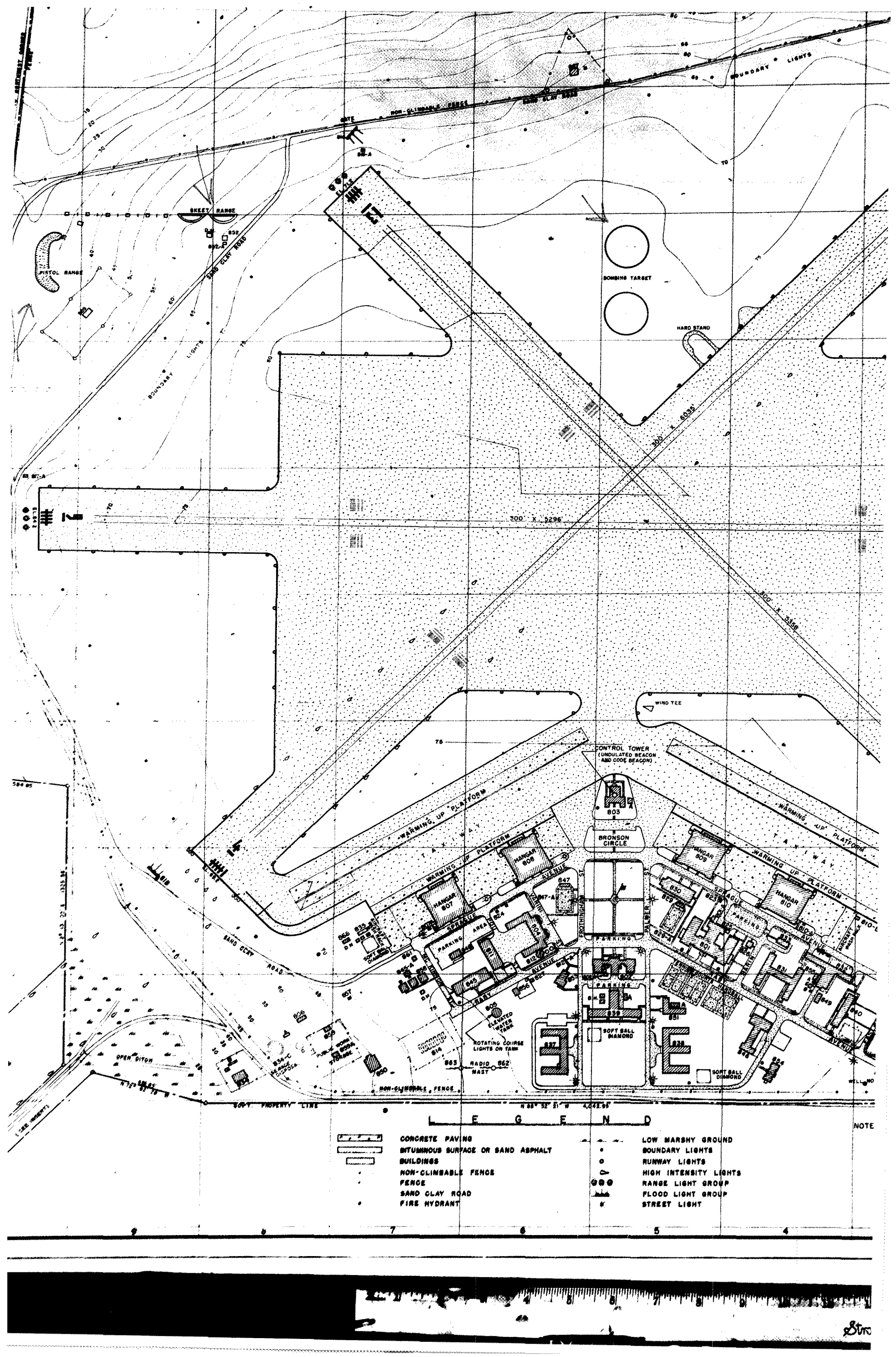
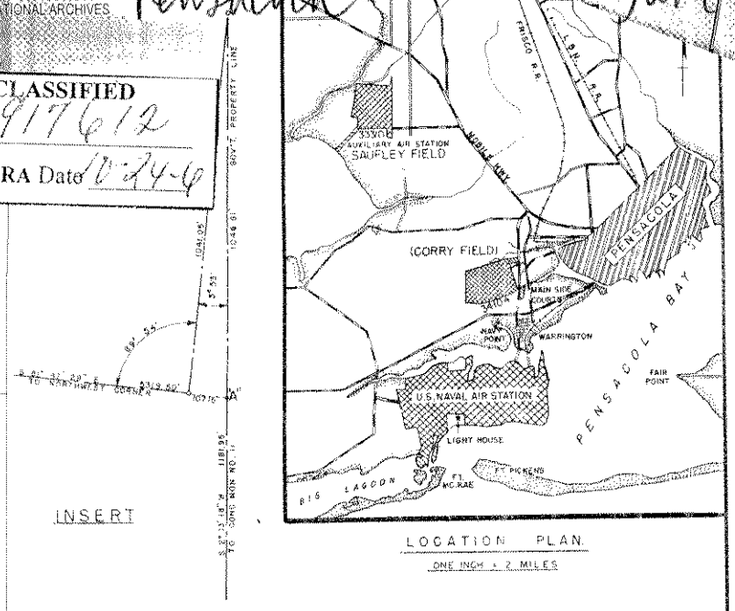

SKEET RANGE
PISTOL RANGE
SAND CLAY ROAD
BOUNDARY LIGHTS
NON-CLIMBABLE FENCE
GATE
BOMBING TARGET
HARD STAND
300' X 6035'
300' X 5296'
300' X 3358'
WIND TEE
CONTROL TOWER
(UNDULATED BEACON AND CODE BEACON)
803
BRONSON CIRCLE
WARMING UP PLATFORM
TAXIWAY
HANGAR 808
HANGAR 807
HANGAR 809
HANGAR 810
SPRAGUE AVENUE
FROTHINGHAM ST.
PALMER ST.
PARKING AREA
SOFT BALL DIAMOND
ELEVATED WATER TANK
ROTATING COURSE LIGHTS ON TANK
RADIO MAST
OPEN DITCH
PUBLIC WORKS STORAGE
AIRCRAFT PARK
LEGEND
CONCRETE PAVING
BITUMINOUS SURFACE OR SAND ASPHALT
BUILDINGS
NON-CLIMBABLE FENCE
FENCE
SAND CLAY ROAD
FIRE HYDRANT
LOW MARSHY GROUND
BOUNDARY LIGHTS
RUNWAY LIGHTS
HIGH INTENSITY LIGHTS
RANGE LIGHT GROUP
FLOOD LIGHT GROUP
STREET LIGHT
NOTE

REPRODUCED AT THE NATIONAL ARCHIVES

Pensacola June 30, 1949

DECLASSIFIED
Authority NND 917612
By JE NARA Date 10-24-94



LOCATION PLAN
ONE INCH = 2 MILES

STRUCTURES

NO.	LOCA.	DEPT.	USE	NO.	LOCA.	DEPT.	USE
800	B-3	Y	GATE HOUSE	834	B-8	P	PUMP HOUSE & CHLOR. BLDG. (SEWAGE DISPOSAL)
800-A	B-3	P	BUS SHELTER	834-A	B-8	P	PRIMARY SETTLING TANK
800-B	B-3	P	TRANSFORMER VAULT, NEAR BLDG. 800	834-B	B-8	P	FINAL SETTLING TANK
801	D-6	XP XG	BARRACKS, MESS HALL AND LIBRARY	834-C	B-8	P	TRICKLING FILTER
801-A	D-6	XP	WASH HOUSE, REAR OF BUILDING 801	834-D	B-8	P	DIGESTER
802	C-5	XP XSS REC	RECREATION BUILDING. (CPO MESS, S.S. REST.)	834-E	B-8	P	SLUDGE DRYING BEDS
802-A	C-5	XSS	GARBAGE HOUSE NEAR BUILDING 802.	834-F	B-8	P	CHLORINE CONTACT CHAMBER
802-B	C-5	P	TRANSFORMER VAULT, NEAR BUILDING 802	835	C-7	BTU-3	CREWS SHELTER (WEST SIDE)
803	D-5	P	ADMINISTRATION BUILDING	836	C-3	BTU-3	CREWS SHELTER (EAST SIDE)
803-A	D-5	O P	CRASH SHACK	837	B-6	XP	MIDN. QTRS. (ZERO-CH. MOD. 320 MIDN)
804	C-6	P	INDUSTRIAL BUILDING	837-A	B-6	X.A	SOFT BALL DIAMOND
804-A	C-6	P	CHIMNEY FOR INDUSTRIAL BLDG	839	B-5	XP	MIDN. QTRS TYPE Q-4, MOD 320 MIDN (FEVEL BKS
804 A-B	C-6	P	4-186 BBL. FUEL OIL STORAGE TANKS (UNDERGRD)	838-A	B-5	P	HOSE REEL HOUSE
805	B-5	P	150,000 GAL. ELEVATED WATER TANK.	838-B	B-5	X.A	SOFT BALL DIAMOND
806	B-8	P	SEPTIC TANK.	839	B-5	XP XW	SUBSISTENCE BLDG. (MIDN.)
806-A	B-8	P	PUBLIC WORKS STORAGE	839-A	B-5	S.C.	GARBAGE HOUSE NEAR BUILDING 839
807	C-7	STU-3	LANDPLANE HANGAR	840	B-4	C.H.	8-ENLISTED MENS APARTMENTS
807-A	C-7	BTU-3	PAINT LOCKER, NEAR BLDG. 807	841	B-3	OCCUPANTS	5-MARRIED OFFICERS APARTMENTS
807-B	C-7	BTU-3	2000 GAL. USED OIL TANK	841-A	B-3	OCCUPANTS	GARAGE
807-C	C-7	BTU-3	1,000 GAL. KEROSENE TANK	842	B-3	B.O.Q	BACHELOR OFFICERS QUARTERS (60 JR. OFFICERS)
807-D	C-7	BTU-3	1,000 GAL. GASOLINE TANK	843	B-3	B.O.Q	BACHELOR OFFICERS QTRS (TYPE Q-4 160 OFFICERS)
808	D-6	BTU-3	LANDPLANE HANGAR	844	B-3	B.O.Q	BACHELOR OFFICERS SUBSISTENCE BLDG. (114 OFFICERS)
809	C-5	BTU-3	LANDPLANE HANGAR	844-A	B-3	B.O.Q	GARBAGE HOUSE NEAR BUILDING 844
810	C-4	BTU-3	LANDPLANE HANGAR	844-B	B-3	P	TRANSFORMER VAULT, NEAR BUILDING 844
810-A	C-4	BTU-3	PAINT HOUSE, NEAR BUILDING 810	844-C	B-3	B.O.Q	HOSE REEL HOUSE, NEAR BUILDING 844
810-B	C-4	BTU-3	2,000 GAL. USED OIL TANK	845	B-6	X.O.S	GROUND SCHOOL BUILDING
810-C	C-4	BTU-3	1,000 GAL. KEROSENE TANK	845-A	B-6	P	GAS CHAMBER, S. OF BUILDING 835 (SECURED)
810-D	C-4	BTU-3	1,000 GAL. GASOLINE TANK	846	B-4	M	MEDICAL BUILDING
810-E	C-3	BTU-3	GARAGE	846-A	B-4	M	GARBAGE HOUSE
811	C-6	P	STOREHOUSE & PUBLIC WORKS SHOP	847	C-6	P	FILTER HOUSE
812	C-6	P	50,000 GAL. CONCRETE SERVICE RESERVOIR	847-A	C-6	X.A	TRAING TANK
812-A	C-6	P	WELL NO 1 & PUMP HOUSE	848	C-7	P	PUBLIC WORKS GARAGE
813	C-5	P	FLAG POLE	849	B-4	X.P	STERILIZATION HOUSE
814	B-7	S.A	25,000 GAL. GASOLINE STORAGE TANK (UNDGRD)	850	B-7	P	FURNITURE STORAGE, PUBLIC WORKS
814-A-F	B-7	S.A	6-25,000 GAL. GASOLINE STORAGE TANKS (UGD)	851	B-5	XA-XW	BOWLING ALLEY & HOBBY SHOP
814-G	B-7	S.A	OFFICE	851-A	B-5	X.A	HAND BALL COURTS
814-H	B-7	S.A	FIRE EXTINGUISHER SHED	851-B	B-5	X.A	TENNIS COURTS
815	J-1	P	FLOODLIGHT GROUP NO 1	852	H-9	T.G.G	SKEET RANGE HOUSE
815-A	J-1	P	TRANSFORMER VAULT	852-A	H-8	P	WELL & PUMP HOUSE AT SKEET RANGE
816	J-7	P	FLOODLIGHT GROUP NO 2	853	B-6	X.G	CHAPEL—LIBRARY BUILDING
816-A	J-7	P	TRANSFORMER VAULT	854	B-4	X.W	CPO CLUB
817	F-10	P	FLOODLIGHT GROUP NO 3	855	B-4	X.W	STORAGE BUILDING, NEAR 832
817-A	F-10	P	TRANSFORMER HOUSE	856	B-6	P	PAINT SHOP
818	C-9	P	FLOODLIGHT GROUP NO 4	857	B-7	T.G.G	MAGAZINE (PYROTECHNIC) 2 XX
818-A	C-8	P	TRANSFORMER HOUSE	858	B-7	T.G.G	AIR GUN STRUCTURE (PREFABRICATED)
819	B-2	P	FLOODLIGHT GROUP NO 5	858-A	B-7	T.G.G	AIR GUN STRUCTURE ( )
819-A	B-2	P	TRANSFORMER HOUSE	858-B	B-7	T.G.G	AIR GUN STRUCTURE ( )
820	B-2	P	FLOODLIGHT GROUP NO. 6	859	B-8	P	PUBLIC WORKS STORAGE
820-A	B-2	P	TRANSFORMER VAULT	859-A	B-7	P	PUBLIC WORKS STORAGE
821	F-1	P	FLOODLIGHT GROUP NO. 7	860	C-5	P	PUBLIC WORKS STORAGE
821-A	F-1	P	TRANSFORMER HOUSE	861	C-7	T.G.G	BATTERY CHARGING SHOP
822	J-1	P	FLOODLIGHT GROUP NO 8	862	B-6	R.C	RADIO MAST (EAST)
822-A	J-1	P	TRANSFORMER HOUSE	863	B-6	R.C	RADIO MAST (WEST)
823	C-5	P	HOSE REEL HOUSE NO. 1	864	G-11	X.W	CLUB HOUSE
824	C-6	P	HOSE REEL HOUSE NO 2	864-A	C-11	P	GENERATOR SHED
825	C-4	S.C	GARBAGE HOUSE, NEAR 801	864-B	G-11	X.W	WHARF (4 X 300)
826	C-4	X.P	WASH HOUSE	865	B-5	X.A	SOFT BALL DIAMOND
827	B-6	T.G.G	MAGAZINE (PYROTECHNIC)	866	A-1	X.A	ATHLETIC FIELD
828	B-3	X.S.S	AUTOMOBILE SERVICE STATION	867	J-6	R.C	TRANSMITTER BUILDING
828-A	B-3	X.S.S	GASOLINE STORAGE TANK (10,000 GAL.)	867-A	J-6	R.C	RADIO MAST (EAST)
828-B	B-3	X.S.S	GASOLINE STORAGE TANK (10,000 GAL.)	867-B	J-6	R.C	RADIO MAST (WEST)
829	C-5	P	FILTER HOUSE	867-C	J-6	R.C	RADIO MAST (NORTH)
829-A	C-5	X.A	TRAINING TANK	867-D	J-6	P	SUB-STATION NO. 9
830	C-5	X.A	GYMNASIUM BUILDING	868	G-7	R.O	HIGH INTENSITY CONTROL EQUIP. VAULT
831	B-4	O.S.S	BARRACKS BUILDING	869	H-9	R.C.	RADIO RECEIVER STATION
832	C-4	S.C	SUBSISTENCE BUILDING				
832-A	B-4	S.C	GARBAGE HOUSE NEAR BUILDING 832				
832-B	B-4	P	TRANSFORMER VAULT, NEAR BUILDING 832				
832-C	B-4	S.G	STORAGE SHED				
833	C-4	X.S.S	CLOTHING & SMALL STORES BUILDING				

#. Station Priority

SCALE IN FEET
ONE INCH = 200 FEET

RG72, BuAer
E-1001-B, Uncl. Gen. Corr. 1950
Box 204

MAP OF
SAUFLEY FIELD
NAVAL AUXILIARY AIR STATION
PENSACOLA, FLA.
SHOWING CONDITIONS ON
JUNE 30, 1949

[redacted]

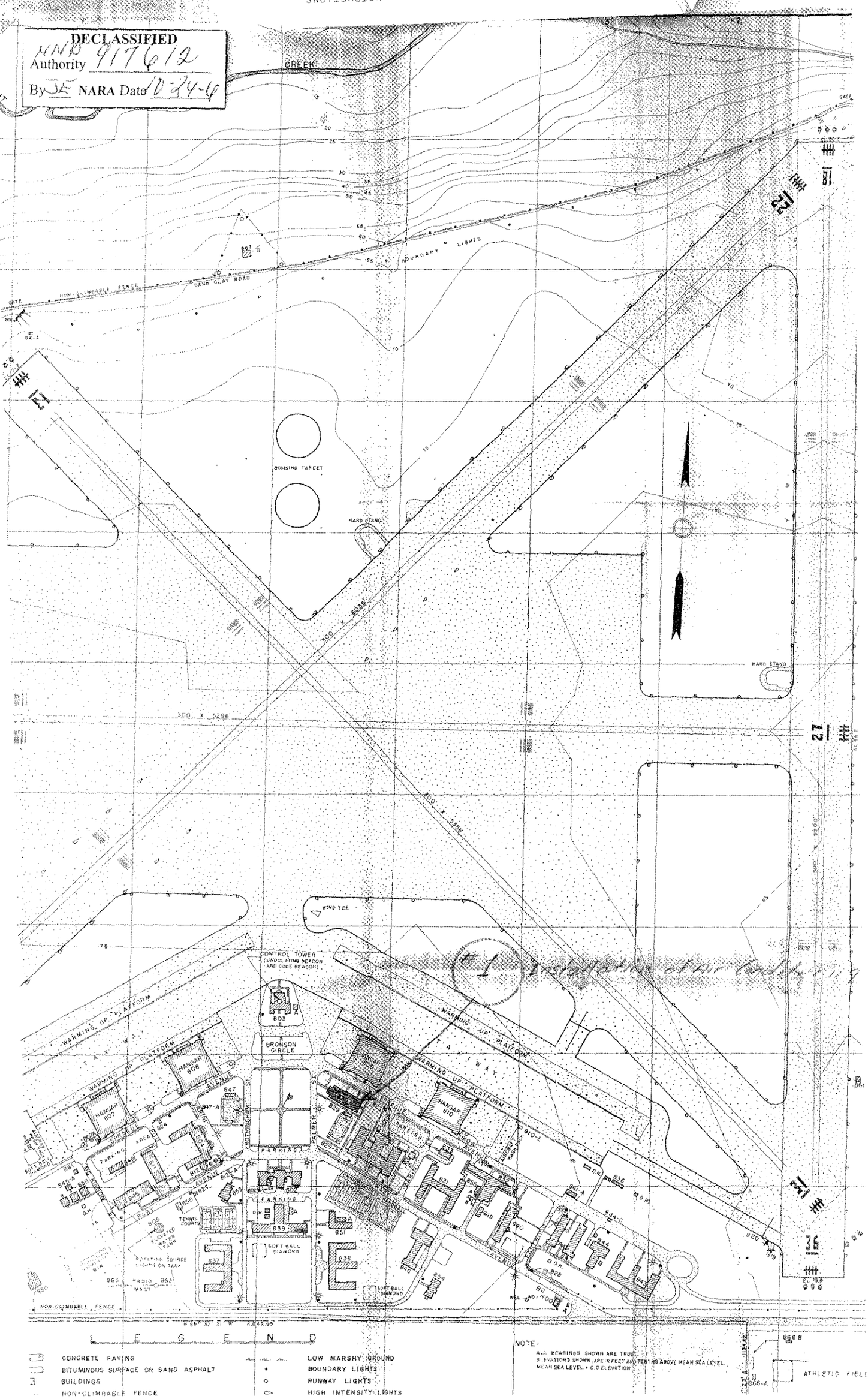
REVISED AND RESUBMITTED

PUBLIC WORKS OFFICER, N.A.B.T.

N.A.B.T. DWG. 26011

REPRODUCED AT THE NATIONAL ARCHIVES

DECLASSIFIED
NND 917612
Authority
By JE NARA Date 10-24-6



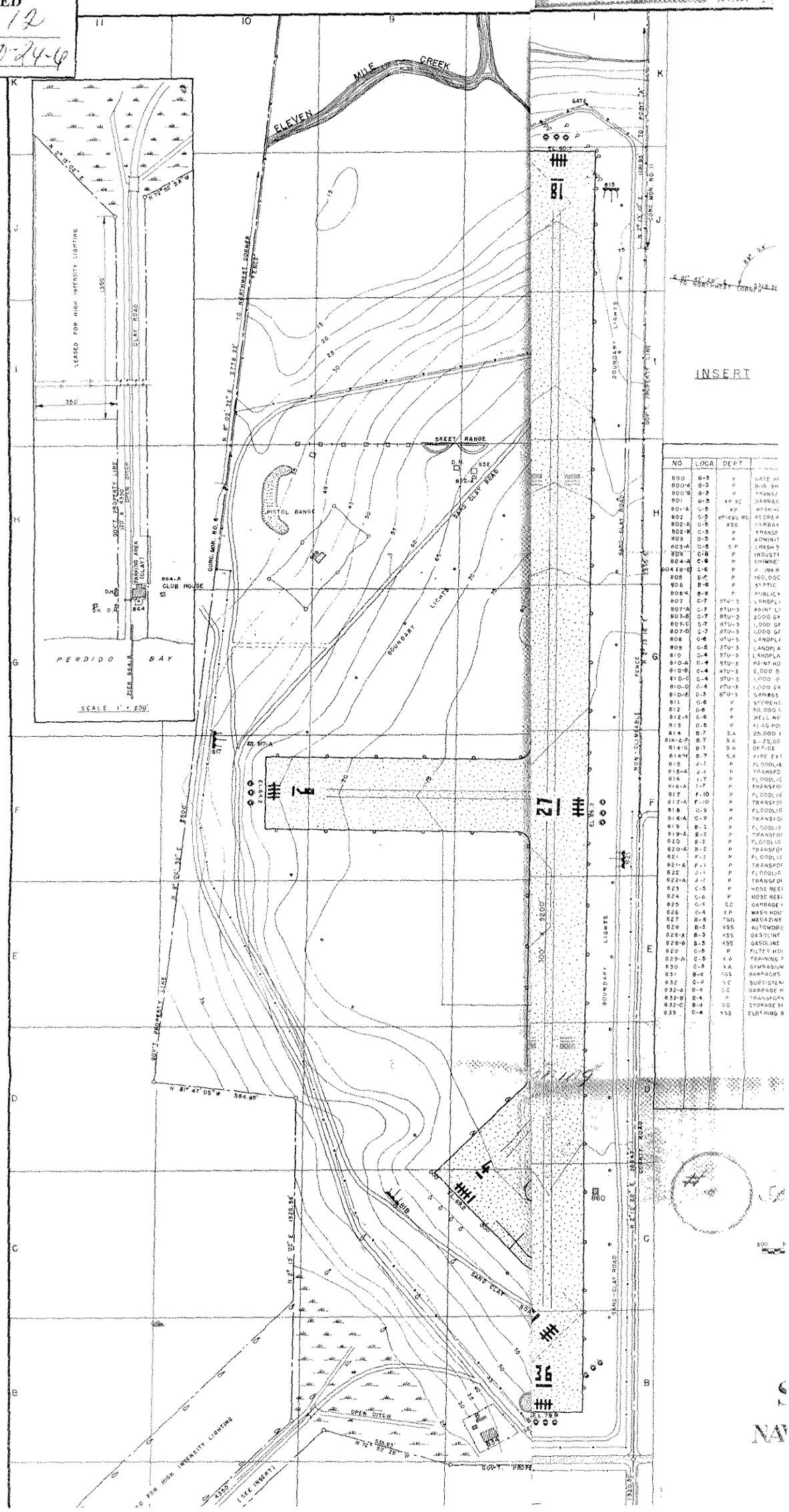
L E G E N D

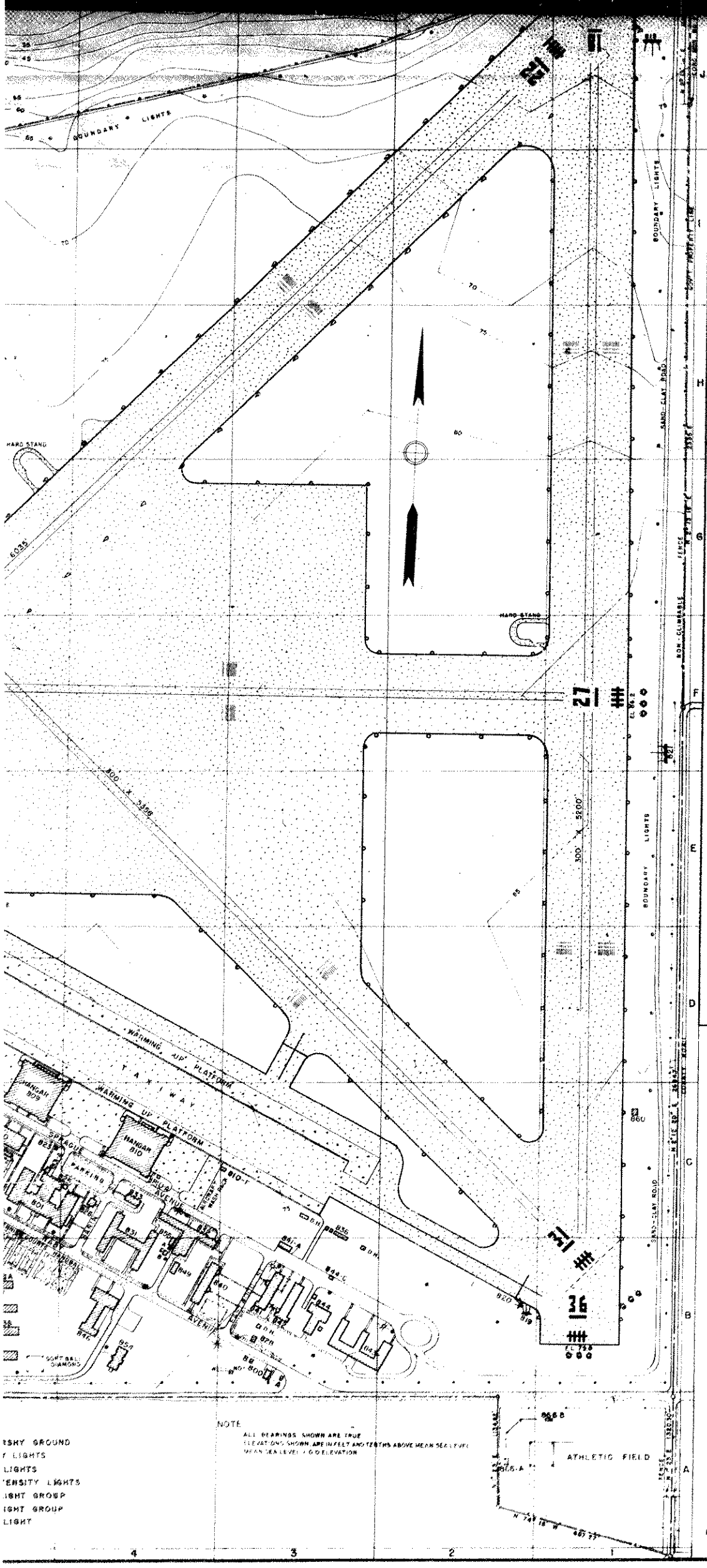
- CONCRETE PAVING
- BITUMINOUS SURFACE OR SAND ASPHALT
- BUILDINGS
- NON-CLIMBABLE FENCE
- LOW MARSHY GROUND
- BOUNDARY LIGHTS
- RUNWAY LIGHTS
- HIGH INTENSITY LIGHTS

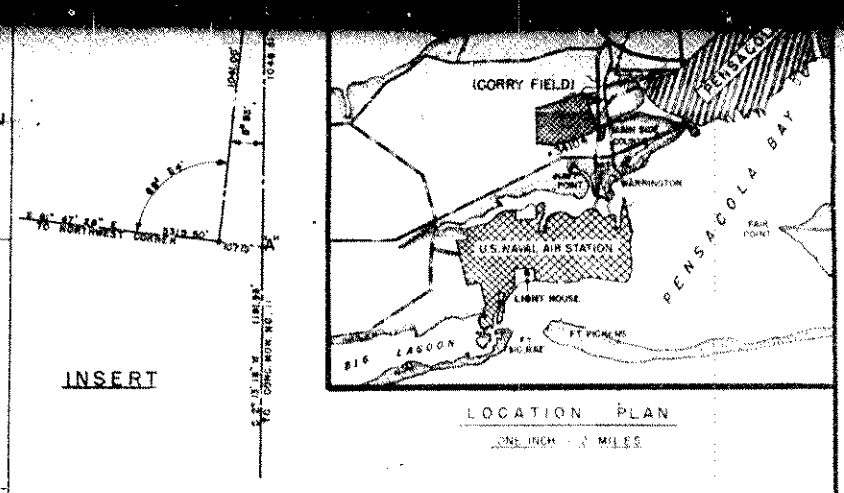
NOTE:
ALL BEARINGS SHOWN ARE TRUE.
ELEVATIONS SHOWN ARE IN FEET AND TENTHS ABOVE MEAN SEA LEVEL.
MEAN SEA LEVEL = 0.0 ELEVATION

REPRODUCED AT THE NATIONAL ARCHIVES

DECLASSIFIED
Authority NND 917612
By JE NARA Date 10-24-4







LOCATION PLAN

ONE INCH = 2 MILES

STRUCTURES

NO.	LOCA.	DEPT.	USE	NO.	LOCA.	DEPT.	USE
800	B-5	Y	GATE HOUSE	834	B-6	P	PUMP HOUSE & CHLOR BLDG (SEWAGE DISPOSAL)
800-A	B-3	P	BUS SHELTER	834-A	B-6	P	PRIMARY SETTLING TANK
800-B	B-3	P	TRANSFORMER VAULT, NEAR BLDG 800	834-B	B-6	P	FINAL SETTLING TANK
801	D-5	XP XC	BARRACKS, MESSHALL AND LIBRARY	834-C	B-6	P	TRICKLING FILTER
801-A	D-5	XP	WASH HOUSE, REAR OF BUILDING 801	834-D	B-6	P	DIGESTER
802	D-5	XP XSS XC	RECREATION BUILDING (CPO MESS, S.S. REST)	834-E	B-6	P	SLUDGE DRYING BEDS
802-A	D-5	XSS	GARBAGE HOUSE NEAR BUILDING 802	834-F	B-6	P	CHLORINE CONTACT CHAMBER
802-B	D-5	P	TRANSFORMER VAULT, NEAR BUILDING 802	835	D-7	BTU-3	CREWS SHELTER (WEST SIDE)
803	D-3	P	ADMINISTRATION BUILDING	836	D-7	BTU-3	CREWS SHELTER (EAST SIDE)
803-A	D-3	O P	CRASH SHACK	837	B-4	KP	MIDN QTR'S (TYPE G-4, MOD 320 MIDN)
804	C-6	P	INDUSTRIAL BUILDING	837-A	B-4	K A	SOFT BALL DIAMOND
804-A	C-6	P	CHIMNEY FOR INDUSTRIAL BLDG	838	B-5	KP	MIDN QTR'S (TYPE G-4, MOD 320 MIDN)
804 EB-E	C-6	P	4-100 BBL. FUEL OIL STORAGE TANKS (UNPROD)	838-A	B-5	P	HOSE REEL HOUSE
805	B-6	P	150,000 GAL. ELEVATED WATER TANK	838-B	B-5	K A	SOFT BALL DIAMOND
806	B-8	P	SEPTIC TANK	839	B-5	XP XW	SUBSISTENCE BLDG (MIDN)
806-A	B-8	P	PUBLIC WORKS STORAGE	839-A	B-5	S C	GARBAGE HOUSE NEAR BUILDING 839
807	C-7	BTU-3	LANDPLANE HANGAR	840	D-4	C N	8 ENLISTED MEN'S APARTMENTS
807-A	C-7	BTU-3	PAINT LOCKER, NEAR BLDG 807	841	B-3	OCCUPANTS	5 MARRIED OFFICERS APARTMENTS
807-B	C-7	BTU-3	8000 GAL. USED OIL TANK	841-A	B-3	OCCUPANTS	GARAGE
807-C	C-7	BTU-3	1,000 GAL. KEROSENE TANK	842	B-3	B O Q	BACHELOR OFFICERS QUARTERS (60 JR OFFICERS)
807-D	C-7	BTU-3	1,000 GAL. GASOLINE TANK	843	B-3	B O Q	BACHELOR OFFICERS QTRS (TYPE D-4 180 OFFS)
808	C-8	BTU-3	LANDPLANE HANGAR	844	B-3	B O Q	BACHELOR OFFICERS SUBSISTENCE BLDG (MESS)
809	C-8	BTU-3	LANDPLANE HANGAR	844-A	B-3	B O Q	GARBAGE HOUSE NEAR BUILDING 844
810	C-4	BTU-3	LANDPLANE HANGAR	844-B	B-3	P	TRANSFORMER VAULT, NEAR BUILDING 844
810-A	C-4	BTU-3	PAINT HOUSE, NEAR BUILDING 810	844-C	B-3	B O Q	HOSE REEL HOUSE, NEAR BUILDING 844
810-B	C-4	BTU-3	8,000 GAL. USED OIL TANK	845	B-6	X G S	GROUND SCHOOL BUILDING
810-C	C-4	BTU-3	1,000 GAL. KEROSENE TANK	845-A	B-6	P	GAS CHAMBER, S OF BUILDING 835 (SECOND)
810-D	C-4	BTU-3	1,000 GAL. GASOLINE TANK	846	B-4	M	MEDICAL BUILDING
810-E	C-3	BTU-3	GARAGE	846-A	B-4	M	GARBAGE HOUSE
811	C-8	P	STOREHOUSE & PUBLIC WORKS SHOP	847	C-6	P	FILTER HOUSE
812	C-8	P	50,000 GAL. CONCRETE SERVICE RESERVOIR	847-A	C-6	X A	TRAING TANK
812-A	C-8	P	WELL NO 2 & PUMP HOUSE	848	C 7	P	PUBLIC WORKS GARAGE
813	C-5	P	FLAG POLE	848	B-4	X P	STERILIZATION HOUSE
814	B-7	S A	25,000 GAL. GASOLINE STORAGE TANK (UNPROD)	850	B-7	P	FURNITURE STORAGE, PUBLIC WORKS
814-A-P	B-7	S A	6-25,000 GAL. GASOLINE STORAGE TANKS (UNPROD)	851	B-5	XA XW	BOWLING ALLEY & HOBBY SHOP
814-B	B-7	S A	OFFICE	851-A	B-5	X A	HAND BALL COURTS
814-H	B-7	S A	FIRE EXTINGUISHER SHED	851-B	B-5	X A	TENNIS COURTS
815	J-1	P	FLOODLIGHT GROUP NO 1	852	H-8	T G O	SKEET RANGE HOUSE
816-A	J-1	P	TRANSFORMER VAULT	852-A	H-8	P	WELL & PUMP HOUSE AT SKEET RANGE
816	I-7	P	FLOODLIGHT GROUP NO 2	853	B-6	X C	CHAPEL (LIBRARY BUILDING)
816-A	I-7	P	TRANSFORMER VAULT	854	B-4	X W	CPO CLUB
817	F-10	P	FLOODLIGHT GROUP NO. 3	855	B-4	X W	STORAGE BUILDING, NEAR 832
817-A	F-10	P	TRANSFORMER HOUSE	856	B-6	P	PAINT SHOP
818	C-8	P	FLOODLIGHT GROUP NO. 4	857	B-7	T G G	MAGAZINE (PYROTECHNIC) 2 YX
818-A	C-8	P	TRANSFORMER HOUSE	858	B-7	T G G	AIR GUN STRUCTURE (PREFABRICATED)
819	B-2	P	FLOODLIGHT GROUP NO 5	858-A	B-7	T G G	AIR GUN STRUCTURE (" ")
819-A	B-2	P	TRANSFORMER HOUSE	858-B	B-7	T G G	AIR GUN STRUCTURE (" ")
820	B-2	P	FLOODLIGHT GROUP NO 6	859	B-8	P	PUBLIC WORKS STORAGE
820-A	B-2	P	TRANSFORMER VAULT	859-A	B-7	P	PUBLIC WORKS STORAGE
821	F-1	P	FLOODLIGHT GROUP NO 7	860	G-1	P	PUBLIC WORKS STORAGE
821-A	F-1	P	TRANSFORMER HOUSE	861	C-7	T G G	BATTERY CHARGING SHOP
822	J-1	P	FLOODLIGHT GROUP NO 8	862	B-8	R C	RADIO MAST (EAST)
822-A	J-1	P	TRANSFORMER HOUSE	863	B-8	R C	RADIO MAST (WEST)
823	C-5	P	HOSE REEL HOUSE NO 1	864	B-11	X W	CLUB HOUSE
824	C-6	P	HOSE REEL HOUSE NO 2	864-A	C-11	P	GENERATOR SHED
825	C-4	S C	GARBAGE HOUSE, NEAR 801	864-B	G-11	X W	WHARF (4 x 500)
826	C-4	X P	WASH HOUSE	865	B-5	X A	SOFT BALL DIAMOND
827	B-6	T G G	MAGAZINE (PYROTECHNIC)	866	A-1	X A	ATHLETIC FIELD
828	B-3	X S S	AUTOMOBILE SERVICE STATION	867	J-6	R C	TRANSMITTER BUILDING
828-A	B-3	X S S	GASOLINE STORAGE TANK (10,000 GAL.)	867-A	J-6	R C	RADIO MAST (EAST)
828-B	B-3	X S S	GASOLINE STORAGE TANK (10,000 GAL.)	867-B	J-6	R C	RADIO MAST (WEST)
829	C-8	P	FILTER HOUSE	867-C	J-6	R C	RADIO MAST (NORTH)
829-A	C-8	X A	TRAINING TANK	867-D	J-6	P	SUB-STATION NO 6
830	C-5	K A	GYMNASIUM BUILDING	868	G-7	R C	HIGH INTENSITY CONTROL EQUIP VAULT
831	B-4	C G S	BARRACKS BUILDING	869	H-9	R C	RADIO RECEIVER STATION
832	C-	S C	SUBSISTENCE BUILDING				
832-A	B-4	S C	GARBAGE HOUSE NEAR BUILDING 832				
832-B	B-4	P	TRANSFORMER VAULT, NEAR BUILDING 832				
832-C	B-4	S C	STORAGE SHED				
833	C-4	X S S	CLOTHING & SMALL STORES BUILDING				

SCALE IN FEET

ONE INCH = 200 FEET

MAP OF SAUFLEY FIELD

NAVAL AUXILIARY AIR STATION

PENSACOLA, FLA.

SHOWING CONDITIONS ON JUNE 30, 1949

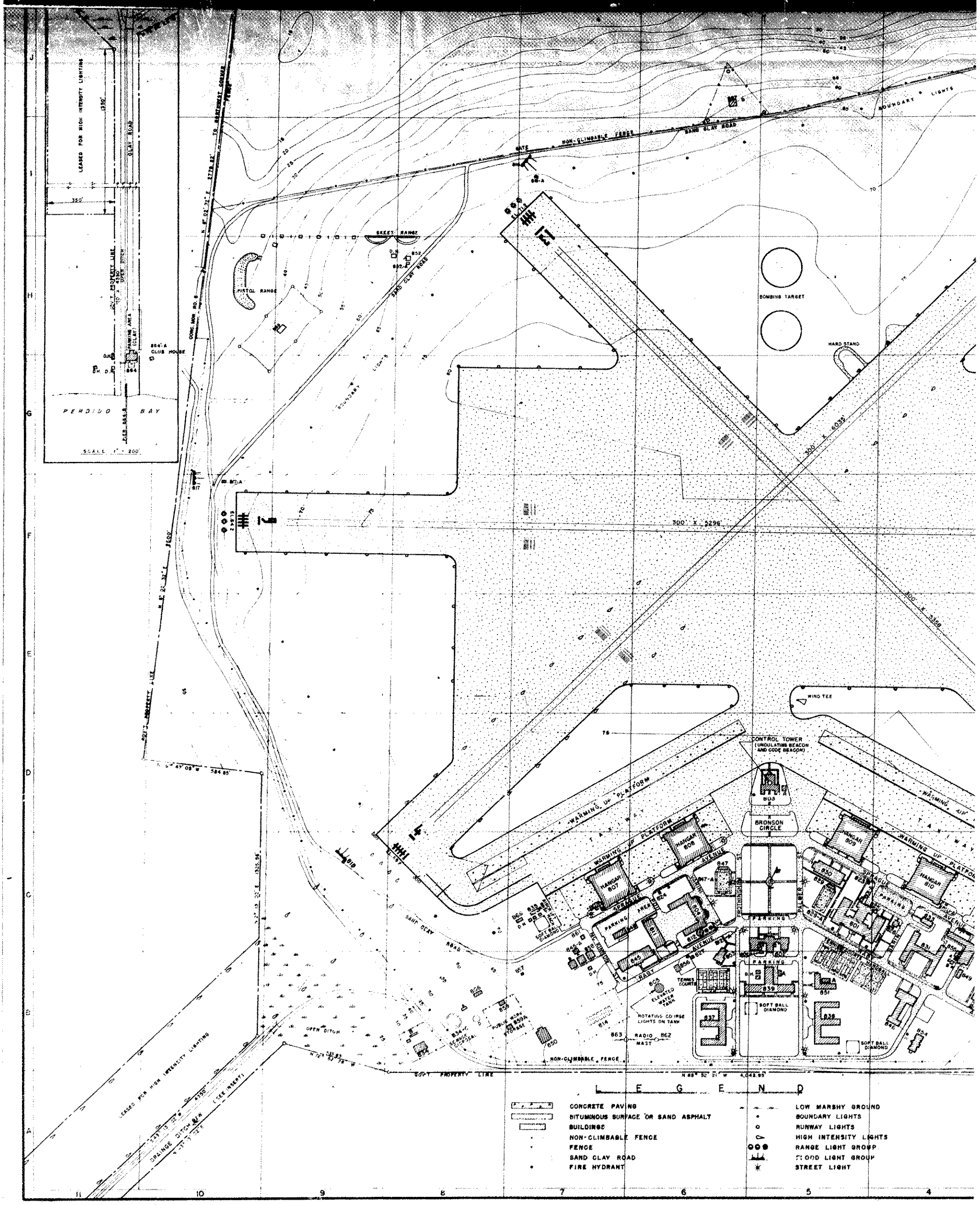
RESTRICTED

REVISED AND RESUBMITTED 200-3-45

N.A.B.T DWG. 26011

RG 71, Bureau of Docks, Series II microfilm, Reel 633

15


PERDIDO BAY
SCALE 1" = 200'
LEASED FOR HIGH INTENSITY LIGHTING
CLAY ROAD
GOV'T PROPERTY LINE
CLUB HOUSE
PARKING AREA
SKEET RANGE
PISTOL RANGE
SAND CLAY ROAD
BOUNDARY LIGHTS
NON-CLIMBABLE FENCE
GATE
BOMBING TARGET
HARD STAND
300' X 6039'
300' X 5296'
300' X 5398'
WIND TEE
CONTROL TOWER (UNDULATING BEACON AND CODE BEACON)
WARMING UP PLATFORM
TAXIWAY
BRONSON CIRCLE
HANGAR 808
HANGAR 807
HANGAR 805
HANGAR 810
AVENUE
PARKING
SOFT BALL DIAMOND
TENNIS COURTS
ELEVATED WATER TANK
ROTATING COURSE LIGHTS ON TANK
RADIO MAST
PUBLIC WORKS STORAGE
OPEN DITCH
DRAINAGE DITCH
LEGEND
CONCRETE PAVING
BITUMINOUS SURFACE OR SAND ASPHALT
BUILDINGS
NON-CLIMBABLE FENCE
FENCE
SAND CLAY ROAD
FIRE HYDRANT
LOW MARSHY GROUND
BOUNDARY LIGHTS
RUNWAY LIGHTS
HIGH INTENSITY LIGHTS
RANGE LIGHT GROUP
FLOOD LIGHT GROUP
STREET LIGHT

POOR COPY

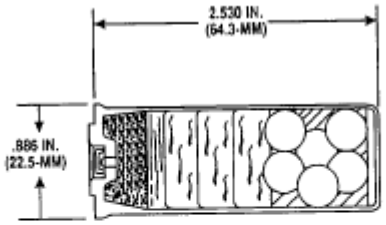
15

Appendix D: Ordnance Technical Data Sheets

Ordnance Technical Data Sheet

12-Gauge, Shotgun, No. 00

CARTRIDGE, 12 GAGE, SHOTGUN, NO. 00, M162



Nomenclature:	12-gauge, Shotgun, No. 00
Ordnance Family:	Small Arms
DODIC:	A011
Propelling Charge:	Smokeless Powder
Item Weight:	0.736 gr
Diameter:	22.5 mm (0.886 in)
Length:	64.3 mm (2.53 in)
Maximum Range:	Not provided
Fuze:	Percussion

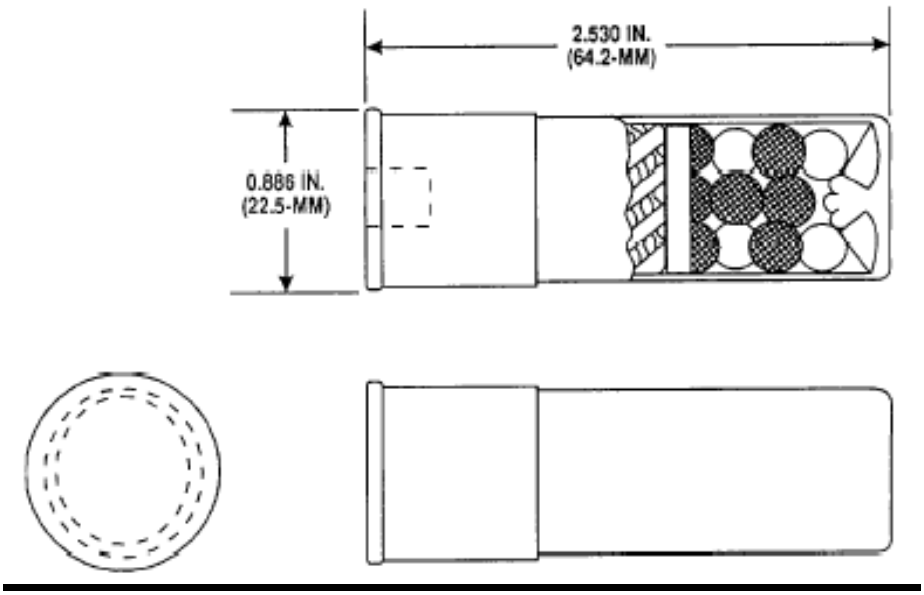
Usage: Military issue shotgun, 2-3/4 inch chamber. The cartridge is intended for guard and combat use.

Description: The cartridge case is plastic and is loaded with No. 00 commercial shot. Smokeless powder is used as the propelling charge.

Reference: U.S. Army Technical Manual, TM 9-1400-200, Ammunition General, October 1969
U.S. Army Field Manual, FM 9-13, Ammunition Handbook, January 1981

Ordnance Technical Data Sheet

Cartridge, 12-Gauge, Shotgun, No. M247



Nomenclature:	12-Gauge, Shotgun, No. M247
Ordnance Family:	Small Arms
DODIC:	1305-A011
Propelling Charge:	Smokeless Powder
Item Weight:	740 gr
Diameter:	22.5 mm (0.886 in)
Length:	64.2 mm (2.530 in)
Maximum Range:	Not Provided
Fuze:	Percussion

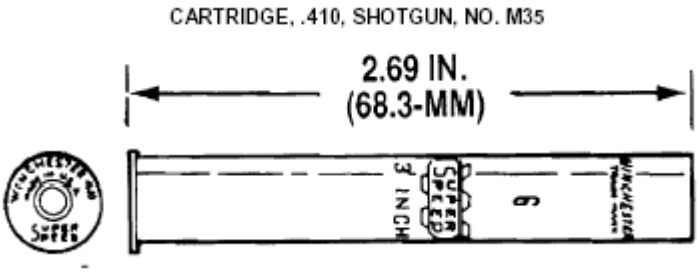
Usage: Military issue, riot-type shotgun, 20-in barrel cylinder bore. The cartridge is intended for use against small game and for riot control.

Description: The cartridge case may be paper or plastic and is loaded with No. 4 hard chilled shot. Smokeless powder is used as the propelling charge.

Reference: U.S. Army Technical Manual, TM 9-1400-200, Ammunition General, October 1969
U.S. Army Field Manual, FM 9-13, Ammunition Handbook, January 1981

Ordnance Technical Data Sheet

Cartridge, .410, Shotgun, No. M35



Nomenclature:	.410, Shotgun, No. M35
Ordnance Family:	Small Arms Ammunition
DODIC:	1305-A055
Propelling Charge:	Smokeless Powder
Item Weight:	430 gr
Diameter:	10.4 mm (.410 in)
Length:	68.3 mm (2.69 in)
Maximum Range:	Not Provided
Fuze:	Percussion

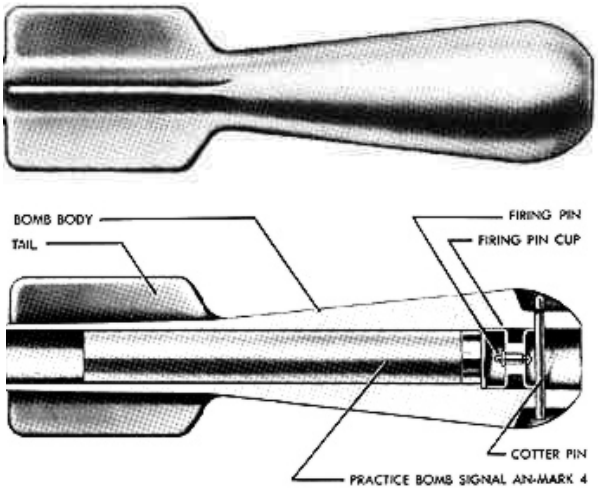
Usage: Rifle/Shotgun, Caliber .22/.410 Bore, Survival, M6. The cartridge is intended for use in survival weapons against small game.

Description: The cartridge case can be paper, plastic, or aluminum and is loaded with No. 6 copper-coated lead shot. Smokeless powder is used as the propelling charge.

Reference: U.S. Army Technical Manual, TM 9-1400-200, Ammunition General, October 1969
U.S. Army Field Manual, FM 9-13, Ammunition Handbook, January 1981

Ordnance Technical Data Sheet

U.S. Bomb, 3 lb, Minature, AN-MK 23



Nomenclature: AN-MK 23 Miniature Bomb
Ordnance Family: Bomb
DODIC: Not Provided
Filler: Titanium Tetrachloride*
Filler weight: Not provided
Item weight: 1.36 kg (3 lb)
Diameter: 55.37 mm (2.18 in)
Length: 209.55 mm (8.25 in)
Maximum Range: Not Provided
Fuze: Impact fired

Usage: These small, cast-alloy bombs have a tube along their longitudinal axis which houses the Signal Cartridge AN-Mk 4 or Mk 5, a pyrotechnic charge for spotting purposes.

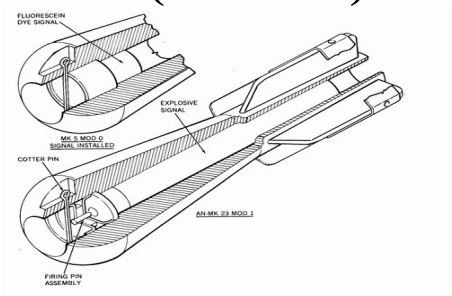
Description: The bombs are unpainted. The bombs are made of cast alloy.

Reference: ORDATA Online.

* **Titanium tetrachloride -** is the chemical compound with the formula $TiCl_4$. $TiCl_4$ is an important intermediate in the production of titanium metal and other titanium compounds. It is an unusual example of a liquid metal halide that is very volatile in air, where it forms spectacular opaque clouds of titanium dioxide (TiO_2) and hydrogen chloride (HCl).

Ordnance Technical Data Sheet

U.S. Bomb, MK 3 & MK 4 (Practice)



Nomenclature:	MK(s) 3 & 4, Bomb, Practice
Ordnance Family:	Bomb
DODIC:	Not Provided
Filler:	Pyrotechnic Mixture*
Filler weight:	Not Provided
Item Weight:	1.36 kg (2.998 lbs)
Diameter:	55.37 mm (2.18 in)
Length:	209.55 mm (8.25 in)
Maximum Range:	Not Provided
Fuze:	Impact

Usage: These bombs are impact fired signal-generating, practice bombs used for training aircrews. WARNINGS: Do not drop or jar a loaded practice bomb. These bombs contain no positive safety features. Keep hands clear of the flash tube and emission holes. Accidental firing of the signal cartridge could cause injury. Do not attempt to pry the firing pin assembly or signal cartridge out of a practice bomb. Prying could initiate the signal cartridge.

Description: The Mk 3 and Mk 4 bombs are unpainted with markings cast into the bomb body. The Mk 5 Mods 0, 1, 2, & 3, AN-Mk 23 Mods 0 & 1, and Mk 43 Mods 0 & 1 bombs are unpainted with markings cast or stamped into the bomb body. The Mk 3, Mk 4, Mk 5, and Mk 43 practice bombs (not shown) are externally identical to the AN-Mk 23 bomb.

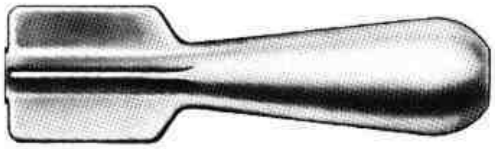
Reference: ORDATA Online.

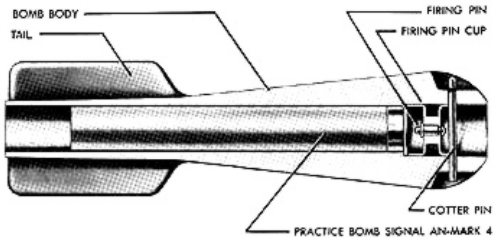
***Pyrotechnic** and screening devices contain combustible chemicals which, when ignited, rapidly generate a flame of intense heat, flash, infrared radiation, smoke or sound display (or combinations of these effects) for a variety of purposes. Compared to other explosive substances, pyrotechnics are more adversely affected by moisture, temperature, and rough handling. Some compositions may become more sensitive, and even ignite, when exposed to moisture or air. Mixtures which contain chlorates and sulfur are susceptible to spontaneous combustion. Most pyrotechnics produce a very hot fire that is difficult to

extinguish and most burn without serious explosions. Many chemicals used in pyrotechnics produce toxic effects when ignited. Other pyrotechnics, which contain propelling charges create an extremely hazardous missile hazard if accidentally ignited.

Ordnance Technical Data Sheet

U.S. Bomb, 4.5 lb, Miniature, AN-MK 43





Nomenclature:	AN-MK 43, 4.5 pound, Miniature Bomb
Ordnance Family:	Bomb
DODIC:	Not Provided
Filler:	Pyrotechnic Compositions*
Filler weight:	Not Provided
Item Weight:	2.04 kg (4.5 lbs)
Diameter:	55.37 mm (2.18 in)
Length:	209.55 mm (8.25 in)
Maximum Range:	Not Provided
Fuze:	Impact

Usage: These small, cast-alloy bombs have a tube along their longitudinal axis which houses the Signal Cartridge AN-Mk 4 or Mk 5, a pyrotechnic charge for spotting purposes.

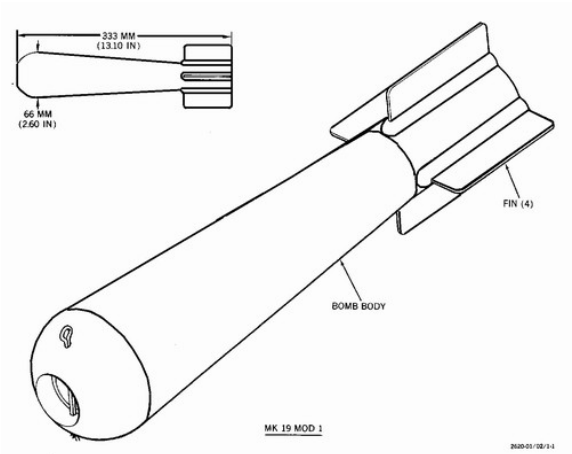
Description: The bombs are unpainted metal alloy.

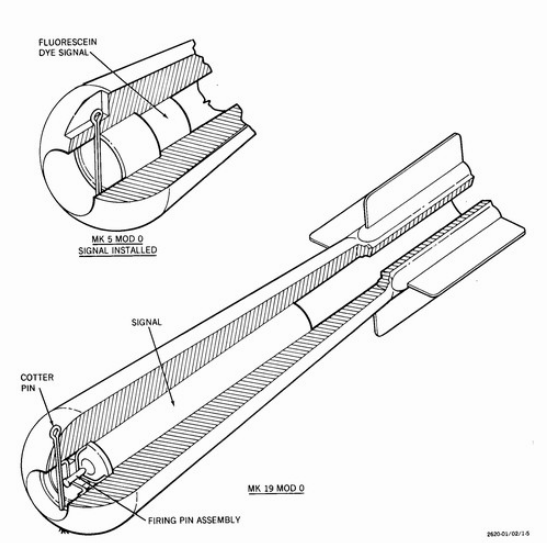
Reference: ORDATA Online.

* **Pyrotechnic** and screening devices contain combustible chemicals which, when ignited, rapidly generate a flame of intense heat, flash, infrared radiation, smoke or sound display (or combinations of these effects) for a variety of purposes. Compared to other explosive substances, pyrotechnics are more adversely affected by moisture, temperature, and rough handling. Some compositions may become more sensitive, and even ignite, when exposed to moisture or air. Mixtures which contain chlorates and sulfur are susceptible to spontaneous combustion. Most pyrotechnics produce a very hot fire that is difficult to extinguish and most burn without serious explosions. Many chemicals used in pyrotechnics produce toxic effects when ignited. Other pyrotechnics, which contain propelling charges create an extremely hazardous missile hazard if accidentally ignited.

Ordnance Technical Data Sheet

U.S. Bomb, 13 lb, Practice, MK 19 MODS 0 & 1





Nomenclature:	MK 19 Mods 0 & 1, Practice Bomb
Ordnance Family:	Bomb
DODIC:	Not Provided
Filler:	Pyrotechnic mixture
Filler weight:	Not Provided
Item weight:	5.90 kg (13.01 lbs)
Diameter:	66.00 mm (2.598 in)
Length:	333.00 mm (13.11 in)
Maximum Range:	Not Provided
Fuze:	Impact fired

Usage: These bombs are impact fired signal-generating, practice bombs used for training aircrews.

Description: Mk 19 Mods 0 and 1, and BDU-2/B practice bombs are painted black with white markings stenciled on the bomb body. The Mk 4 signal cartridges are unpainted with black markings stenciled on the cartridge case.

Reference: ORDATA Online.

***Pyrotechnic** and screening devices contain combustible chemicals which, when ignited, rapidly generate a flame of intense heat, flash, infrared radiation, smoke or sound display (or combinations of these effects) for a variety of purposes. Compared to other explosive substances, pyrotechnics are more adversely affected by moisture, temperature, and rough handling. Some compositions may become more sensitive, and even ignite, when exposed to moisture or air. Mixtures which contain chlorates and sulfur are susceptible to

spontaneous combustion. Most pyrotechnics produce a very hot fire that is difficult to extinguish and most burn without serious explosions. Many chemicals used in pyrotechnics produce toxic effects when ignited. Other pyrotechnics, which contain propelling charges create an extremely hazardous missile hazard if accidentally ignited

Ordnance Technical Data Sheet

U.S. Bomb, 100 lb, Practice, M38A2

Nomenclature: M38A2, Bomb, Practice, 100 lb
Ordnance Family: Bomb
DODIC: Not Provided
Filler: Black Powder* (spotting Charge)
Filler weight: 1.36 kg (3 lbs)
Item Weight: 45.36 kg (100 lbs)
Diameter: 206.00 mm (8.11 in)
Length: 1.21 mm (3.97 ft)
Maximum Range: Not Provided
Fuze: Impact

Usage: The M38A2 is a round-nosed cylindrical bomb designed to simulate GP bombs. They are typically loaded with sand and/or water/sand to provide the required weight.

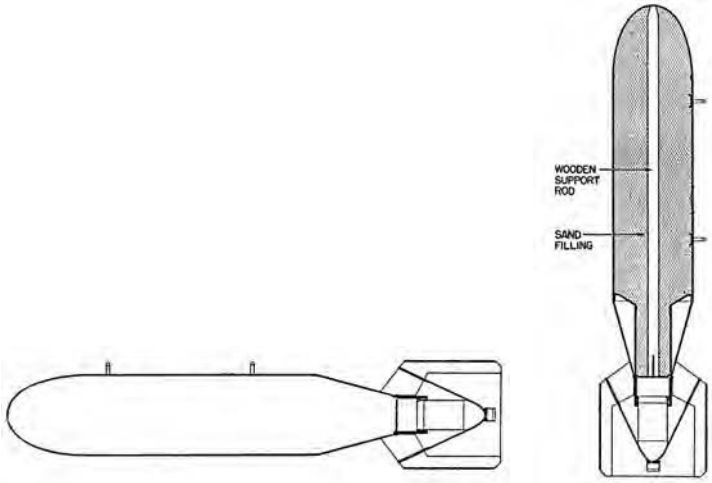
Description: The bomb is painted blue with white markings.

Reference: ORDATA Online.

* **Black Powder:** Characteristics. Black powder, the oldest explosive known, is an intimate uniform mechanical mixture of finely pulverized potassium nitrate (or sodium nitrate), charcoal, and sulfur. Until the development of nitrocellulose propellants, black powder was the only propellant and explosive available. Potassium nitrate is used in most military black powders. It ignites spontaneously at about 300 degrees Celsius or 540 degrees Fahrenheit, and develops a fairly high temperature of combustion (2,300 degrees to 3,800 degrees Celsius or 4,172 degrees to 6,872 degrees Fahrenheit), which causes erosion in the bore of weapons. Black powder is usually in the form of small, black grains that are polished by glazing with graphite. It is hygroscopic and subject to rapid deterioration when exposed to moisture. If kept dry, it retains its explosive properties indefinitely. It is one of the most dangerous explosives to handle because of the ease with which it is ignited by heat, friction, or spark.

Ordnance Technical Data Sheet

U.S. Bomb, 100 lb, Practice, M85



Nomenclature:	M85, 100 lb, Practice Bomb
Ordnance Family:	Bomb
DODIC:	Not Provided
Filler:	Water/Sand
Filler weight:	Not Provided
Item Weight:	45.36 kg (100 lbs)
Diameter:	203.20 mm (8 in)
Length:	1.19 m (3.9 ft)
Maximum Range:	Not Provided
Fuze:	Impact

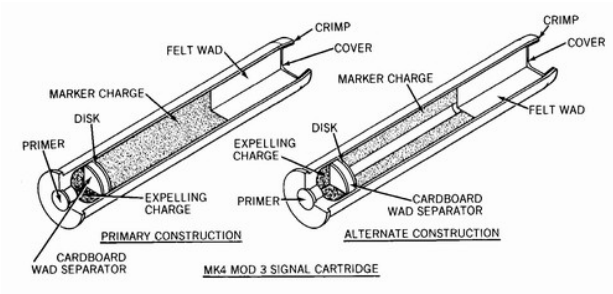
Usage: This is a fin stabilized, practice bomb. The bomb is filled with sand. This model was ordered to relieve a temporary shortage of the Practice Bomb M38A2 during the war.

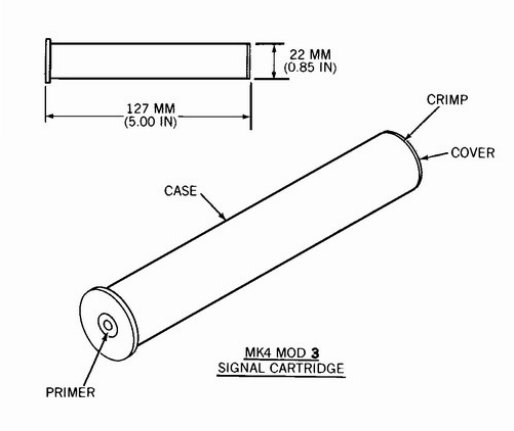
Description: Thin steel normally painted blue.

Reference: ORDATA Online.

Ordnance Technical Data Sheet

U.S. Bomb, Signal Cartridge, MK 4 MODS 0 - 4





Nomenclature:	MK 4 MODS 0 – 4, Signal Cartridge, Bomb
Ordnance Family:	Signals & Pyrotechnic
DODIC:	Not Provided
Filler:	Red Phosphorus*
Filler weight:	10.00 g (.35 oz)
Item weight:	58.00 g (2.04 oz)
Diameter:	22.00 mm (.86 in)
Length:	596.00 mm (23.46 in)
Maximum Range:	Not Provided
Fuze:	Impact

Usage: These are signal-generating signal cartridges and spotting charges. They are used in various size practice bombs to provide visual observance of target impact in the bombing of surface and water targets.

Description: The Mk 4-series are unpainted with black stenciled markings depicting nomenclature, NSN, production date, DOD No., Lot No., and manufacturer's identification data.

Reference: ORDATA Online.

* **Red phosphorus** - After World War II, RP smoke was developed as an attempt to avoid the toxicity associated with the manufacturing of white phosphorus. RP is 95% phosphorus in a 5% butyl rubber base and provides an adequate tank screen on the battlefield. When RP is oxidized, it forms a mixture of phosphorus acids. When these acids are exposed to water vapor, they in turn form polyphosphoric acids, which may be responsible for the toxic injuries to the upper air ways. Most of these injuries are mild irritations. No human deaths have been reported from exposure to either white phosphorous or RP smokes.