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INSTALLATION RESTORATION PROGRAM. PHASE I. RECORDS SEARCH. SEYM--ETC(U)

JUL 82 F08637-80-G-0009

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INSTALLATION RESTORATION PROGRAM

PHASE I - RECORDS SEARCH

SEYMOUR JOHNSON AFB, NORTH CAROLINA

PREPARED FOR

UNITED STATES AIR FORCE
AFESC/DEV
Tyndall AFB, Florida

and

HQ TAC/DEE
Langley AFB, Virginia

ES ENGINEERING-SCIENCE

JULY, 1982

This report has been prepared for the U.S. Air Force by Engineering-Science for the purpose of aiding in the implementation of the Air Force Installation Restoration Program. It is not an endoresement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the United Staes Air Force or the Department of Defense.

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PHASE I: RECORDS SEARCH
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Langley AFB, Virginia

July, 1982

By

ENGINEERING-SCIENCE, INC.
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Atlanta, Georgia 30329

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ES ENGINEERING-SCIENCE

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26020

July 28, 1982

Mr. Bernard Lindenberg
AFESC/DEVP
Tyndall AFB, Florida 32403

Dear Mr. Lindenberg:

Enclosed is the Engineering-Science, Inc. (ES) final report entitled "Installation Restoration Program, Phase I - Records Search, Seymour Johnson AFB, North Carolina." This report has been prepared in accordance with the ES proposal dated December 14, 1981 and Air Force Contract Number F08637-80-G0009 Call #0013.

Presented in this report are introductory background information on the Installation Restoration Program; a description of the Seymour Johnson AFB installation including past activities, mission and environmental setting; a review of industrial activities at Seymour Johnson AFB; an inventory of major solid and hazardous waste from past activities; a review of past and present waste handling, treatment and disposal facilities; an evaluation of the pollution potential of waste disposal sites; and recommendations for the Installation Restoration Program, Phase II, Confirmation Study.

Any questions concerning this report should be directed to the Office of Public Affairs, Seymour Johnson Air Force Base (919/736-5411).

We appreciate the opportunity to work with you and the other Air Force personnel who contributed information to us for the completion of this assessment.

Very truly yours,

ENGINEERING-SCIENCE, INC.

E J Schroeder

E. J. Schroeder, P.E.
Manager, Solid & Hazardous Waste

EJS/lmr

Enclosure

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The Department of Defense (DOD) has developed a program to identify and evaluate past hazardous material disposal sites on DOD property, to control the migration of hazardous contaminants, and to control hazards to health or welfare that may result from these past disposal operations. This program is called the Installation Restoration Program (IRP). The IRP has four phases consisting of Phase I, Initial Assessment/Records Search; Phase II, Confirmation; Phase II, Technology Base Development; and Phase IV, Operations. Engineering-Science (ES) was retained by the Air Force Engineering and Services Center to conduct the Phase I, Initial Assessment/Records Search at Seymour Johnson AFB under Contract No. F08637-80-G0009, Call No. 0013, using funding provided by the Tactical Air Command.

to pg. 3

INSTALLATION DESCRIPTION

Seymour Johnson Air Force Base is located fifty miles southeast of Raleigh, North Carolina, 89 miles west of Wilmington, and is in the approximate center of the Coastal Plains Section of North Carolina. The base was activated in 1942, deactivated in 1946 and reactivated in 1956. The base presently comprises 3,216 acres of contiguous property with 1,065 acres of additional easements. In addition the base owns or has easements on four additional sites totaling 13 acres. The annexed sites are in the general locale of the base and are used primarily for navigational and communication purposes. The primary mission at Seymour Johnson AFB is the Tactical Air Command's mission to train, deploy and fight utilizing the F-4E Weapons Systems anywhere in the world. Seymour Johnson AFB also has a Strategic Air Command wing equipped with B-52 Bombers and KC-135 Tankers.

Seymour Johnson AFB owns 46,604 acres of land in the southern portion of mainland Dare County, North Carolina approximately 120 miles

northeast of the base. This site is a bombing and gunnery range used for conducting tactical fighter pilot training for the Air Force, Navy, Marines and Air National Guard.

ENVIRONMENTAL SETTING

The environmental setting data reviewed for this study indicate the following key items need to be considered when evaluating past hazardous material handling and disposal practices on the base:

- o Surficial and alluvial unconsolidated deposits form the upper twenty feet of the installation. These deposits are typically sandy and permeable.
- o The northern and western portions of the base adjacent to the Neuse River, Stoney Creek and the major drainage ditch are subject to flooding during 100-year storm events.
- o Surface soils of the Goldsboro area inclusive of Seymour Johnson AFB are thought to form an undefined shallow aquifer. Base study data indicates that ground water is generally present at shallow depths (six feet or less) in the upper aquifer.
- o The principal area hydrogeologic units, the Black Creek and Tuscaloosa (Cape Fear) Formations comprise the regional "Lower Sandy Aquifer" and are present at shallow depth (twenty feet). The units forming this major aquifer contain interbedded clays which may temporarily separate water-bearing layers over short lateral distances, but do not isolate discrete units from each other.
- o The lower sandy aquifer probably receives recharge from the overlying upper sandy aquifer. The actual degree of interconnection between local aquifers and surface waters is unknown. Ground-water flow directions have not been defined.
- o Seymour Johnson Air Force Base obtains 70 percent of its potable water from a well system, located primarily along the Neuse River. All wells are screened into the lower sandy aquifer. The remaining water is obtained from the City of Goldsboro which withdraws water from the Neuse River.
- o The mean annual precipitation rate is 50.4 inches. The net annual precipitation is 8.6 inches.

- No wetlands are present on the base.
- No threatened or endangered species have been observed on base lands.

METHODOLOGY

During the course of this project, interviews were conducted with base personnel (past and present) familiar with past waste disposal practices; file searches were performed for past hazardous waste activities; interviews were held with local, state and federal agencies; and inspections were conducted at past hazardous waste activity sites. Ten sites located on the Seymour Johnson AFB property were identified as potentially containing hazardous materials resulting from past activities (Figure 1). These sites have been assessed using a Hazard Assessment Rating Methodology (HARM) which takes into account factors such as site characteristics, waste characteristics, potential for contaminant migration and waste management practices. The details of the rating procedure are presented in Appendix F and the results of the assessment are given in Table 1. The rating system is designed to indicate the relative need for follow-on action.

FINDINGS AND CONCLUSIONS

The following conclusions have been developed based on the results of the project team's field inspection, review of base records and files and interviews with base personnel.

The areas determined to have a high potential for environmental contamination are as follows:

(1) Leakage from the Fuel Hydrant System at the TAC Aircraft Parking Apron;

(2) Tank Farm Fuel Spill.

The areas determined to have a moderate potential for environmental contamination migration are as follows:

(1) Landfill No. 4;

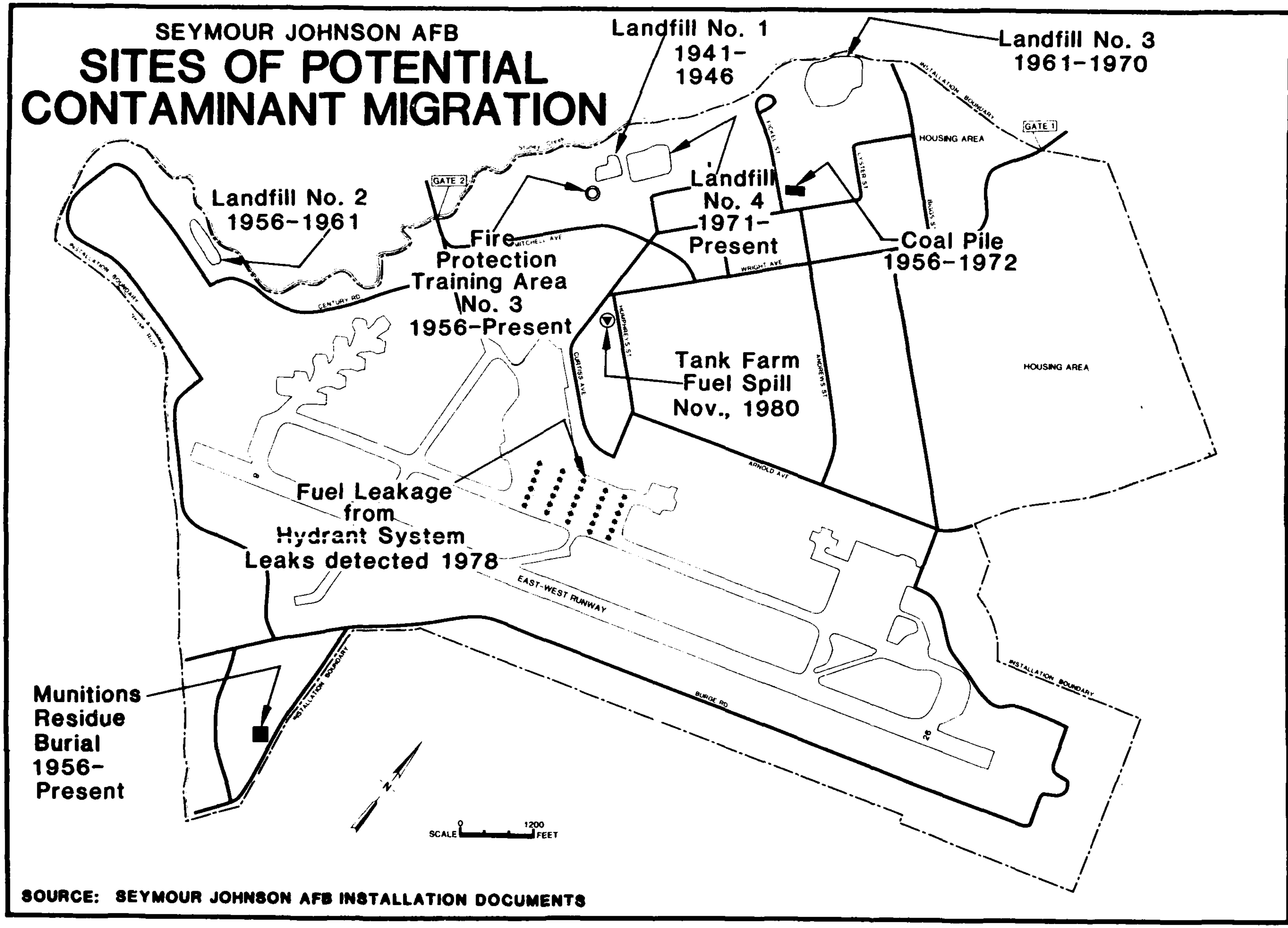
(2) Fire Protection Training Area No. 3.

TABLE 1
PRIORITY RANKING OF POTENTIAL CONTAMINATION SOURCES
SEYMOUR JOHNSON AFB

Rank	Site Name	Date of Operation or Occurrence	Overall Total Score
1	Leakage from Fuel Hydrant System	Leaks detected 1978	76
2	Tank Farm Fuel Spill	November 1980	75
3	Landfill No. 4	1970 - present	57
4	Fire Protection Training Area No. 3	1956 - present	56
5	Landfill No. 3	1961 - 1970	51
6	B-52 Crash Site	1961	45
7	Munitions Residue Burial Site	1956 - present	44
8	Landfill No. 1	1941 - 1946	41
8	Landfill No. 2	1956 - 1961	41
9	Coal Pile	1956 - 1972	39

Note: This ranking was performed according to the Hazard Assessment Rating Methodology (HARM) described in Appendix F. Individual site rating forms are in Appendix G.

FIGURE 1



SEYMOUR JOHNSON AFB
SITES OF POTENTIAL CONTAMINANT MIGRATION
Landfill No. 1
1941-
1946
Landfill No. 3
1961-1970
Landfill No. 2
1956-1961
Landfill
No. 4
1971-
Present
Coal Pile
1956-1972
Fire
Protection
Training Area
No. 3
1956-Present
Tank Farm
Fuel Spill
Nov., 1980
Fuel Leakage
from
Hydrant System
Leaks detected 1978
Munitions
Residue
Burial
1956-
Present
GATE 1
GATE 2
HOUSING AREA
HOUSING AREA
INSTALLATION BOUNDARY
CENTURY RD
MITCHELL AVE
WRIGHT AVE
ANDREWS ST
ARNOLD AVE
CURTISS AVE
HUMPHREYS ST
FICKEL ST
LYSTER ST
BIGGS ST
BURGE RD
EAST-WEST RUNWAY
28
N
SCALE 0 1200 FEET
SOURCE: SEYMOUR JOHNSON AFB INSTALLATION DOCUMENTS

The areas determined to have a low potential for environmental contamination are as follows:

- o Landfill No. 3
- o B-52 Crash Site
- o Munitions Residue Burial Site
- o Landfill No. 1
- o Landfill No. 2
- o Coal Pile

RECOMMENDATIONS

The detailed recommendations developed for further assessment of potential environmental contamination are presented in Chapter 6. The recommended actions are generally one time sampling programs to determine if contamination does exist at the site. If contamination is identified the sampling program may need to be expanded to further define the extent of contamination. The recommendations are summarized as follows:

o Fuel Leakage from the Hydrant System at the TAC Aircraft Parking Apron.	Conduct geophysical survey, implement ground-water monitoring program, and monitor storm drainage system.
o Tank Farm Fuel Spill	Conduct geophysical survey, implement ground-water monitoring program, monitor dike drainage, and record fuel recovery quantities.
o Landfill No. 4	Sample and analyze leachate stream.
o Fire Protection Training Area No. 3	Collect and analyze soil boring samples from the fire training area.
o Water Supply Wells	Collect and analyze water samples from well nos. 13-73, 10-60, 7-73 and the hospital well. (Wells are not suspected of being contaminated. Information is desired to establish background water quality.)

CHAPTER 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

BACKGROUND AND AUTHORITY

The United States Air Force has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state and local governments have developed strict regulations to require that disposers identify the locations and contents of disposal sites and take action to eliminate the hazards in an environmentally responsible manner. The Department of Defense (DOD) has issued Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5 which requires the identification and evaluation of past hazardous material disposal sites on DOD property, the control of migration of hazardous contaminants, and the control of hazards to health or welfare that could result from these past operations. This program is called the Installation Restoration Program (IRP). The IRP will be a basis for response actions on Air Force Installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. DEQPPM 81-5 implemented by Air Force message dated 21 January 1982 reissued and amplified all previous directives and memoranda on IRP.

PURPOSE AND SCOPE OF THE ASSESSMENT

The Installation Restoration Program has been developed as a four-phased program as follows:

Phase I - Initial Assessment/Records Search
Phase II - Confirmation
Phase III - Technology Base Development
Phase IV - Operations (Control Measures)

Engineering-Science (ES) was retained by the Air Force Engineering and Services Center to conduct the Phase I Records Search at Seymour Johnson Air Force Base (AFB) under Contract No. F08637-80-G0009, Call No. 0013, using funding provided by the Tactical Air Command. The geographic scope of this study covers the main base of Seymour Johnson AFB, the Neuse Annex, the Paley Annex, the Saulston Annex, the Summerall Annex and the Dare County Bombing Range. This report contains a summary and an evaluation of the information collected during Phase I of the IRP.

The goal of the first phase of the program was to identify the potential for environmental contamination from past waste disposal practices at Seymour Johnson AFB, and to assess the potential for contaminant migration. The activities undertaken in Phase I included the following:

- Reviewed site records
- Interviewed personnel familiar with past generation and disposal activities
- Inventoried wastes
- Determined quantities and locations of current and past hazardous waste storage, treatment and disposal
- Defined the environmental setting at the base
- Reviewed past disposal practices and methods
- Conducted field inspection
- Gathered pertinent information from federal, state and local agencies
- Assessed potential for contaminant migration

To perform the on-site portion of the records search phase (April 19-22, 1982), ES assembled the following core team of professionals:

- E. J. Schroeder, Environmental Engineer and Project Manager, MSCE, 14 years of professional experience
- J. R. Absalon, Hydrogeologist, BS Geology, 8 years of professional experience
- R. J. Reimer, Chemical Engineer, MSChE, 2 years of professional experience
- M. I. Spiegel, Environmental Scientist, BS Environmental Science, 5 years of professional experience
- R. M. Reynolds, Chemical Engineer, BChE, 8 years of professional experience

More detailed information on these individuals is presented in Appendix A.

METHODOLOGY

The methodology utilized in the Seymour Johnson AFB Records Search began with a review of past and present industrial operations conducted at the base. Information was obtained from available records such as shop files and real property files, as well as interviews with past and present base employees from the various operating areas. Those interviewed included current and past personnel associated with the Civil Engineering Squadron, Bioenvironmental Engineering Services, Aircraft Ground Services, Field Maintenance Services and Fuels Management. Experienced personnel from the tenant organizations were also interviewed. Formal interviews were conducted with 66 individuals to obtain the needed past activity information.

Concurrent with the base interviews the applicable federal, state and local agencies were contacted for pertinent base related environmental data. The agencies contacted and interviewed are listed as follows:

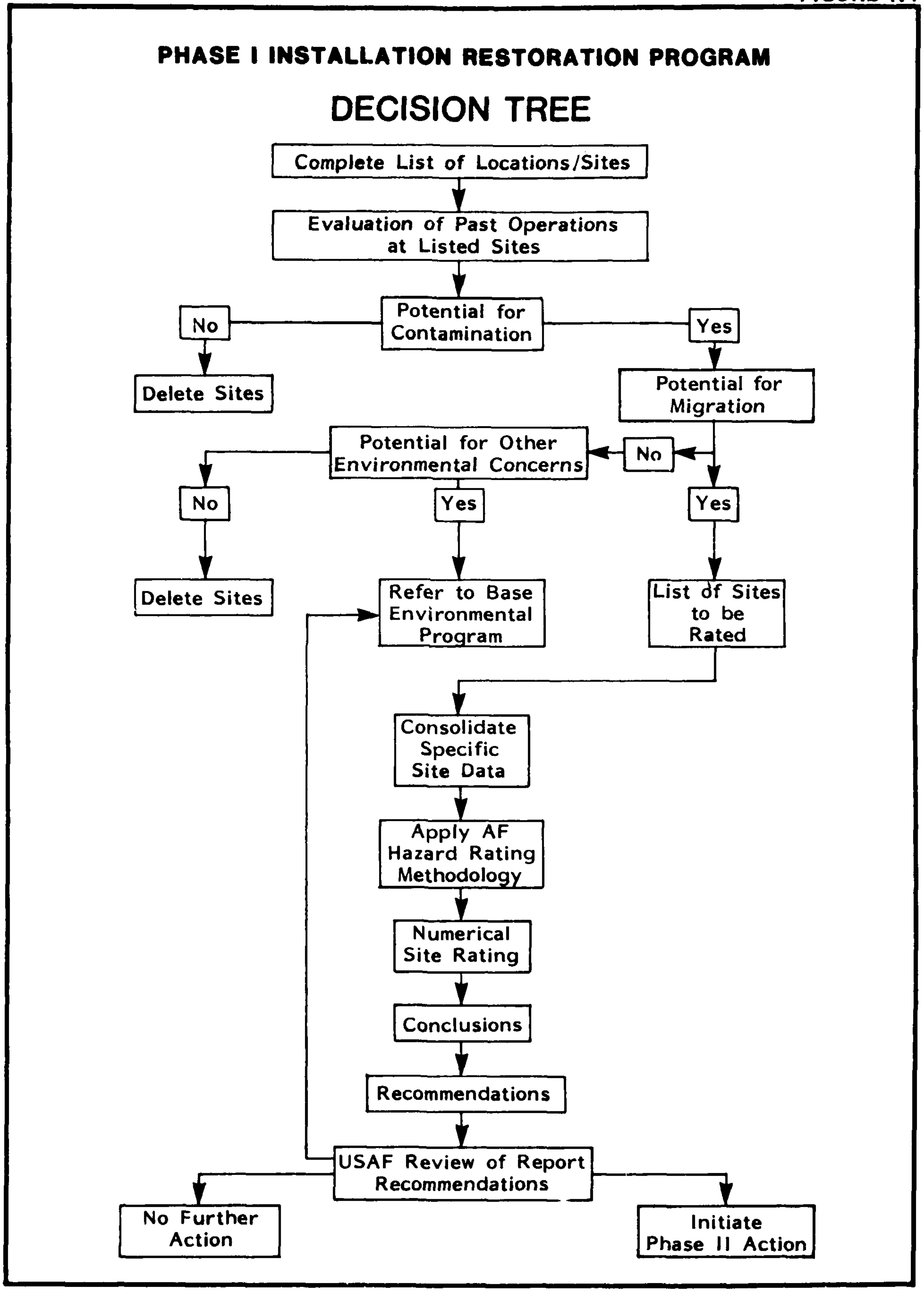
- North Carolina Division of Environmental Management, Ground Water Section, Raleigh, N.C.
- North Carolina Division of Environmental Management, Water Quality Section, Raleigh, N.C.
- North Carolina Division of Land Resources, Geological Survey Section, Raleigh, N.C.
- U.S. Environmental Protection Agency, Region IV, Atlanta, GA
- U.S. Geological Survey, Water Resources Division, District Office, Raleigh, N.C.
- U.S. Department of Agriculture, Soil Conservation Service, Raleigh, N.C.
- City of Goldsboro Public Works Department

The next step in the activity review was to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from the various operations on the base. Included in this part of the activities review was the identification of all known past disposal sites and other possible sources of contamination such as fuel-saturated areas resulting from spills.

A general ground tour of the identified sites was then made by the ES Project Team to gather site specific information including (1) visual evidence of environmental stress, (2) the presence of nearby drainage ditches or surface-water bodies, and (3) visual inspection of these water bodies for any obvious signs of contamination or leachate migration.

A decision was then made, based on all of the above information, whether a potential exists for hazardous material contamination at any of the identified sites using the decision tree shown in Figure 1.1. If no potential exists, the site was deleted from further consideration. For those sites where a potential for contamination was identified, a determination of the potential for migration of the contamination was made by considering site-specific conditions. If there was no further environmental concerns, then the site was deleted. If the potential for contaminant migration was considered significant, then the site was evaluated and prioritized using the hazard assessment rating methodology (HARM).

The HARM score indicates the relative potential for environmental contamination at each site. For those sites showing a high potential, recommendations are made to quantify the potential contaminant migration problem under Phase II of the Installation Restoration Program. For those sites showing a moderate potential, a limited Phase II program may be recommended to confirm that a contaminant migration problem does or does not exist. For those sites showing a low potential, no further follow-up Phase II work would be recommended.


PHASE I INSTALLATION RESTORATION PROGRAM
DECISION TREE
Complete List of Locations/Sites
Evaluation of Past Operations at Listed Sites
Potential for Contamination
No
Yes
Delete Sites
Potential for Migration
Potential for Other Environmental Concerns
No
No
Yes
Yes
Delete Sites
Refer to Base Environmental Program
List of Sites to be Rated
Consolidate Specific Site Data
Apply AF Hazard Rating Methodology
Numerical Site Rating
Conclusions
Recommendations
USAF Review of Report Recommendations
No Further Action
Initiate Phase II Action

CHAPTER 2

INSTALLATION DESCRIPTION

CHAPTER 2

INSTALLATION DESCRIPTION

LOCATION, SIZE AND BOUNDARIES

Seymour Johnson Air Force Base is located fifty miles southeast of Raleigh, North Carolina, 89 miles north of Wilmington, and is in the approximate center of the Coastal Plains section of North Carolina (Figure 2.1). The base is situated in Wayne County, on the south side of the City of Goldsboro. As shown in Figures 2.2 and 2.3, the base is bounded on the west by the Neuse River and on the northwest by Stoney Creek. The base comprises 3,216 acres of contiguous property with 1,065 acres of additional easements. An aerial photograph of the base is shown in Appendix E, page E-4. In addition, the Air Force owns or has easements on four additional sites totaling 13 acres which are located in the immediate vicinity of the Seymour Johnson AFB as shown in Figure 2.2. These sites are primarily used for navigational and communication purposes.

The Air Force also owns a 46,604 acre tract of land in the southern portion of mainland Dare County, North Carolina which is approximately 120 miles northeast of the base (Figure 2.4). This site is called the Dare County Bombing Range and is used as a bombing and gunnery facility for conducting tactical fighter pilot training for the Air Force, Navy, Marines and Air National Guard. The Dare County Range contains two cleared areas approximatley 3,800 acres and 2,300 acres. The remainder of the range is covered with timber in various stages of growth. The entire range site is low and swampy with elevations from 0 to 10 feet above sea level. There are no homes, public buildings, public roads nor major drainage canals within the boundaries of the range.

BASE HISTORY

Seymour Johnson AFB was activated in June 1942, when the War Department approved the establishment of a technical training school two miles southeast of Goldsboro, North Carolina. The primary mission was

FIGURE 2.1

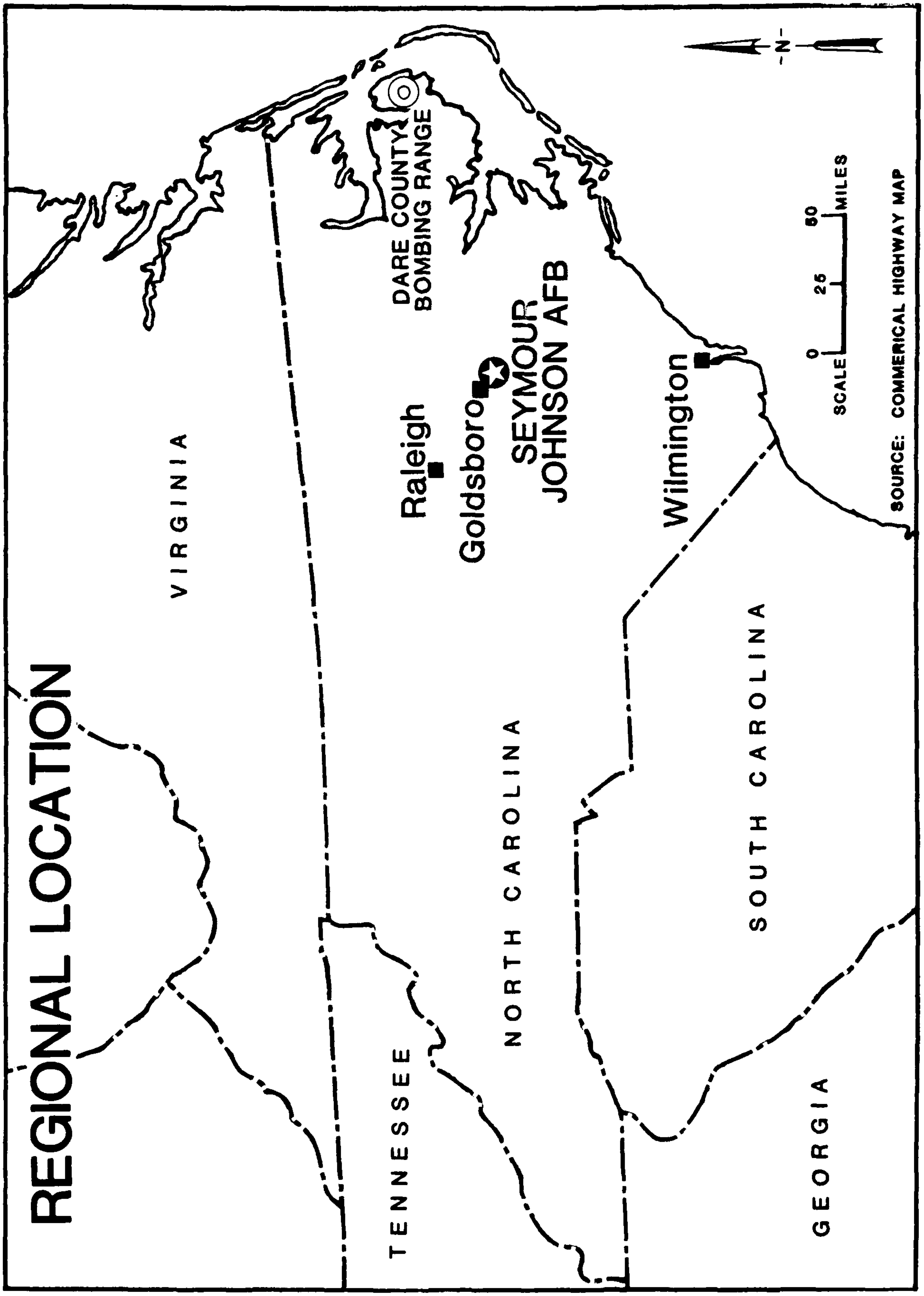
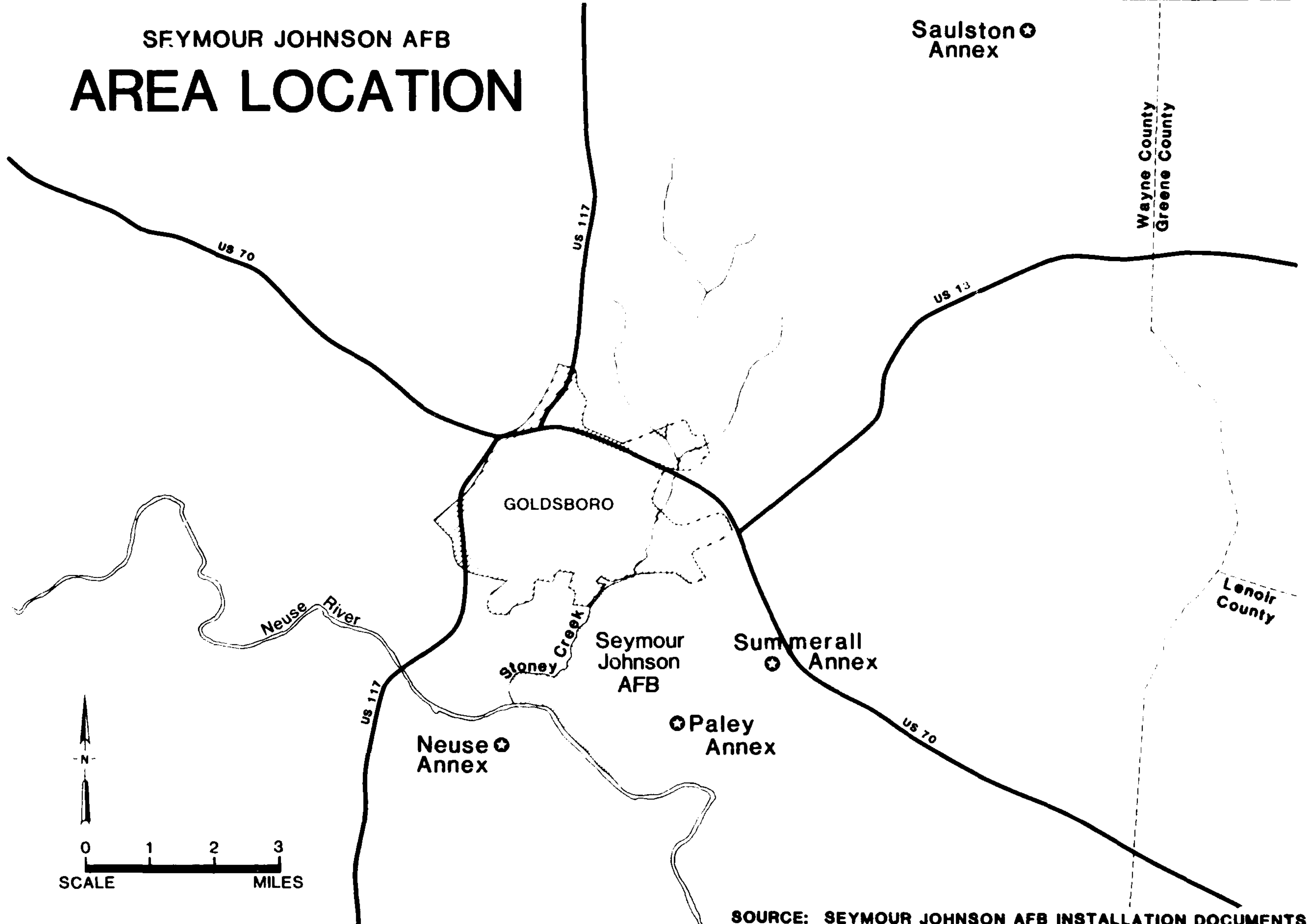

REGIONAL LOCATION
VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
TENNESSEE
GEORGIA
DARE COUNTY BOMBING RANGE
Raleigh
Goldsboro
SEYMOUR JOHNSON AFB
Wilmington
N
SCALE 0 25 50 MILES
SOURCE: COMMERICAL HIGHWAY MAP

FIGURE 2.2

SEYMOUR JOHNSON AFB
AREA LOCATION



SOURCE: SEYMOUR JOHNSON AFB INSTALLATION DOCUMENTS

FIGURE 2.3

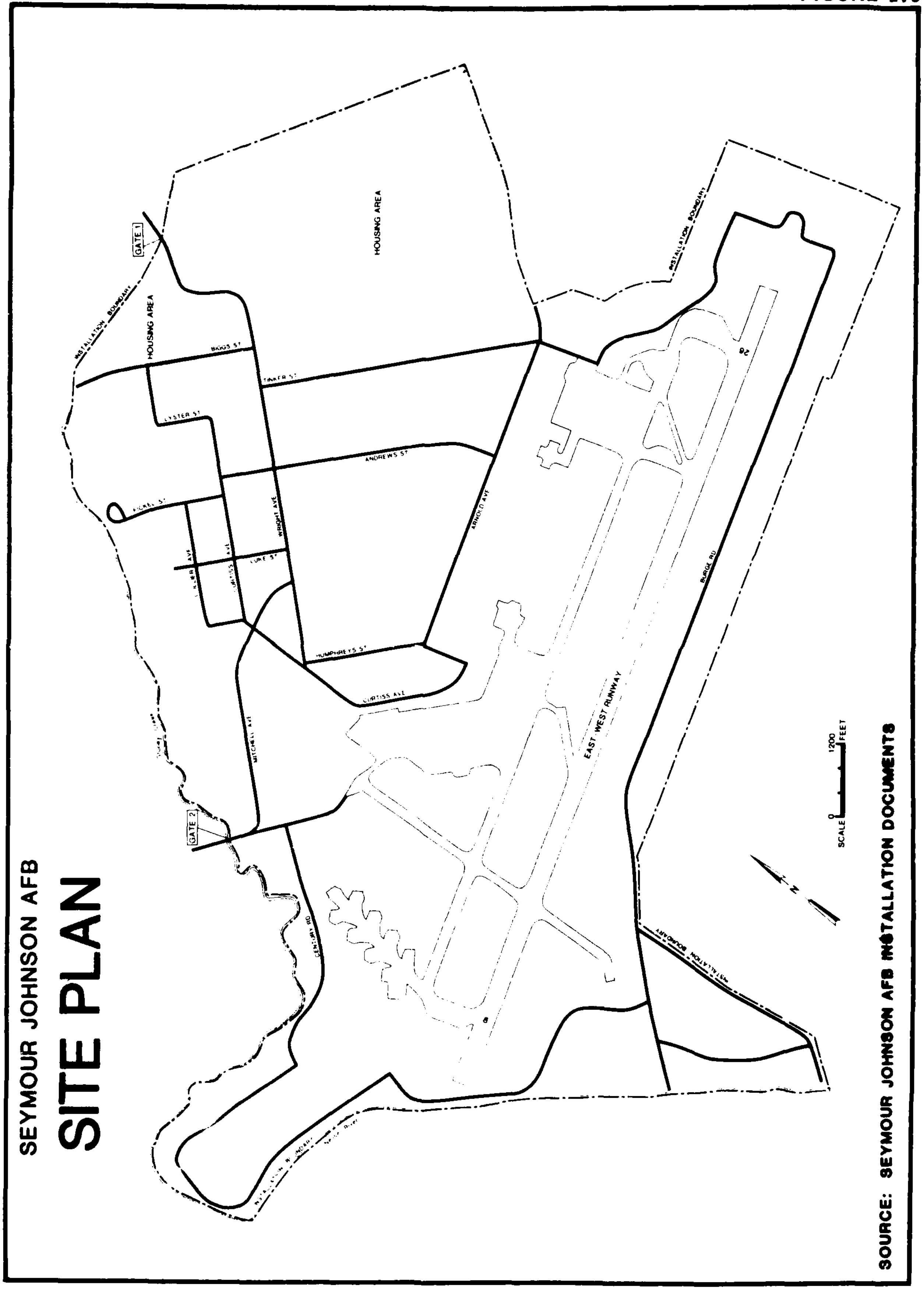
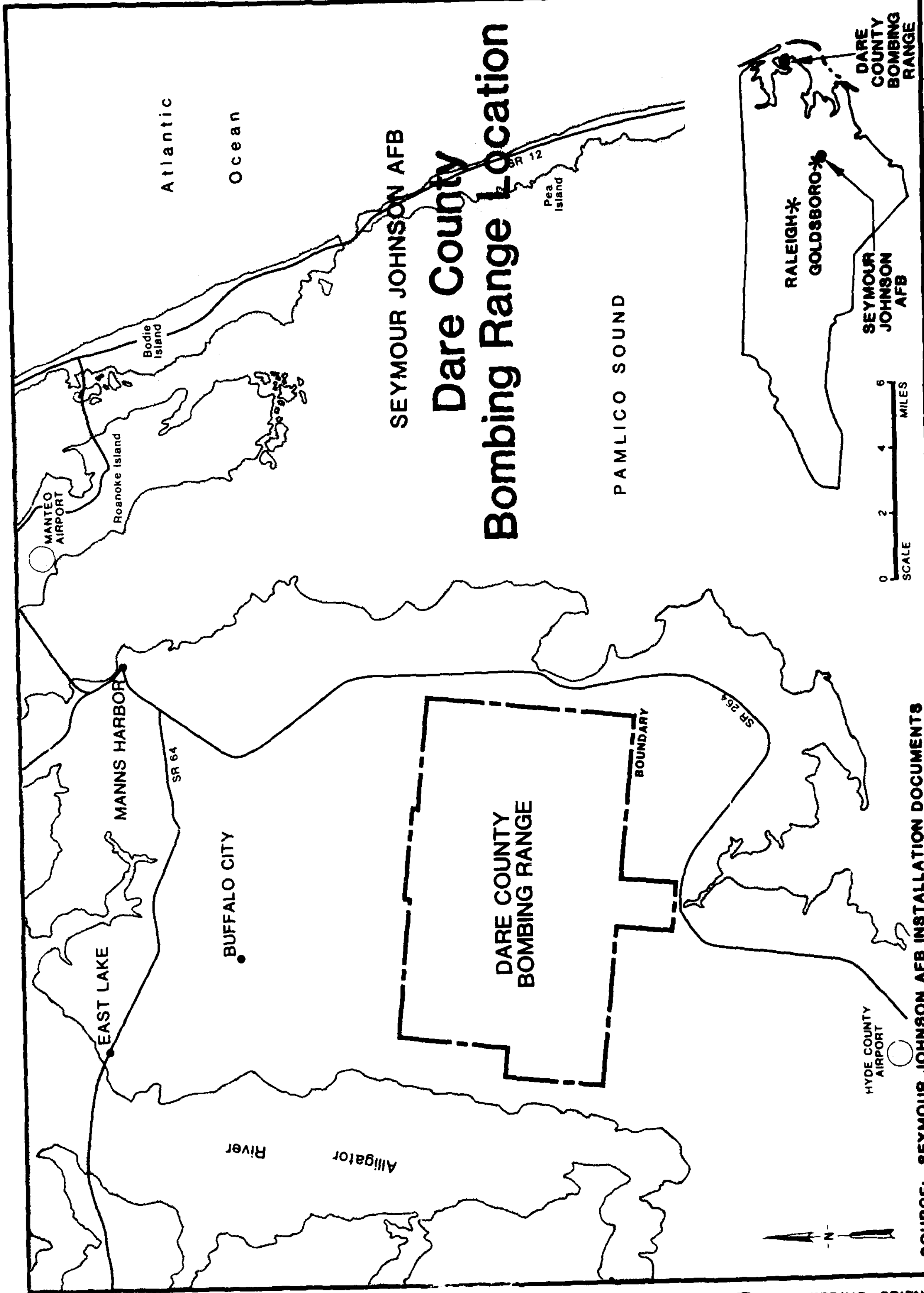

SEYMOUR JOHNSON AFB
SITE PLAN
HOUSING AREA
HOUSING AREA
GATE 1
GATE 2
INSTALLATION BOUNDARY
BIGGS ST
TINKER ST
LYSTER ST
ANDREWS ST
VICKERS ST
WRIGHT AVE
ARNOLD AVE
LUKE ST
CURTISS AVE
HUMPHREYS ST
MITCHELL AVE
CENTURY RD
BURGE RD
EAST WEST RUNWAY
26
SCALE
0
1200
FEET
N
SOURCE: SEYMOUR JOHNSON AFB INSTALLATION DOCUMENTS

FIGURE 2.4



ES ENGINEERING-SCIENCE

as Headquarters Technical School, Army Air Force. Additional missions followed in 1943 which included the Provisional Overseas Replacement Training Center, preparing officers and enlisted men for overseas duty; the 75th Training Wing, providing training for the Army Air Forces; and the 326th Fighter Group providing training for replacement pilots for the P-47 Thunderbolt. In 1944, basic training of P-47 pilots became the primary mission at Seymour Johnson AFB.

At the end of World War II in Europe, Seymour Johnson AFB was designated a Central Assembly Station for processing and training troops being reassigned throughout the continental United States and the Pacific. This function was discontinued in September 1945, and the base became an Army Air Force Separation Center.

In May 1946, Seymour Johnson AFB was deactivated and in 1949 the property was deeded to the City of Goldsboro. Between 1950 and 1953, Piedmont Airlines conducted regular flights into the Seymour Johnson Field. Other facilities at the base were leased to private interests for warehousing, temporary residence for a road circus, light manufacturing, family housing, and special presentations.

At the end of 1952, the City of Goldsboro transferred the base to the Federal Government and shortly thereafter, the U.S. Army Corps of Engineers began construction activities for reopening the base. In 1956, Seymour Johnson AFB was reactivated as a Tactical Air Command Base and during the same year the 83rd Fighter-Day Wing was assigned to the base. The 83rd Fighter-Day Wing was deactivated in 1957 and the 4th Fighter Group was assigned to the base as the primary, or host, unit. The 4th Fighter Group was later designated the 4th Tactical Fighter Wing.

A Strategic Air Command Unit designated the 4241st Strategic Wing was activated at Seymour Johnson in 1958. Activation of the 911th Refueling Squadron took place in early 1959. The 4241st was redesignated the 68th Bomb Wing in 1963.

A more detailed description of the Seymour Johnson AFB history is presented in Appendix B.

ORGANIZATION AND MISSION

The host command at Seymour Johnson AFB is the 4th Tactical Fighter Wing whose primary mission is to train, deploy and fight, utilizing the F-4E Weapons System anywhere in the world. Seymour Johnson AFB is a Tactical Air Command (TAC) base with a primary air to air combat mission.

Tenant organizations at Seymour Johnson AFB include the following organizations.

68th Bombardment Wing (SAC)
2012th Communications Squadron (AFCC)
Detachment 2104, Office of Special Investigations (AFOSI)
Detachment 2, 3rd Weather Squadron
Detachment 7, 2nd Aircraft Delivery Group
Defense Investigative Service
Detachment 15, 440th Management Engineering Squadron
14 Flying Training Wing, Detachment OL-B
Field Training Detachment 205
U.S. Air Force Judiciary
U.S. Army Corps of Engineers (COE)
Off-Site Branch (OSB) Seymour Johnson AFB
Operating Location Alpha Delta (OLAD), 191 Fighter Interceptor Group (FIG), Michigan Air National Guard
Air Force Commissary

Descriptions of the tenant organizations and their missions are presented in Appendix B.

CHAPTER 3

ENVIRONMENTAL SETTING

CHAPTER 3

ENVIRONMENTAL SETTING

The environmental setting of Seymour Johnson Air Force Base is described in this chapter with the primary emphasis directed toward identifying features which may affect the movement of hazardous waste contaminants. A summary of the environmental setting pertinent to the study is highlighted at the end of the section.

METEOROLOGY

Temperature, precipitation and snowfall data furnished by Detachment 2, 3rd Weatner Squadron, Seymour Johnson AFB, are presented as Table 3.1. The period of record is 22 years. The summarized data indicate that mean annual precipitation is 50.4 inches. This corresponds with the value obtained from the National Oceanic and Atmospheric Administration (NOAA, 1977). The NOAA has determined the mean annual class A pan evaporation for the area to be 55 inches with a 76 percent coefficient. These values result in a total net precipitation of 8.6 inches.

GEOGRAPHY

The Goldsboro area is located within the Inner Coastal Plain section of the Atlantic Coastal Plain Physiographic Province (Lobeck, 1950). This physiographic division is characterized by a wide belt (70 to 100 miles) of flat to gently rolling lowlands, extensive surficial dissection and mature streams, extending from the arbitrarily marked tidewater boundary, westward to the Fall Line, which forms the western Inner Coastal Plain margin. Figure 3.1 depicts the physiographic features of North Carolina. The valleys of major Coastal Plain streams typically possess low flats and swamps on the northward embankments and high banks or relatively steep bluffs on the southern sides.

Topography

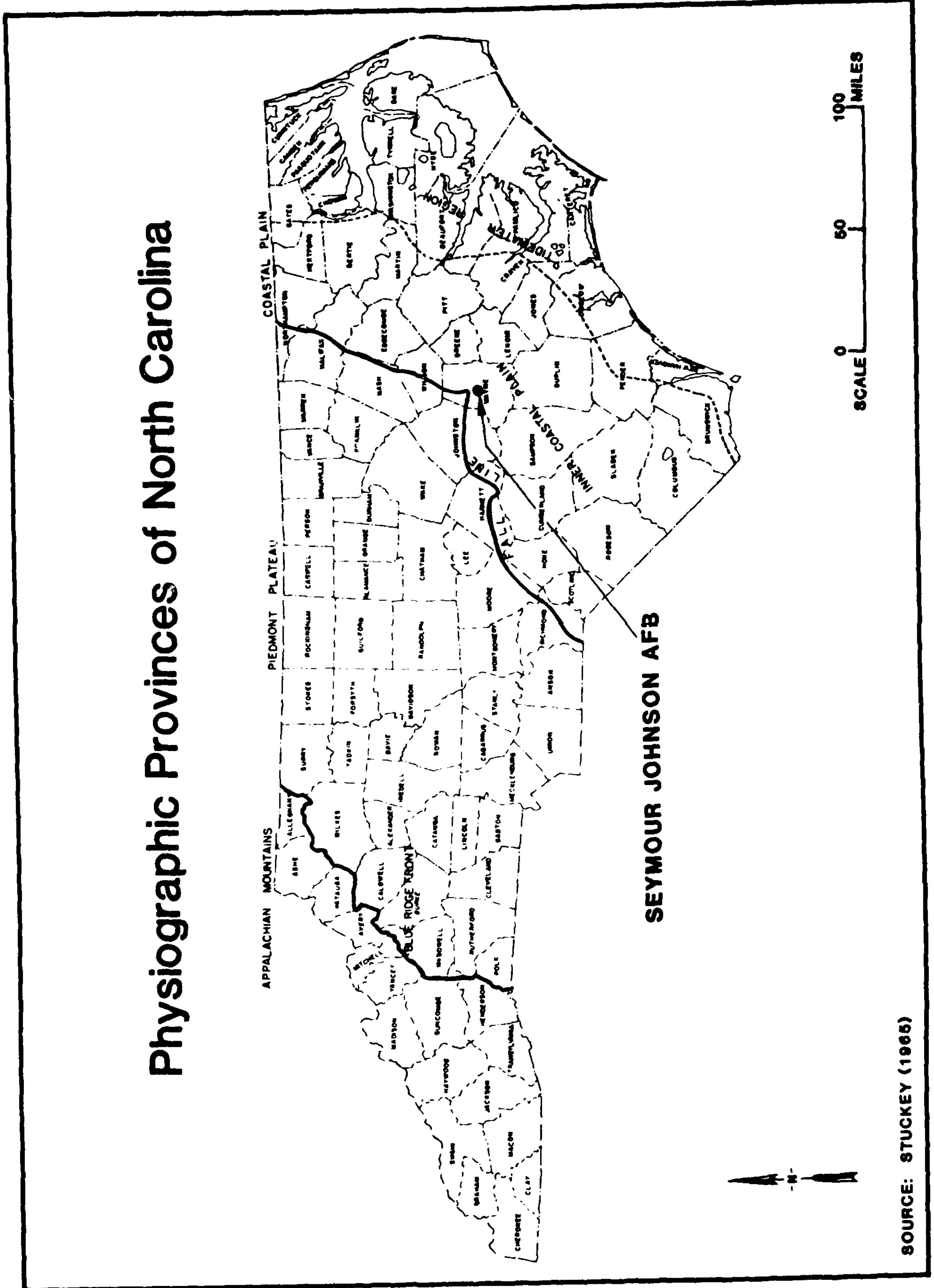
The topography of Goldsboro and proximate environs vary from generally level to gently rolling in appearance. Local relief is primarily

TABLE 3.1
SEYMOUR JOHNSON AFB
CLIMATIC CONDITIONS

MONTH	TEMPERATURE (°F)					PRECIPITATION (IN)				SNOWFALL (IN)		
	Mean			Extreme		Monthly				Monthly		
	Daily											
	Max	Min	Monthly	Max	Min	Mean	Max	Min	Max 24 Hrs	Mean	Max	Max 24 Hrs
JAN	51	33	42	82	6	4.1	7.2	1.5	3.0	2	13	5
FEB	54	34	44	85	9	3.8	6.4	1.0	2.1	2	13	12
MAR	62	42	52	96	20	4.1	8.1	.8	4.2	1	9	6
APR	73	51	62	95	32	3.0	6.4	.2	2.3	0	0	0
MAY	79	59	70	97	35	3.9	6.7	.9	4.2	0	0	0
JUN	85	66	75	100	47	4.2	9.2	1.8	4.1	0	0	0
JUL	88	71	83	104	56	7.4	12.5	1.6	5.0	0	0	0
AUG	87	70	79	100	49	5.4	11.3	2.7	5.1	0	0	0
SEP	83	64	74	95	44	4.4	8.7	.6	4.8	0	0	0
OCT	73	52	63	90	25	2.9	9.0	.4	5.9	0	0	0
NOV	64	43	54	87	19	3.3	6.9	.5	5.2	0	0	0
DEC	55	35	45	80	10	3.4	7.1	.6	2.9	1	14	13
ANNUAL	71	52	62	104	6	50.4	12.5	.2	5.9	6	14	13

Source: Detachment 2, 3rd Weather Squadron, Seymour Johnson Air Force Base
Period of Record: 1957-1979

FIGURE 3.1



Physiographic Provinces of North Carolina
APPALACHIAN MOUNTAINS
PIEDMONT PLATEAU
COASTAL PLAIN
BLUE RIDGE FRONT
FALL LINE
INNER COASTAL PLAIN
TIDEWATER REGION
SEYMOUR JOHNSON AFB
SCALE
0
50
100
MILES
N
SOURCE: STUCKEY (1965)

the result of dissection by erosional activity or stream channel development. In the Goldsboro vicinity, surface elevations average 100 feet MSL. Land surface at Seymour Johnson Air Force Base, tends to slope from elevations slightly above 100 feet MSL on the northeast portion of the base to approximately 55 feet MSL along the southwest base border in the Neuse River floodplain.

Drainage

Drainage of Seymour Johnson Air Force Base land areas is accomplished by overland flow to diversion structures, and then to area surface streams, all of which are tributaries of the Neuse River. Generally, the north portion of the base drains to Stoney Creek, while the south portion of the base drains to a man-made channel terminating at the Neuse River. Installation documents reviewed in support of this study indicate that portions of the base are subject to flooding from Stoney Creek and the Neuse River during 100-year storm events. Stoney Creek drains an area of some 27.5 square miles at its confluence with the Neuse River (Stony Creek Watershed Land Potential Study, 1971). The Neuse River drains an area of some 2,420 square miles, measured from its point of origin to the west installation boundary (COE, 1972). Base areas subject to flooding and installation surface drainage features are identified on Figure 3.2. Seymour Johnson AFB land areas are generally well drained and no normally occurring wetland areas have been identified.

Surface Soils

Surface soils of the Seymour Johnson Air Force Base area have been reported by the U.S. Department of Agriculture, Soil Conservation Service (1974). Twenty-one soil types have been identified within installation boundaries. The individual soil types are described in Table 3.2 and are mapped as Figure 3.3. All of the soil units mapped on base impose moderate to severe restrictions on waste disposal facility development. The soils present on base are typically sandy, and poorly to well drained. Seven soil units present on base are subject to flooding.

FIGURE 3.2

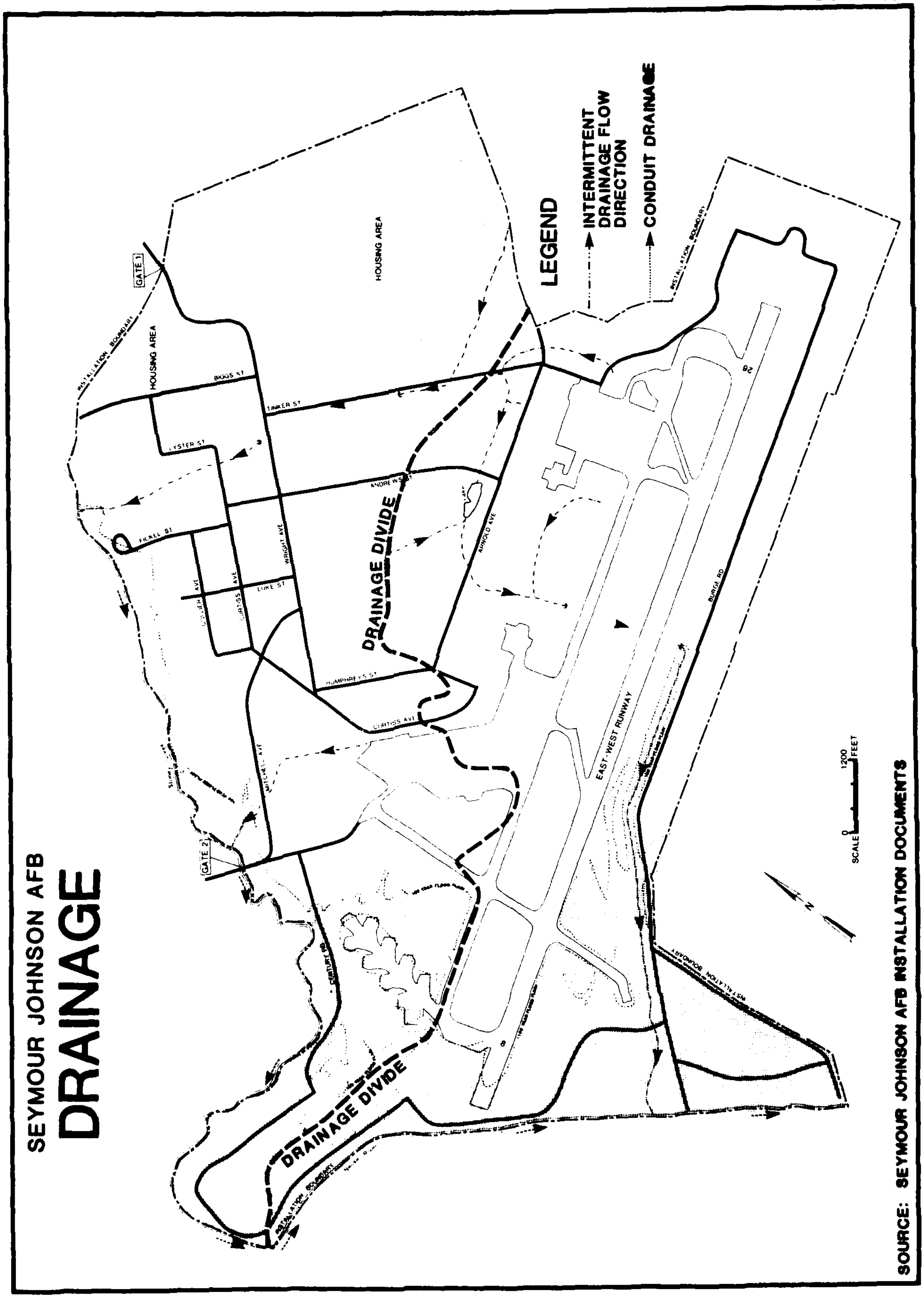
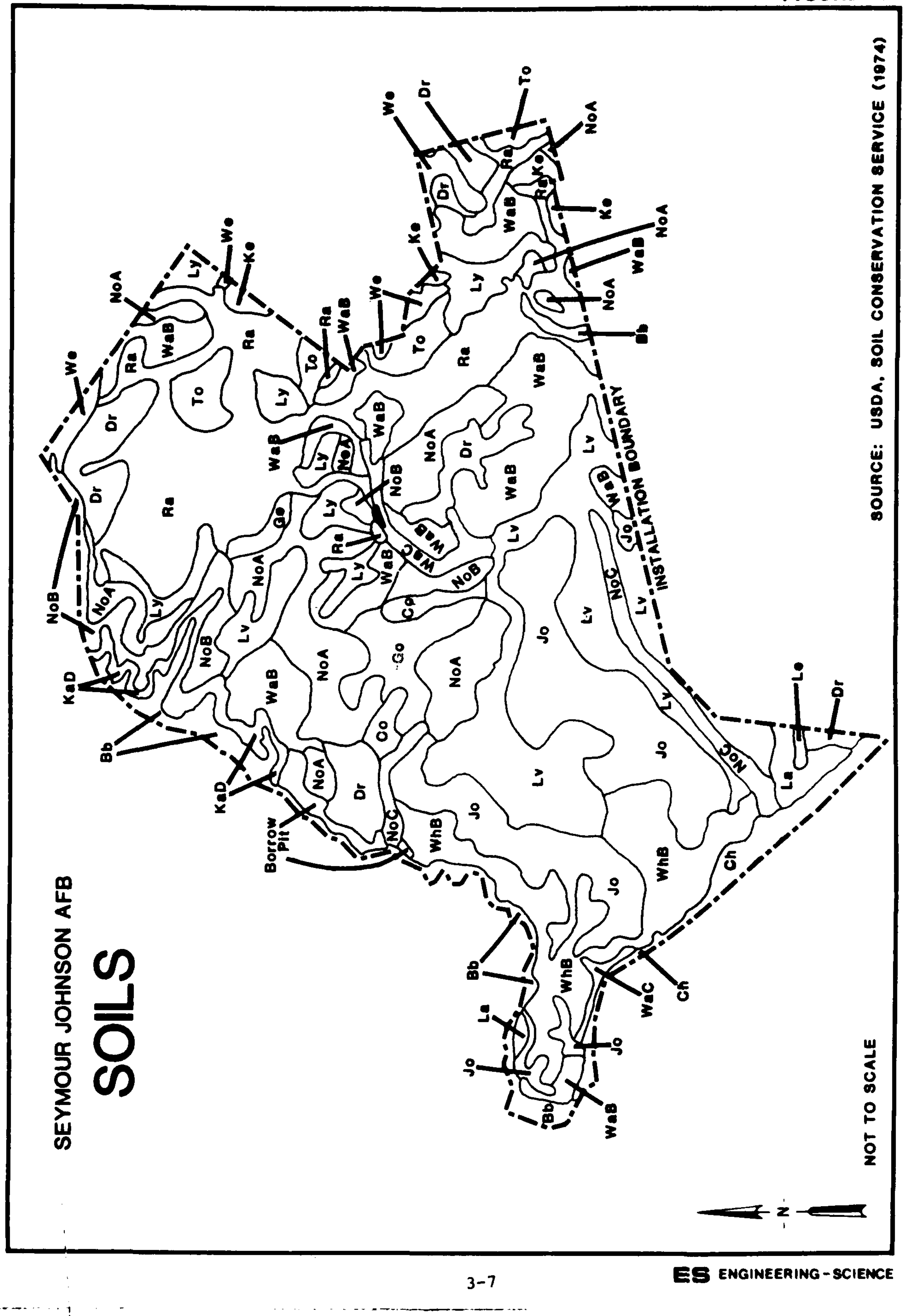

SEYMOUR JOHNSON AFB
DRAINAGE
LEGEND
INTERMITTENT DRAINAGE FLOW DIRECTION
CONDUIT DRAINAGE
DRAINAGE DIVIDE
DRAINAGE DIVIDE
HOUSING AREA
HOUSING AREA
GATE 1
GATE 2
INSTALLATION BOUNDARY
BIGGS ST
TINKER ST
LYSTER ST
ANDREWS ST
FICKEL ST
LUKE ST
WRIGHT AVE
ARNOLD AVE
HUMPHREYS ST
CURTISS AVE
MITCHELL AVE
CENTURY RD
EAST-WEST RUNWAY
26
SCALE 0 1200 FEET
N
SOURCE: SEYMOUR JOHNSON AFB INSTALLATION DOCUMENTS

TABLE 3.2
SEYMOUR JOHNSON AIR FORCE BASE SOILS

Map Symbol	Unit Description	USDA Texture (Major Fraction)	Thickness (inches)	Unified Classification (Major Fraction)	Permeability (inches/hour)	Disposal Site Facility Use Constraints
Bb	Bibb sandy loam	Sandy, sandy loam; loamy sand	65	SM	0.63-6.3	Severe - floods
Ch	Chewacla loam	Loam, sandy loam	75	ML, CL, SM	0.63-6.3	Severe - floods
Co	Coxville loam	Loam, sandy loam, sandy clay loam, sandy clay	70	ML, CL, SC	0.2-2.0	Severe - high water table
Dr	Dragston loamy sand	Loamy sand, sandy loam, sand	75	SM, SC, SP	2.0-20.0	Severe - high permeability
Go	Goldsboro loamy sand	Loamy sand, sandy clay loam, sandy loam	76	SM, SC, CL	0.63-6.3	Severe - high water table
Jo	Johns sandy loam	Sandy loam, sandy clay loam, sand	65	SM, SC, SP	0.63-20.0	Severe - permeability - high water table
KaD	Kalmia loamy sand, 10-15 percent slopes	Loamy sand, sandy clay loam, sandy loam	72	SM, SC, SP	0.63-20.0	Severe - floods
Ke	Kenansville loamy sand	Loamy sand, sandy loam, sand	70	SM, SP	2.0-20.0	Severe - permeability
La	Lakeland sand	Sand	100	SM, SP	6.3-20.0	Severe - permeability
Le	Leaf loam loam	Loam, clay loam, clay, sandy	110	ML, CL, CH, SM	0.06-2.0	Moderate-infrequent flooding
Lv	Lumbee sandy loam	Sandy loam, sandy clay loam, loamy sand	65	SM, SC, CL	0.63-20.0	Severe - floods
Ly	Lynchburg sandy loam	Sandy loam, sandy clay loam, sandy clay	72	SM, SC, CL	0.63-6.3	Severe - high water table
NoA	Norfolk sandy loam, 0-2 percent slopes	Loamy sand, sandy clay loam	75	SM, SC, CL	0.63-6.3	Moderate - permeability
NoB	Norfolk sandy loam, 2-6 percent slopes	Loamy sand, sandy clay loam	75	SM, SC, CL	0.63-6.3	Moderate - permeability
NoC	Norfolk sandy loam, 6-10 percent slopes	Loamy sand, sandy clay loam	75	SM, SC, CL	0.63-6.3	Moderate - permeability
Ra	Rains sandy loam	Sandy loam, sandy clay loam	78	SM, SC, CL	0.63-6.3	Severe - high water table
To	Torhunta loam	Loam, sandy loam	40	SM, SC, ML, SM-SC, SP-SM	2.0-6.3	Severe - floods
WaB	Wagram sandy loam, 0-6 percent slopes	Loamy sand, sandy clay loam	86	SM, SC, CL, SP-SM	2.0-20.0	Severe - permeability
WaC	Wagram sandy loam, 6-10 percent slopes	Loamy sand, sandy clay loam	86	SM, SC, CL, SP-SM	2.0-20.0	Severe - permeability
We	Weston sandy loam	Loamy sand, sandy loam	65	SM, SC	0.63-6.3	Severe - high water table
WhB	Wickham sandy loam, 2-6 percent slopes	Loay sand, clay loam, sandy loam, coarse sand to gravelly sand	65	SM, SC, CL, GM, GC	0.63-20.0	Severe - floods - permeability
Bp	Borrow pit	Highly variable	Physical properties not estimated.			Probably Severe - floods - permeability

Source: USDA, Soil Conservation Service, 1974.

FIGURE 3.3


SEYMOUR JOHNSON AFB
SOILS
SOURCE: USDA, SOIL CONSERVATION SERVICE (1974)
INSTALLATION BOUNDARY
Borrow Pit
NOT TO SCALE
N

GEOLOGY

The geology of the Seymour Johnson Air Force Base area has been reported by Berry (1947), Spangler (1950), Stuckey and Conrad (1958) and Stuckey (1965). Additional information has been obtained from interviews with U.S. Geological Survey (USGS) personnel. A brief review of their work and pertinent comments has been summarized in support of this investigations.

Stratigraphy

Geologic units ranging in age from pre-Cambrian to Pleistocene have been identified in the project area. Table 3.3 summarizes the major units and presents their significant characteristics. The lithologies of these units range from unconsolidated materials to sedimentary rocks, reposing on a crystalline basement complex.

Distribution

The surface distribution of geologic units relevant to this study is mapped as Figure 3.4, which has been modified from the North Carolina State Geologic Map (1958). Generally, the geology of the Seymour Johnson Air Force Base area is dominated by moderately thick sections of interbedded marine sands and clays of the Black Creek and Tuscaloosa/ Cape Fear Formations. The degree of interbedding is highly variable and it is reported that individual layers within major formations can not be correlated over great distances due to lithological variations or past erosional effects following depositional cycles. The highly variable nature of upper geologic units present at Seymour Johnson Air Force Base may be seen on the logs of two foundation construction test borings drilled at opposite ends of the base, Figures 3.5 and 3.6.

Structure

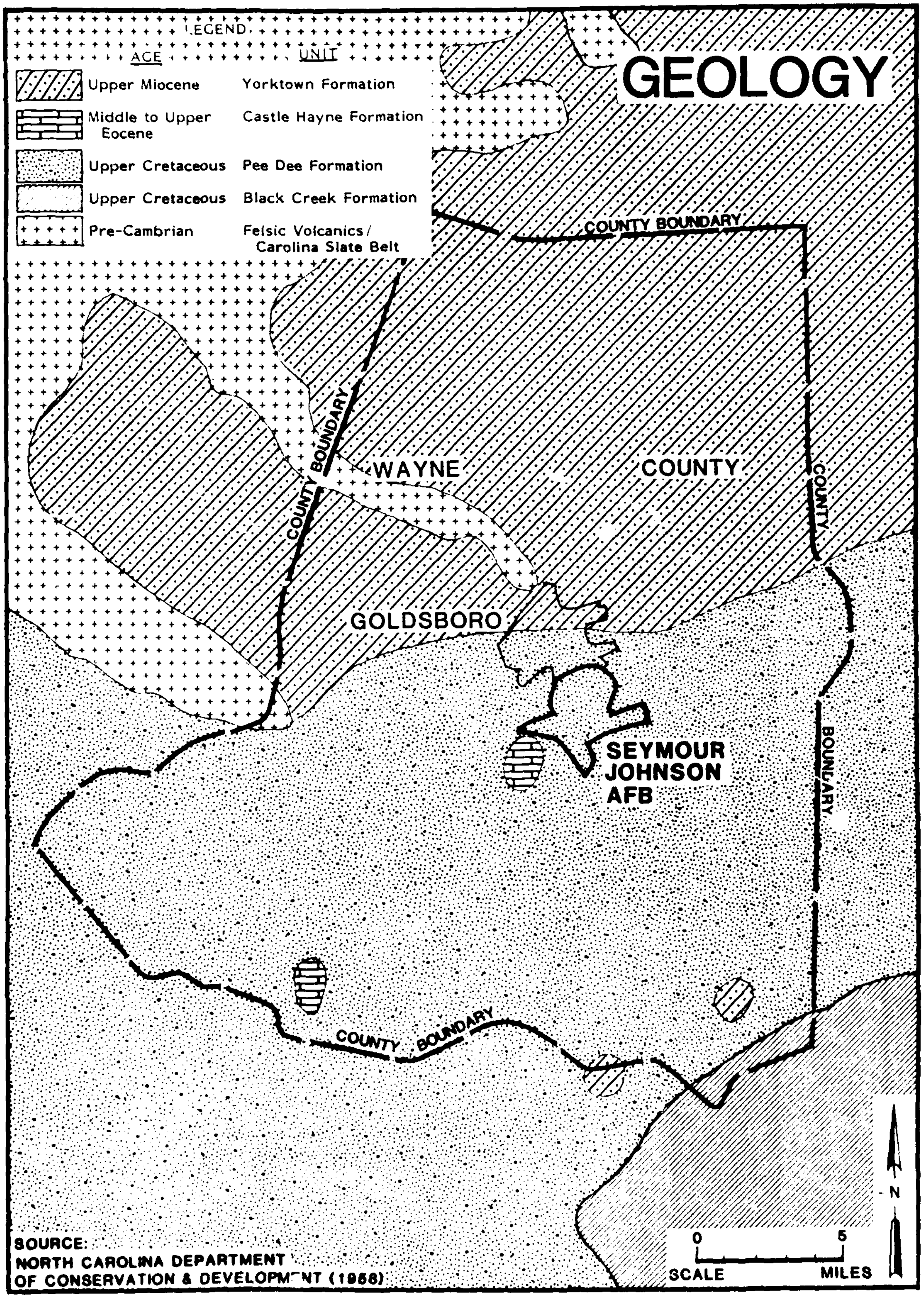
The Coastal Plain sediments form a wedge with its point of origin at the Fall Line near Goldsboro (refer to Figure 3.1) and thicken seaward to some 10,000 feet at Cape Hatteras (Stuckey and Conrad, 1958). Individual units within the Coastal Plain, such as the Black Creek which dominates base geology, tend to thicken in a southeast (downdip) direction and possess an approximate unit dip of ten to twelve feet per mile (relatively flat). These units are normally not disrupted by faulting or other geologic discontinuities; however, depositional effects such as current bedding are known to cause some isolated beds to occur at

TABLE 3.3
WAYNE COUNTY, NC
GEOLOGIC UNITS

System	Series	Formation		Thickness (feet)
Quaternary	Pleistocene-Miocene	Surface and alluvial deposits:	Sand, gravel, silt , clay deposited on flood plains and along major streams.	40-80
Tertiary	Late Miocene	Yorktown Formation:	Gray massive marine clay (discontinuous)	0-60
	Eocene	Castle Hayne Formation:	Limestone, sand, shells (scattered outliers)	0-40
Cretaceous	Late	Pee Dee Formation:	Interbedded sands, clays, limestone	0-50
		Black Creek Formation:	Marine sands, clay, silt interbedded with shell layers.	65-250
		Tuscaloosa Formation: (now called Cape Fear)	Sand and clay, interbedded	80-220
Pre-Cambrian	---	Basement Complex:	Slate and volcanics	unknown

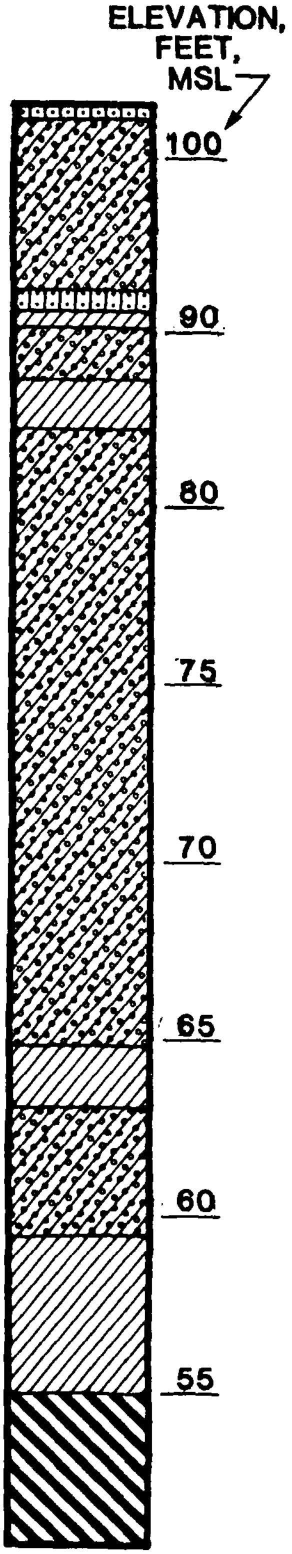
Source: Stuckey (1965), Pusey (1960) and Spangler (1950)

FIGURE 3.4


GEOLOGY
LEGEND
AGE
UNIT
Upper Miocene
Yorktown Formation
Middle to Upper Eocene
Castle Hayne Formation
Upper Cretaceous
Pee Dee Formation
Upper Cretaceous
Black Creek Formation
Pre-Cambrian
Felsic Volcanics / Carolina Slate Belt
COUNTY BOUNDARY
WAYNE
COUNTY
GOLDSBORO
SEYMOUR JOHNSON AFB
N
0
5
SCALE
MILES
SOURCE:
NORTH CAROLINA DEPARTMENT
OF CONSERVATION & DEVELOPM'NT (1958)

SEYMOUR JOHNSON AFB

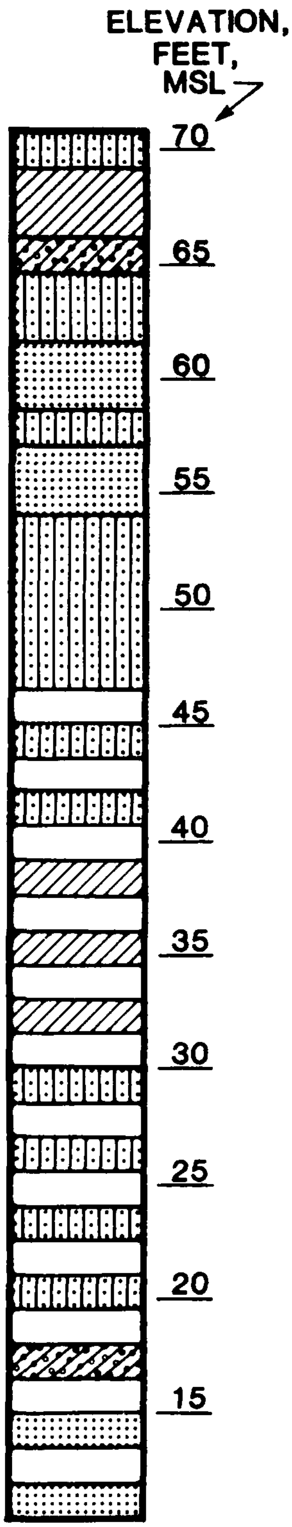
INSTALLATION TEST BORING LOG



- INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
- SILTY SANDS, SAND - SILT MIXTURES
- CLAYEY SANDS, SAND - CLAY MIXTURES
- INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY: GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS

LOCATION: Southwest Corner Building 4909
NOTE: Ground-water Level Not Indicated

SOURCE: SEYMOUR JOHNSON AFB INSTALLATION DOCUMENTS



SEYMOUR JOHNSON AFB

INSTALLATION TEST BORING LOG

- POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES
- SILTY SANDS, SAND - SILT MIXTURES
- CLAYEY SANDS, SAND - CLAY MIXTURES
- INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
- UNSAMPLED INTERVAL

LOCATION: SAC Ammo Storage Area Between Buildings 22[illegible] And 2214

NOTE: Ground-water Level Not Indicated

SOURCE: SEYMOUR JOHNSON AFB INSTALLATION DOCUMENTS

steeply dipping angles or be replaced abruptly on a local scale (Stuckey and Conrad, 1958). Figure 3.7, a generalized subsurface section of the North Carolina Coastal Plain, depicts the significant structural conditions of major geologic units.

HYDROLOGY

Introduction

Ground-water hydrology of the project area has been reported by Pusey (1960), Wooten and Company (1970), Robison and Mann (1977), Cederstrom et al (1979) and Heath (1980). Additional information has been obtained from interviews with scientists of the U.S. Geological Survey, Water Resources Division District Office and officials of the North Carolina Department of Environmental Management.

Aquifers

Seymour Johnson Air Force Base is located within the Central Coastal Plain Hydrogeologic Area of North Carolina, which is shown on Figure 3.8. This area is typically underlain by moderately permeable sands interbedded with less permeable silts and clays (Robison and Mann, 1977). These deposits thicken seaward, as mentioned in the discussion of area geology.

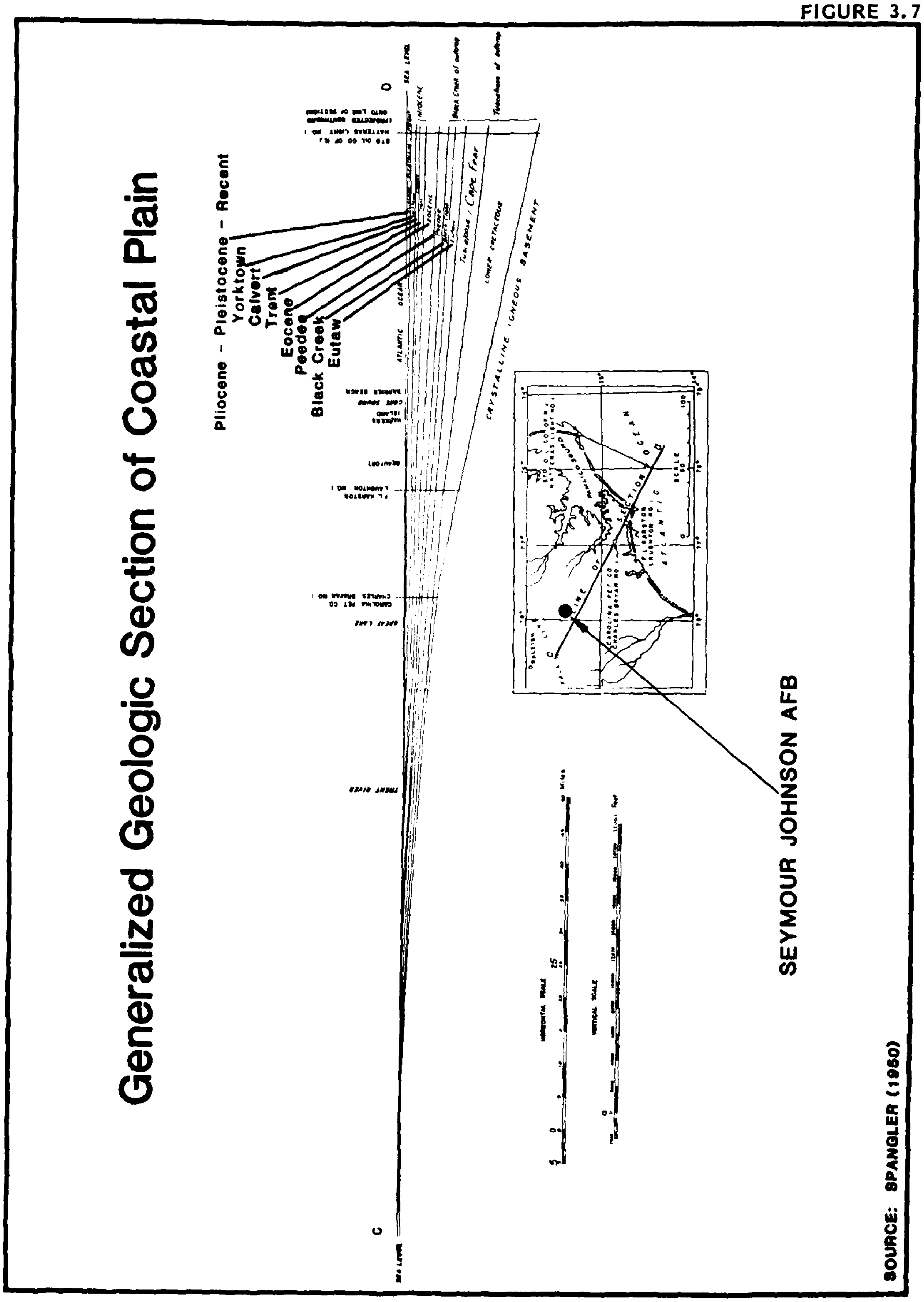
In Wayne County, most individuals and communities with the notable exception of Goldsboro derive potable water supplies from unconsolidated sediments producing moderate to large quantities of ground water. In contrast, the City of Goldsboro withdraws surface waters from the Neuse River (Gallamore, 1982).

Hydrogeologic Units

Two major hydrogeologic units have been identified at Seymour Johnson Air Force Base through interpretation of installation well logs. According to Coble and Winner (1982) geophysical logging of "Old Well No. 2" (USGS No. Wa-50) indicates the following units to be present:

Surface to 18 feet	Surface/Alluvial Sands & Silts
18 feet to 87 feet	Black Creek Formation
87 feet to 149 feet	Tuscaloosa/Cape Fear Formation
156 feet to 178 feet	Basement Rock

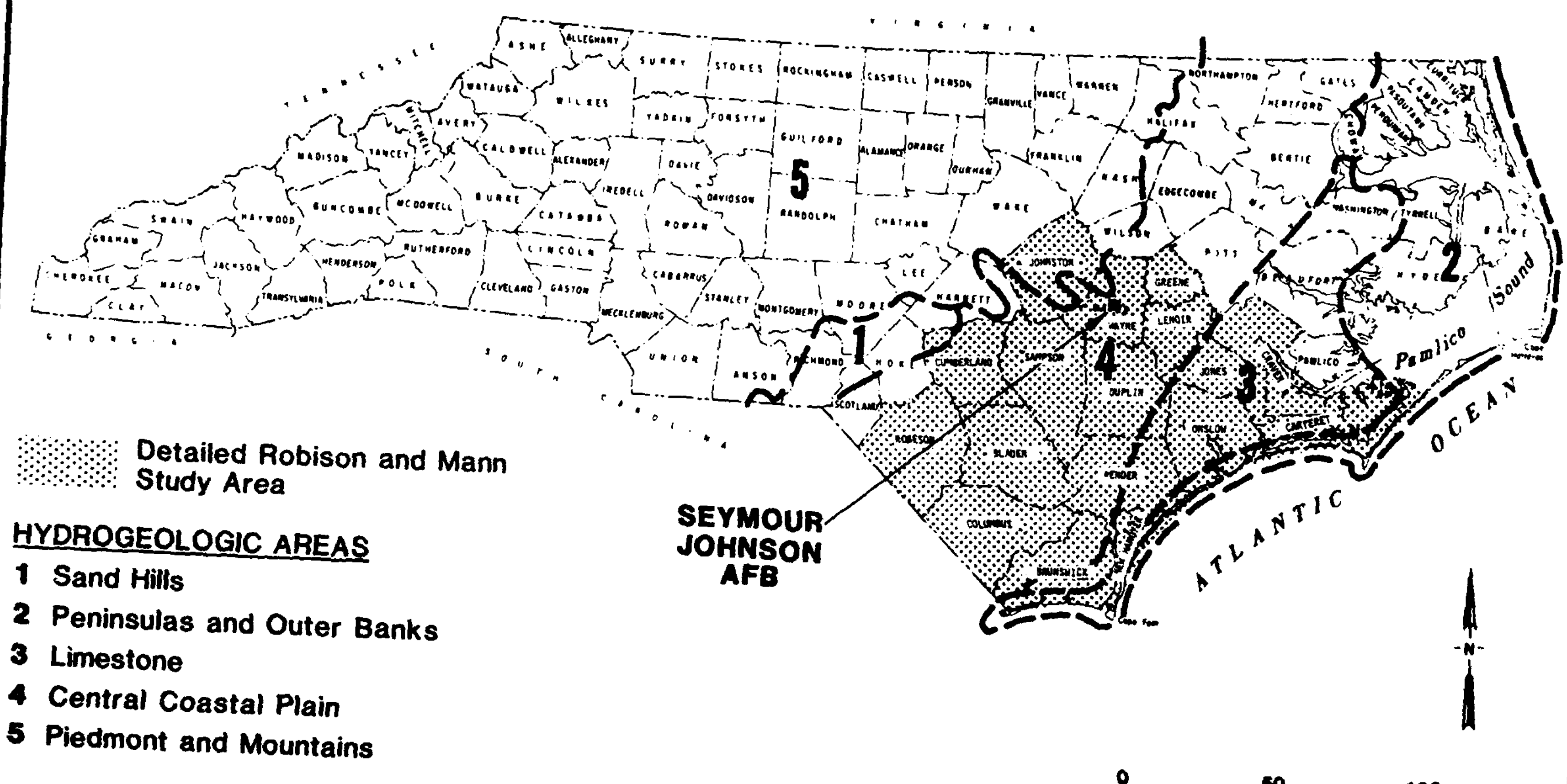
FIGURE 3.7



SOURCE: SPANGLER (1950)

FIGURE 3.8

Central Coastal Plain Aquifer Area



SOURCE: ROBISON and MANN (1977)

Collectively, the Black Creek and the Tuscaloosa (Cape Fear) are referred to as the "Lower Sandy Aquifer" in many reports, such as Heath (1980). Figure 3.9 shows the approximate relationships of the surface strata and the lower sandy units, which is typical for the North Carolina Costal Plain.

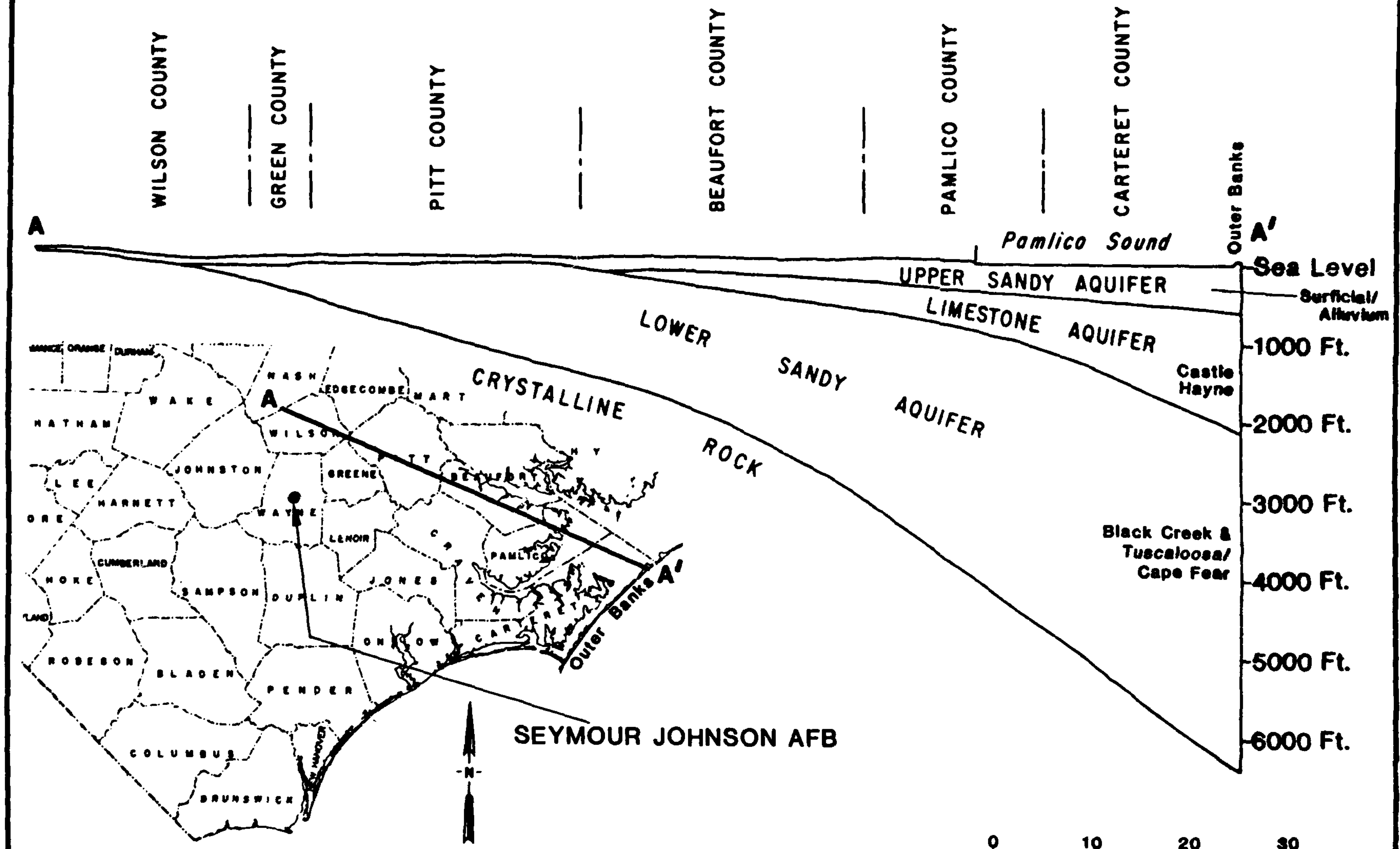
Ground water generally exists in the upper sands at shallow depths in an undefined "upper aquifer." This phenomenon has been observed by the Soil Conservation Service (1974) who noted that ground water was usually present within six feet of ground surface in many of the soil units mapped at the base. It is assumed that water is unconfined in this unit.

Ground water is usually present under artesian (confined) conditions in the lower units. Water encountered at lower elevations tends to rise in a tightly screened well to a point several tens of feet above the zone from which it was originally obtained. This is due to the confining effect of the clay layers interbedded among the water producing sands. The Black Creek and Tuscaloosa Formations (in North Carolina, the name "Tuscaloosa" is being replaced by "Cape Fear" as an identifier for units lithologically and chronologically correlative with those of the Southern and Gulf Coastal Plain) are the most prolific hydrogeologic units of the area. Wells drilled into these formations are usually constructed with multiple screens to permit water intake at several productive zones along the vertical column of the well casing. Figure 3.10 is the log of a typical base well which depicts the interbedding of sands and clays in the hydrogeologic units present at the base. However, a review of base well logs does not indicate the presence of a discrete and continuous confining layer which isolates the hydrogeologic units identified at Seymour Johnson Air Force Base.

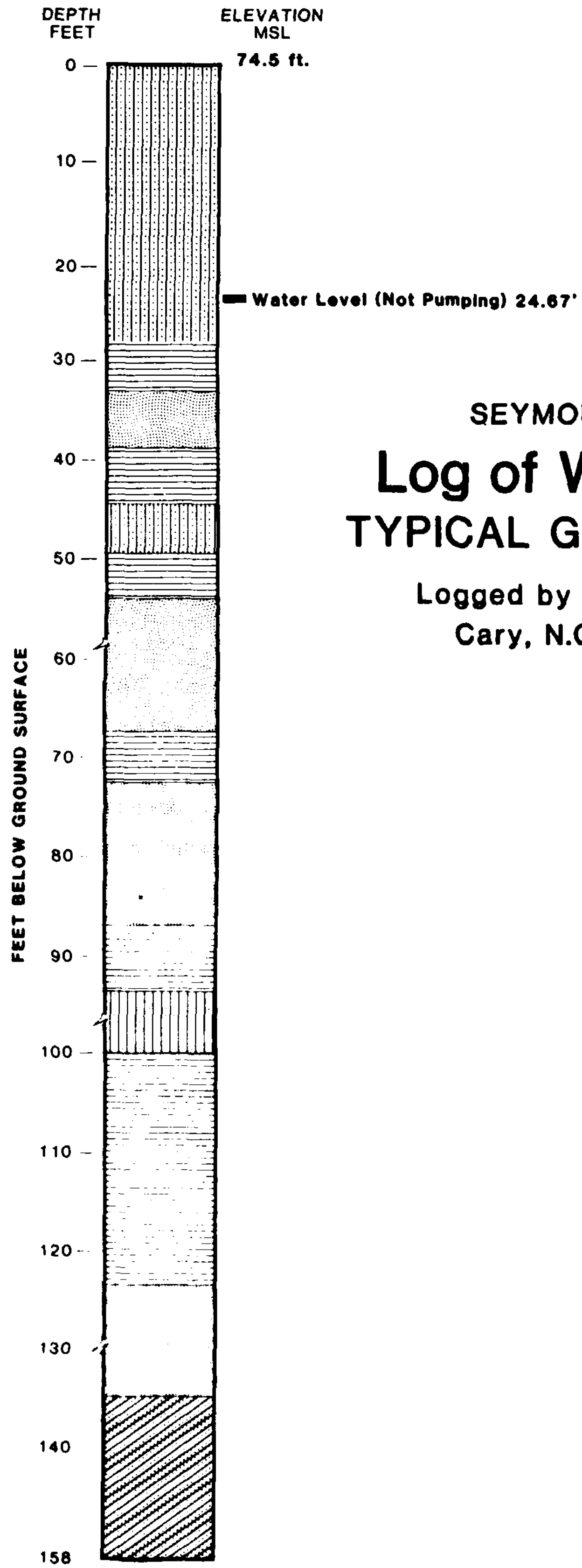
Study area hydrogeologic units are probably recharged directly from precipitation falling on these or interconnecting units. At present, the degree of communication among water bearing units is unknown; however, it is assumed to be considerable. It is believed that rainfall infiltrating through the surficial sands would eventually reach lower aquifers through communicating flow. At present the USGS is developing a ground-water model to quantify this and other relevant hydrogeologic parameters and the North Carolina Department of Environmental Management is performing a capacity-use study for the Inner Coastal Plain. One

FIGURE 3.9

Principal Aquifers of the North Carolina Coastal Plain



SOURCE: ROBISON and MANN (1977)



SEYMOUR JOHNSON AFB

Log of Well No. 12-60

TYPICAL GEOLOGIC COLUMN

Logged by Heater Well Company,
Cary, N.C., 27 Sept. 1979

LEGEND

- Sand and Clay
- Clay
- Sand
- Tight Clay

SOURCE: SEYMOUR JOHNSON AFB DOCUMENTS (UNDATED) significant point that is presently unknown is the degree of communication among the upper aquifer, lower aquifer and the Neuse River. Undoubtedly, some base flow of the Neuse River is derived from the upper aquifer. The actual characteristics of base flow, seasonal and consumptive use impacts should be known in order to quantify this issue. A generalized example, presented by Heath (1980) and portrayed here as Figure 3.11, depicts relative times of ground-water flow and flow directions. It is assumed that in this case, general ground-water flow directions in the upper aquifer will be toward surface streams. In the deep aquifers, it is assumed that ground-water flow will progress down dip in a southeasterly direction toward the sea. Locally, consumptive use may modify these trends.

Seymour Johnson Air Force Base derives seventy percent of its water supplies from a system of eleven wells. Three wells are inactive because of high iron content. Three additional wells provide local or emergency service to the rifle range, the base hospital and the TAC engine test cell. Figure 3.12 depicts the locations of base water wells. Table 3.4 is a summary of base well construction and operation information. The remaining thirty percent of the base water supply, water for the old housing area (Berkeley Village), is purchased from the City of Goldsboro.

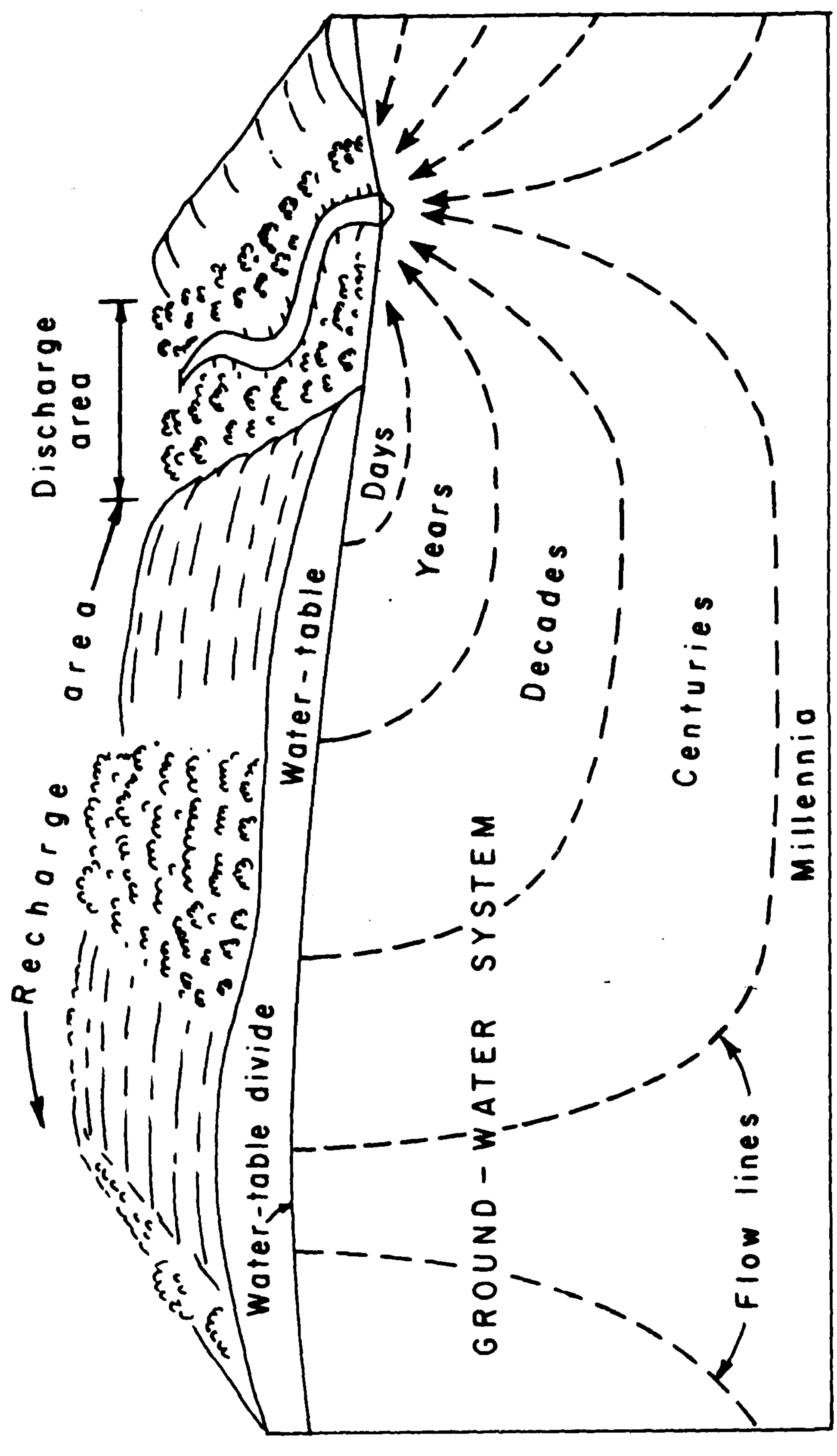
Ground-Water Quality

According to reports published by Pusey (1960) and Robison and Mann (1977) water derived from the lower sandy aquifer is of generally acceptable quality, with the possible exception of iron content, which tends to be high. At Seymour Johnson Air Force Base, excessive iron levels have forced the closing of three wells. The iron problem is most likely related to the mineralogy of the water bearing unit.

SURFACE WATER QUALITY

All surface drainage from Seymour Johnson AFB eventually flows into the Neuse River. The surface runoff may either enter the river directly, or flow to the river via an open drainage channel on the southern side of the base or Stoney Creek on the northern perimeter of the base. The Neuse River and Stoney Creek are designated as "Classification C" waters by the State of North Carolina (Williams, 1982).

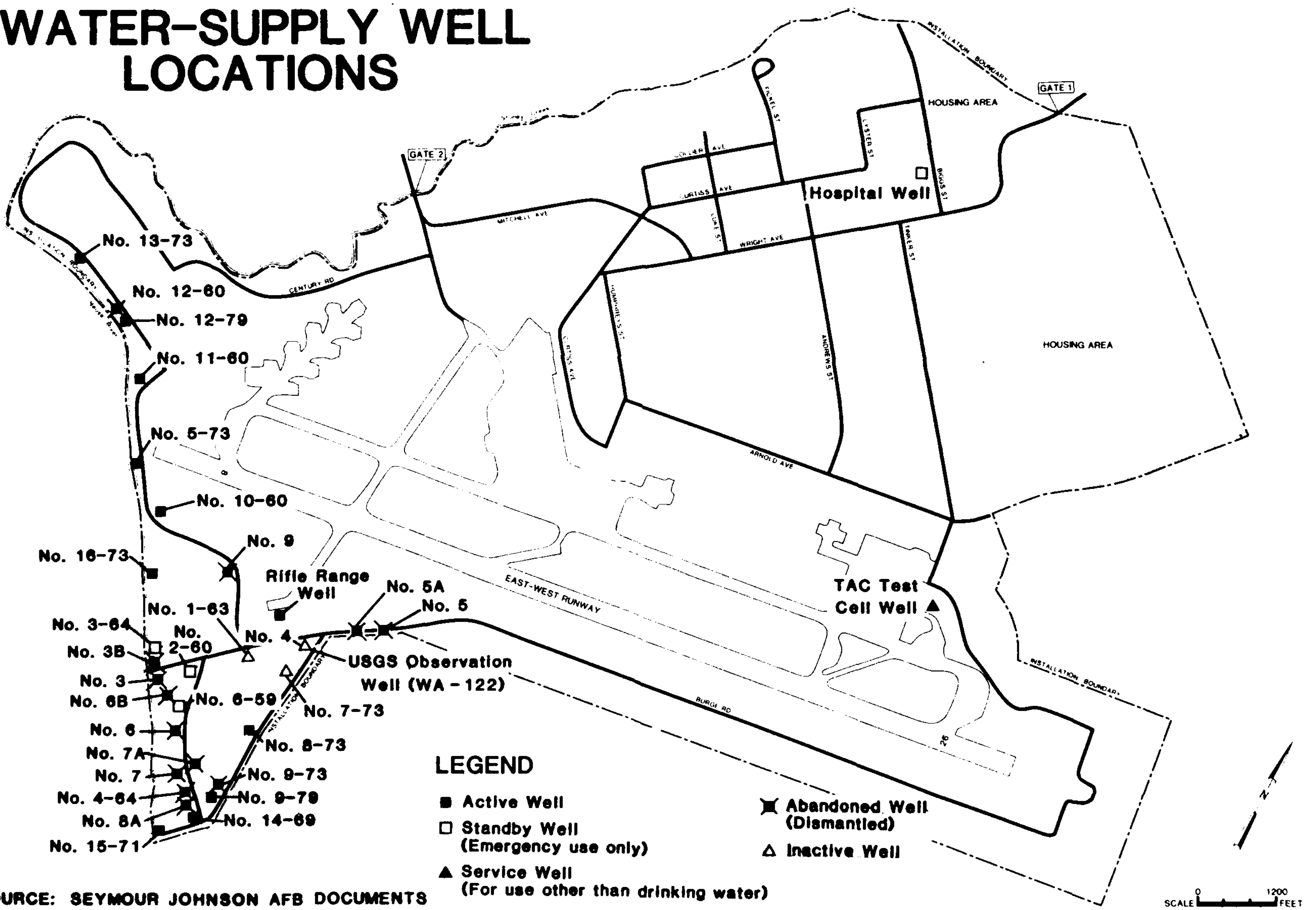
Relative Rates of Ground-Water Movement



SOURCE: HEATH (1980)

SEYMOUR JOHNSON AFB

WATER-SUPPLY WELL LOCATIONS



LEGEND

- ■ Active Well
- □ Standby Well (Emergency use only)
- ▲ Service Well (For use other than drinking water)
- Abandoned Well (Dismantled)
- △ Inactive Well

SOURCE: SEYMOUR JOHNSON AFB DOCUMENTS

TABLE 3.4
WELL DATA FOR SEYMOUR JOHNSON AIR FORCE BASE, WAYNE COUNTY

Base Well No.	USGS No.	Driller	Date Drilled	Total depth (ft)	Cased to (ft)	Screened intervals (ft)	Elevations of land surface (MSL)	Static water level below land surface (MSL)	Pump setting (ft)	Pump capacity (gal/min)
4-64	Wa-122	Sydnor Hydrodynamics	1960	195	47	47-52;59-64;175-195	61	25	96	190
5-73	Wa-123	Sydnor Hydrodynamics	5/73	114	48	48-68;74-84	50	16.3	92	170
6-59		Heater Well Company	7/59	108	--	46-50;60-64;73-85	--	32 90-98	75	250
7-73	Wa-124	Sydnor Hydrodynamics	4/73	122	122	62-92	64	3	107	60
8-73	Wa-125	Sydnor Hydrodynamics	4/73	124	58	58-78;84-94	62	6	102	195
9-73	Wa-126	Sydnor Hydrodynamics	1973	115	48	48-58;62-72;75-85	63	12.9	42	190
10-60	Wa-127	Sydnor Hydrodynamics	12/59	140	110	110-140	54	25	--	200
11-60	Wa-128	Sydnor Hydrodynamics	1959	140	70	70-100	61	23.3	--	160
12-60			11/59	158	--	102.05-107.5; 117.5-127.5; 72.5-82.5;92.5-97.5	74.5	24.67	--	200
13-73	Wa-129	Sydnor Hydrodynamics	1973	120	70	70-90	62	19.5	115	145
14-69	Wa-130	Carolina Well & Pump	11/69	186	48	48-63;73-93; 177.5-182.5	61	18.7	92	155
15-71	Wa-133	Sydnor Hydrodynamics	11/71	112	45	45-55;65-75	55	10.8	102	180
16-73	Wa-132	Sydnor Hydrodynamics	5/73	118	56	56-67;72-88	51	12.7	102	130
1-63	Wa-133	------	5/73*	157	--	75-95;152-157	61	25	70	250(88)
2-60	Wa-134	Carolina Well & Pump	8/67*	113	79	79-113	61	26.3	80	240 (unknown)
3-64	Wa-135	------	6/64	134.5	--	58-73;85-90 123-128	50	19.5	50	300
TAC Test Cell Well Building 2800		Sydnor Hydrodynamics	9/71	190	178	99-99;104-109; 114-119;148-153; 158-163;168-173	--	7.67	105	50
Hospital Well		No data on file.			Well is utilized for emergency service only.					
Rifle Range Well		No data on file.			Well is used for local service only.					

* Date of reconstruction ( ) Capacity after reconstruction

Source: Installation Documents and Robison and Mann (1977)

Classification C waters are suitable for fish and wildlife support and for secondary recreation. The Neuse River, Stoney Creek and the surface drainage ditch south of the runway have been monitored routinely by the base Bioenvironmental Engineering Services (Figure 3.13). A summary of the data collected from the most recent sampling (April, 1982) is presented in Appendix C. An evaluation of these data reveals a small increase in the oil and grease concentration in the Neuse River within the reach of the base boundaries. The increase may be attributed to runoff from the ditch on the southside of the runway where oil and grease has been detected as well as the discharge from the City of Goldsboro wastewater treatment plant which occurs within this section of the river. COD and TDS concentrations in the Neuse River also rise slightly within the reach of the base boundaries; these values may also be attributable to similar sources.

BIOTIC ENVIRONMENT

There are approximately 395 acres of forest land on Seymour Johnson AFB. None of the wooded areas on the base are under a forest management plan. The trees are basically of the pine and oak variety. The base has no unique natural areas. There are no known threatened or endangered plant species on base. The only endangered animal species which may potentially inhabit the base is the Red-Cockaded Woodpecker; however, none have been sighted at the base (Seymour Johnson AFB, Tab A-1 Narrative).

SUMMARY OF ENVIRONMENTAL SETTING

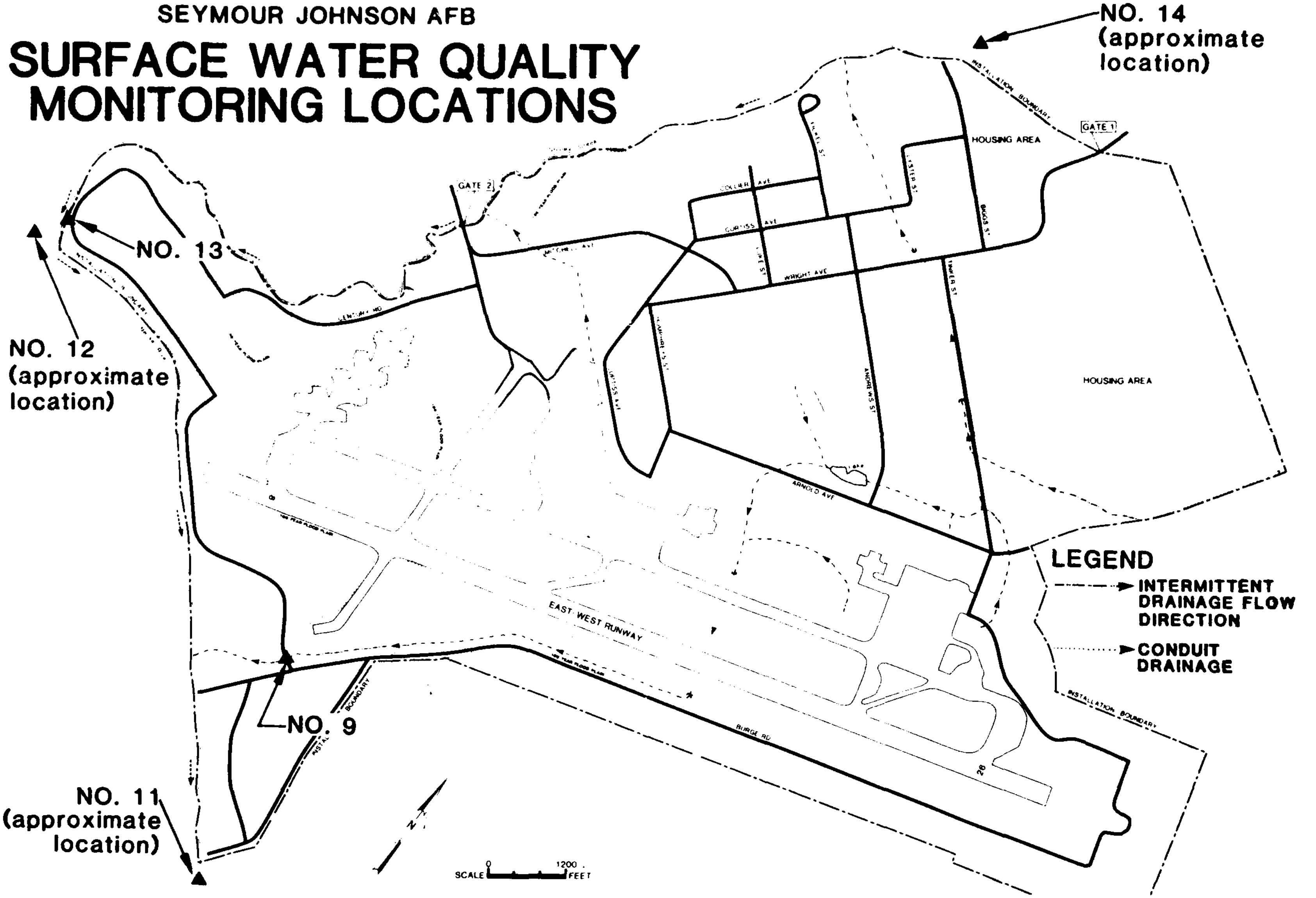
The environmental setting data reviewed for this study indicate the following key items are important when evaluating past hazardous material handling and disposal practices at Seymour Johnson AFB.

- Surficial and alluvial unconsolidated deposits form the upper twenty feet of the surface at the installation. These deposits are typically sandy and permeable.
- The northern and western portions of the base adjacent to the Neuse River, Stoney Creek and the major drainage ditch are subject to flooding during 100-year storm events.

FIGURE 3.13

SEYMOUR JOHNSON AFB

SURFACE WATER QUALITY MONITORING LOCATIONS



NOTE: Station 12 located at Neuse Rd. and Arrington Rd. bridge.
Station 14 located at Stoney Creek and Elm St. bridge.

SOURCE: SEYMOUR JOHNSON AFB INSTALLATION DOCUMENTS

- Surface soils of the Goldsboro area inclusive of Seymour Johnson AFB are thought to form an undefined shallow aquifer. Base study data indicates that ground water is generally present at shallow depths (six feet or less) in the upper aquifer.
- The principal area hydrogeologic units, the Black Creek and Tuscaloosa (Cape Fear) Formations, comprise the regional "Lower Sandy Aquifer" and are present at shallow depth (twenty feet). The units forming this aquifer contain interbedded clays which may temporarily separate water-bearing layers over short lateral distances, but do not isolate discrete units from each other.
- The lower sandy aquifer probably receives recharge from the overlying upper sandy aquifer. The actual degree of interconnection between local aquifers and surface waters is unknown. Ground-water flow directions have not been defined.
- Seymour Johnson AFB obtains 70 percent of its potable water from a well system, located primarily along the Neuse River. All wells are screened into the lower sandy aquifer. The remaining water is obtained from the City of Goldsboro which withdraws water from the Neuse River.
- The mean annual precipitation rate is 50.4 inches. The net annual precipitation is 8.6 inches.
- No wetlands are present on the base.
- No threatened or endangered species have been observed on the base property.

From these major points, it may be seen that the potential pathways for the migration of contamination caused by past waste disposal practices exists. If a contaminated leachate is generated and mobilized at a disposal site, it may reach the upper sandy aquifer and subsequently move to the lower aquifer or surface water.

CHAPTER 4

FINDINGS

CHAPTER 4

FINDINGS

To assess hazardous waste management at Seymour Johnson Air Force Base, past activities of waste generation and disposal methods were reviewed. This chapter summarizes the hazardous waste generated by activity, describes waste disposal methods, identifies the disposal sites located on the base, and evaluates the potential for contaminant migration.

PAST SHOP AND BASE ACTIVITY REVIEW

To identify past base activities that resulted in generation and disposal of hazardous waste, a review was conducted of current and past waste generation and disposal methods. This review consisted of interviews with base employees, a search of files and records, and site inspections.

The source of most hazardous wastes on Seymour Johnson AFB can be associated with any of the following activities:

- o Industrial shops
- o Fire protection training
- o Pesticide utilization
- o Fuels management

The following discussion addresses only those wastes generated on base which are either hazardous or potentially hazardous. In this discussion a hazardous waste is defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). A potentially hazardous waste is one which is suspected of being hazardous although insufficient data are available to fully characterize the waste material.

Industrial Operations (Shops)

Major mission support activities were conducted at Seymour Johnson AFB by various groups and squadrons through industrial shops. These shops maintained, fabricated and repaired components and parts of aircraft and ground equipment. A list of past and present industrial shops was obtained from the Bioenvironmental Engineering Services (BES) files. Information contained in the files indicated those shops which handled and/or generated hazardous waste. A summary review of the shop files is shown in Appendix D, Master List of Industrial Shops.

For those shops that handled hazardous materials or generated hazardous waste, key personnel within the base maintenance support functions were interviewed. A timeline of disposal methods was established for major wastes generated. The information from interviews with base personnel and base records is summarized in Table 4.1. This table presents a list of building locations as well as the waste material names, waste quantities, and disposal method timeline. Many of the disposal methods are based on speculative information derived from personnel currently at the base. Confirmation of some of the past disposal methods at the flightline was difficult because of the typically short tenures of many of the past military shop personnel assigned to Seymour Johnson AFB. The waste quantities shown in Table 4.1 are based on verbal estimates given by shop personnel at the time of the interviews. A list of shops that have generated insignificant quantities or no hazardous waste is presented in Table 4.2.

Little information concerning past waste practices was not available during the records search for the period 1941 through 1946. Some maintenance activities likely occurred in support of the pilot training mission at Seymour Johnson AFB during this period. These activities typically generate waste fuels and oil. The waste fuels and oils disposal practices for this period were determined and are described later in this section. Other waste generation is believed to have been small. During the period 1946 through 1956 when the installation was deactivated, negligible wastes were believed to have been generated.

A portion of the waste fuels and oils generated on the base during the initial activation period, 1941 through 1946, and between 1956 until the mid 1970's were burned during routine fire protection training exercises. The Defense Property Disposal Office (DPDO, referred to as Salvage during this period) accepted some of these combustible materials during the mid 1960's through 1975. These wastes were either donated to

TABLE 4.1

INDUSTRIAL OPERATIONS (Shops)

WASTE MANAGENENT SUMMARY

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY (1)	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 1960 1970 1980)
4 TRANSPORTATION SQUADRON				
COMPOSITE ALL SHOPS	3100	WASTE OILS	100 GALS./MO.	1956 FIRE PROTECTION TRAINING, HEAT PLANT
		WASTE LUBE FLUIDS	30 GALS./MO.	FIRE PROTECTION TRAINING, HEAT PLANT
		PD-680	25 GALS./1 to 2 MOS.	FIRE PROTECTION TRAINING, HEAT PLANT
		BATTERY ACID	20 to 40 GALS./1 to 2 MOS.	NEUTRALIZED TO SANITARY SEWER
		FLOOR WASHDOWN	50 to 100 GALS./2 WKS.	O/W SEPARATOR TO SANITARY SEWER
		WASTE PAINTS, THINNERS	55 GALS./1 to 2 MOS.	(2), DPDO, OFF-BASE CONTRACTOR
4 CIVIL ENGINEERING SQUADRON (CES)				
ENTOMOLOGY SHOP	3300	EMPTY CONTAINERS	20 to 25 EA./MO.	ON-BASE LANDFILL, RINSED TO COUNTY LANDFILL
		RINSE SOLUTIONS	30 to 40 GALS./WK.	SANITARY SEWER, TOTALLY RECYCLED
		BANNED PESTICIDES	1,000 LBS. (DDT) 110 GALS. (2,4,5-T)	DPDO CONTRACTOR ▲ DPDO CONTRACTOR ▲
POWER PRODUCTION	3300	BATTERY ACID	10 to 20 GALS./MO.	NEUTRALIZED TO STORM DRAIN
HEAT PLANT	2700	WASTE FUELS, OILS, SOLVENTS	500 GALS./MO.	1972 WASTE FUEL BOILER
PAINT SHOP	3300	WASTE PAINTS, THINNERS	55 GALS./2 MOS.	(2), DPDO, OFF-BASE CONTRACTOR
4 COMBAT SUPPORT GROUP				
BOMB RANGE VEHICLE MAINTENANCE	DARE COUNTY	WASTE OILS, FUELS, FLUIDS	110 to 165 GALS./YR.	FIRE PROTECTION TRAINING, HEAT PLANT
		WASTE PAINTS, THINNER	2 to 5 GALS./MO.	COUNTY LANDFILL

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

▲ ONE TIME ACTIVITY

(1) BASED ON CURRENT RATES AND BEST ESTIMATES OF PAST RATES

(2) DURING THIS PERIOD, THESE WASTES MAY HAVE BEEN TEMPORARILY STORED IN A DRUM STORAGE AREA AND LATER DISPOSED OF OFF-BASE BY CONTRACTORS OR DIRECTLY DISPOSED OF IN THE STORM DRAINAGE SYSTEM OR AT THE FIRE PROTECTION TRAINING AREA.

TABLE 4.1 (Cont'd.)

INDUSTRIAL OPERATIONS (Shops)

WASTE MANAGEMENT SUMMARY

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 / 1960 / 1970 / 1980)
4 COMPONENT REPAIR SQUADRON (CRS)				
ELECTRIC SHOP	4534	WASTE BATTERY ACID	15 GALS./MO.	1956 NEUTRALIZED TO SANITARY SEWER
NON DESTRUCTIVE INSPECTION SHOP (NDI)	2151	DEVELOPER	55 GALS./YR.	SANITARY SEWER; SILVER RECOVERY, SANITARY SEWER
		FIXER	55 GALS./YR.	SANITARY SEWER; SILVER RECOVERY, SANITARY SEWER
		PENETRANT	55 GALS./YR.	SANITARY SEWER
		PD-680	55 GALS./YR.	FIRE PROTECTION TRAINING; HEAT PLANT
		SYNTHETIC OIL	40 GALS./YR.	FIRE PROTECTION TRAINING; HEAT PLANT
PNEUDRAULICS SHOP	4534	PD-680	40 GALS./MO.	FIRE PROTECTION TRAINING; HEAT PLANT
		ENGINE OIL	15 GALS./MO.	FIRE PROTECTION TRAINING; HEAT PLANT
PROPULSION SHOP	4908	PD-680	300 GALS./MO.	FIRE PROTECTION TRAINING; HEAT PLANT
		TRICHLOROETHYLENE	8 GALS./MO.	FIRE PROTECTION TRAINING; HEAT PLANT
		CARBON REMOVER	220 GALS./YR.	(UNKNOWN); HEAT PLANT
		SYNTHETIC OIL	110 GALS./MO.	FIRE PROTECTION TRAINING; HEAT PLANT
	10328 (TEST CELL)	WASTE OILS	55 GALS./YR.	FIRE PROTECTION TRAINING; HEAT PLANT
		WASTE FUELS	30 to 40 GALS./MO.	FIRE PROTECTION TRAINING; HEAT PLANT

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

TABLE 4.1 (Cont'd.)

INDUSTRIAL OPERATIONS (Shops)

WASTE MANAGEMENT SUMMARY

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1950 1960 1970 1980
4 EQUIPMENT MAINTENANCE SQUADRON (EMS)				
AEROSPACE GROUND EQUIPMENT BRANCH (AGE)	4720, 4533	PD-680	55 GALS./MO.	1956 FIRE PROTECTION TRAINING → HEAT PLANT
		HYDRAULIC FLUID	220 GALS./MO.	FIRE PROTECTION TRAINING → HEAT PLANT
		MOTOR OIL	200 GALS./MO.	FIRE PROTECTION TRAINING → HEAT PLANT
ARMAMENT/MUNITIONS SHOP	2150	PD-680	55 GALS./4 MOS.	FIRE PROTECTION TRAINING → HEAT PLANT
CORROSION CONTROL	4500, 4530	METAL CLEANER SOLUTIONS	5 GALS./MO.	SANITARY SEWER (3)
		PD-680	60 GALS./MO.	SANITARY SEWER (3)
		PAINT STRIPPERS (BIODEGRADABLE)	10 GALS./WK.	1970 SANITARY SEWER (3)
		WASTE THINNERS, SOLVENTS	55 GALS./2 MOS.	(2) → DPDO → OFF-BASE CONTRACTOR
		PAINT STRIPPER (PHENOLIC)	55 GALS./2 to 6 MOS.	(2) → DPDO → OFF-BASE CONTRACTOR
EQUIPMENT MAINTENANCE	2125	PD-680	10 GALS./MO.	FIRE PROTECTION TRAINING → HEAT PLANT
		WASTE PAINT & THINNERS	2 GALS./MO.	STORM DRAIN
WHEEL & TIRE SHOP	4512	PD-680	165 GALS./6 MOS.	FIRE PROTECTION TRAINING → HEAT PLANT
		PAINT STRIPPER (PHENOLIC)	55 GALS./6 MOS.	(2) → DPDO → OFF-BASE CONTRACTOR

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

(3) AN OIL/WATER SEPARATOR IS UTILIZED FOR THESE WASTES PRIOR TO DISCHARGE TO SANITARY SEWER.

TABLE 4.1 (Cont'd.)

INDUSTRIAL OPERATIONS (Shops)

WASTE MANAGEMENT SUMMARY

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 1960 1970 1980)
68 AVIONICS MAINTENANCE SQUADRON (AMS)				
FIRE CONTROL SHOP	4900	TRICHLOROETHYLENE SLUDGE	100 to 180 GALS./YR.	1956 FIRE PROTECTION TRAINING - - → DPDO →
		PD-680	50 to 60 GALS./6 MOS.	FIRE PROTECTION TRAINING - - → HEAT PLANT →
		LUBE OIL	40 GALS./18 MOS.	FIRE PROTECTION TRAINING - - → HEAT PLANT →
68 FIELD MAINTENANCE SQUADRON (FMS)				
CORROSION CONTROL	4820	WASTE PAINTS, THINNERS	50 GALS./MO.	(2) - - → DPDO → OFF-BASE CONTRACTOR →
		PAINT STRIPPER (PHENOLIC)	5 GALS./MO.	(2) - - → DPDO → OFF-BASE CONTRACTOR →
PNEUDRAULICS SHOP	4909	PD-680	70 GALS./MO.	FIRE PROTECTION TRAINING - - → HEAT PLANT →
PROPULSION SHOP	4810	PD-680	200 GALS./YR.	FIRE PROTECTION TRAINING - - → HEAT PLANT →
		CALIBRATION FLUID	50 to 100 GALS./YR.	FIRE PROTECTION TRAINING - - → HEAT PLANT →
		CARBON REMOVER [3]	110 GALS./YR.	(UNKNOWN) - - → HEAT PLANT →
		SYNTHETIC OIL	200 GALS./YR.	FIRE PROTECTION TRAINING - - → HEAT PLANT →
WHEEL & TIRE SHOP	4906	PD-680	110 GALS./MO.	FIRE PROTECTION TRAINING - - → HEAT PLANT →
		PAINT STRIPPER (PHENOLIC)	50 GALS./MO.	(2) - - → DPDO → OFF-BASE CONTRACTOR →
AEROSPACE GROUND EQUIPMENT SHOP (AGE)	4534	WASTE OILS	75 to 100 GALS./MO.	FIRE PROTECTION TRAINING - - → HEAT PLANT →
		HYDRAULIC FLUID	5 GALS./MO.	FIRE PROTECTION TRAINING - - → HEAT PLANT →
		PD-680	50 GALS./6 to 12 MOS.	FIRE PROTECTION TRAINING - - → HEAT PLANT →

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

TABLE 4.1 (Cont'd.)

INDUSTRIAL OPERATIONS (Shops)

WASTE MANAGEMENT SUMMARY

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 1960 1970 1980)
68 MUNITIONS MAINTENANCE SQUADRON (MMS)				
EQUIPMENT MAINTENANCE SHOP	2121	PD-680	50 GALS./3 MOS.	1956 FIRE PROTECTION TRAINING, HEAT PLANT
		WASTE OILS	15 GALS./3 MOS.	FIRE PROTECTION TRAINING, HEAT PLANT
68 ORGANIZATIONAL MAINTENANCE SQUADRON (OMS)				
ALL SHOPS (Combined Total)	4909, 4821 4540, 4740	WASTE FUELS	2,700 GALS./MO.	FIRE PROTECTION TRAINING, HEAT PLANT
		PD-680, SOAP AND WATER	500 GALS./MO.	O/W SEPARATOR TO SANITARY SEWER
		WASTE OILS	125 GALS./MO.	FIRE PROTECTION TRAINING, HEAT PLANT

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

TABLE 4.2
INDUSTRIAL SHOPS WITH INSIGNIFICANT
HAZARDOUS WASTE QUANTITIES

Name	Location (Bldg. No)
USAF HOSPITAL	
Medical Maintenance	2800
Medical Lab	2800
Medical X-ray	2800
Dental X-ray	2805
Dental Lab	2805
Central Supply	2800
Surgery	2800
4 SUPPLY SQUADRON	
Fuels Lab	3204
4 CIVIL ENGINEERING SQUADRON (CES)	
Carpentry Shop	3300
Electric Shop	3300
Golf Course Maintenance	4040
Housing Maintenance	4050
Liquid Fuels Maintenance	3400
Plumbing Shop	3300
Refrigeration Shop	3300
Roads and Grounds	3300
Sheetmetal Shop	3300
Water Plant	3003
4 COMBAT SUPPORT GROUP	
Small Arms Train. Unit	2304/2330
Auto Hobby Shop	2500
Arts & Crafts	4215

TABLE 4.2
INDUSTRIAL SHOPS WITH INSIGNIFICANT
HAZARDOUS WASTE QUANTITIES
(Continued)

Name	Location (Bldg. No)
4 CSG (Continued)	
Photo Shop	2501
4 COMPONENT REPAIR SQUADRON (CRS)	
Auto Pilot Shop	4312
Avionics AGE[1]	4312
Communications/Nav. Shop	4312
Elect. Countermeasures	4404
Inertial Navig. Shop	4312
Photo and Sensor Shop	4312
Precision Measurement Equipment Lab (PMEL)	4312
Radar Calibration	4513
Structural Repair	4514
Weapons Controls System	4513
Machine/Metal Process	4534
Parachute Shop	4408
4 EQUIPMENT MAINTENANCE SQUADRON (EMS)	
Bomb Lift Veh. Shop	4533
Egress Shop	4534
Fuel Systems Repair	4735
Missile Maintenance	2201
Non-Powered AGE	4514/4533
Repair & Reclamation	4511
2012 COMMUNICATIONS SQUADRON	
Closed Circuit TV Shop	2904
Computer Maintenance	3500
Crypto Maintenance	2904

(1) Aerospace Ground Equipment

TABLE 4.2
INDUSTRIAL SHOPS WITH INSIGNIFICANT
HAZARDOUS WASTE QUANTITIES
(Continued)

Name	Location (Bldg. No)
2012 COMMUNICATIONS SQUADRON (Continued)	
Navig. Aids	4745
Radar Maintenance	4760/4560
Radio Maintenance	4709
RAPCOM	4750
Communications Maintenance (SAC)	4901
Teletype Maintenance	2904
68 AVIONICS MAINTENANCE SQUADRON (AMS)	
Auto Pilot Shop	4900
Bomb Navig. Shop	4900
Communications Shop	4900
Doppler Maintenance	4900
Elect. Countermeasures	4900
Instrument Shop	4900
Radar Navig. Shop	4900
68 FIELD MAINTENANCE SQUADRON (FMS)	
Egress Shop	4909
Electric Shop	4909
Environmental Systems	4909
Fuel Systems Shop	4828
Structural Repair	4534
Parachute Shop	4810
Metal Processing Shop	4810
Welding Shop	4810

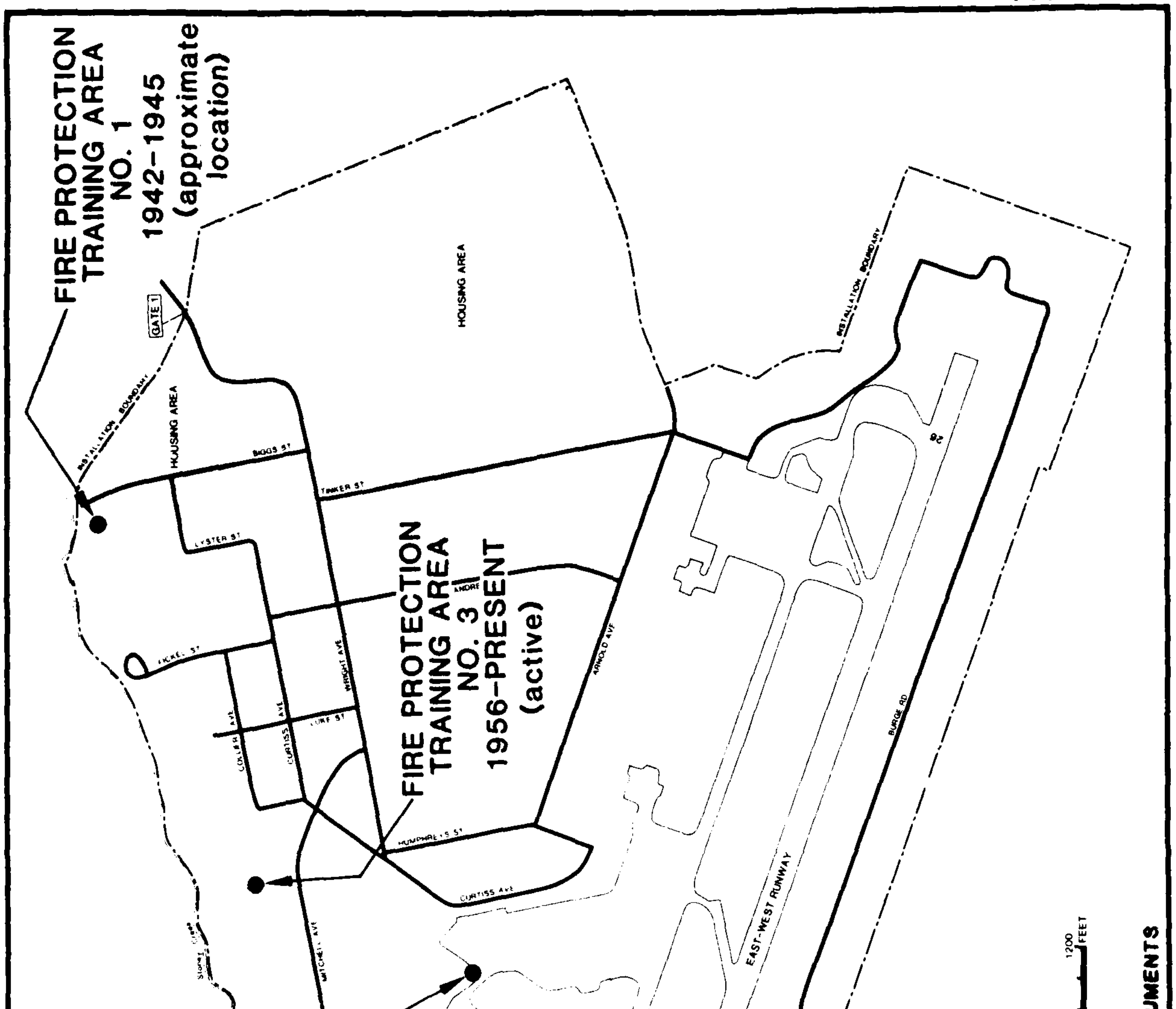
a local vocational school for fire training exercises, or sold to contractors for recycling and off-base disposal. Since 1976, waste fuels and oils have been burned as supplemental fuel in the steam plant (Building 2700).

Waste chemicals generated on the base have been handled in several manners throughout active periods of operation. During the initial periods of the base operation up to the early 1970's many of the combustible waste chemicals (i.e., waste solvents) were burned during fire training exercises. Those chemicals which were not burned were discharged into the sanitary sewer or storm drainage systems or stored in a drummed waste storage area in the vicinity of the existing liquid oxygen (LOX) storage facility (south of Bldg 4709). The use of the drummed waste storage area was discontinued in approximately 1963 and all waste materials at the site were disposed off-base in 1966 (DPDO contractor). Some small quantities of waste chemicals may have been disposed of in on-base landfills. Between the mid 1960's through 1973, DPDO received custody of many of the waste chemicals (i.e., carbon remover, paint stripper, spent solvents). These chemicals were sold to contractors for recycling or off-base disposal. From 1973 until just recently, trichloroethylene sludge has been the only waste chemical routinely contracted for disposal by DPDO. All of the other chemicals were contracted for disposal through the Civil Engineering Squadron. In 1981, the responsibility for contract disposal of waste chemicals reverted back to DPDO (now designated as Off-Site Branch, Seymour Johnson AFB).

Fire Protection Training

The Fire Department has operated three fire protection training areas at which fires were ignited and then extinguished. The following list gives specific designation for these areas and their approximate period of use. Figure 4.1 depicts their location.

Fire Protection Training Area	Period of Operation
No. 1	1942 - 1945
No. 2	1956 (several months)
No. 3	1956 to present


SEYMOUR JOHNSON AFB
FIRE PROTECTION TRAINING AREAS
FIRE PROTECTION TRAINING AREA NO. 1 1942-1945 (approximate location)
FIRE PROTECTION TRAINING AREA NO. 3 1956-PRESENT (active)
FIRE PROTECTION TRAINING AREA NO. 2 1956 (approximate location)
HOUSING AREA
HOUSING AREA
GATE 1
GATE 2
INSTALLATION BOUNDARY
BIGGS ST
TINKER ST
LYSTER ST
ANDRE
WRIGHT AVE
ARNOLD AVE
CURTISS AVE
HUMPHREYS ST
MITCHELL AVE
CENTURY RD
EAST-WEST RUNWAY
BURGE RD
Stoney Creek
Neuse River
26
N
SCALE
0
1200
FEET
SOURCE: SEYMOUR JOHNSON AFB INSTALLATION DOCUMENTS

Fire Protection Training Area No. 1

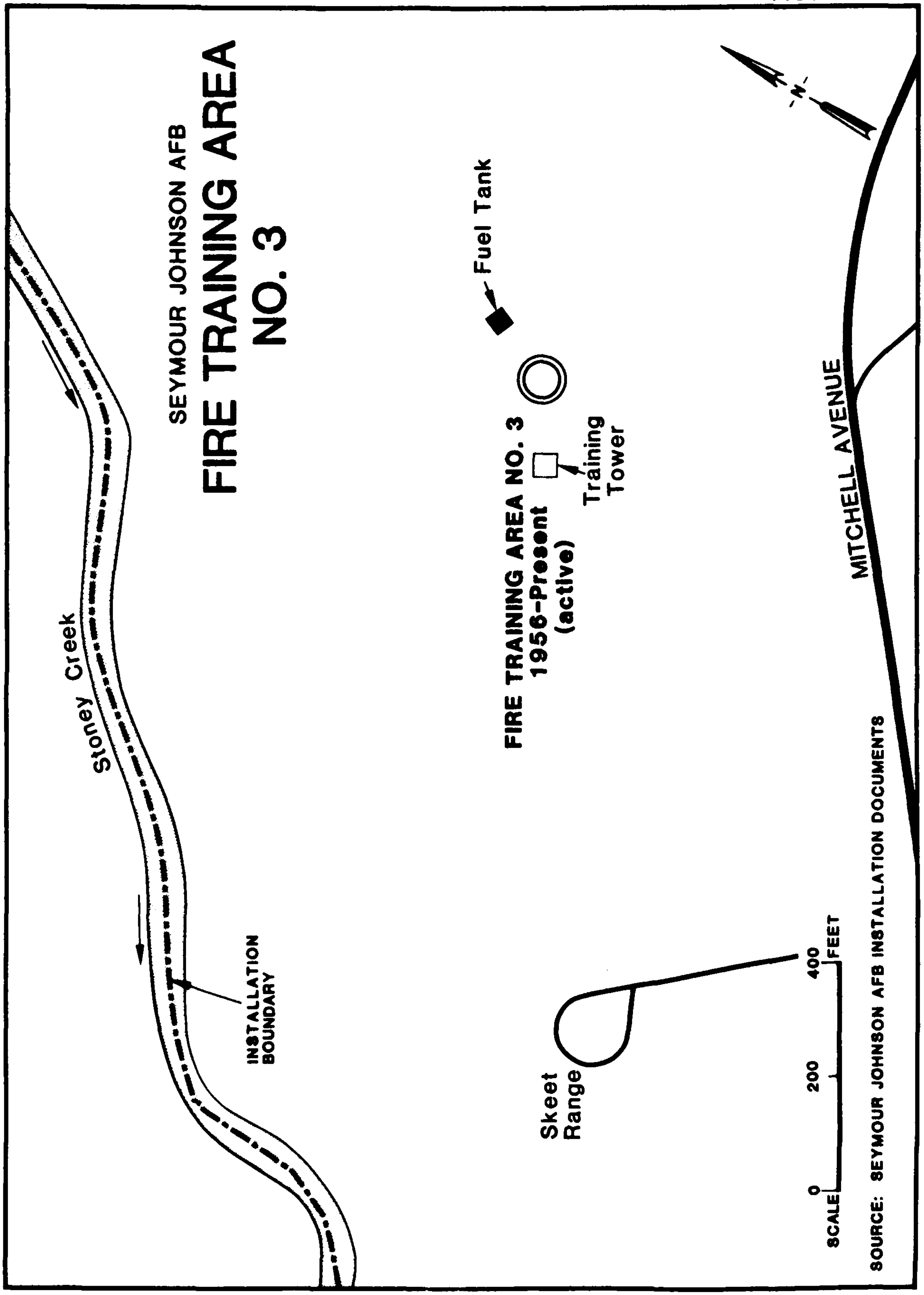
Fire Protection Training Area No. 1 was utilized during the early period of base operation, 1942-1945 and was reportedly a pit located on the northeast corner of the base (Figure 4.1). The area was utilized one to two times per month and the principal fuels burned were aviation gas and waste oil. High pressure water was used to extinguish the fires during these early training exercises. Visual examination of the area revealed subsequent construction and no evidence of the training area.

Fire Protection Training Area No. 2

Fire Protection Training Area No. 2 was utilized as a temporary training area at the time the base was reactivated in 1956. The training area was operated for a period of several months with training exercises occurring on a weekly basis. Fire Training Area No. 2 was located approximately 300 feet southwest of Hanger 4511 (Figure 4.1). The area was reported to have been a diked area with automobile bodies laid out to simulate an aircraft. Typical training exercises used 300-500 gallons of contaminated fuels, waste oils and solvents. The area was saturated with water prior to the application of fuel. The extinguishing agents were reported to have been protein foams. Visual examination of the area revealed a concrete aircraft apron and a graded grassy field. No evidence of the training area was apparent.

Fire Protection Training Area No. 3

Fire Protection Training Area No. 3 is the major permanent fire training area at Seymour Johnson AFB. The facility is located on the northwest side of the base between Mitchell Avenue and Stoney Creek (Figure 4.2). The fire training area is comprised of a diked pit formed on a compacted base. An underdrain system was installed (date undetermined) to drain the pit via an underground oil/water separator prior to discharging the water into the storm drainage system. A fuel system was later installed to evenly distribute the fuel within the pit from an adjacent fuel storage tank. Fire Protection Training Area No. 3 was established during the later half of 1956. Until 1974, the area was used on a monthly basis; when at that time, the frequency of training was reduced to quarterly exercises. Between 1956 and the mid 1970's contaminated fuels and some combustible waste chemicals were burned in the pit. Beginning 1976, fire training exercises were conducted using


SEYMOUR JOHNSON AFB
FIRE TRAINING AREA
NO. 3
Fuel Tank
FIRE TRAINING AREA NO. 3
1956-Present
(active)
Training
Tower
MITCHELL AVENUE
N
Stoney Creek
INSTALLATION
BOUNDARY
Skeet
Range
SCALE
0
200
400
FEET
SOURCE: SEYMOUR JOHNSON AFB INSTALLATION DOCUMENTS

only uncontaminated JP-4. Approximately 500 gallons of fuel were used during a typical training exercise. The area was saturated with water prior to the application of fuel. Protein foams, AFFF, Halon 1211 and dry chemicals were utilized as extinguishing agents from 1956 to the present. Residual fuels were burned prior to draining the pit.

Pesticide Utilization

Seymour Johnson AFB has conducted a pest control program since 1959. Initially, the program was implemented by the Pavements and Grounds shop; however, in 1960 the responsibilities were transferred to the Entomology shop. The Pavement and Grounds shop and the Entomology shop are located in the Civil Engineering (CE) compound (Bldg. 3300). The program entails routine and specific job order chemical application and spraying. Pesticides are stored in a locked building within a fenced complex. A variety of pest control chemicals on-hand or used during the year are listed in Appendix C.

Between 1959 and 1972, empty pesticide containers were disposed of in the base sanitary landfills. Any rinse water generated from equipment cleaning operations or container rinsing was drained to the sanitary sewer. In 1972, new procedures were implemented for handling pesticides. All empty pesticide containers were triple-rinsed and punched with holes prior to disposal with the base general refuse. Rinse water was collected in a holding tank and reused as make-up water for diluting chemicals.

Interviews with base personnel indicated no knowledge of any pesticide spills, or the disposal of off-spec or unwanted chemicals in any of the base landfills. DDT, which had been stored on base, was recently disposed of by an off-base contractor and 2,4,5-T has recently been transferred to the DPDO yard for contractor disposal. Use of these materials was discontinued in the 1970s when they were banned by Federal regulations.

Fuels Management

The Seymour Johnson AFB Fuels Management Storage System consisted of a number of above-ground and underground storage tanks in various locations throughout the base. A summary of the major bulk fuel and bulk oil storage capacities is provided in Table 4.3. A list of these storage tanks is shown in Table C.4, Appendix C. Fuels handled on the

TABLE 4.3

SUMMARY OF MAJOR FUEL AND OIL STORAGE CAPACITIES
SEYMOUR JOHNSON AIR FORCE BASE

	No. of Above Ground Tanks	Total Above Ground Storage Volume (gals.)	No. of Under Ground Tanks	Total Under Ground Storage Volume (gals)
JP-4	6	3,361,000	24	821,900
MOGAS	2	800	12	77,675
Fuel Oil (FS-2 & FS-5)	3	285,075	16	54,825
Diesel Fuel	NA	NA	3	32,000
Contaminated Fuels	1	10,000	2	15,550
Kerosene	NA	NA	1	500

base have included JP-4, MOGAS (leaded and unleaded), AVGAS (1950s to 73) fuel oils (FS-2 and FS-5), diesel fuel, and contaminated fuels. The base has received JP-4 primarily by pipeline, although it is equipped to receive the fuel directly from rail tank cars. Other fuels arrive by tank truck. Approximately 5 to 6 million gallons of JP-4 per month are used on base. Other fuels are utilized in lesser quantities.

Most of the JP-4 is stored at the POL tank farm in five above-ground tanks (two 420,000 gal. tanks and three 840,000 gal. tanks). These tanks are inspected regularly and each tank is surrounded by clay dikes. A ten inch fuel transfer line supplies JP-4 from bulk storage to sixteen 50,000 gal. underground tanks located near the SAC and TAC aircraft parking aprons. Three pumphouses deliver fuel from these tanks to the fuel hydrant network which runs beneath the aircraft parking apron. The entire system has been in use since its construction in 1956. Sections have been repaired or replaced as required.

Fuel storage tanks have been cleaned every four years, generating approximately twenty gallons of sludge per tank. Leaded AVGAS and unleaded JP-4 sludges has been disposed by various methods in the past. These sludges have been delivered to DPDO, which consequently donated it to Wilson Tech, a local vocational school, for fire training practice, air-dried and surface disposed at the tank farm and air dried and disposed in on-base landfills. Spent fuel filters (280 each per year) have been air-dried at the Liquid Fuels Maintenance shop and disposed of in the base landfills or with general refuse.

Spills and Accidents

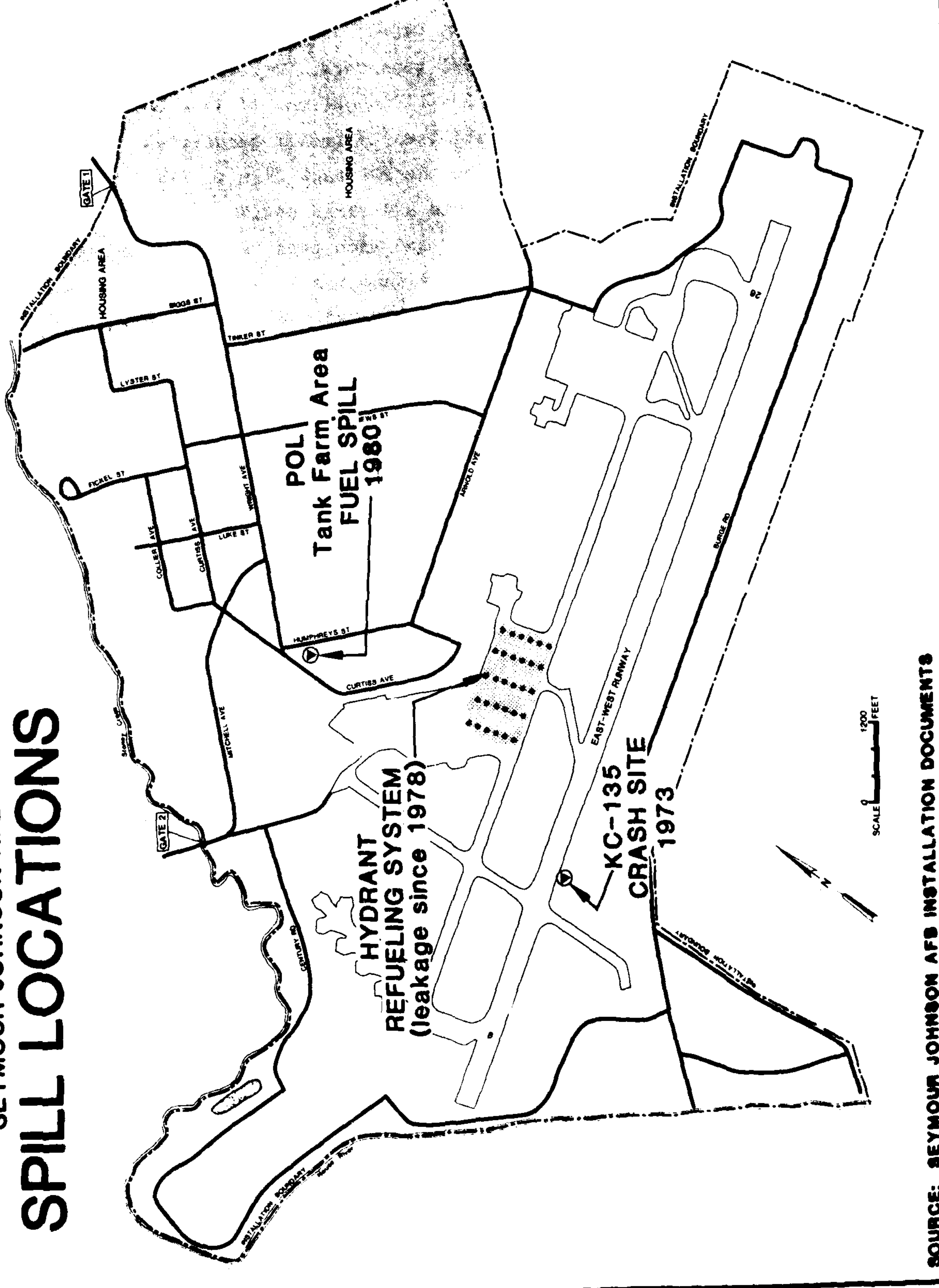
Small spills have occurred on Seymour Johnson AFB. These spills are generally cleaned up and do not cause significant environmental damage. These include small spills which have routinely occurred on the aircraft parking apron as a consequence of fuel expansion in the aircraft fuel tanks. Overflow from these fuel tanks has been collected in 55 gallons drums and reused.

Several larger fuel spills have also occurred on base, some of which may have the potential for ground-water contamination. The locations of the larger fuel spills are shown in Figure 4.3. In November 1980, a large fuel spill occurred at the POL tank farm (Figure 4.4). The spill was caused when a valve stem at the base of Tank No. 2 was

FIGURE 4.3

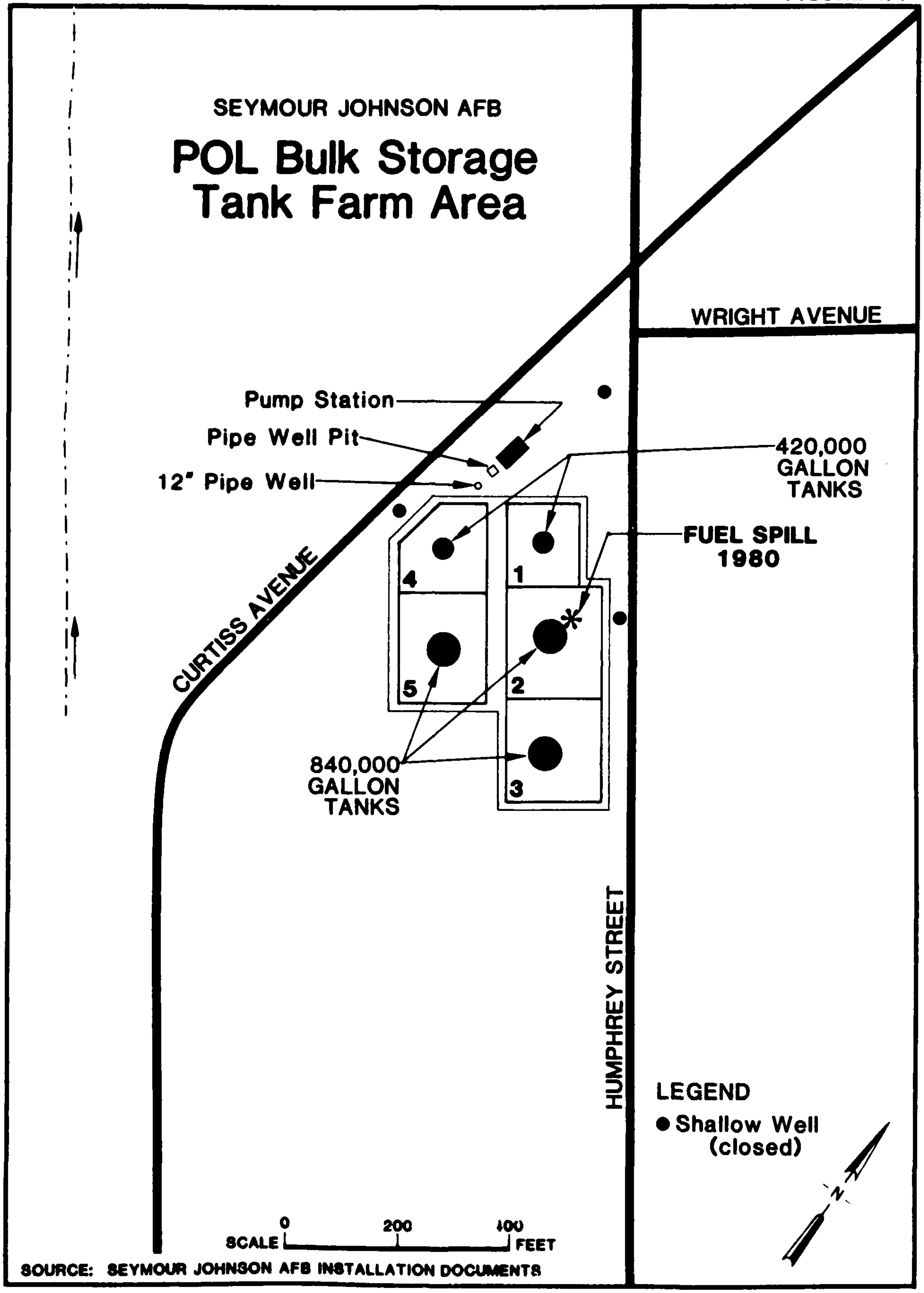
SEYMOUR JOHNSON AFB

SPILL LOCATIONS



SOURCE: SEYMOUR JOHNSON AFB INSTALLATION DOCUMENTS

FIGURE 4.4



ES ENGINEERING-SCIENCE

unbolted while an associated safety valve was still open to the tank (Figure 4.4). Approximately 400,000 gallons of JP-4 were spilled and an estimated 375,000 gallons of fuel were recovered. A reconstruction of the incident indicated that at no time did the tank dike overflow. After clean up, test pits were dug in the diked area to a depth of one foot and shallow wells (six inches diameter, three feet deep) were dug. Little or no infiltration into the soil was detected. Rainwater collected within the dike had no significant concentration of oil and grease prior to discharge. The test pits and shallow wells were covered and filled in within a few months of the spill date.

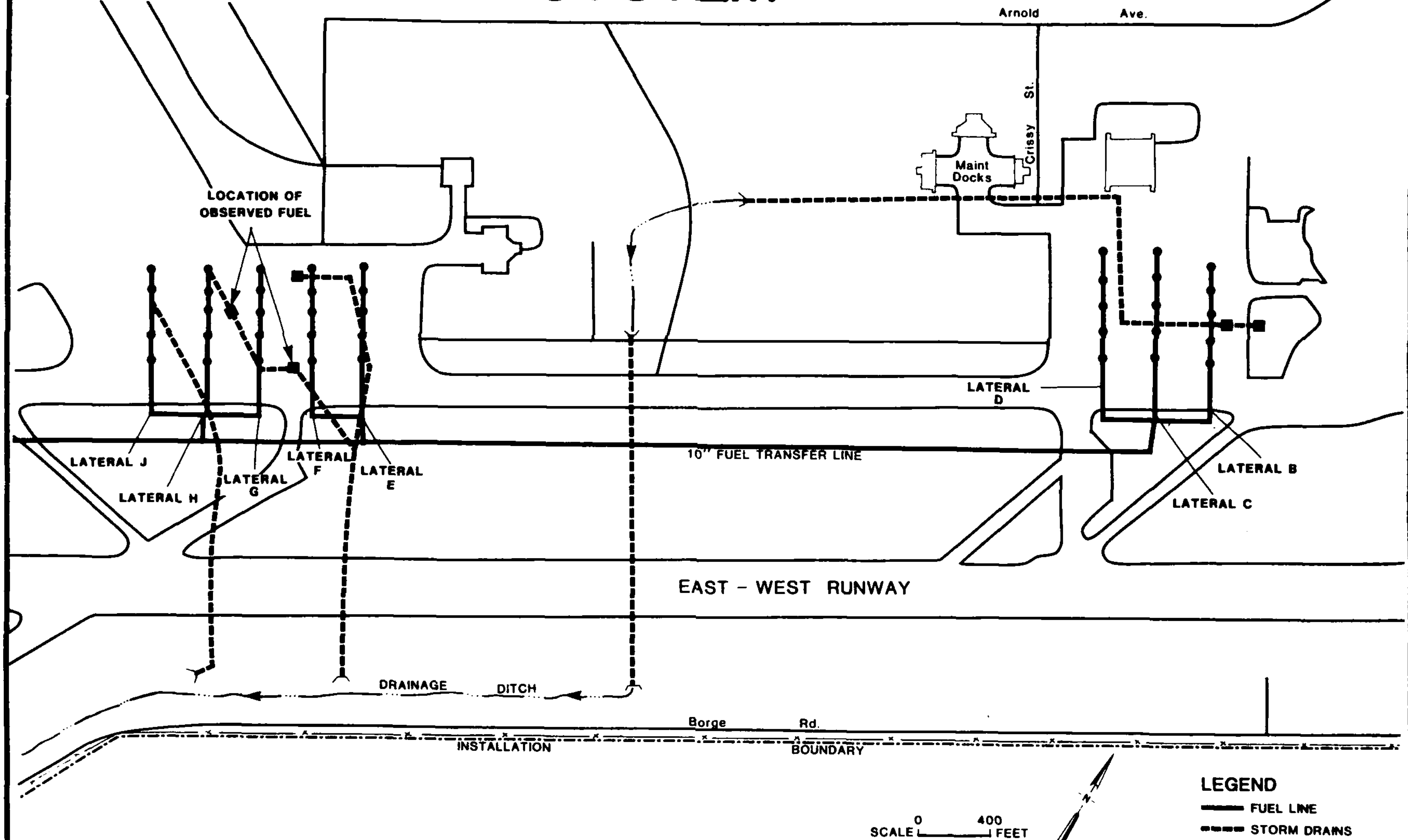
Since 1981, rainwater collected within the dike surrounding Tank No. 5 has shown abnormally high oil and grease concentrations (580 mg/l to 124,000 mg/l). There has been no history of fuel spillage within this dike. No explanation for this occurrence has been disclosed during the recent study.

In mid-1981, relatively pure JP-4 began to seep into a small, three foot deep, concrete well-pit adjacent to the tank farm pump station. Excavation of the immediate area to a four foot depth revealed no source for this fuel. Pressure testing of pump station piping indicated no leaks were occurring. During back-filling, a 12-inch diameter steel pipe was placed vertically next to the well-pit to provide a well which could be regularly pumped (Figure 4.4). JP-4 is recovered from the well on a regular basis. The fuel level varies from one to three feet below the ground surface and appears to fluctuate with rainfall.

The underground hydrant refueling system, located beneath the aircraft parking apron has developed leaks on occasion (Figure 4.5). Since 1978, leaks resulting from cathodic reaction have been detected and repaired in Laterals D, F, G and H. The Liquid Fuels Maintenance shop performs (at a minimum) annual pressure tests on the hydrant lines. No pressure loss has been recently observed; however, metal flakes and other foreign material are beginning to appear in increased amounts during vacuum defueling procedures in the fuel filters associated with the hydrant refueling system. This foreign material is considered indicative of corrosion in the system piping. JP-4 has been observed infiltrating into the storm drain at two manholes on the aircraft parking apron on rows F and G. It is uncertain whether the source of the

FIGURE 4.5

SEYMOUR JOHNSON AFB
FUEL HYDRANT SYSTEM



SOURCE: SEYMOUR JOHNSON AFB INSTALLATION DOCUMENTS

infiltrating fuel is occurring from an active leak or from a residual which may have developed during a past leak. A contract has been awarded to apply exopy coating to the inside of each line beginning in August 1982.

In December 1973, a KC-135 refueling aircraft crashed on the Seymour Johnson AFB runway (Figure 4.3). The forward fuel compartment spilled approximately 9,600 pounds of JP-4 (1,700 gal.). A four foot wide, six inch deep trench was dug down-gradient of the crash site to retain the spilled fuel. All of the residual fuel spilled was burned, which reduced the potential for long-term environmental damage.

An additional aircraft accident occurred in January 1961 in an area approximately 15 miles northeast of Seymour Johnson AFB (See Saulston Annex, Figure 2.2). The accident involved a B-52 bomber on an airborne alert mission. As a consequence of the mid-air breakup of the aircraft, two weapons separated from the aircraft. One bomb parachute deployed and the weapon received little impact damage and was completely recovered. The other bomb fell free and broke apart upon impact. No explosion occurred. An extensive five month excavation effort was made which recovered all significant parts and pieces of the weapon with the exception of one inert portion containing uranium metal. This remaining piece is not explosive. The excavation was conducted to a depth of approximately 50 feet. During the excavation activities no contamination was detected. The Air Force purchased an easement on the three acre piece of property restricting any drilling, digging, boring, excavation or other disturbances of the land below a depth of five feet.

DESCRIPTION OF PAST ON-BASE DISPOSAL METHODS

The facilities on Seymour Johnson AFB which have been used for the management and disposal of waste can be categorized as follows:

- Landfills
- Drummed Waste Storage Area
- Explosive Ordnance Disposal
- Refuse Incineration
- Sanitary Wastewater Treatment System
- Storm Drainage System

These waste management facilities are discussed individually in the following sub-sections.

Landfills

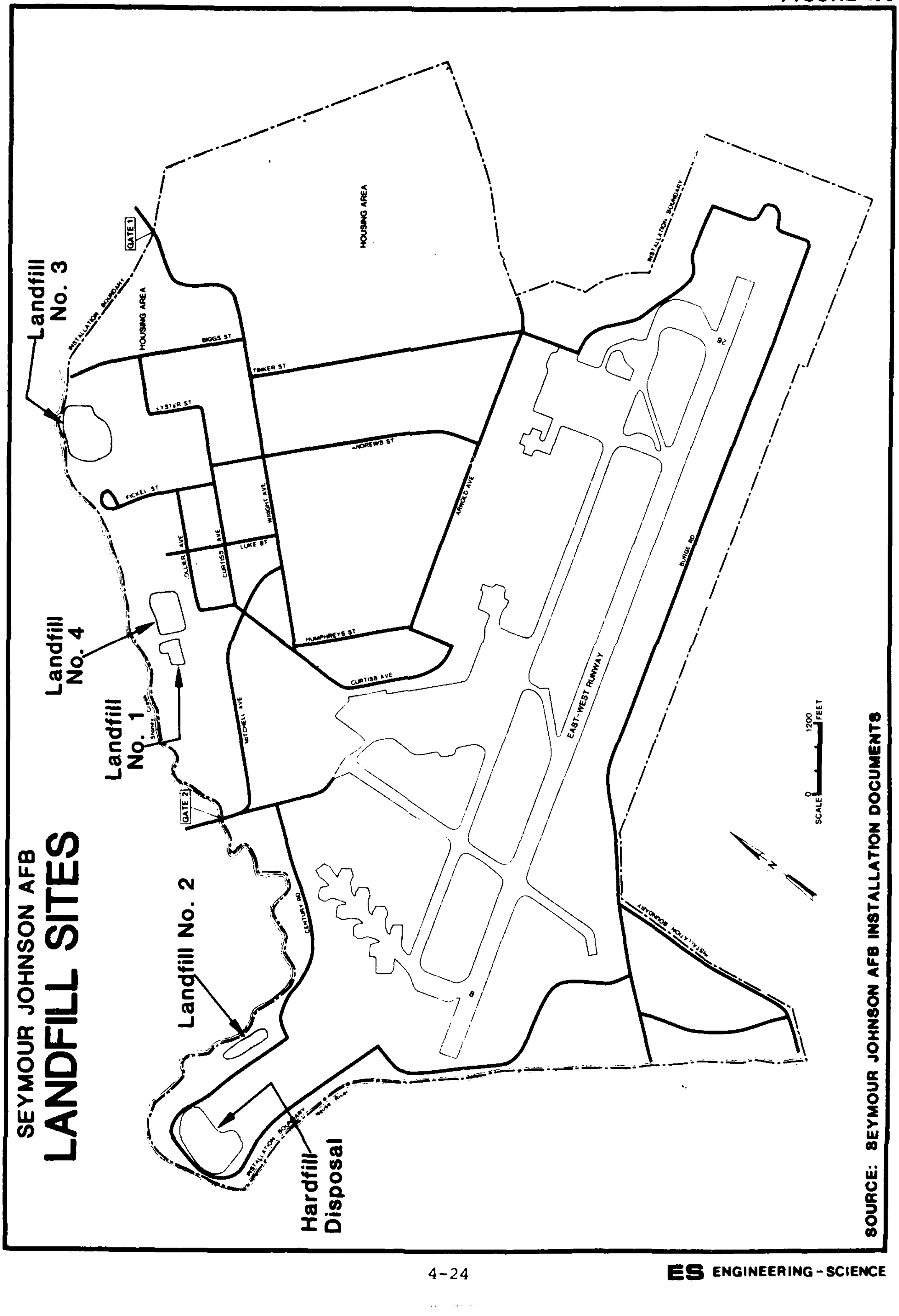
On-base landfills at Seymour Johnson AFB have been used for disposal of non-hazardous solid wastes and some industrial waste materials. Landfills were operated at four locations on the base as shown in Figure 4.6. Table 4.4 contains a summary of pertinent information concerning each landfill disposal site. An additional site, located south of Mitchell Avenue and directly east of Building 2400, may have been used for a short time, around 1962, for the disposal of solid wastes. However, due to wet soil conditions, the area was not amenable to disposal equipment operations and an alternative site was found. It is not known what quantity of waste, if any, was actually disposed of at the site. Since 1978, refuse generated on the base has been hauled off-base for disposal by contractors. One base landfill is however still in operation. The only waste presently accepted is trash comprising rubble from grounds maintenance.

A hardfill disposal site located in the northwest corner of the base (northwest Bldg. 2215, Figure 4.6) has been utilized for the disposal of contractor wastes. These materials include primarily construction debris, timber and landscape wastes. An inspection of the site indicated no hazardous materials were being disposed of at this site. The materials are used to fill an area which was once excavated for use as a pond. Photographs of the landfills are shown in Appendix E.

Landfill No. 1

Landfill No. 1 is located on the northern portion of the base between Mitchell Avenue and Stoney Creek (Figure 4.7). The total area of the site is approximately 2.5 acres. The site was operated during the initial activation of the base, 1941 through 1946. During this same period the base operated a refuse incinerator, indicating the landfill only received a portion of the waste and refuse generated at the base. Ash from the incinerator was likely disposed of in this landfill along with a small quantity of miscellaneous industrial wastes. Refuse suitable for animal feed was sold to local farmers and scrap metals were salvaged. The landfill is closed and the area has an established vegetative cover. In recent years an excavation training program was

FIGURE 4.6



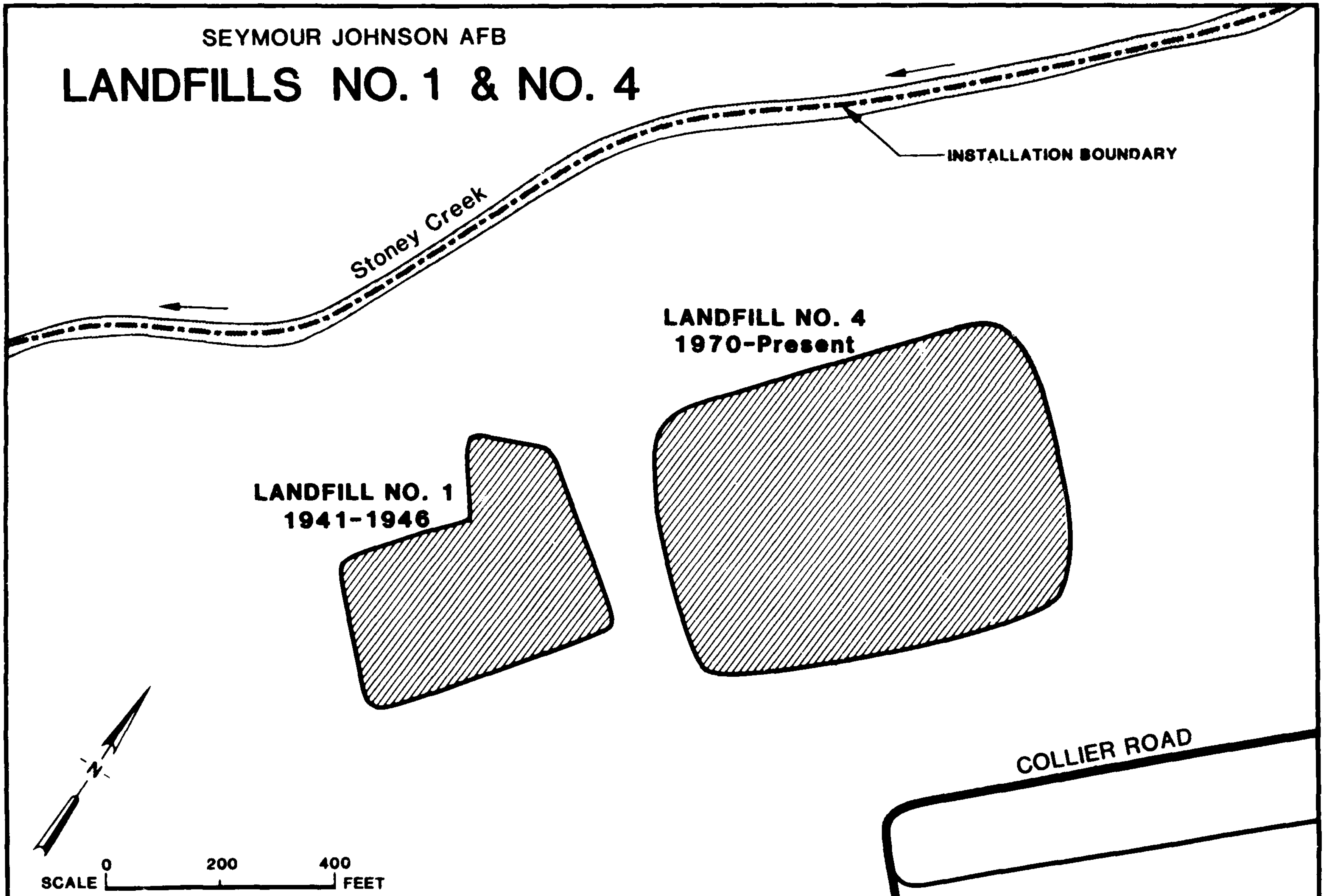
SEYMOUR JOHNSON AFB
LANDFILL SITES

SOURCE: SEYMOUR JOHNSON AFB INSTALLATION DOCUMENTS

FIGURE 4.7

SEYMOUR JOHNSON AFB

LANDFILLS NO. 1 & NO. 4



SOURCE: SEYMOUR JOHNSON AFB INSTALLATION DOCUMENTS

ES ENGINEERING-SCIENCE

TABLE 4.4

SUMMARY OF LANDFILL DISPOSAL SITES

[illegible]	Operation Period	Approximate Size (Acres)	Depth (feet)	Types of Waste	Estimated Waste Quantity (cu. yd.)	Method of Operation	Closure Status	Surface Drainage	Comments
No. 1	1941-1946	[illegible]	8	o General refuse o Ash from refuse incinerator o Heat plant coal ash o Small quantities miscellaneous industrial wastes	40,000	Unknown	Closed, cover of sandy-loam and local grasses.	To Stoney Creek	Excavations for runway repair exercises have uncovered landfill remnants
No. 2	1956-1961	4	9	o General refuse o Heat plant coal ash o Small quantities miscellaneous industrial wastes o Construction debris	60,000	Trench fill	Closed, cover of sandy-loam. Construction debris situated over one half of the site. Remainder of site covered with local vegetation.	To Stoney Creek	
No. 3	1961-1970	15	10	o General refuse o Heat Plant coal ash o Miscellaneous industrial wastes (suspected)	235,000	Burn and daily cover. Trench fill and slope fill.	Closed, 2 foot cover of sandy-loam and local grasses.	To Stoney Creek	
No. 4	1970-Present	8	7	General refuse o Miscellaneous industrial wastes o Rubble from grounds maintenance	90,000	Trench and daily cover. Slope fill after 1978.	Landfill still in use. Covered except for open face to the north. Leachate flowing toward Stoney Creek	To Stoney Creek	Utilized for disposal of general refuse, 1970-1978. Utilized only for disposal of rubble from 1978 to present.

conducted in the landfill area. These excavations have uncovered remnants of landfill debris.

Landfill No. 2

Landfill No. 2 is located in the northwest corner of the base between the munitions storage area and Stoney Creek (Figure 4.8). The site was operated between 1956 and 1961. The total area of the landfill is approximately 4 acres. The landfill received general refuse from the base which may have included a small amount of industrial wastes. Coal bottom ash and slag from the heat plants were also disposed of in the landfill. The landfill is closed and has an earth cover. Large piles of construction debris are located over half of the landfill area.

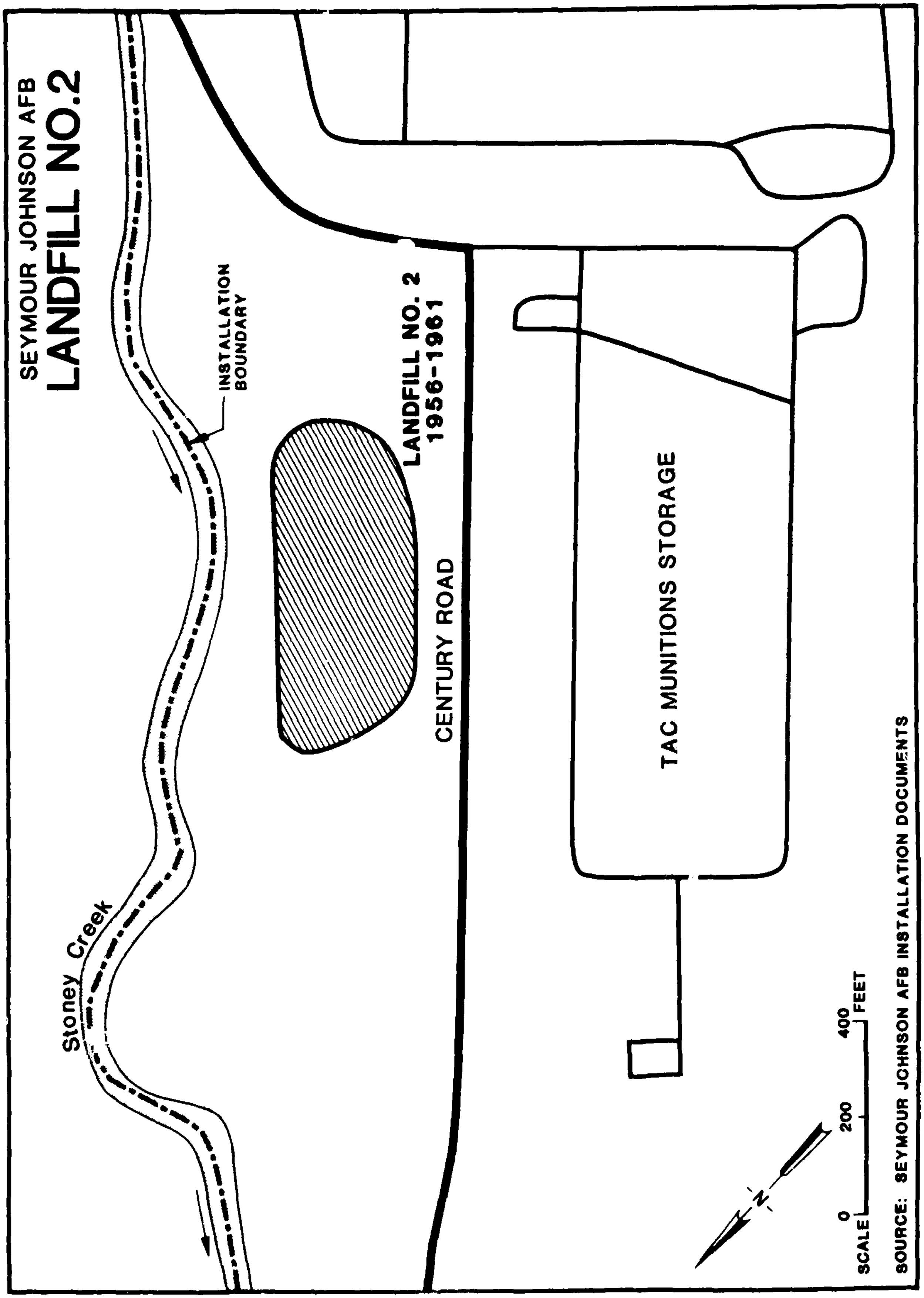
Landfill No. 3

Landfill No. 3 is located along the north periphery of the base, north of the trailer park (Figure 4.9). The site was operated between 1961 and 1970, and encompasses an area of approximately 15 acres. Soils in the landfill area are a sand clay mix. The landfill area, which is adjacent to Stoney Creek was described as being swampy in the region nearest to the creek. Landfill operations included both trench and slope fill practices. Trenches were said to have ranged from 30 to 35 feet long and a maximum depth of 10 feet. Past operators indicated no ground-water infiltration occurred. The landfill was started in the southwest portion and constructed towards the northeast. The depth of the fill material became more shallow as the landfill approached Stoney Creek (3 to 4 feet deep). The early operational procedures included daily burning and covering; however, during the final stages of the landfill operations the burning practice was discontinued. The waste materials disposed of in the landfill included: general refuse, glass, coal bottom ash and paint residues. It is also suspected that small quantities of spent solvents and other miscellaneous industrial wastes may have been disposed of in this landfill. Contaminated fuels and oils were not disposed of in the landfill. The area was closed in 1970 and covered with two feet of sandy-loam soil. No leachate has been observed from the landfill.

Landfill No. 4

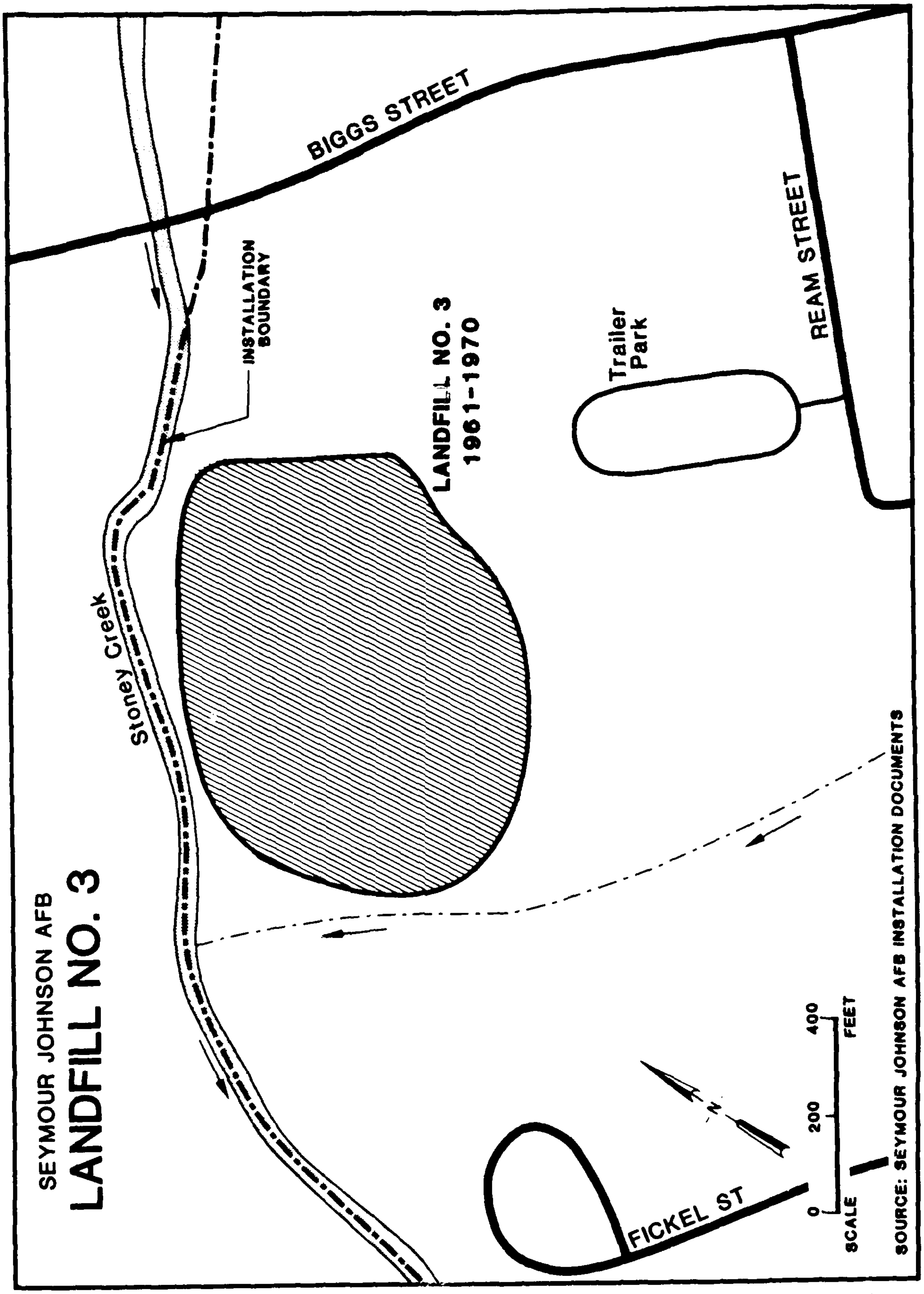
Landfill No. 4 is located on the northern portion of the base, northeast of the fire protection training area and south of Stoney Creek

FIGURE 4.8



SEYMOUR JOHNSON AFB
LANDFILL NO.2
INSTALLATION BOUNDARY
LANDFILL NO. 2
1956-1961
CENTURY ROAD
TAC MUNITIONS STORAGE
Stoney Creek
N
SCALE
0
200
400
FEET
SOURCE: SEYMOUR JOHNSON AFB INSTALLATION DOCUMENTS

FIGURE 4.9



ES ENGINEERING-SCIENCE

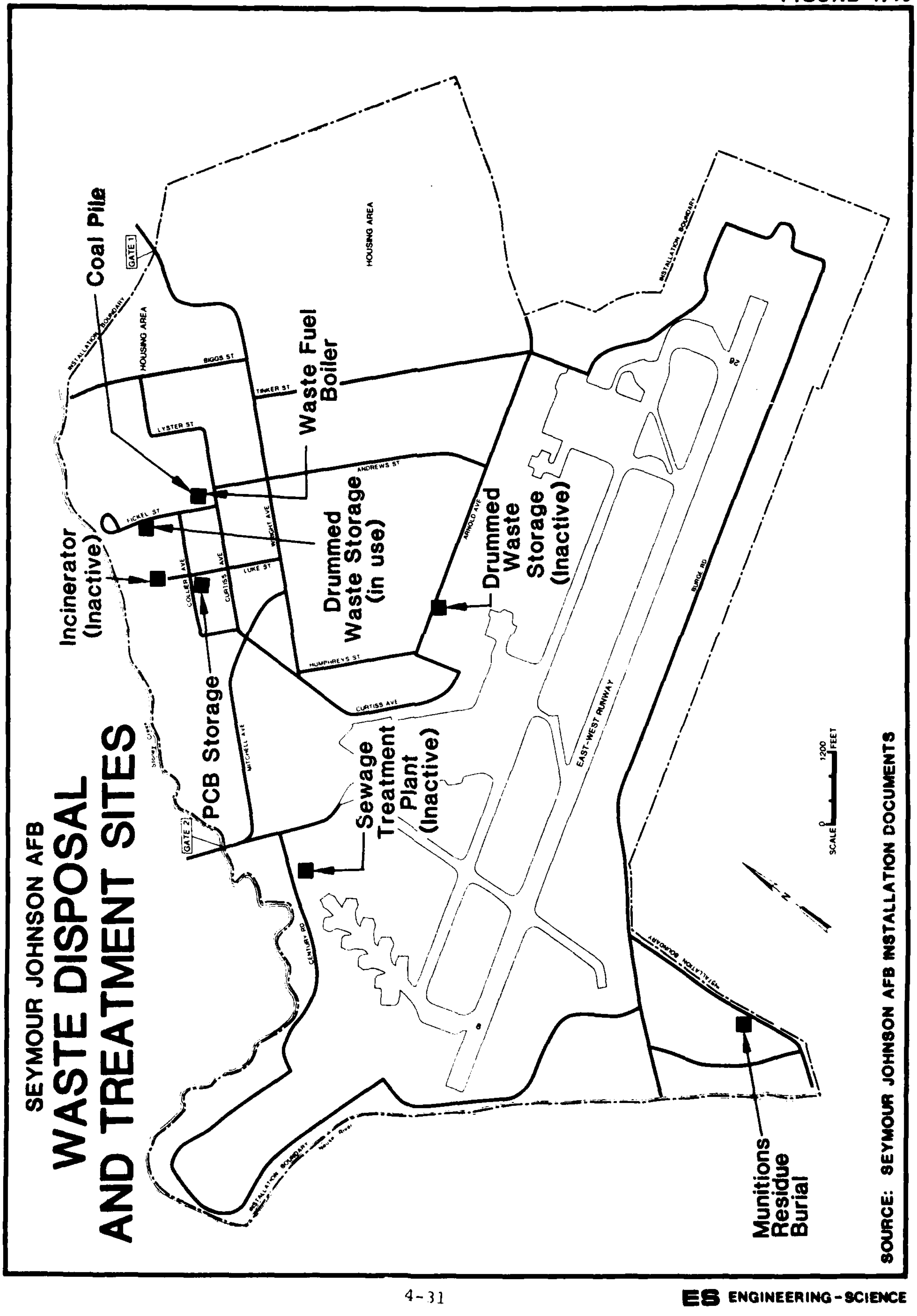
(Figure 4.7). The total area of the site is approximately 8 acres. Soils in the area are composed primarily of clay. The landfill operation at this site began in 1970. Landfill No. 4 was utilized through 1978 for the disposal of general refuse generated on the base with the exception of refuse from the housing area and some miscellaneous industrial chemicals. The housing area refuse was disposed of in a municipal landfill and the miscellaneous chemicals were disposed of by off-base contractors. The landfill was operated in a trench and fill fashion, no burning occurred and the wastes were covered daily. Trenches were described to have ranged from six to seven feet in depth.

In 1978, the base established a contract for collection and off-base disposal of all refuse generated at Seymour Johnson AFB. The only waste which has been disposed of in the landfill from 1978 to the present is trash comprising rubble from grounds maintenance. Trench and fill procedures were discontinued and the landfill was filled along a slope. During the field observations a small leachate stream was flowing from the toe of the fill with a yellowish color moving toward Stoney Creek at an estimated flow of approximately 2 to 3 gallons per minute.

Drummed Waste Storage Areas

From 1956 until 1963, several types of aqueous wastes from the industrial shops were placed in an area located in a wooded plot between the existing liquid oxygen (LOX) storage facility and the flightline (Figure 4.10). Drums of waste paint residues, spent solvents and waste petroleum products were reported to have been stored at this site. No burial of drums or waste was known to have occurred. In 1966, these waste materials were removed and the wastes were disposed of off-base through DPDO contractors. Visual observation of the site revealed no evidence of past activities. Since the site was cleaned up 16 years ago there appears to be little or no potential for migration of contaminants.

Out of service PCB transformers, awaiting off-base contractor disposal, have been stored in the Civil Engineering pole yard in an enclosed building (Figure 4.10). In service transformers have been stored outside in the yard area. No spills or leaks of oil were observed or reported in these areas.


SEYMOUR JOHNSON AFB
WASTE DISPOSAL AND TREATMENT SITES
Coal Pile
Waste Fuel Boiler
Drummed Waste Storage (in use)
Drummed Waste Storage (Inactive)
Incinerator (Inactive)
PCB Storage
Sewage Treatment Plant (Inactive)
Munitions Residue Burial
HOUSING AREA
GATE 1
GATE 2
INSTALLATION BOUNDARY
BIGGS ST
TINKER ST
LYSTER ST
ANDREWS ST
NICKEL ST
LUKE ST
COLLER AVE
CURTISS AVE
WRIGHT AVE
ARNOLD AVE
HUMPHREYS ST
MITCHELL AVE
CENTURY RD
BURGE RD
EAST-WEST RUNWAY
26
Stoney Creek
Neuse River
SCALE 0 1200 FEET
N
SOURCE: SEYMOUR JOHNSON AFB INSTALLATION DOCUMENTS

Drummed hazardous wastes have been stored in a 50 foot by 50 foot fenced area on the west side of Fickel Street north of Collier Avenue (Figure 4.10). A 20,000 gallon underground storage tank located within the fenced area was previously used by DPDO to store hazardous wastes. The contents of the tank were recently pumped out and disposed of off base by a service contractor. No spills or leaks are known to have occurred in this area.

Explosive Ordnance Disposal (EOD)

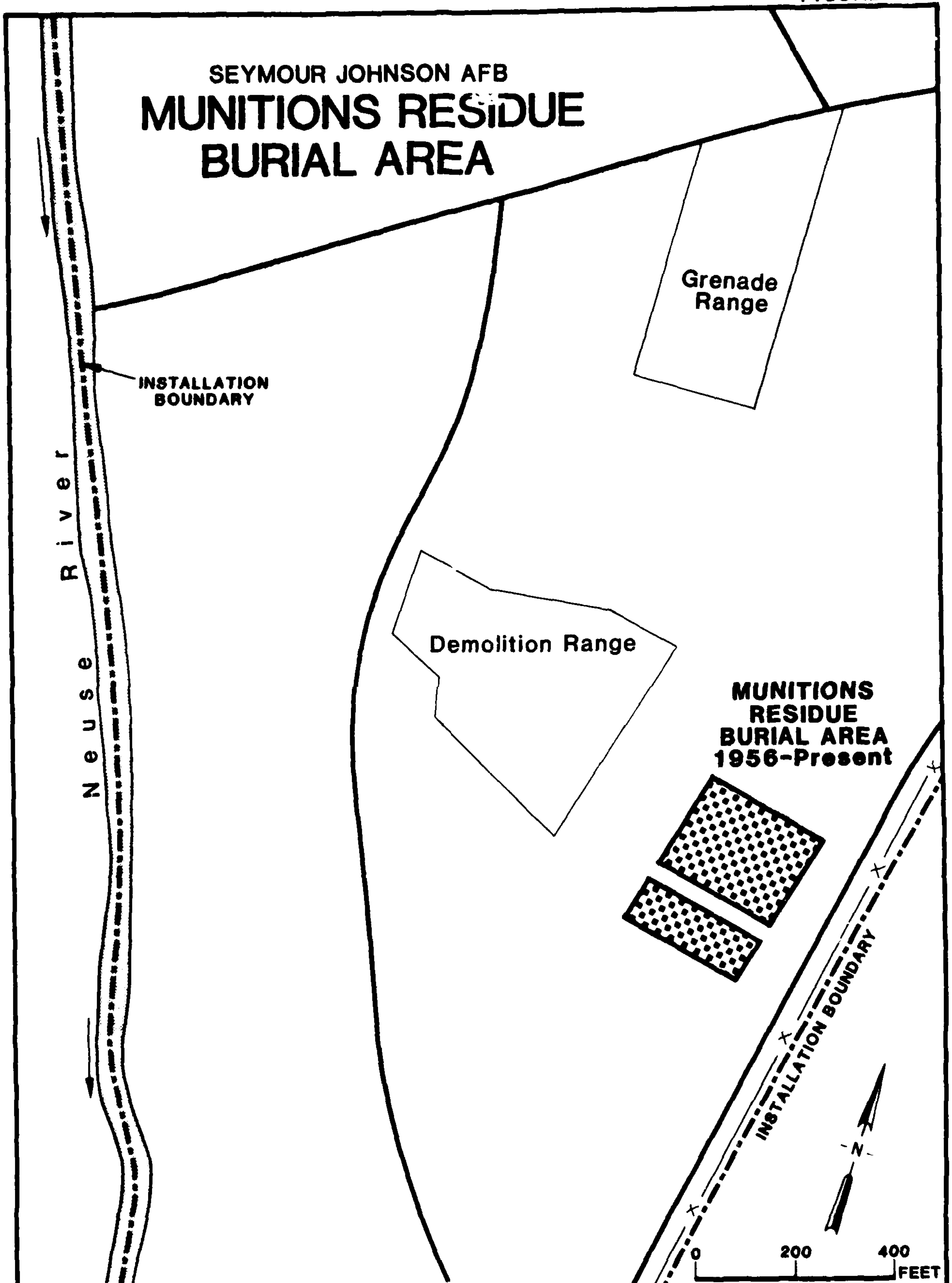
An explosive ordinance disposal (EOD) area, located south of the runway on the west end of the base, has been used for the detonation of explosives and the disposal, by burial, of munitions residue (Figure 4.11). Munitions residue consists mainly of remnants of practice bombs (mostly scrap metal) collected from the Dare County Bombing Range by EOD personnel. Practice bombs used at the Dare County Bombing Range are metal casings containing a spotting charge equivalent to a shotgun shell. All items are inspected and verified as explosive-free before burial. Those items which are identified as munition items (explosive) are generally shipped to Shaw AFB, South Carolina for disposal. Small explosive items and items which cannot be visually inspected, are destroyed by fire or explosion on the Demolition Range prior to burial. The burial area is comprised of 13 closed pits and one open pit in use. The pit sizes range from 15 square feet to 300 square feet and average approximately 10 feet in depth.

The Dare County Bombing Range has not been used for the disposal of ordnance materials or other waste materials. The area has been routinely inspected by EOD personnel and all practice ordnance found on the surface has been removed for disposal at the previously designated ordnance disposal sites. Due to the swampy conditions in the area, some practice ordnance may have sunk below the surface and go undetected during the routine inspections. This site is believed to pose no threat of environmental contamination.

Waste Fuel Boilers and Coal Pile

The steam boilers located in Bldg. 2700 (Figure 4.10) were modified in 1976 to burn waste liquid petroleum products in addition to No. 5 fuel oil. Since that time it is estimated that an average of 7,000 gallons per month of waste materials are burned in the boilers as fuel.

FIGURE 4.11



SOURCE: SEYMOUR JOHNSON AFB INSTALLATION DOCUMENTS

Two waste material storage tanks have been utilized by the heat plant to accumulate waste materials from the shop organizations. One tank is used for waste JP-4 (5,000 gallons) and one tank for other waste petroleum products (3000 gallons). Shop personnel have been responsible for transporting the wastes to the heat plant area. Upon delivery, the waste materials have been inspected by the heat plant personnel for compatibility with the combustion system prior to pumping the wastes into their appropriate tanks. No spills or leaks which may have contaminated the area are known to have occurred.

The boilers have been fired with oil since 1972. Prior to 1972, the boilers were fired with coal. A large outdoor area was used for coal storage during this period. The area is approximately 300 feet long by 300 feet wide and located adjacent to the heat plant. Coal residue is still noticeable in the area. No liners or surface barriers were provided for the coal pile during its active use. Since the coal pile has been depleted for ten years and only small amounts of coal residue are present, contamination from coal pile runoff is considered to be insignificant. Recent sampling completed in the coal pile area indicated no metals concentrations above background levels.

Refuse Incineration

An incinerator was used for disposal of general refuse from the base during the initial activation period, 1941-1946. The incinerator was located at the northern end of Luke Street (Figure 4.10). The ash from the incinerator was most likely buried in Landfill No. 1. The operation was discontinued in 1946 when the base was deactivated and was never used after the reactivation of the base in 1956. The incinerator structure is still situated at the designated site. This site is believed to pose no threat for environmental contamination.

Sanitary Sewage System

Domestic sewage was treated at a primary sewage treatment plant (STP) located along Century Road north of the SAC Alert Apron (Figure 4.10) during the initial activation of the base (1941-1946) and up to 1968. The STP was rehabilitated when the base was reactivated in 1956 and consisted of primary settling tanks, a sludge digester and sludge drying beds. The dried sludge was landfarmed on grassy areas throughout the base. The effluent from the STP was discharged directly to the

Neuse River. In 1968, Seymour Johnson AFB entered into an agreement with the City of Goldsboro, North Carolina for the treatment of all domestic sewage generated on the base. The Bioenviromental Engineer has routinely sampled the wastewater at manholes prior to exiting the base boundaries. The most recent samples collected from the sewer lines are characterized in Appendix C, Table C.1. The STP area and the sludge disposal areas do not pose potential environmental contaminant concerns.

Storm Drainage System

The storm drainage system on Seymour Johnson AFB consists primarily of concrete conduits or open-channels which drain toward the Neuse River either directly or via Stoney Creek. Waste materials from aircraft maintenance functions have occasionally been spilled to the storm drains. These materials were reported to have included compounds such as motor oil and hydraulic fluid. In the 1970's, oil/water separators were installed in many of the sources and the effluent has been discharged to the sanitary sewer systems. A list of the oil/water separators located on Seymour Johnson AFB is provided in Appendix C, Table C.3.

Since 1980, JP-4 has been observed in the storm drain at two manholes on the TAC aircraft parking apron, rows F and G. This particular storm drain discharges to an open ditch on the south side of the runway. The ditch flows into the Neuse River 1.25 miles to the west. No visible sheen has been observed leaving the base during low flow conditions, but oil and grease concentrations of 20 mg/l have been detected in recent samples. It was suspected that JP-4 was originating from leakage in the nearby fuel hydrant system. Several leaks have occurred in the hydrant system in the past years (since 1978) which may have contributed to a buildup of fuel underground which may be slowly infiltrating into the storm drainage system. The leaks have been repaired and recent pressure tests of the hydrant system have not indicated any new leakage.

EVALUATION OF PAST DISPOSAL ACTIVITIES AND FACILITIES

The review of past operation and maintenance functions and past waste management practices at Seymour Johnson AFB has resulted in the identification of ten sites potentially containing hazardous waste materials and having the potential for environmental contamination.

Other sites were reviewed and eliminated from further evaluation based on the logic presented in the decision tree shown in Figure 1.1.

The ten sites have been assessed using a Hazard Assessment Rating Methodology (HARM), which takes into account characteristics of poten- l receptors, waste characteristics, pathways for migration, and specific characteristics of the site related to waste management practices. The details of the rating procedures are presented in Appendix F and the results of the assessment are summarized in Table 4.5. The HARM system is designed to indicate the relative need for follow-on action. The information presented in Table 4.5 is intended as a guide for assigning priorities for further evaluation of the Seymour Johnson AFB disposal areas under IRP, Phase II. The rating forms for the individual waste disposal sites on Seymour Johnson AFB are presented in Appendix G. Photographs of some of the key disposal sites are contained in Appendix E.

TABLE 4.5

SUMMARY OF HARM SCORES FOR POTENTIAL CONTAMINATION SOURCES

Rank	Site Name	Appendix Page	Receptor Subscore	Waste Characteristics Subscore	Pathways Subscore	Waste Management Factor	Overall Total Score
1	Leakage from Fuel Hydrant System	H-2	47	100	80	1.0	76
2	Tank Farm Fuel Spill	H-4	46	100	80	1.0	75
3	Landfill No. 4	H-6	54	80	36	1.0	57
4	Fire Protection Training Area No. 3	H-8	52	53	72	0.95	56
5	Landfill No. 3	H-10	57	60	36	1.0	51
6	B-52 Crash Site	H-12	51	60	30	0.95	45
7	Munitions Residue Burial Site	H-14	51	67	15	1.0	44
8	Landfill No. 2	H-16	45	67	12	1.0	41
8	Landfill No. 1	H-18	47	63	12	1.0	41
9	Coal Pile	H-20	48	53	15	1.0	39

CHAPTER 5

CONCLUSIONS

CHAPTER 5

CONCLUSIONS

The goal of the IRP Phase I study is to identify sites where there is the potential for environmental contamination resulting from past waste disposal practices and to assess the probability of contaminant migration from these sites. The conclusions given below are based on the assessment of the information collected from the project team's field inspection, review of records and files, review of the environmental setting, and interviews with base personnel, past employees and state and local government employees. Table 5.1 contains a list of the potential contamination sources identified at Seymour Johnson AFB and a summary of HARM scores for those sites.

1) The fuel leakage from the hydrant system located beneath the TAC aircraft parking apron has a *high potential* for environmental contamination. JP-4 has been observed in the storm drain at two manholes along the aircraft parking apron since 1980. The source of the infiltrating fuel may be occurring from residuals which may have developed during past leaks. Lateral D, F, G and H have undergone repairs on several occasions since 1978. Annual pressure tests are currently performed on the system and no pressure losses have been observed. The distance to ground water is approximately six feet. Regional geology indicates the soils comprise permeable materials. The area received a HARM score of 76.

2) The JP-4 fuel spill site in the POL tank farm has a high potential for environmental contamination. The spill occurred in November 1980 from Tank No. 2 and was contained by the earthen dike surrounding the tank. The spill quantity was estimated as 400,000 gallons and 375,000 gallons were recovered. The 25,000 gallon loss may be attributed to volatilization of the fuel and percolation of fuel into the

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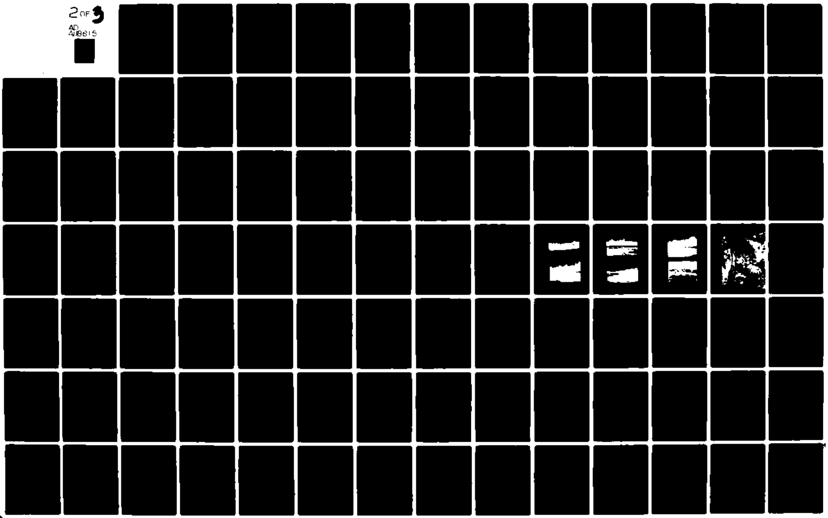


TABLE 5.1
PRIORITY RANKING OF POTENTIAL CONTAMINATION SOURCES
SEYMOUR JOHNSON AFB

Rank	Site Name	Date of Operation or Occurrence	Overall Total Score
1	Leakage from Fuel Hydrant System	Leaks detected 1978	76
2	Tank Farm Fuel Spill	November 1980	75
3	Landfill No. 4	1970 - present	57
4	Fire Protection Training Area No. 3	1956 - present	56
5	Landfill No. 3	1961 - 1970	51
6	B-52 Crash Site	1961	45
7	Munitions Residue Burial Site	1956 - present	44
8	Landfill No. 1	1941 - 1946	41
8	Landfill No. 2	1956 - 1961	41
9	Coal Pile	1956 - 1972	39

Note: This ranking was performed according to the Hazard Assessment Rating Methodology (HARM) described in Appendix F. Individual site rating forms are in Appendix G.

into the ground. After clean-up operations were completed, no significant concentrations of oil and grease were detected from rainwater collected within the Tank No. 2 retention dike; however, significant concentrations have been detected from an adjacent diked area. In addition, by mid-1981 JP-4 was detected in a well-pit located approximately 30 feet north of the tank farm. The well is presently generating clean JP-4 on a regular basis. Ground water in the area varies from one to three feet below the surface. The soils in the area are permeable. The spill site received a HARM score of 75.

3) Landfill No. 4 has a moderate potential for environmental contamination. Between 1970 and 1978, all general refuse generated on base, with the exception of the housing area and miscellaneous industrial chemicals, was disposed in this landfill. The landfill was operated in a trench and fill fashion. Since 1978, the landfill has only received trash comprising rubble from ground maintenance. During this period, the landfill has been filled along a slope which is currently expanding to the north. The landfill is located within 500 feet of Stoney Creek which serves as the base boundary. Soils in the area are composed primarily of clay. A leachate discharge was observed flowing from the toe of the open face of the landfill in the direction of Stoney Creek. The landfill received a HARM score of 57.

4) Fire Protection Training Area No. 3 has a moderate potential for environmental contamination. Training exercises conducted in this area between 1956 and the mid 1970's may have utilized some spent solvents and other waste chemicals with contaminated fuels and waste oils. Since 1976 only clean JP-4 has been used in fire protection training exercises. The training area consists of a diked pit constructed over compacted natural soils. Discharges from the pit are routed to an oil/water separator draining to the storm drain. The pit is situated approximately 800 feet from Stoney Creek and 3,600 feet from a drinking water well. Fire Protection Training Area No. 3 received a HARM score of 56.

5) Landfill No. 3 has a moderate potential for contaminant migration. This landfill was utilized between 1961 and 1970 and is now

closed. The landfill is covered with approximately two feet of sandy-loam soil and a sparse growth of local grasses. The landfill received the base's general refuse as well as coal bottom ash and other miscellaneous industrial wastes (i.e., waste paints and spent solvents). The landfill operations included both trench and slope fill practices. Daily burning was conducted until the late 1960's. Landfill No. 3 is situated within 70 feet of Stoney Creek which also serves as the base boundary. The distance to ground water from the base of the landfill is suspected to be less than six feet. No leachate was observed or has been reported to have been discharged from the landfill. Landfill No. 3 received a HARM score of 51.

6) The B-52 crash site is an area which poses a low potential for environmental contamination. The site is the location of impact of a weapon which was separated from a B-52 aircraft during the mid-air breakup of the aircraft in 1961. The weapon broke apart on impact and no explosion occurred. A five month excavation effort was conducted in the area which recovered all significant parts and pieces of the weapon with the exception of one inert portion containing uranium metal (non-explosive). Excavations were conducted to 50 feet below the surface and the uranium metal piece was not detected. The Air Force purchased an easement restricting any disturbance of the land below five feet on the three acre parcel of land located approximately 15 miles northeast of the base. The site received a HARM score of 45.

7) The Munitions Residue Burial Site has a low potential for environmental contamination. The area is located in the southwest corner of the base near the deep well field. The site is used for the burial of munitions residue. All items are inspected and verified as explosive-free before burial. The burial site is comprised of 13 closed pits and one open pit currently in use. The pit sizes range from 15 sq. feet to 300 sq. feet and average approximately 10 feet in depth. The site is located within 200 feet of the deep well field and 50 feet of the base boundary. The Munition Residue Burial Site received a HARM score of 44.

8) Landfill No. 1 has a low potential for environmental contamination. The landfill received waste during the initial activation

repair training exercises requiring land excavation has been conducted in an area of the landfill. These excavations have uncovered remnants of landfill debris. The landfill is situated within 300 feet of Stoney Creek. No leachate was detected or was ever reported to have occurred. Landfill No. 1 received a HARM score of 41.

9) Landfill No. 2 poses a low potential for environmental contamination. The landfill is located in the northwest corner of the base near the TAC munitions storage area. The landfill, operated between 1956 and 1961, received general refuse, coal bottom ash and some miscellaneous industrial wastes. The landfill is closed; however, half of the landfill area is covered with piles of construction debris. The landfill is situated within 300 feet of Stoney Creek. Landfill No. 2 received a HARM score of 41.

10) The coal pile is an area which poses a low potential for environmental contamination. The site was used to store coal for powering the steam boilers from 1956 up to 1972. The coal pile has been depleted for ten years and only small amounts of coal residue are present. The site received a HARM score of 39.

CHAPTER 6

RECOMMENDATIONS

CHAPTER 6
RECOMMENDATIONS

To aid in the comparison of the ten sites on Seymour Johnson AFB with those sites identified in the IRP at other Air Force Installations, a Hazard Assessment Rating Methodology (HARM) was developed for prioritizing IRP Phase II studies. Of primary concern at Seymour Johnson AFB are those sites with a high potential for environmental contamination which are listed in Table 6.1. These sites require further investigation in Phase II. Sites of secondary concern are those with moderate potential for contaminant migration. Further investigation at these sites is recommended. No further monitoring is recommended for those sites with low potential for migration of contaminants unless other data collected indicate a potential problem could exist at one of these sites.

The following recommendations are made to further assess the potential for environmental contamination from past activities at Seymour Johnson AFB. The recommended actions are generally one time sampling programs to determine if contamination does exist at the site. If contamination is identified the sampling program may need to be expanded to further define the extent of contamination. The recommended monitoring program for Phase II is summarized in Table 6.1.

1) Fuel leakage from the hydrant system beneath the TAC aircraft parking apron has a high potential for environmental contamination and monitoring of the area is recommended. The upper strata of soils in this area is believed to be moderately permeable and shallow ground water can be found at depths of ten feet. In order to make a preliminary determination of the severity and extent of fuel contamination, it is recommended that surface geophysical methods (electromagnetic conductivity, ground penetrating radar and electrical resistivity) be used to map the subsurface zones in the immediate area outside the apron. Based on the results from this preliminary survey, six to eight monitoring wells should be installed in order to obtain ground-water samples in the

TABLE 6.1
RECOMMENDED MONITORING PROGRAM FOR PHASE II
SEYMOUR JOHNSON AIR FORCE BASE

Site	Rating Score	Recommended Monitoring	Comments
Landfill No. 4	57	Sample leachate stream and analyze for the parameters in Table 6.2.	
Fire Protection Training Area No. 3	56	Collect six soil borings in and around perimeter of the fire training pit. Borings should be ten feet deep with soil samples taken at regular intervals and at any interface. A water extraction analysis should be performed on the soil samples which should subsequently be analyzed for the parameters in Table 6.2. The bore holes should be refilled with clay to prevent infiltration to the shallow ground-water aquifer.	If observations made during the soil boring collection indicate that contamination is present, then a ground-water monitoring system should be installed consisting of four wells placed around the pit area.
Water Supply Wells		Collect water samples from Well Nos. 13-73, 10-60, 7-73 and the hospital well. Analyze for the parameter in Table 6.2 and a GC/MS scan.	

TABLE 6.1
(Continued)
RECOMMENDED MONITORING PROGRAM FOR PHASE II
SEYMOUR JOHNSON AIR FORCE BASE

Site	Rating Score	Recommended Monitoring	Comments
Fuel Leakage from Hydrant System at TAC Aircraft Parking Apron.	76	a) Perform surface geophysical survey to map subsurface zones in the immediate area outside apron. b) Based on results of a), install 6 to 8 monitoring wells (in the contaminated area, at the edge of the plume and downgradient). Wells should be constructed of Schedule 40 PVC pipe, screened into the uppermost extent of the saturated zone. Sample wells and analyze for floating material, TOC, fuel additives and oil and grease. c) Collect upstream and downstream samples from the storm water sewer and analyze for floating material, TOC, fuel additives and oil and grease.	JP-4 has been observed infiltrating into the storm drainage system along the the parking apron
Tank Farm Fuel Spill	75	a) Perform surface geophysical survey to map subsurface zones in the area around the tank farm. b) Based on results of a) install 4 to 6 monitoring wells to collect ground-water samples upgradient, downgradient, and at the edge of the plume. Wells should be constructed of Schedule 40 PVC pipe, screened into the uppermost extent of the saturated zone. Sample wells and analyze for floating material, TOC, fuel additives and oil and grease. c) Rain water collected in the dike areas should be sampled and analyzed for floating material, TOC and oil and grease. d) Record quantity of fuel recovered from shallow well pit north of the tank farm.	Records indicate 25,000 gallons of JP-4 were not recovered from a 1980 spill. Fuel has been detected in rainwater collected in Dike No. 5 (spill occurred in Dike No. 2). Significant quantities of fuel have been pumped from a shallow well located just north of tank farm.

contaminated zone, at the edge of the plume and down gradient of the plume. The monitoring system should consist of PVC schedule 40 wells screened to intercept inflow at the uppermost extent of the saturated zone. Samples from the wells should be analyzed for floating material (fuels), oil and grease, fuel additives and total organic carbon (TOC). The storm drain upstream and downstream of the site should be sampled over a minimum two-week period to collect representative wet weather and dry weather samples. The samples should be analyzed for floating material, TOC, fuel additives, and oil and grease. It is also recommended that a special testing program be conducted to identify any leakage from the fuel hydrant system.

2) The POL tank farm spill site is considered to have a high potential for environmental contamination and monitoring of the area is recommended. Surface geophysical methods (electomagnetic conductivity, ground penetrating radar and electrical resistivity) should be used to map the subsurface zones in the area around the tank farm. Based on the results from this preliminary monitoring, four to six monitoring wells should be installed to collect ground-water samples upgradient, downgradient and at the edge of the plume. The monitoring wells should be constructed of schedule 40 PVC and screened to intercept inflow from the uppermost saturated zone. The wells should be sampled and analyses performed for floating material, TOC, fuel additives and oil and grease. Any rainwater collected in the dike area should also be sampled and analyzed for floating material, TOC, fuel additives and oil and grease. Records should be maintained on the quantity of fuel withdrawn from the shallow well situated just north of the tank farm.

3) The Fire Protection Training Area No. 3 is considered to have a moderate potential for environmental contamination. Six soil borings should be performed in and around the perimeter of the training pit. The borings should be ten feet deep with soil samples taken at regular intervals and at any interface. A water extraction process should be performed on the soil samples and the resulting extract analyzed for parameters in Table 6.2. If observations made during the soil boring collection indicate that contamination is present, then a ground-water monitoring system should be installed consisting of four wells placed

TABLE 6.2
RECOMMENDED LIST OF ANALYTICAL PARAMETERS

Samples from:

Water extract of soil borings and soils samples
Ground-water monitoring wells
Leachate

Analyses to include:

Total organic carbon
pH
Copper
Zinc
Manganese
Oil and Grease
Nickel
Cyanide
Phenol
PCB
Total dissolved solids
Interim Primary Drinking Water Standards (selected list)

Arsenic	Lead	Endrin	2,4,5-TP Silvex
Barium	Mercury	Lindane	Radium
Cadmium	Nitrate	Methoxychlor	
Chromium	Selenium	Toxaphene	
Fluoride	Silver	2,4-D	

NOTE: The recommendation for these analyses does not indicate a known contaminant. The parameters shown serve as a general list for contaminant screening purposes.

around the pit area. The bore holes should be refilled with clay to prevent infiltration to the shallow ground-water aquifer.

4) Landfill No. 4 is considered to have a moderate potential for environmental contamination. A leachate stream was observed flowing from the open face of the landfill in the direction of Stoney Creek. The leachate from the landfill should be sampled and analyzed for the parameters listed in Table 6.2.

5) Landfill No. 1 is considered to have a low potential for environmental contamination and no follow-on monitoring is recommended. The excavation of large craters have been occurring in an area directly adjacent to this landfill as part of runway repair training exer-ises. During interviews with base personnel, it was stated that these cava-tions have uncovered remnants of the old landfill. Any disturb of this landfill may contribute to the release of a contaminated l ate. It is recommended that future runway repair training exercises -ducted in a location which will not disturb any of the base lan is. Any disturbance of Landfill No. 1 which has previously occurred should be covered, properly graded and reseeded.

6) Water supply wells Nos. 13-73, 10-60, 7-73 and the hospital well should be sampled and analyzed one time for the parameters in Table 6.2 and a GC/MS scan performed. This recommendation does not indicate a known or suspected contaminants present in these wells, however, the sample results will provide background water quality information.

APPENDICES

APPENDIX A

BIOGRAPHICAL DATA

J. R. Absalon, C.P.G.
R. J. Reimer
R. M. Reynolds, P.E.
E. J. Schroeder, P.E.
M. I. Spiegel

Biographical Data

JOHN R. ABSALON
Hydrogeologist

Personal Information

Date of Birth: 12 May 1946

Education

B.S. in Geology, 1973, Upsala College, East Orange, New Jersey

Professional Affiliations

Certified Professional Geologist (Indiana No. 46)
Association of Engineering Geologists
Geological Society of America
National Water Well Association

Experience Record

1973-1974 Soil Testing Incorporated-Drilling Contractors, Seymour, Connecticut. Geologist. Responsible for the planning and supervision of subsurface investigations supporting geotechnical, ground-water contamination, and mineral exploitation studies in the New England area. Also managed the office staff, drillers, and the maintenance shop.

1974-1975 William F. Loftus and Associates, Englewood Cliffs, New Jersey. Engineering Geologist. Responsible for planning and management of geotechnical investigations in the northeastern U.S. and Illinois. Other duties included formal report preparation.

1975-1978 U.S. Army Environmental Hygiene Agency, Fort McPherson, Georgia. Geologist. Responsible for performance of solid waste disposal facility siting studies, non-complying waste disposal site assessments, and ground-water monitoring programs at military installations in the southeastern U.S., Texas, and Oklahoma. Also responsible for operation and management of the soil mechanics laboratory.

1978-1980 Law Engineering Testing Company, Atlanta, Georgia. Engineering Geologist/Hydrogeologist. Responsible for the project supervision of waste management, water quality assessment, geotechnical, and hydrogeologic studies at commercial, industrial, and government

John R. Absalon (Continued)

facilities. General experience included planning and management of several ground-water monitoring programs, development of remedial action programs, and formulation of waste disposal facility liner system design recommendations. Performed detailed ground-water quality investigations at Robins Air Force Base in Georgia, a paper mill in southwestern Georgia, and industrial facilities in Tennessee.

1980-Date Engineering-Science. Hydrogeologist. Responsible for supervising efforts in waste management, solid waste disposal, ground-water contamination assessment, leachate generation, and geotechnical and hydrogeologic investigations for clients in the industrial and governmental sectors. Performed geologic investigations at eight Air Force bases and other industrial sites to evaluate the potential for migration of hazardous materials from past waste disposal practices. Conducted RCRA ground-water monitoring studies for industrial clients and evaluated remedial action alternatives for a county landfill in Florida.

Publications

"An Investigation of the Brunswick Formation at Roseland, NJ," 1973, with others, The Bulletin, Vol 18, No. 1, NJ Academy of Science, Trenton, NJ.

"Engineering Geology of Fort Bliss, Texas," 1978, with R. Barksdale, in Terrain Analysis of Fort Bliss, Texas, US Army Topographic Laboratory, Fort Belvoir, VA.

"Geologic Aspects of Waste Disposal Site Evaluations," 1980, with others, Program and Abstracts AEG-ASCE Symposium on Hazardous Waste Disposal, April 26, Raleigh, NC.

"Practical Aspects of Ground-Water Monitoring at Existing Disposal Sites," 1980, with R.C. Starr, Proceedings of the EPA National Conference on Management of Uncontrolled Hazardous Sites, HMCRI, Silver Spring, MD.

"Improving the Reliability of Ground-Water Monitoring Systems," 1981, Proceedings of the Madison Conference of Applied Research and Practice on Municipal and Industrial Waste, University of Wisconsin-Extension, Madison, WI.

Biographical Data

ROBERT J. REIMER

Chemical Engineer

Personal Information

Date of Birth: 12 April 1956

Education

B.S. in Chemical Engineering, 1979, University of Notre Dame
B.A. in Art, 1979, University of Notre Dame
M.S. in Chemical Engineering, 1980, University of Notre Dame

Professional Affiliations

American Institute of Chemical Engineers

Honorary Affiliations

Amoco Company Fellowship for Graduate Studies in Chemical Engineering (1979-1980)

Experience Record

1978-1979 — PEDCo Environmental, Cincinnati, Ohio. Engineer's Assistant. Responsible for compilation and keywording of data base on the non-ferrous smelting industry with emphasis on solid waste disposal for the EPA. Performed field work on SO_2 scrubber emissions testing program at Conesville Generating Station in Columbus, Ohio. Established groundwork for in-house computer search file on all aspects of non-ferrous smelting. Performed technical editing and report review.

1979-1980 — Camargo Associates, Ltd., Cincinnati, Ohio. Design Engineer and Drafter. Responsible for HVAC design on numerous projects. Designed a fire protection system for plastics press under a Monsanto contract. Served as designer on various general plumbing jobs for the U.S. Army. Filed EPA air pollution permit applications for the U.S. Army.

1980-Date — Engineering-Science. Chemical Engineer. Responsible for preparing environmental reports and permit documents as well as providing general environmental assistance to clients to assure compliance with state and federal regulations. Developed cost estimates for several hazardous waste management facility closures. Prepared several Interim Status Standards

Robert J. Reimer (Continued)

manuals including manifest plans, waste analysis and closure plans, and contingency/emergency procedures. Provided technical assistance for design of a one million gallon per year fuel alcohol production facility.

Papers and Presentations

"The Effect of Bi-metallic Catalysis on the Dehydrogenation of Cyclohexane," M.S. Thesis, University of Notre Dame, 1980.

Biographical Data

Randal M. Reynolds

Senior Engineer

Personal Information

Date of Birth: 21 December 1949

Education

BChE (Chemical Engineering), 1973, Georgia Institute of Technology, Atlanta, Georgia

Professional Affiliations

Registered Professional Engineer, Georgia #13023
Air Pollution Control Association
American Institute of Chemical Engineers (Chapter Secretary)

Experience Record

1973-1975 U.S. Environmental Protection Agency, Water Enforcement Branch, Atlanta, Georgia. Chemical Engineer. Responsible for developing draft NPDES limitations for industrial discharges, issuing public notices and final NPDES permits and participating in public hearings concerning NPDES permits.

1975-1981 Gold Kist Inc., Corporate Engineering, Atlanta, Georgia. Environmental Process Engineer. Responsible for reviewing and implementing new air quality, NPDES, RCRA and TSCA regulations. Supervised preparation and submittal of air quality, water quality and hazardous waste permit applications. Kept management informed of impact of regulations on existing and future projects.

Served as staff engineer responsible for preparing preliminary designs for air pollution control systems and detailed cost estimates for air system capital projects. Major projects included the preliminary selection of alternatives for a particulate emission control system for a 60,000 lbs/hr industrial steam boiler (peanut hull/wood fired).

1981-Date Engineering-Science, Inc., Atlanta, Georgia. Senior Engineer. Responsibility for developing environmental studies and alternative evaluations for clients.

Randal M. Reynolds, Continued

Project Engineer for Phase I Installation Restoration Program projects for the Department of Defense. Conducted interviews of past and present employees, examined records, and performed site investigations to determine hazardous chemical usage, waste generation and waste disposal practice timelines for industrial operations at several Air Force bases. Through environmental audit procedures, identified industrial operation disposal practices which could result in waste migration and recommended priority disposal practices requiring further investigation.

Project Engineer assisting in a comprehensive study of the solid waste management program for the City of Roswell, Georgia. Developed conceptual cost estimates for a city operated sanitary landfill and incinerator disposal alternatives.

Project Manager for development of a Spill Prevention Control and Countermeasures (SPCC) Plan for an industrial facility. Coordinated the design of spill containment structures and recommended structure modifications. Recommended essential spill control and clean-up equipment.

Publications and Presentations

R. M. Reynolds, "Practical Tips - Bagging Sludge?", Pollution Engineering, Vol. 12, No. 7, July 1980, pg. 28.

R. M. Reynolds, "Pulse-Type Fabric Filters in a Soybean Processing Facility," Operation and Maintenance of Air Particulate Control Equipment, R. A. Young, F. L. Cross, Jr., editors, Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, July 1980, pp. 121-123.

"Operation, Maintenance and Design of Fabric Filters for a Soybean Processing Facility," a slide presentation for the EPA technology transfer serminar, "Operation and Maintenance of Air Pollution Equipment for Particulate Control," April 12, 1979, Atlanta, Georgia.

Biographical Data

ERNEST J. SCHROEDER

Environmental Engineer
Manager, Solid and Hazardous Waste

Personal Information

Date of Birth: 17 June 1944

Education

B.S. in Civil Engineering, 1966, University of Arkansas, Fayetteville, Arkansas
M.S. in Sanitary Engineering, 1967, University of Arkansas, Fayetteville, Arkansas

Professional Affiliations

Registered Professional Engineer (Arkansas No. 3259, Georgia No. 10618, Texas No. 33556 and Florida No. 0029175)
Water Pollution Control Federation

Honorary Affiliations

Chi Epsilon

Experience Record

1967-1976 Union Carbide Technical Center, Engineering Department, South Charleston, West Virginia (1967-1968). Project Engineer. Responsible for environmental protection engineering projects for various organic chemicals and plastics plants. Conducted industrial waste surveys, landfill design, and planning for plant environmental protection programs; evaluated air pollution discharges from new sources; reviewed a wastewater treatment plant design; and participated on a project team to design a new chemical unit.

Union Carbide Corporation, Environmental Protection Department, Texas City, Texas (1969-1975). Project Engineer and Engineering Supervisor. Responsible for various aspects of plant pollution abatement programs, including preparation of state and federal permits for wastewater treatment activities.

Operations Representative on $8 million regional wastewater treatment project and member of design team which made the initial site selection and process evaluation

ERNEST J. SCHROEDER (Continued)

and recommendation. Participated in contract negotiations, process and detailed engineering design, construction of the facilities, preparation of start-up manuals, operator training, and the start-up activities. Designated as Project Engineer after start-up on expansion to original waste treatment unit.

Engineering Supervisor responsible for operation of wastewater treatment facilities including collection system, sampling and monitoring programs, spill control and clean-up, primary waste treatment, wastewater transfer system, biological waste treatment, and waste treatment pilot plants. Developed odor control program which successfully reduced odor emissions and represented Union Carbide at a public hearing on community odor problems.

Led special projects such as an excess loss control program to reduce water pollution losses; sewer segregation program involving coordination and reporting of 38 projects for the separation of contaminated and non-contaminated water; and sludge disposal program to develop long-term sludge disposal alternatives and recover land in present sludge landfill area. Developed improved methods of sampling and continuous monitoring of wastewater.

Union Carbide Corporation, Environmental Protection Project Engineer, Toronto, Ontario, Canada (1975-1976). Responsible for the overall environmental permitting, engineering design, construction and start-up of waste treatment systems associated with a new refinery.

1976-Date Engineering-Science, Inc., Project Manager (1976-1978). Responsible for several industrial wastewate projects including the following: wastewater investigation to characterize sources of waste streams in a chemical plant and to develop methods to reduce the wastes, sludge settling studies to evaluate settling characteristics of activated sludge at a chemical plant, development of a process document for the design and operation of a wastewater treatment facility at a petrochemical complex, wastewater treatment evaluation which included characterization of wastewater, unit process evaluation, inhibition studies, design review, operations review, preparation of operations manual, operator training and providing operating assistance for waste treatment facilities, various biological treatability studies and bench-scale and pilot-scale evaluation of advanced waste treatment technologies such as granular carbon adsorption, multimedia filtration, powdered activated carbon treatment, ion exchange and ozonation.

ERNEST J. SCHROEDER (Continued)

Project Manager for hazardous waste disposal projects involving waste characterization, development of criteria for disposal of hazardous waste, site investigation, preparation of permits, detailed design, construction of facilities and spill clean-up activities.

Deputy Project Manager for industry-wide pilot plant study of advanced waste treatment in the textile industry. Technologies evaluated included coagulation/clarification, multi-media filtration, granular carbon adsorption, powdered activated carbon treatment, ozonation and dissolved air flotation.

Engineering-Science, Inc., Manager of the Industrial Waste Group in the Atlanta, Georgia office (1978-1980). Responsible for the supervision of industrial waste project managers and project engineers and the management of industrial waste studies conducted in the office. Also directly involved in project management consulting with clients on environmental studies and environment assessment projects, e.g., project manager for several spill control and wastewater treatability projects and for a third-party EIS for a new phosphate mine in Florida.

Engineering-Science, Inc., Manager of Solid and Hazardous Waste Group in the Atlanta, Georgia office (1980-date). Responsible for the supervision of solid and hazardous waste project managers and project engineers and the management of solid and hazardous waste projects in the office. Project activities have included permit and regulatory assistance, environmental audits, waste management program development, ground water monitoring, landfill evaluations, landfill closure design, hazardous waste management, waste inventory, waste recovery/recycle evaluation, waste disposal alternative evaluation, transportation evaluation, and spill control and countermeasure planning.

Project Manager for several Phase I Installation Restoration Program projects for the U.S. Air Force. The objective of this program is to audit past hazardous waste disposal practices that could result in migration of contaminants and recommend priority sites requiring further investigation. Also conducted environmental audits (air, water and solid waste) at several Gulf Oil Company facilities.

ERNEST J. SCHROEDER (Continued)

Publications and Presentations

Schroeder, E. J., "Filamentous Activated Sludge Treatment of Nitrogen Deficient Waste," research paper submitted in partial fulfillment of the requirements for MSCE degree, 1967.

Schroeder, E. J., and Loven, A.W., "Activated Carbon Adsorption for Textile Wastewater Pollution Control," Symposium Proceedings: Textile Industry Technology, December 1978, Williamsburg, VA.

Schroeder, E. J., "Summary Report of the BATEA Guidelines (1974) Study for the Textile Industry," North Carolina Section of AWWA/ WPCA, Pinehurst, North Carolina, November 1979.

Mayfield, R. E., Sargent, T. N. and Schroeder, E. J., "Evaluation of BATEA Guidelines (1974) Textiles," U.S. EPA Report, Grant No. R-804329, February 1980.

Storey, W. A., and Schroeder, E. J., "Pilot Plant Evaluation of the 1974 BATEA Guidelines for the Textile Industry," Proceedings of the 35th Industrial Waste Conference, Purdue University, May 1980.

Pope, R. L., and Schroeder, E. J., 'Treatment of Textile Wastewaters Using Activated Sludge With Powdered Activated Carbon," U.S. EPA Report, Grant No. R-804329, December 1980.

Schroeder, E. J., "Industrial Solid Waste Management Program to Comply with RCRA," Engineering Short Course Instructor, Auburn University, October 1980.

Schroeder, E. J., "Technical and Economic Impact of RCRA on Industrial Solid Waste Management, Florida Section, American Chemical Society, May 1981.

Biographical Data

MARK I. SPIEGEL

Environmental Scientist

Personal Information

Date of Birth: 11 April 1954

Education

B.S. in Environmental Health Science (Magna cum laude), 1976, University of Georgia, Athens, Georgia
Limnology and Environmental Biology, University of Florida, Gainesville, Florida
Business Administration, Georgia State University

Professional Affiliations

American Water Resources Association
Technical Association of the Pulp and Paper Industry

Experience Record

1974-1976 — U.S. Environmental Protection Agency, Surveillance and Analysis Division. Cooperative Student. On assignment to Air Surveillance Branch, participated in ambient air study in Natchez, Mississippi, and operated unleaded fuel sampling program for Southeast National Air Surveillance Network. For Engineering Branch, participated in NPDES compliance monitoring of industrial facilties throughout the southeast; operation and maintenance studies of municipal waste treatment facilities; and post-impoundment study of West Point Reservoir, West Point, Georgia. Participated in industrial bioassay studies for the Ecological Branch.

1977-Date — Engineering-Science. Environmental Scientist. Responsible for the conduct of water and wastewater sampling programs and analyses, quality control, laboratory process evaluations, and evaluation of other environmental assessment data. Conducted leachate extraction studies of sludges produced at a large organic chemicals plant to define nature of sludges according to the Resource Recovery and Conservation Act guidelines. Involved in laboratory quality assurance program for the analysis of water samples used in a stream modeling project. Conducted water quality modeling study for Amerada Hess Corporation to determine the assimilative capacity of a stream receiving effluent from a southern Mississippi refinery.

Mark I. Spiegel (Continued)

Participated in bench-scale industrial treatability studies conducted for the American Textile Manufacturers Institute and Eli Lilly Pharmaceuticals in Mayaguez, Puerto Rico, and in carbon adsorption studies for an American Cyanamid chemical plant and Union Carbide Agricultural Products Division.

Involved in various aspects of several industrial environmental impact assessments including preliminary planning for a comprehensive study for St. Regis Paper Company on a major pulp and paper mill expansion project. Assisted in preparation of third-party EIS for EPA and Mobil Chemical Company concerning a proposed 16,000-acre phosphate mining and beneficiation facility. Developed an EIA prior to construction of a pulp and paper complex by the Weyerhaeuser Company in Columbus, Mississippi, which included preparation of a separate document for the Interstate Commerce Commission concerning the construction of a railroad spur to serve the complex. Also involved in formulating the water quality, water resource and socio-economic aspects of an environmental impact assessment for International Paper Company. Participated in large scale site evaluation to determine the suitability and environmental permitting requirements of a site for an east coast brewery for the Adolph Coors Company. Assisted in development of a peat mining and restoration plan for a private concern in coastal North Carolina.

Project Manager. Conducted comprehensive process evaluation of an 80 mgd wastewater treatment system for Weyerhaeuser Company. Responsible for a study to determine the leaching characteristics of sludges for a paint manufacturing facility for RCRA compliance. Also managed study for development of a solid waste management plan for a ceramic pottery manufacturer in northern Alabama which included evaluating surface and groundwater contamination potential from the existing disposal site and assisting manufacturer in developing a disposal program acceptable to state agencies.

Participated as project team member for Phase I Installation Restoration Program projects for the Department of Defense. Studies were conducted at five Air Force bases to identify past hazardous waste disposal practices that could result in migration of contaminants and recommend priority sites requiring further investigation.

APPENDIX B

INSTALLATION HISTORY, ORGANIZATION AND MISSIONS

APPENDIX B

INSTALLATION HISTORY, ORGANIZATIONS AND MISSIONS

HISTORY

This ıformation was obtained from the Seymour Johnson AFB Tab A Narrative and other Seymour Johnson AFB records.

Seymour Johnson Air Force Base is a Tactical Air Command installation named in honor of Navy Lieutenant Seymour Johnson, a former native of Goldsboro, North Carolina. In April 1942, the War Department approved the establishment of a technical training school two miles southeast of Goldsboro. The installation was activated on 12 June 1942 as Headquarters, Technical School, Army Air Forces. In June 1943, a secondary mission was added which included preparation of officers and enlisted men for overseas duty. The responsible unit was known as the Provisional Overseas Replacement Training Center. Seymour Johnson Field received a third mission in September 1943, to provide basic military training of Technical Training Command. Almost from the outset, Seymour Johnson Field (the term "Air Base" did not come into use until 1947) was charged with a number of responsibilities, or missions.

The primary mission of Seymour Johnson Field was to train selected enlisted personnel of the Army Air Forces to inspect, maintain and provide first-echelon repairs for light attack aircraft and dive bombers, and cadets preparing to become technical officers in the Army Air Forces. The 75th Training Wing was established to conduct the program through its Aviation Cadet Pre-Training School.

The 326th Fighter Group arrived in October 1943, and in January 1944 began training replacement pilots for the P-47 Thunderbolt. In April of that year, basic training of P-47 pilots became the primary mission of Seymour Johnson Field.

After the end of World War II in Europe, Seymour Johnson Field was designated a Central Assembly Station for processing and training troops being reassigned throughout the continental United States and the Pacific. This function was discontinued in September 1945, and the field became an Army Air Force Separation Center.

In May 1946, Seymour Johnson Field was deactivated and in 1949 the property was deeded to the City of Goldboro. The installation was then operated as a municipal airport and the facilities thereon were leased to private interests for small plants, warehousing, and family housing. Between 1950 and 1953, Piedmont Airlines conducted regular flights into Seymour Johnson Field serving Goldsboro and Wayne County.

On 30 December 1952 the City of Goldsboro transferred the base "with all privileges and appurtenances to the U.S. of America." In October 1954 the base was activated and major development of the base was conducted by the Corps of Engineers. Rehabilitation of existing facilities included the following: five warehouses, four hangars heating plant 1 and 2, sewage treatment plant, CE shops and administration building, theater, and several miscellaneous structures.

On 1 April 1956 Seymour Johnson AFB was reactivated as a Tactical Air Command base. Three months later the 83rd Fighter-Day Wing was assigned to the base. The 83rd Fighter Wing was deactivated on 8 December 1957 and the 4th Fighter Group, later designated the 4th Tactical Fighter Wing, was assigned to the base as the primary, or host, unit. While at Seymour Johnson AFB the 4th Tactical Fighter Wing has flown several different aircraft including the F-100, F-105, F-4D, and currently the F-4E.

In addition to the 4th Tactical Fighter Wing, Seymour Johnson AFB is the home of the 68th Bombardment Wing and a number of other tenant units. Aircraft based at Seymour Johnson include the F-4E, T-37, B-52G, and KC-135. There are about 5,100 military members and 800 civilian employees assigned to the base.

ORGANIZATIONS AND MISSIONS

This information was obtained from the Seymour Johnson Air Force Base Tab A-1 Narrative and other Seymour Johnson AFB records.

Primary Organization and Mission

The 4th Tactical Fighter Wing (TFW) is the host unit at Seymour Johnson AFB with a mission to train, deploy and fight, using the F-4E weapons systems anytime and anyplace.

Tenant Organizations and Missions

Seymour Johnson AFB is the host to several tenants and provides services, facilities, and other support to these organization. The following list shows the tennant units located on Seymour Johnson AFB and their missions.

68th Bombardment Wing (Heavy)

The mission of the 68th Bombardment Wing is to organize and maintain a force capable of immediate sustained offensive bombardment and air refueling operations in any part of the world. The wing is made up of seven squadrons: the 911th Air Refueling Squadron, 51st Bomb Squadron and the 68th Avionics Maintenance, Field Maintenance, Munitions Maintenance, Organizational Maintenance and Headquarter Squadron. The wing has one squadron of Boeing B-52G Stratofortress heavy bombers and one squadron of Boeing KC-135 Stratotanker aircraft tasked in worldwide air-to-air refueling in support of bombers, fighters, and airlift aircraft.

2012th Communications Squadron

The mission of the 2012th Communications Squadron is to provide base and long-haul communications, navigational aids and air traffic control services to the 4TFW, 4CSG, 68BW, and other agencies designated by the Commander, 4CSG, and Commander, Tactical Communications Area and/or other competent authority.

Detachment 2, 3rd Weather Squadron

The mission of the 3rd Weather Squadron, Det. 2 is to provide meteorological service required to support the 4th TFW and 68th BW and to fulfill any special requirements established by the Air Weather Service Commander.

205th Field Training Detachment

The mission of the 205th Field Training Detachment is to provide on-site maintenance training and aircrew familiarization for personnel of the 4th TFW.

Air Force Office of Special Investigations (AFOSI), Detachment 2104

The mission of the AFOSI, Det. 2104 is to provide a criminal, counterintelligence and special investigations service for all Air Force activities on the base.

Defense Property Disposal Office (DPDO)

The mission of the DPDO is to provide for the sale of Department of Defense generated waste.

U.S. Army Corps of Engineers (COE)

The mission of the Army Corps of Engineers Office is to provide resident inspection for all military construction as authorized by Congress.

U.S. Air Force Judiciary

The USAF Judiciary Office provides area legal defense council to military personnel.

14th Flying Training Wing (FTW), Detachment OL-B

The mission of the 14th FTW, Det. OL-B is to provide flight time training for B-52 pilots under the Accelerated Co-pilot Enrichment (ACE) program in T-37 aircraft.

Detachment 15, 4400th Management Engineering Squadron

The mission of the 4400th Management Engineering Squadron, Det. 15 is to provide the capability for improving the management of USAF and TAC manpower resources.

Detachment 7, 2nd Aircraft Delivery Group

The mission of the 2nd Aircraft Delivery Group, Det. 7 is to prepare and ferry tactical aircraft from the United States to overseas locations.

Defense Investigative Service

The mission of the Defense Investigative Service is to provide security investigative service for the Department of Defense.

APPENDIX C

SUPPLEMENTAL ENVIRONMENTAL SETTING
AND
BASE FINDINGS INFORMATION

APPENDIX C

SUPPLEMENTAL ENVIRONMENTAL SETTING AND BASE FINDINGS INFORMATION

Appendix C includes supplemental data pertaining to the following specific areas:

Table C.1 - Surface Water Quality Data and Wastewater Characterization Data

Table C.2 - Pesticides Used During 1981 and 1982

Table C.3 - Oil/Water Separators Located at Seymour Johnson AFB

Table C.4 - List of Petroleum Product Storage Tanks at Seymour Johnson AFB

TABLE C.1
SEYMOUR JOHNSON AFB
CURRENT SURFACE WATER QUALITY AND WASTEWATER CHARACTERIZATION DATA
SAMPLE COLLECTED APRIL 1982

Parameter	Units	Station Number and Location Description						
		No. 61[1] STP Manhole @ Curtis Ave.	No. 79[1] Weir in Sanitary Sewer Line	No. 9 Ditch on South Side of Runway	No. 11 Neuse River South of Base	No. 12 Neuse River North of Base	No. 13 Stoney Creek Near Neuse River	No. 14 Stoney Creek Upstream of Base
Chromium	μg/l	<50	<50	<50	<50	<50	<50	<50
Lead	μg/l	<50	<50	<50	<50	<50	<50	<50
Zinc	μg/l	110	125	<50	<50	<50	<50	<50
Phenol	μg/l	58	46	<10	<10	<10	<10	<10
Total Dissolved Solids (TDS)	mg/l	351	340	109	86	68	100	89
Residue	mg/l	483	436	111	111	94	100	99
Surfactants (MBAS)	mg/l	6.7	6.8	<0.1	<0.1	<0.1	<0.1	<0.1
Turbidity	Units	---	---	7	28	28	6	7
Acidity, Total	mg/l, $CaCO_3$	---	---	16	5	4	6	6
Alkalinity, Total	mg/l, $CaCO_3$	---	---	14	32	29	24	24
Oil and Grease	mg/l	47	78	20	10.6	1.1	0.5	1.6
COD	mg/l	155	110	13	47	22	15	18
Nitrate (as N)	mg/l	---	---	1.9	0.5	0.5	1.3	1.7
TKN (as N)	mg/l	21	22	<1.0	<1.0	<1.0	<1.0	<1.0
Phosphorus (as P)	mg/l	9.88	10.13	<.10	0.20	0.21	0.10	0.11
Mercury	μg/l	<5	<5					

[1] These monitoring points are located on Century Road near Building 2103.

Source: Seymour Johnson AFB records.

TABLE C.2
SEYMOUR JOHNSON AFB
PESTICIDES USED DURING 1981 AND 1982

Chemical Name	Common Name	Estimate of Past Annual Quantity Used (lbs)
0,0,0',0'-Tetramethyl, 0-Thiodi-P-Phenylene Phosphorothioate	Abate - 4E	10
Aluminum Phosphide	Aluminum Phosphide	<1
Ammonium Sulfamate	Ammonium Sulfamate	200
3-(Alpha-Acetonylbenzl) 4-Hydroxycoumarin	Anticoagulant rat bait	100
4-Aminopyridine	Avitrol bird control	50
Phenol Methylcarbamate	Baygon 1% - S Baygon roach bait	25
Calcium Cyanide	Calcium Cyanide	20
Octachloro - 4,7 Methanotetra Hydroindane	Chlordane 73.6% Chlordane D 50%	300
2,2-Dichloropropionic Acid	Dalapon 85%	300
P,P-Diethyl-0-(2-Isopropyl-6-Methyl-5-Pyrimidinyl) Phosphorothioate	Diazinon, 2% Dust Diazinon, 48% EC	25 150
Dimethyl-1,2-Dibromo-2,2-Dichloroethyl Phosphate	Dibrom fly killer	15
Bacillus Thuring Densis	Dipel Dust 0.064%	50
2-Diphenylagetyl-1, 3-inpandione	Diphacinone bait blocks	100
6,7-Dehydrodiphyrido (1,2-A, 2', 1'-C) Pyrazidinium Dibromide	Diquat 64.7%	12

TABLE C.2
SEYMOUR JOHNSON AFB
PESTICIDES USED DURING 1981 AND 1982

Chemical Name	Common Name	Estimate of Past Annual Quantity Used (lbs)
3-(3,4-Dichlorophenyl) 1,1-Dimethylurea	Diuron 80%	200
0,0-Diethyl-0-(3,5,6-Trichloro-2-Pyridyl) Phosphorothioate	Dursban 41.2%	40
2,2-Dimethyl-1,3-Benzo-dioxol-4-Methylcarbamate	FICAM 76%	20
2-(1-Methylethoxyphenyl) Methylcarbamate	Hornet and wasp killer	400 cans
5-Bromo-3-SEC-Butyl 6-Methyluracil	Hyvar XL 21.9%	800
2-(2,4,5-Trichlorophenoxy) Propionic Acid	Kuron; 2,4,5-T	20
Gama-1,2,3,4,5,6- Hexa-chlorohexane	Lindane 1% D	10
O,O-Dimethyl Phos-phorodithioate Ester of Diethyl Mercapto-succinate	Malathion D 5% Malathion 57% EC Malathion 95% S Malathion WP 25%	150 total
p-Dichlorobenzene	Paradichlorobenzene	200
1,1-Dimethyl-4,4'-Bipyridinium (cation) Dichloride	Paraquat CL 29.1%	250
3-Phenoxybenzyl D-Cis-and 2,2-Dimethyl-3-(2-Methylpropenyl) Cyclopropanecarboxylate	Phenothrin Refrosal	1400 cans
Sodium Chlorate	POLY-BOR-CHLORATE	3,000
2-Methoxy-4,6-BIS (Isopropylamino)-S-Triazine	Pramitol 25E	125

TABLE C.2
SEYMOUR JOHNSON AFB
PESTICIDES USED DURING 1981 AND 1982
(Continued)

Chemical Name	Common Name	Estimate of Past Annual Quantity Used (lbs)
2-Chloro-4,6-BIS (Ethylamino)-S-Triazine	Princep/Simazine 80% W	100
N-(phosphonomethyl) Glycine (Isopropyl-amine salt)	Round-Up 41% E	500
1-Naphthyl-Methyl-Carbamate	Sevimol liquid 40% Sevin D 5%	150
4-Amino-3,5,6-Trichloro-picolinic Acid	Tordon 10K Pel 8%	100
Sodium N-Methyldi-thiocarbamate Dihydrate	Vapam 32.7%	20
1-(4'-hydroxy-3'-coumarinyl)-1-phenyl-3-butanone	Warfarin 0.025% Warfarin (Cat-in-Bag)	20

SOURCE: Seymour Johnson AFB Records

TABLE C.3
LIST OF OIL/WATER SEPARATORS LOCATED
AT SEYMOUR JOHNSON AFB

Bldg. No.	Facility	Tank or Sump Liquid Storage Capacity (Gal.)
2150	Armament Shop	55-60
2500	Hobby Shop	280
2505	Locomotive Engine Shop	Skim Only
3100	Vehicle Maintenance	300
3220	Refuel Maintenance	500
		280
4500	Aircraft Paint Shop	360
4600	Fire Station	330
4715	AGE (Washrack)	315
4720	AGE (Sand Trap - inside)	---
4730	TAC Washrack Tank	Skim Off
4735	Fuel System Dock	270
4740	SAC Washrack	728
4810	Engine Shop	350
4820	Nose Dock	450
4821	Nose Dock	260
4828	Nose Dock	260
		260
4908	TAC Engine Shop	280
10163	Power Check Pad	500
10279	Power Check Pad	500
10328	Jet Engine Test Cell	285
10431	Fire Training Facility	Skim

Source: Seymour Johnson AFB records.

TABLE C.4
LIST OF PETROLEUM PRODUCT STORAGE
TANKS AT
SEYMOUR JOHNSON AFB

JP-4 STORAGE TANKS

Location	No. of Tanks	Tank Volume (gals)	Description
Fuel Tank Farm	2	420,000	above ground
	3	840,000	above ground
Fire Training	1	5,000	above ground
TAC Trim Pads	2	2,500	above ground
Test Cell (2110)	1	1,000	above ground
AGE Shop (4715)	2	1,500	underground
AGE Shop (TAC)	1	1,000	above ground
Pumphouse No. 1	6	50,000	underground
Pumphouse No. 2	4	50,000	underground
Test Cell (5008)	1	5,000	above ground
Pumphouse No. 3	6	50,000	underground
SAC Apron	1	400	underground
Maintenance Docks	1	3,000	underground

MOGAS AND UNLEADED STORAGE TANKS

Fuel Tank Farm	1	25,000	underground
Auxiliary Storage	1	2,000	above ground
Fire Station	1	2,000	underground
Military Service Station	1	8,000	underground
Military Service Station	1	12,000	underground

TABLE C.4
LIST OF PETROLEUM PRODUCT STORAGE
TANKS AT
SEYMOUR JOHNSON AFB
(Continued)

MOGAS AND UNLEADED STORAGE TANKS (Continued)

Location	No. of Tanks	Tank Volume (gals)	Description
Vehicle Maintenance	1	7,230	underground
	1	11,700	underground
Base Exchange Service Station	3	10,000	underground
	1	5,000	underground
Golf Course	1	500	underground
CE Maintenance	1	500	underground
Building 2121 (MMS)	1	500	above ground
Building 2213	1	500	above ground
Building 5005	1	2,000	underground
AGE Shop (4715)	1	1,500	underground
AGE Shop (TAC)	1	1,000	above ground

TABLE C.4
LIST OF PETROLEUM PRODUCT STORAGE
TANKS AT
SEYMOUR JOHNSON AFB
(Continued)

FUEL OIL STORAGE TANKS

Location	No. of Tanks	Tank Volume (gals)	Description
Missle Run-up	1	1,500	underground
Engine Test Cell	1	500	underground
Service Shop	1	6,000	underground
Pumphouse (3400)	2	12,000	underground
Heat Plant (4503, 2700,5000)	1	75,000	above ground
	1	210,000	above ground
	1	75,000	above ground
Fire Station Washrack*	1	75	above ground
Auto Hobby Shop (3104)	1	750	underground
Serv Hangar (2121)	1	6,000	underground
72 Hangar (2123)	1	500	underground
Comb. Systems (2125)	1	1,500	underground
SAC Alert	1	500	underground
SAC Alert	1	4,000	underground
Ordinance (2150)	1	2,000	underground
NDI Lab	1	2,000	underground
TAC Ammo	1	1,000	underground
Missile Assembly	1	5,000	underground
SAC Ammo Guard House	1	5,000	underground
SAC S & I (6238)	1	1,000	underground

* Water demineralizer tank

TABLE C.4
LIST OF PETROLEUM PRODUCT STORAGE
TANKS AT
SEYMOUR JOHNSON AFB
(Continued)

FUEL OIL STORAGE TANKS (Continued)

Location	No. of Tanks	Tank Volume (gals)	Description
TAC Ammo	1	2,000	underground
Hobby Shop	1	1,000	underground
Photo Lab	1	1,500	underground
Admin Serv	1	1,500	underground
Salvage Sales (6695)	1	550	underground
Medical Storage	1	500	underground
BX Service Station	1	550	underground
Child Day Care Ctr	1	4,000	underground
Emerald Maint (5643)	1	300	above ground
Multi. Rec. Shop	1	2,000	underground
Wing Intelligence	1	1,000	underground
Paint & Dope Shop	1	1,000	underground
Battery Shop	1	550	underground
Fuel Cell Repair	2	3,000	underground
AGE	1	3,000	underground
Corrosion Control (4730)	1	1,000	underground
RAPCON (4750)	1	3,000	underground
Tower (4745)	1	1,000	underground

TABLE C.4
LIST OF PETROLEUM PRODUCT STORAGE
TANKS AT
SEYMOUR JOHNSON AFB
(Continued)

DIESEL FUEL STORAGE TANKS

Location	No. of Tanks	Tank Volume (gals)	Description
Fuel Tank Farm	1	25,000	underground
Military Service Station	1	8,000	underground
Fire Station	1	2,000	underground
Landfill Area	1	500	underground
CE Maintenance	1	500	underground
Auxiliary Storage	1	2,000	above ground
Vehicle Maintenance	1	5,000	underground

CONTAMINATED FUEL STORAGE TANKS

Fuel Tank Farm	1	12,000	underground
Heat Plant	1	5,000	above ground
	1	3,000	above ground
BX Gas Station	1	550	underground
Building 4532	1	4,000	underground

KEROSENE STORAGE TANKS

CE Maintenance	1	500	underground

APPENDIX D

MASTER LIST OF INDUSTRIAL SHOPS

APPENDIX D

MASTER LISTS

INDUSTRIAL SHOPS

Name	Present Location (Bldg. No)	Handles Hazardous Materials	Generates Hazardous Wastes	Treatment, Storage, Disposal Method(s)
USAF HOSPITAL				
Medical Maintenance	2800	yes	no	
Medical Lab	2800	yes	yes	(1)
Medical X-ray	2800	yes	yes	(1)
Dental X-ray	2805	yes	yes	(1)
Dental Lab	2805	yes	no	----
Central Supply	2800	yes	no	----
Surgery	2800	yes	no	----
4 TRANSPORTATION SQUADRON				
General Veh. Maintenance	3100	yes	yes	waste fuel boiler
Allied Trades	3100	yes	yes	waste fuel boiler
Quality Assurance (2)	3100	yes	yes	sanitary sewer
Special Veh. Maintenance	3100	yes	yes	waste fuel boiler
Refueling Maintenance	3230	yes	yes	waste fuel boiler
Packing/crating	3500	yes	no	-----
Fire Dept. Veh. Maint.	4600	yes	yes	waste fuel boiler
Base Vehicle Maintenance	3100	yes	yes	waste fuel boiler
4 SUPPLY SQUADRON				
Fuels Lab	3204	yes	yes	waste fuel boiler

(1) Silver recovery; effluent to sanitary sewer

(2) Formerly Battery Shop and Dynomometer Room

APPENDIX D
(Continued)

MASTER LISTS
INDUSTRIAL SHOPS

Name	Present Location (Bldg. No)	Handles Hazardous Materials	Generates Hazardous Wastes	Treatment, Storage, Disposal Method(s)
4 CIVIL ENGINEERING SQUADRON (CES)				
Carpentry Shop	3300	yes	no	----
Electric Shop	3300	yes	no	----
Entomology Shop	3300	yes	yes	recycling
Fire Department	4600	yes	yes	fire prot. training
Golf Course Maintenance	4040	yes	yes	recycling
Heating Plant	2700	yes	yes	waste fuel boiler
Housing Maintenance	4050	yes	no	----
Liquid Fuels Maintenance	3400	yes	yes	evaporation
Paint Shop	3300	yes	yes	contractor
Plumbing Shop	3300	yes	no	----
Power Production	3300	yes	yes	neutralized to storm drain
Refrigeration Shop	3300	yes	no	----
Roads and Grounds	3300	no	no	----
Sheetmetal Shop	3300	yes	no	----
Water Plant	3003	yes	yes	sanitary sewer
4 COMBAT SUPPORT GROUP				
Small Arms Train. Unit	2304/2330	yes	no	-----
Auto Hobby Shop	2500	yes	yes	waste fuel boiler
Arts & Crafts	4215	yes	no	-----
Photo Shop	2501	yes	yes	(1)
Dare Co. Bombing Range	Dare Co.	yes	yes	waste fuel boiler
4 COMPONENT REPAIR SQUADRON (CRS)				
Auto Pilot Shop	4312	yes	no	----
Avionics AGE[3] Shop	4312	no	no	----
Communications/Nav. Shop	4312	no	no	----
Electric Shop	4534	yes	yes	sanitary sewer

(3) Aerospace Ground Equipment

APPENDIX D
(Continued)

MASTER LISTS
INDUSTRIAL SHOPS

Name	Present Location (Bldg. No)	Handles Hazardous Materials	Generates Hazardous Wastes	Treatment, Storage, Disposal Method(s)
4 CRS (Continued)				
Elect. Countermeasures	4404	yes	no	----
Inertial Navig. Shop	4312	no	no	----
NDI[4] Lab	2151	yes	yes	sanitary sewer, heat plant
Photo and Sensor Shop	4312	yes	yes	(1)
Precision Measurement Equipment Lab (PMEL)	4312	yes	no	----
Pneudraulics Shop	4534	yes	yes	heat plant
Propulsion Shop	4908/10328	yes	yes	heat plant
Radar Calibration	4513	no	no	----
Structural Repair	4514	yes	no	----
Weapons Controls System	4513	yes	no	----
Machine/Metal Process	4534	yes	no	----
Parachute Shop	4408	yes	no	----
4 EQUIPMENT MAINTENANCE SQUADRON (EMS)				
AGE[2] Branch	4720/4533	yes	yes	heat plant
Armaments/Munitions Shop	2150	yes	yes	heat plant
Bomb Lift Veh. Shop	4533	yes	yes	heat plant
Corrosion Control	4500	yes	yes	sanitary sewer
Egress Shop	4534	yes	yes	heat plant
Equipment Maintenance	2125	yes	yes	storm drain
Fuel Systems Repair	4735	yes	yes	heat plant
Missile Maintenance	2201	yes	yes	heat plant
Non-Powered AGE	4514/4533	no	no	----
Repair & Reclamation	4511	yes	no	----
Wheel/Tire Shop	4512	yes	yes	heat plant
2012 COMMUNICATIONS SQUADRON (CS)				
Closed Circuit TV Shop	2904	no	no	----

(4) Non-Destructive Inspection

APPENDIX D
(Continued)

MASTER LISTS
INDUSTRIAL SHOPS

Name	Present Location (Bldg. No)	Handles Hazardous Materials	Generates Hazardous Wastes	Treatment, Storage, Disposal Method(s)
2012 CS (Continued)				
Computer Maintenance	3500	no	no	----
Crypto Maintenance	2904	no	no	----
Navig. Aids	4745	no	no	----
Radar Maintenance	4760/4560	no	no	----
Radio Maintenance	4709	no	no	----
RAPCOM	4750	no	no	----
Communications Maintenance (SAC)	4901	yes	no	----
Teletype Maintenance	2904	no	no	----
68 AVIONICS MAINTENANCE SQUADRON (AMS)				
Auto Pilot Shop	4900	no	no	----
Bomb Navig. Shop	4900	no	no	----
Communications Shop	4900	no	no	----
Doppler Maintenance	4900	no	no	----
Elect. Countermeasures	4900	no	no	----
Fire Control Shop	4900	yes	yes	DPDO
Instrument Shop	4900	no	no	----
Radar Navig. Shop	4900	no	no	----
68 FIELD MAINTENANCE SQUADRON (FMS)				
Corrosion Control	4820	yes	yes	contractor, sanitary sewer
Egress Shop	4909	no	no	----
Electric Shop	4909	yes	yes	sanitary sewer
Environmental Systems	4909	yes	no	----
Fuel Systems Shop	4828	yes	yes	heat plant
Pneudraulics Shop	4909	yes	yes	heat plant
Propulsion Shop	4810	yes	yes	heat plant
Structural Repair	4534	yes	no	----
Wheel & Tire Shop	4906	yes	yes	contractor, heat plant

APPENDIX D
(Continued)

MASTER LISTS
INDUSTRIAL SHOPS

Name	Present Location (Bldg. No)	Handles Hazardous Materials	Generates Hazardous Wastes	Treatment, Storage, Disposal Method(s)
68 (FMS)(Continued)				
AGE Shop	4720	yes	yes	heat plant
Parachute Shop	4810	yes	no	----
Metal Process/Machine Shop	4534	yes	no	----
Welding Shop	4534	yes	no	----
68 MUNITIONS MAINTENANCE SQUADRON (MMS)				
Aircraft Inspection Shop	2121	no	no	----
B-52 Loading Shop	2121	no	no	----
Munitions Maintenance	2208	yes	no	----
Equipment Maintenance	2121	yes	yes	heat plant
Munitions Maint. (SRAM)	2202	yes	no	----
SRAM Missile Shop	2202	yes	no	----
VACE Shop	2202	yes	no	----
68 ORGANIZATIONAL MAINTENANCE SQUADRON (OMS)				
Bomber Phase Shop	4909	yes	yes	heat plant
Tanker Phase Shop	4821	yes	yes	o/w separ. to san. sewer
Non-Power AGE	4909	yes	no	heat plant
SAC Washrack	4540	yes	yes	o/w separ. to san. sewer

APPENDIX E

PHOTOGRAPHS

SEYMOUR JOHNSON AFB

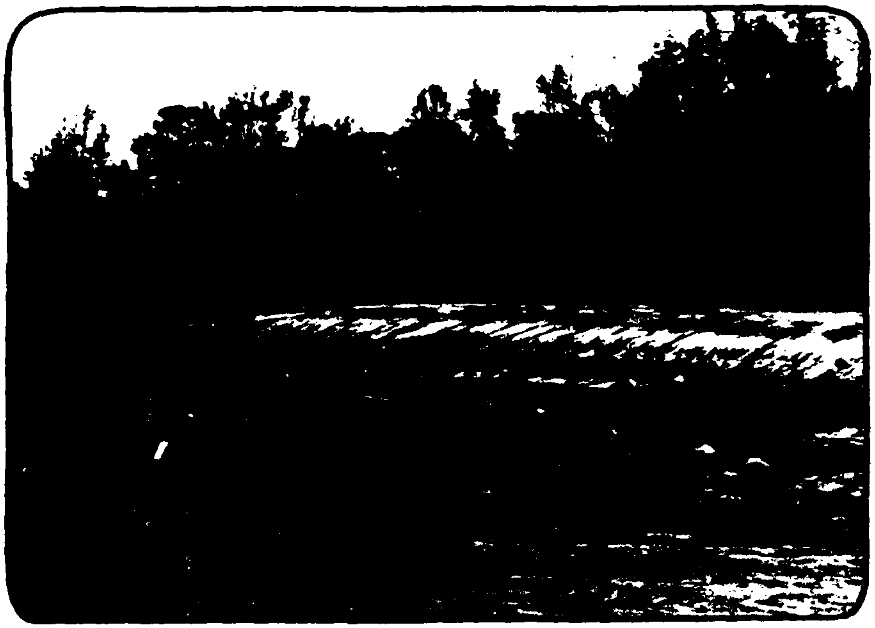
Fire Protection Training Area No. 3

Landfill No. 1

Landfill No. 2

Landfill No. 3

SEYMOUR JOHNSON AFB



Landfill No. 4

Landfill No. 4


JOHNSON AFB NC
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APPENDIX F

HAZARD ASSESSMENT RATING METHODOLOGY

APPENDIX F

USAF INSTALLATION RESTORATION PROGRAM
HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with representatives from USAF Occupational Environmental Health Laboratory (OEHL), Air Force Engineering Services Center (AFESC), Engineering-Science (ES) and CH_2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering Science, and CH_2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Record Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, potential pathways for waste contaminant migration, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste managment practices category factor to the sum of the scores for the other three categories.

FIGURE 1

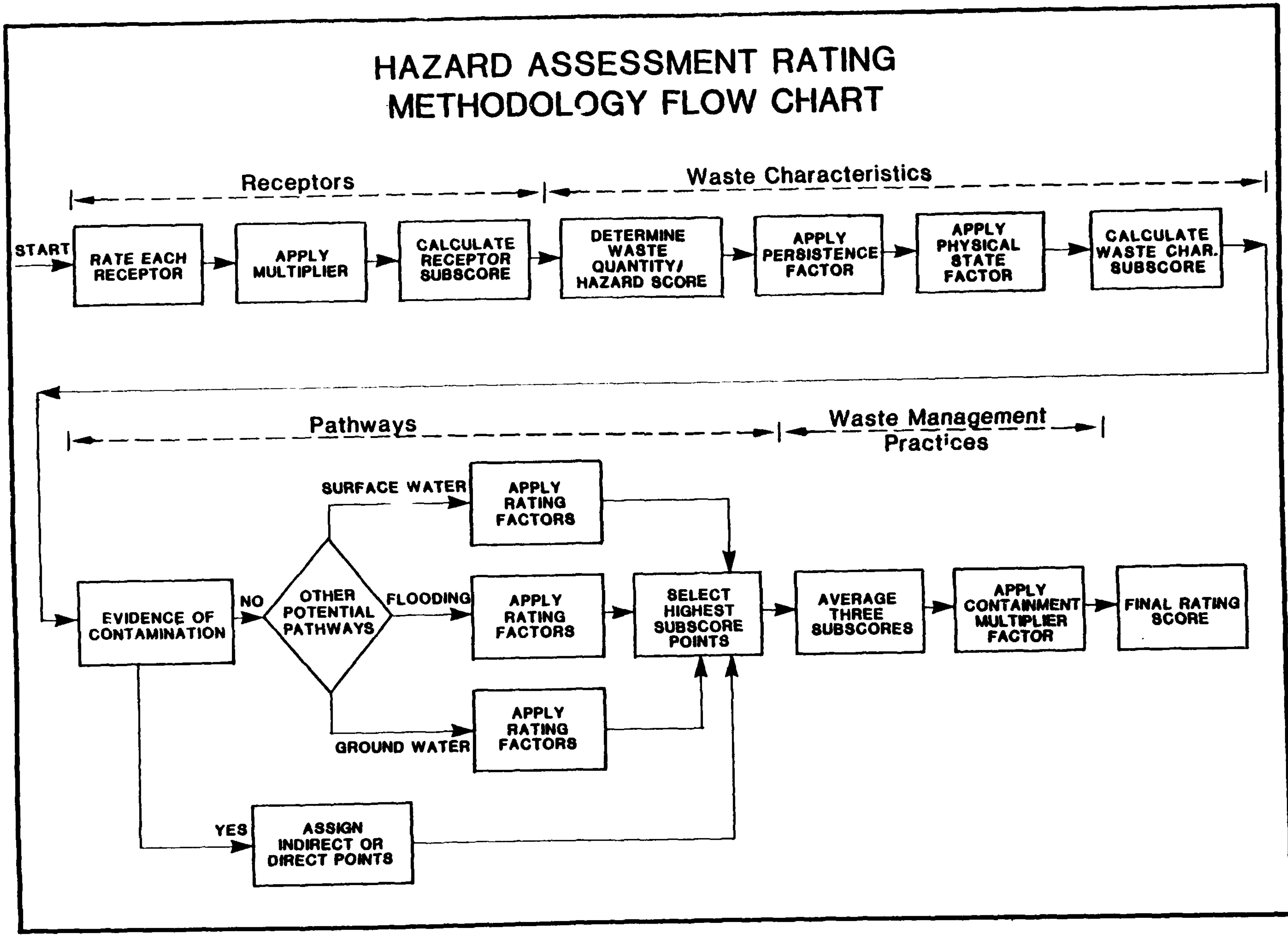
HAZARD ASSESSMENT RATING
METHODOLOGY FLOW CHART
Receptors
Waste Characteristics
START
RATE EACH RECEPTOR
APPLY MULTIPLIER
CALCULATE RECEPTOR SUBSCORE
DETERMINE WASTE QUANTITY/ HAZARD SCORE
APPLY PERSISTENCE FACTOR
APPLY PHYSICAL STATE FACTOR
CALCULATE WASTE CHAR. SUBSCORE
Pathways
Waste Management Practices
SURFACE WATER
APPLY RATING FACTORS
EVIDENCE OF CONTAMINATION
NO
OTHER POTENTIAL PATHWAYS
FLOODING
APPLY RATING FACTORS
SELECT HIGHEST SUBSCORE POINTS
AVERAGE THREE SUBSCORES
APPLY CONTAINMENT MULTIPLIER FACTOR
FINAL RATING SCORE
GROUND WATER
APPLY RATING FACTORS
YES
ASSIGN INDIRECT OR DIRECT POINTS

FIGURE 2

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE ______________________________

LOCATION ______________________________

DATE OF OPERATION OR OCCURRENCE ______________________________

OWNER/OPERATOR ______________________________

COMMENTS/DESCRIPTION ______________________________

SITE RATED BY ______________________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals	______	______

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ______

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ______
2. Confidence level (C = confirmed, S = suspected) ______
3. Hazard rating (H = high, M = medium, L = low) ______

Factor Subscore A (from 20 to 100 based on factor score matrix) ______

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

FIGURE 2 (Continued)

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
		Subtotals	______	______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
		Subtotals	______	______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ______

TABLE 1

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	6
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	3
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (<5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (>20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least [illegible] or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records.
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

Rating Factor	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8
B-2 POTENTIAL FOR FLOODING					
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1

B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION

Rating Factor	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. WASTE MANAGEMENT PRACTICES FACTOR

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Proection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX G

SITE RATING FORMS

SITE RATING FORMS

TABLE OF CONTENTS

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Leakage from Fuel Hvdrant System

LOCATION Aircraft Parking Apron

DATE OF OPERATION OR OCCURRENCE Leaks have been detected since 1978

OWNER/OPERATOR Seymour Johnson AFB

COMMENTS/DESCRIPTION

SITE RATED BY E. J. Schneider

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			85	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 47

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 0.8 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 100

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
Subtotals				

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
Subtotals				

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pat.. ways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	47
Waste Characteristics	80
Pathways	100
Total 227 divided by 3 =	76 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

76 x 1.0 = 76

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Tank Farm Fuel Spill

LOCATION POL Tank Farm

DATE OF OPERATION OR OCCURRENCE November, 1980

OWNER/OPERATOR Seymour Johnson AFB

COMMENTS/DESCRIPTION JP-4 being removed from recovery well north of the tank farm

SITE RATED BY [signature]

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	83	180

Receptors subscore (100 X factor score subtotal/maximum score [illegible]) 46

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 0.8 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 100

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
Subtotals				

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
Subtotals				

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	46
Waste Characteristics	80
Pathways	100

Total 226 divided by 3 = 75 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

75 x 1.0 = 75

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Landfill No. 4
LOCATION East of Fire Training Area
DATE OF OPERATION OR OCCURRENCE 1971 to Present
OWNER/OPERATOR Seymour Johnson AFB
COMMENTS/DESCRIPTION Received Base Refuse through 1978, still open for trash disposal
SITE RATED BY E J Schraeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	98	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 54

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 0.9 = 36

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

36 x 1.0 = 36

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			82	108

Subscore (100 X factor score subtotal/maximum score subtotal) 76

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
Subtotals			68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	54
Waste Characteristics	36
Pathways	80
Total 170 divided by 3 =	57 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

57 x 1.0 = 57

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Fire Protection Training Area No. 3

LOCATION Facility 10431 - Between Mitchell Avenue and Stoney Creek

DATE OF OPERATION OR OCCURRENCE 1956 to Present

OWNER/OPERATOR Seymour Johnson AFB

COMMENTS/DESCRIPTION Contaminated Fuels and waste chemicals burned in pit.

SITE RATED BY E. J. Schneider

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	94	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.9 = 72

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

72 x 1.0 = 72

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			60	114

Subscore (100 x factor score subtotal/maximum score subtotal) 53

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 53

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	52
Waste Characteristics	72
Pathways	53

Total 177 divided by 3 = 59 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

59 X 0.95 = 56

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Landfill No. 3

LOCATION By Trailer Park

DATE OF OPERATION OR OCCURRENCE 1961 thru 1970

OWNER/OPERATOR Seymour Johnson AFB

COMMENTS/DESCRIPTION Received Base Refuse, Some Burning; Closed Site.

SITE RATED BY [signature]

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	102	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 0.9 = 36

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

36 x 1.0 = 36

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
		Subtotals	68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 57
Waste Characteristics 36
Pathways 60

Total 153 divided by 3 = 51
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

51 x 1.0 = 51

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE B-52 Crash Site

LOCATION Saulston Annex

DATE OF OPERATION OR OCCURRENCE 1962

OWNER/OPERATOR Air Force Easement

COMMENTS/DESCRIPTION

SITE RATED BY E / [illegible signature]

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well Assumed	3	10	30	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
Subtotals			91	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 51

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 0.5 = 30

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	44	108

Subscore (100 X factor score subtotal/maximum score subtotal) 41

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
		Subtotals	68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	51
Waste Characteristics	30
Pathways	60

Total 141 divided by 3 = 47 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

47 x 0.95 = 45

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Munitions Residue Burial Site

LOCATION Southwest Area of Base

DATE OF OPERATION OR OCCURRENCE 1956 to Present

OWNER/OPERATOR Seymour Johnson AFB

COMMENTS/DESCRIPTION Disposal of Non-Explosive Munitions Residue.

SITE RATED BY [signature]

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	91	180

Receptors score (100 X factor score subtotal/maximum score subtotal) 51

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 30

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

30 x 1.0 = 30

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

30 x 0.5 = 15

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	2	1	2	

Subscore (100 x factor score/3) 67

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
Subtotals			68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	51
Waste Characteristics	15
Pathways	67

Total 133 divided by 3 = 44 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

44 x 1.0 = 44

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Landfill No. 2

LOCATION North of Munitions Storage

DATE OF OPERATION OR OCCURRENCE 1956 thru 1961

OWNER/OPERATOR Seymour Johnson AFB

COMMENTS/DESCRIPTION Received Base Refuse, Burned, Closed Site

SITE RATED BY [illegible signature]

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	81	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 45

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 20

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

20 x 0.8 = 16

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

16 x 0.75 = 12

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			69	108

Subscore (100 X factor score subtotal/maximum score subtotal) 62

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	2	1	2	

Subscore (100 x factor score/3) 67

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
Subtotals			68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	45
Waste Characteristics	12
Pathways	67

Total [illegible] divided by 3 = 41 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

41 X [illegible] = 41

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Landfill No. 1

LOCATION North of Fire Training Area

DATE OF OPERATION OR OCCURRENCE 1941 thru 1946

OWNER/OPERATOR Seymour Johnson AFB

COMMENTS/DESCRIPTION Received Base Refuse & Ash from Incinerator. Closed Site.

SITE RATED BY E J Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	84	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 47

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) [illegible]
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) [illegible]

Factor Subscore A (from 20 to 100 based on factor score matrix) [illegible]

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

20 x 0.8 = 16

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

16 x 0.75 = 1[illegible]

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			68	108

Subscore (100 X factor score subtotal/maximum score subtotal) 63

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
Subtotals			60	114

Subscore (100 x factor score subtotal/maximum score subtotal) 53

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 63

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 47
Waste Characteristics 12
Pathways 63

Total _____ divided by 3 = 41 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

41 x 1.0 = 41

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Coal Pile

LOCATION Adjacent to Bldg. 2700

DATE OF OPERATION OR OCCURRENCE 1956 to 1972

OWNER/OPERATOR Seymour Johnson AFB

COMMENTS/DESCRIPTION Coal residues are present on the inactive site

SITE RATED BY [illegible signature]

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	86	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 48

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 30

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

30 x 1.0 = 30

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

30 x 0.5 = 15

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			60	114

Subscore (100 x factor score subtotal/maximum score subtotal) 53

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 53

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 48
Waste Characteristics 15
Pathways 53

Total 116 divided by 3 = 39
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

39 x 1.0 = 39

APPENDIX H

REFERENCES

APPENDIX H
REFERENCES

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APPENDIX I

GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

APPENDIX I

GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

ACFT MAINT: Aircraft Maintenance

AF: Air Force

AFFF: Aqueous Film Forming Foam

AFB: Air Force Base

AFR: Air Force Regulation

AFSC: Air Force Systems Command

Ag: Chemical symbol for silver

AGE: Aerospace Ground Equipment

Al: Chemical symbol for aluminum

ARTESIAN: Ground water contained under hydrostatic pressure

AQUICLUDE: Poorly permeable formation that impedes ground-water movement and does not yield water to a well or spring

AQUIFER: A geologic formation, group of formations, or part of a formation that is capable of yielding water to a well or spring

AQUITARD: A soils formation which impedes groundwater flow

AVGAS: Aviation Gasoline

Ba: Chemical symbol for barium

BES: Bioenvironmental Engineering Services

BIOACCUMULATE: Tendency of elements or compounds to accumulate or build up in the tissues of living organisms when they are exposed to these elements in their environments, e.g., heavy metals

CARBON REMOVER: A material containing approximately 15 percent butyl cellusolve and 10 percent monoethanol amine and 75 percent petroleum distillates

Cd: Chemical symbol for cadmium

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act

CES: Civil Engineering Squadron

CIRCA: About; used to indicate an approximate date

CLOSURE: The completion of a set of rigidly defined functions for a hazardous waste facility no longer in operation

COD: Chemical Oxygen Demand, a measure of the amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water

COE: Corps of Engineers

CONFINED AQUIFER: An aquifer bounded above and below by impermeable beds or by beds of distinctly lower permeability than that of the aquifer itself

CONTAMINATION: The degradation of natural water quality to the extent that its usefulness is impaired; there is no implication of any specific limits since the degree of permissible contamination depends upon the intended end use or uses of the water

Cr: Chemical symbol for chromium

Cu: Chemical symbol for copper

DASC: Direct Air Support Center

DET: Detachment

DISPOSAL FACILITY: A facility or part of a facility at which hazardous waste is intentionally placed into or on land or water, and at which waste will remain after closure

DISPOSAL OF HAZARDOUS WASTE: The discharge, deposit, injection, dumping, spilling, or placing of any hazardous waste into or on land or water so that such waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground water

DOD: Department of Defense

DOWNGRADIENT: In the direction of decreasing hydraulic static head; the direction in which ground water flows

DPDO: Defense Property Disposal Office, previously included Redistribution and Marketing (R&M) and Salvage.

DUMP: An uncovered land disposal site where solid and/or liquid wastes are deposited with little or no regard for pollution control or aesthetics; dumps are susceptible to open burning and are exposed to the elements, disease vectors and scavengers

EOD: Explosive Ordnance Disposal

EFFLUENT: A liquid waste discharge from a manufacturing or treatment process, in its natural state, or partially or completely treated, that discharges into the environment

EPA: U.S. Environmental Protection Agency

EROSION: The wearing away of land surface by wind or water

FAA: Federal Aviation Administration

FACILITY: Any land and appurtenances used for the treatment, storage and/or disposal of hazardous wastes

Fe: Chemical symbol for iron

FLOOD PLAIN: The lowland and relatively flat areas adjoining inland and coastal areas of the mainland and off-shore islands, including, at a minimum, areas subject to a one percent or greater chance of flooding in any given year

FLOW PATH: The direction or movement of ground water and any contaminants that may be contained therein, as governed principally by the hydraulic gradient

FPT: Fire Protection Training

FTA: Fire Training Area

GROUND WATER: Water beneath the land surface that is under atmospheric or artesian pressure

GROUND WATER RESERVOIR: The earth materials and the intervening open spaces that contain ground water

HALF-LIFE: The time required for half the atoms present in radioactive substance to disintegrate

HALON 1211: A fire fighting foam compound

HARDFILL: Disposal sites receiving construction debris, wood, miscellaneous spoil material

HARM: Hazard Assessment Rating Methodology

HAZARDOUS WASTE: A solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed

HAZARDOUS WASTE GENERATION: The act or process of producing a hazardous waste

HEAVY METALS: Metallic elements, including the transition series, which include many elements required for plant and animal nutrition in trace concentrations but which become toxic at higher concentrations

Hg: Chemical symbol for mercury

HQ: Headquarters

HWMF: Hazardous Waste Management Facility

INCOMPATIBLE WASTE: A waste unsuitable for commingling with another waste or material because the commingling might result in generation of extreme heat or pressure, explosion or violent reaction, fire, formation of substances which are shock sensitive, friction sensitive, or otherwise have the potential for reacting violently, formation of toxic dusts, mists, fumes, and gases, volatilization of ignitable or toxic chemicals due to heat generation in such a manner that the likelihood of contamination of ground water or escape of the substance into the environment is increased, any other reaction which might result in not meeting the air, human health, and environmental standard

INFILTRATION: The gradual passing of liquid through matter.

IRP: Installation Restoration Program

JP-4: Jet Fuel

LEACHATE: A solution resulting from the separation or dissolving of soluble or particulate constituents from solid waste or other man-placed medium by percolation of water

LEACHING: The process by which soluble materials in the soil, such as nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water

LINER: A continous layer of natural or man-made materials beneath or on the sides of a surface impoundment, landfill, or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents or leachate

LOX: Liquid Oxygen

LYSIMETERS: A vacuum operated sampling device used for extracting pore water samples at various depths within the unsaturated zone

MAC: Military Airlift Command

MAS: Military Air Service

MGD: million gallons per day

MOA: Military Operating Area

Mn: Chemical symbol for manganese

MONITORING WELL: A well used to measure ground-water levels and to obtain samples

MSL: Mean Sea Level

MUNITION ITEMS: Munitions or portions of munitions having an explosive potential.

MUNITIONS RESIDUE: Non-explosive segments of waste munitions (i.e., bomb casings)

NET PRECIPITATION: The amount of annual precipitation minus annual evaporation.

Ni: Chemical symbol for nickel

OEHL: Occupational and Environmental Health Laboratory

ORGANIC: Being, containing or relating to carbon compounds, especially in which hydrogen is attached to carbon

O&G: Symbols for oil and grease

OT&E: Operations, Training and Evaluation

Pb: Chemical symbol for lead

PCB: Polychlorinated Biphenyls; highly toxic to aquatic life; they persist in the environment for long period and are biologically accumulative

PERCOLATION: Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil

PERMEABILITY: The rate at which fluids may move through a solid, porous medium.

PD-680: Cleaning solvent, safety solvent, Stoddard solvent, petroleum distillate

pH: Negative logarithm of hydrogen ion concentration; measurement of acids and bases

PL: Public Law

POL: Petroleum, Oils and Lubricants

POLLUTANT: Any introduced gas, liquid or solid that makes a resource unfit for a specific purpose

PRECIPITATION: Rainfall

RCRA: Resource Conservation and Recovery Act

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RECHARGE AREA: An area in which water is absorbed that eventually reaches the zone of saturation in one or more aquifers

RECHARGE: The addition of water to the ground-water system by natural or artificial processes

RECON: Reconnaissance

RWDS: Radioactive Waste Disposal Site

SAC: Strategic Air Command

SANITARY LANDFILL: A land disposal site using an engineered method of disposing solid wastes on land in a way that minimizes enviromental hazards

SATURATED ZONE: That part of the earth's crust in which all voids are filled with water

SJAFB: Seymour Johnson Air Force Base

SLUDGE: The solid residue resulting from a manufacturing or wastewater treatment process which also produces a liquid stream

SOLID WASTE: Any garbage, refuse, or sludge from a waste treatment plant, water suply treatment, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, or agricultural operations and from community activities, but does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges which are point source subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 USC 880); or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (68 USC 923)

SPILL: Any unplanned release or discharge of a hazardous waste onto or into the air, land, or water

STORAGE OF HAZARDOUS WASTE: Containment, either on a temporary basis or for a longer period, in such a manner as not to constitute disposal of such hazardous waste

TAC: Tactical Air Command

TKN: Total Kjeldahl Nitrogen

TOC: Total Organic Carbon

TOXICITY: The ability of a material to produce injury or disease upon exposure, ingestion, inhalation, or assimilation by a living organism

TRANSMISSIVITY: The rate at which water is transmitted through a unit width under a unit hydraulic gradient

TREATMENT OF HAZARDOUS WASTE: Any method, technique, or process including neutralization designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize the waste or so as to render the waste nonhazardous

TS: Training site

UPGRADIENT: In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of ground-water

USAF: United States Air Force

V: Chemical symbol for vanadium

WATER TABLE: Surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere

Zn: Chemical symbol for zinc

LME

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