SD-TR-85-31

AD-A157 208

INSTALLATION RESTORATION PROGRAM
PHASE I: RECORDS SEARCH
SUNNYVALE AIR FORCE STATION, CALIFORNIA

FINAL REPORT

PREPARED FOR
DEPARTMENT OF THE AIR FORCE
HQ SPACE DIVISION (DEV)
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JULY 1985

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

An Installation Restoration Program Phase I records Search was conducted of Sunnyvale Air force Station and Camp Parks Communication Annex from Jan. 8 to Jan. 31, 1985. Past and current employees were interviewed, records were reviewed, regulatory agencies were contacted, and a ground reconnaissance was conducted. Past waste handling and disposal practices were evaluated, and six past waste disposal or spill sites were identified. The sites were evaluated for potential for contamination and migration of contaminants using a decision tree process. All six sites were found

20. Abstract *(Continued)*

to have no potential for residual contamination and/or contaminant migration. Therefore, no Phase II confirmatory sampling and analysis programs are recommended for these sites. Operations at two sites need to be reviewed by the base environmental program and modifications made in accordance with state and federal regulations.

PREFACE

The Installation Restoration Program Phase I: Records Search, Sunnyvale Air Force Station, California was prepared by Environmental Science and Engineering, Inc., Gainesville, Florida.

It describes the installation missions, environment including geology and hydrology, findings of the records search for past hazardous material disposal sites, conclusions and recommendations. It will be used to identify and control the migration of hazardous contaminants, and to control hazards to health or welfare that may result from past disposal practices.

This work was initiated in September, 1984 and was completed in July, 1985. Mr. John R. Edwards, Headquarters Space Division was the Project Manager.

This report has been reviewed by the office of Public Affairs (PA) and is releasable to the National Technical Information Service (NTIS). At the NTIS, it will be available to the general public, including foreign nations.

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INSTALLATION RESTORATION PROGRAM

PHASE I: RECORDS SEARCH

SUNNYVALE AIR FORCE STATION, CALIFORNIA

Prepared for:

UNITED STATES AIR FORCE
HQ SD/DEV
Los Angeles AFS, California

Prepared by:

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.
Gainesville, Florida

July 1985

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EXECUTIVE SUMMARY

INTRODUCTION

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 known as the Installation Restoration Program (IRP) and consists of four phases: Phase I--Initial Assessment/Records Search, Phase II--Confirmation and Quantification, Phase III--Technology Base Development, and Phase IV--Operations/Remedial Actions. Environmental Science and Engineering, Inc. (ESE) conducted the Phase I study of Sunnyvale Air Force Station (SAFS) and Camp Parks Communications Annex (CPCA), with funds provided by the Air Force Systems Command (AFSC).

INSTALLATION DESCRIPTION

SAFS is situated approximately 40 miles southeast of San Francisco in Santa Clara County, Calif., near the southwest edge of San Francisco Bay. The station occupies 19.6 acres bounded on the east by Mathilda Ave., on the south by Moffett Drive, and on the west by Lockheed Way. The property north and west of SAFS is owned by Prudential Insurance Co. and leased by Lockheed Missile and Space Co. The property south of SAFS is completely developed, and the land east of Mathilda Ave. has been developed for commercial use. SAFS housing is located on Naval Air Station Moffett Field, approximately 2 miles north of SAFS. A photograph of SAFS is presented in App. H.

CPCA is situated approximately 23 miles northeast of SAFS in Alameda County, Calif. The annex occupies 11.6 acres southeast of Dublin, Calif., directly north of Pleasanton, Calif. The interchange of Interstate Highways 580 and 680 is immediately southwest of the installation. CPCA is located in an isolated area at the top of a hill and consists of several communication towers and buildings.

HISTORY

Sunnyvale AFS

The Air Force Satellite Control Facility (AFSCF) at SAFS evolved from the Air Force ballistic missile development program and the establishment of a west coast field office to manage the nation's first intercontinental ballistic missile (ICBM) program. In August 1958, a 20-man field office was activated in Palo Alto, Calif., to achieve an early orbital capability with the Thor booster and to support an aerobiomedical program to assist in the development of the U.S. Man-in-Space program. In January 1959, Lockheed Missile Systems Division completed an interim satellite control center at Palo Alto. In March 1960, the operation was moved from Palo Alto to Sunnyvale, where an interim control center was established by Lockheed. By the end of June 1960, the Satellite Test Center (STC) was activated on a portion of 11.4 acres of land purchased by the Air Force in the southeast corner of the Lockheed complex (AFSCF, 1982). The STC was redesignated the Satellite Test Annex (STA) in July 1960. In 1969, USAF purchased an additional 8.2 acres, adjacent to the 11.4 acres purchased in 1960, from Lockheed Aircraft Corp. This purchase increased the acreage of the station to 19.6 acres. The station was redesignated SAFS in January 1971.

Camp Parks Communications Annex

CPCA is located within an area known as the Parks Reserve Forces Training Area (PRFTA), which is a subinstallation of the U.S. Army's Presidio of San Francisco (PSF). The 11.6 acres that comprise CPCA have been operated as a radiometric test facility since 1961. In 1970, AFSCF assumed responsibility for the Camp Parks Radiometric Test Facility, and in 1972 the facilities and land were officially transferred from the Army to the Air Force. The facility was redesignated CPCA in 1975.

ENVIRONMENTAL SETTING

Sunnyvale AFS

Most of the area surrounding SAFS consists of a gently sloping, nearly level area that contains residential housing located approximately 1,000 feet (ft) southeast of the facility, commercial establishments, paved streets, and parking areas. Elevations in the vicinity SAFS range from 40 ft above mean sea level (MSL) to sea level.

The station is drained by a small canal that borders the southern and eastern edges of the installation. Because a majority of SAFS consists of buildings and paved parking areas, most rainfall drains off the station as stormwater runoff.

SAFS has a mild, Mediterranean-type climate, with temperatures moderated by San Francisco Bay. The average monthly temperature ranges from a low of 48.0°F in January to a high of 65.5°F in July. The average annual rainfall is 12.99 inches, 83 percent of which occurs from November through March. Net precipitation is -29.01 inches per year, and the 1-year, 24-hour rainfall event is 3 inches. The low value for net precipitation indicates a low potential for significant infiltration or the formation of permanent surface water features. The 1-year, 24-hour rainfall event of 3 inches indicates a moderate potential for runoff and erosion. The majority of the installation, however, is asphalt-paved and contains stormwater drainage systems to control runoff, thus eliminating any significant potential for flooding and soil erosion.

The surficial lithology of SAFS consists of alluvial deposits of the San Jose Plain. Underlying the recent alluvium deposits is the Pleistocene Santa Clara Formation, which consists of nonmarine conglomerates, sandstones, siltstones, and clays. Underlying this formation, various marine sedimentary and volcanic units overlie the basement Franciscan Formation. It has been postulated that a dip-slip type fault is adjacent to SAFS. The extent and depth of subsurface movement along this fault is unknown. No surficial, vertical displacement is visible in the fault zone.

Two major aquifer systems are encountered in the vicinity of SAFS. The lower aquifer occurs at a depth of approximately 200 ft. This aquifer consists of sand and gravel overlain by a confining unit approximately 100 ft thick. Above the confining unit, an upper aquifer system occurs between ground surface and a maximum depth of 100 ft. Lateral ground water movement in the upper and lower aquifers would be approximately 100 ft per year. Migration of any contaminant entering the ground water system would be in a northerly direction with some downward movement. Saltwater intrusion has occurred in the upper aquifer adjacent to San Francisco Bay from heavy pumping of the aquifer.

As a result of the developed nature of the installation and its urban location, wildlife habitat on or adjacent to the station is small. Vegetation is limited to cultivated species such as ornamental shrubs, bushes, and trees. Various urban bird species forage in the trees and on the lawns. Common rodents (e.g., mice) occur onbase. No state-listed or Federally listed threatened or endangered species are present.

<u>Camp Parks Communications Annex</u>

CPCA is situated approximately 23 miles northeast of SAFS. The 11.6-acre hilltop installation is located southeast of Dublin, Calif., and directly north of Pleasanton, Calif. Elevations at CPCA decrease in all directions from 690 ft above MSL to 640 ft above MSL at the installation boundary. The topographic gradient from Bldg. 2002 to the western boundary of CPCA is approximately -1 ft per 5 ft. Due to the location of CPCA on a hilltop, stormwater drainage occurs rapidly through a system of open ditches and swales. Stormwater runoff drains approximately 0.5 mile east of the installation to Tassajara Creek.

The climate of CPCA is mild, with average monthly temperatures ranging from a low of 45.7°F in January to a high of 71.3°F in July. The average annual temperature is 58.7°F. Average annual rainfall is 14.11 inches, 81 percent of which occurs from November through March.

Net precipitation is -29.90 inches per year, and the 1-year, 24-hour rainfall event is 2 inches. The low value for net precipitation indicates a low potential for significant infiltration. The 1-year, 24-hour rainfall event of 2 inches indicates a moderate potential for runoff and erosion.

CPCA is located in Amador Valley, the western portion of Livermore Valley. The Livermore Valley is composed of a downwarped and faulted sequence of Miocene and Pliocene sandstones and conglomerates. CPCA is underlain by the Pliocene Tassajara Formation, consisting of bedding deposits of sandstone, tuffaceous sandstone, and shale. CPCA is located in a seismically active region, with the Pleasanton Fault suspected approximately 2.5 miles west of the annex.

CPCA is underlain by the Camp subbasin, a portion of the Livermore Valley Ground Water Basin. The subbasin covers an area of 2,858 acres and is drained by Tassajara Creek and Cottonwood Creek. Well yields are relatively low in the Camp subbasin due to the presence of shale units with low permeability. Recharge to the aquifer system occurs through infiltration of precipitation within the outcrop areas.

The habitat of CPCA is predominantly valley grasslands with small areas of altered habitat. The grasslands are occupied primarily by a variety of introduced species. Common grasses include wild oats, western rye grasses, common barley, and common foxtail.

Grasslands support a variety of wildlife, including mammals, birds, and reptiles. Common mammals include mice, moles, gophers, and hares.

A variety of large predatory birds and mammals occur in proximity to the site; however, these species probably do not occur onsite because of the small size of CPCA. Common birds of the property include American kestrel, burrowing owl, sparrows, blackbirds, finches, and larks. Reptiles found onbase consist of lizards, snakes, and skinks.

METHODOLOGY

During the course of the Phase I investigation of SAFS and CPCA, interviews were conducted with base personnel (past and current) 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 ground reconnaissance inspections were conducted at past hazardous waste activity sites.

The review of past operation and maintenance functions and past waste management practices at SAFS/CPCA resulted in the identification of six sites that were initially considered areas of concern, with potential for contamination.

FINDINGS AND CONCLUSIONS

The goal of the IRP Phase I study is to identify sites where there is potential for environmental contamination resulting from past waste disposal practices and to assess the potential for contaminant migration from these sites.

Six sites were initially considered areas of concern with potential for contamination. A list of these sites and a summary of the evaluations of each site are presented in Table 1. Fig. 1 shows the site locations on SAFS, and Fig. 2 shows the site location on CPCA. Two of these sites were former stormwater drainage disposal sites that have little potential for residual contamination. One site (Site No. 2) is an operating stormwater drainage disposal site that may require an industrial discharge permit; therefore, this site was determined to warrant review and modification under the base environmental program. Three sites were fuel spill sites at which cleanup operations were sufficient and little residual contamination remained. A sink drain disposal site (Site No. 6) on CPCA, while having a potential for residual contamination, does not present potential for migration or for endangerment of human health or environmental quality. This sink drain

Table 1. Summary of Information on Potential Contamination Sites on SAFS and CPCA

Site* No.	Site Description	Report Designation	Dates of Operations or Occurrence	Waste Description	Conclusion
1	Storm Drain, Bldg. 1007, Cooling Filter Backwash	SD-1	1979-1982	Filter backwash containing suspended solids	No potential for contamination. Disposal Tower practice ceased.
2	Storm Drain, Bldgs. 1009 and 1012, Washwater from Antenna Maintenance	SD-2	1976-Present	Washwater from antenna maintenance containing an alkaline detergent-based aircraft-cleaning compound	No potential for residual contamination. Refer to base environmental program for review of operation.†
3	Fuel Spill, 1,000 gal JP-5, Fuels Area	FS-1	March, 1980	1,000 gal JP-5	No potential for residual contamination. Spill cleanup by SAFS.
4	Fuel Spill, 10 gal JP-5, Fuels Area	FS-2	1980	10 gal JP-5	No potential for residual contamination. Spill cleanup by SAFS.
5	Fuel Spill, 5 gal POL,, Antenna Area	FS-3	1983	5 gal POL	No potential for residual contamination. Spill cleanup by SAFS.
6	CPCA Bldg. 2001 Wet Well Disposal Site	DS-1	1960-Present	Wastewater from maintenance area sink drain. Diluted small quantities of various chemicals used in maintenance operations.	Potential for residual contamination. No potential for migration or endangerment of Human Health or Environment.**

*Site Nos. 1 through 5 located on SAFS (Fig. 1); Site No. 6 located on CPCA (Fig. 2).
†Subsequent to the site visit, it was reported that SAFS has applied to the California Regional Water Quality Control Board for a discharge permit.
**Subsequent to the site visit, it was reported that preliminary plans are being developed to connect the wet well disposal system to the sanitary sewer disposal system.

Source: ESE, 1985.

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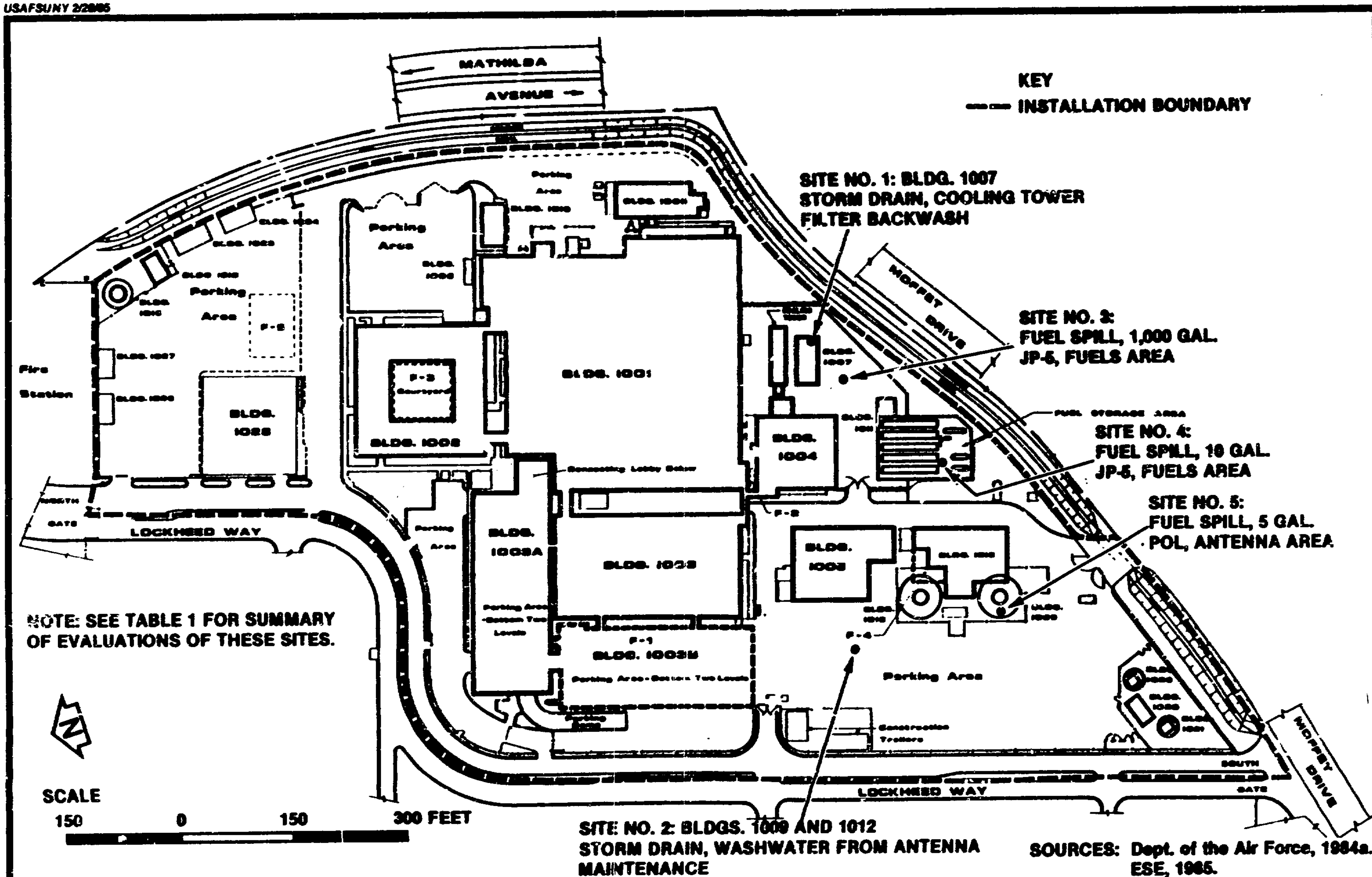

Figure 1
LOCATIONS OF POTENTIAL CONTAMINATION SITES ON SAFS

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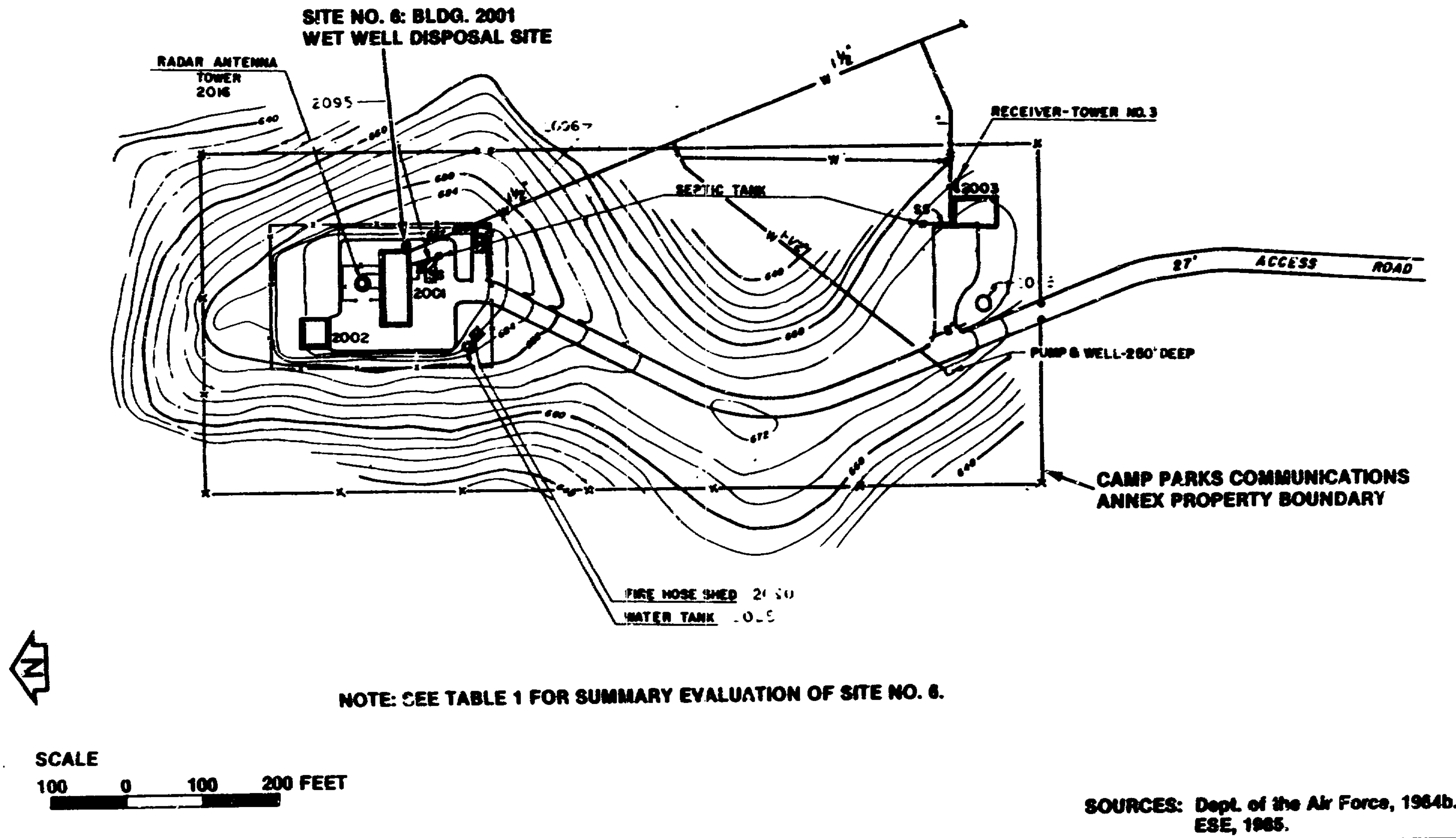

Figure 2
LOCATION OF POTENTIAL CONTAMINATION SITE ON
CAMP PARKS COMMUNICATIONS ANNEX

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system was also determined to warrant review and modification under the base environmental program.

All six sites were evaluated using the decision process. Because the sites were found to have little or no potential for contamination or contaminant migration, none of the sites were evaluated using the HARM system.

RECOMMENDATIONS

No sites on SAFS/CPCA were identified as having potential for contamination and contaminant migration; therefore, no Phase II actions are recommended. One operating stormwater drainage disposal site (Site No. 2) on SAFS and a sink drain disposal site (Site No. 6) on CPCA need to be reviewed by the base environmental program. Appropriate operational modifications should be made in accordance with state and Federal regulations. (Subsequent to the site visit, it was reported that SAFS has applied to the California Regional Water Quality Control Board for a discharge permit for Site No. 2, and that preliminary plans are being developed to connect the wet well disposal system (Site No. 6) at CPCA to the sanitary sewer disposal system.)

1.0 INTRODUCTION

1.1 BACKGROUND

Due to its primary mission, the U.S. Air Force (USAF) has long been engaged in 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 primary Federal legislation governing disposal of hazardous waste is the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Under Sec. 6003 of the Act, Federal agencies are directed to assist the U.S. Environmental Protection Agency (EPA), and under Sec. 3012, state agencies are required to inventory past disposal sites and make the information available to the requesting agencies. To assure compliance with these hazardous waste regulations, the Department of Defense (DOD) developed the Installation Restoration Program (IRP). The current DOD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated Dec. 11, 1981, and implemented by USAF message dated Jan. 21, 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the IRP. DOD policy is to identify and fully evaluate suspected problems associated with past waste disposal practices and to control hazards to health and welfare that resulted from these past operations. The IRP will be the basis for response actions on USAF installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as clarified by Executive Order 12316. CERCLA is the primary Federal legislation governing remedial action at the past hazardous waste disposal sites.

1.2 PURPOSE, AUTHORITY, AND SCOPE OF THE ASSESSMENT

The IRP has been developed as a 4-phase program, as follows:

Phase I--Initial Assessment/Records Search

Phase II--Confirmation and Quantification

Phase III--Technology Base Development

Phase IV--Operations/Remedial Actions

Environmental Science and Engineering, Inc. (ESE) conducted the records search at Sunnyvale Air Force Station (SAFS) and Camp Parks Communications Annex (CPCA), with funds provided by the Air Force Systems Command (AFSC). This report contains a summary and evaluation of the information collected during Phase I of the IRP and recommendations for any necessary Phase II action.

The objective of Phase I was to identify the potential for environmental contamination from past waste disposal practices at SAFS and to assess the potential for contaminant migration. Activities performed in the Phase I study included the following:

1. Review of site records;
2. Interviews with personnel familiar with past generation and disposal activities;
3. Inventory of wastes;
4. Determination of estimated quantities and locations of current and past hazardous waste treatment, storage, and disposal;
5. Definition of the environmental setting at the base;
6. Review of past disposal practices and methods;
7. Performance of field and aerial inspections;
8. Gathering of pertinent information from Federal, state, and local agencies;
9. Assessment of potential for contaminant migration; and
10. Development of conclusions and recommendations for any necessary Phase II action.

ESE performed the onsite portion of the records search during January 1985. The following team of professionals was involved:

- o Charles D. Hendry, Jr., Ph.D., Staff Chemist and Project Manager; Team Leader for the SAFS, Los Angeles Air Force Station (LAAFS), and Fort MacArthur (FMA) records searches; 11 years of professional experience.
- o Allen P. Hubbard, P.E., Engineer, 6 years of professional experience.
- o Jeffrey J. Kosik, Engineer, 3 years of professional experience.
- o Donald F. McNeill, Geologist, 3 years of professional experience.

Detailed information on these individuals is presented in App. B.

1.3 METHODOLOGY

The methodology utilized in the SAFS records search began with a review of past and current 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 current base employees from the various operating areas. Interviewees included current and former personnel associated with the mission of SAFS and tenant organizations onbase. A list of interviewees, by position and approximate years of service, is presented in App. C.

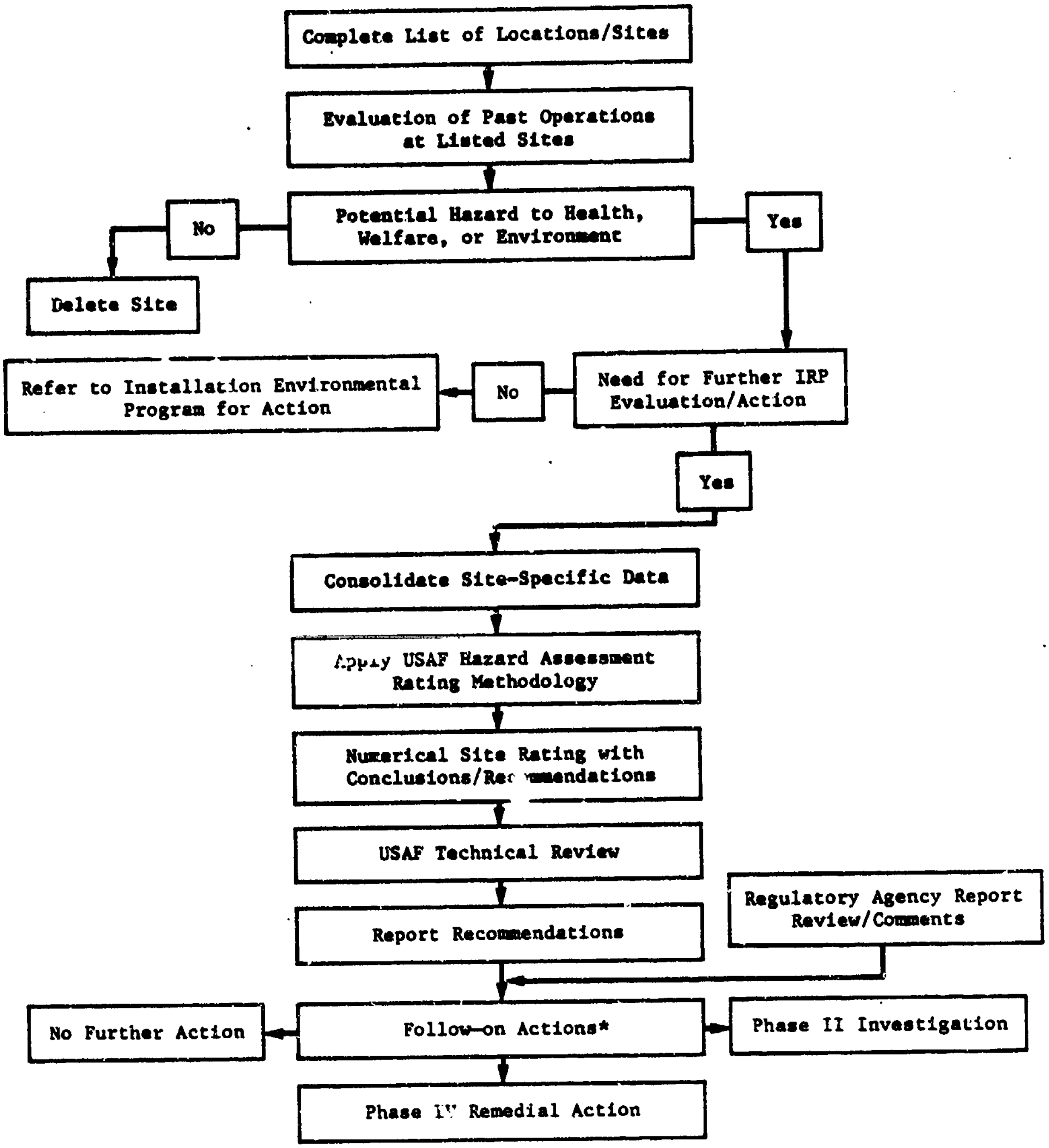
Concurrent with the base interviews, the applicable Federal, state, and local agencies were contacted for pertinent base-related environmental data. The outside records centers and agencies contacted and personnel interviewed are listed in App. C.

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 spill areas.

A general ground tour of the identified sites was then made by the ESE Project Team to gather site-specific information including: (1) visual evidence of environmental stress, (2) the presence of drainage ditches and systems, and (3) visual inspection for any obvious signs of contamination or leachate migration. A helicopter overflight was not available as part of the onsite visit.

Using the process shown in Fig. 1.3-1, a decision was then made, based on all of the above information, regarding the potential for hazardous material contamination at any of the identified sites. If no potential existed, the site was deleted from further consideration. If potential for contamination was identified, the potential for migration of the contaminant was assessed based on site-specific conditions. If there were no further environmental concerns, the site was deleted. If the potential for contaminant migration was considered significant, the site was evaluated and prioritized using the Hazard Assessment Rating Methodology (HARM). A discussion of the HARM system is presented in App. G.

PHASE I INSTALLATION RESTORATION PROGRAM
RECORDS SEARCH FLOWCHART



*Beyond scope of Phase I.

SOURCES: HQ AFESC, 1983.
ESE, 1985.

Figure 1.3-1
DECISION PROCESS

INSTALLATION RESTORATION PROGRAM
SUNNYVALE AIR FORCE STATION

2.0 INSTALLATION DESCRIPTION

2.1 LOCATION, SIZE, AND BOUNDARIES

SAFS is situated approximately 40 miles southeast of San Francisco in Santa Clara County, Calif., near the southwest edge of San Francisco Bay (Fig. 2.1-1). SAFS occupies 19.6 acres bounded on the east by Mathilda Ave., on the south by Moffett Drive, and on the west by Lockheed Way (Fig. 2.1-2). The property north and west of SAFS is owned by Prudential Insurance Co. and leased by Lockheed Missile and Space Co. (LMSC). The property south of SAFS is completely developed, and the land east of Mathilda Ave. has been developed for commercial use (AFSCF, 1984a). SAFS housing is located on Naval Air Station (NAS) Moffett Field, approximately 2 miles north of SAFS. SAFS supports a total base population of 3,300, consisting of 1,050 military personnel and 2,250 civilian employees. A photograph of SAFS is presented in App. H.

CPCA is situated approximately 23 miles northeast of SAFS in Alameda County, Calif. (Fig. 2.1-1). CPCA occupies 11.6 acres southeast of Dublin, Calif., and directly north of Pleasanton, Calif. The interchange of Interstate Highways 580 and 680 is immediately southwest of the installation. CPCA is located in an isolated area at the top of a hill. The facility consists of several communication towers and four permanent and three semipermanent buildings (Fig. 2.1-3).

2.2 HISTORY

Sunnyvale AFS

The history of SAFS is summarized in this section. A number of Air Force organizational changes that have affected the command structure of the facility have occurred during its history. A brief chronology of these changes is presented in Table 2.2-1, and additional details associated with these changes are provided in the following paragraphs.

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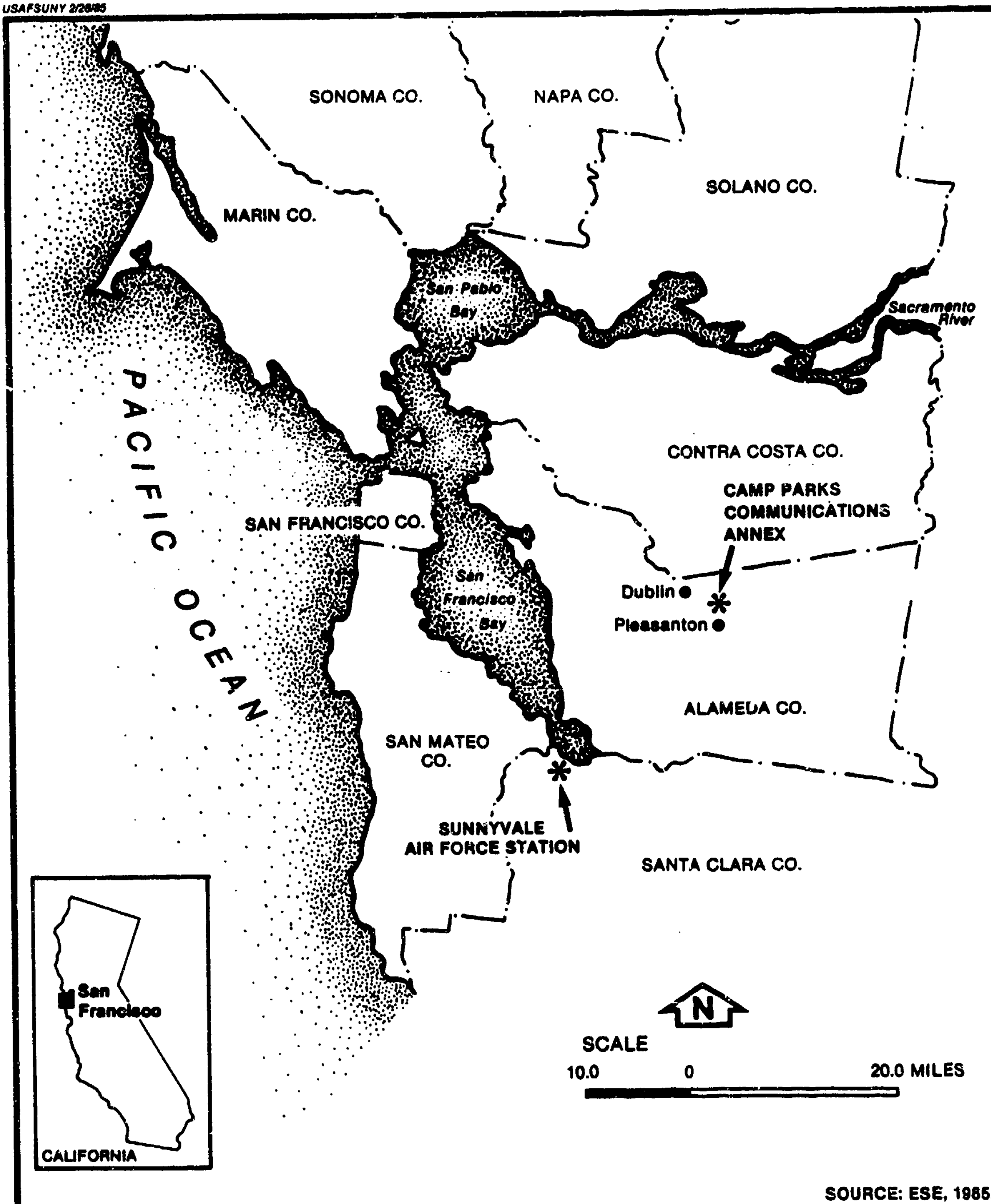

SOURCE: ESE, 1985.

Figure 2.1-1
LOCATION MAP

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SUNNYVALE AIR FORCE STATION

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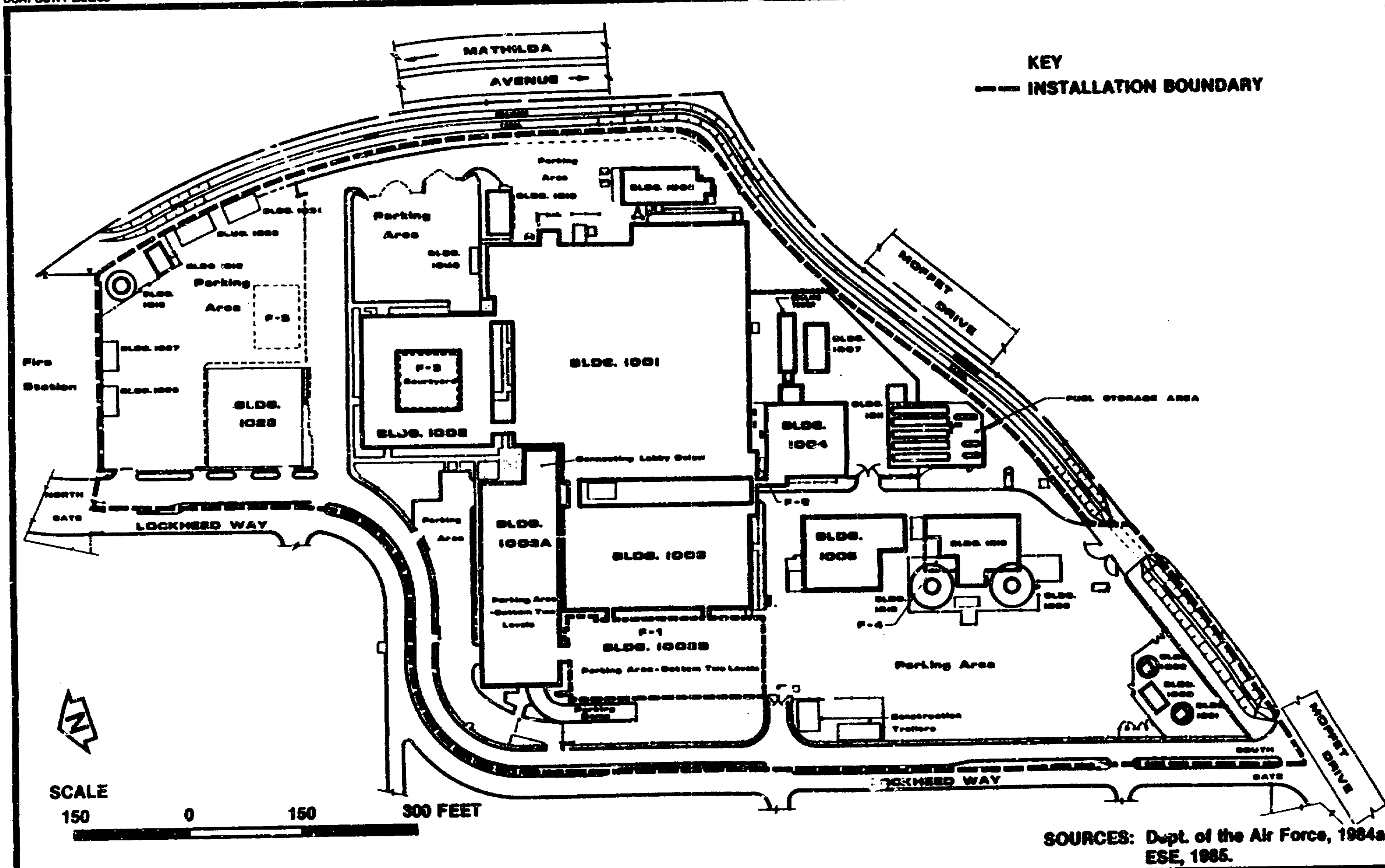

Figure 2.1-2
SITE MAP OF SUNNYVALE AIR FORCE STATION

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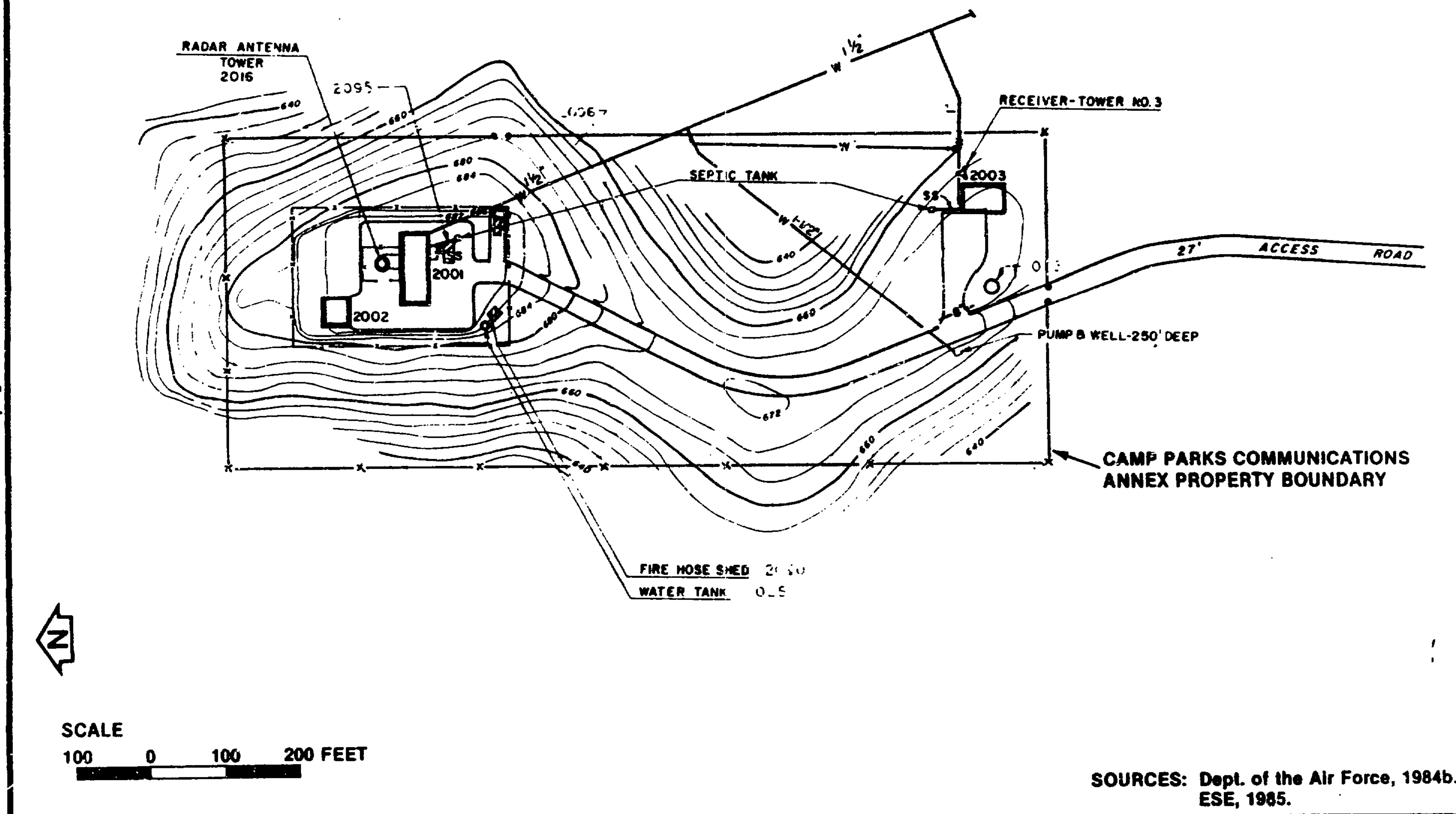

Figure 2.1-3
SITE MAP OF CAMP PARKS COMMUNICATIONS ANNEX

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Table 2.2-1. Chronology of Historical Events and Organizational Changes for SAFS

Date	Organization	Event
January 1959		Lockheed Missile Systems Division establishes an interim satellite control at Palo Alto
Apr. 6, 1959	HQ Air Research Development Command (ARDC) formed the 6594th Test Wing at the Lockheed Center in Palo Alto	
Nov. 11, 1959		Air Force purchases 11.4 acres of property in Sunnyvale to establish a Satellite Test Center (STC)
Mar. 1, 1960		The 6594th Test Wing moved from Palo Alto to the Sunnyvale STC
July 7, 1960	The STC redesignated the Satellite Test Annex (STA)	
Nov, 1, 1961	The 6594th Test Wing redesignated HQ 6594th Aerospace Test Wing	
July 1, 1965	Det. 1, Air Force Satellite Control Facility (AFSCF) was designated and organized with the 6594th Support Group. HQ 6594th Aerospace Test Wing at Sunnyvale was discontinued	
1969		Air Force purchases an additional 8.2 acres adjacent to the facility
1970		AFSCF assumes responsibility for the Camp Parks Radiometric Test Facility
Jan. 1, 1971	STA redesignated Sunnyvale Air Force Station (SAFS)	
July 1, 1977	HQ AFSCF was reorganized and moved to SAFS; Det. 1, AFSCF was inactivated	

Sources: AFSCF, 1982.
ESE, 1985.

In January 1959, Lockheed Missile Systems Division completed an interim satellite control center at Palo Alto. During the launch of Discoverer I on Feb. 28, the interim facility received 514 seconds of telemetry from the world's first polar orbiting satellite (AFSCF, 1982).

On April 6, 1959, Headquarters (HQ) Air Research Development Command (ARDC) formed the 6594th Test Wing at the Lockheed Palo Alto location. This was the first U.S. military unit to be charged with military satellite operations (AFSCF, 1982).

In June 1959, the Air Force Ballistic Missile Division (AFBMD) field office was disestablished and its personnel transferred to the 6594th Test Wing. Operational control of the 6593rd Test Squadron (Special) was assigned to the 6594th Test Wing.

By the end of 1959, the Vandenberg, Hawaii, and New Hampshire Tracking Stations and the 6594th Recovery Control Group had joined the 6594th Test Wing. In late 1959, the ARDC was reorganized and decentralized. HQ AFBMD was activated at Los Angeles, Calif., and the 6594th Test Wing at Palo Alto was reassigned from HQ ARDC to HQ AFBMD effective Nov. 15, 1959.

On Nov. 11, 1959, the Air Force purchased 11.4 acres of land in Sunnyvale from the Prudential Insurance Co. This land included Lockheed Bldg. 171 (now Bldg. 1001).

On Jan. 15, 1960, HQ 6594th Test Wing was redesignated as HQ 6594th Test Wing (Satellite). On Mar. 1, the 6594th was moved from Palo Alto to the 11.4-acre site at Sunnyvale, where an interim control center had been established by Lockheed. By the end of June, the Satellite Test Center (STC) was activated to support the Dept. of Defense's emerging space program (AFSCF, 1982).

The STC was redesignated the Satellite Test Annex (STA), under the jurisdiction of AFBMD, on July 7, 1960.

In February 196 , a new satellite control room was built in what is now Bldg. 1001. Lockheed personnel conducted the first multiple satellite operations for two Discoverer satellites on Feb. 17 and 18 in Bldg. 1001 (AFSCF, 1982).

The test wing was redesignated HQ 6594th Aerospace Test Wing on Nov. 1, 1961, with no change in station or assignment.

During the early 1960s, various proposals were considered for expanding the facility. These included adding a second story to Bldg. 1001 to house personnel. In 1961 45,600 square feet were added to Bldg. 1001 for a mechanical equipment room, electrical equipment room, receiving and shipping storage, kitchen, cafeteria, sculler, tape storage processor, printer rooms, and a data records section.

In 1962, costruction of Bldg. 1002 added 30,000 square feet (ft^2) of administrative support space. Another 4,200 ft^2 were added to Bldg. 1001 in 1963 to provide space for a communications center, cryptographic equipment room, and another electrical and mechanical room. Additionally, a 1,400-ft^2 penthouse was built to house chillers and related equipment. A second wing of Bldg. 1002 and another 30,000 ft were completed in 1964.

On July 1, 1965, HQ AFSCF was designated and organized at LAAFS. Det. 1, AFSCF was designated and organized with the 6594th Support Group at Sunnyvale. HQ 6594th Aerospace Test Wing at Sunnyvale was discontinued.

In 1969, USAF purchased an additional 8.2 acres, adjacent to the 11.4 acres purchased in 1960, from Lockheed Aircraft Corp. This purchase increased the acreage of the station to 19.6 acres (SAFS, 1969). Additionally, Bldg. 1003, originally designated and built to support the Manned Orbiting Laboratory, was completed as was Bldg. 1004 which housed the nation's first total energy plant.

In 1970, AFSCF assumed responsibility for the Camp Parks Radiometric Test Facility and accepted the Sunnyvale power plant and Bldg. 1003 from the U.S. Navy (AFSCF, 1982).

The STA was redesignated SAFS on Jan. 1, 1971.

Det. 3, 1901st Communications Squadron (AFSC) was activated at SAFS in July 1975 to operate the Defense Communications Agency (DCA) Satellite Communication (SATCOM) Facility.

HQ AFSCF was reorganized and moved to SAFS on July 1, 1977. Det. 1 of the AFSCF at SAFS was inactivated.

AFSCF operational support increased from 300 contacts and 400 operational hours in 1960 to more than 94,000 contacts and more than 82,000 flight support hours in 1982 (AFSCF, 1982).

Currently, AFSCF consists of seven geographically separated tracking stations in addition to STC, CPCA, and the 6594th Test Group in Hawaii, with recovery forces used for aerial and surface recovery of reentry vehicles (AFSCF, 1984b).

Camp Parks Communications Annex

CPCA is located within an area known as the Parks Reserve Forces Training Area (PRFTA), which is a subinstallation of the U.S. Army's Presidio of San Francisco (PSF). The area now occupied by PRFTA was formerly USAF property known as Parks Air Force Base, which served as an Army Air Corps and, later, an Air Force installation and a U.S. Navy training center from 1942 to 1959. In 1959, control of the installation was transferred from USAF to the Army as a subinstallation of PSF (Secretary of the Army, 1972). From 1959 to 1964, PRFTA was held in standby status under jurisdiction of the 6th U.S. Army. In 1964, much of the installation's land was declared excess and transferred to Federal or local public agencies. In 1975, the Army began using PRFTA as a reserve component training site and mobilization station.

The 11.6 acres that comprise CPCA have been operated as a radiometric test facility since 1961. In 1961, the portion of the annex known as Area A was developed and operated by the Massachusetts Institute of Technology (MIT). In 1972, facilities on Area B were constructed. MIT operated the facility from 1961 to 1970, and Lockheed Aircraft Corp. has been the operating contractor since 1970. In 1970, AFSCF assumed responsibility for the Camp Parks Radiometric Test Facility, and in 1972 the facilities and land were officially transferred from the Army to the Air Force (Secretary of the Army, 1972). The facility was redesignated CPCA in 1975, and AFSCF Operating Location (OL) AB was activated to operate the facility.

2.3 MISSION AND ORGANIZATION

The AFSCF is headquartered at SAFS. The primary mission of AFSCF is to acquire, maintain, and operate a common-user spacecraft support network for DOD (AFSCF, 1984b). AFSCF provides capability for simultaneous command and control of large numbers of military spacecraft through its worldwide network of satellite tracking and commanding stations. Tracking stations have been strategically located to (1) support equatorial launches from the Eastern Space and Missile Center, (2) support polar launches from the Western Space and Missile Center, (3) continuously support satellites in a variety of orbiters, and (4) support low-altitude satellites during their daily earth revolutions.

The following units and contractors are located at SAFS (AFSC, 1984):

Primary Organizations

- HQ AFSCF
- 6594th Air Base Squadron

Tenants

- 1999th Communications Squadron
- AFSC Liaison Office
- HQ SD/OL-AI
- Satellite Control Division/OL-A

Contractors

Aerospace Corp.

AMEX Systems, Inc.

Control Data Corp.

Ford Aerospace and Communications Corp.

LMSC

Martin Marietta Aerospace

Mellonics Systems Development

RCA Corp.

Rockwell International

System Development Corp.

Sperry Corp.

Organizations, missions, and tenant activities are described in App. D.

3.0 ENVIRONMENTAL SETTING

This section describes the environmental conditions at SAFS and CPCA, including specific site data for meteorology, geology, soils, surface hydrology, geohydrology, and biota. These data subsequently are used in the HARM scoring system to numerically assess the pollutant transport mechanisms and potential receptors present at the site. App. G describes the factors used in the HARM system.

3.1 METEOROLOGY

Climatological data for SAFS are summarized in Table 3.1-1. These data were collected at the NAS Moffett Field meteorological station, which is located approximately 2 miles north of SAFS. The period of record for the data is 31 years (1945 to 1976).

SAFS has a mild, Mediterranean-type climate, with temperatures moderated by San Francisco Bay. The daily temperature range is small. The average monthly temperature ranges from a low of 48.0°F in January to a high of 65.5°F in July. The annual average temperature is 57.6°F.

The area is characterized by dry summers and wet winters. Mean annual rainfall for the area is 12.99 inches, 83 percent of which occurs from November through March at an average rate of approximately 2.2 inches per month. In contrast, the summer (April to October) is dry, with rainfall rates ranging from 0.02 to 0.95 inch per month. During summer, rainfall occurs at an average rate of 0.32 inch per month.

Climatological data (Table 3.1-2) for CPCA were obtained from the National Oceanic and Atmospheric Administration meteorological station at Livermore, Calif., located approximately 6 miles southeast of CPCA. The period of record for the data is 29 years (1951-1980). The climate of CPCA is mild, with average monthly temperatures ranging from a low of

Table 3.1-1. Climatological Data for SAFS

Month	Temperature (°F)	Precipitation (inches)
January	48.0	2.75
February	51.5	1.87
March	53.0	1.77
April	56.0	0.95
May	59.0	0.38
June	63.5	0.08
July	64.5	0.02
August	65.5	0.02
September	65.0	0.16
October	61.0	0.65
November	55.0	1.77
December	49.5	2.57
Annual	57.6	12.99
Period of Record	1945-1976	1945-1976

Note: Data are for NAS Moffett Field; Santa Clara Co.; elevation = 15 ft above mean sea level (MSL).

Sources: Det. 3, HQ Air Weather Service, 1976.
ESE, 1985.

Table 3.1-2. Climatological Data for CPCA

Month	Temperature (°F)	Precipitation (inches)
January	45.9	3.04
February	49.6	2.19
March	51.7	1.81
April	55.8	1.28
May	61.3	0.38
June	67.1	0.11
July	71.3	0.04
August	70.9	0.07
September	69.0	0.18
October	62.2	0.67
November	52.8	1.77
December	46.5	2.57
Annual	58.7	14.11
Period of Record	1951-1980	1951-1980

Note: Data are for Livermore, Calif.; Station Index No. 4997; Alameda Co.; 37°47'N 121°46'W; elevation = 480 ft above MSL.

Sources: National Climatic Data Center, 1983.
ESE, 1985.

45.9°F in January to a high of 71.3°F in July. The average annual temperature is 58.7°F. The area is characterized by wet winters and dry summers. Approximately 81 percent of 14.11 inches of annual rainfall occurs from November through March (Table 3.1-2).

The pathways category of the HARM scoring system includes surface water migration, flooding, and ground water migration routes. Numerical evaluation of these routes involves factors associated with the particular migration route (see App. G). Two meteorological factors used in this evaluation are net precipitation and the 1-year, 24-hour rainfall event. Mean annual evaporation for SAFS is 42 inches per year (U.S. Dept. of Commerce, 1968); therefore, net precipitation, which is the difference between annual precipitation and evaporation, is -29.01 inches per year. The 1-year, 24-hour rainfall event is 3 inches (U.S. Dept. of Commerce, 1961). The low value for net precipitation indicates a low potential for significant infiltration or the formation of permanent surface water features. The 1-year, 24-hour rainfall event of 3 inches indicates a moderate potential for runoff and erosion. Most of the installation, however, is asphalt-paved and contains stormwater drainage systems to control runoff, thus eliminating any potential for significant flooding and soil erosion.

Net precipitation at CPCA is -29.90 inches per year, and the 1-year, 24-hour rainfall event is 2 inches (U.S. Dept. of Commerce, 196[illegible], 1961).

3.2 GEOGRAPHY

3.2.1 PHYSIOGRAPHY

Due to its small size, most of SAFS consists of buildings and asphalt-paved parking areas (Fig. 2.1-2). Several areas (e.g., the courtyard) of the facility contain natural soils that are used for ornamental landscaping. The station is situated in an area of light industrial use, dominated by aerospace and electronics industries. Residential housing is located approximately 1,000 ft southeast of the installation. The installation is nearly level at approximately 19 to 25 ft above mean sea level (MSL) (SAFS-24a).

CPCA is located at the top of a hill and consists of two areas with radar towers, small buildings, and adjacent asphalt-paved parking (Fig. 2.1-3). Bldgs. 2001 and 2002 are situated at 692 ft above MSL, and Bldg. 2003 is at 668 ft above MSL. Due to its location on a hilltop, elevations decrease in all directions to approximately 640 ft above MSL at the boundary of CPCA. The topographic gradient from Bldg. 2002 to the western boundary of CPCA is approximately -1 ft per 5 ft.

3.2.2 SURFACE HYDROLOGY

Stormwater drainage from rooftops and parking areas on SAFS is transmitted off the station through a system of catch basins and 6- to 36-inch-diameter underground concrete pipes (Fig. 3.2-1). Most of the runoff drains into a small canal that borders the southern and eastern edges of the installation. This canal empties into Guadalupe Slough, which drains into San Francisco Bay. The western edge of the station drains into a 36-inch storm drain located along Lockheed Way. Because most of SAFS consists of buildings or paved parking areas, all rainfall drains off the station as stormwater runoff. Very little infiltration of rainfall is expected to occur on the installation.

Stormwater runoff on CPCA is directed through a surface drainage system of open ditches and swales. Due to its location on a hilltop, stormwater drainage is not a problem. The annex is located in the drainage basin of Tassajara Creek, which flows in a southerly direction approximately 0.5 mile east of the installation.

3.3 GEOLOGY

3.3.1 GEOLOGIC SETTING

Sunnyvale AFS

SAFS is situated in the northern Santa Clara Valley on alluvial deposits of the San Jose Plain. The Santa Clara Valley is a large structural depression created by tectonic movement of the San Andreas Fault to the west and the Hayward Fault to the east (Canonie Environmental Services,

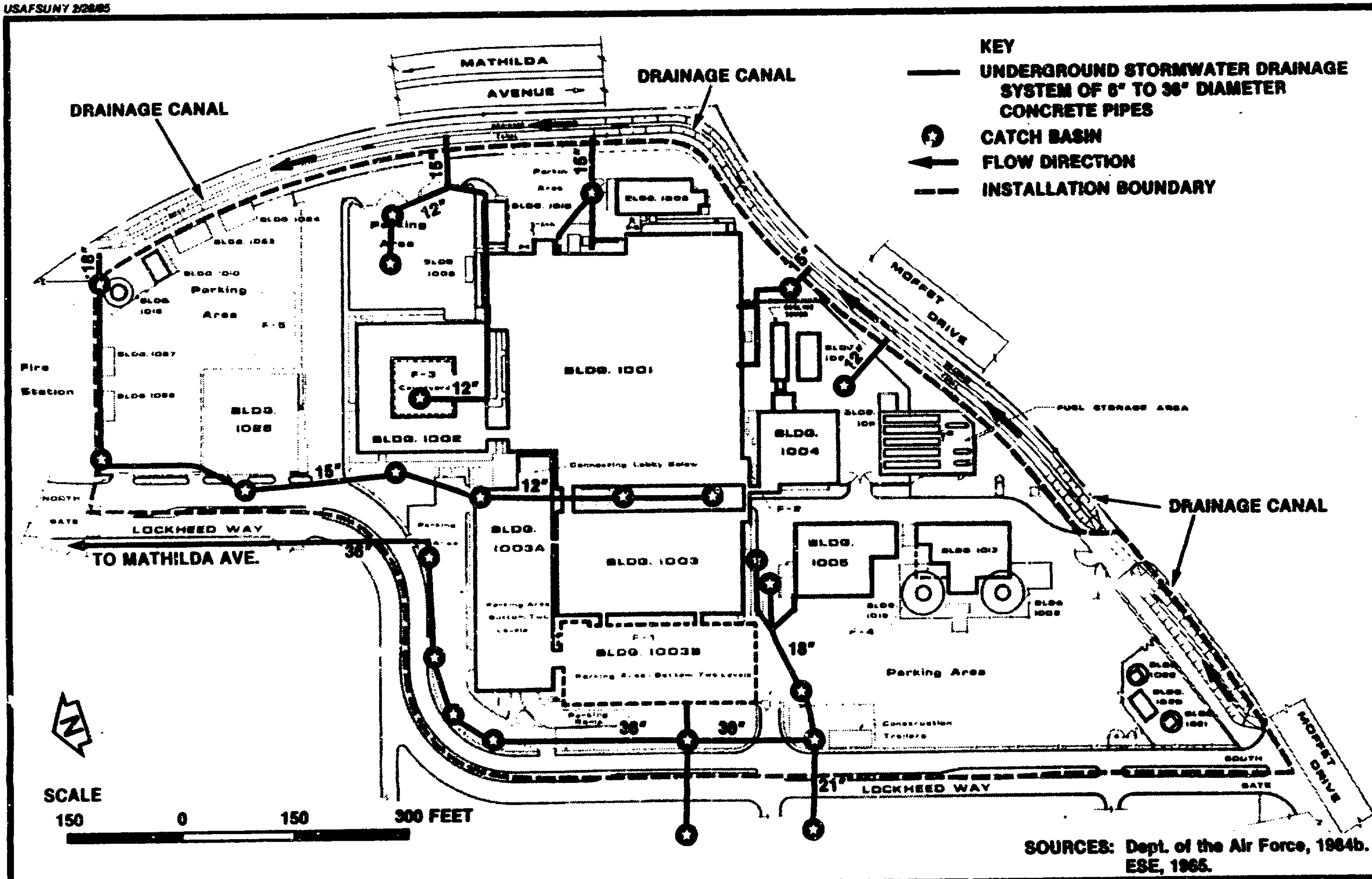

Figure 3.2-1
STORMWATER DRAINAGE SYSTEM ON SAFS

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1983). The valley is partially filled with alluvial sediments weathering from the Santa Cruz Mountains to the west and the Diablo Mountains to the east (see Fig. 3.3-1).

The Pleistocene Santa Clara Formation underlies Recent alluvium deposits within the basin. The Santa Clara Formation consists of nonmarine conglomerates, sandstones, siltstones, and clays. Underlying this formation, various marine sedimentary and volcanic units overlie the basement Franciscan Formation. A generalized geologic section for the SAFS vicinity is presented in Table 3.3-1.

The upper sections of the Santa Clara Formation consist of mixtures of gravel, sand, silt, and clay. Distribution of these sediments depended on ancient river deposition with finer material deposited further downslope away from the source area. The maximum depth of alluvial deposits has been estimated to be in excess of 1,500 ft in the valley floor (Canonie Environmental Services, 1983). Younger fan deposits on the west side of the valley interfinger with shallow marine sediments from San Francisco Bay. Lithologic logs adjacent to NAS Moffett Field reveal multiple sand and gravel units separated by silt or clay units. The surficial geologic units have been mapped as interfluvial basin deposits of Recent age (see Fig. 3.3-2). Soil borings on SAFS (see Fig. 3.3-3) exhibit alternating units of sandy silt, silty clay, and sandy gravel, typical of both alluvial and shallow marine deposition.

Structurally, one fault has been postulated in the vicinity of SAFS (Canonie Environmental Services, 1983). This fault is a normal, dip slip type, located just west of the installation near the intersection of Routes 101 and 237. The extent and depth of subsurface movement along this fault is unknown. No surficial, vertical displacement is visible in the fault zone.

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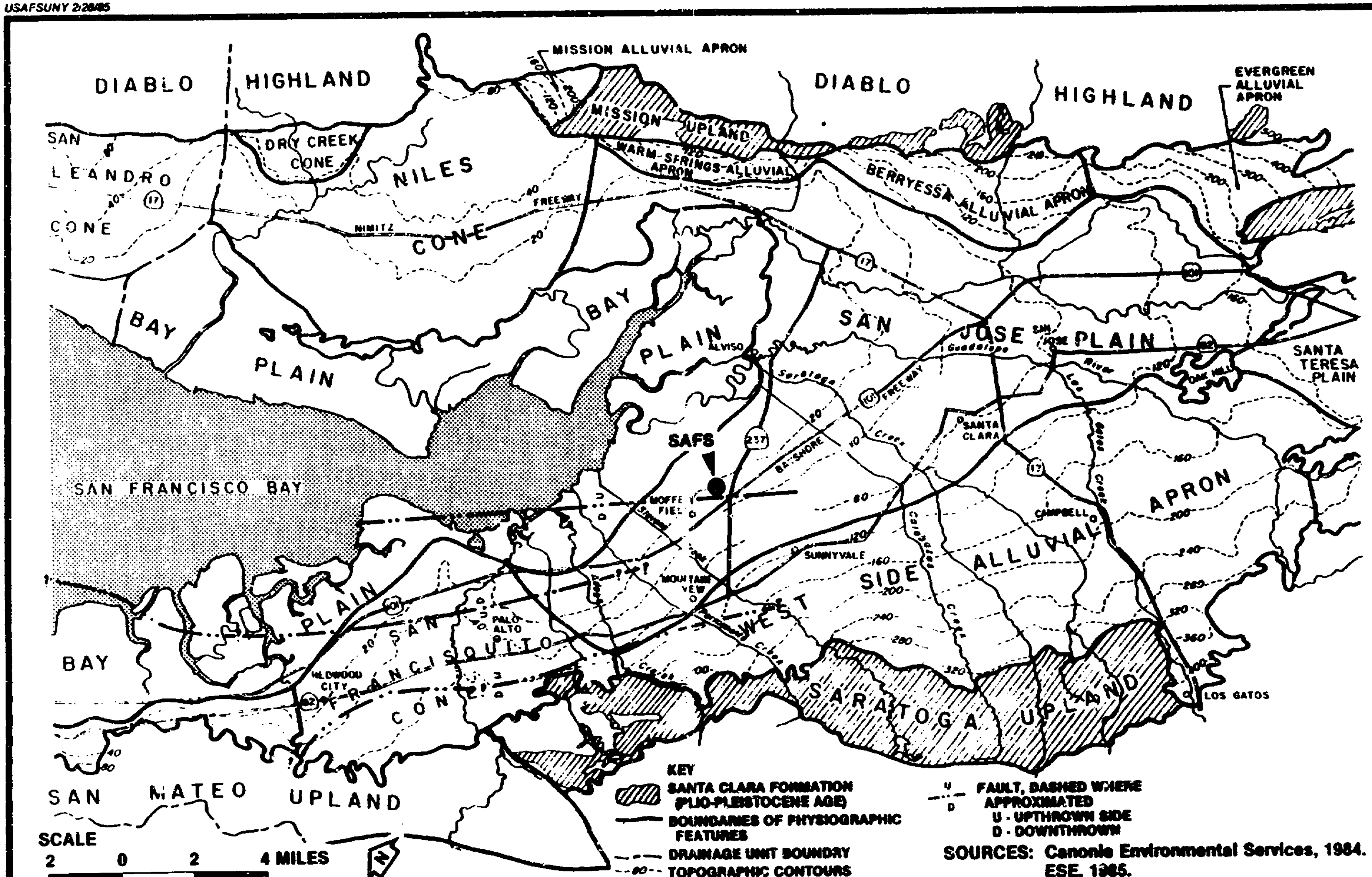

Figure 3.3-1
REGIONAL GEOLOGIC FEATURES IN VICINITY OF SAFS

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Table 3.3-1. Generalized Geologic Section in Vicinity of SAFS

System		Geologic Units	Informal Unit Name	Lithologic Character
Quaternary	Recent	Surficial sediments	Alluvium (Qb and Qal)	Stream-laid gravel, sand, and silt.
			Bay mud and clay (Qobm)	Brackish marine-gray to nearly black, commonly alkaline in places, with small molluscan fossils.
	Pleistocene	Older Alluvium	Alluvium	Stream-laid gravel composed of cobbles and pebbles in a matrix of light-brown to reddish-brown sand and silt derived from adjacent hills. Generally unformed; dissected where elevated; thickness unknown.
		Santa Clara Formation		Terrestrial sedimentary rocks, weakly consolidated; consisting of stream-laid conglomerate and interbedded soft gritty sandstone, siltstone, and clay; as well as lacustrian clay and sandstone at the base of the section. Northeast of the San Andreas Fault, the formation rests with profound unconformity on the Franciscan Formation and other Tertiary formations.
Tertiary	Pliocene	<u>Unconformity</u> Merced Formation		Soft-yellow fine to medium-grained sandstone with abundant shallow marine molluscan fossils less than 150 ft thick.
	Miocene	<u>Unconformity</u> Monterey Shale		Marine semisiliceous shale.

Table 3.3-1. Generalized Geologic Section in Vicinity of SAFS (Continued, Page 2 of 2)

System		Geologic Units	Informal Unit Name	Lithologic Character
Tertiary (Continued)	Miocene (Continued)	Unnamed sandstone		Marine, light-gray massive to poorly bedded soft, mostly fine sandstone, in places contains concretions.
		Page Mill Basalt		Extrusive basalt, black, hard, very fine, composed mainly of calcic plagioclase, pyroxene, and iron oxides.
		Mindego Basalt		Extrusive basalt submarine flows, flow breccias, agglomerates, and tuff breccias.
	Oligocene and (or) Miocene	Basalt and Diabase		Basalt and diabase black, massive forms isolated flows and or sills in San Lorenzo Formation and Lambert shale.
		Lambert shale		Marine shale.
		Vaqueros sandstone		Marine sandstone, light-gray semifriable to hard, bedded to massive.
		San Lorenzo Formation		Marine sedimentary rocks, mostly clay, shale, and siltstone.
	Eocene	Butano sandstone		Marine sedimentary rocks, mostly clay, shale, and siltstone.
Cretaceous		Franciscan Formation		Sequence of volcanic and unmetamorphosed marine sedimentary rocks; brecciated or sheared in places.

Sources: Naval Energy and Environmental Support Activity (NEESA), 1984.
ESE, 1985.

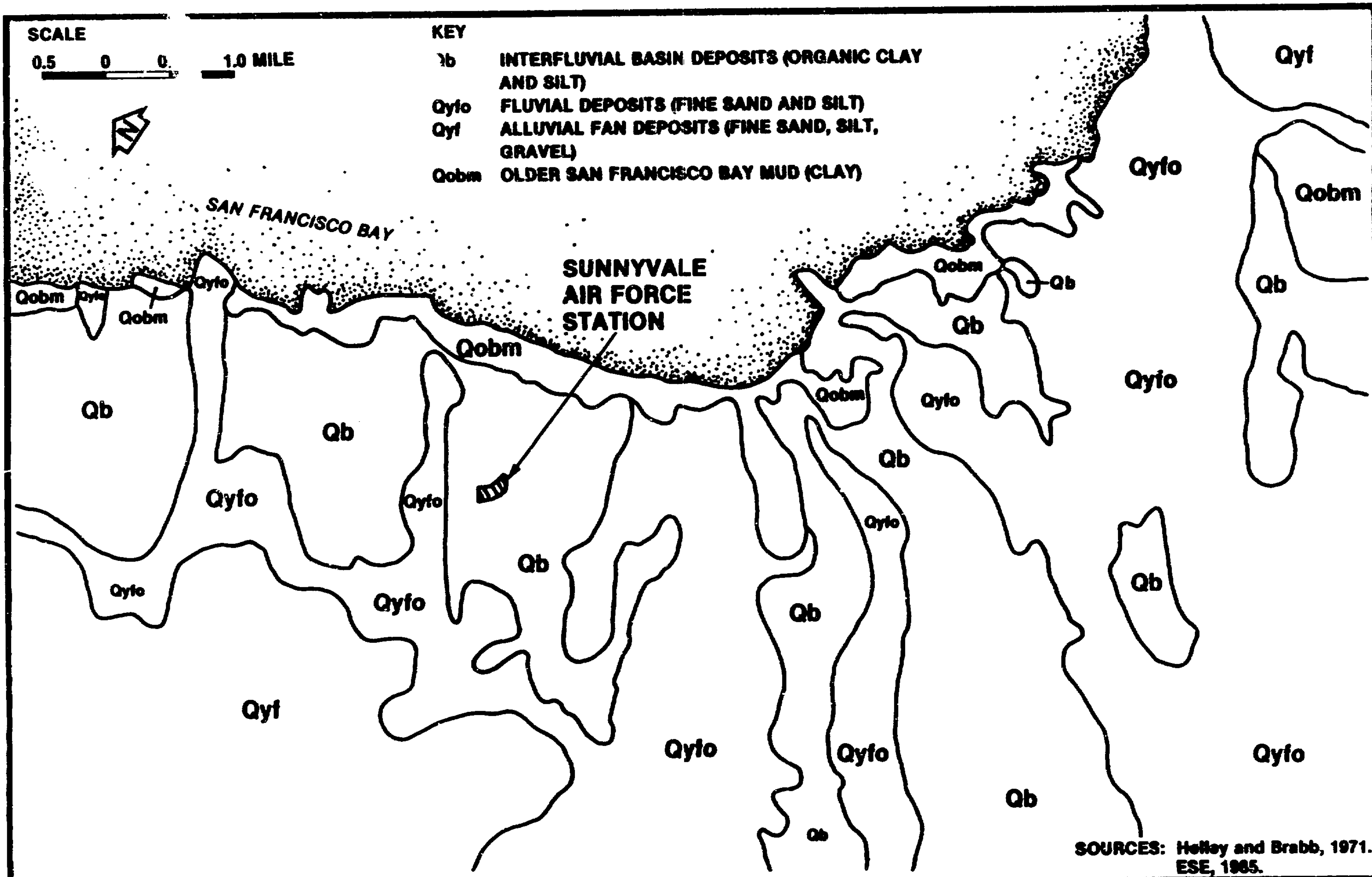

Figure 3.3-2
SURFICIAL GEOLOGY IN VICINITY OF SAFS

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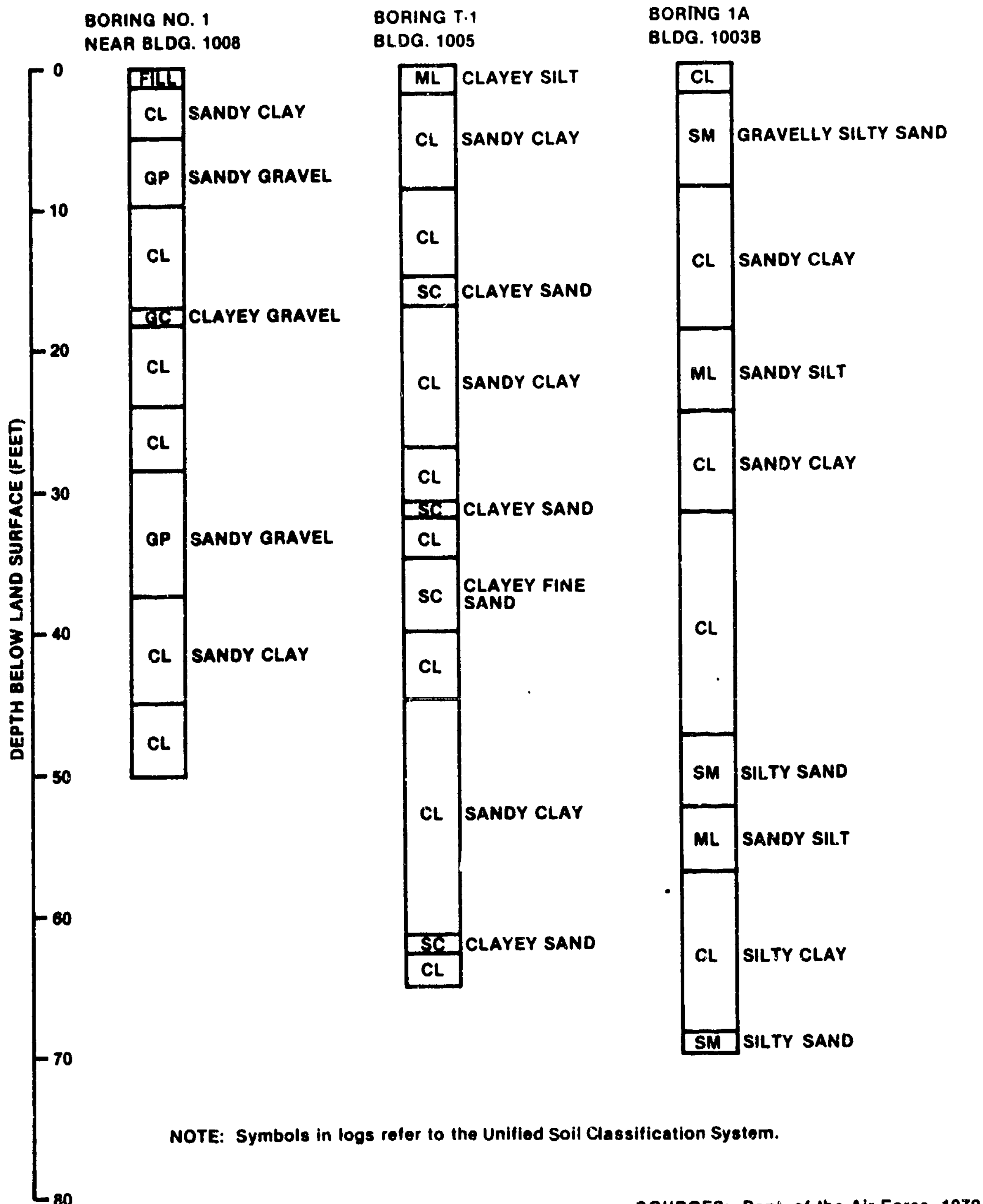

NOTE: Symbols in logs refer to the Unified Soil Classification System.

SOURCES: Dept. of the Air Force, 1970.
ESE, 1985.

Figure 3.3-3
TYPICAL LITHOLOGIC SOIL PROFILES
AT SAFS

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Camp Parks Communications Annex

CPCA is located in Amador Valley, the western portion of Livermore Valley. The Livermore Valley is the most prominent valley within the Hamilton-Mt. Diablo Range of central California. The valley is bounded on the west by the Pleasanton Ridge and on the east by the Altamont Hills. The Pleasanton Ridge and the Altamont Hills consist of Jurassic to Cretaceous sedimentary rocks known as the Great Valley Sequence and are bounded on the foothills by Tertiary sedimentary rocks (U.S. Army Corps of Engineers, 1981). The Livermore Valley is composed of a downwarped and faulted sequence of Miocene to Pliocene sandstones and conglomerates. The syncline defining the valley is oriented approximately east-west (U.S. Army Corps of Engineers, 1981). CPCA is underlain by the Pliocene Tassajara Formation, consisting of bedded deposits of sandstone, tuffaceous sandstone, and shale. The underlying units at CPCA are shown in Fig. 3.3-4. This profile was constructed from the log of the CPCA water supply well. As shown, layers of clay, cemented gravel, shale, and sandstone underlie CPCA. CPCA is located in a seismically active region, with the Pleas[illegible] Fault suspected approximately 2 [illegible] miles west of the annex. This fault [illegible] potentially active if it does exist. Positive identification of the fault zone is unavailable based on currently available information (U.S. Army Corps of Engineers, 1981).

3.3.2 SOILS

Sunnyvale [illegible]S

The U.S. Soil Conservation Service (SCS) (1967, 1968) has mapped and identified the regional soil types near SAFS. SAFS is located within the Sunnyvale-Castro Association (see Fig. 3.3-5). The association consists of poorly drained, fine-textured soils developed on fine, noncalcareous alluvium. This soil type occupies nearly level, low positions of interfluvial basin deposits. The soils exhibit low permeability and a high water table. The Sunnyvale soils have calcareous, gray silty clay subsoils. Castro soils have dark gray, calcareous c[illegible]y surface layers and gray, partially calcareous cemented

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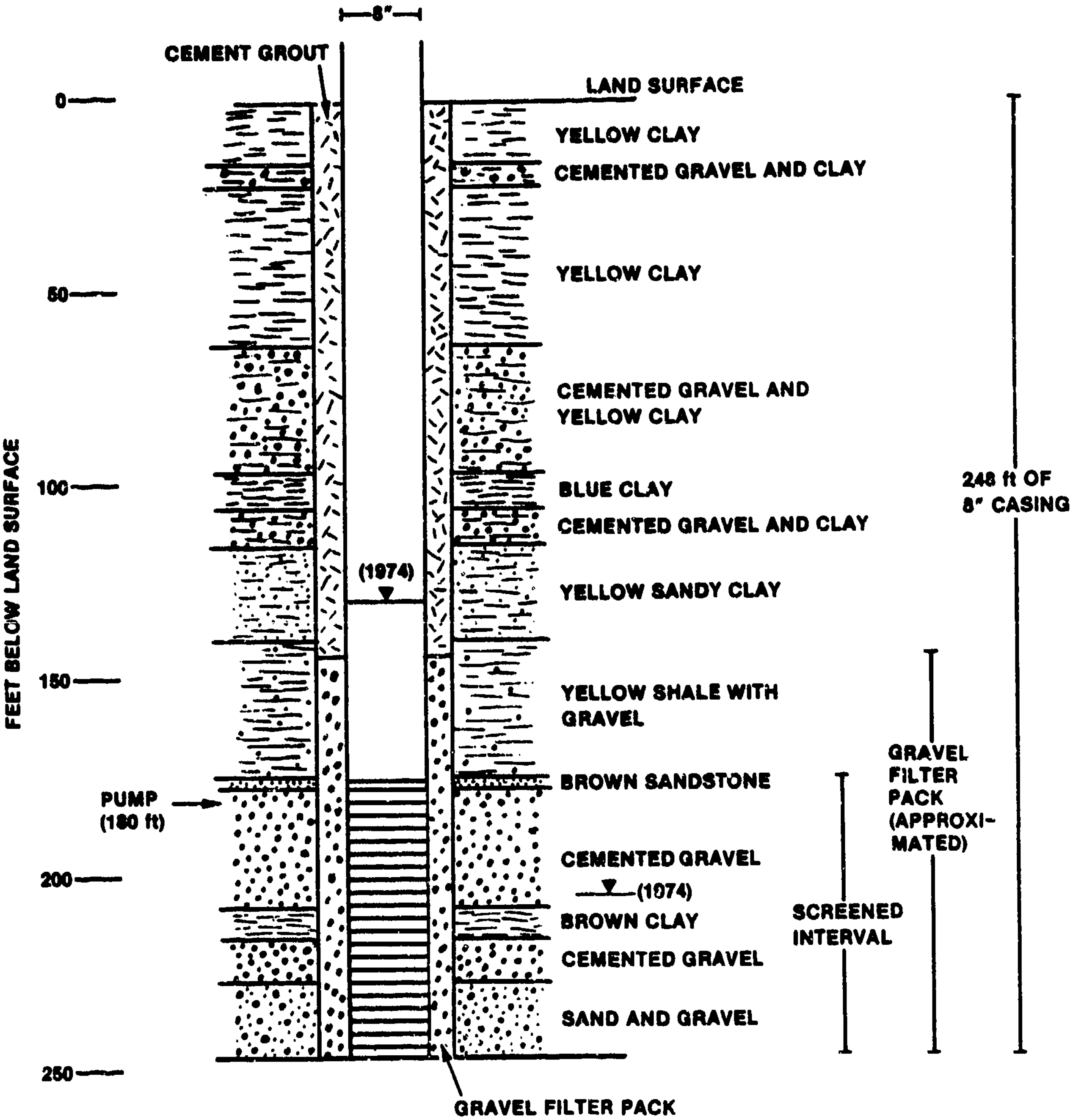

SOURCES: SAFS, 1985.
ESE, 1985.

Figure 3.3-4
GEOLOGIC LOG AND WELL CONSTRUCTION FOR CPCA WATER SUPPLY WELL

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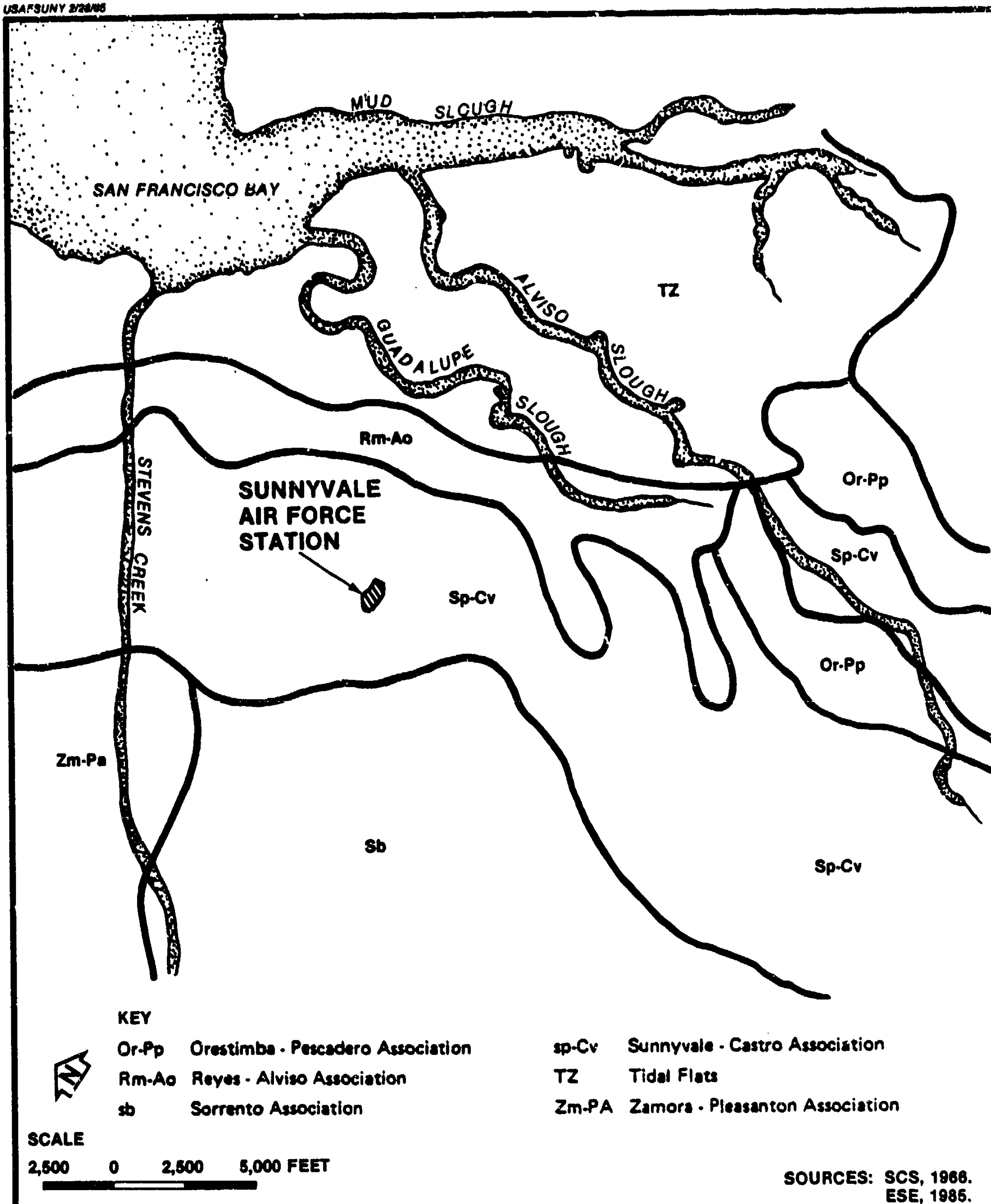

Figure 3.3-5
GENERAL SOIL TYPES IN VICINITY OF SAFS

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clay subsoils. Shallow and deep soil lithologies from soil boring data (Fig. 3.3-3) consist of alternating units of sandy silt, silty clay, and sandy gravel typical of alluvial and shallow marine deposition. Slopes encountered in the Sunnyvale-Castro Association are usually very low, ranging from 0 to 1 percent. Surface runoff is very slow, and the erosion hazard is extremely low.

Camp Parks Communications Annex

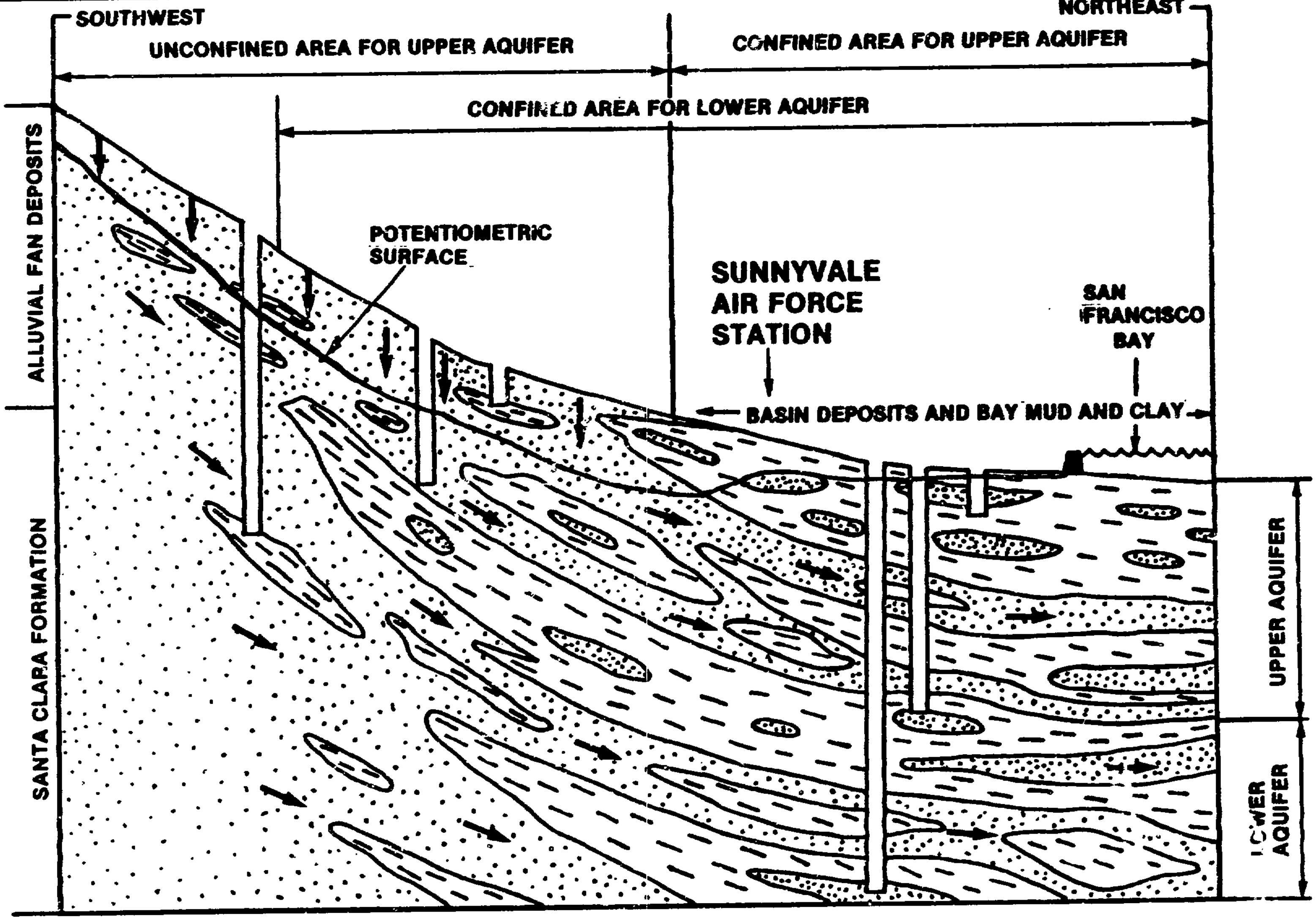
Soil units overlying the Tassajara Formation are classified within the Diablo series. The Diablo clay on CPCA has slopes ranging from 9 to 30 percent and are characterized by a high shrink-swell potential and permeability ranging from 0.6 to 2.0 inches per hour. The runoff rate is slow to medium, and the hazard of erosion is light to moderate where soil is exposed (U.S. Army Corps of Engineers, 1981).

3.3.3 HYDROGEOLOGY

Sunnyvale AFS

Aquifers underlying SAFS consist of sand and gravel stream deposits interlayered with less permeable silt and clay aquicludes. The coarser and more permeable deposits occur closer to the Santa Cruz Mountains, south of SAFS. The alluvium becomes finer grained and less permeable in the vicinity of San Francisco Bay. The fine nature of the alluvium results from the reduced bed load capacity of the streams as their velocities decrease near San Francisco Bay. These sediments are mixed and interfingered with Pleistocene marine deposits associated with San Francisco Bay (Canonie Environmental Services, 1983).

Two major aquifer systems are encountered in the vicinity of SAFS. The lower aquifer system occurs at a depth of approximately 200 ft (see Fig. 3.3-6). This aquifer consists of sand and gravel overlain by a confining unit approximately 100 ft thick, consisting of silty clay and clayey silt (Canonie Environmental Services, 1983). The potentiometric surface in this confined aquifer is approximately 100 ft below land surface. Recharge to the confined aquifer in the lower aquifer zone is



KEY
→ FLOW DIRECTION

NOT TO SCALE

SOURCE: ESE, 1985.

Figure 3.3-6
GENERALIZED GEOLOGIC AND HYDROGEOLOGIC SECTION IN THE VICINITY OF SAFS

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from leakage of water from the shallow unconfined aquifer. Recharge also occurs from precipitation, stream flow, and excess irrigation on the upgradient alluvial fans (NEESA, 1984).

Above this thick confining unit, an upper aquifer system occurs between ground surface and a maximum depth of about 100 ft (see Fig. 3.3-6). Confining units within the upper aquifer may be discontinuous, and the aquifer is characterized by both confined and unconfined sections. Recharge to the upper aquifer occurs by surface infiltration and local stream flow. Locally perched and semiperched ground water is known to occur in the upper zone sands overlying localized clay lenses. These aquifers are usually within the top 20 ft of the unconsolidated deposits. Aquifer performance tests at different depths in the upper aquifer show that these localized aquifers are hydraulically connected. The potentiometric surface for the upper aquifer generally conforms to the topographic gradient. At SAFS, ground water in the shallow aquifer flows in a northerly direction toward San Francisco Bay (see Fig. 3.3-7). The potentiometric map represents ground water elevation contours in a specific subsurface aquifer. In each aquifer, flow is perpendicular to the contours from areas of higher elevation (ft MSL) to areas of lower elevation as indicated by the flow direction arrows. The upper aquifer and lower aquifer are not in hydraulic connection due to the continuous, low-permeable confining unit. Well clusters in the upper aquifer have shown a vertical gradient downward (Canonie Environmental Services, 1983). Recharge to the unconfined and confined sections of the upper aquifer occurs primarily through percolation of rainfall and streamflow. Lateral ground water movement in the upper and lower aquifers would be in the range of 100 ft per year maximum, based on a study performed near SAFS by Canonie Environmental Services (1983). Migration of any contaminant entering the ground water system would be in a northerly direction with some downward flow component.

Figure 3.3-7
POTENTIOMETRIC SURFACE (ft MSL) OF THE UPPER AQUIFER IN VICINITY OF SAFS

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SUNNYVALE AIR FORCE STATION

Saltwater intrusion has occurred in the upper aquifer adjacent to San Francisco Bay from heavy pumping in the aquifer. In the vicinity of SAFS, chloride concentrations range from less than 100 milligrams per liter (mg/l) to greater than 5,000 mg/l north of the installation (NEESA, 1984).

SAFS has no potable wells located on the installation. All potable and industrial water is supplied by municipal sources. The installation has one monitor well located immediately west of Bldg. 1007. The well was installed in October 1983 to monitor water quality in the vicinity of the fuel storage area. The well has a total depth of 22.4 ft and is cased with 2-inch polyvinyl chloride (PVC) pipe.

Camp Parks Communications Annex

CPCA is underlain by the Camp subbasin, a portion of the Livermore Valley Ground Water Basin. The subbasin covers an area of 2,858 acres and is drained by Tassajara Creek and Cottonwood Creek. The subbasin is bounded on the west by the Pleasanton Fault and on the east by steeply dipping units, which make the basin hydraulically separate from adjacent ground water basins. Well yields are relatively low in the Camp subbasin due to the presence of shale units with low permeability. Recharge to the aquifer system occurs through infiltration of precipitation within the outcrop areas.

CPCA has one water well within the annex boundaries. The well was installed in 1974 to a depth of 248 ft. The well was originally used for potable water supply purposes. Currently, it is used for sanitary and supply purposes, and bottled water, supplied in a water cooling unit, is used for potable uses due to its convenience. No water quality data were available from CPCA, SAFS, or Oaknoll Naval Hospital on the well-water quality. Well construction details are presented in Fig. 3.3-4.

Before 1974, potable water was obtained through PRFTA. PRFTA operates a well field approximately 2 miles south of CPCA. The well field consists of four wells, with three wells actively pumping.

3.4 WATER QUALITY

3.4.1 SURFACE WATER QUALITY

Sunnyvale AFS

There are no surface water features on SAFS. A small drainage canal borders the southern and eastern boundaries of the installation (Fig. 3.2-1) and receives stormwater runoff along Mathilda Ave. and Moffett Drive. Consequently, the canal has intermittent flow, depending on rainfall. This canal empties into Guadalupe Slough, which drains into San Francisco Bay.

Surface water quality data are available for stations along Guadalupe Slough and Coyote Creek, located approximately 2 miles north of SAFS. These data were collected by the State of California Dept. of Water Resources and were obtained from the EPA Storage and Retrieval (STORET) water quality data base. The data are summarized in Table 3.4-1.

As shown, the creeks exhibit high conductivity values indicative of high dissolved solids, presumable due to sodium chloride. This reflects the brackish nature of these aquatic systems and their interface between freshwater streams and the saline water of San Francisco Bay. The data also indicate relatively high levels of inorganic nutrients. For example, inorganic nitrogen (ammonia plus nitrate) and inorganic phosphorus (orthophosphorus) comprise 80 to 90 percent of the total nitrogen and total phosphorus in the systems. This likely reflects runoff of fertilizers from the predominantly urban areas that drain into these creeks. Dissolved oxygen levels and pH values shown in Table 3.4-1 are typical for estuarine systems.

Table 3.4-1. Summary of Water Quality Data for Streams in the Vicinity of SAFS

Parameter	Guadalupe Slough at Moffett Channel	Guadalupe Slough at NAS Moffett Field	Coyote Creek Estuary off Guadalupe Slough	Coyote Creek Near SAFS
Sampling Date	6/19/75	6/19/75	6/18-19/75	6/18-19/75
pH (std. units)	7.8	8.2	7.9	7.8
Dissolved Oxygen (mg/l)	4.1	6.6	7.5	6.6
Conductivity (umhos/cm)	20,450	14,800	32,893	27,850
Turbidity (FTU)	99	51	41	51
Ammonia (mgN/l)	5.9	7.0	0.74	2.9
Nitrate (mgN/l)	0.77	2.0	2.3	2.9
Kjeldahl Nitrogen (mg/l)	6.3	7.9	1.1	4.0
Total Nitrogen (mg/l)	7.1	9.9	3.4	6.9
Orthophosphate (mgP/l)	3.6	3.8	1.6	2.9
Total Phosphorus (mg/l)	4.5	4.2	2.5	3.0

Notes: FTU = Formazin turbidimetric units.
umhos/cm = Micromhos per centimeter.
mg/l = Milligrams per liter.
mgN/l = Milligrams of nitrogen per liter.
mgP/l = Milligrams of phosphorus per liter.

Sources: EPA, 1985.
ESE, 1985.

Camp Parks Communications Annex

Because of its small size and location at the top of a hill, no surface water features exist on CPCA. Tassajara Creek receives drainage from CPCA and vicinity. This creek is located approximately 0.5 mile east of the site. Water quality of Tassajara Creek is characterized as slightly alkaline with high levels of sodium bicarbonate (U.S. Army Corps of Engineers, 1981).

3.4.2 GROUND WATER QUALITY

Sunnyvale AFS

Ground water underlying SAFS has been sampled and analyzed from one existing monitor well (adjacent to Bldg. 1007). The water was analyzed for selected volatile organic compounds (see App. F). Results indicated a trace of trans-1,2-dichloroethene, with a concentration below the level necessary for accurate quantitation. Regionally, the upper aquifer system exhibits organic contamination due to solvents discharged by the surrounding electronics industry. Analysis of ground water from one local electronics facility revealed elevated levels of various organic compounds, including trans-1,2-dichloroethene (Canonie Environmental Services, 1983).

Camp Parks Communications Annex

Prior to 1981, when bottled water usage began, a potable supply well was operated at CPCA. This well was installed in 1974 and is used for sanitary, irrigation, and other nonpotable purposes. No water quality data were available from this well. Prior to onbase water supply in 1974, water was supplied to CPCA by PRFTA. Analytical data for raw water from the PRFTA wells are summarized in Table 3.4-2. The PRFTA well fields are located approximately 1 mile southeast of PRFTA (Fig. 3.4-1). The data were obtained in five sampling events conducted from 1972 to 1977.

As shown by the data in Table 3.4-2, the ground water in the area is alkaline and very hard and contains high levels of dissolved solids. These characteristics are typical of ground water in the area obtained

Table 3.4-2. Summary of Ground Water Quality Data for PRFTA Wells

Parameter	Federal Drinking Water Maximum Contaminant Level	Well 3001	Well 3002	Well 3003
pH, Units	6.5-8.5*	7.5	7.6	7.5
Alkalinity, mg/l as Calcium Carbonate ($CaCO_3$)		344.0	342.0	334.0
Total Hardness, mg/l as $CaCO_3$		449.0	524.0	494.0
Specific Conductance, umhos/cm		1,717.0	1,563.0	1,540.0
Total Dissolved Solids (TDS), mg/l	500*	837.0	824.0	804.0
Calcium, mg/l		72.7	78.3	75.2
Magnesium, mg/l		72.8	77.5	78.3
Sodium, mg/l		113.6	75.0	63.6
Chloride, mg/l	250*	182.0	162.2	159.0
Sulfate, mg/l	250*	58.6	84.0	59.8
Nitrate, mg/l as Nitrogen	10†	5.8	4.1	5.0
Arsenic, mg/l	0.05†	<0.02	<0.02	<0.02
Barium, mg/l	1.0†	<0.30	0.37	0.37
Cadmium, mg/l	0.01†	<0.002	<0.002	<0.002
Chromium, mg/l	0.05†	<0.04	<0.04	<0.04
Copper, mg/l	1.0*	<0.12	<0.187	<0.12
Iron, mg/l	0.3*	<0.10	<0.10	<0.10
Lead, mg/l	0.05†	<0.009	<0.008	<0.009
Manganese, mg/l	0.05*	<0.03	<0.03	<0.03
Mercury, mg/l	0.002†	0.0027	0.0004	0.0044
Selenium, mg/l	0.01†	NA	NA	NA
Silver, mg/l	0.05†	<0.021	<0.021	<0.021
Zinc, mg/l	5.0*	<0.213	<0.223	<0.213
Fluoride, mg/l	1.4-2.4†	0.2	0.2	0.2
Gross Alpha, pCi/l	15.0†	1.2	2.3	2.3
Gross Beta, pCi/l	50.0†	3.2	3.9	3.0
Tritium, pCi/l	20,000	0.03	0.0406	0.0258

Note: PRFTA well field locations are shown in Fig. 3.4-1.

*NSDWR (EPA, 1984b).
†NIPDWR (EPA, 1984a).

Note: pCi/l = Picocuries per liter.

Sources: USAEHA, 1978.
ESE, 1985.

USAFSUNY 2/20/85

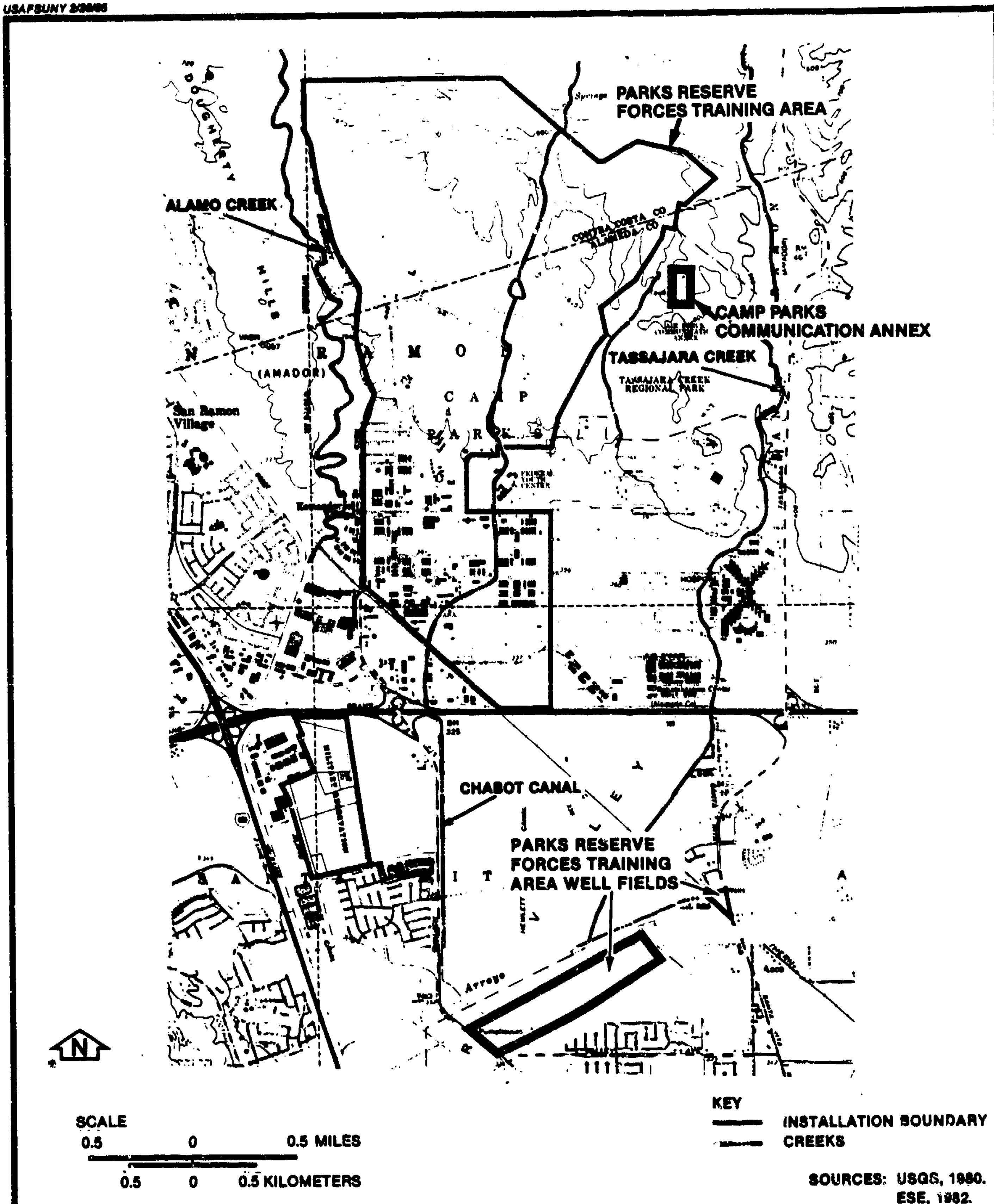

Figure 3.4-1
AREA MAP SHOWING THE LOCATION OF PARKS RESERVE FORCES TRAINING AREA WELL FIELDS

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from the sandstone, tuffaceous sandstone, and shale deposits that comprise the underlying Tassajara Formation. Included in Table 3.4-2 are the National Interim Primary Drinking Water Regulations (NIPDWR) (EPA, 1984a) and the National Secondary Drinking Water Regulations (NSDWR) (EPA, 1984b) maximum contaminant levels (MCLs) for the listed parameters. With the exception of total dissolved solids (TDS) and mercury, the raw ground water is within the NIPDWR and NSDWR MCLs for the parameters listed in Table 3.4-2. TDS levels range from 804 to 837 mg/l, which is well above the 500-mg/l criterion. High TDS levels in water from the Tassajara Formation are principally due to calcium, magnesium, and sodium bicarbonate and do not present a health-related concern. Levels of mercury (0.0027 to 0.0044 mg/l) were slightly above the NIPDWR MCL (0.002 mg/l). These mercury levels likely arise from either well head pump contamination or volcanic tuffs that are components of the underlying geologic formations. For example, in the upland areas surrounding San Francisco Bay, cinnabar (a mercuric sulphide mineral) is mined commercially.

3.4.3 POTABLE WATER QUALITY

Sunnyvale AFS

Potable water at SAFS is supplied by the City of Sunnyvale from the Hetch-Hetchy Reservoir, the Alameda East Portal, and the San Antonio Reservoir. No potable wells have been operated by the Air Force on SAFS.

Available results from analyses performed by the San Francisco Water Department Water Quality Division include a number of health-related NIPDWR and NSDWR parameters. Water supplied to SAFS conforms with the primary and secondary drinking water standards. Detailed water analyses on samples collected at SAFS have not been performed. Results of analyses performed on water supplied to SAFS are presented in App. F. No bacteriological water quality problems have been reported at SAFS.

Camp Parks Communications Annex

Because of the intermittent use of the annex, bottled water in a standard water cooler has been used for potable supply at CPCA since 1981. From 1974 until 1981, a potable supply well was used. Prior to 1974, water was supplied by PRFTA (see Sec. 3.4.2).

3.5 BIOTIC COMMUNITIES

Sunnyvale AFS

The station is situated in an industrial and commercial area of Sunnyvale. Due to the small size of the site, it is entirely developed with buildings, antenna, and paved vehicle parking areas. No natural vegetation communities and only scattered, cultivated plantings of ornamental trees and shrubs occur on the station.

As a result of the developed nature of the site and its urban location, wildlife diversity is small. Birds that may occur onbase are those species that typically inhabit urban areas of the San Francisco Bay area. These birds may forage in the shrubs and trees onbase. Due to human activity and lack of habitat on or adjacent to the station, few mammalian species are expected to occur. These would be limited to rodent species.

Camp Parks Communications Annex

The following description of biotic communities, including plant and animal species, was reported in an environmental impact statement prepared for PRFTA (U.S. Army Corps of Engineers, 1981). While no actual wildlife surveys or species counts have been performed specifically for CPCA, these species are expected to potentially occur on the annex.

The habitat of CPCA is predominantly valley grasslands with small areas of altered habitat. Common grasses include wild oats (Avena fatua), western rye grasses (Elymus glaucus), common barley (Hordeum vulgare), and common foxtail (Hordeum hystrix). Introduced forbs common onsite are black mustard (Brassica nigra), bindweed (Convolvulus arvensis), bristly ox tongue (Picris echioides), and sweet fennel (Foeniculum vulgare) (U.S. Army Corps of Engineers, 1981). Altered habitats consist of buildings, pavement, and unpaved roads.

Grasslands support a variety of wildlife including mammals, birds, and reptiles. Common mammals include the California meadow mouse (Peromyscus californicus), western harvest mouse (Reithrodontomys megalotis), California mole, botta pocket gopher (Thomomys bottae), and black-tailed hare (Odocoileus hemionus) (U.S. Army Corps of Engineers, 1981).

A variety of large predatory birds and mammals occur in proximity to the site; however, these species probably do not occur onsite because of the small size of CPCA. Common birds of the property include American kestrel, burrowing owl (Falco sparverius), grasshopper sparrow (Ammodramus savannarum), Brewer's blackbird (Euphagus cyanocephalus), lesser goldfinch (Spinus psaltria), horned lark (Eremophilia alpestris), and Say's phoebe (Sayornis saya) (U.S. Army Corps of Engineers, 1981).

Reptiles consist of western fence lizard (Sceloporus occidentalis), racer (Coluber constrictor), gopher snake (Pituophis melanoleucus), western skink (Eumeces skiltonianus), garter snake (Thamnophis elegans), and common kingsnake (Lamproprelatis getulus) (U.S. Army Corps of Engineers, 1981).

There are no wetland areas on the site.

3.6 ENVIRONMENTAL SETTING SUMMARY

Sunnyvale AFS

Most of the area surrounding SAFS consists of a gently sloping, nearly level area that contains residential housing located approximately 1,000 ft southeast of the facility, commercial establishments, paved streets, and parking areas. Elevations in the vicinity of SAFS range from 40 ft above MSL to sea level.

There are no surface water features at SAFS. The station is drained by a small canal that borders the southern and eastern edges of the installation. Because a majority of SAFS consists of buildings and paved parking areas, most rainfall drains off the station as stormwater runoff.

SAFS has a mild, Mediterranean-type climate, with temperatures moderated by San Francisco Bay. The average monthly temperature ranges from a low of 48.0°F in January to a high of 65.5°F in July. The average annual rainfall is 12.99 inches, 83 percent of which occurs from November through March. The low value for net precipitation indicates a low potential for significant infiltration or the formation of permanent surface water features. The 1-year, 24-hour rainfall event of 3 inches indicates a moderate potential for runoff and erosion. Most of the installation, however, is asphalt-paved and contains stormwater drainage systems to control runoff, thus eliminating any potential for significant flooding and soil erosion.

The surficial lithology of SAFS consists of alluvial deposits of the San Jose Plain. Underlying the recent alluvium deposits is the Pleistocene Santa Clara Formation, which consists of nonmarine conglomerates, sandstones, siltstones, and clays. Underlying this formation, various marine sedimentary and volcanic units overlie the basement Franciscan Formation. It has been postulated that a dip-slip type fault is adjacent to SAFS. The extent and depth of subsurface movement along this fault is unknown. No surficial, vertical displacement is visible in the fault zone.

Two major aquifer systems are encountered in the vicinity of SAFS. The lower aquifer occurs at a depth of approximately 200 ft. This aquifer consists of sand and gravel overlain by a confining unit approximately 100 ft thick. Above the confining unit, an upper aquifer system occurs between ground surface and a maximum depth of 100 ft. Lateral ground water movement in the upper and lower aquifers would be approximately 100 ft per year. Migration of any contaminant entering the ground water system would be in a northerly direction with some downward movement.

Saltwater intrusion has occurred in the upper aquifer adjacent to San Francisco Bay from heavy pumping of the aquifer.

As a result of the developed nature of the installation and its urban location, wildlife habitat on or adjacent to the station is small. Vegetation is limited to cultivated species such as ornamental shrubs, bushes, and trees. Various urban bird species forage in the trees and on the lawns. Common rodents (e.g., mice) occur onbase. No state-listed or Federally listed threatened or endangered species are present.

Camp Parks Communications Annex

CPCA is situated approximately 23 miles northeast of SAFS. The 11.6-acre hilltop installation is located southeast of Dublin, Calif., and directly north of Pleasanton, Calif. Elevations at CPCA decrease in all directions from 690 ft above MSL to 640 ft above MSL at the installation boundary. The topographic gradient from Bldg. 2002 to the western boundary of CPCA is approximately -1 ft per 5 ft. Due to the location of CPCA on a hilltop, stormwater drainage occurs rapidly through a system of open ditches and swales. Stormwater runoff drains approximately 0.5 mile east of the installation to Tassajara Creek.

The climate of CPCA is mild, with average monthly temperatures ranging from a low of 45.7°F in January to a high of 71.3°F in July. The average annual temperature is 58.7°F. Average annual rainfall is 14.11 inches, 81 percent of which occurs from November through March.

Net precipitation is -29.90 inches per year, and the 1-year, 24-hour rainfall event is 2 inches. The low value for net precipitation indicates a low potential for significant infiltration. The 1-year, 24-hour rainfall event of 2 inches indicates a moderate potential for runoff and erosion.

CPCA is located in Amador Valley, the western portion of Livermore Valley. The Livermore Valley is composed of a downwarped and faulted sequence of Miocene and Pliocene sandstones and conglomerates. CPCA is underlain by the Pliocene Tassajara Formation, consisting of bedding deposits of sandstone, tuffaceous sandstone, and shale. CPCA is located in a seismically active region, with the Pleasanton Fault suspected approximately 2.5 miles west of the annex.

CPCA is underlain by the Camp subbasin, a portion of the Livermore Valley Ground Water Basin. The subbasin covers an area of 2,858 acres and is drained by Tassajara Creek and Cottonwood Creek. Well yields are relatively low in the Camp subbasin due to the presence of shale units with low permeability. Recharge to the aquifer system occurs through infiltration of precipitation within the outcrop areas.

The habitat of CPCA is predominantly valley grasslands with small areas of altered habitat. The grasslands are occupied primarily by a variety of introduced species. Common grasses include wild oats, western rye grasses, common barley, and common foxtail.

Grasslands support a variety of wildlife, including mammals, birds, and reptiles. Common mammals include mice, moles, gophers, and hares.

A variety of large predatory birds and mammals occur in proximity to the site; however, these species probably do not occur onsite because of the small size of CPCA. Common birds of the property include American kestrel, burrowing owl, sparrows, blackbirds, finches, and larks. Reptiles found onbase consist of lizards, snakes, and skinks.

4.0 FINDINGS

To assess hazardous waste management at SAFS and CPCA, past activities of waste generation and disposal methods were reviewed. This section contains a summary of hazardous wastes generated, descriptions of waste disposal methods, identification of the disposal sites onbase, and evaluation of the potential for environmental contamination.

4.1 CURRENT AND PAST ACTIVITY REVIEW

To identify past activities that resulted in the generation and disposal of hazardous waste, current and past waste generation and disposal methods were reviewed. This activity consisted of a review of files and records, interviews with current and former base employees, and site inspections.

SAFS and CPCA operations described in this section are those which handle, store, or dispose of potentially toxic or hazardous materials. These operations include industrial and laboratory operations and activities in which pesticides; polychlorinated biphenyls (PCB); petroleum, oils, and lubricants (POL) (including organic solvents); radiological materials; and explosives are handled. No large-scale product-manufacturing operations have been conducted at SAFS or CPCA. Industrial operations conducted at SAFS are primarily maintenance-support functions provided for facilities, electronic equipment, satellite tracking antennas, and power production.

Since the initiation of industrial activity in 1959, various disposal practices for wastes have been used. In general, past waste disposal methods conformed to standard practices for that time period. With the promulgation of State of California and EPA regulations in the 1970s controlling toxic and hazardous materials, many disposal practices changed. Since then, regulated wastes have been disposed of offsite by hazardous waste contractors in approved hazardous waste disposal facilities.

Industrial activity, waste composition, and generation rates at SAFS have remained relatively constant since 1960. Often, specific information concerning waste generation rates and waste types of the early industrial activity was not available during the onsite survey. Therefore, unless otherwise stated, current waste types, generation rates, and shop locations are assumed to be representative of historical Air Force activity. App. E contains a list of shops currently operating on SAFS. Past and current shops, activities, and waste treatment, storage, and disposal practices are discussed in this section.

A summary of waste generation from SAFS industrial operations is presented in Table 4.1-1. Industrial shops; activities; and waste treatment, storage, and disposal are described in the following paragraphs. (Waste disposal, hazardous or otherwise, that is handled by contract will be referred to as "contract disposal" throughout this report.)

4.1.1 INDUSTRIAL OPERATIONS

4.1.1.1 AIR FORCE SATELLITE CONTROL FACILITY

CIVIL ENGINEERING

Power Plant

The SAFS Power Plant (gas turbine design) was constructed in 1971 to provide energy self-sufficiency to the Air Force Station.

Maintenance--Power Plant Maintenance (Bldgs. 1004 and 1007) generates waste lube oil [1,600 gallons per year (gal/yr)], solvent containing chlorinated hydrocarbons (60 gal/yr), and a detergent-based aircraft-cleaning compound (100 gal/yr). Since operational startup of the power plant in 1971, waste lube oil and solvent have been contract disposed. Also since 1971, the aircraft-cleaning compound has been diluted and discharged to the sanitary sewer system for treatment.

Table 4.1-1. Sunnyvale AFS Industrial Operations--Waste Generation

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950, 1960, 1970, 1980)
I. AIR FORCE SATELLITE CONTROL FACILITY				
A. Civil Engineering				
1. Power Plant				
a. Maintenance	1004, 1007	Lube oil	1,600	Contract disposal
		Solvent (contains chlorinated hydrocarbons)	60	Contract disposal
		Aircraft-cleaning compound (alkali detergent)	100	Diluted and discharged to sanitary sewer
b. POL Area	1011	Fuel sludge	Variable	Contract disposal
		Oily water (from JP-5 auto water separator)	900	Contract dispsoal
		Fuel filter cartridges	120/yr	Contract disposal
c. Cooling System	1007	Cooling tower blowdown	≤2,000 gpd	Discharged to sanitary sewer
		Boiler blow-down	2,000 gpd	Discharged to sanitary sewer

Table 4.1-1. Sunnyvale AFS Industrial Operations--Waste Generation (Continued, Page 2 of 4)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980)
c. Cooling System (continued)				
		Filter backwash	Variable	Discharged to to storm drain; Discharged to sanitary sewer
		Water treatment analytical chemicals	Variable (small)	Discharged to sanitary sewer
2. Paint Shop	1001	Paint wastes	20	Contract disposal
		Thinner (mineral spirits, lacquer)	100	Contract disposal
		Stripper	10	Contract disposal
3. Facilities Engineering	1002	Sanitary sewage	70,000 gpd	Discharged to City of Sunnyvale sewage system
		Solid waste (refuse)	200 tons/ month	Hauled to Offbase Sanitary landfill
II. 6594TH AIR BASE SQUADRON				
A. Security Police	1028	Rifle bore cleaner	<1	Hauled to NAS Moffett Field for contract disposal
B. Reprographics	1001	Rags (contaminated with chlorinated solvent)	Variable	Hauled to offbase sanitary landfill

Table 4.1-1. Sunnyvale AFS Industrial Operations--Waste Generation (Continued, Page 3 of 4)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 · 1960 · 1970 · 1980)
III. 1999TH COMMUNICATIONS SQUADRON--ANTENNA MAINTENANCE	1012, 1009	Ethylene glycol	110	Contract disposal →
		Transmission fluid	80	Contract disposal →
		Lube oil	20	Contract disposal →
		Kerosene	10	Contract disposal →
		Alkaline, detergent-based Air-craft-cleaning compound†	20	Discharged to storm drain →
IV. CONTRACTOR				
A. Ford Aerospace and Communications Corp.--Data Link Terminal Maintenance	1016	Lube oil	20	Given to employee for use offbase →
		Grease	15 lb/yr	Hauled to off-base Sanitary landfill →

Table 4.1-1. Sunnyvale AFS Industrial Operations--Waste Generation (Continued, Page 4 of 4)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices: 1950 — 1960 — 1970 — 1980
		Oily rags	Variable	Hauled to off-base sanitary landfill --->

*Unit of measurement is gallons per year (gal/yr) unless indicated otherwise.
†Permit pending; see text.

Key:
______ Confirmed timeframe and disposal data from shop personnel.
------ Estimated timeframe and disposal data from shop personnel.
-----> Arrow indicates current practice at time of site visit.
gpd Gallons per day.

Source: ESE, 1985.

POL Area--Waste generation from the power plant POL area (Facility 1011) includes fuel sludge (variable generation rate), oily water from the jet propellant (JP-5)/water separator (900 gal/yr), and spent fuel filter cartridges (120 cartridges/yr). Fuel sludges have been contrac disposed since 1971. The oily water and fuel filter cartridges have been contract disposed since the installation of the separator and filter components in 1974.

Cooling System--The power plant cooling system (Facility 1007) generates waste cooling tower blowdown [$\leq$2,000 gallons per day (gpd)], boiler blowdown (2,000 gpd), filter backwash (variable quantity), and water treatment analytical chemicals (variable but small quantity). Since installation of the cooling system in 1971, the cooling tower blowdown, boiler blowdown, and analytical chemicals have been discharged to the sanitary sewer. Filter backwash was discharged to a storm drain from 1979 to 1982 and discharged to the sanitary sewer from 1982 to present.

Paint Shop

The Civil Engineering Paint Shop (Bldg. 1001) produces waste paint (20 gal/yr), waste thinner (100 gal/yr), and waste stripper (10 gal/yr). All paint shop wastes have been contract disposed since 1970.

Facilities Engineering

Wastes from Facilities Engineering (Bldg. 1002) include sanitary sewage (average 70,000 gpd) and solid waste (200 tons/month). Sanitary sewage has been discharged to the City of Sunnyvale sewage system for treatment since 1959. Solid waste (refuse) has been hauled to offbase sanitary landfills since 1959.

4.1.1.2 6594TH AIR BASE GROUP

SECURITY POLICE

The Security Police (Bldg. 1028) constructed an armory at SAFS in 1983. Prior to 1983, all weapons were stored and maintained offbase. Rifle bore cleaner (<1 gal/yr) is the typical waste material generated through weapons maintenance. Since 1983, waste rifle bore cleaner has been sent to NAS Moffett Field for contract disposal.

REPROGRAPHICS

Reprographics (Bldg. 1001) generates variable quantities of cleaning rags contaminated with chlorinated solvent at a variable rate. Since 1959, the rags have been hauled to an offbase sanitary landfill for disposal.

4.1.1.3 1999TH COMMUNICATIONS SQUADRON

ANTENNA MAINTENANCE

The 1999th Communications Squadron is responsible for the operation and maintenance of two large satellite tracking antennas (Facilities 1012 and 1009). Waste generation through normal maintenance includes ethylene glycol (110 gal/yr), transmission fluid (80 gal/yr), lube oil (20 gal/yr), kerosene (10 gal/yr), and a detergent (an alkaline, water base compound diluted 20:1) aircraft-cleaning compound (20 gal/yr). Since installation of the antennas in 1976, the waste ethylene glycol, transmission fluid, lube oil, and kerosene have been contract disposed. The aircraft-cleaning compound has been discharged to a storm drain. (Subsequent to the site visit, the installation has applied to the California Regional Water Quality Control Board for a wastewater discharge permit for this discharge.)

4.1.1.4 CONTRACTORS

FORD AEROSPACE AND COMMUNICATIONS CORP.--DATA LINK TERMINAL MAINTENANCE

The Ford Data Link Terminal operates and maintains a large satellite tracking antenna at the north end of SAFS (Facility 1016). Wastes generated through routine maintenance are lube oil (20 gal/yr), grease [15 pounds per year (lb/yr)], and oily rags (variable quantity). Since 1976, the waste lube oil reportedly has been given to a Ford employee for personal use offbase. The waste grease and oily rags have been hauled to an offbase sanitary landfill.

4.1.1.5 CAMP PARKS COMMUNICATIONS ANNEX

EQUIPMENT MAINTENANCE

Industrial operations at CPCA (Bldg. 2001) are limited mainly to electronic equipment and component maintenance. These operations are summarized in Table 4.1-2. Waste materials generated as a result of this maintenance are paint thinner (<1 gal/yr), kerosene ($\leq$5 gal/yr), methy ethyl ketone (MEK) (<1 gal/yr), acetone (<1 gal/yr), alcohol (1 gal/yr), rags and empty chemical containers (variable quantity), Bright Dip® (chromic acid) (<1 gal/yr), and solid waste [2 cubic yards (yd^3)/week]. Since operational startup in 1960, the waste paint thinner, kerosene, MEK, acetone, and alcohol have been disposed of by allowing the wastes to evaporate from the parking area. From 1960 to 1972, the waste Bright Dip® was discharged via a sink drain to a dry well adjacent to Bldg. 2001. Since 1960, all solid waste (including rags and empty containers) has been hauled to an offbase sanitary landfill.

4.1.2 LABORATORY OPERATIONS

Laboratory operations at SAFS are performed by the 1369th Audiovisual Squadron (AVS) Reproduction and Photographic Laboratory. This laboratory's location; wastes generated; and waste treatment, storage, and disposal methods are summarized in Table 4.1-3. The operations are briefly described in the following paragraph.

The Reproduction and Photographic Laboratory (Bldg. 1001) generates waste photographic developer (60 gal/yr), fixer (300 gal/yr), and scrap film (180 lb/yr). Since 1959, the waste developer has been discharged to the sanitary sewer for treatment. Also since 1959, the waste fixer and scrap film have been hauled to NAS Moffett Field for silver recovery.

4.1.3 PESTICIDE HANDLING, STORAGE, AND DISPOSAL

Pesticides are used at SAFS by KILLROY Pest Control, Inc. to maintain grounds and structures and to prevent pest-related problems. Prior to

Table 4.1-2. Camp Parks Communications Annex Industrial Operations--Waste Generation

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 / 1960 / 1970 / 1980)
Equipment Maintenance	2001	Paint thinner	<1	1960 → Evaporated from parking area →
		Kerosene	≤5	1960 → Evaporated from parking area →
		Methyl ethyl ketone	<1	1960 → Evaporated from parking area →
		Acetone	<1	1960 → Evaporated from parking area →
		Alcohol	1	1960 → Evaporated from parking area →
		Rags and empty containers	Variable	1960 → Hauled to offbase sanitary landfill →
		Bright Dip® (chromic acid)	<1	1960 ─ Sink disposal to dry well ─┤ (ended early 1970s)
		Solid waste (refuse)	2 yd^3/wk	1960 → Hauled to offbase sanitary landfill →

*Unit of measurement is gallons per year (gal/yr) unless indicated otherwise.

Key:
_____ Confirmed timeframe and disposal data from shop personnel.
------ Estimated timeframe and disposal data from shop personnel.
-----> Arrow indicates current practice at the time of the site visit.

Source: ESE, 1985.

Table 4.1-3 Sunnyvale AFS Laboratory Operations--Waste Generation

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices 1950 1960 1970 1980
1369th AVS Reproduction and Photographic Lab	1001	Developers	60	Discharged to sanitary sewer
		Fixers	300	Hauled to NAS Moffett Field for silver recovery
		Film	180 lb/yr	Hauled to NAS Moffett Field for silver recovery

*Unit of measurement is gallons per year (gal/yr) unless indicated otherwise.

Key:
- ______ Confirmed timeframe and disposal data from shop personnel.
- ------ Estimated timeframe and disposal data from shop personnel.
- ——— Arrow indicates current practice at the time of the site visit.

Source: ESE, 1985.

1973, Lockheed Missile and Space Co. was responsible for pest management at SAFS. Those pest management practices were reported to have been the same as current practices.

According to available records, pesticides have been stored and mixed off the station throughout the history of the installation by the respective contractors. An inventory for the pesticides applied at SAFS is presented in Table 4.1-4. The SAFS groundskeeper stores a single 1-pint container of Diazinon for spot application around SAFS. No liquid wastes are generated from this application. Empty containers from this application are broken and included with building refuse for disposal in a sanitary landfill.

Pest control at CPCA is limited to weed and rodent control. Weed-B-Gone® (2,4,5-T) was applied for weed control by Lockheed up to 1983 when AMEX Systems, Inc. assumed pest-control responsibilities. Rodents (up to 400/yr) are caught live and transported off the installation by the contractor. As with SAFS, no pesticides have been stored or mixed at CPCA.

4.1.4 PCB HANDLING, STORAGE, AND DISPOSAL

The SAFS electrical equipment and distribution system have been maintained by AMEX Systems, Inc. since 1973. From 1959 to 1973, the electrical system was maintained by Lockheed as the operating contractor. All but minor repairs and maintenance are performed by offbase contractors. Before 1973, minor repairs were reportedly performed by Lockheed offbase. Major repairs were performed by offbase subcontractors working for Lockheed. A list of PCB transformers at SAFS is presented in Table 4.1-5.

Since 1973, no transformers have been taken out of service at SAFS. No records exist for transformers from the period before 1973. In December 1984, two 55-gal drums containing PCB-contaminated rags, cardboard, and absorbent clay granules were transported from SAFS by

Table 4.1-4. SAFS Pesticides Inventory

Pesticide	Rodenticide
Ficam W	Talon G
Diazinon 4E	
Diazinon 260	
Resmethrin 110	
Ramik Green	
Max Force®	
Baygon®	
Knoxout®	
Dursban 270	

Sources: AFSCF, 1983, 1984c.
ESE, 1985.

Table 4.1-5. PCB Transformers on SAFS

Room Number*	Number of Transformers	Volume of Fluid (gal)
107	3	260
		255
		280
167	2	208
		308
326	2	281 each
426	2	74
		153
498	1	297

*All PCB transformers are located in Bldg. 1001 in the rooms indicated.

Sources: Sunnyvale Dept. of Public Safety, 1982.
ESE, 1985.

Transformer Fluid Services, Inc. of San Jose, Calif., to a hazardous waste landfill operated by U.S. Ecology, Inc. in Beatty, Nev. The wastes were generated during routine cleanup of small leaks from the PCB transformers located in Bldg. 1001.

4.1.5 POL HANDLING, STORAGE, AND DISPOSAL

The types of POL used and stored at SAFS include jet propellant (JP-5), natural gas, kerosene, petroleum-based solvents, hydraulic fluid, and lube oil. No POL materials are used or stored at CPCA.

In addition to fixed storage tanks, drums and smaller containers are used for aboveground storage of incoming and waste materials, mainly solvents, hydraulic fluid, and lube oil. POL spill management is addressed in the SAFS Civil Engineering Oil and Hazardous Materials Pollution Contingency Plan and the Base Civil Engineer's Emergency Fuel Leak/Spill Procedures. These plans are revised regularly to ensure that they accurately reflect POL storage and spill prevention/containment.

Existing Aboveground POL Storage

Seven existing aboveground storage tanks were identified at SAFS. These JP-5 storage tanks range in size from 10,000 to 50,000 gal, with a total aboveground storage tank capacity of 270,000 gal. All seven storage tanks are enclosed in the POL storage area (Facility 1011). Spill containment consists of gravel bedding and a concrete dike surrounding the storage area.

The only other aboveground POL storage tank is a 500-cubic-foot natural gas accumulator located in the southeast corner of the POL storage area.

Existing Underground POL Storage

Three existing underground POL storage tanks, with a total capacity of 62,700 gal, were identified at SAFS. Two of the tanks contain JP-5, with a capacity of 31,000 gal each. These tanks are located under Bldg. 1007. The third underground tank is located near the northeast corner of the POL storage area. This tank has a 700-gal capacity and contains waste POL.

Abandoned POL Storage

There were no abandoned POL storage tanks identified at SAFS.

Waste POL Storage, Handling, and Disposal

Waste POL at SAFS include waste fuels, lube oils, petroleum-based solvents, and hydraulic fluids. The generation and disposal of waste POL are summarized in Table 4.1-1 (in Sec. 4.1.1).

Wastes are stored at their generation points in drums, aboveground tanks, and underground tanks until the maximum storage capacity is reached.

Waste lube oil from the power plant is collected behind Bldg. 1004 and transferred to either 55-gal drums or a 700-gal underground waste POL tank (depending on available storage) for temporary storage.

Since initiation of industrial activities in 1959, all waste POL has been contract disposed by offbase waste oil dealers. Reportedly, no waste POL has been disposed of at SAFS.

Waste POL generated at CPCA (<5 gal/yr of kerosene) is allowed to evaporate from the CPCA parking lot.

4.1.6 RADIOACTIVE MATERIALS HANDLING, STORAGE, AND DISPOSAL

According to available records, no radioactive materials have been used, stored, or disposed of at SAFS or CPCA.

4.1.7 EXPLOSIVE/REACTIVE MATERIALS HANDLING, STORAGE, AND DISPOSAL

The only explosive materials stored at SAFS are small-rounds ammunition for the Security Police (Bldg. 1003). Access to this area is controlled. Available records indicate that no other explosive or reactive materials have been used, stored, or disposed of at SAFS or CPCA.

4.2 WASTE DISPOSAL METHODS AND DISPOSAL SITE IDENTIFICATION, EVALUATION, AND HAZARD ASSESSMENT

As described in the current and past activity review (Sec. 4.1), various methods have been used for disposal of wastes generated by SAFS and CPCA operations. Because of the small sizes and urban location (SAFS) of the installations, no large-scale onsite disposal methods such as landfilling, open burning, or landspreading have been used.

Depending on type, wastes have either been transported offsite to municipal landfills, contract disposed to POL recycling companies, or discharged to the stormwater or sanitary sewer systems. In each of these cases, the wastes ultimately are transported offsite, leaving minimal or no potential for residual onsite contamination. One site (DS-1) on CPCA, however, was identified as having a potential for residual contamination. This site (DS-1) is an underground dry well that received discharge from a sink in the maintenance area of Bldg. 2001. The following paragraphs describe the disposal sites that were identified in Sec. 4.1.

4.2.1 STORMWATER DRAINAGE DISPOSAL SITES

Two stormwater drainage disposal sites were identified on SAFS. Site descriptions, designations used in this report, dates of operation, and waste descriptions are listed in Table 4.2-1. The locations of these sites are shown in Fig. 4.2-1.

Stormwater Drainage System Disposal Site No. 1 (SD-1)

Filter backwash water from the power plant cooling system (Bldg. 1007) was discharged to the stormwater drainage system from 1979 to 1982. The stormwater drainage system discharged into a drainage canal located adjacent to the station. This wastewater is currently discharged to the sanitary sewer system.

Stormwater Drainage System Disposal Site No. 2 (SD-2)

Washwater generated by antenna maintenance operations is discharged to a storm drain adjacent to Bldg. 1012. A detergent-based aircraft-cleaning

Table 4.2-1. Summary of Information on SAFS Stormwater Drainage System Disposal Sites

Site Description	Designation	Dates of Operation	Waste Description
Storm Drain Bldg. 1007, Cooling Tower Filter Backwash	SD-1	1979-1982	Filter backwash containing suspended solids
Storm Drain, Bldgs. 1009 and 1012, Washwater from Antenna Maintenance	SD-2	1976-Present	Washwater from antenna maintenance containing an alkaline detergent-based aircraft-cleaning compound

Source: ESE, 1985.

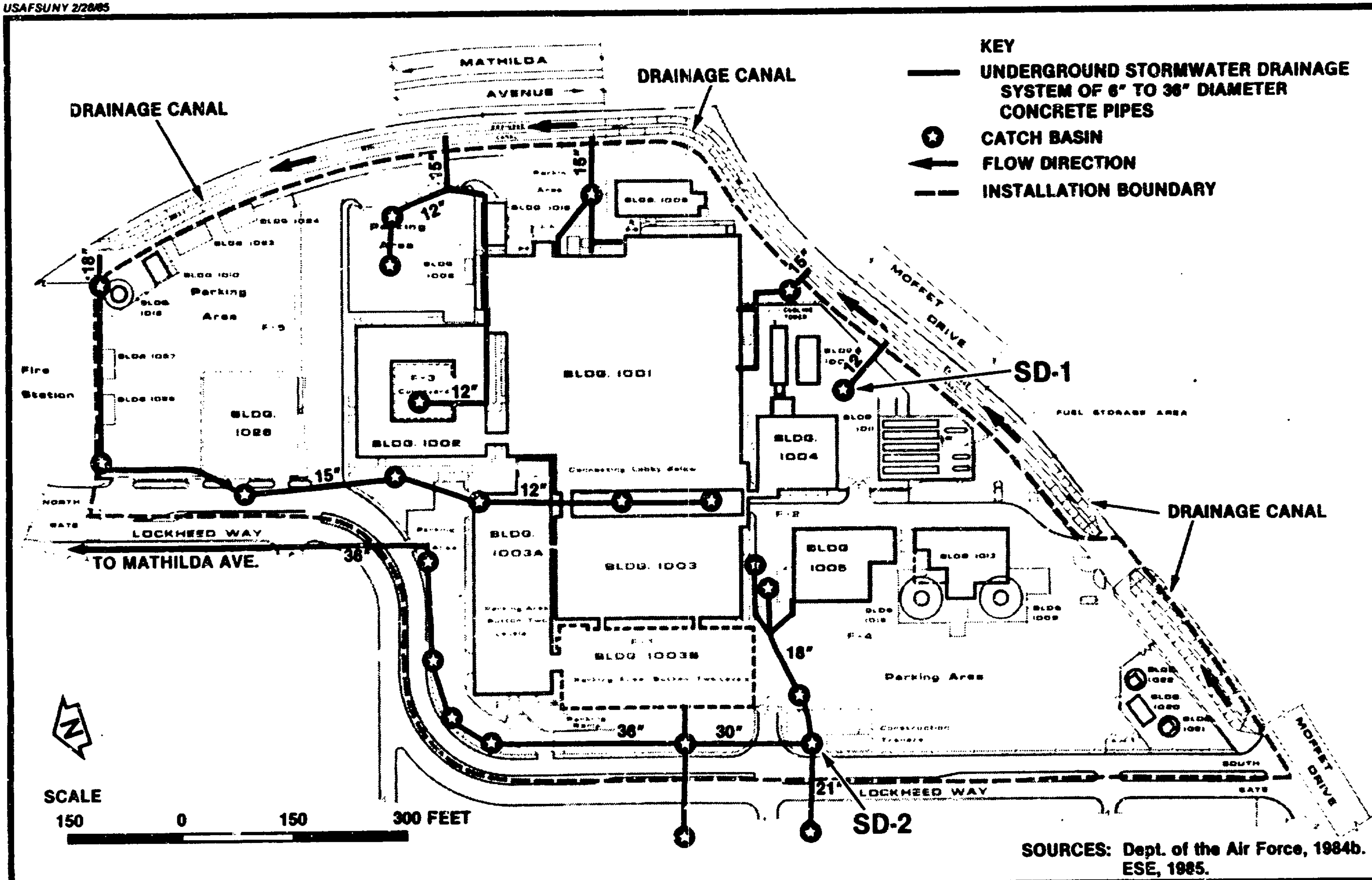

Figure 4.2-1
STORMWATER DRAINAGE DISPOSAL SITES ON SAFS

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compound is used in the cleaning process. The stormwater drainage system discharges to a stormwater drain along Lockheed Way, eventually emptying into the drainage canal adjacent to the station. The washwater contains detergent surfactants from the cleaning compound and suspended solids. Because this is an ongoing operation, a discharge permit may be required. (Subsequent to the site visit, the installation has applied to the California Regional Water Quality Control Board for a wastewater discharge permit for this discharge.)

4.2.2 LANDFILLS

No landfills used for either sanitary or debris disposal were identified at SAFS. All wastes generated at SAFS were hauled offbase for disposal.

No landfills were used on CPCA for disposal of sanitary waste or debris. All solid wastes generated at CPCA have been hauled to an offbase landfill. Interviews with CPCA personnel reveal no burial or disposal of solid wastes within CPCA.

4.2.3 FUEL SPILL SITES

Records indicate that one large POL spill occurred at SAFS. In March 1980, approximately 1,000 gal of JP-5 were lost during tank rotation in the fuel circulation system as a result of a partially open valve. Approximately 300 gal were contained on SAFS; the remainder was contained within the drainage ditch adjacent to the station. This spill site is shown as FS-1 in Fig. 4.2-2. The 700 gal that entered the drainage channel were removed with contaminated water. A sandbag levee approximately 500 ft downgradient contained the spill. Due to the proper remedial actions, this spill has minimal or no potential for contamination or migration. Therefore, based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Several smaller fuel spills have occurred on SAFS. In 1980, approximately 10 gal of JP-5 were spilled during operation in the fuels area (site designated FS-2 in Fig. 4.2-2). The soil in the spill area was removed and contained for disposal by a private contractor. In

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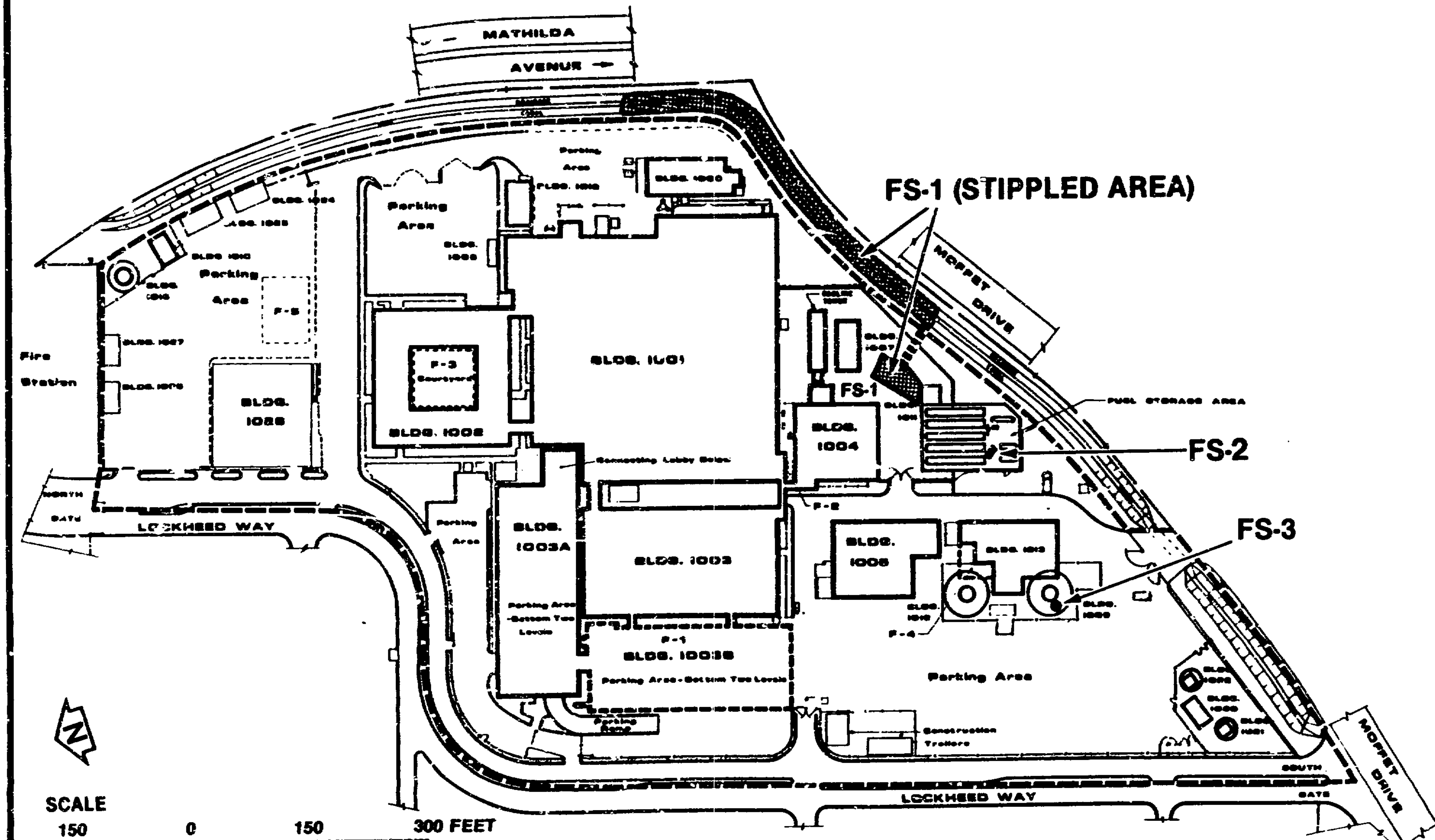

SOURCES: Dept. of the Air Force, 1984a.
ESE, 1985.

Figure 4.2-2
FUEL SPILL SITES ON SAFS

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1983, a 5-gal POL spill (FS-3) occurred near the satellite communications antenna near Bldg. 1009. The area was cleaned with a detergent-based aircraft-cleaning compound and rinsed to the storm drain. Due to cleanup procedures, these spills have minimal or no potential for contamination or migration. Therefore, based on the decision process outlined in Fig. 1.3-1, these sites were deleted from further consideration.

No fuel spill sites were identified on CPCA.

4.2.4 FIREFIGHTER TRAINING AREA

No firefighter training areas were identified at SAFS or CPCA. Due to the sizes and missions of the installations, no burn pits, smokehouses, or mock aircraft were used for training purposes.

4.2.5 CHEMICAL DISPOSAL SITES

No chemical disposal sites were identified on SAFS. A sink located in the maintenance area of Bldg. 2001 at CPCA discharges to an underground dry well located adjacent to the southeast corner of the building. The sink drain wet well disposal site is designated as DS-1 (see Fig. 4.2-3). Fig. 4.2-4 shows the construction details of this dry well. As shown in Fig. 4.2-4, the floor drains in Bldg. 2001 also discharge to dry wells. These dry wells were installed at the time the facility was constructed (1960) to prevent detergent-type wastes from entering the septic tank sanitary disposal system and disrupting the biological treatment process. Several of the floor drains are no longer operational, and the others are not currently used. In the past, the sink had been used for disposal of small quantities of various chemicals used in maintenance operations, including a chromic acid Bright Dip® solution. Because of the small volumes disposed and infrequent use of the sink, residual contamination is expected to be minimal with no potential for migration. Because the sink discharges to the dry well, the potential exists for future contamination from accidental spillage or inadvertent disposal of toxic or hazardous materials in the sink.

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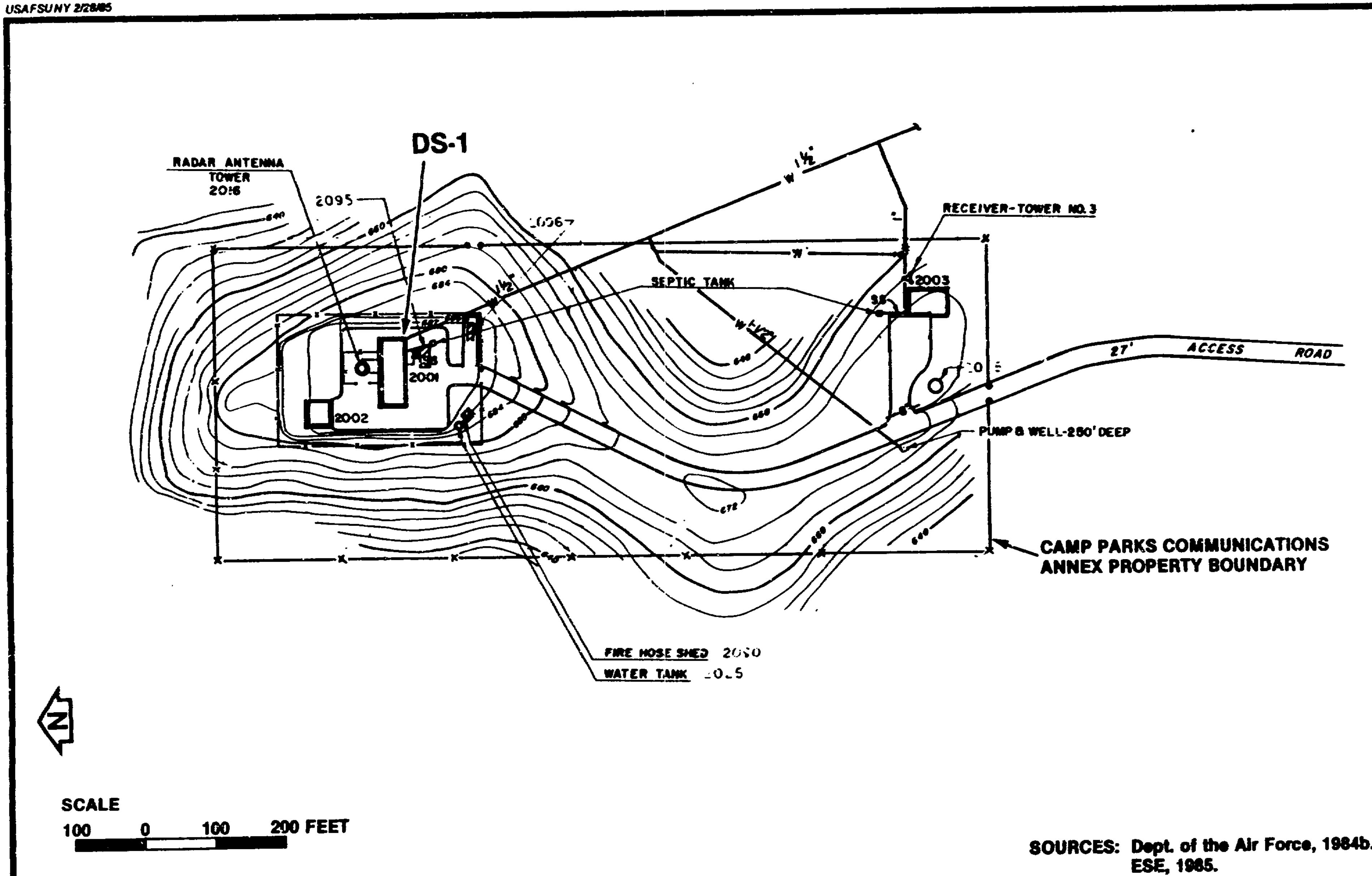

Figure 4.2-3
LOCATION OF WET-WELL DISPOSAL SITE DS-1

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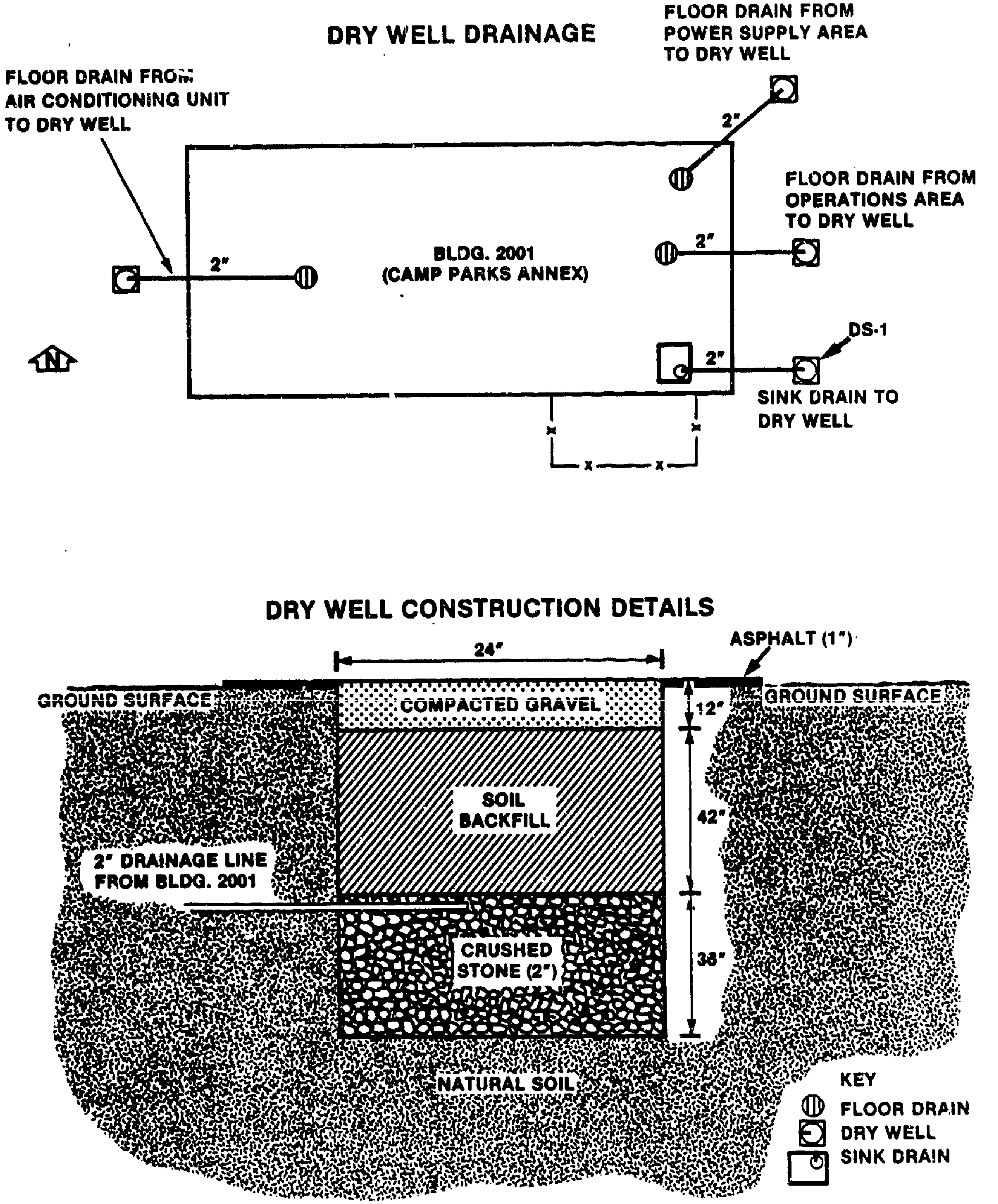

SOURCE: ESE, 1985.

Figure 4.2-4 LOCATIONS AND CONSTRUCTION DETAIL FOR THE DRY WELLS ADJACENT TO BLDG. 2001 AT CPCA	INSTALLATION RESTORATION PROGRAM SUNNYVALE AIR FORCE STATION

4.2.6 HAZARD EVALUATION ASSESSMENT

The review of past operation and maintenance functions and past waste management practices at SAFS and CPCA has resulted in the identification of six sites that were initially considered areas of concern, with potential for contamination. These sites, described in Secs. 4.2.1 through 4.2.5, were evaluated using the decision process presented in Fig. 1.3-1 (in Sec. 1.3). The results of this decision process are summarized in Table 4.2-2. All six sites were found to have little or no potential for contamination or contaminant migration and, thus, were not evaluated using the HARM system. Operational procedures at two of these sites (SD-2 at SAFS and DS-1 at CPCA) were deemed to warrant review and modification under the base environmental program. These sites are identified under the column "Refer to Base Environmental Programs" in Table 4.2-2.

Table 4.2-2. Summary of Decision Process Logic for Areas of Initial Environmental Concern at SAFS and CPCA

Site Description	Designation	Potential For Contamination	Potential For Contaminant Migration	Potential For Other Environmental Concern	Refer to Base Environmental Programs	HARM Rating
Bldg. 1007, Cooling Tower Filter Backwash	SD-1	No	No	No	No	No
Bldgs. 1009 and 1012, Washwater from Antenna Maintenance	SD-2	No	No	No	Yes	No
Fuel Spill Site No. 1	FS-1	No	No	No	No	No
Fuel Spill Site No. 2	FS-2	No	No	No	No	No
Fuel Spill Site No. 3	FS-3	No	No	No	No	No
Bldg. 2001, Dry Well Disposal Site	DS-1	Yes	No	No	Yes	No

Source: ESE, 1985.

5.0 CONCLUSIONS

The goal of the IRP Phase I study is to identify sites where there is potential for environmental contamination resulting from past waste disposal practices and to assess the potential for contaminant migration from these sites. The conclusions 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.

Six sites (five on SAFS and one on CPCA) were initially considered areas of concern with potential for contamination. Table 5.0-1 lists these sites and summarizes the evaluations of each site. Figs. 5.0-1 and 5.0-2 show the locations of the sites. Two of these sites were former stormwater drainage disposal sites that have little potential for residual contamination. One site (Site No. 2) is an operating stormwater drainage disposal site that may require an industrial discharge permit; therefore, this site was determined to warrant review and modification under the base environmental program. Three sites were fuel spill sites at which the cleanup operations were sufficient that little residual contamination remained. A sink drain disposal site (Site No. 6) on CPCA, while having a potential for residual contamination, does not present potential for migration or for endangerment of human health or environmental quality. This sink drain system was also determined to warrant review and modification under the base environmental program.

All six sites were evaluated using the decision process. Because the sites were found to have little or no potential for contamination or contaminant migration, none of the sites were evaluated using the HARM system.

Table 5.0-1. Summary of Information on Potential Contamination Sites on SAFS and CPCA

Site * Number	Site Description	Report Designation	Dates of Operation or Occurrence	Waste Description	Conclusions
1	Storm Drain, Bldg. 1007, Cooling Tower Filter	SD-1	1979-1982	Filter backwash containing suspended solids	No potential for contamination; disposal practice ceased
2	Storm Drain, Bldgs. 1009 and 1012, Washwater from Antenna Maintenance	SD-2	1976-present	Washwater from antenna maintenance containing an alkaline detergent-based aircraft-cleaning compound	No potential for residual contamination; refer to base environmental program for review of operation†
3	Fuel Spill, 1,000 gal JP-5, Fuels Area	FS-1	March 1980	1,000 gal JP-5	No potential for residual contamination; spill cleanup by SAFS
4	Fuel Spill, 10 gal JP-5, Fuels Area	FS-2	1983	10 gal JP-5	No potential for residual contamination; spill cleanup by SAFS
5	Fuel Spill, 5 gal POL, Antenna Area	FS-3	1983	5 gal POL	No potential for residual contamination; spill cleanup by SAFS
6	CPCA Bldg. 2001, Wet Well Disposal Site	DS-1	1960-present	Wastewater from maintenance area sink drain; diluted small quantities of various chemicals used in maintenance operations	Potential for residual contamination; no potential for migration or endangerment of human health or environment**

*Site Nos. 1 through 5 located on SAFS (Fig. 5.0-1); Site No. 6 located on CPCA (Fig. 5.0-2).

†Subsequent to the site visit, it was reported that SAFS has applied to the California Regional Water Quality Control Board for a discharge permit.

**Subsequent to the site visit, it was reported that preliminary plans are being developed to connect the wet well disposal system to the sanitary sewer disposal system.

Source: ESE, 1985.

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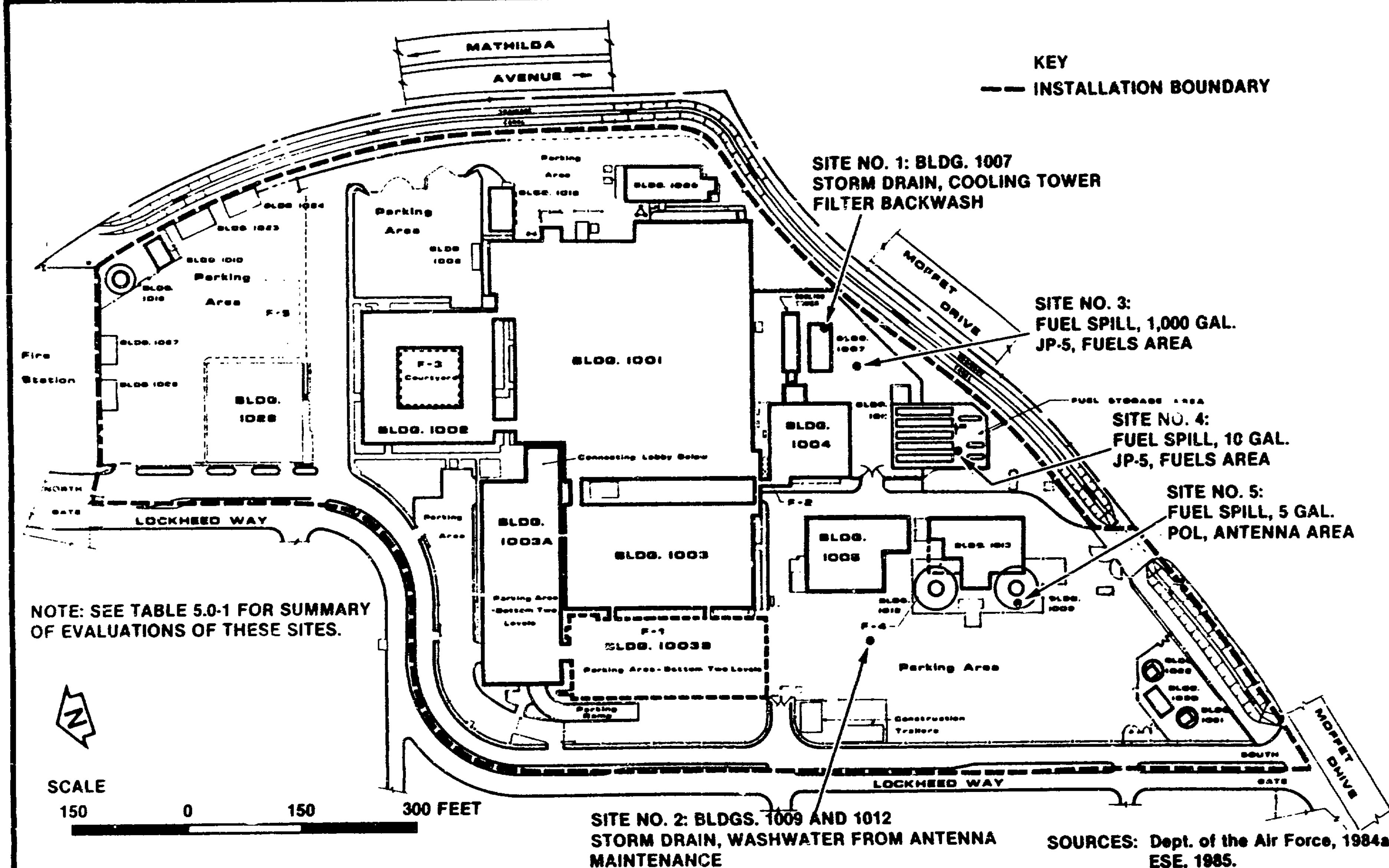

Figure 5.0-1
LOCATIONS OF POTENTIAL CONTAMINATION SITES ON SAFS

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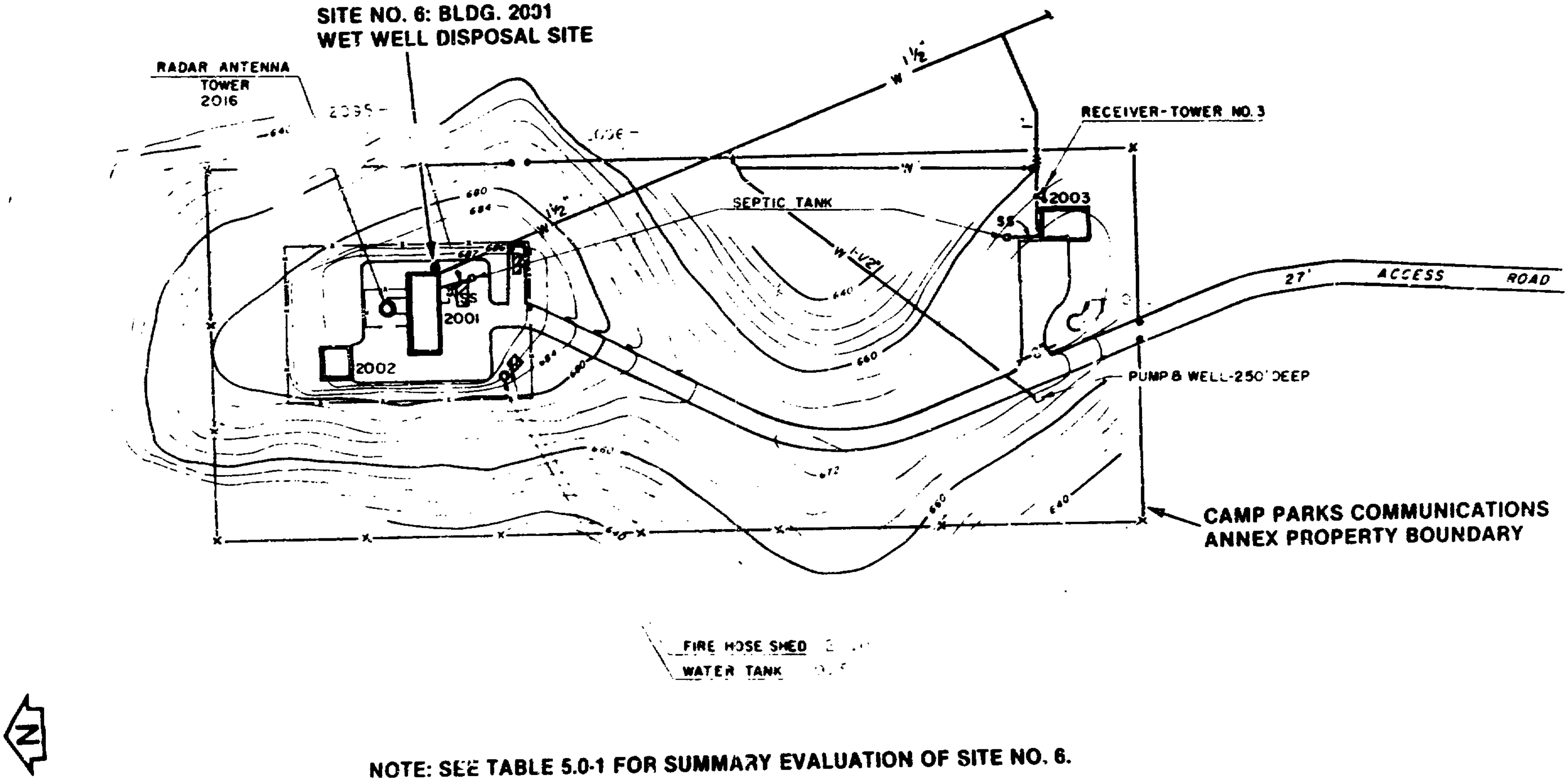

NOTE: SEE TABLE 5.0-1 FOR SUMMARY EVALUATION OF SITE NO. 6.

SCALE

100 0 100 200 FEET

SOURCES: Dept. of the Air Force, 1984b.
ESE, 1985.

Figure 5.0-2
LOCATION OF POTENTIAL CONTAMINATION SITE ON CAMP PARKS COMMUNICATIONS ANNEX

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6.0 RECOMMENDATIONS

No sites on SAFS or CPCA were identified as having potential for contamination and contaminant migration; therefore, no Phase II actions are recommended. One operating stormwater drainage disposal site (Site No. 2) on SAFS and a sink drain disposal site (Site No. 6) on CPCA need to be reviewed by the base environmental program, and appropriate operational modifications should be made in accordance with state and Federal regulations. [Subsequent to the site visit, it was reported that SAFS has applied to the California Regional Water Quality Control Board for a discharge permit for Site No. 2 and that preliminary plans are being developed to connect the wet well disposal system (Site No. 6) at CPCA to the sanitary sewer disposal system.]

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APPENDIX A

GLOSSARY OF TERMINOLOGY, ABBREVIATIONS, AND ACRONYMS

APPENDIX A
GLOSSARY OF TERMINOLOGY, ABBREVIATIONS, AND ACRONYMS

AFB	Air Force Base
AFBMD	Air Force Ballistic Missile Division
AFSC	Air Force Systems Command
AFSCF	Air Force Satellite Control Facility
AMC	Air Materiel Command
Aquifer	A geologic formation, group of formations, or part of a formation capable of yielding water to a well or spring
ARDC	Air Research and Development Command
ARPA	Advanced Research Projects Agency
AVS	Audio Visual Squadron
BEE	Bioenvironmental Engineering
BSD	Ballistics Systems Division
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Contamination	Degradation of natural water quality to the extent that its usefulness is impaired; degree of permissible contamination depends on intended use of water
CPCA	Camp Parks Communications Annex
DCA	Defense Communications Agency
DEQPPM	Defense Environmental Quality Program Policy Memorandum
Det.	Detachment

Disposal of hazardous waste	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, be emitted into the air, or be 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
Effluent	Liquid waste discharged in its natural state or partially or completed treated, from a manufacturing or treatment process
EPA	U.S. Environmental Protection Agency
ESE	Environmental Science and Engineering, Inc.
FMA	Fort MacArthur
ft	feet
ft^2	square feet
FTU	Formazin turbidity units
gal	gallon(s)
gal/yr	gallon(s) per year
gpd	gallon(s) per day
Ground water	Water beneath the land surface in the saturated zone that is under atmospheric or artesian pressure
HARM	Hazard Assessment Rating Methodology
Hazardous waste	As defined in RCRA, 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, disposed of, or otherwise managed

HQ	Headquarters
ICBM	Intercontinental ballistic missile
Infiltration	Movement of water through the soil surface into the ground
IOC	Initial operating capability
IRBM	Intermediate-range ballistic missile
IRP	Installation Restoration Program
JP	Jet propellant
LAAFS	Los Angeles Air Force Station
lb	pound(s)
LMSC	Lockheed Missile and Space Company
MCL	Maximum contaminant level
MEK	Methyl ethyl ketone
mg/l	milligram(s) per liter
MIT	Massachusetts Institute of Technology
MSL	Mean sea level
NA	Not applicable
NASA	National Aeronautics and Space Administration
NAS	Naval Air Station
NCOIC	Noncommissioned Officer-in-Charge
NEESA	Naval Energy and Environmental Support Activity
NIPDWR	National Interim Primary Drinking Water Regulations
NSDWR	National Secondary Drinking Water Regulations
OL	Operating Location
PCB	Polychlorinated biphenyl--liquid used as a dielectric in electrical equipment; suspected human carcinogen; bioaccumulates in the food chain and causes toxicity to higher trophic levels

pCi/l	picocurie(s) per liter
Permeability	The capacity of a porous rock, soil, or sediment of transmitting a fluid without damage to the structure of the medium
POL	Petroleum, oils, and lubricants
PRFTA	Parks Reserve Forces Training Area
PSF	Presidio of San Francisco
PVC	Polyvinyl chloride plastic
RCRA	Resource Conservation and Recovery Act
SAC	Strategic Air Command
SAFS	Sunnyvale Air Force Station
SAMSO	Space and Missile Systems Organization
SATCOM	Satellite Communications
SD	Space Division
SSD	Space Systems Division
STA	Satellite Test Annex
STC	Satellite Test Center
STORET	Storage and retrieval
STS	Space Transportation System
TDS	Total dissolved solids
UCMJ	Uniform Code of Military Justice
umhos/cm	micromhos per centimeter
Upgradient	In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of ground water
USAF	U.S. Air Force
Water table	Surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere

WDD	Western Development Division
WS	Weapon system
yd^3	cubic yard(s)

APPENDIX B

TEAM MEMBER BIOGRAPHICAL DATA

ESE

PROFESSIONAL RESUME

CHARLES D. HENDRY, JR., Ph.D.
Staff Chemist

SPECIALIZATION

Water Quality Chemistry, Atmospheric Chemistry, Physical-Chemical Transport of Toxic/Hazardous Substances, Environmental Fate of Toxic Substances

RECENT EXPERIENCE

Toxic/Hazardous Materials, Handling and Disposal, USATHAMA and NEESA, Project Manager--Assessment of present and past handling and disposal practices for toxic/hazardous materials on 32 U.S. Army and Navy installations conducted for USATHAMA and NEESA. These sites include seven installations in the southeastern United States. Includes evaluation of the potential for off-post migration of toxic materials, recommendations for sampling and analysis, and compliance with existing federal and state regulations.

Toxic Substances--Fate in the Environment, U.S. Environmental Protection Agency, Subproject Manager--Assessment of the release transport and fate of toxic organic and inorganic substances in the environment. This assessment is based upon physical and chemical properties (e.g., volatility, solubility, photolysis, hydrolysis, sorption, and biodegradation) of the compounds and evaluation of predicted environmental concentrations using computer models.

Toxic/Hazardous Materials Sampling and Analysis-Quality Assurance/Control--Analytical chemistry QA/QC for project involving sampling and analysis of soils, waters, and biota at a U.S. Army ammunition manufacturing plant, Alabama Army Ammunitions Plant, Alabama.

Florida Power Coordinating Group, Atmospheric Deposition Study, Technical Consultant--Three-year study measuring deposition of chemical substances by atmospheric precipitation. Includes monitoring, source attribution studies, and ecological effects evaluation. Emphasis placed upon water quality impacts.

EDUCATION

Ph.D.	1983	Environmental Engineering	University of Florida
M.S.	1977	Environmental Engineering	University of Florida
B.S.	1974	Chemistry	University of Florida

ASSOCIATIONS

American Chemical Society
Water Pollution Control Federation
Air Pollution Control Association

RECENT REPORTS

Approximately 35 hazardous waste site investigations of U.S. military installations.

PUBLICATIONS

Approximately 15 publications related to transport and transformation of pollutants in the atmosphere and the aquatic environment.

ALLEN P. HU ARD, B.S.E.
Department Manager, Remedial Engineering

ESE PROFESSIONAL RESUME

SPECIALIZATION

Hazardous Waste Management, Remedial Actions, Industrial Waste Operations Design and Permitting

RECENT EXPERIENCE

Design and Implementation of Remedial Actions for Petroleum Product Spill in a Stormwater Detention Basin, Project Manager—Manager for site investigations, alternatives evaluation, engineering design, and confirmation of decontamination. Project involved a site at which an undetermined large volume of petroleum products had been spilled into a stormwater collection system over a period of 10 to 15 years. Site was decontaminated and restored to FDER specifications.

Superfund Site Remedial Action Feasibility Study, Sapp Battery Site, Florida, Project Engineer—Under contract to Florida Department of Environmental Regulation (DER), ESE is evaluating potential remedial actions for this former industrial facility contaminated with lead and sulfuric acid from past battery reclamation operations. Project engineers are responsible for development of initial and long-term remedial measures for eliminating actual and potential contaminant migration with cost and liability as primary factors.

Project Manager/Engineer Hazardous Waste Delisting Projects, Project Manager—Four separate projects for three plants in the steel finishing industry. Projects included negotiation with state and federal agencies (in different states), sampling and analysis, and formal petition documents to exclude listed hazardous wastes from RCRA regulations according to 40 CFR Part 260.22.

Hazardous Waste Inventory and Delisting, Carolina Galvanizing Corporation (CGC), Aberdeen, North Carolina, Project Manager—Developed sampling and analysis plan after evaluating plant processes and regulatory requirements specific to CGC. Sludge analyses demonstrated that the generated sludge met delisting criteria. Delisting petition prepared for EPA Region IV and the North Carolina Department of Human Resources (DHR). Also performed a hydrogeologic survey to demonstrate that sludge could be deposited in an onsite landfill, which was later designed and permitted. Responsibilities included supervising sampling, negotiation with regulatory agencies and clients, preparing and overseeing fixation studies, and evaluating all reports.

Project Manager/Engineer RCRA Closure Plans for Hazardous Waste Treatment and Storage Facilities, Project Manager—Developed plans for five separate clients for closure of hazardous waste treatment, storage, disposal facilities (TSDFs). Types of operations included hazardous waste incinerator, burning ground, and storage tank farm, chemical/physical treatment system, land treatment facility, surface impoundments. Final plans complied with 40 CFR Part 265.

Industrial Wastewater Permit for Coal-Slag Reclamation Facility, Mineral Aggregates, Inc. (Lonestar Minerals), Tampa, Florida, Project Engineer—Prepared engineering report for permit application involving reuse of bottom slag from a coal-fired power plant. Client recycles the slag as sandblasting grit, roofing material, and other products. Runoff from slag piles enters Tampa Bay, necessitating a mixing zone as part of the permit.

Hazardous Waste Remedial Action/Decontamination Study, Alabama Army Ammunition Plant, Project Engineer—Project to develop and implement corrective measures for decontamination of buildings, process equipment, sewers and soil to control surface water and ground water contamination at U.S. Army ammunition plant. Developed decontamination alternatives with consideration of risk, cost and technical feasibility.

Industrial Wastewater Treatment/Disposal System Design and Permitting Projects, Project Manager, Project Engineer—Seven permitting projects for industrial clients in various SIC codes (two metal finishing, two food and beverage, one aircraft maintenance, and two cement products). These industrial permitting projects involved conceptual and final design, waste characterization, report preparation, extensive negotiation with regulatory agencies, and interaction with legal counsel for some clients.

Expert Witness Testimony for Industrial Clients, Ardmore Farms and Martin Electronics, Inc., Florida—Testimony helped the clients with a lawsuit and regulatory action to avoid costly penalties.

Preparation of RCRA Part B Permit Applications, Project Engineer—Responsible for various engineering aspects of Part B applications for five industrial clients. Facilities included storage tanks, chemical/physical treatment operations, and land disposal. Permitting involved both federal and state criteria.

Hazardous Waste Landfill Siting Study, Allied Chemical Company, Project Engineer—Evaluation of six existing commercial hazardous waste disposal sites, including development of corrective construction requirements and RCRA comipliance measures required. This study included location of potential sites for a hazardous waste landfill using RCRA siting criteria.

Industrial/Hazardous Waste Characterization and Evaluation, Project Engineer—Evaluation of existing and proposed industrial and hazardous waste treatment storage and disposal facilities at three industrial free zones in Egypt. Project included a characterization of wastes using RCRA regulations.

EDUCATION
B.S.E. 1979 Environmental Engineering University of Florida

REGISTRATION
P.E. Florida 1984

ASSOCIATION
American Society of Civil Engineers

JEFFREY J. KOSIK, B.S.E.
Associate Engineer

ESE PROFESSIONAL RESUME

SPECIALIZATION

Hazardous Waste Management, Water and Wastewater Treatment, Water Supply and Field of Investigations

RECENT EXPERIENCE

Initial Assessment Studies for the United States Air Force, Team Engineer--Comprehensive studies at 2 Air Force bases to determine both past and present history with regard to the use and disposal of toxic and hazardous materials. Conducted in accordance with the Department of Defense Installation Restoration Program policies.

Reassessment for Hazardous Wastes at Army Installation, Team Engineer--Comprehensive study at an Army installation to determine both past and present history with respect to the use of hazardous substances, quantities used, disposal methods and disposal sites. Also includes a current assessment of safety practices and compliance with regulations.

Hazardous Waste Survey and Assessment and Review of Potential Liability for a Major U.S. Industrial Corporation, Project Engineer--Comprehensive survey of over 50 corporate facilities to determine past and present activities with respect to the use of hazardous substances, quantities used, disposal methods, disposal sites and potential legal liability of those activities. Study also includes an assessment of compliance with regulations.

Industrial Wastewater Treatment/Disposal Systems Design and Permitting, Project Engineer--Several projects for the conceptual and final design of a treatment/disposal system, design of treatment instrumentation systems, and permitting.

Effluent Guidelines Development for the Pharmaceuticals Manufacturing Point Source Category, Project Engineer-- Comprehensive study for wastewater characterization, treatment system performance evaluation, and estimation of installation and operating costs for treatment systems to remove toxic and conventional pollutants.

EDUCATION

B.S.E.	1982	Environmental Engineering	University of Florida
1984	Hazardous Materials/Site Investigations Training Course		

AFFILIATIONS

Society of Environmental Engineers
American Water Works Association
Water Pollution Control Federation
Boy Scouts of America
American Red Cross

ESE

PROFESSIONAL RESUME

DONALD F. McNEILL, M.S.
Associate Scientist

SPECIALIZATION

Hydrogeology, Ground Water Monitoring and Evaluation, Clastic Sedimentology, Carbonate Sedimentology, Peat and Organic Sediment Analysis, Geomorphology, Stratigraphy, Field Mapping, and Sampling Techniques

RECENT EXPERIENCE

U.S. Army Toxic and Hazardous Materials Agency, Project Geologist--Installation assessment of Ft. Riley, Kansas. Geohydrologic assessment of present and past waste disposal methods, responsible for evaluation of the potential for migration of contaminants in the subsurface.

U.S. Army Toxic and Hazardous Materials Agency, Project Geologist--Installation assessment of Military District of Washington. Geohydrologic assessment of present and past waste disposal methods, responsible for evaluation of the potential for migration of contaminants in the subsurface.

U.S. Army Toxic and Hazardous Materials Agency, Project Geologist--Installation assessment of West Virginia Ordnance Works. Geologic and ground water investigation of past waste disposal methods. Responsible for evaluation of ground water contamination and off-post contaminants migration.

Florida Department of Environmental Regulation, Site Contamination Assessment, Project Hydrogeologist--Investigated organic and inorganic contamination at City Chemical Company, Orlando, Florida. Assessment of shallow aquifer with respect to contaminant migration.

EDB Contamination Investigation, Project Hydrogeologist--Investigated EDB contamination of drinking water wells at Sanford, Florida, including drilling and field sampling, installation of piezometers, measuring water levels and sampling wells, evaluating alternatives, and preparing report.

Adcom Wire Company, Project Hydrogeologist--Development of a ground water monitoring plan for a wire galvanizing plant including site analysis, geohydrology, and proposed ground water monitoring network.

Orange County, Project Hydrogeologist--Development of a ground water monitoring plan for a sanitary landfill near Orange, Florida. Project consisted of monitor well installation, measuring water levels, geohydrologic evaluation and report preparation.

U.S. Air Force Installation Restoration Program, Project Geologist--Installation assessment of Columbus, Andersen, and Vandenburg Air Force Bases. Responsible for geohydrologic evaluation of sanitary and solid waste disposal areas, and the potential for off-post migration.

Minerals Management Service, Project Geologist--Responsible for sediment core and sediment trap analysis for evaluation of sediment transport in selected areas of the Gulf of Mexico.

University of Florida, Research Associate--Texaco U.S.A.- funded research grant involving the development of a method of increasing BTU values in autochthonous mineral-rich peats and organic sediments.

Department of Energy and Governor's Energy Office, State of Florida, Research Assistant--Florida fuel grade peat assessment program conducted through the University of Florida; involved sampling, mapping, and analysis of Florida fuel peat resources.

EDUCATION

M.S.	1983	Geology	University of Florida
B.S.	1981	Geology	State University of New York

AFFILIATIONS

American Association of Petroleum Geologists--Energy Minerals Division
Geological Society of America
Southeastern Geological Society
Society of Economic Paleontologists and Mineralogists

APPENDIX C

LIST OF INTERVIEWEES AND OUTSIDE AGENCY CONTACTS

APPENDIX C
LIST OF INTERVIEWEES

	Interviewee	Years of Service at SAFS
1.	Chief of Programs and Operations	13
2.	Manager, Power Plant	14
3.	Manager, Power Plant Maintenance	5
4.	Power Plant Safety Officer	3
5.	Noncommissioned Officer-In-Charge (NCOIC), Superintendent of STC Maintenance	1
6.	NCOIC, Chief of Maintenance, 1999th Communications Squadron	2
7.	Base Historian	1
8.	Arms and Equipment Custodian, 6594th ABG	1
9.	Chief of Safety	0.3
10.	Director of Civil Engineering	2
11.	NCOIC, Reprographics	3
12.	Environmental Coordinator	
13.	Facility Contractor/Mechanical Engineer	9
14.	Bioenvironmental Engineer, Travis AFB, Calif.	1
15.	Lead Earth Station Technician, RCA	3
16.	Data Link Terminal Supervisor, Ford Aerospace and Communications Corp.	3
17.	CPCA Station Manager, Lockheed	23
18.	Fire Protection Technician, AMEX	12
19.	Facility Contract Manager, AMEX Systems, Inc.	15

	Interviewee	Years of Service at SAFS
20.	Chief Engineer, AMEX Systems, Inc.	15
21.	Painter, AMEX Systems, Inc.	11
22.	Painter, AMEX Systems, Inc.	9
23.	Groundskeeper, AMEX Systems, Inc.	5
24.	Carpenter, AMEX Systems, Inc.	10
25.	Air Conditioning Technician, AMEX Systems, Inc.	10
26.	Materials Section Manager, AMEX Systems, Inc.	12
27.	Mechanical and Machine Shop, AMEX Systems. Inc.	10
28.	Superintendent of Maintenance, AMEX Systems, Inc.	28

APPENDIX C
OUTSIDE AGENCY CONTACTS

1. Tom Burkens
   State of California
   California Regional Water Quality Control Board
   San Francisco Bay Region
   1111 Jackson Street, Room 6040
   Oakland, CA 94607

2. Don Eisenberg
   State of California
   California Regional Water Quality Control Board
   San Francisco Bay Region
   1111 Jackson Street, Room 6040
   Oakland, CA 94607

3. Bob Peterson
   Santa Clara Valley Water District
   5750 Almaden Expressway
   San Jose, CA 95118
   408/265-2600

4. Donald Firth
   Water Conservation Division
   City of Sunnyvale
   Sunnyvale, CA 94039
   408/738-5665

5. California Division of Mines and Geology, Sacramento, CA

6. Albert F. Simpson Historical Research Center, Maxwell AFB, AL

7. U.S. Geological Survey, Alexandria, VA, and Denver, CO

8. California Dept. of Fish and Game, Sacramento, CA

9. Santa Clara Valley Water District, San Jose, CA

10. DOD Explosives Safety Board, Alexandria, VA

APPENDIX D

ORGANIZATIONS, MISSIONS, AND TENANT ACTIVITIES

APPENDIX D

ORGANIZATIONS, MISSIONS, AND TENANT ACTIVITIES

PRIMARY ORGANIZATIONS

HEADQUARTERS, AIR FORCE SATELLITE CONTROL FACILITY

The primary mission of AFSCF is to acquire, maintain, and operate a common-user spacecraft support network for DOD. AFSCF provides capability for simultaneous command and control of large numbers of military spacecraft through its worldwide network of satellite tracking and commanding stations. Tracking stations have been strategically located to (1) support equatorial launches from the Eastern Space and Missile Center, (2) support polar launches from the Western Space and Missile Center, (3) continuously support satellites in a variety of orbiters, and (4) support low-altitude satellites during their daily earth revolutions.

6594TH AIR BASE SQUADRON

The 6594th Air Base Squadron provides administrative, security, civil engineering, and chaplain support to personnel of HQ AFSCF and CPCA. The Commander, 6594th Air Base Squadron, exercises summary court-martial jurisdiction, including authority under Article 15, Uniform Code of Military Justice (UCMJ) over all military personnel assigned or attached to HQ SD (AFSC) and its subordinate organizations located at SAFS. Generally, the Commander, 6594th Air Base Squadron, also exercises summary court-martial jurisdiction and authority under Article 15 UCMJ over all military personnel assigned or attached to tenant units at SAFS.

TENANT ORGANIZATION

1999TH COMMUNICATIONS SQUADRON

The 1999th Communications Squadron is organized into three major areas: operations, maintenance, and the orderly room. The operations division is comprised of the Technical Control Workcenter, the communications center in support of the Air Force Special Security Office, and the Defense Satellite Communication System Phase III Operations Center. Due to the complexity and variety of the communications system, the Chief of Maintenance and the Work Center employ the services of an Air Force Engineering and Technical Services Representative who provides formal training for all satellite communications specialists in the squadron. The administrative section supports all administration needs for the entire squadron.

APPENDIX E

MASTER LIST OF SHOPS AND LABS

APPENDIX E

MASTER LIST OF SHOPS AND LABS

Shop Name	Location	Handles Hazardous Materials	Generates Hazardous Wastes	Typical Treatment, Storage, and Disposal Method
<u>SUNNYVALE AFS</u> <u>Civil Engineering</u>				
Power Plant Maintenance	1004,1007	Yes	Yes	Contract disposal
POL Area	1011	No	Yes	Contract disposal
Cooling System	1007	No	No	
Paint Shop	1001	Yes	Yes	Contract disposal
Facilities Engineering	1002	No	No	
<u>6549th Air Base Squadron</u>				
Security Police	1028	Yes	Yes	Contract disposal
Reprographics	1001	Yes	Yes	Contract disposal
<u>1999th Communications Squadron</u>				
Antenna Maintenance	1012,1004	No	Yes	Contract disposal
<u>Contractor</u>				
Ford Aerospace Data Link Terminal	1016	No	Yes	Given to Ford employee for offbase use
<u>CAMP PARKS COMMUNICATIONS ANNEX</u>				
Equipment Maintenance	2001	Yes	Yes	Evap rated from parking area

APPENDIX F

WATER QUALITY DATA

HETCH-HETCHY WATER SUPPLY

QUALITY OF WATER
(LATEST/MOST COMPLETE ANALYSIS)

(RECEIVED JUNE '84)

Source(s) (Surface, Ground, Public, Catchments, or Sea)	Raw Water *	Finished Water *
Parameters (Primary)		
mg/1		
Arsenic	< 0.005	
Barium	< 0.5	
Cadmium	< 0.001	
Chromium	< 0.001	
Fluoride	< 0.01	
Lead	< 0.0005	
Mercury	< 1.0	
Nitrates (as N)	< 0.0005	
Selenium	N.D.*	
Silver	N.D.	
Endrin	N.D.	
Lindane	N.D.	
Methoxychlor	N.D.	
Toxaphene	N.D.	
2,4-D	N.D.	
2,4,5-TP Silvex	N.D.	
Trihalomethanes	N.D.	
Turbidity, N.T.U.	0.6	
Radium (RA226 & RA228)	***	
Gross Alpha Particle Activity	***	
Microbiological, bacteria/100 ml	***	
Parameters (Secondary)		
mg/1		
Chloride	3	
Copper	0.001	
Foaming Agents	***	
Iron	0.066	
Manganese	0.002	
Sodium	1.9	
Sulfate	<1.0	
Total Dissolved Solids	28	
Zinc	< 0.001	
Color, units	0	
Corrosivity	***	
Odor (Threshold Odor Number)	***	
PH	0.6	
Priority Pollutants (If performed)		

*-Hetch-Hetchy storage reservoir water requires little treatment

** Not detectable at minimum quantitation limit

*** Not measured

Atch 1a

CURRENTLY SUNNYVALE IS SERVED 90% ALAMEDA EAST
10% SAN ANTONIO
0% CALAVERAS

80 – 90% (UNFILTERED)

10 – 20% (FILTERED)

SAN FRANCISCO WATER DEPARTMENT
WATER QUALITY DIVISION
ANNUAL MINERAL ANALYSIS

Source	Primary Drinking Water Standard MCL (mg/l)	A Hetch Hetchy Reservoir (Surface)	* B Alameda East Portal (Treated)	C Calaveras Reservoir (Surface)	D San Antonio Reservoir (Surface)	E Crystal Springs Reservoir (Surface)	F San Andreas Reservoir (Surface)	G Pilarcitos Reservoir (Surface)	H Stone Dam Reservoir (Surface)	I Lake Merced Reservoir (Surface)	J Sunol Filter Galleries	K Pleasanton Well Field 0-1	L Cherry Reservoir (Surface)
Date Sampled		July 27, 1983	July 26, 1983	July 26, 1983	July 26, 1983	July 25, 1983	July 25, 1983	July 25, 1983	July 25, 1983	July 25, 1983	July 26, 1983	July 26, 1983	July 27, 1983
Chemical Constituents													
Cations (+) (mg/l)													
Aluminum		0.03	0.08	0.06	0.04	0.07	0.05	0.03	0.04	0.02	0.09	0.09	0.03
Arsenic	(0.05)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Barium	(1)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Boron		0.06	0.08	0.15	0.18	0.20	0.15	0.05	0.09	0.20	0.45	0.36	0.07
Cadmium	(0.01)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	[illegible]
Calcium		0.67	4.8	16.9	18.3	16.5	15.0	10.6	16.7	24.9	44.8	54.5	0.
Chromium	(0.05)	<0.001	<0.001	0.001	0.001	0.001	0.001	<0.001	<0.001	0.001	0.001	0.004	[illegible]
Copper		0.001	0.001	0.002	0.003	0.023	0.013	0.003	0.003	0.004	0.111	0.002	[illegible]
Iron		0.018	0.066	0.006	0.036	0.062	0.149	0.040	0.144	0.039	0.007	0.008	0.019
Lead	(0.05)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002	[illegible]	<0.001
Magnesium		0.11	0.27	7.8	9.8	8.4	7.3	3.6	6.1	25.1	19.4	[illegible]	0.13
Manganese		0.001	0.002	<0.001	0.002	0.002	0.004	0.002	0.003	0.025	<0.001	<0.001	0.001
Mercury	(0.002)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Potassium		0.2	0.3	1.4	1.7	1.2	1.0	0.4	0.7	1.9	1.7	1.7	0.2
Selenium	(0.01)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	(0.05)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sodium		1.3	1.9	10.4	15.4	11.2	11.5	13.2	15.5	43.2	21.4	31.0	1.3
Zinc		0.001	<0.001	<0.001	<0.001	0.001	0.001	0.001	<0.001	0.001	0.233	0.002	0.001
Anions (-) (mg/l)													
Bicarbonate		4.6	14.4	110	112	77	71	55	95	161	190	281	4.5
Carbonate		0	2.0	2.6	2.1	0.8	0	0	0	2.0	0	0	0
Chloride		1	3	7	15	15	15	17	23	65	21	50	1
Fluoride*	(1.4–2.4)	<0.01	<0.01	0.03	0.03	0.02	0.02	0.03	0.03	0.06	0.04	0.03	<0.01
Hydroxide		0	0	0	0	0	0	0	0	0	0	0	0
Nitrate	(45)	<1.0	<1.0	1.6	1.6	1.6	1.5	1.5	1.9	2.4	10.2	10.6	<1.0
Nitrite		<0.002	<0.002	<0.002	<0.002	0.006	0.009	<0.002	0.002	<0.002	<0.002	<0.003	<0.002
Phosphate		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.45	<0.05	<0.05
Sulfate		<1.0	<1.0	14.0	24.0	18.5	12.0	7.1	9.0	21.5	70.0	57.0	<1.0
Nonionics (mg/l)													
MBAS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	[illegible]
Free Ammonia (NH_3)		<0.05	<0.05	<0.05	0.05	0.10	0.05	0.05	0.10	0.05	<0.05	<0.05	<0.05
Dissolved Oxygen (O_2)		10.4	11.4	8.5	8.2	8.9	9.2	8.9	9.4	6.5	8.6	8.6	8.9
Silica (SiO_2)		2.6	3.7	9.7	5.5	9.0	7.5	14.5	16.5	21.0	14.2	18.5	2.6
Derived Values (mg/l)													
Hardness as $CaCO_3$		2.0	14	104	114	80	76	50	90	170	236	318	2.0
Alkalinity as $CaCO_3$		4.0	14	190	104	70	66	50	84	154	176	250	4.0
Total Dissolved Solids at 103° C - 105° C		8	28	130	176	138	125	101	147	328	372	481	8
Physical Measurements													
Conductivity (µmhos/cm)		9	41	255	296	230	209	161	249	540	555	745	9.0
pH		6.5	7.6**	8.6	8.7	8.3	8.2	8.0	7.8	8.3	7.3	7.6	6.4
Turbidity (NTU)	(1)	0.2	0.6	0.9	1.0	0.8	1.7	0.5	1.2	3.6	0.4	0.08	0.2
Color (Units)		0	0	5	18	20	15	15	15	20	0	0	0

*Fluoride – Water served to the City of San Mateo north to and including San Francisco are fluoridated to 1.0 mg/l

** Ranges between pH 7.6 – 9.5 due to lime treatment

F-2

* ALAMEDA EAST PORTAL WATER IS HETCH-HETCHY WATER WITH LIME AND CHLORINE ADDED

McKESSON ENVIRONMENTAL SERVICES

PRIORITY POLLUTANT ANALYSIS

7072-ES(09)

McIntosh Laboratories

SML/18029

LAB I.D. 11583

SAMPLE I.D. AMEX (Sample of 1/10/84)

DATE RECEIVED 1/16/84

DATE ANALYZED 1/17/84

VOLATILES	µg/L
benzene	ND
bromodichloromethane	ND
bromoform	ND
bromomethane	ND
carbon tetrachloride	ND
chlorobenzene	ND
chloroethane	ND
2-chloroethylvinyl ether	ND
chloroform	ND
chloromethane	ND
dibromochloromethane	ND
1,2-and/or 1,4-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,1-dichloroethane	ND
1,2-dichloroethane	ND
1,1-dichloroethene	ND
trans-1,2-dichloroethene	*
1,2-dichloropropane	ND
cis-1,3-dichloropropene	ND
trans-1,3-dichloropropene	ND
ethyl benzene	ND
methylene chloride	ND
1,1,2,2-tetrachloroethane	ND
tetrachloroethene	ND
toluene	ND
1,1,1-trichloroethane	ND
1,1,2-trichloroethane	ND
trichloroethene	ND
vinyl chloride	ND

OTHER COMPOUNDS FOUND	CONCENTRATION

N. W. Flynn (signature)

N. W. Flynn, Laboratory Manager

Detection Limits: 2-10 µg/L

ND = Not Detected

* = Compound detected; concentration below level for accurate quantitation

** = Estimated value; compound saturated detector

REV: 10/13/83

APPENDIX G

USAF IRP HAZARD ASSESSMENT RATING METHODOLOGY

APPENDIX G

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 management practices category factor to the sum of the scores for the other three categories.

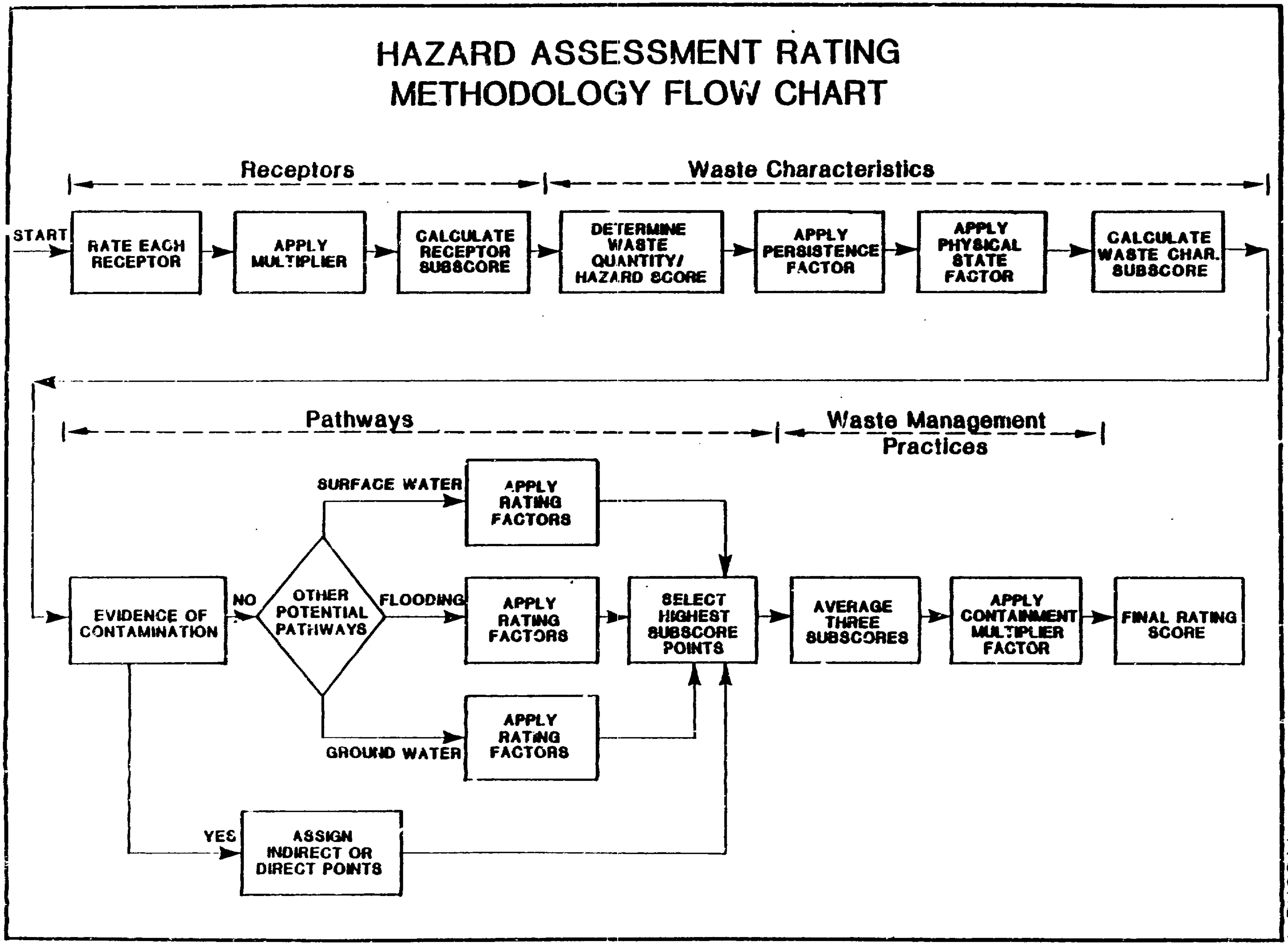

HAZARD ASSESSMENT RATING
METHODOLOGY FLOW CHART
Receptors
Waste Characteristics
START
RATE EACH RECEPTOR
APPLY MULTIPLIER
CALCULATE RECEPTOR SUBSCORE
DETERMINE WASTE QUANTITY/ HAZARD SCORE
APPLY PERSISTENCE FACTOR
APPLY PHYSICAL STATE FACTOR
CALCULATE WASTE CHAR. SUBSCORE
Pathways
Waste Management Practices
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 1

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 ______ = ______

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	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
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.	Pota[illegible] 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 2) 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

Rating Factor	0	1	2	3	Multiplier
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, subsurface features, 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:

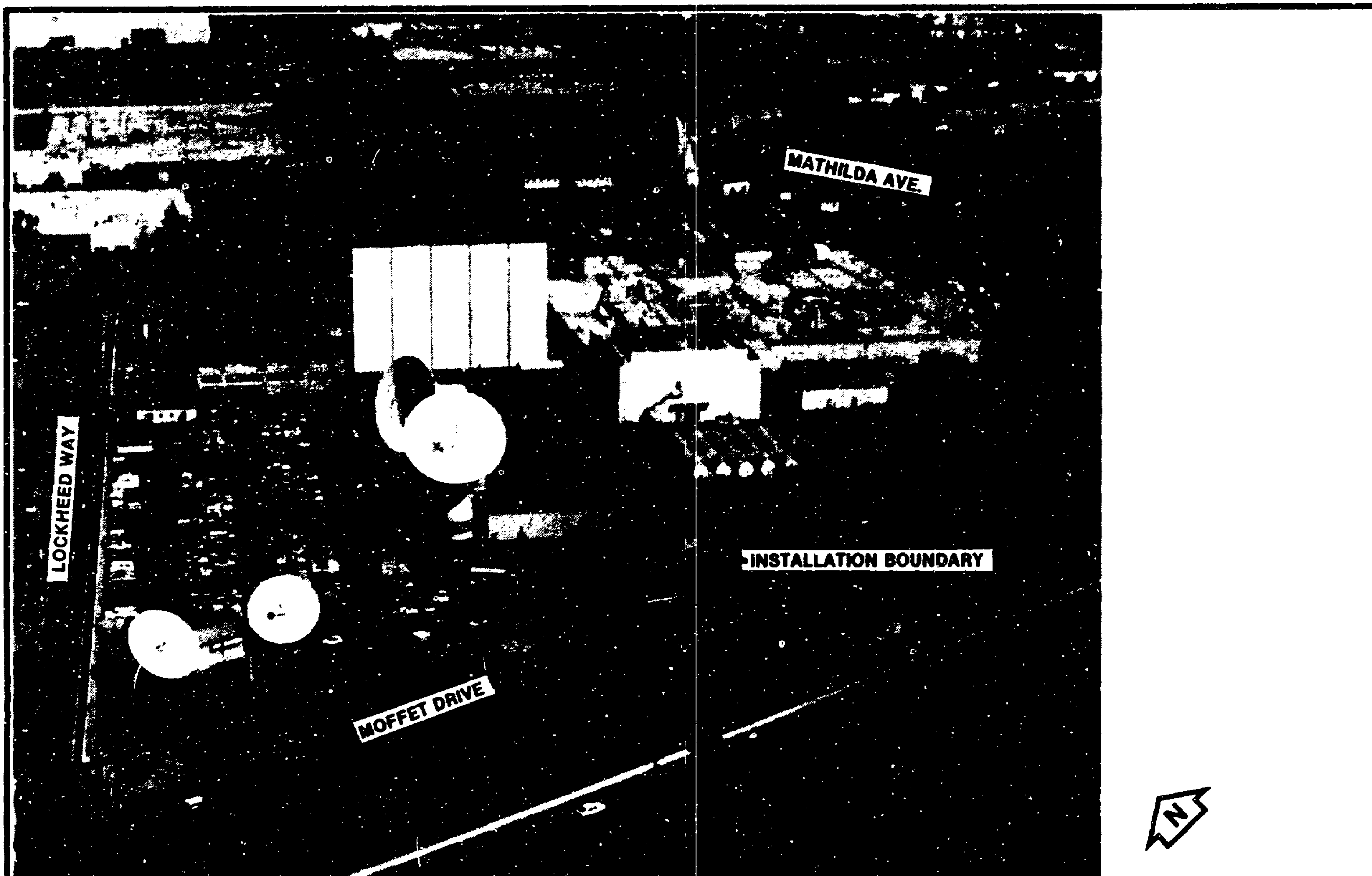
- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Protection 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 H
PHOTOGRAPH OF SUNNYVALE AIR FORCE STATION



PHOTOGRAPH OF SUNNYVALE AIR FORCE STATION

INSTALLATION RESTORATION PROGRAM
SUNNYVALE AIR FORCE STATION