INSTALLATION RESTORATION PROGRAM
PHASE I: RECORDS SEARCH
BEALE AFB, CALIFORNIA

Prepared For

UNITED STATES AIR FORCE
STRATEGIC AIR COMMAND
Deputy Chief of Staff
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The identification of hazardous waste disposal sites at military installations was directed by Defense Environmental Quality Program Policy Memorandums. Phase I constitutes a records search to determine the potential, if any, for off base imgration of toxic or hazardous wastes as a result of past operations and disposal activities. The final report reveals no direct evidence of off base pollution migration. However, it has been recommended that several areas receive additional attention to determine if pollution migration exists.

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EXECUTIVE SUMMARY

The Department of Defense (DOD) has developed a program to identify and evaluate past hazardous material disposal sites on DOD property, to control the migration of hazardous contaminants, and to control hazards to health or welfare that may result from these past disposal operations. This program is called the Installation Restoration Program (IRP). The IRP has four phases consisting of Phase I, Initial Assessment/Records Search; Phase II, Confirmation and Quantification; Phase III, Technology Base Development/Evaluation of Remedial Action Alternatives; and Phase IV, Operations/Remedial Actions. Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I, Initial Assessment/Records Search for Beale AFB under Contract No. F08637-83-R0099.

INSTALLATION DESCRIPTION

Beale AFB is located in Yuba County, which is 45 miles north of Sacramento and 130 miles northeast of San Francisco, California. The western portion of the base is relatively flat, annual grassland while the eastern portion of the base has elevations ranging from 70 to 200 feet. The base is surrounded by predominantly agricultural lands and is located 10 miles east of Marysville. The base contains 22,944 acres of land comprising runways and airfield operations, industrial areas, housing and recreational facilities.

Beale AFB was initially activated in 1942 as an army base to be used for training an armored division. In 1947, Camp Beale was declared surplus and in 1948, it was transferred to the Air Force. In 1958, the base's first runway was operational. B-52's and KC-135's were assigned to the base in the 1960's and 1970's. The B-52's were reassigned in 1976. In 1966, the SR-71 aircraft was assigned to Beale AFB and the U-2 aircraft was later assigned in 1976. In 1979, PAVE PAWS (a phased array radar system used to detect sea launched ballistic missile attack on the continental United States) was operational at Beale.

ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation indicate the following major points that are relevant to the evaluation of past hazardous waste management practices at Beale AFB:

- The mean annual precipitation is 21.73 inches; the net precipitation is -44.8 inches and the one-year, 24-hour rainfall event is estimated to be 2.5 inches. These data indicate that there is little or no potential for precipitation to infiltrate the surface soils on the base. Also, there is a moderate potential for runoff and erosion.
- The soil characteristics on the base are a function of the underlying geology. The geology of the western part of the base consists of sedimentary deposits that have hardpan associated with soil development. The hardpan appears to be pervasive even though it varies in thickness and cementation. The hardpan restricts or eliminates vertical infiltration of water. Areas underlain by hardpan probably have very limited recharge capabilities from surface infiltration to the aquifer system.
- Ground water is found at depths ranging from 80 to 90 feet; the effective base of the ground-water reservoir is at depths of 315 to 525 feet under the base. Recharge to the ground-water aquifers is primarily from the rivers to the north, west and south of the base. Ground-water movement is to the south-southwest toward a pumping trough located outside the base.
- The existing ground-water quality appears good, with some elevated levels of manganese; this is a regional anomaly.
- There are no known threatened or endangered plant species identified on Beale AFB. The Bald Eagle and Peregrine Falcon use the base for foraging but there are no known nesting locations on the base.

METHODOLOGY

During the course of this project, interviews were conducted with base personnel (past and present) familiar with past waste disposal practices; file searches were performed for past hazardous waste activities; interviews were held with local, state, and federal agencies; and field and aerial surveys were conducted at suspected past hazardous waste activity sites. Fourteen sites located within Beale AFB boundaries were identified as potentially containing hazardous contaminants and having the potential for migration resulting from past activities. These sites have been assessed using a Hazard Assessment Rating Methodology (HARM) which takes into account factors such as site characteristics, waste characteristics, potential for contaminant migration, and waste management practices. The details of the rating procedure are presented in Appendix G and the results of the assessment are given in Table 1. The rating system is designed to indicate the relative need for follow-on action. Sites recommended for follow on investigation have also been reviewed with regard to future land use restrictions.

FINDINGS AND CONCLUSIONS

The following conclusions have been developed based on the results of the project team's field inspection, review of base records and files, and interviews with base personnel. Each of the six sites listed below was ranked using the HARM system and was determined to have a sufficient potential for environmental contamination to warrant some degree of follow-on investigation (See Figure 1).

- Discharge Area No. 1 - West Drainage Ditch
- Photo Wastewater Treatment Plant
- Photo Waste Injection Well No. 2
- Fire Protection Training Areas No. 1 & 2
- Discharge Area No. 2 - Battery Shop Dry Well
- Discharge Area No. 3 - SR-71 Shelter Area

RECOMMENDATIONS

A program for proceeding with Phase II of the IRP at Beale AFB is presented in Chapter 6. The Phase II recommendations are summarized as follows:

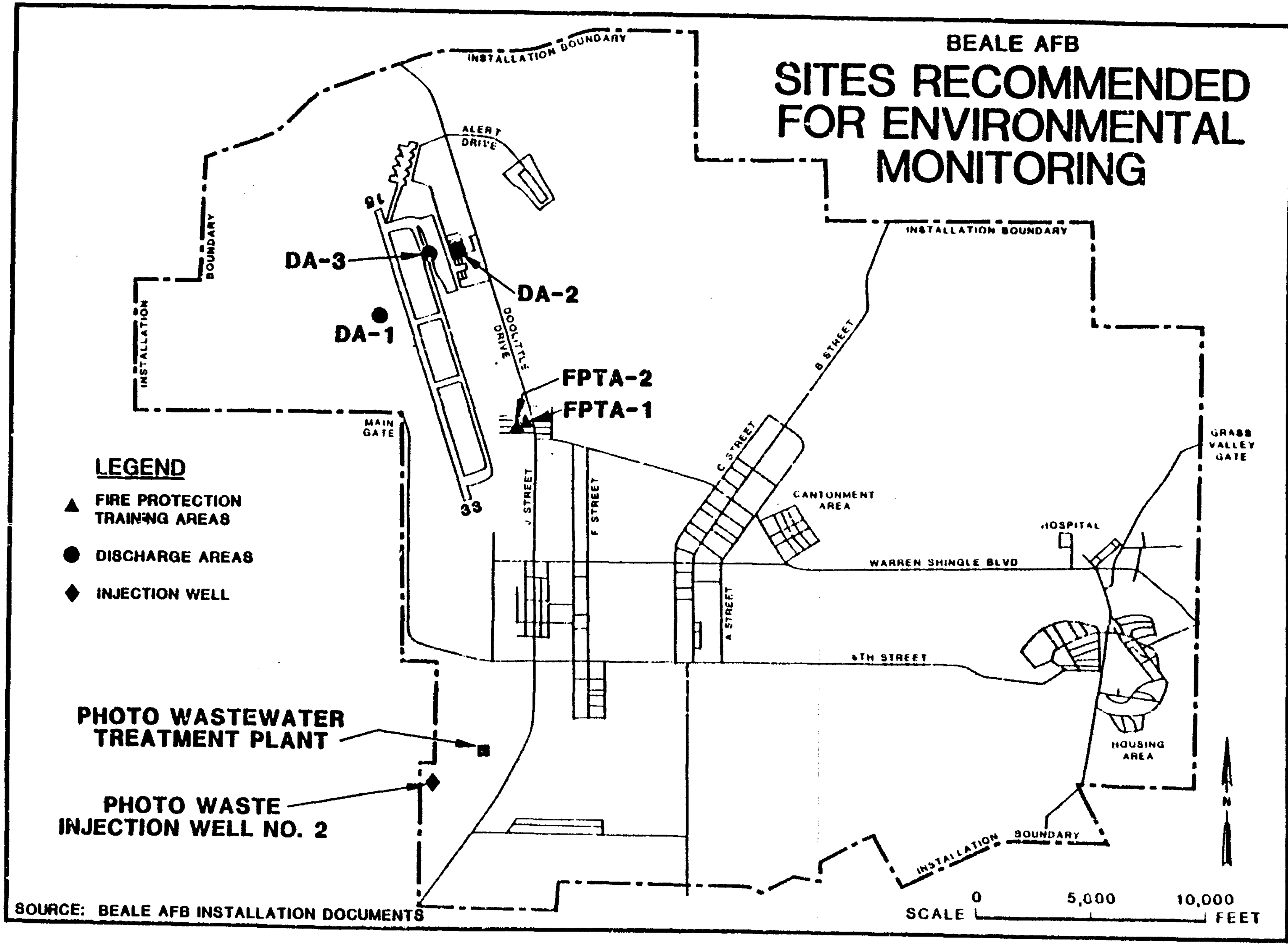
Discharge Area No. 1 - West Drainage Ditch	Collect four soil core borings to an approximate depth of five feet. Analyze samples for parameters in List A, Table 6.2.
Photo Wastewater Treatment Plant	Collect four soil core borings to an approximate depth of five feet. Analyze samples for parameters in List B, Table 6.2.
Fire Protection Training Areas No. 1 and 2	Collect six soil core borings to an approximate depth of five feet. Analyze samples for parameters in List C, Table 6.2.
Discharge Area No. 2 - Battery Shop Dry Well	Collect one soil core boring to an approximate depth of five feet below the bottom of the dry well. Analyze samples for lead and pH.
Discharge Area No. 3 - SR-71 Shelter Area	Collect ten soil core borings to an approximate depth of five feet. Analyze samples for parameters in List A, Table 6.2.
Photo Waste Injection Well No. 2	Collect three soil core borings to an approximate depth of five feet. Analyze samples for pentachlorophenol.

TABLE 1
SITES EVALUATED USING THE
HAZARD ASSESSMENT RATING METHODOLOGY FORMS
BEALE AFB

Rank	Site Name	Date of Operation or Occurrence	Overall Total Score
1	Discharge Area No. 1 - West Drainage Ditch	1965-1984	84
2	Photo Wastewater Treatment Plant	1967-1984	75
3	Photo Waste Injection Well No. 2	1967-1984	72
4	Fire Protection Training Areas No. 1 & 2	1958-1984	64
5	Discharge Area No. 2 - Battery Shop Dry Well	1960's-1984	59
6	Discharge Area No. 3 - SR-71 Shelter Area	1966-1984	53
7	Landfill No. 2	1950's-1980	52
8	Discharge Area No. 4 - Army Biological Production Site	1962-1969	52
9	Discharge Area No. 6 - J-57 Test Cell	1960's-1984	52
10	Discharge Area No. 9 - Entomology Bldg. 2560	1981-1984	51
11	Discharge Area No. 5 - J-58 Test Cell	1960's-1984	50
12	Discharge Area No. 7 - AGE Maintenance/ Drainage Area	1960's-1984	48
13	Discharge Area No. 10 - Entomology Bldg. 440	1965-1980	48
14	Landfill No. 1	1940's	47
15	Discharge Area No. 8 - Transformer Drainage Area	1977-1979	44
16	Landfill No. 3	1981-1984	39

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

FIGURE 1



BEALE AFB

SITES RECOMMENDED FOR ENVIRONMENTAL MONITORING

SOURCE: BEALE AFB INSTALLATION DOCUMENTS

CHAPTER 1

INTRODUCTION

BACKGROUND AND AUTHORITY

The United States Air Force, due to its primary mission, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations to require that disposers identify the locations and contents of past disposal sites and take action to eliminate 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 Section 6003 of the Act, Federal agencies are directed to assist the Environmental Protection Agency (EPA) and under Section 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, 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 11 December 1981 and implemented by Air Force message dated 21 January 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program. DOD policy is to identify and fully evaluate suspected problems associated with past hazardous contamination, and to control hazards to health and welfare that resulted from these past operations. The IRP will be the basis for response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, Executive Order 12316, and 40 CFR 300 Subpart F (National Oil and Hazardous Substances Contingency Plan). CERCLA is the primary legislation governing remedial action at past hazardous waste disposal sites.

PURPOSE AND SCOPE OF THE ASSESSMENT

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

- Phase I - Initial Assessment/Records Search
- Phase II - Confirmation/Quantification
- Phase III - Technology Base Development
- Phase IV - Operations/Remedial Actions

Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I Records Search at Beale Air Force Base under Contract No. F08637-80-G0009-5017. This report contains a summary and an evaluation of the information collected during Phase I of the IRP.

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

- Review of site records
- Interviews with personnel familiar with past generation and disposal activities
- Survey of types and quantities of waste generated
- Determination of estimated quantities and locations of current and past hazardous waste treatment, storage, and disposal
- Definition of the environmental setting at the base
- Review of past disposal practices and methods
- Collection of pertinent information from federal, state, and local agencies
- Assessment of the potential for contaminant migration
- Development of recommendations for follow-on actions

ES performed the on-site portion of the records search during January 1984. The following core team of professionals was involved:

- Charles M. Mangan, P.E., Environmental Engineer and Project Manager, 17 years of professional experience.
- Brian D. Moreth, Environmental Scientist, 13 years of professional experience.
- Yane Nordhav, Hydrogeologist, 7 years of professional experience.
- Robin Cort, Environmental Scientist, 3 years of professional experience.

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

METHODOLOGY

The methodology utilized in the Beale AFB Records Search began with a review of past and present industrial operations conducted at the base. Information was obtained from available records such as shop files and real property files, as well as interviews with 66 past and present base employees from the various operating areas. A list of Air Force interviewees by position and years of service is presented in Table B.1 (see Appendix B).

Concurrent with the base interviews, applicable federal, state and local agencies were contacted for pertinent base related environmental data. The agencies contacted and interviewed are listed below and with more detail in Table B.2 (see Appendix B).

- U.S. Environmental Protection Agency (EPA), Region IX
- U.S. Army Corps of Engineers, Flood Plain Management Group
- U.S. Geological Survey (USGS)
- U.S. Soil Conservation Service
- U.S. Army/Air Force Archives
- California Department of Health Services
- California Department of Fish and Game, Region II
- Central Valley Regional Water Quality Control Board
- Wheatland Water District
- Yuba County Agricultural Commission
- Yuba County Water Agency

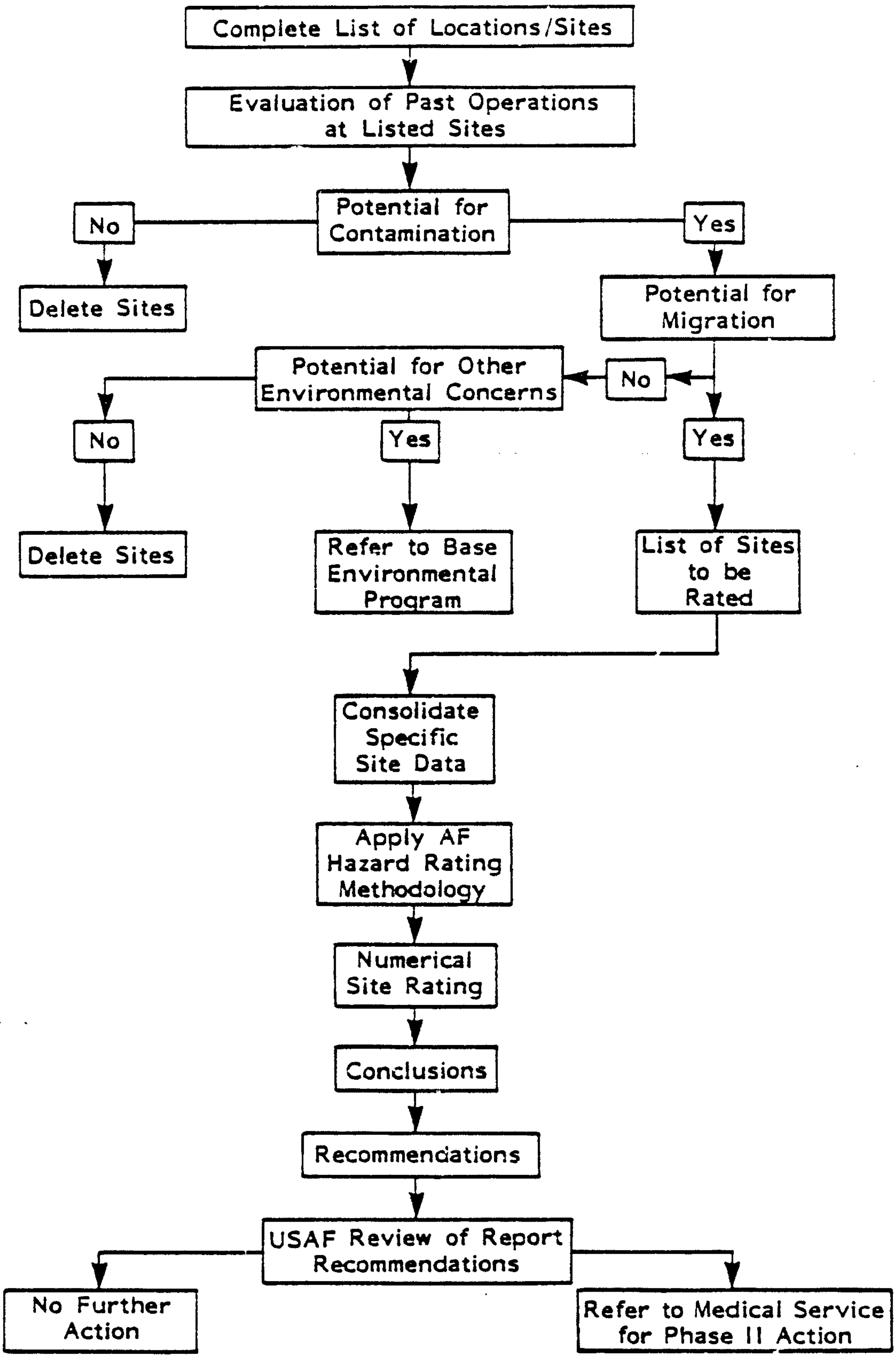
The next step in the activity review was to identify all sources of hazardous waste generation and to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from the various Air Force operations on the base. A master list of industrial shops is provided in Appendix C. 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 and a helicopter overflight of the identified sites were then made by the ES Project Team to gather site-specific information including: (1) general observations of existing site conditions; (2) visual evidence of environmental stress; (3) the presence of nearby drainage ditches or surface water bodies; and (4) visual inspection of these water bodies for any obvious signs of contamination or leachate migration.

A decision was then made, based on all of the above information, whether a potential exists for hazardous material contamination at any of the identified sites using the Decision Tree shown in Figure 1.1. If no potential existed, the site was deleted from further consideration. For those sites where a potential for contamination was identified, a determination of the potential for migration of the contamination was made by considering site-specific conditions. If there were no further environmental concerns, then the site was deleted. If there are other environmental concerns, then these are referred to the base environmental program. If the potential for contaminant migration was considered significant, then the site was evaluated and prioritized using the Hazard Assessment Rating Methodology (HARM). A discussion of the HARM system is presented in Appendix G.

PHASE I INSTALLATION RESTORATION PROGRAM

DECISION TREE



CHAPTER 2

INSTALLATION DESCRIPTION

LOCATION, SIZE, AND BOUNDARIES

Beale Air Force Base is located in Yuba County between the Bear and Yuba Rivers, some 10 miles east of Marysville, California. It is approximately 45 miles north of Sacramento and 130 miles northeast of San Francisco, California (Figures 2.1 and 2.2). The base comprises approximately 22,944 acres of land located in the Sacramento Valley and the lower foothills of the Sierra Nevada Mountains (Figure 2.3). The western portion of the base is relatively flat, annual grassland while the eastern portion of the base has elevations ranging from 70 to 200 feet.

BASE HISTORY

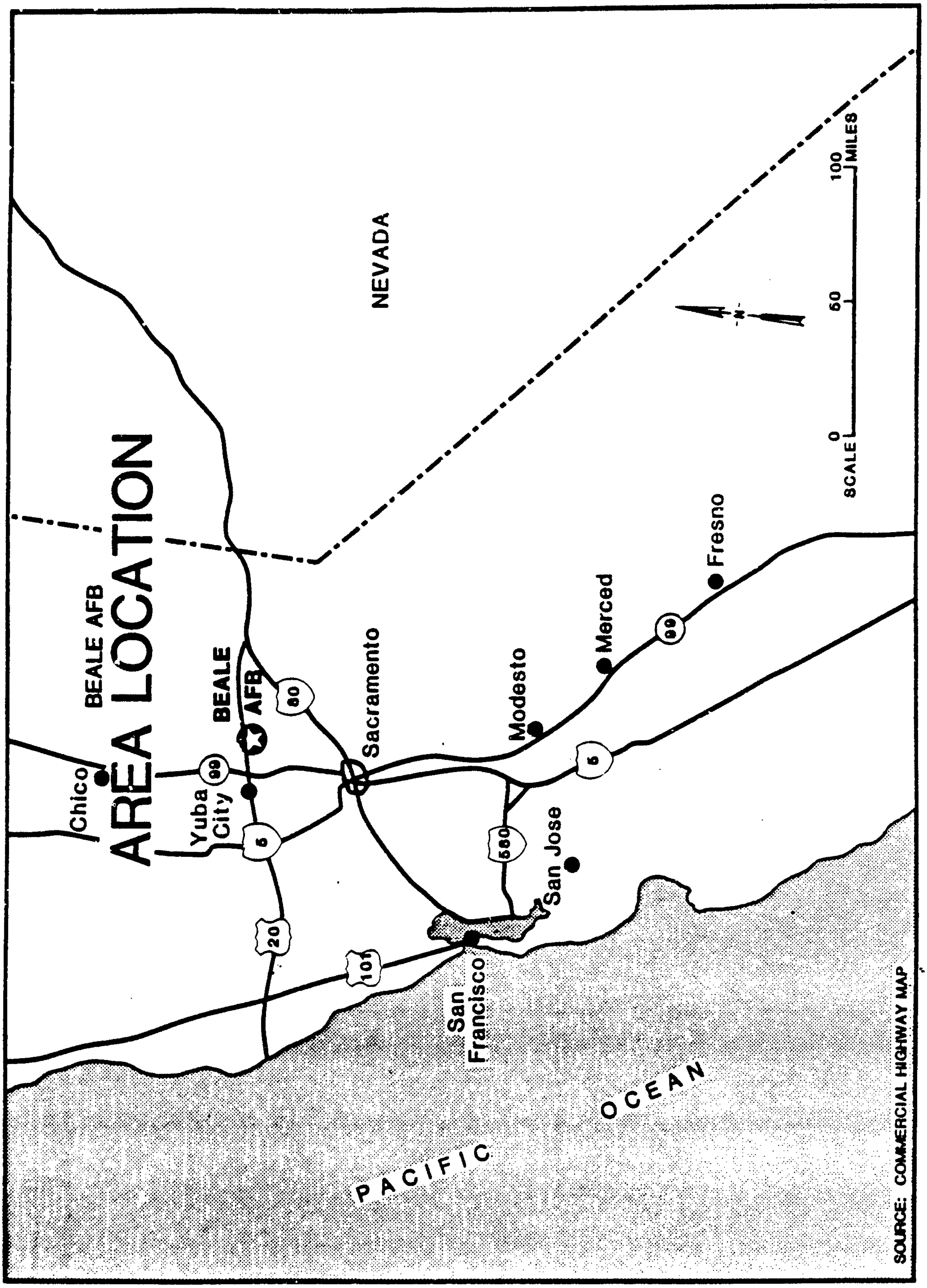
Camp Beale opened in October 1942. The 13th Armored Division was the first unit to actively train at Beale. However, during the course of World War II, the 81st and 96th Infantry Divisions also received training there. The camp was also used as a personnel replacement depot and prisoner of war encampment. It was the site of a 1,000-bed hospital and, at the end of the war, was used as the west coast separation center.

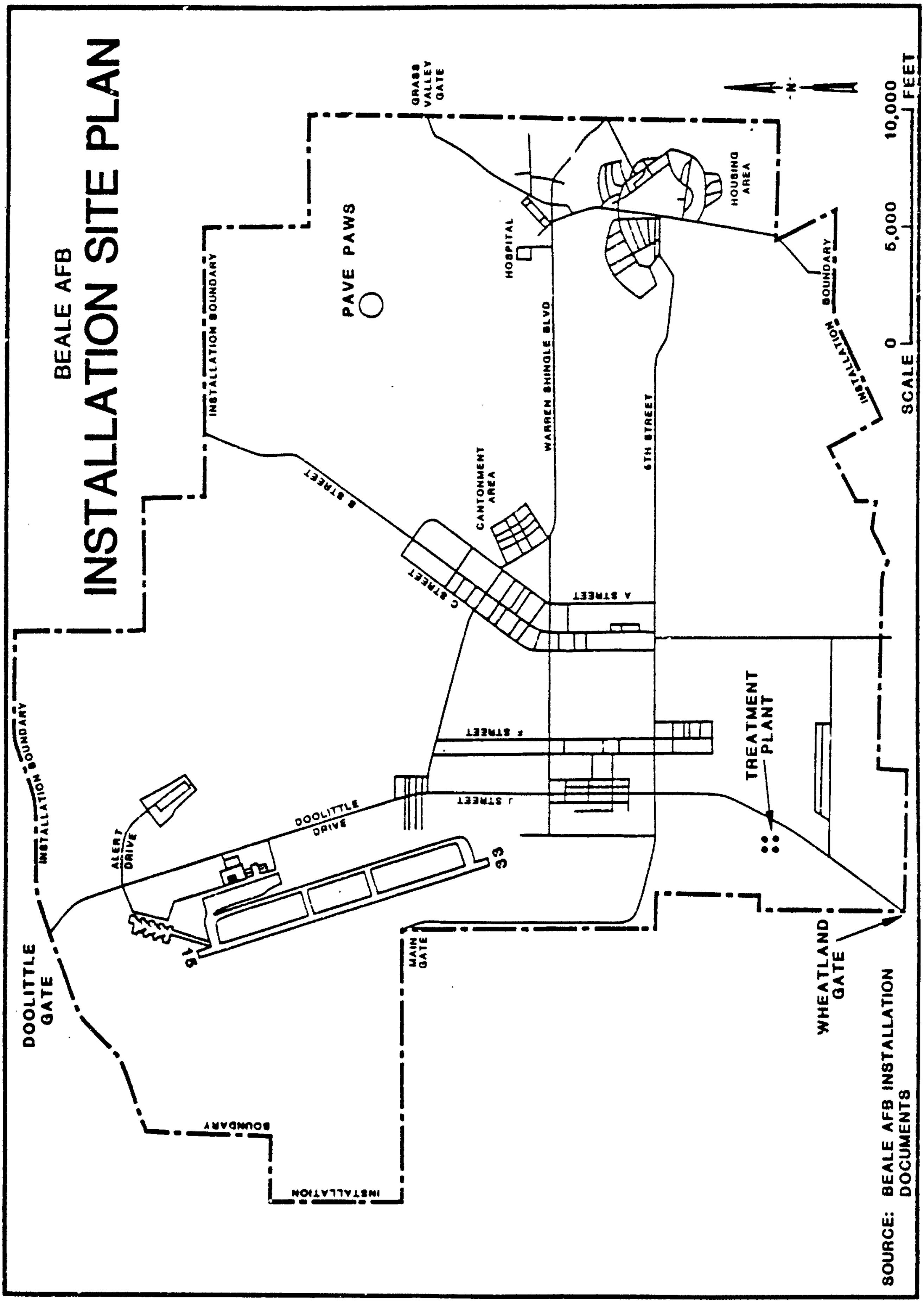
During the war, the camp supported a military population of more than 60,000 personnel. In May of 1947, Camp Beale was declared surplus by the War Department and the War Assets Administration assumed custody. In the early part of 1948, the United States Air Force asked the War Assets Administration for Beale and a transfer was arranged. For a period of about three years, until 1951, the base was used for bombardier-navigator training.

As the base began to expand, the Department of the Air Force redesignated the Beale Bombing and Gunnery Range as "Beale Air Force Base" in November 27, 1951. During Beale's early years in the Air

FIGURE 2.1


OREGON
IDAHO
Eureka
Redding
BEALE AFB
REGIONAL
LOCATION
BEALE
AFB
Sacramento
NEVADA
San Francisco
Modesto
San Jose
Merced
Fresno
CALIFORNIA
PACIFIC OCEAN
Los Angeles
ARIZONA
N
San Diego
SOURCE: COMMERCIAL HIGHWAY MAP
SCALE 0 35 75 MILES
MEXICO


BEALE AFB
AREA LOCATION
NEVADA
BEALE AFB
Chico
Yuba City
Sacramento
Modesto
Merced
Fresno
San Jose
San Francisco
99
80
5
20
101
580
PACIFIC OCEAN
SCALE
0
50
100
MILES
N
SOURCE: COMMERCIAL HIGHWAY MAP



BEALE AFB
INSTALLATION SITE PLAN
GRASS VALLEY GATE
PAVE PAWS
HOSPITAL
HOUSING AREA
INSTALLATION BOUNDARY
WARREN SHINGLE BLVD
6TH STREET
B STREET
CANTONMENT AREA
C STREET
A STREET
F STREET
J STREET
TREATMENT PLANT
DOOLITTLE DRIVE
ALERT DRIVE
15
33
MAIN GATE
DOOLITTLE GATE
WHEATLAND GATE
0
5,000
10,000
FEET
SCALE
N
SOURCE: BEALE AFB INSTALLATION DOCUMENTS

Force, it underwent a number of jurisdictional changes, at times being part of Air Training Command, Aviation Engineer Force, and finally the Strategic Air Command. By April 13, 1957, ground was broken for the construction of the first runway. It went into operation on August 27, 1958 (see aerial photos in Appendix F dated December, 1953 and May, 1982).

In July 1959, Beale received its first KC-135 jet Stratotanker, which was assigned to the 903rd Air Refueling Squadron of the 456th Bombardment Wing. In September, 1959 Beale was assigned to be the support base for three Titan I missile sites. In 1960, B-52's were assigned to the base. By 1965, the Titan I missile program was inactivated. Coupled with the deactivation of the missile unit, however, was the activation of the 4200th Strategic Reconnaissance Wing that would man and maintain the SR-71.

In 1976 as a result of a major reorganization at Beale, all B-52 aircraft were reassigned. At the same time, the 9th Strategic Reconnaissance Wing (formally the 4200th Strategic Reconnaissance Wing) gained U-2 aircraft and the 99th Strategic Reconnaissance Squadron.

By October 1979, construction of a radar facility (known as PAVE PAWS) was essentially complete. The 10-story phased array radar is an Air Force developed detection and early warning system against sea launched ballistic missile (SLBM) attack on the continental United States.

ORGANIZATION AND MISSION

The 9th Strategic Reconnaissance Wing (SRW) flies three unique aircraft, SR-71, TR-1 and the U-2. Training missions, principally, are flown from Beale. The mission of the wing is to provide the capability of sustaining continuous reconnaissance operations and to develop and maintain a capability of conducting peacetime global reconnaissance operations.

The tenant organizations at Beale Air Force Base are listed below. Descriptions of support and major tenant organizations and their missions are presented in Appendix E.

14th Air Division (SAC)

7th Missile Warning Squadron

1883rd Communications Squadron (AFCC)

Detachment 11, 9th Weather Squadron (MAC)

Field Training Detachment 525 (ATC)

Detachment 1901, Air Force Office of Special Investigation

SAC Management Engineering Team (SACMET)

Air Force Audit Agency Office

Air Force Commissary Service

U.S. Postal Service

CHAPTER 3

ENVI' ONMENTAL SETTING

The environmental setting of Beale Air Force Base described in this section focuses on those features that may influence or be influenced by the migration of hazardous materials. In 1978 and 1980, the U.S. Geological Survey (Rockwell 1978 and Page, 1980) prepared site-specific ground-water evaluations for Beale Air Force Base to evaluate the ground-water resources. As a result, a site-specific data base is available for description of the hydrologic regime at and near the base.

METEOROLOGY

Temperature and precipitation data for Beale Air Force Base are presented in Table 3.1. The summarized data indicate an average annual precipitation of 21.73 inches. The annual evaporation rate in Yuba County is 66.5 inches (CIMIS, 1984). The computed net precipitation is minus(-) 44.8 inches. Net precipitation is an indicator of the potential for leachate generation and is equal to the difference between precipitation and evaporation. The negative value of net precipitation indicates that there is little or no potential for precipitation to infiltrate the surface soils on the base.

The one-year, 24-hour rainfall event on Beale AFB is estimated to be 2.5 inches (NOAA, 1963). Rainfall intensity is an indicator of the potential for excessive runoff and erosion. The one-year, 24-hour rainfall event is used to gauge the potential for runoff and erosion. The 2.5 inch value in the area of Beale AFB indicates that there is a moderate potential for runoff and erosion.

Almost 95 percent of the rainfall occurs from October to April. Annual precipitation in California has fluctuated widely in the past eight years. Two years of drought conditions have been followed by several very wet winters.

TABLE 3.1

BEALE AFB CLIMATIC CONDITIONS

Months	Temperature (°F) Average	Absolute Min.	Absolute Max.	Precipitation (in.) Average
Jan.	46	22	77	4.46
Feb.	51	27	79	3.51
Mar.	54	26	86	2.82
Apr.	58	33	90	1.78
May	67	38	102	.42
Jun.	74	44	111	.23
Jul.	79	52	114	.10
Aug.	77	49	111	.11
Sep.	74	42	109	.33
Oct.	64	35	101	1.34
Nov.	53	29	85	3.64
Dec.	45	20	75	2.99
Yearly Avg.	62	20	114	21.73

NOTE: Based on 22 years of record, 1959-1981, at Beale AFB, elevation 113 feet.

Source: Beale AFB Installation Documents.

GEOGRAPHY

Beale AFB is located in the eastern part of the Sacramento Valley which, together with San Joaquin Valley to the south, constitutes the Great Central Valley of California (Figure 3.1). The Great Valley extends from Bakersfield in the south to Red Bluff in the north; it is about 60 miles across, and is bordered to the east by Sierra Nevada Mountain foothills and to the west by the Coast Ranges. The Sacramento River drains the Sacramento Valley flowing southerly to the Sacramento-San Joaquin Delta for eventual discharge through San Francisco Bay into the Pacific Ocean (see Figure 3.1 for location of physiographic provinces near Beale AFB).

The Feather River, a tributary to the Sacramento River flows southward west of the base (see Figure 3.2). The Yuba River to the north of Beale AFB, and the Bear River to the south, both drain from east to west into the Feather River. Beale AFB straddles the Sacramento Valley at the western base boundary and the foothills of the Sierra Nevada in the east.

The Sacramento Valley is one of the largest agricultural areas in California, providing agricultural products to California and all of the United States. The major crops grown in Yuba County around the base are peaches, prunes, pears, walnuts, grain, rice, almonds, and alfalfa. Cultivation of the diverse range of agricultural products has been made possible by extensive and intensive irrigation (Herbert and Begg, 1969).

TOPOGRAPHY

The elevation of Beale AFB ranges from 80 to 90 feet above the National Geodetic Vertical Datum of 1929 (NGVD) along the western and southwestern boundary toward the Great Central Valley to more than 400 feet in the northeastern part of the base. The rise in elevation is occurring along gently sloping hills common to the Sierra Nevada Foothills, which rise gradually to over 13,000 feet NGVD at the Sierra Nevada crests.

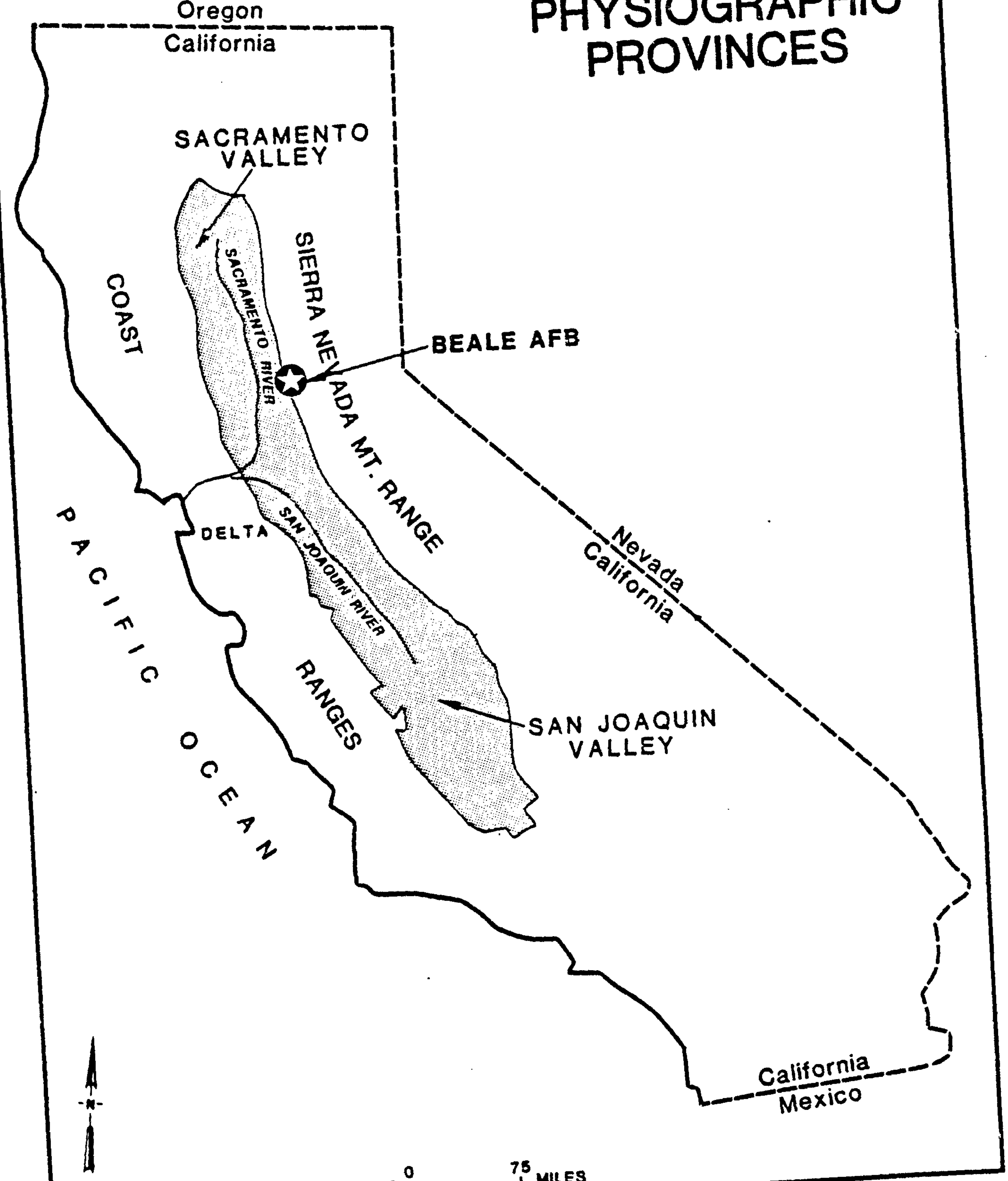
DRAINAGE

Beale AFB is drained by three main creeks that traverse the base (Figure 3.2) These creeks, including their tributaries, are from east

FIGURE 3.1

BEALE AFB

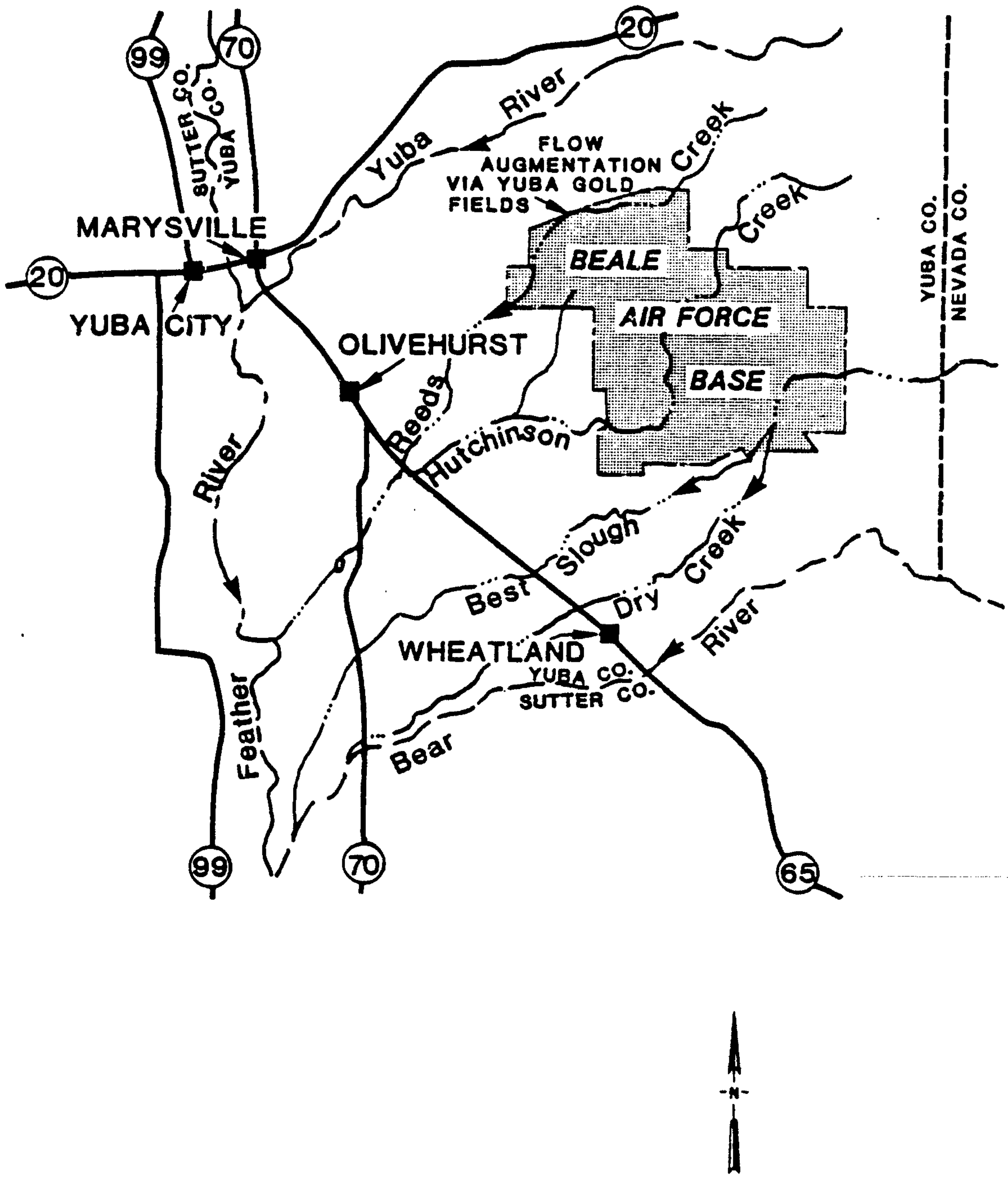
REGIONAL PHYSIOGRAPHIC PROVINCES



SOURCE: DAILY, 1966

FIGURE 3.2

BEALE AFB
REGIONAL DRAINAGE



SOURCE: USGS, 1980

SCALE 0 5 MILES

to west Dry Creek (which prior to leaving the base divides into Dry Creek and Best Slough), Hutchinson Creek, and Reeds Creek; in addition, an unnamed creek located immediately east of Reeds Creek flows southward toward Hutchinson Creek. Figure 3.3 depicts surface waters and ponds draining the area generally from north-northeast to south-southwest. The creeks with the exception of Dry Creek and Reeds Creek are primarily intermittent along their courses on the base.

Runoff from the base housing area empties into Dry Creek; the cantonment area drains into Hutchinson Creek, and runoff from the flightline and fire training area drains into the unnamed creek.

Reeds Creek has had its flows augmented at the northern base boundary from ground-water pumping discharges associated with dewatering of old hydraulic mine tailings being reworked to extract gold by Yuba Gold Fields, Inc. The water from the gravel dewatering has been discharged to a canal that flows toward Reeds Creek at the base boundary; there, controlled releases of the canal flows to Reeds Creek which occur by opening and closing flap gates. This flow augmentation has been arranged by the Brophy Water District.

Hutchinson and Reeds Creeks converge prior to draining into Plumas Lake southwest of the base, south of the City of Olivehurst. Dry Creek flows southwest for eventual discharge into the Bear River.

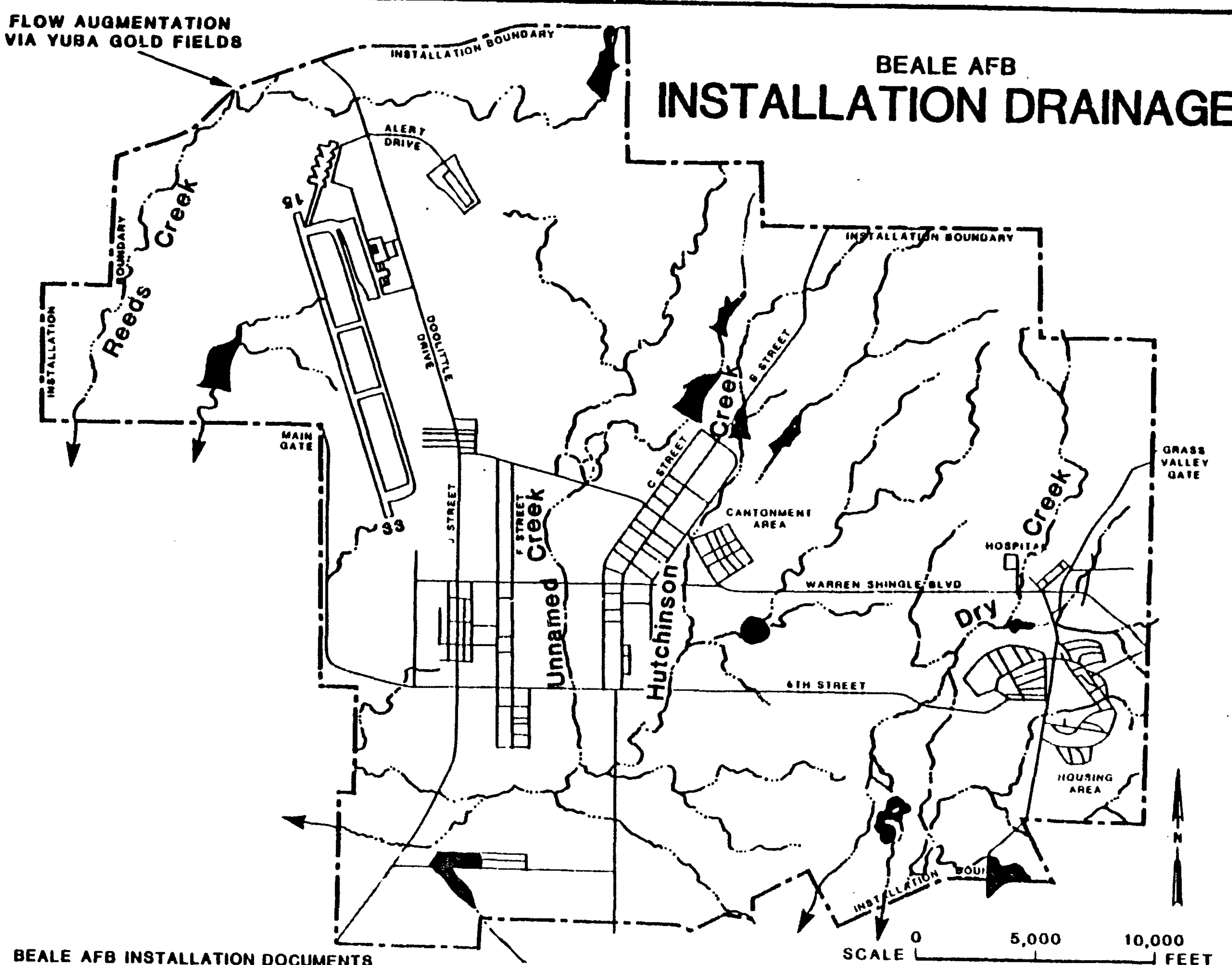
SURFACE SOILS

The soils in the Yuba County area have been classified and mapped by Herbert and Begg (1969). No detailed mapping was undertaken at Beale AFB identifying specific soil types; however a generalized soil map was developed by Herbert and Begg (1969) for the entire Yuba County study area delineating soil associations.

The soil associations identified on the base are reflective of the transitional geologic environment between the Sierra Nevada Foothills and the Great Central Valley. Figure 3.4 shows the general soils at the base. The eastern part of the base is underlain by the Auburn-Sobrante-Las Posas Association, a gravelly and rocky soil formed from "greenstone" (a common name for volcanic rocks). West of this association is the Redding-Corning Association, a gravelly, hardpan and claypan soil formed on old alluvial fans or terraces. The soils on the western part

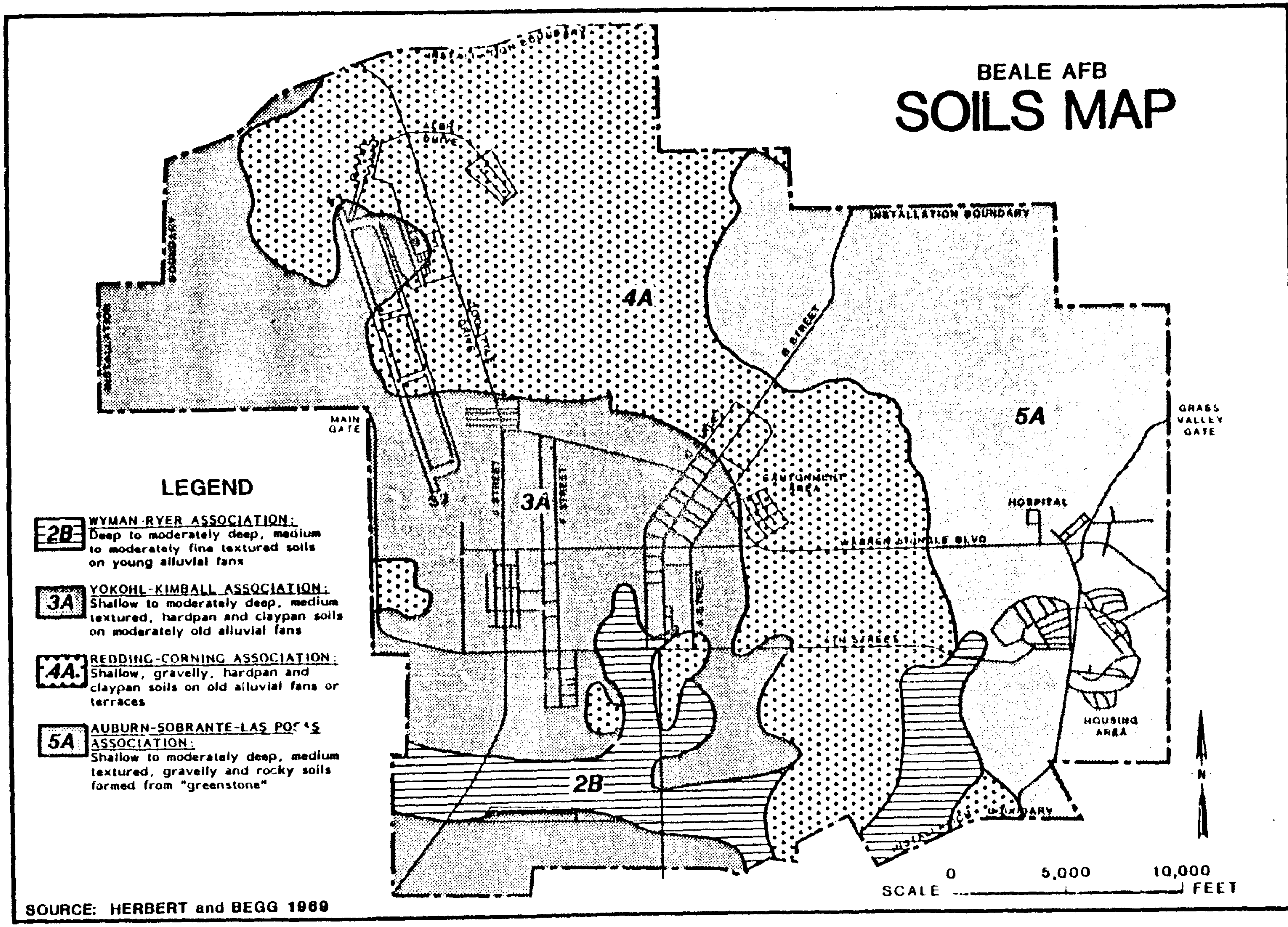
FIGURE 3.3

BEALE AFB INSTALLATION DRAINAGE



SOURCE: BEALE AFB INSTALLATION DOCUMENTS

FIGURE 3.4



SOURCE: HERBERT and BEGG 1969

of the base belong to the Yokohl-Kimball Association, hardpan or claypan soils formed on moderately old alluvial fans. In addition, the Wyman-Ryer Association soils can be found adjacent to major drainage ways, formed on young alluvial fans.

The general soil characteristics for the associations found on the base have been described by Herbert and Begg (1969) and are summarized below.

- Auburn-Sobrante-Las Posas Association. These soils are shallow to moderately deep, medium textured, and are gravelly and rocky formed from "greenstone". The soils occur in a complex pattern, where the soil depth and degree of soil development is related to the hardness and density of the "greenstone" and the mean annual rainfall. The soils are brown to reddish brown, slightly to medium acid, and have loamy surface soils. They are well-drained.

- Redding-Corning Association. These soils are developed from old gravelly alluvial fans and contain cobbly and gravelly materials with a high percentage of hard quartzite and chert. The Redding soils of this association have a gravelly loam surface soil that abruptly overlies a reddish brown-red, very dense, slightly gravelly or gravelly clay subsoil (claypan) at shallow depth. The claypan rests abruptly on a cemented hardpan layer at a depth of 18 to 30 inches, the thickness and hardness of the hardpan are variable over short distances. The Corning soils are similar to the Redding soils except that the hardpan layer is missing.

  The Redding soils are generally well drained, but during the rainy season, the surface soil may become saturated above the claypan; surface infiltration is moderate, but subsoil permeability is very slow. The hardpan is generally impervious to vertical water movement.

- Yokohl-Kimball Association. These soils are shallow to moderately deep on broad, moderately old alluvial fans formed from basic igneous and metamorphic rock types. The Yokohl soils overlies a dense, red clay subsoil (claypan) ranging in thickness from 12 to 25 inches. The hardpan is variable in hardness and thickness and becomes less cemented with depth. The Kimball soils are similar, but lack the hardpan. During rainy periods, runoff often ponds on these soils.

- Wyman-Ryer Association. These soils are formed in alluvium from primarily basic metamorphic and igneous rocks. They are deep and well-drained and occur on nearly level to very gently sloping young alluvial fans, particularly along drainage ways. In places, they are underlain by an unrelated hardpan or light colored siltstone at depths ranging from 36 to 50 inches.

GEOLOGY

The geology of the Sacramento Valley has been described by Dickinson and Rich (1972), California Department of Water Resources (DWR 1978), Jenkins (1965), Rockwell (1978), Aetron and Hydrodevelopment Inc. (1965), and Page (1974). Information developed by these authors form the basis for the following description of the geologic regime near Beale AFB.

Geologic History

The base is underlain at depth by the Great Valley Sequence. The Great Valley Sequence consists of thousands of feet of sediments accumulated in a "trough" created over 100 million years ago when the Sierra Nevada Mountains to the east were forming. The newly exposed Sierra Nevada was a source of sediments to the Great Valley area, which at that time was below sea level and constituted the continental shelf. About 40 million years ago, the Coast Mountain Ranges along the Great Valley's western margin were formed, and the Great Valley became a closed basin receiving sediments from its eastern and western boundaries. Within the last several million years, alluvial fans were developed along the valley margins. The eastern alluvial fans were developed along the rivers carrying volcanic, metamorphic, and granitic type fines, sands, and gravels down toward the valley floor. Various tectonic and climatic conditions and stream morphology resulted in sediments being deposited ranging in grain size from clays to cobbles, interfingering both laterally and vertically.

Stratigraphy

Beale Air Force Base is located along the boundary of the basement complex of the Sierra Nevada and the sedimentary deposits of the Great Valley. The rocks of the Sierra Nevada range in age from Paelozoic to Mesozoic. The rocks of the Great Valley range in age from Teritary to Quaternary. Figure 3.5 shows the geology of the base and its vicinity, and Figure 3.6 shows two geologic cross-sections illustrating the stratigraphy.

Along the eastern boundary of the base, the Sierra Nevada basement complex outcrops sloping to the southwest. The complex consists of metamorphosed igneous and sedimentary rocks and intrusive igneous rock. The depth to the complex ranges from 0 to over 5,000 feet by the confluence of the Bear and Feather Rivers. There are no known water wells reaching into the complex, but if water were present, it would probably be mainly from fractures and in small quantities (Page, 1980).

The basement complex is overlain by fine-grained sedimentary rocks. These rocks do not outcrop at the base, but have been identified in subsurface investigations. The top of these deposits constitute the effective base of the ground-water reservoir.

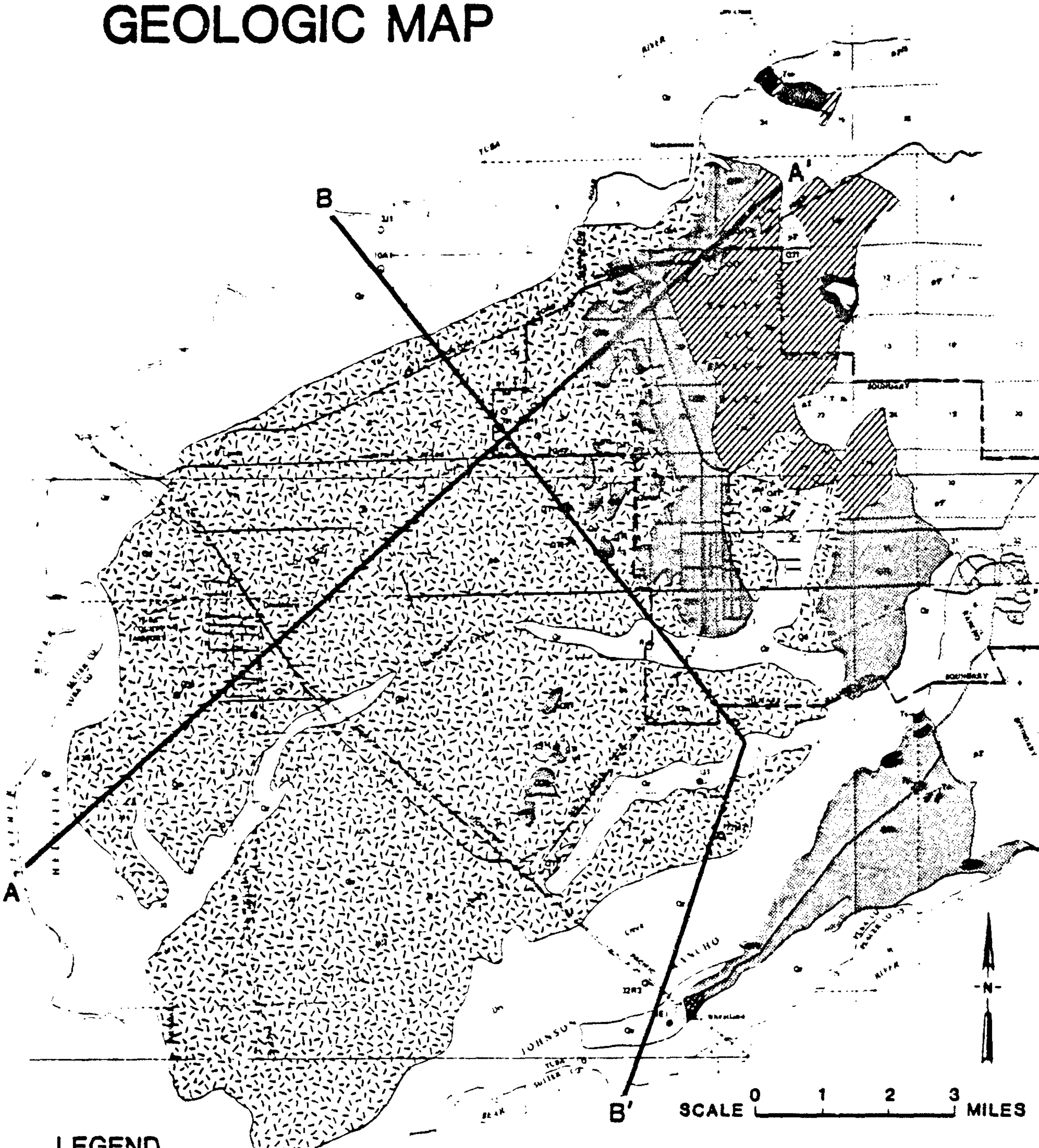
The fine-grained sedimentary rocks are overlain by undifferentiated sedimentary rocks of marine, non-marine, and deltaic origin. These sedimentary rocks only outcrop in a few isolated places on the base; however, they are found under the base, sloping gently to the southwest ranging in thickness from 0 to about 150 feet. Only a few water wells are known to reach these deposits and they are not pumping exclusively from these rocks (Page, 1980).

Overlying the undifferentiated sedimentary rocks are volcanic rocks from the Sierra Nevada; the volcanics consist of dark, poorly consolidated fluvial volcanic siltstone, sandstone, conglomerate and shale. The volcanics slope gently toward the southwest.

The middle of the base is underlain by the Laguna Formation and related continental deposits (the Arroyo Seco gravels). The deposits

BEALE AFB

GEOLOGIC MAP



LEGEND

A——A' LOCATION OF GEOLOGIC CROSS-SECTION

GEOLOGIC CONTACT

VICTOR FORMATION AND RELATED DEPOSITS (PLEISTOCENE)-Lenticular silt, gravel, and clay deposited by streams draining the Sierra Nevada

LAGUNA FORMATION AND RELATED CONTINENTAL DEPOSITS (PLEISTOCENE AND PLIOCENE (?))-Silt, sand, clay, and unsorted gravel

VOLCANIC ROCKS FROM THE SIERRA NEVADA (PLIOCENE AND EOCENE (?))-Poorly to well consolidated fluviatile volcanic siltstone, sandstone, conglomerate, and shale; volcanic breccia, tuff breccia, and tuff; predominantly andesitic and rhyolitic; andesitic at Reeds Creek

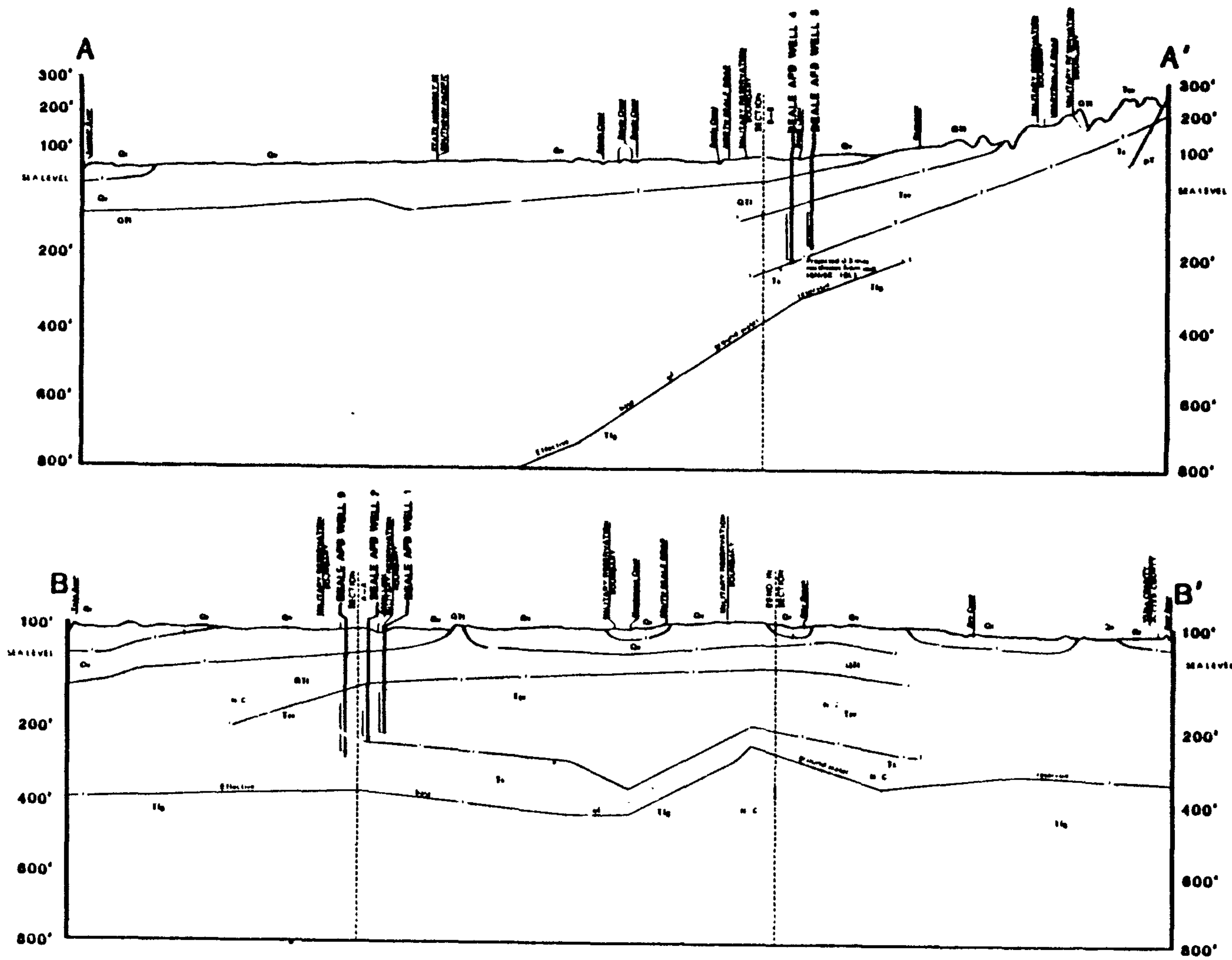
UNDIFFERENTIATED SEDIMENTARY ROCKS (OLIGOCENE (?) AND EOCENE)-Marine, nonmarine, and deltaic sedimentary rocks; sand, clay, conglomerate, sandstone, tuff breccia, siltstone, and shale

BASEMENT COMPLEX OF THE SIERRA NEVADA (PRE-TERTIARY)-Metamorphosed igneous and sedimentary rocks and intrusive igneous rocks

SOURCE: PAGE, 1980

BEALE AFB

GEOLOGIC CROSS-SECTIONS



LEGEND

STRATIGRAPHIC CONTACT

QTl — GEOLOGIC UNIT (See Figure 3.5 for Description)

WELL LOCATION AND WELL NUMBER

SOURCE: USGS 1980

NOTE: FIGURE 3.5 SHOWS THE LOCATIONS OF THE CROSS-SECTIONS range from fine-grained, compacted continental deposits, to coarse, poorly-sorted gravels. These deposits slope gently to the southwest. Soils developed on the Laguna Formation contain hardpan.

Overlying the Laguna Formation is the Victor Formation, outcropping along the western and southwestern base boundary. It consists of heterogeneous mixtures of clay, silt, sand, and gravel; in some places buried channels (gravel deposits) may exist. The Victor Formation is highly productive for wells located within its boundaries. It slopes gently to the southwest, as shown in Figure 3.6. Soils developed on the Victor and related deposits contain hardpan. Beale AFB obtains its water supply from the Victor Formation (see Figure 3.7).

The youngest deposits at the base are river deposits consisting of highly permeable silts, sands, and gravel. At the base, they are found along the Hutchinson and Dry Creek drainage courses.

Table 3.2 summarizes the stratigraphy underlying Beale AFB and describes the water-bearing characteristics of the geologic units. Ground-water wells supplying water to the base are located in the northwestern part of Beale AFB (see Figure 3.7 for location). Ground-water wells in the area are shown on Figure 3.8.

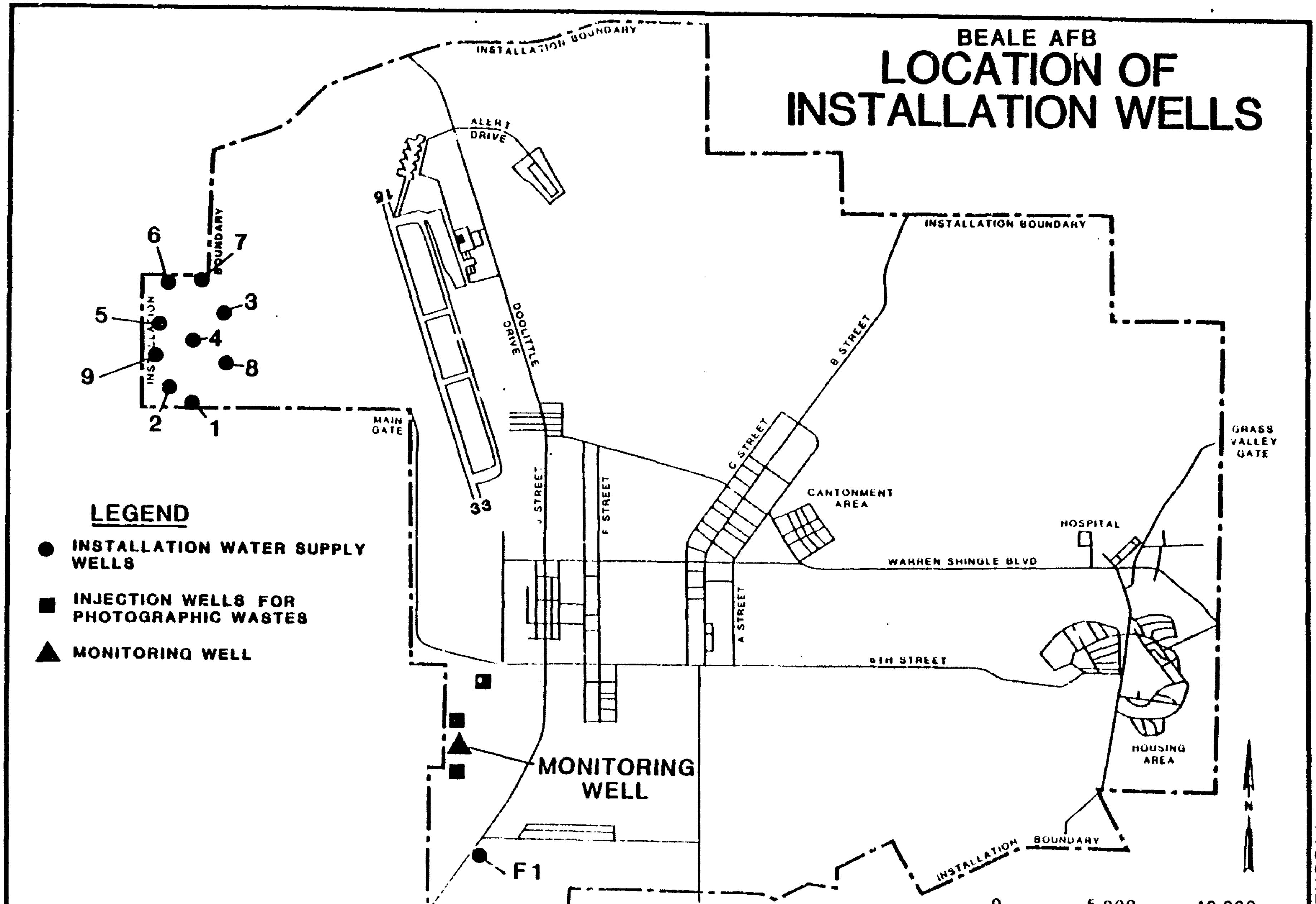
There are no known active or inactive faults mapped within the base boundaries (Jennings, 1975 and Jenkins, 1965). A shear zone (wide area of past geologic activity with no identified fault plane) is delineated east of the base, trending in a northwest-southeast direction (Jennings, 1975).

HYDROLOGY

Ground-water occurrences at and near Beale AFB have been documented by, among others, Aetron and Hydrodevelopment, Inc. (1965), California DWR (1978 and 1980), Page (1980), and Rockwell (1978). Additional information has been obtained through interviews with scientists and staff of the:

- U.S. Environmental Protection Agency
- California Regional Water Quality Control Board, Central Valley Region
- California Department of Health Services

BEALE AFB
LOCATION OF INSTALLATION WELLS



LEGEND

- ● INSTALLATION WATER SUPPLY WELLS
- ■ INJECTION WELLS FOR PHOTOGRAPHIC WASTES
- ▲ MONITORING WELL

SOURCE: INSTALLATION DOCUMENTS

TABLE 3.2

GEOLOGIC UNITS NEAR BEALE AFB

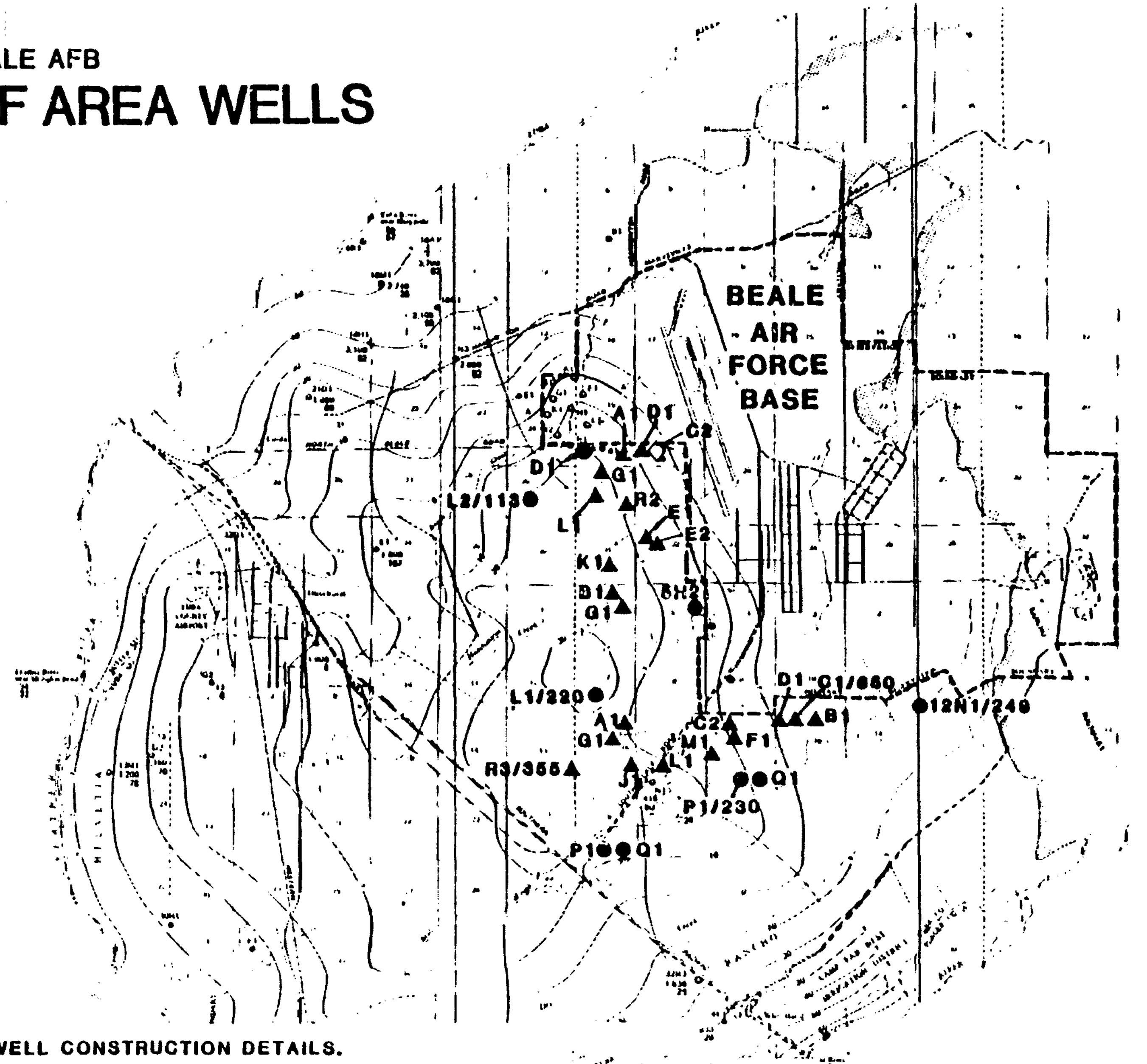
System and Series	Geologic Unit	Lithology	Thickness (feet)	Depth[1] (feet)	Water-Bearing Characteristics
QUATERNARY Holocene	River deposits	Continental deposits of silt, sand, and gravel, with minor amounts of clay	0-90	0-100(?)	Soils on river deposits have permeabilities of 15 to 80 gpd/ft^2.
QUATERNARY Pleistocene	Victor Formation	Continental deposits of silt, sand, and gravel	0-135	0-90	Most permeable deposits on East Side of Sacramento Valley. Well yield ranges from 1,000 to 1,600 gpm. Soils on the Victor and related deposits contain hardpan.
QUATERNARY AND TERTIARY(?) Pleistocene(?) and Pliocene	Laguna Formation and related continental deposits	Continental fine grained sediments to poorly-sorted gravels	0-180	0-175	Yields ranging from 100 to 3,100 gpm. Soils on the Laguna Formation contain hardpan.
TERTIARY Pliocene and Eocene(?)	Volcanics from the Sierra Nevada	Fluvial volcanic siltstone, sandstone, conglomerate	0-325	0-270	Wells perforated in the volcanics have yields ranging from 415 to 2,500 gallons per minute.
TERTIARY Oligocene (?) and Eocene	Fine-grained sedimentary rocks	Clay, sandy clay, silty clay, sand, and claystone	---	315-865	Limited; top of unit is the effective base of ground-water reservoir.
	Undifferentiated sedimentary rocks	Marine, non-marine and deltaic sedimentary rocks	0-150	0-455	Limited.
MEZOZOIC AND PALEOZOIC	Basement complex	Metamorphosed igneous and sedimentary rocks and intrusive igneous rocks	---	1-5000	Limited to rock fractures. No known wells in the Basement complex.

(1) Depth to the top of the unit.

SOURCE: USGS, 1980.

BEALE AFB

LOCATION OF AREA WELLS



NOTE: SEE TABLE 3.3 FOR WELL CONSTRUCTION DETAILS.
SOURCE: ROCKWELL, 1978, PAGE, 1980, YUBA COUNTY AGRICULTURAL COMMISSION

- Yuba County Water Agency
- Wheatland Water District
- Yuba County Agricultural Commission

<u>Regional Ground-Water Regime</u>

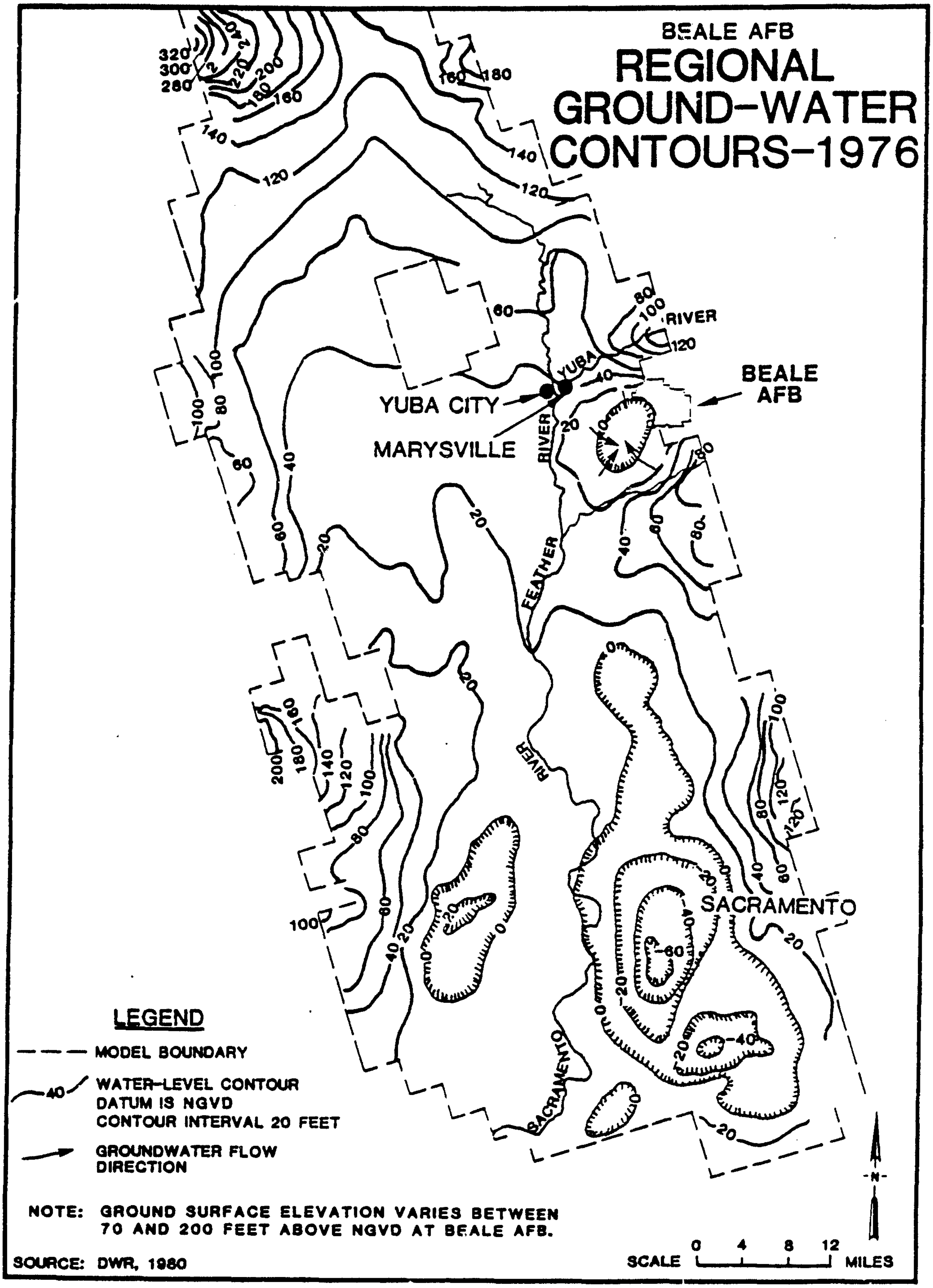
Beale AFB is located within the Sacramento Basin Hydrologic Area (DWR, 1980) along the eastern basin margin. Ground-water movement along this margin, at the turn of the century, was from the Sierra Nevada Foothills in the east toward the Feather and Sacramento Rivers to the west; the river system thus served as discharge points for the ground water. As a result of extensive ground-water extraction, primarily for crop irrigation since the turn of the century, the major discharge for the ground water has been through pumping. The ground-water pumping has caused changes in the direction of ground-water movement in many places of Sacramento Valley, including near Beale AFB, such that the rivers no longer serve as ground-water discharge points, but rather water from the river channels recharge the ground-water system.

Another source of recharge to the regional ground-water reservoir is along the formation outcrops in the Sierra Nevada Foothills, which at depth constitute the major water supply aquifers. Percolation of rainwater or irrigation waters through these materials reaches the ground-water reservoir; however, only lands with sufficiently permeable soil will permit percolation. Soils containing hardpan severely restrict downward movement of water (DWR, 1978).

In the Sacramento Valley, ground water occurs under unconfined and confined conditions. Holocene deposits, such as floodplains and alluvial fans, usually contain unconfined ground water, except when the sediments are overlain by clayey (floodplain) materials. In older materials, the water may be unconfined at shallow depths, and completely confined at greater depths. The depth to the water varies in the Sacramento Valley from less than ten feet in the central part of the Valley to almost 100 feet along the Valley margins (DWR, 1978).

The regional ground-water level contours (1976) are shown in Figure 3.9. As can be seen, Beale AFB straddles the eastern ground-water basin

FIGURE 3.9


BEALE AFB
REGIONAL GROUND-WATER CONTOURS-1976
RIVER
YUBA
BEALE AFB
YUBA CITY
MARYSVILLE
RIVER
FEATHER
RIVER
SACRAMENTO
SACRAMENTO
LEGEND
MODEL BOUNDARY
WATER-LEVEL CONTOUR
DATUM IS NGVD
CONTOUR INTERVAL 20 FEET
GROUNDWATER FLOW DIRECTION
NOTE: GROUND SURFACE ELEVATION VARIES BETWEEN 70 AND 200 FEET ABOVE NGVD AT BEALE AFB.
SOURCE: DWR, 1980
SCALE 0 4 8 12 MILES
N

margin; a pumping trough is located south-southwest of the base, bordered by the Yuba, the Feather, and the Bear Rivers. Ground-water flow from the base is to the south-southwest toward the trough.

Site-Specific Ground-Water Regime

Evaluation of ground-water conditions at and near Beale AFB was completed by Rockwell (1978) and Page (1980) for determination of future base water supply options. The studies assumed that ground water occurred under unconfined conditions except where local confinement may occur due to discontinuous lenses of confining fine-grained material of unknown extent. The effective base of the ground-water reservoir is at the base of the undifferentiated sedimentary rocks ranging in depth from 315 to 525 feet (Page, 1980).

Recharge to the ground-water reservoir at Beale is ultimately from in-stream percolation from the Yuba River, north of the base, manifested as ground-water inflow from the north, northwest, and northeast, but may also occur from infiltration of precipitation, irrigation waters, and intermittent creeks; these latter recharge sources would be strongly dependent on the presence of hardpan, since hardpan severely restricts vertical movement of water.

Discharge of ground water from the aquifer system occurs mainly from pumping. At Beale, ground water is pumped from nine water supply wells; water not extracted moves south-southwesterly toward a trough that in March 1976 was located west-southwest of the base (see Figure 3.9).

Ground-water level contours, and direction of movement from Beale AFB and vicinity is shown in Figure 3.10. As shown, ground-water flow from the base is to the south and southwest. The depth to the water ranges from 80 to 90 feet on the base. This is a dramatic reduction in water levels compared to previous decades. In water supply Well No. 7 (see Figure 3.7 for location), the non-pumping water level in 1945 was about 30 feet and in 1976 it was more than 90 feet. However, the rate of water level decline has diminished and stabilized since 1969 (Page 1980).

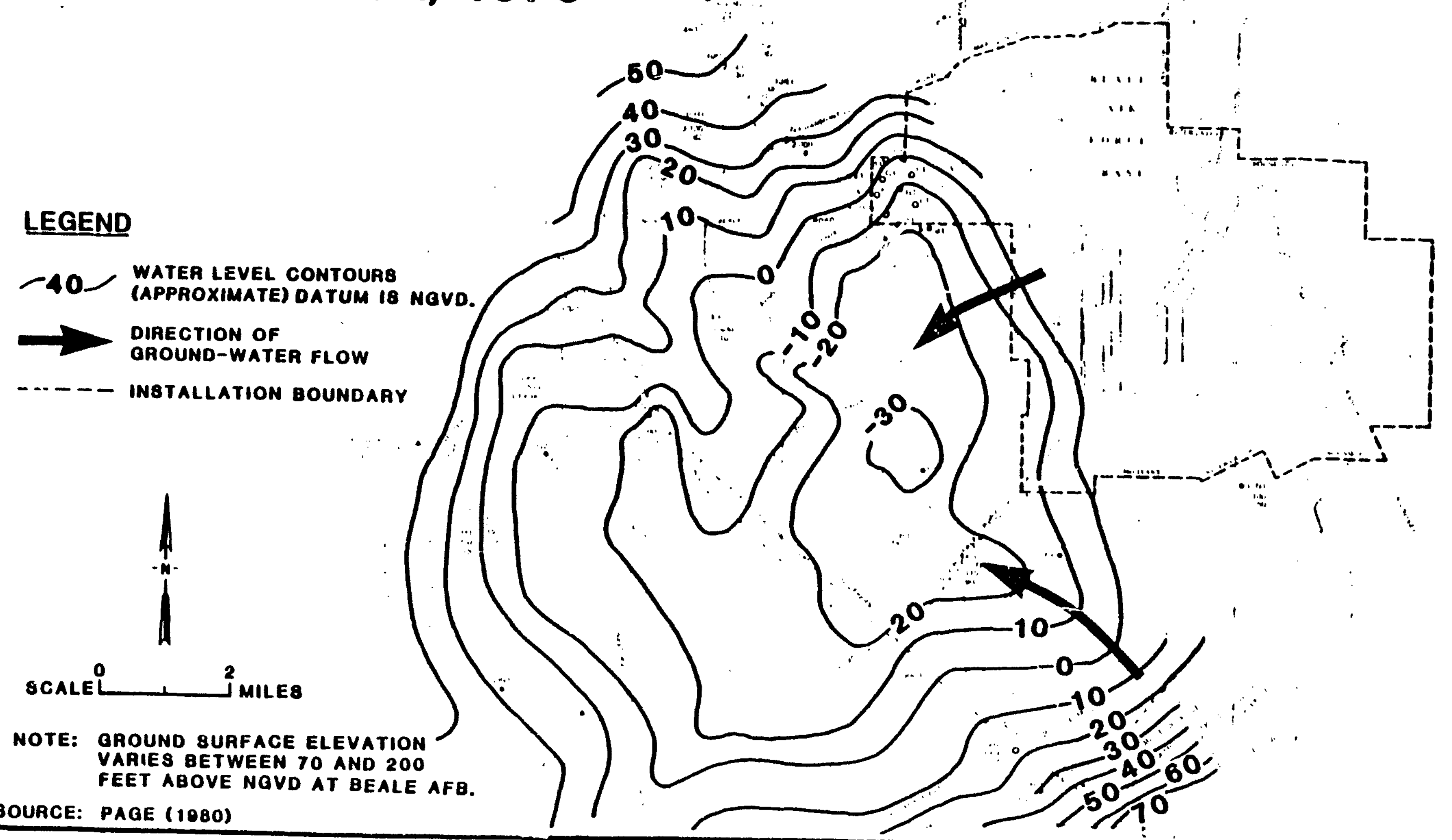
Installation and Area Wells

The base water demand is supplied by nine wells located within the base boundary. The locations of the base wells are shown in Figure 3.7.

FIGURE 3.10

BEALE AFB

ALTITUDE OF WATER SURFACE IN THE SEMICONFINED AQUIFER MARCH, 1976



NOTE: GROUND SURFACE ELEVATION VARIES BETWEEN 70 AND 200 FEET ABOVE NGVD AT BEALE AFB.

SOURCE: PAGE (1980)

Figure 3.8 shows the location of domestic and irrigation wells located downgradient of the base. The wells are identified according to the U.S. Geological Survey well numbering system (see Appendix J - Glossary). Figure 3.8 shows that many irrigation and some domestic wells are located downgradient from the base boundaries. The depths of specific wells are not known, but based on data available from other wells in the vicinity (unpublished data from Yuba County Agricultural Commission), the depths are probably in excess of 100 feet.

Table 3.3 contains a summary of the construction details of the base wells and their U.S. Geological Survey identification number. Pumpage from the ground-water reservoir at Beale AFB ranged from 1,370 to 4,240 acre-feet between 1960 and 1975 (Page, 1980) with the major part of the pumping occurring between May and September.

WATER QUALITY

Beale AFB established an Environmental Pollution Monitoring Program (EPMP) in December 1982 which included efforts in the areas of water, air, and noise pollution. The water pollution monitoring program consists of surface water sampling and analyses at specified locations (see section below on Surface Water Quality), and sampling of ground water.

Ground-Water Quality

Ground-water quality data from Beale AFB are available from samples collected from the base water supply wells. Table D.1 (see Appendix D) contains data collected from 1961 to 1975 on the ground-water quality. The waters generally of good quality, appear to be of sodium-calcium chloride and sodium-calcium bicarbonate types. Over the years of sampling, the dissolved solids concentrations have increased as have specific conductance, indicating that the wells y be drawing water from greater depths where brackish water occurs i. the older marine-deltaic-non-marine sediments (Page, 1980).

Ground-water quality data were collected in 1976 (Page, 1980) for selected wells outside the base boundary. These data are presented in Table D.2. The water quality analyses show that they exceed secondary drinking water standards for manganese, nitrates, and chloride; various drinking water standards are included in Table D.3 for comparative purposes. It should be noted that manganese in the ground water in the

TABLE 3.3

CONSTRUCTION DETAILS FOR INSTALLATION WATER SUPPLY WELLS

Well Installation Number	Well U.S.G.S. Number	Depth (feet)	Perforation Intervals (feet)	Casing Diameter (inches)
1	15N/4E-24R1	296	175-296	12/16
2	15N/4E-24R2	326	145-160 234-310	16
3	15N/5E-19F1	264	152-251	
4	15N/4E-24H1	405	158-288	16
5	15N/4E-24G1	299	112-154 210-224 238-280	16
6	15N/4E-24B1	313	130-156 192-213 235-241 252-264 289-299	16
7	15N/4E-24A1	300	140-270	16(?)
8	15N/5E-19L1	405	129-206 280-293	?
9	15N/4E-24K1	370	186-330	?

SOURCE: Page, 1980; Beale AFB Installation Documents.

eastern part of the Sacramento Valley is generally greater than 0.2 mg/l. The source of the manganese may be the dark metamorphosed volcanic materials outcropping at the margin of the basin (DWR, 1978).

In February 1978, Beale AFB sampled the base water supply wells (Wells 1, 2, 4, 5, 6, 7, 8, and 9; Well 3 was out of operation) and one tapwater sample for presence of trichloroethylene (TCE). None of the samples showed TCE concentrations above the detection limit of 1.5 parts per billion (ppb). In August 1983, samples were obtained from Wells 1, 2, 3 and 8 and the TCE concentrations were all below the detection limit of 0.1 ppb.

Monitoring Well Adjacent to Photographic Waste Injection Wells

A monitoring well was installed in the vicinity of the three photographic waste injection wells in 1966 (see Figure 3.8 for location). The injection wells reach depths in excess of 1,200 feet, and inject the wastes into saline water-bearing strata at depths of 1,104 to 1,164 feet and 1,183 to 1,203 feet. The waste is injected at a rate of 25 gpm, 24 hours a day, 7 days a week.

In June 1983, the Regional Water Quality Control Board sampled the photographic wastes at the base and analyzed it for the priority pollutants. The results are presented in Table 3.4.

The monitoring well with a 8-5/8 inch diameter casing, reaches a depth of 352 feet, with perforations at depth intervals of 132 to 172 feet, 192 to 232 feet, and 310 to 352 feet, and gravel packed the entire length; a sanitary seal was placed in the upper 50 feet between an 8-5/8 inch casing and an outer 16-inch casing.

Ground-water samples are collected from the monitoring well on a monthly basis. The samples are analyzed for cyanide, silver, and bromide. The results of the analyses from January 1982 to December 1983 are shown in Table 3.5. These results show that cyanide was detected above the detection limit (0.1 mg/l) in the amount of 5 mg/l in November 1982, and that bromide had elevated levels of 10.2 mg/l and 30 mg/l in July and August 1983, respectively. These analytical results, deviating from the trend of previous results, have been attributed to laboratory errors. Existing bromide data on the untreated photo wastewaters indicate concentrations in the range of 5.0 mg/l (SCS, 1982). It would seem unlikely that the bromide level could be as high as 30 mg/l as shown in

TABLE 3.4

CONSTITUENTS IDENTIFIED IN PHOTOGRAPHIC WASTES
BEALE AFB

Constituent	Photographic Wastes mg/l
pH	7.1 (su)
Cyanide - mg/l	0.13
Chromium - mg/l	0.04
Silver - mg/l	0.01
Fluoride - mg/l	0.2
Nitrate as N - mg/l	0.06
COD - mg/l	77
Boron - mg/l	8.0
Sulfates - mg/l	460
Acids	
2,4,6 trichlorophenol - ug/l	2.2
Pentachlorophenol - ug/l	7,600
Phenol - ug/l	24
GC/MS Characterization	
2-chloro-4,5-dimethylphenol - ug/l	5.2
2,5,8,11,14 pentaoxapentadecane - ug/l	18
Tetrachlorophenol - ug/l	55

Note: The wastes were analyzed for priority pollutants using EPA Method 625 for acids and base/neutrals, EPA Method 624 for volatiles, and titration for bromides. Constituents identified above the detection limits are shown above.

Source: Inspection Report by Edwin Crawford and Karen O'Haire, Regional Water Quality Control Board, Central Valley Region, dated 12 July 1983.

TABLE 3.5

ANALYTICAL RESULTS FROM
MONITORING WELL NEAR PHOTOGRAPHIC WASTE INJECTION WELLS

Date of Sample	Cyanide (mg/l)	Silver (ug/l)	Bromide (mg/l)
1982			
7 January	<.01	<10.	0.44
3 February	<.01	<10.	0.57
2 March	<.01	<10.	0.66
21 April	<.01	<10.	0.6
4 May	<.01	<10.	0.55
1 June	<.01	<10.	0.6
6 July	<.01	<10.	0.6
3 August	<.01	<10.	0.5
8 September	<.01	<10.	0.3
5 October	<.01	<10.	0.4
3 November	5.00*	<10.	0.4
13 December	<.01	<10.	<0.10
1983			
4 January	<.01	<10.	0.5
1 February	<.01	<10.	0.4
1 March	<.01	<10.	0.5
5 April	<.01	<10.	0.3
3 May	<.01	<10.	0.4
17 June	<.01	<10.	0.3
5 July	<.01	<10.	10.2*
2 August	<.01	<10.	30.0*
6 September	<.01	<10.	0.1
1 November	<.01	<10.	<0.1
1 December	<.01	<10.	<0.1

Note: *Attributed to lab error.

Source: Beale AFB Installation Documents.

Table 3.5. In addition subsequent sampling results have returned to normal levels. However, future analytical data should be carefully screened to assess the possibility of future laboratory anomalies.

Surface-Water Quality

The Environmental Pollution Monitoring Program for surface water at Beale AFB consists of sampling surface water entering and leaving the base. Figure 3.11 shows the location of surface water sample collection points as of 1983. The sampling locations are coded according to the base nomenclature. The base is using numbers 32 to 44 to identify surface water sampling sites and samples are collected quarterly. Site 43 is not reported because routine sampling is not accomplished at that site. Table D.4 (see Appendix D) contains the analytical results of surface-water samples collected in 1983 from the sampling locations shown in Figure 3.11.

At sampling location 044, a drainage ditch adjacent to the flightline (see Figure 3.11), oil and grease, and trichloroethylene (TCE) was identified in the March and June samplings. As a result, additional samples were collected in August 1983, and the samples analyzed for methylene chloride, TCE, and 1,2-dichloroethylene. The results of this sampling are also shown in Table D.4. In order to locate the source of the chlorinated hydrocarbons and to evaluate whether any of these constituents were in the streams on the base additional samples were collected above and beyond those samples collected to satisfy the EPMP. In September 1983 surface stream samples were collected for waters leaving the base. The samples were analyzed by EPA Methods 601 and 602 for volatile halocarbons and aromatics; no constituents were identified above the detection limit.

Samples from the storm drainage manholes were also collected and subjected to the same analyses. The compounds identified above detection limits are shown in Table 3.6. The manholes are located on Figure 3.11. All of these manholes are upstream of monitoring location 044.

BIOTIC COMMUNITIES

The vegetation of Beale Air Force Base is predominantly valley grassland grading into about a thousand acres of valley and foothill woodland in the eastern portion of the base. Three streams, Hutchinson

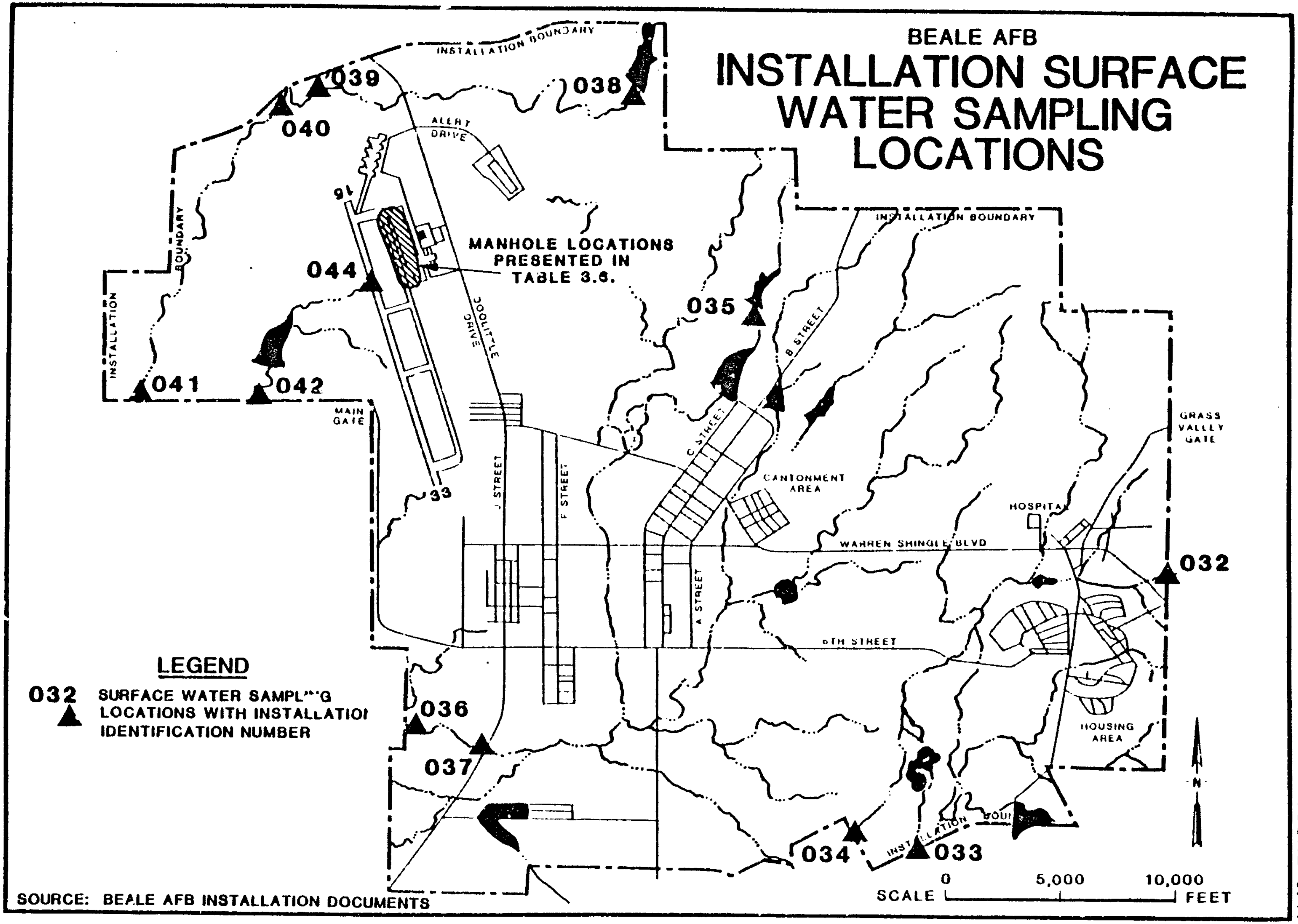

BEALE AFB
INSTALLATION SURFACE WATER SAMPLING LOCATIONS
INSTALLATION BOUNDARY
INSTALLATION BOUNDARY
INSTALLATION BOUNDARY
INSTALLATION BOUNDARY
039
038
040
ALERT DRIVE
16
MANHOLE LOCATIONS PRESENTED IN TABLE 3.6.
044
035
DOOLITTLE DRIVE
B STREET
041
042
MAIN GATE
GRASS VALLEY GATE
C STREET
CANTONMENT AREA
33
J STREET
F STREET
HOSPITAL
WARREN SHINGLE BLVD
A STREET
032
6TH STREET
LEGEND
032 SURFACE WATER SAMPL""G LOCATIONS WITH INSTALLATIOI IDENTIFICATION NUMBER
036
037
HOUSING AREA
N
034
033
SCALE 0 5,000 10,000 FEET
SOURCE: BEALE AFB INSTALLATION DOCUMENTS

TABLE 3.6

VOLATILE COMPOUNDS IDENTIFIED IN STORM DRAINAGE MANHOLES, SEPTEMBER 1983, BEALE AFB

Compound (ug/l)	Storm Drainage Manhole 19	21A	22	24	29
Bromodichloromethane	--	5.2	--	--	--
Carbon Tetrachloride	--	2.1	--	2.5	--
Chloroform	--	3.6	--	11.5	--
Dibromochloromethane	--	0.9	--	--	--
1,1-Dichloroethane	--	Trace	--	--	--
1,2-Dichloroethane	--	--	--	6.7	--
1,1-Dichloroethene	--	Trace	--	--	--
1,2-Dichloropropane	--	22.9	--	--	--
Tetrachloroethylene	--	Trace	--	--	--
1,1,1-Trichloroethane	--	4.0	--	--	--
Trichloroethylene	--	--	3.8	7.2	--
Benzene	--	--	--	--	Trace
Methyl Ethyl Ketone	--	8.0	--	--	15.0

Note: See Figure 3.11 for manhole locations. When results were not reported above then all concentrations are below detectable limits.

Source: Beale AFB Installation Documents.

Creek, Dry Creek, and the smaller Reeds Creek flow through the base. Riparian vegetation occurs along these watercourses.

Large portions of the valley grassland plant community have been replaced by introduced annual grasses used for pasturage. Large areas of the base are leased out for cropland and grazing of cattle. Native perennial grasses have been reduced significantly in grazed areas throughout the central valley. Dominant grasses in the area are now Bromus, Avena, Elymus and Festuca. In the more gently sloping terrain in the western and southwestern part of the base vernal pools occur in the grassland. Vernal pools are formed when depressions in the grassland fill with water during the winter. They are characterized by a diverse array of annual grasses and forbs which are restricted to the unique habitat formed as the pools begin to dry up in the spring (Ornduff, 1974).

The valley and foothill woodland community is dominated by blue oak, Quercus douglasii, with an understory of annual grasses. Riparian vegetation includes Fremont cottonwood (Populus fremontii), willows (Salix spp.), and valley oak (Quercus lobata) (Ornduff, 1974). The California Natural Diversity Data Base reports no endangered or threatened plant species located on the base (Shaw, 1983). There are no threatened animal species nesting on the base; however, the bald eagle and Peregrine Falcon use the base for foraging.

ENVIRONMENTAL SETTING SUMMARY

The environmental setting data for Beale AFB indicate that the following characteristics are important when evaluating past hazardous waste disposal practices.

1. The mean annual precipitation is 21.73 inches; the net precipitation is - 44.8 inches and the one-year, 24-hour rainfall event is estimated to be 2.5 inches. These data indicate that there is little or no potential for precipitation to infiltrate the surface soils on the base. Also, there is a moderate potential for runoff and erosion.

2. The soil characteristics on the base are a function of the underlying geology. The geology of the western part of the installation consists of sedimentary deposits that have hardpan associated with soil development. The hardpan appears to be pervasive even though it varies in thickness and cementation. The hardpan restricts or eliminates vertical infiltration of water. Areas underlain by hardpan probably have very limited recharge capabilities to the aquifer system.

3. Ground water is found at depths ranging from 80 to 90 feet; the effective base of the ground-water reservoir is at depths of 315 to 525 feet under the base. Recharge to the ground-water aquifers are primarily from the rivers to the north, west and south of the base. Ground-water movement is to the south-southwest toward a pumping trough located outside the base.

4. The existing ground-water quality appears good, with some elevated levels of manganese and iron; these are regional anomalies.

5. There are no known threatened or endangered plant species identified on Beale AFB. The bald eagle and Peregrine Falcon use the base for foraging but there are known nesting locations on the base.

CHAPTER 4

FINDINGS

This chapter presents information for Beale Air Force Base wastes generated by past activity, describes past waste disposal methods, identifies the disposal and spill sites located on the base, and evaluates the potential for environmental contamination.

PAST SHOP AND BASE ACTIVITY REVIEW

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

The sources of most hazardous wastes on Beale AFB can be associated with one of the following activities:

- Industrial operations (shops)
- Pesticide utilization
- Fire protection training
- Management of fuels
- Spills
- Hazardous Waste Storage Areas

The subsequent discussion addresses only those wastes generated at Beale AFB which are either hazardous or potentially hazardous. Potentially hazardous wastes are grouped with and referenced as "hazardous wastes" throughout this report. A hazardous waste, for this report, is defined by, but not limited to, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) or the California Administrative Code, Title 22. A potentially hazardous waste is one which is suspected of being hazardous although sufficient data are not available to fully characterize the material.

Industrial Operations (Shops)

Industrial operations at Beale AFB consist primarily of aircraft and vehicle maintenance, and repair activities. These and other mission support operations generate potentially hazardous materials at a number of industrial shops. The Bioenvironmental Engineering (BEE) Office provided a listing of industrial shops which was used as a basis for evaluating past waste generation and hazardous material disposal practices. The BEE individual shop files were also examined for information on hazardous material usage, and hazardous waste generation and disposal practices. From this information, a master list of industrial shops (Appendix C) was prepared showing building locations, hazardous materials handlers, hazardous waste generators, and typical treatment and disposal methods. Additionally, documents prepared by the base Civil Engineering Squadron were reviewed to develop further information on the shops located at Beale AFB.

Shops which were determined to be generators of hazardous wastes, which could pose a potential for ground-water or surface water contamination, were selected for further evaluation. During the site visit, interviews were conducted with personnel from the industrial shops, particularly the shops that generate the largest amounts of hazardous wastes. Shops generating lesser amounts of hazardous wastes were contacted by telephone. Shop interviews focused on hazardous waste materials, waste quantities, and disposal methods. Disposal timelines were prepared for each major hazardous waste from information provided by shop records, shop personnel and others familiar with the shop's operations and activities.

Table 4.1 summarizes the information obtained from the detailed shop review. The table includes a listing of the types of hazardous wastes generated at the various shops, waste quantities and disposal methods. Table 4.1 does not include the shops which generate minor quantities of hazardous waste.

During the early period of activity (1942 through 1947) under command of the Army, major shops were involved primarily in tank repair. Many of these were housed in the cantonment area. There are no known

TABLE 4.1

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	WASTE MANAGEMENT PRACTICES 1950 1960 1970 1980
9th FIELD MAINTENANCE SQUADRON (FMS)				
CORROSION CONTROL	1071	WASTE PAINT	60 GALS./MO.	
		MEK	20 GALS./MO.	1958 FIRE PROTECTION TRAINING AREA 1972 D"DO
		TOLUENE	5 GALS./MO.	
		WASTE THINNERS	5 GALS./MO.	
NON-DESTRUCTIVE INSPECTION	1243	SPENT DEVELOPER	40 GALS./YR.	DILUTED TO SANITARY SEWER
		SPENT FIXER	30 GALS./YR.	SILVER RECOVERY THEN SEWER
		PENETRANT (AROMATIC NAPTHA AND MINERAL OIL)	165 GALS./YR.	FIRE PROTECTION TRAINING AREA DPDO
		EMULSIFIER (ALIPHATIC PETROLEUM SOLVENTS)	165 GALS./YR.	FIRE PROTECTION TRAINING AREA 1972 DPDO
		RINSE EMULSIFIER	25 GALS./YR.	SANITARY SEWER
		DEODORIZED KEROSENE	3 GALS./YR.	SANITARY SEWER OIL/WATER SEPARATOR
INTERMEDIATE MAINTENANCE J-58	1025	JP-7	5 GALS./MO.	FIRE PROTECTION TRAINING AREA 1972 DPDO
		WASTE OILS	15 GALS./MO.	FIRE PROTECTION TRAINING AREA DPDO

KEY

———— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

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

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	WASTE MANAGEMENT PRACTICES (1950 / 1960 / 1970 / 1980)
9th FIELD MAINTENANCE SQUADRON (cont'd)				
INTERMEDIATE MAINTENANCE J-57	1086	WASTE OILS	45 GALS./MO.	1958 FIRE PROTECTION TRAINING AREA - - - 1972 DPDO →
		JP-4	5 GALS./MO.	FIRE PROTECTION TRAINING AREA - - - →
ACCESSORY REPAIR	1086	CARBON REMOVER	2 GALS./MO.	FIRE PROTECTION TRAINING AREA - - - 1972 DPDO →
		SOLVENTS (Stoddard)	40 GALS./MO.	FIRE PROTECTION TRAINING AREA - - - DPDO →
		CALIBRATING FLUID	100 GALS./MO.	FIRE PROTECTION TRAINING AREA - - - DPDO →
		TCE	2 GALS./MO.	1964 DPDO →
ENGINE CONDITIONING	1086	JP-4	15 GALS./MO.	FIRE PROTECTION TRAINING AREA - - - →
SR 71 TEST CELL J-58	1154	JP-7 AND SOLVENTS SPILLAGE	25 GALS./MO.	FIRE PROTECTION TRAINING AREA AND SURFACE DITCH - - - →
J-57 TEST CELL	1247	JP-4 AND SOLVENTS SPILLAGE	10 GALS./MO.	FIRE PROTECTION TRAINING AREA AND SURFACE DITCH - - - →
REPAIR AND RECLAMATION	1086	STRIPPER AND SOLVENTS	110 GALS./MO.	} FIRE PROTECTION TRAINING AREA - - - 1972 DPDO →
		PD-680 TYPE II	55 GALS./MO.	
		MEK	2 GALS./MO.	
PNEUDRALICS	1086	PD-680 TYPE II	55 GALS./MO.	FIRE PROTECTION TRAINING AREA - - - DPDO →
		HYDRAULIC FLUID	55 GALS./MO.	MANUFACTURER RECLAIMED - - - →
FUEL SYSTEM REPAIR	1077	WASTE FUELS (JP-4 & JP 7)	5 GALS./MO.	OIL/WATER SEPARATOR - - - →

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

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

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	WASTE MANAGEMENT PRACTICES 1950 1960 1970 1980
9th FIELD MAINTENANCE SQUADRON (cont'd)				
ELECTRIC SYSTEM REPAIR	1086/1088	BATTERY ACID	4 GALS./MO.	1958 NEUTRALIZED TO SEWER (estimated) → 1972 NEUTRALIZED TO DRY WELL → 1983 DPDO
EGRESS SYSTEMS	1075	PD 680-II	4 GALS./MO.	FIRE PROTECTION TRAINING AREA (estimated) → DPDO
POWERED AGE	1225	SOAPS AND SOLVENTS	40 GALS./MO.	OIL/WATER SEPARATOR
		WASTE OILS	50 GALS./MO.	FIRE PROTECTION TRAINING AREA (estimated) → DPDO
		HYDRAULIC OILS	160 GALS./MO.	MANUFACTURER RECYCLED
		HYDRAULIC FLUID	55 GALS./MO.	DPDO
		WASTE FUELS	100 GALS./MO.	FIRE PROTECTION TRAINING AREA
		DRY CLEANING SOLVENTS	50 GALS./MO.	DPDO
		CARBON REMOVER	15 GALS./MO.	NOT PREVIOUSLY USED; 1982 DPDO
9th TRANSPORTATION SQUADRON (LGT)				
VEHICLE MAINTENANCE	2496	WASTE OIL & HYDRAULIC FLUID	150 GALS./MO.	1955 FIRE PROTECTION TRAINING AREA (estimated) → 1983 CONTRACTOR RECYCLE
REFUELING TANK MAINTENANCE	2470	BATTERY ACID	20 GALS./MO.	NEUTRALIZED TO SANITARY SEWER (estimated) → 1982 DPDO
PAINT AND BODY SHOP	2489	ANTIFREEZE	55 GALS./MO.	DPDO
TIRE & BATTERY SHOP	2497	SOLVENTS	20 GALS./MO.	FIRE PROTECTION TRAINING AREA (estimated) → 1982 DPDO
		WASTE FUEL	100 GALS./MO.	OIL/WATER SEPARATOR

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

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

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	WASTE MANAGEMENT PRACTICES 1950 1960 1970 1980
9th TRANSPORTATION SQUADRON (LGT)(cont'd)				
FIRE TRUCK MAINTENANCE	1086	WASTE OIL	5 GALS. /MO.	1955 FIRE PROTECTION TRAINING AREA (estimated) – 1972 DPDO
9th ORGANIZATIONAL MAINTENANCE SQUADRON (OMS)				
SR-71 BRANCH	1075	JP-7	100 GALS. /WK.	1966 RECYCLE
		JP-7 & HYDRAULIC FLUID	50 GALS. /WK.	FIRE PROTECTION TRAINING AREA
		JP-7, SPILLAGE ON RUNWAYS	300 GALS. /WK.	OIL/WATER SEPARATOR & STORM SEWER
		ENGINE OIL	10 GALS. /MO.	SUPPLY RECYCLE
KC-135 BRANCH	1076	JP 4, JP 7	250 GALS. /WK.	1958 FIRE PROTECTION TRAINING AREA/RECLAIM (estimated)
		ENGINE OIL	16 GALS. /MO.	DPDO (estimated)
		HYDRAULIC FLUID	16 GALS. /MO.	FIRE PROTECTION TRAINING AREA (estimated) – 1972 DPDO
U-2 BRANCH	1075	JPTS	900 GALS. /MO.	FIRE PROTECTION TRAINING AREA OR RECLAIM 1976
		HYDRAULIC FLUID	3 GALS. /MO.	DPDO
T-38 BRANCH	1076	JP 4	20 GALS. /MO.	1966 FIRE PROTECTION TRAINING AREA/RECLAIM
		HYDRAULIC FLUID, OILS & LUBS	10 GALS. /MO.	FIRE PROTECTION TRAINING AREA – 1972 DPDO 1983
		PD 680 II	7 GALS. /MO.	DPDO

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

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

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	WASTE MANAGEMENT PRACTICES 1950 1960 1970 1980
9th ORGANIZATIONAL MAINTENANCE SQUADRON (OMS) (cont'd)				
SUPPORT VEHICLE	1092	WASHRACK SKIMMINGS	110 GALS./MO.	1958 FIRE PROTECTION TRAINING AREA - - - → DPDO ——→
		OILS, HYDRAULIC FLUID	55 GALS./MO.	FIRE PROTECTION TRAINING AREA - - - → 1972 DPDO ——→
NON-POWERED AGE	1240	PD 680 TYPE II	15 GALS./MO.	DPDO - - - →
		HYDRAULIC FLUID	1 GAL./MO.	FIRE PROTECTION TRAINING AREA - - - → 1972 DPDO - - - →
9th RECONNAISSANCE TECHNICAL SQUADRON (RTS)				
PHOTO PROCESSING	2145	PHOTOPROCESSING CHEMICALS AND RINSE WATERS	36,000 GALS./DAY	1966 PHOTO WASTE TREATMENT PLANT SILVER RECOVERY ——→
LOGISTICS	2145	WASTE OILS	30 GALS./MO.	} DPDO ——→
		WASTE PAINTS & SOLVENTS	5 GALS./MO.	
		DIESEL FUEL	5 GALS./MO.	
9th SUPPLY SQUADRON (LGS)				
BULK STORAGE, FUEL	411	FUEL (JP-4, JP-7, JPTS)	500 GALS./MO.	} FIRE PROTECTION TRAINING AREA OR RECLAIMED - - - →
FUELS LABORATORY	1064	FUEL (JP-4, JP-7, JPTS)	1,025 GALS./MO.	
FUELS DISTRIBUTION	1062	FUEL (JP-4, JP-7, JPTS)	150 GALS./MO.	

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

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

TABLE 4 1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	WASTE MANAGEMENT PRACTICES (1950 / 1960 / 1970 / 1980)
9th CIVIL ENGINEERING SQUADRON (CES)				
PAVEMENT AND GROUNDS	2565	EMPTY HERBICIDE CONTAINERS	1 DRUM/MO.	1958 TRIPLE RINSE TO LANDFILL 1983 DPDO
ENTOMOLOGY	2560	EMPTY PESTICIDE CONTAINER	1 DRUM/MO.	TRIPLE RINSE TO LANDFILL 1983 DPDO
		EQUIPMENT WASH (DILUTE)	10 GALS./WK.	ON GROUND (BLD. [illegible]) 1981 BLDG. 2560
PAINT SHOP	2536	PAINT THINNER	55 GALS./MO.	FIRE PROTECTION TRAINING AREA 1968 LANDFILL 1982 DPDO
		EMPTY LATEX PAINT CANS	45 CANS/MO.	LANDFILL
		EMPTY OIL PAINT CANS	5 CANS/MO.	LANDFILL 1983 DPDO
LIQUID FUELS MAINTENANCE	2537	TANK CLEANING SLUDGE	10 GALS./TANK	CONTRACTOR DISPOSED
		WASTE FUELS	16 GALS./MO.	FIRE PROTECTION TRAINING AREA
		OIL FROM OIL/WATER SEPARATORS	200 GALS./MO.	FIRE PROTECTION TRAINING AREA 1972 DPDO
EXTERIOR ELECTRIC	2535	TRANSFORMER OIL	80 GALS./YR.	DPDO 1977 PONDED 1979 DPDO
POWER PRODUCTION	2541	WASTE OIL, HYDRAULIC FLUID	30 GALS./MO.	FIRE PROTECTION TRAINING AREA 1972 DPDO
		ANTIFREEZE	5 GALS./MO.	ON GROUND AT LOCATION DPDO
		SULPHURIC ACID	90 GALS./YR.	NEUTRALIZED SEWER

KEY

———— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

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

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	WASTE MANAGEMENT PRACTICES 1950 1960 1970 1980
UTILITY SUPPORT	2145	DIESEL FUEL	5 GALS./MO.	FIRE PROTECTION TRAINING AREA; DPDO; CONTRACTOR RECYCLE
		LUBE OIL	60 GALS./MO.	1966 FIRE PROTECTION TRAINING AREA; 1972 DPDO; 1980 CONTRACTOR RECYCLE
USAF HOSPITAL				
MEDICAL X-RAY	5700	SPENT DEVELOPER	100 GALS./MO.	1958 DILUTED TO SEWER
		SPENT FIXER	50 GALS./MO.	SILVER RECOVERY THEN SEWER
DENTAL CLINIC	5700	SPENT DEVELOPER	1/2 GALS./MO.	DILUTED TO SEWER
		SPENT FIXER	1/2 GALS./MO.	SILVER RECOVERY THEN SEWER
9th COMBAT SUPPORT GROUP (MWR)				
AUTO HOBBY SHOP & RECREATIONAL SUPPLY	2427/2185	WASTE OIL	500 GALS./MO.	CONTRACTOR RECYCLE
PHOTO HOBBY SHOP	2427	SPENT FIXER	2 GALS./MO.	DILUTE TO SEWER; 1980 SILVER RECOVERY
		SPENT PHOTO CHEMICALS & RINSE	10 GALS./MO.	DILUTE TO SEWER
7th MISSILE WARNING SQUADRON (PAVE PAWS)				
PAVE PAWS	5760	WASTE OIL	400 GALS./YR.	UNIT ACTIVATED 1980 DPDO

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL accounts of waste disposal methods used by the shops. During the period, 1948 through 1958, under command of the Air Force the base andits shops were oriented toward minor vehicle maintenance.

The period of greatest industrial waste generation has occurred since the runway and aircraft facilities were completed in 1958. Since then most of the industrial shops have been oriented towards aircraft maintenance and repair. These shops have for the most part remained in their present location for a number of years. Base-support shops, however, such as those in the Civil Engineering Squadron, have moved several times. The wastes generated in shops at Beale AFB consist mainly of contaminated jet fuel (JP-4, JP-7, JPTS), waste oils and lubricants, acid and alkaline cleaning solutions, solvents, paint strippers, and paints.

In the past most flammable chemicals including oils, fuels and solvents were burned in the fire training areas. This practice was curtailed in the late 1960's with the imposition of stricter air pollution control regulations. Thereafter waste solvents and oils were accumulated in a storage tank at the fire training area and hauled off site by a DPDO contractor.

Contaminated jet fuels (JP-4, JP-7, JPTS) are recycled or downgraded and reused or used for fire protection training. Waste oils and lubricants are disposed through the Defense Property Disposal Office (DPDO) in Sacramento. Since 1982 most of the hazardous or potentially hazardous wastes have been recycled or disposed of through DPDO.

In the past some of the chemical wastes were reported to have been discharged to the sanitary and storm sewers or allowed to run off onto surface soils directly adjacent to maintenance facilities. The base has 19 oil/water separators (see Table D.6 in Appendix D) which have been used to remove contaminants from runoff and washrack wastes. Oil and fuels from separators were burned in fire training exercises. Some oils, paint and solvents from the cantonment area were disposed in the landfills. The photo wastewater treatment plant was built in 1966 to treat chemical wastes discharged from the photo laboratory (Building 2145). Sludge from the treatment plant was disposed in the landfill on base from 1967 to 1978.

Pesticide Utilization

The pest control program at the Beale AFB involves routine and specific job order applications of pesticides. Pesticides are stored in a locked and covered area of the Entomology Shop in Building 2560. Before 1981, the Entomology Shop was located in Building 440. Table D.5 in Appendix D includes a list of pest control agents currently in use or storage. Some herbicides were stored and applied by the Pavement and Grounds Shop (Building 2565) prior to 1980.

The procedure for the disposal of pesticide containers at Beale AFB is to place all small containers in labeled drums for disposal by DPDO. The 55 gallon drums were triple rinsed prior to 1983 and taken to DPDO for contract disposal. Drums are now taken unrinsed to DPDO. The drum rinse water is collected and used for diluent in the preparation of future batches. Equipment rinse wash is allowed to run into a gravel area and percolate into the soil.

Waste Discharge Areas (DA)

Several of the industrial maintenance facilities at Beale AFB were known to have discharged the wastes generated at the facility onto the surface soils in areas immediately adjacent to the specific facility. Nine discharge areas were identified on the base. These areas were depicted on Figure 4.1 and discussed in the following paragraphs.

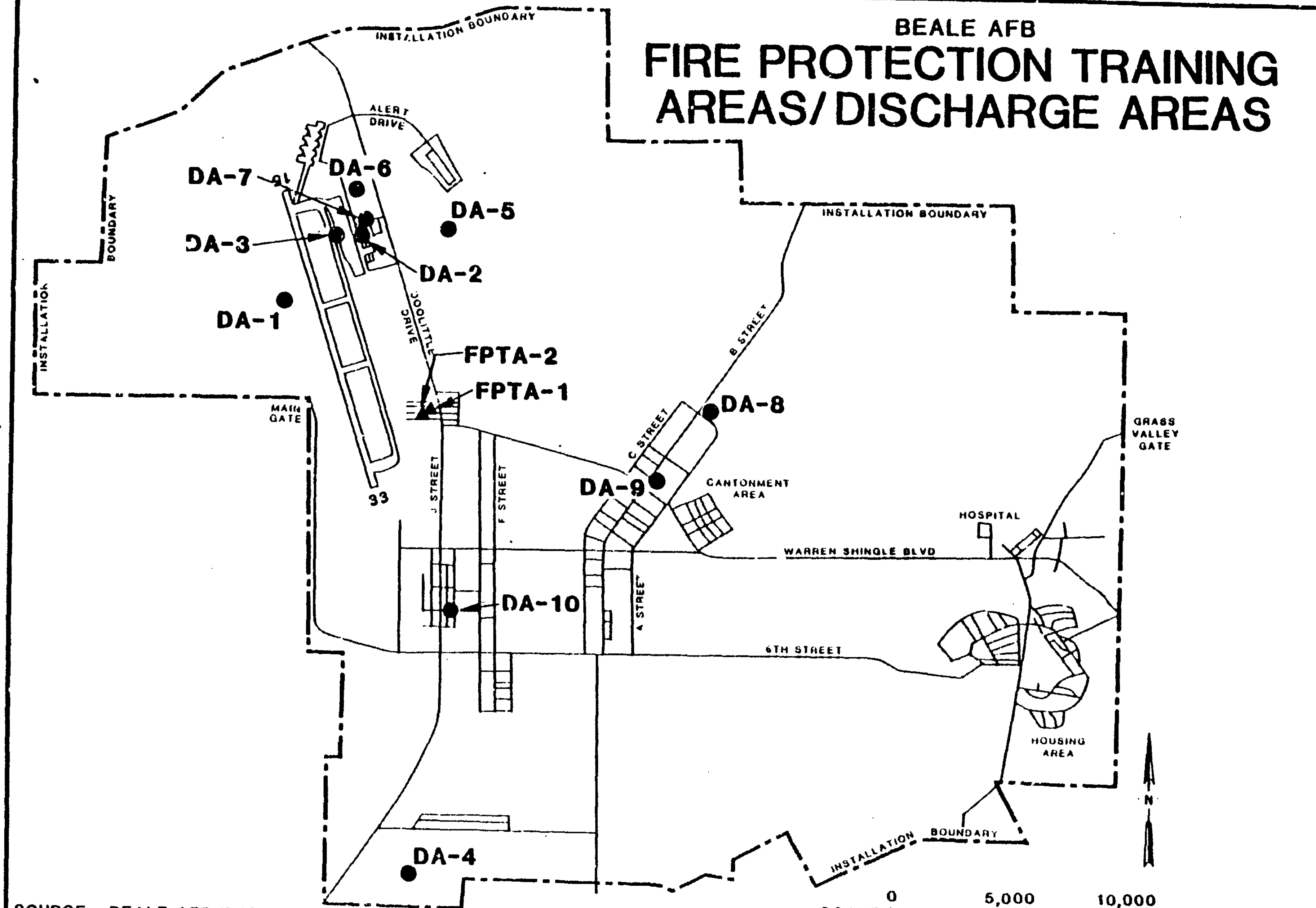
Discharge Area No. 1 (DA-1)

Discharge Area No. 1 (West Drainage Ditch) is a drainage system which drains the flightline and surface runoff from the runway area. The drainage system discharges through a headwall located about 800 feet west of the main runway and into a ditch which is filled with vegetation. Oil absorbent booms are immediately downstream from the headwall. Surface water quality data (see Table D.4 - Sampling Location 044) indicated oil and grease and trans-1,2 dichloroethene. Visual observations indicate that oils have accumulated in the soils of the ditch adjacent to the headwall.

Discharge Area No. 2 (DA-2)

A sink drain (in Building 1088), used to dispose of neutralized acid from batteries, was tied into a dry well. The hole was 4 feet in diameter and approximately 20 feet deep and filled with cobbles. The

BEALE AFB
FIRE PROTECTION TRAINING AREAS/DISCHARGE AREAS



SOURCE: BEALE AFB INSTALLATION DOCUMENTS

neutralized acid could have high concentrations of lead. Use of the dry well was discontinued in 1983.

Discharge Area No. 3 (DA-3)

The SR-71 aircraft is so constructed that it will leak JP-7 while on the ground. It has been estimated that the planes loose about 300 gallons of fuel per week. A major portion of the fuel is lost in the vicinity of the SR-71 shelter and on Taxiway No. 10. Some of the fuel runs off the taxiway into an oil-water separator. Another portion of the fuel runs off into the adjacent storm sewer which is upstream of DA-1. The soils adjacent to the taxiway area are discolored in areas indicating potential contamination.

Discharge Area No. 4 (DA-4)

During the period 1962 to 1969, the U.S. Army produced wheat stem rust (Puccinia graminis tritici). Beale AFB was selected as a production site because wheat is not normally grown in the area and operations would not create hazards to commercial agriculture. In addition, the Beale site was within the confines of a military establishment where access to activities would be restricted and controlled. Further, because stem rust fungus had been present in California since 1928, most commercial wheat varieties were resistant. The stem rust of wheat uredospores and the infections do not survive from one growing season to the next in areas north of the Mexican border region. All operations at the site were coordinated with and approved by the Corps Research Division, Agriculture Research Service, Department of Agriculture which was provided samples to be checked for purity and authenticity.

In the production process, the spores, diluted with bentonite or talcum were dispersed over the crop from an agricultural type crop duster, harvested, sieved to remove coarse contaminants, dried when necessary, further cleaned with freon, placed in containers from which air was withdrawn, nitrogen added, stored at 4°C and transferred to the storage site at Rocky Mountain Arsenal, Colorado. Assays for purity and authenticity were conducted at various times during the process and during storage.

No chemical or biological testing was accomplished at the site since it was used for fungus production. In 1969, the production stocks remaining at Beale were ordered destroyed. In the destruction process, the material was rendered inactive by carboxide treatment (10% ethylene oxide, 90% carbon dioxide) for seven days at 4 psig. Each lot of material was tested to assure 99.964% kill at 99.5% confidence based on a statistically designed sampling plan. All of the material was then rendered unidentifiable by incineration in a multiple hearth furance. Plant wastewater was also incinerated to prevent agent material from being released. The residual ash was assayed and plowed into the soil at the site to a depth of six inches. The entire destruction process was accomplished successfully in complete cooperation with and guidance from the U.S. Department of Agriculture and the California Department of Food and Agriculture.

The only chemicals used at the site, as noted above, were freon, carbon dioxide, ethylene oxide and possibly trichloroethylene. Actual quantities used are not available. Table D.8 (see Appendix D) describes the changes in levels of chemical elements in the soil at the site after incorporation of the incineration residue into the soil.

Discharge Area No. 5 (DA-5)

Discharge Area No. 5 (J-58 Test Cell Drainage Ditch) is located just off Doolittle Drive adjacent to Building 1154. The area receives runoff from the test stand which is used to test SR-71 engines. The chemicals which may have run off include JP-7, soap, oil, TCE and PD-680. The ditch area adjacent to the test stand was observed to be discolored during the site visit.

Discharge Area No. 6 (DA-6)

Discharge Area No. 6 (J-57 Test Cell Drainage Ditch) is located adjacent to Building No. 1247. The area has received runoff from the test stand which has been used to test B-52 and KC-135 engines. Chemicals which have runoff into the drainage area include JP-4, PD-680 and soap. Some contamination was observed at the time of this study.

Discharge Area No. 7 (DA-7)

Discharge Area No. 7 is a drainage ditch located behind Building No. 1225 (AGE maintenance). The soils adjacent to the paved vehicle parking area have received quantities of oil in the past. Some contaminated surface soils have been removed and replaced with uncontaminated soils.

Discharge Area No. 8 (DA-8)

Discharge Area No. 8 (Transformer Oil Drainage Area) is a diked area adjacent to 34th Street near B Street. The area was used from 1977 to 1979 to drain transformers before bringing them into the shop for repair. During the site visit, no contamination was visible. Eleven soil samples were later collected by base personnel in January 1984 which indicated that PCB concentrations were below the detectable limit of 0.5 mg/kg. One sample was 14 mg/kg of PCB. These low values do not pose a potential for contaminant migration.

Discharge Area No. 9 (DA-9)

Since 1981, wash water from cleaning pesticide application tanks is discharged to a gravel area adjacent to Building 2560 and allowed to percolate into the ground. This site could represent a potential for contaminant migration.

Discharge Area No. 10 (DA-10)

Prior to 1981, for approximately a 15-year period, the Entomology Shop was located in Building 440. The mixing area (adjacent to the southeast corner of the building) and a low lying area (approximately 50 feet due east from the southeast corner of the building) received spills of chemicals in the past.

Fire Protection Training Areas (FPTA)

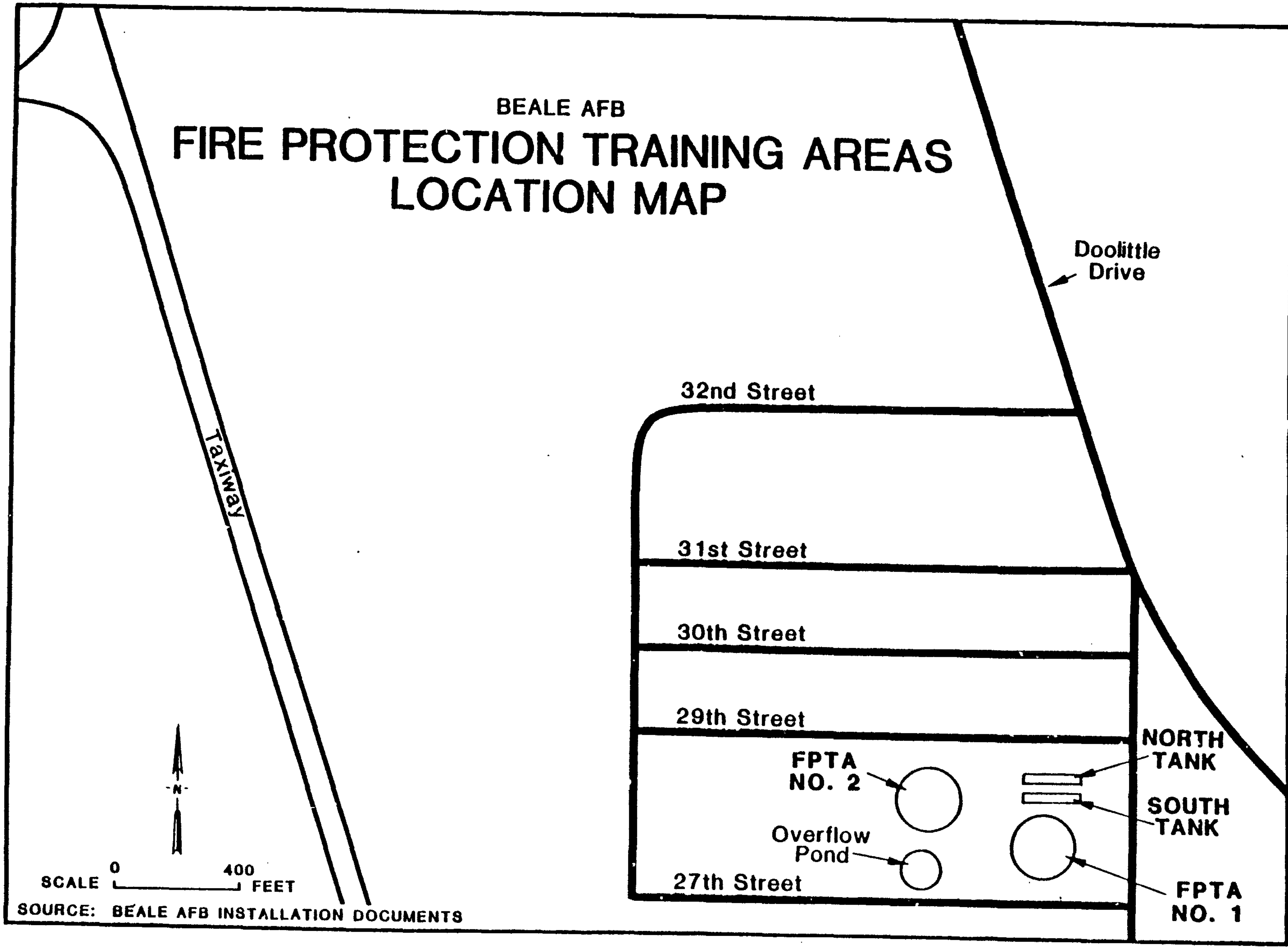
The Fire Department has operated two fire protection training areas (FPTA) since the activation of Beale AFB. The following list gives specific designations for these areas and identifies their approximate period of use. Figure 4.1 depicts their relative location on the base while Figure 4.2 indicates their exact location (see Appendix F).

Fire Protection Training Areas	Period of Operation
FPTA No. 1	1958-1971
FPTA No. 2	1972-Present

Fire Protection Training Area No. 1

From approximately 1958 until 1971, the fire department conducted fire protection training exercises within a half acre area located adjacent to the intersection of J and 27th Streets.

FIGURE 4.2



BEALE AFB
FIRE PROTECTION TRAINING AREAS
LOCATION MAP
Doolittle Drive
Taxiway
32nd Street
31st Street
30th Street
29th Street
27th Street
NORTH TANK
SOUTH TANK
FPTA NO. 1
FPTA NO. 2
Overflow Pond
N
SCALE 0 400 FEET
SOURCE: BEALE AFB INSTALLATION DOCUMENTS

Until the late 1960's, combustible waste chemicals were accumulated in a shallow two foot deep basin in the FPTA. These chemicals were reported to have included waste oils, spent solvents, and jet fuel. Chemicals were accumulated weekly and burned in the basin. Other chemicals were accumulated in 55-gallon drums and burned in the same basin. The basin area did not have a liner system nor was there any pre-application of water to prevent the percolation of the waste chemicals into the soil. The materials were applied directly to the soil and ignited.

Fire Protection Training Area No. 2

The new fire protection training area was constructed and put into operation in 1972 (FPTA No. 2). At that time, the use of FPTA No. 1 was discontinued. FPTA No. 2 is located just west of FPTA No. 1. The basin is approximately 150 feet in diameter and is surrounded by a 12-inch berm. A drain has been installed in the center of the FPTA to direct the runoff to a nearby unlined pond. Discharge from the pond is directed to a nearby ditch. The new fire protection training area is operated in a different manner than FPTA No. 1. Only contaminated jet fuel is burned and the burn area is first saturated with water before the fuel is applied.

In the early 1970's, two 23,000-gallon tanks were used at the FPTA to accumulate flammable wastes. The north tank was designated for contaminated fuels while the south tank was used to accumulate mixed wastes. Stricter air pollution regulations prevented the fire department from burning mixed wastes. The south tank was then pumped out by a contractor from the late 1960's to the present time.

On May 19, 1983, approximately 3,000 to 5,000 gallons of liquid containing lead and chromium was pumped out of the underground tanks onto the soil south of the storage area. Fourteen soil samples were taken in the general spill area and only one sample contained a lead value of 1,250 ug/gm which is above the California cleanup standard of 1,000 ug/gm (see Table D.9).

Management of Fuels

The Beale AFB petroleum handling system includes substantial volumes of: JP-4, JP-7, and JPTS jet fuels; diesel fuel; motor vehicle gasoline (MOGAS); unleaded gasoline; and No. 2 fuel oil. The petroleum storage facilities and their locations and capacities are identified in Table D.7 (see Appendix D). The fuels are delivered by pipeline, train or truck to on-base storage tanks. Jet fuels (JP-4 and JP-7) are pumped through a pipeline to hydrant systems for refueling aircraft. Trucks are also used to refuel the aircraft.

Tanks are checked for cleaning periodically. When cleaning is required, the tanks are emptied to other available storage. Contaminated fuel is recycled or used in fire protection training. An off-base contractor conducts the tank cleaning operations and removes and disposes of any resulting sludges.

Spills

Numerous small spills of fuels and oils were confirmed by base records and interviews with base personnel. These spills occurred onto paved areas or inside shop areas and were contained with absorbent materials or washed into the drainage system to an oil-water separator. As a result, no potential for environmental contamination is associated with these small spills. There have been no known major spills of fuels or oils which present a potential for contaminant migration.

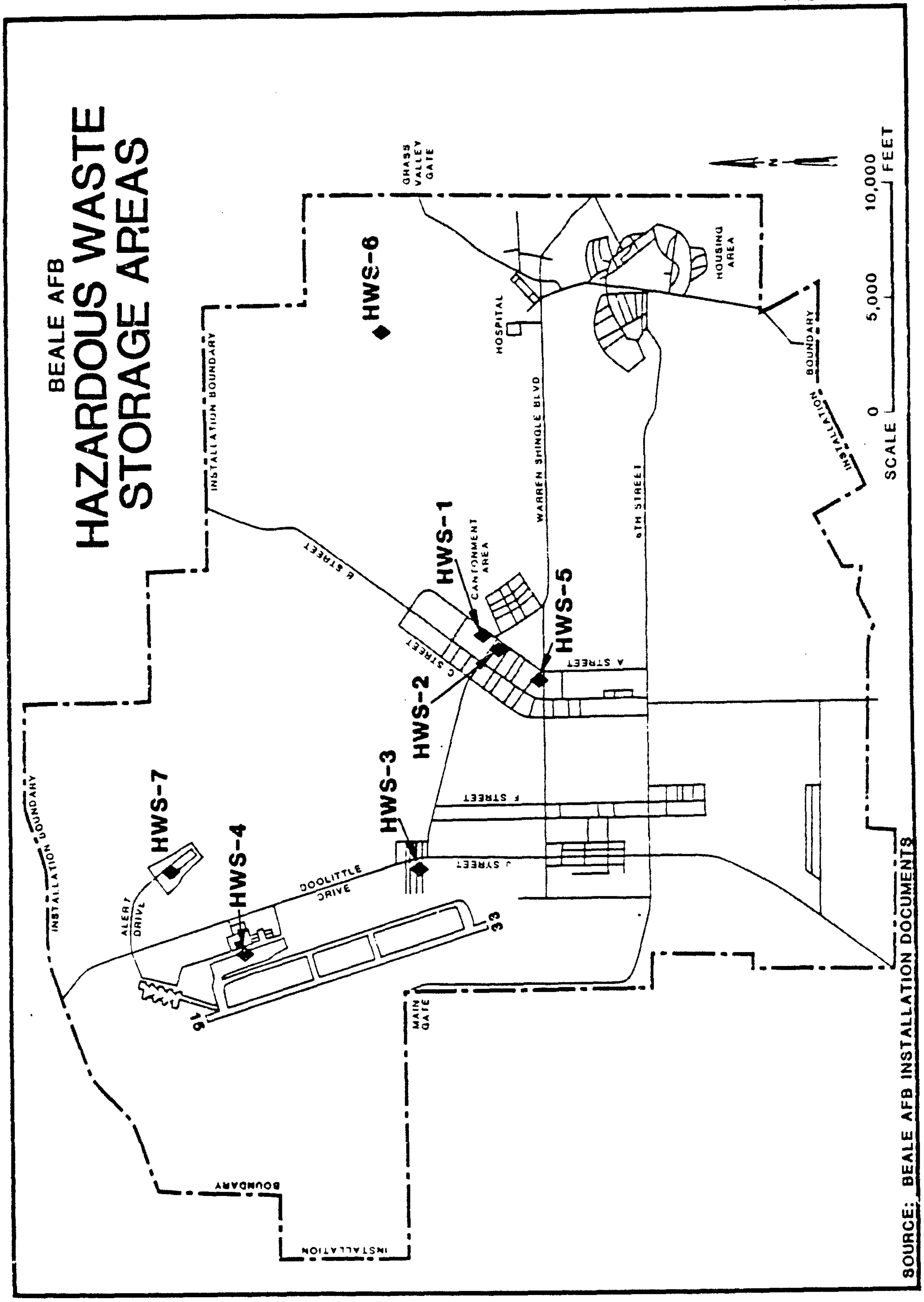
Hazardous Waste Storage Areas (HWS)

Several areas around Beale AFB have been designated for the storage of hazardous waste. Many of the hazardous wastes such as oils and solvents have been temporarily stored in drums and bowsers at the point of generation. When a sufficient quantity of these wastes have been accumulated, they have been transferred to the bulk hazardous waste storage areas (see Figure 4.3). Table 4.2 identifies these storage areas and the types of waste stored at each location.

DESCRIPTION OF PAST ON-BASE TREATMENT AND DISPOSAL METHODS

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

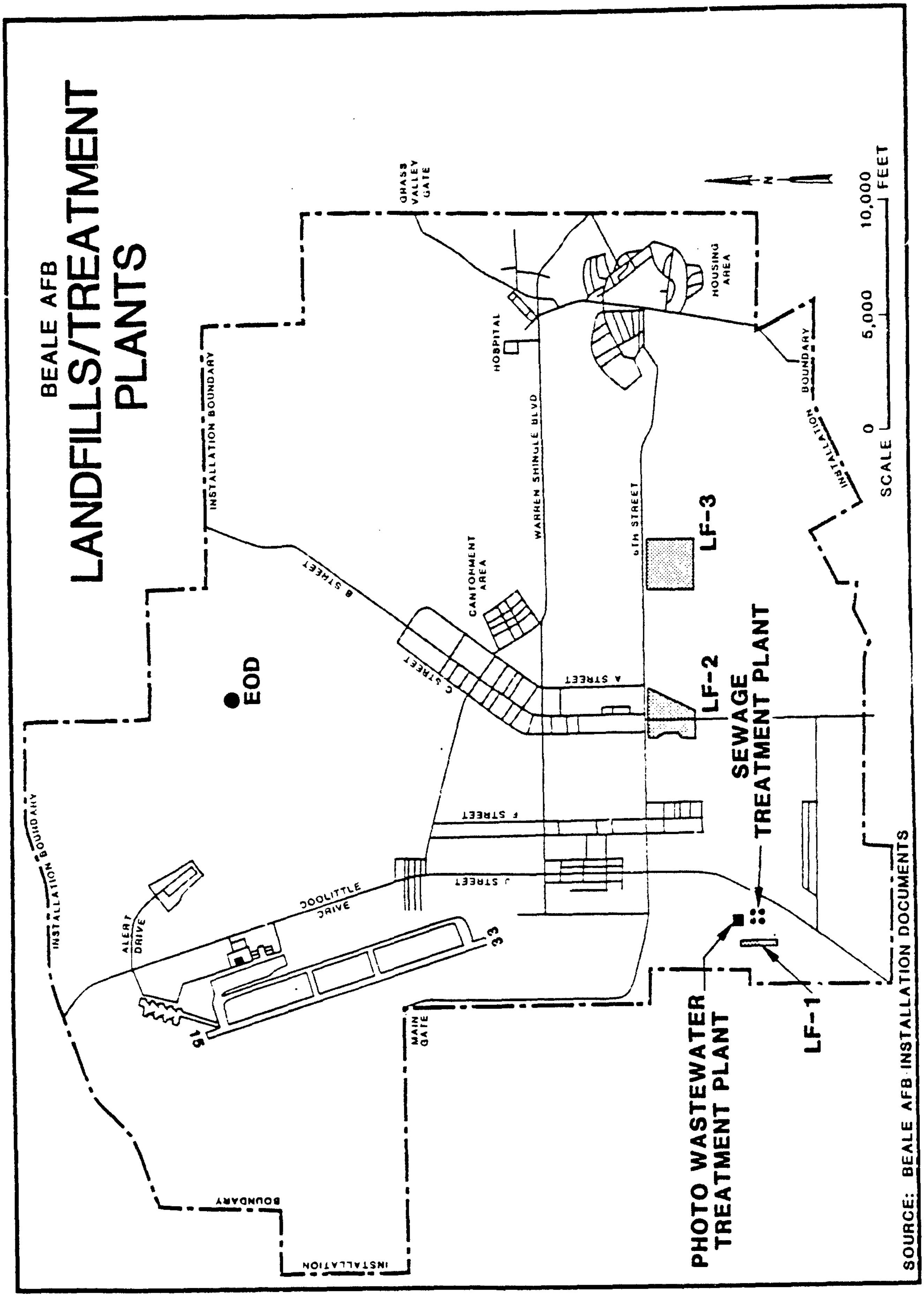
- Landfills
- Sewage Treatment Plant
- Photo Wastewater Treatment Plant
- Storm Drainage
- Explosive Ordnance Disposal Area



SOURCE: BEALE AFB INSTALLATION DOCUMENTS

TABLE 4.2
HAZARDOUS WASTE STORAGE AT
BEALE AFB

Site	Facility Name	Facility No.	Description of Storage Facility	Waste Material In Storage
HWS-1	Civil Engineering	Behind Bldg. 2539	Drum storage - Fenced/asphalt storage yard	Oils, solvents
HWS-2	Transportation	Behind Bldg. 2470	Drum storage - Fenced storage yard	Oils, solvents
			1-2000 gallon above ground tank	Used oil
HWS-3	Fire Training	-	2 - 23,000 gallon under-ground storage tanks	Contaminated fuel, waste oils and solvents
HWS-4	Aircraft Wash Rack	Near Taxiway No. 10	Drum storage	Oils, solvents
HWS-5	Auto Hobby Shop	Behind Bldg. 2427	500 gallon under-ground storage tank	Used oil
HWS-6	PAVE PAWS	Behind Bldg. 5760	2,000 gallon under-ground tank	Used oil
HSW-7	Interim Central Storage	Bldg. 1317	Building with concrete floor, controlled access area	PCB Transformers, Waste chemicals



SOURCE: BEALE AFB INSTALLATION DOCUMENTS

Landfills

Three landfills, used for the disposal of refuse, were identified at Beale AFB. Landfill locations have been identified on Figure 4.4 and a summary of pertinent information concerning each landfill has been presented in Table 4.3.

Landfill No. 1

Landfill No. 1 is located in the southwestern sector of the base behind the sludge dewatering beds at the sewage treatment plant. The landfill area was identified from aerial photos and employee interviews. The landfill is approximately 4 acres and was used in the early 1940's. No specific information was uncovered regarding wastes disposed or method of operation.

Landfill No. 2

Landfill No. 2 is located in the southern sector of the base. The landfill is approximately 56 acres and was used for refuse disposal between the early 1950's and 1980. Wastes were placed in trenches and burned daily until the late 1960's. The burning operation was discontinued because of stricter air pollution control regulations. Thereafter, the landfill was operated as a sanitary landfill. Only small quantities of waste chemicals and petroleum were disposed in the landfill. From 1967 until 1978, approximately 380 cubic yards of sludge from the dewatering beds at the Photo Wastewater Treatment Plant (see discussion below) were disposed in the landfill. The sludge has been classified as a hazardous waste using the EP toxicity test.

Landfill No. 3

Landfill No. 3 is located east of Landfill No. 2 off 6th Street. The landfill was started in 1981 and is currently in use. It currently comprises about 40 acres. The landfill received primarily general refuse and only small quantities of waste chemicals are suspected of being disposed of directly in this landfill.

Sewage Treatment Plant

Beale AFB has operated a sewage treatment plant from the 1940's through the present. The plant is located in the southwest portion of the base (see Figure 4.4). The plant has a design capacity of 5.0 million gallons per day and includes comminutors, two high rate trickling filters, primary and secondary clarifiers, two digesters, sludge

TABLE 4.3
SUMMARY OF LANDFILL DISPOSAL SITES

Landfill	Operation Period	Approximate Size (acres)	Depth (feet)	Type of Waste	Estimated Waste Quantity (cu. yd.)	Method of Operation	Closure Status	Surface Drainage
Landfill No. 1	Early 1940's	4	ND	General Refuse	ND	ND	Closed, earth covered with grass established	To Hutchinson Creek
Landfill No. 2	1950 - 1980	56	20	General Refuse[1]	45,000	Trench and fill daily burning	Closed, earth covered with grass established	To Hutchinson Creek
Landfill No. 3	1981 - Present	40	20	General Refuse[1]	5,000	Trench and fill	Active, two trenches open	To Hutchinson Creek

ND - Not determined.

[1]General Refuse - includes small quantities of chemicals.

drying beds and a 3 million gallon polishing pond. During the summer period, a portion of the effluent is applied to the base golf course. During other periods, the effluent is discharged to Hutchinson Creek.

From 1955 to 1977, the plant would annually experience three to four major fuel spills which would upset the treatment plant. There were approximately three major fish kills during that period.

Photo Wastewater Treatment Plant

In 1966, a wastewater treatment plant was constructed to treat wastewaters from the photo laboratory (see Building 2145). The wastewater runs through a silver recovery unit at Building 2145. From there, the water is pumped approximately 2.5 miles to the photo wastewater treatment plant (see Figure 4.4). The average flow is 36,000 gpd and the plant contains equalization, chemical flocculation, settling, filtration and effluent disposal in three injection wells. At the current time, one of the wells is not in operation.

In 1975, the synthetic liner in the equalization pond was gunited because the liner had developed cracks. Soils in the area were tested previously and indicated a permeability of $1 \cdot 10^{-5}$ cm/sec.

When the plant started operation in January 1967, sludge was dried in two concrete drying beds. When the sludge was dry, it was placed in the Landfill No 2. In 1974, the current unlined sludge ponds were constructed and used during the winter months, however, the plant continued to use the concrete drying beds during the summer months. Any sludge dried in the concrete drying beds was placed in Landfill No. 2. In November 1978, the concrete drying beds were phased out and all photowaste sludge was placed in the current sludge ponds. The first time any sludge from the current sludge ponds was disposed of was in September 1983 when approximately 380 cubic yards of sludge was disposed off-site in a state approved Class I facility.

To limit corrosion in the photo wastewater system, Dowicide G (containing pentachlorophenate) is added to the wastewater. This procedure has been in use since 1967. Whenever the system was shut-down to change filters or for maintenance, as much as 500 to 2000 gallons of photowaste plant effluent was flushed onto the ground at the wells or the filters at the plant. This was done to clean out any corrosion in the lines so the filters would not immediately plug up again. From 1967 to 1984, this procedure occurred approximately 12 times/year. Since the state expressed concern over this operational procedure in February 1984, this practice of flushing the lines has been stopped.

In February 1984, the California Regional Water Quality Control Board took soil samples for pentachlorophenol at the photowaste treatment plant Well No. 2 and adjacent to the filters at the plant. Results were 3.1 ppm at Well No.2 and 0.3 ppm at the filters. California phenol standards for soil are 1.7 ppm if there is potential for surface run-off and 21 ppm if there is no surface run-off potential. The base is waiting for a state letter directing appropriate clean-up actions.

Storm Drainage

The surface drainage system at Beale AFB comprises storm sewers which discharge to well defined drainage ditches. The major drainage ditches discharge to three main creeks that traverse the base. (Refer to Chapter 3, Drainage, for additional information.)

Since the initial operations began at Beale AFB, the storm sewers served as one method for disposing of liquid wastes. Any spills which occurred in maintenance areas were routinely washed down the storm sewers. Fuel spills occurring along the flightline areas were rinsed with large volumes of water directly into the surface drainage system. Many of the washracks located throughout the base were also known to have discharged into the surface drainage system. It is therefore likely that only until recently, the storm drainage system was the carrier of soaps, solvents, fuels and oils. Many of the non-miscible materials (i.e., fuels and oils) may have been retained on-base by means of booms and other containment measures. The miscible compounds would however have been discharged with the storm water.

Explosive Ordnance Disposal Area (EOD)

The explosive ordnance disposal (EOD) area on Beale AFB is shown in Figure 4.4. The EOD area consists of a depressed area for detonation of active explosives. The detonation remains are disposed of in the depressed area at the center of the EOD area. The remains after burni' are inspected to allow removal of any unburned ammunition and the burned portion is disposed of at the site. There is no potential for contaminant migration from the EOD area.

EVALUATION OF PAST DISPOSAL ACTIVITIES AND FACILITIES

The review of past operation and maintenance functions and past waste management practices at Beale AFB has resulted in the identification of sites which were initially considered as areas of concern with regard to the potential for contamination, as well as the potential for the migration of contaminants. These sites were evaluated using the Decision Tree Methodology referred to in Figure 1.1. Those sites which were considered as not having a potential for contamination were deleted from further consideration. Those sites which were considered as having a potential for the occurrence of contamination and migration of contaminants were further evaluated using the Hazard Assessment Rating Methodology (HARM). Table 4.4 summarizes the decision tree logic used for each of the areas of initial concern. Operational procedures at several of the sites studied were deemed to warrant review and modification under other base environmental programs. These sites were identified under the column (Refer to Base Environmental Programs") in Table 4.4.

All of the sites identified on Table 4.4 were evaluated using the Hazard Assessment Rating Methodology. The HARM process takes into account characteristics of potential receptors, waste characteristics, pathways for migration, and specific characteristics of the site related to waste management practices. The details of the rating procedures are presented in Appendix G. Results of the assessment for the sites are summarized in Table 4.5. The HARM system is designed to indicate the relative need for follow-on action. The information presented in Table 4.5 is intended for assigning priorities for further evaluation of the Beale AFB disposal areas (Chapter 5, Conclusions and Chapter 6, Recommendations). The rating forms for the individual waste disposal sites at Beale AFB are presented in Appendix H. Photographs of some of the key disposal sites are included in Appendix F.

TABLE 4.4
SUMMARY OF DECISION TREE LOGIC FOR AREAS OF INITIAL ENVIRONMENTAL CONCERN AT BEALE AFB

Site Description	Potential For Contamination	Potential For Contaminant Migration	Potential For Other Environmental Concern[1]	Refer to Base Environmental Programs	HARM Rating
Discharge Area No. 1 - West Drainage Ditch	Yes	Yes	No	Yes	Yes
Discharge Area No. 2 - Battery Shop Dry Well	Yes	Yes	No	N/A	Yes
Discharge Area No. 3 - SR-71 Shelter Area	Yes	Yes	No	Yes	Yes
Discharge Area No. 4 - Army Biological Production Site	Yes	Yes	No	N/A	Yes
Discharge Area No. 5 - J-58 Test Cell	Yes	Yes	No	Yes	Yes
Discharge Area No. 6 - J-57 Test Cell	Yes	Yes	No	Yes	Yes
Discharge Area No. 7 - AGE Maintenance/ Drainage Area	Yes	Yes	No	Yes	Yes
Discharge Area No. 8 - Transformer Drainage Area	Yes	No	No	N/A	Yes
Discharge Area No. 9 - Entomology Bldg. 2560	Yes	Yes	No	Yes	Yes
Discharge Area No. 10 - Entomology Bldg. 440	Yes	Yes	No	N/A	Yes
Landfill No. 1	Yes	Yes	No	N/A	Yes
Landfill No. 2	Yes	Yes	No	N/A	Yes
Landfill No. 3	Yes	Yes	No	N/A	Yes
Photo Waste Water Treatment Plant	Yes	Yes	No	N/A	Yes
Photo Waste Injection Well No. 2	Yes	Yes	No	N/A	Yes
Fire Protection Training Areas No. 1 & 2	Yes	Yes	No	N/A	Yes

[1] Other Environmental Concerns - Includes environmental problems which are not within the scope of this study (i.e., air pollution occupational safety requirements).

N/A - Not Applicable

TABLE 4.5
SUMMARY OF HARM SCORES FOR POTENTIAL CONTAMINATION SOURCES

Rank	Site	Receptor Subscore	Waste Characteristics Subscore	Pathways Subscore	Waste Management Factor	Overall Total Score
1	Discharge Area No. 1 - West Drainage Ditch	52	100	100	1.0	84
2	Photo Wastewater Treatment Plant	59	100	67	1.0	75
3	Photo Waste Injection Well No. 2	59	90	67	1.0	72
4	Fire Protection Training Areas No. 1 & 2	39	100	54	1.0	64
5	Discharge Area No. 2 - Battery Shop Dry Well	42	80	54	1.0	59
6	Discharge Area No. 3 - SR-71 Shelter Area	42	64	54	1.0	53
7	Landfill No. 2	51	38	67	1.0	52
8	Discharge Area No. 4 - Army Biological Production Site	59	30	67	1.0	52
9	Discharge Area No. 6 - J-57 Test Cell	42	60	54	1.0	52
10	Discharge Area No. 9 - Entomology Bldg. 2560	38	60	54	1.0	51
11	Discharge Area No. 5 - J-58 Test Cell	36	60	54	1.0	50
12	Discharge Area No. 7 - AGE Maintenance/ Drainage Area	42	48	54	1.0	48
13	Discharge Area No. 10 - Entomology Bldg. 440	40	60	46	1.0	48
14	Landfill No. 1	59	16	67	1.0	47
15	Discharge Area No. 8 - Transformer Drainage Area	38	40	54	1.0	44
16	Landfill No. 3	51	20	46	1.0	39

TABLE 4.5

SUMMARY OF HARM SCORES FOR POTENTIAL CONTAMINATION SOURCES

Rank	Site	Receptor Subscore	Waste Characteristics Subscore	Pathways Subscore	Waste Management Factor	Overall Total Score
1	Discharge Area No. 1 - West Drainage Ditch	52	100	100	1.0	84
2	Photo Wastewater Treatment Plant	59	100	67	1.0	75
3	Photo Waste Injection Well No. 2	59	90	67	1.0	72
4	Fire Protection Training Areas No. 1 & 2	39	100	54	1.0	64
5	Discharge Area No. 2 - Battery Shop Dry Well	42	80	54	1.0	59
6	Discharge Area No. 3 - SR-71 Shelter Area	42	64	54	1.0	53
7	Landfill No. 2	51	38	67	1.0	52
8	Discharge Area No. 4 - Army Biological Production Site	59	30	67	1.0	52
9	Discharge Area No. 6 - J-57 Test Cell	42	60	54	1.0	52
10	Discharge Area No. 9 - Entomology Bldg. 2560	38	60	54	1.0	51
11	Discharge Area No. 5 - J-58 Test Cell	36	60	54	1.0	50
12	Discharge Area No. 10 - Entomology Bldg. 440	40	60	46	1.0	49
13	Discharge Area No. 7 - AGE Maintenance/ Drainage Area	42	48	54	1.0	48
14	Landfill No. 1	59	16	67	1.0	47
15	Discharge Area No. 8 - Transformer Drainage Area	38	40	54	1.0	44
16	Landfill No. 3	51	20	46	1.0	39

CHAPTER 5

CONCLUSIONS

The goal of the IRP Phase I study is to identify sites where there is the potential for environmental contamination resulting from past waste disposal practices and to assess the probability of contaminant migration from these sites. The conclusions given below are based on field inspections, review of records and files, review of the environmental setting, and interviews with base personnel, past employees, and federal, state, and local government employees. Table 5.1 contains a list of the potential contamination sources identified at Beale AFB and a summary of the HARM scores for those sites is summarized below. The follow-on recommendations are presented in Chapter 6.

DISCHARGE AREA NO. 1 (WEST DRAINAGE DITCH)

Discharge Area No. 1 (West Drainage Ditch) is a drainage system which receives runoff from the flightline as well as the runway area. The drainage system discharges through a headwall located about 800 feet west of the main runway. The site has a high potential for environmental contamination. Surface water quality data has documented oil and grease, trans-1,2 dichloroethene and trace amounts of TCE. Visual observations at the headwall indicate that oil has accumulated in the soils located in the ditch. Surface soils in the area typically comprise medium textured hardpan and claypan soils which have a characteristically low permeability. The site received a HARM score of 84.

PHOTO WASTEWATER TREATMENT PLANT AND INJECTION WELL NO. 2

The Photo Wastewater Treatment Plant has a significant potential for environmental contamination and follow on investigation is warranted. The plant has been used since 1966 to treat photo wastes which contain silver and cyanide. In 1974, two unlined sludge ponds were constructed and used during the winter months to hold sludge. This

TABLE 5.1
SITES EVALUATED USING THE
HAZARD ASSESSMENT RATING METHODOLOGY FORMS
BEALE AFB

Rank	Site Name	Date of Operation or Occurrence	Overall Total Score
1	Discharge Area No. 1 - West Drainage Ditch	1965-1984	84
2	Photo Wastewater Treatment Plant	1967-1984	75
3	Photo Waste Injection Well No. 2	1967-1984	72
4	Fire Protection Training Areas No. 1 & 2	1958-1984	64
5	Discharge Area No. 2 - Battery Shop Dry Well	1960's-1984	59
6	Discharge Area No. 3 - SR-71 Shelter Area	1966-1984	53
7	Landfill No. 2	1950's-1980	52
8	Discharge Area No. 4 - Army Biological Production Site	1962-1969	52
9	Discharge Area No. 6 - J-57 Test Cell	1960's-1984	52
10	Discharge Area No. 9 - Entomology Bldg. 2560	1981-1984	51
11	Discharge Area No. 5 - J-58 Test Cell	1960's-1984	50
12	Discharge Area No. 7 - AGE Maintenance/ Drainage Area	1960's-1984	48
13	Discharge Area No. 10 - Entomology Bldg. 440	1965-1980	48
14	Landfill No. 1	1940's	47
15	Discharge Area No. 8 - Transformer Drainage Area	1977-1979	44
16	Landfill No. 3	1981-1984	39

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

practice was continued until 1978 when the ponds were used year round to handle sludge. The sludge from the plant is identified as a hazardous waste. In 1975, the original synthetic liner in the plant's equalization basin was gunited because the liner had developed cracks. From 1967 until 1984, whenever the treatment plant was shut down for maintenance, treated effluent (500 to 2,000 gallons) containing pentachlorophenol was discharged to the ground in the vicinity of the filters and injection well No. 2. Surface soils in the area typically comprise medium textured hardpan, which has a characteristically low permeability. The treatment plant site received a HARM score of 75. The photo injection well No. 2 received a score of 72.

FIRE PROTECTION TRAINING AREAS NO. 1 AND 2

Fire Protection Training Areas No. 1 and 2 have been used since 1958 for conducting fire training exercises. The sites have been combined because of their close proximity and have a significant potential for environmental contamination and follow on investigation is warranted. From 1958 until the late 60's, combustible waste chemicals were accumulated in an unlined basin and burned weekly. Other chemicals were stored at the area in 55-gallon drums and later in two 23,000 gallon underground tanks. The soils in the area contain hardpan which has a very low permeability. The site received a HARM score of 64.

DISCHARGE AREA NO. 2 (BATTERY SHOP DRY WELL)

Discharge Area No. 2 has a significant potential for environmental contamination and follow on investigation is warranted. Approximately 24 gallons per month of neutralized battery acid was discharged to a dry well adjacent to Building 1088. The discharge could have high lead concentrations. This dry well has been in use at least since 1972. Use of the dry well was discontinued in 1983. The soils in the area contain hardpan which has a very low permeability. The site received a HARM score of 59.

DISCHARGE AREA NO. 3 (SR-71 SHELTER AREA)

The ground operation of the SR-71 aircraft results in about 300 gallons per week of JP-7 being lost in the vicinity of the SR-71 shelter area and on Taxiway No. 10. Some of the fuel runs off from the taxiway onto soil before reaching an oil-water separator. The area has a significant potential for environmental contamination and follow on investigation is warranted. The soils in the area contain hardpan which has a very low permeability. The site received a HARM score of 53.

LANDFILL NO. 2

Landfill No. 2 was operated from the early 1950's until 1980. The site is approximately 56 acres and was used primarily for refuse disposal. Small amounts of chemicals were disposed in the landfill along with about 380 cubic yards of hazardous sludge from the photo wastewater treatment plant. The site does not have a significant potential for environmental contamination because of its large size (56 acres) and the large volume of non-hazardous waste present. The landfill is located in hardpan which has a low permeability. The site received a HARM score of 52.

DISCHARGE AREA NO. 4 (ARMY BIOLOGICAL PRODUCTION SITE)

Discharge Area No. 4 was a U.S. Army biological test site located in the southwestern portion of the base. The site was used to produce wheat stem rust from 1962 to 1969. During production, the chemicals used on-site were freon, carbon dioxide, ethylene oxide and possibly TCE. In 1969, production stocks of wheat stem rust were chemically treated, incinerated and the ash plowed into the soil on the site. The Army has indicated that the site has been decontaminated. The site does not have a significant potential for contamination. The site received a HARM score of 52.

DISCHARGE AREA NO. 6 (J-57 TEST CELL)

Discharge Area No. 6 (J-57 Test Cell) is located adjacent to Building 1247. Chemicals discharged include JP-4, PD-680 and soap. A slight degree of soil contamination was observed at the time of the study. The soils in the area contain hardpan. The site received a HARM score of 52.

DISCHARGE AREA NO. 9 (ENTOMOLOGY - BLDG. 2560)

Since 1981, wash water from cleaning pesticide application tanks was discharged to a gravel area adjacent to Building 2560 and allowed to percolate into the soil. The site does not represent a potential for contaminant migration. Soils contain hardpan. The site received a score of 51.

DISCHARGZ AREA NO. 5 (J-58 TEST CELL)

Discharge Area No. 5 (J-58 Test Cell) is located adjacent to Building 1154. The test cell is routinely used to test the SR-71 jet engine. Wastes which may have run off include JP-7, soap, oil, TCE and PD-680. The soils in the ditch adjacent to the test cell are oil stained. The site received a HARM score of 50.

DISCHARGE AREA NO. 7 (AGE MAINTENANCE/DRAINACE DITCH)

Discharge Area No. 7 is a drainage ditch located behind Building No. 1225 (AGE maintenance). Vehicles parked on the paved area adjacent to the drainage ditch have leaked oil and hydraulic fluids on the ground over a long period of time. Some of the contaminated soils have been removed in the past. The soils contain hardpan and very impervious. The site received a HARM score of 48.

DISCHARGE AREA NO. 10 (ENTOMOLOGY - BLDG. 440)

Discharge Area No. 10 is located adjacent to Building 440. From 1965 to 1980, the building was used by Entomology and two areas outside the building received spills of chemicals. The soils in the area around the building contain hardpan. The site received a HARM score of 48. The site does not have a significant potential for contaminant migration.

LANDFILL NO. 1

Landfill No. 1 is located in the southwestern sector of the base behind the sludge dewatering beds at the sewage treatment plant and adjacent to Hutchinson Creek. The site was identified from aerial photos and employee interviews. The site received refuse but the exact operation was not able to be determined. The site was used in the

1940's. The site does not have a significant potential for contaminant migration. The site received a HARM score of 47.

DISCHARGE AREA NO. 8 (TRANSFORMER DRAINAGE AREA)

Discharge Area No. 8 (Transformer Drain Area) is located near 34th and B Streets. The diked area was used from 1977 to 1979 to drain transformers before bringing them into the shop for repair. No visible contamination was present at the site. The soils contain hardpan. Eleven soil samples subsequently collected by base personnel indicated that PCB concentrations were below the detectable limit of 0.5 mg/kg. One sample was 14 mg/kg of PCB. The site does not have a significant potential for contaminant migration. The site received a HARM score of 44.

LANDFILL NO. 3

Landfill No. 3 is located east of Landfill No. 2 on 6th Street. The landfill was started in 1981 and is currently in use. The site comprises about 40 acres. The landfill has received general refuse and only small quantities of chemicals are suspected of being disposed in this landfill. The site does not have a significant potential for contaminant migration and received a HARM score of 39. The site has characteristic hardpan soils which are impermeable.

CHAPTER 6

RECOMMENDATIONS

Six sites were identified as having the potential for environmental contamination (see Figure 6.1). These sites have been evaluated using the HARM system which assessed their relative potential for contamination. Each of the sites were determined to have sufficient evidence to indicate a potential for environmental contamination. Additional data concerning these sites will be required in order to clearly ascertain whether or not these sites have contributed toward environmental contamination. Therefore, the following recommendations have been developed for each of these sites.

PHASE II MONITORING RECOMMENDATIONS

The following recommendations are made to further assess the potential for environmental contamination from waste disposal areas at Beale AFB. The recommended actions are a one-time sampling program to determine if contamination does exist at the site. If contamination is confirmed, the sampling program may need to be expanded to further quantify the extent of contamination. The recommended monitoring program for Phase II is summarized in Table 6.1.

The recommended monitoring for the six sites at Beale AFB involve soil sampling. Lysimeters and/or ground-water monitoring wells are not recommended at this time due to the presence of hardpan and its restriction of downward ground-water movement to the water table (approximately 80 to 90 feet below the ground surface). Additionally, there is a net precipitation of -44.8 inches, further restricting recharge in the area of the sites. Soil sampling is considered adequate for the initial sampling program to determine if contamination does exist at the site.

FIGURE 6.1

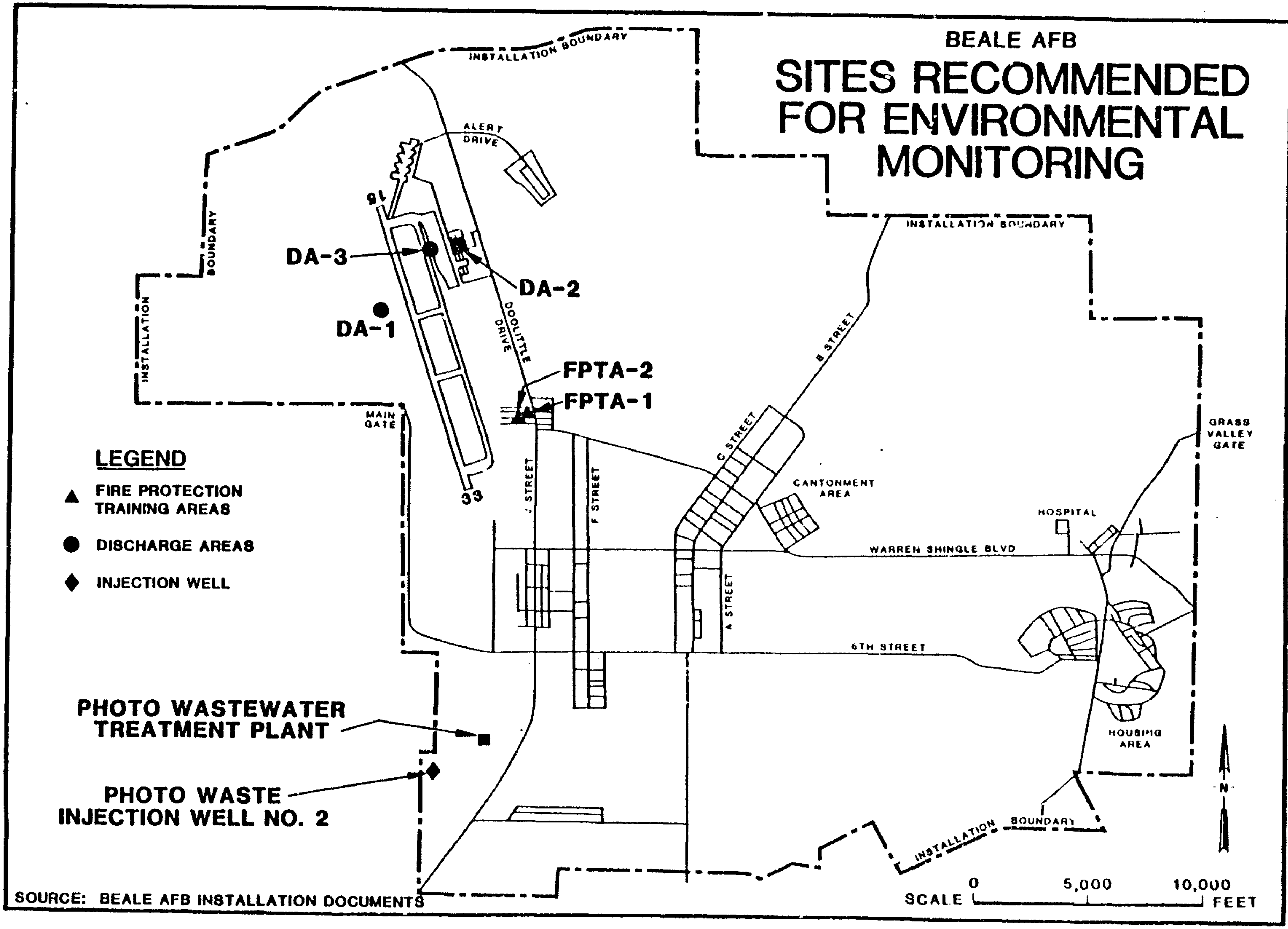

BEALE AFB
SITES RECOMMENDED FOR ENVIRONMENTAL MONITORING
INSTALLATION BOUNDARY
ALERT DRIVE
DOOLITTLE DRIVE
DA-3
DA-2
DA-1
FPTA-2
FPTA-1
MAIN GATE
B STREET
C STREET
J STREET
F STREET
A STREET
CANTONMENT AREA
HOSPITAL
WARREN SHINGLE BLVD
6TH STREET
GRASS VALLEY GATE
HOUSING AREA
LEGEND
FIRE PROTECTION TRAINING AREAS
DISCHARGE AREAS
INJECTION WELL
PHOTO WASTEWATER TREATMENT PLANT
PHOTO WASTE INJECTION WELL NO. 2
SOURCE: BEALE AFB INSTALLATION DOCUMENTS
SCALE 0 5,000 10,000 FEET
N

TABLE 6.1
RECOMMENDED MONITORING PROGRAM FOR PHASE II
BEALE AFB

Site Name	Rating Score	Recommended Monitoring	Comments
Discharge Area No. 1 - West Drainage Ditch	84	Collect four soil core borings to an approximate depth of five feet. Analyze samples for parameters in List A, Table 6.2.	Collect additional soil core boring samples if contamination is found to quantify the extent of contamination.
Photo Wastewater Treatment Plant	75	Collect four soil core borings to an approximate depth of five feet. Analyze samples for parameters in List B, Table 6.2.	Collect additional soil core boring samples if contamination is found to quantify the extent of contamination.
Photo Waste Injection Well No. 2	72	Collect three soil core borings to an approximate depth of five feet. Analyze samples for pentachlorophenol.	Collect additional soil core boring samples if contamination is found to quantify the extent of contamination.
Fire Protection Training Areas No. 1 and 2	64	Collect six soil core borings to an approximate depth of five feet. Analyze samples for parameters in List C, Table 6.2.	Collect additional soil core boring samples if contamination is found to quantify the extent of contamination.
Discharge Area No. 2 - Battery Shop Dry Well	59	Collect one soil core boring to an approximate depth of five feet below the bottom of the dry well. Analyze samples for lead and pH.	Collect additional soil core boring samples if contamination is found to quantify the extent of contamination.
Discharge Area No. 3 - SR-71 Shelter Area	53	Collect ten soil core borings to an approximate depth of five feet. Analyze samples for parameters in List A, Table 6.2.	Collect additional soil core boring samples if contamination is found to quantify the extent of contamination.

Soil cores should be of sufficient depth to penetrate the hardpan to determine if contamination has migrated through the hardpan. The drive-casing technique should be used to case the borehole after soil cores are obtained. An organic vapor analyzer (OVA) or similar equipment should be used to monitor the borehole and immediately surrounding air space during the coring operations. Following the soil coring, the casing should be removed and the borehole should be back-filled with bentonite pellets to the ground surface. OVA may be used to determine chemical contamination by indicating elevated organic vapor levels (above ambient) in boreholes, specific lengths of core sample or in air during the coring operation. The use of OVA is useful in minimizing the overall number of soil analyses, which have to be submitted for laboratory analysis.

Discharge Area No. 1 - West Drainage Ditch

Four soil core borings should be collected at Discharge Area No. 1 to a depth of approximately five feet. One soil core boring should be east of the drainage area and not influenced by possible contamination and three soil core borings should be within the drainage ditch (in the vicinity of headwall) where visible observations indicate possible contamination. Solvent extraction analyses should be performed on sections of the soil core where the OVA indicates probable contamination, where visible observations indicate possible contamination and/or where lithologic changes are visible (i.e., at contact of hardpan). Analyses should be for the parameters in List A, Table 6.2.

Photo Wastewater Treatment Plant

Six soil core borings should be collected at the Photo Wastewater Treatment Plant to a depth of approximately five feet. One soil core boring should be north of the unlined sludge dewatering ponds and not influenced by possible contamination and three soil core borings should be south of the ponds. Two soil core borings should be collected in the vicinity of the filter unit. The solvent extraction method should be performed for organic analyses and the metal digestion method should be performed for metal analyses. Core sections for analyses should be selected based on OVA indications, visible observations, and/or lithologic changes. Analyses should be for the parameters in List B, Table 6.2.

TABLE 6.2

RECOMMENDED LIST OF ANALYTICAL PARAMETERS

BEALE AFB

<u>List A</u>

Oil and Grease	Trans-1,2 Dichloroethene
Total Organic Halogen	Trichloroethylene (TCE)
Total Organic Carbon	pH

<u>List B</u>

Cyanide	Total Organic Carbon
Chromium	Total Organic Halogen
Silver	Sulfate
Bromide	pH
Pentachlorophenol	

<u>List C</u>

Oil and Grease	pH
Total Organic Halogen	Benzene
Total Organic Carbon	Methyl Ethyl Ketone (MEK)
Trichloroethylene (TCE)	Lead
Chromium	

Photo Waste Injection Well No. 2

Three soil core borings should be collected in the vicinity of Injection Well No. 2 to a depth of approximately five feet. Core sections for analysis should be selected based on OVA indications, visible observations and/or lithologic changes. Analyses should be for pentachlorophenol.

Fire Protection Training Areas No. 1 and 2

Six soil core borings should be collected in the area of Fire Protection Training Areas No. 1 and 2 to a depth of approximately five feet. One soil core boring should be collected north of FPTA No. 2 and not influenced by possible contamination. One soil core boring should be between the unlined pond and the drainage ditch near FPTA No. 2. One soil core boring should be approximately 100 feet south of the underground tanks and three soil core borings should be in the area of FPTA No. 1. Core sections for analyses should be selected based on OVA indications, visible observations and/or lithologic changes. Analyses should be for the parameters in List C, Table 6.2.

Discharge Area No. 2 - Battery Shop Dry Well

One soil core boring should be collected from the sink dry well at Discharge Area No. 2. Steel casing should be driven through the cobble fill to the bottom of the dry well. A soil core should then be taken below the bottom of the well to a depth of five feet. Sections of the core for analyses should be selected based on visible observations and/or lithologic changes. The acid digestion method should be used for analyses of lead content. Soil pH should also be tested.

Discharge Area No. 3 - SR-71 Shelter Area

Ten soil core borings should be collected in the vicinity of Discharge Area No. 3 to a depth of approximately five feet. One soil core boring should be north of and not influenced by the discharge while nine soil core borings should be west of the SR-71 aircraft shelter area where surface soil contamination is visible. Core sections for analyses should be selected based on visible observations and/or lithologic changes. Analyses should be for the parameters in List A, Table 6.2.

RECOMMENDED GUIDELINES FOR LAND USE RESTRICTIONS

It is desirable to have land use restrictions for the identified waste sites for the following reasons: (1) to provide the continued protection of human health, welfare, and the environment; (2) to insure that the migration of potential contaminants is not promoted through improper land uses; (3) to facilitate the compatible development of future USAF facilities; and (4) to allow for identification of property which may be proposed for excess or outlease.

The recommended guidelines for land use restrictions at each of the identified waste sites at Beale Air Force Base are presented in Table 6.3. A description of the land use restriction guidelines is presented in Table 6.4. Land use restrictions at sites recommended for Phase II monitoring should be re-evaluated upon the completion of the Phase II monitoring program and changes made where appropriate.

TABLE 6.3
RECOMMENDED GUIDELINES AT POTENTIAL CONTAMINATION SITES FOR LAND USE RESTRICTIONS
BEALE AIR FORCE BASE

Site	Construction on the Site	Excavation	Well Construction on or Near the Site	Agricultural Use	Silvicultural Use	Water Infiltration (run-on, Ponding, Irrigation)	Recreational Use	Burning or Ignition Source	Disposal Operations	Vehicular Traffic	Material Storage	Housing on or Near the Site
	Recommended Guidelines for Future Land Use Restrictions(1)											
Discharge Area No. 1 - West Drainage Ditch	NR	NR	R	R	R	NA	R	R	R	R	R	R
Photo Wastewater Treatment Plant	NR	NR	R	R	R	R	R	R	PU	NR	R	R
Fire Protection Training Areas No. 1 and 2	NR	NR	R	R	R	R	R	PU (No. 2 only)	R	R	R	R
Discharge Area No. 2 - Battery Shop Dry Well	NR	NR	R	R	R	NA	R	R	R	R	R	R
Discharge Area No. 3 - SR-71 Shelter Area	NR	NR	R	R	R	NA	R	R	R	R	R	R
Photo Waste Injection Well No. 2	NR	NR	R	-	R	NA	R	R	R	R	R	R

R = Restriction
NA = Not Applicable
PU = Present Use
NR = No Restriction

(1) See Table 6.4 for land use restriction definitions.

TABLE 6.4
DESCRIPTION OF GUIDELINES FOR LAND-USE RESTRICTIONS

Guideline	Description
Construction on the site	Restrict the construction of structures which make permanent (or semi-permanent) and exclusive use of a portion of the site's surface.
Excavation	Restrict the disturbance of the cover or subsurface materials.
Well construction on or near the site	Restrict the placement of any wells (except for monitoring purposes) on or within a reasonably safe distance of the site. This distance will vary from site to site, based on prevailing soil conditions and ground-water flow.
Agricultural use	Restrict the use of the site for agricultural purposes to prevent food chain contamination.
Silvicultural use	Restrict the use of the site for silvicultural uses (root structures could disturb cover or subsurface materials).
Water infiltration	Restrict water run-on, ponding and/or irrigation of the site. Water infiltration could produce contaminated leachate.
Recreational use	Restrict the use of the site for recreational purposes.
Burning or ignition sources	Restrict any and all unnecessary sources of ignition, due to the possible presence of flammable compounds.
Disposal operations	Restrict the use of the site for waste disposal operations, whether above or below ground.
Vehicular traffic	Restrict the passage of unnecessary vehicular traffic on the site due to the presence of explosive material(s) and/or of an unstable surface.

TABLE 6.4
(Continued)
DESCRIPTION OF GUIDELINES FOR LAND-USE RESTRICTIONS

Guideline	Description
Material storage	Restrict the storage of any and all liquid or solid materials on the site.
Housing on or near the site	Restrict the use of housing structures on or within a reasonably safe distance of the site.

APPENDIX A

BIOGRAPHICAL DATA

C. M. Mangan, P.E.
Brian D. Moreth
Yane Nordhav
Robin Cort

Biographical Data

Charles M. Mangan

Senior Environmental Engineer

Personal Information

Date of Birth: 23 August 1944

Education

B.S. in Civil Engineering, 1966, Newark College of Engineering
M.S. in Civil Engineering, 1967, New York University

Professional Affiliations

Registered Professional Engineer (Tennessee No. 11607, Georgia Pending, New Jersey No. 18366, New York No. 48280)
Diplomate - American Academy of Environmental Engineers
Water Pollution Control Federation
American Society of Civil Engineers
American Water Works Association

Honorary Affiliations

Chi Epsilon

Experience Record

1967-1970 Quirk Lawler and Matusky Engineers, New York, New York

Project Engineer. Responsible for a $400,000 water system renovation in Walton, New York. This included water main cleaning, a test well program and water main installation. In addition, supervised a surveying team and boring crew used for a stand pipe site evaluation.

As a staff engineer in the design department, participated in the design of an industrial wastewater treatment plant for Carleton Woolen Mills in Maine. Participated in various equipment evaluations prior to the writing of the required specifications.

Evaluated the installation of a centrifuge to increase the sludge dewatering capability of the municipal Bernardsville, New Jersey treatment plant which necessitated renovation of an existing building.

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Charles M. Mangan (Continued)

Organized and prepared a hydrology study of the Indian Point area of West Chester County, New York for Consolidated Edison. This study was required by the Atomic Energy Commission as part of their licensing requirements for proposed nuclear reactors.

Prepared a Comprehensive Water Supply Study for Rockland County, New York. The study entailed population and water usage projections and evaluation of existing County water supplies. Various water supply projects, including a pump storage scheme were proposed and corresponding cost estimates were prepared.

Prepared computerized design of various sized domestic wastewater treatment plants for the Federal Water Quality Administration. Work consisted of the detailed sizing of various units (grit chambers, primary and secondary clarifiers, and sludge thickeners) and the preparation of detailed construction drawings.

1970-1980 Roy F. Weston Inc. West Chester, PA and Atlanta, GA

Assistant Project Engineer. Supervised current and diffusion studies off the coast of Aquadilla, Puerto Rico, and subsequently prepared a conceptual design report for a primary wastewater treatment plant and ocean outfall design.

Prepared a reference manual on various wastewater treatment processes which are applicable to the upgrading of existing treatment plants. The manual was used by EPA in their Technology Transfer program at Seminars being held for consulting engineers throughout the United States.

While working in conjunction with the Luzerne County Planning Board, prepared a solid waste regional plan to be implemented under the requirements of Pennsylvania Act 241.

Prepared an operations manual for Washington Suburban Sanitary Commission's (WSSC) 5 MGD advanced wastewater treatment plant at Piscataway, Maryland. Unit operations include 2 stage line precipitation of phosphorus, recarbonation for pH adjustment, dual media filtration and carbon adsorption for suspended and dissolved organics removal.

Charles M. Mangan (Continued)

Prepared a comprehensive water supply plan for WILMAPCO, a regional planning agency encompassing counties in Maryland, Delaware and New Jersey. This study was required by WILMAPCO in order to obtain certification from H.U.D. for water supply funding.

Supervised the process design for the 30 MGD advanced wastewater treatment plant to be constructed for WSSC at Piscataway, Maryland. Unit operations included two stage suspended biological growth for nitrification and denitrification, alum addition for phosphorus removal, dual media filtration and post aeration. In addition, computer facilities provide the ultimate in automation of an advanced wastewater treatment facility.

Participated in biological treatability studies and the conceptual design of two industrial wastewater treatment plants providing secondary treatment for citric acid and rayon wastewaters, respectively.

Participated on an EPA project which developed supporting information for pretreatment regulations.

Project Manager on biological treatability studies and the conceptual designs of wastewater treatment plants involving cellulose acetate, wire mill, secondary metals refining, and peanut blanching and candy manufacture.

Managed a hazardous sludge disposal study for an industry in Rome, Georgia, which included a preliminary siting study for a hazardous waste landfill.

Prepared over 5 SPCC plans for various industries throughout the Southeast for the containment of oil and hazardous wastes.

Technical consultant on a project which developed a portable treatment process capable of treating 2 million gallons of hazardous wastes from the Anniston Army Depot containing chrome, metals, phenol and large amounts of organics. Associated sludge disposal techniques included dewatering, and chemical fixation with disposal in a sanitary or secure landfill.

Conducted a program to assess phenol contamination of the groundwater table emanating from a lagoon containing wastewater.

Managed a sanitary landfill permitting project for Ft. Benning, Georgia which included multiple site evaluations, waste characterization and quantification.

Charles M. Mangan (Continued)

Project Manager on various phases of three 201 Facilities Plans for Dekalb County, GA., Valparaiso, FL. and Alapaha, GA.

Managed sewer system evaluation surveys for Knoxville, Charlotte and five other smaller communities.

1980-Date Engineering-Science, Inc. Atlanta, Georgia. Manager of Environmental Studies. Recent experience included the water permitting for a petroleum refinery expansion for Hess Oil Co. in southern Mississippi, and developmental permits including Corps Section 404 and 10, and coastal zone permits for 20,000 acres of coastal property in eastern North Carolina. Other pertinent experience includes a site assessment for a pulp and paper mill in southern Alabama and an environmental assessment for a major wastewater treatment plant expansion.

Performed a solid waste management evaluation for New Hanover County, North Carolina. Conducted hazardous waste audits on three U.S. Air Force bases to identify past chemical handling practices and the possibility of contaminant migraton off the base property.

Conducted environmental audits for two chemical companies -- one in West Virginia and the other in Texas. Was project director on the preparation of an audit manual prepared for a confidential client which addressed both New Jersey and Federal environmental regulations. Project manager on a multi-million dollar study to determine the impacts on fossil fuel fired facilities of RCRA, CAA and the CWA.

Publications

"Aquadilla, P.R. Current and Diffusion Studies" presented at the Pollution Control Federation - Reconvened Session 1972.

"EPA Effluent Guideline Studies" presented to the Gum and Wood Chemicals Association, Atlanta, GA 1974.

"Hazardous Spill Regulations" presented to the Gum and Wood Chemicals Association. Charleston, SC 1976.

Biographical Data

BRIAN D. MORETH

Environmental Scientist

Personal Information

Date of Birth: 27 September 1949

Education

B.S. in Forest Science and Zoology, 1971, Pennsylvania State University, University Park
Wildlife Management, Pennsylvania State University, University Park

Professional Affiliations

American Fisheries Society
Society of American Foresters
Wildlife Society

Honorary Affiliations

Phi Epsilon Phi
Phi Sigma
Xi Sigma Phi

Experience Record

1971-1973 Pennsylvania Cooperative Wildlife Unit. Research Assistant. Participated in wildlife research studies and design and implementation of public land use surveys. Cover mapped a parcel of state game lands by means of aerial photography and prepared suggestions for land management. Conducted research on the vegetative preferences of the ruffed grouse. Delivered public lectures to organized groups and schools.

1973-1980 Buchart-Horn, Inc., Environmental Division, York, Pennsylvania. Project Scientist. Researched, prepared, and supervised aspects of environmental studies dealing with wildlife, fishery, forestry, and land use. Coordinated preparation of various environmental impact statements. Prepared natural resource inventories for proposed sewer and highway construction areas and assessed possible impacts. Participated in evaluation of alternative sewage disposal systems. Coauthored a trout hatchery feasibility study of present facilities for the State of New Jersey, and prepared revegetation plans for reservoir and strip mined lands.

Brian D. Moreth (Continued)

Task Force Leader. Prepared an inventory of all natural resources and environmentally sensitive and degraded areas for the environmental quality segment of the Comprehensive Water Quality Management Plan for a seven-county area in northeast Pennsylvania.

1974-1980 Pennsylvania Game Commission, York County, Pennsylvania (concurrent position). Deputy Game Protector. Responsible for enforcement of game, fish, forestry, and park laws of the Commonwealth of Pennsylvania. Assisted in public presentations including instruction of hunter safety courses.

1980-Date Engineering-Science. Scientist. Involved in the development of environmental studies, inventories, and evaluations for municipal, industrial, and federal government projects. Served as deputy project manager for preparation of a third-party EIS addressing multiple impacts from construction and operation of a phosphate mine in Florida. Involved in site and records searches of hazardous waste disposal activities and associated biological effects at several Air Force Bases. Assisted in development of a peat mining and restoration plan for a private concern in North Carolina.

Biographical Data

YANE NORDHAV

Hydrogeologist

Personal Information

Date of Birth: 29 September 1949

Education

B.A. in Political Science, 1974, University of Copenhagen
B.A. in Geology, 1976, University of California, Berkeley
M.Sc. candidate in Geology, 1983, California State University, Hayward

Professional Affiliations

Association of Engineering Geologists
Association of Environmental Professionals
Association of Women Geoscientists

Experience Record

1977-1980 Environmental Impact Planning Corporation, San Francisco, California. Geologist/Project Manager. Conducted geologic and hydrologic studies to evaluate adverse impacts of residential, commercial, and industrial developments. Responsible for evaluating effects on groundwater quality and quantity of converting 750 acres of prime agricultural land to residential use in Fresno County. Developed a water balance for the basin for existing and future conditions and estimated water quality impacts of installing septic tank systems in areas with a high water table and well-developed hardpan.

Supervised study of quantity and quality of available sand and gravel resources in Sacramento County, including an estimate of the cost-effectiveness of extraction versus importation. Conducted hydrogeologic investigation focusing on groundwater occurrence and movement, fault activity, and nature of soil material to determine suitable disposal sites for sludge generated in the San Francisco Bay area. Served as project manager for numerous environmental studies focusing on hazards from slope instability, settlement, subsidence, erosion, and flooding in California, Wyoming, and Nevada.

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Yane Nordhav (Continued)

1981-Date Engineering-Science. Hydrogeologist/Project Manager. Responsible for hydrologic and geologic investigations supporting hazardous waste investigations and water resource development and groundwater management programs in a variety of geologic and hydrologic regimes. Activities include development of drilling programs, supervision of well installation, geophysical logging, and groundwater sampling for trace metals and organic analysis. Developed and supervised drilling programs to investigate potential groundwater contamination at Edwards AFB and McClellan AFB as part of the U.S. Air Force's Installation Restoration Program - Phase II. Directed installation and sampling of groundwater monitoring wells and completion of soil borings downgradient from suspected contamination sources to determine the extent of area contamination resulting from past waste management practices of semiconductor firms. Involved in a study of past material handling practices at Drew Manufacturing Company to determine surface and subsurface distribution of trace metals and the extent of soil contamination.

Served as project manager on field investigations and preparation of environmental impact reports concerning increased discharge of wastewater treatment plant effluent to the Santa Ynez River in Santa Barbara County, development of an area subject to severe flooding in Richmond, California, and proposed gold mining operations in Napa County. Also involved in major research and field demonstration project investigating the feasibility of irrigating food crops with treated wastewater. Duties include preparing reports on studies of aerosol generation and pathogen dispersion as well as interpreting water quality and physical/chemical soils data.

Biographical Data

ROBIN P. CORT, Ph.D.

Ecologist

Personal Information

Date of Birth: 7 May 1954

Education

B.S. in Biology (magna cum laude), 1975, Stetson University, Deland, Florida
Ph.D. in Ecology, 1982, State University of New York, Stony Brook

Professional Affiliations

Ecological Society of America
Entomological Society of America
Society for the Study of Evolution

Honorary Affiliations

Beta Beta Beta

Experience Record

1976-1981 State University of New York, Stony Brook, New York. Laboratory Instructor (1976-1981). Taught courses in ecology, entomology, plant ecology, population biology, genetics, and general biology. Developed and coordinated laboratory and field exercises.

Herbarium Curator (1980-1981). Responsible for collection and identification of specimens as well as organization and maintenance of the Long Island flora reference collection.

1977-1980 Brookhaven National Laboratory, Upton, New York. Guest Research Associate. Conducted research on the influence of plant community structure on potato insect pest population levels and assessed methods for biological control of these pests.

1980 Organization for Tropical Studies, Costa Rica. Visiting Scientist/Faculty. Lectured and coordinated research activities for a graduate course in tropical ecology.

Robin P. Cort, Ph.D. (Continued)

1981 Agricultural University, Wageningen, Netherlands. Research Entomologist. Researched the effects of environmental factors on reproduction and diapause in Colorado potato beetles.

1982 Tippetts-Abbett-McCarthy-Stratton, New York, New York. Terrestrial Ecologist. Responsible for assessing environmental impacts from power facilities construction and preparing descriptions of existing wildlife, botanical, and wetlands resources. Participated in environmental impact studies for hydroelectric projects on the Mohawk and Oswego Rivers, New York. Conducted vegetation analysis and assessed the impact on plant communities from proposed alignments of the I88/I81 Connector in Binghamton, New York, for inclusion in the Draft Environmental Impact Statement. Performed preliminary wetland vegetation survey for proposed wetlands enhancement project in Staten Island, New York.

1983-Date Engineering-Science. Environmental Scientist. Performed soil and groundwater sampling to determine extent of possible hazardous waste contamination of sites throughout California. Sampled for a variety of possible contaminants, including nitrates, trace metals and volatile organics. Conducted pump tests to determine groundwater flow characteristics. Projects include sampling for contamination at semiconductor firms in Santa Clara County, for a metal refinery facility in Contra Costa County, and at Edwards Air Force Base as part of the U.S. Air Force's Installation Restoration Program.

Responsible for synthesizing data and preparing reports for environmental analyses. Projects include Environmental Impact Reports for a residential development in Vallejo and for a sewage transport storage facility in San Francisco. Involved in data management for a five-year study to determine the feasibility of irrigating food crops with treated wastewater.

Papers and Presentations

"Effect of Nonhost Plants on Movements of Colorado Potato Beetles, *Leptinotarsa decemlineata* (Say) (Coleoptera: Chrysomelidae)," presented at the Eastern Branch Meeting of the Entomological Society of America, September 1980.

"Insect Communities on Potatoes: The Effect of Plant Community Structure," Ph.D. Dissertation, State University of New York, Stony Brook, 1982.

APPENDIX B

TABLE B.1 - LIST OF INTERVIEWEES

TABLE B.2 - OUTSIDE CONTACTS

TABLE B.1

LIST OF INTERVIEWEES

	Most Recent Position	Years of Service at Beale AFB
1.	Fuels Manager	15
2.	Assistant Branch Chief, Propulsion	16
3.	Jet Engine Maintenance, Foreman	2
4.	Hazardous Waste Assistant, Propulsion	1
5.	Chief, Fabrication Branch	5
6.	Chief, Aerospace Systems Branch	4
7.	Hazardous Waste Coordinator, Aerospace Systems Branch	2
8.	Foreman, Repair and Reclamation	1
9.	Pneudraulics, Foreman	2
10.	Electrical Systems Repair, Coordinator	2
11.	Fuels Repair, Mechanic	2
12.	Superintendent, Field Maintenance	18
13.	Supervisor, Corrosion Control	4
14.	Superintendent, AGE	4
15.	Assistant NCOIC, NDI	4
16.	Chief, Transportation	3
17.	Vehicle Maintenance, Superintendent	3
18.	SR-7 Maintenance Supervisor	19
19.	Line Chief, SR-71	16
20.	Chief, U-2 Branch	8
21.	NCOIC, Phase Dock	8
22.	Chief, KC-135 Branch	5
23.	Chief, Support Vehicles	15
24.	Operations Monitor, Support Vehicles	4
25.	Chief, Maintenance Support	13
26.	Chief, T-38 Branch	13
27.	Foreman, Plumbing Shop	10
28.	NCOIC, Fuels Maintenance	4
29.	Assistant, Liquid Fuels Maintenance	17
30.	NCOIC, POWER PRODUCTION	2
31.	Foreman, POWER PRODUCTION	17
32.	Refer/Air Conditioning Foreman	20
33.	Refer/Air Conditioning, Mechanic	25
34.	Entomology, Foreman	15
35.	NCOIC, Radiology	2
36.	Assist NCOIC, Accounting & Administration	2
37.	NCOIC Medical Supplies	2
38.	Supervisor, Munitions Materials Branch	3
39.	Chief, Materials Management	4
40.	Supervising Civil Engineer PAVE PAWS	4
41.	Shop Chief, Electronic Warfare	8
42.	NCOIC, Non-Powered AGE	2
43.	Supervisor of Recreation	9
44.	Manager Auto Hobby Shop	5
45.	Base Environmental Engineer	2

TABLE B.1

LIST OF INTERVIEWEES
(Continued)

	Most Recent Position	Years of Service at Beale AFB
46.	Environmental Coordinator	1
47.	Pavement and Grounds Foreman	25
48.	Base Historian, Assistant	2
49.	NCOIC, Bioenvironmental Engineer	2
50.	Environmental Coordinator	5
51.	Deputy Base Civil Engineer	20
52.	Equipment Operator	29
53.	Equipment Operator	41
54.	Firefighter	29
55.	Firefighter	9
56.	Firefighter	24
57.	Supervisor Wastewater Treatment Plant	31
58.	Supervisor Water System	24
59.	Foreman, Interior Electric	17
60.	Foreman, Exterior Electric	8
61.	Construction Inspector	9
62.	Foreman Paint Shop	18
63.	Superintendent Operations and Maintenance	18
64.	Deputy Superintendent Operations and Maintenance	18
65.	Superintendent Operations and Maintenance	8
66.	Electrician - Exterior Electric	2

TABLE B.2

OUTSIDE CONTACTS

Tony Landis Engineer	California Department of Health Services Sacramento Regional Office 4250 Power Inn Road Sacramento, CA (916) 739-3145
Edward Crawford Water Resources Control Engineer	Central Valley Regional Water Quality Control Board 3201 S Street Sacramento, CA (916) 445-0270
Debbie Robinson Environmental Resources Specialist	U.S. Environmental Protection Agency, Region IX 215 Fremont San Francisco, CA (415) 974-7472
Jerry Mensch Environmental Services Supervisor	California Department of Fish and Game, Region II 1701 Nimbus Road Rancho Cordoba, CA (916) 355-7030
Carrie Shaw Biologist	California Department of Fish and Game Planning Branch Natural Diversity Data Base 1416 Ninth Street, Room 1225 Sacramento, CA (916) 324-3812
John Sibilsky Engineer	U.S. Army Corps of Engineers Flood Plain Management Group Federal Courthouse Building 650 Capitol Mall Sacramento, CA (916) 440-2863
Robert Blackford Manager	Wheatland Water District 103 Olive Street Wheatland, CA (916) 633-2848

TABLE B.2

OUTSIDE CONTACTS
(Continued)

Bernie Engle Assistant Agricultural Commissioner	Yuba County Agricultural Commission 215 Fifth Street Marysville, CA (916) 741-6278
Donald R. Frost Administrator	Yuba County Water Agency 215 Fifth Street Marysville, CA (916) 741-6278
Gene Ginochio	Brophy Water District 3457 Erle Road Marysville, CA (916) 743-6280
Katherine Deaton	U.S. Soil Conservation Service 1531 Butte House Road Yuba City, CA (916) 671-0850
Gil Bertoldi	U.S. Geological Survey California District Office Sacramento, CA (916) 484-4606

APPENDIX C

MASTER LIST OF INDUSTRIAL SHOPS

APPENDIX C
MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Waste Management Practices
9 Field Maintenance Squadron (FMS)				
Machine Shop	1086	Yes	No	
Metals Processing (Welding)	1086	Yes	No	
Structural Repair	1086	Yes	No	
Corrosion Control	1071	Yes	Yes	DPDO
Survival Equipment	1086	Yes	No	
Non-Destructive Inspection (NDI)	1243	Yes	Yes	Silver Recovery, Sewer, Fire Protection Training, DPDO
Intermediate Maintenance J-58	1025	Yes	Yes	Fire Protection Training
Intermediate Maintenance J-57	1086	Yes	Yes	Fire Protection Training
Accessory Repair	1086	Yes	Yes	Fire Protection Training
Small Gas Turbine	1225	Yes	No	
Engine Conditioning	1086	Yes	Yes	Reclaimed
SR-71 Test Cell J-58	1154	Yes	Yes	Fire Protection Training
Test Cell J-57	1247	Yes	Yes	Fire Protection Training
Engine Conditioning	1025	Yes	No	

APPENDIX C (continued)
MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Waste Management Practices
Repair and Reclamation	1086	Yes	Yes	DPDO
Fuel System Repair	1077	Yes	Yes	O/W Separator
Electrical Systems Repair	1086 &	Yes 1088	Yes	DPDO
Pneudraulics	1086	Yes	Yes	Recycled DPDO
Environmental Systems		1086	Yes	No
Egress Systems	1075	Yes	Yes	Fire Protection Training Area
Powered AGE	1225	Yes	Yes	O/W Separator, DPDO
9 Strategic Reconnaisance Wing (SRW)				
Life Support	1086	Yes	No	
Data Automation	2180	No	No	
9 Transportation Squadron (LGT)				
Packing and Crating	1023	No	No	
Vehicle Maintenance	2496	Yes	Yes	DPDO/Recycled

APPENDIX C (continued)
MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Waste Management Practices
Crash and Fire Truck Maintenance	1086	Yes	Yes	Fire Protection Training Area
Refueling Truck Maintenance	2470	Yes	Yes	DPDO/Recycled
Paint and Body Shop	2489	Yes	Yes	DPDO
Tire and Battery Shop	2497	Yes	Yes	DPDO
9 Supply Squadron (LGS)				
Conventional Munitions	1322	Yes	No	
Bulk Storage, Fuel	411	Yes	Yes	Fire Protection Training or Recycle
Fuels Laboratory	1064	Yes	Yes	Fire Protection Training or Recycle
Fuels Distribution	1062	Yes	Yes	Fire Protection Training or Recycle
Explosive Ordnance Disposal Branch	1322	Yes	No	
9 Combat Support Group (CSG)				
Base Photo Laboratory	2427	Yes	Yes	Silver recovery, sanitary sewer.
Small Arms Range	2409	No	No	
Ceramics Hobby Shop	2185	No	No	
Wood Hobby Shop	2185	No	No	

APPENDIX C (continued)
MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Waste Management Practices
Bowling Alley	2431	Yes	No	
Recreational Service Supply	2185	Yes	Yes	Contract Disposal
Reproduction Center	2483	Yes	No	
Auto Hobby Shop	2427	Yes	Yes	Contract Disposal
9th Security Police Squadron (SPS)		No	No	
9 Civil Engineering Squadron (CES)				
Fire Department	1086	Yes	No	
Pavement and Grounds	2565	Yes	Yes	DPDO
Entomology	2560	Yes	Yes	DPDO
Sheet Metal (Structural Repair)	2539	Yes	No	
Protective Coating (Paint Shop)	2536	Yes	Yes	DPDO
Plumbing Shop	2539	Yes	No	
Metal Processing Shop (Welding)	2539	Yes	No	
Refer/Air Conditioning Shop	2541	Yes	No	
Liquid Fuels Maintenance	2537	Yes	Yes	Contractor Disposed

APPENDIX C (continued)
MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Waste Management Practices
Heating System Shop	2539	Yes	No	
Sewage Treatment Plant	124	Yes	No	
Water Wells	700	Yes	No	
Interior Electric Shop	2539	Yes	No	
Exterior Electric Shop	2535	Yes	Yes	DPDO
Power Production Shop	2541	Yes	Yes	DPDO
Utility Support	2145	Yes	Yes	Photo Waste Treatment Plant
Hospital (USAF) Beale				
Medical Maintenance	5700	No	No	
Medical X-Ray	5700	Yes	Yes	Silver Recovery, Sanitary Sewer
Dental Clinic	5700	Yes	Yes	Silver Recovery, Sanitary Sewer
Medical Lab	5700	Yes	No	
Physiological Support Division		1024	Yes	No
Surgery		5700	Yes	No
TENANT ORGANIZATIONS				

APPENDIX C (continued)
MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Waste Management Practices
Commissary	2459	No	No	
1883 Communications Squadron (CS)				
NAV Aids	2170	Yes	No	
GCA Shack	1008	Yes	No	
Weather Equipment Maintenance	1060	Yes	No	
9th Reconnaissance Technical Squadron				
Photo Processing	2145	Yes	Yes	Photo Waste Treatment Plant
Photo Maintenance	2145	Yes	No	
Logistics	2145	Yes	Yes	DPDO
9 Organizational Maintenance Squadron (OMS)				
SR-71 Branch	1075	Yes	Yes	Fire Protection Training or DPDO
KC-135 Branch	1076	Yes	Yes	Fire Protection Training or DPDO
U-2 Branch	1075	Yes	Yes	Fire Protection Training or DPDO
T-38 Branch	1076	Yes	Yes	Fire Protection Training or DPDO

APPENDIX C (continued)
MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Waste Management Practices
Support Vehicle	1092	Yes	Yes	Fire Protection Training or DPDO
Non-Powered AGE	1230	Yes	Yes	Fire Protection Training or DPDO
9 Avionics Maintenance Squadron (AMS)				
Communications Shop	1025	Yes	No	
Navigation Shop	1025	Yes	No	
Electronic Warfare Systems Repair	1025	Yes	No	
Navigation Shop	1025	Yes	No	
Automatic Flight Control & Instruments	1025	Yes	No	
MRS Shop	1025	Yes	No	
Electronic Sensor Shop	1025	Yes	No	
Aerial Photo Shop	1025	Yes	No	
PMEL	1032	Yes	No	
Branch Simulator Maintenance	2145	Yes	No	

APPENDIX C (continued)
MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Waste Management Practices
Space Command (SC)				
PAVE PAWS 7th Missle Warning Squadron	5760	Yes	Yes	DPDO
2156th Comm. Sq. - AFCC			Yes	No

APPENDIX D

SUPPLEMENTAL BASE ENVIRONMENTAL DATA

TABLE D.1
CHEMICAL ANALYSES OF WATER FROM
SUPPLY WELLS AT BEALE AIR FORCE BASE

Beale Well Number	USGS Well Number	Date of Sample	Depth (ft)	Specific conductance (umho/cm at 25°C)	ph (units)	Temperature (°C)	Hardness (Ca, Mg) (mg/L)	Calcium (Ca) (mg/L)	Magnesium (Mg) (mg/L)	Sodium (Na) (mg/L)	Potassium (K) (mg/L)	Bicarbonate (HCO_3) (mg/L)	Sulfate (SO_4) (mg/L)	Chloride (Cl) (mg/L)	Fluoride (F) (mg/L)	Silica (SiO_2) (mg/L)	Dissolved solids, residue at 180°C (mg/L)	Dissolved solids, sum (mg/L)	Dissolved nitrate (N) (mg/L)	Total nitrite plus nitrate (N) (mg/L)	Iron (Fe) (ug/L)	Manganese (Mn) (ug/L)
1	15N/4E-24R1	11-21-61	294	257	7.4	--	64	13	7.7	25	1.6	80	6.0	3.6	.3	73	199	203	1.0	--	20	--
		10-28-68		215	6.8	--	57	10	7.0	23	1.8	81	5.4	20	.2	67	177	177	2.4	--	--	--
		9-5-74		301	7.2	20	93	19	11	22	1.9	92	8.1	42	.1	49	214	199	--	.02	10	0
2	15N/4E-24R2	11-11-61	326	192	7.6	--	69	15	7.7	13	1.4	94	0	15	.2	47	138	145	.1	--	40	--
		11-14-67		147	7.1	--	50	9.6	6.5	10	1.0	74	6.0	4.6	.3	55	127	131	2.0	--	0	--
		11-7-75		299	7.4	23	72	15	8.5	33	2.0	88	--	45	.1	61	216	--	--	.09	0	70
		3-2-82		290	8.0	21	73	15	8.7	29	0.9	88	6	36	<.1	56	-	-	0.1	-	984	2920
3	15N/5E-19F1	11-14-67	264	169	7.6	--	52	11	6.0	14	1.3	77	6.0	11	.3	53	141	142	.9	--	10	--
		11-7-75		186	8.0	21.6	53	11	6.2	14	1.4	74	8.0	14	.2	56	160	147	--	0	0	100
		3-2-82		180	7.7	20.5	58	12	6.6	14	1.0	68	10	8	<.1	48	-	-	<.1	-	<100	329
4	15N/4E-24M1	11-11-61	300	369	7.7	--	83	18	9.2	38	1.9	86	6.0	67	.2	54	238	37	.1	--	40	--
	11-03-69		298	7.6	--	76	16	8.6	29	45	79	6.0	51	.3	54	208	206	0	--	--	--	
		11-07-75		30	7.8	21.6	81	18	8.7	23	1.8	86	.3	45	.1	58	212	198	--	.02	0	200
5	15N/4E-24G1	11-21-71	299	184	7.4	--	68	14	8.0	10	1.4	92	1.0	12	.2	50	139	142	.1	00	30	--
		11-03-69		186	7.6	--	71	12	10	11	.9	100	5.0	5.6	.2	42	130	136	0	--	--	--
		11-18-75		194	7.6	21	74	14	9.6	10	.9	113	--	6.1	.1	43	144	--	--	0	280	260
6	15N/4E-24B1	11-11-61	313	192	7.6	--	69	15	7.7	13	1.4	94	0	15	.2	47	138	145	.1	--	40	--
		11-03-69		197	7.9	--	69	14	8.3	13	1.4	96	1.0	13	.1	39	136	137	0	--	--	--
		11-13-75		232	7.9	20	84	18	9.6	13	1.7	107	--	19	.1	45	163	--	--	0.06	140	140
7	15N/4E-24A1	11-06/62	300	236	7.3	--	68	14	8.0	22	1.5	82	5.0	28	0.2	43	161	166	4.0	--	0	--
		11-16-67		464	7.4	--	105	24	11	50	1.7	84	1.0	103	.3	40	298	272	.1	--	10	--
		11-07-75		809	7.4	22	190	45	20	61	2.6	75	--	210	.1	43	493	--	--	0	0	40
8	15N/5E-19L1	10-28-68	[2] 405	165	7.0	--	53	9.6	7.0	13	1.8	76	6.8	6.0	.2	66	148	152	4.1	--	--	--
		11-13-75		176	7.7	20	57	11	7.1	13	1.7	74	4.0	7.3	.2	65	165	154	--	1.80	10	10
9	15N/4E-24K1	10-28-68	[1] 370	297	7.3	--	86	18	10	25	2.3	94	1.0	44	0	51	206	198	.3	--	--	--
		11-10-75		250	7.6	22	90	18	11	14	1.3	114	--	21	.1	45	169	--	--	0	190	610

[1] Cement grout from 354 to 370 ft.
[2] Cement grount from 325 to 405 ft.
Source: Page, 1980; Beale AFB Installation Documents.

TABLE D.2
CHEMICAL ANALYSES OF WATER FROM SELECTED WELLS OUTSIDE BEALE AIR FORCE BASE

Well Number	Date of Sample	Depth (ft)	Specific conductance (umho/cm at 25°C)	pH (units)	Temperature (°C)	Hardness (Ca, Mg) (mg/L)	Calcium (Ca) (mg/L)	Magnesium (Mg) (mg/L)	Sodium (Na) (mg/L)	Potassium (K) (mg/L)	Bicarbonate (HCO_3) (mg/L)	Sulfate (SO_4) (mg/L)	Chloride (Cl) (mg/L)	Fluoride (F) (mg/L)	Silica (SiO_2) (mg/L)	Dissolved solids, residue at 180°C (mg/L)	Dissolved solids, sum (mg/L)	Total nitrite plus nitrate (N) (mg/L)	Iron (Fe) (ug/L)	Manganese (Mn) (ug/L)
14N/5E-7L1	8-16-76	220	183	7.3	20.0	77	16	9.1	12	--	86	6.0	13	--	--	178	--	1.2	--	--
12M1	8-16-76	249	254	7.0	21.0	130	27	14	13	.7	154	10	11	.1	25	170	177	.15	10	30
16P1	8-16-76	230	1,120	7.3	19.0	420	100	42	39	2.7	85	29	280	.1	64	712	599	.83	0	0

Source: Page, 1980.

TABLE D.3
EPA/CALIFORNIA
WATER QUALITY CRITERIA

Parameter	Units	Primary/Secondary** Drinking Water Standard	Irrigation/ Livestock	Fish & Wildlife
Physical Properties				
Dissolved oxygen	mg/L	-	-	5.0
pH	Units	6.5-8.5**	-	6.5-9.0
Alkalinity total	mg/L $CaCO_3$	-	-	30-130
Color	P.C.U.	15**	-	-
Odor	T.O.N.	3**	-	-
Dissolved solids	mg/L	500**	5000	-
General Mineral				
Chloride	mg/L	250**	-	-
Cyanide *	mg/L	0.2	-	.052
Fluoride	mg/L	1.8	2.0	-
Foaming Agents	mg/L	0.5**	-	-
Nitrate	mg/L	10	100	-
Ammonia	mg/L	-	-	.02
Sulfate	mg/L	250**	-	.26
Metals				
Aluminum	mg/L	-	5.0	.1
Arsenic*	mg/L	.05	.1/.2	.05
Barium	mg/L	1.0	-	-
Beryllium*	mg/L	-	0/.1	.9-1.1
Boron	mg/L	-	.75/5	-
Cadmium*	mg/L	.010	.01/.050	.012
Calcium	mg/L	-	-	-
Chromium IV*	mg/L	.05	.1/1.0	.1
Cobalt	mg/L	-	.05/1	-
Copper*	mg/L	1.0**	.02/.5	.02
Iron	mg/L	.3**	-	1.0
Lead*	mg/L	.05	5/.1	.1-.03
Magnesium	mg/L	-	-	-
Manganese	mg/L	.05**	.2/-	1.0
Mercury*	mg/L	.002	.001	.00005
Molybdenum	mg/L	-	.01	-
Nickel*	mg/L	-	.2	.30
Potassium	mg/L	-	-	-
Selenium*	mg/L	.01	.02/.05	.05
Silver*	mg/L	.05	-	.0002
Sodium	mg/L	-	-	-
Vanadium	mg/L	-	.1	-
Zinc*	mg/L	5**	2.0/25	.30

*Compound identified on EPA list of 129 Priority Pollutants (SWRCB, 1981)

TABLE D.4

ANALYTICAL RESULTS OF SURFACE WATER SAMPLING EVENTS AT BEALE AFB, 1983 (in ug/L, except where noted)

Constituents	Sampling Location[a] 032			
	Sampling Date			
	1/83	3/83	6/83	9/83
Kjeldahl nitrogen (mg/L)	<1	<1	<1	<1
Nitrate (mg/L)	0.1	0.1	460	<.1
Nitrite (mg/L)	<.02	<.02	<.02	<.02
Oil & grease (mg/L)	<.3	0.7	<.3	0.5
Organic carbon (mg/L)	1	3	3	2
Phosphorus (mg/L)	<.1	0.1	<.1	0.12
Phenols	N/R	N/R	N/R	N/R
Barium	N/R	N/R	N/R	N/R
Cadmium	N/R	N/R	N/R	N/R
Chromium VI	N/R	N/R	N/R	N/R
Copper	N/R	N/R	N/R	N/R
Lead	N/R	N/R	N/R	N/R
Mercury	N/R	N/R	N/R	N/R
Silver	N/R	N/R	N/R	N/R
Surfactants (mg/L)	<.1	<.1	<.1	<.1
Chlordane	N/R	N/R	N/R	N/R
Endrin	N/R	N/R	N/R	N/R
Lindane	N/R	N/R	N/R	N/R
Methoxychlor	N/R	N/R	N/R	N/R
Toxaphene	N/R	N/R	N/R	N/R
2,4-D	N/R	N/R	N/R	N/R
2,4,5,-TP silvex	N/R	N/R	N/R	N/R
1,2 Dichloroethylene	N/R	N/R	N/R	N/R
Methylene chloride	N/R	N/R	N/R	N/R
Trichloroethylene	N/R	N/R	N/R	N/R
PCBs	N/R	N/R	N/R	N/R
Dissolved oxygen (mg/l)	9.9	12.8	10.5	10.5
Fecal coliform (/100 ml)	13	0	N/R	N/R
Total coliform (/100 ml)	0	137	N/R	N/R
pH	N/R	N/R	N/R	N/R
Temperature (°C)	6	9.5	20.0	20.0

[a]Sampling locations depicited in Figure 3.11.
N/R = not analyzed for.

TABLE D.4 - Continued
(in ug/L, except where noted)

Constituents	Sampling Location[a] 033 Sampling Date 1/83	3/83	6/83	9/83
Kjeldahl nitrogen (mg/L)	<1	<1	<1	<1
Nitrate (mg/L)	0.1	<.1	0.7	<.1
Nitrite (mg/L)	<.02	<.02	<.02	<.02
Oil & grease (mg/L)	<.3	0.6	<.3	<.3
Organic carbon (mg/L)	<1	6	4	3
Phosphorus (mg/L)	<.1	0.1	0.1	<.1
Phenols	N/R	N/R	N/R	N/R
Barium	N/R	N/R	N/R	N/R
Cadmium	N/R	N/R	N/R	N/R
Chromium VI	N/R	N/R	N/R	N/R
Copper	N/R	N/R	N/R	N/R
Lead	N/R	N/R	N/R	N/R
Mercury	N/R	N/R	N/R	N/R
Silver	N/R	N/R	N/R	N/R
Surfactants (mg/L)	<.1	<.1	<.1	<.1
Chlordane	N/R	N/R	N/R	N/R
Endrin	N/R	N/R	N/R	N/R
Lindane	N/R	N/R	N/R	N/R
Methoxychlor	N/R	N/R	N/R	N/R
Toxaphene	N/R	N/R	N/R	N/R
2,4-D	N/R	N/R	N/R	N/R
2,4,5,-TP silvex	N/R	N/R	N/R	N/R
1,2 Dichloroethylene	N/R	N/R	N/R	N/R
Methylene chloride	N/R	N/R	N/R	N/R
Trichloroethylene	N/R	N/R	N/R	N/R
PCBs	N/R	N/R	N/R	N/R
Dissolved oxygen (mg/l)	9.9	12	9.625	11.0
Fecal coliform (/100 ml)	0	N/R	0	19
Total coliform (/100 ml)	0	N/R	0	180
pH	N/R	N/R	N/R	N/R
Temperature (°C)	7	9.5	21.6	24.0

[a]Sampling locations depicted in Figure 3.11.
N/R = not analyzed for.

TABLE D.4 - Continued
(in ug/L, except where noted)

Constituents	Sampling Location[a] 034			
	Sampling Date			
	1/83	3/83	6/83	9/83
Kjeldahl nitrogen (mg/L)	<1	<1	<1	<1
Nitrate (mg/L)	0.1	<.1	0.2	<.1
Nitrite (mg/L)	<.02	<.02	<.02	<.02
Oil & grease (mg/L)	0.4	<.3	<.3	0.5
Organic carbon (mg/L)	<1	4	4	5
Phosphorus (mg/L)	<.1	0.1	0.1	<.1
Phenols	N/R	N/R	N/R	N/R
Barium	N/R	N/R	N/R	N/R
Cadmium	N/R	N/R	N/R	N/R
Chromium VI	N/R	N/R	N/R	N/R
Copper	N/R	N/R	N/R	N/R
Lead	N/R	N/R	N/R	N/R
Mercury	N/R	N/R	N/R	N/R
Silver	N/R	N/R	N/R	N/R
Surfactants (mg/L)	<.1	<.1	<.1	<.1
Chlordane	N/R	N/R	N/R	N/R
Endrin	N/R	N/R	N/R	N/R
Lindane	N/R	N/R	N/R	N/R
Methoxychlor	N/R	N/R	N/R	N/R
Toxaphene	N/R	N/R	N/R	N/R
2,4-D	N/R	N/R	N/R	N/R
2,4,5,-TP silvex	N/R	N/R	N/R	N/R
1,2 Dichloroethylene	N/R	N/R	<.1	N/R
Methylene chloride	N/R	N/R	<.2	ND
Trichloroethylene	N/R	N/R	<.1	ND
PCBs	N/R	N/R	N/R	N/R
Dissolved oxygen (mg/l)	9.35	11.2	9.1	9.35
Fecal coliform (/100 ml)	0	N/R	0	2
Total coliform (/100 ml)	12	N/R	126	NA
pH	N/R	N/R	N/R	N/R
Temperature (°C)	6	9	20.5	22.0

[a]Sampling locations depicted in Figure 3.11.
N/R = not analyzed for. ND = none detected. NA = not available.

TABLE D.4 - Continued
(in ug/L, except where noted)

Constituents	Sampling Location[a] 035			
	Sampling Date			
	1/83	3/83	6/83[b]	9/83[b]
Kjeldahl nitrogen (mg/L)	<1	<1		
Nitrate (mg/L)	0.3	<.1		
Nitrite (mg/L)	<.02	<.02		
Oil & grease (mg/L)	<.3	0.7		
Organic carbon (mg/L)	4	3		
Phosphorus (mg/L)	1	0.1		
Phenols	<10	<10		
Barium	<1000	<200		
Cadmium	<10	<10		
Chromium VI	<50	<50		
Copper	<20	<20		
Lead	<50	<50		
Mercury	<2	<2		
Silver	<10	<10		
Surfactants (mg/L)	<.1	<.1		
Chlordane	N/R	N/R		
Endrin	N/R	N/R		
Lindane	N/R	N/R		
Methoxychlor	N/R	N/R		
Toxaphene	N/R	N/R		
2,4-D	N/R	N/R		
2,4,5,-TP silvex	N/R	N/R		
1,2 Dichloroethylene	N/R	N/R		
Methylene chloride	<.2	N/R		
Trichloroethylene	<.1	N/R		
PCBs	N/R	N/R		
Dissolved oxygen (mg/l)	9.3	10.8		
Fecal coliform (/100 ml)	3	N/R		
Total coliform (/100 ml)	0	N/R		
pH	N/R	N/R		
Temperature (°C)	5	10		

[a]Sampling locations depicited in Figure 3.11.
[b]Stream bed dry - no samples taken.
N/R = not analyzed for.

TABLE D.4 - Continued
(in ug/L, except where noted)

Constituents	Sampling Location[a] 036			
	Sampling Date			
	1/83	3/83	6/83	9/83
Kjeldahl nitrogen (mg/L)	1.8	<1	3.0	<1
Nitrate (mg/L)	5.0	0.2	8.4	<.1
Nitrite (mg/L)	.05	.02	.19	N/R
Oil & grease (mg/L)	1.8	0.6	3.5	0.5
Organic carbon (mg/L)	6	5	13	3
Phosphorus (mg/L)	1.0	0.2	5.8	0.58
Phenols	<10	<10	<10	<10
Barium	<1000	<200	<200	<200
Cadmium	<10	<10	<10	<10
Chromium VI	<50	<50	<50	<50
Copper	<20	<20	<20	<20
Lead	<50	<50	<20	N/R
Mercury	<2	<2	<1	N/R
Silver	<10	<10	N/R	N/R
Surfactants (mg/L)	.02	<.1	N/R	<.1
Chlordane	N/R	N/R	N/R	N/R
Endrin	N/R	N/R	N/R	N/R
Lindane	N/R	N/R	N/R	N/R
Methoxychlor	N/R	N/R	N/R	N/R
Toxaphene	N/R	N/R	N/R	N/R
2,4-D	N/R	N/R	N/R	N/R
2,4,5,-TP silvex	N/R	N/R	N/R	N/R
1,2 Dichloroethylene	N/R	N/R	N/R	N/R
Methylene chloride	<.2	N/R	<.3	ND
Trichloroethylene	<.1	N/R	<.2	ND
PCBs	N/R	N/R	N/R	N/R
Dissolved oxygen (mg/l)	9.5	12.8	5.45	8.85
Fecal coliform (/100 ml)	0	N/R	N/R	70
Total coliform (/100 ml)	0	N/R	N/R	NA
pH	N/R	N/R	N/R	N/R
Temperature (°C)	8	9.5	21.0	24.0

[a]Sampling locations depicited in Figure 3.11.
N/R = not analyzed for. ND = none detected. NA = not available.

TABLE D.4 - Continued
(in ug/L, except where noted)

Constituents	Sampling Location[a] 037			
	Sampling Date			
	1/83	3/83	6/83[b]	9/83
Kjeldahl nitrogen (mg/L)	<1	<1		<1
Nitrate (mg/L)	0.4	<.1		<.1
Nitrite (mg/L)	<.02	<.02		<.02
Oil & grease (mg/L)	<.3	0.7		0.3
Organic carbon (mg/L)	1	3		2
Phosphorus (mg/L)	<.1	0.1		0.15
Phenols	<10	<10		<10
Barium	<1000	<200		<200
Cadmium	<10	<10		<10
Chromium VI	<50	<50		<50
Copper	<20	<20		<20
Lead	<50	<50		<20
Mercury	<2	<2		N/R
Silver	<10	<10		N/R
Surfactants (mg/L)	<.1	N/R		<.1
Chlordane	N/R	N/R		N/R
Endrin	N/R	N/R		N/R
Lindane	N/R	N/R		N/R
Methoxychlor	N/R	N/R		N/R
Toxaphene	N/R	N/R		N/R
2,4-D	N/R	N/R		N/R
2,4,5,-TP silvex	N/R	N/R		N/R
1,2 Dichloroethylene	N/R	N/R		N/R
Methylene chloride	<.2	N/R		ND
Trichloroethylene	<.1	N/R		ND
PCBs	N/R	N/R		N/R
Dissolved oxygen (mg/l)	12	10.6		9.9
Fecal coliform (/100 ml)	0	N/R		38
Total coliform (/100 ml)	0	N/R		NA
pH	N/R	N/R		N/R
Temperature (°C)	6	9.5		23.0

[a] Sampling locations depicited in Figure 3.11.
[b] Stream bed dry - no samples taken.
N/R = not analyzed for. ND = none detected. NA = not available.

TABLE D.4 - Continued
(in ug/L, except where noted)

Constituents	Sampling Location[a] 038			
	Sampling Date			
	1/83	3/83	6/83	9/83
Kjeldahl nitrogen (mg/L)	<1	<1	2.4	<1
Nitrate (mg/L)	<.1	<.1	<.1	<.1
Nitrite (mg/L)	<.02	<.02	<.02	<.02
Oil & grease (mg/L)	8.4	0.5	.05	.05
Organic carbon (mg/L)	4	4	8	5
Phosphorus (mg/L)	<.1	<.1	.14	<.1
Phenols	<10	<10	<10	<10
Barium	<1000	<200	<200	<200
Cadmium	<10	<10	<10	<10
Chromium VI	<50	<50	<50	<50
Copper	<20	<20	<20	<20
Lead	<50	<50	<20	<20
Mercury	<2	<2	<1	<1
Silver	<10	<10	N/R	N/R
Surfactants (mg/L)	<.1	<.1	<.1	<.1
Chlordane	N/R	N/R	N/R	N/R
Endrin	N/R	N/R	N/R	N/R
Lindane	N/R	N/R	N/R	N/R
Methoxychlor	N/R	N/R	N/R	N/R
Toxaphene	N/R	N/R	N/R	N/R
2,4-D	N/R	N/R	N/R	N/R
2,4,5,-TP silvex	N/R	N/R	N/R	N/R
1,2 Dichloroethylene	N/R	N/R	N/R	N/R
Methylene chloride	<.2	N/R	N/R	ND
Trichloroethylene	<.1	N/R	N/R	ND
PCBs	N/R	N/R	N/R	N/R
Dissolved oxygen (mg/l)	9.35	13.6	1.55	11.0
Fecal coliforms (/100 ml)	4	N/R	103	0
Total coliform (/100 ml)	34	N/R	84	2
pH	N/R	N/R	N/R	N/R
Temperature (°C)	6	12	18.8	23.0

[a]Sampling locations depicted in Figure 3.11.
N/R = not analyzed for. ND = none detected.

TABLE D.4 - Continued
(in ug/L, except where noted)

Constituents	Sampling Location[a] 039				
	Sampling Date				
	11/82	1/83	3/83	6/83[b]	9/83[b]
Kjeldahl nitrogen (mg/L)	1	<1	<1		
Nitrate (mg/L)	<.1	<.1	<.1		
Nitrite (mg/L)	<.02	<.02	<.02		
Oil & grease (mg/L)	<.3	<.3	0.6		
Organic carbon (mg/L)	8	1	4		
Phosphorus (mg/L)	<.1	<.1	.1		
Phenols	<10	<10	<10		
Barium	<1000	<1000	<200		
Cadmium	<10	N/R	<10		
Chromium VI	<50	<50	<50		
Copper	<20	<20	<20		
Lead	<50	<50	<50		
Mercury	<5	<2	<2		
Silver	<10	<10	<10		
Surfactants (mg/L)	<.1	<.1	<.1		
Chlordane	N/R	N/R	N/R		
Endrin	N/R	N/R	N/R		
Lindane	N/R	N/R	N/R		
Methoxychlor	N/R	N/R	N/R		
Toxaphene	N/R	N/R	N/R		
2,4-D	N/R	N/R	N/R		
2,4,5,-TP silvex	N/R	N/R	N/R		
1,2 Dichloroethylene	N/R	N/R	N/R		
Methylene chloride	N/R	<.2	N/R		
Trichloroethylene	N/R	<.1	N/R		
PCBs	<.25	N/R	N/R		
Dissolved oxygen (mg/l)	9.3	12.6	11.0		
Fecal coliforms (/100 ml)	N/R	40	N/R		
Total coliform (/100 ml)	N/R	0	N/R		
pH	7.0	N/R	N/R		
Temperature (°C)	12	5	10		

[a] Sampling locations depicted in Figure 3.11.
[b] Stream bed dry - no samples taken.
N/R = not analyzed for.

TABLE D.4 - Continued
(in ug/L, except where noted)

Constituents	Sampling Location[a] 040				
	Sampling Date				
	11/82	1/83	3/83	6/83	9/83
Kjeldahl nitrogen (mg/L)	1	<1	<1	<1	<1
Nitrate (mg/L)	<.1	<.1	<.1	<.1	<.1
Nitrite (mg/L)	<.02	<.02	<.02	<.02	<.02
Oil & grease (mg/L)	<.3	<.3	0.7	0.5	0.5
Organic carbon (mg/L)	6	2	4	4	1
Phosphorus (mg/L)	<.1	<.1	0.1	.12	<.1
Phenols	<10	<10	<10	<10	<10
Barium	<1000	<1000	<200	<200	<200
Cadmium	<10	N/R	<10	<10	<10
Chromium VI	<50	<50	<50	<50	<50
Copper	<20	<20	<20	<20	<20
Lead	<50	<50	<50	<20	N/R
Mercury	<5	<2	<2	<1	<1
Silver	<10	<10	<10	<10	N/R
Surfactants (mg/L)	<.1	<.1	<.1	<.1	<.1
Chlordane	N/R	N/R	N/R	N/R	N/R
Endrin	N/R	N/R	N/R	N/R	N/R
Lindane	N/R	N/R	N/R	N/R	N/R
Methoxychlor	N/R	N/R	N/R	N/R	N/R
Toxaphene	N/R	N/R	N/R	N/R	N/R
2,4-D	N/R	N/R	N/R	N/R	N/R
2,4,5,-TP silvex	N/R	N/R	N/R	N/R	N/R
1,2 Dichloroethylene	N/R	N/R	N/R	<.1	N/R
Methylene chloride	N/R	<.2	N/R	<.2	ND
Trichloroethylene	N/R	<.1	N/R	<.1	ND
PCBs	N/R	N/R	N/R	N/R	N/R
Dissolved oxygen (mg/l)	9.4	12.5	10	9.625	9.9
Fecal coliform (/100 ml)	N/R	20	N/R	0	5
Total coliform (/100 ml)	N/R	0	N/R	230	20
pH	7.4	N/R	N/R	N/R	N/R
Temperature (°C)	12	5	10	18.8	23

[a]Sampling locations depicted in Figure 3.11.
N/R = not analyzed for. ND = none detected.

TABLE D.4 - Continued
(in ug/L, except where noted)

Constituents	Sampling Location[a] 041			
	Sampling Date			
	1/83	3/83	6/83	9/83
Kjeldahl nitrogen (mg/L)	<1	<1	<1	<1
Nitrate (mg/L)	0.2	<.1	<.1	<.1
Nitrite (mg/L)	<.02	<.02	<.02	<.02
Oil & grease (mg/L)	<.3	0.6	0.5	0.5
Organic carbon (mg/L)	6	4	4	1
Phosphorus (mg/L)	<.1	.1	.11	<.1
Phenols	<10	<10	<10	<10
Barium	<1000	<200	<200	<200
Cadmium	N/R	<10	<10	<10
Chromium VI	<50	<50	<50	<50
Copper	<20	<20	<20	<20
Lead	<50	<50	<20	<20
Mercury	<2	<2	<1	<1
Silver	<10	<10	N/R	N/R
Surfactants (mg/L)	<.1	<.1	<.1	<.1
Chlordane	N/R	N/R	N/R	N/R
Endrin	N/R	N/R	N/R	N/R
Lindane	N/R	N/R	N/R	N/R
Methoxychlor	N/R	N/R	N/R	N/R
Toxaphene	N/R	N/R	N/R	N/R
2,4-D	N/R	N/R	N/R	N/R
2,4,5,-TP silvex	N/R	N/R	N/R	N/R
1,2 Dichloroethylene	N/R	N/R	<.1	N/R
Methylene chloride	<.2	N/R	<.2	N/R
Trichloroethylene	<.1	N/R	<.1	N/R
PCBs	N/R	N/R	N/R	N/R
Dissolved oxygen (mg/l)	10.5	10.6	N/R	10.5
Fecal coliform (/100 ml)	4	N/R	160	92
Total coliform (/100 ml)	0	N/R	192	NA
pH	N/R	N/R	N/R	N/R
Temperature (°C)	6	9.5	N/R	22

[a]Sampling locations depicted in Figure 3.11.
N/R = not analyzed for. NA = not available.

TABLE D.4 - Continued
(in ug/L, except where noted)

Constituents	Sampling Location[a] 042			
	Sampling Date			
	1/83	3/83	6/83[b]	9/83[b]
Kjeldahl nitrogen (mg/L)	N/R	<.1		
Nitrate (mg/L)	N/R	<.1		
Nitrite (mg/L)	N/R	<.02		
Oil & grease (mg/L)	3	0.6		
Organic carbon (mg/L)	5	4		
Phosphorus (mg/L)	N/R	0.1		
Phenols	<10	<10		
Barium	<1000	<200		
Cadmium	<10	<10		
Chromium VI	<50	<50		
Copper	<20	<20		
Lead	<50	<50		
Mercury	<2	<2		
Silver	<10	<10		
Surfactants (mg/L)	<.1	<.1		
Chlordane	N/R	N/R		
Endrin	N/R	N/R		
Lindane	N/R	N/R		
Methoxychlor	N/R	N/R		
Toxaphene	N/R	N/R		
2,4-D	N/R	N/R		
2,4,5,-TP silvex	N/R	N/R		
1,2 Dichloroethylene	N/R	N/R		
Methylene chloride	<.2	<.2		
Trichloroethylene	<.1	<.1		
PCBs	N/R	N/R		
Dissolved oxygen (mg/l)	11	10.3		
Fecal coliform (/100 ml)	1	N/R		
Total coliform (/100 ml)	0	N/R		
pH	N/R	N/R		
Temperature (°C)	5	10		

[a] Sampling locations depicted in Figure 3.11.
[b] Stream bed dry - no samples taken.
N/R = not analyzed for.

TABLE D.4 - Continued
(in ug/L, except where noted)

Constituents	Sampling Location[a] 044				
	Sampling Date				
	1/83[b]	3/83	6/83	8/83	9/83
Kjeldahl nitrogen (mg/L)		1.7	N/R	N/R	N/R
Nitrate (mg/L)		<.1	N/R	N/R	N/R
Nitrite (mg/L)		<.2	N/R	N/R	N/R
Oil & grease (mg/L)		13600	2.3	N/R	2.3
Organic carbon (mg/L)		120	25	N/R	23
Phosphorus (mg/L)		<.1	N/R	N/R	N/R
Phenols		<10	<10	N/R	16
Barium		<200	<200	N/R	<200
Cadmium		<10	<10	N/R	<10
Chromium VI		<50	<50	N/R	<50
Copper		<20	<20	N/R	N/R
Lead		<50	<20	N/R	N/R
Mercury		<2	<1	N/R	<1
Silver		<10	N/R	N/R	N/R
Surfactants (mg/L)		<.1	.34	N/R	0.3
Chlordane		N/R	N/R	N/R	N/R
Endrin		N/R	N/R	N/R	N/R
Lindane		N/R	N/R	N/R	N/R
Methoxychlor		N/R	N/R	N/R	N/R
Toxaphene		N/R	N/R	N/R	N/R
2,4-D		N/R	N/R	N/R	N/R
2,4,5,-TP silvex		N/R	N/R	N/R	N/R
Trans-1,2-Dichloroethene		N/R	225	436/428	41.1
1,2-Dichloropropane		N/R	N/R	N/R	0.3
Methylene chloride		<.2	1.3	ND	ND
1,1,1-Trichloroethane		N/R	N/R	N/R	0.7
Trichloroethylene		1.9	11.7	2.3/1.8	2.9
PCBs		N/R	N/R	N/R	N/R
Dissolved oxygen (mg/l)		N/R	N/R	N/R	8.85
Fecal coliform (/100 ml)		N/R	N/R	N/R	N/R
Total coliform (/100 ml)		N/R	N/R	N/R	N/R
pH		N/R	N/R	N/R	N/R
Temperature (°C)		N/R	N/R	N/R	21

[a] Sampling locations depicited in Figure 3.11.
[b] No data.
N/R = not analyzed for. ND = none detected.

TABLE D.5

LIST OF PESTICIDES - DECEMBER 1983
BEALE AFB

Dacthal W-75
Aquathol K
Hyvar-X
Roundup
Amino Trizaole
FORE
Acti-Dione Thiram
Avitrol
Dursban 4E
Diazinon
Ficam W
Baygon 1.5
PT 515 - Wasp - Freeze
Malathion 57%
Chlorodane
Dursban T.C.
Sevin
Strychnine Alkaloid
Cyanogas
Warfarin
Cythion
Dursban Crystal
Octagon

TABLE D.6

LIST OF OIL/WATER SEPARATORS
BEALE AFB

ID	Location	Using Shops	Capacity
A	1094	AGE Wash Rack	808 gal
B	1077N	Fuel System Maintenance	500 gal
C	1077S	Fuel System Maintenance	500 gal
D	1075W	SR-71 Maintenance	--
E	1075E	SR-71 Maintenance	--
F	1076E	KC-135 Maintenance	--
G	1076W	KC-135 Maintenance	--
H	1086	Wheel & Tire	--
I	1072	Aircraft Wash	500 gal
J	1069	Transient A/C Maintenance	500 gal
K	1064	Refuel Vehicle Wash	590 gal
L	1058 (Taxi 11)	SR-71 Hangars	450 gal
M	2496	Motor pool	--
N	2470	Refuel Vehicle Maintenance	540 gal
O	2427	Auto Hobby Shop	65 gal
P	1243	KC-135 Maintenance	--
Q	1240	Non-Powered AGE Washrack	--
R	5760	PAVE PAWS (Two Units)	--
S	2491	Transportation	--

TABLE D.7

PETROLEUM STORAGE FACILITIES
BEALE AFB

Facility Number	Type of POL	Capacity	Description	Location
402	JP-7	10,000 bbl	Above-ground diked	POL farm
403	JP-7	10,000 bbl	Above-ground diked	POL farm
404	JP-7	10,000 bbl	Above-ground diked	POL farm
405	JP-7	10,000 bbl	Above-ground diked	POL farm
406	JP-TS	10,000 bbl	Above-ground diked	POL farm
407	JP-7	10,000 bbl	Above-ground diked	POL farm
408	JP-7	10,000 bbl	Above-ground diked	POL farm
409	JP-4	10,000 bbl	Above-ground diked	POL farm
417	JP-4	15,000 bbl	Above-ground diked	POL farm
418	JP-4	15,000 bbl	Above-ground diked	POL farm
491	MOGAS	595 bbl	Above-ground diked	POL farm
492	MOGAS	595 bbl	Above-ground diked	POL farm
493	MOGAS	595 bbl	Above-ground diked	POL farm
494	MOGAS	595 bbl	Above-ground diked	POL farm
495	MOGAS	595 bbl	Above-ground diked	POL farm
496	MOGAS	595 bbl	Above-ground diked	POL farm
497	DIESEL	476 bbl	Above-ground diked	POL farm
498	DIESEL	476 bbl	Above-ground diked	POL farm
499	DIESEL	476 bbl	Above-ground diked	POL farm
603	JP-TS	2-595 bbl ea	Underground	POL farm

TABLE D.7 (continued)

PETROLEUM STORAGE FACILITIES
BEALE AFB

Facility Number	Type of POL	Capacity	Description	Location
--	Heating Fuel Oil (DF-2)	3 ea - 1500, 1000, 550 gal	Above-ground (no dikes)	Bldg. 1069
--	Heating Fuel Oil (DF-2)	2 ea - 2000 gal	Above-ground (no dikes)	Bldg. 1074 - 1076
--	Heating Fuel Oil (DF-2)	3 ea - 2300 gal	Above-ground (no dikes)	Bldg. 2539
--	MOGAS	12,000, gal 10,000, gal 7,500, gal	Underground	Bldg. 362
--	MOGAS	3-10,000 gal	Underground	Bldg. 3300
1250	JP-4	5,000 gal	Above-ground diked for test cell	Flightline
1154	JP-7	2-10,000 gal	Above-ground diked for test cell	Flightline
1086	DIESEL	5000 gal 275 gal	Underground Above-ground	--
1015	DIESEL	1000 gal	Underground	--
1060	DIESEL	500 gal	Underground	--
1010	DIESEL	275 gal	Above-ground	--
5702	DIESEL	3000 gal	Underground	--
810	DIESEL	275 gal	Above-ground	--
510	MOGAS	500 gal	Underground	--
830	MOGAS	500 gal	Underground	--
800	DIESEL	275 gal	Above-ground	--

TABLE D.7 (continued)

PETROLEUM STORAGE FACILITIES
BEALE AFB

Facility Number	Type of POL	Capacity	Description	Location
815	DIESEL	500 gal	Underground	--
124	DIESEL	300 gal	Above-ground	--
1150	MOGAS	300 gal	Above-ground	--
1034	DIESEL	550 gal	Underground	--
2159	DIESEL	3000 gal	Underground	--
1430	MOGAS	300 gal	Underground	--
1324	DIESEL	3000 gal	Underground	--

TABLE D.8

CHANGES IN LEVELS OF CHEMICAL ELEMENTS IN SOIL AT THE INCINERATOR ASH RESIDUE SITE AFTER INCORPORATION OF THE RESIDUE BEALE AFB

Element	Incinerator Residue	Beale AF Base Soil	Soil Analysis After Blending Computed[1]	Tl_m for Fish (ppm)[2]
Aluminum	>10%	4.0%	4.01%	10
Arrenic	ND	ND	NC	2
Antimony	ND	ND	NC	10
Barium	500	10 ppm	10.45 ppm	100
Beryllium	ND	ND	NC	1
Boron	ND	ND	NC	1000
Bismuth	ND	ND	NC	--
Cadmium	ND	ND	NC	1
Calcium	1.0%	0.75%	NC	1000
Carbon	0.03%	0.77%	NC	--
Chromium	500 ppm	ND	0.467 ppm	10
Cobalt	ND	ND	NC	25
Copper	100 ppm	100 ppm	NC	1
Gallium	100 ppm	ND	0.092 ppm	100
Iridium	ND	10 ppm	NC	--
Iron	1.5%	0.5%	0.501%	5
Lead	20 ppm	ND	0.018 ppm	1
Lithium	75 ppm	5 ppm	5.06 ppm	100
Magnesium	0.75%	800 ppm	806 ppm	1000
Manganese	0.10%	0.2%	NC	50
Mercury	ND	ND	NC	0.1
Molybdenum	500 ppm	ND	0.459 ppm	70
Niobium	ND	ND	NC	--
Nickel	600 ppm	ND	0.550 ppm	5
Phosphorus	0.8%	ND	7.34 ppm	--
Potassium	2.5%	0.35%	0.352%	1000
Selenium	ND	ND	NC	2
Sodium	<0.5%	0.9%	NC	1000
Sulphur	ND	ND	NC	1000
Silicon	>10%	>10%	NC	--
Silver	2 ppm	4 ppm	NC	0.01
Rubidium	150 ppm	ND	0.137 ppm	--
Tantalum	ND	ND	NC	--
Tellurium	ND	100 ppm	NC	--
Tin	ND	ND	NC	5
Titanium	0.3%	0.1%	0.1%	10
Tungston	ND	ND	NC	--
Uranium	ND	ND	NC	5

TABLE D.8 (continued)

· NGES IN LEVELS OF CHEMICAL ELEMENTS IN SOIL
AT THE INCINERATOR ASH RESIDUE SITE AFTER
INCORPORATION OF THE RESIDUE

Element	Incinerator Residue	Beale AF Base Soil	Soil Analysis After Blending Computed (1)	TL_m for Fish (ppm) (2)
Vanadium	100 ppm	100 ppm	NC	10
Zinc	ND	ND	NC	1
Zirconium	ND	ND	NC	15

(1) Values computed by direct porportioning. Size plot considered: 1/2 acre by 0.5 feet depth. Weight of soil 100 lbs/ft^3.
(2) Data extracted from McKee & Wolf, Water Quality Criteria, Second Edition, 1963, State Water Quality Control Board, Sacramento, California.

NC - No change from background.
ND - Not detected.

Source: Letter to Donald Rothenbaum, California Regional Water Quality Board from General Niles Fulwyler, Director of Nuclear and Chemical, Department of the Army, November 5, 1980.

TABLE D.9

ANALYTICAL RESULTS OF SOIL SAMPLES FROM SPILL AREA
SOUTH OF STORAGE TANKS AT FIRE PROTECTION TRAINING AREA

MAY 19, 1983

OEHL Sample No.[2]	Sample No.[2]	Lead[1]	Chromium[1]	Hexavalent Chromium[1]
26966	GS830055	46.68	20.61	<0.2
26967	GS830056	1250.0	30.47	<0.2
26968	GS830057	9.66	11.65	<0.2
26969	GS930058	43.50	10.78	<0.2
26970	GS830059	347.0	16.85	<0.2
26971	GS830060	71.82	11.22	<0.2
26972	GS830061	61.20	10.12	<0.2
26973	GS830062	38.04	9.05	<0.2
26974	GS830063	22.62	10.60	<0.2
26975	GS830064	22.49	9.99	<0.2
26976	GS830065	18.87	10.44	<0.2
26977	GS830066	27.71	11.28	<0.2
26978	GS830067	378.0	9.94	<0.2
26979	GS830068	5.57	18.32	<0.2

(1) All results are reported as micrograms per gram of soil.

(2) Soil samples were taken from fire protection training basin, nearby drainage ditch and 100 feet south of south tank.

APPENDIX E

TENANT MISSIONS - BEALE AFB

APPENDIX E

TENANT MISSIONS - BEALE AFB

14TH AIR DIVISION

The mission of the 14th Air Division is that of the Strategic Air Command (SAC) of which it is a part. The SAC mission is to maintain a portion of SAC's force capable of preventing nuclear war by maintaining a strong deterrent posture; yet if war should come, to destroy the enemy's war making capability. The division performs three major functions of bombardment, air refueling and reconnaissance.

7TH MISSILE WARNING SQUADRON

The 7th Missle Warning Squadron is represented at Beale by the PAVE PAWS Sea Launched Ballistic Missile (SLBM) Detection and Warning system. This high priority Phased Array Warning System (PAWS) has a three-fold mission. The radar's primary and secondary missions are detection and warning of SLBM and ICBM attack make it a vital component of the North American Aerospace Defense Command's (NORAD) Tactical Warning and Attack Assessment system. The system's tertiary role supports the USAF SPACE-TRACK System by providing positional and velocity data on all earth orbiting satellites.

Although the system is operationally under the control of NORAD, it was initially placed under the administrative control of SAC.

1883RD COMMUNICATIONS SQUADRON, AIR FORCE COMMUNICATIONS COMMAND (AFCC)

The 1883rd Communications Squadron provides terminal air traffic control; navigation aids; and record and voice communications services for the 14th Air Division, 9th Strategic Reconnaissance Wing, 9th Combat Support Group and all tenant units on Beale AFB. The 1883rd Communications Squadron is part of the Air Force Communications Command (AFCC) with intermediate headquarters at Strategic Communications Division, Offutt AFB, Nebraska.

DETACHMENT 11, 9TH WEATHER SQUADRON (MAC)

Detachment 11 provides weather support to the 14 AD, 9 SRW and 7 MWS. Four off-base DOD facilities are supported by telephone briefings. Weather observers assigned to Detachment 11 provide current weather conditions to operations and control agencies. Sophisticated equipment measures and records cloud heights, temperature, dew point, surface wind, and runway visibility. Weather forecasters provide briefings and planning data for all flying activities on a world-wide basis. Observations and forecasts are entered into the global Automated Weather Network. Weather warnings and advisories are issued for severe or hazardous weather. Forecasts are based on experience, scientific reasoning and advanced computer products. Meteorological satellite data and weather radar reports aid in forecasting and flight briefings.

FIELD TRAINING DETACHMENT 525 (ATC)

FTD 525 located in Building 1086 is a detachment of 3785th Field Training Group located at Sheppard AFB, Texas. They are responsible for providing training to maintenance technicians assigned to 9 SRW on the KC-135Q, SR-71, TR-1/U2 and T-38. They also provide associate and aircrew training to the 9 SRW. Courses in Advanced Digital Techniques, Solid State and Integrated Circuit Devices, Basic Electronics and Soldering are available.

DETACHMENT 1901, AIR FORCE OFFICE OF SPECIAL INVESTIGATONS (AFOSI)

The Air Force Office of Special Investigations is a separate operating agency which provides criminal, fraud, counterintelligence and other special investigative services to all USAF activities world-wide. AFOSI Det. 1901 services Beale AFB and USAF interests in the 16 northernmost counties of California.

SAC MANAGEMENT ENGINEERING TEAM (SACMET)

The Beale SACMET is a detachment of the 3904th Management Engineering Squadron and reports directly to the Director of Manpower and Organization, DCS Plans, Headquarters SAC. SACMET constructs and implements manpower standards as directed by Headquarters USAF and/or SAC, and handles routine day-to-day manpower actions. SACMET also, upon request, provides management consultant services geared toward finding and implementing solutions to management problems.

AIR FORCE AUDIT AGENCY OFFICE

Air Force auditors provide all levels of management with an independent, objective and constructive evaluation of the effectiveness and efficiency of management. They help management achieve efficient administration of resources, including personnel, material and funds. Audits relate to the need, acquisition, custody, use and conservation of these resources.

AIR FORCE COMMISSARY SERVICE

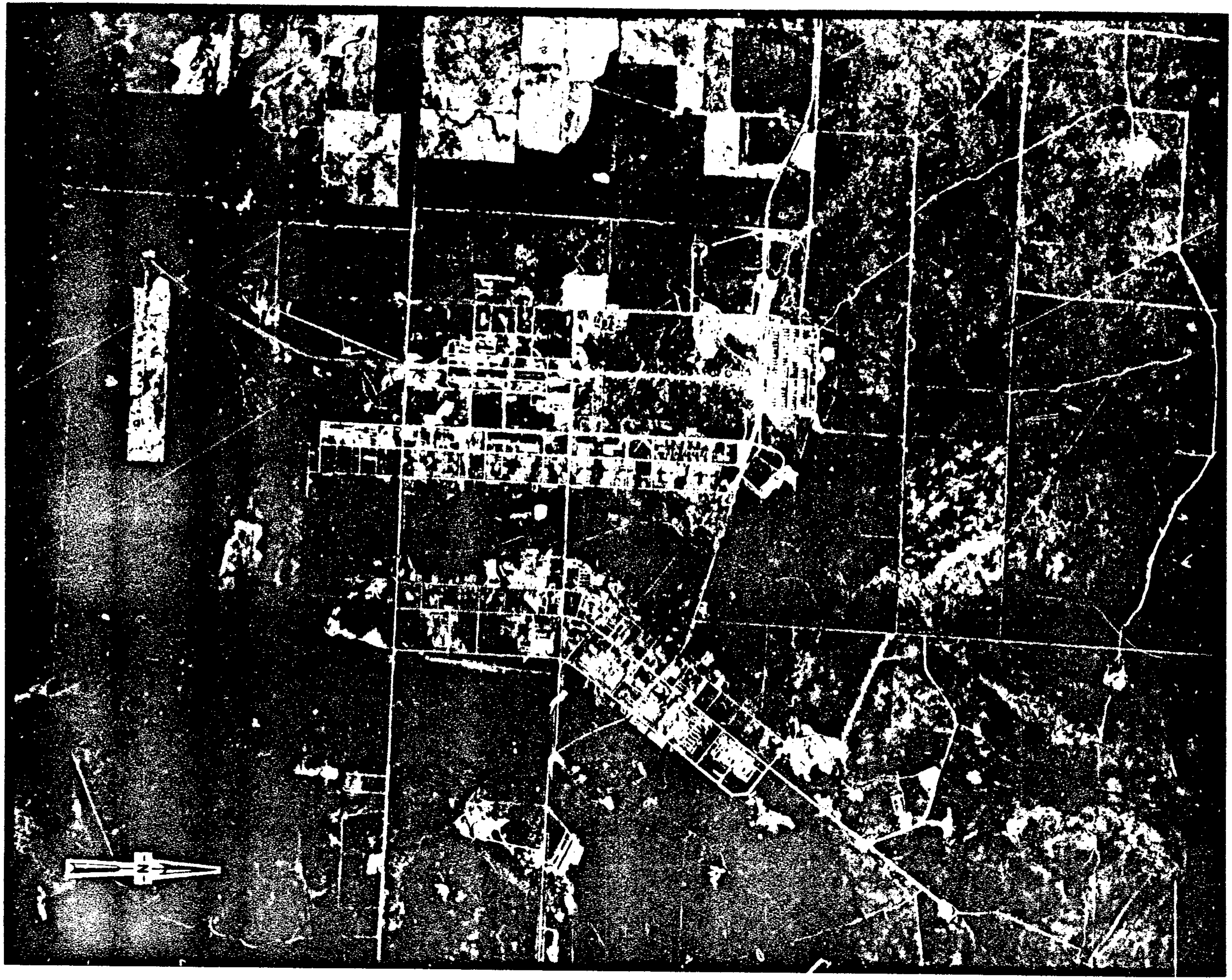
The Air Force Commissary Service's mission is to provide food service to all personnel on base.

U.S. POSTAL SERVICE

The U.S. Postal Service provides non-military postal services to the base.

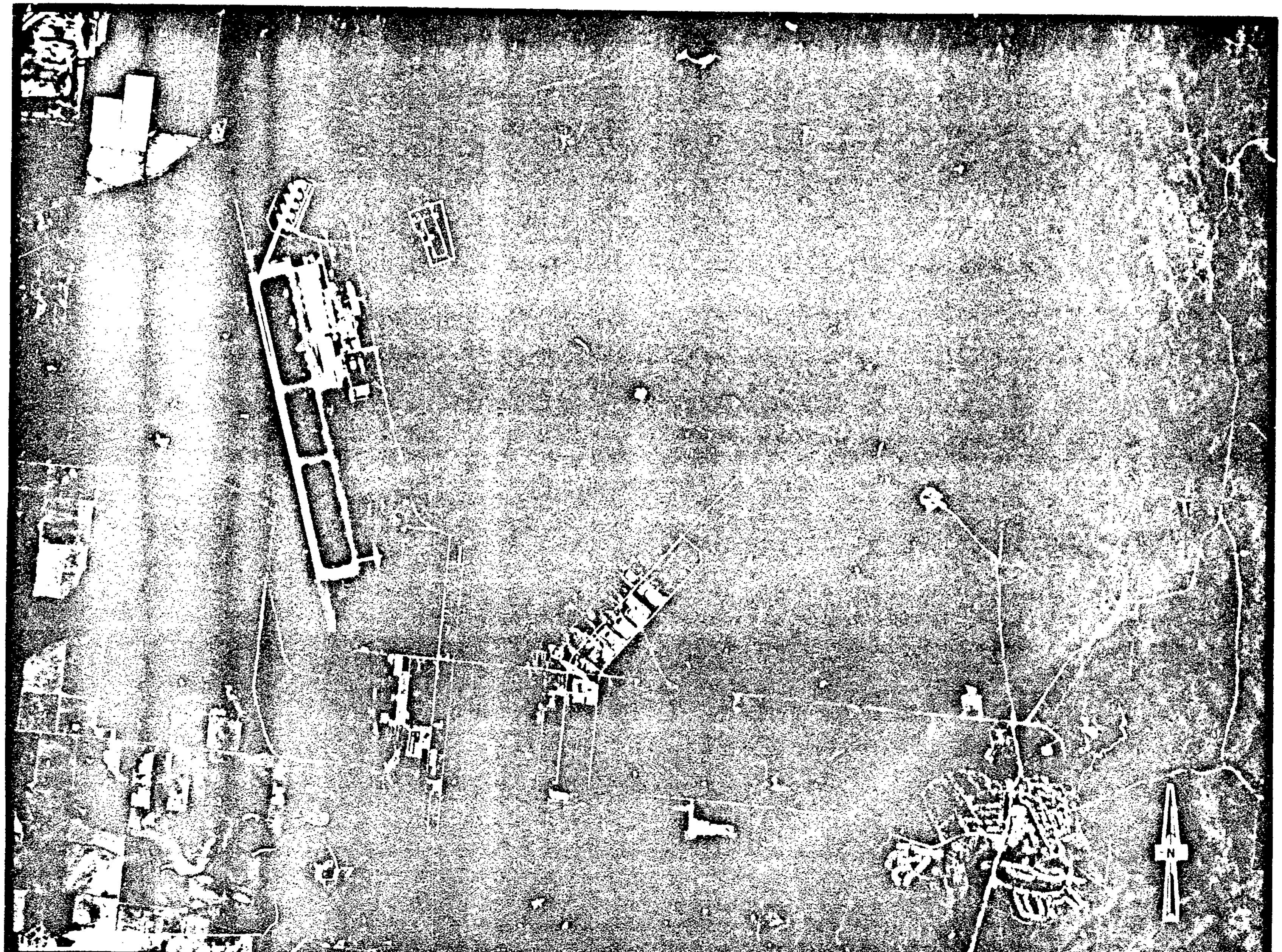
APPENDIX F

SITE PHOTOGRAPHS



BEALE AFB, CALIFORNIA

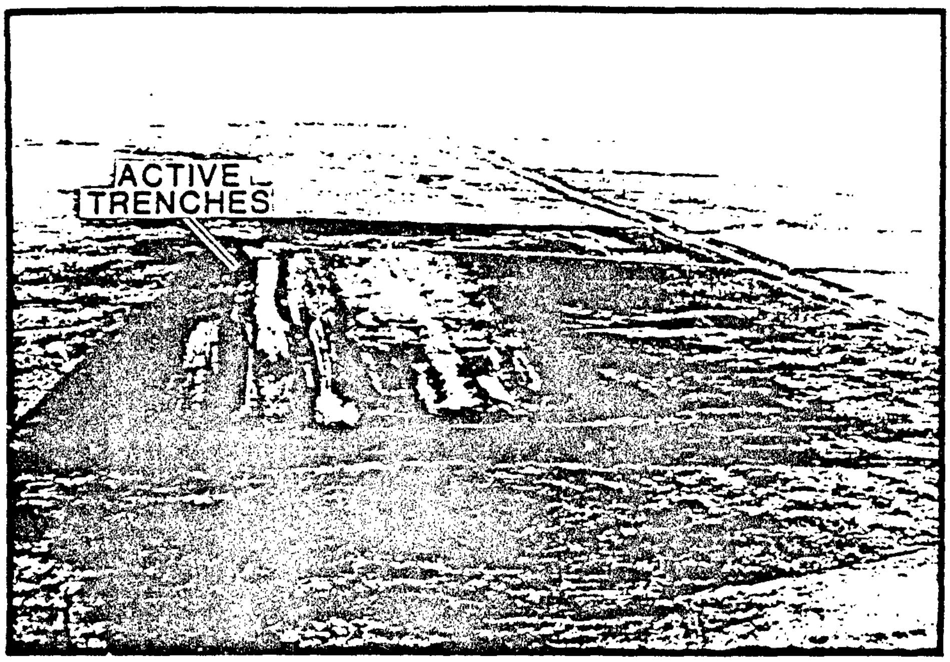
DECEMBER 28, 1953



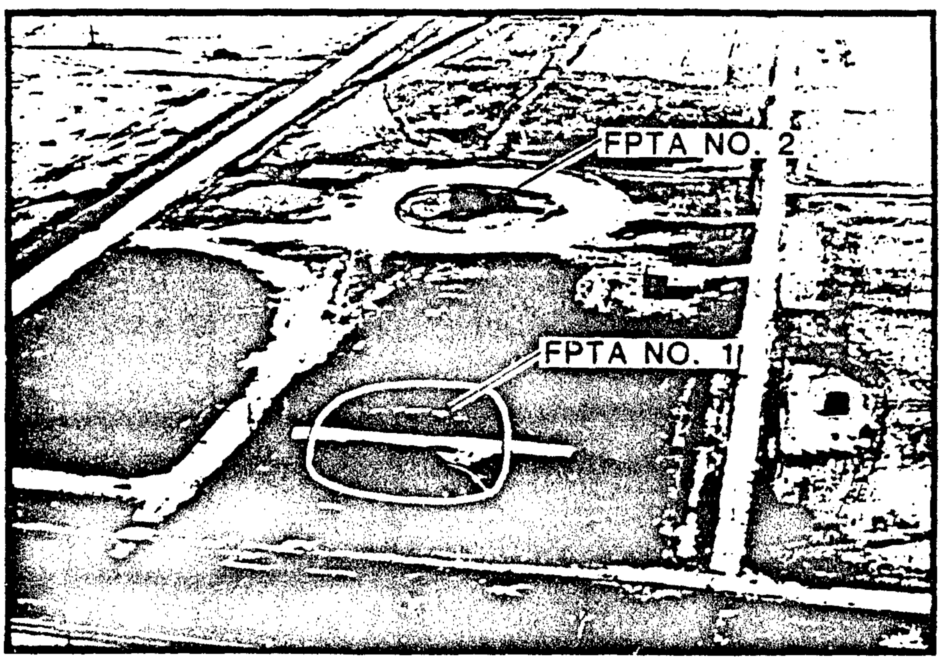
BEALE AFB, CALIFORNIA

MAY 3, 1982

BEALE AFB

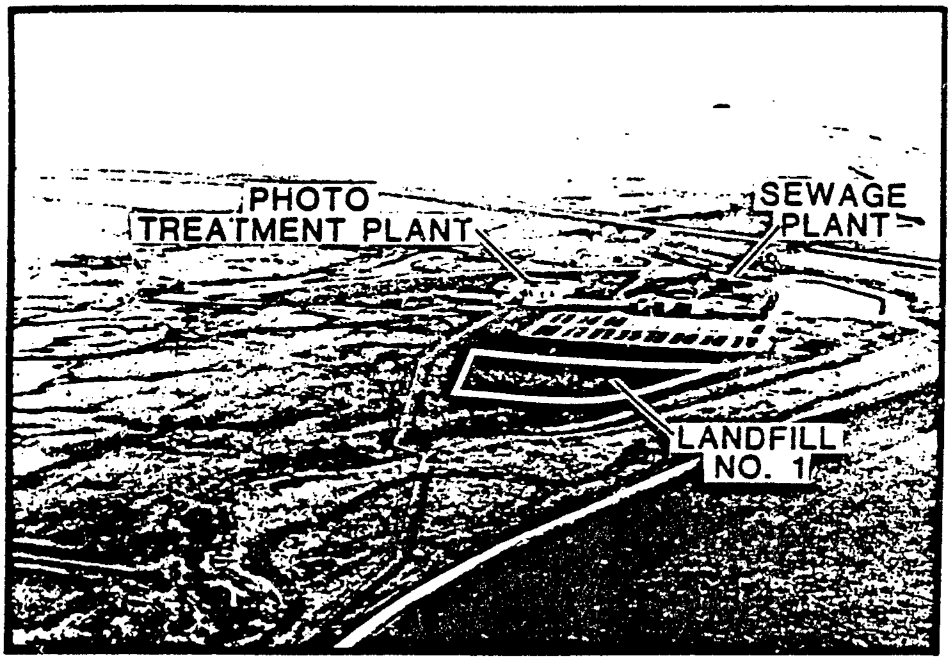


Landfill No. 3

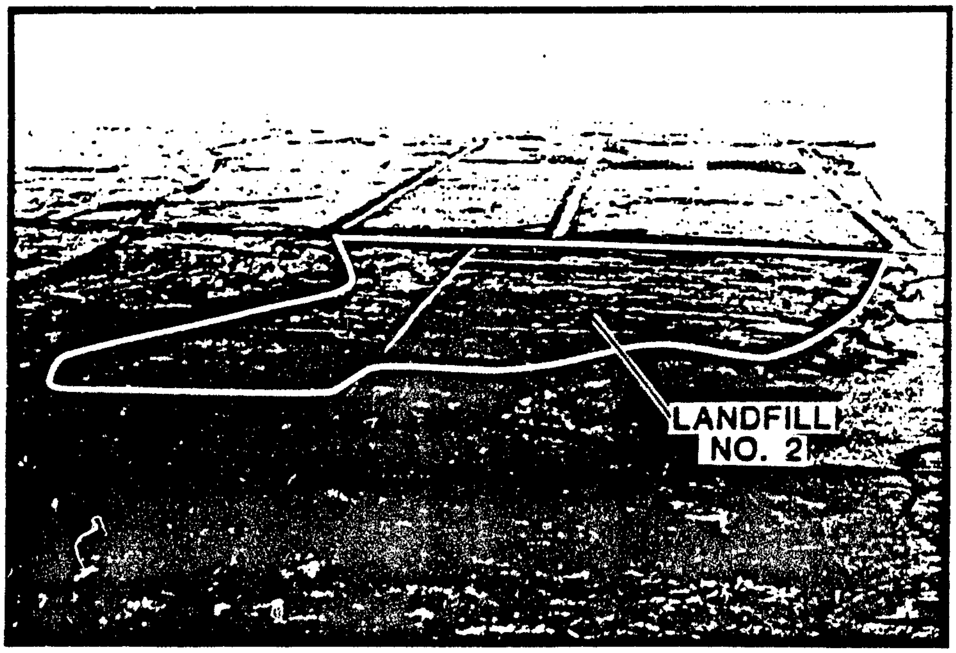


Fire Protection Training
Areas No. 1 and 2

BEALE AFB



Landfill No. 1, Sewage Treatment Plant and Photo Wastewater Treatment Plant



Landfill No. 2

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM

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 represenatives from USAF Occupational and Environmental Health Laboratory (OEHL), Air Force Engineering and Services Center (AFESC), Engineering-Science (ES) and CH2M 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 CH2M 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 the 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 Records 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

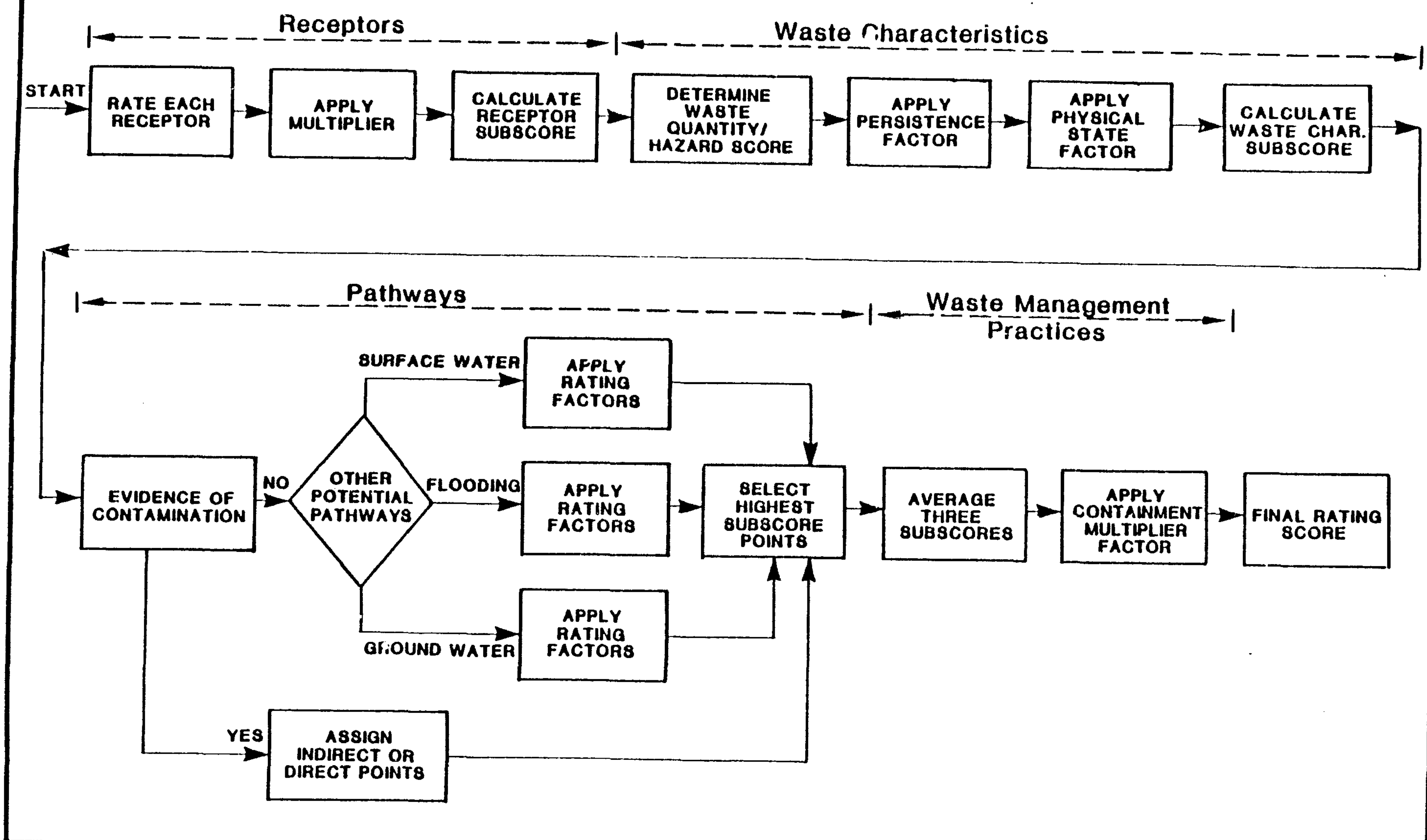


FIGURE 1

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 ______ = ______

FIGURE 2 (Continued)

III. PATHWAYS

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

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

Subscore ______

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

1. Surface water migration

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

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

2. Flooding

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

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		3		
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.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

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

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 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					
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1
B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION					
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

IV. WASTE MANAGEMENT PRACTICES CATEGORY

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

B. WASTE MANAGEMENT PRACTICES FACTOR

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

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

Guidelines for fully contained:

<u>Landfills:</u>

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

<u>Spills:</u>

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

<u>Surface Impoundments:</u>

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

<u>Fire Proection Training Areas:</u>

- 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

HAZARD ASSESSMENT RATING FORMS

APPENDIX H

TABLE OF CONTENTS

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: West Drainage Ditch - Discharge Area No.1 (DA-1)
Location: West of Runway
Date of Operation or Occurrence: 1965 to Present
Owner/Operator: Beale AFB
Comments/Description: Large amounts of oils

Site Rated by: C. Mangan

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			93	180

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

II. WASTE CHARACTERISTICS

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

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

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

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

100 x 1.00 = 100

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

100 x 1.00 = 100

III. PATHWAYS

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

Subscore 100

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

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			8	114
Subscore (100 x factor score subtotal/maximum score subtotal)				7

C. Highest pathway subscore.

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

Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	52
Waste Characteristics	100
Pathways	100
Total 252 divided by 3 =	84 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

84 x 1.00 = 84 FINAL SCORE

BEST AVAILABLE COPY

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Photo Waste Water Treatment Plant
Location: North of Sanitary Wastewater Treatment Plant
Date of Operation or Occurrence: 1966 to Present
Owner/Operator: Beale AFB
Comments/Description: Sludge dewatering ponds received hazardous waste, leaks in equalization basin gunited.

Site Rated by: C. Mangan

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			107	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 59

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 (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

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

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

100 x 1.00 = 100

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

100 x 1.00 = 100

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III. PATHWAYS

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 0

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			8	114
Subscore (100 x factor score subtotal/maximum score subtotal)				7

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

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

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

Receptors		59
Waste Characteristics		100
Pathways		67
Total	226 divided by 3 =	75 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

75 x 1.00 = 75

FINAL SCORE

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HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: PHOTO WASTE INJECTION WELL No. 2
Location: PHOTO WASTEWATER TREATMENT PLANT
Date of Operation or Occurrence: 1967-1984
Owner/Operator: BEALE AFB
Comments/Description:

Site Rated by: C. MANGAN

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			107	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 59

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 (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

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

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

100 x 0.90 = 90

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

90 x 1.00 = 90

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III. PATHWAYS

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 0

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			8	114
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 67

IV. WASTE MANAGEMENT PRACTICES

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

Receptors		59
Waste Characteristics		90
Pathways		67
Total	216 divided by 3 =	72 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

72 x 1.00 = 72

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HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Fire Training Areas No. 1 and No. 2
Location: Northeast of Taxiway No. 3
Date of Operation or Occurrence: 1960's to Present
Owner/Operator: Beale AFB
Comments/Description: Chemicals dumped into pit until late 1960's

Site Rated by: C. Mangan

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			71	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 39

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 (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

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

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

100 x 1.00 = 100

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

100 x 1.00 = 100

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III. PATHWAYS

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 0

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			8	114
Subscore (100 x factor score subtotal/maximum score subtotal)				7

C. Highest pathway subscore.

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

Pathways Subscore 54

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	39	
Waste Characteristics	100	
Pathways	54	
Total 193 divided by 3 =		64 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

64 x 1.00 = 64 FINAL SCORE

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HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Battery Repair Shop - Discharge Area No. 2 DA-2
Location: Building 1000
Date of Operation or Occurrence: Mid 1960's to 1983
Owner/Operator: Beale AFB
Comments/Description: Neutralized battery acid discharged to dry well

Site Rated by: C. Margan

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			76	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 42

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 (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

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

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

80 x 1.00 = 80

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 1.00 = 80

III. PATHWAYS

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 0

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			8	114
Subscore (100 x factor score subtotal/maximum score subtotal)				7

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

Pathways Subscore 54

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	42
Waste Characteristics	80
Pathways	54
Total 176 divided by 3 =	59 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

59 x 1.00 = 59 FINAL SCORE

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HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: SR71 Shelter Area Drainage Ditch - Discharge Area No. 3 (DA-3)
Location: East of Taxiway No. 10
Date of Operation or Occurrence: 1975 to Present
Owner/Operator: Beale AFB
Comments/Description: Fuel leakage runs off of taxiway into storm sewer

Site Rated by: C. Mangan

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi- plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			75	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 42

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 (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 2

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

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

80 x 0.80 = 64

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

64 x 1.00 = 64

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III. PATHWAYS

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 0

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			8	114
Subscore (100 x factor score subtotal/maximum score subtotal)				7

C. Highest pathway subscore.

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

Pathways Subscore 54

IV. WASTE MANAGEMENT PRACTICES

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

Receptors		42
Waste Characteristics		64
Pathways		54
Total	160 divided by 3 =	53 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

53 x 1.00 = 53 FINAL SCORE

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HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No.2
Location: South of 6th Street - adjacent to So. Earle Road
Date of Operation or Occurrence: Early 1950's to 1960
Owner/Operator: Beale AFB
Comments/Description: Burned daily until 1965 - received photo treatment plant sludge

Site Rated by: C. Mangan

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			91	180

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

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

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

50 x 1.00 = 50

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

50 x 0.75 = 38

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III. PATHWAYS

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 0

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			8	114
Subscore (100 x factor score subtotal/maximum score subtotal)				7

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

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

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

Receptors		51
Waste Characteristics		38
Pathways		67
Total	155 divided by 3 =	52 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

52 x 1.00 = 52

FINAL SCORE

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HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: U.S.Army Biological Testing Site - Discharge No. 4 (DA-4)
Location: Southeast of Sanitary Wastewater Treatment Plant
Date of Operation or Occurrence: 1962 - 1969
Owner/Operator: Beale AFB
Comments/Description: Testing of wheat stem rust - ethylene oxide and possibly TCE used at site

Site Rated by: C. Mangan

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			107	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 59

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 (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 1

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

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

30 x 1.00 = 30

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

30 x 1.00 = 30

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III. PATHWAYS

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 0

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			8	114
Subscore (100 x factor score subtotal/maximum score subtotal)				7

C. Highest pathway subscore.

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

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

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

Receptors		59
Waste Characteristics		30
Pathways		67
Total	156 divided by 3 =	52 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

52 x 1.00 = 52 FINAL SCORE

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HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: J-57 Test Cell - Discharge Area No. 6 (DA-6)
Location: Building 11-7
Date of Operation or Occurrence: 1960's to Present
Owner/Operator: Beale AFB
Comments/Description: Oily runoff discharged to ditch

Site Rated by: B. Moreth

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	[illegible]	[illegible]
D. Distance to reservation boundary	1	5	[illegible]	[illegible]
E. Critical environments within 1 mile radius of site	0	10	[illegible]	[illegible]
F. Water quality of nearest surface water body	1	5	[illegible]	[illegible]
G. Ground water use of uppermost aquifer	2	9	[illegible]	[illegible]
H. Population served by surface water supply within 3 miles downstream of site	0	5	[illegible]	[illegible]
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			76	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 42

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 (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

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

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

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.00 = 60

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Name of Site: J-57 Test Cell

III. PATHWAYS

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 0

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			8	114
Subscore (100 x factor score subtotal/maximum score subtotal)				7

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

Pathways Subscore 54

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	42
Waste Characteristics	60
Pathways	54
Total 156 divided by 3 =	52 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

52 x 1.00 = 52 FINAL SCORE

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HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: ENTOMOLOGY WASH WATER DISCHARGE AREA - DISCHARGE AREA No. 3 (DA-3)
Location: BLDG. 2560
Date of Operation or Occurrence: 1981-PRESENT
Owner/Operator: BEALE AFB
Comments/Description: TANK WASH DISCHARGE TO GROUND

Site Rated by: C. MANGAN

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi- plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	0	10	0	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundry	1	6	6	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			69	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 38

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 (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

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

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

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.00 = 60

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III. PATHWAYS

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 0

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			8	114
Subscore (100 x factor score subtotal/maximum score subtotal)				7

C. Highest pathway subscore.

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

Pathways Subscore 54

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	38		
Waste Characteristics	60		
Pathways	54		
Total	152 divided by 3 =	51	Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

51 x 1.00 = 51

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HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: [illegible] Test Cell - Discharge Area No. 3 (DA-3)
Location: Building [illegible]
Date of Operation or Occurrence: 1960's to Present
Owner/Operator: Beale AFB
Comments/Description: Oily runoff to ditch - TCE used in 60's for general cleanup

Site Rated by: B. Moreth

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			55	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 31

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 (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

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

B. Apply persistance factor
Factor Subscore A x Persistance Factor = Subscore B

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.00 = 60

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III. PATHWAYS

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 0

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			8	114
Subscore (100 x factor score subtotal/maximum score subtotal)				7

C. Highest pathway subscore.

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

Pathways Subscore 54

IV. WASTE MANAGEMENT PRACTICES

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

Receptors 26
Waste Characteristics 70
Pathways 54
Total 150 divided by 3 = 50 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

50 x 1.00 = 50 FINAL SCORE

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HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: ENTOMOLOGY SHOP BLDG. 440 - DISCHARGE AREA No. 12
Location: ADJACENT TO BLDG. 440
Date of Operation or Occurrence: 1955-1980
Owner/Operator: BEALE AFB
Comments/Description: MIXING AREA - S.E. CORNER OF BLDG., DRAIN AREA - 50 FT. EAST OF BLDG.

Site Rated by: C. MANGAN

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundry	1	6	6	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			72	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 40

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 (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

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

B. Apply persistance factor
Factor Subscore A x Persistance Factor = Subscore B

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.00 = 60

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III. PATHWAYS

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 0

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			8	114
Subscore (100 x factor score subtotal/maximum score subtotal)				7

C. Highest pathway subscore.

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

Pathways Subscore 54

IV. WASTE MANAGEMENT PRACTICES

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

Receptors		38
Waste Characteristics		60
Pathways		54
Total	152 divided by 3 =	51 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

51 x 1.00 = 51

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HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: AGE Maintenance Area and Drainage Ditch - Discharge Area No. 7 (DA-7)
Location: Building 1025
Date of Operation or Occurrence: 1960's to Present
Owner/Operator: Beale AFB
Comments/Description: Oily run off from maintenance and cleaning of Ground Equipment

Site Rated by: B. Moreth

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			76	[illegible]

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

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 (1=small, 2=medium, 3=large)	1
2. Confidence level (1=confirmed, 2=suspected)	1
3. Hazard rating (1=low, 2=medium, 3=high)	3

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

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

60 x 0.80 = 48

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 1.00 = 48

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III. PATHWAYS

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 0

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			8	114
Subscore (100 x factor score subtotal/maximum score subtotal)				7

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

Pathways Subscore 54

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	42	
Waste Characteristics	48	
Pathways	54	
Total	144 divided 3 =	48 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

46 x 1.00 = [illegible] FINAL SCORE

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HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 1
Location: West of existing Sanitary Wastewater Treatment Plant
Date of Operation or Occurrence: Early 1940's
Owner/Operator: Beale AFB
Comments/Description: Operated during early 1940's - identified from aerial photos.

Site Rated by: C. Mangan

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			107	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 59

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 (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 2
3. Hazard rating (1=low, 2=medium, 3=high) 1

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

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

20 x 0.80 = 16

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

16 x 1.00 = 16

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III. PATHWAYS

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 0

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	12
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			8	114
Subscore (100 x factor score subtotal/maximum score subtotal)				7

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

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	59
Waste Characteristics	15
Pathways	67
Total 142 divided by 3 =	47 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

47 x 1.00 = 47 FINAL SCORE

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HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Transformer Oil Drainage Area - Discharge Area No. [illegible]
Location: On 34th Street between A and B Streets
Date of Operation or Occurrence: [illegible]
Owner/Operator: Beale AFB
Comments/Description: Received quantities of transformer oils

Site Rated by: C. Mangan

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	0	10	0	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			69	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 38

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 (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 2
3. Hazard rating (1=low, 2=medium, 3=high) 3

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

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

40 x 1.00 = 40

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.00 = 40

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III. PATHWAYS

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 0

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.

Rating Factor	Factor Rating (0-3)	Multi- plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			8	114
Subscore (100 x factor score subtotal/maximum score subtotal)				7

C. Highest pathway subscore.

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

Pathways Subscore 54

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	38
Waste Characteristics	40
Pathways	54
Total 132 divided by 3 =	44 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

44 x 1.00 = 44 FINAL SCORE

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HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 3
Location: South of 5th Street - About 4000 feet east of A Street
Date of Operation or Occurrence: 1981 - Present
Owner/Operator: Beale AFB
Comments/Description: Received small amounts of drums of chemicals

Site Rated by: C. Mangan

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			91	180

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

II. WASTE CHARACTERISTICS

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

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

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

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

20 x 1.00 = 20

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

20 x 1.00 = 20

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III. PATHWAYS

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 0

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			50	108
Subscore (100 x factor score subtotal/maximum score subtotal)				46
2. Flooding	1	1	1	3
Subscore (100 x factor score/3)				33
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			8	114
Subscore (100 x factor score subtotal/maximum score subtotal)				7

C. Highest pathway subscore.

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

Pathways Subscore 46

IV. WASTE MANAGEMENT PRACTICES

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

Receptors		51
Waste Characteristics		20
Pathways		46
Total	117 divided by 3 =	39 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

39 x 1.00 = 39 FINAL SCORE

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APPENDIX I

REFERENCES

APPENDIX I
REFERENCES

Aetron and Hydrodevelopment, Inc., 1965, Processing Waste-disposal System, Feasibility Study - Phase II, Beale Air Force Base, California, Fairchild Space and Defence Systems, Covina, Bakersfield, Los Angeles, and Sacramento, California; No. 3092/ 15 October.

Bertoldi, G.L., 1974, Estimated Permeabilities for Soils in the Sacramento Valley, California; U.S. Geological Survey, Water-Resources Investigations 51-73.

CIMIS, 1984; California Irrigation Management Information System, Davis, California.

Dickinson, W.R. and E.I. Rich, 1972, Petralogic Intervals and Petrofacies in the Great Valley Sequence, Sacramento Valley, California, Geological Society of America Bulletin, V:83.

DWR, California Department of Water Resources, 1978, Evaluation of Groundwater Resources: Sacramento Valley; in cooperation with the U.S. Geological Survey, Bulletin 118-6, August.

DWR, California Department of Water Resources, 1980, Groundwater Basins in California, A Report to the Legislature in Response to Water Code Section 12924, Bulletin 148-80, January.

Herbert, F.W. and Begg, E.L., 1969, Soils of the Yuba Area California, University of California, Davis, Department of Soils and Plant Nutrition, in Cooperation with County of Yuba, California.

Jenkins, O.P., 1965, Geologic Map of California, Chico Sheet; California Division of Mines and Geology; Scale 1:250,000.

Jennings, C.W., 1975, Fault Map of California, California Division of Mines and Geology.

National Oceanic and Atmospheric Administration, 1963. Rainfall Frequency Atlas of the United States, Technical Paper No. 40. National Climatic Center, Asheville, North Carolina.

Olmsted, F.J. and Davis, G.H., 1961, Geologic Features and Groundwater Storage Capacity of the Sacramento Valley, California; U.S. Geological Survey Water-Supply Paper 1497.

Ornduff, Robert, 1974, Introduction to California Plant Life, University of California Press, Berkeley.

Page, R.W., 1974, Base and Thickness of the Post-Eocene Continental Deposits in the Sacramento Valley, California; U.S. Geological Survey Water-Resources Investigations.

Page, R.W., 1980, Groundwater Conditions at Beale Air Force Base and Vicinity, California, U.S. Geological Survey Open-File Report 80-204.

Rockwell, Gerald, 1978, Description of Wells at Beale Air Force Base and Vicinity, California; U.S. Geological Survey Open-File Report 78-10.

SCS Engineers. Photo Wastewater Disposal System-Beale Air Force Base, California. September 15, 1982.

Shaw, C., 1983. California Department of Fish and Game Planning Branch, Sacramento, California.

APPENDIX J
GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

APPENDIX J
GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

ABG: Air Base Group.

ACFT MAINT: Aircraft Maintenance.

ADC: Air Defense Command.

AF: Air Force.

AFB: Air Force Base.

AFCS: Air Force Communications Service.

AFESC: Air Force Engineering and Services Center.

AFR: Air Force Regulation.

AFRES: Air Force Reserve.

AFS: Air Force Station.

AFSC: Air Force Systems Command.

AGE: Aerospace Ground Equipment.

AGS: Aircraft Generation Squadron.

ALLUVIUM: Materials eroded, transported and deposited by streams.

ALLUVIAL FAN: A fan-shaped deposit formed by a stream either where it issues from a narrow mountain valley into a plain or broad valley, or where a tributary stream joins a main stream.

AMS: Avionics Maintenance Squadron

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

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

AQUITARD: A geologic unit which impedes ground-water flow.

ATC: Air Training Command.

AVGAS: Aviation Gasoline.

BES: Bioenvironmental Engineering Services.

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

BOWSER: Metal tank mounted on 4 wheels and used to collect liquid wastes including contaminated fuels, hydraulic fluids, etc.

CAMS: Consolidated Aircraft Maintenance Squadron.

Cd: Chemical symbol for cadmium.

CE: Civil Engineering.

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act.

CES: Civil Engineering Squadron.

CIRCA: About; used to indicate an approximate date.

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

CMS: Component Maintenance Squadron.

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

COE: Corps of Engineers.

COMD: Command.

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

CONFINING UNIT: An aquitard or other poorly permeable layer which restricts the movement of ground water.

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

CONUS: Continental United States.

CRS: Component Repair Squadron.

CSG: Combat Support Group.

Cu: Chemical symbol for copper.

DET: Detachment.

DIP: The angle at which a stratum is inclined from the horizontal.

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

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

DOD: Department of Defense.

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

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

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

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

EMS: Equipment Maintenance Squadron.

EOD: Explosive Ordnance Disposal.

EP: Extraction Procedure, the EPA's standard laboratory procedure for leachate generation.

EPA: U.S. Environmental Protection Agency.

EPHEMERAL AQUIFER: A water-bearing zone typically located near the surface which normally contains water seasonally.

EROSION: The wearing away of land surface by wind, water, or chemical processes.

FAA: Federal Aviation Administration.

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

FAULT: A fracture in rock along which the adjacent rock surfaces are differentially displaced.

Fe: Chemical symbol for iron.

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

FLOW PATH: The direction or movement of ground water as governed principally by the hydraulic gradient.

FMS: Field Maintenance Squadron.

FPTA: Fire Protection Training Area.

FT: Fire Training Area.

GATR: Ground to Air Transmitter Receiver Site.

GC/MS: Gas chromatograph/mass spectrophotometer, a laboratory procedure for identifying unknown compounds.

GLACIAL TILL: Unsorted and unstratified drift consisting of clay, sand, gravel and boulders which is deposited by or underneath a glacier.

GROUND WATER: Water beneath the land surface in the saturated zone that is under atmospheric or artesian pressure.

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

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

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, or disposed of, or otherwise managed.

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

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

Hg: Chemical symbol for mercury.

HQ: Headquarters.

HWS: Hazardous Waste Storage.

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

INFILTRATION: The movement of water through the soil surface into the ground.

IRP: Installation Restoration Program.

JPTS: Jet Propulsion. (Fuel used for U-2 aircraft.) Low flash point.

JP-4: Jet Propulsion Fuel Number Four. Low flash point.

JP-7: Jet Propulsion Fuel Number Seven. High flash point.

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

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

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

LOX: Liquid Oxygen.

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

MAC: Military Airlift Command.

MAINT: Recording System Maintenance.

MATS: Military Air Transport Service.

MAW: Military Airlift Wing.

MEK: Methyl Ethyl Ketone.

MGD: Million Gallons per Day.

MOA: Military Operating Area.

MOGAS: Motor gasoline.

Mn: Chemical symbol for manganese.

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

MORAINE: An accumulation of glacial drift deposited cheifly by direct glacial action and possessing initial constructional form independent of the floor beneath it.

MSL: Mean Sea Level. The reference MSL used by the U.S. Geological Survey is the MSL of 1929 (also referred to as NGVD of 1929).

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

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

NCO: Non-commissioned Officer.

NCOIC: Non-commissioned Officer In-Charge.

NDI: Non-destructive Inspection.

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

NGVD: National Geodetic Vertical Datum of 1929. The NGVD of 1929 is the mean sea level elevation of 1929.

NON-CALCAREOUS: Not bearing calcium carbonate ($CaCO_3$) a characteristic mineral of marine paleoenvironment.

NPDES: National Pollutant Discharge Elimination System.

OEHL: Occupational and Environmental Health Laboratory.

OIC: Officer-In-Charge.

OMS: Organizational Maintenance Squadron.

OPNS: Operations.

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

OSI: Office of Special Investigations.

O&G: Symbols for oil and grease.

PAVE PAWS: A radar system capable of detecting SLBM and ICBM attack.

PCB: Polychlorinated Biphenyl; liquids used as a dielectrics in electrical equipment.

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

PERMEABILITY: The capacity of a porous rock, soil or sediment for transmitting a fluid without damage to the structure of the medium.

PD-680: Cleaning solvent.

pH: Negative logarithm of hydrogen ion concentration.

PL: Public Law.

PMEL: Precision Measurement Equipment Lab.

POL: Petroleum, Oils and Lubricants.

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

POTENTIALLY ACTIVE FAULT: A fault along which movement has occurred within the last 25-million years.

POTENTIOMETRIC SURFACE: The imaginery surface to which water in an artesian aquifer would rise in tightly screened wells penetrating it.

PPB: Parts per billion by weight.

PPM: Parts per million by weight.

PSIG: Pounds per square inch gage - reading from a pressure indicator.

PRECIPITATION: Rainfall.

QUATERNARY MATERIALS: The second period of the Cenozoic geologic era, following the Tertiary, and including the last 2-3 million years.

QUICKTRANS: Automated Terminal Service.

RCRA: Resource Conservation and Recovery Act.

RECHARGE AREA: A surface area in which surface water or precipitation percolates through the unsaturated zone and eventually reaches the zone of saturation. Recharge areas may be natural or manmade.

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

RTS: Reconnaissance Technical Squadron.

RWDS: Radioactive Waste Disposal Site.

SAC: Strategic Air Command.

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

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

SCS: U.S. Department of Agriculture Soil Conservation Service.

SEISMICITY: Pertaining to earthquakes or earth vibrations.

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

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

SP: Spill area.

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

SS: Supply Squadron.

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

STP: Sewage Treatment Plant.

TAC: Tactical Air Command.

TACC: Tactical Air Control Center.

TASS: Tactical Air Support Squadron.

TCA: 1,1,1,-Tetrachloroethane.

TCE: Trichloroethylene.

TDS: Total Dissolved Solid, a water quality parameter.

TFW: Tactical Fighter Wing.

TIDAL STRIP: Physiographic subdivision commonly associated with (ocean) wave activity. Usually includes berms, beach ridges, tidal flats and related landforms typically produced by coastal erosional and depositional processes.

TOC: Total Organic Carbon.

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

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

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

TS: Transportation Squadron.

TSD: Treatment, storage or disposal.

TTW: Technical Training Wing.

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

USAF: United States Air Force.

USAFSS: United States Air Force Security Service.

USFWS: United States Fish and Wildlife Service.

USGS: United States Geological Survey.

USGS WELL NUMBERING SYSTEM: The well-numbering system used by the Geological Survey in California indicates the location of wells according to the rectangular system for the subdivision for public lands. For example, in the number 15N/4E-24K1, the part of the number preceding the slash indicates the township (T. 15 N.); the number after the slash the range (R. 4 E.); the digits after the hyphen the section (sec. 24); and the letter after the section number the 40-acre subdivision of the section as indicated on the diagram below. Within each 40-acre tract the wells are numbered serially as indicated by the final digit of the well number. Thus, well 15N/4E-24K1 was the first well to be listed in NW 1/4 SE 1/4 sec 24. For wells not located in the field by the Geological Survey, the final digit has been omitted. The entire study area is north and east of the Mount Diablo base line and meridian.

USMC: United States Marine Corps.

USN: United States Navy.

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

WWTP: Wastewater Treatment Plant.

Zn: Chemical symbol for zinc.

APPENDIX K

INDEX OF REFERENCES TO POTENTIAL CONTAMINATION SOURCES

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