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The Resource Conservation and Recovery Act of 1976 (RCRA) was promulgated to regulate the generation, transportation, storage, treatment and disposal of hazardous wastes. Simultaneous to the passage of RCRA, the Department of Defense (DOD) devised a Comprehensive Installation Restoration Program (IRP) to identify, assess and correct potential environmental deficiencies that could result in groundwater contamination and probable migration of contaminants beyond DOD installation boundaries. The IRP has been developed as a four phase program:

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Phase I	-	Problem Identification/Records Search
Phase II	-	Problem Confirmation and Quantification
Phase III	-	Technology Base Development
Phase Iv	-	Corrective Action

Engineering-Science was retained by the Air Force to conduct the Hill AFB Records Search.

Past and present waste generation sources at the base are reviewed through interviews with personnel and file searches. Thirteen areas located on Air Force property are identified as warranting further evaluation in the study. These sites are then assessed using a rating system which takes into account factors such as site characteristics, waste characteristics, potential for contaminant migration and waste management practices. Recommendations are then made as to what actions should be taken at these sites for the Phase II of the IRP at Hill AFB.

INSTALLATION RESTORATION PROGRAM
PHASE I: RECORDS SEARCH
HILL AFB, UTAH

Prepared For

UNITED STATES AIR FORCE
AFESC/DEV
Tyndall AFB, Florida

January, 1982

By

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The Resource Conservation and Recovery Act of 1976 (RCRA) was promulgated to regulate the generation, transportation, storage, treatment and disposal of hazardous wastes. Simultaneous to the passage of RCRA, the Department of Defense (DOD) devised a Comprehensive Installation Restoration Program (IRP) to identify, assess and correct potential environmental deficiencies that could result in ground water contamination and probable migration of contaminants beyond DOD installation boundaries. The IRP has been developed as a three phase program:

- Phase I - Problem Identification/Records Search,
- Phase II - Problem Confirmation and Quantification, AND
- Phase III - Corrective Action.

Engineering-Science (ES) was retained by the Air Force Engineering and Services Center on 15 July 1981, to conduct the Hill AFB Records Search under Contract No. F08637-80-G0009, Call No. 0011, using funding provided by the Air Force Logistics Command.

The on-site portion of Phase I was performed at Hill AFB on September 3 and 4, and September 21 through September 25, 1981. During this period formal interviews were conducted with base personnel familiar with past waste disposal practices, and file searches were performed for identified facilities which have generated, handled, transported, and disposed of waste materials.

INSTALLATION DESCRIPTION

Hill AFB is located in northern Utah approximately 25 miles north of Salt Lake City and 5 miles south of Ogden. The base covers nearly 6,666 acres and is situated on a plateau which is approximately 300 feet above the valley floor. The base is bordered on the west by Interstate 15, the south by State Route 193, and the northeast and north by the Davis & Weber Canal.

ENVIRONMENTAL SETTING

As a result of our on-site visit, the following observations have been made with regard to the environmental sensitivity of Hill AFB:

- The primary regional aquifer, the Delta Aquifer, underlies Hill Air Force Base at great depth (418-515 feet). The Delta Aquifer is confined by thick clay layers overlying it.
- Hill Air Force Base and most adjacent municipalities obtain water supplies from wells screened into the Delta Aquifer. An exception to this is the shallow aquifer at Roy, west of Hill AFB.
- Area precipitation is 18.9 inches and evapotranspiration averages 40 inches. Soils tend to be moderately permeable.
- The Davis & Weber Canal marks the northeastern and northern perimeter of the base boundry and provides a potential for surface water contamination.

Based on these regional characteristics, it is concluded that the potential for the migration of contamination to deep aquifers, caused by past waste disposal practices is low. With regard to the shallow aquifer at Roy, it is unlikely that installation-generated contamination would impact local ground water quality because of the following:

- the localized extent of the shallow aquifer
- the isolation of the aquifer from the ground surface by a confining layer
- the aquifer is four miles from the bases' waste sites and separated by a vertical distance of some 300 feet.

Perched water tables are known to develop locally in the study area due to the presence of near-surface clay layers at shallow depths. These clay layers tend to impede the downward migration of infiltrating precipitation, which then may flow downdip along the clay layer, emerging at a point where the clay intersects the topographic surface as springs. Installation-generated contamination would thus typically appear in these springs before contaminating under lying aquifers.

PROCEDURES

A review of past and present waste generation sources at the base was conducted to determine past disposal methods for hazardous wastes. This review included industrial shop areas, pesticide and herbicide utilization, radioactive waste sources, fire control training area, hazardous waste storage areas and Fuels Management areas. Past and present waste materials were identified and the disposal methods used for each source were determined according to base records or interviews. The waste management facilities included on-site landfills (five sites), evaporation ponds, wastewater treatment plants, sanitary sewers, storm sewers, septic tanks, and off-site waste contract disposal.

Thirteen areas located on Air Force property were identified as warranting further evaluation into this study. These sites were assessed using a rating system which takes into account factors such as site characteristics, waste characteristics, potential for contaminant and waste management practices. The details of the rating procedure are presented in Appendix F and the results of the assessment are given in Table 1. Rating scores were developed for the individual sites and the sites are listed in order of ranking. The rating system is designed to indicate the relative need for more detailed site assessment under Phase II.

FINDINGS AND CONCLUSIONS

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

Landfills

a. Landfill No. 4 has the greatest potential for off-site migration of contaminants and has received a score of 77.

b. Landfill No. 3 received a score of 70 because it received large quantities of industrial sludge and chemicals; however, no specific leachate has been observed coming from this area.

TABLE 1

SUMMARY RANKING OF POTENTIAL CONTAMINATION SOURCES

RANK	SITE NAME	PERIOD OF OPERATION	SCORE
1	Landfill No. 4	1967-1973	77
2	Chemical Disposal Pit No. 1 & 2	1954-1973	72
3	Landfill No. 3	1947-1967	70
4	Sodium Hydroxide Leak	1980[1]	62
5	Berman Pond	1940-1956	61
6	IWTP - Drying Beds	1956-1976	57
7	Chemical Disposal Pit No. 3	1967-1975	56
8	Little Mtn. - Drying Beds	1973-1978	53
9	Fire Training Area No. 1	1958-1973	50
10	Landfill No. 5	1977-Present	43
11	Landfill No. 2	1963-1965	40
12	Landfill No. 1	1955-1967	38
13	Herbicide Orange Test Plot	1973[2]	20

[1] Leak occurred over a 12 month period.

[2] Small scale test procedure conducted on a remote portion of the Utah Test and Training Range.

c. Landfill No. 5, the hazardous waste landfill located at Lakeside, received a score of 43 because of its remote location from population and distance from the base boundary.

Chemical Disposal Pits

a. Chemical Disposal Pits No. 1 and No. 2 received a combined score of 72 because they received large quantities of solvents, oils and paint strippers.

b. Chemical Disposal Pit No. 3, which was operated from 1967 to 1975, received large quantities of TCE bottoms from the solvent recovery unit and vapor degreasers and received a rating of 56.

Leak Incident

The only major leak incident which has been identified is a sodium hydroxide leak at the industrial wastewater treatment plant occurred in 1980. This leak received a score of 62.

Evaporation Pond

Berman Pond received industrial plating wastewater from 1940 to 1956. The site received a score of 61 because of its potential for contaminant migration.

Sludge Drying Beds

a. The sludge drying beds located at the industrial wastewater treatment plant were operated from 1956 to 1976. During that time they received large quantities of metallic sludges. Filtrate from the sludge entered the ground and could possibly have contaminated the ground water. The site received a score of 57.

b. Sludge drying beds located adjacent to the industrial water treatment plant at Little Mountain were utilized in the 70's as a disposal area for phenolic paint strippers. The site received a score of 53.

Fire Training Area

Fire Training Area No. 1 received a score of 50.

Herbicide Orange Test Plot

The Herbicide Orange Test Plot area located adjacent to target 21 at the UTTR received a score of 20. The testing was on a very small scale, and the test area is remote, received small amounts of chemical and has soils which are relatively impermeable. The site poses little or no contamination potential.

RECOMMENDATIONS

The following recommendations are made to further assess potential for contaminant migration from waste disposal areas at Hill Air Force Base. The recommended monitoring program for Phase II is summarized as follows:

Site	Parameters
Landfill No. 4	Electrical resistivity survey
Chemical Disposal Pits No. 1 and No. 2	Electrical resistivity survey combined with a ground water montoring program
Landfill No. 3	Electrical resistivity survey combined with a ground water monitoring program
Sodium Hydroxide Leak	Site monitoring using lysimeters
Berman Pond	Site monitoring using lysimeters
IWTP Sludge Beds	Site monitoring using lysimeters
Chemical Disposal Pit	Site monitoring using lysimeters

Other recommendations address the operation of Landfill No. 5 at Lakeside, and the analyzing of samples from Wells No. 3 and No. 4 for all organic parameters from EPA's priority pollutant list.

CHAPTER 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

BACKGROUND

The discharge, disposal, and storage of solid wastes into or on the land surface is regulated by state and federal laws. The key legislation governing the management and disposal of solid waste is the Resource Conservation and Recovery Act of 1976 (RCRA). The Act was promulgated to regulate the generation, transportation, treatment, storage and disposal of hazardous wastes; to phase out the use of open dumps for disposal of solid wastes; and to promote the conservation of natural resources through the management, reuse or recovery of solid and hazardous waste. Regulations and implementation instructions of RCRA are continuing to be developed by the U.S. Environmental Protection Agency (EPA).

Under RCRA Section 3012 (PL 96-482, October 21, 1980), each state is required to inventory all past and present hazardous waste disposal sites. Section 6003 of RCRA requires federal agencies to assist EPA and make available all requested information on past disposal practices. It is the intent of the Deparment of Defense (DOD) to comply fully with these as well as other requirements of RCRA.

AUTHORITY

Simultaneous with the passage of RCRA, the DOD devised a comprehensive Installation Restoration Program (IRP). The purpose of the IRP is to assess and control the migration of environmental contamination that may have resulted from past operations and disposal practices on DOD facilities. In response to RCRA and in anticipation of the Comprehensive Environmental Response Compensation and Liability Act of 1980 (Superfund), the DOD issued (June 1980) directive Defense Environmental Quality Program Policy Memorandum (DEQPPM 80-6) requiring identification and quantification of hazardous waste disposal sites on DOD installations. The Air Force implemented DEQPPM 80-6 by message in December 1980.

PURPOSE AND SCOPE

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

Phase I - Problem Identification/Records Search

Phase II - Problem Confirmation and Quantification

Phase III - Corrective Action

The objective of Phase I, Problem Identification/Records Search, is to provide answers to the following questions:

1. What hazardous materials/wastes have been generated on the installation?
2. How have the wastes been managed?
3. Was the waste management procedure adequate to immobilize, contain, treat, destroy or detoxify the waste?
4. By what routes or means (if any) can the wastes migrate off the installation?
5. Which identified sites are recommended for further investigation in Phase II?

The purpose of this report is to summarize and evaluate the information collected during Phase I of the IRP.

Phase I Project Description

The goal of the first phase of the program was to identify the potential for environmental contamination from past waste disposal practices at Hill AFB, and to assess the probability of contaminant migration beyond the installation boundary. The activities undertaken by Engineering-Science (ES) in Phase I included the following:

- Review site records
- Interview personnel familiar with past generation and disposal
- Inventory hazardous materials and hazardous wastes
- Determine quantities and locations of current and past hazardous waste storage, treatment and disposal
- Define environmentally sensitive conditions at the base
- Evaluate past disposal practices and methods
- Conduct field inspection
- Gather pertinent information from federal, state and local agencies

- Assess potential for contamination
- Determine potential for materials to migrate off site.

In order to perform the on-site portion of the records search phase, ES assembled the following core team of professionals:

- C.M. Mangan, Environmental Engineer and Project Manager, MSCE, 14 years of professional experience
- J. R. Absalon, Hydrogeologist, BS Geology, 8 years of professional experience
- R.M. Reynolds, Chemical Engineer, BSChE, 8 years of professional experience
- B.D. Moreth, Environmental Scientist, BS Forest Science, BS Zoology, 10 years of professional experience
- M.I. Spiegel, Environmental Scientist, BS Environmental Health Science, 5 years of professional experience

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

The on-site portion of the Records Search Phase was performed at Hill AFB on September 3 and 4, and September 21 through September 25, 1981. During the on-site portion of the project, site visits were conducted at Little Mountain Test Annex and the Utah Test and Training Range (UTTR). Only Air Force owned land in the UTTR was included in this project.

METHODOLOGY

The methodology utilized in the Hill AFB Records Search began with a review of past and present industrial operations conducted at the base. Information was obtained from available records such as shop files and real property files, as well as interviews with past and present base employees from the various operating areas of the base. The interviewees included current and past environmental personnel associated with the Civil Engineering Squadron, Bioenvironmental Engineer's office, and the Directorate of Maintenance. Several current or past personnel associated with the wastewater treatment plant, the pesticide operations, fuels management and the base solid waste disposal areas were interviewed extensively. Finally, experienced personnel from the tenant aircraft related organizations were interviewed. Eighty interviews were conducted to obtain the needed past activity information.

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

- o Utah Department of Social Services - Division of Health, Salt Lake City, Utah
- o Utah State Engineer's Office - Water Rights Division, Salt Lake City, Utah
- o Utah Geological and Mineral Survey, Salt Lake City, Utah
- o U.S. Geological Survey, Salt Lake City, Utah
- o U.S. Environmental Protection Agency, Region VIII, Denver, Colorado
- o Weber Basin Water Conservancy District, Layton, Utah
- o Davis County Health Department, Farmington, Utah

The next step in the activity review was to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from the various operations on the base. Included in this part of the activities review was the identification of all known past landfill sites and burial sites; as well as any other possible sources of contamination such as evaporation ponds.

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

A decision was then made, based on all the above information, whether a potential exists for hazardous material contamination in any of the identified sites. If not, 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 off the installation boundaries was made by considering site-specific soil and ground water conditions. If there was little potential for contaminant migration, then the site was deleted from further consideration. If the potential for contaminant migration was considered significant, then the site was evaluated and prioritized using the site rating methodology.

The site rating indicates the relative potential for contaminant migration at each site. For those sites showing a high potential, recommendations are made to quantify the potential contaminant migration problem under Phase II of the Installation Restoration Program. For those sites showing a low potential, no further follow-up Phase II work would be recommended unless data collected from other sites indicate a problem.

CHAPTER 2

INSTALLATION DESCRIPTION

CHAPTER 2

INSTALLATION DESCRIPTION

LOCATION, SIZE AND BOUNDARIES

Hill Air Force Base (AFB) is located in northern Utah approximately 25 miles north of Salt Lake City and approximately 5 miles south of Ogden as shown in Figure 2.1. The base contains 6,666 acres. The northwest portion of Hill AFB, comprising approximately eight percent of the total base, lies in the southern portion of Weber County while the remaining portion of the base is contained in the northern part of Davis County as shown in Figure 2.2.

Topographically the base is a plateau which is approximately 300 feet above the valley floor. The western boundary of the base is formed by Interstate 15 while the southern portion of the boundary coincides with State Route 193. The northeastern and northern perimeter of the base is marked by the Davis & Weber Canal, a privately owned irrigation canal.

As of December, 1981, the Base employed a total of 19,804 people (14,407 being civilian with the remainder military). The 1980 census noted that 291,156 people resided in the Davis and Weber county area which equates to 20 percent of the total state's population. The two-county land area of 1,308 square miles, however, represents less than 1.5% of the total state land area.

The City of Ogden which is just north of Hill AFB, has a current population of over 73,000 people which makes Ogden the second largest city in the state. The city in its early development was structured around the railroads. Ogden was the turnaround point for the eastern end of the Southern Pacific Railroad and the western transfer point for the Union Pacific Railroad. While the railroads are still functioning at the present time, they are not major contributors to the economy or land use.

At present, the major use of land in Davis and Weber Counties is largely devoted to agriculture or vacant. Approximately 39% of the land

FIGURE 2.1

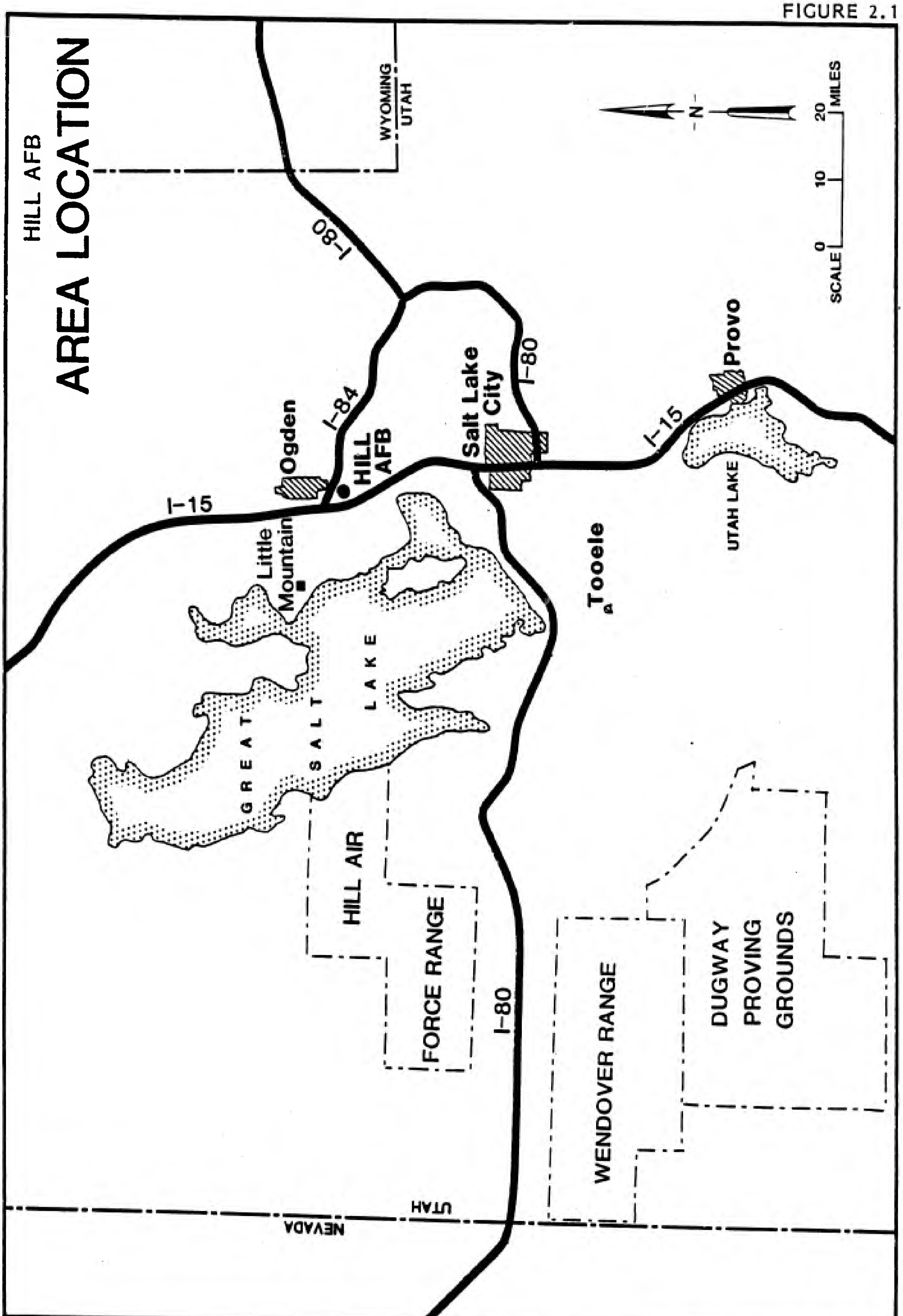
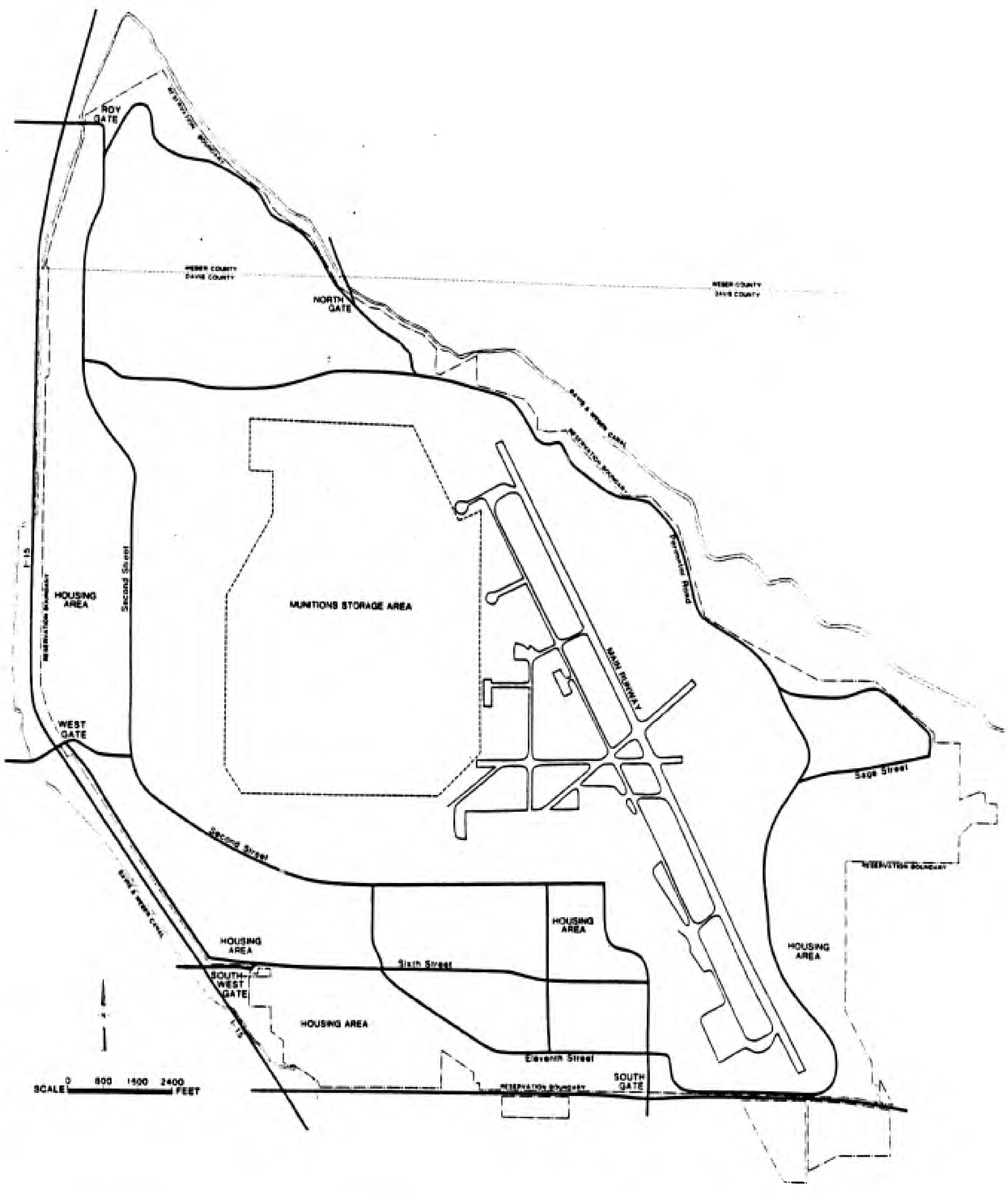

HILL AFB
AREA LOCATION
WYOMING
UTAH
I-80
I-84
I-15
Ogden
HILL AFB
Salt Lake City
Provo
UTAH LAKE
Little Mountain
Tooele
GREAT SALT LAKE
HILL AIR FORCE RANGE
WENDOVER RANGE
DUGWAY PROVING GROUNDS
UTAH
NEVADA
N
SCALE
0
10
20
MILES

FIGURE 2.2

HILL AFB

SITE PLAN



SOURCE: HILL AFB INSTALLATION DOCUMENTS

falls into this category. It is estimated that approximately 12% of this agriculture/vacant land is non-developable due to steep mountains or marshy conditions which exist along the Great Salt Lake. Water of the highly saline Great Salt Lake inundates 40 percent of the two counties. Public lands, mostly forest, occupy under 14 percent. Residential, commercial, industrial and public improvements are sited on the remaining 7 percent. The general trend has been to develop a large private economic industrial base.

Industrial parks have been established in both counties. Continued residential growth is projected in support of new industries and also to support continued expansion of existing industries. Residential development in areas immediately adjacent to the base boundaries is nearing saturation and future growth should take place outwards in areas accessible to both rail and interstate highway systems.

Besides the base, there is an off-base missile component hardness test facility on a 740 acre site at Little Mountain just west of Odgen (See Figure 2.1). In addition Air Force personnel at Hill maintain air space control over the Utah Test and Training Range (UTTR) which is a combination of the Hill Air Force Range, Wendover Range, and Dugway Proving Grounds (See Figure 2.1). The Air Force is responsible for all property within the UTTR except the Dugway Proving Grounds, which is controlled by the U.S. Army. The UTTR comprises 1,770,019 acres with Air Force owned land being 927,696 acres. The UTTR is used for low and high altitude bombing, air to surface gunnery and rocketry and munitions disposal. Air Force owned land within the UTTR was included in this study.

A brief installation history is presented in Appendix B and summarized in the following text. Hill Field was commissioned in November, 1940. In 1952, the Air Materiel Command made Hill the prime depot for the F-89 Scorpion. Later in 1959 Hill became the logistics manager of the Minuteman Missile and in 1965 was assigned complete logistics management for the Minuteman missile force. In 1968 Hill AFB became manager for the Maverick Missile and assumed responsibility of the Air Force Logistics Command Test Range.

A SAC satellite base was established at Hill AFB from 1973 to 1975. In 1979, Hill assumed worldwide management of the F-16.

CURRENT ORGANIZATION AND MISSION

The Ogden Air Logistics Center (ALC) is the major organization at Hill AFB. It is one of five air logistics centers which comprise the Air Force Logistics Command (AFLC) with headquarters at Wright-Patterson AFB, Ohio. AFLC has the mission objective of ensuring that Air Force weapon systems are kept at maximum operational capability at least possible cost. AFLC provides the supplies, material and services necessary to maintain the Air Force in a constant combat-ready posture.

The Ogden Air Logistics Center commander has five major groups, which may impact on hazardous waste generation, reporting to him. They are:

- Directorate of Maintenance
- Directorate of Distribution
- Directorate of Materiel Management
- Directorate of Contracting and Manufacturing
- Commander-2849th Air Base Group (ABG)

Directorate of Maintenance

The Directorate of Maintenance employs about 6,500 personnel to accomplish worldwide support including maintenance, repair and modernization of the F-4 Phantom, the F-16 Fighting Falcon, and the Maverick, SRAM, Titan, Minuteman and MX missiles. The Directorate also has worldwide repair responsibilities for training devices, landing gear, photographic equipment, navigational equipment and air munitions.

Directorate of Distribution

The Directorate of Distribution has a work force of approximately 2,100 people. The Directorate's mission is to receive, store, issue, package and transport Air Force material to customers worldwide. The heart of the distribution complex is the 440,000 square foot Logistics Materiel Processing Facility. This is interconnected by tunnel and conveyor systems to major storage locations within the Directorate as well as the Air Freight Terminal.

Directorate of Materiel Management

The Directorate of Materiel Management keeps aircraft, missiles, and support systems assigned to Ogden ALC at the highest level of operational readiness. Managers assure the effectiveness of weapon systems, such as the Minuteman, Titan and Maverick missiles, F/RF-4 and F-101 aircraft systems and the GBU-15 Maverick Guided Bomb.

Directorate of Contracting and Manufacturing

The Directorate of Contracting and Manufacturing acquires equipment, supplies and services for Department of Defense programs. The mission is threefold: 1) supporting the needs of Hill Air Force Base in all of its local operations including repair facilities. This requires the services of approximately 85 employees who write and administer 63,000 contractual actions annually; 2) acquisition of those items for which the Directorate has been designated the Single Air Force Contracting Activity. This involves approximately 400 employees who annually prepare 26,000 contractual actions; 3) contracting accomplished for Ogden ALC by other Department of the Defense agencies. Activity in this area accounts for approximately 1,000 contractual actions annually.

2849th Air Base Group

There are five squadrons/squadron sections at Hill AFB for administration of military assigned or attached for administrative purposes as follows: 2849th Security Police Squadron, Civil Engineering Squadron, Ammunitions Test HQ Squadron, Distribution HQ Squadron, and HQ Squadron Section.

Tenants

The major tenant units at Hill AFB are: 388th Tactical Fighter Wing, 6545th Test Group, 1954th Radar Evaluation Squadron, the 1881st Communication Squadron, the 533rd Field Training Detachment and the 508th Tactical Fighter Group.

The 388th Tactical Fighter Wing's primary roles are air-to-ground weapons delivery and air-to-air combat training using the F-16 aircraft. The 6545th Test Group consolidates the Air Force's testing and evaluation of unmanned aircraft termed Drone-RPV's (Remotely Piloted Vehicles). The 1954th Radar Evaluation Squadron has global responsibilities to optimize radar sensor configurations, quality sensor systems capabilities and limitations, and monitor the development of new radar systems. The 1881st Communications Squadron operates and maintains the control tower, precision-approach radar, and two separate telephone exchanges. The 533rd Field Training Detachment has the primary mission of test oriented training of F-16 aircraft personnel. The 508th Tactical Fighter Group is assigned to the Air Force Reserves. Reserve flying groups have been stationed on base since 1959.

CHAPTER 3

ENVIRONMENTAL SETTING

CHAPTER 3
ENVIRONMENTAL SETTING

The environmental setting of Hill Air Force Base is described in this chapter with the primary emphasis directed toward identifying features that may facilitate the movement of hazardous waste contaminants off base. Environmentally sensitive conditions pertinent to this study are highlighted at the end of this section.

METEOROLOGY

Temperature, precipitation, snowfall and other relevant climatic data (furnished by Detachment 6, 15th Weather Squadron, Hill AFB) is presented as Table C.1. The indicated period of record is 30 years. The summarized data indicate that the mean annual precipitation is 18.9 inches including the mean annual snowfall of 79 inches. According to the Climatic Atlas of the United States, estimated lake evaporation for the Ogden area averages 40 inches per year.

GEOGRAPHY

The Ogden area is located in the Great Basin, subdivision of the Basin and Range Physiographic Province (Fenneman, 1931). This area is primarily characterized by isolated ranges of dissected fault block mountains, separated over varying distances by aggraded desert plains.

Hill Air Force Base is situated within the Weber Delta district of the Great Basin, which is constituted by broad plains and terraces extending from the shore of the Great Salt Lake eastward to the base of the Wasatch Range.

Topography

The Weber Delta, located immediately west of the Wasatch Range, slopes in a westerly direction toward the Great Salt Lake. Raised areas, such as the terrace on which Hill Air Force Base is located, are generally level and exhibit slight to moderate relief, especially where dissected by erosional activity. Surface elevations at Hill vary from a low of approximately 4600 feet MSL along the west installation boundary to 5045 feet MSL, between the east installation boundary and Building 720. Typical airfield elevations average 4775 feet MSL. In contrast, the Wasatch Range to the east rises abruptly from the Delta floor to elevations on the order of 9572 feet MSL at Mount Ogden.

Drainage

The study area is drained by three systems, Kays Creek, Fife Ditch and a man-made feature, the Davis & Weber Canal. Drainage of installation land areas is accomplished by overland flow to dry swales terminating at the previously cited systems, or simply by infiltration to surface soils. Water reaching the streams may be employed for irrigation purposes or may flow westward into the Great Salt Lake. Flooding is not a problem typical of the Hill AFB area, although localized flooding may occur for brief periods where surface drainage is restricted within erosional features. Installation surface drainage and infiltration are depicted on Figure 3.1. Drainage from the southern portion of the base is routed through drainage ponds (See Figure 3.1) to equalize storm flows and then to a five mile outfall terminating in Kays Creek.

Surface Soils

Soil boring information indicates that Hill Air Force Base surface soils are predominantly silts, clays, sand and gravels typical of the Weber Delta district. Surface soils are well drained with deep water levels, have a slight to moderate erosion susceptability and possess good soil bearing values.

GEOLOGY

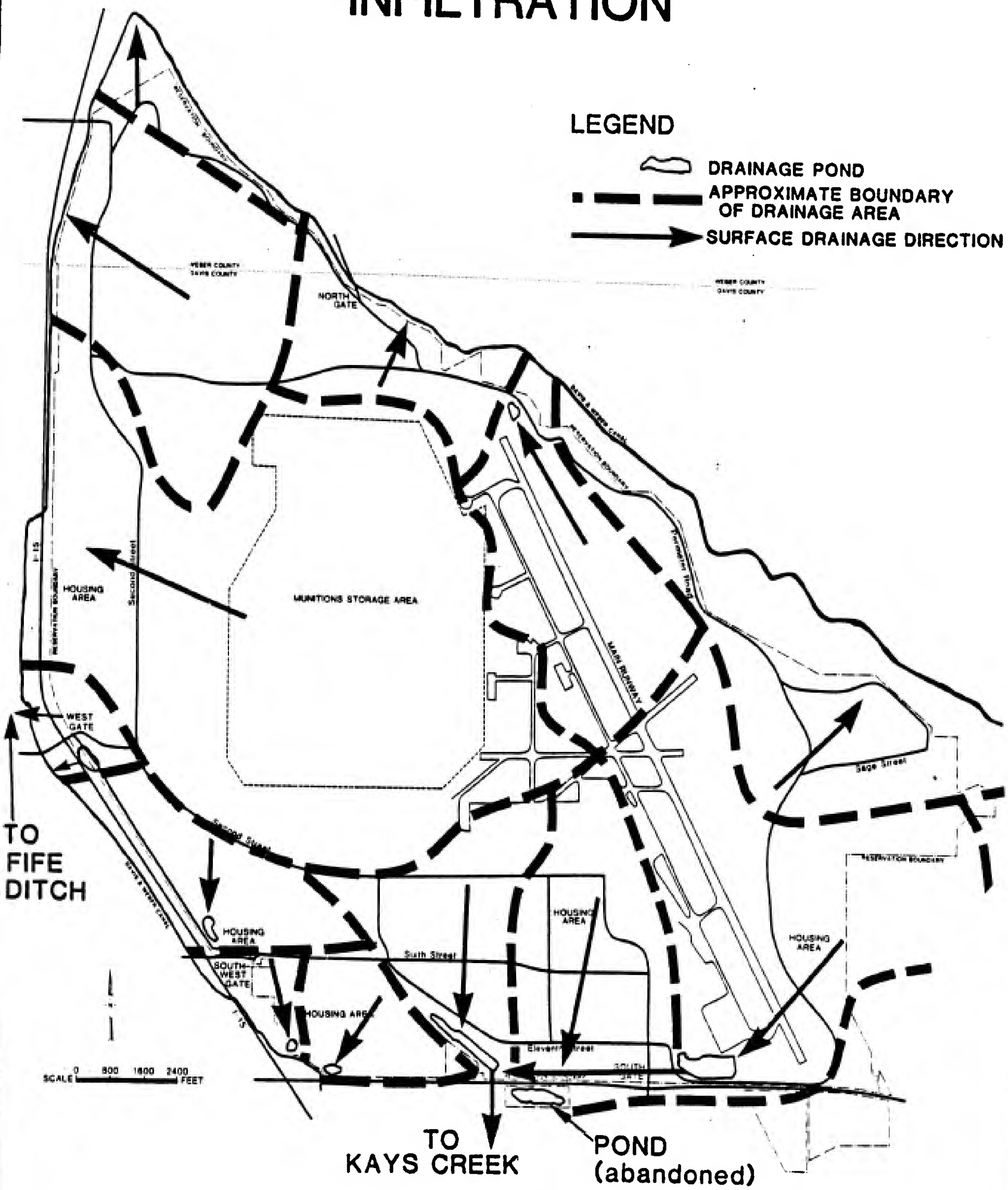
The geology of the Hill Air Force Base area has been reported by numerous investigators, including Feth et al., 1966 and Glenn et al., 1980. A brief review of their work has been summarized in support of this investigation.

General Stratigraphy

Geologic units ranging in age from Precambrian to Quaternary have been described in the Ogden area and are presented as Table 3.1. The lithologies of these units include unconsolidated materials, sedimentary rocks and metamorphic rocks.

HILL AFB

SURFACE DRAINAGE and INFILTRATION*



*During many storms the precipitation will infiltrate directly into the ground with little or no run-off.

SOURCE: HILL AFB INSTALLATION DOCUMENTS

TABLE 3.1

HILL AIR FORCE BASE
GENERALIZED STRATIGRAPHY

Symbol	System	Series	Formation and Lithology	Thickness in feet
Qa	Quaternary	Recent	Alluvium: Permeable river sand and gravel; includes windflows near mountains which are impermeable locally.	200
Qg			Gravel: Permeable floodplain sand and gravel	Unknown
Qs			Sand: Permeable fine sands underlying lowlands	10-20
Qc			Clay: Impermeable plastic to non-plastic clay overlying artesian aquifer	35+
			UNCONFORMITY	
	Quaternary	Pleistocene	(Lake, Bonneville Group)	
Qpg			Proud Formation: gravel, permeable	5-20
Qpgs			gravel and sand, permeable	10-50
Qps			sand, permeable	10-20
Qba			Bonneville and Alpine Formation: sand and gravel over bedrock, very permeable	5-50
Qag			Alpine Formation: gravel, permeable	<25
Qas			sand; permeable	100
Qac			clay, silt, fine sand, usually impermeable.	200
Qm	Quatenary	Pleistocene	Mudflow deposits: particle size varies from clay to boulders. Usually impermeable.	varies
			UNCONFORMITY	
Cl	Cambrian	Middle to Late(?)	Limestone: Silty with interbeeded shale and dolomite. Permeable.	1375 (±)
Ct		Lower to Middle(?)	Tintic Quartzite: massive, cross-bedded, pebbly. Permeable where fractured.	500-700
			ANGULAR UNCONFORMITY	
Pcf		Precambrian	Farmington Canyon Complex: metasedimentary and meta-volcanic rocks. Permeable where jointed or fractured.	10,000

Source: Feth et al. (1966).

The predominant geologic materials deposited in the Hill Air Force Base area consist of unconsolidated silts, clays, gravels and sands, deposited in a complex basin system formed by the block faulting of older consolidated units. The development and eventual disappearance of Glacial Lake Bonneville during Pleistocene time created many area geomorphologic features such as the Weber Delta and is responsible for the deposition of major Quaternary geologic units.

An examination of installation test boring and water well logs indicates that Weber Delta sediments have been deposited in an almost systematic manner that has formed discrete layers of materials according to particulate grain size. For example, the log of installation well number 2, presented as Figure 3.2, depicts distinct strata of sand, gravel, clay, etc. This development of preferred layering has a significant impact on the occurrence and movement of local ground waters and is discussed in greater detail in the section HYDROLOGY. It should be noted that correlation of specific geologic units over long distances (0.5 miles or more) may be difficult without additional site specific data.

Distribution

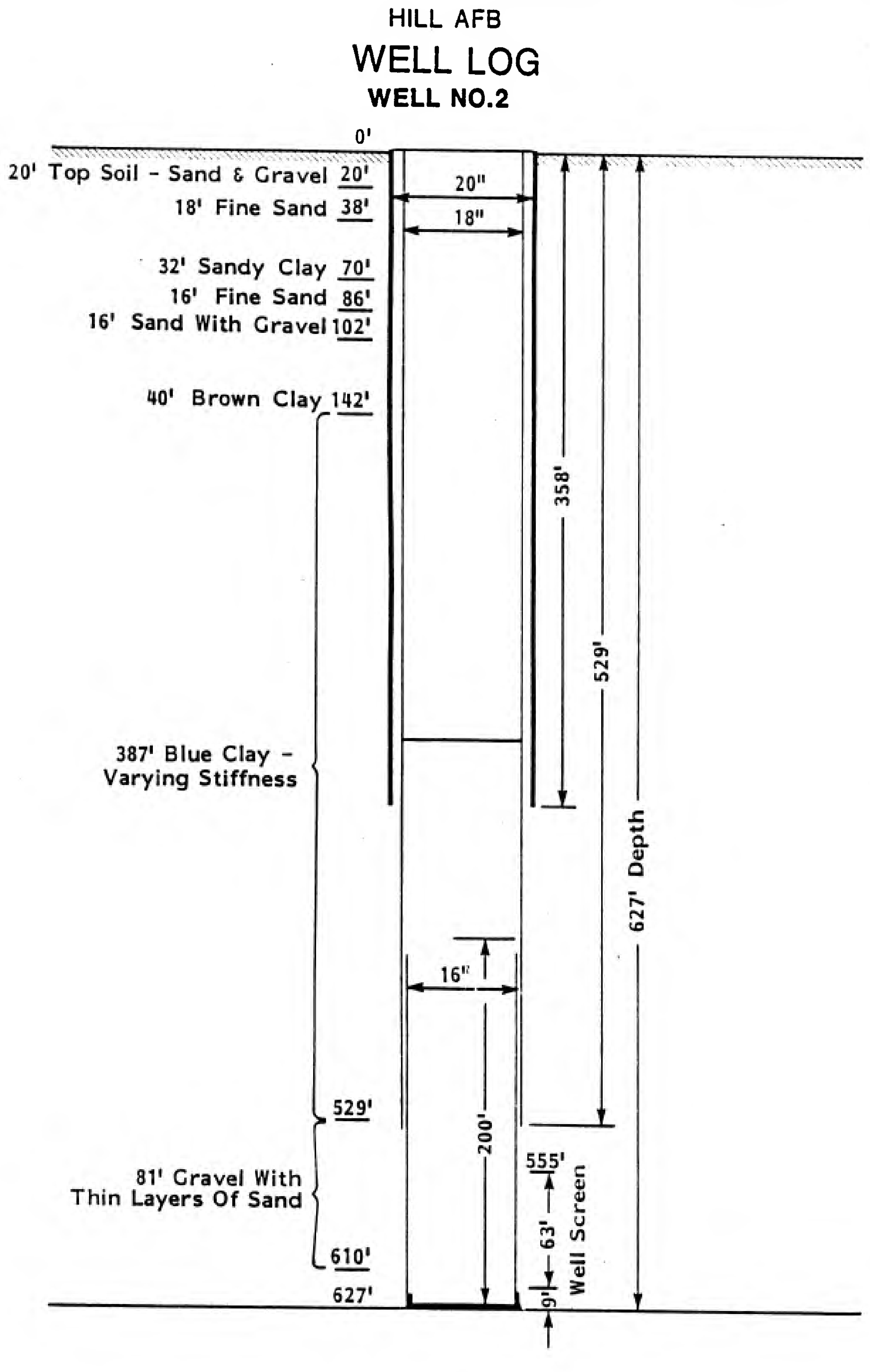
The areal distribution of significant geologic units relevant to this study are mapped as Figure 3.3, which has been modified from the work of Feth et al (1966). Table 3.1, Generalized Stratigraphy, serves as the legend for the Geologic Map. Generally, the geology of Hill Air Force Base is dominated by unconsolidated units, while consolidated units occur east of the base as the Wasatch Range.

Structure

As discussed previously, unconsolidated units of the study area have been deposited in a basin. Geophysical data implies that the thickness of unconsolidated materials deposited within the deepest areas of the basin have a maximum total thickness on the order of 6000 feet (Feth et al., 1966). The younger Weber Delta deposits occur to depths of approximately 800 feet along their eastern margin, near the Wasatch Range. The Weber Canyon as a fan, dips westward slightly and becomes significantly thinner along the line presently thought to define its western limit.

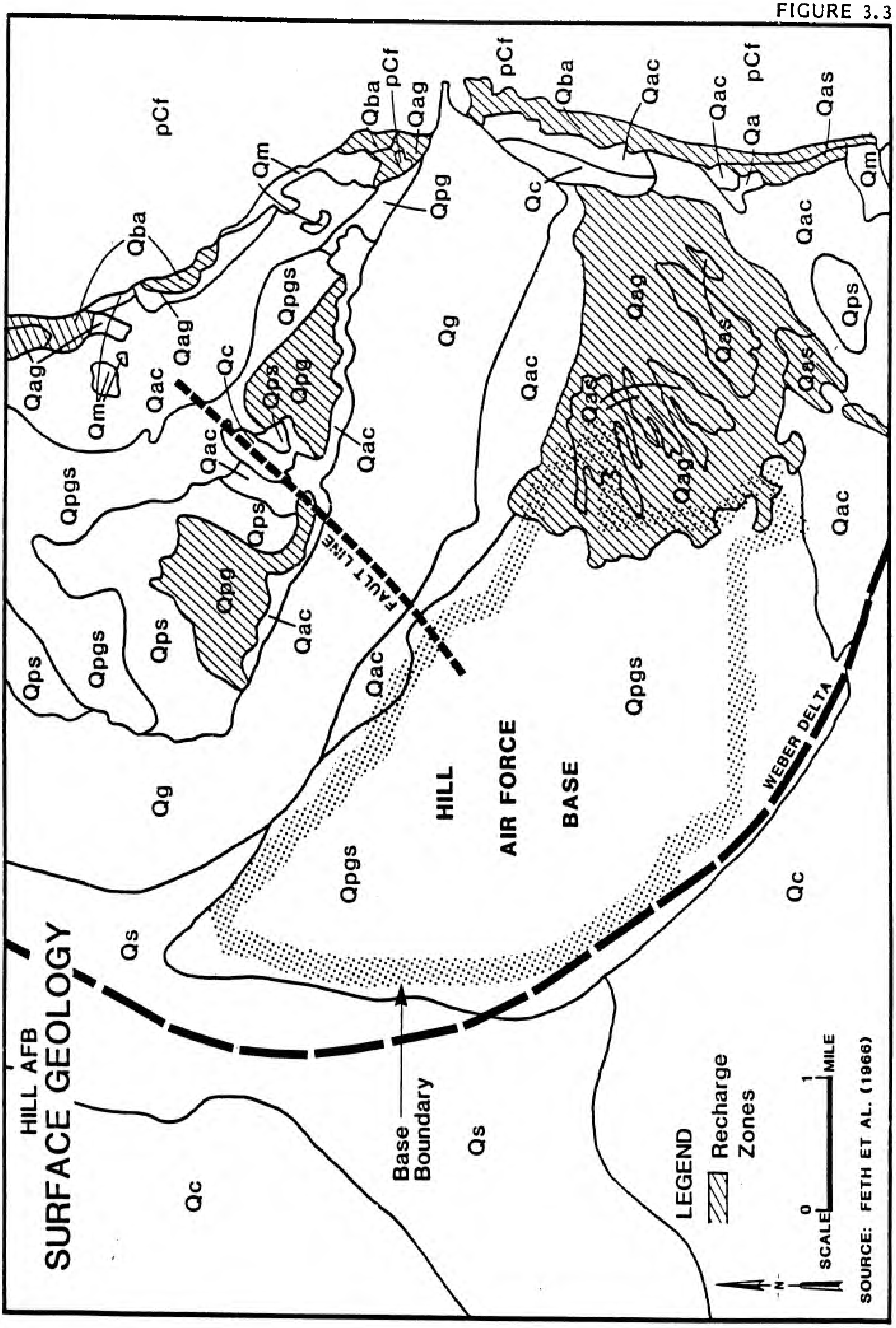
Few significant geologic discontinuities are known to exist in the study area. The major discontinuities in geologic units are the Wasatch

FIGURE 3.2



SOURCE: HILL AFB INSTALLATION DOCUMENTS

FIGURE 3.3



ES ENGINEERING-SCIENCE

Fault, east of the base, and an inferred fault extending from the main instrument runway northeast, and a few folds in Pleistocene unconsolidated deposits (Feth et al., 1966). Numerous lineaments interpreted from remote sensing data also exist on the base. Lineaments (a simple linear structure) may indicate the presence of underlying geologic discontinuities, which may have modified the structure of overlying geologic units locally. The Wasatch Fault extends along the western margin of the Wasatch Range, forming the boundary between the Basin and Range Physiographic Province in which the installation is situated and the Rocky Mountains to the east. The Wasatch Fault is probably not a single break but rather a mile-plus wide zone of breakage and slippage, extending over a length of some 150 miles. Vertical displacement along the fault is thought to exceed 10,000 feet (Feth et al., 1966).

Generally, the Wasatch is a normal fault or series of normal faults where exposed to observation, downthrown to the west and dipping westward an average of 33 degrees. Thrust faults along the basin floor (postulated by Glenn et al., 1980), may serve as conduits for the horizontal movement of the ground water. The fault zone is significant to ground water movement as warm, mineralized waters may occur along its length locally. Near Hill Air Force Base, the fracture alignment is marked by multiple fault facets. Erosion of the fault facets has created several coarse-grained unconsolidated geologic units that receive and transmit recharge to deeper aquifers of the Weber area (Map units Qag, Qas, Qpg and Qba depicted on Figure 3.3).

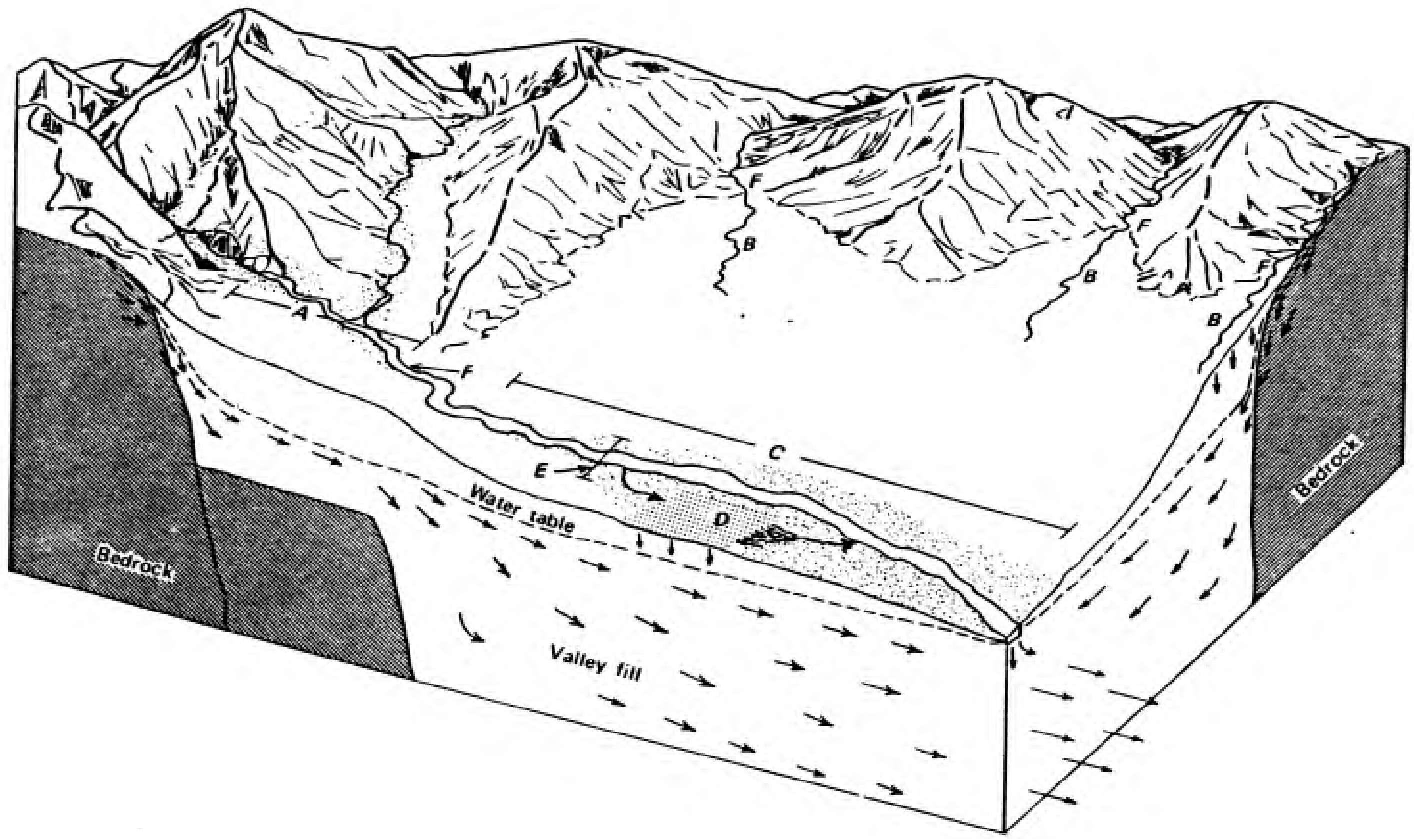
HYDROLOGY

Ground Water

Ground-water hydrology of the Ogden-Hill Air Force Base area has been reported by Feth et al., (1966), Bolke and Waddell (1972) and Eakin, Price and Harrill (1976). Additional information has been obtained from a geothermal energy study performed by Glenn et al., (1980).

Hill Air Force Base lies within the limits of the Weber Delta ground water district of Utah. The area hydrology functions as a complex system whose major components and their relationships are depicted in Figure 3.4. Ground water is contained in the unconsolidated

AREA HYDROLOGIC SYSTEM



A. Ground-water reservoir supports stream flow
B. Minor streams lose flow to ground-water system on alluvial fans
C. Stream loses water to water table and surface diversions
D. Irrigated area recharges ground-water system
E. Flood plain
F. Point of maximum stream flow

SOURCE: EAKIN ET AL. (1976)

FIGURE 3.4

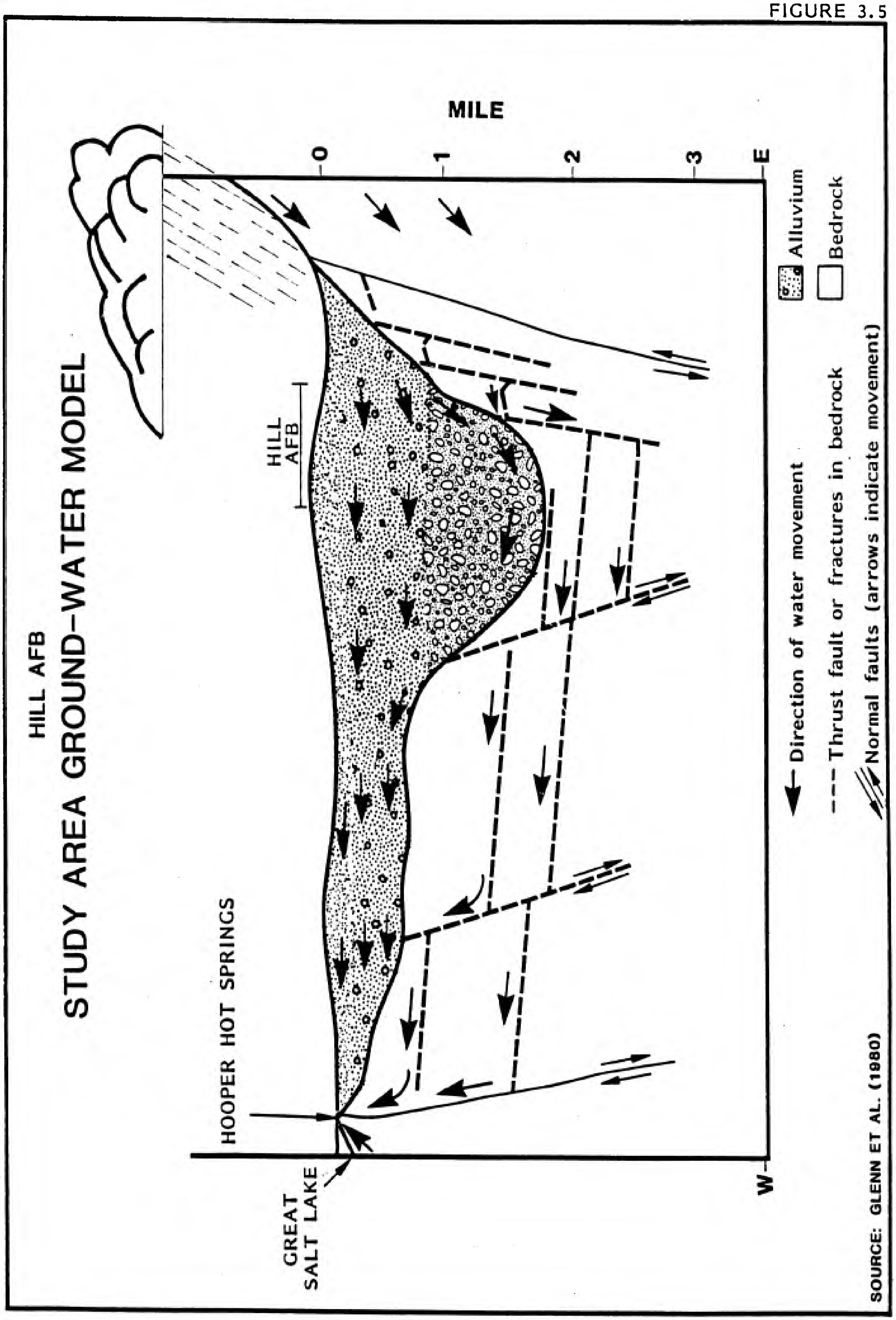
alluvial materials that have been deposited in the down-faulted basins of the region. The major sources of recharge to the ground water reservoir consist of subsurface flow from the Wasatch Range, direct infiltration from precipitation and seepage from streams and irrigated areas. Ground water moves through the system from the recharge areas in a generally westward direction. Geologic units, previously identified in this report as recharge zones include map units Qag, Qas, Qba and Qpg which are depicted in Figure 3.3. A ground water model of the study area is presented as Figure 3.5 showing general directions of movement.

Hill Air Force Base and adjacent communities derive water resources from the Delta Aquifer, the major source of ground water for the region. The Delta Aquifer consists of a thick and extensive deposit of interlayered gravel, sand, silt and clay arranged in a fan-shaped body that extends west from the area of Weber Canyon. The upper surface of the Delta is thought to be 500-700 feet below ground surface and is shown in Figure 3.6. The aquifer typically functions under artesian (confined) conditions due to the existence of thick clay sequences overlying it. Such clay sequences may be identified on the logs of Hill Air Force Base water wells (See Figure 3.7). The principal water-bearing zone of the Delta Aquifer is estimated to be 50-150 feet thick, however, according to Feth et al., (1966), greater thicknesses have been encountered without determination of a lower boundary.

Figure 3.8 depicts the piezometric surface of the Delta Aquifer as it was determined as of 1960. An examination of the piezometric surface data suggests that movement of ground water in this hydrogeologic unit radiates outward (generally westward) from Weber Canyon and that an important source of recharge to it is the Weber River. The Delta Aquifer is known to be a very productive aquifer, from which large quantities of water may be obtained. The general quality of ground water recovered from this unit may be described as acceptable, however it tends to be hard, containing dissolved calcium, sodium and magnesium.

Two shallow aquifers have been described by Feth et al., (1966) which are known to exist in the general vicinity of the study area. The first, an artesian (confined) aquifer of relatively small areal extent is present west of Roy (See Figure 3.8). Wells tapping ground water supplies from this aquifer are typically drilled to depths in the range

FIGURE 3.5

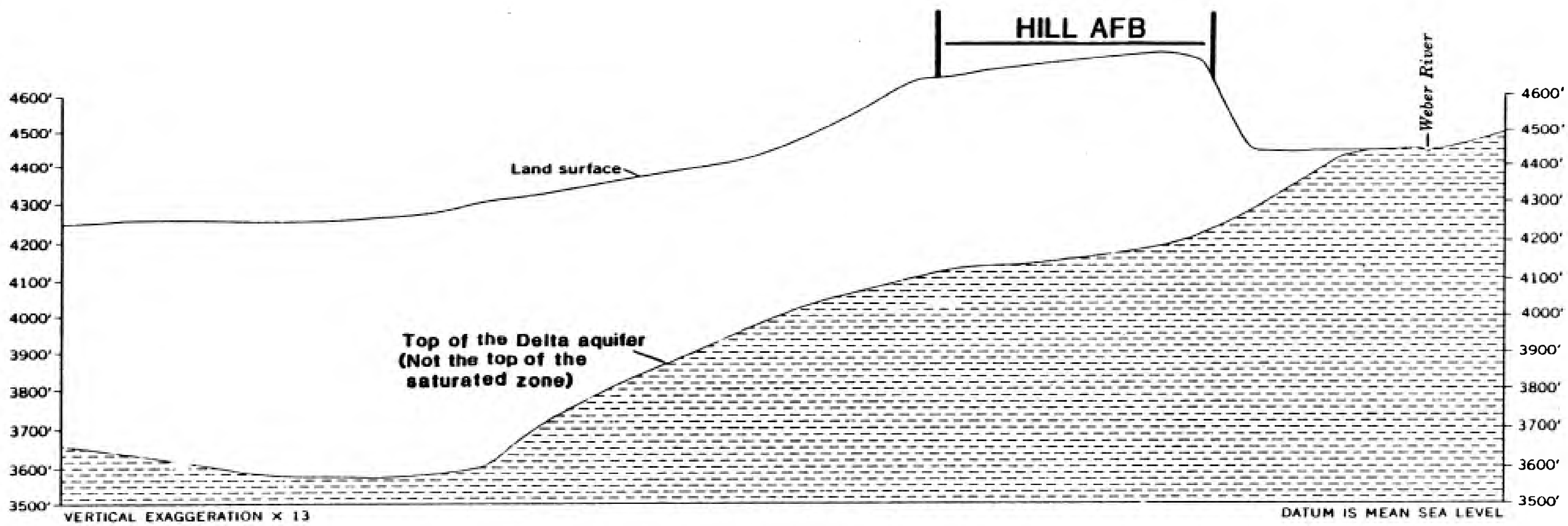


HILL AFB
STUDY AREA GROUND-WATER MODEL

FIGURE 3.6

HILL AFB

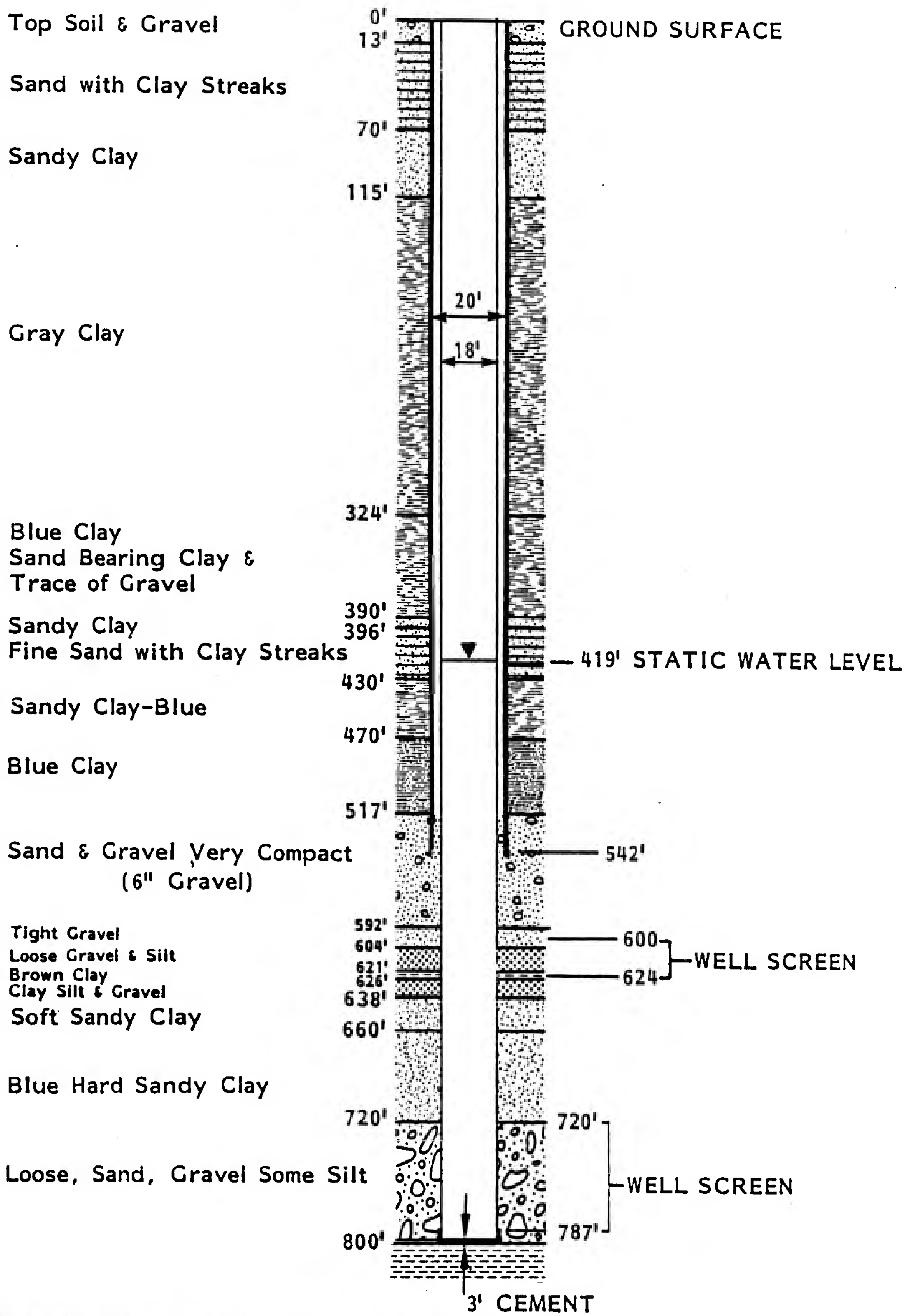
PROFILE OF THE DELTA AQUIFER



SOURCE: FETH ET AL. (1966)

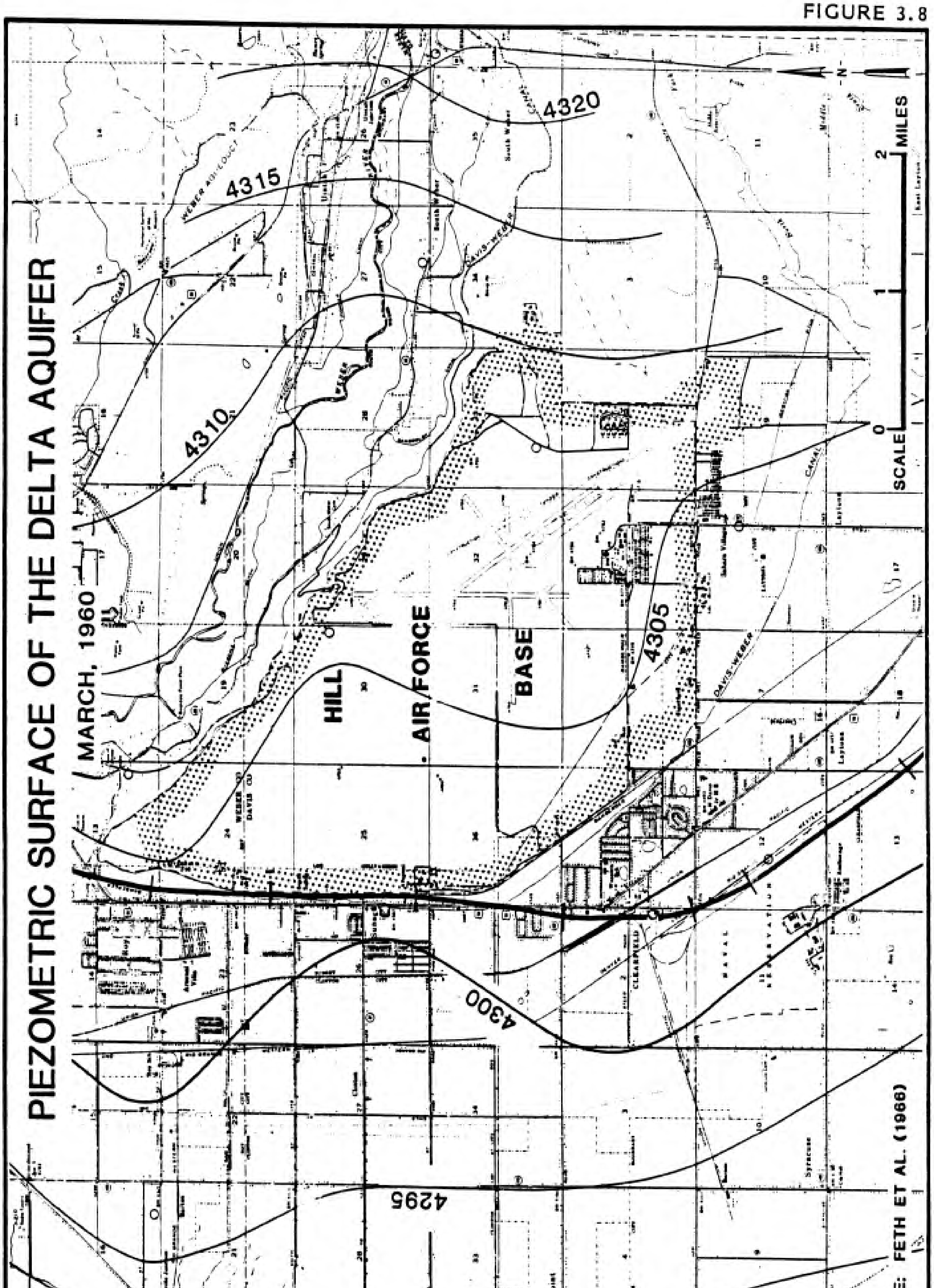
NOTE: Generalized profile showing a West to East orientation.

HILL AFB
WATER WELL LOG
WELL NO.3



SOURCE: HILL AFB INSTALLATION DOCUMENTS

FIGURE 3.8


PIEZOMETRIC SURFACE OF THE DELTA AQUIFER
MARCH, 1960
4320
4315
4310
4305
4300
4295
4290
HILL
AIR FORCE
BASE
DAVIS-WEBER
CLEARFIELD
West Point
Syracuse
Clinton
SCALE
0
1
2
MILES
N
SOURCE: FETH ET AL. (1966)

of 50 to 150 feet. The Roy city well is a deep well and is not in this system.

The extent of hydraulic communication between this shallow aquifer and the underlying Delta Aquifer are thought to be slight if any, as water obtained from the shallow unit is more highly mineralized than Delta supplies. A second shallow aquifer is known to exist near Syracuse, where wells usually less than 250 feet deep encounter it. This second shallow aquifer may be in hydraulic communication with underlying water-bearing units. Perched water tables are known to develop locally in the study area due to the presence of near-surface clay layers at shallow depths. These clay layers tend to impede the downward migration of infiltrating precipitation, which then may flow downdip along the clay surface, emerging at a point where the clay intersects the topographic surface as springs. Most spring activity tends to occur following periods of precipitation and may cease entirely during dry periods.

Hill Air Force Base currently obtains approximately 85% of its water resources (culinary) from base wells and purchases the remainder according to need from the Weber Basin Water Conservancy District. All Hill AFB wells are finished in the Delta Aquifer. Locations of installation wells are shown on Figure 3.9. Base wells now in service range in depth from 627 feet to 900 feet. The relatively high yields and low drawdowns observed in base wells indicate a very permeable and productive aquifer. Static water levels range from 418 feet below land surface at well number 2 to 515 feet at well number 4. Hill AFB well construction data is summarized as Table C.2. The quality of water derived from Hill Air Force Base wells is generally good as shown in Table C.3.

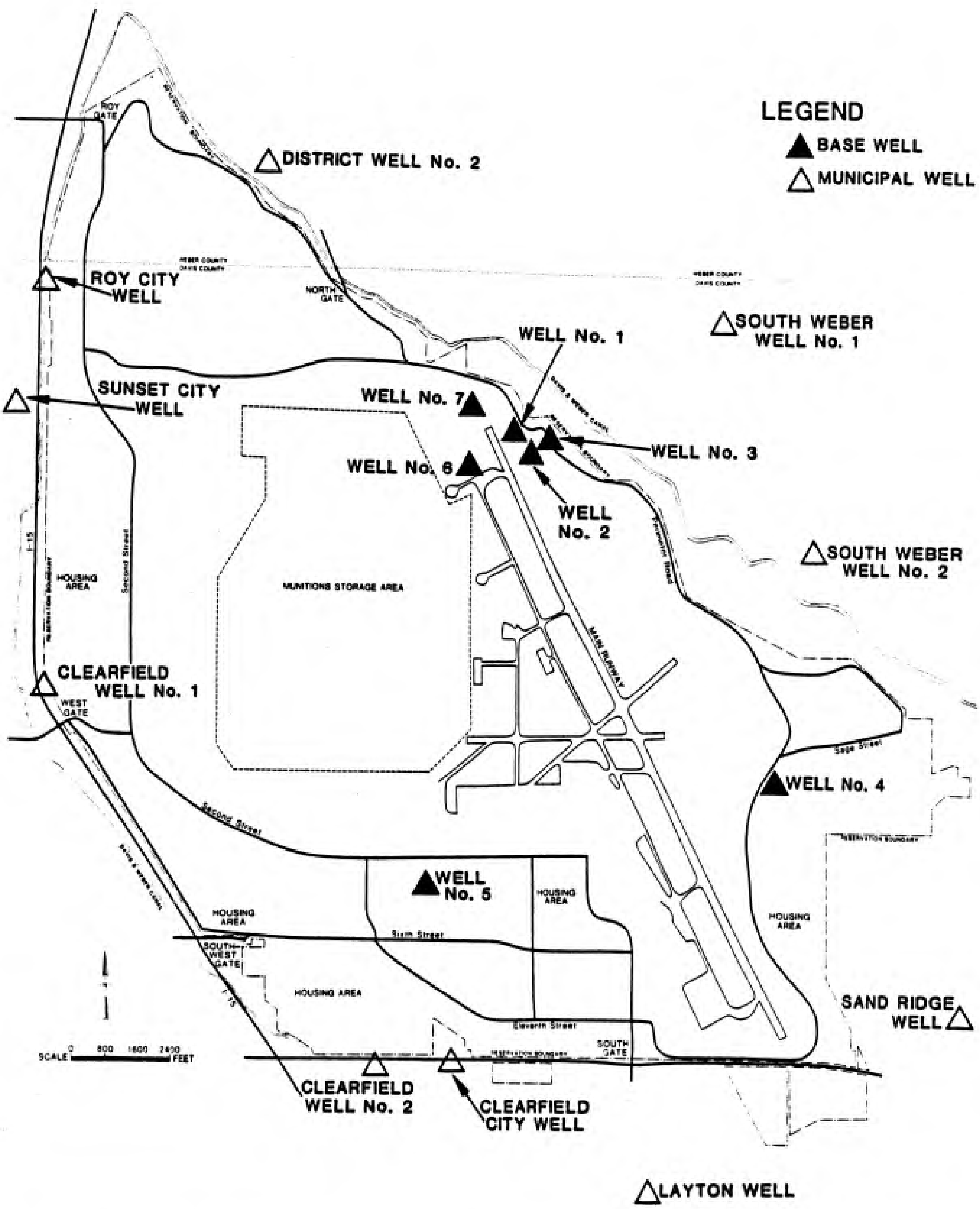
Figure 3.9 also shows the locations of known municipal wells in the vicinity of the base perimeter. Well data on these municipal wells is presented in Table C.4.

<u>Surface Water</u>

The State Department of Social Services (Division of Health) has regulatory responsibility for the maintenance of water quality in the Hill Air Force Base area. Wastewater Disposal Regulations (Part II) sets forth the authority for the assignment of stream classifications

HILL AFB

DEEP WELL LOCATIONS



SOURCE: HILL AFB INSTALLATION DOCUMENTS AND MUNICIPAL RECORDS for all state waters. The standards presented in Appendix D are summarized as follows:

> Kays Creek - Class 3C - protected for non-game fish and other aquatic life, including necessary aquatic organisms in their food chain.

Hill AFB has a National Pollutant Discharge Elimination System (NPDES) permit which was revised in the spring of 1981. The permit is for the discharge of storm water to Kays Creek and requires a spill and contingency plan, best management practices on base, and secondary containment for outside chemical storage greater in volume than four 55-gallon drums. There are no numeric limits regarding the quality of the storm water discharged.

To comply with AFR 19-7 (Environmental Pollution Monitoring), the Base Bioenvironmental Engineer obtains monthly grab samples from all detention ponds on base which discharge to streams off base.

SUMMARY OF ENVIRONMENTAL SETTING

Geographical, geologic and hydrologic data evaluated for this study indicate the following:

- o The primary regional aquifer, the Delta Aquifer, underlies Hill Air Force Base at great depth (418-515 feet). The Delta Aquifer is confined by thick clay layers overlying it.
- o Hill Air Force Base and most adjacent municipalities obtain water supplies from wells screened into the Delta Aquifer. An exception to this is the shallow confined aquifer at Roy, west of Hill AFB.
- o Area precipitation is low, evapotranspiration rates tend to be substantially higher.
- o The Davis & Weber Canal marks the northeastern and northern perimeter of the base boundry and provides a potential for surface water contamination.

Based on these regional characteristics, it is concluded that the potential for the migration of contamination to deep aquifers, caused by past waste disposal practices is low. With regard to the shallow aquifer at Roy, it is unlikely that installation-generated contamination would impact local ground water quality because of the following:

- the localized extent of the shallow aquifer
- the isolation of the aquifer from the ground surface by a confining layer
- the aquifer is four miles from the bases' waste sites and separated by a vertical distance of some 300 feet.

There are no known threatened or endangered plant or animal species on Hill AFB. There are threatened and endangered animal species on the UTTR. Available information would indicate that none of the previous hazardous waste disposal practices would impact these species.

A portion of the storm water runoff from the base is discharged through a five mile outfall to Kays Creek which has a "3C" water classification.

CHAPTER 4

FINDINGS

CHAPTER 4

FINDINGS

To assess hazardous waste management at Hill AFB, past activities of waste generation and disposal were reviewed. This chapter contains a summary of the wastes generated by activity, a description of disposal methods used at Hill AFB, and an identification and evaluation of disposal sites located on the base. Figure 4.1 presents the decision tree utilized in the review of past waste practices. This tree provides a logical algorithm for the consistent evaluation of all base practices.

PAST ACTIVITY REVIEW

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

Waste Generated by Activity

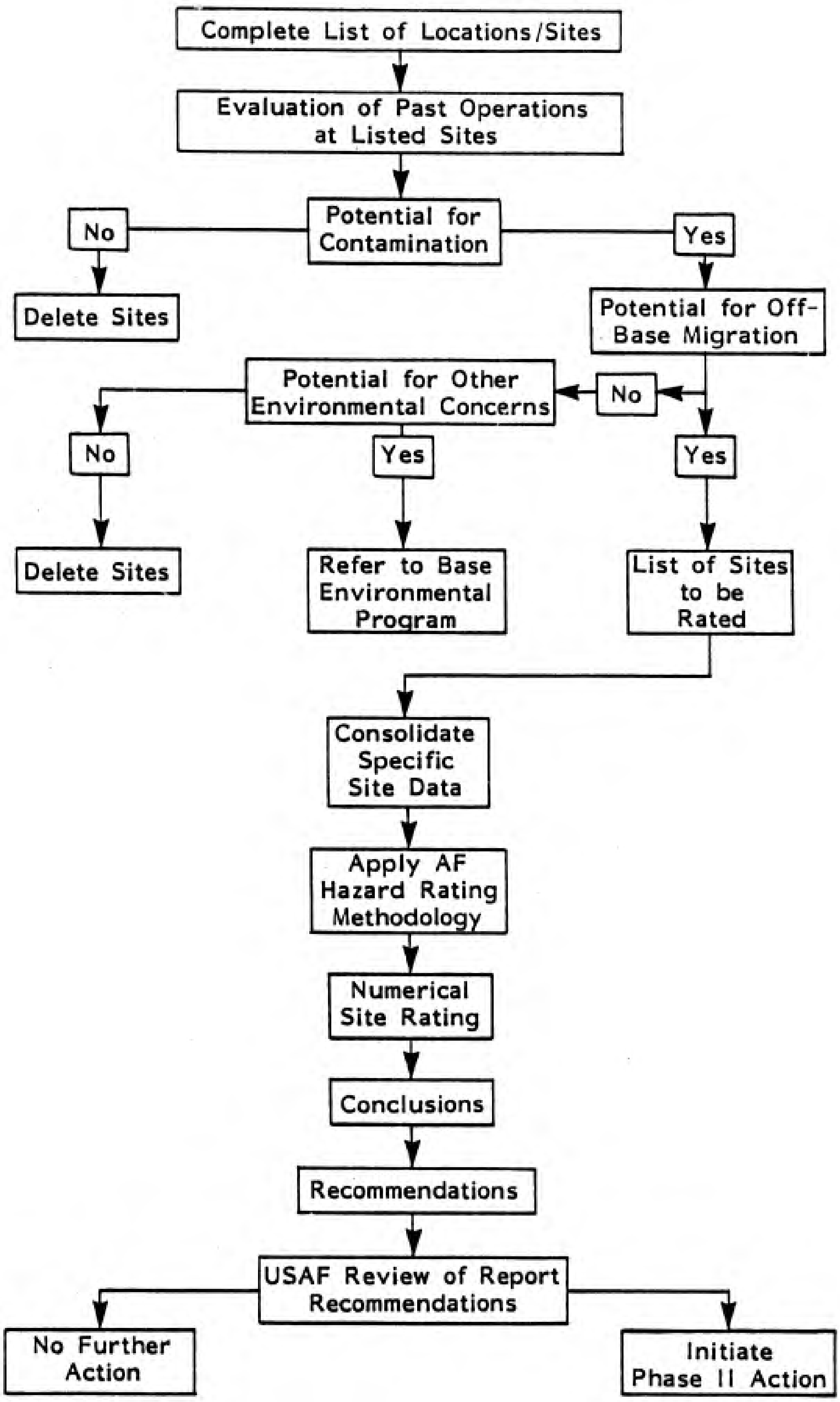
All hazardous wastes generated on Hill AFB can be associated with one of the following six activities carried out on base:

- Industrial Operations (Shops)
- Pesticide and Herbicide Utilization
- Fire Control Training
- Radioactive Waste
- Hazardous Waste Storage
- Fuels Management

The following discussion addresses only those wastes generated on base which are either hazardous or potentially hazardous. In this discussion, a hazardous waste is defined as hazardous by either the Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCL), or the Hill documents which have been reviewed. A potentially hazardous waste is

PHASE I INSTALLATION RESTORATION PROGRAM

DECISION TREE



one which was suspected of being defined under RCRA as hazardous although insufficient data was available to fully characterize the waste.

Industrial Operations (Shops)

Industrial operations at Hill AFB can be divided into two major groups as follows: Directorate of Maintenance and Tactical Fighter Wing support activities. The Directorate of Maintenance provides large facilities for servicing and repairing of primarily F-4 aircraft. The tactical fighter facilities provide routine support services for the tenant aircraft groups, wings, and squadrons.

The ES project team initially interviewed senior supervisors from the Directorate of Maintenance and Tactical Fighter Wing to determine large volume hazardous waste generators and specific waste disposal methods utilized which included landfilling, chemical disposal pits, evaporation ponds, industrial sewer, and DPDO. Based on these interviews, it was possible to prepare a list of industrial shops, presented in Appendix E, which handled hazardous materials or generated hazardous wastes.

Additional on-site interviews were conducted with shop supervisors each generally having thirty or more years of experience at Hill AFB. Information from the interviews combined with base records were used to prepare the industrial operations table (See Table 4.1). This table itemizes the waste material, waste quantities, and gives a timeline showing methods of treatment, storage and disposal. Also the changes in building locations are listed in Table 4.1. The industrial shops presented in Table 4.1 are those which are significant either because of the quantity or type of hazardous waste generated or unique disposal method utilized.

Waste disposal methods used by the Directorate of Maintenance included Air Force landfills, the chemical disposal pits, and disposal through DPDO. The on-base landfill received waste from the Directorate of Maintenance including acid cleaning sludge, alkaline cleaning sludge, plating masking materials, and sandblast media from the early 1950s to 1972. The Little Mountain drying beds received paint stripper wastes from approximately 1973 to 1980. From a period beginning in 1975 to approximately 1980, the Lakeside landfill area received beryllium waste, paint stripper waste, industrial waste treatment plant sludge, slop

TABLE 4.1

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATION

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY [1]	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL ('50 '60 '70 '80)
DIRECTORATE OF MAINTENANCE				
CSA BRAKE SHOP	204	BERYLLIUM WASTE	4000 - 7000 LBS/MO.	LAKESIDE LANDFILL
WHEEL AND BRAKE SHOP	205 & 507	ACID CLEANING BATHS	Quantity Not Obtained [2]	STORM SEWER; PUMPOUT TO IWTP [3] (BATCH); BLDG. 507 (SAME)
		ALKALINE CLEANING BATHS	Quantity Not Obtained [2]	STORM SEWER; PUMPOUT TO IWTP (BATCH); (SAME)
		RINSE WATER OVERFLOW	Quantity Not Obtained [2]	STORM SEWER; DISCHARGE TO IWTP SEWER; (SAME)
		PAINT STRIPPERS, PHENOLIC	5,000 GALS/YR.	DISPOSAL METHOD UNKNOWN; LITTLE MTN. DRYING BEDS
AIRCRAFT WASHRACK	225	TOLUENE	UNDETERMINED	METHOD UNDETERMINED (WASHRACK RELOCATED TO 218)
		PAINT BOOTH SCRUBBER WATER	UNDETERMINED	METHOD UNDETERMINED (WASHRACK RELOCATED TO 218)
AIRCRAFT WASHRACK	218	TOLUENE	UNDETERMINED	IWTP (WASHRACK RELOCATED TO 220)
		PAINT BOOTH SCRUBBER WATER	UNDETERMINED	IWTP (WASHRACK RELOCATED TO 220)

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ASSUMED TIME-FRAME DATA BY SHOP PERSONNEL

(1) BASED ON CURRENT RATES AND BEST ESTIMATES OF PAST RATES
(2) WASTE QUANTITIES WERE NOT OBTAINED FOR PUMPOUTS OR DISCHARGES TO THE IWTP DUE TO THE VARIATIONS IN THESE QUANTITIES AND THE STANDARD TREATMENT ACHIEVED BY THE IWTP SYSTEM.
(3) IWTP - INDUSTRIAL WASTE TREATMENT PLANT. BATCH REFERS TO BATCH TREATMENT AT THE IWTP. THIS FACILITY IS A PRETREATMENT SYSTEM PRIOR TO DISCHARGE TO THE CITY SYSTEM.

TABLE 4.1 (Cont'd)

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATION

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY [1]	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL ('50 '60 '70 '80)
DIRECTORATE OF MAINTENANCE (Cont'd)				
WASHRACK & PAINT SHOP	220	SLOP THINNERS	140 to 160 GALS./WK.	DISCHARGE TO IWTP; LAKESIDE LANDFILL; DPDO
		PAINT STRIPPERS, PHENOLIC	350 GALS./MO.	DISCHARGE TO IWTP
		PAINT SLUDGES	2,000 GALS./6 MOS.	BASE LANDFILL; LAKESIDE LANDFILL
		PAINT BOOTH SCRUBBER SLUDGE	55 GALS./2 WKS.	BASE LANDFILL; LAKESIDE LANDFILL; DPDO
ELECTROPLATING SHOP	225 & 505	PLATING SOLUTIONS & TANK SLUDGES	Quantity Not Obtained [2]	PUMPOUT TO IWTP (BATCH); BLDG 505 (SAME)
		RINSE TANK OVERFLOW	Quantity Not Obtained	DISCHARGE TO IWTP; (SAME)
		ACID CLEANING BATHS	Quantity Not Obtained	PUMPOUT IWTP (BATCH); (SAME)
		ALKALINE CLEANING BATHS	Quantity Not Obtained	PUMPOUT TO IWTP (BATCH); (SAME)
		ACID CLEANING SLUDGE	60 GALS/YR.	BASE LANDFILL; COUNTY LANDFILL; PUMPOUT TO IWTP (BATCH)
		ALKALINE CLEANING SLUDGE	110 GALS/3 MOS.	BASE LANDFILL; COUNTY LANDFILL; PUMPOUT TO IWTP (BATCH)
		NICKEL FILTER CARTRIDGES	24 EA./3-4 MOS.	(NOT USED); COUNTY LANDFILL
		CADIUM, SILVER FILTER CARTRIDGES	12 EA./YR.	(NOT USED); COUNTY LANDFILL; DPDO

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ASSUMED TIME-FRAME DATA BY SHOP PERSONNEL

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

(2) WASTE QUANTITIES WERE NOT OBTAINED FOR PUMPOUTS OR DISCHARGES TO THE IWTP DUE TO THE VARIATIONS IN THESE QUANTITIES AND THE STANDARD TREATMENT ACHIEVED BY THE IWTP SYSTEM.

TABLE 4.1 (Cont'd)

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATION

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY (1)	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL '50 '60 '70 '80
DIRECTORATE OF MAINTENANCE (Cont'd)				BLDG. 505
		PLASTIC MASKINGS	1500-2000 LBS./MO.	BASE LANDFILL; COUNTY LANDFILL; REACTED THEN TO CO. LANDFILL
		OTHER MASKINGS	100 LBS./MO.	BASE LANDFILL; COUNTY LANDFILL; RINSED THEN TO CO. LANDFILL
		SPENT SANDBLAST MEDIA	5 YD/3 MOS.	BASE LANDFILL; LAKESIDE LANDFILL; COUNTY LANDFILL
		ION EXCHANGE MEDIA	480 FT^3 EACH BATCH DISPOSAL PER LOCATION	LITTLE MTN.; IWTP SLUDGE BEDS
STRUTS/LANDING GEAR SHOPS	264 & 507	RINSE WATER OVERFLOW	Quantity Not Obtained (2)	BLDG. 507; DISCHARGE TO IWTP; (SAME)
		BULK CLEANING SOLUTION	Quantity Not Obtained	PUMPOUT TO IWTP (BATCH); (SAME)
		PAINT STRIPPERS, PHENOLIC AND NON PHENOLIC	8,000 to 10,000 GALS./YR. (1970 to present)	(METHOD UNDETERMINED); LAKESIDE LANDFILL; PUMPOUT TO DPDO
			2,000 to 3,000 GALS./YR. (to 1970)	
SOLVENT DISTILLATION FACILITY	265	DISTILLATION BOTTOMS FROM TRICHLOROETHYLENE & TRICHLOROETHANE (TCE)	UNDETERMINED	CHEMICAL DISPOSAL PIT NO.3; LAKESIDE LANDFILL

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ASSUMED TIME-FRAME DATA BY SHOP PERSONNEL

(1) BASED ON CURRENT RATES AND BEST ESTIMATES OF PAST RATES
(2) WASTE QUANTITIES WERE NOT OBTAINED FOR PUMPOUTS OR DISCHARGES TO THE IWTP DUE TO THE VARIATIONS IN THESE QUANTITIES AND THE STANDARD TREATMENT ACHIEVED BY THE IWTP SYSTEM.

TABLE 4.1 (Cont'd)

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATIONS

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY (1)	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL '50 '60 '70 '80
DIRECTORATE OF MAINTENANCE (Cont'd)				
MISSILE TRAILER MAINTENANCE	847	PAINT STRIPPERS	55 GALS/QR.	IWTP
		MIXED SOLVENTS AND PAINT WASTES	55 GALS/MO.	LAKESIDE LANDFILL, DPDO
		SAND BLASTING WASTE	6 CU. YDS./2 MOS.	LAKESIDE LANDFILL, DPDO
		METAL WASTES	1500 LBS./MO.	DPDO RECYCLE
		OIL	1000 GALS/YR.	DPDO
		HYDRAULIC FLUID	100 GALS/ MO.	DPDO

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

(1) BASED ON CURRENT RATES AND BEST ESTIMATES OF PAST RATES
(2) WASTE QUANTITIES WERE NOT OBTAINED FOR PUMPOUTS OR DISCHARGES TO THE IWTP DUE TO THE VARIATIONS IN THESE QUANTITIES AND THE STANDARD TREATMENT ACHIEVED BY THE IWTP SYSTEM.

TABLE 4.1 (Cont'd)

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATION

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY (1)	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL '65 '70 '75 '80
388 TACTICAL FIGHTER WING (TFW)				
AIRCRAFT GENERATION SQUADRON	41, 58, 40	HYDRAULIC FLUID	500 GALS./MO.	CO MIXED PICKUP TO DPDO; SEGREGATED PICKUP TO DPDO
COMPONENT REPAIR SQUADRON		ENGINE OIL	150 GALS./MO.	
EQUIPMENT MAINTENANCE SQUADRON		VEHICLE MOTOR OIL	200 GALS./MO.	
(The list of waste materials and quantities shown for the 388 TFW is a composite for all shops.)		JET FUEL	300 GALS./MO.	
		ZYGLO PENETRANT	10 GALS./MO.	
		PD-680	123 GALS./MO.	
		PAINT THINNERS	10 GALS./MO.	
		BRAKE FLUID	7 GALS./MO.	
508 TACTICAL FIGHTER GROUP (TFG)				
COMPOSITE - ALL SHOPS	590, 593, 594, 597	PAINT STRIPPING WASH WATER	Quantity Not Obtained (2)	DISCHARGE TO IWTP
		PD-680	45 GALS./6 MOS.	PUMPOUT BY CES, DISPOSAL TO DPDO
		ENGINE OILS	80 GALS./YR.	PUMPOUT BY CES, DISPOSAL TO DPDO
NOTE: This unit was formerly the 733 TFG.				

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ASSUMED TIME-FRAME DATA BY SHOP PERSONNEL

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

(2) WASTE QUANTITIES WERE NOT OBTAINED FOR PUMPOUTS OR DISCHARGES TO THE IWTP DUE TO THE VARIATIONS IN THESE QUANTITIES AND THE STANDARD TREATMENT ACHIEVED BY THE IWTP SYSTEM.

TABLE 4.1 (Cont'd)

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATION

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY (1)	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL '65 '70 '75 '80
6514 TEST SQUADRON (TS)				
COMPOSITE - ALL SHOPS	1, 1A	SYNTHETIC LUBRICANTS	40 to 50 GALS./MO.	CO MIXED PICKUP TO DPDO; SEGREGATED PICKUP TO DPDO
		HYDRAULIC FLUID	25 to 30 GALS./MO.	
		MOTOR OIL	25 to 40 GALS./MO.	
		JP-4 (Reusable)	100 GALS./MO.	
		JP-4 (Contaminated)	50 GALS./MO.	
U.S. ARMY - TOOELE DEPOT				
RAIL SHOP DIVISION	1701	ALKALINE DEGREASING SOLUTION	2,500 GALS./3 MOS.	'59 PUMPOUT TO DPDO
		TRICHLOROETHYLENE	150 GALS./ 2 MOS.	'59 GEN. ARMY DEPOT-OGDEN; CHEMICAL DISPOSAL PIT NO.3; PUMPOUT TO DPDO
		ENGINE OIL	500 GALS./MO.	'59 PUMPOUT TO DPDO

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ASSUMED TIME-FRAME DATA BY SHOP PERSONNEL

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

thinner waste and sandblast media waste. Chemical Disposal Pit No. 3 received solvent distillation bottom sludges from the TCE recovery facility from the late 60's until approximately 1975.

A major method for petroleum based waste disposal has been their collection by the Civil Engineering Squadron (CES) and disposal through the Defense Property Disposal Office (DPDO). This disposal activity has been in practice for both the Directorate of Maintenance facilities and the tactical fighter tenant units. Prior to 1980, waste materials including petroleum based solvents, oils, fuels and other chemicals were co-mixed prior to pickup by CES. After 1980, the waste materials were separated and collected and disposed separately. The collected waste materials were stored in large tanks in the vicinity of the fire training area. Contractors were selected on a bid basis to remove the waste material from these tanks. During the late 50's and early 60's, quantities of oil base waste materials were spread over unpaved roads to reduce fugitive dust emissions.

Numerous waste streams are treated in the industrial waste pretreatment system. This system was originally designed for electroplating waste treatment. The industrial waste pretreatment facility receives these electroplating waste streams as well as some slop thinners, paint wastes and paint strippers. Several plating rinse tank overflows are discharged to the industrial waste pretreatment facility.

Past activity information for the tactical fighter units was obtained by interviewing key squadron supervisors for the shop areas including the Quality Assurance Section (388th Tactical Fighter Wing), the 508th Tactical Fighter Group and the 6514th Test Squadron. Results of the interviews indicated that tenant tactical fighter units have utilized the base CES waste collection service.

The U.S. Army operates a railroad shop at Hill AFB. Degreasing solutions and engine oils wastes are generated at this facility. Also trichloroethylene (TCE) wastes are generated. The degreasing solution has been pumped out of a degreasing tank by CES then sold to contractors through DPDO. This practice has been in effect since approximately 1959. The practice has also been in effect for engine oils since approximately 1949. The TCE waste was sent to the general Army Depot in Ogden, Utah, from approximately 1949 to 1964. The TCE waste was then disposed in Chemical Disposal Pit No. 3 until 1974. The TCE waste has since been drummed and disposed through DPDO.

Pesticide and Herbicide Utilization

Pesticides and herbicides have been used on Hill AFB to maintain control of pest infestations and ground foliage, respectively. The following is a listing of common pesticides and herbicides which are currently being used as well as container disposal procedures:

Chemical	Container Disposal Method
Malathion	Drums, triple rinsed, crushed, sent to landfill
Hyvar XL	5-gallon can triple rinsed to landfill
Sevin	5-gallon can triple rinsed to landfill
Roundup	Container to landfill
2-4-D	Container to landfill

During the April, May and June, 1981 period, the Entomology Shop utilized approximately 1,900 pounds of herbicide concentrates and approximately 60 pounds of insecticide concentrates. The major insect control problem at the Hill AFB is the grasshopper. In the past DDT, was the primary pesticide used on the Base until it was discontinued in the 1958 to 1960 time period.

Mixed chemicals are applied at the site so that little excess is returned to the Entomology Shop. Spray vehicles are washed daily at the industrial wastewater treatment plant.

Radioactive Waste

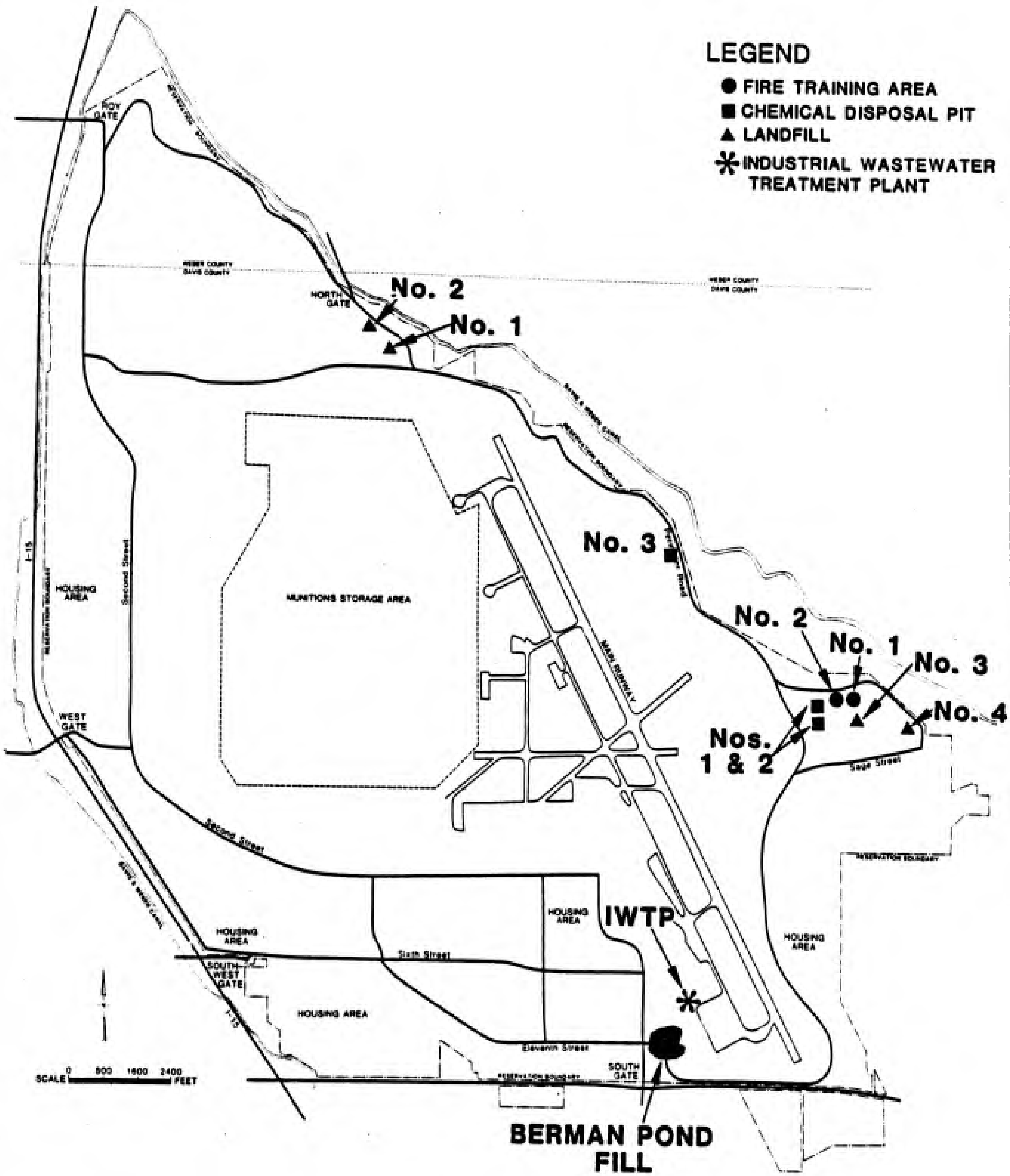
There is no radioactive waste generation or storage on the Hill AFB or either of its two annexes.

Fire Control Training

The Fire Control Department has operated two fire training areas since 1958. These areas have continued to serve as a practice learning/extinguishing area, where petroleum based fires are set and thereafter extinguished. The following are specific designations for the individual training areas as well as their approximate operational period (See Figure 4.2):

HILL AFB

HAZARDOUS WASTE DISPOSAL LOCATIONS



SOURCE: HILL AFB INSTALLATION DOCUMENTS

Fire Training Area	Period of Operation
No. 1	1958 to 1973
No. 2	1973-to present

In the past, the common mode of operation was for the Fire Department to burn fuels contaminated with alcohol, water or hydraulic fluid. Fire Training Area No. 1 was a dirt pit with a surrounding earthen dike to contain the liquid. The ground was initially saturated with water and then fuel was poured inside the dike from barrels. Chemicals were then applied to extinguish the fire. As air pollution control regulations became more stringent in the mid 60's, the fire training exercises were curtailed from a weekly schedule until at the present time, there are two fire training exercises per quarter and the fuel utilized is uncontaminated JP-4 fuel. On occasion during previous fire training exercises in Fire Training Area No. 1, it was observed that liquids would overflow the dike and flow downhill towards the Davis & Weber Canal. Flow was never observed actually entering the canal but percolating into the soil uphill of the canal.

Fire Training Area No. 2 was placed into service in 1973. The fire training area is concrete lined which contains all of the petroleum products utilized for the fire training exercise. The concrete pit is filled with water and fuels are then added to the water surface. A fire retardant is then applied to extinguish the fire. The use of AFFF was initiated within the Air Force in 1972; prior to that time protein foam was utilized as an extinguishing agent. After the training exercise, the pit was drained through a discharge line which allowed the water to infiltrate into the soil.

Based on the past operation of Fire Training Area No. 2, this area is not considered to have significantly contributed to either surface or ground water pollution.

Hazardous Waste Storage

The Defense Property Disposal Office (DPDO) is located in Building 890 at Hill AFB and furnishes disposal for excess surplus property and most hazardous waste generated by the Department of Defense (DOD activities within the Base). One responsibility of DPDO is to provide interim storage for hazardous waste before shipment off base. The storage area adjacent to building 890 is fenced in and controlled. A portion of the storage area is paved and the remaining portion is dirt.

At the present time because the existing DPDO facility does not meet RCRA standards, Civil Engineering is accumulating drums of hazardous chemicals at the industrial wastewater treatment plant site. No major spills have been reported at either site.

At the DPDO, there are approximately 60 drums of unknown chemicals which have been stored for a long period of time. Samples have been taken from the drums and sent to an outside contractor for analyses in order to determine the drum contents before disposal. Because the drums have been stored for a long period of time, they are in a deteriorated condition with some leaking and others without proper covers.

. Fuels Management

The Hill AFB Fuels Management storage system consist of a number of under-ground and above-ground storage tanks in various locations through out the Base. The fuels handled are JP-4, diesel, MOGAS, AVGAS and heating oil. At the present time, there are 20 above-ground tanks located in tank farms, 8 above-ground tanks located adjacent to a number of manufacturing facilities and a total of 182 tanks below-ground. Tanks, which are twenty-five thousand gallons or over, are checked using a differential level measurement on two successive days in order to detect any leaks. Based on the limited testing program, no leaks have been detected.

Waste and Recoverable Petroleum Products

Used or contaminated petroleum products are either filtered for reuse or disposed of through DPDO by private contractors. Contaminated JP-4 is tested by the Petroleum, Oil and Lubricants (POL) Laboratory to determine the purity of the fuel prior to re-entry into the Base's fuel system. The JP-4 which is considered too contaminated for reuse is stored in two tanks each 25,000 gallons in volume and located near the existing fire training area. When a substantial quantity of contaminated fuel is available for sale, DPDO will be contacted by Civil Engineering to arrange for a private contractor to remove the fuel. Waste oils, lubricants and hydraulic fluid are collected near their generation points in either small tanks or barrels. The liquids are segregated either hydraulic oils or a mixture of waste motor oil and PD-680. The hydraulic oil is stored by Civil Engineering in a 25,000 gallon tank located adjacent to the previous two tanks described above which store contaminated JP-4. A fourth tank (25,000 gallons) located just below the previous three tanks stores a mixture of waste motor oil and PD-680. These waste products are sold by DPDO and removed by a private contractor. No major spills have been reported in this area.

Prior to discarding used fuel filters, POL personnel will place the filters on existing above-grade pipelines to allow the fuel to evaporate before disposal. After the filter has sufficiently weathered, the fuel filter is placed in a dumpster for disposal.

Petroleum and Chemical Spills

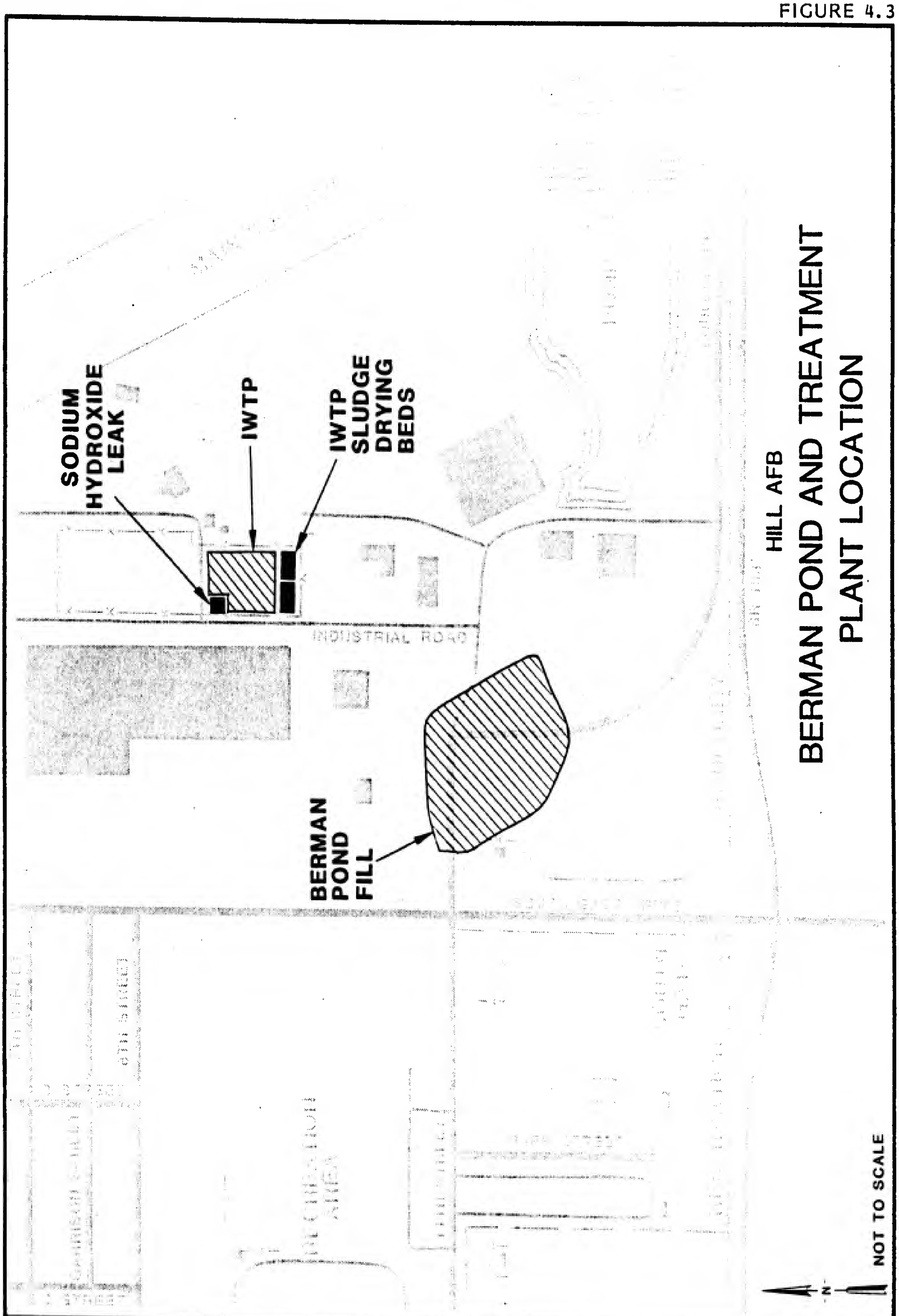
Based on records and on-site interviews, there have been only three major spills in the past. A sodium hydroxide leak from an underground storage tank, a PCB spill inside Building 850 and a sulfuric acid leak into the industrial wastewater sewer.

The sodium hydroxide leak in the under-ground caustic storage tank was adjacent to the industrial wastewater treatment plant (See Figures 4.2 and 4.3). An undetermined amount of caustic leaked from the underground tank before being discovered. This leak occurred over approximately a twelve-month period when the treatment plant was being upgraded and was operationally in a transition period. This is the reason why the caustic spill went undetected for such a long period of time.

In April 1981, thirty-five to forty gallons of PCB liquid was spilled from a rectifier onto a concrete floor in Building 850. The cleanup was supervised by Bioenvironmental Engineering. The spill is not considered to have contributed to either surface or ground water pollution.

On 28 September, 1979, approximately 500 gallons of sulfuric acid leaked from an above ground storage tank at the industrial waste treatment plant into the industrial wastewater sewer. Caustic was added to help neutralize the acid and no problem was reported subsequently from the North Davis County Sewer District Treatment Plant.

Also of interest was a PCB spill which occurred at the U.S. Army railroad shop at the base. A capacitor which was on a truck trailer bed leaked and the cleanup was handled by the U.S. Army under the supervision of EPA.



HILL AFB
BERMAN POND AND TREATMENT PLANT LOCATION

DESCRIPTION OF DISPOSAL METHODS

Waste Management Facilities

The on-site facilities which have been used for management of waste can be categorized as follows:

- Landfills
- Chemical Disposal Pits
- Wastewater Treatment Plants
- Industrial Wastewater Pretreatment Plant
- Evaporation Ponds
- Septic Tanks
- Storm Sewers
- Utah Test and Training Range (UTTR)

The types of waste management facilities are discussed individually in the following subsections.

Landfills

On-site landfills have been used for disposal of solid and liquid hazardous and non-hazardous waste at Hill AFB. Landfilling has been done at a total of four separate locations on the Base (See Figure 4.2). Table 4.2 contains a summary of pertinent information concerning each landfill. Since 1973, all municipal solid waste generated on-base has been hauled off-base by a private contractor to the Davis County Landfill.

Landfill No. 1 is situated in the northeastern portion of the Hill property, encompassing approximately five acres as is shown in Figure 4.1. The landfill was operated as a hill side dump with a daily burning operation, which at that time was the accepted practice. This area served the Hill base from 1955 until 1967 when burning on the base was terminated and all solid waste was landfilled in the vicinity of Fire Training Area No. 2. Based on the information available little if any chemicals were directly disposed of within this landfill during this period. Based on a number of interviews, it is felt that this general area was also the site of solid waste disposal from the old Ogden Arsenal. This may have included waste oils and solvents from their vehicle maintenance facility. Past Arsenal employees vaguely remember a daily burn operation.

TABLE 4.2
LANDFILL INFORMATION SUMMARY

Landfill	Operation Period	Approximate Size (Acres)	Major Types of Wastes	Estimated Waste Quantity (Cu. Yd.)	Method of Operation	Closure Status	Surface Drainage	Site Characteristics and Potential Problems
Number 1	1955-1967	5	General Refuse	80,000	Surface dump & daily burn	Inactive - cover of local soil & native grasses	Drainage toward Davis & Weber Canal	• Topography • Moderately permeable Soils
Number 2	1963-1965	2	General Refuse	10,000	Surface dump & daily burn	Inactive - cover of local soil & native grasses	Drainage toward Davis & Weber Canal	• Topography • Moderately permeable soils
Number 3	1947-1967	5	General Refuse	440,000	Surface dump & daily burn	Inactive - cover of local soil - partially vegetated	Drainage toward Davis & Weber Canal	• Leachate observed in general vicinity • Shallow ground water contaminated in the general vicinity
Number 4	1967-1973	37	General Refuse	260,000	Northern portion - surface dump & compaction Southern portion - trench and cover	Inactive - cover local soil & native grasses	Drainage toward Davis & Weber Canal	• Leachate observed in general vicinity • Shallow ground water contaminated in the general vicinity • Moderately permeable soil
Number 5	1977-Present	5 (Active)	Hazardous Waste	15,000	Trench and cover	Active - five cells covered - one open	Not applicable due to low rainfall	• Possible scavenging problems

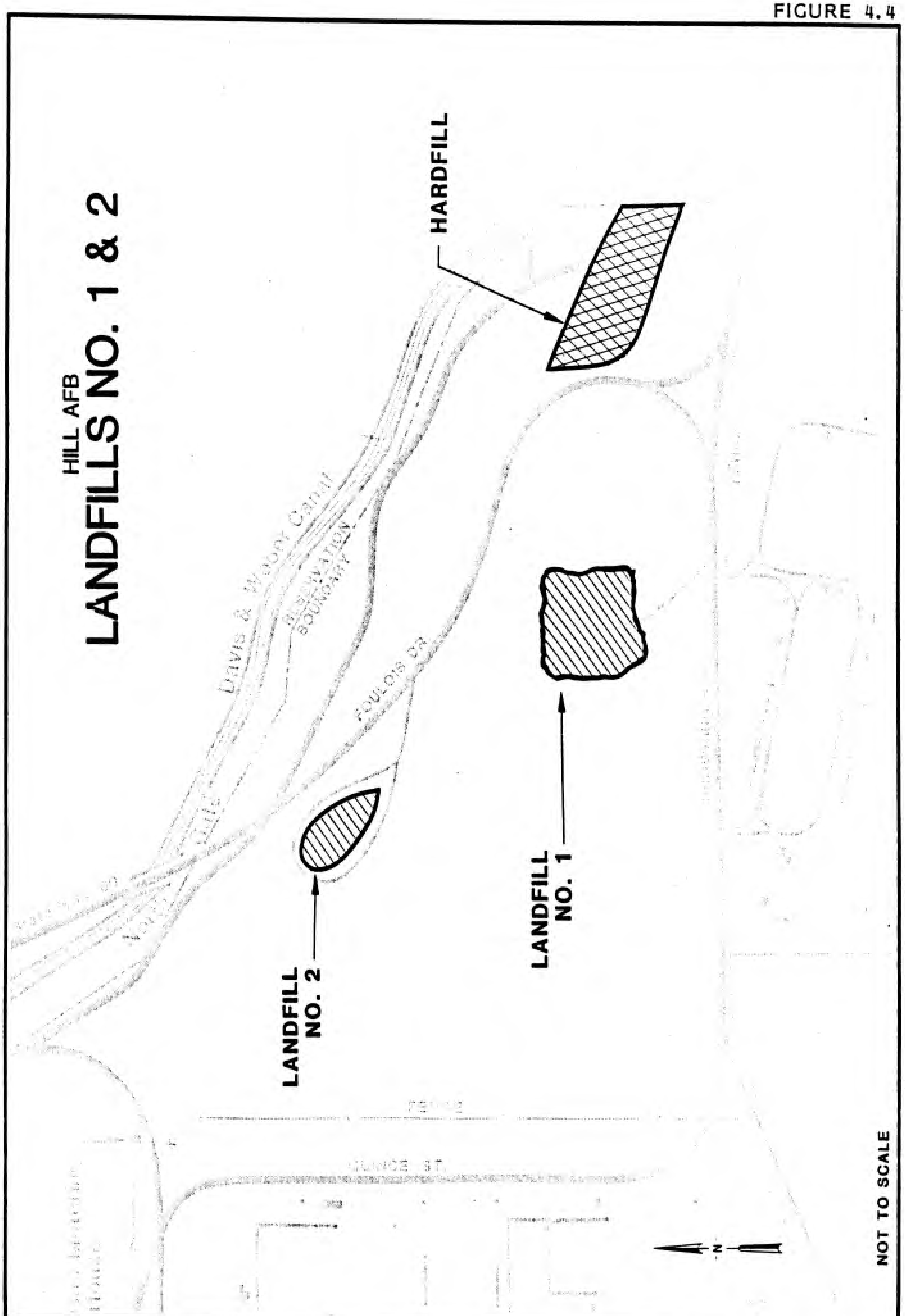
Landfill No. 2 is situated northwest of Landfill No. 1 and was utilized from 1963 to 1965. The site was located on the side of the hill and the solid waste was dumped down the hill and periodically burned. Again no chemicals were disposed of at this location. The boundary of the two acre site is shown in Figure 4.4.

Landfill No. 3 is located on the eastern boundary of the Hill property and was operated as a refuse burn pit from 1947 through 1967. The boundary of this five acre site is shown in Figure 4.5. This site in the past had approximately a thirty to forty foot elevation difference from the southern to the northern extremity. Materials were dumped on the top of the site and burned daily (See Photo - Appendix H - pg. H-1).

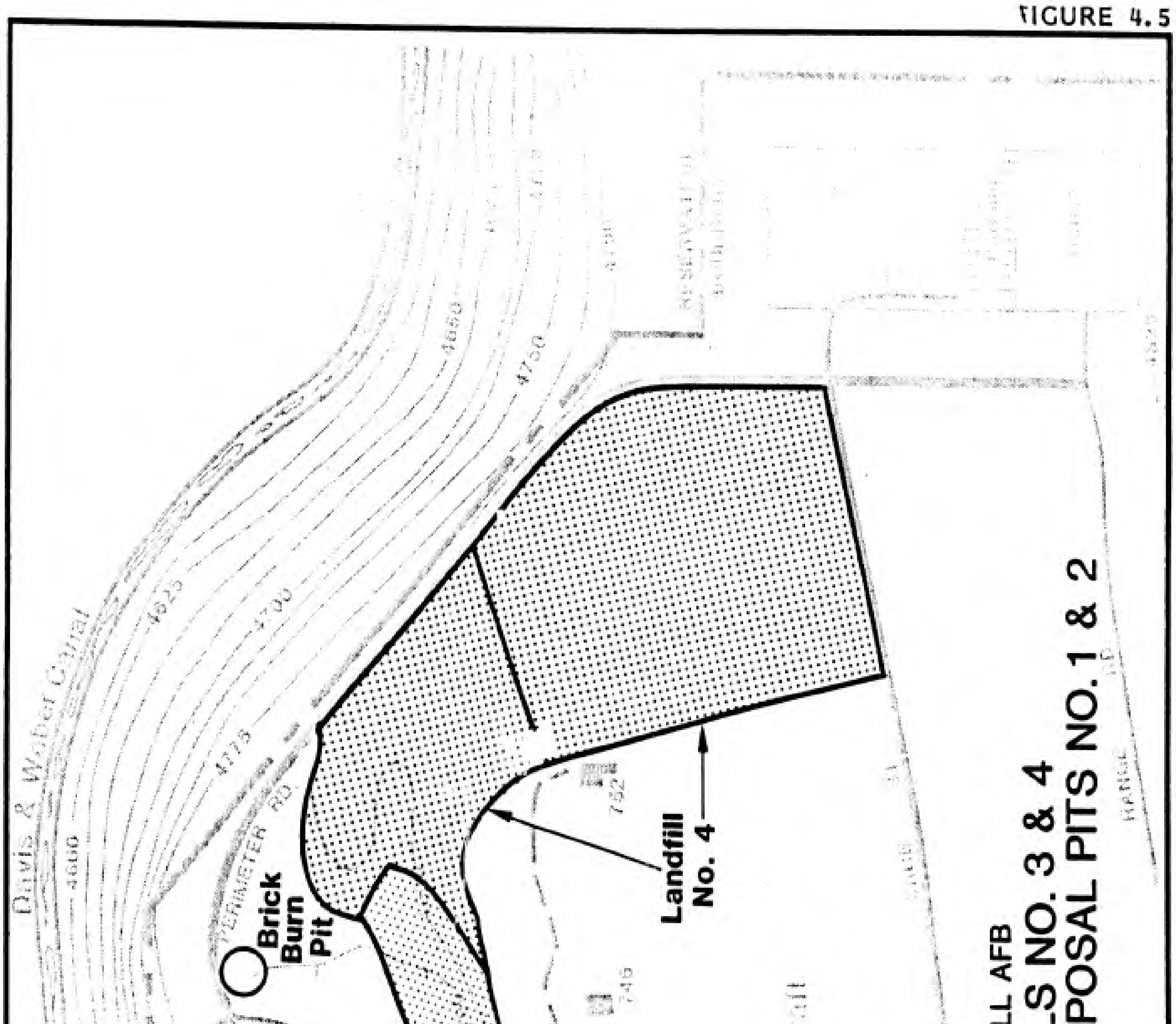
Based on our on-site interviews, hundreds of drums of chemicals were dumped in this area during World War II, and that sludge from the industrial plant was sent to this area from 1955 to 1967. Bottoms from solvent cleaning operations and waste solvents were deposited in these areas up to 1967. This area represents the largest accumulation of hazardous chemicals deposited on Hill AFB property. Based on our experience, the burning operation tends to destroy a large portion of the volatile chemicals, however the heavy metals from the industrial wastewater treatment plant sludge dumped into the area would not be affected by the daily burning.

Landfill No. 4, immediately southeast of the Landfill No. 3, encompassed two distinct operating areas (See Figure 4.5). The northernmost area was operated from 1967 to 1970 as a hill side surface dumping area followed by compaction of the refuse and application of cover material. This operation was terminated after 1970 and the operation then shifted to the southern portion of that same site as shown on Figure 4.5 (See Photo - Appendix H - pg. H-1). This 25 acre site was operated as a trench and cover operation with no burning. Small quantities of chemicals including sulfuric acid, chromic acid, and methyl ethyl ketone (MEK) and sludge from the industrial waste treatment plant were deposited at this site. Of the landfills receiving hazardous waste, Landfill No. 4 has received the least.

During the three years of operation of this portion of the landfill, approximately ten parallel trenches, each twenty to thirty feet wide and fifteen to twenty-five feet deep were dug. Two trenches, one



HILL AFB
LANDFILLS NO. 1 & 2


HILL AFB
LANDFILLS NO. 3 & 4
AND CHEMICAL DISPOSAL PITS NO. 1 & 2
NOT TO SCALE
N
Chemical Disposal Pits No. 1 & 2
Waste Petroleum Storage Tanks (4)
Fire Training Area No. 2
Fire Training Area No. 1
Landfill No. 3
Landfill No. 4
Brick Burn Pit
Davis & Weber Canal
PERIMETER RD.

in use and one being dug, were typically open. Overall trench orientation was generally north to south. Dewatered sludge from the industrial pretreatment plant was also deposited in this landfill during its operating period.

Landfill No. 5 is located approximately four miles north of Lakeside on the UTTR as shown in Figure 4.6. Until recently, this landfill was the only recognized hazardous waste landfill within the state of Utah. The site encompasses over a hundred acres which are available for immediate use. The permeability of the local soil has been determined to be approximately 10^{-8} cm/sec (0.124 in./yr.), which is highly impermeable.

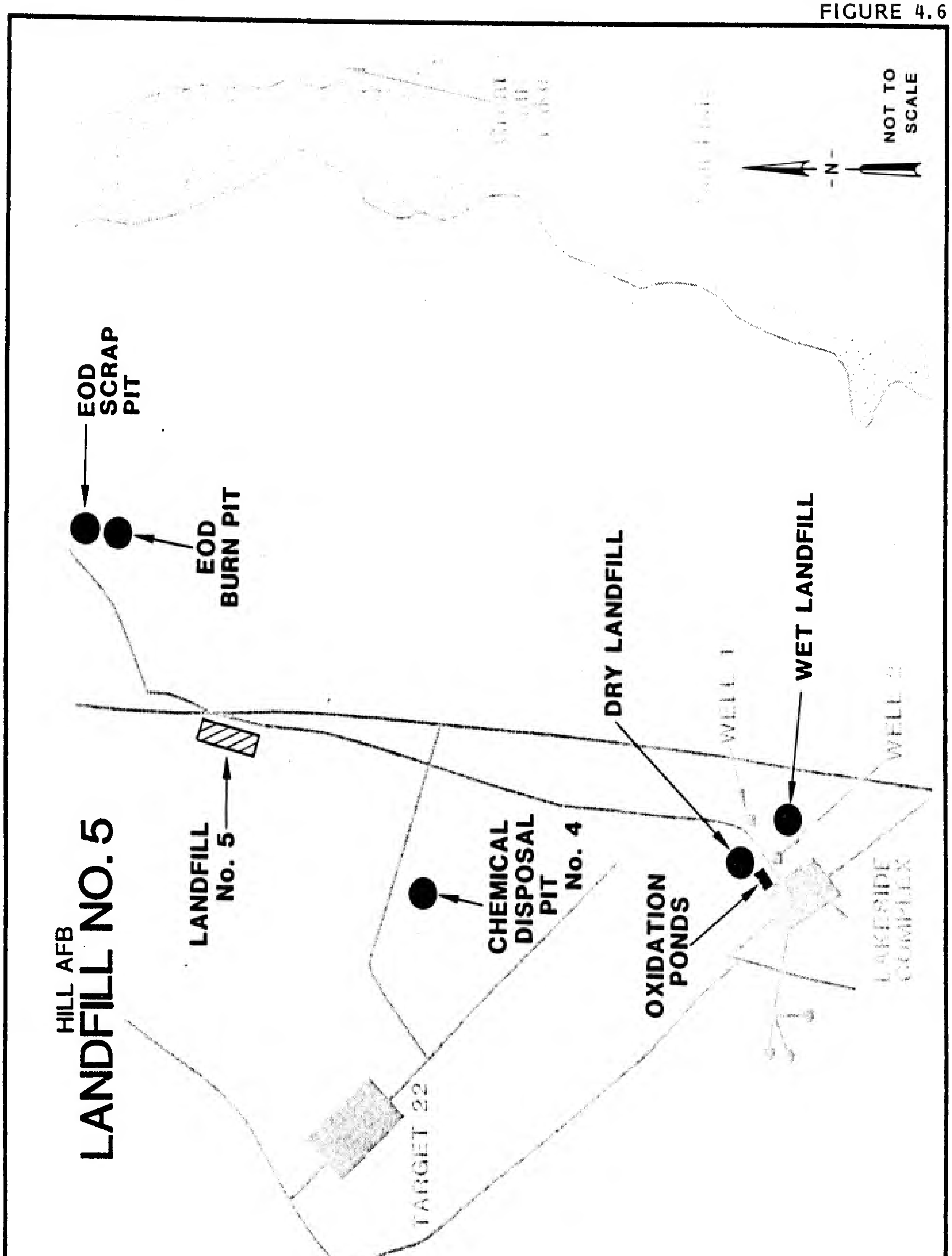
A ground water observation well was placed south of the disposal site and it has been dry when checked by Civil Engineering personnel.

Waste which has been sent to the landfill includes:

- o Beryllium contaminated waste-4,000 to 7,000 pounds per month. The beryllium concentration is approximately .15 mg/gm.
- o Waste sludge-1700 to 1900 cu yd of wet sludge per year.
- o Drums of Spent Solvents-trichloroethylene, methanol, MEK trichloroethane
- o Paint containers
- o Pesticide
- o Asbestos

Page H-2 (See Appendix H) shows an existing cell at the hazardous landfill. Each cell is approximately 150 feet by 90 feet at the surface with a 2 to 1 sideslope. The overall depth is approximately 15 feet deep. At the present time five cells have been filled with the sixth cell approximately half full. In addition to the chemicals sited above, seven PCB contaminated (drained) electrical transformers were buried in cell (South n-3).

Starting in November, 1980, the materials disposed in the landfill have been limited to treatment plant sludge from Hill and JP-4 contaminated foam. Currently the cells are covered once per year after the sludge has had additional time to dry out. As shown in the photos on page H-2 of Appendix H, the landfill is approximately 50 feet from a county road. The location of the landfill is extremely remote; however, the possibility of scavenging by local residents does exist. Therefore,


HILL AFB
LANDFILL NO. 5
EOD SCRAP PIT
EOD BURN PIT
LANDFILL No. 5
CHEMICAL DISPOSAL PIT No. 4
DRY LANDFILL
WET LANDFILL
WELL 1
WELL 2
OXIDATION PONDS
LAKESIDE COMPLEX
TARGET 22
-N-
NOT TO SCALE

it is suggested that the contaminated foam be stored in the fenced-in holding area until the cell is scheduled to be covered.

Chemical Disposal Pits

Two waste chemical disposal pits were dug adjacent to the fire training area (See Figure 4.5) and were used to accumulate liquid chemicals 1954 to 1973. The chemical pits were burned periodically until 1967. Thereafter, all burning activities were terminated.

In addition to the two previously described chemical pits (No. 1 and 2), there was a TCE disposal area (Pit No. 3) on the eastern portion of the Base adjacent to the current National Guard Area. Information collected during the on-site interviews indicated that this area has been utilized since the early 40's to dispose of hazardous waste such as the bottoms from plating tanks. In more recent years it was utilized to discharge the sludge from TCE vapor degreasers and bottoms from the TCE recovery unit. This chemical disposal pit is indicated in Figure 4.7.

Wastewater Treatment Plant

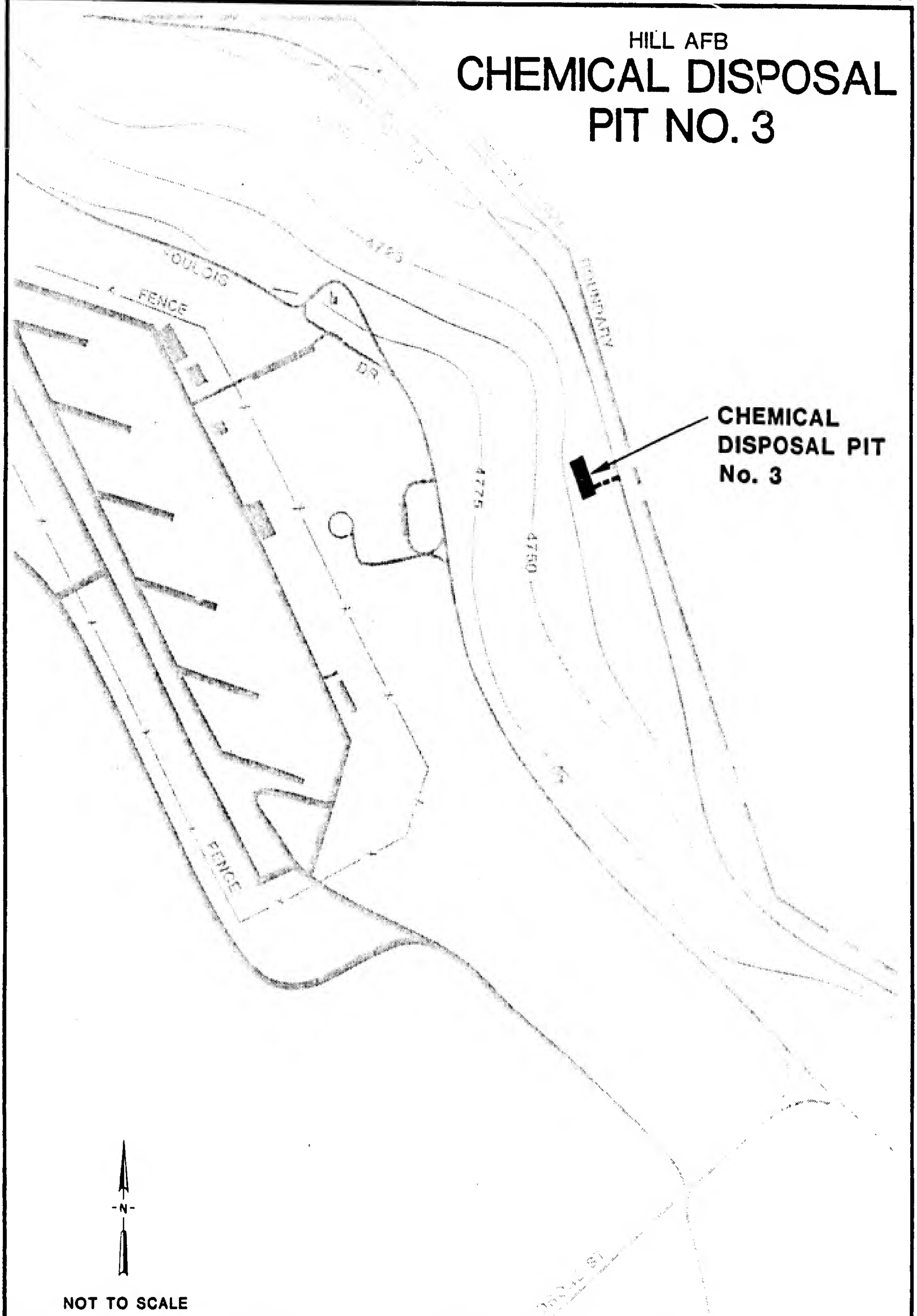
During World War II, the west complex of Hill AFB was the Ogden Arsenal. Activities included the manufacture of ammunition and the handling and distributing of motorized equipment, artillery and other general ordnance. In 1941, the Army constructed a trickling filter plant with sludge dewatering on drying beds and the effluent discharged to a two-acre tile field. There was no discharge to surface water from the facility. The plant was phased out of operation in 1955 when the Arsenal was acquired by Hill AFB.

At Hill AFB during World War II, a major electroplating line was initiated. Little wastewater treatment was undertaken from this line. All of the waste from the plating operation as well as other industrialized areas within the Base were discharged to Berman Pond which is shown in Figure 4.3. The Pond was constructed to act as an evaporation pond; however, on occasion during heavy rainfalls the Pond would overflow. Recently Berman Pond was filled and the area regraded.

To serve the treatment needs of domestic wastewaters, an oxidation pond was constructed in the 1940's at the current site of detention pond no. 2 which is southwest of the South Gate at Hill AFB. As the Base activity increased, a biological treatment plant was constructed in the late 1940's south of the Base's existing hospital.

FIGURE 4.7

HILL AFB
CHEMICAL DISPOSAL PIT NO. 3



This plant continued in operation until in 1958 when the Base tied into the new North Davis Sewer District Treatment Plant. It was at that point in time that an industrial pretreatment plant was constructed at Hill and the existing biological treatment plant was abandoned.

Industrial Wastewater Treatment Plant

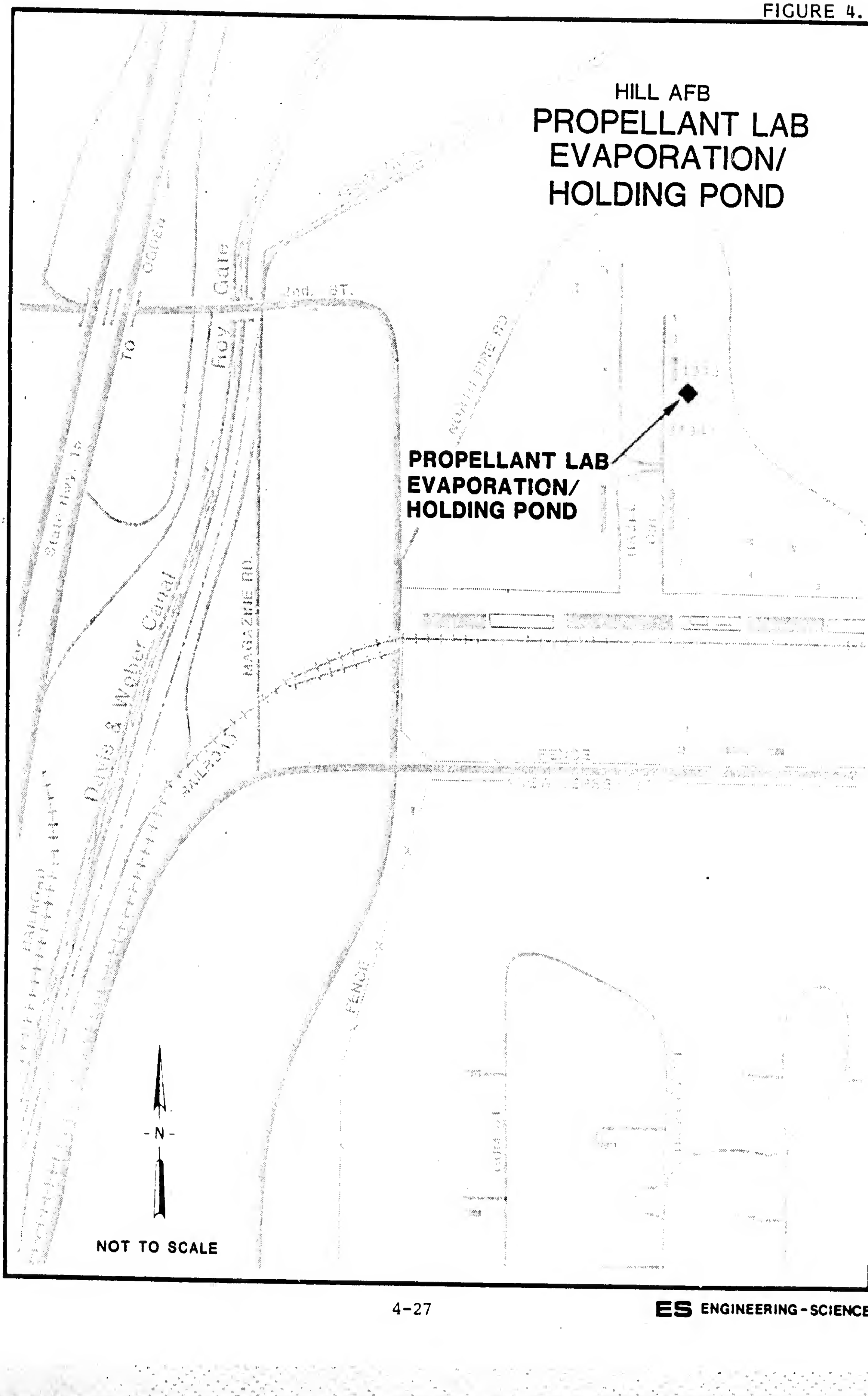
The industrial wastewater treatment plant was constructed in 1956 (See Figure 4.2). The plant pretreats the base's industrial wastewater before discharging to the North Davis Sewer District Treatment Plant. The facilities at that time included one equalization tank, one primary clarifier, a secondary clarifier, control building and sludge drying beds. Over the years, the plant has been modified at various times and the latest expansion was just completed in 1980 with the plant being increased to 1.5 mgd. Approximately four or five years ago, the sludge drying beds were modified and converted from dirt bottoms to a completely enclosed concrete structure in which the sludge filtrate could be recirculated back to the head of the treatment plant. Up to that point in time, all liquids draining from the sludge went directly into the ground. Dewatered sludge from the plant was disposed of in the existing landfills until 1975. Thereafter, the sludge has been hauled in trucks to Landfill No. 5 located in the UTTR at Lakeside.

Little Mountain Sludge Drying Beds. In the mid 70's, Hill disposed of phenolic paint strippers at the sludge drying beds which are adjacent to the industrial wastewater treatment plant at Little Mountain (See pg. H-4 - Appendix H). This practice was curtailed in 1980.

Evaporation Ponds

At Lakeside located in the UTTR the average annual rainfall is approximately six inches while the evaporation rate has been reported to be fifty-eight inches. For this reason evaporation ponds are utilized to handle wastewater from the Lakeside facility. Based on the information available, no hazardous material has been disposed of in the existing evaporation ponds.

Another evaporation pond is utilized at Hill AFB. This serves the propellant laboratory (Building 1951) and receives waters which are used for washing down the various test areas. The water is filtered and sent to a small pond approximately fifteen feet in diameter by two feet deep which is adjacent to the laboratory (See Figure 4.8). Samples are taken


HILL AFB
PROPELLANT LAB
EVAPORATION/
HOLDING POND
PROPELLANT LAB
EVAPORATION/
HOLDING POND
2nd. ST.
Roy Gate
TO
State Hwy. 15
Davis & Weber Canal
MAGAZINE RD.
FENCE
N
NOT TO SCALE

out of the pond periodically to check for propellant levels. When the propellant in the pond reaches a level of one percent, the water is pumped to a tank truck and sent to Lakeside for burning in the EOD burn pit. Major constituents in the pond are ammonium perchlorate and nitroglycerin.

Septic Tanks

There are about eighteen septic tanks on the Hill AFB serving facilities which are located too far from existing sanitary lines to economically justify a sewer service connection. These units have been used primarily for the disposal of sanitary sewage and should not pose a hazard from the standpoint of possible ground water contamination.

Storm Sewer System

Hill AFB is drained by three major streams: Davis & Weber Canal, Kays Creek and Fife Ditch. Individual surface drainage patterns have been presented earlier in Figure 3.1. Storm sewers are utilized only in the heavily developed areas, residential areas, and areas adjacent to the flight line where the use of drainage ditches is impractical. It is estimated that over 70 percent of the base area is drained by surface ditches. The ditches are shallow usually 12 to 18 inches in depth.

Over the years, there has been a concerted effort on the part of the base personnel to eliminate the discharge of contaminated wastewaters to the existing drainage system. As potential discharges were located, specific construction projects were completed to remove these discharges from the drainage ditches. From a historical viewpoint, these ditches have received various quantities of fuel oil and other miscellaneous chemical spills and discharges. However, under the current surface water sampling program, analytical data is collected on the major discharge on a monthly basis. The data indicate that residual chemicals in the ditches are not a problem.

Utah Test and Training Range (UTTR)

During the visit to the UTTR, a number of waste handling facilities were catalogued. Figure 4.6 shows a number of these facilities. The Lakeside complex has a wet (garbage) and dry (refuse) landfill neither of which has received any hazardous waste. Chemical Disposal Pit No. 4 located north of the complex is an abandoned gravel pit which received quantities of oil and solvent in the early 70's. The site is 3 miles away from the two Lakeside wells and should pose no hazard because of the impermeable soils in the area. The wells are 739 feet (Well No. 1) and 302 feet (Well No. 2) deep.

EOD operates a demolition area approximately seven miles from the Lakeside complex. Munitions are exploded and the residual metals are disposed in the scrap pit (See Figure 4.6). Flammable materials, eg. cartons, pallets, containers, are stored in a pit and periodically burned in the EOD area. Neither operation would create a potential ground water contamination problem.

In 1973 under the supervision of EHL and USAFA, tests were conducted at the UTTR to evaluate the biodegradation of herbicide orange and the corrosion rate of coated steel herbicide containers. The test site is adjacent to an approach road to Target 21, which is 13 miles from Lakeside (See Figure 4.9).

The biodegradation work entailed applying herbicide orange to six test plots each 10' x 15'. Application rates varied between 1,000 and 4,000 pounds per acre (equivalent to about 35 pounds on the entire test area.) Three inch core samples were later obtained over a six year period to monitor degradation. Within one year after the test, it was reported that little trace of the herbicide orange remained.

The corrosion testing involved the digging of six trenches each 50 feet long, 10 feet wide and 5 feet deep. Lids were cut from 360 - 55 gallon drums, weighed and buried in the above trenches along with sixty empty drums. Certain trenches were backfilled with flyash, soil and dried sewage sludge to evaluate corrosion potential. The metal samples were then periodically removed to evaluate their weight loss.

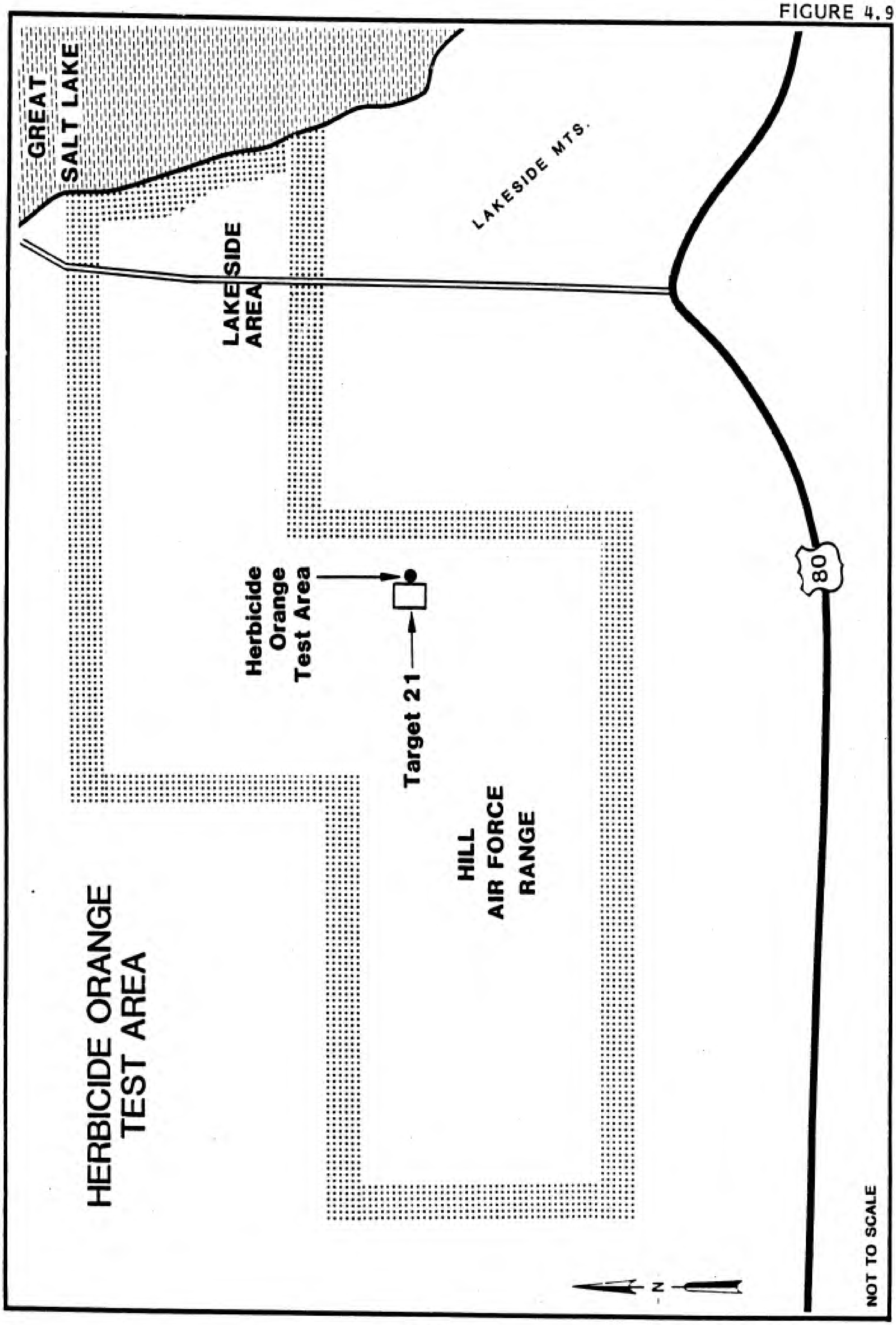
It is felt that the herbicide orange testing did not contribute to either surface or ground water contamination because of the following:

- o the site is 13 miles from the closest population center
- o the testing was of very small scale
- o the area is under government controlled access
- o the soils in the area are relatively impermeable

<u>Off Site Disposal Facilities</u>

The methods used for disposal of Hill AFB hazardous and non-hazardous wastes include:

FIGURE 4.9



HERBICIDE ORANGE TEST AREA

- Off site waste oil contract disposal
- Off site refuse contract disposal
- Off site waste chemical contract disposal

Waste Oil Disposal

Waste oil, waste fuels and hydraulic fluids which are resalable are marketed through DPDO on a competitive bid basis.

Refuse Disposal

Residential solid waste was placed in landfills on the base from 1955-1973. In 1973, all refuse was hauled off base by a contractor and the landfills were closed. Solid waste is sent to the North Davis County landfill just east of the base.

Waste Chemical Disposal

In accordance with Defense Environmental Quality Program Policy Memorandum (DEQPPM No. 80-5), Department of the Air Force has the responsibility of disposing of eight categories of hazardous materials (See Table C.5) which are handled through the Base Contracting Office by using a one time contract with a waste management firm. Other hazardous materials are disposed of by DPDO in accordance with DEQPPM No. 80-5 and 80-8.

EVALUATION OF PAST WASTE DISPOSAL FACILITIES

Thirteen disposal sites associated with Hill AFB were identified as containing hazardous material resulting from past waste disposal activities. These sites have been assessed using a rating system which takes into account factors such as site characteristics, waste characteristics, potential for contamination and waste management practices. The details of the rating procedure are presented in Appendix F and the results of the assessment are summarized in Table 4.3. Rating scores were developed for the individual sites and the sites are listed in order of ranking. The rating system is designed to indicate the relative need for more detailed site assessment and/or remedial action. The information presented in Table 4.3 should be used as a guide for assigning priorities for dealing with the Hill AFB disposal sites. The rating forms for the individual waste disposal sites are presented in Appendix G for review.

TABLE 4.3

PRIORITY RANKING OF POTENTIAL CONTAMINATION SOURCES

HILL AFB

Rank	Site Name	Period Of Operation	Receptor Subscore	Pathways Subscore	Waste Characteristics Subscore	Waste Management Subscore	Overall Score	Refer To Appendix G Page No.
1	Landfill No. 4	1967-1973	51	66	100	90	77	G-7
2	Chemical Disposal Pit No. 1 & 2	1954-1973	51	70	100	66	72	G-11
3	Landfill No. 3	1947-1967	51	72	100	75	70	G-5
4	Sodium Hydroxide Leak	1980	43	30	100	85	62	G-17
5	Berman Pond	1940-1956	48	36	100	66	61	G-21
6	IWTP-Drying Beds	1956-1976	43	27	100	65	57	G-15
7	Chemical Disposal Pit No. 3	1967-1975	26	22	100	84	56	G-13
8	Little Mtn. Drying Beds	1973-1978	33	26	100	65	53	G-17
9	Fire Training Area No. 1	1958-1973	51	23	50	82	50	G-25
10	Landfill No. 5	1977-Present	0	7	100	44	43	G-9
11	Landfill No. 2	1963-1965	53	26	30	56	40	G-3
12	Landfill No. 1	1955-1967	56	22	30	55	38	G-1
13	Herbicide Orange Test Plot	1973	0	12	60	13	20	G-23

In addition to the rating information in Table 4.3, the period of operation is also presented. It should be pointed out that the rating system does not take in consideration a "time factor". This is especially pertinent when considering spills, chemical disposal pits and the fire training areas.

In Table 4.3 Landfill No. 4, which was the most recently used and currently exhibiting a leachate problem received the highest score of 77. Landfill No. 3, which is immediately adjacent to Landfill No. 4, received a score of 70 because of the large quantities of hazardous materials which were disposed there and its proximity to Landfill No. 4. Chemical Disposal Pit No. 1 and No. 2, which are in the general vicinity of Landfill No. 3 and No. 4, received a score of 72. These pits received large quantities of solvents and oils, and shallow ground water monitoring data (See Appendix I) indicated an elevated COD, and oil and grease concentration in this vicinity. The sodium hydroxide leak occurring at the industrial wastewater pretreatment plant received a rating of 62. This is because of its proximity to the base boundry as well as to populated areas.

Berman Pond utilized between 1940 and 1956 as an evaporation pond for industrial waste within Hill AFB received a score of 61 because of the large volume and the toxic nature of many of the chemicals. The Chemical Disposal Pit No. 3 and the industrial wastewater treatment plant drying beds received scores of 56 and 57. The chemical disposal pit received large volumes of TCE from 1967 to 1975. It was also a suspected dumping ground in the 40's for bottoms from the plating operations which were operated at Hill Air Force Base. The drying beds associated with the industrial wastewater pretreatment plant handled metallic sludges and allowed the filtrate to drain into the ground during its period of operation from 1956 to 1976.

Fire Training Area No. 1 which was utilized from 1958 to 1973 received a score of 50. This is because the site was flooded before the fire training exercises and a minimal amount of chemicals would have entered the ground water table. The sludge drying beds located at Little Mountain, which received phenolic paint strippers, received a score of 53 because of their remote location.

Landfill No. 5 which is the hazardous waste landfill located at Lakeside received a score of 43 because of its remote location and the unlikelihood of contamination potential. Landfills No. 1 and No. 2 located in the northern portion of the base received small quantities of hazardous waste and operated as burn operations; therefore, there is little potential for groundwater or surface water contamination from either of these two sites. The last site evaluated was the Herbicide Orange Test Plot located at Target 21 at the UTTR. This site received a rating of 20 because of its remote location, impermeable soil and the small quantity of hazardous waste placed at the site.

SUMMARY OF PREVIOUS ENGINEERING STUDIES

In 1975, the Base Bioenvironmental Engineer had reported a leachate source at the toe of Landfill No. 4. This situation was studied in two separate reports one undertaken by OEHL and the other by Calscience Research, Inc. (CRI). The data collected and the specific conclusions and recommendations of the individual reports is presented in detail in Appendix I and summarized in the following text.

The conclusion of the studies was that Landfill No. 4 was underlain with a continuous clay lens at approximately 30 to 35 feet deep. Precipitation falling on the landfill was permeating the trenches and flowing in a general south to north direction. In addition, groundwater flow also moving in that direction was flowing through the bottom portion of the trench and adding to the observed quantity of leachate generated. Precipitation on Landfill No. 4 (based on mass balance calculations) was contributing to 80% of the quantity of leachate. The recommended renovation option was the installation of a well point system upstream of Landfill No. 4 to lower the groundwater table. This would be combined with the covering of the landfill with an impermeable cover to minimize overall leachate generation.

As shown in Figure 4.5, the area to the west of Landfill No. 4 has experienced a heavy concentration of activity associated with hazardous waste disposal in the past. As such, it is felt that any renovation scheme applied only to Landfill No. 4, at this time, may impact the surrounding landfill and chemical disposal pits.

CHAPTER 5

CONCLUSIONS

CHAPTER 5
CONCLUSIONS

The goal of Phase I of the IRP was to identify the potential for environmental contamination from past waste disposal practices and spill incidents at Hill AFB and to assess the probability of contamination migrating beyond the base boundaries. Based on the results of the project team's field inspection, review of records and files, and interviews with base personnel, past employees and state and local government employees, the following rankings have developed. Table 5.1 contains the priority ranking of potential contamination sources at Hill AFB. The following conclusions are listed by category.

Landfills

a. Landfill No. 4 has the greatest potential for off-site migration of contaminants and has received a score of 77. The landfill has been used for the disposal of industrial wastewater treatment plant sludge and waste chemicals. Precipitation and ground water intrusion has resulted in a leachate contamination problem which has been well documented in the OEHL and CRI engineering studies discussed in Chapter 4. This situation is compounded by the site's topographic location and proximity to the base boundary.

b. Landfill No. 3 received a score of 70 because it also received large quantities of industrial sludge and chemicals; however, no specific leachate has been observed coming from this area.

c. Landfill No. 5, the hazardous waste landfill located at Lakeside, received a score of 43 because of its remote location from population and distance from the base boundary. Landfills No. 1 and No. 2 received scores of 38 and 40, respectively. Waste disposed of in these sites were burned and pose little or no contamination potential.

Chemical Disposal Pits

a. Chemical disposal pits no. 1 and no. 2 received a combined score of 72 because they received large quantities of solvents, oils and paint

TABLE 5.1

SUMMARY RANKING OF POTENTIAL CONTAMINATION SOURCES

RANK	SITE NAME	PERIOD OF OPERATION	SCORE
1	Landfill No. 4	1967-1973	77
2	Chemical Disposal Pit No. 1 & 2	1954-1973	72
3	Landfill No. 3	1947-1967	70
4	Sodium Hydroxide Leak	1980[1]	62
5	Berman Pond	1940-1956	61
6	IWTP - Drying Beds	1956-1976	57
7	Chemical Disposal Pit No. 3	1967-1975	56
8	Little Mtn. - Drying Beds	1973-1978	53
9	Fire Training Area No. 1	1958-1973	50
10	Landfill No. 5	1977-Present	43
11	Landfill No. 2	1963-1965	40
12	Landfill No. 1	1955-1967	38
13	Herbicide Orange Test Plot	1973[2]	20

[1] Leak occurred over a 12 month period.

[2] Small scale test procedure conducted on a remote portion of the Utah Test and Training Range.

strippers. The disposal pits were burned periodically until 1967 and thereafter until 1973 no burning was conducted. Ground water data obtained from observation wells in their vicinity also indicate contamination of the perched water table (See Appendix I).

b. Chemical disposal pit No. 3, which was operated from 1967 to 1975, received large quantities of TCE bottoms from the solvent recovery unit and vapor degreasers and received a rating of 56. It was also reported that this site was a dumping ground during the 1940's for bottoms from the plating operation. Since TCE is a highly mobile chemical in ground water, this area is considered to have a high potential for contaminant migration.

Leak Incident

The only major leak incident which has been identified is a sodium hydroxide leak at the industrial wastewater treatment plant that occurred in 1980. The leak resulted from a break in the piping associated with an underground sodium hydroxide storage tank and took place over a 12 month period. This leak received a score of 62. At the present time, base personnel are making attempts to better quantify the volume of chemical spilled as well as the extent of any contaminant migration.

Evaporation Pond

Berman Pond received industrial plating wastewater from 1940 to 1956. The site received a score of 61 because of its potential for contaminant migration.

Sludge Drying Beds

a. The sludge drying beds located at the industrial wastewater treatment plant were operated from 1956 to 1976. During that time they received large quantities of metallic sludges. Filtrate from the sludge entered the ground and could possible have contaminated the ground water. The site received a score of 57.

b. Sludge drying beds located adjacent to the industrial water treatment plant at Little Mountain were utilized in the 70's as a disposal area for phenolic paint strippers. The site received a score of 53.

Fire Training Area

Fire Training Area No. 1 received a score of 50. The practice was to flood the pit before a fire training exercise thereby minimizing the amount of chemicals entering the ground water.

Herbicide Orange Test Plot

The Herbicide Orange Test Plot area located adjacent to target 21 at the UTTR received a score of 20. The testing was on a very small scale, and the test area is remote, received small amounts of chemical and has soils which are relatively impermeable. The site poses little or no contamination potential.

CHAPTER 6

RECOMMENDATIONS

CHAPTER 6

RECOMMENDATIONS

In order to aid in the comparison of these thirteen sites with those sites identified in the IRP of other Air Force bases, a priority ranking scale has been developed. Sites at Hill AFB with overall scores of 56 to 100 are of primary concern, based on their potential for contaminant migration off-site. They require further investigation in Phase II. All of the remaining sites are considered to have a low potential for contamination and no further monitoring is recommended unless data collected from other sites indicate a problem.

The following recommendations are made to further assess potential for contaminant migration from past waste disposal areas at Hill Air Force Base. The recommended monitoring program for Phase II is summarized in Table 6.1.

1. Landfill No. 4 is considered to have the highest potential for migration of contaminants and an electrical resistivity survey of this site is recommended. An electrical resistivity survey will better define the extent of the leachate plume and the continuity of the clay lens under the site.

2. Chemical Disposal Pits No. 1 and No. 2 and Landfill No. 3 are considered to have a high potential for migration of contaminants and monitoring of these sites is recommended. An electrical resistivity study should be employed at these sites to determine the following:

- the lateral extent and thickness of the clay lens under the above sites
- the lateral extent of any contamination plume originating from the sites.

TABLE 6.1

RECOMMENDED MONITORIING PROGRAM FOR PHASE II
HILL AIR FORCE BASE

Site	Rating Score	Monitoring Technique	Contaminant Parameters	Comments
Landfill No. 4	77	• Electrical resistivity survey to determine the extent of the leachate plume and continuity of the clay lens under the site.		• Conducting the electrical resistivity survey of Chemical Disposal Pit No. 1 and No. 2 and Landfills No. 3 and No. 4 jointly is advantageous because of their proximity.
Chemical Disposal Pit No. 1 and No. 2	72	• Electrical resistivity survey to determine lateral extent of clay lens under the site and extent of plume.		
		• Four ground water monitoring wells - three downgradient-one upgradient.	• Phenol, O&G TOC, pH, total organic halogen	• Well W-13 may be used as the upgradient well if new sampling data indicates reduced pollutant levels.
		• Depending upon the above results initiate a soil sampling program to define the vertical and horizontal limits of the pits.	• Phenol, O&G TOC, pH, total organic halogen	
Landfill No. 3	70	• Electrical resistivity survey to determine lateral extent of clay lens under the site and extent of plume.		
		• Four ground water monitoring wells - three down gradient - one upgradient.	• Phenol, pH, chromium, cyanide, TOC, beryllium, cadmium	
		• Depending upon the above results initiate soil sampling program to define the vertical and horizontal limits of the landfill.	• Phenol, pH, chromium, cyanide, TOC, beryllium, cadmium.	
Sodium Hydroxide Leak	62	• Four lysimeters placed equidistant around the periphery of the IWTP leak area	• pH, Na	
Berman Pond	61	• Four lysimeters placed equidistant around the periphery of the site.	• Cadmium, cyanide, TOC, O & G, Phenol, Chromium	
IWTP Sludge Beds	57	• Four lysimeters placed equidistant around the periphery of the beds.	• Chromium, cyanide, cadmium, pH, beryllium	
Chemical Disposal Pit No. 3	56	• Four lysimeters placed equidistant around the periphery of the pit	• TCE, Chromium, pH, Cyanide, Beryllium	

If all of these sites are approved for Phase II then consider undertaking the survey in conjunction with Landfill No. 4 (See No. 1 above). Since these sites are adjacent to each other, it is felt that any restoration scheme applied to only one site could adversely impact ground water quality at other sites (See Chapter 4 for discussion).

If a contamination plume is identified, it will be necessary to establish a ground water monitoring program at the site to quantify the type and magnitude of the contaminants. It is believed that at least three monitoring wells located down-gradient from each site should be adequate to define each site specific plume.

In addition to the down-gradient monitoring, it is recommended that Well W-13 (existing background water quality well) be redeveloped and samples obtained to verify oil and grease, phenol and COD concentrations. If values are as high as the previous data collected, it is recommended that a well be drilled up-gradient of W-13 in order to determine actual baseline water quality. If more than one of the above sites is approved for Phase II then consider the use of only one up-gradient well for these sites.

At this time it is believed that wells comprising such a monitoring system will have a total depth on the order of 35 feet based upon existing base monitoring wells. It should be noted that wells in this vicinity could be dry part of the year. The actual design of this ground water monitoring system must be predicated upon site-specific hydrogeologic data. Care should also be taken during the drilling to maintain the integrity of the clay lens underlining the sites. Water samples obtained from these wells should be evaluated for the parameters presented in Table 6.1.

If the resistivity survey and ground water monitoring program indicate a contaminant problem then a soil sampling program should be undertaken to define the vertical and horizontal boundries of each site.

Four test borings should be drilled equidistant around the periphery of each site. The location of the boring should be beyond the known limits of the disposal site. These soil samples should be taken on 2.5 foot intervals for the first 10 feet and 5 foot intervals thereafter. Soil samples should be tested for chemical parameters of wastes known to have been disposed in each site. These parameters are presented in Table 6.1.

3. Berman Pond, IWTP Sludge Beds, Chemical Disposal Pit No. 3 and the Sodium Hydroxide Leak are considered to have a high potential for migration of contaminants and monitoring of these sites is recommended. Since the base ground water aquifer is quite deep in this area and it is not known whether perched water tables exist, it is recommended that four lysimeters be placed equidistant around the periphery for each of the sites. Samples collected by the lysimeter should be analyzed for the contaminant parameters presented in Table 6.1. Obtaining representative data from a lysimeter requires the services of an experienced geotechnical firm. The criteria developed to select the contractor to undertake this work should carefully weigh his previous experience.

4. Currently the cells at Landfill No. 5 are covered once per year. Since the landfill is 50 feet from a county road, it is recommended that hazardous wastes with the exception of the industrial wastewater plant sludge be held in the existing fenced holding area until the cell is about to be covered. This will minimize the possibility of scavenging.

5. Obtain a water sample from Well No. 3 (located in the vicinity of Landfill No. 3) and Well No. 4 (located in the vicinity of Chemical Disposal Pit No. 3, and run an organic pollutant scan on the GC/MS. All organic parameters from EPA's priority pollutant list should be measured.

APPENDIX A

PROJECT TEAM QUALIFICATIONS

C. M. Mangan, P.E.

J. R. Absalon, CPG

R. M. Reynolds, P.E.

B. D. Moreth

M. I. Spiegel

Biographical Data

Charles M. Mangan

Senior Environmental Engineer

[redacted]

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. Margan (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 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.

Participated in a study for the U.S. Environmental Protection Agency to develop effluent limitations and new source performance standards of water pollution control in the organic chemicals industry. The study included (1) categorization of chemicals based on contact water usage in associated manufacturing processes, (2) establishment of production-based raw waste loads obtained through field sampling, (3) effluent limitations obtained through waste reduction factors based on in-process controls and end-of-pipe treatment technologies.

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.

Charles M. Mangan (Continued)

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.

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 wetlands 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.

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

JOHN R. ABSALON
Hydrogeologist

[redacted]

Education

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

Professional Affiliations

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

Experience Record

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

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

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

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

John R. Absalon (Continued)

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

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

Publications

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

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

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

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

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

Biographical Data

Randal M. Reynolds

Senior Engineer

[redacted]

Education

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

Professional Affiliations

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

Experience Record

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

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

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

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

Randal M. Reynolds, Continued

Project Engineer for Phase I Installation Restoration Program projects for the Department of Defense. Developed hazardous chemical usage, waste generation and waste disposal practice timelines for industrial operations at several Air Force bases. Identified industrial operation disposal practices which could result in waste migration off the base property and recommended priority disposal practices requiring further investigation.

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

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

Publications and Presentations

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

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

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

Biographical Data

BRIAN D. MORETH

Environmental Scientist

[redacted]

Education

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

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 in the 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. Presented 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 feasiblity

Brian D. Moreth (Continued)

study of facilities for the State of New Jersey, and prepared revegetation plans for reservoir and strip mined lands.

Served as Task Force Leader for the Environmental Quality segment of Comprehensive Water Quality Management Plan for a seven-county area in northeast Pennsylvania, which involved preparing an inventory of all natural resources and environmentally sensitive and degraded areas.

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. Project Scientist. Involved in the development of environmental studies, inventories, and evaluations for municipal, industrial, and Federal government projects.

Served as Deputy Project Director of a third-party EIS for a central Florida phosphate mine. This involved preparation, direction and coordination of the multiple environmental facets associated with the construction of a new mine.

Served as Project Scientist for site and record searches of several Air Force Bases evaluating hazardous waste disposal and any biological effects associated with it.

Assisted in development of a peat mining and restoration plan for a private concern in North Carolina.

Biographical Data

MARK I. SPIEGEL

Environmental Scientist

[redacted]

Education

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

Professional Affiliations

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

Experience Record

1974-1976	U.S. Environmental Protection Agency, Surveillance and Analysis Division. Cooperative Student. On assignment to Air Surveillance Branch, participated in ambient air study in Natchez, Mississippi, and operated unleaded fuel sampling program for Southeast National Air Surveillance Network. For Engineering Branch, participated in NPDES compliance monitoring of industrial facilties throughout the southeast; operation and maintenance studies of municipal waste treatment facilities; and post-impoundment study of West Point Reservoir, West Point, Georgia. Participated in industrial bioassay studies for the Ecological Branch.
1977-Date	Engineering-Science. Environmental Scientist. Responsible for the conduct of water and wastewater sampling programs and analyses, quality control, laboratory process evaluations, and evaluation of other environmental assessment data. Conducted leachate extraction studies of sludges produced at a large organic chemicals plant to define nature of sludges according to the Resource Recovery and Conservation Act guidelines. Involved in laboratory quality assurance program for the analysis of water samples used in a stream modeling project. Conducted water quality modeling study for Amerada Hess Corporation to determine the assimilative capacity of a stream receiving effluent from a southern Mississippi refinery.

Mark I. Spiegel (Continued)

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

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

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

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

APPENDIX B

INSTALLATION HISTORY

APPENDIX B

INSTALLATION HISTORY

OGDEN ARSENAL

During World War II the west complex of Hill AFB was the Ogden Arsenal. The Army installation had been activated in April, 1920 as a reserve depot to store ordnance from factories for emergency use and restored ordnance left over from World War I. The workforce was small, being commanded between 1926 and 1935 by Sargent Pierce. In 1929, all but six of the storage magazines blew down during a storm. No serious attempt was made to repair them until 1935. During the period 1939 through 1942, the Base was rehabilitated and modernized. At the beginning of World War II, the Arsenal was already busily engaged in loading 100 to 2,000 lb. bombs, artillery and small arms in addition to storing ammunition. As World War II progressed, the Arsenal's mission changed to manufacturing ammunition, and handling and distributing motorized equipment, artillery and other general ordnance. The industrial operations of the Arsenal were discontinued in the latter part of 1945 when the post became a master depot for the storage and distribution of vehicles, artillery, small arms, parts and supplies. At its peak activity, the depot had about 6,100 civilians and 35 military personnel.

To provide wastewater treatment for the Arsenal's employees, the Army constructed a wastewater treatment plant in 1941 comprising an Imhoff tank, a thirty foot diameter trickling filter and secondary clarifier. Sludge was dewatered on drying beds and the effluent was discharged to a 2-acre leach field. Based on the information available, the wastewater treatment plant was phased out of operation in 1955.

HILL AFB

Hill Field was commissioned in November of 1940. During World War II, aircraft depended on Hill for rehabilitation with the workforce growing to a peak of 22,000 in 1943. In 1947, the Army Air Corps became the U.S. Air Force ending its association with the Army that had lasted for forty years. Following an Air Force-wide pattern of renaming fields as bases, Hill Field became Hill AFB in February, 1948. By the end of 1947, over two hundred million dollars worth of aircraft had been preserved at Hill and in perfect condition for possible future use. When North Korea invaded South Korea in 1950, Hill personnel quickly removed needed B-29's and B-26's from storage and added them to the active Air Force inventory. In 1955, the Department of Defense added the adjacent Ogden Arsenal property to Hill AFB thereby doubling in size and adding over 600 buildings and structures.

In 1952, the Air Materiel Command had made Hill the prime depot for parts for Northrop Aircraft, specifically the F-89 Scorpion. The following year, it was assigned the job of modifying this aircraft thus opening the door for subsequent F-84, F-101, F-102, F-4 and F-16 aircraft maintenance. To handle the expanding jetcraft workload, the Base modernized its aircraft facilities. This included the construction of a new 13,500 foot heavy-duty runway completed in 1957.

In January 1959, Hill was selected to be the logistics manager of the Minuteman Missile. In addition, it was selected for the assembly point for the Minuteman. The old Arsenal area was a determining factor in Hill's selection. The location of a range complex, about sixty miles west of Hill AFB was another point in its favor. Here, testing of missile motors could be carried out with essentially no impact on communities. Air Force Plant 77, an eleven million dollar complex was built in the Base's west area on land previously transferred from the Arsenal. The Plant became the assembly point for the Minuteman Missile and began operation in 1961 and was operated by the Boeing Company. In 1959, there were nearly twelve thousand civilians and a thousand military people assigned to Hill AFB.

In 1965, Hill AFB was assigned complete logistics management for the Missileman missile force. In the same year, the Titan Missile workload was transferred from the San Bernardino Depot which was being closed. Hill AFB thus had management responsibility for the Nation's twin-pronged Intercontinental Ballistic Missile (ICBM) effort. To accommodate the increasing workload, a great construction boom occurred during the 1960's at Hill AFB. Buildings, warehouses and laboratories for all aspects of the missile program as well as other emerging responsibilities necessary to serve the Air Force. In 1968, Hill became the manager for the air to ground Maverick Missile.

The first production Minuteman Missile was produced in April, 1962. By March of 1964, the five hundredth minuteman had been assembled and in May of 1965 Boeing completed the last Minuteman I before moving into production of the more advanced Minuteman II. The last Minuteman Missile assembled by the Boeing Company at Hill was produced in November, 1978. In September, 1968, Hill assumed the responsibility for the development, operation and management of the Air Force Logistics Command Test Range which included the entire air space over the Hill Air Force Range and Wendover Complex and 1.8 million acres of government-owned land stretching west and south of the Great Salt Lake.

At the end of 1962 there were almost 15,000 personnel assigned to Hill AFB.

In 1973, the Air Force established a Strategic Air Command satellite base with B-52 bombers on 24-hour-a-day alert. Then in 1975, SAC's B-52 alert committment at Hill was terminated and the B-52's returned to their home station at Beale Air Force Base, California.

A major tenant located at Hill is the 388th Tactical Fighter Wing of the Tactical Air Command which moved from Korat Royal Thai Air Base, Thailand in late 1975. The 388th received it first F-16 in January, 1979 and later became the first operational F-16 unit in the Air Force to become combat ready. In December of 1979, Hill assumed worldwide management of the F-16; this included the maintenance responsibility following the F-16 introduction into the inventory.

LITTLE MOUNTAIN TEST ANNEX

Little Mountain Test Annex was constructed in 1958 as a hardness test center to test missile components in a simulated nuclear blast environment. Hardness testing is conducted utilizing electronic and mechanical techniques to simulate a nuclear blast environment. During the early 1960's, there were approximately 300 people located at Little Mountain, now there are between 70 and 80 people. Little Mountain Test facility was operated by Marquardt Aircraft Company.

APPENDIX C

ENVIRONMENTAL SETTING

TABLE C.1

HILL AFB CLIMATIC DATA
Period of Record September 1948 - August 1978

MONTH	TEMPERATURE (°F) MEAN DAILY MAX	TEMPERATURE (°F) MEAN DAILY MIN	TEMPERATURE (°F) MEAN MONTHLY	TEMPERATURE (°F) EXTREME MAX	TEMPERATURE (°F) EXTREME MIN	PRECIPITATION (IN) MONTHLY MEAN	PRECIPITATION (IN) MONTHLY MAX	PRECIPITATION (IN) MONTHLY MIN	PRECIPITATION (IN) MAX 24 HRS	SNOWFALL (IN) MONTHLY MEAN	SNOWFALL (IN) MONTHLY MAX	SNOWFALL (IN) MAX 24 HRS	RELATIVE HUMIDITY (%) LST 04	RELATIVE HUMIDITY (%) LST 13	SURFACE WINDS PVLG DRCTN (16 PT)	SURFACE WINDS SPEED MEAN (KT)	SURFACE WINDS SPEED MAX (KT)
JAN	33	21	27	56	-13	2.3	5.6	.1	1.6	18	45	14	69	64	ESE	7	65
FEB	39	25	32	65	-5	1.6	4.1	.4	1.7	12	32	9	68	59	ESE	8	59
MAR	47	30	39	72	3	1.9	4.3	*	1.8	12	38	13	63	50	ESE	8	73
APR	56	38	48	83	17	2.4	5.8	.6	1.7	9	37	14	58	43	ESE	7	62
MAY	67	47	58	81	24	1.8	6.4	*	1.7	2	20	13	55	37	ESE	7	83
JUN	78	55	67	101	37	1.3	4.0	*	1.4	*	*	*	50	32	ESE	7	69
JUL	88	64	76	104	49	.5	2.2	*	1.1	0	0	0	43	28	ESE	7	62
AUG	85	62	74	101	39	.8	3.9	*	1.6	*	*	*	41	26	ESE	8	66
SEP	75	53	64	97	28	1.2	4.0	*	1.9	*	4	4	45	29	ESE	7	64
OCT	62	43	52	88	21	1.5	4.2	.0	1.7	2	16	10	49	37	ESE	7	75
NOV	47	32	39	70	-6	1.5	3.1	.1	1.5	7	23	15	59	49	ESE	6	66
DEC	36	23	30	59	-9	2.1	5.0	.1	1.2	17	48	10	68	63	ESE	6	57
ANN	59	41	51	104	-13	18.9	6.4	.0	1.9	79	48	15	56	43	ESE	7	83

SOURCE: Detachment 6, 15th Weather Squadron, Hill AFB

TABLE C.2

SUMMARY OF HILL AIR FORCE BASE WELL DATA

No.	Finished Depth (feet)	Casing Diameter (inches)	Elevation (ft, MSL)	Water Level (feet)	Yield (gpm)	Drawdown (feet)
1	Well not in service					
2	627	20	4736	418	750	6
3	800	20	4731	-	740	8
4	730	20	4798	515	1080	8
5	805	20	4630	470	1000	-
6	900	20	4773	461	875	8
7	900	20	4767	469	537	19

Sources: Bolke and Waddell (1972) and Hill AFB Records.

TABLE C.3

CHEMICAL ANALYSES OF HILL AFB WELLS

Parameter	Well No 4	Well No 5	Well No 6	Well No 7
pH	7.40	7.40	7.50	7.50
Arsenic as As mg/l	0.01	0.01	0.01	0.01
Cadmium as Cdmg/l	0.001	0.001	0.001	0.001
Chromium as Cr (Hexavalent) mg/l	0.01	0.01	0.01	0.01
Cyanide as Cn mg/l	0.01	0.02	0.01	0.01
Fluoride as F mg/l	0.45	0.33	0.57	0.55
Barium as Ba mg/l	0.20	0.13	0.20	0.14
Calcium as Ca mg/l	55.20	44.0	72.80	71.20
Magnesium as Mg mg/l	17.28	14.40	17.76	16.32
Sodium as Na mg/l	46.20	43.70	27.30	29.40
Iron as Fe mg/l	0.42	0.36	0.11	0.08
Total Hardness mg/l	210.0	270.0	256.0	246.0
Alkalinity as $CaCO_3$ mg/l	282.0	242.0	254.0	250.0
Total Solids mg/l	493.0	427.0	484.0	465.0
Total Dissolved Solids at 180 C mg/l	481.0	419.0	476.0	461.0
Conductivity μmhos/cm	695.0	600.0	680.0	665.0
Manganese as Mn mg/l	0.22	0.19	0.03	0.01
Chloride as Cl mg/l	22.0	20.0	18.0	18.0
Phosphate as PO_4 mg/l	0.77	0.43	0.09	0.06
Nitrate as NO_3-N mg/l	0.65	0.70	1.05	1.20
Nitrate as NO_2 -N mg/l	0.10	0.05	0.08	0.10
Surfactants MBAS mg/l	0.01	0.01	0.01	0.01
Ammonia as NH_3-N mg/l	0.02	0.05	0.01	0.01
Oil and Grease mg/l	1.0	1.0	1.0	1.0

Source: Utilities Modernization Program Volume I, Hill AFB, Utah. A Study by R.W. Beck Associates (Analytical and Consulting Engineers) 1975.

TABLE C. 4

SUMMARY OF MUNICIPAL WELLS NEAR BASE PERIMETER

Well Name	Finished Depth (Feet)	Design Cap. (CGS)	Casing Diam. (Inches)	Elevation (Ft. MSL)	Static Water Level (Ft. MSL)	Yield (gpm)	Drawdown (Feet)
<u>Weber Basin Water Conservancy District:</u>							
District Well No. 2 [a]	915	11.5	16	4366	4281	6000	26
South Weber Well No. 1	1000	10.4	20	4226	4071	4476	25
South Weber Well No. 2	1208	10.6	20	4533	4266	4500	53
Laytona Well	-	5.1	-	4626	4264	-	25
Clearfield Well No. 2	-	5.1	-	4584	4276	1100	15
Clearfield Well No. 1	-	5.0	-	4570	4275	1100	45
<u>City Wells:</u>							
Sand Ridge Well	1000	-	12	0	530 ft. Below Surface	900	6
Hill Field Road Well	850	-	12	-	-	2000	15
Sunset City Well	850	-	16	-	-	1250	-
Roy City Well No. 1	900	-	12	-	-	850	-
Clearfield City Well	1000	-	18	-	-	2000	-

[a] To be used for production on near future.

TABLE C.5

HAZARDOUS MATERIALS HANDLED
THROUGH BASE CONTRACTING OFFICE

---

1. Toxicological, biological, radiological, and lethal chemical warfare materials which, by U.S. law, must be destroyed. Disposal of the by-products of such material is the responsibility of the DOD component with assistance from DLA.
2. Material which cannot be disposed of in its present form due to military regulations, e.g., consecrated religious items and cryptographic equipment.
3. Municipal type garbage, trash, and refuse resulting from residential, institutional, commercial, agricultural, and community activities, which the facility engineer or public works office routinely collect.
4. Contractor generated materials which are the contractor's responsibility for disposal under the terms of the contract.
5. Sludges resulting from municipal type wastewater treatment facilities.
6. Sludges and residues generated as a result of industrial plant processes or operations.
7. Refuse and other discarded materials which result from mining, dredging, construction, and demolition operations.
8. Unique wastes and residues of a non-recurring nature which research and development experimental programs generate.

SOURCE: DEQPPM 80-5

APPENDIX D

STATE WATER CLASSIFICATION STANDARDS SYSTEM

STATE OF UTAH
DEPARTMENT OF SOCIAL SERVICES
DIVISION OF HEALTH

WASTEWATER DISPOSAL REGULATIONS

PART II
STANDARDS OF QUALITY FOR WATERS OF THE STATE

Adopted By
Utah Water Pollution Control Board May 18, 1965
Utah State Board of Health May 19, 1965

Revised by Action of the Boards June 2, 1967 and June 21, 1967

Further Revised by Action of the Utah Water Pollution Committee November 18, 1968 and September 13, 1978, and by Action of the Utah State Board of Health November 20, 1968 and October 23, 1978

Under Authority of
26-15-4 & 5 and 73-14-1 through 13
Utah Code Annotated 1953, as Amended

Certified Official Copy
Utah State Division of Health

By Lyman J. Olsen
Lyman J. Olsen, M.D., M.P.H.
Director of Health

INTRODUCTION

This is Part II of five parts comprising "Wastewater Disposal Regulations" of the Utah State Division of Health.

The entire set consists of the following:

PART I - DEFINITIONS AND GENERAL REQUIREMENTS

PART II - STANDARDS OF QUALITY FOR WATERS OF THE STATE

PART III - SEWERS AND WASTEWATER TREATMENT WORKS

PART IV - INDIVIDUAL WASTEWATER DISPOSAL SYSTEMS

PART V - SMALL UNDERGROUND WASTEWATER DISPOSAL SYSTEMS

All have been adopted by both the Utah Water Pollution Committee and the Utah State Board of Health with the purpose of coordinating and consolidating the authority and action of the Committee and Board in areas relating to control of water pollution and maintenance of a healthful environment.

The definitions appearing in PART I apply throughout and are not repeated.

The initial document covering the subject of standards of water quality for classification of state waters was adopted by the Utah Water Pollution Control Board (later renamed "Water Pollution Committee") in 1955 under the title "The Standards of Quality and the Regulations for Water Classifications".

It was revised in 1960, 1965, 1967 and 1968. Some requirements of the Federal Water Pollution Control Act were incorporated in 1967.

The current revision (1978) was made to accomplish Utah program needs and to meet requirements of the present Federal Act.

Throughout this document the term "shall" means a mandatory requirement. The terms "should", "recommend" and "preferred" mean a desirable standard.

Issuance of construction permits based on plans reviewed by the Division will not relieve any person of responsibility to meet all requirements of these regulations.

CONTENTS

2.0 PUBLIC POLICY

Whereas the pollution of the waters of this state constitute a menace to public health and welfare, creates public nuisances, is harmful to wildlife, fish and aquatic life, and impairs domestic, agricultural, industrial, recreational and other legitimate beneficial uses of water, and whereas such pollution is contrary to the best interests of the state and its policy for the conservation of the water resources of the state, it is hereby declared to be the public policy of this state to conserve the waters of the state and to protect, maintain and improve the quality thereof for public water supplies, for the propagation of wildlife, fish and aquatic life, and for domestic, agricultural, industrial, recreational and other legitimate beneficial uses; to provide that no waste be discharged into any waters of the state without first being given the degree of treatment necessary to protect the legitimate beneficial uses of such waters; to provide for the prevention, abatement and control of new or existing water pollution; to place first in priority those control measures directed toward elimination of pollution which creates hazards to the public health; to insure due consideration of financial problems imposed on water polluters through pursuit of these objectives; and to cooperate with other agencies of the state, agencies of other states and the federal government in carrying out these objectives. (Section 73-14-1, Utah Code Annotated 1953, as amended).

2.1 AUTHORITY

These standards are promulgated pursuant to Sections 73-14-1 through 73-14-13 and Sections 26-15-4 and 26-15-5, Utah Code Annotated 1953, as amended.

2.2 SCOPE

These standards shall apply to all waters of the state and shall be assigned to specific waters through the classification procedures prescribed by Section 73-14-6, Utah Code Annotated 1953, as amended. (See also Section 2.6 of these regulations).

2.3 ANTI-DEGRADATION POLICY

2.3.1 Maintenance of Water Quality

Waters whose existing quality is better than the established standards for the designated uses will be maintained at high quality unless it is determined by the Committee that a change is justifiable as a result guiding sample collection procedures. The zone shall be small in extent and must not form a barrier to migrating aquatic life. Domestic wastewater effluents discharged to mixing zones shall meet effluent requirements specified in Section 1.3 of these regulations.

2.6 USE DESIGNATIONS

The Committee and Board, as required by 73-14-6 and 63-46-1 through 13, Utah Code Annotated 1953, as amended, shall group the waters of the state into classes so as to protect against controllable pollution the beneficial uses designated within each class as set forth below. Waters of the state are hereby classified as shown in Appendix B.

2.6.1 Class 1 -- protected for use as a raw water source for domestic water systems.

a. Class 1A -- protected for domestic purposes without treatment.

b. Class 1B -- protected for domestic purposes with prior disinfection.

c. Class 1C -- protected for domestic purposes with prior treatment by standard complete treatment processes as required by the Utah State Division of Health.

2.6.2 Class 2 -- protected for in-stream recreational use and aesthetics.

a. Class 2A -- protected for recreational bathing (swimming).

b. Class 2B -- protected for boating, water skiing, and similar uses, excluding recreational bathing (swimming).

2.6.3 Class 3 -- protected for in-stream use by beneficial aquatic wildlife.

a. Class 3A -- protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain.

b. Class 3B -- protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain.

c. Class 3C -- protected for non-game fish and other aquatic life, including the necessary aquatic organisms in their food chain. Standards for this class will be determined on a case-by-case basis. (See Appendix D).

d. Class 3D -- protected for waterfowl, shorebirds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.

CLASSIFICATION OF WATERS OF THE STATE	USE CLASSES							
	DOMESTIC SOURCE	RECREATION AND ESTHETICS		AQUATIC WILDLIFE				AGRICULTURE
	1C	2A	2B	3A	3B	3C	3D	4
GREAT SALT LAKE BASIN (continued)								
WESTERN GREAT SALT LAKE DRAINAGE (continued)								
Curlew (Deep) Creek, Box Elder County				X				X
Pine Creek and tributaries, Box Elder County				X				X
Dove Creek and tributaries, Box Elder County				X				X
Dunn Creek and tributaries, Box Elder County				X				X
North Willow Creek and tributaries, Tooele County				X				X
South Willow Creek and tributaries, Tooele County				X				X
Clover Creek and tributaries, Tooele County				X				X
Vernon Creek and tributaries, Tooele County				X				X
Ophir Creek and tributaries, Tooele County				X				X
Settlement Canyon Creek and tributaries, Tooele County				X				X
Middle Canyon Creek and tributaries, Tooele County				X				X
Basin Creek and tributaries, Juab and Tooele Counties				X				X
Indian Farm Creek and tributaries, Juab County				X				X
Thomas Creek and tributaries, Juab County				X				X
Cottonwood Creek and tributaries, Juab County				X				X

CLASSIFICATION OF WATERS OF THE STATE	USE CLASSES							
	DOMESTIC SOURCE	RECREATION AND ESTHETICS		AQUATIC WILDLIFE				AGRICULTURE
	1C	2A	2B	3A	3B	3C	3D	4
GREAT SALT LAKE BASIN (continued)								
WESTERN GREAT SALT LAKE DRAINAGE (continued)								
Granite Creek and tributaries, Juab County				X				X
Trout Creek and tributaries, Juab County				X				X
Birch Creek and tributaries, Juab County				X				X
Deep Creek and tributaries, from Rock Spring Creek to headwaters, Juab and Tooele Counties				X				X
Lake Creek, from Garrison (Pruess) Reservoir to Nevada state line				X				X
Snake Creek and tributaries, Millard County					X			X
Hamlin Valley Wash and tributaries, from Nevada state line to headwaters (Beaver & Iron Counties)							X	X
FARMINGTON BAY DRAINAGE								
Corbett Creek and tributaries, from Highway US-89 to headwaters				X				X
** Kays Creek and tributaries, from Farmington Bay to U.S. National Forest boundary						X		X
North Fork Kays Creek and tributaries, from U.S. National Forest boundary to headwaters				X				X
Middle Fork Kays Creek and tributaries, from U.S. National Forest boundary to headwaters	X			X				X
South Fork Kays Creek and tributaries, from U.S. National Forest boundary to headwaters	X			X				X
Snow Creek and tributaries						X		X

** Kays Creek

APPENDIX D

TABLE D-1

NUMERICAL STANDARDS FOR PROTECTION OF CLASS 3C WATER USE

Physical	
Minimum D.O. (mg/l)	5*
Maximum Temperature	27^{o}C**
Maximum Temperature Change	4^{o}C
pH	6.5-9.0
Turbidity Increase (NTU)	15****
Chemical (Maximum mg/l)	
Cadmium, dissolved	0.004
Chromium, dissolved	0.1
Copper, dissolved	0.01
Cyanide	0.005
Iron, dissolved	1.0
Lead, dissolved	0.05
Mercury, total	0.0005
Phenol	0.01
Selenium, dissolved	0.05
Silver, dissolved	0.01
Zinc, dissolved	0.05
Chlorine	0.2
H_2S	0.02
Radiological (Maximum pCi/l)	
Gross Alpha	15
Gross Beta	30
Pesticides (Maximum mg/l)	
Endrin	0.004
Lindane	0.01
Methoxychlor	0.03
Toxaphene	0.005
Pollution Indicators***	
BOD (mg/l)	5.0
NO_3 as N (mg/l)	4.0

*Minimum D.O. (mg/l) limitation is 4 in the following segments:
San Rafael River and tributaries, from confluence with Green River to confluence with Ferron Creek
Malad River and tributaries, from confluence with Bear River to state line

**Maximum temperature limitation is 35^{o}C in the following segments:
Virgin River and tributaries from state line to headwaters except as listed in APPENDIX B

***Investigations should be conducted to develop more information where these pollution indicator levels are exceeded

****At background levels of 150 NTU's or greater, a 10% increase limit will be used instead of the numeric values. Short term variances may be considered on a case-by-case basis

APPENDIX E

LIST OF INDUSTRIAL SHOPS

APPENDIX E

LIST OF INDUSTRIAL SHOPS
HILL AFB

Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Past On-Site Treatment Storage Disposal
Directorate of Maintenance					
Photo Repair	5	None Known			
Missile Electronic Repair	5	None Known	X		
Rubber Repair Shop	5	None Known	X		
Parachute and Fabric Shop	5	None Known	X		
Training Devices Repair	5	1913 (to '76)	X		
Optical Photographic Repair	100	None known	X		
Navigation Instrument Repair	100	None known	X	X	IWTP
Electromechanical Instrument Section	100	None known	X		
Microminiature Repair	100	None known	X	X	IWTP
Chemistry Lab	100	None known	X	X	IWTP or Lakeside Landfill
Missile Electronics Repair	100	None known	X	X	IWTP
Sealing Room	100	None known	X	X	IWTP
Aim 9 Missile Repair	100	None known	X	X	IWTP
CSA brake shop (beryllium work)	204	None known	X	X	Lakeside landfill
Electrodimensional Metrology Shop	214	None known	X		
Bearing Shop	214	None known	X		
Avionics Sealing Room	214	None known	X		

APPENDIX E (Continued)

Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Past On-Site Treatment Storage Disposal
Directorate of Maintenance (Con't)					
Aircraft Washrack	NA	225 (40's to 1950)	X	X	IWTP
Aircraft Washrack	NA	218 ('50 to '57)	X	X	IWTP
Washrack & Paint Shop	220 ('57 to pres.)	225, 218	X	X	See Table 4.1
Production Lines	225	None known	X	X	IWTP or Lakeside Range
Fuel/Defuel Docks	227 & 228	287 (to 77)	X	X	DPDO
Maintenance Transportation	240	None known	X		
Plastics Shop	257	None known	X		
Metalizing Shop	258	None known	X	X	Landfill
Tire Shop & Reclamation	261	251	X		
Solvent Distill. Facility	265	None known	X	X	See Table 4.1
Chemical Milling	265	None known	X	X	IWTP
Paint Shop	266	None known	X	X	Landfill
Pattern Shop	266	None known	X		
Reproduction	267	None known	X		
Radiac Range	267	None known	X		
Armament Shop	268	None known	X		
Plumbing Shop	274	None known	X	X	Landfill
Paint Shop	275	274 (to 79)	X		

APPENDIX E (Continued)

Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Past On-Site Treatment Storage Disposal
Directorate of Maintenance (Con't)					
Electroplating Shop	505	225	X	X	See Table 4.1
Wheel and Brake Shop	507 ('78 to pres)	205 (to '78)	X	X	See Table 4.1
Struts & Landing Gear	507	264	X	X	See Table 4.1
Hydraulic Repair	510	None known	X	X	DPDO & IWTP
Electrical Harness Shop	511	None Known	X	X	Solvent Pit DPDO
Weapons Repair	840	None Known	X		
Missile Trailer Repair	847	515 (to 72) 240 (to 75) 1248 (72-75) 1258 (72-75)	X	X	See Table 4
Radome Repair	860	None known	X	X	Landfill Lakeside
Missile Maintenance	935	None known	X		
Missile Assembly	940, 945, 950 960, 965, 970 975, 980, 2409	None known	X		
Equipment Maintenance	1133	None known	X		
Missile Electrical/Mech Repair	1208	None known	X		
Explosives Test	1642	None known	X		
Missile Accessory Repair	1913	None known	X		
Pneudraulics	1915, 1917	None known	X		

APPENDIX E (Continued)

Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Past On-Site Treatment Storage Disposal
Directorate of Maintenance (Con't)					
Propellant Test Lab	1941, 1943	None known	X	X	Evaporation Pit Toxic Landfill Lakeside
Missile Retractor Test	2005	None Known	X	X	Recycle
Instrument Repair	2008	None known	X		
Missile Ordinance Repair	2014	None known	X		
Missile Test Prep	2114	None known	X		
Rocket Motor Repair	2211, 2212, 2213	None known	X		
Munitions Renovation	2248, 2214	None known	X		
Directorate of Supply					
Welding Machine Shop	800	None known	X		
Packaging Test	800	None known	X		
Electrical Shop	800	None known	X		
Woodworking Shop	800	None known	X		
Paint Shop	810	None known	X		
Equipment Maintenance	849	None known	X		
Heavy Crating Section	849	None known	X	X	DPDO

APPENDIX E (Continued)

Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Past On-Site Treatment Storage Disposal
388 Tactical Fighter Wing					
4th Aircraft Maintenance Unit	46	(None known)	X	X	DPDO
16th Aircraft Maintenance Unit	42	(None known)	X	X	DPDO
34th Aircraft Maintenance Unit	45	(None known)	X	X	DPDO
Avionic Branch	58	(None known)	X	X	DPDO
NDI & SOAP Lab	39	(None known)	X	X	DPDO
Propulsion Branch	272	(None known)	X	X	DPDO
Aerospace Ground Equipment	56	(None known)	X	X	DPDO
Munitions Branch	52	(None known)	X	X	DPDO
Munitions Production	1601, 1602, 1609	(None known)	X	X	DPDO
508 Tactical Fighter Group (TFG)					
Communications Shop	590	(None known)	X		See Table 4.1
Instrument Shop	590	(None known)			
Navigation Shop	508	(None known)	X		
Weapons Control Shop	590	(None known)	X	X	See Table 4.1
Corrosion Control Shop	590	(None known)	X	X	See Table 4.1
Egress Shop	597	590 to '80	X		
Electric Shop	597	590 to '80	X	X	See Table 4.1
Environmental Shop	597	(None known)	X		
Fabrication Shop	590	(None known)	X		

APPENDIX E (Continued)

Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Past On-Site Treatment Storage Disposal
508 Tactical Fighter Group (TFG) (Con't)					
Fuel Systems Shop	576	(None known)	X	X	See Table 4.1
Machine & Metal Processing Shop	590	(None known)	X	X	See Table 4.1
Non-Destructive Inspection	597	(590 to '80)	X	X	See Table 4.1
Parachute Shop	590	(597 to '80)	X		
Pneudraulics Shop	597	(590 to '80)	X	X	See Table 4.1
Aerospace Ground Equipment	592	(None known)	X	X	See Table 4.1
Propulsion Section	589	(None known)	X	X	See Table 4.1
Engine Shop	589	(None known)	X	X	See Table 4.1
Repair and Reclamation Section	597	(590 to '80)	X	X	See Table 4.1
Structural Repair Shop	590	(None known)	X		
Nonpowered Support Equipment	508	(None known)	X	X	See Table 4.1
Munitions Storage Section	2242	(None known)	X		See Table 4.1
Det 8, 1356 Audio Visual Squadron					
Production	1269	(None known)	X		
Graphics	1277	(None known)	X		

APPENDIX E (Continued)

Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Past On-Site Treatment Storage Disposal
1881 Communications Squadron (CS)					
Navaids Maintenance	762	(None known)			
Ground Radio Maintenance	11	(None known)			
Closed Circuit TV Maintenance	1132	(None known)			
Outside Plant Maintenance	800	(None known)	X		
Cable Maintenance	888	(None known)			
Teletype Maintenance	11	(None known)	X		
Crypto Maintenance	11	(None known)			
USAF Hospital					
Dental Clinic Lab.	570	to '74	X	X	DPDO
Medical Lab	570	to '74	X	X	IWTP or DPDO
1954 Radar Evaluation Squadron					
Reproduction	500	(None known)	X		
Photographic Unit	371	(None known)	X	X	San. Sewer
2349 Administrative Management					
Reproduction Branch	1229	(None known)	X	X	San. Sewer
Photo Lab	1267	(None known)	X	X	San. Sewer

APPENDIX E (Continued)

Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Past On-Site Treatment Storage Disposal
2849 Civil Engineering Division					
Paint Shop	12	(None known)	X	X	DPDO
Sanitation Section	20	(None known)	X	X	Lakeside, DPDO
Entomology Section	20	(None known)	X	X	DPDO
Industrial Water Plant	575	(None known)	X	X	San. Sewer
Welding Shop	30	(None known)	X	X	Base Landfill
2849 Vehicle Trans. Division					
Construction/Heavy Equip.	1258	(None known)	X	X	DPDO
Inspection	1258	(None known)	X	X	DPDO
Tire Shop	1135	(None known)	X	X	DPDO
Material Handling	1248	(None known)	X	X	DPDO
Fuels Services/Vech. Repair	514	(None known)	X	X	DPDO
Gen. Purpose Repair	1258	(None known)	X	X	DPDO
Special Purpose Vech.	1248	(None known)	X	X	DPDO
6514 Test Squadron					
Avionics Maintenance Unit	(1A)	(None known)	X		
Unmanned Aircraft (UMA) Avionics	(1)	(None known)	X		
UMA Mech Maintenance	(1)	(None known)	X	X	See Table 4.1
Weapons Maintenance	(1)	(None known)	X	X	See Table 4.1

APPENDIX E (Continued)

Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Past On-Site Treatment Storage Disposal
6514 Test Squadron (Con't)					
Sheet Metal	(1)	(None known)	X		
Comm/Nav Section	(1A)	(None known)	X		
Doppler Section	(1A)	(None known)	X		
AFSC/Inst Section	(1A)	(None known)			
Control Radar Section	(1A)	(None known)			
Field Maintenance Unit	(1A)	(None known)	X	X	See Table 4.1
Aerospace Systems Section	(1A)	(None known)	X	X	See Table 4.1
Fabrication Section	(1A)	(None known)	X		
Structural Repair Section	(1A)	(None known)	X		
Propulsion Section	(1A)	(None known)	X	X	See Table 4.1
Support Equipment Section	(1A)	(None known)	X	X	See Table 4.1
Aircraft Maintenance Section	(1)	(None known)	X	X	See Table 4.1
Flight Line Maintenance	(1)	(None known)	X	X	See Table 4.1
Organization Maintenance Unit	(1)	(None known)	X	X	See Table 4.1
Prop Electric	(1)	(None known)	X	X	See Table 4.1
C-130 Section	(1)	(None known)	X	X	See Table 4.1
Helo Section	(1)	(None known)	X	X	See Table 4.1
Unmanned Vehicle Section	(1)	(None known)	X	X	See Table 4.1
U.S. Army - Toole Depot					
Rail Shop Division	1701	(None known)	X	X	See Table 4.1

APPENDIX F

HAZARD EVALUATION METHODOLOGY

APPENDIX F

HAZARD EVALUATION METHODOLOGY

PRELIMINARY POTENTIAL CONTAMINATION ASSESSMENT

Various numerical methods for preliminary assessment of sites to determine the need of follow-up action have been developed. Under the auspices of EPA's Office of Enforcement, JRB Associates have devised a methodology for selecting sites for further investigation based on their potential for adverse environmental impact. A modified JRB technique has been developed by Engineering-Science and CH_2M Hill for analysis of the Phase I IRP studies (see memorandum dated July 8, 1981 at end of this Appendix). The methodology relies primarily on available information, but does provide some mechanisms for handling missing data so that sites can be preliminarily rated in most cases. A brief discussion of the rating factor system of anaylsis follows.

Site rating Factor System

The following four basic assessment criteria categories are used in the evaluation:

- Receptors
- Pathways
- Waste Characteristics, and
- Waste Management Practices

These categories have been further broken down into 31 generally applicable rating factors as presented in Table F-1. For each of the factors, a four-level rating scale has been developed ranging from "0" (indicating no potential hazard) to "3" (indicating a high potential hazard). These rating scales are also presented in Table F-1. It should be pointed out that these scales have been devised so that rating factors can typically be evaluated on the basis of readily available information from published materials, public and private records, interviews with knowledgeable parties and site visits.

TABLE F.1

RATING FACTOR SYSTEM

RATING FACTORS	RATING SCALE LEVELS 0	1	2	3
		RECEPTORS		
Population Within 1,000 Feet	0	1 to 25	26 to 100	Greater than 100
Distance to Nearest Drinking Water Well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet
Distance to Reservation Boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet
Land Use/Zoning	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential
Critical Environments	Not a critical environment	Pristine natural areas	Wetlands. flood-plains, and pre-served areas; presence of economically important natural resources	Major habitat of an en-dangered or threatened species; presence of recharge area
Water Quality Designation of Nearest Surface Water Body	Agricultural or indus-trial use	Recreation, pro-pagation and management of fish & wildlife	Shellfish pro-pagation and harvesting	Potable water supplies

TABLE F.1

RATING FACTOR SYSTEM (cont'd)

RATING FACTORS	RATING SCALE LEVELS 0	1	2	3
PATHWAYS				
Evidence of Water Contamination	No contamination	Indirect evidence	Positive proof from direct observation	Positive proof from laboratory analyses
Level of Water Contamination	No contamination	Low levels, trace levels, or levels less than maximum contaminant level (MCL) or EPA drinking water standards	Moderate levels or levels near MCL or EPA drinking water standards	High levels greater than MCL or EPA drinking water standards
Type of Contamination - Soil/ Biota	No contamination	Suspected contamination	Moderate contamination	Severe contamination
Distance to Nearest Surface Water	Greater than 1 mile	2,001 ft to 1 mile	501 ft. to 2,000 ft.	0 to 500 ft.
Depth to Groundwater	Greater than 500 ft.	51 to 500 ft.	11 to 50 ft.	0 to 10 ft.
Net Precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.
Soil Permeability	Greater than 50% clay ($<10^{-6}$ cm/s)	30% to 50% clay (10^{-4} to 10^{-6} cm/s)	15% to 30% clay (10^{-2} to 10^{-4} cm/s)	0 to 15% clay ($>10^{-2}$ cm/s)
Bedrock Permeability	Impermeable ($<10^{-6}$ cm/s)	Relatively impermeable (10^{-4} to 10^{-6} cm/s)	Relatively permeable (10^{-2} to 10^{-4} cm/s)	Very permeable ($>10^{-2}$ cm/s)
Depth to Bedrock	Greater than 60 ft.	31 to 60 ft.	11 to 30 ft.	0 to 10 ft.
Surface Erosion	None	Slight	Moderate	Severe

TABLE F.1

RATING FACTOR SYSTEM (cont'd)

WASTE CHARACTERISTICS

Judgemental hazardous rating from 30 to 100 points based on the following guidelines:

Points	Condition
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

TABLE F.1

RATING FACTOR SYSTEM (con'd)

RATING FACTORS	RATING SCALE LEVELS 0	1	2	3
	WASTE MANAGEMENT PRACTICES			
Record Accuracy and Ease of Access to Site	Accurate records, no unauthorized dumping	Accurate records, no barriers	Incomplete records, no barriers	No records, no barriers
Hazardous Waste Quantity	<1 ton	1 to 5 tons	5 to 20 tons	>20 tons
Total Waste Quantity	0 to 10 acre ft.	11 to 100 acre ft.	101 to 250 acre ft.	Greater than 250 acre ft.
Waste Incompatibility	No incompatible wastes are present	Present, but does not pose a hazard	Present and may pose a future hazard	Present and posing an immediate hazard
Absence of Liners or Confining Strata	Liner and confining strata	Liner or confining strata	Low quality liner or low permeability strata	No liner, no confining strata
Use of Leachate Collection Systems	Adequate collection and treatment	Inadequate collection or treatment	Inadequate collection and treatment	No collection or treatment
Use of Gas Collection Systems	Adequate collection and treatment	Collection and controlled flaring	Venting or inadequate treatment	No collection or treatment
Site Closure	Impermeable cover	Low permeability cover	Permeable cover	Abandoned site, no cover
Subsurface Flows	Bottom of landfill greater than 5 ft. above high groundwater level	Bottom of landfill occasionally submerged	Bottom of fill frequently submerged	Bottom of fill located below mean groundwater level

Since the rating factors do not all assess the same magnitude of potential environmental impact, a numerical multiplier has been assigned to each factor. These multipliers were developed to indicate the relative magnitude of impact of that factor. In addition, weighting factors have been assigned to the Factor Subscores to arrive at a properly balanced Overall Score.

The following five hazard potential scores are the result of a site rating:

- Overall Score
- Receptors Subscore
- Pathways Subscore
- Waste Characteristics Subscore, and
- Waste Management Subscore

MEMORANDUM

TO: Mr. Bernard Lindenberg, AFESC, Tyndall AFB, FL
Major Gary Fishburn, USAF OEHL, Brooks AFB, TX

FROM: Norman N. Hatch, Jr., CH_2M HILL, Gainesville, FL, NNH by E/S
Ernest J. Schroeder, Engineering-Science, Atlanta, GA, E/S

DATE: July 8, 1981

SUBJECT: Joint Meeting between CH_2M HILL and Engineering-Science to develop a uniform site rating system for use in all Air Force Installation Restoration Program Records Search Projects.

MEETING LOCATION: CH_2M HILL, Gainesville, Florida office

MEETING DATE: Monday, June 29, 1981

A. Introduction and Purpose

A joint meeting was held at the CH_2M HILL Gainesville, Florida office on Monday, June 29, 1981. The purpose of the meeting was to develop a uniform site rating system for use in all upcoming Air Force Installation Restoration Program Records Search projects. Attendees at the meeting included:

- Norman N. Hatch, Jr., CH_2M HILL Representative
- Ernest J. Schroeder, Engineering-Science Representative
- Major Gary Fishburn, Air Force Observer

The basis for the rating system is the document developed by JRB Associates, Inc., Mclean, Virginia, for the EPA Hazardous Waste Enforcement Office, Washington, D.C. The above document presents a methodology for selecting sites for investigation based on their potential for adverse environmental impact. Careful scrutiny of this document by CH_2M HILL and Engineering-Science indicated that the rating system could readily be used, with some modifications, for evaluating Air Force Installation sites.

These modifications would be necessary for the following reasons:

1. The methodology presented in the JRB document was developed primarily for large landfill operations throughout the nation. Modifications are necessary to accurately address specific Air Force installation conditions.

2. The rating system must include an equivalent comparison of landfill sites and suspected contaminated sites other than landfills, e.g., PCB spills.

B. Modifications to the JRB Rating System

The specific modifications jointly developed by CH_2M HILL and Engineering-Science, based on experience in performing Record Searches at several Air Force installations, are presented in the revised JRB rating form and rating factor system (attached). The modifications, in general, are summarized below:

1. Changes in multipliers for several of the rating factors in the receptors, pathways, and waste management practices categories.

2. Deletion of several existing rating factors and addition of new rating factors in the receptors, pathways, and waste management practices categories.

3. Revision of the waste characteristics category.

4. Special considerations in the use of the waste management practices category to provide meaningful comparison of landfills and contaminated areas other than landfills. These special considerations include:

   a. Use of all nine rating factors for the evaluation of landfills.

   b. Deletion of non-applicable rating factors when evaluating other contaminated areas. The category score is then normalized to provide an equivalent comparison with landfills.

CONCLUSION

All parties present at the meeting agreed that the above modifications would provide a meaningful rating system for Air Force installation sites. The system would be used in the next several Record Searches and then re-evaluated to determine if further modifications are necessary.

NNH/EJS/lmr

APPENDIX G

SITE RATING FORMS

SITE RATING FORMS

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WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site: Landfill Number 1

Location: Between Foulois Drive and Browning Avenue behind building 2337.

Owner/Operator:

Comments: Landfill operated from 1955 to 1967 -- surface dumping and burn operation.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	2	4	8	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	0	6	0	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 77 138

SUBSCORE 56

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
**Bedrock Permeability	-	4	-	-
**Depth to Bedrock	-	4	-	-
Surface Erosion	1	4	4	12

Number of Assumed Values = ____ Out of 10

Percentage of Assumed Values = ____ %

**Number of Missing Values = 2 Out of 10

Percentage of Missing Values = 20 %

SUBTOTALS 38 171

SUBSCORE 22

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 30

Reason for Assigned Hazardous Rating:

The landfill served the northern portion of the base. Not a major source of hazardous waste. Burning would destroy solvents, etc.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity	0	7	0	21
Total Waste Quantity	1	4	4	12
Waste Incompatibility	-	3	-	-
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	9
Site Closure	2	8	16	24
Subsurface Flows	0	7	0	21

Number of Assumed Values = ____ Out of 9

Percentage of Assumed Values = ____ %

Number of Missing and Non-Applicable Values = 1 Out of 9

Percentage of Missing and Non-Applicable Values = 11 %

SUBTOTALS 77 141

SUBSCORE 55

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 0 Out of 25

Overall Percentage of Assumed Values = ____ %

OVERALL SCORE 38

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site Landfill Number 2

Location Approximately 600 feet south of north gate.

Owner/Operator

Comments Operated as an auxiliary surface dump and burn area from 1962-1965. Serving the northern portion of the base.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	1	4	4	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	0	6	0	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 73 138

SUBSCORE 53

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	3	6	18	18
Bedrock Permeability	-	4	-	-
Depth to Bedrock	-	4	-	-
Surface Erosion	0	4	0	12

Number of Assumed Values = ____ Out of 10

Percentage of Assumed Values = ____ %

Number of Missing Values = ____ Out of 10

Percentage of Missing Values = ____ %

SUBTOTALS 44 171

SUBSCORE 26

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 30

Reason for Assigned Hazardous Rating:

Landfill served northern portion of the base which is not a generator of hazardous waste.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity	0	7	0	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	-	3	-	-
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	2	8	16	24
Subsurface Flows	0	7	0	21

Number of Assumed Values = ____ Out of 9

Percentage of Assumed Values = ____%

Number of Missing and Non-Applicable Values = 1 Out of 9

Percentage of Missing and Non-Applicable Values = 11 %

SUBTOTALS 79 141

SUBSCORE 56

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = ____ Out of 25

Overall Percentage of Assumed Values = ____%

OVERALL SCORE 40

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site: Landfill Number 3

Location: Approximately 250 feet south of fire training area.

Owner/Operator:

Comments: Used between 1947 and 1967 as a surface dump and burn area.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	1	4	4	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	1	3	3	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	0	6	0	18
		SUBTOTALS	70	138
		SUBSCORE		51

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBSCORE (Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	3	10	30	30
Level of Water Contamination	3	15	45	45
Type of Contamination, Soil/Biota	2	5	10	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
** Bedrock Permeability	-	4	-	-
** Depth to Bedrock	-	4	-	-
Surface Erosion	1	4	4	12
		SUBTOTALS	123	171
		SUBSCORE		72

* Number of Assumed Values = ____ Out of 10

Percentage of Assumed Values = ____ %

** Number of Missing Values = 1 Out of 10

Percentage of Missing Values = 10 %

SUBSCORE (Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 100

Reason for Assigned Hazardous Rating:

Received dewatered sludge from the industrial waste water plant (1956-1967). Thousands of gallons of chemicals were dumped in this area during World War II.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity	2	7	14	21
Total Waste Quantity	3	4	12	12
Waste Incompatibility	2	3	6	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	2	8	16	24
Subsurface Flows	1	7	7	21

Number of Assumed Values = ____ Out of 9

Percentage of Assumed Values = ____ %

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicable Values = 0 %

SUBTOTALS 112 150

SUBSCORE 75

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 3 Out of 25

Overall Percentage of Assumed Values = 12 %

OVERALL SCORE 70

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site: Landfill Number 4

Location: Intersection of Perimeter Road and Sage Street.

Owner/Operator: ______

Comments: Operated between 1967 and 1973 - the northern portion as a surface dump and cover, and the southern portion as a trench and cover operation.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	1	4	4	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	1	3	3	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	0	6	0	18
		SUBTOTALS	70	138
		SUBSCORE		51

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	3	10	30	30
Level of Water Contamination	3	15	45	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
** Bedrock Permeability	-	4	-	-
** Depth to Bedrock	-	4	-	-
Surface Erosion	0	4	0	12
		SUBTOTALS	114	171
		SUBSCORE		67

Number of Assumed Values = ____ Out of 10

Percentage of Assumed Values = ____ %

** Number of Missing Values = 1 Out of 10

Percentage of Missing Values = 10 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 100

Reason for Assigned Hazardous Rating:

Large quantities of hazardous waste were disposed. These included MEK, sulfuric acid, chromic acid and sludge from the industrial treatment plant.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	3	4	12	12
Waste Incompatibility	3	3	9	9
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	-	2	-	-
Site Closure	2	8	16	24
Subsurface Flows	3	7	21	21

Number of Assumed Values = 0 Out of 9

Percentage of Assumed Values = 0 %

Number of Missing and Non-Applicable Values = 4 Out of 9

Percentage of Missing and Non-Applicable Values = 44 %

SUBTOTALS 130 144

SUBSCORE 90

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = ____ Out of 25

Overall Percentage of Assumed Values = ____ %

OVERALL SCORE 77

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site Landfill Number 5

Location UTTR -- northeast of Lakeside Facility.

Owner/Operator

Comments Operated from 1977-present as a hazardous waste disposal facility. Only one in the State of Utah.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	0	6	0	18
Land Use/Zoning	0	3	0	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	0	6	0	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 0 138

SUBSCORE

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	0	4	0	12
Depth to Groundwater	1	7	7	21
Net Precipitation	0	6	0	18
Soil Permeability	0	6	0	18
Bedrock Permeability	-	4	-	-
Depth to Bedrock	-	4	-	-
Surface Erosion	0	4	0	12

Number of Assumed Values = ____ Out of 10

Percentage of Assumed Values = ____ %

Number of Missing Values = ____ Out of 10

Percentage of Missing Values = ____ %

SUBTOTALS 12 171

SUBSCORE 7

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 100

Reason for Assigned Hazardous Rating:

This area is a designated disposal site for hazardous wastes.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	1	7	7	21
Hazardous Waste Quantity	3	7	21	21
**Total Waste Quantity	-	4	-	-
Waste Incompatibility	2	3	6	9
Absence of Liners or Confining Beds	1	6	6	18
**Use of Leachate Collection System	-	6	-	-
**Use of Gas Collection Systems	-	2	-	-
**Site Closure	-	8	-	-
Subsurface Flows	0	7	0	21

Number of Assumed Values = ____ Out of 9

Percentage of Assumed Values = ____%

**Number of Missing and Non-Applicable Values = 4 Out of 9

Percentage of Missing and Non-Applicable Values = 44 %

SUBTOTALS 40 90

SUBSCORE 44

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = ____ Out of 25

Overall Percentage of Assumed Values = ____%

OVERALL SCORE 43

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site: Chemical Disposal Pit No. 1 & 2

Location: Approximately 150 feet southwest of existing fire training area

Owner/Operator:

Comments: Operated from 1954 to 1973. Received volumes of solvents, paint strippers. Periodically burned.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	1	4	4	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	1	3	3	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	0	6	0	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 70 138

SUBSCORE 51

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	3	10	30	30
Level of Water Contamination	3	15	45	45
Type of Contamination, Soil/Biota	2	5	10	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
** Bedrock Permeability	-	4	-	-
** Depth to Bedrock	-	4	-	-
Surface Erosion	0	4	0	12

Number of Assumed Values = ___ Out of 10

Percentage of Assumed Values = ___ %

** Number of Missing Values = 2 Out of 10

Percentage of Missing Values = 20 %

SUBTOTALS 119 171

SUBSCORE 70

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 100

Reason for Assigned Hazardous Rating:

Received large volumes of chemicals - solvents, strippers, oils. Occasionally burned.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	1	4	4	12
Waste Incompatibility	1	3	3	9
Absence of Liners or Confining Beds	2	6	12	19
Use of Leachate Collection System	3	6	18	18
** Use of Gas Collection Systems	-	2	-	-
Site Closure	2	9	16	24
Subsurface Flows	0	7	0	21
		SUBTOTALS	95	144
		SUBSCORE		66

Number of Assumed Values = ____ Out of 9

Percentage of Assumed Values = ____%

Number of Missing and Non-Applicable Values = 1 Out of 9

Percentage of Missing and Non-Applicable Values = 11 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 0 Out of 25

Overall Percentage of Assumed Values = ____%

OVERALL SCORE 72

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site: Chemical Disposal Pit No. 3

Location: Between Foulois Road and Perimeter Road southesast of old SAC area

Owner/Operator:

Comments: Used from 1967 to 1975 as a TCE disposal area. Also used in the 40's to dump bottoms from plating tanks and other concentrated chemicals.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	1	3	3	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	0	6	0	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 66 138

SUBSCORE 48

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
** Bedrock Permeability	-	4	-	-
** Depth to Bedrock	-	4	-	-
Surface Erosion	1	4	4	12

Number of Assumed Values = ___ Out of 10

Percentage of Assumed Values = ___ %

** Number of Missing Values = 2 Out of 10

Percentage of Missing Values = 20 %

SUBTOTALS 38 171

SUBSCORE 22

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 100

Reason for Assigned Hazardous Rating:

Trichloroethylene, a designated carcinogen was known to be segregated for special disposal in this area between the years of 1967 and 1975.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity	3	7	21	21
** Total Waste Quantity	-	4	-	-
Waste Incompatibility	3	3	9	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System	3	6	18	18
** Use of Gas Collection Systems	-	2	-	-
Site Closure	3	8	24	24
Subsurface Flows	0	7	0	21

Number of Assumed Values = ____ Out of 9

Percentage of Assumed Values = ____%

** Number of Missing and Non-Applicable Values = 2 Out of 9

Percentage of Missing and Non-Applicable Values = ____%

SUBTOTALS 111 122

SUBSCORE 94

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = ____ Out of 25

Overall Percentage of Assumed Values = ____%

OVERALL SCORE 56

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site: Industrial Wastewater Treatment Plant - Sludge Drying Beds

Location: Approximately 150 feet east of Building 507

Owner/Operator:

Comments: During the period 1956 - 1976 the sludge drying beds drained to the ground.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	3	4	12	12
Distance to Nearest Drinking Water Well	2	15	30	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	0	6	0	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 60 138

SUBSCORE 44

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	-	15	-	-
Type of Contamination, Soil/Biota	-	5	-	-
Distance to Nearest Surface Water	1	4	4	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
Bedrock Permeability	-	4	-	-
Depth to Bedrock	-	4	-	-
Surface Erosion	0	4	0	12

Number of Assumed Values = ____ Out of 10

Percentage of Assumed Values = ____ %

Number of Missing Values = ____ Out of 10

Percentage of Missing Values = ____ %

SUBTOTALS 30 111

SUBSCORE 27

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 100

Reason for Assigned Hazardous Rating:

Filtrate from the drying beds was allowed to drain into the ground

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	0	7	0	21
Hazardous Waste Quantity	3	7	21	21
**Total Waste Quantity	-	4	-	-
**Waste Incompatibility	-	3	-	-
Absence of Liners or Confining Beds	3	6	18	18
**Use of Leachate Collection System	-	6	-	-
**Use of Gas Collection Systems	-	2	-	-
**Site Closure	-	8	-	-
**Subsurface Flows	-	7	-	-

Number of Assumed Values = ____ Out of 9

Percentage of Assumed Values = ____ %

**Number of Missing and Non-Applicable Values = 6 Out of 9

Percentage of Missing and Non-Applicable Values = 66 %

SUBTOTALS 39 60

SUBSCORE 65

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = ____ Out of 25

Overall Percentage of Assumed Values = ____ %

OVERALL SCORE 57

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site: Little Mountain - Sludge Drying Beds

Location: Southeast of Main Facility

Owner/Operator:

Comments: Received phenolic paint stripper during the period 1973 to 1978.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	1	4	4	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	0	3	0	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	0	6	0	18
		SUBTOTALS	46	138
		SUBSCORE		33

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
** Level of Water Contamination	-	15	-	-
** Type of Contamination, Soil/Biota	-	5	-	-
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	0	7	0	21
Net Precipitation	0	6	0	18
Soil Permeability	3	6	18	18
** Bedrock Permeability	-	4	-	-
** Depth to Bedrock	-	4	-	-
** Surface Erosion	-	4	-	-
		SUBTOTALS	26	99
		SUBSCORE		26

Number of Assumed Values = ____ Out of 10

Percentage of Assumed Values = ____ %

Number of Missing Values = 5 Out of 10

** Percentage of Missing Values = 50 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 100

Reason for Assigned Hazardous Rating:

Known large quantities of phenolic paint stripper were applied to the sludge drying beds

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	0	7	0	21
Hazardous Waste Quantity	3	7	21	21
*Total Waste Quantity	-	4	-	-
*Waste Incompatibility	-	3	-	-
Absence of Liners or Confining Beds	3	6	18	18
*Use of Leacnate Collection System	-	6	-	-
*Use of Gas Collection Systems	-	2	-	-
*Site Closure	-	8	-	-
*Subsurface Flows	-	7	-	-

Number of Assumed Values = ____ Out of 9

Percentage of Assumed Values = ____%

Number of Missing and Non-Applicable Values = 6 Out of 9

Percentage of Missing and Non-Applicable Values = 66 %

SUBTOTALS 39 60

SUBSCORE 65

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 0 Out of 25

Overall Percentage of Assumed Values = ____%

OVERALL SCORE 53

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site Sodium Hydroxide Leak - Industrial Wastewater Treatment Plant

Location

Owner/Operator Within the industrial wastewater treatment plant

Comments Spill occurred over a 12 month period in 1980

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	3	4	12	12
Distance to Nearest Drinking Water Well	2	15	30	45
Distance to Reservation Boundary	3	6	12	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	0	6	0	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 60 138

SUBSCORE 43

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
** Level of Water Contamination	-	15	-	-
** Type of Contamination, Soil/Biota	-	5	-	-
Distance to Nearest Surface Water	1	4	4	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	2	6	12	18
** Bedrock Permeability	-	4	-	-
** Depth to Bedrock	-	4	-	-
** Surface Erosion	-	4	-	-

Number of Assumed Values = ____ Out of 10

Percentage of Assumed Values = ____ %

Number of Missing Values = 5 Out of 10

** Percentage of Missing Values = 50 %

SUBTOTALS 30 99

SUBSCORE 30

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

Reason for Assigned Hazardous Rating: SUBSCORE 100

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	-	7	-	-
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	-	4	-	-
Waste Incompatibility	-	3	-	-
Absence of Liners or Confining Beds	2	6	12	18
Use of Leachate Collection System	-	6	-	-
Use of Gas Collection Systems	-	2	-	-
Site Closure	-	8	-	-
Subsurface Flows	-	7	-	-

Number of Assumed Values = ____ Out of 9

Percentage of Assumed Values = ____%

Number of Missing and Non-Applicable Values = 6 Out of 9

Percentage of Missing and Non-Applicable Values = 67%

SUBTOTALS 33 39

SUBSCORE 35

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = ____ Out of 25

Overall Percentage of Assumed Values = ____%

OVERALL SCORE 62

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site: Berman Pond

Location: Approximately 500 feet northeast of South gate

Owner/Operator:

Comments: Received industrial waste from the 1940's to 1956. Constructed as an evaporation pond.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	3	4	12	12
Distance to Nearest Drinking Water Well	2	15	30	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	0	6	0	18
		SUBTOTALS	66	138
		SUBSCORE		48

Number of Assumed Values = ____ Out of 6

Percentage of Assumed Values = ____%

Number of Missing Values = ____ Out of 6

Percentage of Missing Values = ____%

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
** Level of Water Contamination	-	15	-	-
** Type of Contamination, Soil/Biota	-	5	-	-
Distance to Nearest Surface Water	1	4	4	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	3	6	18	18
** Bedrock Permeability	-	4	-	-
** Depth to Bedrock	-	4	-	-
** Surface Erosion	-	4	-	-
		SUBTOTALS	36	99
		SUBSCORE		36

Number of Assumed Values = ____ Out of 10

Percentage of Assumed Values = ____%

** Number of Missing Values = 5 Out of 10

Percentage of Missing Values = 50 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 100

Reason for Assigned Hazardous Rating:

Received large volumes of metal plating wastes, solvents, strippers, and oils.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	2	7	14	21
Hazardous Waste Quantity	3	7	21	21
Total Waste Quantity	-	4	-	-
Waste Incompatibility	2	3	6	9
Absence of Liners or Confining Beds	3	6	13	13
Use of Leachate Collection System	-	6	-	-
Use of Gas Collection Systems	-	2	-	-
Site Closure	2	8	15	24
Subsurface Flows	0	7	0	21

Number of Assumed Values = ____ Out of 9

Percentage of Assumed Values = ____%

Number of Missing and Non-Applicable Values = ____ Out of 9

Percentage of Missing and Non-Applicable Values = ____%

SUBTOTALS [illegible] [illegible]

SUBSCORE 55

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = ____ Out of 25

Overall Percentage of Assumed Values = ____%

OVERALL SCORE 51

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site: Herbicide Orange Test Plot

Location: Hill Air Force Range - Near target 21

Owner/Operator:

Comments: Used to test the decompostion rate of Herbicide orange and the rate of container corrosion.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	0	6	0	13
Land Use/Zoning	0	3	0	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	0	6	0	18

Number of Assumed Values = 0 Out of 6
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 6
Percentage of Missing Values = 0 %

SUBTOTALS 0 138
SUBSCORE 0
(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	0	4	0	12
Depth to Groundwater	1	7	-	21
Net Precipitation	0	6	0	13
Soil Permeability	0	6	0	13
** Bedrock Permeability	-	4	-	-
** Depth to Bedrock	-	4	-	-
Surface Erosion	2	4	8	12

Number of Assumed Values = 0 Out of 10
Percentage of Assumed Values = 0 %
Number of Missing Values = 2 Out of 10
** Percentage of Missing Values = 20%

SUBTOTALS 20 171
SUBSCORE 12
(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 24

Reason for Assigned Hazardous Rating:

Area was used to test the rate of chemical decomposition of herbicide orange and empty agent orange herbicide containers.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	0	7	0	21
Hazardous Waste Quantity	0	7	0	21
** Total Waste Quantity	-	4	-	-
** Waste Incompatibility	-	3	-	-
Absence of Liners or Confining Beds	1	6	6	18
** Use of Leachate Collection System	-	6	-	-
__ Use of Gas Collection Systems	-	2	-	-
** Site Closure	-	3	-	-
** Subsurface Flows	-	7	-	-

Number of Assumed Values = ____ Out of 9

Percentage of Assumed Values = ____%

** Number of Missing and Non-Applicable Values = 6 Out of 9

Percentage of Missing and Non-Applicable Values = 66%

SUBTOTALS 6 60

SUBSCORE 10

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = ____ Out of 25

Overall Percentage of Assumed Values = ____%

OVERALL SCORE 20

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA

ASSESSMENT AND RATING FORM

Name of Site Fire Training Area No. 1

Location Approximately 1100 feet northwest of Landfill Number 1

Owner/Operator

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	1	4	4	12
Distance to Nearest Drinking Water Well	3	15	45	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	1	3	3	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	0	6	0	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 70 138

SUBSCORE 51

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	2	7	14	21
Net Precipitation	0	6	0	18
Soil Permeability	3	6	18	18
** Bedrock Permeability	-	4	-	-
** Depth to Bedrock	-	4	-	-
Surface Erosion	0	4	0	12

Number of Assumed Values = 0 Out of 10

Percentage of Assumed Values = 0 %

** Number of Missing Values = 2 Out of 10

Percentage of Missing Values = 20%

SUBTOTALS 40 171

SUBSCORE 23

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

Quantities of volatile waste chemicals were used between the period of 1958 and [illegible] as fuel for fire training. Most of the chemicals were burned during the exercise.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
WASTE MANAGEMENT PRACTICES				
Record Accuracy and Ease of Access to Site	2	7	14	21
Hazardous Waste Quantity	2	7	14	21
Total Waste Quantity	-	4	-	-
Waste Incompatibility	-	3	-	-
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	-	2	-	-
Site Closure	-	3	-	-
Subsurface Flows	-	7	-	-

Number of Assumed Values = ____ Out of 9

Percentage of Assumed Values = ____%

Number of Missing and Non-Applicable Values = 5 Out of 9

Percentage of Missing and Non-Applicable Values = 56 %

SUBTOTALS 64 78

SUBSCORE [illegible]

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = ____ Out of 25

Overall Percentage of Assumed Values = ____%

OVERALL SCORE [illegible]

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

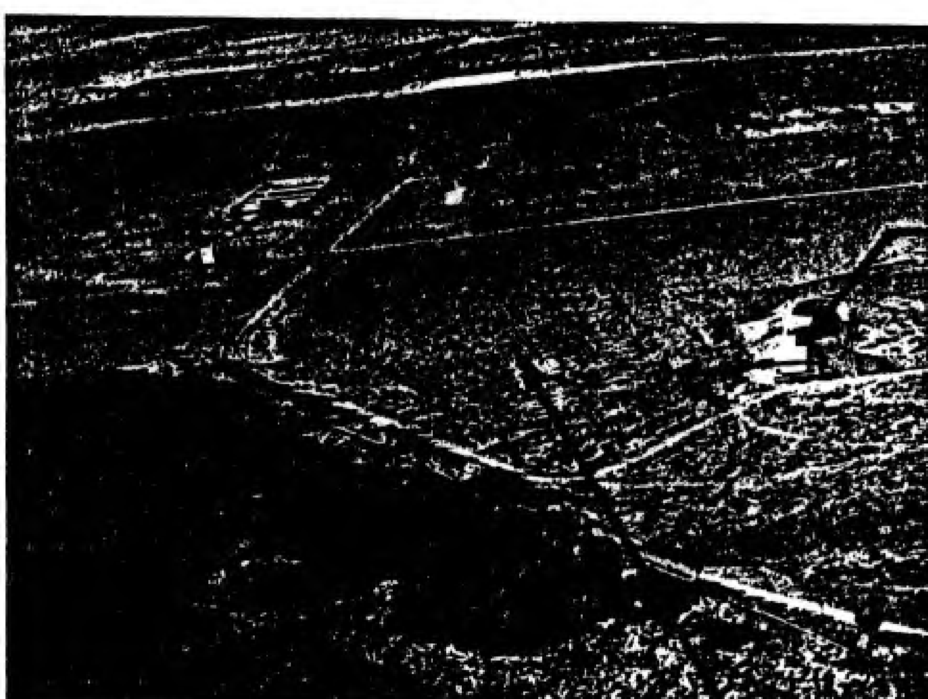
APPENDIX H

PHOTOGRAPHS

HILL AFB

LANDFILLS

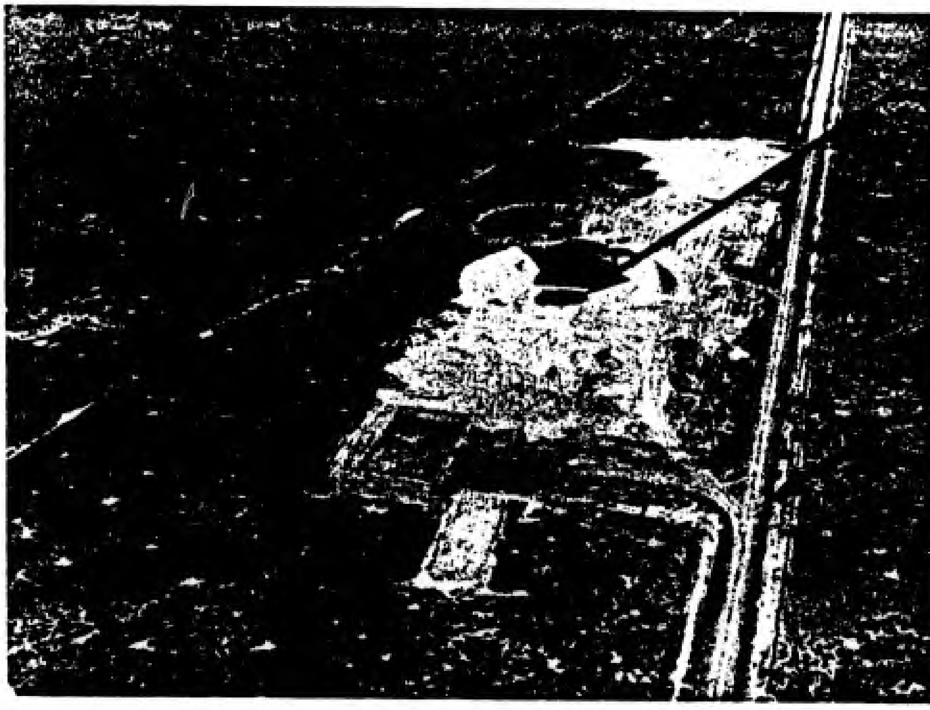
LANDFILL NO. 3



LANDFILL NO. 4

HILL AFB

LANDFILLS (Continued)



LANDFILL NO. 5

HILL AFB

CHEMICAL DISPOSAL PITS

PIT LOCATIONS

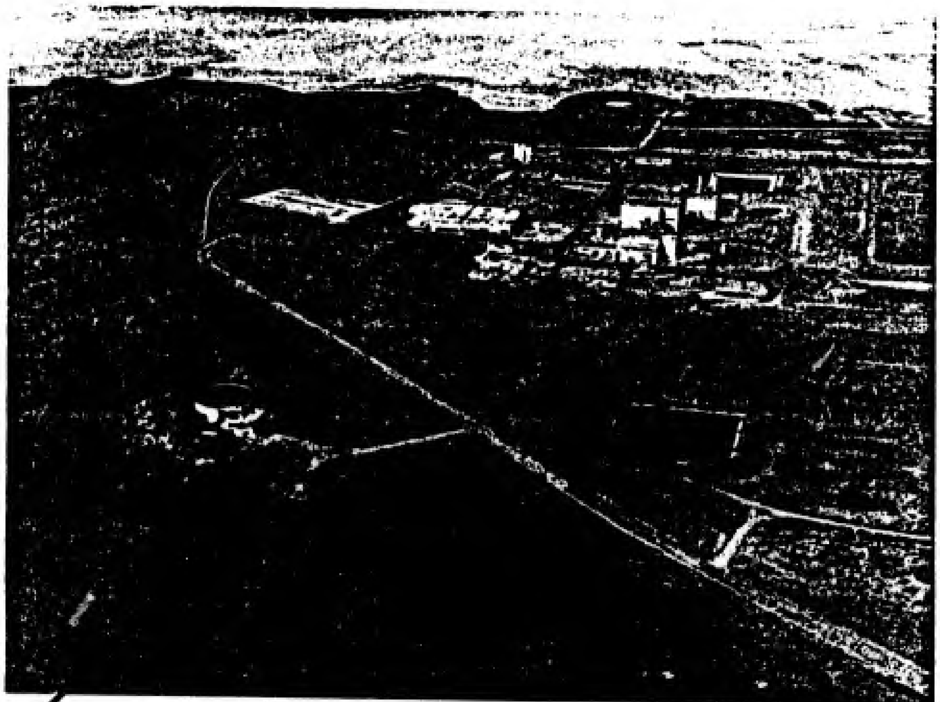
PITS NO. 1 & 2

PIT LOCATION

PIT NO. 3

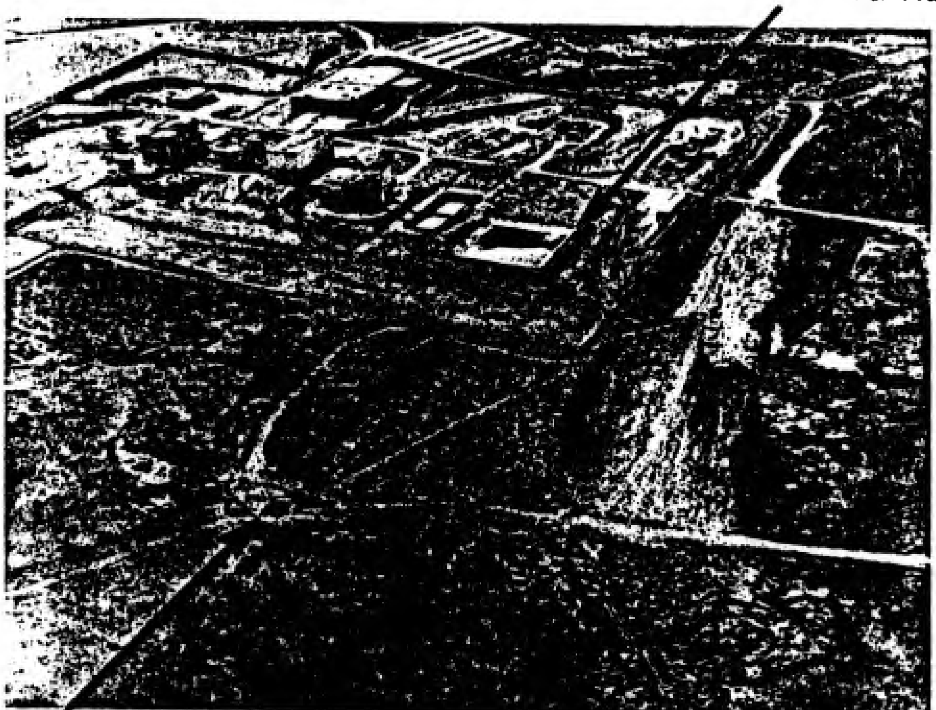
HILL AFB

LITTLE MOUNTAIN TEST FACILITY



SLUDGE DRYING BEDS

HOLDING RESERVOIR



LANDFILL AREA

APPENDIX I

ENGINEERING STUDIES AT LANDFILL NO. 3
AND NO. 4

APPENDIX I

Engineering Studies At Landfill No. 3 and No. 4

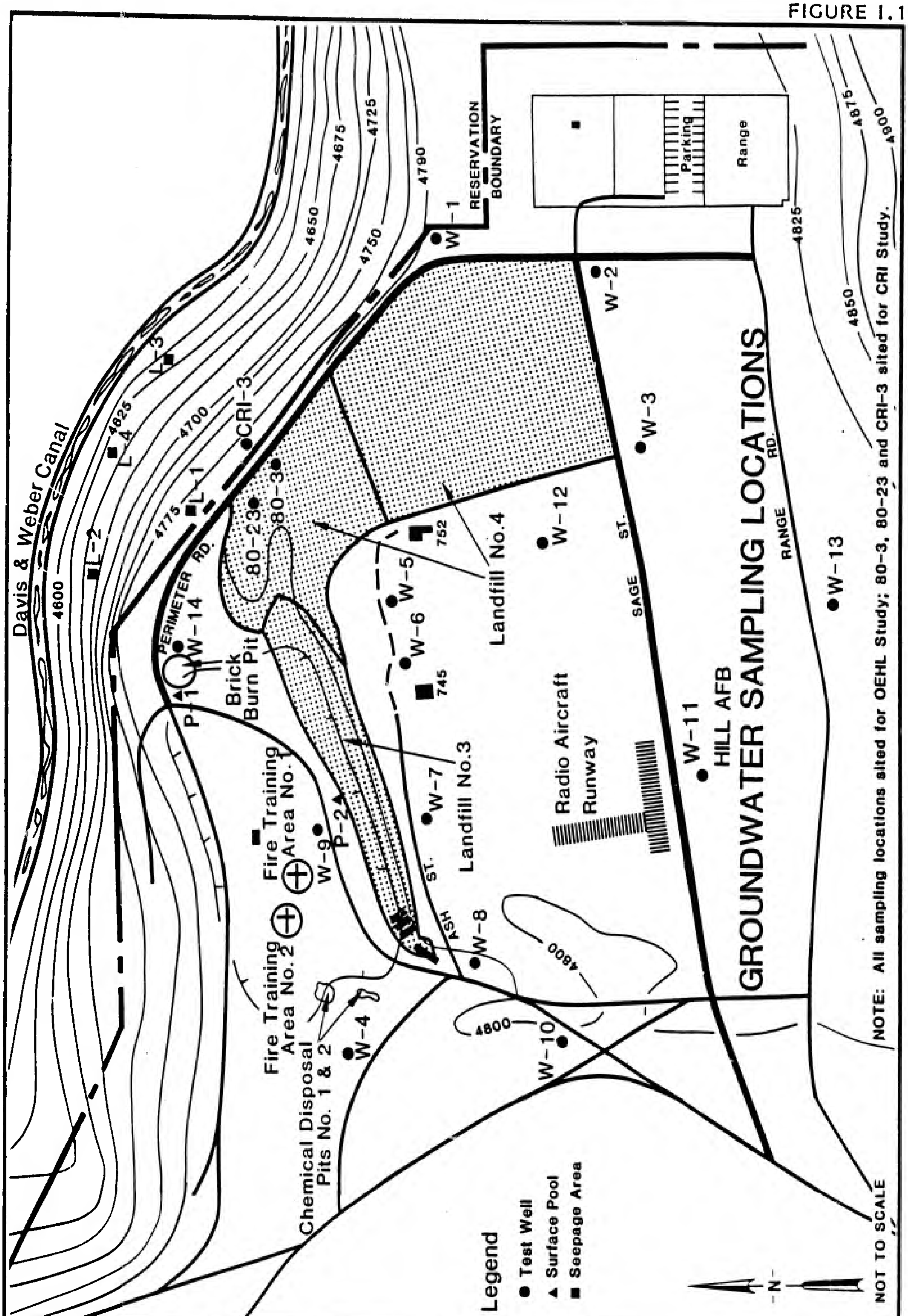
In June 1975, the Bioenvironmental Engineering Division discovered that leachate was surfacing along the toe of Landfill No. 4. Samples taken of the leachate indicated a COD ranging between 440 to 1200 mg/l. In November of that same year, the Davis and Weber Counties Canal Company formally requested that Hill AFB address the fact that polluted waters were entering the canal and in some cases undermining the canal itself.

As a result of this situation, the USAF Occupational and Environmental Health Laboratory (OEHL) was requested to conduct a ground and surface water pollution evaluation at Hill AFB. In December, 1976, the results of their study were published.

Figure I.1 is a map showing the location of the ground water sampling locations used for the above study. Other ground water monitoring wells were also installed but are not shown on Figure I.1. Analytical data from these sampling locations is presented in Table I.1. It should be noted that sample location W-4 and W-5 have the highest concentrations. It should also be noted that location W-13 which is the southern most sampling location and supposedly indicative of background concentrations has a COD of 71 mg/l and a phenol of 1.2 mg/l.

Review of the drilling logs for the above wells indicated a clay layer was encountered in all wells at elevations indicating that there is a relatively continuous lens beneath the landfill. The clay lens exhibits a north-northwesternly downslope (as does the soil surface) and apparently has a topographic high in the vicinity of W-6.

The conclusions of the above study were that the leachate was resulting from ground water flowing through the lower layers of the landfill trench and also by the percolation of precipitation. In 1976, the base was planning to install and operate a series of well points in an attempt to lower the water table beneath the landfill. The intent was to intercept



ES ENGINEERING-SCIENCE

TABLE I.1

ANALYTICAL RESULTS FROM
OEHL REPORT - 1976

SAMPLE SITE[3]	COD[1]	BOD[1]	PHENOLS[1]	Fe[2]	MBAS[2]	OIL/GREASE[2]	As[1]
W1	55	6	0.07	25.23	0.27	3.23	0.02
W2	16	2	0.05	3.67	0.20	4.37	<0.01
W3	152	3	0.05	20.81	0.16	2.70	0.02
W4	14,700	2,300	8.00	1.05	6.70	10%	0.04
W5	2,990	1,260	3.20	131.73	29.40	26.20	0.50
W6	76	54	0.06	31.79	1.60	4.00	0.01
W7	250	39	0.10	10.30	0.90	5.60	0.04
W8	22	3	0.105	11.15	0.50	3.10	<0.01
W9	137	4	0.07	5.25	1.09	4.40	0.03
W10	11	1	0.088	4.56	0.13	2.70	<0.01
W11	38	1	0.005	17.33	0.21	3.10	0.02
W12	103	5	0.05	3.40	0.60	3.20	0.02
W13	71	1	1.20	16.70	0.20	3.00	0.02
W14	162	10	0.022	12.38	1.56	3.50	0.02
L1	1,420	610	1.30	77.32	1.18	6.20	0.13
L2	566	308	0.52	24.92	0.75	4.80	0.10
L3	503	234	0.46	14.51	0.49	4.30	0.04
L4	-	-	0.04	2.69	0.50	-	<0.01
P1	165	4	0.025	4.86	1.10	2.40	<0.01
P2	104	5	-	1.11	1.03	4.80	<0.01

[1]Values shown are "worst-case" from the results of only 2-3 analyses.

[2]Values shown are means based on 4, or more analyses.

[3]Samples obtained from wells at about 25 feet deep.

the groundwater, before it entered the area underneath the landfill, lower the groundwater and discharge the groundwater to another area.

In January 1981 Calscience Research Inc. (CRI) was hired to conduct a further investigation to provide specific recommendations to alleviate leachate contamination of ground water and from leachate surfacing on adjacent property. Recommendations were to consist of a primary solution and three alternative solutions which are to be technically and economically feasible.

As part of the program, 16 existing wells were upgraded and two additional monitoring wells were installed. These wells are shown on Figure I.1. Sampling data collected from wells W-2, W-3 and W-13 (background data) are presented in Table I.2. Sampling data from L-1, 80-3, CRI-3 and 80-23 are presented in Table I.3.

Five piezometric measurements made during a four month period (January though May) revealed northern trending streamlines which manifested as springs along the northern slope of the landfill. An apparently consistent clay layer underlines the site between 30 and 35 feet, and represents a vertical groundwater barrier. Based upon mass balance calculations for the landfill, precipitation and groundwater intrusion represents the major leachate sources. Precipitation could account for 5.8 million gallons per year with groundwater contributing an additional 1 to 1.5 million gallons per year or approximately 15 to 20 percent.

Leachate sources were found primarily during the winter period. Leachate formed from groundwater intrusion requires six months to pass through the landfill while leachate formed from precipitation could require as little as seven days to migrate to the bottom of the landfill and recharge the underlying groundwater.

A number of viable mitigation measures were examined and resulted in the recommendation of four option groups. The components of the individual options are as follows:

Number	Components
Option 1	groundwater extraction system
	landfill cover
	gas venting system
	surface grading
	monitoring system

TABLE I.2

BACKGROUND WATER QUALITY DATA

ITEM	W2 (6/17/76)	W2 (6/19/76)	W2 (6/21/76)	W3 (6/15/76)	W3 (6/18/76)	W3 (6/20/76)	W3 (6/22/76)	W3 (6/24/76)	W3 (6/26/76)	W2 (4/14/80)	W3 (4/14/80)	W13 (2/6/81)
COD (mg/l)	16			16			11	152		10	30	154
BOD (mg/l)	2			2			0	3				
Phenol (mg/l)	0.050						0.003	<0.001				<0.02
Oil/Gr (mg/l)	5.2	4.7	3.2	Dry	3.6	2.8	2.8	3.6	0.8			18.4*
pH	7.2	7.2	7.1	7.1	7.2	7.2	7.3	7.4	7.4			7.9
Cd (ug/l)	30	10	20	<10	<10	20	20	20	<10	13	<10	<10
Cr (ug/l)	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	20
Hg (ug/l)	<5	<5	<5	<5	<5	<5	<5	<5	<5			<200
Pb (ug/l)	<50	<50	<50	<50	<50	50	<50	70	<50			280
Zn (ug/l)	80	<50	100	80	110	130	160	160	70			

* Data not used in calculations due to suspected sample bias.

SOURCE: Leachate Investigation at the Hill AFB Landfill, CRI Draft Final Report: July, 1981.

TABLE I.3

GROUND WATER SAMPLING RESULTS
FROM CRI REPORT - 1981

ITEM	L1 (6/17/76)	L1 (6/18/76)	L1 (6/19/76)	L1 (6/20/76)	L1 (6/21/76)	L1 (6/22/76)	L1 (6/23/76)	L1 (6/24/76)	L1 (6/25/76)	L1 (6/26/76)	L1 (6/27/76)	80-3 (4/14/80)	CRI-3 (2/6/81)	80-23 (2/6/81)	CRI-3 (5/15/81)	80-23 (5/15/81)
COD (mg/l)		1,110			1,300				1,420	980	980		4,000	3,840		
BOD (mg/l)		525			610					565	572					
TOC (mg/l)													500	100		
Phenol (mg/l)		0.74			1.30								0.17	0.67	0.14	0.04
Oil/Gr (mg/l)	7.2	8.0	12.3	5.6	6.0	5.6	6.8	5.6	5.6	2.4	3.4		79.6		0.5	22.9
pH	7.0	6.8	6.8	6.7	7.1	6.9	6.9	6.9	6.8	7.0	7.0		7.1	8.0	7.4	6.7
Cd (ug/l)	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	18	20	<10	<10	20
Cr (ug/l)	240	<50	<50	<50	<50	<50	50	110	<50	<50	<50	<50	70	20	<100	300
Hg (ug/l)	<5	<5	<5	<5	20	<5	<5	<5	<5	<5	<5		<200	<200	<200	<200
Pb	<50	<50	<50	<50	<50	60	<50	<50	<50	<50	<50		500	410	200	1,500
Zn (ug/l)	<50	60	<50	70	60	<50	<50	<50	50	<50	<50					

SOURCE: CRI Draft Final Report; July, 1981.

Number	Components
Option 2	bentonite slurry trench
	landfill cover
	gas control system
	surface grading
	revegetation of the landfill surface
	installation of a monitoring system
Option 3	groundwater drain
	surface grading
	landfill cover
	gas venting
	revegetation
	monitoring system
Option 4	leachate collection
	leachate treatment
	surface treatment
	surface grading
	landfill cover
	gas control
	revegetation

Of these control options, Option 1 was recommended as the best approach. The major disadvantage associated with this system was the high operating cost (e.g., electricity for the pumps). Annualized cost for the entire system is $84,000.

APPENDIX J

GLOSSARY

APPENDIX J

GLOSSARY

AF: Air Force

AFA: Air Force Academy

AFB: Air Force Base

AFR: Air Force Regulation

AFSC: Air Force Systems Command

AG: Adjutant General

AGE: Aerospace Ground Equipment

AFLC: Air Force Logistics Command

ALC: Air Logistics Center

ARTESIAN: Ground water contained under hydrostatic pressure

AQUICLUDE: Impermeable formation that impeeds ground-water movement and does not yield water to a well or spring

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

AVGAS: Aviation Gasoline

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

CERL: Construction Engineering Research Laboratory

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

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

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

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

CRI: Calscience Research, Inc.

Culinary Water: Water used for domestic purposes as compared to water used for irrigation.

Det: Detachment

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

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

DOD: Department of Defense

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

DPDO: Defense Property Disposal Office

DSA: Defense Supply Agency

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

EPA: Environmental Protection Agency

ES: Engineering-Science, Inc.

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

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

FCT: Fire Control Training

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

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

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

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

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

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

HAFB: Hill Air Force Base

HQ: Headquarters

HWMF: Hazardous Waste Management Facility

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

INFILTRATION: The flow of liquid through pores or small openings

IRP: Installation Restoration Program

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 impoundmnet, landfill, or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents or leachate

LWDS: Liquid Waste Disposal System

MOGAS: Gasoline for trucks and automobiles

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

MSL: Mean Sea Level

OEHL: Occupational and Environmental Health Laboratory

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

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

PERCOLOATION: Movement of moisture by gravity or hydrostatic pressure thorugh interstices of unsaturated rock or soil

PD-680: Cleaning solvent

pH: Negative Logarithm of hydrogen ion concentration

PL: Public Law

POL: Petroleum, Oils and Lubricants

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

PS-661: Cleaning Solvent

RCRA: Resource Conservation and Recovery Act

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

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

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

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

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

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

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

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

TAC: Tactical Air Command

TCE: Trichloroethylene - a toxic organic solvent

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

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

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

USAF: United States Air Force

USDA: United States Department of Agriculture

USDH: Utah State Department of Health

USGS: United States Geological Survey

UTTR: Utah Test and Training Range

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

APPENDIX K

REFERENCES

APPENDIX K

REFERENCES

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APPENDIX L

HAZARD ASSESSMENT RATING METHODOLOGY

HILL AIR FORCE BASE

USAF INSTALLATION RESTORATION PROGRAM

HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

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

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

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

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

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

PURPOSE

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

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

DESCRIPTION OF MODEL

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

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

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

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

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

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

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

NOTE: All ratings shown in the main body of this report were obtained from the original, June 1981, rating model. (See Appendices F and G)

FIGURE 1

HAZARD ASSESSMENT RATING METHODOLOGY FLOW CHART

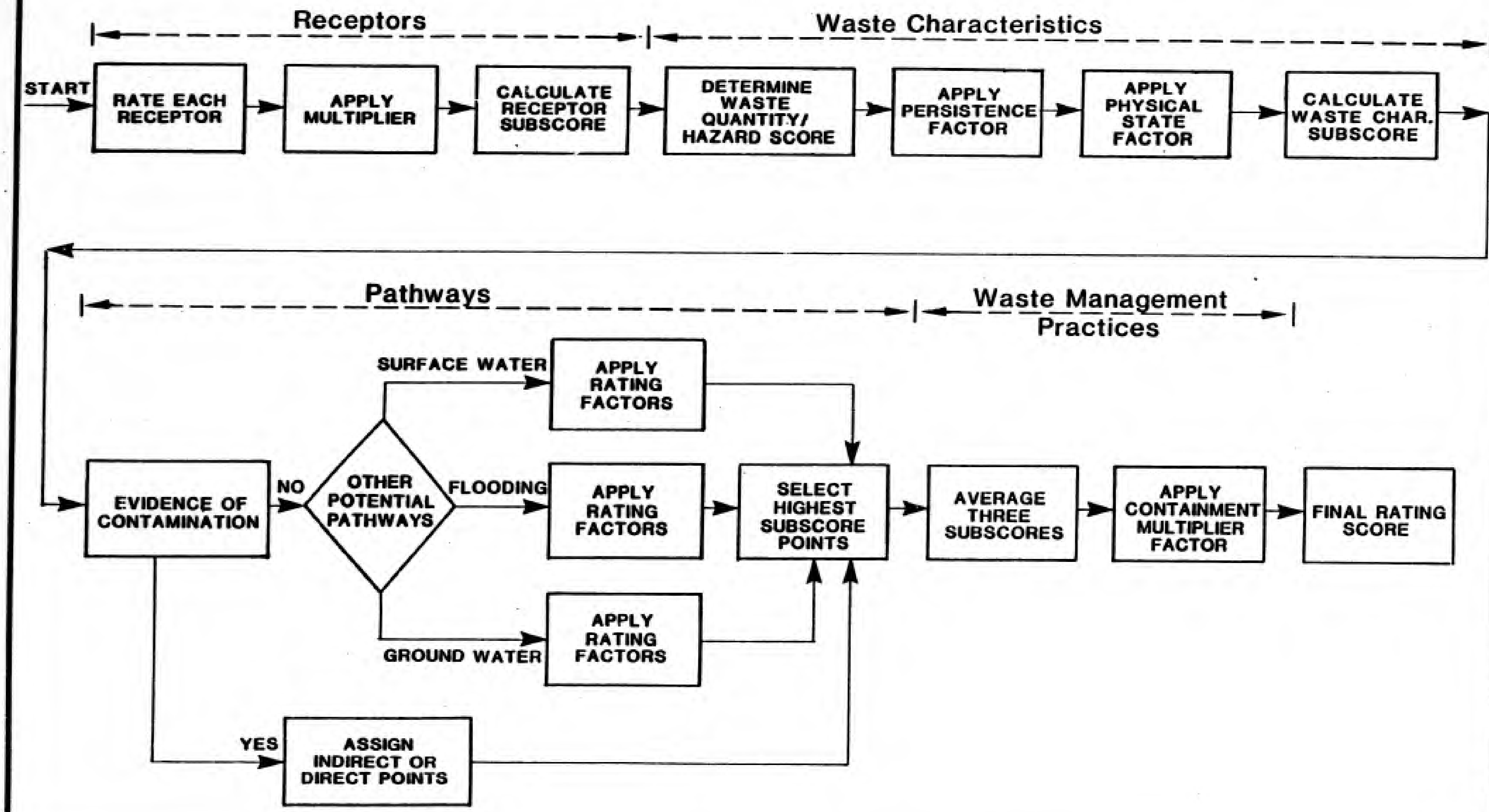

FIGURE 2

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE ______

LOCATION ______

DATE OF OPERATION OR OCCURRENCE ______

OWNER/OPERATOR ______

COMMENTS/DESCRIPTION ______

SITE RATED BY ______

I. RECEPTORS

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

Subtotals ______ ______

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

II. WASTE CHARACTERISTICS

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

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

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

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

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

FIGURE 2 (Continued)

III. PATHWAYS

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

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

Subscore ______

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

1. Surface water migration

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

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

2. Flooding

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

Subscore (100 x factor score/3) ______

3. Ground-water migration

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

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

C. Highest pathway subscore.

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

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

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

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ☐

TABLE 1

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

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

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

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

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 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	3	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:

Landfills:

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

Spills:

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

Surface Impoundments:

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

Fire Proection Training Areas:

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

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

APPENDIX M

HAZARD ASSESSMENT RATING METHODOLOGY FORMS

HILL AIR FORCE BASE

HAZARD ASSESSMENT RATING METHODOLOGY SCORES

HILL AIR FORCE BASE

	Site	HARM Score	Page No.
1.	Chemical Disposal Pit No. 1 & 2	81	M-1
2.	Landfill No. 4	81	M-3
3.	Landfill No. 3	75	M-5
4.	Berman Pond	61	M-7
5.	Fire Training Area No. 1	57	M-9
6.	Chemical Disposal Pit No. 3	56	M-11
7.	Little Mountain-Sludge Drying Beds	54	M-13
8.	Industrial Wastewater Treatment Plant	52	M-15
9.	Landfill No. 5	44	M-17
10.	Sodium Hydroxide Leak - Industrial Wastewater Treatment Plant	41	M-19
11.	Landfill No. 1	36	M-21
12.	Landfill No. 2	35	M-23
13.	Herbicide Orange Test Plot	29	M-25

SUMMARY OF REVISED PHASE II RECOMMENDATIONS
HILL AIR FORCE BASE

Site	Initial Score/[1] Recommendation	Revised Score/[2] Recommendation	Comments
Chemical Disposal Pit Nos. 1 & 2	77/Geophysical Survey and Ground-Water Monitoring	81/Geophysical Survey and Ground-Water Monitoring	No Change in Recommendation
Landfill No. 4	77/Geophysical Survey	81/Geophysical Survey	No Change in Recommendation
Landfill No. 3	70/Geophysical Survey and Ground-Water Monitoring	75/Geophysical Survey and Ground-Water Monitoring	No Change in Recommendation
Berman Pond	61/Ground-Water Monitoring	61/Ground-Water Monitoring	No Change in Recommendation
Fire Training Area No. 1	50/None	57/Geophysical Survey Performed in Conjunction with Landfill No. 3	Change in Recommendation Add Site to Phase II Study
Chemical Disposal Pit No. 3	56/Ground-Water Monitoring	56/Ground-Water Monitoring	No Change in Recommendation
Little Mountain-Sludge Drying Bed	53/None	54/None	No Change in Recommendation
IWTP Drying Beds	57/Ground-Water Monitoring	52/Ground-water Monitoring	No Change in Recommendation
Sodium Hydroxide Leak	62/Ground-Water Monitoring	41/Ground-water Monitoring in Conjunction with IWTP Drying Beds	No Change in Recommendation
All Other Sites	-/None	-/None	No Change in Recommendations

(1) Hazard Evaluation Methodology, July 1981
(2) Hazard Assessment Rating Methodology, January 1982

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Chemical Disposal Pit No. 1 & 2

LOCATION Approximately 150 feet southwest of existing Fire Training Area

DATE OF OPERATION OR OCCURRENCE 1954 to 1973

OWNER/OPERATOR Hill AFB

COMMENTS/DESCRIPTION Received solvents & paint strippers; periodically burned

SITE RATED BY [illegible signature]

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	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	100	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

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

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

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

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

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

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

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

Subscore 100

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

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	30	108

Subscore (100 X factor score subtotal/maximum score subtotal) 28

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

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	32	114

Subscore (100 x factor score subtotal/maximum score subtotal) 28

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	56
Waste Characteristics	100
Pathways	100
Total 256 divided by 3 =	85
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

85 x 0.95 = 81

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Landfill No. 4

LOCATION Intersection of Perimeter Road and Sage Street

DATE OF OPERATION OR OCCURRENCE 1967 to 1973

OWNER/OPERATOR Hill AFB

COMMENTS/DESCRIPTION 37 acre site, local soil cover, vegetation-native grasses

SITE RATED BY C M 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	3	10	30	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	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	100	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

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

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

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

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

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

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

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

Subscore 100

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

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	30	108

Subscore (100 X factor score subtotal/maximum score subtotal) 28

2. Flooding

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

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	3	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	3	3	24	24
Direct access to ground water	0	3	0	24
		Subtotals	56	114

Subscore (100 x factor score subtotal/maximum score subtotal) 49

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	56
Waste Characteristics	100
Pathways	100

Total [illegible] divided by 3 = 85
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

85 X 0.95 = 81

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Landfill No. 3

LOCATION Approximately 250 feet south of Fire Training Area

DATE OF OPERATION OR OCCURRENCE 1947-1967

OWNER/OPERATOR Hill AFB

COMMENTS/DESCRIPTION 5 acre site, local soil cover, partially vegetated

SITE RATED BY CM 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	3	10	30	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	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	100	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

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

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

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

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

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

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

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

Subscore 80

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

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
Subtotals			38	108

Subscore (100 X factor score subtotal/maximum score subtotal) 35

2. Flooding

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

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
Subtotals			40	114

Subscore (100 x factor score subtotal/maximum score subtotal) 35

C. Highest pathway subscore.

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

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	56
Waste Characteristics	100
Pathways	80

Total 236 divided by 3 = 79 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

79 x 0.95 = $\boxed{75}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Berman Pond

LOCATION Approximately 500 feet northeast of South gate

DATE OF OPERATION OR OCCURRENCE 1940's to 1956

OWNER/OPERATOR Hill AFB

COMMENTS/DESCRIPTION Constructed as an evaporation pond for industrial wastes

SITE RATED BY CMMangan

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	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	101	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

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

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

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

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

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

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

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

Subscore N/A

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

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	-	8	-	-
Surface permeability	0	6	0	18
Rainfall intensity	1	8	8	24
Subtotals			16	84

Subscore (100 X factor score subtotal/maximum score subtotal) 19

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

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			40	114

Subscore (100 x factor score subtotal/maximum score subtotal) 35

C. Highest pathway subscore.

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

Pathways Subscore 35

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	56
Waste Characteristics	100
Pathways	35

Total 191 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 0.95 = 61

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Fire Training Area No. 1

LOCATION Approximately 1100 feet northwest of Landfill No. 3

DATE OF OPERATION OR OCCURRENCE 1958 to 1973

OWNER/OPERATOR Hill AFB

COMMENTS/DESCRIPTION Waste fuels burned

SITE RATED BY C. M. 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	3	10	30	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	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			100	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

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

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

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

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

100 x .8 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

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

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

Subscore N/A

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

1. Surface water migration

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

Subscore (100 X factor score subtotal/maximum score subtotal) 22

2. Flooding

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

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	40	114

Subscore (100 x factor score subtotal/maximum score subtotal) 35

C. Highest pathway subscore.

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

Pathways Subscore 35

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	56
Waste Characteristics	80
Pathways	35
Total 171 divided by 3 =	57 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

57 X 1.0 = 57

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Chemical Disposal Pit No. 3

LOCATION Between Foulois Road and Perimeter Road southeast of old SAC area

DATE OF OPERATION OR OCCURRENCE 1940's to 1975

OWNER/OPERATOR Hill AFB

COMMENTS/DESCRIPTION Used for disposal of TCE and several other industrial wastes

SITE RATED BY C M 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	3	10	30	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	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	96	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 53

II. WASTE CHARACTERISTICS

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

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

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

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

80 x 1.0 = 30

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

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

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

Subscore N/A

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

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	38	108

Subscore (100 X factor score subtotal/maximum score subtotal) 35

2. Flooding

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

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	32	114

Subscore (100 x factor score subtotal/maximum score subtotal) 28

C. Highest pathway subscore.

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

Pathways Subscore 35

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	53
Waste Characteristics	80
Pathways	35

Total 168 divided by 3 = 56 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

56 x 1.0 = 56

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Little Mountain-Sludge Drying Beds

LOCATION Southeast of Main Facility

DATE OF OPERATION OR OCCURRENCE 1973 to 1978

OWNER/OPERATOR Hill AFB

COMMENTS/DESCRIPTION Received phenolic paint stripper

SITE RATED BY C M 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	0	10	0	30
C. Land use/zoning within 1 mile radius	0	3	0	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	0	6	0	18
G. Ground water use of uppermost aquifer	0	9	0	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			60	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 33

II. WASTE CHARACTERISTICS

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

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

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

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

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

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

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

Subscore N/A

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

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	–	8	–	–
Surface permeability	0	6	0	18
Rainfall intensity	1	8	8	24
		Subtotals	24	84

Subscore (100 X factor score subtotal/maximum score subtotal) 29

2. Flooding

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

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	0	8	0	24
Net precipitation	0	6	0	18
Soil permeability	3	8	24	24
Subsurface flows	–	8	–	–
Direct access to ground water	0	8	0	24
		Subtotals	24	90

Subscore (100 x factor score subtotal/maximum score subtotal) 27

C. Highest pathway subscore.

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

Pathways Subscore 29

IV. WASTE MANAGEMENT PRACTICES

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

Receptors 33
Waste Characteristics 100
Pathways 29

Total 162 divided by 3 = 54
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

54 x 1.0 = 54

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Industrial Wastewater Treatment Plant - Sludge Drying Beds

LOCATION Approximately 150 feet east of Building 507

DATE OF OPERATION OR OCCURRENCE 1956-1976

OWNER/OPERATOR Hill AFB

COMMENTS/DESCRIPTION Drained to the ground

SITE RATED BY C M 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	2	10	20	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	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	95	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 53

II. WASTE CHARACTERISTICS

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

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

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

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

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x .75 = 75

III. PATHWAYS

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

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

Subscore N/A

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

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	22	108

Subscore (100 X factor score subtotal/maximum score subtotal) 20

2. Flooding

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

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	–	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	32	114

Subscore (100 x factor score subtotal/maximum score subtotal) 28

C. Highest pathway subscore.

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

Pathways Subscore 28

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	53
Waste Characteristics	75
Pathways	28

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 1.0 = 52

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Landfill No. 5

LOCATION UTTR--Northeast of Lakeside Facility

DATE OF OPERATION OR OCCURRENCE 1977 to present

OWNER/OPERATOR Hill AFB

COMMENTS/DESCRIPTION 5 acre site, active hazardous waste disposal facility

SITE RATED BY [signature]

I. RECEPTORS

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

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 15

II. WASTE CHARACTERISTICS

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

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

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

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

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

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

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

Subscore N/A

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

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	0	8	0	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	1	8	8	24
		Subtotals	26	108

Subscore (100 X factor score subtotal/maximum score subtotal) 24

2. Flooding

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

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	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 24

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	15
Waste Characteristics	100
Pathways	24

Total 139 divided by 3 = 46 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 0.95 = 44

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Sodium Hydroxide Leak - Industrial Wastewater Treatment Plant

LOCATION

DATE OF OPERATION OR OCCURRENCE Occurred over 12 months in 1980

OWNER/OPERATOR Hill AFB

COMMENTS/DESCRIPTION

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	2	10	20	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	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	101	130

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

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

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

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 0.4 = 32

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

32 x 1.0 = 32

III. PATHWAYS

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

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

Subscore N/A

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

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	-	8	-	-
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
Subtotals			22	84

Subscore (100 X factor score subtotal/maximum score subtotal) 26

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

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	-	8	-	-
Direct access to ground water	0	8	0	24
Subtotals			32	90

Subscore (100 x factor score subtotal/maximum score subtotal) 36

C. Highest pathway subscore.

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

Pathways Subscore 36

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	56
Waste Characteristics	32
Pathways	36

Total 124 divided by 3 = 41 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

41 x 1.0 = $\boxed{41}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Landfill No. 1

LOCATION Between Foulais Drive and Browning Avenue behind Building 2337

DATE OF OPERATION OR OCCURRENCE 1955 to 1967

OWNER/OPERATOR Hill AFB

COMMENTS/DESCRIPTION 5-acre site, local soil cover, vegetation-native grasses

SITE RATED BY C M Mangan

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	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 (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) M

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

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

30 x .9 = 27

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

27 x .5 = 14

III. PATHWAYS

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

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

Subscore N/A

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

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	38	108

Subscore (100 X factor score subtotal/maximum score subtotal) 35

2. Flooding

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

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	32	114

Subscore (100 x factor score subtotal/maximum score subtotal) 28

C. Highest pathway subscore.

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

Pathways Subscore 35

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	59
Waste Characteristics	14
Pathways	35

Total 108 divided by 3 = 36 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

36 x 1.0 = 36

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Landfill No. 2

LOCATION Approximately 600 feet south of North Gate

DATE OF OPERATION OR OCCURRENCE 1963-1965

OWNER/OPERATOR Hill AFB

COMMENTS/DESCRIPTION 2-acre site, local soil cover, vegetation-native grasses

SITE RATED BY C M 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	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	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	103	180

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

II. WASTE CHARACTERISTICS

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

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

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

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

30 x .9 = 27

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

27 x .5 = 14

III. PATHWAYS

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

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

Subscore N/A

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

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	1	8	8	24
Subtotals			32	108

Subscore (100 X factor score subtotal/maximum score subtotal) 30

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

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			40	114

Subscore (100 x factor score subtotal/maximum score subtotal) 35

C. Highest pathway subscore.

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

Pathways Subscore 35

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	57
Waste Characteristics	14
Pathways	35

Total 106 divided by 3 = 35 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

35 x 1.0 = 35

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Herbicide Orange Test Plot

LOCATION Hill Air Force Base - Near Target 21

DATE OF OPERATION OR OCCURRENCE

OWNER/OPERATOR Hill AFB

COMMENTS/DESCRIPTION Used to test decompostion rate of Herbicide Orange & rate of container corrosion.

SITE RATED BY C M 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	0	10	0	30
C. Land use/zoning within 1 mile radius	0	3	0	9
D. Distance to reservation boundary	0	6	0	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	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	0	6	0	18
		Subtotals	27	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 15

II. WASTE CHARACTERISTICS

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

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

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 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

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

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

Subscore N/A

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

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	0	8	0	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	3	6	18	18
Rainfall intensity	1	8	8	24
		Subtotals	42	108

Subscore (100 X factor score subtotal/maximum score subtotal) 39

2. Flooding

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

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	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 39

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	15
Waste Characteristics	40
Pathways	39
Total 94 divided by 3 =	31
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

31 x 0.95 = 29