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INSTALLATION RESTORATION PROGRAM RECORDS SEARCH

For
Air Force Plant 6, Georgia

CH2M HILL

Prepared for

AIR FORCE ENGINEERING AND SERVICES CENTER
DIRECTORATE OF ENVIRONMENTAL PLANNING
TYNDALL AIR FORCE BASE, FLORIDA 32403
AND
AIR FORCE SYSTEMS COMMAND
AERONAUTICAL SYSTEMS DIVISION
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

MARCH 1984

NOTICE

This report has been prepared for the United States Air Force by CH2M HILL SOUTHEAST, INC., for the purpose of aiding in the implementation of the Air Force Installation Restoration Program. It is not an endorsement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the United States Air Force, nor the Department of Defense.

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AIR FORCE PLANT 6, GEORGIA

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Gainesville, Florida

CH2M HILL

January 1984

Contract No. F08637-80-G0010-5008

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EXECUTIVE SUMMARY

A. INTRODUCTION

1. CH2M HILL was retained on August 17, 1983, to conduct the Air Force (AF) Plant 6 records search under Contract No. F08637-80-G0010-5008, with funds provided by Aeronautical Systems Division (ASD).

2. Department of Defense (DoD) policy, directed by Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, is to identify and fully evaluate suspected problems associated with past hazardous material disposal sites on DoD facilities, control the migration of hazardous contamination from such facilities, and control hazards to health and welfare that may have resulted from these past operations.

3. To implement the DoD policy, a four-phase Installation Restoration Program has been directed. Phase I, the records search, is the identification of potential problems. Phase II (not part of this contract) consists of follow-on field work to determine the extent and magnitude of contaminant migration. Phase III (not part of this contract) consists of technology base development to support the development of project plans for controlling migration or restoring the installation. Phase IV (not part of this contract) includes those efforts which are required to control identified hazardous conditions.

4. The AF Plant 6 records search included a detailed review of pertinent installation records, contacts with 12 government organizations for documents

relevant to the records search effort, and an onsite installation visit conducted by CH2M HILL during the week of November 14 through November 18, 1983. Activities conducted during the onsite visit included interviews with 29 installation employees, ground tours of installation facilities, a detailed search of installation records, and a helicopter overflight to identify past disposal areas.

B. MAJOR FINDINGS

1. AF Plant 6 was constructed in 1941 for the sole purpose of manufacturing large aircraft in support of the war effort. The Bell Aircraft Corporation operated AF Plant 6 until 1946 where they produced the B-29 aircraft. From 1946 to 1951, AF Plant 6 was occupied by the Tumpane Company which was engaged in process preservation and storage of machine tools. In 1951, the Lockheed-Georgia Company reopened AF Plant 6 under contract with the Air Force to modify B-29 aircraft for the Korean Conflict. After the B-29 aircraft modification program ended, the Lockheed-Georgia Company continued to operate AF Plant 6. Since their work ended on B-29 aircraft modification, the Lockheed-Georgia Company has manufactured B-47, C-130, JetStar, C-141, and C-5 aircraft. They have also modified the C-141 aircraft during the "stretch" program and C-5 aircraft during the wing modification program.

   The major industrial operations at AF Plant 6 include tooling, cutting, shaping, forming, cleaning, treating, and painting aircraft parts; subassembly of aircraft components; major assembly of aircraft sections; final assembly of entire aircraft; aircraft cleaning and painting; maintenance of building, aircraft, and aircraft-support equipment; and operations and support services; These industrial operations generate varying quantities of waste oils, recovered fuels, spent solvents and cleaners, plating sludge, paint sludges from water-wash paint booths, and heat-treatment salt wastes. The total quantity of waste oils, recovered fuels, and spent solvents and cleaners is approximately 135,000 gallons per year. This includes approximately 75,000 gpy of waste oils and recovered fuels and 60,000 gpy of spent solvents and cleaners. Spent salt baths (20 tons per year [tpy]), plating sludges (3,500 tpy), and sealants (1 tpy) are also generated. This represents the total current estimated quantity of wastes generated at AF Plant 6.

Wastes quantities are dependent upon the workload of AF Plant 6 and vary greatly from one period to the next. Total waste quantities generated are believed to have been at their peak in the late 1960s.

2. In general, the standard procedures for past and present industrial waste disposal practices have been as follows: (1) waste oils and recovered fuels have generally been recycled or used to produce energy, (2) spent solvents and cleaners have been collected by contractors for offsite disposal (1951 to present), (3) concentrated plating baths have been treated prior to surface discharge, (4) dilute plating rinsewater wastes and oily wastewaters have been discharged to the sanitary WWTP (1951 to 1972) or to the Industrial Waste Treatment Plant (IWTP) (1972 to present), and (5) plating sludges have been discharged to an earthen basin in the B-10 area (1951 to 1972) or

to Site No. 1, the Surface Impoundment (1972 to present). More specific industrial waste disposal practices for each industrial site are summarized in Section IV.A.1, "Summary of Industrial Waste Disposal Practices."

3. Interviews with installation employees resulted in the identification of 12 past disposal or spill sites at AF Plant 6 and the approximate dates that these sites were active (see Figure 1 for site locations).

C. CONCLUSIONS

1. Information obtained through interviews with installation personnel, installation records, and field observations indicate that hazardous wastes have been disposed of on AF Plant 6 property in the past.

2. Direct evidence (confirmed by laboratory analyses) of contaminant migration exists for Site No. 1, the Surface Impoundment; Site No. 9, the TCE Spill; and Site No. 5, Stormwater Retention Basin No. 2.

3. Indirect evidence (confirmed by visual observation) of contamination exists at Site No. 7, Position 65--the C-5 Washrack.

4. No evidence of environmental stress due to past disposal of hazardous wastes was observed at AF Plant 6.

5. The potential for surface-water migration of hazardous contaminants is high primarily because of (1) the relatively high precipitation rate, (2) the relatively low evapotranspiration rate,

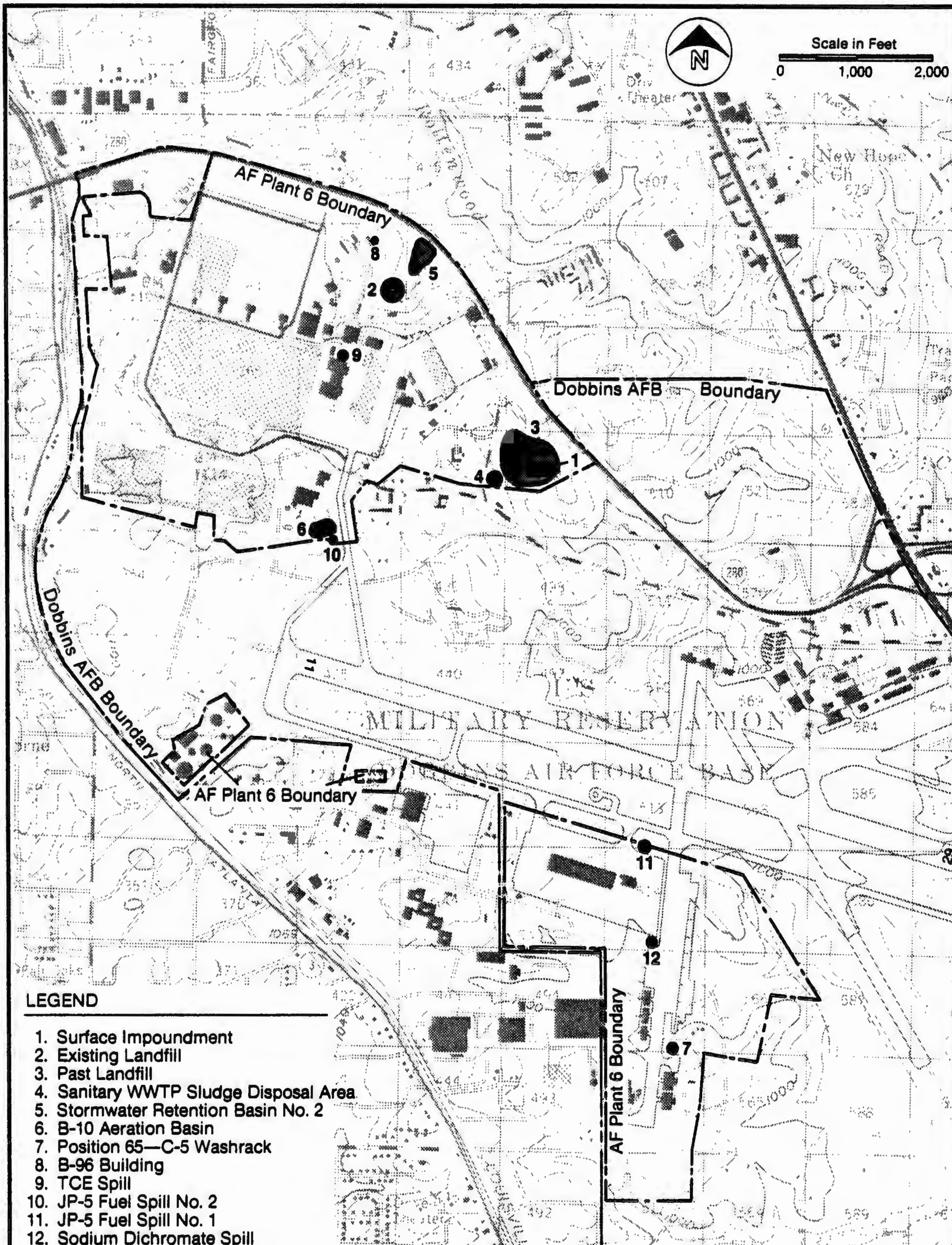

FIGURE 1.
Location Map of Identified Disposal and Spill Sites at AF Plant 6.

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(3) the presence of stormwater drainage ditches and creeks on AF Plant 6 property which are flowing most of the year, (4) the proximity of several disposal sites to these water courses, and (5) moderately low to very low soil permeabilities (1×10^{-3} to 1×10^{-7} cm/sec).

6. The potential for ground-water migration of hazardous contaminants is moderate primarily due to: (1) the relatively high precipitation rate, (2) the relatively low evapotranspiration rate, (3) shallow depth to ground water (20 to 30 feet), and (4) low to very low permeabilities (1×10^{-3} to 1×10^{-7} cm/s).

7. Table 1 presents a priority listing of the rated sites and their overall scores. The following sites were designated as areas showing the most significant potential (relative to other AF Plant 6 sites) for environmental impact.

   a. Site No. 1--the Surface Impoundment

   b. Site No. 2--The Existing Landfill

   c. Site No. 3--The Past Landfill

   d. Site No. 4--The Sanitary WWTP Sludge Disposal Area

   e. Site No. 5--Stormwater Retention Basin No. 2

   f. Site No. 6--the B-10 Aeration Basin

   g. Site No. 7--Position 65--the C-5 Washrack

   h. Site No. 9--the TCE Spill

Table 1
LISTING OF DISPOSAL AND SPILL SITES

Ranking No.	Site No.	Description	Overall Score
1	1	Surface Impoundment	74
2	6	B-10 Aeration Basin	74
3	7	Position 65--C-5 Washrack	72
4	9	TCE Spill	74
5	5	Stormwater Retention Basin No. 2	69
6	12	Sodium Dichromate Spill	66
7	10	JP-5 Fuel Spill No. 2	64
8	4	Sanitary WWTP Sludge Disposal Area	62
9	2	Existing Landfill	61
10	3	Past Landfill	61
11	8	B-96 Building	49
12	11	JP-5 Fuel Spill No. 1	7

i. Site No. 10--JP-5 Fuel Spill No. 2

j. Site No. 12--Sodium Dichromate Spill

8. Sites No. 8 and 11 are not considered to present significant environmental concerns. In general, these sites received low receptor and waste characteristics subscores.

D. RECOMMENDATIONS

1. A Phase II monitoring program is recommended to confirm or rule out the presence and/or migration of hazardous contaminants. Specifically, sampling is recommended for Site No. 2, the Existing Landfill; Site No. 4, the Sanitary WWTP Sludge Disposal Area; Site No. 5, Stormwater Retention Basin No. 2; Site No. 6, the B-10 Aeration Basin; Site No. 7, Position 65--the C-5 Washrack; Site No. 9, the TCE Spill; Site No. 10, JP-5 Fuel Spill No. 2; and Site No. 12, Sodium Dichromate Spill. A groundwater quality assessment plan was prepared for Site No. 1, the Surface Impoundment, by the Chester Engineers under contact with the Lockheed-Georgia Company in November 1983. In this report, an extensive monitoring program was recommended to determine the extent and magnitude of the ground-water contamination at the site. This program was approved by the Lockheed-Georgia Company, AFPRO, and ASD and is now being reviewed by the Georgia Environmental Protection Division (EPD). Because of this, no Phase II recommendations were made for this site. Because of its proximity to Site No. 1, recommendations for Site No. 3, the Past Landfill will also be

covered by these recommendations. Figure 2 shows the locations of the sites being recommended for Phase II monitoring.

2. In addition to the Phase II recommendations made for each disposal site, all existing and proposed monitoring wells should be surveyed to determine their ground-water surface elevations. A potentiometric map should be constructed from this information.

3. Ground-water samples should be collected from all of the existing monitoring wells to confirm or rule out the presence of contamination due to leaking tanks. The parameters to be analyzed for should be established based on the constituents of each tank.

4. The final details of the monitoring program, including the exact locations of sampling points, should be determined as part of the Phase II program. In the event that contaminants at levels of serious concern are detected, a more extensive field survey program should be implemented to determine the extent of contaminant migration.

5. Other environmental recommendations in addition to the Phase II sampling include:

    a. Discontinuing the use of the two ponds at Site No. 7, Position 65--the C-5 Washrack. The contaminated water should be pumped to the IWTP for treatment and the ponds should be properly closed. The piping system should be reworked to pump washwater from the washrack directly to the IWTP.

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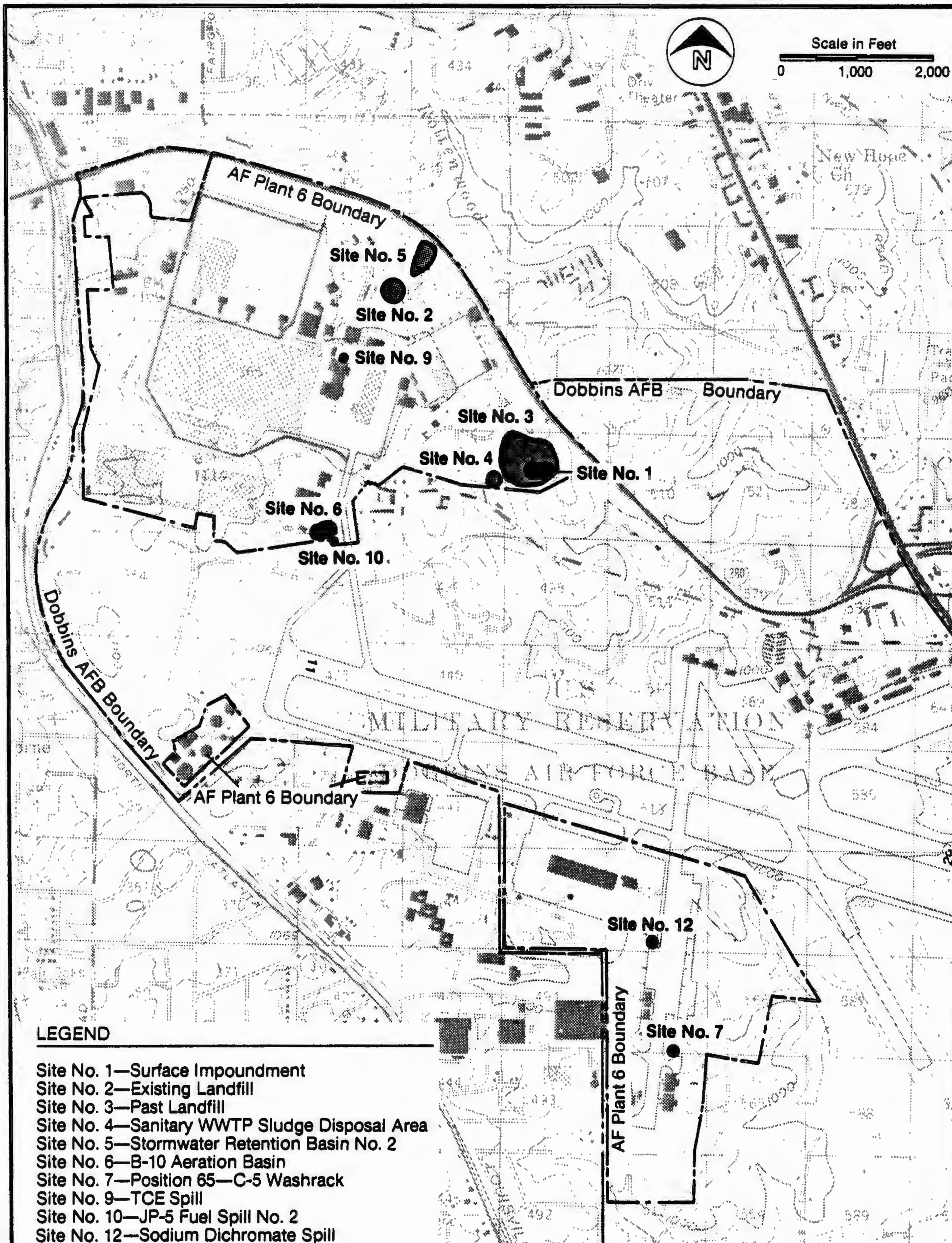

FIGURE 2.
Location Map of Sites Recommended for Phase II Monitoring.

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b. Pressure testing all major belowground (BG) tanks.

c. Testing the discharge lines from the production areas to the IWTP to determine if exfiltration is occurring which could potentially pollute the ground water.

d. Investigating the future use of existing production wells located on AF Plant 6 and Dobbins property. If the wells are going to be used in the future, they should be logged to determine their existing condition. If they are going to be abandoned, they should be properly capped.

e. Inspecting the production wells to ensure that they are not connected to the existing water system.

I. INTRODUCTION

A. BACKGROUND

The United States Air Force (USAF), due to its primary mission, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations to require that disposers identify the locations and contents of disposal sites and take action to eliminate the hazards in an environmentally responsible manner. The primary Federal legislation governing disposal of hazardous waste is the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Under Sections 6003 and 3012 of the Act, Federal agencies are directed to assist the Environmental Protection Agency (EPA) and state agencies to inventory past disposal sites and make the information available to the requesting agencies. The Installation Restoration Program (IRP) will be the basis for remedial actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as clarified by Executive Order 12316. CERCLA is the primary Federal legislation governing remedial actions at uncontrolled hazardous waste sites. The specific federal regulation is 40 CFR 300, Subpart F, National Contingency Plan (NCP).

The Department of Defense (DoD) developed the current IRP to ensure compliance with these hazardous waste regulations. The current DoD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981 and implemented by Headquarters Air Force message dated 21 January 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the IRP. DoD policy is to identify and fully evaluate suspected problems associated with past hazardous material contamination, and to control hazards to health and welfare that may have resulted from these past operations.

To conduct the IRP Hazardous Materials Disposal Sites Records Search for Air Force (AF) Plant 6, Georgia, CH2M HILL was retained on August 17, 1983 under Contract No. F08637-80-G0010-5008 with funds provided by Aeronautical Systems Division (ASD). A location map of AF Plant 6 is shown in Figure 3.

The records search comprises Phase I of the DoD IRP and is intended to review installation records for the purpose of identifying possible hazardous waste-contaminated sites and assessing the potential for contaminant migration. Phase II (not part of this contract) consists of follow-on field work as determined from Phase I. Phase II consists of a preliminary survey to confirm or rule out the presence and/or migration of contaminants and, if necessary, additional field work to determine the extent and magnitude of the contaminant migration. Phase III (not part of this contract) consists of technology base development to support the development of project plans for controlling migration or restoring the installation. Phase IV (not part of this contract) includes those actions which are required to control identified hazardous environmental conditions.

B. AUTHORITY

The identification of hazardous waste disposal sites at Air Force installations was directed by Defense Environmental Quality Program Policy Memorandum 81-5 (DEQPPM 81-5) dated 11 December 1981, and implemented by Headquarters Air

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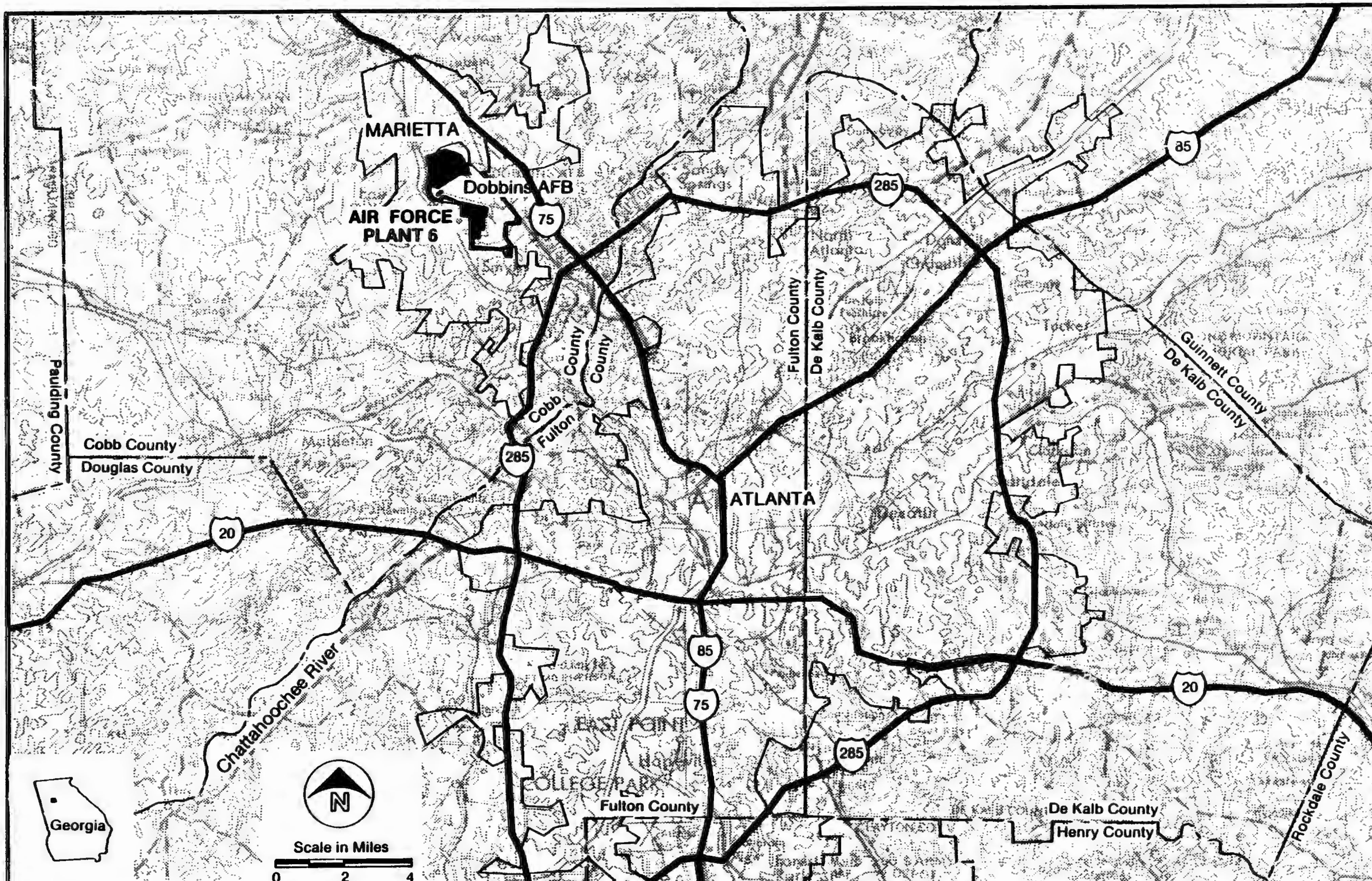

FIGURE 3.
Location Map of AF Plant 6.

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Force message dated 21 January 1982, as a positive action to ensure compliance of Air Force installations with existing environmental regulations.

C. PURPOSE OF THE RECORDS SEARCH

The purpose of the Phase I records search is to identify and evaluate suspected problems associated with past hazardous material disposal sites and spill sites on DoD facilities. The existence and potential for migration of hazardous material contaminants were evaluated at AF Plant 6 by reviewing the existing information and conducting an analysis of installation records. Pertinent information included the history of operations, the geological and hydrogeological conditions which may have contributed to the migration of contaminants, and the ecological settings which indicated environmentally sensitive habitats or evidence of environmental stress. The evaluation is to determine which identified sites, if any, exhibit a significant potential for environmental impact and warrant further investigation. No sampling is conducted during Phase I.

D. SCOPE

The records search program included a pre-performance meeting, an onsite installation visit, a review and analysis of the information obtained, and preparation of this report.

The pre-performance meeting was held at AF Plant 6, Georgia, on October 7, 1983. Attendees at this meeting included representatives of the Air Force Engineering and Services Center (AFESC), Air Force Plant Representative Office (AFPRO), Lockheed-Georgia Company, and CH2M HILL. The purpose of the pre-performance meeting was to provide detailed project instructions, to provide clarification and technical guidance by AFESC, and to define the responsibilities of all parties participating in the AF Plant 6 records search.

The onsite installation visit was conducted by CH2M HILL from November 14 through 18, 1983. Activities performed during the onsite visit included a detailed search of installation records, ground tours, and helicopter overflight of the installation, and interviews with installation personnel. At the conclusion of the onsite visit, representatives from AFPRO and the Lockheed-Georgia Company were briefed on the preliminary findings. The following individuals constituted the CH2M HILL records search team:

1. Mr. J. Kendall Cable, Project Manager/Environmental Engineer (M.E., Civil Engineering, 1980).

2. Mr. Mark Corey, Assistant Project Manager/ Environmental Engineer (M.S., Environmental Systems Engineering, 1981).

3. Mr. Gary Eichler, Hydrogeologist (M.S., Engineering Geology, 1974).

4. Dr. Robert Knight, Ecologist (Ph. D., Ecology, 1980).

Resumes of these team members are included in Appendix A. Dr. Knight was not a member of the site visit team.

Government organizations were contacted for information and relevant documents. Appendix B lists the organizations contacted.

The following individuals from the Air Force and the Lockheed-Georgia Company assisted in the AF Plant 6 records search:

1. Capt. Gail Graban, AFESC, Project Manager, Phase I.

2. Mr. Charles Alford, Aeronautical Systems Division (ASD), Environmental Programs Manager.

3. Mr. Joe Caldwell, Air Force Plant Representative Office (AFPRO) Point of Contact.

4. Mr. Ken Warren, AFPRO Point of Contact.

5. Ms. Della Ridley, Lockheed-Georgia Company Point of Contact, Safety Engineer Senior.

E. METHODOLOGY

The methodology used in the AF Plant 6 records search is shown in Figure 4. First, a review of past and present industrial operations was conducted at the installation. Information was obtained from available records such as contractor files and real property files, as well as interviews with employees from the various operating areas of the installation. This information was used to identify which activities generated hazardous waste. The information obtained from interviewees on past activities was based on their best recollection. A list of the 29 interviewees from AF Plant 6, with areas of knowledge and years at the installation, is given in Appendix C.

The next step in the activity review process was to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from

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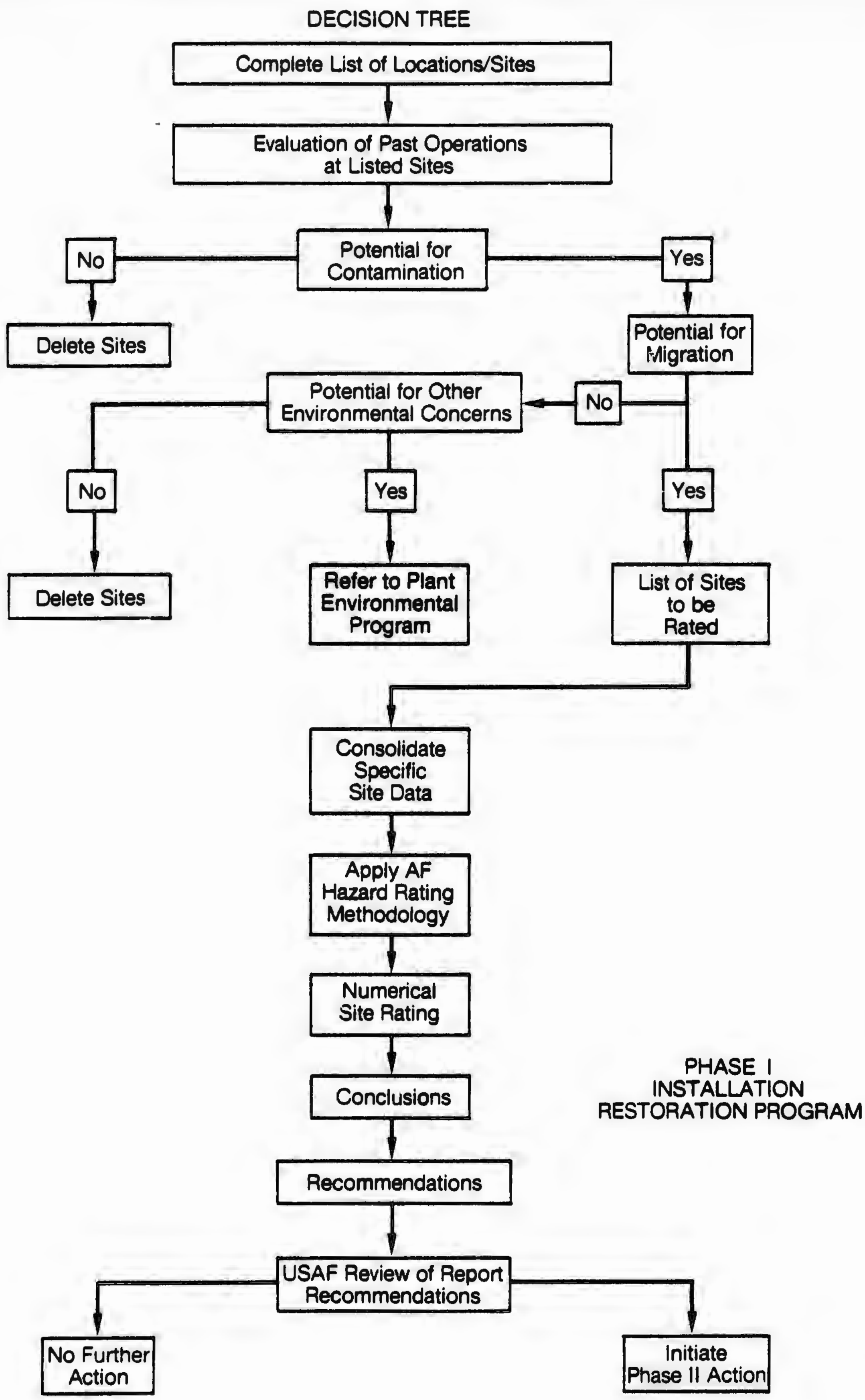

FIGURE 4.
Records Search Methodology.

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all the industrial operations on the installation. This part of the activity review included the identification of landfill and burial sites as well as other possible sources of contamination such as major PCB or solvent spills, or fuel-saturated areas resulting from significant fuel spills or leaks.

A helicopter overflight and a general ground tour of identified sites was then made by the records search team to gather site-specific information including general site conditions, evidence of environmental stress, and the location of nearby drainage ditches, surface-water bodies, and wells. Water bodies were visually inspected for any evidence of contamination or leachate migration. Past aerial photographs of the installation were reviewed to help locate past disposal sites.

A decision was then made, based on all of the above information, as to whether a potential exists for hazardous material contamination from any of the identified sites. If not, the site was deleted from further consideration.

For those sites at which a potential for contamination was identified, the potential for contaminant migration was evaluated by considering site-specific waste management, soil, and ground-water conditions. If there was no potential for contaminant migration, but other environmental concerns were identified, the site was referred to the installation environmental protection program. If no further environmental concerns were identified, the site was deleted from consideration. If the potential for contaminant migration was identified, then site specific information was evaluated and the site was rated and prioritized using the site rating methodology described in Appendix H, "Hazard Assessment Rating Methodology."

The site rating indicates the relative potential for adverse environmental impact at each site. For those sites showing a significant potential, recommendations were made to conduct a more detailed investigation of the potential contaminant migration problem under Phase II of the Installation Restoration Program. For those sites showing a low potential, no Phase II work was recommended.

II. INSTALLATION HISTORY

A. LOCATION

Air Force Plant 6 is located in Cobb County, Georgia, adjacent to the Cities of Marietta and Smyrna, as shown in Figure 3. The plant is part of the Military Complex colocated with Dobbins Air Force Base (AFB) and the Naval Air Station (NAS) Atlanta. The plant is located approximately 15 miles northwest of the City of Atlanta and 1.5 miles southeast of the center of the City of Marietta. The complex has a total land area of approximately 3,336 acres of which about 720 acres, in four separate parcels, constitute Air Force Plant 6. AF Plant 6 is a government- owned Air Force facility which is operated under contract by the Lockheed-Georgia Company. The largest parcel lies north of the main Dobbins AFB runway and is referred to as the Industrial Area. The second largest parcel is located south of the runway and is referred to as the Flightline Area. Smaller parcels of land constitute the Third-Level Treatment Plant and the Sanitary Wastewater Treatment Plant (WWTP), and the Fuel Tank Farm. The real estate map of AF Plant 6 is shown in Figure 5, and the site map is shown in Figure 6.

B. ORGANIZATION AND MISSION

AF Plant 6 was constructed by the Air Force in 1942 for the sole purpose of producing large aircraft in support of the war effort. Bell Aircraft Corporation, under contract with the Air Force, operated AF Plant 6 from 1943 to 1946 where they produced 665 B-29 aircraft. After World War II ended, AF Plant 6 was closed. From 1947 to 1948, all machinery was greased, oiled, packed, and stored in the B-1 building by Allied Packaging Company. From 1948 to 1951,

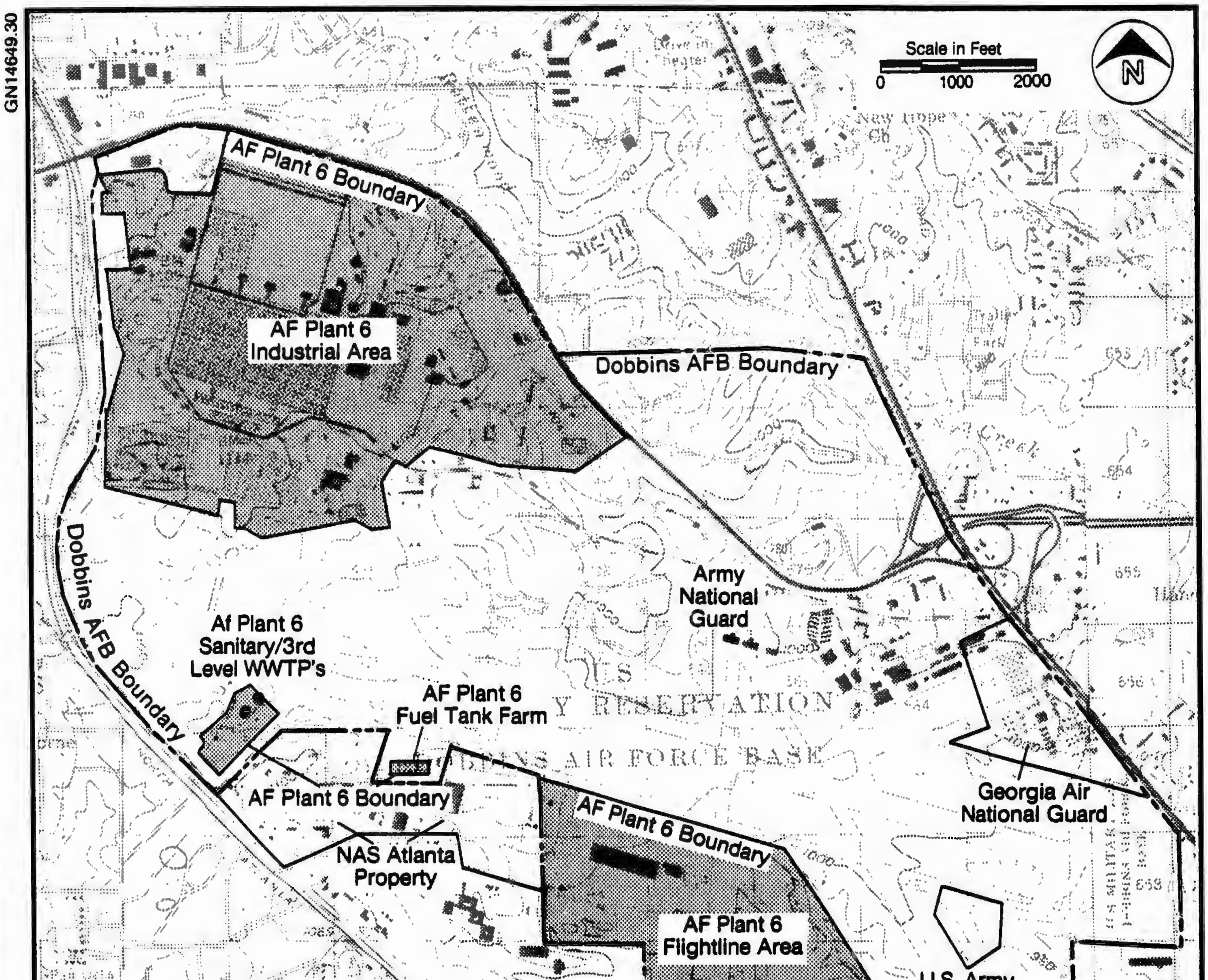

FIGURE 5.
Real Estate Map of AF Plant 6.

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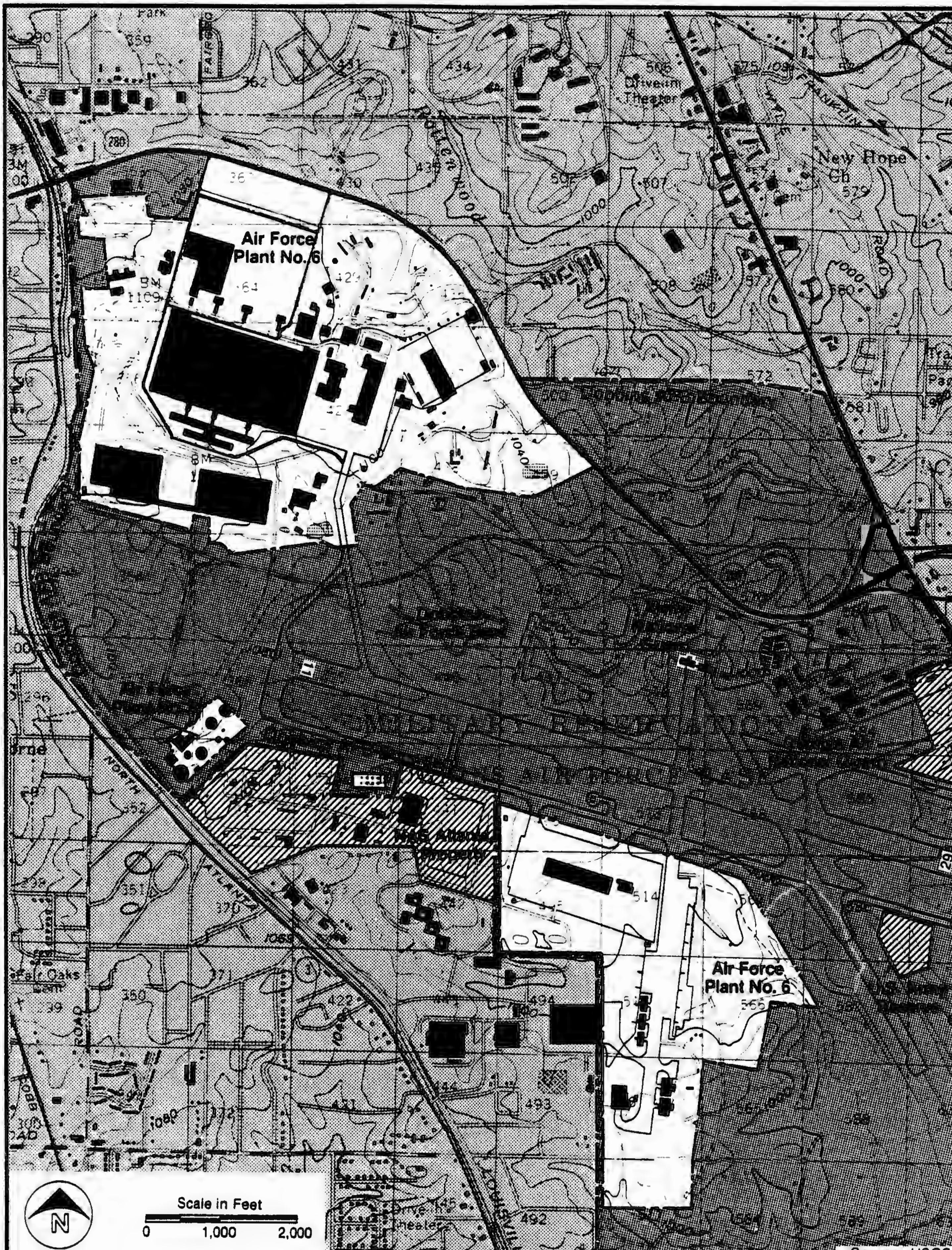

FIGURE 6.
Site Map of AF Plant 6.

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the Tumpane Company maintained the facility. During this period, machine tooling equipment was cleaned using mineral spirits.

In January 1951, Lockheed Aircraft Corporation, at the request of the U.S. Air Force, reopened AF Plant 6 to modify B-29 aircraft for the Korean conflict and to prepare for production of the Boeing B-47 aircraft. Since opening the plant in 1951, Lockheed-Georgia Company has manufactured approximately 2,625 large aircraft. Additionally, more than 6,200 aircraft have been modified to extend their service life or increase their performance. They have produced B-47, C-130, JetStar, C-141, and C-5 aircraft. They have also modified B-29, C-5A, and C-141 aircraft.

In July 1951, Lockheed was awarded a contract to develop two YC-130A prototype aircraft. In early 1956, the first production C-130 aircraft were completed and flight-tested at AF Plant 6. In August 1961, C-130E was flight-tested.

In June 1960, the first four-engine JetStar aircraft was finished and flight-tested in July. In August, the FAA certified the JetStar aircraft. By September, the first version of the corporate JetStar was delivered.

In March 1961, Lockheed-Georgia Company was awarded the contract to develop and build the C-141 Starlifter aircraft. In May 1962, production began on the C-141 Starlifter aircraft. By August 1963, the first C-141 Starlifter aircraft was completed. In December, this aircraft was flight-tested. In 1974, the Nixon Administration asked Congress to fund the Defense Department plans to "stretch" the C-141 aircraft and add inflight refueling. In December, the first prototype C-141 aircraft arrived at AF Plant 6 for the "stretch" program. The first C-141B stretched prototype was completed in January 1977 and flight-tested in March. In 1978, AF Plant 6 received a contract to stretch 271 C-141 aircraft which belonged to the Air Force. Work began immediately on lengthening the fuselages and adding aerial refueling capabilities. The changes in the aircraft added 23 feet to the length of the fuselage (one third more capacity) and unlimited range. By July, the first production stretch C-141B was completed, and in December, it was delivered to the Air Force. The C-141 aircraft "stretch" program was completed in 1982. A total of 271 C-141 aircraft were stretched to increase their capacity and range of access.

In September 1965, Lockheed-Georgia Company was selected by the Air Force to produce the C-5 aircraft. In August 1966, production began on the C-5 Galaxy aircraft. In March 1968, the first C-5 aircraft was completed. By June, this new aircraft had been flight-tested. In 1970, the first C-5 aircraft was delivered to Charleston AFB in South Carolina. By May 1973, the 81st and final C-5 aircraft was delivered to the Air Force. In 1974, AF Plant 6 was awarded the contract for the C-5 aircraft wing modification. In February, testing and evaluation began on the C-5 wing modification program. In July 1980, Lockheed-Georgia Company received the contract to retrofit the C-5A cargo fleet with new wings. The C-5A wing modification program is scheduled for completion in 1987 when all 77 C-5A aircraft owned by the Air Force will have had their wings modified. In 1983, the C-5B aircraft production contract was awarded to Lockheed-Georgia Company to produce 50 C-5B aircraft at AF Plant 6. This program is projected to last into the 1990s. Eighteen aircraft per year will be delivered to the Air Force from 1986 to the end of the program.

A historical summary of aircraft production operations at AF Plant 6 is presented in Table 2. Because of the changing production schedule and modification programs, the employment at AF Plant 6 has fluctuated from a low of 6,000 in 1951 to a high of 32,000 in 1969. Table 3 summarizes the number of people employed by AF Plant 6 since Lockheed-Georgia Company started to operate the plant in 1951. In 1973, following the termination of the C-5A program, aircraft production and the number of employees dropped sharply and has shown a gradual increase over the past 10 years. Industrial activities are currently half of what they were during the peak production of the C-5A aircraft (1973).

The Lockheed-Georgia Company is responsible for manufacturing C-130 and C-5 aircraft and modifying C-141 and C-5 aircraft at AF Plant 6 under contract with the USAF. The majority of the work conducted at AF Plant 6 by the Lockheed-Georgia Company is under government contract (approximately 75 percent in 1983). Contracts between the Lockheed-Georgia Company and AF Plant 6 are administered by the AFPRO. The AFPRO functions as the single on-site agency responsible for Government contract administration at the Lockheed-Georgia Company. Following a contract award to the company, the AFPRO provides the contract management and surveillance for DoD military branches and other Government agencies as assigned. The mission of AFPRO is to:

1. Perform Government contract administration functions.

2. Support system program directors and buying agencies in the accomplishment of their objectives.

Table 2
HISTORICAL SUMMARY OF PRODUCTION OPERATIONS AT AF PLANT 6

Contractor	Time Period	Task	Total Aircraft Production/ Modification
Bell Aircraft Corporation	1943 to 1946	B-29 Aircraft Production	665
Tumpane Company	1946 to 1951	Facility Maintenance	0
Lockheed-Georgia Company	1951 to 1952	B-29 Aircraft Modification	120
	1953 to 1957	B-47 Aircraft Production	394
	1954 to 1963	B-47 Aircraft Modification	2,896
	1956 to Pres.	C-130 Aircraft Production[a]	1,700
	1961 to 1976	JetStar Production	198
	1976 to Pres.	JetStar Modification	35
	1963 to 1968	C-141 Starlifter Aircraft Production	285
	1965 to Pres.	C-141 Starlifter Aircraft Modification	191
	1969 to 1973	C-5A Galaxy Aircraft Production	81
	1971 to Pres.	C-5 Aircraft Modification	93
	1974 to 1982	C-141 "Stretch" Program	271
	1974 to 1987[b]	C-5A Aircraft Wing Modification Program	77
	1983 to 1990s[b]	C-5B Aircraft Production	50

[a]Production of C-130 aircraft fluctuated from a high of 10 per month in the late 1960s to a low of three per month at present.

[b]Projected.

Table 3
SUMMARY OF LOCKHEED-GEORGIA COMPANY
EMPLOYMENT AT AF PLANT 6
1951 TO 1983

Year	Employment
1951	6,000
1956	20,000
1960	12,000
1969	32,000
1973	10,000
1980	13,000
1983	14,000+

3. Continuously evaluate the contract's management systems and practices to ensure their maximum effectiveness in attaining an efficient and economical operation.

4. Oversee the operations and usage of the Government-owned contractor operated facilities.

Currently, approximately 14,606 people are working at AF Plant 6, 14,460 for the Lockheed-Georgia Company and 146 for the AFPRO.

A more complete history of the AF Plant 6 is found in Appendix D.

III. ENVIRONMENTAL SETTING

A. METEOROLOGY

The climate in the vicinity of AF Plant 6 is characteristic of the northern temperate zone, with four clearly separated seasons and predominant weather system movement from west to east. Spring is usually short, with frequent periods of storminess of varying intensity. Summer is generally warm and humid, and autumn is characterized by long periods of mild, sunny weather. During the winter and early spring, cyclonic storms move with regularity across Georgia. These storms, characterized by sudden cold snaps, are generally followed by periods of milder weather which last until the next cold front passes through the area.

The annual average temperature at AF Plant 6 is 61°F with an average daily maximum and minimum of 70°F and 50°F, respectively (Table 4). Although the weather is generally mild, an extreme maximum temperature of 102°F has been reported during July and an extreme minimum temperature of -4°F has been reported for January. AF Plant 6 experiences an average of 58 days with freezing temperatures each year.

The average annual rainfall at AF Plant 6 is 49.7 inches. Precipitation is fairly evenly distributed throughout the year, although minor peaks in the rainfall curve are generally recorded in early spring and in mid-summer. Autumn is generally the driest season. An approximate average of 2 inches of snowfall is recorded each year between the months of December and March. Lake evaporation is approximately 40 inches per year and evapotranspiration over land areas may be greater or less than this value depending on vegetative cover type. Average net precipitation is expected to be equal to the difference

Table 4
METEOROLOGICAL DATA SUMMARY FOR AF PLANT 6, GEORGIA

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
Temperature (°F)													
Average Maximum	50	54	62	72	79	85	88	87	81	72	61	53	70
Averge Minimum	33	34	41	50	58	66	69	66	63	51	41	35	51
Mean	42	44	51	61	69	76	79	78	72	61	51	44	61
Precipitation (inches)													
Mean	5.1	4.7	6.3	4.5	4.5	3.7	5.2	3.9	3.5	2.8	3.8	5.0	53.0
Maximum Monthly	12.4	11.2	13.3	12.6	8.9	10.4	11.9	1.2	8.7	8.4	75.3	12.3	15.3
Minimum Monthly	0.0	0.0	0.0	1.3	0.2	0.8	0.1	0.5	0.0	0.0	0.0	0.0	0.0
Maximum in 24 hours	4.7	4.1	4.2	3.9	4.3	3.2	4.0	3.0	3.5	4.5	4.7	3.0	4.9
Snowfall (inches)													
Mean	§1	1	1	0	0	0	0	0	0	0	§1	1	3
Maximum Monthly	3	5	13	0	0	0	0	0	0	0	1	5	13
Maximum in 24 hours	2	4	4	0	0	0	0	0	0	0	1	4	4
Relative Humidity (%)													
Mean	69	63	61	69	70	79	71	74	74	70	78	69	69
Surface Winds (knots)													
Mean	6	6	6	5	5	4	4	4	4	5	5	6	5
Maximum Peak	52	64	52	52	63	78	69	69	48	46	47	49	78
Prevailing Direction	WNW	WNW	WNW	W	W	W	W	E	E	E	E	WNW	WNW

Period: 1948-1980.
Source: National Oceanographic and Atmospheric Administration, 1982.

between average total precipitation and average lake evaporation or approximately 13 inches per year. An average of 47 thunderstorms per year have been recorded at AF Plant 6. Extreme storm events such as tornadoes, hail, storms, and ice storms occasionally occur in the vicinity of the plant. The maximum precipitation recorded in a 24-hour period was 4.9 inches.

Mean cloud cover averages 50 percent throughout the year at AF Plant 6, and some fog is present on an average of 167 days per year. The prevailing wind direction during most of the year is from the west and northwest, with an annual average speed of 6 knots. Peak winds above 45 knots have been recorded in every month of the year, and a maximum peak wind of 78 knots has been recorded during the month of June.

B. PHYSICAL GEOGRAPHY

AF Plant 6 is located in the Central Uplands district of the Piedmont physiographic province. This district is characterized by a series of low, linear ridges separated by broad, open valleys. Streams flowing through this section are generally transverse to the underlying geologic structure and occupy valleys 150 to 200 feet below the ridge crests. Figure 7 illustrates the major physiographic features in the vicinity of AF Plant 6.

The installation is situated on a gently rolling plateau which slopes gradually downward to the southeast. The plateau is dissected by several small stream channels including Rottenwood and Poorhouse Creeks. Elevations range from approximately 1,075 feet above mean sea level (msl) at the northwest corner of the installation to approximately 950 feet above msl at the southwest corner.

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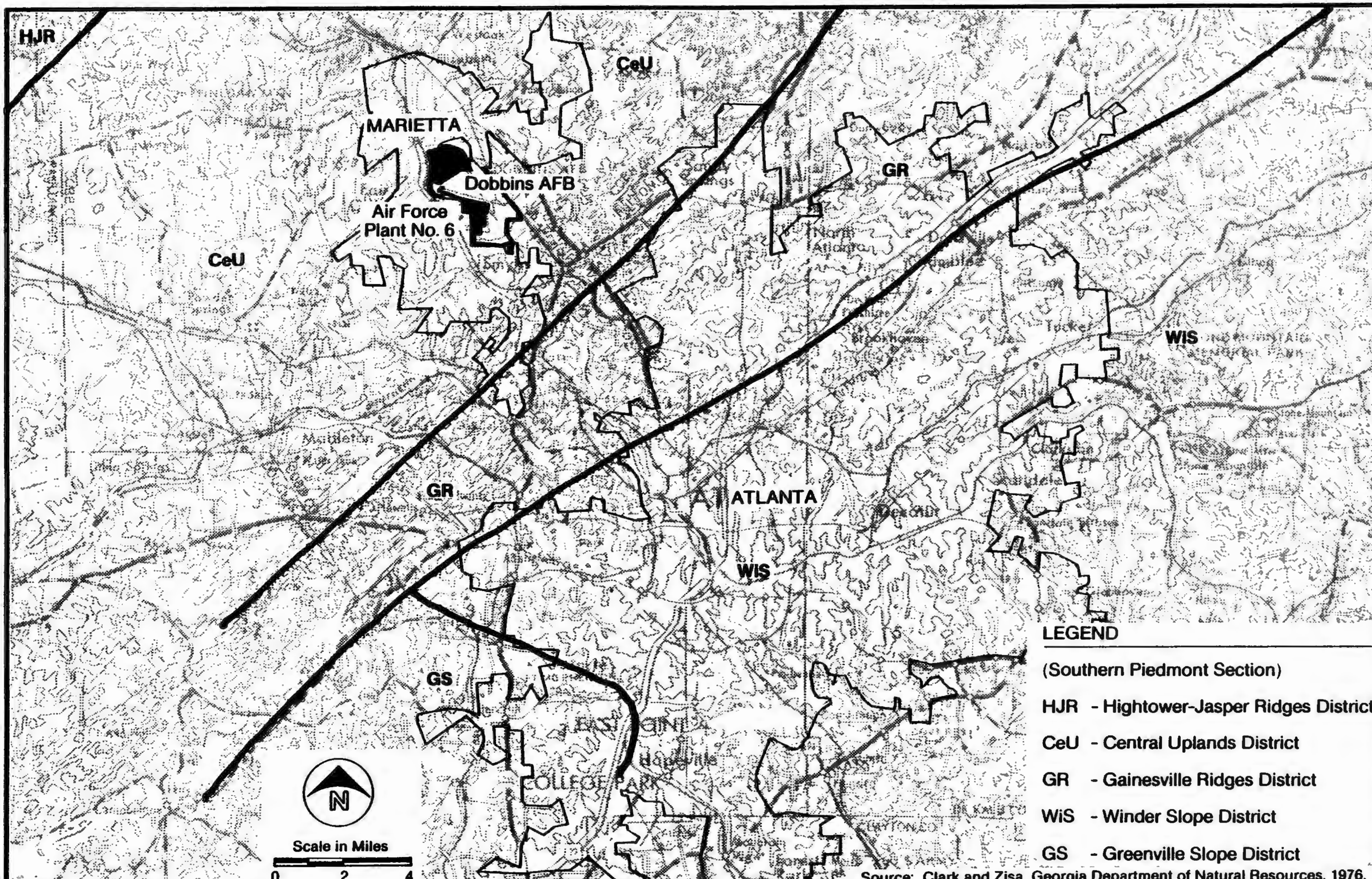

FIGURE 7.
Physiographic Map of AF Plant 6 Area.

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Surficial deposits at AF Plant 6 consist of residual soils derived from the in-place weathering of the underlying igneous and metamorphic rocks. These soils are primarily micaceous, clayey silts and micaceous, sandy silts. Soils are generally firm in the upper 15 to 20 feet, becoming stiffer at greater depth. There is a gradual transition between the soil horizon and the underlying rock. The weathered erosional surface of the rock is irregular and therefore depth to competent rock is variable across the installation. The permeability of the soil horizon is variable depending on the degree of compaction and relative percentages of sand and clay. Permeabilities probably range from low (1×10^{-3} to 1×10^{-5} cm/sec) to very low (1×10^{-5} to 1×10^{-7} cm/sec).

The rock strata occurring below the weathered soil horizon consist of metamorphic rock (primarily biotite gneiss and schist) and possibly some igneous rock (primarily granite). Metamorphic rock within southeastern Cobb County occurs in wide belts trending in a northeast direction. These belts are the result of repeated structural deformations which have produced extremely complex structures including closed folds, overthrust faults, and igneous intrusions. Figure 8 is a geologic map of the AF Plant 6 vicinity illustrating the complexity of the geology.

Primary permeability of the metamorphic rock is extremely low; however, deformations have produced structural planes along which ground-water movement occurs. Fault planes, shear zones, planes of schistosity resulting from folding, intrusive contacts around the margins of large intrusive bodies, and joints are the prominent structural features.

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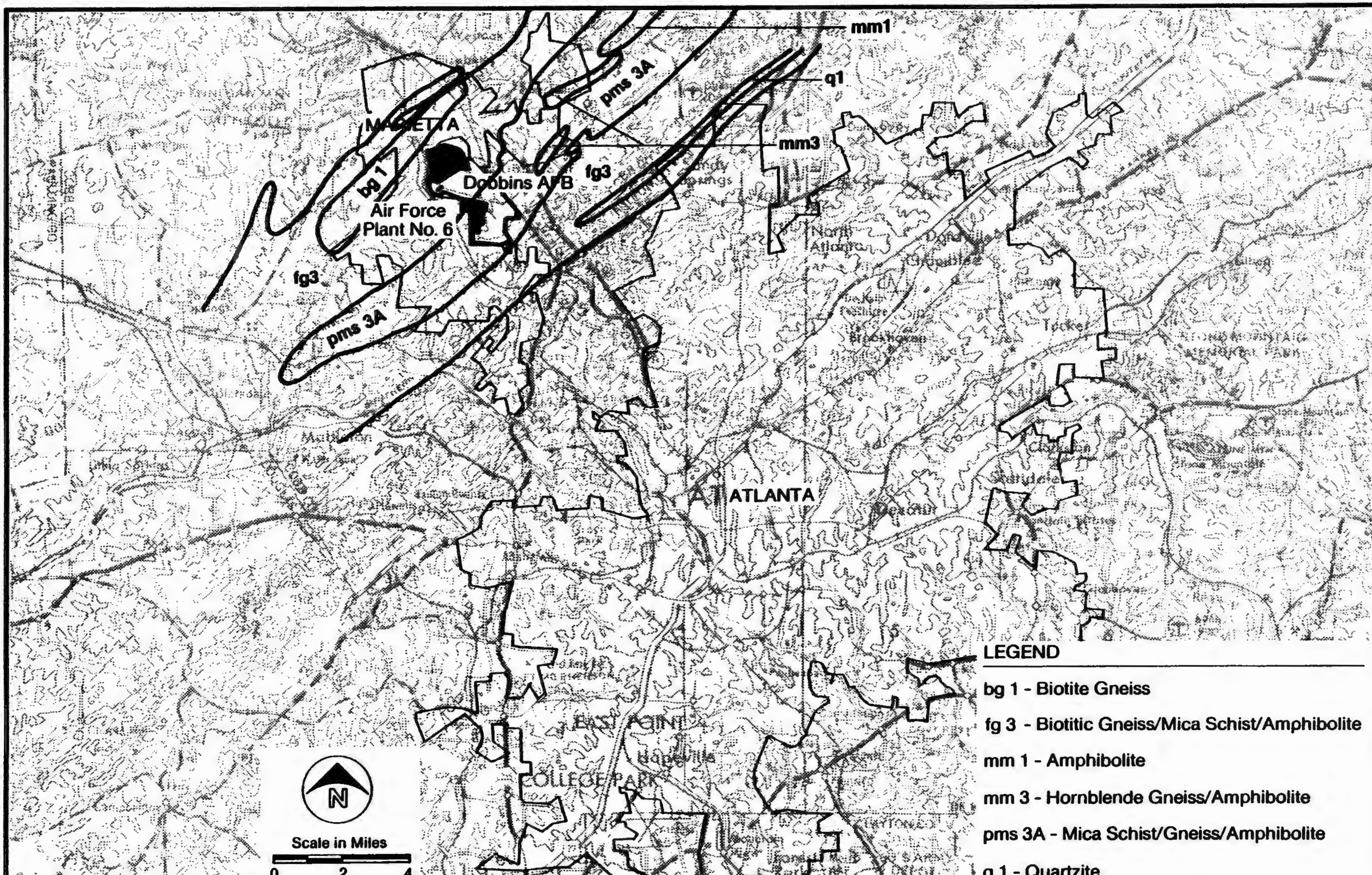

Source: Georgia Department of Natural Resources, 1976.

FIGURE 8.
Geologic Map of AF Plant 6 Area.

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Igneous rock occurs as granitic intrusions into the older metamorphic rock. Horizontal joints or parting planes occur occasionally within granite intrusive bodies producing horizontally concentric sheets--similar to the layers of an onion--that are convex-upward beneath hills and uplands and concave-upward beneath valleys and lowlands. This type of joint pattern is conducive to the accumulation and storage of ground water in the valleys and to drainage of water beneath hills.

In March 1981, site specific investigations were conducted at Site No. 1, the Surface Impoundment (see Section IV.B, Disposal and Spill Sites Identification and Evaluation, page IV-50). These studies included soil borings and the installation of monitoring wells (see Figure 9 for locations). Fill material consisting of approximately 7 feet of silty sand and 16 feet of soil and wood chips was encountered in borings B-1 through B-4 of this site.

Residual soils were encountered beneath the fill material. Partially weathered rock was encountered beneath the residual soils. This rock was encountered at all borings ranging in depth from 28 to 43 feet. Permeability of the fill material was tested at 6×10^{-7} cm/sec while residual soil permeability ranged from 4×10^{-6} to 1×10^{-4} cm/sec.

C. HYDROLOGY

AF Plant 6 is located within the drainage basin of the Chattahoochee River. The Chattahoochee is the longest river in Georgia, extending approximately 436 miles from its source in northeastern Georgia to the Florida line. Tributaries of the Chattahoochee include Rottenwood and Poorhouse Creeks, both of which drain AF Plant 6. Flow in

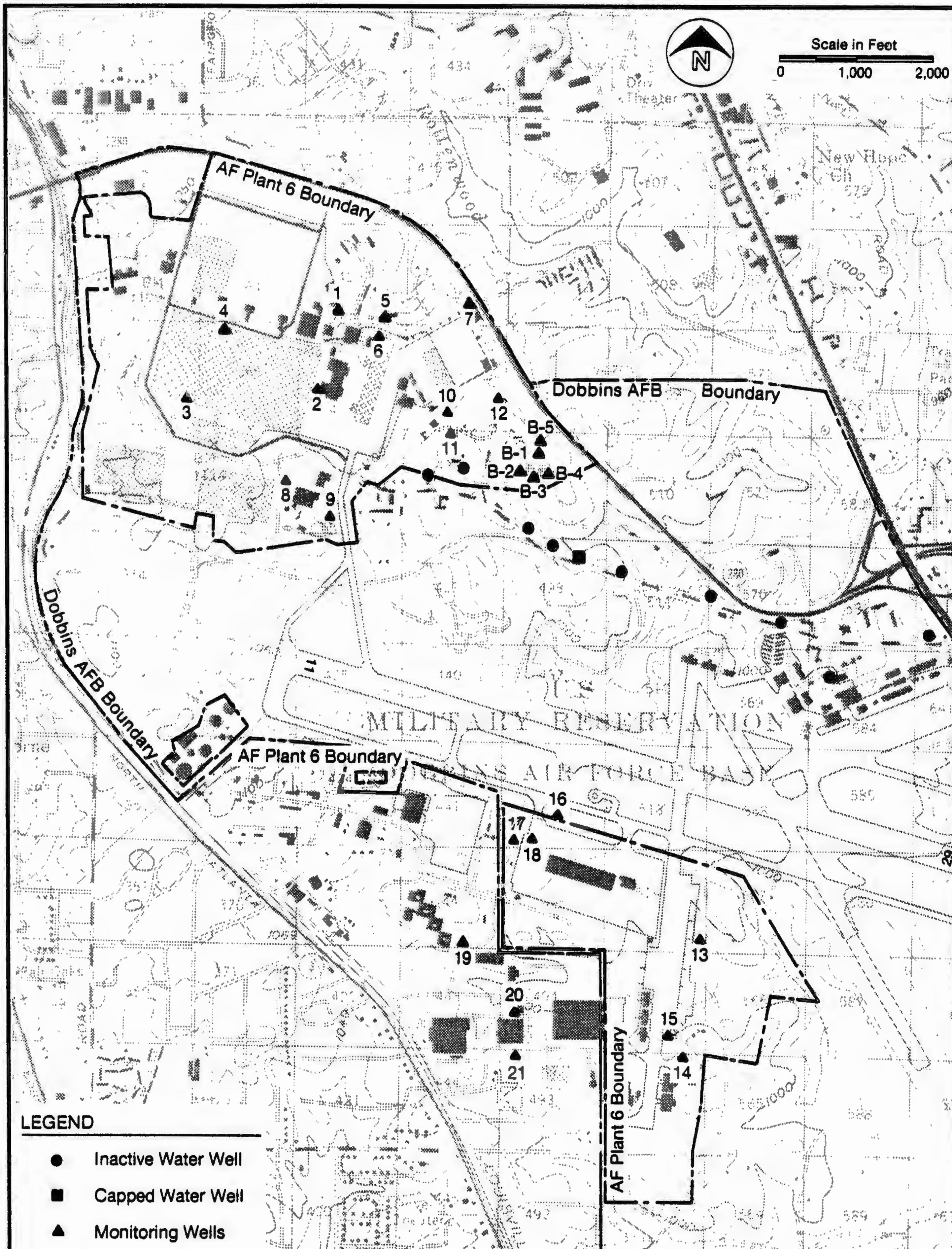

FIGURE 9.
Location Map of Wells on AF Plant 6 and Surrounding Area.

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these creeks is in a south or southeast direction discharging to the Chattahoochee just north of where Interstate 75 crosses the river. The Chattahoochee River is used as a source of water supply for the area and is generally of good quality.

Surface-water drainage on the installation is generally toward the southeast, being directed towards Rottenwood and Poorhouse Creeks by the storm drainage system. Figure 10 illustrates onsite topography and relief as well as direction of surface-water flow. Two surface retention areas located on Dobbins AFB property referred to as Big Lake and Little Lake are also illustrated in Figure 10. Big Lake is a dammed reservoir, which was once used (prior to 1941) as a water supply source for the City of Marietta. Little Lake is also man-made, formed by a small dike across a tributary of Rottenwood Creek. Both lakes receive surface drainage from AF Plant 6. Water quality measured in Big Lake and in tributary streams leaving AF Plant 6 is characterized by neutral to slightly acidic pH and low hardness and alkalinity.

The Lockheed-Georgia Company routinely samples surface streams at five locations, two of which (Stormwater Retention Basins No. 1 and No. 2), are on AF Plant 6 property and three of which (No. 3, No. 4, and No. 5) are on Dobbins AFB property (see Figure 10). Stormwater Retention Basin No. 2 is described further in Section IV. B as Site No. 5. Figure 10 shows the locations of the five sampling points. Stream samples are analyzed daily for pH and TOC and three times per week for total chromium. A summary of average values for samples collected from October 1982 tc September 1983 at Stormwater Retention Basins No. 1 and No. 2 are presented in Table 5. These analyses have revealed no significant contamination of surface waters during the period of record (1977 to 1983).

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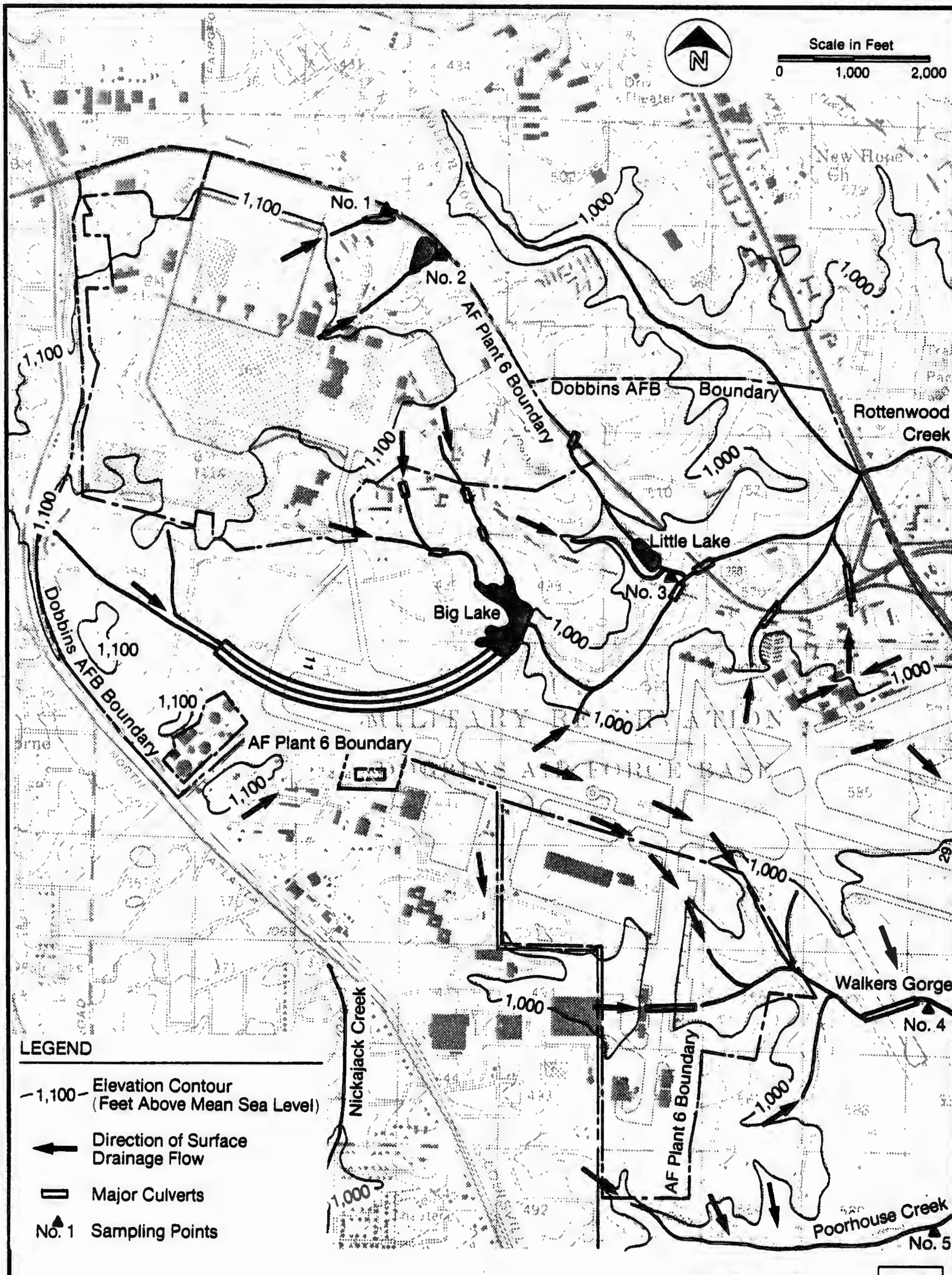


FIGURE 10.
Surface Drainage Map of AF Plant 6 and Surrounding Area.

Table 5
SUMMARY OF SAMPLING RESULTS FOR STORMWATER RETENTION BASINS NO. 1 AND NO. 2

		Stormwater Retention Basin No. 1			Stormwater Retention Basin No. 2		
Year	Month	pH	TOC (mg/l)	Total Chromium (mg/l)	pH	TOC (mg/l)	Total Chromium (mg/l)
1982	October	6.83	2.67	0.014	6.82	2.97	0.004
	November	6.90	3.04	0.014	6.93	3.17	0.002
	December	6.87	2.51	ND[a]	6.93	5.77	0.0036
1983	January	6.81	2.84	0.004	6.89	3.13	0.004
	February	6.76	2.55	0.002	6.91	3.03	0.028
	March	6.70	2.76	0.003	6.80	2.92	0.008
	April	6.65	3.01	0.003	6.95	2.79	0.002
	May	6.53	3.17	0.002	7.02	3.05	0.002
	June	6.60	2.86	0.002	7.20	2.6	ND[a]
	July	6.66	2.73	0.001	7.12	2.56	0.002
	August	6.72	2.84	0.016	7.10	2.54	ND[a]
	September	6.71	3.03	0.008	7.13	2.97	0.005

[a]ND = None detected.

Source: Monthly Operating Monitoring Report.

Ground water occurs under unconfined or water table conditions within the residual soils and underlying rock. In some areas, the residual soils at a particular depth below the surface contain a high percentage of clay, which tends to prevent or impede the downward infiltration of ground water. In these areas, a perched water table of limited extent may exist above the clayey soils.

The depth to the water table is highly variable (see Table 6), being dependent on surface topography, soil permeability, rainfall/evapotranspiration, and underlying structure. The water table generally follows the contour of the surface topography, being somewhat higher beneath hills than beneath valleys. However, the occurrence of horizontal joints or parting planes within the crystalline rock tends to result in the drainage of ground water from beneath hills and the accumulation of ground water beneath valleys.

In February 1983, soil borings were drilled and monitoring wells were installed at 21 locations on or adjacent to AF Plant 6 property (see Figure 9 for locations). These monitoring wells were installed in the vicinity of belowground (BG) tanks to be used to verify or rule out the presence of ground-water contamination due to leaking tanks. In Monitoring Well No. 18, a strong chemical odor was noted during construction. Monitoring Wells No. B-1 through B-5 were installed at the Surface Impoundment in 1980 for routine RCRA monitoring. A summary of monitoring well locations is presented in Table 6. Results of these studies indicate that ground-water surface generally conforms to local topography. Ground-water flow then is towards the creeks and ponds at the site and generally flows south-eastward, parallel to Rottenwood and Nickajack Creeks towards the Chattahoochee River. Figure 11 illustrates the installation of a typical monitoring well.

Table 6
SUMMARY OF MONITORING WELL LOCATIONS

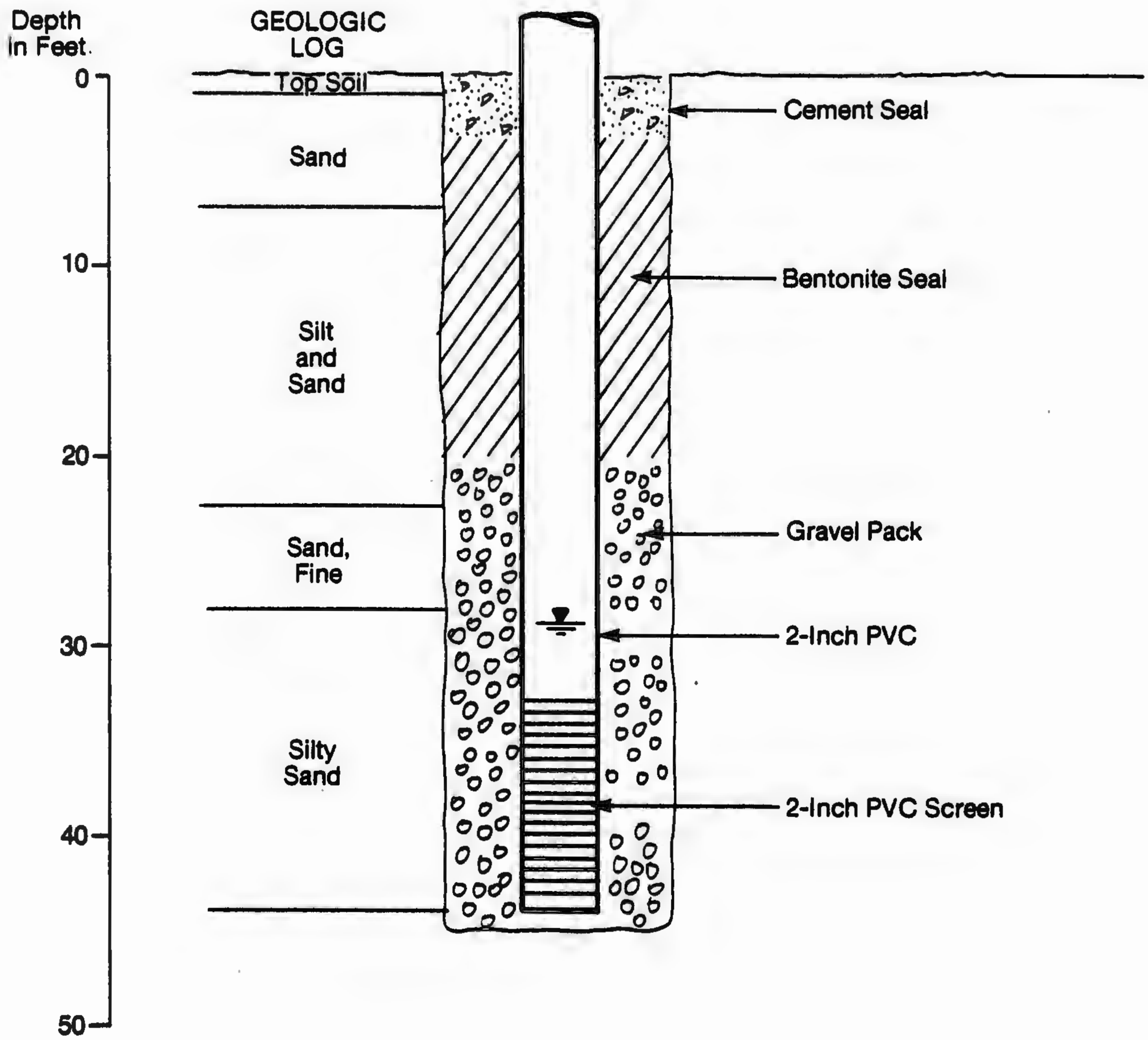
Well No.	Location	Depth to Ground Water (ft-bls)[a]
1	Building B-30	41.5
2	West of Building B-77	23.0
3	Southwest of Building B-1	18.0
4	Northwest of Building B-1	22.5
5	West of Building B-43	Not Encountered
6	East of Building B-99	51.0
7	North of Building B-58	26.0
8	Northeast of Building B-27	31.0
9	Southeast of Building B-91	15.5
10	B-64 Parking Lot	24.0
11	Southwest of Building B-64	12.0
12	East of Building B-90	21.0
13	West of C-5 Fuel Storage	13.0
14	C-5 Washrack	24.0
15	Southwest of Building B-104	19.0
16	West of Fuel Weighing Station	6.5
17	Position 19	31.0
18	Position 19	12.5
19	Northeast of L-2	11.0
20	North of L-11	9.0
21	South of L-11	5.0
B-1	North of Surface Impoundment	28.6
B-2	South of Surface Impoundment	18.1
B-3	South of Surface Impoundment	22.9
B-4	South of Surface Impoundment	23.7
B-5	North of Surface Impoundment	27.0

[a]bls = Below land surface.

Source: Federer-Sailors and Associates, Inc.
Ground-Water Monitoring Wells
AF Plant 6
Marrietta, Georgia

and

Law Engineering Testing Company
Report of Subsurface Exploration and Preliminary Ground-Water Monitoring Program
AF Plant 6
Lockheed-Georgia Company
Marrietta, Georgia



Source: Law Engineering & Testing Co.
Note: Geologic Log is not Typical for AF Plant 6.

FIGURE 11.
Sample of Monitoring Well Construction (Existing).

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Results of analysis from wells completed during these studies indicate some degradation of shallow ground water (Table 7). Further discussion of ground-water quality in this area will be included in Section IV.B.

Recharge to the water table aquifer is direct through the surface deposits either by infiltration of rainfall or by seepage from creek bottoms and surface impoundments. Infiltration rates are low, and therefore runoff rates high, due to the low to very low permeability of the residual soils.

At AF Plant 6, the probable direction of ground-water flow would be toward the creeks, such as Poorhouse and Rottenwood Creeks, with a regional trend southeast toward the Chattahoochee River. In some areas, ground water occurs under a perched condition; that is, water which infiltrates at the surface is prevented from reaching the water table by discontinuous layers of clay and silt which have a very low permeability. In those areas, ground water moves downward vertically to a stratum of low permeability and then horizontally either to discharge into the creeks and streams or to recharge the lower aquifer. Figure 12 shows a subsurface cross section of AF Plant 6 and Dobbins AFB, illustrating this generalized hydrologic cycle.

Ground water is seldom used for public water supply within the Piedmont province, primarily because of the limited yield. However, numerous private wells are located in the region. Well yields are usually low, ranging from one to 25 gallons per minute (gpm). Well yields are also unpredictable, since the yield is dependent on the occurrence of underlying permeable structural features such as joints, faults, and shear zones, which are highly irregular in occurrence. Most water supply in the vicinity of AF Plant 6

Table 7
SHALLOW GROUND-WATER ANALYSIS

Well	Sulfate Ion SO_4 (mg/l)	Total Manganese (mg/l)	Average of Four Replicate Tests[a] pH	Specific Conductance (µmhos/cm @ 25°C)	TOC (mg/l)	TOX (mg/l as Cl)
B-2	600	9	6.3	1,818	41	1.4
B-3	570	12	5.3	1,380	25	1.7
B-4	120	6.8	5.4	815	10	0.5
B-5	3	0.93	7.0	38	6	0.5

[a] Parameters used a indicators of ground-water contamination (40 CFR 265.92 "Sampling and Analysis, Federal Register, May 19, 1980, p. 33240).

Note: Samples collected in March 1981. Further inspection of the GC scan indicated the following: Well B-5 Sample--trace of DDT and 0.18 ppb 2, 4, 5 - T (2 columns); Well B-2 Sample--0.93 ppb methyl parathion (2 columns), numerous organophosphates.

Well B-1 was abandoned and replaced by B-4 due to interference with landfill.

Source: Law Engineering Testing Company

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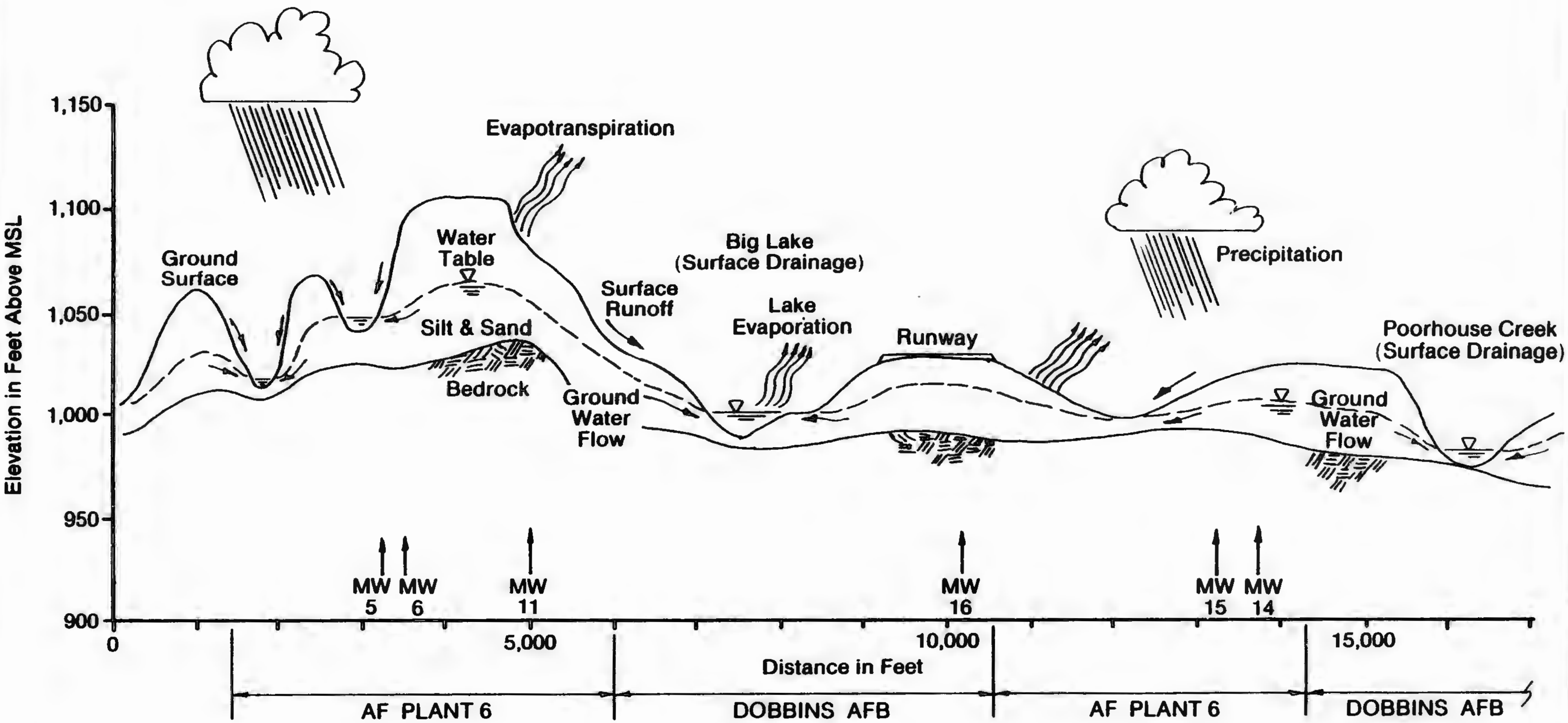

Source: Federer-Sailors and Associates, 1983; USGS.

FIGURE 12.
Generalized North-South Subsurface Cross Section Illustrating Hydrologic Cycle at AF Plant 6 and Dobbins AFB, Georgia.

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is developed from surface-water sources. AF Plant 6 receives its water from the Marietta Water Authority. Eight wells on Dobbins AFB property and two on AF Plant 6 property, which were formerly maintained by Lockheed, have been out of service since the early 1950s (see Figure 9 for well locations). These wells are all less than 300 feet deep and were of varying yield. Total capacity of all 10 wells was only 300 gpm. These wells were constructed as standby potable water sources in the event that adequate amounts of water were not available from the Marietta Water Authority. They were reportedly never used. The present condition and future use of each well is not known.

General ground-water quality is fairly good in the vicinity of AF Plant 6. Table 8 presents expected ranges of various ground-water constituents.

D. ECOLOGY

1. Flora and Fauna

Several areas of semi-natural vegetation are present on AF Plant 6 property. Major vegetation habitats include successional pine forest, mixed pine-hardwood forest, and oak-hickory climax forest. Aquatic habitats include drainage ditches, small streams, and man-made ponds.

Forest ecosystems on AF Plant 6 are comprised of all gradations from pure stands of loblolly pine to pure oak-hickory hardwood stands, depending on the time since disturbance, moisture content of the soil, and amount and orientation of slope. In most forested areas, successional hardwoods such as sweetgum, are invading the pine forest. In a few small areas, mesic hardwood stands of white oak, shagbark hickory, and tulip poplar present the appearance of a mature forest ecosystem. Some wildlife is probably

Table 8
EXPECTED RANGES OF CONCENTRATIONS OF
SELECTED GROUND-WATER CONSTITUENTS

Parameter	Range of Concentration
Silica	21 - 40 mg/l
Alkalinity, as $CaCO_3$	25 - 100 mg/l
Sulfate	0 - 10 mg/l
Dissolved Solids	101 - 250 mg/l
Hardness, as $CaCO_3$	0 - 100 mg/l
Specific Conductance	101 - 300 μmhos/cm
pH	6.5 - 7.5

Source: Sonderegger and Cressler. Information Circular 48, Georgia Department of Natural Resources.

present in these areas, including: squirrels, rabbits, skunks, raccoons, and oppossums. Many resident and migratory birds are also present in these semi-natural areas.

Principal surface waters on AF Plant 6 property include drainage ditches and small surface impoundments. Several of these impoundments were created specifically to serve as traps for accidental discharge of pollutants and do not provide suitable habitat for fish or other wildlife.

2. Threatened and Endangered Species

No evidence was found to indicate the presence of any threatened or endangered (T&E) plant or animal species on AF Plant 6; however, no exhaustive surveys have been made. Several T&E species are known to occur within a 50-mile radius of the installation (Table 9). The habitats found at AF Plant 6 (discussed in Section III-D-1) may be suitable for some of these T&E species.

E. SUMMARY OF ENVIRONMENTAL SETTING

AF Plant 6 is located in Cobb County, Georgia, approximately 15 miles northwest of Atlanta. The climate at AF Plant 6 is characteristic of the northern temperate zone, with short, frequently stormy springs; warm humid summers; and mild autumns and winters segmented by frontal storm systems. Annual average temperature is 61°F and average annual rainfall is about 50 inches.

AF Plant 6 is located in the Piedmont physiographic province, which is locally characterized by low, linear ridges separated by broad, open valleys. Average elevation above sea level is approximately 1,000 feet. Several small

Table 9
THREATENED AND ENDANGERED SPECIES OCCURRING WITHIN 50 MILES OF AF PLANT 6, GEORGIA

Common Name	Scientific Name	Status[a] State	Status[a] Federal	Habitat
Fauna				
Eastern Cougar	*Felis concolor cougar*	E	E	Large wooded tracts
Gray Bat	*Myotis grisescens*	E	E	Caves
Indiana Bat	*Myotis sodalis*	E	E	Caves
Red-Cockaded Woodpecker	*Picoides borealis*	E	E	Mature pine stands
Peregrine Falcon	*Falco peregrinus*	E	E	Occasional migrant
Southern Bald Eagle	*Haliaeetus leucocephalus*	E	E	Occasional migrant
Amphianthus	*Amphianthus pusillus*	E		Pools in granite outcrops
Flora				
Rock Cress	*Arabis georgiana*	T		Shaded riverbanks
Pink Lady's Slipper	*Cypripedium acaule*	T		Pinelands
Golden Slipper	*Cypripedium calceolus*	T		Rich, moist hardwood coves
Draba	*Draba aprica*	E		On or near granite outcrops
Quillwort	*Isoetes melanospora*	T		Pools in granite outcrops
Twin Leaf	*Jeffersonia diphylla*	E		Rich, moist woods
Nestronia	*Nestronia umbellula*	T		Mixed pine-deciduous woods
Bay Star-vine	*Schisandra glabra*	T		On small trees and shrubs in rich alluvial woods
Stonecrop	*Sedum pusillum*	T		Granite outcrops under cedar trees
False Helebore	*Veratrum woodii*	E		Moist, rich, wooded slopes
Barren Strawberry	*Waldsteinia lobata*	T		Moist woods along streams

[a]E = Endangered; T = Threatened.

Source: Odom et al., 1977; McCollum and Ettman, 1977.

stream channels drain AF Plant 6 property, with surface water eventually reaching the Chattahoochee River above the City of Atlanta.

Soils at AF Plant 6 generally consist of clayey and sandy silts derived from the in-place weathering of underlying igneous and metamorphic rocks. The permeability of these soils is generally low to very low. Primary permeability of the underlying igneous and metamorphic rocks is extremely low; however, deformations have produced structural planes along which ground-water movement occurs.

Ground water occurs under unconfined conditions within the residual soils and underlying rock at AF Plant 6. The depth to the water table is highly variable, but the surface of the ground water generally follows the contour of the surface topography, with ground-water flow expected to be towards the creeks and ponds and towards the southeast to the Chattahoochee River. Recharge to the water table aquifer is direct by rainfall through surface deposits; however, infiltration rates are low and surface runoff is high due to the low permeability of the soils. Ground water is seldom used for public water supply in the Piedmont province; however, private wells are common.

AF Plant 6 is largely industrialized, although a few semi-natural areas are still present. Major native vegetation habitats include pine forest, mixed pine-hardwood forest, and oak-hickory forest. Several small man-made impoundments in the vicinity of AF Plant 6 property provide small areas conducive to aquatic wildlife. There is no record of any threatened or endangered wildlife or plant species occurring on AF Plant 6 property; however, no exhaustive surveys have been made and several protected species are known to occassionally occur within a 50-mile radius of the plant.

IV. FINDINGS

A. ACTIVITY REVIEW

1. Summary of Industrial Waste Disposal Practices

The majority of industrial operations at AF Plant 6 have been in existence since 1951. The primary function of these operations has been the production, maintenance, and modification of large aircraft. The major industrial operations include: tooling, cutting, shaping, forming, cleaning, treating, and painting aircraft parts; subassembly, major assembly, and final assembly of aircraft; painting finished parts and assemblies; electrical, mechanical, building, utility, and flightline maintenance; and support services. These operations generate varying quantities of industrial wastewater, paint and electroplating sludges, heat treatment salt wastes, waste oils, recovered fuels, and spent solvents and cleaners.

The total quantity of waste oils, recovered fuels, and spent solvents and cleaners is approximately 135,000 gallons per year (gpy). This includes approximately 75,000 gpy of waste oils and recovered fuels and 60,000 gpy of spent solvents and cleaners. Spent salt baths (20 tpy), plating sludges (3,500 tpy), and sealants (1 tpy) are also generated. This range of total waste quantities is based on current estimates. Waste quantities are dependent on contractor workload and may vary greatly from one time period to the next. Total waste quantities generated were greatest during the late 1960s when the workload and employment at AF Plant 6 were at their peak. Present waste quantities generated are approximately one-half of the amount generated during the peak production of the C-5 aircraft. Past (based on information obtained from files

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and the best recollection of interviewees) and present industrial waste disposal practices are presented in this section.

a. <u>Industrial Wastewater Collection, Treatment, and Disposal</u>

The initial industrial waste water treatment facility for Air Force Plant 6 was constructed in 1942 and consisted of four basins which were used for batch treatment of concentrated cyanide and chromate waste streams. In 1942, treatment facilities for the cyanide waste stream consisted of a small 12-foot x 12-foot earthen basin with a concrete curb located at the present B-10 area. This basin had no discharge point and acted as a percolation pond. It was used for pH adjustment and cyanide reduction only. The three remaining basins were used for treatment of the chromate waste stream. In 1956, a fifth earthen basin was constructed for a settling basin. Basin effluent discharged to Rottenwood Creek which flows into the Chattahoochee River, upstream of the City of Atlanta's water intake. Diluted plating and oily wastewaters were discharged to the Sanitary Wastewater Treatment Plant (WWTP). In 1972, this operation was modified by excavating the area to form one basin which is now referred to as the B-10 aeration basin.

In 1956, approximately 14,000 gallons of spent sodium dichromate solution were spilled and ultimately discharged to Rottenwood Creek. This prompted construction of a holding basin and installation of chemical feed equipment. Pumps were installed to pump treated industrial waste to the Sanitary WWTP. The Sanitary WWTP discharges to Nickajack Creek which flows into the Chattahoochee River downstream of Atlanta's water intake.

In 1964, the treatment system was rehabilitated. After the expansion, the B-10 treatment facilities consisted of a receiving tank, three concrete treatment tanks, three concrete settling tanks, and a settling pond. A survey conducted in 1966 showed that these facilities were operated when the influent pH was low or when the operator was notified in advance that a chromium tank was discharged.

With the continuing development and advent of new processes for the chemical milling, treatment, and painting of aluminum materials coupled with normal industrial wastes identified with an aircraft manufacturing plant, the Lockheed-Georgia Company and the U.S. Air Force instigated a series of studies on the treatment and disposal of industrial wastes during the period from February 1966 to December 1969. With the issuance of the President's Executive Order No. 11507 in 1970, the Federal Environmental Protection Agency in conjunction with the Georgia Water Quality Control Board established the effluent criteria for both the industrial and sanitary sewage waste streams. The Lockheed-Georgia Company and the U.S. Air Force, further indicating their concern and interest in the disposition of wastewaters, initiated a design and construction program to provide the required treatment facilities at Air Force Plant 6.

The Surface Impoundment was constructed in 1971 for disposal of the sludge produced from the industrial waste treatment plant (IWTP) and other wastes which cannot be treated at the IWTP. The Surface Impoundment was constructed over an old landfill which was used for disposal of sludge from the sanitary WWTP and for other solid wastes. The impoundment has an approximate surface area of 1.42 acres and a depth of 17.5 feet top of berm. The Surface Impoundment is lined with 4 feet of compact soil containing clay (sides and bottom). A small, self priming pump and 2-inch polypropylene pipeline was installed at the Surface Impoundment to return supernatant to the IWTP. (Rated capacity for this pump is approximately 30 gpm.)

When the impoundment was first opened, wastes from the B-10 area (primarily precipitated heavy metals) were disposed of in this area. Since then, this area has been used primarily for the disposal of electroplating sludges. For several years, paint sludge from water-wash booths was disposed of in the Surface Impoundment. Since 1980, this waste is hauled to an approved hazardous waste disposal facility in Alabama. Waste heat-treat salt, composed primarily of sodium nitrate, potassium nitrate, and sodium dichromate, which is used in molten phase to heat-treat aluminum is also disposed of in the Surface Impoundment.

In the past, other wastes including waste materials generated from the rehabilitation of the chemical milling process in Building B-91, etch vent duct waste, and sludge from chemical milling solutions have been disposed of in the Surface Impoundment. The Surface Impoundment is discussed in more detail in Section IV.B.

In the spring of 1972, the present day industrial waste treatment plant including segregated collection systems and the industrial waste, general (IWG), industrial waste, oily (IWO), and industrial waste, concentrated (IWC) treatment plants were placed in operation. At that time, this plant was one of the most modern industrial waste treatment plants in the country.

In May 1976, the Third Level WWTP and the modernized existing Sanitary WWTP were placed into operation. A description of the current wastewater treatment system is presented in Section 7 of this chapter.

b. <u>Waste Oil, Spent Solvents and Cleaners, and Recovered Fuels</u>

Since 1951, AF Plant 6 has contracted haulers, recyclers, and disposers for offsite disposal of drummed wastes, including waste oils, spent solvents and cleaners, paint wastes, recovered fuels, sludges, and other materials. Efforts were made to recycle and recover as much of the waste solvents, oils, and fuels as possible.

From 1951 to 1980, drums containing commingled waste oils, spent solvents and cleaners, recovered fuels, and paint wastes were taken to the Lockheed-Georgia Company's Conservation Department for offsite disposal and/or recycling under contract with local companies. Trichloroethylene (TCE) was distilled in the basement of the B-7 building from 1951 to 1964. A small portion of waste oils were burned in the waste oil incinerator, and some of the recovered fuels were burned in fire department training activities at Dobbins AFB.

AF Plant 6 currently uses commercially reconditioned drums for waste storage. AF Plant 6 trades emptied raw material drums for drums reconditioned by J&B Smith Company of Atlanta, Georgia. Once onsite, the Lockheed-Georgia Company's Conservation Department affixes labels and delivers empty drums to accumulation areas. When wastes are initially placed in the drum, the label is filled out to indicate wastes being accumulated. When drums are full, the generator closes bungs/lids, completes the label, and attaches an internal shipping ticket. For potentially recoverable materials (e.g., solvents, oils, fuels, etc.), the Conservation Department will obtain a sample and determine if the waste can be recovered. Wastes determined to be recoverable are transferred to the B-32 storage area.

Wastes judged to be non-recoverable (e.g., sludges, mixed chlorinated/non-chlorinated wastes) are picked up by Lockheed-Georgia Company's Transportation and delivered to the Building B-10 storage area, or, in the case of cyanide baths and sludges, to the Building T-569 storage area. Waste cyanides are no longer generated at AF Plant 6.

Onsite handling and transfer of waste is accomplished through the use of forklifts and four-wheeled carts. Offsite transportation is provided through authorized contracted commercial haulers. In 1982, the following haulers were reported to have transported AF Plant 6 generated wastes:

- o Chemical Waste Management, Inc., Emelle, Alabama
- o Byrson Industrial, Lexington, South Carolina
- o S.C. SCA Services, Inc., Pinewood, South Carolina
- o Grover F. Boyd Trucking, Emelle, Alabama

Offsite disposal of generated wastes is provided through contractural arrangements with authorized commercial disposal companies. In 1982, AF Plant 6 wastes were disposed of by the following facilities:

- o <u>Chemical Waste Management, Emelle, Alabama</u>
  - -- Waste paint sludge, waste solvents (115 tons)

-- Waste petroleum, naptha flammable liquid (6 tons)

-- Manganese naptherate - petroleum blend flammable liquid (0.3 tons)

-- Waste paint and solvent (98 tons)

o <u>S.C. SCA Services, Inc., Pinewood, South Carolina</u>

-- High protein fire foam concentrate (113 tons)

Recycling generated wastes is primarily accomplished through the use of off-site commercial facilities. AF Plant 6 secures recycling contractors through annual bids.

Currently, J&B Smith, Inc. (Atlanta, Georgia) reconditions drums through a tolling arrangement. Arivec Chemicals, in Douglasville, Georgia, recovers generated hazardous wastes. The following wastes are reported to be recycled offsite:

o Spent trichloroethylene sludge from vapor degreasing

o Spent solvents and residues from paint equipment cleaning operations and paint thinning

o Spent 1,1,1-trichloroethane from cleaning of aircraft integral fuel tanks prior to post sealing

- Empty drums with raw material residues.

Onsite recovery of generated wastes is limited to burning plant trash and rags from clean-up operations in the plant steam recovery facility; burning excess fuels from fueling and testing operations in the plant boiler; burning recovered fuel in fire department training activities at Dobbins AFB; and incinerating waste oils in the waste oil incinerator.

The oil incinerator located in the B-10 area is used to burn waste oils, oils removed through wastewater treatment, and magna flux materials. The incinerator has been historically plagued with operating problems. During the site visit and shortly after, personnel reported that controls were being installed to eliminate the release of incomplete combustion of oils.

c. Solid Wastes and Construction Rubble

Disposal of solid wastes and construction rubble has been conducted at two locations on AF Plant 6 property. From 1942 to 1971, a landfill (Site No. 3, Section IV.B) located adjacent to Building B-90, the Radome Building, was constructed for disposal of miscellaneous construction rubble. Use of this area for disposal of construction rubble was discontinued after the construction of the Surface Impoundment (Site No. 1, Section IV.B) in 1971. The landfill currently being used today for disposal of construction rubble is located on the north side of AF Plant 6 near Buildings B-65, B-30, and B-44. This landfill has been used since the 1940s.

Sludge from the Sanitary WWTP is disposed of in an area immediately east of Building B-64. This area has been used since 1951 for disposal of all sludge from the plant.

The solid waste steam plant was built in 1982 to burn general plant refuse, wood, paper, and lightly soiled rags from general clean-up operations. The facility has an operating capacity of 13.2 tons per day and operates 250 days per year. The plant operates at 63 percent efficiency, deriving 7,500 Btu heat value per pound of material burned for a yearly total of 31,200 x 10^6 Btu.

From 1951 until 1968, the degreaser tank sludge discharged to the IWTP, sanitary, and stormwater sewers. From 1968 to 1978, the stormwater sewers were segregated and degreaser sludge went to the IWTP or the sanitary treatment plant. Beginning in 1978, the sludges were drummed and sent to Chemical Waste Management in Emelle, Alabama.

2. Industrial Operations

Primary industrial operations at AF Plant 6 include production, maintenance and modification of cargo aircraft. Major programs have been conducted by the Lockheed-Georgia Company at AF Plant 6 for production of the B-47, C-130, JetStar, C-141, and C-5 aircraft. A wing modification program for the C-5A aircraft and a "stretch" program for the C-141 have also been conducted. Since 1952, over 1,700 C-130 aircraft have been produced. From 1961 to 1968, AF Plant 6 produced 284 C-141 aircraft. From 1968 to 1973, a total of 81 C-5A aircraft were produced. The stretch program for the C-141 occurred from 1978 to 1981 and involved lengthening the fuselage and strengthening the aircraft to handle heavier loads. In 1981, the C-5 wing modification program began because of stress crack problems in the wings of the C-5 aircraft. Work is currently underway to prepare for production of the C-5B which is expected to begin in 1984. Appendix E contains a master list of industrial operations, and Appendix F contains an inventory of process tanks.

A review of installation records and interviews with installation employees resulted in the identification of the industrial operations in which the majority of industrial chemicals are handled and hazardous wastes are generated. Table 10 summarizes the major industrial operations and includes the current estimated quantities of wastes generated as well as the past and present disposal practices of these wastes, i.e., treatment, storage, and disposal. Information on estimated waste quantities and past disposal practices was obtained from files and interviews with shop personnel based upon their best recollection. Waste quantities are dependent on workload and may vary significantly between time periods. The Bell Aircraft Corporation operated AF Plant 6 from 1943 to 1946 for production of the B-29 aircraft. Waste oils, spent solvents and cleaners, and recovered fuels would also have been generated from these operations. Because of the difficulty in contacting former Bell Aircraft Corporation employees, little information was obtained concerning shop activities and waste quantities.

Specific major Lockheed-Georgia Company industrial activities include all operations necessary for the fabrication of aircraft parts including tooling, cutting, shaping and forming, and metal cleaning, treating and painting; subassembly, major assembly, and final aircraft assembly; electrical, mechanical, building and utility and

Table 10
MAJOR INDUSTRIAL OPERATIONS SUMMARY

Dept.	Name	Present Location (Bldg. No.)	Waste Material	Current Estimated Waste Quantity[a] (gpy)	Waste Management Methods 1950 1960 1970 1980
11-15	Transportation	B-80	Engine Oil Hydraulic Fluid	660	Offsite Recycling
18-07	Sheet Metal Fabrication	B-1	Spent Salt Baths	20[b]	Surface Impoundment
18-08	Electric Tubing and Cable Fabrication	B-1	MEK Paint Waste Trichloroethylene	660	Offsite Contractor Disposal[c]
			Hydraulic Fluid	660	Offsite Recycling
18-09	Paint and Process	B-1	MEK Paint Waste	4,900	IWTP Surface Impoundment
			Metal Finishing and Plating Sludges	3,500[b]	B-10 Aeration Basin Surface Impoundment
			Chromium Sludge	90[b]	Offsite Contractor Disposal[c]
			Spent Salt Baths	10[b]	Surface Impoundment
18-28	Saw and Shear	B-28	MEK Paint Waste	600	Offsite Contractor Disposal[c]
			Hydraulic Fluid 1,1,1-Trichloroethane	170 275	Offsite Recycling

[a]Estimated quantities have varied significantly in the past.

[b]Tons per year.

[c]After 1980, contractors were RCRA certified.

[d]Pounds per year.

Table 10--Continued

Dept.	Name	Present Location (Bldg. No.)	Waste Material	Current Estimated Waste Quantity[a] (gpy)	Waste Management Methods (1950, 1960, 1970, 1980)
23-12	C-130 Outer Wing	B-58	1,1,1-Trichloroethane Sealant	2,640 600[d]	Offsite Contractor Disposal[c]
23-14	C-130 Bodymate and Final	B-1	Engine Oil	110	Offsite Recycling
			1,1,1-Trichloroethane	55	Offsite Contractor Disposal[c]
			Hydraulic Fluid	110	Offsite Recycling
23-18	Paint	B-3	Sludges and Paint Waste	16,500	IWTP — Surface Impoundment
			MEK 1,1,1-Trichloroethane)	7,590 150	Offsite Contractor Disposal[c]
23-21	C-130 Functional Systems Development	B-1	MEK Acetone 1,1,1-Trichloroethane Paint Waste	330	Offsite Contractor Disposal[c]
			Alodine 1,1,1-Trichloroethane	170 220	Offsite Contractor Disposal[c]
26-12	C-5 Wing Removal Installation and Pressure	B-84	1,1,1-Trichloroethane Engine Oil Hydraulic Fluid	330	Offsite Recycling
			Empty Epoxy Sealant Drums (approximately 5 gal left in drums)	600[d]	Offsite Contractor Disposal[c]

[a]Estimated quantities have varied significantly in the past.

[b]Tons per year.

[c]After 1980, contractors were RCRA certified.

[d]Pounds per year.

Table 10--Continued

Dept.	Name	Present Location (Bldg. No.)	Waste Material	Current Estimated Waste Quantity[a] (gpy)	Waste Management Methods 1950 1960 1970 1980
26-11	C-5 Structures Assembly	B-26	1,1,1-Trichloroethane Turco 1000	2,600	Offsite Contractor Disposal[c]
26-14	C-5 Wing Modification Final Assembly	B-1	1,1,1-Trichloroethane MEK Alodine	110 110 220	Offsite Contractor Disposal[c]
		B-25	Hydraulic Fluid	1,400	Offsite Recycling
30-12	C-130 Production and Modification Flightline	T-566	1,1,1-Trichloroethane	110	Offsite Contractor Disposal[c]
30-13	C-130 Modification	B-1	MEK Mineral Spirits	220	Offsite Contractor Disposal[c]
		T-554	MEK Paint Waste	1,265	Offsite Contractor Disposal[c]
43-15	Standard Tool Engineering	B-1B	1,1,1-Trichloroethane	660	Offsite Contractor Disposal[c]
45-12	Sheet Metal and Machine Tool	B-1	Acetone Lacquer Thinner	55	Offsite Contractor Disposal[c]
		B-28	Acetone Paint Waste	660	Offsite Contractor Disposal[c]

[a]Estimated quantities have varied significantly in the past.

[b]Tons per year.

[c]After 1980, contractors were RCRA certified.

[d]Pounds per year.

Table 10--Continued

Dept.	Name	Present Location (Bldg. No.)	Waste Material	Current Estimated Waste Quantity[a] (gpy)	Waste Management Methods (1950 1960 1970 1980)
45-14	AGE and Assembly Tooling	B-1	MEK Paint Waste Toluene	605	Offsite Contractor Disposal[c]
49-21	Electrical Maintenance	B-57	Hydraulic Fluid Engine Oil	1,500	IWTP
49-22	Mechanical Maintenance	B-1	Hydraulic Fluid Hexcel 1,1,1-Trichloroethane	3,190	Offsite Recycling
			Oil from Milling Operations Hydraulic Fluid Engine Oil	52,000 330	Offsite Recycling
		B-4	Hydraulic Fluid Hexcel	220	Offsite Recycling
		B-6	Hydraulic Fluid Hexcel	165	Offsite Recycling
		B-28	Hydraulic Fluid Hexcel	220	Offsite Recycling
		T-556	Hydraulic Fluid Hexcel	220	Offsite Recycling

[a]Estimated quantities have varied significantly in the past.

[b]Tons per year.

[c]After 1980, contractors were RCRA certified.

[d]Pounds per year.

Table 10--Continued

Dept.	Name	Present Location (Bldg. No.)	Waste Material	Current Estimated Waste Quantity[a] (gpy)	Waste Management Methods 1950 1960 1970 1980
49-25	Buildings and Utilities Maintenance	B-30	Paint Waste Solvents	1,650	Offsite Contractor Disposal[c]
49-26	Flightline Facilities Maintenance	B-86FL	MEK 1,1,1-Trichloroethane Paint Waste	660	Offsite Contractor Disposal[c]
			Hydraulic Fluid	17,000	Offsite Recycling
59-13	Quality Laboratories	B-1	Paint Waste Solvents	480	Offsite Contractor Disposal[c]
			Solvents	110	Offsite Recycling
		B-24FL	Hydraulic Fluid 1,1,1-Trichloroethane	110	Offsite Recycling
61-14	Process Services	B-1	MEK 1,1,1-Tirchloroethane Acetone Paint Waste Methylene Chloride Sealant	1,760 100[d]	Offsite Contractor Disposal[c]

[a]Estimated quantities have varied significantly in the past.

[b]Tons per year.

[c]After 1980, contractors were RCRA certified.

[d]Pounds per year.

Table 10--Continued

Dept.	Name	Present Location (Bldg. No.)	Waste Material	Current Estimated Waste Quantity[a] (gpy)	Waste Management Methods 1950 1960 1970 1980
		B-54	Hydraulic Fluid	770	Offsite Recycling
			Solvents 1,1,1-Trichloroethane MEK	660	Offsite Contractor Disposal[c]
		B-28	MEK Turco 1000 1,1,1-Trichloroethane	660	Offsite Contractor Disposal[c]
64-22	Customer Training	B-65	Hydraulic Fluid	110	Offsite Recycling
		L-59	Hydraulic Fluid	60	Offsite Recycling
72-33	Material Sciences and Testing Laboratory	B-4	Trichloroethylene	110	Offsite Contractor Disposal[c]
72-35	Electronics Laboratory	B-4/64	Hydraulic Fluid	55	Offsite Recycling
			1,1,1-Trichloroethane Acetone	55	Offsite Contractor Disposal[c]
72-37	Experimental Shops	B-4	Hydraulic Fluid MEK	495	Offsite Recycling
		B-72	Hydraulic Fluid JP-5	110	Offsite Recycling

[a]Estimated quantities have varied significantly in the past.

[b]Tons per year.

[c]After 1980, contractors were RCRA certified.

[d]Pounds per year.

Table 10--Continued

Dept.	Name	Present Location (Bldg. No.)	Waste Material	Current Estimated Waste Quantity[a] (gpy)	Waste Management Methods (1950 – 1960 – 1970 – 1980)
86-22	Photo Processing	B-1	Waste Silver	25[d]	Recovered
89-22	Skills and Technical Training	B-1/C-31 FL	Paint Waste	110	Offsite Contractor Disposal[c]
			1,1,1-Trichloroethane Solvent Waste	110	Offsite Contractor Disposal[c]

[a]Estimated quantities have varied significantly in the past.

[b]Tons per year.

[c]After 1980, contractors were RCRA certified.

[d]Pounds per year.

flight line maintenance operations; and support operations. Brief descriptions of waste generation operations are given below.

a. Transportation, Department 11-15

This department conducts all transportation services for AF Plant 6. This includes aircraft moving and hazardous waste drum collection. This department generates approximately 660 gpy of commingled waste engine oil and hydraulic fluid.

b. Sheet Metal Fabrication, Department 18-07

Sheet Metal Fabrication, Department 18-07, is made up of five sections. The brake and roll section makes single bends and contours, joggles, and punching. Parts are also identified. The Hot Check and Straightening and Hot Forming Section performs four operations: (1) hot check straightening, (2) hot forming, (3) hot and cold joggling, and (4) tube flattening. The Punch and Hydro Press Section pierces, blanks, and forms metal parts on hydro presses. Parts are also checked and straightened. In Heat Treat and Line-Up, aluminum alloy parts are heat-treated, checked, straightened, and artificially aged. Steel parts for production and tooling are heat-treated, tempered, and case hardened. In the Extrusion and Trim Section, extrusions and brake formed sheet metal sections are sawed, trimmed, routed, shaped, milled, joggled, and drilled. In this department salt baths used for heat treating fabricated metal parts are replaced as required. The salt baths consist of KNO_3 and $NaNO_3$ with some chrome, and wastes are defined as corrosive and toxic. Upon generation, wastes are drummed and transferred to the Surface Impoundment. Drums are cut open and salts are disposed of in the Surface Impoundment. Emptied drums are transferred to Scrap and Salvage prior to contracted transportation and disposal. An estimated 20 tons of salt bath wastes are generated annually.

c. Electric Tubing and Cable Fabrication, Department 18-08

Several operations are conducted in Department 18-08, Electrical Wire, Tubing, and Cable Fabrication. Electrical wiring is prepared for subsequent operations by cutting to length, identifying, stripping, and installing terminals, where necessary. Tubing is also prepared for subsequent operations by cutting to length and finishing the ends. Electrical harnesses are installed on major assembly form boards. Feeder harnesses are fabricated for electrical panels and junction boxes. Electrical harnesses, instruments, and gauges are installed on electrical panels and junction boxes. Electrical wiring and tubing are manufactured in this department for use in the aircraft. This department generates approximately 660 gpy of commingled MEK, paint wastes, and trichloroethylene (TCE), and approximately 660 gpy of waste hydraulic fluid.

d. Paint and Process-Department 18-09

A majority of the industrial wastewater is generated in paint and process by metal cleaning and treating and aircraft washing and painting operations. Aluminum is the material used for most structural components of the aircraft. Aluminum cleaning and treating operations include degreasing; sulfuric, chromic and phosphoric acid anodizing; color and clear conversion coating; and cadmium, chromium and nickel plating processes.

(1) <u>Vapor Degreasing</u>

Vapor degreasing is the removal of soil and grease by a boiling liquid solvent, the vapor being considerably heavier than air. At least one constituent of the soil must be soluble in the solvent.

AF Plant 6 has 10 vapor degreasers. Degreaser tank locations are shown in Table 11. The degreasing process involves submerging parts in the solvent vapor until degreasing is complete. Trichloroethylene is the solvent used for most degreasing. Operations generate spent trichloroethylene and sludge defined as toxic by the State of Georgia. Spent solvents are collected in 55-gallon drums for reuse. Waste sludges are placed in 55-gallon drums during cleaning operations. The Conservation Department is contacted to evaluate the potential for recovery of solvents from sludge. Potentially recoverable solvent sludges are transferred by the Conservation Department to Building B-32 for storage prior to contracted transportation and offsite recycling. Non-recoverable sludges are picked up by the Transportation Department and transferred to the Building B-10 storage area prior to contracted transportation and offsite disposal. Solvents include tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, chlorinated fluorocarbons, and associated solvent sludges.

(2) <u>Anodizing</u>

Anodizing is the production of a protective oxide film on aluminum or other light metal by passing a high voltage electric current through a bath in which the metal is suspended. This process is usually preceded by vapor degreasing, alkaline cleaner, and

TABLE 11
SUMMARY OF DEGREASER TANK LOCATIONS

Tank No.	Contents	Location
1	Trichloroethylene	B-1 Building Col. B-5
2	Trichloroethylene	B-1 Building Col. B-13
50	Trichloroethylene (Currently inactive)	B-1 Building Col. D-60
53	Either Trichloroethylene or Freon	B-1 Building Col. A-33
95	Trichloroethylene	B-27 Building Col. H-21
111	Trichloroethylene	B-1 Building Col. B-30
211	(Currently inactive)	B-1 Building Col. K-31
Z-5	Trichloroethylene	B-1 Building Col. A-5
I-QE	Trichloroethylene	L-10 Building Col. 0-17
E-51-7	Trichloroethylene	B-4 Building Bay 1
T-20	Trichloroethylene	B-91 Building

Source: Spill Prevention, Control and Countermeasure Plan.

deoxidizer baths. All rinse waters from these processes are dischar~ed to the IWG treatment plant. Chemical baths usually last several years and are dumped infrequently to the IWC batch treatment plant.

Three anodizing processes in use are chromic, sulfuric, and phosphoric anodizing. All anodizing is performed in the B-1 building (Col B-16). Chromic anodizing has been in use since 1952 with sulfuric anodizing starting in 1970 and phosphoric anodizing beginning more recently in 1980.

Tank volumes and ingredients for the three primary anodizing processes are listed below:

Process	Tank No.	Volume (gal)	Ingredients
Chromic Anodizing	25	23,050	Chromic Acid
Sulfuric Anodizing	22	15,060	Sulfuric Acid Zeromist Regular Fluorinated Wetting Agent
Phosphoric Anodizing	21	15,060	Phosphoric Acid

(3) Conversion Coating

Conversion coatings are produced by chemical or electrochemical treatment of a metallic surface that gives a superficial layer containing a compound of the metal. Conversion coatings provide corrosion protection and adhesion for painting. Conversion coating is preceded by degreasing, alkaline cleaning and deoxidizing. Clear and color conversion coatings are used. After conversion, coating parts are rinsed, dried, and painted. Tank volumes and locations for the conversion coating tanks in use are listed below:

Process	Tank No.	Volume (gal)	Location
Color Conversion	17	8,980	B-1 Col B-16
Clear Conversion	19	8,980	B-1 Col B-16
Chromate Conversion	135	840	B-1 Col B-30
Chromate Conversion	B-17	180	B-1 Col B-30

All tanks contain hydrofluoric acid, phosphates and chromates in low concentrations. Rinse waters go to the IWG treatment plant and chemical baths are dumped to the IWC treatment plant.

(4) Electroplating

Electroplating is the production of a thin surface coating of one metal upon another by electrodeposition. This surface coating is applied to provide corrosion protection, wear or erosion resistance, antifrictional characteristics, or for decorative purposes. Electroplating processes in use at AF Plant 6 include cadmium, chromium and nickel plating of steel parts. The electroplating process involves the following sequence of chemical baths: electrolytic alkaline cleaner, rinse, HCl pickling, rinse, cadmium oxide and sulfuric acid, rinse, metal plating tank, two rinses and dry or bake to remove hydrogen. After electroplating, the parts are ready for painting or assembly.

Electroplating is performed by Department 18-09. Major electroplating operations are located on the main floor of the B-1 building. Electroplating operations generate spent plating baths and sludges which are reactive or toxic.

Spent cyanide solutions from cadmium plating are currently collected in drums and transferred to Building T-599 for temporary storage. Other spent chemical baths are discharged to the Concentrated Industrial Wastes (IWC) industrial wastewater treatment system. Personnel indicated that cyanide metal treatment and finishing processes have been discontinued, thereby eliminating future cyanide waste generation and subsequent treatment.

When treated, wastewaters from the electroplating processes produce a sludge high in metals. The IWG treatment plant currently generates approximately 3500 wet tons/year of waste sludge. This sludge is dewatered using vacuum filtration to 10-12 percent solids and is disposed in the Surface Impoundment. An additional 90 tpy of chromium sludge is drummed for offsite disposal.

(5) Painting

Painting of detailed aircraft parts, assemblies, and completed aircraft is an integral part of the manufacturing process. AF Plant 6 has 36 paint spray booths. Of this total, 21 are water wall and 15 are dry wall. Paint booth locations are given in Table 12. Water wall booths generate sludges, defined as toxic by the State of Georgia, and wash waters. Dry wall booths generate paint residues and sludges defined as toxic. Both systems generate solvents from thinners and gun and equipment cleaning. This operation generates approximately 4,900 gpy of MEK and paint waste.

Chrome containing spent salt bath solutions, defined as corrosive and toxic, are generated by operations involving the heat stripping of paint from racks

Table 12
SUMMARY OF PAINT BOOTH LOCATIONS

Building	Location	Type[a]
B-1	Appl Line PF01	W
B-1	Appl Line PF03	W
B-1	Col. B-27 No. 60152	W
B-1	Col. B-27 No. 15656	W
B-1	Col. B-26 No. 85543	W
B-1	Col. B-24 No. 86553	W
B-1	Col. A-13 Skin Paint	W
B-1	Col. C-9/11 No. 19653	W
B-1	Col. K-32	D
B-1	Col. D-32 2nd Mexx. No. 45559	W
B-1	Central Paint Booth	W
B-1	Col. F-64 No. 14851	D
B-1	Chem. Lab D/59-13 B-1B	D
B-1	Col. B-28 B-Wall D/18-09 No. G18362	W
B-27	Col. K-32 No. 17242	W
B-28	Col. K-41 No. 8609	D
B-28	Col. A-14 No. 19799	W
B-28	Col. A-15 No. 19275	W
B-28	Col. J-41 No. 60151	D
B-28	Col. N-31 No. 22364	W
B-28	Col. E-4 No. 19798	W
B-28	Col. F-4 No. 3300	W
B-28	Plastic Shop Ventilation Wall	D
B-28	Col. D-4 Carpenter Shop	W
B-28	Col. P-44 Paint Spray Booth	W
B-30	Paint Spray Booth	D
B-84	C-5 Parts Cleaning Booth	D
B-28	Col. J-31 No. G-117256	D
B-28	Col. B-30 Plastic Shop	D
B-28	Typewriter Repair Shop	D
T-554	Step Program No. G-84675	D
B-86	Engine Shop	D
B-3	Hangar	W
B-78	Hangar	W
B-77	Hangar	D
B-79	Hangar	D

[a]W = Wet Wall Paint Booth; D = Dry Paint Booth.

used for holding painted parts. Salt bath wastes are drummed and transferred to the Surface Impoundment. Drums are cut open and salt bath solutions are dumped into the Surface Impoundment. Cut open drums are transferred to Scrap and Salvage prior to contracted offsite transportation and disposal. The generation rate for salt bath solution is estimated to be 10 tpy.

e. <u>Chemical Milling, Department 18-12</u>

Chemical milling is the removal of large amounts of stock by etching selected areas of complex work pieces. This process entails cleaning, masking, etching and demasking. Chemical milling is conducted in Building B-91. The primary purpose of chemical milling is to reduce the weight of the aircraft. Chemical milling was primarily used during production of the C-5 from 1968 to 1972 and was essentially stopped in 1972. This process will be restarted when production of the C-5B begins in 1984.

Chemical milling process sequence is as follows: masking, NaOH hot etch, rinse, bright dip tank, rinse, and dry. Contents of the bright dip tank are sodium dichromate and sulfuric acid. Vapor degreasing, alkaline cleaning and deoxidizing are also performed in the chemical milling building. Spent chemical baths are discharged to the IWC treatment plant. Rinse waters are discharged to the IWG treatment plant.

f. <u>Saw and Shear, Department 18-28</u>

In Saw and Shear, Department 18-28, there are three cost centers. In the Saw and Shape Cost Center, "first cut" operations are conducted on production tube, plate, bar, rod, extrusions, and standard sections.

In the Shear Section Cost Center, flat stock is cut to net dimensions, as closely as possible. In the Route and Drill Section, stack cuts are made on flat aluminum stock. This department generates 600 gpy of commingled MEK and paint wastes, 170 gpy of hydraulic fluid, and 275 gpy of 1,1,1-trichloroethane.

g. C-130 Outer Wing, Department 23-12

In this department, the outer wing structure is assembled. Operations include buildup of the front and rear beam and trailing edge; outer wing subassembly; and outer wing tank seal and build up. This department generates 2,640 gpy of 1,1,1-trichloroethane, and 600 lb/yr of sealant waste.

h. C-130 Bodymate and Final Assembly, Department 23-14

Department 23-14, C-130 Bodymate and Final Assembly, conducts final assembly operations on the C-130 aircraft. This department generates 110 gpy of waste engine oil, 55 gpy of 1,1,1-trichloroethane, and 110 gpy of waste hydraulic fluid.

i. Paint Department, Department 23-18

Building B-3 is used to paint aircraft. B-3 is separated into three bays. In Bay 1, the aircraft is washed with soap and ammonia, hand cleaned with MEK, checked for cleanliness, and brightened by spraying with sodium dichromate. Alodine is then applied for corrosion protection. Rinse waters are discharged to the IWO treatment plant. In Bay 2, the aircraft is spot cleaned and masked for priming. Epoxy primer pressure pots are used. A waterfall system collects overspray. Pressure pots and paint lines are cleaned with approximately 5 gallons of MEK per pot. Since the paint sets up in 8 hours, the paint equipment must be cleaned daily. In the Bay 3, small stencil guns are used to apply final markings.

Essentially the same process occurs in Building B-79 except no water wall spray boothes are available. B-79 is used to handle excess capacity from B-3. Building B-77 is used to paint forward and aft wing bulk heads, completed assemblies, forward fuselage inside wheel well and the avionics compartment.

Waterwashes are discharged on a regular schedule to the general industrial wastewater (IWG) treatment system. Paint booths are cleaned and maintained by Guardian Industrial Service, Inc. Sludges from water wall booths are placed in drums and transferred to the Building B-10 storage area prior to contracted transportation and offsite disposal.

A sludge waste is produced in organic solvents when the solvents are used to clean non-usable paints and residue from paint containers, equipment, and fluid hoses. The sludge residue consists of a variety of resinous compounds, such as: alkyd, nitrocellulose, vinyl, aromatic and aliphatic polyurethanes, silicone, epoxy polyamide and amine, chloroprene, acrylics, Buna N, nitrile, phenolic, polysulfide, and acrylic nitrocellulose. The sludge also contains a broad variety of colorant pigments, corrosion-inhibiting pigments, flattening agents, and fillers.

Potentially recoverable solvent wastes are collected in drums and evaluated for recovery by the Lockheed-Georgia Company's Conservation Department. Recoverable solvents are transferred to Building B-32 for storage prior to contracted transportation and offsite recycling. Non-recoverable solvents and generated sludges are transferred to the Building B-10 for storage prior to contracted offsite transportation and disposal. Generation rates for 1982 for spent solvents are 7,590 gallons per year. Generation rates for waterwashes are not available. An estimated 16,500 gallons of paint residues and sludges were generated in 1982.

Cleaning of aircraft integral fuel tanks prior to post assembly sealing is conducted in Building B-26 and B-58 and generates spent 1,1,1-trichloroethane defined as toxic by the State of Georgia. As with other solvents, wastes are collected in drums and evaluated for recovery by the Conservation Department. Recoverable solvents are transferred to Building B-32 prior to offsite transportation and disposal. Those defined as non-recoverable are transferred to Building B-10 prior to off-site transportation and disposal. Approximately 150 gallons of spent 1,1,1-trichloroethane are generated each year.

j. <u>C-130 Functional Systems Development, Department 23-21</u>

In Department 23-21, C-130 Functional Systems Development, there are five cost centers. In Plumbing, Environment, and Control Development, all plumbing and controls are developed and fabricated. In Sheet Metal and Machine Parts Development, sheet metal extruded or machined parts are fabricated, shop tools are fabricated, and assemblies and parts are reworked to the latest engineering changes. In Electrical Systems Department and Wire Assembly Development, electrical systems, wire harness routing, electrical panel internal wiring, and data for the fabrication of electrical form boards are developed in an effort to support production, fabrication, and installation operations. In Mock-up Fabrication of Wire Assemblies, electrical assemblies and panels are reworked to meet the latest changes.

This department generates 330 gpy of commingled MEK, acetone, 1,1,1-trichloroethane, and paint waste; 170 gpy of alodine; and 220 gpy of 1,1,1-trichloroethane.

k. <u>C-5 Wing Removal/Installation and Pressure Department 26-12</u>

Aircraft Sealing operations conducted in Building B-84 involve sealing of wings for fuel-tight integrity. Operations involve the use of 2-part base and catalyst epoxy sealant materials. Base and catalyst materials consist of chrome containing naphtha derivatives and petroleum distillates, respectively. These materials are supplied in 55-gallon drums. Emptied drums are transferred to Building B-10 for storage. Drums are disposed of offsite using commercial facilities. This department generates 330 gpy of commingled 1,1,1-trichloroethane, waste engine oil, and waste hydraulic fluid. Approximately 600 lb/yr of waste epoxy sealant is also generated.

l. <u>C-5 Structures Assembly, Department 26-11</u>

In this department, the original inner and outer wings of the C-5 aircraft are removed and new wings are installed, pressure tested and sealed. This department generates approximately 2,600 gpy of commingled 1,1,1-trichloroethane and Turco 1000.

m. C-5 Wing Modification Final Assembly, Department 26-14

In this department, the final assembly on the wing modification is complete, and the aircraft tail section checkout is conducted. This department generates 110 gpy of 1,1,1-trichloroethane, 110 gpy of MEK, and 220 gpy of alodine in the B-1 building. Approximately 1,400 gpy of waste hydraulic fluid is generated in the B-25 building from this operation.

n. C-130 Production and Modification Flightline, Department 30-12

This department prepares C-130 aircraft for final delivery to the customer and receives C-130 aircraft in preparation for modification. The aircraft are fueled, oxygen tested, and flight equipment is installed in preparation for delivery. Aircraft which are brought in for modification undergo system functional tests, engine operational tests, and pre/post flights. This shop generates approximately 110 gpy of 1,1,1-trichloroethane.

o. C-130 Modification, Department 30-13

This department is responsible for C-130 military and commercial aircraft modification and maintenance. Propellers are assembled, tested, and repaired. All C-130 aircraft tires and wheels are repaired and built-up. In addition, maintenance and modification programs for other aircraft are also conducted. In the B-1 building, this department generates approximately 220 gpy of commingled MEK and mineral spirits. In the T-554 Building, this department generates approximately 1,265 gpy of commingled MEK and paint waste.

p. Standard Tool Engineering, Department 43-15

In this department, design requirements and specifications are developed for Standard Tools. Small, hand held tools are repaired. This department generates approximately 660 gpy of 1,1,1-trichloroethane.

q. Sheet Metal and Machine Tool, Department 45-12

This department fabricates, assembles, and proof tests project tools for all manufacturing programs at AF Plant 6. This department generates 55 gpy of commingled acetone and lacquer thinner, and 660 gpy of commingled acetone and paint waste.

r. AGE and Assembly Tooling, Department 45-14

Aerospace ground equipment (AGE) is fabricated, assembled, and painted in this department. Major project tools are also fabricated, assembled, proven, and maintained. All transportation dollies are maintained. Flame cutting and welding services are provided to all departments. This shop generates 605 gpy of commingled MEK, paint waste, and toluene.

s. Electrical Maintenance, Department 49-21

This department provides electrical maintenance for AF Plant 6. This department generates 1,500 gpy of waste hydraulic fluid and engine oil. This waste is pumped to the IWTP.

t. Mechanical Maintenance, Department 49-22

Maintenance activities include machine tool coolant oil and lubricant changes, oil changing on hydraulic carts, calibration of hydraulic ground support equipment, draining and replenishment of aircraft hydraulic systems, changing vehicle oil in engines and other activities involving hydraulic equipment. Waste oil and hydraulic fluid is placed in drums provided by the Conservation Department and are disposed in the same manner as waste solvents.

In the B-1 building, this department generates approximately 3,190 gpy of commingled waste hydraulic fluid, hexcel, and 1,1,1-trichloroethane; 52,000 gpy of waste oil from milling operations; and 330 gpy of commingled waste engine oils and hydraulic fluids. This department generates approximately 220 gpy of waste hydraulic fluid and hexcel in Buildings No. B-4, B-28, and T-556 and 165 gpy in Building No. B-6.

u. Buildings and Utilities Maintenance, Department 49-25

This department maintains the buildings and utilities on AF Plant 6 and generates approximately 1,650 gpy of commingled paint waste and solvents.

v. Flightline Facilities Maintenance, Department 49-26

This department provides maintenance support for the flightline area of AF Plant 6 and generates approximately 660 gpy of commingled MEK, 1,1,1-trichloroethane, and paint waste, as well as approximately 17,000 gpy of waste hydraulic fluid.

Excess fuels from fueling and testing operations are collected in fuel carts and transferred to a 30,000 gallon belowground (BG) tank for storage. These fuels are recycled as a supplemental fuel in the plant boiler (near B-98). Other fuel and hydraulic oil mixtures are collected in fuel carts and transferred to an BG tank (near B-65) prior to contracted off-site transportation and disposal (Fossel Chemical-Tennessee).

w. Quality Laboratory, Department 59-13

The Quality Laboratory, Department 59-13, performs experiments to test and maintain product quality and assurance. This includes testing chemical solutions, finished products, paints, sealants, metal bonds, fuel from the fuel farm, the industrial wastewater, and heat treating operations. This department also originates and masters all Process Analysis Requirements (PAR). In the B-1 building, this department generates approximately 480 gpy of commingled paint waste and solvents and 110 gpy of waste solvents. At the B-24 flightline, this department generates approximately 110 gpy of commingled waste hydraulic fluid and 1,1,1-trichloroethane.

x. Process Services, Department 61-14

This department inspects all process tanks and ensures that the contents meet the required specifications. In the B-1 building, this department generates approximately 1,760 gpy of commingled MEK, 1,1,1-trichloroethane, acetone, paint waste, and methylene chloride and 100 lb/yr of sealant wastes. In the B-54 building, this department generates approximately 770 gpy of waste hydraulic fluid and 660 gpy of commingled solvents, 1,1,1-trichloroethane, and MEK. In the B-28 building, this department generates approximately 660 gpy of commingled MEK, Turco 1,000, and 1,1,1-trichloroethane.

y. <u>Customer Training, Department 64-22</u>

This department is responsible for training customers on the proper operation and maintenance of aircraft manufactured at AF Plant 6. This department generates approximately 110 gpy of waste hydraulic fluid in Building B-65 and 160 gpy of waste hydraulic fluid in Building L-59.

z. <u>Material Sciences and Testing Laboratory, Department 72-33</u>

In the Material Sciences and Testing Laboratory, Department 72-33, there are three separate areas. The structural group conducts failure analysis on selected materials. The metallurgical group inspects each piece to determine the reason that failure occurred. This group has a Photography Laboratory. The chemistry group conducts product development work on new alloys and materials. This department generates approximately 110 gpy of TCE.

aa. <u>Electronics Laboratory, Department 72-35</u>

The Electronics Laboratory, Department 72-35, develops electronic equipment for aircraft manufactured at AF Plant 6. This department generates approximately 55 gpy of waste hydraulic fluid and 55 gpy of commingled 1,1,1-trichloroethane and acetone.

bb. <u>Experimental Shops, Department 72-37</u>

In the B-44 building, this department generates approximately 495 gpy of commingled waste hydraulic fluid and MEK. In the B-72 building, this department generates approximately 110 gpy of commingled waste hydraulic fluid and JP-5.

cc. Photo Processing, Department 86-22

Silk screen and photographic reproduction are conducted by Departments 86-22 and 86-23. This shop is located on the west end of the second mezzanine of the B-1 building. Photo-processing operations at AF Plant 6 facilities involve approximately 600 square feet of film per week and 600 square feet of sheets per week. Spent fixer solution is treated for silver recovery using small electrolytic cells. Recovered silver amounts to about 50 pounds every 2 to 3 years. Treated fixer overflow and untreated rinse waters, containing small amounts of silver, are discharged to the industrial wastewater treatment system.

dd. Skills and Technical Training, Department 89-22

This department generates approximately 110 gpy of paint waste and 110 gpy of commingled 1,1,1-trichloroethane and solvent waste.

3. Fuels

The major aircraft fuel storage area at AF Plant 6 is located at the Aviation Fuel Farm. This area consists of eight 50,000-gallon aboveground (AG) storage tanks and a pump station. Two of the tanks contain JP-4 and six tanks contain JP-5. Each individual tank and the entire tank farm are diked. Bulk fuels are supplied to the tank farm by a pipeline from a tank car and tank truck unloading terminal near the B-10 Building. Fuel is then supplied to the different areas of AF Plant 6 by a mobile transport fleet consisting of fifteen 5,000-gallon vehicles, two 4,000-gallon vehicles, eight 10,000-gallon vehicles and a fuel delivery hydrant system.

Large quantities of aircraft fuel are also stored at other locations on AF Plant 6 property. JP-5 aircraft fuel is stored at the B-24/25 apron in a belowground (BG) 35,000-gallon tank. JP-5 aircraft fuel is also stored in two 50,000-gallon AG tanks at the C-5 fuel farm, one 50,000-gallon BG tank between the N/S runway and the C-5 fuel farm, one 25,000-gallon AG tank at Position 65 on the N/S runway, and two 30,000-gallon BG tanks at Position 19. Smaller quantities of aircraft fuel are stored at other locations on AF Plant 6 property.

The major fuel oil storage location on AF Plant 6 property is at Building B-7, the Main Steam Plant, in a 425,000-gallon AG tank and a 2.25-million-gallon fuel oil tank. Building 98 has two 30,000-gallon BG tanks: one which contains fuel oil and one which contains contaminated fuels. Smaller quantities of fuel oil are stored at several locations on AF Plant 6 property. Fuel oil is supplied to the smaller locations in mobile transport vehicles ranging in capacity from 145 to 5,000 gallons.

The automotive fuel dispensing station has two 12,000-gallon BG tanks which contain MOGAS. Smaller quantities of MOGAS are stored at other locations on AF Plant 6 property.

Many other tanks at AF Plant 6 contain waste oils, chemicals, and other substances. A complete inventory of the major POL and chemical storage tanks at AF Plant 6 is presented in Appendix G.

All tanks which provide bulk storage of aviation fuel are inspected every four years. If the sludge layer on the bottom of the tank is greater than one-half inch thick, then the tank is pumped down and the sludge is removed. All sludge is currently collected in 55-gallon hazardous waste drums for offsite disposal. The tank walls are then sand-blasted and coated with epoxy.

Several inactive storage tanks have been identified at AF Plant 6. Two 8,000-gallon MOGAS tanks at the old filling station were filled with sand and abandoned in 1978. In 1982, a 5,000-gallon tank behind Building B-78 containing alcohol was pumped out, filled with sand, and abandoned. In 1971, during the expansion of the IWTP, three to four JP-4/5 tanks of unknown capacity were excavated and removed.

Belowground (BG) tanks at AF Plant 6 are not physically leak tested. Inventories are checked on a monthly or bimonthly basis to determine if leakage is occurring. In February 1983, monitor wells were installed at each large BG storage tanks to provide a means of determining if ground-water contamination was occurring through tank leakage. Samples are periodically collected from these wells and visually inspected to confirm or deny the presence of gross contamination. Visual test results are negative with the exception of Well No. 18.

Several major JP-5 spills have occurred at AF Plant 6 in the past. Approximately 25,000 gallons of JP-5 were spilled at the flightline in 1974 when a gasket at a fuel filter in a 6-inch fuel line ruptured. In January 1981, approximately 21,000 gallons of JP-5 were lost through a leak in the fuel system. These spill incidents are discussed further in Section IV.B. In addition to these major spills, minor spills have occurred in the past at AF Plant 6. In a memorandum from Lockheed-Georgia Company to the Aeronautical Systems Division, a Status Report dated February 22, 1977, indicated that, for the entire year of 1975, there were 31 spills ranging in size from 2 gallons to 95 gallons. During 1976, 24 spills ranging in size from

0.5 gallons of gasoline to 110 gallons of paint thinner occurred. Table 13 presents a list of more recent spills. In the case of the smaller spills, the material was cleaned up and disposed of properly.

4. Fire Department Training Exercises

All fire department training activities for the AF Plant 6 fire department have been conducted on Dobbins AFB property. These fire department training activities are conducted twice per year for each of the three shifts (a total of 6 activities). During each fire department training activity, three burns using 100 to 300 gallons of JP-5 per burn are conducted. Most of the waste material used during the fire department training exercises is provided by Dobbins AFB. However, occasionally 500 to 1,000 gallons of contaminated fuel is taken from AF Plant 6 to the fire department training area and consumed during the training activity.

5. Polychlorinated Biphenyls (PCBs)

Typical sources of PCBs at AF Plant 6 are electrical transformers and capacitors. Seventeen out-of-service transformers containing oil with PCB concentrations greater than 500 parts per million (ppm) have been collected over the past 5 years and are currently stored in Building T-666 awaiting offsite disposal by January 1, 1984. Building T-666 was constructed in 1980 specifically for the purpose of storing transformers containing PCB-contaminated oils. This building has an impervious floor with no drains and bermed sides. Transformers containing PCB-contaminated oil are in service at AF Plant 6. Routine maintenance and upgrading results in the deactivation of these transformers. There were no reports or evidence of PCB spills from leaking or blown transformers.

Table 13
SUMMARY OF RECENT SMALL SPILLS AT AF PLANT 6

No.	Type of Spill	Date	Quantity (gal)	Location
1	Fire Fighting Foam	05/13/79	Unknown	B-96
2	JP-5	06/03/81	40	Position 8
3	JP-5	06/04/81	60	Position 23, North Apron
4	JP-5	08/06/81	30	Position 11
5	MEK-Naptha	08/31/81	55	B-32 Staging Area
6	JP-5	09/01/81	2	Position 24
7	JP-5	10/29/81	4	Position 59
8	JP-5	12/09/81	5	B-96
9	JP-5	12/22/81	15	Position 7, South Apron
10	JP-5	01/28/82	10	North Apron, Position 26-A
11	JP-5	03/16/82	15	Position 23
12	JP-5	03/18/82	10	Position 25
13	JP-5	04/16/82	30 to 100	Position 53
14	JP-5	05/27/82	10	Position 24
15	JP-5	06/15/82	5	B-25 Hangar
16	JP-5	07/08/82	5	B-4
17	JP-5	07/27/82	10	Position 23
18	JP-5	11/01/82	25	Position 7
19	JP-5	12/09/82	20	Position 4
20	JP-5	12/16/82	10	Position 22
21	JP-5	02/19/83	150	Fuel Farm
22	High Protein Foam	03/24/83	400	B-24
23	Toluene	04/14/83	10	B-1
24	JP-5	06/10/83	15	Position 59
25	JP-5	06/28/83	10	Position 19
26	JP-4	09/20/83	50 to 200	Position 57
27	JP-5	10/20/83	15	Position 53
28	JP-5	10/21/83	10	Position 12

Source: AFPRO files.

6. Pesticides

Pesticides are applied at AF Plant 6 on an as-needed basis by an outside contractor. Information was not available on the quantities of pesticides used. Principal herbicides used at AF Plant 6 include Diuron, Karmex Weed Killer, Monuron, and Dowpon M Grass Killer. The application of pesticides generates empty pesticide containers containing pesticide residues. All pesticide cans are reported to be triple rinsed prior to contractor removal. The rinsate is collected and reused. There are no reports of banned or restricted pesticides currently being used on the installation or of any pesticide-related spills.

7. Wastewater Treatment

Wastewater treatment facilities at AF Plant 6 consist of separate sanitary and industrial waste treatment plants followed by the third level wastewater treatment plant. The third level treatment plant is designed to treat 7.0 million gallons per day (mgd) of waste in two streams: (1) 3.5 mgd of treated industrial waste and (2) 3.5 mgd of treated sanitary sewage. Actual flows are usually much lower than the design flows. Industrial wastewaters are segregated according to waste category into three separate treatment systems: (1) industrial waste general (IWG), (2) industrial waste oily (IWO), and (3) industrial waste concentrated (IWC). Schematic flow diagrams of each treatment system are given in Figures 13 and 14. Total yearly and average daily industrial wastewater flows are summarized in Table 14.

a. Industrial Waste General (IWG) Treatment Plant

The IWG plant has the capability of treating 3.5 million gallons per day of IWG wastes. IWG waste

GN14649.30

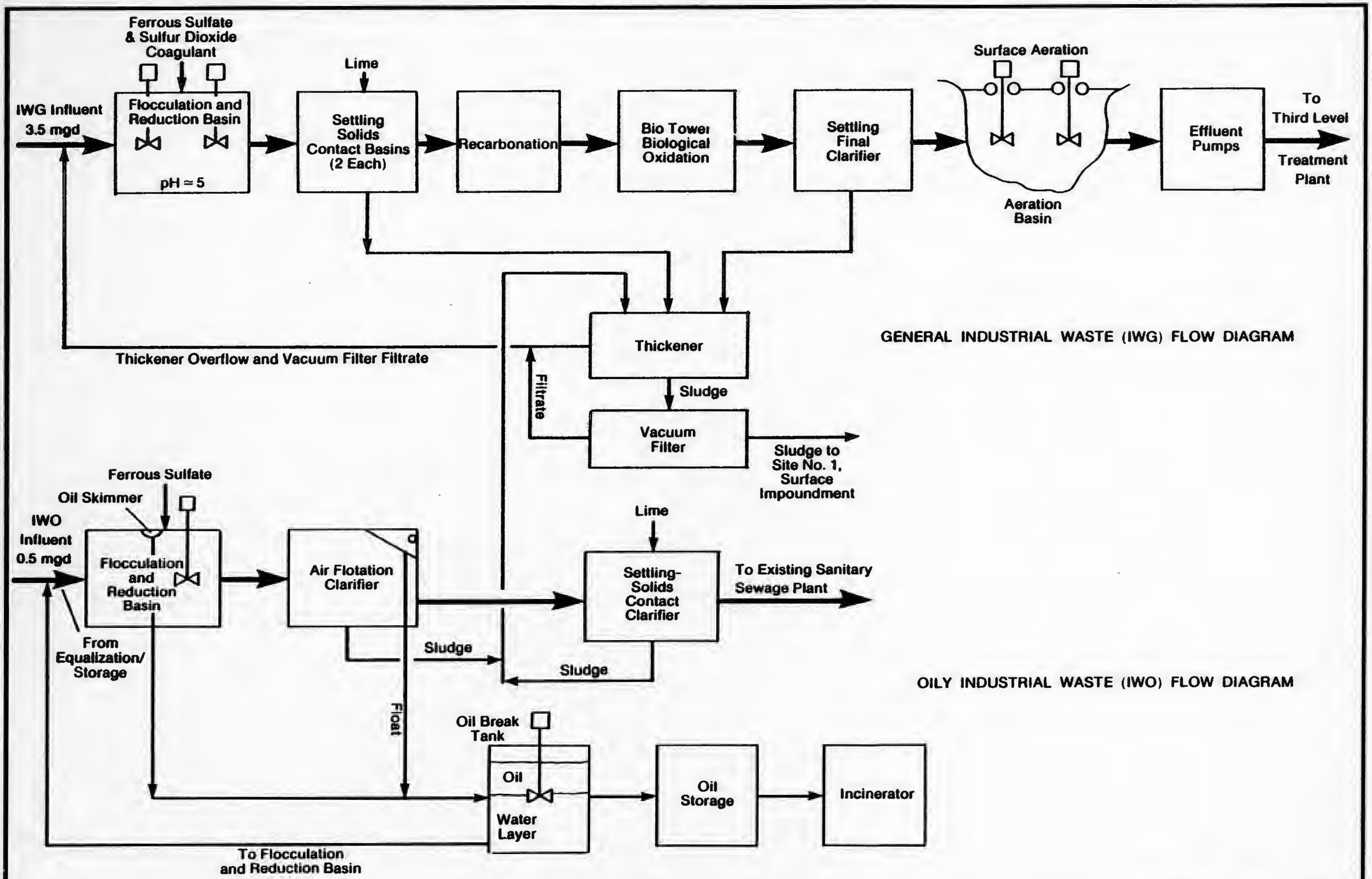

FIGURE 13.
General and Oily Industrial Wastewater Treatment Flow Diagram.

GN14649.30

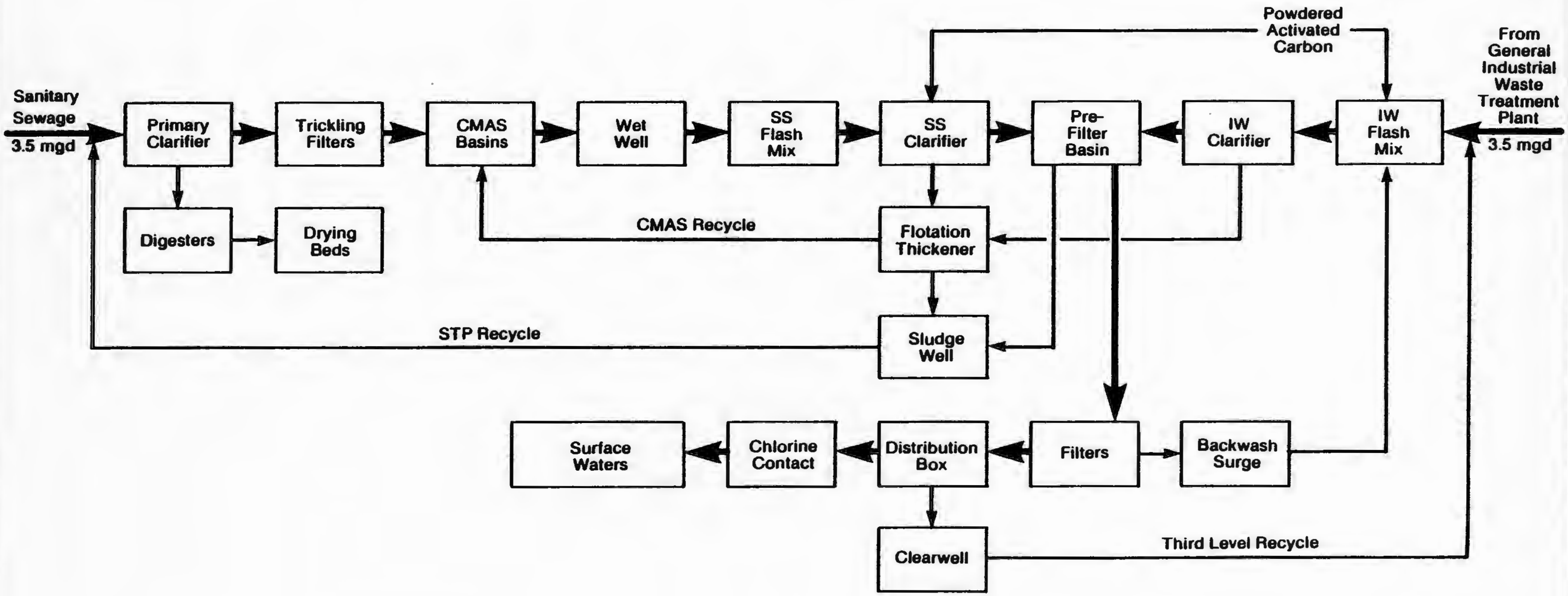

FIGURE 14.
Sanitary and Third Level Wastewater Treatment Flow Diagram.

Table 14
TOTAL YEARLY AND AVERAGE DAILY INDUSTRIAL WASTEWATER FLOWS

	IWG Treatment Plant		IWO Treatment Plant		IWC Batch Treatment Plant
Year	Total Yearly Flow (MG)	Average Daily Flow (mgd)	Total Yearly Flow (MG)	Average Daily Flow (mgd)	Total Yearly Flow (MG)[a]
1973	418	1.15	108	0.30	--
1974	399	1.09	115	0.31	--
1975	418	1.15	117	0.32	0.17
1976	441	1.21	117	0.32	0.098
1977	357	0.98	81	0.22	0.043
1978	398	1.09	93	0.26	0.077
1979	423	1.16	107	0.29	0.099
1980	462	1.27	120	0.33	0.23
1981	456	1.25	137	0.37	0.18
1982	353	0.97	151	0.41	0.18

[a]Obtained by totaling recorded batch treatment volumes for each year.

includes dilute wastes from processing such as rinse tanks and quench waters; boiler blowdown waters; and floor and contaminated area drainage. These streams are relatively free of significant amounts of fuel or oil. The waste contains slight amounts of organics and toxic heavy metal ions. The waste stream is treated with ferrous sulfate, coagulants, and lime.

IWG influent enters the flocculation and reduction basins where ferrous sulfate is added to reduce hexavalent chromium to trivalent chromium. The optimum pH for this reaction is in the range of 5.5 to 6.5.

Reduced flocculated waste then flows to two solids contact basins where lime is added causing the trivalent chrome and ferric iron to precipitate. Lime addition also precipitates Cd^{+2}, Cu^{+2}, Zn^{+2}, Ni^{+2} Mn^{+2}, Ag^{+}, and Al^{+3}. Lime also removes phosphorus and fluoride, and increases the pH to a level above 8.0.

Treated waste passes into the recarbonation basins where the pH is lowered to about 7.0 to 7.5 by dissolving carbon dioxide in the waste. This lowers the total and calcium hardness by precipitating calcium carbonate ($CaCO_3$) which is removed in the final clarifier.

Neutralized waste then passes over a weir to the biotower recycle well where it is pumped over the biotower. The biotower is essentially a trickling filter packed with an expanded PVC plastic material. Organic materials are removed by biological oxidation, air oxidation, and air stripping.

Treated waste then flows to the final clarifier which removes algae, slimes, inorganic precipitates and other remaining settleable solids from the wastewater. Effluent from the clarifier flows to the process water pump station and then to the B-10 Lake.

The B-10 aeration basin has an estimated volume of approximately 3.26 million gallons. The aeration basin is equipped with surface aerators which increase dissolved oxygen levels and provide mixing. Effluent from the lake flows to the lake sump and is pumped to the flash mix basins of the third level treatment plant.

b. Industrial Waste Oily (IWO) Treatment Plant

The IWO plant is capable of treating 0.5 million gallons per day of IWO wastes. IWO wastes include all soluble and free oil-containing discharges such as machine tool cutting oils and coolants, fuel spills and process tank discharges, detergents, aircraft wash rack wastes and paint booth effluents. These wastes also contain some heavy metals (15 mg/l or less), organic strippers, phenols and chlorinated hydrocarbons and suspended solids. This waste stream is treated with ferrous sulfate and lime.

IWO waste is pumped from various collection points to the IWO storage tank which provides equalization of the IWO waste flow. IWO waste then flows by gravity to a skimming chamber where free oil rises to the top and is removed by a rotary skimmer. Skimmed oil flows by gravity to the oil break tank. Wastewater then passes into the flocculation and reduction chamber. Ferrous sulfate is added to reduce hexavalent chrome and to act as a coagulant for emulsified oils. Waste then flows over a weir into the air flotation chamber.

The air flotation chamber is a circular clarifier equipped with an oil skimmer. Free oils and emulsified oils which have been coagulated by the addition of ferrous sulfate float to the surface by means of dissolved air flotation and are skimmed into the float box and flow by gravity to the oil break tank.

Effluent from the air flotation clarifier flows to the neutralization clarifier where lime is added to increase the pH and precipitate heavy metals. Effluent from the neutralization clarifier discharges to the sanitary sewer and proceeds to the sewage treatment plant for further treatment.

Oil and water separate in the oil break tank. Oil is pumped to an oil storage tank prior to burning in the incinerator. Water is recycled to the flocculation and reduction basin.

c. Industrial Waste Concentrated (IWC) Treatment System

IWC wastes include concentrated heavy metal solutions; cyanides (no longer being generated; acid bath discharges containing nitric, phosphoric, hydrofluoric, and sulfuric acid; and more exotic solutions containing permangantes, halogenated hydrocarbons, molybdic acid, cyanide complexes, hydrogen peroxide, acetic or formic acid, penetrant oils, phenols and numerous proprietary mixtures. Treatment of these wastes is accomplished by batch treatment methods. The concentrated waste system has the capability of treating with sulfur dioxide, chlorine gas, lime slurry, ferrous sulfate, sulfuric acid, sodium hydroxide, and other miscellaneous chemicals such as sodium sulfide. Treatment tank cooling is accomplished either by air agitation or dilution. Four separate, interconnected waste process and storage tanks have been provided, each with a capacity of 24,000 gallons, for batch treatment of concentrated wastes. After treatment, the neutralized waste is discharged to the IWG treatment stream for blending and further treatment.

d. Thickening, Dewatering and Disposal of Industrial Wastewater Treatment Sludges

Sludges from the settling solids contact basins and clarifiers in the IWG and IWO treatment plants are collected in a sludge sump for mixing and aging. Mixed sludge is then pumped to a gravity thickener. Thickened sludge is drawn off the bottom of the thickener and dewatered on vacuum filters to approximately 10 to 12 percent solids. Sludge thickener supernatant and vacuum filter filtrate are recycled to the IWG treatment system. Filter cake is discharged to a sludge hopper and subsequently trucked to the Surface Impoundment (Site No. 1).

e. Sanitary Wastewater Treatment Plant

Sanitary sewage is treated by screening, comminution, and primary clarification. The sewage is then treated in two 150-foot trickling filters, followed by two 100,000-gallon complete mix activated sludge (CMAS) basins in parallel. The sewage is then pumped to the sanitary sewage flash mix basin where activated carbon is added for removal of color, odor, and refractory organics. The stream then goes to the sanitary sewage secondary clarifier. Sludge from the bottom of the clarifier is returned to the CMAS basins. Clarifier effluent goes to the pre-filter mix basin.

f. Third Level Treatment Plant

The third level treatment plant provides tertiary treatment of industrial and sanitary wastewater. Treated industrial waste enters the plant through the industrial waste flash mix basin where it is mixed with powdered activated carbon for removal of color, odor, and refractory organics. Carbon is removed in the industrial waste clarifier. Waste then passes to the pre-filter mix basin, where it is mixed with the sanitary sewage stream.

The combined treated industrial and sanitary waste streams pass from the pre-filter mix basin to the filters. The filters are dual media type containing anthracite coal and sand, and are equipped with surface wash and air backwash in addition to hydraulic backwash. Backwash water supply is from the clearwell and wastewater is returned to the industrial waste clarifier.

Filtered water then goes to the chlorine contact basin, where it is chlorinated for bacteria removal. Final treated effluent is then discharged to Nickajack Creek.

8. Other Activities

In addition to Lockheed-Georgia Company's activities at AF Plant 6, they have an industrial complex on privately owned land located adjacent to AF Plant 6 which is involved in the C-5 Wing Modification Program. This area generates wastes with characteristics similar to AF Plant 6 waste. Wastewater from this complex is discharged to the IWTP located on AF Plant 6 property.

B. DISPOSAL AND SPILL SITES IDENTIFICATION AND EVALUATION

Interviews were conducted with installation personnel (Appendix C) to identify disposal and spill sites at AF Plant 6. A preliminary screening was performed on all of the identified sites based on the information obtained from the interviews and available records from the installation and outside agencies. Using the decision tree process described in the "Methodology" section, a determination was made whether a potential exists for hazardous material contamination in any of the identified sites. For those sites where potential hazardous material contamination was considered significant, a determination was made whether significant potential exists for contaminant migration from these sites. These sites were then rated using the U.S. Air Force Hazard Assessment Rating Methodology (HARM), which was developed jointly by the Air Force, CH2M HILL, and Engineering-Science for specific application to the Air Force Installation Restoration Program. The HARM system considers four aspects of the hazard posed by a specific site: (1) the possible receptors of the contamination, (2) the waste and its characteristics, (3) potential pathways for waste contaminant migration, and (4) any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating. A more detailed description of the HARM system is included in Appendix H.

A total of 12 disposal and spill sites were identified at AF Plant 6. Of these, 11 were rated using the HARM rating system. A complete listing of all of the sites, indicating potential hazards, is shown in Table 15. Copies of the completed rating forms are included in Appendix I, and a summary of the hazard ratings for the sites is presented in Table 16.

Table 15
DISPOSAL AND SPILL SITE SUMMARY

Site No.	Site Description	Potential Hazard Contamination	Potential Hazard Migration	Rating
1	Surface Impoundment	Yes	Yes	Yes
2	Existing Landfill	Yes	Yes	Yes
3	Past Landfill	Yes	Yes	Yes
4	Sanitary WWTP Sludge Disposal Area	Yes	Yes	Yes
5	Stormwater Retention Basin No. 2	Yes	Yes	Yes
6	B-10 Aeration Basin	Yes	Yes	Yes
7	Position 65--C-5 Washrack	Yes	Yes	Yes
8	B-96 Building	Yes	Yes	Yes
9	TCE Spill	Yes	Yes	Yes
10	JP-5 Fuel Spill No. 2	Yes	Yes	Yes
11	JP-5 Fuel Spill No. 1	Yes	Yes	Yes
12	Sodium Dichromate Spill	Yes	Yes	Yes

Table 16
SUMMARY OF DISPOSAL AND SPILL SITE RATINGS

Site No.	Site Description	Subscore (% of Maximum Possible Score in Each Category)			Factor for Waste Management Practices	Overall Score	Page Reference of Site Rating Form
		Receptors	Characteristics	Pathways			
1	Surface Impoundment	59	75	100	0.95	74	I-1
2	Existing Landfill	59	50	74	1.0	61	I-3
3	Past Landfill	59	50	74	1.0	61	I-5
4	Sanitary WWTP Sludge Disposal Area	59	53	74	1.0	62	I-7
5	Stormwater Retention Basin No. 2	59	60	100	0.95	69	I-9
6	B-10 Aeration Basin	58	100	74	0.95	74	I-11
7	Position 65--C-5 Washrack	51	100	67	1.0	72	I-13
8	B-96 Building	51	30	67	1.0	49	I-15
9	TCE Spill	61	60	100	1.0	74	I-17
10	JP-5 Fuel Spill No. 2	47	64	80	1.0	64	I-19
11	JP-5 Fuel Spill No. 1	53	64	80	0.1	7	I-21
12	Sodium Dichromate Spill	49	60	100	0.95	66	I-23

Descriptions of each site, including a brief discussion of the rating results and the most significant factors which contributed in the rating score, are presented below. Approximate locations of the sites are shown in Figure 15. Figure 16 presents approximate operating dates for identified landfills and continuous or intermittent spills.

- Site No. 1-1, the Surface Impoundment (overall score 74), is located immediately south of Building B-90, the Radome Building. This impoundment, which was constructed in 1971, has a surface area of approximately 1.4 acres, interior side slopes of 1.5:1 (horizontal to vertical), 2 feet of freeboard, a depth of approximately 17.5 feet (top of berm), and a total volume of approximately 6.7 million gallons. The Surface Impoundment presently contains approximately 5.5 million gallons (MG) of chemical solutions. During construction of the Surface Impoundment, a 4-foot liner consisting of native material with a high concentration of clay was placed and compacted.

  The Surface Impoundment has primarily been used for disposal of metal plating sludge from the IWTP and heat treatment salt wastes from heat treating and paint stripping operations. Approximately 3,500 tons of wet metal plating sludge (13.5 percent solids) is generated annually during the treatment of spent electroplating baths and rinsewaters which contain cadmium, chromium, lead, mercury, and silver. The Surface Impoundment is used for disposal of this waste. The chemical analysis of the metal plating sludge is presented in Table 17. Two types of heat-treatment salt

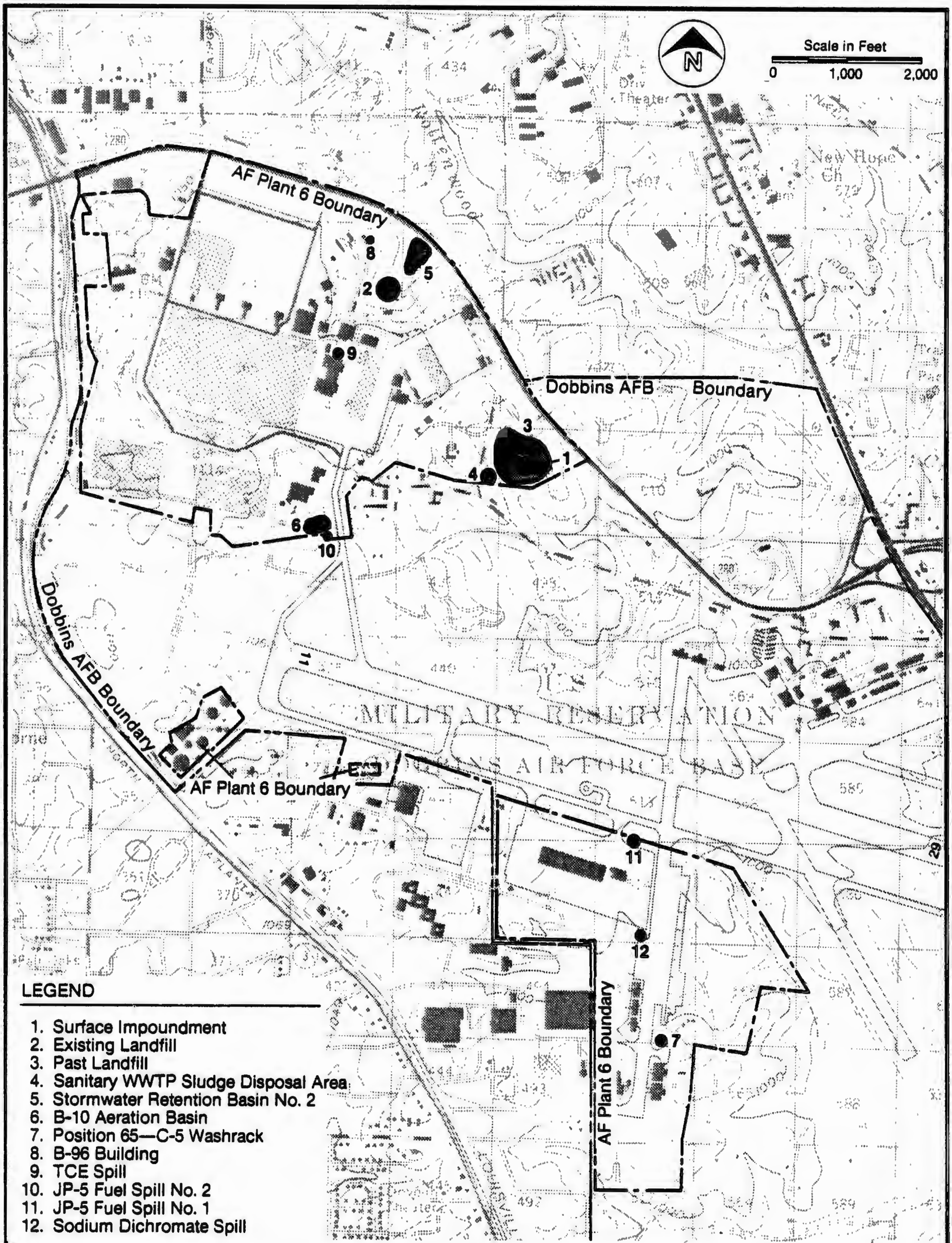

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FIGURE 15.
Location Map of Identified Disposal and Spill Sites at AF Plant 6.

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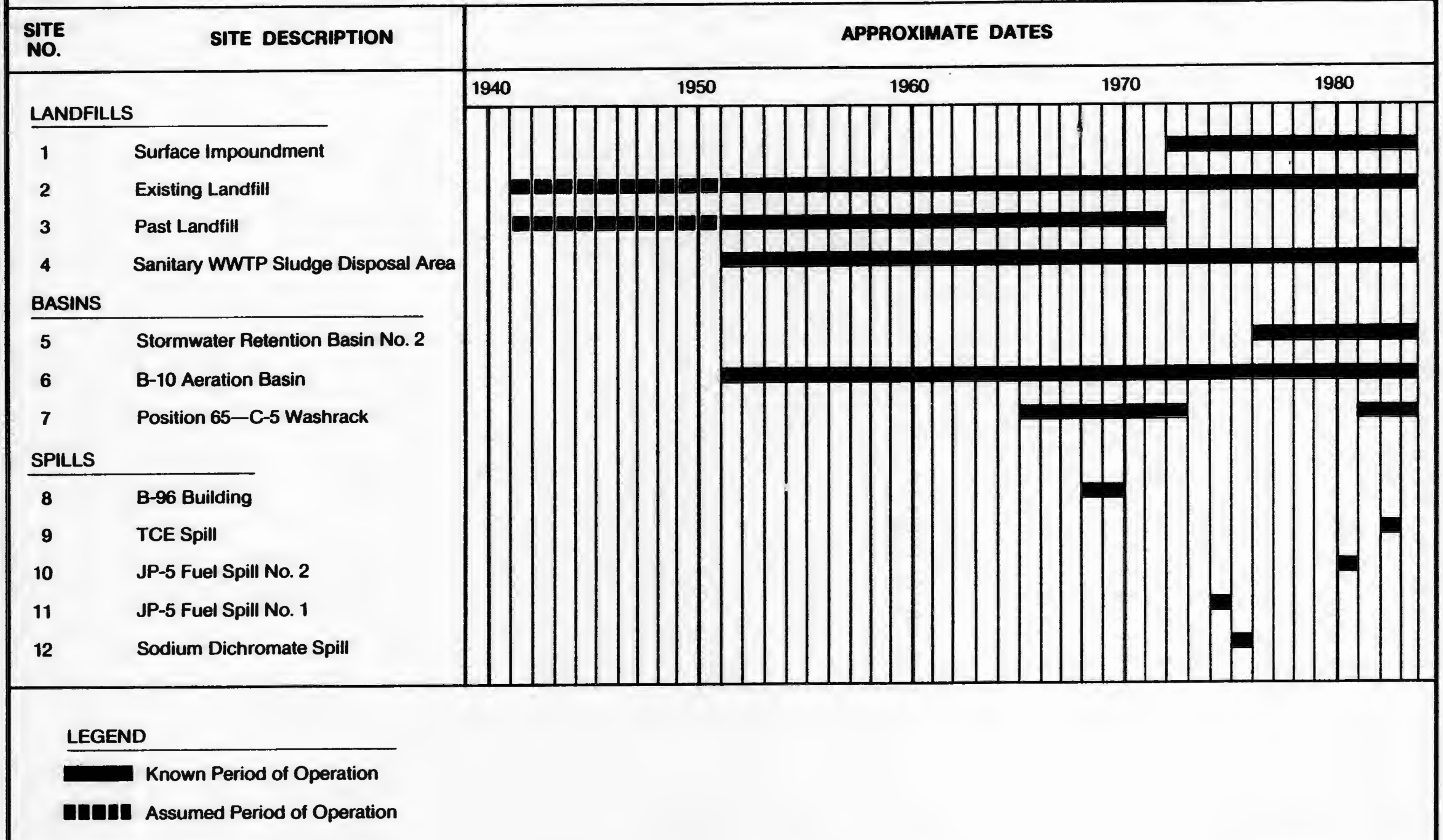


FIGURE 16.
Historical Summary of Activities at Major Disposal and Spill Sites at AF Plant 6.

Table 17
TYPICAL CHEMICAL COMPOSITION OF AF PLANT 6
METAL PLATING SLUDGE

Parameter	Concentration (mg/L) Supernatant	Sludge[a]
Mercury	<0.0001	0.0023
Cadmium	0.04	6.4
Copper	0.415	79.6
Chromium	2.04	526.0
Nickel	0.228	7.69
Lead	0.076	12.86
Zinc	0.697	111.6
Silver	0.31	0.50
Aluminum	6.34	611.4

Source: Information from Chemical Waste Management Material Profile Sheet.

[a]Solids content = 13.5%.

wastes, generated at a rate of approximately 20 tpy, are also stored in the Surface Impoundment. The first type of waste heat treat salt is used in the molten phase to heat-treat aluminum and consists of approximately equal parts of sodium nitrate and potassium nitrate with about one percent sodium dichromate. The second type of salt is used in the molten phase to clean painting hooks and fixtures. This material contains equal parts of sodium nitrate and sodium hydroxide.

From 1971 to 1980, the Surface Impoundment was also used for disposal of approximately 50 tpy of sludge from water-wash paint booths. A typical analysis of the paint sludge is presented in Table 18.

During the upgrading of the IWTP in 1972, an unknown quantity of sludge from the Industrial Waste Lake at the B-10 area was pumped to the Surface Impoundment for disposal (one time occurrence). No analyses are available for the sludge removed from this area; however, since it was primarily composed of precipitated heavy metals, it was probably similar to the metal plating sludge currently being disposed of there.

In 1983, Building B-91, the Chemical Milling building, was cleaned and rehabilitated. Approximately 300 cubic yards (cy) of dry chemical wastes were removed from the building and placed in the Surface Impoundment during this effort. Two types of waste from the Chemical Milling Building were disposed of in the Surface Impoundment: (1) dry material from the etch-tank vent ducts and

Table 18
TYPICAL CHEMICAL COMPOSITION OF AF PLANT 6
PAINT SLUDGE

Parameter	Concentration
Total Solids (%)	29.6
Total Dissolved Solids (%)	6.1
Specific Weight (lb/gal)	9.1
pH	6.1
Flashpoint	None at boil
Btu/lb	1,400
Ash Content (%)	9.85
Organic Components (%)	
Polyvinyl Acetate	5-10
Acrylic Resin	5-10
Metals (ppm)	
Chromium	1,800
Copper	15
Lead	40
Zinc	1,200
Inorganic Components (%)	
Sulfates	2-3
Magnesium	1-2
Silicon Dioxide	2-3
Calcium Carbonate	1-2
Manganese	1-2
Calcium Hydroxide	0.1-0.5

Source: Information from Chemical Waste Management Material Profile Sheet.

(2) sludge from the chemical milling solution. The waste material from the etch-tank vent ducts consisted primarily of carbonate, water, aluminum, sodium sulfate, and miscellaneous metals (trace quantities). The sludge from the chemical milling solution contained primarily copper, zinc, and sulfide. The chemical composition of these two waste materials is presented in Table 19.

In November 1980, the Resource Conservation and Recovery Act (RCRA) became effective. In this regulation (40 CFR 265.90 through 265.94), installation of monitoring wells and ground-water monitoring are required to determine if surface-water impoundments are leaking. As a result of the requirements of this regulation, Law Engineering Testing Company installed five wells (B-1, B-2, B-3, B-4, and B-5) as shown in Figure 16. Monitoring Well B-1 was the initial upgradient well; however, this well was drilled in the area of the Past Landfill (Site No. 3) so Monitoring Well No. B-5 was installed to replace it.

Ground-water samples were collected and analyzed on a quarterly basis in 1982 and a semiannual basis in 1983 in accordance with EPA-approved methods and procedures. The result of the sampling episodes are presented in Table 20. Significant differences in concentrations between the upgradient well (B-5) and the downgradient wells (B-2, B-3, and B-4) can be seen in specific conductivity, total organic halogens, total organic carbon, cadmium, chlorides, phenols, sodium, manganese, and sulfates which indicate that contaminants are migrating from the Surface Impoundment.

Table 19
ANALYSIS OF MATERIAL FROM ETCH-TANK VENT DUCTS AND SLUDGE FROM CHEMICAL MILLING REHABILITATION

ETCH-TANK VENT DUCT MATERIAL

Parameter	Concentration (mg/g)
Carbonate	11
Water	2
Aluminum	66
Calcium	0.007
Chromium	0.0007
Copper	0.0024
Iron	0.0028
Magnesium	0.0036
Phosphorus	0.0029
Silicon	0.02
Sodium	38.6
Sulfate	42.8
Zinc	0.018

SLUDGE FROM CHEMICAL MILLING REHABILITATION

Parameter	Concentration (mg/g)
pH	12.42
Metals (mg/g)	
Copper	258
Zinc	214
Sulfide (mg/g)	0.5325

Source: Lockheed-Georgia Company Part "B" Permit Application.

Table 20
SUMMARY OF RESULTS FOR GROUND-WATER MONITORING PROGRAM

Parameter	January 28, 1982				April 8, 1982				July 7, 1982			
	Well No. 2	Well No. 3	Well No. 4	Well No. 5-B	Well No. 2	Well No. 3	Well No. 4	Well No. 5-B	Well No. 2	Well No. 3	Well No. 4	Well No. 5-B
pH	6.7	5.5	5.2	5.9	7.2	5.6	5.5	6.1	7.0	5.5	5.4	6.2
Specific Conductance, µmhos/cm	1,310	1,410	940	47	1,210	1,450	850	50	1,250	1,400	800	39
Total Organic Halogens, µg/l Cl	1,167	2,385	743	2,215	1,000	1,700	540	780	230	1,490	312	92
Total Organic Carbon, mg/l C	47	49	13	1.2	90	32	15	9.6	10	82	30	11
Cadmium, mg/l Cd	0.02	0.05	0.08	0.01	0.01	0.02	0.04	0.03	0.013	0.027	0.067	0.023
Total Fluoride, mg/l F	0.17	0.17	0.20	0.28	0.28	0.20	0.89	0.14	0.20	0.11	0.56	0.16
Nitrates, mg/l N	0.012	0.14	45	0.068	0.005	0.007	0.062	0.050	0.030	0.013	39	0.34
Chlorides, mg/l Cl	55	51	48	3	49	55	60	3	49	54	53	2
Sodium, mg/l Na	340	300	162	2.8	320	300	148	4	330	330	134	3
Phenols, mg/l as Phenol	0.013	0.008	0.009	0.005	0.011	0.007	0.005	0.007	0.021	0.007	0.005	≤0.004
Manganese, mg/l Mn	3.3	12	5.2	0.26	2.8	13	6.0	0.35	2.6	12	4.7	0.21
Sulfates, mg/l SO_4	292	495	113	19	326	616	165	10	266	656	192	4

Parameter	October 5, 1982				April 1, 1983				October 6, 1983			
	Well No. 2	Well No. 3	Well No. 4	Well No. 5-B	Well No. 2	Well No. 3	Well No. 4	Well No. 5-B	Well No. 2	Well No. 3	Well No. 4	Well No. 5-B
pH	6.9	5.6	5.5	6.2	6.6	5.3	5.0	5.9	6.8	5.6	5.3	6.3
Specific Conductance, µmhos/cm	1,675	1,950	1,075	53	1,192	1,400	871	60	1,390	1,216	776	44
Total Organic Halogens, µg/l Cl	1,490	2,980	510	123	478	2,132	870	42	616	1,125	296	26
Total Organic Carbon, mg/l C	55	63	14	9	40	40	13	10	34	24	5	≤1
Cadmium, mg/l Cd	0.008	0.024	0.070	0.018	0.008	0.012	0.015	0.008	0.018	0.018	0.038	0.015
Total Fluoride, mg/l F	1.34	0.20	0.53	0.34								
Nitrates, mg/l N	0.008	0.008	21.3	0.48								
Chlorides, mg/l Cl	46	54	54	3								
Sodium, mg/l Na	350	320	133	3								
Phenols, mg/l as Phenol	0.019	0.010	0.009	0.006								
Manganese, mg/l Mn	2.7	13	5.8	0.20								
Sulfates, mg/l SO_4	314	624	180	17								

In November 1983, the Chester Engineers prepared a Groundwater Quality Assessment Plan for the Surface Impoundment in accordance with the requirements of Chapter 391-3-11-10 of the Georgia Rules for Hazardous Waste Management (40 CFR Part 265.93(d)(3) Interim Status of Ground-water Quality Monitoring Regulations). The draft plan was reviewed and approved by the Air Force and Lockheed-Georgia Company on Monday, November 21, 1983. The plan was then submitted to the Georgia Environmental Protection Division (EPD) on November 30, 1983 for their review and approval. Implementation of this plan is dependent upon the approval of the Georgia EPD. The recommendations made in the plan were intended to determine the presence or absence of ground-water contamination, the rate and extent of ground-water contaminant migration, and the concentrations of various ground-water contaminants. The Ground-water Quality Assessment Plan recommended that eight additional monitoring wells be installed, four of which would be constructed at locations selected based on the results of a resistivity survey. From the Chester Engineers' report, the basis for locating proposed Monitoring Wells B-6 through B-10, which are located in Figure 16, is presented below:

1. Monitoring Well No. B-6 will establish or discount the presence of any eastern movement of leachate.

2. Monitoring Well No. B-7 will establish or discount the presence of any countergradient flow off the ground-water mound.

3. Monitoring Well No. B-8 will establish or discount the presence of any significant southwestward movement of the plume under the creek and would indicate the presence of any confounding ground-water quality influences from the material placed on the west side of the stream.

4. Monitoring Well No. B-9 will indicate the extent of the contaminant plume because it is located directly downgradient from B-3.

5. Monitoring Well No. B-10 will be used as the new upgradient location.

Installing one new bedrock monitoring well near the location of proposed Monitoring Well No. B-9 was recommended in the Chester Engineers' report. Collecting soil samples from the soil borings used to construct the monitoring well for possible analysis at a later time was also recommended. A comprehensive analysis program was recommended for samples collected from Monitoring Wells No. B-1 through B-10 (including the bedrock well), the existing bedrock wells located on Dobbins AFB, the Surface Impoundment (liquid and solid), and the stream adjacent to the site. A resistivity survey was recommended to determine the extent of contamination. The samples were to be analyzed for the parameters presented in Table 21. A general layout of the Surface Impoundments showing the locations of the proposed and existing monitoring wells is shown in Figure 17.

Table 21
MONITORING PROGRAM RECOMMENDED BY THE CHESTER ENGINEERS IN NOVEMBER 1983
FOR SITE NO. 1--THE SURFACE IMPOUNDMENT

Parameter	Basin Supernatant	Basin Sediment	Sediment Leachate	RCRA Detection Wells	Supplemental Wells	Stream Water	Stream Sediment Water
DRINKING WATER							
Arsenic	X	X	X	X	X	X	X
Barium	X	X	X	X	X	X	X
Cadmium	X	X	X	X	X	X	X
Lead	X	X	X	X	X	X	X
Mercury	X	X	X	X	X	X	X
Selenium	X	X	X	X	X	X	X
Silver	X	X	X	X	X	X	X
Fluoride	X	X	X	X	X	X	X
Nitrate + Nitrite	X	X	X	X	X	X	X
QUALITY (RCRA)							
Chlorides	X	X	X	X	X	X	X
Sodium	X	X	X	X	X	X	X
Phenols	X	X	X	X	X	X	X
Manganese	X	X	X	X	X	X	X
Iron	X	X	X	X	X	X	X
Sulfate	X	X	X	X	X	X	X
INDICATOR (RCRA)							
pH	X	X	X	X	X	X	X
Specific Conductance	X		X	X	X	X	X
Total Carbon	X	X	X	X	X	X	X
Inorganic Carbon	X	X	X	X	X	X	X
Total Organic Carbon	X	X	X	X	X	X	X
Total Organic Halogens (TOX)	X	X	X	X	X	X	X
PRIORITY POLLUTANTS (GC/MS)							
Volatile	X		X		X	X	X
Acid Extractable	X		X				
Base Neutral	X		X				

Table 21--Continued

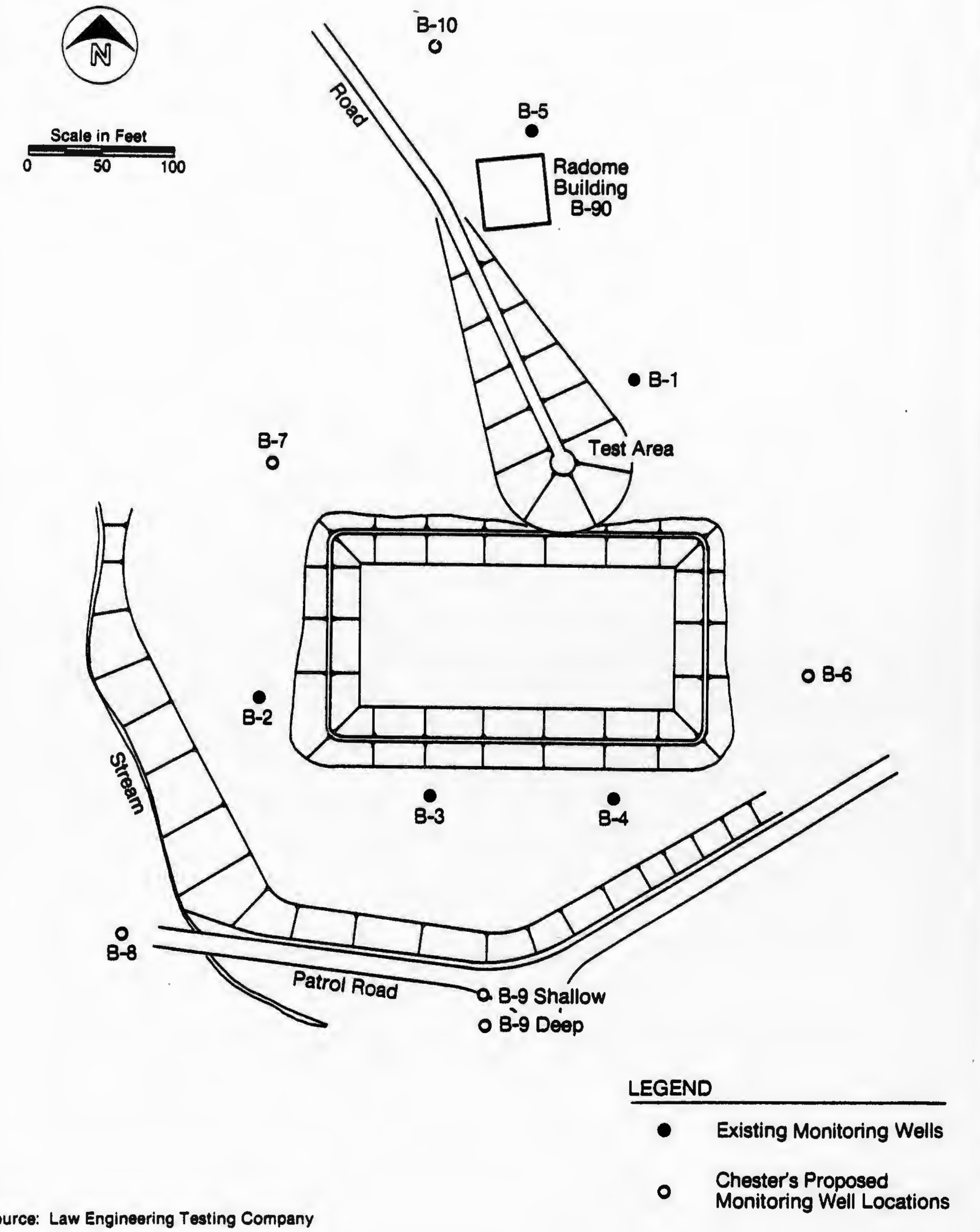
Parameter	Basin Supernatant	Basin Sediment	Sediment Leachate	RCRA Detection Wells	Supplemental Wells	Stream Water	Stream Sediment Water
PART 261 APPENDIX VIII--HAZARDOUS CONSTITUENTS		X		X			
MISCELLANEOUS METALS							
Aluminum	X	X	X	X	X	X	X
Boron	X	X	X	X	X	X	X
Calcium	X	X	X	X	X	X	X
Lithium	X	X	X	X	X	X	X
Magnesium	X	X	X	X	X	X	X
Nickel	X	X	X	X	X	X	X
Potassium	X	X	X	X	X	X	X
Titanium	X	X	X	X	X	X	X
Zinc	X	X	X	X	X	X	X
MISCELLANEOUS ORGANICS							
Acetone	X	X	X	X	X	X	X
Perchloroethylene	X	X	X	X	X	X	X
Oil & Grease (Freon Extract)	X	X	X	X	X	X	X
Herbicides			X	X		X	X
Cyanide	X	X	X	X	X	X	X

Source: Ground-water Quality Assessment Plan prepared by the Chester Engineers.

Notes: 1. Subject to approval by the Georgia EPD.

2. Significantly reducing the number of metallic parameters may be possible if initial analyses indicate unimportant concentrations (Page IV-2, Chester Engineers, 1983).

3. This analytical schedule will undoubtedly be modified during the course of the project.



Source: Law Engineering Testing Company

FIGURE 17.
Layout of Site No. 1—the Surface Impoundment.

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Site No. 1, the Surface Impoundment, received an overall HARM rating score of 74, primarily due to: (1) the known disposal of a large quantity of hazardous waste, (2) direct evidence of contamination, (3) the proximity of the site to an inactive domestic well on Dobbins AFB property (approximately 800 feet), (5) distance to the reservation boundary (600 feet), and (6) the presence of residential areas within one mile of the installation.

o Site No. 2, the Existing Landfill (overall score 61), is located on the north side of the AF Plant 6 near Buildings B-65, B-30, and B-44. This landfill was in use in 1951 when the Lockheed-Georgia Company reopened AF Plant 6. No information was available during the site visit concerning the actual beginning date of the landfill. The landfill, which covers an area of approximately 3 acres, is primarily used for disposal of construction rubble, scrap metal parts, old crates, empty drums, scrap lumber, and other miscellaneous items. During the interviews, reports indicated that medium quantities of waste engine oils, fuels, and solvents may also have been dumped in this area during the 1950s and possibly the 1960s.

Site No. 2, the Existing Landfill, received an overall HARM rating score of 61 primarily due to: (1) suspected disposal of a medium quantity of high hazard waste, (2) proximity of the site to the production wells on AF Plant 6 property (2,600 feet), (3) distance to the reservation boundary, and (4) the presence of residential areas within one mile of the installation.

- Site No. 3, the Past Landfill (overall score 61) is located adjacent to Building B-90, the Radome Building, in the same area as Site No. 1, the Surface Impoundment. This area was first constructed by the Bell Aircraft Company during World War II for disposal of miscellaneous construction rubble. The landfill, used after 1951 by AF Plant 6 for disposal of construction rubble, was closed down in 1971 after construction of the Surface Impoundment (Site No. 1) was completed. The landfill covered an area of approximately 4 acres. Medium quantities of sealants, paints, and adhesives are suspected to have been disposed of in this area from approximately 1970 to 1972. Similar types of wastes may have also been disposed of at other times; however, no reports were given to that effect.

  Site No. 3, the Past Landfill, received an overall HARM rating score of 61 primarily due to: (1) suspected disposal of a medium quantity of high hazard wastes, (2) proximity of the site to an inactive domestic well on Dobbins AFB (800 feet), (3) distance to the reservation boundary, and (4) the presence of residential areas within one mile of the installation.

- Site No. 4, the Sanitary WWTP Sludge Disposal Area (overall score 62) is located east of Building B-64, the Electronics Laboratory. This area has been used since 1951 for disposal of all anaerobically digested dewatered sludge from the Sanitary WWTP. Approximately 500 cy of sludge are collected annually from the sludge drying beds at the Sanitary WWTP for disposal in this area.

Site No. 4, the Sanitary WWTP Sludge Disposal Area, received an overall HARM rating score of 62 primarily due to: (1) suspected disposal of a large quantity of high hazard waste, (2) the proximity of the site to an inactive well on AF Plant 6 (1,500 feet), (3) distance to the reservation boundary, and (4) the presence of residential areas within one mile of the installation.

o Site No. 5, Stormwater Retention Basin No. 2 (overall score 69), is located north of the Existing Landfill (Site No. 2) adjacent to the installation boundary and was constructed in 1977. The stormwater retention basin has a surface area of approximately 0.5 acres. This stormwater retention basin collects runoff from the area in and around the Existing Landfill (Site No. 2) and has received two major spills in the past. The most recent spill occurred on March 22, 1983, when approximately 1,066 gallons of TCE spilled in the B-3 Chemical Lot (see Site No. 9, TCE Spill). Approximately 500 gallons of TCE entered the stormwater drainage system and was diverted to Stormwater Retention Basin No. 2. In an effort to clean up the contaminated water, a granular activated carbon system was used for 30 days to treat the water. This system was later replaced by two surface aerators which remove the TCE from the water by air stripping. The Georgia EPD is aware of this situation and approves of the use of surface aerators for TCE removal. The TCE Spill (Site No. 9) is described later in more detail. Another spill incident occurred in 1980 when the chip collection system sump in Building B-1 clogged and the sump overflowed cutting oil into Stormwater Retention Basin No. 2. The spill was contained by damming the pond and transporting the contaminated water via 10,000-gallon tanker trucks to the IWTP.

Stormwater Retention Basin No. 2 is sampled on a daily basis. The analytical results for these sampling episodes from October 1982 to September 1983 are presented in Table 22.

Site No. 5, Stormwater Retention Basin No. 2, received an overall HARM rating score of 69 primarily due to: (1) confirmed disposal of a small quantity of high hazard waste (TCE), (2) direct evidence of hazardous contaminant migration, (3) proximity of the site to the production wells on AF Plant 6 property (2,800 feet), (4) distance to the reservation boundary (0 feet), and (5) presence of residential areas within one mile of the site.

- Site No. 6, the B-10 Aeration Basin (overall score 74) is located near Building B-10 and is part of the new IWTP. From 1942 to 1972, a small earthen basin, located at or near the B-10 Aeration Basin, was used to treat concentrated cyanide and metal plating wastes. In 1972, the earthen basin was dredged and expanded. All dredged material was pumped to the then newly constructed Surface Impoundment (Site No. 1). The existing B-10 Aeration Basin was constructed in 1972 primarily for three reasons: (1) flow equalization prior to discharge to the Third Level WWTP, (2) biological degradation of carbonaceous material, and

Table 22

SUMMARY OF TRICHLOROETHYLENE CONCENTRATIONS (ppb) IN GROUND-WATER AND STORMWATER RETENTION BASIN NO. 2 AFTER SPILL

Sample Source	Date of Sampling/Concentration																			
	4/01/83	4/04/83	4/11/83	4/14/83	4/18/83	4/20/83	4/22/83	4/29/83	5/03/83	5/09/83	5/17/83	5/20/83	5/24/83	6/01/83	6/10/83	6/14/83	8/15/83	9/12/83	10/11/83	11/14/83
Well No. 1	--	--	--	--	--	--	--	<1.9	--	--	--	2.4	--	--	--	--	--	--	--	--
Well No. 5	--	--	--	--	--	--	--	1,140	--	771	1,035	622	3,190	--	705	2,045	609	132	95	--
Well No. 6	--	--	--	--	--	--	--	--	26.5	10,000	2,100	6,960	156,000	10,300	7,720	5,195	4,120	5,010	6,230	--
Stormwater Retention Basin No. 2 Influent	34	33	558	313	297	792	581	430	--	203	--	--	1,040	226	215	109	245	876	101	366
Stormwater Retention Basin No. 2 Discharge	<1.9	<1.9	--	--	--	509	268	16.2	--	<1.9	--	--	1.9	1.9	11.1	1.9	16.3	20.6	22.8	24.0

(3) spill containment. During the interviewing process, several references were also made to dichromate spills in this area.

Site No. 6, the Industrial Waste Lake, received an overall HARM rating score of 74 primarily due to: (1) confirmed disposal of a large quantity of hazardous waste, (2) the distance to the nearest surface water, (3) proximity of the site to production wells on AF Plant 6 property (1,000 feet), and (4) the presence of residential areas within one mile of the site.

- Site No. 7, Position 65, C-5 Washrack (overall score 72), is located south of the runway near Building B-87. This area was originally constructed in 1967 to wash down newly manufactured C-5A aircraft. It was later used for cleaning C-141 aircraft prior to stretching and C-5A aircraft prior to wing modification. All washwater from the area is pumped to two small retention basins adjacent to the site prior to discharging to the IWTP. These two basins are approximately 50 feet by 100 feet and 25 feet by 50 feet, respectively. The water contained in these basins was visibly contaminated during the site visit.

  From 1967 to 1973, this area was used to clean two C-5A aircraft per month. Approximately 100 gallons of commingled alodine, MEK, and Turco fabrifilm remover was used to clean each aircraft. In 1973, the C-5A program ended and Position 65 was deactivated until 1978 when the stretch program for the C-141 aircraft began. From 1978 to 1981, this area was used to strip paint (approximately 250 square feet) from the bodies of 271 C-141 aircraft so that the fasteners could be located. This operation generated 5 to 10 gallons of paint stripper per aircraft. Also, the bilge area of each aircraft was washed out which generated approximately 50 gallons of hydraulic oil and emulsion cleaner. During the wing modification program from 1981 to 1983, this area was used to clean one C-5A aircraft per month using approximately 100 gallons of Turco.

Site No. 7, Position 65, C-5 Washrack, received an overall HARM rating score of 72 primarily due to: (1) confirmed disposal of a large quantity of high hazard material, (2) proximity of the site to production wells on Dobbins AFB (5,000 feet), and (3) the presence of residential areas within one mile of the site.

- Site No. 8, Building B-96 (overall score 55), is located in the northern portion of AF Plant 6. Based on information obtained during the interviews, the area behind the building may have been used for disposal of approximately 20 gallons per month of commingled sealants, paints, and adhesives from 1968 to 1970.

  Site No. 8, Building B-96, received an overall HARM rating score of 55 primarily due to: (1) suspected disposal of a small quantity of hazardous waste, (2) proximity of the site to production wells on AF Plant 6 property (3,000 feet), (3) distance to the reservation boundary (700 feet), (4) the presence of residential areas within one mile of the site, and (5) the distance to the nearest surface water, Stormwater Retention Basin No. 2 (200 feet).

- Site No. 9, the TCE Spill (overall score 74), occurred on March 22, 1983 in the B-3 Chemical Lot during the off-loading of 10,000 gallons of TCE from a tank car to the 12,000-gallon AG storage tank. A methyl alcohol tank which had a common line with the trichloroethylene tank to the point of tank car off-loading had been recently removed and the maintenance crew had failed to cap off all of the underground lines. As the TCE was transferred from the tank car, it was pumped through the uncapped transfer lines into the ground beneath the asphalt drive (where the methyl alcohol tank had once been). As the pressure built up, the asphalt cracked and TCE began to leak out onto the ground. Approximately 1,066 gallons of TCE were spilled. Approximately half of the spilled TCE entered the storm drain system and was diverted to Stormwater Basin No. 2. The remaining TCE saturated the soil in the area of the spill.

  Immediately following the spill, the Spill Prevention Control, and Countermeasure Plan was implemented to contain the TCE in Stormwater Retention Pond No. 2. A portable Calgon granular activated carbon unit was set up adjacent to the site for 30 days to treat the contaminated water. Because of the effectiveness and lower cost of aeration as a means of removing TCE, two surface aerators were installed in Stormwater Retention Basin No. 2 to replace the GAC System and have been operating since May 1983. Influent and effluent samples from the basin, as well as ground-water samples from Monitoring Wells No. 2, 5, and 6 have been collected and analyzed on a regular basis since the spill. The results of these analyses are presented in Table 22. No action was taken to contain and/or recover the TCE from the soil and ground water in the immediate vicinity of the spill.

Site No. 9, the TCE Spill, received an overall HARM rating score of 74 primarily due to: (1) confirmed disposal of a small quantity of high hazard material, (2) direct evidence of contamination, (3) the population within 1,000 feet of the site, (4) the proximity of the site to production wells on AF Plant 6 property (2,000 feet), and (5) the presence of residential areas within one mile.

- Site No. 10, the JP-5 Fuel Spill No. 2 (overall score 64), occurred on January 14, 1981, when a leak in the fuel system resulted in the loss of 21,000 gallons of JP-5. The incident was caused by a leak in an 8-inch underground JP-5 fuel line between the railroad tank car off-loading station and the fuel tank farm. The leaking line was repaired. In April 1981, Law Engineering Testing Co. conducted surface and subsurface investiga tions to locate the missing fuel. In a meeting between the Environmental Protection Agency, Law Engineering Testing Company, and Lockheed-Georgia Company, a decision was made to leave the fuel-contaminated soil in place and take monthly samples of the ground water for 6 months to ensure that no contamination existed. No evidence of fuel was found during the 6-month sampling program.

Site No. 10, the JP-5 Fuel Spill No. 2, received an overall HARM rating score of 64 primarily due to: (1) confirmed disposal of a large quantity of medium hazard waste, (2) indirect evidence of contamination, (3) proximity of the site to production wells on AF Plant 6 property (2,000 feet), and (4) the presence of residential areas within one mile of the site.

- Site No. 11, JP-5 Fuel Spill No. 1 (overall score 6), occurred on September 28, 1974 when a gasket at a fuel filter in a 6-inch fuel line ruptured causing approximately 25,000 gallons of JP-5 to spill onto the flightline. The JP-5 flowed from the flightline through a concrete storm sewer into Rottenwood Creek and onto the Chattahoochee River. Rottenwood Creek was dammed in an effort to control the spill. The fuel and water mixture was pumped out and trucked to the IWTP. Approximately 90 percent of the spilled fuel was recovered.

  Site No. 11, JP-5 Fuel Spill No. 1, received an overall HARM rating score of 6 primarily due to: (1) recovery and treatment of a confirmed large quantity of medium hazard waste, (2) proximity of the spill to production wells on Dobbins AFB property (3,300 feet), (3) the presence of residential areas within one mile of the site, and (4) the distance to the nearest surface water. A waste management factor of 0.1 was used for this site because the fuel spill was cleaned up and no fuel-contaminated soils were produced because the spill entered a concrete storm sewer.

- Site No. 12, Sodium Dichromate Spill (overall score 66), occurred on December 31, 1976. This spill was caused by a failed electrical feeder which served the L-39 Fire Pump Station. When the electrical feeder failed, six diesel driven pumps started automatically. The pressure surge which resulted when the pumps came on simultaneously caused a rupture in a 24-inch diameter water main approximately 300 feet north of Building B-82 near the intersection of the north-south runway and the B-25 south ramp. Three reservoirs were emptied when the water main ruptured. The reservoir at L-40 contained 3.75 MG of water containing 20 parts per million (ppm) sodium dichromate which was used for corrosion control in the fire protection system and C-5A testing. Reservoirs at B-52 and U-151 contained 0.75 MG and 0.25 MG, respectively, of uncontaminated water. All of the spilled water ran into a stormwater drainage ditch which intersect Rottenwood Creek and, ultimately, the Chattahoochee River and the intake to the Atlanta WTP. Chromium concentrations in Rottenwood Creek ranged from 6 to 8 ppm. By the time the contaminated water reached the Chattahoochee River, the chromium concentration was less than 0.5 ppm.

  Site No. 12, the Sodium Dichromate Spill, received an overall HARM rating score of 66 primarily due to: (1) confirmed disposal of a small quantity of highly hazardous material, (2) proximity of the site to the reservation boundary (500 feet), (3) the water quality of the Chattahoochee River, (4) the distance to the nearest surface water (0 feet), and (5) a waste management practice factor of 0.95.

C. ENVIRONMENTAL STRESS

During the November 1983 site visit, all of the disposal sites were examined for signs of environmental stress related to the presence or migration of hazardous wastes. No signs of stress were detected during the site visit.

V. CONCLUSIONS

A. Information obtained through interviews with 29 installation personnel, installation records, and field observations indicates that hazardous wastes have been disposed of on AF Plant 6 property in the past.

B. Direct evidence (confirmed by laboratory analyses) of contaminant migration exists for the Surface Impoundment (Site No. 1); Stormwater Retention Basin No. 2 (Site No. 5); and the TCE Spill (Site No. 9).

C. Indirect evidence (confirmed by visual observation) of contamination exists at Site No. 7, Position 65, the C-5 Washrack.

D. No evidence of environmental stress due to past disposal of hazardous wastes was observed at AF Plant 6.

E. The potential for surface-water migration of hazardous contaminants is high primarily because of (1) the relatively high precipitation rate, (2) the relatively low evapotranspiration rate, (3) the presence of stormwater drainage ditches and creeks on AF Plant 6 property which are flowing most of the year, (4) several disposal sites are within proximity of these water courses, and (5) moderately low to very low soil permeabilities (1×10^{-3} to 1×10^{-7} cm/sec).

F. The potential for ground-water migration of hazardous contaminants is moderate, primarily because of (1) relatively high precipitation rates, (2) a low evapotranspiration rate, (3) the depth to groundwater, which is shallow (20 to 30 feet), and (4) moderately low to very low soil permeabilities (1×10^{-3} to 1×10^{-7} cm/sec).

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G. Table 23 presents a listing of the sites and their overall scores. The following sites were determined to have significant potential for environmental contamination and warrant some degree of follow-on investigation.

1. Site No. 1, The Surface Impoundment

The Surface Impoundment has been used for disposal of plating sludge, paint sludge, waste heat-treatment salts, and chemical milling wastes since it was first constructed in 1972. Direct evidence of contamination was confirmed by laboratory analyses which revealed statistically significant differences between the upgradient and downgradient wells in specific conductivity, total organic halogens, total organic carbon, chlorides, sodium, manganese, and sulfates.

2. Site No. 6, The B-10 Aeration Basin

The B-10 Aeration Basin is located near Building B-10 and is part of the IWTP. This basin receives treated effluent from the IWG WWTP and provides flow equalization prior to discharge to the 3rd Level WWTP. In addition to receiving treated effluent, this area has been used in the past for spill containment, cyanide treatment, and metal plating treatment.

3. Site No. 7, Positions 65, The C-5 Washrack

Position 65, the C-5 Washrack was used in the past to washdown newly manufactured C-5 aircraft, washdown and strip paint from C-141 aircraft for the stretch program, and washdown C-5 aircraft for the Wing Modification Program. These operations

Table 23
LISTING OF DISPOSAL AND SPILL SITES

Ranking No.	Site No.	Description	Overall Score
1	1	Surface Impoundment	74
2	6	B-10 Aeration Basin	74
3	7	Position 65--C-5 Washrack	72
4	9	TCE Spill	74
5	5	Stormwater Retention Basin No. 2	69
6	12	Sodium Dichromate Spill	66
7	10	JP-5 Fuel Spill No. 2	64
8	4	Sanitary WWTP Sludge Disposal Area	62
9	2	Existing Landfill	61
10	3	Past Landfill	61
11	8	B-96 Building	49
12	11	JP-5 Fuel Spill No. 1	7

generated spent Stoddard Solvent, dry cleaning solution, Turco fabrifilm remover, paint strippers, hydraulic fluids, and emulsion cleaner. Wash waters from these operations are collected in two earthen retention basins prior to discharge to the IWTP. Indirect evidence of contamination observed during the site visit included visibly contaminated water in the earthen basins and a chemical odor in the area.

4. Site No. 9, The TCE Spill

The TCE Spill occurred on March 22, 1983, in the B-3 chemical lot during the off-loading of 10,000 gallons of TCE from a tank car to the 14,000-gallon AG storage tank. Approximately 1,066 gallons of TCE were spilled. Of this, half entered the stormdrain system and was diverted to Stormwater Retention Basin No. 2. The remaining TCE saturated the soil in the area of the spill. Direct evidence of contamination was confirmed by laboratory analyses which revealed TCE ground-water contamination in samples collected from Monitoring Wells No. 5 and 6.

5. Site No. 5, Stormwater Retention Basin No. 2

Stormwater Retention Basin No. 2 was constructed in 1977 for spill containment. This stormwater basin has been used on two occasions to minimize the migration of contaminants off the installation. Currently, Stormwater Retention Basin No. 2 is receiving ground-water contaminated with TCE. To minimize off-site migration of contaminants, two surface aerators were installed to strip the TCE from the water prior to leaving the installation. Direct evidence of contamination was confirmed by laboratory analysis which revealed TCE contamination in the water.

6. <u>Site No. 12, The Sodium Dichromate Spill</u>

The sodium dichromate spill occurred on December 31, 1976. Three reservoirs were emptied when a water main ruptured. The L-40 reservoir contained 3.75 MG of water containing 20 parts per million (ppm) sodium dichromate which was used for corrosion control in the fire protection system and C-5A testing. A reservoir at B-52 and reservoir U-151 contained 0.75 MG and 0.25 MG, respectively, of uncontaminated water. All of the spilled water ran into a stormwater drainage ditch to Poorhouse Creek which intersects Rottenwood Creek and, ultimately, the Chattahoochee River and the intake to the Atlanta WTP. Chromium concentrations in Rottenwood Creek ranged from 6 to 8 ppm. By the time the contaminated water reached the Chattahoochee River, the chromium concentration was less than 0.5 ppm.

7. <u>Site No. 10, The JP-5 Fuel Spill No. 2</u>

The JP-5 Fuel Spill No. 2 occurred on January 14, 1981, when a leak in the fuel system resulted in the loss of 21,000 gallons of JP-5. The incident was caused by a leak in an 8-inch BG JP-5 fuel line between the railroad tank car off-loading station and the fuel tank farm. The leaking line was repaired. In April 1981, Law Engineering Testing Company conducted surface and subsurface investigations to locate the missing fuel. In a meeting between the Environmental Protection Agency, Law Engineering Testing Company, and Lockheed-Georgia Company, a decision was made to leave the fuel-contaminated soil in place and take monthly samples of the ground water to ensure that no contamination exists. No evidence of fuel was found during the 6-month sampling program.

8. <u>Site No. 4, Sanitary WWTP Sludge Disposal Area</u>

The Sanitary WWTP Sludge Disposal Area has been used since 1951 for disposal of all sludge from the Sanitary WWTP.

9. <u>Site No. 2, The Existing Landfill</u>

The Existing Landfill is located on the north side of the AF Plant 6 near Buildings B-65, B-30, and B-44. The landfill, which covers an area of approximately 3 acres, is primarily used for disposal of construction rubble, scrap metal parts, old crates, empty drums, scrap lumber, and other miscellaneous items. During the interviews, reports indicated that medium quantities of waste engine oils, fuels, and solvents may also have been dumped in this area during the 1950s and possibly the 1960s.

10. <u>Site No. 3, The Past Landfill</u>

The Past Landfill is located adjacent to Building B-90, the Radome Building, in the same area as Site No. 1, the Surface Impoundment. The landfill covered an area of approximately 4 acres. The landfill, used after 1951 by AF Plant 6 for disposal of construction rubble, was closed in

1971 after construction of the Surface Impoundment (Site No. 1) was completed. Medium quantities of sealants, paints, and adhesives are suspected to have been disposed of in this area from approximately 1970 to 1972.

H. Sites No. 8 and 11 are not considered to present significant environmental concerns. In general, these sites received low receptor and waste characteristics subscores.

VI. RECOMMENDATIONS

A. PHASE II PROGRAM

A Phase II monitoring program is recommended to confirm or rule out the presence and/or migration of hazardous contaminants.

Tables 24 and 25 present a summary of sites recommended for monitoring, parameters to be measured, and the rationale for the analyses. Figure 18 presents the locations of the sites where sampling is recommended. Sampling is specifically recommended for Site No. 1, the Surface Impoundment; Site No. 2, the Existing Landfill; Site No. 3, the Past Landfill; Site No. 4, Sanitary WWTP Sludge Disposal Area; Site No. 5, Stormwater Retention Basin No. 2; Site No. 6, the B-10 Aeration Basin; Site No. 7, Position 65, the C-5 Washrack; Site No. 9, the TCE Spill; Site No. 10, JP-5 Fuel Spill No. 2; and Site No. 12, the Sodium Dichromate Spill. Work is currently being conducted at Site No. 1, the Surface Impoundment, to determine the extent and magnitude of ground-water contamination at the site. Because of the proximity of Site No. 3 (the Past Landfill) to Site No. 1 (the Surface Impoundment), the recommendations made by the Chester Engineers will also provide information on the extent and migration of contaminants from the Past Landfill. Therefore, no further recommendations for these sites are made in this report. Recommendations for the remaining sites are made to confirm or deny the presence of contamination but not to determine the extent and magnitude of contamination problem.

1. Site No. 1, Surface Impoundment

Results from the ground-water samples which were collected and analyzed on a quarterly basis in 1982 and a

Table 24
RECOMMENDED PHASE II ANALYSES

Sample Type	Disposal Site[a]	VOC[b]	Heavy Metals	Phenols	COD, TOC, and Oil & Grease	Cyanide
Soil Samples	Site No. 6, B-10 Aeration Basin	X	X		X	
	Site No. 9, TCE Spill	X				
	Site No. 12, Sodium Dichromate Spill		X			
Water Samples	Site No. 2, The Existing Landfill	X	X	X	X	X
	Site No. 4, Sanitary WWTP Sludge Disposal Area	X	X		X	X
	Site No. 5, Stormwater Retention Basin No. 2	X				
	Site No. 6, B-10 Aeration Basin	X	X	X	X	X
	Site No. 7, Position 65, Aircraft Washrack	X	X	X	X	
	Site No. 9, TCE Spill	X				
	Site No. 10, JP-5 Fuel	X			X	

[a]Site No. 1, the Surface Impoundment, is not included in this table because a monitoring program to determine the extent and magnitude of the ground-water contamination is currently being conducted by the Lockheed-Georgia Co.

[b]VOC, Volatile organic compounds.

Table 25
RATIONALE FOR RECOMMENDED ANALYSES

Parameter	Rationale
Volatile Organic Compounds (VOC)	Organic solvents used onsite (past and present); persistent components of fuels and other POL products, e.g., benzene and toluene.
Heavy Metals (lead, chromium, and cadmium)	Potential sources identified (leaded fuel, paint wastes, and metal plating wastewaters/sludges.
Phenols	Phenolic cleaners and paint strippers used in the past.
COD, TOC, and Oil and Grease	Fuel spill indicators and indicators of non-specific contamination.
Cyanide	Plating processes.

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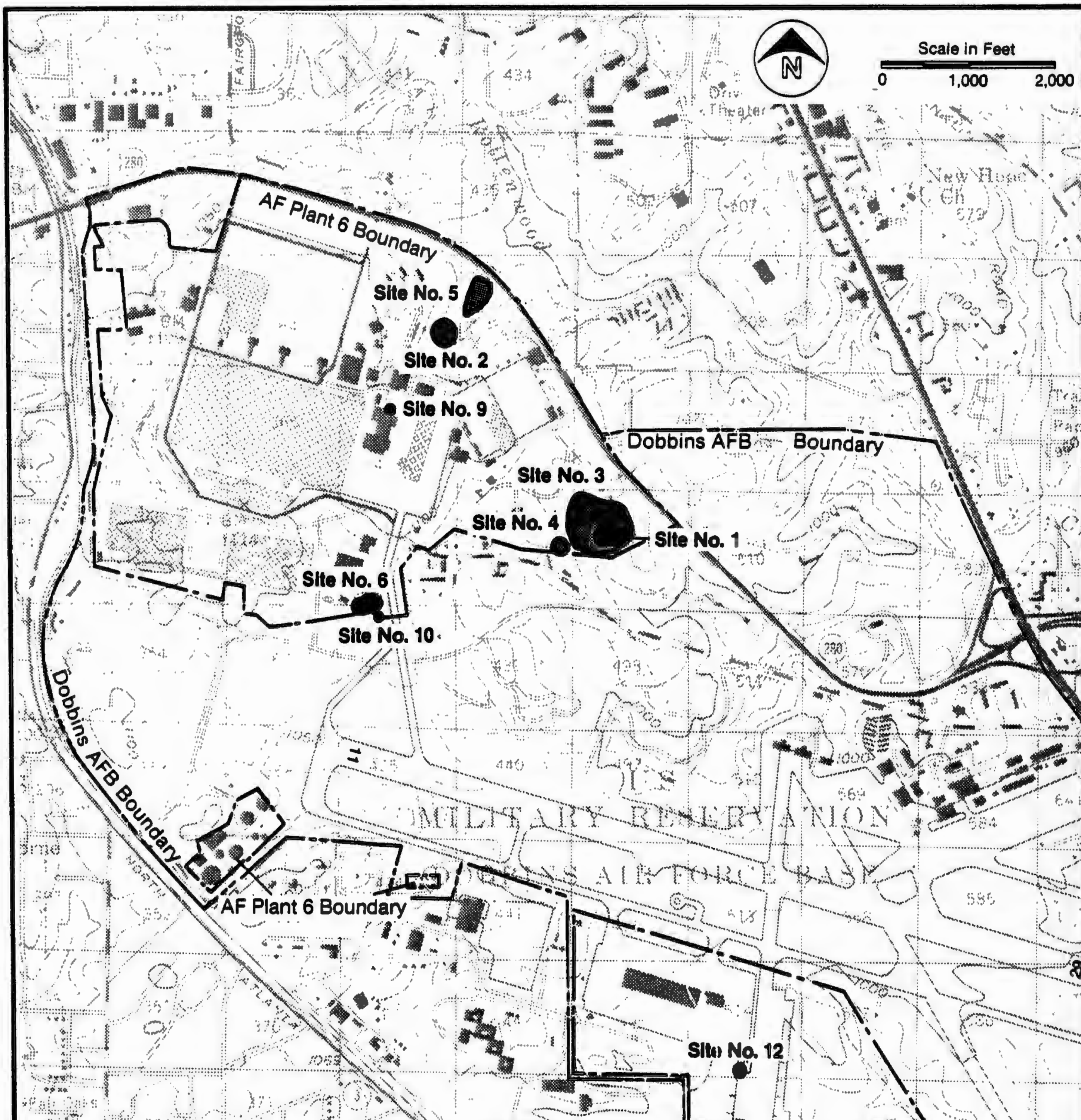
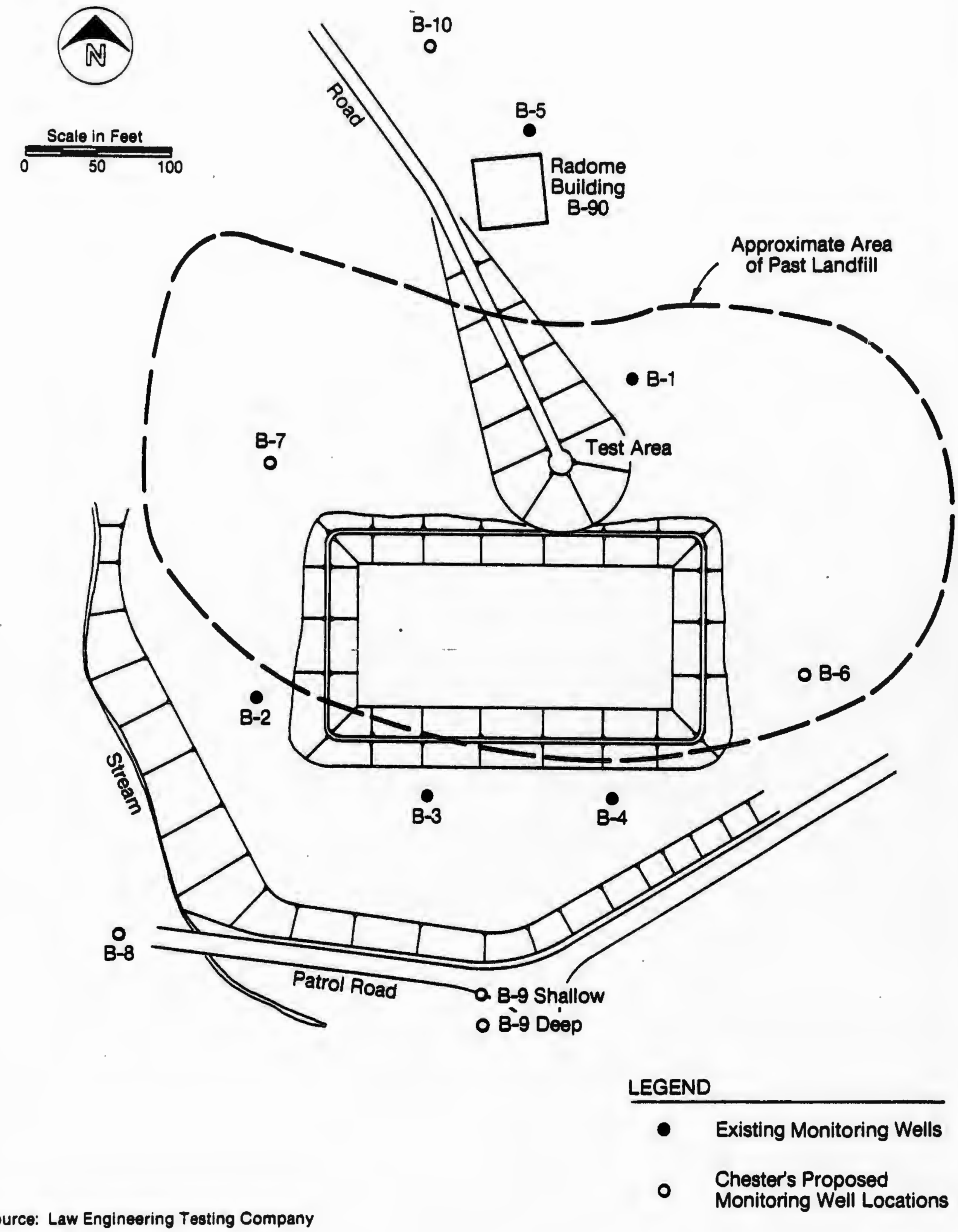


FIGURE 18.
Location Map of Sites Recommended for Limited Phase II Monitoring.

semi-annual basis in 1983 indicate that ground-water contamination and contaminant migration have occurred at the site. Specifically, significant differences in concentrations between the upgradient and downgradient wells can be seen in samples analyzed for specific conductance, total organic carbon, cadmium, chlorides, phenols, sodium, manganese, and sulfates. A ground-water quality assessment plan was developed by the Chester Engineers which recommends a comprehensive monitoring program to determine the extent and magnitude of the contamination problem. The locations of the existing and recommended monitoring wells are shown in Figure 19. This ground-water quality assessment plan was reviewed and approved by the Lockheed-Georgia Company, AFPRO, and ASD. It is currently being reviewed by the Georgia EPD. Since this work is being conducted at the present time, CH2M HILL makes no specific recommendations for monitoring in the Phase I report but recommends that the program under consideration be initiated.

2. <u>Site No. 2, The Existing Landfill</u>

The Existing Landfill is primarily used for disposal of construction rubble. However, medium quantities of waste engine oils, fuels, and solvents using oils reportedly dumped in this area during the 1950s and possibly the 1960s. To confirm or rule out the presence of contamination and its migration from the existing landfill, one upgradient and one downgradient monitoring well are proposed. These monitoring wells should be constructed to the top of the bedrock using a hollow-stem auger. Each well should be screened to 10 feet above the bedrock. Ground-water samples should be collected and analyzed in accordance with Table 24. The locations of the proposed monitoring wells are shown in Figure 20.



Source: Law Engineering Testing Company

FIGURE 19.
Monitoring Well Locations at Site No. 1—the Surface Impoundment and Site No. 3—the Past Landfill.

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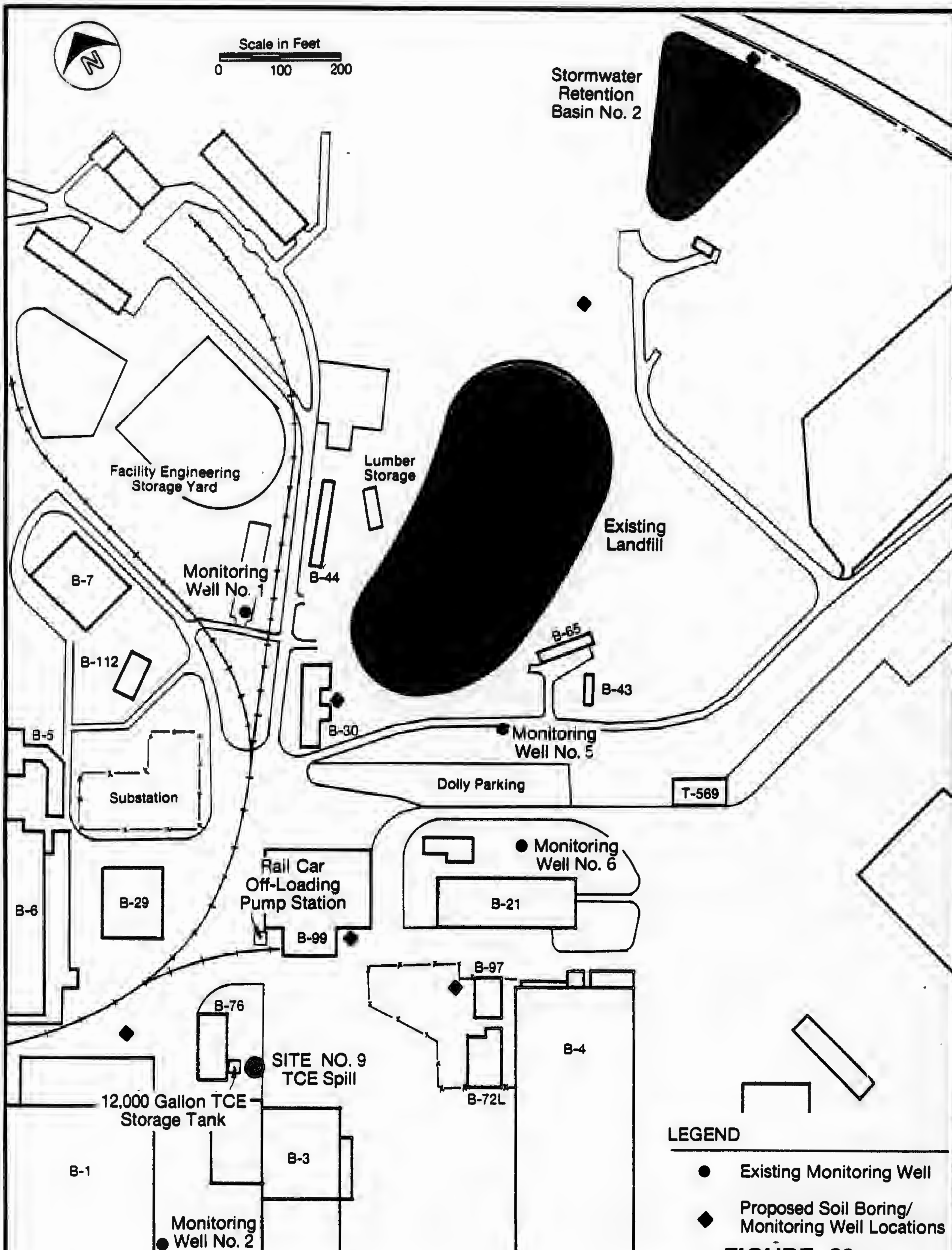

FIGURE 20.
Recommended Monitoring Well and Preliminary Sampling Locations for Site No. 2—the Existing Landfill; Site No. 5—Stormwater Retention Basin No. 2; and, Site No. 9—the TEC Spill.

3. Site No. 3, The Past Landfill

The Past Landfill was used from 1951 to 1972 for disposal of construction rubble. Medium quantities of sealants, paints, and adhesives are suspected to have been disposed of in this area from 1970 to 1972. This site is immediately adjacent to Site No. 1, The Surface Impoundment. The Chester Engineers recommended a comprehensive sampling program for surface impoundment which was outlined in Section IV. The location of the proposed monitoring wells is presented in Figure 19. These monitoring wells will also confirm or rule out the presence and migration of contamination from the Past Landfill. Since the recommendations made by the Chester Engineers are currently being conducted, no additional recommendations will be made in this report for this site.

4. Site No. 4, Sanitary WWTP Sludge Disposal Area

The Sanitary WWTP Sludge Disposal Area has been used since 1951 for disposal of all sludges from the Sanitary WWTP. This sludge could potentially contain heavy metals and organics since the powdered activated carbon (PAC) is commingled with the sludge. To confirm or rule out the presence of contamination and its migration from this area, one downgradient well is recommended. This monitoring well should be constructed to the top of the bedrock using a hollow-stem auger. The monitoring well should be screened 10 feet from the top of the bedrock. Groundwater samples should be collected and analyzed in accordance with Table 24. The location of the proposed well shown in Figure 21.

5. Site No. 5, Stormwater Retention Basin No. 2

Stormwater Retention Basin No. 2 has received two spills in the past, the most recent being a portion of the

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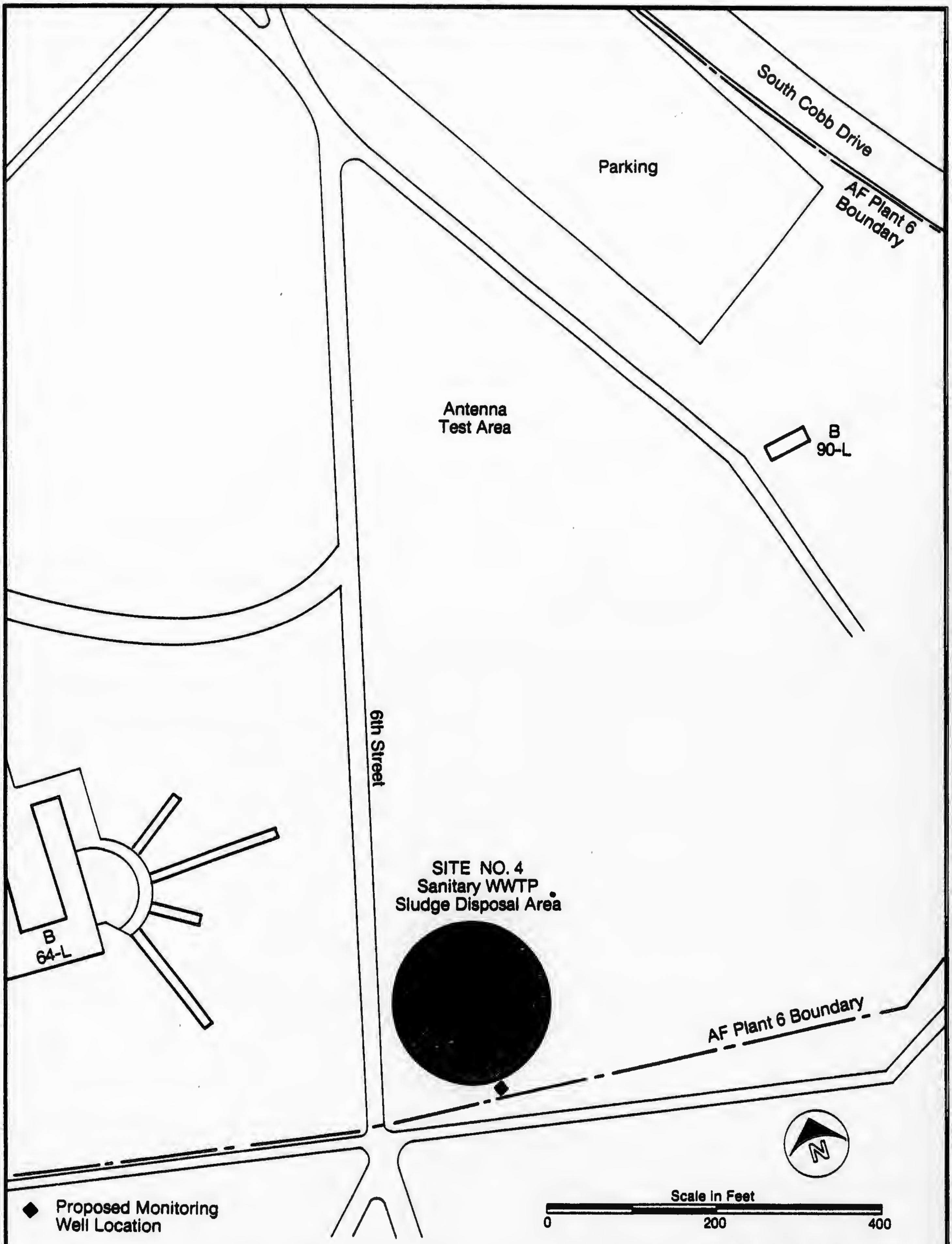

FIGURE 21.
Recommended Monitoring Well Location and Preliminary Sampling Location for Site No. 4 Sanitary WWTP Sludge Disposal Area

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March 22, 1983, TCE spill. Since the spill, samples from the influent and effluent to the Stormwater Retention Basin were collected and analyzed for TCE concentrations. Initially, a portable granular activated carbon unit and later surface aerators were installed at the pond in an effort to remove the TCE prior to discharge off the installation boundary. The surface aerators continue to be used for this purpose. The presence and migration of TCE off of the installation property was confirmed. The Georgia EPD is aware of the situation and has reviewed the method of treatment being used. The Phase II recommendations for Stormwater Retention Basin No. 2 are to continue sampling and analyzing the influent and effluent for VOCs on a monthly basis. One monitoring well should be installed at the property line of AF Plant 6 to determine if groundwater contamination is migrating off of the installation. This monitoring well should be installed to the top of the bedrock using a hollow-stem auger and screened to 10 feet above the bedrock. The location of the monitoring well are shown in Figure 20.

6. Site No. 6, the B-10 Aeration Basin

The B-10 Aeration Basin has been used for effluent storage and spill containment since 1972. Prior to that time, the earthen basin in the general area of the B-10 Aeration Basin was used for treatment of concentrated cyanide and metal-plating wastes. Since this basin is normally full, it provides a constant source for groundwater recharge. Because of the nature of the basin, it has a high potential for ground-water contamination.

A Phase II monitoring program is recommended to determine if contamination exists. In addition to Monitoring Well No. 9, which is already installed, three monitoring wells are recommended in the immediate vicinity of the

B-10 Aeration Basin as shown in Figure 22. These wells should be constructed to the top of the bedrock using a hollow-stem auger. Each well should be screened 10 feet above the bedrock. Soil samples should be collected every 5 feet and preserved. Beginning at ground level, the samples collected at 20-foot intervals should be analyzed in accordance with Table 24. Ground-water samples should also be collected and analyzed in accordance with Table 24.

7. Site No. 7, Position 65, the C-5 Washrack

Visible water contamination was noted during the site-visit at the two basins which collect washwater from the C-5 Washrack. During interviews, the reference was made to aircraft washing and stripping operations conducted in this area. Monitoring Wells No. 14 and 15 were installed in the area of the C-5 Washrack in January 1983. Samples collected from these wells are only visibly inspected for contamination and, to date, no contamination has been seen. However, because of the type of operations conducted in this area, a more quantitative approach is recommended in the Phase II Monitoring Program. Samples should be collected from each of the two basins and from Monitoring Wells No. 14 and 15 and analyzed in accordance with Table 24. If contamination is found, then a more extensive monitoring program should be conducted to determine the extent and magnitude of contamination. Figure 23 illustrates the recommended Phase II monitoring locations.

8. Site No. 9, the TCE Spill

Since the TCE spill occurred on March 22, 1983, ground-water sampling and analysis have been conducted which indicated TCE contamination in Monitoring Wells No. 1, 5, and 6. Since the presence of TCE contamination is confirmed, Phase II recommendations are made to determine the extent and magnitude of the TCE spill.

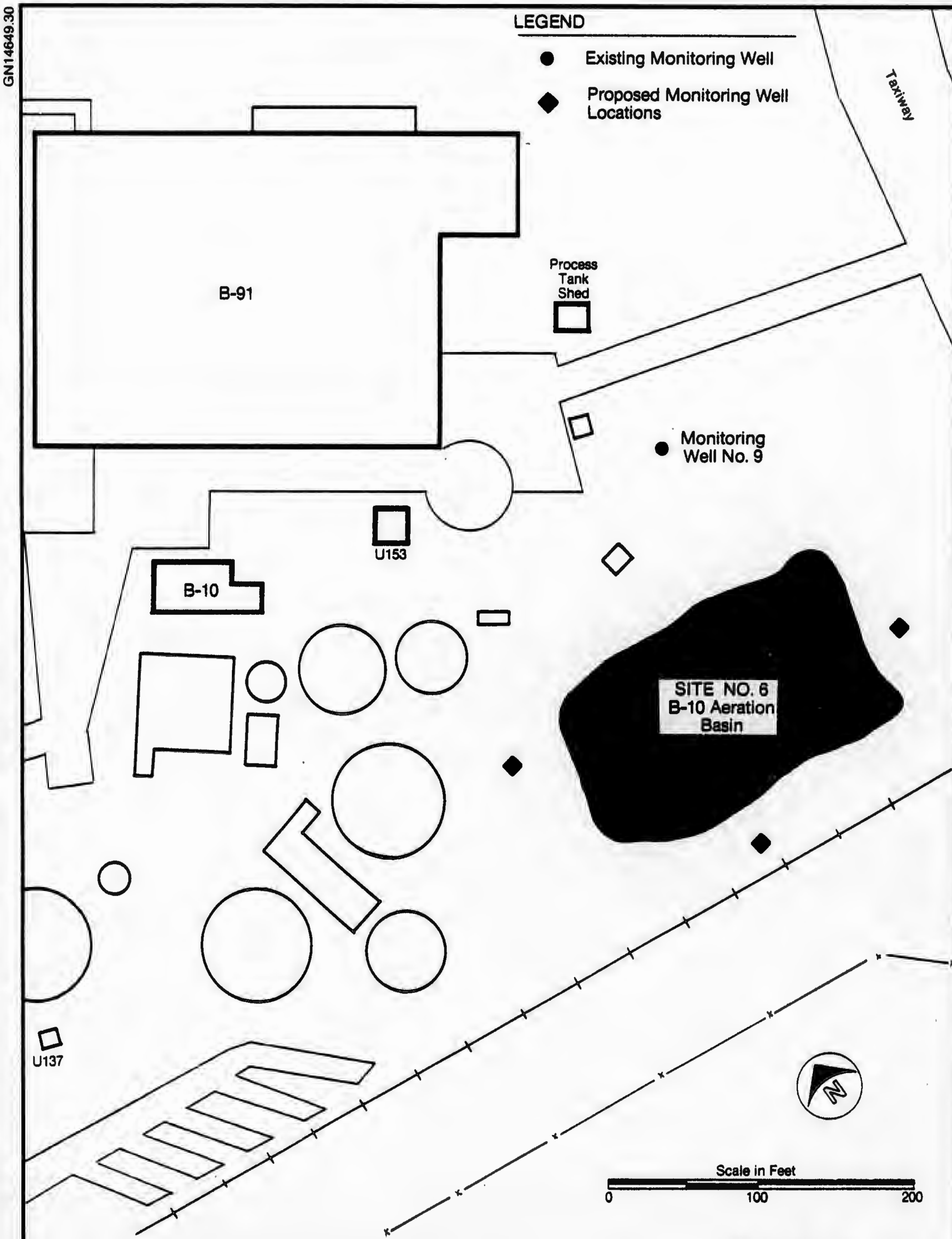

FIGURE 22.
Recommended Monitoring Well and Preliminary Sampling Locations for Site No. 6—the B-10 Aeration Basin.

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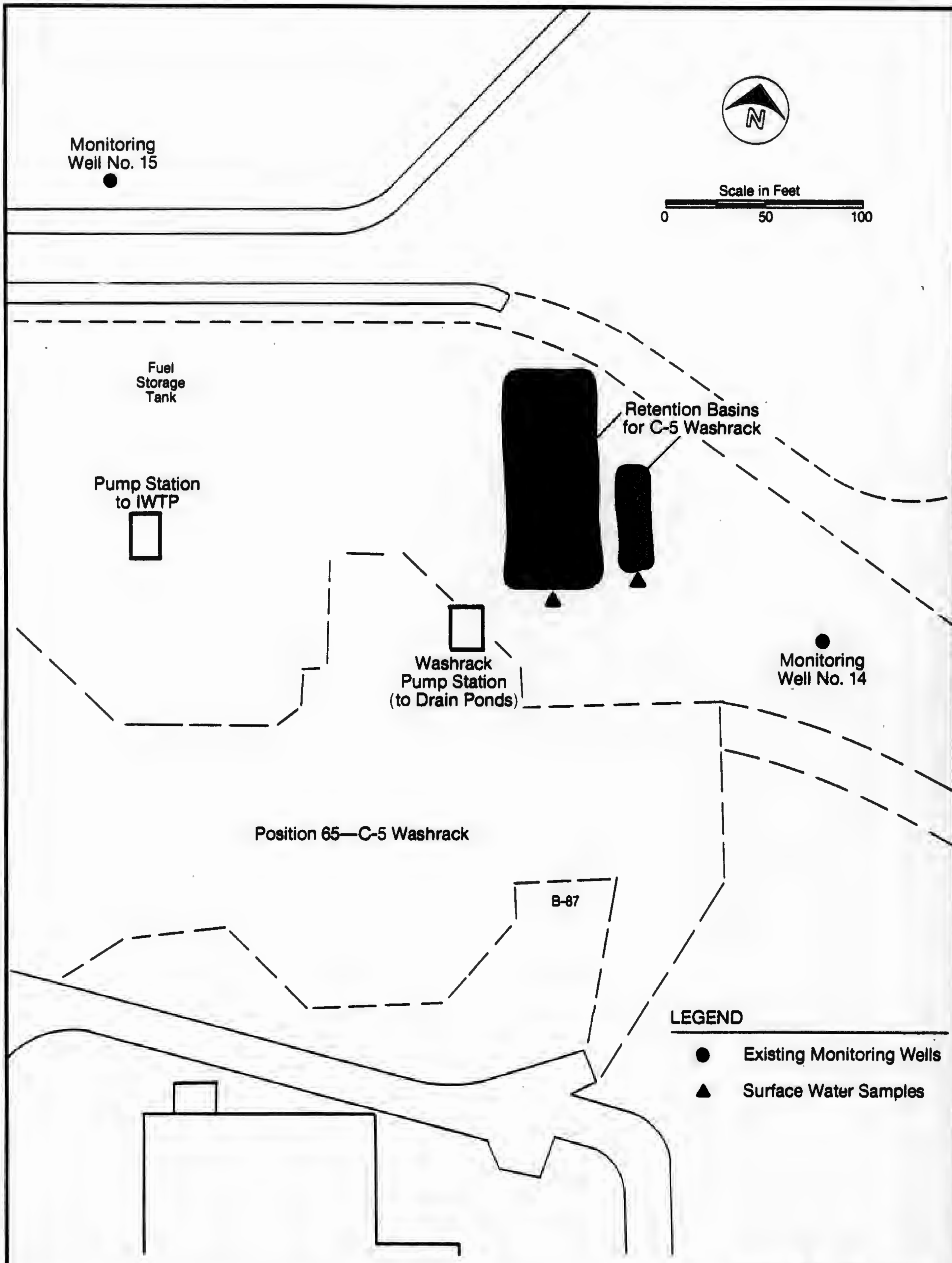

FIGURE 23.
Recommended Preliminary Sampling Locations for Site No. 7—
Position 65—C-5 Washrack.

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Five monitoring wells are recommended in the approximate locations presented in Figure 20. One monitoring well installation is recommended at the site of the spill to determine the vertical distribution of TCE contamination. Two monitoring wells are located to determine the lateral dispersion of the TCE. One monitoring well is recommended between the site of the spill and Monitoring Wells No. 5 and 6 to confirm that the source of contamination in those wells is the March 1983 TCE spill. Installing an additional monitoring well is recommended downgradient from Monitoring Wells No. 5 and 6 to determine the extent and magnitude of the contaminant migration of past Monitoring Wells No. 5 and 6.

These monitoring wells should be constructed to the top of the bedrock using a hollow-stem auger. Each well should be screened to 10 feet above bedrock. Soil samples should be collected at 5-foot intervals and preserved for later analysis (if necessary). The monitoring wells should be screened 10 feet from the top of the bedrock.

Monitoring Well No. 2, assumed to be uncontaminated, should be used as the upgradient well. Samples should be collected from the newly constructed wells, as well as Monitoring Wells No. 1, 2, 5, and 6, and analyzed in accordance with Table 24.

9. <u>Site No. 10, JP-5 Fuel Spill No. 2</u>

The JP-5 Fuel Spill occurred on January 14, 1981, when a leak in the fuel system resulted in a loss of 21,000 gallons of JP-5. In April 1981, the Law Engineering Testing Company was contracted to locate the missing fuel. In a meeting between the EPA, Law Engineering Testing Company and Lockheed-Georgia Company, the decision was made to leave the fuel saturated soil in place and take monthly ground-water samples to ensure that no contamination exists. No evidence of fuel was found during the 6-month sampling program. To ensure that no ground-water contamination has occurred since the end of the 6-month sampling program, further sampling on a quarterly basis for 1 year is recommended.

10. Site No. 12, Sodium Dichromate Spill

The Sodium Dichromate Spill occurred on December 31, 1976, when approximately 3.75 MG of water containing 20 ppm of sodium dichromate spilled into a stormwater drainage ditch which intersected Poorhouse Creek and Rottenwood Creek and eventually discharged to the Chattahoochee River. Contaminated surface water resulting from the spill is probably no longer present in the drainage ditch, Rottenwood Creek, or the Chattahoochee River; however, contaminated soil sediments may still be present. Collection of three soil sediment samples at 100-foot intervals beginning at the site of the spill and continuing down the stormwater drainage ditch are recommended. The sediment samples should be analyzed for chromium (total and leachable). Figure 24 illustrates the locations of the sampling points.

11. Groundwater samples should be collected from all of the existing monitoring wells to confirm or rule out the presence of contamination due to leaking tanks. The parameters to be analyzed for should be established based on the constituents of each tank.

12. All existing and proposed monitoring wells should be surveyed to determine their ground-water surface elevations. A potentiometric map should be constructed from this information.

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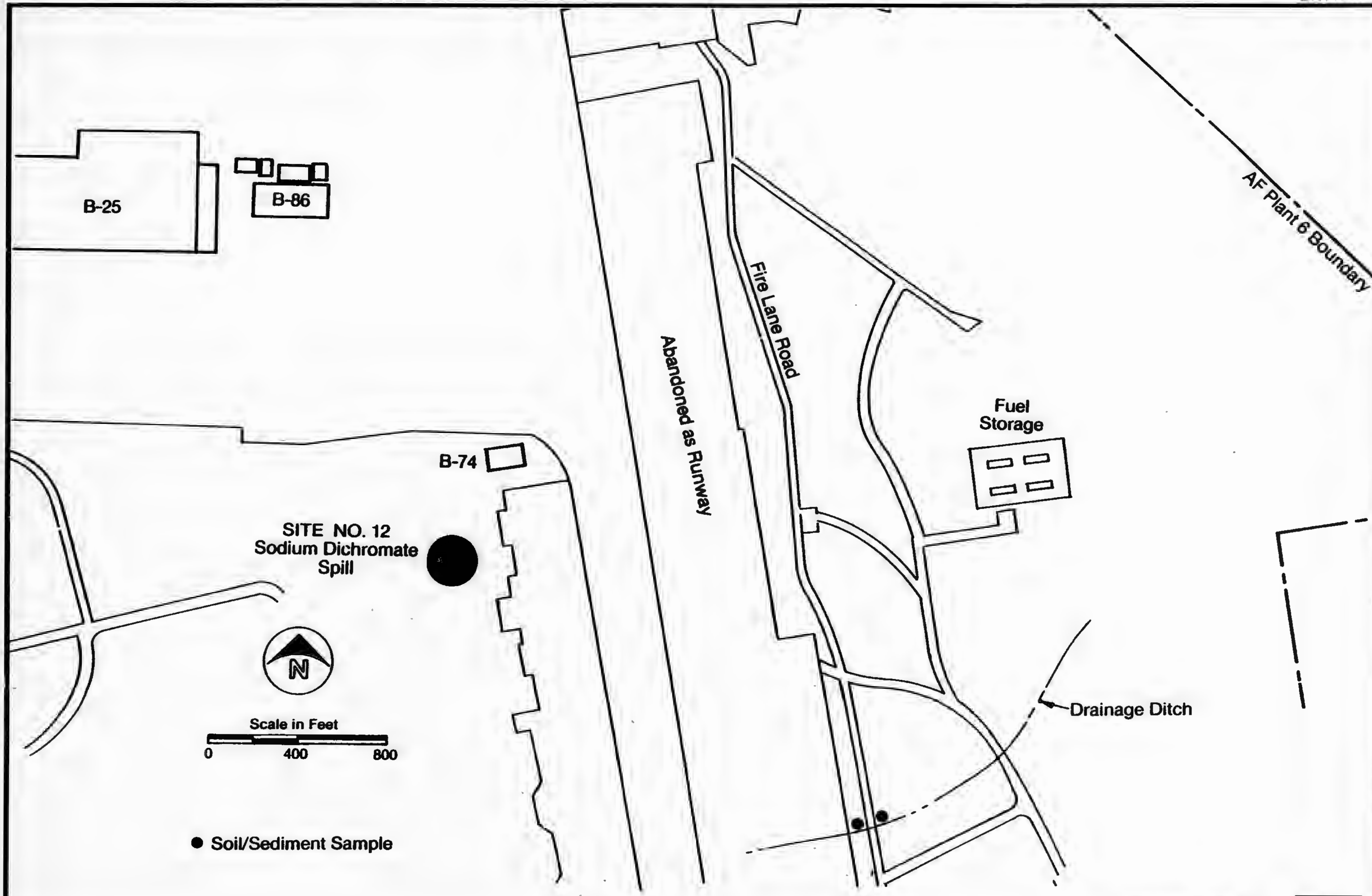

FIGURE 24.
Preliminary Sampling Points for Site. No. 12—the Sodium Dichromate Spill.

B. OTHER IRP ENVIRONMENTAL RECOMMENDATIONS

Other IRP environmental recommendations that have resulted from the installation site visit and records search include the following:

1. The use of the two basins at Site No. 7, Position 65, the C-5 Washrack should be discontinued. The contaminated water should be pumped to the IWTP for treatment, and the basins should be properly closed. The piping system should be reworked to pump washwater from the washrack directly to the IWTP.

2. All major UG tanks should be pressure tested.

3. The use of existing production wells on AF Plant 6 and Dobbins AFB should be investigated. If they are going to be used in the future, they should be logged to determine their existing condition. If they are going to be abandoned, they should be properly capped.

4. The production wells should also be inspected to ensure that they are not connected to the existing water system.

5. The discharge lines from the production areas to the IWTP should be pressure tested to determine if exfiltration is occurring which could potentially pollute the ground water.

APPENDICES

Appendix A RESUMES OF TEAM MEMBERS

Appendix B OUTSIDE AGENCY CONTACT LIST

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Appendix A
RESUMES OF TEAM MEMBERS

J. KENDALL CABLE
Environmental Engineer

Education

M.E., Civil Engineering, University of Tennessee
B.S., Civil Engineering, University of Tennessee

Experience

Mr. Cable's responsibilities at CH2M HILL involve projects dealing with hazardous and solid waste management and industrial waste treatment processes. He is also involved in municipal water and wastewater treatment projects.

Mr. Cable's hazardous waste experience includes hazardous materials records search for the United States Air Force, in which past hazardous material disposal sites were identified and suspected problems associated with the sites were evaluated. He also worked on a conceptual design and conducted pilot testing on a prototype packed tower aeration unit for removal of volatile organic compounds (VOC's) from groundwater in Port Malabar, Florida.

Mr. Cable's industrial wastewater experience includes a bench-scale treatability study and conceptual design for the American Hoechst Corporation in Mt. Holly, North Carolina; wastewaters generated at the facilities were a complex mixture of synthetic organic compounds. He also participated in a pilot plant treatability study and conceptual design for Hercules, Inc., in Brunswick, Georgia; wastewaters generated at the facilities resulted from the production of organic gum and wood chemicals, cellulose-based water-soluble polymers, and specialty organic chemicals.

Mr. Cable's municipal wastewater studies have included a wastewater master plan for Manatee County, Florida, an addendum to the West Pasco County Wastewater Facilities Plan--New Port Richey Service Area, and a cost-effective analysis of two types of package wastewater treatment plants. He also contributed to a study for the U.S. Army Corps of Engineers to develop functions for estimating the capital and O&M costs associated with surface-water intake systems. The cost functions were verified using cost data from projects previously designed by CH2M HILL. He conducted a sampling program and developed design flow and loads for the Ocean Springs Regional Land Treatment System. He helped to develop conceptual documents and design instructions for the Ocean Springs Regional Land Treatment System in Ocean Springs, Mississippi. The system included a 75-acre multicellular facultative lagoon, a 15.75-mgd pump station, and 415 acres of sprinkler irrigation with subsurface drainage. He evaluated the flows, loads, and operating efficiency of an existing facultative lagoon in Ridge Spring, South Carolina. From this information, he developed a conceptual design for an aerated lagoon for the town. He conducted a sampling program and evaluated the existing and future capacity of a 1.0-mgd activated sludge WWTP in Silver Springs Shores near Ocala, Florida. He also participated in development of a municipal sludge disposal plan for the Pascagoula/Moss Point Regional Wastewater Treatment Plant in Pascagoula, Mississippi. In this project, various sludge disposal options were evaluated, and land application on privately owned farmland was selected. Based on this information, a disposal plan and feasibility study were developed. He also evaluated the method of municipal sludge land application used by a WWTP located in Silver Springs Shore near Ocala, Forida.

Professional Registration

Engineer-In-Training, Tennessee

Membership in Professional Organizations

American Society of Civil Engineers
Water Pollution Control Federation
Chi Epsilon
Toastmasters

Publications

"An Evaluation of the Adsorption and Flotation of Nonpolar Organic Compounds in Clay Colloid Suspensions." Masters Thesis, University of Tennessee. 1980.

"Developing Cost Estimating Methods for Surface Water Intake Structures." Presented at ASCE National Specialty Conference entitled Water Supply--The Management Challenge in Conjunction with the U.S. Army Engineer Waterways Experiment Station, Tampa, Florida. March 1983.

Peralta, Jose R., Thomas V. Waldeck, J. Kendall Cable, Henry A. Sheldon, and Manuel R. Vilaret, Ph.D. "Case Study: A Utility's Response to Volatile Organic Compound Contamination in Groundwater." Presented at the 1983 Joint Annual Conference of the FS/AWWA, FPCA, and FW and PCOA, Miami, Florida, October 1983.

MARK W. COREY

Education

M.S., Environmental Systems Engineering, Clemson University
B.S., Civil Engineering, Mississippi State University

Experience

Mr. Corey works in the Industrial Processes Division. His range of engineering experience includes laboratory and pilot treatability testing; sampling and monitoring of industrial waste treatment processes; computer analysis of engineering problems; and preliminary treatment facility design.

Mr. Corey served as lead field engineer for a treatability testing program for the General Electric Plastics Division. The program included bench-scale testing of activated sludge and pilot-scale testing of a rotary drum screener. Other project responsibilities included sewer survey, wastewater characterization, computer analysis of historical WWTP operating data, and predesign of full-scale waste treatment facilities.

Mr. Corey was project engineer for bench and pilot-scale testing of DAF and filtration for algae removal from oxidation pond effluent for Gulf Oil Company, Port Arthur, Texas.

Mr. Corey has had troubleshooting experience for a package activated sludge treatment system for a private restaurant. His responsibilities included limited treatability testing.

As project engineer, Mr. Corey was responsible for bench-scale metals removal testing and preliminary design of full-scale waste treatment facilities for Beech Aircraft.

In previous employment, Mr. Corey worked for an environmental laboratory conducting analytical testing and treatability studies for wastes from chemical manufacturing, poultry processing, and plywood manufacturing. Also, he was field engineer for the M.S. Corps of Engineers for several studies to upgrade oxidation pond effluent.

Professional Registration

Engineer-in-Training: Mississippi

Membership in Professional Organizations

Alabama Association for Water Pollution Control
Water Pollution Control Federation

ROBERT L. KNIGHT
Ecologist

Education

Ph.D., Systems Ecology, University of Florida
M.S.P.H., Environmental Chemistry and Biology, University of North Carolina
B.A., Zoology, University of North Carolina

Experience

Dr. Knight's responsibilities at CH2M HILL involve all aspects of environmental study, including design and implementation of field studies, data analysis and interpretation, project management, environmental systems overview analysis, impact analysis, prediction, and assessment. His experience has covered a wide range of applied research problems in aquatic and terrestrial environments, including computer simulation analyses.

Dr. Knight has managed several marine ecology field studies in Florida including: a 4-year study of estuarine metabolism at the Crystal River Nuclear Power Plant; a baseline conditions assessment of seagrass and oyster reef ecology in the Withlacoochee and Crystal Bays; and a 1-year productivity study and preparation of a simulation model of the Indian River estuary.

Dr. Knight participated in the design and implementation of long-term studies of fate and effects of toxic metals in stream mesocosms. He had direct responsibility for the chemical and biological monitoring of algal and insect populations, prepared a toxicity simulation model for cadmium, and developed general techniques for quantification of toxicity in biological systems.

Dr. Knight performed extensive field work at Silver Springs, Florida, to investigate the relationship between plant productivity and consumer organizations. As one part of that study, he developed a new microcosm design for the study of flowing aquatic systems.

Dr. Knight has conducted several studies on the feasibility of using natural and artificial wetlands for the assimilation of domestic wastewaters. Wetland systems include *Spartina* salt marshes and pocosins in North and South Carolina, hardwood swamp and prairie wetlands in Florida, and a marsh wetland in Mississippi. He has played a major role in site investigations and in developing management criteria for wetland and land treatment systems.

ROBERT L. KNIGHT

Dr. Knight has participated in a number of hazardous waste studies, including three Superfund sites, a hazardous waste landfill, and six Air Force bases, nationwide. He has prepared ecological assessments of susceptible environments and has participated in water quality sampling in groundwater studies.

Dr. Knight has considerable expertise in the study of phytoplankton and other algae in aquatic systems. He has conducted field verification studies of the Algal Assay Procedure, studied the effects of power plant entrainment on phytoplankton, and provided taxonomy and enumeration of phytoplankton and periphyton from rivers and streams.

Publications

Dr. Knight has authored several technical papers on ecosystem metabolism, phytoplankton ecology, and heavy metal dynamics in aquatic systems. Representative papers include:

Energy Model of a Cadmium Stream with Correlation of Embodied Energy and Toxicity Effect. EPA-600/53-048. U.S. EPA, Athens, Georgia. 1982.

"In Defense of Ecosystems," co-authored with D. Swaney. American Naturalist, 117:991-992, 1981.

"A Control Hypothesis for Ecosystems--Energetics and Quantification with the Toxic Metal Cadmium," in W. Mitsch, R. W. Bosserman, and J.M. Klopatek (eds.) Energy and Ecological Modelling. Elsevier Publishing Co., pp. 601-615, 1981.

Record of Estuarine and Salt March Metabolism at Crystal River, Florida, 1977-1981, co-authored with W. F. Coggins. Final Summary Report to Florida Power Corporation, Dept. of Environmental and Engineering Sciences, University of Florida, Gainesville. 1982.

"Large-Scale Microcosms for Assessing Fates and Effects of Trace Contaminants," co-authored with J. W. Bowling, J. P. Giesy, and H. J. Kania. In: J. P. Giesy (ed.) Microcosms in Ecological Research, USDE pp. 224-247, 1980.

"Fates of Cadmium Introduced into Channel Microcosms," co-authored J. P. Giesy, J. W. Bowling, H. J. Kania, and S. Mashburn. Environment International, 5:159-175, 1981.

Energy Basis of Control in Aquatic Ecosystems. Ph.D. Dissertation, University of Florida. 1980.

ROBERT L. KNIGHT

Fate and Biological Effects of Mercury Introduced into Artificial Streams, co-authored with H. J. Kania and R. J. Beyers. PEA-600/3-76-060. U.S. EPA, Athens, Georgia. 1976.

Effects of Entrainment and Thermal Shock on Phytoplankton Numbers and Diversity. Department of Environmental Sciences and Engineering, Publication 336, University of North Carolina, Chapel Hill. 1973.

GARY E. EICHLER
Hydrogeologist

Education

M.S., Geology with Minor in Civil Engineering, University of Florida
B.S., Cum Laude, Construction and Geology, Utica College of Syracuse University

Experience

Mr. Eichler has been responsible for groundwater projects for both water supply and effluent disposal. Studies have included site selection, well design, construction services, monitoring and testing programs, determination of aquifer characteristics, and well field design. In addition, he has conducted numerous studies to determine pollution potential of toxic and hazardous wastes. Prior to joining CH2M HILL, Mr. Eichler was an engineering geologist with an environmental consulting firm. His responsibilities included project management, soils investigations, siting studies, groundwater and surface-water reports, and federal and state environmental impact studies.

Mr. Eichler has been responsible for exploration drilling, testing and design of well fields having a combined total installed capacity of over 75 mgd. Many of these well fields for potable water supply are located in the coastal aquifer in close proximity to saltwater.

His experience includes responsibility for the design and installation of shallow aquifer well fields in unconsolidated formations. Mr. Eichler has designed and installed screened wells, both natural and gravel packed, as well as open hole wells using both cable tool and rotary drilling methods.

Project responsibilities have included management and team participation on more than 20 hazardous waste disposal projects. The studies included initial site investigations, determination of pollutant travel time and direction, and evaluation of the potential for contaminant migration.

Mr. Eichler has been involved in geophysical logging and performance testing of deep disposal wells for both municipal effluent and hazardous waste.

He has conducted projects to determine saltwater intrusion potential and has been responsible for the design of monitoring programs to warn against intrusion.

GARY E. EICHLER

Mr. Eichler has conducted hydrogeological projects using aquifer computer modeling techniques to predict the effects of future large scale groundwater withdrawals.

Professional Registration

Certified Professional Geologist, Certificate No. 4544

Membership in Professional Organizations

American Institute of Professional Geologists
American Water Resources Association
Association of Engineering Geologists
Geological Society of America
Southeastern Geological Society
National Water Well Association
Florida Well Drillers Association

Publications

With U. P. Singh, C. R. Sproul, and J. I. Garcia-Bengochea. "Aquifer Testing of the Boulder Zone of South Florida." ASCE Publication Preprint 82-030. 1982.

Engineering Properties and Lime Stabilization of Tropically Weathered Soils. Master's Thesis. Department of Geology, University of Florida. August 1974.

Appendix B
OUTSIDE AGENCY CONTACT LIST

Appendix B
AGENCY CONTACT LIST

1. Georgia Department of Natural Resources
   Atlanta, Georgia
   Game and Fish Division
   Jerry McCollum
   404/656-3523
   Chief of Fisheries Management
   Mike Jennings
   404/656-3524
   Non-Game Endangered Wildlife
   Jim Armstrong
   404/557-2532
   Protected Plants
   William Butler
   Mary Anne Young
   404/656-4993

2. Georgia Environmental Protection Division
   Atlanta, Georgia
   Industrial and Hazardous Waste Section
   John Taylor--Program Manager
   404/656-2833
   Renee Hudson
   Federal Facilities
   404/656-7802
   Water Quality Control Section
   Joseph Kane
   404/656-4887

3. Georgia Commissioner's Office
   Atlanta, Georgia
   Charlotte Thompson
   404/656-5162

4. Georgia State Clearing House
   Atlanta, Georgia
   Charles Badger
   404/656-3855

5. Georgia Office of Information and Education
   Atlanta, Georgia
   404/656-3530

6. U.S. Fish and Wildlife Service
   Endangered Species Program
   Jacksonville, Florida
   Don Palmer
   904/791-2580
   Law Enforcement Division
   Atlanta, Georgia

Agent Fraser
404/221-6222
State Wildlife Biologist
Brunswick, Georgia
Ron C. Freeman
912/265-7778
Habitat Preservation-Environmental Contaminants
  Evaluation
Atlanta, Georgia
Don Schultz
404/221-6343

7. University of Georgia
   Athens, Georgia
   Museum of Natural History
   Dr. Joseph Laerm
   404/542-1663
   Herbarium
   Nancy Coile
   404/542-3732

8. National Oceanic and Atmospheric Administration
   Environmental Data Services
   Asheville, North Carolina
   704/258-2850

9. U.S. Environmental Protection AGency
   Office of Federal Activities
   Atlanta, Georgia
   Federal Facilities Coordinator
   Arthur Linton
   404/881-2211
   NPDES Officer
   James Holdaway
   404/881-2140

10. U.S. Geological Survey
    Water Resources Division
    District Office
    Atlanta, Georgia
    404/221-4858

11. U.S. Bureau of Mines
    Atlanta, Georgia
    404/221-6204

12. U.S.D.A. Soil Conservation Service
    Area Office
    Decatur, Georgia
    404/373-6543
    Cobb County Office
    Marietta, Georgia
    404/422-2320

13. Cobb County Water and Sewer Department
Marietta, Georgia
404/427-8407

14. Smyrna Engineering Department
City of Smyrna
Smyrna, Georgia
404/434-6600

15. Smyrna Water and Sewer Department
Smyrna, Georgia
404/434-6600

16. Marietta Water and Sewer Department
Marietta, Georgia
404/424-6555

Appendix C
AF PLANT 6 RECORDS SEARCH INTERVIEW LIST

Appendix C
AF PLANT 6 RECORDS SEARCH INTERVIEW LIST

Interviewee	Area of Knowledge	Years at Installation
1	LGC--Manufacturing/Conservation	32
2	LGC--Manufacturing Research	29
3	LGC--Safety	29
4	LGC--Safety	32
5	LGC--Metal Fabrication Manufaturing	31
6	LGC--Transportation	32
7	LGC--Safety	29
8	LGC--Safety	16
9	LGC--Safety	4
10	LGC--Process Services	28
11	LGC--Process Services	21
12	LGC--Material Science Test Laboratory	30
13	LGC--Material Science Test Laboratory	32
14	LGC--Material Science Test Laboratory	23
15	LGC--Paint and Process	22
16	LGC--Project Planning	29
17	LGC--Purchasing	32
18	LGC--Buildings and Utilities Maintenance	32
19	LGC--Buildings and Utilities Maintenance	32
20	LGC--Wastewater Treatment	22
21	LGC--Wastewater Treatment	15
22	LGC--Fire Protection	12
23	LGC--Safety	21
24	LGC--Quality Laboratory	32
25	AFPRO--Safety	4
26	AFPRO--Facilities Engineering	15
27	AFPRO--Facilities Engineering	1
28	AFPRO--Property	25
29	AFPRO--Property	27

Appendix D
INSTALLATION HISTORY

Appendix D
INSTALLATION HISTORY

AF Plant 6 was constructed in 1942 for the sole purpose of producing large aircraft in support of the war effort. Bell Aircraft Corporation, under contract with the Air Force, operated AF Plant 6 from 1943 to 1946 where they produced 665 B-29 aircraft. After World War II ended, AF Plant 6 was closed. From 1947 to 1948 all machinery was greased, oiled, packed, and stored in the B-1 building by Allied Packaging Company. From 1948 to 1951, the Tumpane Company maintained the facility. During this period, machine tooling equipment was cleaned using mineral spirits.

In January 1951, Lockheed-Aircraft Corporation, at the request of the U.S. Air Force, reopened AF Plant 6 to modify B-29 aircraft for the Korean conflict and to prepare for production of the Boeing B-47 aircraft. Since opening the plant in 1951, Lockheed-Georgia Company has manufactured approximately 2,625 large aircraft. Additionally, more than 6,200 aircraft have been modified to extend their service life or increase their performance. They have produced B-47, C-130, JetStar, C-141, and C-5 aircraft. They have also modified B-29, C-5A, and C-141 aircraft.

In December 1952, the first B-47 aircraft built at AF Plant 6 was flight-tested.

In 1951, the U.S. Air Force Tactical Air Command requested proposals from Boeing, Douglas, Fairchild, and Lockheed to develop requirements for a new tactical transport. In July 1951, Lockheed was awarded a contract to develop two YC-130A prototype aircraft as a result of this proposal. In September 1952, the Air Force signed a contract with Lockheed for seven C-130A aircraft, and production was begun in November. In September 1953, a full-scale wooden mockup of a C-130A aircraft arrived at AF Plant 6 after traveling by ship from Los Angeles, California, to Savannah, Georgia, via the Panama Canal. In August 1954, the first prototype C-130A was flight-tested in Burbank, California. In September, the Air Force signed a contract for 48 C-130A aircraft.

In March 1955, the first production C-130 aircraft were completed at AF Plant 6. By April, the first production C-130 aircraft were flight-tested at AF Plant 6. The Air Force signed a contract with Lockheed for 84 C-130 aircraft in August.

In January 1956, the Air Force began flight-testing C-130 aircraft. At this same time, the design of the JetStar aircraft began. The first C-130 aircraft were delivered to the 463 Tactical Airlift Wing in Ardmore, Oklahoma in December.

The first ski-equipped C-130 aircraft was flown in January 1957. In February 1958, a ski-equipped C-130 aircraft established a new world lift record of 124,000 pounds. The first C-130B aircraft were flight-tested in November. In 1961, C-130 E was flight-tested. In December, a maximum delivery rate of 18 C-130 aircraft was reached. In May, the 1000th C-130 aircraft was delivered to the U.S. Coast Guard. In May 1976, the 1400th C-130 aircraft was delivered to the USAF Military Airlift Command.

In September, the first two engine JetStar prototype aircraft were flight-tested. The Air Force selected the JetStar aircraft for a utility transport in October. In June 1960, the first four-engine JetStar aircraft was finished and flight-tested in July. The Air Force ordered five aircraft. In August 1961, the FAA certified the JetStar aircraft. By September, the first version of the corporate

JetStar was delivered. In January 1967, the Dash 8 version of the JetStar aircraft was flight-tested. In 1974, the prototype JetStar II aircraft was also flight-tested.

In January 1975, the JetStar II aircraft went into production. The first JetStar II aircraft was completed in June and flight-tested in August. By September, the first JetStar II was delivered to Allied Stores. In January 1979, the last six Jetstar aircraft were sold to Iraqi Airways.

In March 1961, Lockheed-Georgia Company was awarded the contract to develop and build the C-141 Starlifter aircraft. In May 1962, production began on the C-141 Starlifter aircraft. By August 1963, the first C-141 Starlifter aircraft was completed. In December, the aircraft was flight-tested.

In January 1965, the FAA certified the C-141 aircraft, and, by April, the first aircraft were delivered to the operational squadron at Travis AFB, California. In February 1968, the 284th and final C-141 aircraft was delivered to the Air Force.

In 1974, the Nixon Administration asked Congress to fund the Defense Department plans to "stretch" the C-141 aircraft and add inflight refueling.

In December, the first prototype C-141 aircraft arrived at AF Plant 6 for the "stretch" program. In 1975, AF Plant 6 was awarded the contract to design the C-5 aircraft wing modification. The first C-141B stretched prototype was completed in January 1977 and flight-tested in March.

In 1978, AF Plant 6 received a contract to stretch 271 C-141 aircraft which belonged to the Air Force. Work began immediately on lengthening the fuselages and adding aerial refueling capabilities. The changes in the aircraft added 23 feet to the length of the fuselage (one third more capacity) and unlimited range. By July, the first production stretch C-141B was completed, and in December, it was delivered to the Air Force.

The C-141 aircraft "stretch" program was completed in 1982. A total of 271 C-141 aircraft were stretched to increase their capacity and range of access.

In June 1964, proposals were requested from Lockheed, Boeing, and Douglas for development and production of the C-5 aircraft. In September, Lockheed-Georgia Company was selected by the Air Force to produce the C-5 aircraft. In August 1966, production began on the C-5 Galaxy aircraft. In March, the first C-5 aircraft was completed. By June, the new aircraft had been flight-tested. In October 1960, the C-5 aircraft established a new world airlift record by taking off with a 798,200 pound cargo load.

In 1970, the first C-5 aircraft was delivered to the squadron operations at Charleston, South Carolina. By May 1973, the 81st and final C-5 aircraft was delivered to the Air Force. In February, testing and evaluation began on the C-5 wing modification program. In July 1980, Lockheed-Georgia Company received the contract to retrofit the C-5A cargo fleet with new wings.

The C-5A wing modification program is scheduled for completion in 1987 when all 77 C-5A aircraft owned by the Air Force will have had their wings modified.

In 1983, the C-5B aircraft production contract was given to Lockheed-Georgia Company to produce new C-5B aircraft at AF Plant 6. This program is projected to last into the 1990s. Eighteen aircraft per year will be delivered to the Air Force from 1986 to the end of the program.

A historical summary of aircraft production operations at AF Plant 6 is presented in Table D-1. Because of the changing production schedule and modification programs, the employment at AF Plant 6 has fluctuated from a low of 6,000 in 1951 to a high of 32,000 in 1969. Table D-2 summarizes the number of people employed by AF Plant 6 since Lockheed-Georgia Company started to operate the plant in 1951. In 1973, following the termination of the C-5A program, aircraft production and the number of employees dropped sharply and has shown a gradual increase over the past 10 years. Industrial activities are currently half of what they were during peak production of the C-5A aircraft (1973).

The Lockheed-Georgia Company is responsible for manufacturing C-130 and C-5 aircraft and modifying C-141 and C-5 aircraft at AF Plant 6 under contract with the USAF. The majority of work conducted at AF Plant 6 by the Lockheed-Georgia Company is under government contract (approximately 75 percent in 1983). Contracts between the Lockheed-Georgia Company and AF Plant 6 are administered by the Air Force Plant Representative Office (AFPRO). The AFPRO functions as the single onsite agency responsible for Government contract administration at the Lockheed-Georgia Company. Following a contract award to the company, the AFPRO provides the contract management and surveillance for DoD military branches and other Government agencies as assigned. The mission of AFPRO is to:

1. Perform Government contract administration functions.

2. Support system program directors and buying agencies in the accomplishment of their objectives.

Table D-1
HISTORICAL SUMMARY OF PRODUCTION OPERATIONS AT AF PLANT 6

Contractor	Time Period	Task	Total Aircraft Production/ Modification
Bell Aircraft Corporation	1943 to 1946	B-29 Aircraft Production	665
Tumpane Company	1946 to 1951	Facility Maintenance	0
Lockheed-Georgia Company	1951 to 1952	B-29 Aircraft Modification	120
	1953 to 1957	B-47 Aircraft Production	394
	1954 to 1963	B-47 Aircraft Modification	2,896
	1952 to 1984	C-130 Aircraft Production[a]	1,700+
	1961 to 1976	JetStar Production	200
	1976 to Pres.	JetStar Modification	35
	1963 to 1968	C-141 Starlifter Aircraft Production	285
	1969 to 1973	C-5A Galaxy Aircraft Production	81
	1971 to Pres.	C-5 Aircraft Modification	93
	1974 to 1982	C-141 "Stretch" Program	271
	1974 to 1987[b]	C-5A Aircraft Wing Modification Program	77
	1983 to 1990s[b]	C-5B Aircraft Production	50

[a]Production of C-130 aircraft fluctuated from a high of 10 per month in the late 1960s to a low of three per month at present.

[b]Projected.

Table D-2
SUMMARY OF LOCKHEED-GEORGIA COMPANY
EMPLOYMENT AT AF PLANT 6,
1951 to 1983

Year	Employment
1951	6,000
1956	20,000
1960	12,000
1969	32,000
1973	10,000
1980	13,000
1983	14,000+

3. Continuously evaluate the contract's management systems and practices to ensure their maximum effectiveness in attaining an efficient and economical operation.

4. Oversee the operations and usage of the Government-owned contractor operated facilities.

Currently, approximately 14,606 people are working at AF Plant 6, 14,460 for the Lockheed-Georgia Company and 146 for the AFPRO.

Appendix E
MASTER LIST OF INDUSTRIAL OPERATIONS

Appendix E
MASTER LIST OF INDUSTRIAL OPERATIONS

Dept. No.	Department Name	Present Location (Building No.)	Handles Hazardous Materials	Generates Hazardous Waste	Current Treatment/Storage/ Disposal Methods
11-15	Transportation	B-80	X	X	Offsite contractor disposal
14-AA	Silk Screen Unit Production	B-1			
17-12	Sub-assembly	B-1			
17-14	Plastics	B-1			
18-07	Sheet Metal Fabrication	B-1	X	X	Onsite disposal in Surface Impoundment
18-08	Electrical Tubing and Cable Fabrication	B-1	X	X	Offsite contractor disposal
18-09	Paint and Process	B-1	X	X	Offsite contractor disposal
18-11	Welding	B-1			
18-12	Chemical Milling	B-91			Off-site contractor disposal
18-13	Metal Bond Fabrication	B-1			
18-28	Saw and Shear	B-1	X	X	Offsite contractor disposal
19-21	Numerical Control and Special Mills	B-1			
19-22	Production Machine Shop	B-1			
19-25	Fabrication Special Projects	B-6			
19-24	Spar and Panel Mills	B-1			
23-09	C-130 Structures ASM Dept. J/S Spares	B-1			
23-12	C-130 Outer Wing Structure	B-1	X	X	Offsite contractor disposal
23-14	C-130 Body Mate and Final Assembly	B-1	X	X	Offsite contractor disposal
23-18	Paint	B-3	X	X	Offsite contractor disposal
23-21	C-130 Functional Development	B-1	X	X	Offsite contractor disposal
25-14	C-5B Functional Development	B-1			
25-20	C-5B Structures Assembly Division	B-1			

Appendix E--Continued

Dept. No.	Department Name	Present Location (Building No.)	Handles Hazardous Materials	Generates Hazardous Waste	Current Treatment/Storage/ Disposal Methods
26-10	C-5B Modification Division	B-1			
26-11	C-5 Structures Assembly	B-26	X	X	Offsite contractor disposal
26-12	C-5 Wing Removal/Install and Pressure	B-84	X	X	Offsite contractor disposal
26-13	C-5 Wing Mate and Installation	L-10			
26-14	C-5 Wing Modification Final Assembly	B-1	X	X	Offsite contractor disposal
27-19	C-141 Structural Enhancement	B-1			
30-11	Electronics Flightline	B-24			
30-12	C-130 Production and Modification Flightline	T-566	X	X	Offsite contractor disposal
30-13	C-130 Modification	B-1 and T-544	X	X	Offsite contractor disposal
30-20	C-141 and C-5 Modification Flightline	B-25			
34-21	Composites and Adhesives Bonding				
43-15	Standard Tool Engineering	B-1	X	X	Offsite contractor disposal
45-12	Sheet Metal and Machine Tool	B-28	X	X	Offsite contractor disposal
45-14	AGE and Assembly Tooling	B-1	X	X	Offsite contractor disposal
59-15	Non-destructive Test Lab. and Inspection	B-1		X	
49-21	Electrical Maintenance	B-57	X	X	Incinerator
49-22	Mechanical Maintenance	B-1, B-4, B-6, B-28 and T-556	X	X	Offsite contractor disposal
49-25	Building and Utilities Maintenance	B-30	X	X	Offsite contractor disposal
49-26	Flightline Facilities Maintenance	B-86	X	X	Offsite contractor disposal
59-13	Quality Laboratories	B-1 and B-24 FL	X	X	Offsite contractor disposal
61-14	Process Services	B-1, B-54 and B-28	X	X	Offsite contractor disposal
64-22	Customer Training	B-65 and L-59	X	X	Offsite contractor disposal

Appendix E--Continued

Dept. No.	Department Name	Present Location (Building No.)	Handles Hazardous Materials	Generates Hazardous Waste	Current Treatment/Storage/ Disposal Methods
72-33	Material Sciences and Testing Laboratory	B-4	X	X	Offsite contractor disposal
72-35	Electronics Laboratory	B-64	X	X	Offsite contractor disposal
72-37	Experimental Shops	B-4 and B-72	X	X	Offsite contractor disposal
86-22	Photo Processing	B-1	X	X	Offsite contractor disposal
89-22	Skills and Technical Training	C-31 FL	X	X	Offsite contractor disposal

Appendix F
INVENTORY OF PROCESS TANKS

Appendix F
INVENTORY OF PROCESS TANKS

Location	Description	Contents	Capacity (gal)
B-1	Vapor Degreaser, Tank #1	Trichloroethylene	--
B-1	Vapor Degreaser, Tank #2	Trichloroethylene	--
B-1	Alkaline Cleaner, Tank #4	Sodium borate, sodium triphosphate, sodium silicate, wetting agents or "soaps"	12,050
B-1	Deoxidizer, Alum. Tank #7	Sodium dichromate dihydrate, ammonium bifluoride, sulfuric acid	12,050
B-1	Alkaline Etch Tank #9	Sodium hydroxide	12,050
B-1	Deoxidizer, Alum Tank #15	Sulfuric acid, sodium dichromate dihydrate, ammonium bifluoride	12,050
B-1	Color Conversion Tank #17	Hydrofluoric acid, phosphates, chromates in low concentrations	8,980
B-1	Clear Conversion Tank #19	Hydrofluoric acid, phosphates, chromates in low concentrations	8,980
B-1	Sulfuric Anodize Tank #22	Sulfuric acid, zeromist regular, fluorinated wetting agent	15,060
B-1	Phosphoric Anodize Tank #21	Phosphoric acid	15,060
B-1	Chromic Anodize Tank #25	Chromic acid	23,050
B-1	Neutralize Rinse Tank #27	Sodium bicarbonate	12,050
B-1	Hot Dichromate Seal Tank #29	Sodium dichromate	12,050
B-1	Vapor Degreaser Tank #50	Trichloroethylene	
B-1	Liquid-Vapor Degreaser Tank #52	Trichloroethylene or freon	2,200
B-1	Vapor Degreaser Tank #53	Either trichloroethylene or freon	645
B-1	Alkaline Cleaner Alum Tank #60	Wetting agents sodium borate, sodium borate, sodium triphosphate, sodium silicate	3,400
B-1	Alkaline Cleaner Steel Tank #71	High caustic content with phosphates, borates and silicates plus wetting agent	3,400
B-1	Alkaline Etch Tank #62	Sodium hydroxide, sodium gluconate	3,400
B-1	Deoxidizer Alum Tank #68	Sulfuric acid, sodium dichromate dihydrate	3,400
B-1	Titanium Pickle Tank #74	Nitric acid, ammonium bifluoride	3,400
B-1	Steel Pickle Tank #70	Nitric acid, ammonium bifluoride	1,870
B-1	Steel Passivate Tank #70	Nitric acid	1,870
B-1	Titanium Passivate Tank #75	Hydrofluric acid, trisodium phosphate, sodium fluoride	1,870
B-1	Scale Conditioner Tank #77	Potassium permanganate, sodium carbonate, wetting agents, and stabilizers	1,870

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Location	Description	Contents	Capacity (gal)
B-1	Quench, Oil Tank #83	Petroleum base oil	--
B-1	Quench, Oil Tank #86	Petroleum base oil	--
B-1	Corrosion Preventive Compound Tank #89		100
B-1	Degrease Tank #95	Trichloroethylene	--
B-1	Penetrant Tank #96	Kerosene, fluorescent dye	--
B-1	Developer Tank #98	Talc	--
B-1	Vapor Degreaser Tank #111	Trichloroethylene	200
B-1	Alkaline Cleaner, Anodic Tank #112	Wetting agents, sodium hydroxide, trisodium phosphate	1,050
B-1	Acid Pickle Tank #116	Hydrochloric acid	840
B-1	Chrome Plating, Hard Tank #121	Chromic acid, trace of sulfuric acid	1,050
B-1	Cadmium Plating Tank #122	Cadmium oxide, sodium cyanide, sodium hydroxide, sodium carbonate	1,050
B-1	Chromic Acid Rinse Tank #126	Chromic acid--small amount water	720
B-1	Cerrobend Stripper Tank #132	Nitric acid	530
B-1	Chromate Conversion Coating Tank #135	Hydrofluoric acid, phosphates, chromates	840
B-1	Alkaline Cleaner Tank #137	Sodium borate, sodium triphosphate, sodium silicate, wetting agents	257
B-1	Deoxidizer Tank #139	Sodium dichromate dihydrate, ammonium bifluoride, sulfuric acid	280
B-1	Hard Anodize, Sulfuric Tank #140	Sulfuric acid	340
B-1	Cadmium Stripper Tank #B-1	Ammonium nitrate	220
B-1	Alkaline Cleaner, Anodic Tank #B-3	Sodium borate, sodium triphosphate, sodium silicate	220
B-1	Steel Pickle Tank #B-5	Hydrochloric acid	180
B-1	Nickel Strike Tank #B-7	Nickel, chloride, hydrochloric acid	180
B-1	Rinse, Acid Tank #B-8	Sulfamic acid sour rinse	180
B-1	Nickel Plate Tank #B-10	Nickel sulfamate, sulfamic acid, boric acid	220
B-1	Chromate Conversion Coat Tank #B-17	Hydrofluoric acid, phosphates, chromates, low concentration	180
B-1	Solvent Dip and Drain Tank #161		--
B-1	Magnetic Particle Green Dye Tank #166		--
B-1	Corrosion Preventive Compound Tank #172		25
B-1	Alodine 1200 Tank #201	Hydrofluoric acid, phosphates, chromates	--

Location	Description	Contents	Capacity (gal)
B-1	Vapor Degreaser Tank #211	Sulfuric acid, Zeromist Regular, fluorinated wetting agent	--
B-1	Deoxidizer Tank #213	Trichloroethylene or freon	--
B-1	Emulsion Cleaner Tank #215	Phosphates, silicates, glycols, wetting agents, borates and "soaps"	--
B-1	Color Conversion Coat Tank #216	Wetting agents, sodium borate, sodium triphosphate, sodium silicate	--
B-1	Tube Flushing System, Oxygen and Hydrogen Tank #300	Trichlorotrifluroethane	100
B-1	Hydraulic Tubing Cleaner Tank #301		--
B-1	Solvent Tank #A-14-1		--
B-1	Alkaline Cleaner Tank #D-2	Deactivated	
B-1	Pickle, Magnesium Tank #D-4	Chromic acid	790
B-1	Deoxidizer, Magnesium Tank #D-5	Chromic acid, nitric acid, hydrofluric acid	790
B-1	Anodize, Magnesium Tank #D-6	Ammonium bifluoride, sodium dichromate, phosphoric acid	900
B-1	Strip, Paint Tank #P-1	Not active	--
B-1	Strip, Polyurethane Tank #P-3	--	470
B-1	Strip, Paint Tank #P-5	Not active	260
B-1	Cleaner, Alkaline Steel Tank #R05-1	Empty	--
B-1	Conversion Coat, Titanium Tank #R05-5	Empty	160
B-1	Pickle, Titanium Tank #R05-7	Nitric Acid, hydrofluoric acid	160
B-1	Experimental Bright Dip Tank #R05-9	Empty	160
B-1	Vapor Degreaser Tank #Z-5	Trichloroethylene	--
B-1	Zyglo Penetrant Tank #Z-6	Kerosene, fluorescent dyes	8,980
B-1	Zyglo Emulsifier Tank #Z-8	Proprietary	8,980
B-1	Zyglo Developer Tank #Z-11	Proprietary	8,980
B-1	Zyglo Penetrant Tank #Z-16	Proprietary, kerosene, fluorescent green dye	135
B-1	Zyglo Emulsifier Tank #Z-18	Proprietary	138
B-1	Zyglo Developer Tank #Z-21	Proprietary, talc	138
B-4	Zyglo Penetrant Tank #E-51-1	Proprietary, kerosene, fluorescent dye	--
B-4	Zyglo Emulsifier Tank #E-51-2	Proprietary	--
B-4	Zyglo Developer Tank #E-51-5	Proprietary, talc	--
B-4	Magnaflux Tank #E-5-6	Kerosene, magnetic iron oxide	--

Location	Description	Contents	Capacity (gal)
B-4	Vapor Degreaser Tank #E-51-7	Trichloroethylene	--
B-4	Quench, Oil Tank #E-51-8		--
B-4	Quench, Oil Tank #E-51-9		--
B-4	Zyglo Developer Tank #E-51-10	Proprietary, talc	--
B-4	Zyglo Penetrant Tank #E-51-11	Proprietary, kerosene, fluorescent dye	--
B-4	Zyglo Emulsifier Tank #E-51-12	Proprietary	--
B-79	Strip, Paint, General Purpose, Tank No. G-15	Turco 5668, SEEP-3, Proprietary	495
B-79	Strip, Paint, Tank #G-16	Turco 4737-9, Proprietary	--
B-91	Deoxidizer Tank #T-11HA	Sulfuric acid, ammonia acid, fluoride, sodium dichromate	23,400
B-91	Deoxidizer Tank #T-11HB	Sulfuric acid, ammonia acid fluoride, sodium dichromate	15,600
B-91	Deoxidizer Tank #T-11HC	Sulfuric acid, ammonia acid fluoride, sodium dichromate	15,600
B-91	Deoxidizer Tank #T-11HD	Sulfuric acid, ammonia acid fluoride, sodium dichromate	18,700
B-91	Deoxidizer Tank #T-11V	Sulfuric acid, ammonia acid fluoride, sodium dichromate	44,400
B-91	Caustic Etch Tank #T-12HA	Sodium hydroxide, sodium sulfide	23,400
B-91	Caustic Etch Tank #T-12HB	Sodium hydroxide, sodium sulfide	23,400
B-91	Caustic Etch Tank #T-12HC	Sodium hydroxide, sodium sulfide	15,600
B-91	Caustic Etch Tank #T-12HD	Sodium hydroxide, sodium sulfide	15,600
B-91	Caustic Etch Tank #T-12HE	Sodium hydroxide, sodium sulfide	15,600
B-91	Caustic Etch Tank #T-12HF	Sodium hydroxide, sodium sulfide	15,600
B-91	Caustic Etch Tank #T-12V	Sodium hydroxide, sodium sulfide	39,800
B-91	Cleaner, Alkaline Etch Tank #T-13	Sodium hydroxide, sodium gluconate	18,700
B-91	Surge, Etch Tank #T-14	Sodium hydroxide, sodium sulfide	22,000
B-91	Clarifier Tank #T-15	Sodium hydroxide, sodium sulfide	122,000
B-91	Maskant Dip Tank #T-16	Organic saran	26,400
B-91	Accumulator, Etch Tank #T-17	Sodium hydroxide, sodium sulfide	2,260
B-91	Surge, Etch Solution Filtrate Tank #T-18	Sodium hydroxide, sodium sulfide	450
B-91	Recycle, Etch Solution Tank #T-19	Sodium hydroxide, sodium sulfide	12,700
B-91	Vapor Degreaser, Bond Release Tank #T-20	Trichloroethylene	--
B-10	--	Sodium hydroxide	6,000

Location	Description	Contents	Capacity (gal)
B-10	--	Sodium sulfide	30
B-10	--	Polyelectrolyte	50
B-10	--	Acid	20,300
B-10	--	Miscellaneous	25,140
B-10	--	Caustic	20,300
B-10	--	Miscellaneous	23,020
B-10	--	Sulfuric Acid	4,000

Appendix G
INVENTORY OF EXISTING POL
AND CHEMICAL STORAGE TANKS

Appendix G
INVENTORY OF MAJOR EXISTING POL AND CHEMICAL STORAGE TANKS

Location	Contents	Capacity (gal)	Aboveground (AG) Belowground (BG)
B-1	Nitric Acid	9,000	AG
	MEK	10,000	BG
	Dope/Lacquer Thinner	5,000	BG
	Toluene	10,000	BG
	Diesel Fuel	4 @ 9,000	BG
B-3	TCE	14,000	AG
	Alcohol	2,000	AG
	Sulfuric Acid	1,000 lb.	AG
	Muriatic Acid	500	AG
	Phosphoric Acid	30	AG
	Chromic Acid	--	AG
	Alodine 200-S	600 lb.	AG
	Alodine 1000	360 lb.	AG
	Acetic Acid	35	AG
B-7	Fuel Oil	2,225,000	AG
	Fuel Oil	425,000	AG
	Diesel Fuel	2,000	AG
B-10	Waste Oil	5,000	AG
	Fuel Oil	1,000	BG
B-24/25 Apron	JP-5	35,000	BG
B-30	Fuel Oil	3,000	BG
B-31	JP-5	2 @ 10,000	AG
		2 @ 5,000	AG
		3,000	AG
B-54	Fuel Oil	2 @ 1,500	AG
B-58	Fuel Oil	30,000	BG
B-64	Fuel Oil	3,000	--
		8,000	--
B-65	Fuel Oil	3,000	BG
	Waste JP-5	15,000	BG
B-80	Fuel Oil	2,000	AG
B-90	Fuel Oil	3,000	BG
B-91	Diesel	1,000	BG
	Sulfuric Acid	10,000	AG

Location	Contents	Capacity (gal)	Aboveground (AG) Belowground (BG)
B-91 cont.	Sodium Hydroxide	10,000	AG
	Sodium Sulfide	6,000	AG
	Sodium Aluminate	10,000	AG
	Chromic Acid	2,000	AG
	TCE	9,000	AG
	Toluene	10,000	AG
	Organic Saran (Maskant)	11,000	BG
B-96	JP-5	2 @ 2,000	AG
	Alcohol	3,000	AG
B-98	Fuel Oil/JP-4	2 @ 30,000	BG
T-402	Fuel Oil	3 @ 500	AG
T-569	Fuel Oil	2,000	AG
T-597	Fuel Oil	1,000	AG
U-121	Fuel Oil	500	AG
	Kerosene	500	AG
U-124	MOGAS	500	AG
U-125	MOGAS	50	BG
		500	BG
Gas Station	MOGAS	2 @ 12,000	BG
C-5 Fuel Farm	JP-5	2 @ 50,000	AG
Between N/S Runway and C-5 Fuel Farm	JP-5	50,000	BG
Main Fuel Farm	JP-5	6 @ 50,000	AG
		2 @ 50,000	AG
Mobile	JP-5	15 @ 5,000	AG
	JP-5	2 @ 4,000	AG
	JP-5	8 @ 10,000	AG
	MOGAS	5,000	AG
	Fuel Oil	3 @ 200	AG
	Fuel Oil	145 @ 22	AG
	TCE	2 @ 200	AG
	Nitric Acid	200	AG
	Fuel Oil	5,000	AG
Position 19	JP-5	2 @ 30,000	BG
Position 65	JP-5	25,000	AG
	Waste Oil	7,000	AG

Appendix H
HAZARD ASSESSMENT RATING METHODOLOGY

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 the USAF Occupational and Environmental Health Laboratory (OEHL), Air Force Engineering and Services Center (AFESC), Engineering-Science (ES) and CH2M HILL. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of

USAF OEHL, AFESC, various major commands, Engineering Science, and CH2M HILL met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

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

Site scores are developed using the appropriate ranking factors according to the method presented in the flow chart (Figure H-1). The site rating form is provided on Figure H-2 and the rating factor guidelines are provided in Table H-1.

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, the potential pathways for waste contaminant migration, and any efforts to contain the contamination. 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. Scores for sites at which there is no containment are not reduced. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

HAZARD ASSESSMENT RATING METHODOLOGY FLOW CHART

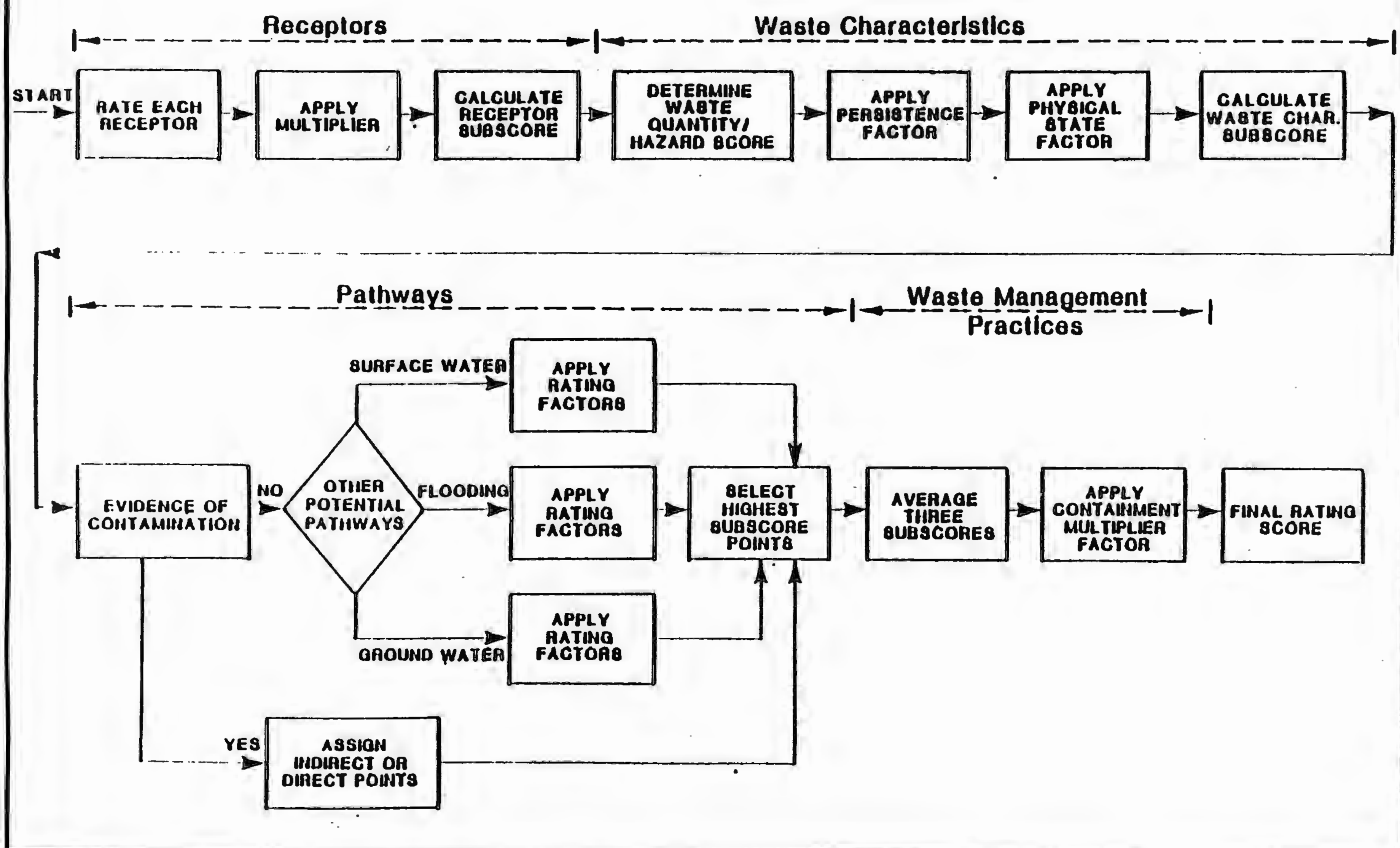

FIGURE 1

Table H-1
HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or Industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Ground-water use of uppermost aquifer	Not used, other sources readily available	Commercial, industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-15	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 H-1--Continued

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

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

Rating Factors	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 H-1--Continued

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

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

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

Confidence Level
- o Confirmed confidence levels (C) can be added.
- o Suspected confidence levels (S) can be added.
- o Confirmed confidence levels cannot be added with suspected confidence levels.

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

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

B. Persistence Multiplier for Point Rating

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

C. Physical State Multiplier

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

Table H-1--Continued

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 Factors	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 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	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-hour rainfall	$\leq$1.0 inch	1.0 to 2.0 inches	2.1 to 3.0 inches	$\geq$3.0 inches	8

B-2 Potential for Flooding

Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1

B-3 Potential for Ground-Water Contamination

Depth to ground water	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to + 20 inches	Greater than +20 inches	6
Soil permeability	Greater than 50% clay ($\leq 10^{-6}$ 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

Table H-1--Continued

B-3 Potential for Ground-Water Contamination--Continued

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
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 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

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

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- 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

Fire Protection Training Areas:

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

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1, or III-6-3, then leave blank for calculation of factor score and maximum possible score.

AF

Appendix I
SITE RATING FORMS

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 1--Surface Impoundment

LOCATION: AF Plant 6

DATE OF OPERATION OR OCCURRENCE: 1977 to 1983

OWNER/OPERATOR: AF Plant 6

COMMENTS/DESCRIPTION: Metal Plating and paint sludges

SITE RATED BY: K. Cable

I. RECEPTORS

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

Receptors subscore (100 x factor score subtotal/maximum subtotal) 59.4

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

1.0 x 100 = 100

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

100 x 0.75 = 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 100

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

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	80	108
Subscore (100 x factor score subtotal/maximum score subtotal)				74.1
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	36	114
Subscore (100 x factor score subtotal/maximum score subtotal)				31.6

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	59.4
Waste Characteristics	75.0
Pathways	100.0
Total 234.4 divided by 3 =	78.1
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

78.1 x 0.95 74

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 2--Existing Landfill

LOCATION: AF Plant 6

DATE OF OPERATION OR OCCURRENCE: 1950 to present

OWNER/OPERATOR: AF Plant 6

COMMENTS/DESCRIPTION: Miscellaneous wastes, some suspected solvents

SITE RATED BY: K. Cable

I. RECEPTORS

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

Receptors subscore (100 x factor score subtotal/maximum subtotal) 59.4

II. WASTE CHARACTERISTICS

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

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

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

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

1.0 x 50 = 50

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

1.0 x 50 = 50

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 0

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

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	80	108
Subscore (100 x factor score subtotal/maximum score subtotal)				74.1
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	36	114
Subscore (100 x factor score subtotal/maximum score subtotal)				31.6

C. Highest pathway subscore

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

Pathways Subscore 74.1

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	59.4
Waste Characteristics	50
Pathways	74.1
Total 183.5 divided by 3 =	61.2
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

61.2 x 1.0 61

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 3--Past Landfill

LOCATION: AF Plant 6

DATE OF OPERATION OR OCCURRENCE: 1950 to 1971

OWNER/OPERATOR: AF Plant 6

COMMENTS/DESCRIPTION: Mainly construction rubble with some solvents

SITE RATED BY: K. Cable

I. RECEPTORS

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

Receptors subscore (100 x factor score subtotal/maximum subtotal) 59.4

II. WASTE CHARACTERISTICS

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

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

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

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

1.0 x 50 = 50

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

1.0 x 50 = 50

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 three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	80	108
Subscore (100 x factor score subtotal/maximum score subtotal)				74.1
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
		Subtotals	44	114
Subscore (100 x factor score subtotal/maximum score subtotal)				38.6

C. Highest pathway subscore

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

Pathways Subscore **74.1**

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	59.4
Waste Characteristics	50.0
Pathways	74.1
Total 183.5 divided by 3 =	61.2
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

61.2 x 1.0 **61**

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 4--Sanitary WWTP Sludge Disposal Area

LOCATION: AF Plant 6

DATE OF OPERATION OR OCCURRENCE: 1941 to present

OWNER/OPERATOR: AF Plant 6

COMMENTS/DESCRIPTION: Sludge from trickling filter/activated sludge system

SITE RATED BY: K. Cable

I. RECEPTORS

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

Receptors subscore (100 x factor score subtotal/maximum subtotal) 59.4

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) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 70

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

70 x 1.0 = 70

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

70 x 0.75 = 52.5

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 0

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

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	80	108
Subscore (100 x factor score subtotal/maximum score subtotal)				74.1
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	36	114
Subscore (100 x factor score subtotal/maximum score subtotal)				31.6

C. Highest pathway subscore

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

Pathways Subscore 174.1

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	59.4
Waste Characteristics	52.5
Pathways	74.1
Total 186 divided by 3 =	62
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

62 x 1.0 62

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 5--Stormwater Retention Basin No. 2

LOCATION: AF Plant 6

DATE OF OPERATION OR OCCURRENCE:

OWNER/OPERATOR: AF Plant 6

COMMENTS/DESCRIPTION: Collects stormwater from AF Plant 6

SITE RATED BY: K. Cable

I. RECEPTORS

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

Receptors subscore (100 x factor score subtotal/maximum subtotal) 59.4

II. WASTE CHARACTERISTICS

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

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

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

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

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

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 three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	80	108
Subscore (100 x factor score subtotal/maximum score subtotal)				74.1
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
		Subtotals	44	114
Subscore (100 x factor score subtotal/maximum score subtotal)				38.6

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	59.4
Waste Characteristics	60.0
Pathways	100.0
Total 219.4 divided by 3 =	73.1
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

73.1 x 0.95 69

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 6--B-10 Aeration Basin

LOCATION: AF Plant 6

DATE OF OPERATION OR OCCURRENCE: 1951 to present

OWNER/OPERATOR: AF Plant 6

COMMENTS/DESCRIPTION: Part of original and new IWTP

SITE RATED BY: K. Cable

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	2	4	8	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	1	10	10	30
F.	Water quality of nearest surface-water body	3	6	18	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	3	6	18	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	105	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 58.3

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 0

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

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	80	108
Subscore (100 x factor score subtotal/maximum score subtotal)				74.1
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
		Subtotals	44	114
Subscore (100 x factor score subtotal/maximum score subtotal)				38.6

C. Highest pathway subscore

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

Pathways Subscore 74.1

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	58.3
Waste Characteristics	100
Pathways	74.1
Total 232.4 divided by 3 =	77.5
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

77.5 x 0.95 74

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 7--Position 65--C-5 Washrack

LOCATION: AF Plant 6

DATE OF OPERATION OR OCCURRENCE: 1968 to present

OWNER/OPERATOR: AF Plant 6

COMMENTS/DESCRIPTION: Washing/stripping of C-141 and C-5 aircraft

SITE RATED BY: K. Cable

I. RECEPTORS

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

Receptors subscore (100 x factor score subtotal/maximum subtotal) 50.6

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	0
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				66.7
2. Flooding	0	1	0	3
		Subscore (100 x factor score/3)		0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
		Subtotals	44	114
Subscore (100 x factor score subtotal/maximum score subtotal)				38.6

C. Highest pathway subscore

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

Pathways Subscore 66.7

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	50.6
Waste Characteristics	100.0
Pathways	66.7
Total 217.3 divided by 3 =	72.4
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

72.4 x 1.0 72

HAZARDOUS ASSESSMENT RATINC FORM

NAME OF SITE: No. 8--B-96 Building

LOCATION: AF Plant 6

DATE OF OPERATION OR OCCURRENCE: 1968 to 1970

OWNER/OPERATOR: AF Plant 6

COMMENTS/DESCRIPTION: Small quantities of solvents

SITE RATED BY: K. Cable

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	1	10	10	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	1	10	10	30
F.	Water quality of nearest surface-water body	3	6	18	18
C.	Ground-water use of uppermost aquifer	0	9	0	27
H.	Population served by surface-water supply within 3 miles downstream of site	3	6	18	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	91	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 50.6

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 1.0 = 30

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

30 x 1.0 = 30

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	0
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				67
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
		Subtotals	44	114
Subscore (100 x factor score subtotal/maximum score subtotal)				38.6

C. Highest pathway subscore

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

Pathways Subscore **67**

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	50.6
Waste Characteristics	30
Pathways	67
Total 147.6 divided by 3 =	49.2
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

49.2 x 1.0 **49**

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 9--TCE Spill

LOCATION: AF Plant 6

DATE OF OPERATION OR OCCURRENCE: 1983

OWNER/OPERATOR: AF Plant 6

COMMENTS/DESCRIPTION: 1,066-gallon TCE spill

SITE RATED BY: K. Cable

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	3	4	12	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	1	10	10	30
F.	Water quality of nearest surface-water body	3	6	18	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	3	6	18	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	109	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 60.6

II. WASTE CHARACTERISTICS

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

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

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

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

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

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 three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	72	108
Subscore (100 x factor score subtotal/maximum score subtotal)				66.7
2. Flooding	0	1	0	3
		Subscore (100 x factor score/3)		0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
		Subtotals	44	114
Subscore (100 x factor score subtotal/maximum score subtotal)				38.6

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	60.6
Waste Characteristics	60
Pathways	100
Total 220.6 divided by 3 =	73.5
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

73.5 x 1.0 74

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 10--JP-5 Fuel Spill No. 2

LOCATION: AF Plant 6

DATE OF OPERATION OR OCCURRENCE: 1981

OWNER/OPERATOR: AF Plant 6

COMMENTS/DESCRIPTION: 21,000-gallon JP-5 fuel spill

SITE RATED BY: K. Cable

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	1	10	10	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	1	10	10	30
F.	Water quality of nearest surface-water body	3	6	18	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	3	6	18	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	85	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 47.2

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 0.8 = 64

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

64 x 1.0 = 64

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 three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	80	108
Subscore (100 x factor score subtotal/maximum score subtotal)				74.1
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
		Subtotals	44	114
Subscore (100 x factor score subtotal/maximum score subtotal)				38.6

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	47.2
Waste Characteristics	64.0
Pathways	80.0
Total 191.2 divided by 3 =	63.7
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

63.7 x 1.0 64

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 11--JP-5 Fuel Spill No. 1

LOCATION: AF Plant 6

DATE OF OPERATION OR OCCURRENCE: 1974

OWNER/OPERATOR: AF Plant 6

COMMENTS/DESCRIPTION: 25,000-gallon JP-5 fuel spill

SITE RATED BY: K. Cable

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	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface-water body	3	6	18	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	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	0	6	0	18
		Subtotals	95	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) **52.8**

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 0.8 = 64

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

64 x 1.0 = 64

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 three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	80	108

Subscore (100 x factor score subtotal/maximum score subtotal) 74.1

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	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
		Subtotals	44	114

Subscore (100 x factor score subtotal/maximum score subtotal) 38.6

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	52.8
Waste Characteristics	64.0
Pathways	80.0
Total 196.8 divided by 3 =	65.6
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

65.6 x 0.1 = 7

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 12--Sodium Dichromate Spill

LOCATION: AF Plant 6

DATE OF OPERATION OR OCCURRENCE: December 31, 1976

OWNER/OPERATOR: AF Plant 6

COMMENTS/DESCRIPTION: 3.75-million gallons of water containing 20-ppm sodium dichromate

SITE RATED BY: K. Cable

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	1	10	10	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	1	10	10	30
F.	Water quality of nearest surface-water body	3	6	18	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	3	6	18	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	88	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 48.9

II. WASTE CHARACTERISTICS

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

1. Waste quantity (S = small, M = medium, L = large) S

2. Confidence level (C = confirmed, S = suspected) C

3. Hazard rating (H = high, M = medium, L = low) H

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

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

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

(4)

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 three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	80	108
Subscore (100 x factor score subtotal/maximum score subtotal)				74.1
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
		Subtotals	44	114
Subscore (100 x factor score subtotal/maximum score subtotal)				38.6

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	48.9
Waste Characteristics	60.0
Pathways	100.0
Total 208.9 divided by 3 =	69.6
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

69.6 x 0.95 66

Appendix J
GLOSSARY OF TERMS

Appendix J
GLOSSARY OF TERMS

ALODINE - Alodine is a substance used for surface treating aluminum prior to applying a coating. This material consists of 70 percent chromic acid and 40 percent fluoride salt.

ALLUVIUM - A general term for clay, silt, sand, gravel, or similar unconsolidated detrital material deposited during comparatively recent geologic time by a stream or other body of running water as a sorted or semisorted sediment in the bed of the stream or on its flood plain or delta.

AQUIFER - A geologic formation, or group of formations, that contains sufficient saturated permeable material to conduct ground water to yield economically significant quantities of ground water to wells and springs.

CONFINING STRATA - A strata of impermeable or distinctly less permeable material stratigraphically adjacent to one or more aquifers.

CONTAMINANT - As defined by section 104(a)(2) of CERCLA, shall include, but not be limited to, any element, substance, compound, or mixture, including disease causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformation, in such organisms or their offspring.

DOWNGRADIENT - A direction that is hydraulically down slope. The downgradient direction can be determined through a potentiometric survey or through the evaluation of existing water level elevations referenced to a common datum (mean sea level).

EP TOXICITY - A laboratory test designed to identify a solid waste as hazardous. A liquid extract from the solid waste is analyzed for selected metals and pesticides. If one or more of the parameters tested for is present in concentration greater than a maximum value then the solid waste is considered a hazardous waste in accordance with RCRA definition.

EVAPOTRANSPIRATION - Evaporation from the ground surface and transpiration through vegetation.

GROUND WATER - All subsurface water, especially that part that is in the zone of saturation.

HAZARDOUS WASTE (expanded version of the RCRA definition) - A solid waste which because of its quantity, concentration, or physical, chemical or infectious characteristics may -

(A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible, illness; or

(B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed.

HEXEL - Hexel F0446 is used as a degreaser and consists primarily of 5 percent potassium hydroxide and 3 percent ethylene glycol mono ethyl ether. Hexel F0606M is used as a stripper and consists primarily of ethanol amine. Hexel F0128 is used as a cleaning solvent and consists primarily of 60 percent aliphatic petroleum hydrocarbon, 15 percent methylene chloride, and 30 percent perchloroethylene.

LOAM - A rich, permeable soil composed of a friable mixture of relatively equal and moderate proportions of clay, silt, and sand particles, and usually containing organic matter (humus) with a minor amount of gravelly material.

MIGRATION (Contaminant) - The movement of contaminants through pathways (ground water, surface water, soil, and air).

NET PRECIPITATION - Mean annual precipitation minus mean annual evapotranspiration. Evapotranspiration is sometimes estimated by pan evaporation measurements.

PD-680 (Type I and Type II) - A military specification for petroleum distillate used as a safety cleaning solvent. The primary difference between PD-680 Type I and Type II is the flash point of the material. The flash points are 100°F and 140°F for PD-680 Types I and II, respectively. Currently, only Type II is authorized for use at Air Force installations.

PERMEABILITY - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.

POTENTIOMETRIC SURFACE - An imaginary surface that represents the static head of ground water and is defined by the level to which water will rise in a cased well.

SOIL HORIZONS -

(A) A-Horizon - The uppermost mineral horizon of a soil; zone of leaching.

(B) B-Horizon - Occurs below the A-Horizon; the mineral horizon of a soil or the zone of accumulation.

(C) C-Horizon - Occurs below the B-Horizon; a mineral horizon of a soil consisting of unconsolidated rock material that is transitional in nature between the parent material below and the more developed horizons above.

STRATA - Plural of stratum.

STRATUM - A single and distinct layer, of homogeneous or gradational sedimentary material (consolidated rock or unconsolidated earth) of any thickness, visually separable from other layers above and below by a discrete change in the character of the material deposited or by a sharp physical break in deposition, or by both.

TURCO 1000 - A cleaning solvent which consists primarily of 30 percent methylene chloride, 35 percent perchloroethylene, 25 percent aromatic petroleum solvent, 5 percent diacetone alcohol, and 5 percent n-butyl alcohol.

UNSATURATED ZONE (Vadose Zone or Zone of Aeration) - A subsurface zone containing water under pressure less than that of the atmosphere, including water held by capillarity;

and containing air or gases generally under atmospheric pressure. This zone is limited above by the land surface and below by the surface of the zone of saturation.

UPGRADIENT - A direction that is hydraulically up slope. The upgradient direction can be determined through a potentiometric survey or through the evaluation of existing water level elevations referenced to a common datum (mean sea level).

WATER TABLE - The upper limit of the portion of the ground completely saturated with water.

Appendix K
LIST OF ACRONYMS, ABBREVIATIONS AND
SYMBOLS USED IN THE TEXT

Appendix K
LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS USED IN THE TEXT

AF	Air Force
AFESC	Air Force Engineering and Services Center
AFPRO	Air Force Plant Representative Office
AG	Aboveground
AGE	Aerospace Ground Equipment
ASD	Aeronautical Sysems Division
AVGAS	Aviation Gasoline
Bldg.	Building
bls	Below Land Surface
BOD_5	Biochemical Oxygen Demand (5-day)
°C	Degrees Celsius (Centigrade)
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
CMAS	Complete Mix Activated Sludge
cm/sec	Centimeters per Second
COD	Chemical Oxygen Demand
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DoD	Department of Defense
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
°F	Degrees Fahrenheit
ft/min	Feet per Minute
gpy	Gallons per Year
gpd	Gallons per Day
gpm	Gallons per Minute
HARM	Hazard Assessment Rating Methodology
IRP	Installation Restoration Program
IWC	Industrial Waste, Concentrated
IWG	Industrial Waste, General
IWO	Industrial Waste, Oily
IWTP	Industrial Waste Treatment Plant
JP	Jet Petroleum

lb	Pounds
lb/yr	Pound(s) per Year
MEK	Methyl Ethyl Ketone
mg/l	Milligram(s) per Liter
mgd	Million Gallons per Day
MIBK	Methyl Isobutyl Ketone
ml	Milliliter
mo.	Month
MOGAS	Motor Gasoline
mph	Miles per Hour
msl	Mean Sea Level
NCP	National Contingency Plan
NDI	Non-Destructive Inspection
No.	Number
NPDES	National Pollutant Discharge Elimination System
OEHL	Occupational and Environmental Health Laboratory
PAR	Process Analysis Requirements
PCB	Polychlorinated Biphenyls
POL	Petroleum, Oil, and Lubricants
ppm	Parts per Million
RCRA	Resource Conservation and Recovery Act
RDTE	Research, Development, Testing, and Evaluation
SCS	Soil Conservation Service
TCE	Trichloroethylene
TDS	Total Dissolved Solids
TOX	Total Organic Halogen
TSS	Total Suspended Solids
TPS	Thermal Protection System
tpy	Tons per Year
UG	Underground
USAF	United States Air Force
USDA	United States Department of Agriculture
VOC	Volatile Organic Compound
WWTP	Wastewater Treatment Plant

Appendix L
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Appendix L
REFERENCES

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