INSTALLATION RESTORATION PROGRAM

PRELIMINARY ASSESSMENT

Alabama Army National Guard

Dannelly Field Municipal Airport
Montgomery, Alabama

February 1990

HAZWRAP SUPPORT CONTRACTOR OFFICE
Oak Ridge, Tennessee 37831
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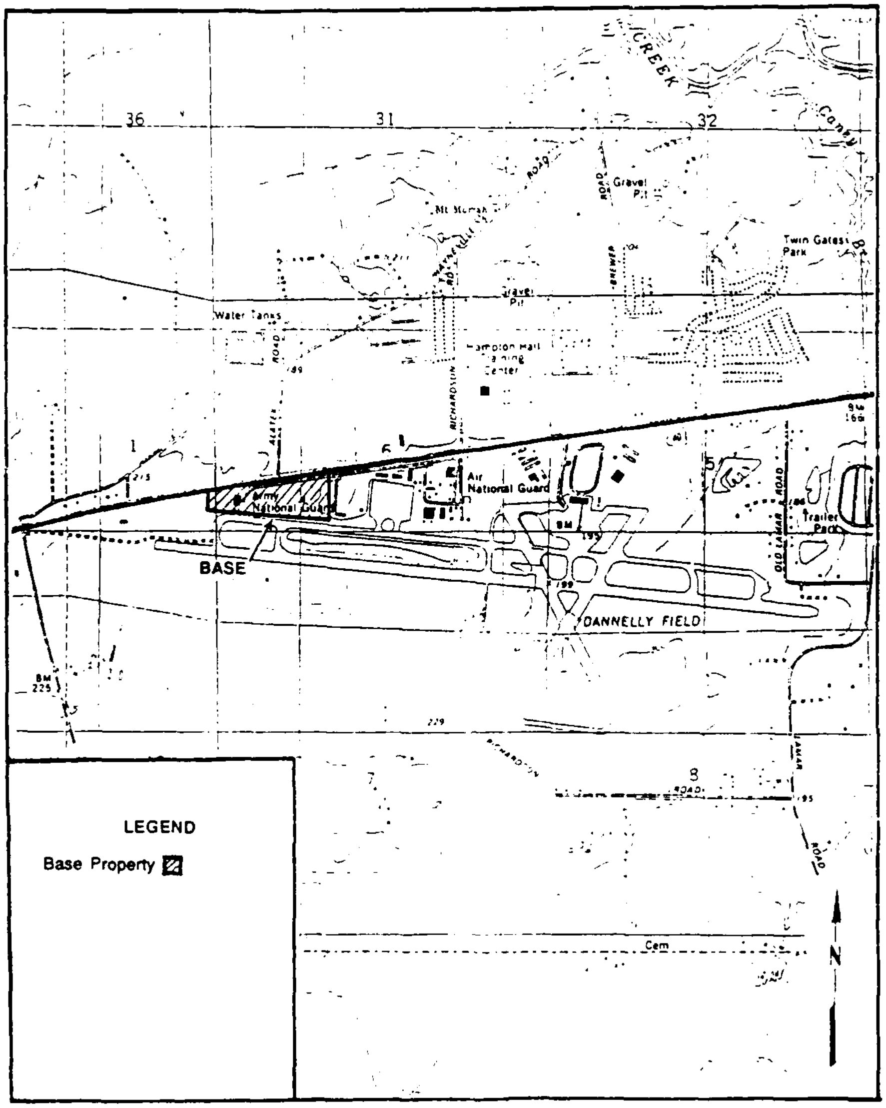

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DANNELLY FIELD MUNICIPAL AIRPORT
MONTGOMERY, ALABAMA

February 1990

Prepared for

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Aberdeen Proving Grounds, Maryland 21010

In Cooperation with
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ACRONYM LIST

AASF	Army Aviation Support Facility
AFB	Air Force Base
AL ANG	Alabama Air National Guard
AL ARNG	Alabama Army National Guard
AMSL	Above Mean Sea Level
ANG	Air National Guard
ARNG	Army National Guard
AVGAS	Aviation Gasoline
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980, also called "Superfund"
CFR	Code of Federal Regulations
DD	Decision Document
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DERP	Defense Environmental Restoration Program
DEVR	Department of Engineering, Installation Restoration Program Branch
DoD	Department of Defense
DRMO	Defense Reutilization and Marketing Office
EO	Executive Order
EPA	Environmental Protection Agency
FR	Federal Register
FS	Feasibility Study
FTA	Fire Training Area
GPD	Gallons Per Day
GPM	Gallons Per Minute
HARM	Hazard Assessment Rating Methodology
HAS	Hazard Assessment Score
HAZWRAP	Hazardous Waste Remedial Actions Program
IRP	Installation Restoration Program
JP-4	Jet Fuel (Army Standard)
MAP	Municipal Airport
MOGAS	Motor Gasoline
NCP	National Contingency Plan
NGB	National Guard Bureau
NPL	National Priorities List
OMS	Organizational Maintenance Shop
O/WS	Oil/Water Separator

ACRONYM LIST (continued)

PA	Preliminary Assessment
POC	Point Of Contact
POL	Petroleum-Oil-Lubricant
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act of 1976
RD	Remedial Design
R&D	Research and Development
SARA	Superfund Amendments and Reauthorization Act of 1986
SciTek	Science & Technology, Inc.
SCS	Soil Conservation Service
SI/RI/FS	Site Investigation/Remedial Investigation/Feasibility Study
TFG	Tactical Fighter Group
USAF	United States Air Force
USC	United States Code
USGS	United States Geological Survey
UST	Underground Storage Tank

EXECUTIVE SUMMARY

A. INTRODUCTION

Science & Technology, Inc. (SciTek) was retained to conduct the Installation Restoration Program (IRP) Preliminary Assessment (PA) of the Alabama Army National Guard (AL ARNG), located at Dannelly Field Municipal Airport, Montgomery, Alabama [hereinafter referred to as the Base]. For the purpose of this document, the Base shall include the total area leased by the AL ARNG at Dannelly Field. This area includes Fort Shepherd Armory, Army Aviation Support Facility No. 1 (AASF No. 1), and Organizational Maintenance Shop No. 18 (OMS No. 18).

At the request of the ARNG, this PA was conducted under Air National Guard (ANG) auspices with ARNG funding. The PA included the following activities:

- an on-site visit, including interviews with a total of 26 persons (24 AL ARNG and 2 ANG) familiar with Base operations, and field surveys by SciTek representatives during September 18-22, 1989;
- acquisition and analysis of information on past hazardous materials use, waste generation, and waste disposal at the Base;
- acquisition and analysis of available geological, hydrological, meteorological, and environmental data from federal, state, and local agencies; and
- the identification and assessment of sites on the Base that may have been contaminated with hazardous wastes.

B. MAJOR FINDINGS

The AL ARNG has utilized hazardous materials and generated small amounts of wastes in mission-oriented operations and maintenance at the Base since 1960.

Operations that have involved the use of hazardous materials and the disposal of hazardous wastes include aircraft maintenance, vehicle maintenance, and petroleum-oil-lubricant (POL) management and distribution. The hazardous wastes disposed of through these operations include varying quantities of POL products, acids, paints, thinners, strippers, and solvents.

The field surveys and interviews resulted in the identification of four sites that exhibit the potential for contaminant presence and migration.

C. CONCLUSIONS

It has been concluded that there are four sites where a potential for contaminant presence exists. These are as follows:

Site No 1 - Old Aircraft Wash Rack Drainage Area

Site No 2 - Old Fire Training Area (FTA)

Site No 3 - North Boundary Fence Line

Site No 4 - OMS POL Area

D. RECOMMENDATIONS

Further work under the IRP is recommended for the four identified sites to determine the presence or absence of contamination.

I. INTRODUCTION

A. Background

The AL ARNG is located at Dannelly Field Municipal Airport (MAP), Montgomery, Alabama. The AL ARNG has been active at Dannelly Field Municipal Airport since 1960, and over the years, a variety of military aircraft have been serviced at the Base. Both the past and current operations have involved the use of potentially hazardous materials and the disposal of wastes. Because of the use of these materials and the disposal of resultant wastes, the ARNG has requested that the National Guard Bureau (NGB) implement the IRP. At the request of the ARNG, this IRP PA was conducted under the auspices of the ANG with ARNG funding.

The IRP is a comprehensive program designed to:

- o Identify and fully evaluate suspected problems associated with past hazardous waste disposal and/or spill sites on Department of Defense (DoD) installations and

- o Control hazards to human health, welfare, and the environment that may have resulted from these past practices.

During June 1980, DoD issued a Defense Environmental Quality Program Policy Memorandum (DEQPPM 80-6) requiring identification of past hazardous waste disposal sites on DoD installations. The policy was issued in response to the Resource Conservation and Recovery Act of 1976 (RCRA) and in anticipation of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, Public Law 96-510), commonly known as "Superfund." In August 1981, the President delegated certain authority specified under CERCLA to the Secretary of Defense via Executive

Order (EO 12316). As a result of EO 12316, DoD revised the IRP by issuing DEQPPM 81-5 (December 11, 1981), which reissued and amplified all previous directives and memoranda.

Although the DoD IRP and the Environmental Protection Agency (EPA) Superfund programs were essentially the same, differences in the definition of program activities and lines of authority resulted in some confusion between DoD and state/federal regulatory agencies. These difficulties were rectified via passage of the Superfund Amendments and Reauthorization Act (SARA, PL-99-499) of 1986. On January 23, 1987, Presidential Executive Order EO 12580 was issued. EO 12580 effectively revoked EO 12316 and implemented the changes promulgated by SARA.

The most important changes effected by SARA included the following:

- Section 120 of SARA provides that federal facilities, including those in DoD, are subject to all provisions of CERCLA/SARA concerning site assessment, evaluation under the National Contingency Plan (NCP) [40CFR300], listing on the National Priorities List (NPL), and removal/remedial actions. DoD must therefore comply with all the procedural and substantive requirements (guidelines, rules, regulations, and criteria) promulgated by the EPA under Superfund authority.

- Section 211 of SARA also provides continuing statutory authority for DoD to conduct its IRP as part of the Defense Environmental Restoration Program (DERP). This was accomplished by adding Chapter 160, Sections 2701-2707 to Title 10 United States Code (10 USC 160).

- SARA also stipulated that terminology used to describe or otherwise identify actions carried out under the IRP shall be substantially the same as the terminology of the regulations and guidelines issued by the EPA under their Superfund authority.

As a result of SARA, the operational activities of the IRP are currently defined and described as follows:

Preliminary Assessment

The PA process consists of personnel interviews and a records search designed to identify and evaluate past disposal and/or spill sites that might pose a potential and/or actual hazard to public health, public welfare, or the environment. Previously undocumented information is obtained through the interviews. The records search focuses on obtaining useful information from aerial photographs; Base plans; facility inventory documents; lists of hazardous materials used at the Base; Base subcontractor reports; Base correspondence; Material Safety Data Sheets; federal/state agency scientific reports and statistics; federal administrative documents; federal/state records on endangered species, threatened species, and critical habitats; documents from local government offices; and numerous standard reference sources.

Site Inspection/Remedial Investigation/ Feasibility Study

The Site Inspection consists of field activities designed to confirm the presence or absence of contamination at the potential sites identified in the PA. The Remedial Investigation consists of field activities designed to quantify and identify the potential contaminant, the extent of the contaminant plume, and the pathways of contaminant migration.

If applicable, a public health evaluation is performed to analyze the collected data. Field tests, which may necessitate the installation of monitoring wells or the collection and analysis of water, soil, and/or sediment samples, are required. Careful documentation and quality control procedures in accordance with CERCLA/SARA guidelines ensure the validity of data. Hydrogeologic studies are conducted to determine the underlying strata, groundwater flow rates, and direction of contaminant migration. The findings from these studies result in the selection of one or more of the following options:

- **No Further Action** - Investigations do not indicate harmful levels of contamination and do not pose a significant threat to human health or the environment. The site does not warrant further IRP action, and a Decision Document (DD) will be prepared to close out the site.

- **Long-Term Monitoring** - Evaluations do not detect sufficient contamination to justify costly remedial actions. Long-term monitoring may be recommended to detect the possibility of future problems.

- **Feasibility Study** - Investigation confirms the presence of contamination that may pose a threat to human health and/or the environment, and some sort of remedial action is indicated. The Feasibility Study (FS) is therefore designed and developed to identify and select the most appropriate remedial action. The FS may include individual sites, groups of sites, or all sites on an installation. Remedial alternatives are chosen according to engineering and cost feasibility, state/federal regulatory requirements, public health effects, and environmental impacts. The end result of the FS is the selection of the most appropriate remedial action with concurrence by state and/or federal regulatory agencies.

Remedial Design/Remedial Action - The Remedial Design (RD) involves formulation and approval of the engineering designs required to implement the selected remedial action. The Remedial Action (RA) is the actual implementation of the remedial alternative. It refers to the accomplishment of measures to eliminate the hazard or, at a minimum, reduce it to an acceptable limit. Covering a landfill with an impermeable cap, pumping and treating contaminated groundwater, installing a new water distribution system, and in situ biodegradation of contaminated soils are examples of remedial measures that might be selected. In some cases, after the remedial actions have been completed, a long-term monitoring system may be installed as a precautionary measure to detect any contaminant migration or to document the efficiency of remediation.

Research and Development - Research and Development (R&D) activities are not always applicable for an IRP site but may be necessary if there is a requirement for additional research and development of control measures. R&D tasks may be initiated for sites that cannot be characterized or controlled through the application of currently available, proven technology. It can also, in some instances, be used for sites deemed suitable for evaluating new technologies.

Immediate Action Alternatives - At any point, it may be determined that a former waste disposal site poses an immediate threat to public health or the environment, thus necessitating prompt removal of the contaminant. Immediate action, such as limiting access to the site, capping or removing contaminated soils, and/or providing an alternate water supply may suffice as effective control measures. Sites requiring immediate removal action maintain IRP status in order to determine the need for additional remedial planning or long-term monitoring. Removal measures or other appropriate remedial actions may be implemented during any phase of an IRP project.

B. Purpose

The purpose of this IRP PA is to identify and evaluate suspected problems associated with past waste handling procedures, disposal sites, and spill sites on Base property.

The potential for migration of hazardous contaminants was evaluated by visiting the Base, reviewing existing environmental data, analyzing Base records concerning the use of hazardous materials and the generation of hazardous wastes, and conducting interviews with current Base and ANG, Dannelly Field personnel who had knowledge of past waste disposal techniques and handling methods. Pertinent information collected and analyzed as part of the PA included a records search of the history of the Base; the local geological, hydrological, and meteorological conditions that might influence migration of contaminants; and ecological settings that indicate environmentally sensitive conditions.

C. Scope

The scope was limited to the identification of sites at or under primary control of the Base and evaluation of potential receptors. The PA included:

- an on-site visit during September 18-22, 1989;
- acquisition of records and information on hazardous materials use and waste handling practices;
- acquisition of available geological, hydrological, meteorological, land use and zoning, critical habitat, and related data from federal and Alabama state agencies;
- a review and analysis of all information obtained; and
- preparation of a summary report to include recommendations for further action.

The subcontractor effort was conducted by the following Science & Technology, Inc. (SciTek) personnel: Mr. Tracy C. Brown, Environmental Analyst; Mr. Ray S. Clark, Civil/Environmental Engineer; Mr. Jack D. Wheat, Hydrogeologist, and Mr. Ron Mathis, Manager of SciTek's Environmental/Waste Operations Group. The resumes of the Search Team members are in Appendix A. Mr. David Hippensteel of the NGB is Project Officer for this Base and participated in the overall assessment during the week of the site visit. Mr. Lee Banicki (NGB) and Ms. Patricia Franzen of the Hazardous Waste Remedial Actions Program (HAZWRAP) also participated in the site visit.

The points of contact (POCs) at the Base were Lieutenant Colonel Roger L. Lane, AASF No. 1; Captain Timothy Lewis, Fort Shepherd Armory; and Chief Warrant Officer Harry Hassey, OMS No. 18.

D. Methodology

The PA began with a site visit to the Base to identify all operations that may have utilized hazardous materials or may have generated hazardous wastes. Figure I.1 is a flow chart of the PA methodology.

Twenty-four current Base employees familiar with the various operating procedures were interviewed. In addition, two Alabama Air National Guard (AL ANG) personnel from the adjacent base of the 187th Tactical Fighter Group (TFG) were interviewed. These interviews were conducted to determine those areas where waste materials (hazardous or nonhazardous) were used, spilled, stored, disposed of, or released into the environment. The interviewees' knowledge and experience with Base operations averaged 15.6 years and ranged from 1 to 37 years.

Records contained in the Base files were collected and reviewed to supplement the information obtained from the interviews. At this Base, available records were limited to Hazardous Materials Checklists (AASF No. 1, 1988) prepared from the Base's Material Safety Data Sheets and plan maps of the Base (State of Alabama, Military Department, 1979).

Detailed geological, hydrological, meteorological, and environmental data for the area of study were obtained from the appropriate federal and state agencies. A listing of federal and state agency contacts is included as Appendix B.

After a detailed analysis of all the information obtained, it was concluded that four sites may be potentially contaminated with hazardous wastes. Under the IRP program, when sufficient information is available, sites are numerically

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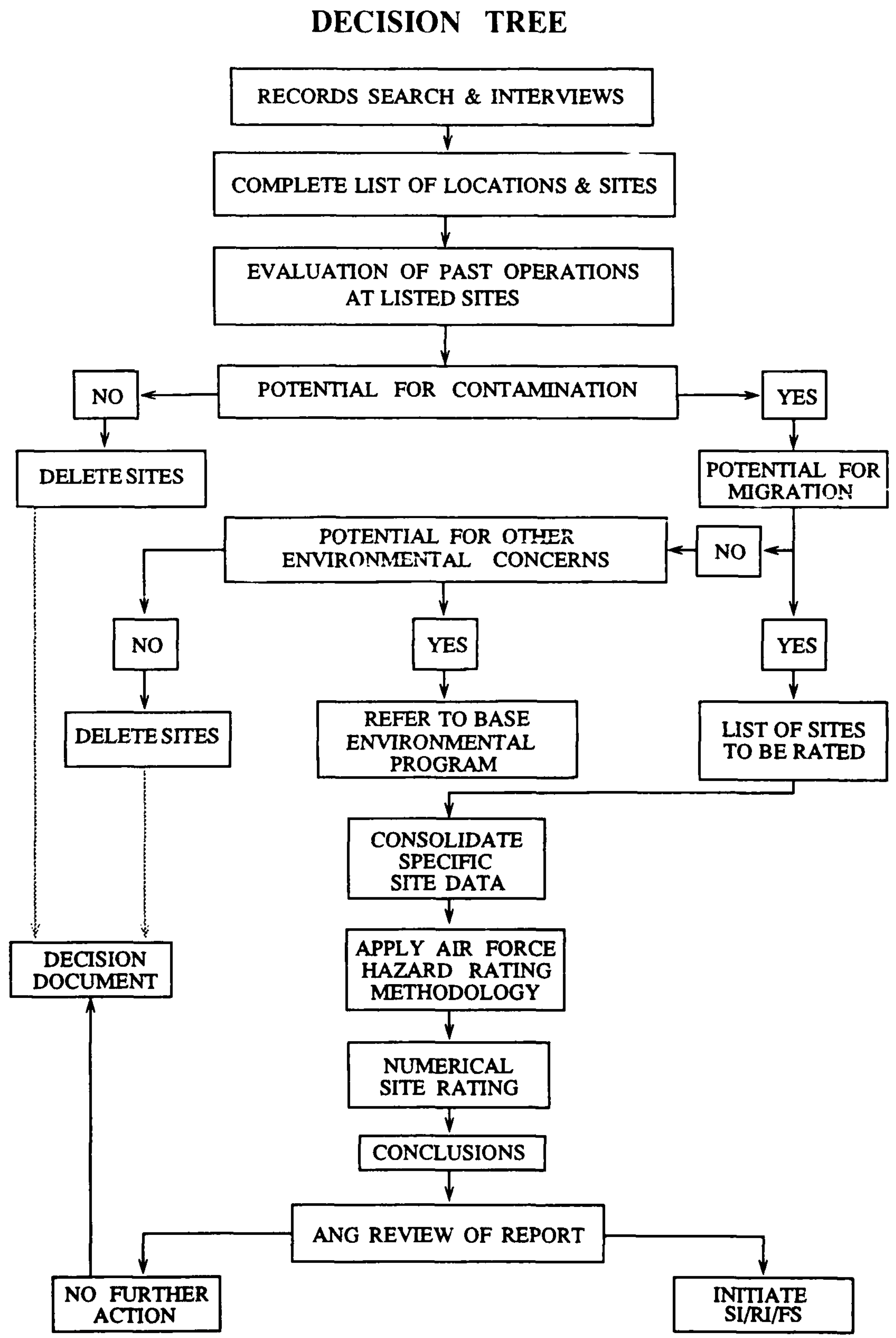
Figure I.1
Preliminary Assessment Methodology Flow Chart



scored using the Air Force Hazard Assessment Rating Methodology (HARM). A description of HARM is presented in Appendix C.

II. INSTALLATION DESCRIPTION

A. Location

The Base is located within Montgomery County, Alabama. It lies approximately 4.5 miles southwest of downtown Montgomery and is adjacent to the Dannelly Field MAP. The major route to the Base is Highway 80.

The Base occupies approximately 19 acres just south of Highway 80 and west of the 187th TFG, AL ANG at Dannelly Field MAP. On weekdays the population of AASF No. 1, OMS No. 18, and Fort Shepherd Armory is normally 43, 9, and 20, respectively. On weekends when several units are training, the maximum population at AASF No. 1, OMS No. 18, and Fort Shepherd Armory is 350, 25, and 300, respectively. Figure II.1 illustrates the location and boundaries of the Base.

B. Organization and History

AASF No. 1 was first constructed in 1960. The aircraft supported here were OH-23 helicopters and O-1 and U-6 airplanes. All aircraft had reciprocating engines that used aviation gasoline (AVGAS) and 50 weight motor oil. Wastes generated by maintenance of these aircraft included AVGAS, oils, solvents, and battery acid.

With the construction of AASF No. 1, the Old Aircraft Wash Rack was installed and put into operation on the east side of this building. For the next 13 years, detergents, solvents, and fuel were used to clean aircraft at the rack. Solvents, fuel, and residual waste oil cleaned from the aircraft may have contaminated an area of soil adjacent to the rack and soil along the rack's drainage ditch.

Figure II.1

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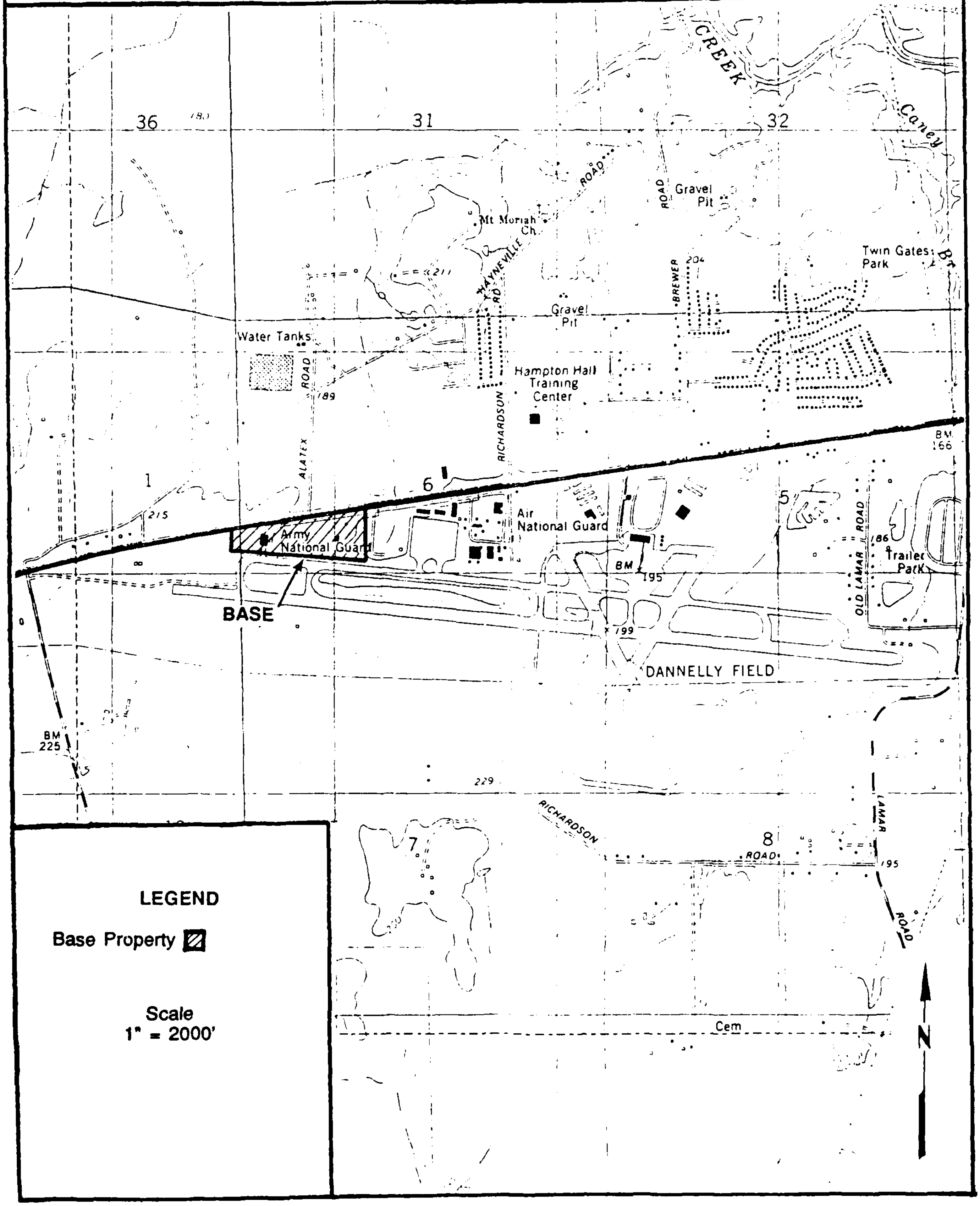
Source: USGS 7.5 Minute Series, Cantelous, Alabama, 1981

Location Map of AL ARNG at Dannelly Field MAP, Montgomery, Alabama



The Fort Shepherd Armory was built in 1965. The Armory was used as a vehicle maintenance shop until 1969 when OMS No. 18 was constructed. Routine vehicle maintenance activities have generated hazardous wastes such as fuels, solvents, and oils that require disposal.

In 1970 turbine engine helicopters were assigned to the Base. This resulted in a change of maintenance procedures. Accordingly, the types and volumes of wastes requiring disposal changed. For example, the new engines utilized JP-4 jet fuel and turbine engine oil rather than AVGAS and 50 weight motor oil.

Construction of new AASF No. 1 began in 1973. This new facility replaced original AASF No. 1 and took three years to complete. From 1973 to 1976, the Base moved its operations to Maxwell Air Force Base (AFB) while construction continued. Along with the new facility, the Base constructed the current aircraft wash rack on the west side of AASF No. 1. Rinse water from the current aircraft wash rack drains through an oil/water separator, and the effluent can be directed to either the sanitary sewer or a drainage ditch.

III. ENVIRONMENTAL SETTING

A. Meteorology

The following climatological data is largely derived from the Soil Survey of Montgomery County, Alabama (Burgess et al, 1960). Montgomery County has a humid, mild, almost subtropical climate. The average annual precipitation, based on an 83 year record (1873-1958), was 51.12 inches and ranged from 26.82 inches in 1954 to 78.25 inches in 1929. By calculating net precipitation according to the method outlined in the Federal Register (47 FR 31224, July 16, 1982), a net precipitation value of 7.12 inches per year is obtained. Rainfall intensity, based on 1-year, 24-hour rainfall, is 2.75 inches (Calculated according to 47 FR 31235, July 16, 1982, Figure 8.) Most precipitation that falls from late April to early June occurs in the form of showers and thundershowers. Droughts have occurred in the spring, late in the summer, and in the early fall. From December until early April, average precipitation is high, and rivers overflow frequently. The average annual temperature over an 83-year period (1873-1958) was 68°F. The average monthly temperature ranged from 49.2°F in January to 81.7°F in July. Winds are usually light. Strong winds generally last only a short time, and dangerous or catastrophic winds are rare.

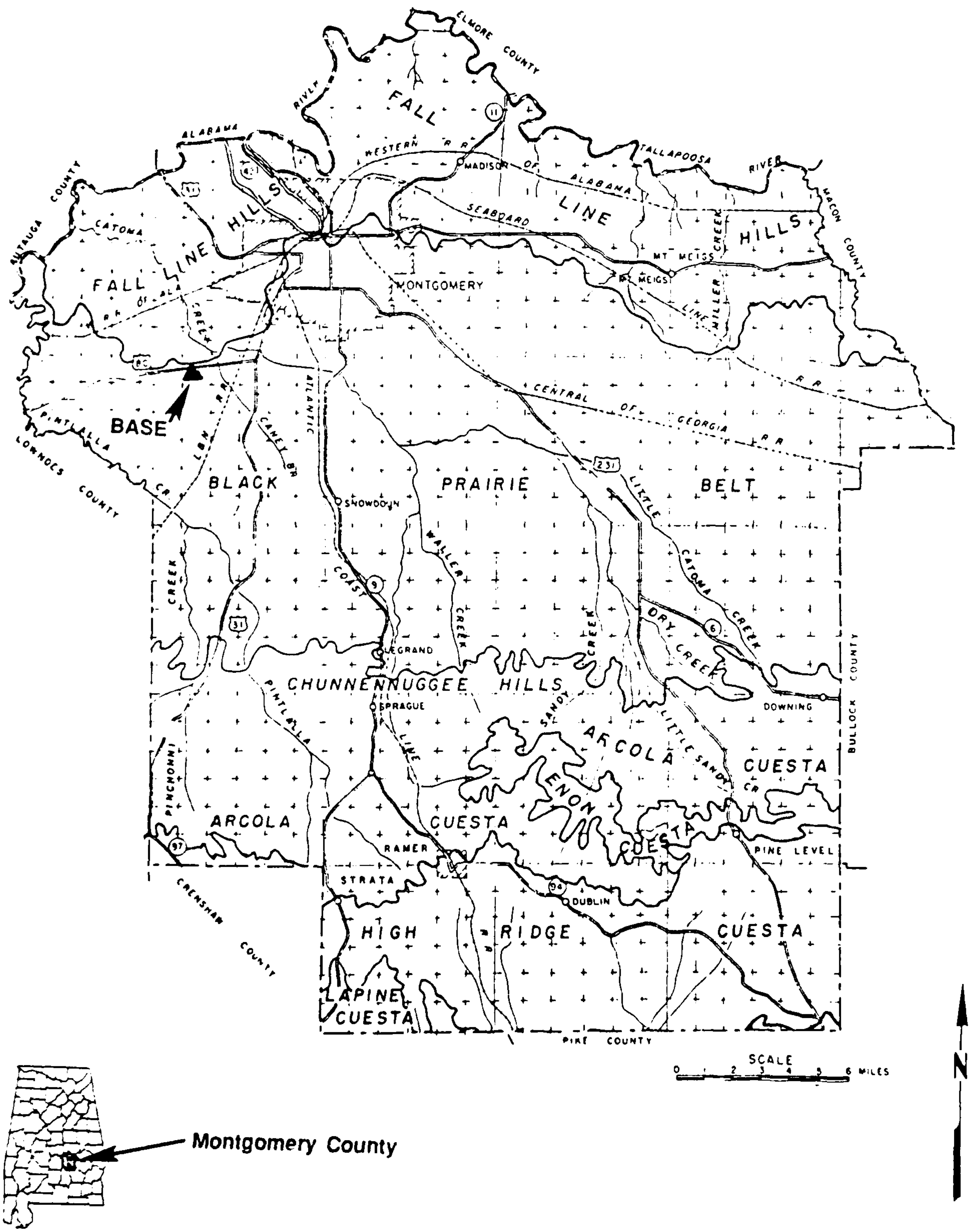
B. Geology

Montgomery County is in the northern part of the Coastal Plain physiographic province and encompasses parts of three physiographic divisions of the Coastal Plain: the Fall Line Hills, the Black Prairie, and the Chunnennuggee Hills. The Base is located within the Black Prairie physiographic division (Knowles et al, 1963). The areal distribution of these divisions is illustrated in Figure III.1. Surface

SciTek Source: Powell et al, 1957

Figure III.1.

Coastal Plain Physiographic Subdivisions in Montgomery County, Alabama



elevations at the Base and in its immediate vicinity range from 200 to 250 feet Above Mean Sea Level (AMSL).

Geologic formations that crop out in Montgomery County are of sedimentary origin and range from Late Cretaceous rocks overlying the crystalline basement complex to Pleistocene terrace deposits and Recent alluvium (Knowles et al, 1963). These stratigraphic units are shown in Table III.1. Test holes G-33 and H-28, which were drilled by the Water Works and Sanitary Sewer Board of the City of Montgomery, penetrated the Precambrian aged basement at depths of 1008 and 1215 feet, respectively. Drilling data for these test holes are presented in Powell et al (1957). Formations within this section in descending stratigraphic sequence include the Quaternary aged Alluvium and Terrace deposits and the Cretaceous aged Mooreville Chalk, Eutaw Formation, Gordo Formation, and Coker Formation. The Cretaceous formations dip to the south at a rate of 40 to 50 feet per mile. The Eutaw, Gordo, and Coker Formations crop out updip and north of the Base (Figure III.2).

The northern part of the Black Prairie physiographic division, where the Base is located, developed on the Cretaceous age Mooreville Chalk, which was formed in warm shallow seas. Various microfossils, which indicate warm, shallow marine origins, comprise a large percent of the chalk (Knowles et al, 1963).

The Mooreville Chalk is a chiefly gray or yellowish-gray to pale-olive silty to finely sandy, argillaceous, fossiliferous chalk. At the Base, the Mooreville Chalk is approximately 137 feet thick (Knowles et al, 1963). The basal 15 to 20 feet is slightly glauconitic and sandy.

The Mooreville Chalk unconformably overlies the Eutaw Formation. The unconformable contact at the Base occurs at a depth of 137 feet from the

SciTek Source: Powell et al, 1957

Table III.1

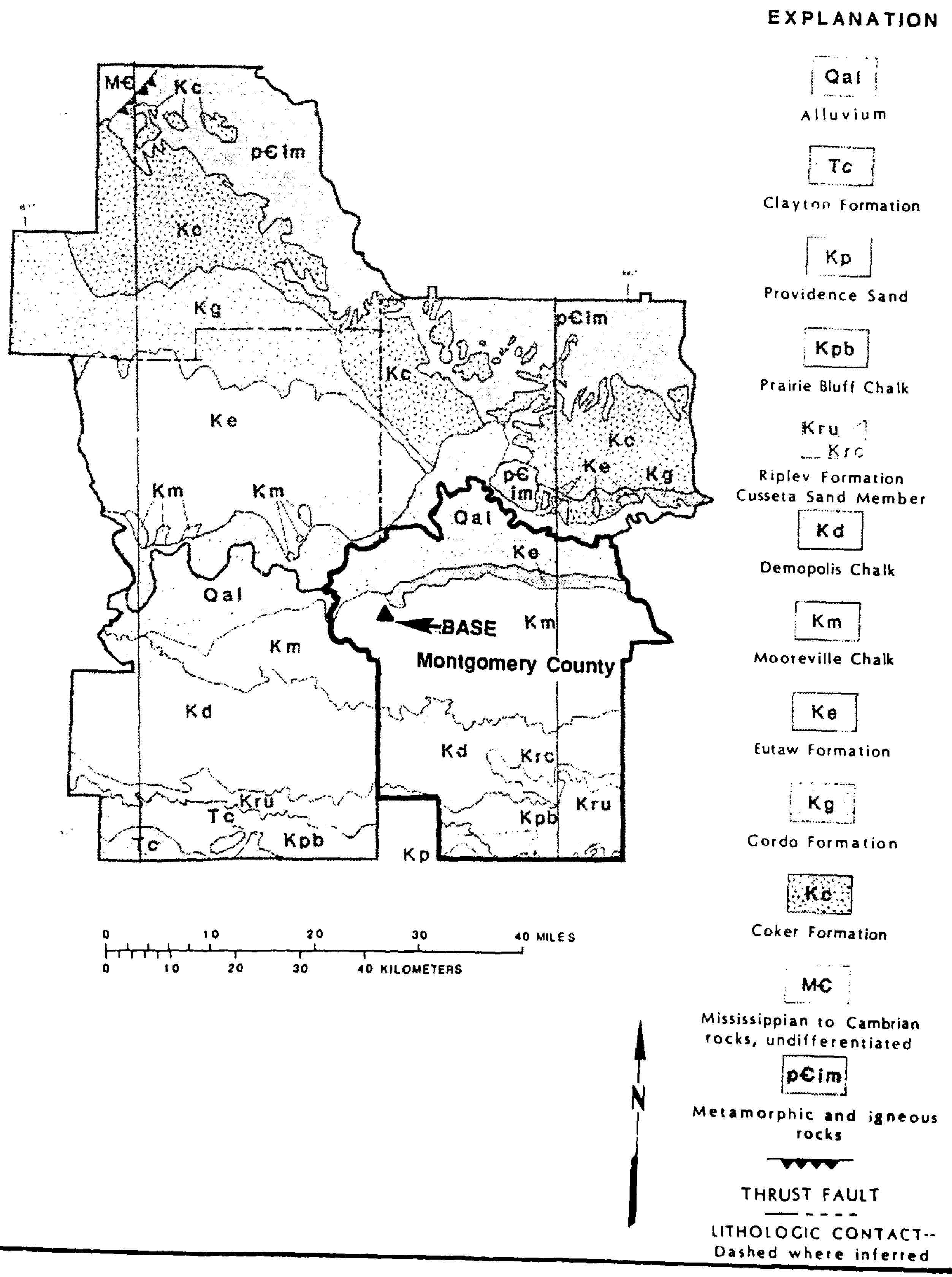
Stratigraphic Section at the Base

System	Series	Subdivision		Thickness (ft.)	Character	Water supply
Quaternary	Recent	Alluvium		0-20	Sand, gravel, silt, and clay, poorly sorted.	Yields small quantities of water to domestic and stock wells.
	Pleistocene	Terrace deposits		0-80	Sand, gravel, and clay, reddish-brown, poorly sorted.	Yield large quantities of water to municipal, industrial, and domestic wells.
Cretaceous	Upper Cretaceous	Selma group	Mooreville chalk	0-260	Chalk, clayey, sandy, fossiliferous. Base of chalk is glauconitic and contains phosphate nodules.	Yields little or no water to wells.
		Eutaw formation		200-400	Greenish-gray sand, fine- to medium-grained, glauconitic; greenish-gray clay, glauconitic, interbedded with sand. Thin beds of white sandstone in upper part.	Sands in the upper and lower part of formation are good aquifers. These aquifers yield moderate to large quantities of water to municipal and industrial wells.
		Tuscaloosa group	Gordo formation	210-350	Yellow sand, medium- to very coarse-grained, poorly sorted; varicolored clay interbedded with sand. Beds of gravel in lower part.	Sands in the upper and middle part of formation are good aquifers and supply water for municipal, industrial, and domestic use. Supplies water to flowing wells in low areas along Alabama River.
			Coker formation	550±	Greenish-gray sand, fine- to medium-grained; greenish-gray clay, lignitic, interbedded with sand.	Sands in the upper part of formation are good aquifers and supply water for municipal use.
Precambrian					Mica schist.	Yields no water to wells.

SciTek Source: Scott et al, 1987

Figure III.2.

Geologic Map of Montgomery County, Alabama and Vicinity



ground surface. The Eutaw Formation averages between 250 and 300 feet thick at the Base and consists of light gray or greenish-gray, cross-laminated fine- to medium-grained, well-sorted micaceous sand that is interbedded with greenish-gray micaceous, glauconitic, fossiliferous clay. Beds of greenish-gray sandy clay are also common. The Eutaw Formation rests unconformably on the Gordo Formation. The Eutaw Formation is extensively developed as a source of water in Montgomery County (Knowles et al, 1963).

The Gordo Formation is composed of yellowish-orange medium- to coarse-grained sand. A section of coarse-grained gravel occurs at the base of the Gordo Formation. At the Base and in its immediate vicinity, the Gordo Formation is penetrated at depths greater than 250 feet below the land surface. Its thickness ranges from 210 to 350 feet. The underlying Coker Formation consists of fine- to medium-grained sand and clay. The Coker Formation is penetrated at depths greater than 400 feet below the land surface. Its thickness commonly exceeds 550 feet (Powell et al, 1957).

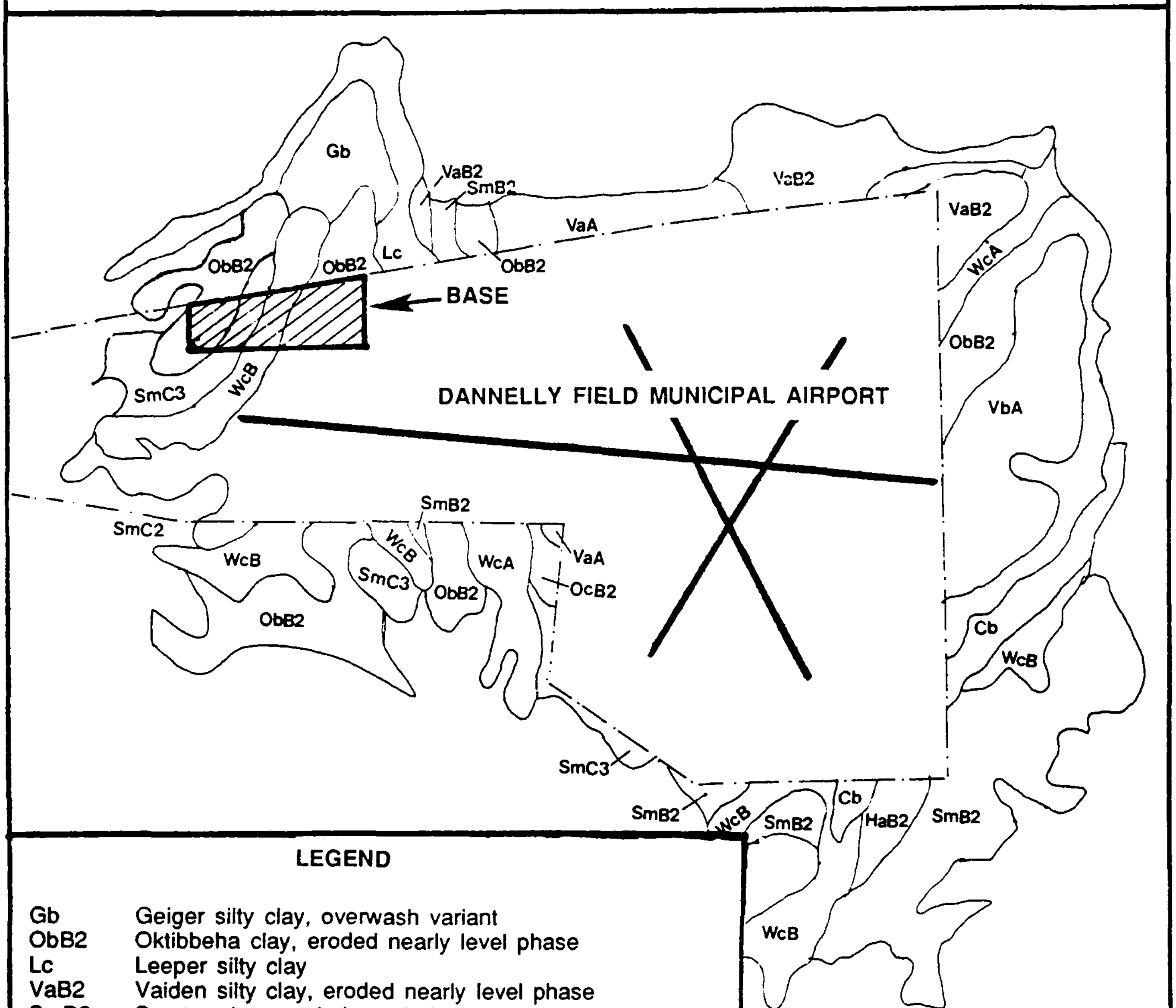
C. Soils

The Soil Conservation Service (SCS) has not discretely mapped the soils within the eastern portion of the Base and at Dannelly Field Municipal Airport. However, conversations with soil scientists at the SCS office in Montgomery, Alabama indicated that one soil type that joins the Base's northern boundary probably extends onto the east portion of the Base. As illustrated in Figure III.3, this soil type is the Oktibbeha clay, eroded nearly level phase (ObB2). To a depth of 60 inches, this soil consists of gray, red, and reddish-brown clay. Soil permeability is slow to very slow. Surficial slopes range from 1 to 3 percent (Burgess et al, 1960).

SciTek Source: Burgess et al, 1960

Figure III.3

Soils Map of the Base and Dannelly Field Municipal Airport, Montgomery, Alabama



LEGEND

Gb	Geiger silty clay, overwash variant
ObB2	Oktibbeha clay, eroded nearly level phase
Lc	Leeper silty clay
VaB2	Vaiden silty clay, eroded nearly level phase
SmB2	Sumter clay, eroded nearly level phase
VaA	Vaiden fine sandy loam, level phase
VaB2	Vaiden fine sandy loam, eroded nearly level phase
WcA	West Point clay, level phase
VbA	Vaiden silty clay, nearly level phase
Cb	Catalpa clay
WcB	West Point clay, nearly level phase
HaB2	Houston clay, eroded nearly level phase
SmB3	Sumter clay, severely eroded nearly level phase
OcB2	Oktibbeha fine sandy loam, eroded nearly level phase
SmC2	Sumter clay, eroded very gently sloping phase
SmC3	Sumter clay, severely eroded very gently sloping phase

Base Property

Soil Series Boundary

Airport Runway

Scale
1" = 1660'

N

The soils within the western portion of the Base are Sumter clay, severely eroded very gently sloping phase (SmC3); the West Point clay, nearly level phase (WcB); and the previously described Oktibbeha clay. Soil grading and cut and fill operations that were associated with the construction of Base facilities have probably changed the soil series boundaries illustrated on Figure III.3. Sumter clay, severely eroded very gently sloping phase soil to a depth of 50 inches consists of gray clay. Soil permeability is moderate to slow. Surficial slopes range from 3 to 5 percent. The West Point clay, nearly level phase soil to a depth of 45 inches consists of gray to black clay. Soil permeability ranges from moderately slow to slow. Soil boring logs derived from soil borings drilled at the 187th TFG indicated a surficial 3 to 5 foot layer of tan and gray plastic clay overlying deeper, undisturbed clay soils. The lithology of the 3 to 5 foot surficial layer suggests that the source of the fill covering the Base is from cut and fill operations on the airport itself, and therefore, it is assumed that the Base clay fill has characteristics similar to natural clay soils in adjacent areas (Burgess et al, 1960).

D. Hydrology

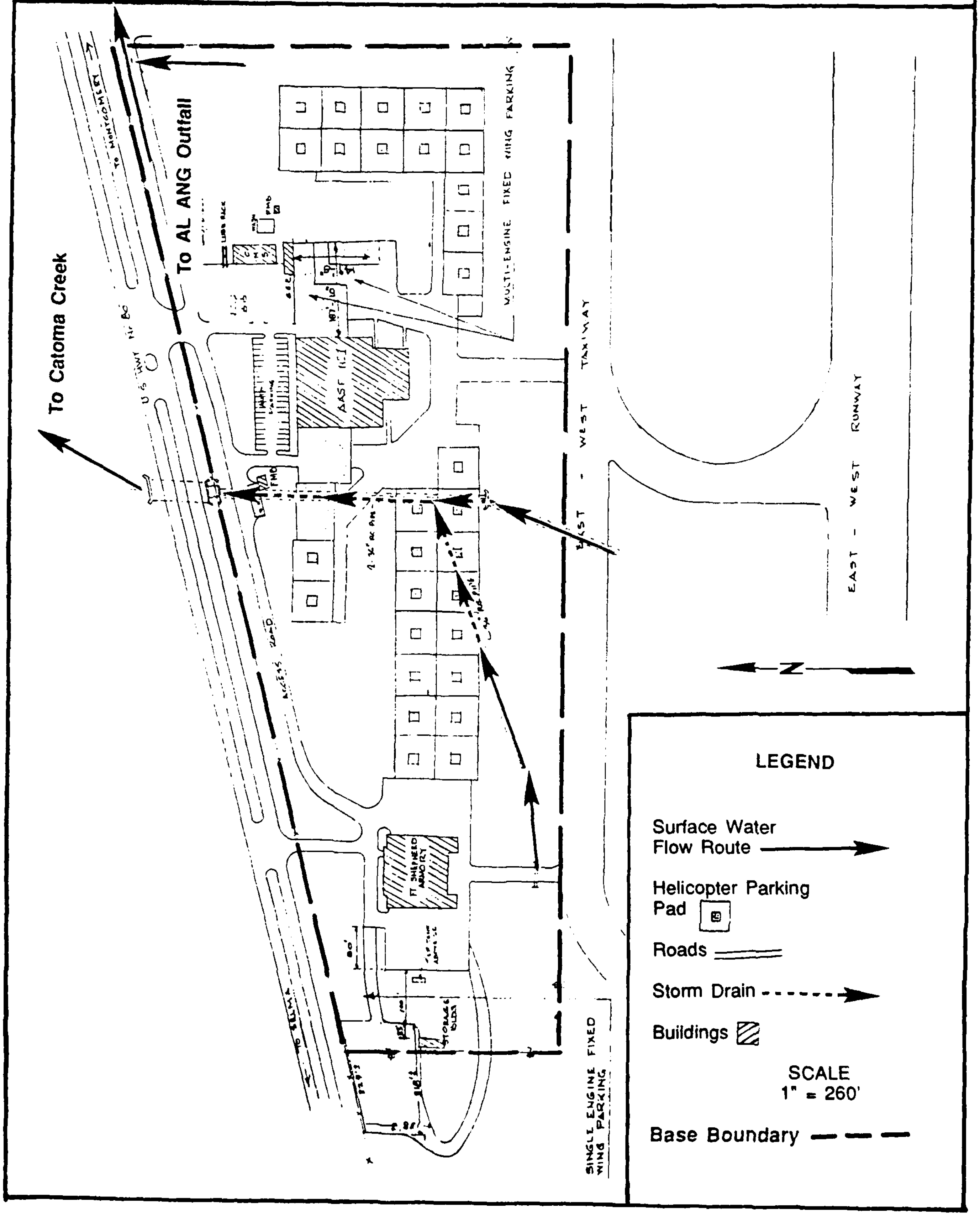
1. Surface Water

The Base is located within the Alabama River drainage basin. Surface water from the entire Base is collected in a 36 inch storm drain west of AASF No. 1 (Figure III.4). This storm drain discharges into an open ditch on the north side of U.S. Highway 80. This open ditch joins an unnamed tributary of Catoma Creek approximately one half mile northeast of the Base (Figure III.5). The unnamed tributary flows into Catoma Creek 1.5 miles northeast of the Base. Catoma Creek joins the Alabama River approximately 6 miles northwest of the Base. According to sources at the Alabama Highway Department, Urban

SciTek Source: State of Alabama, Military Department, 1979

Figure III.4

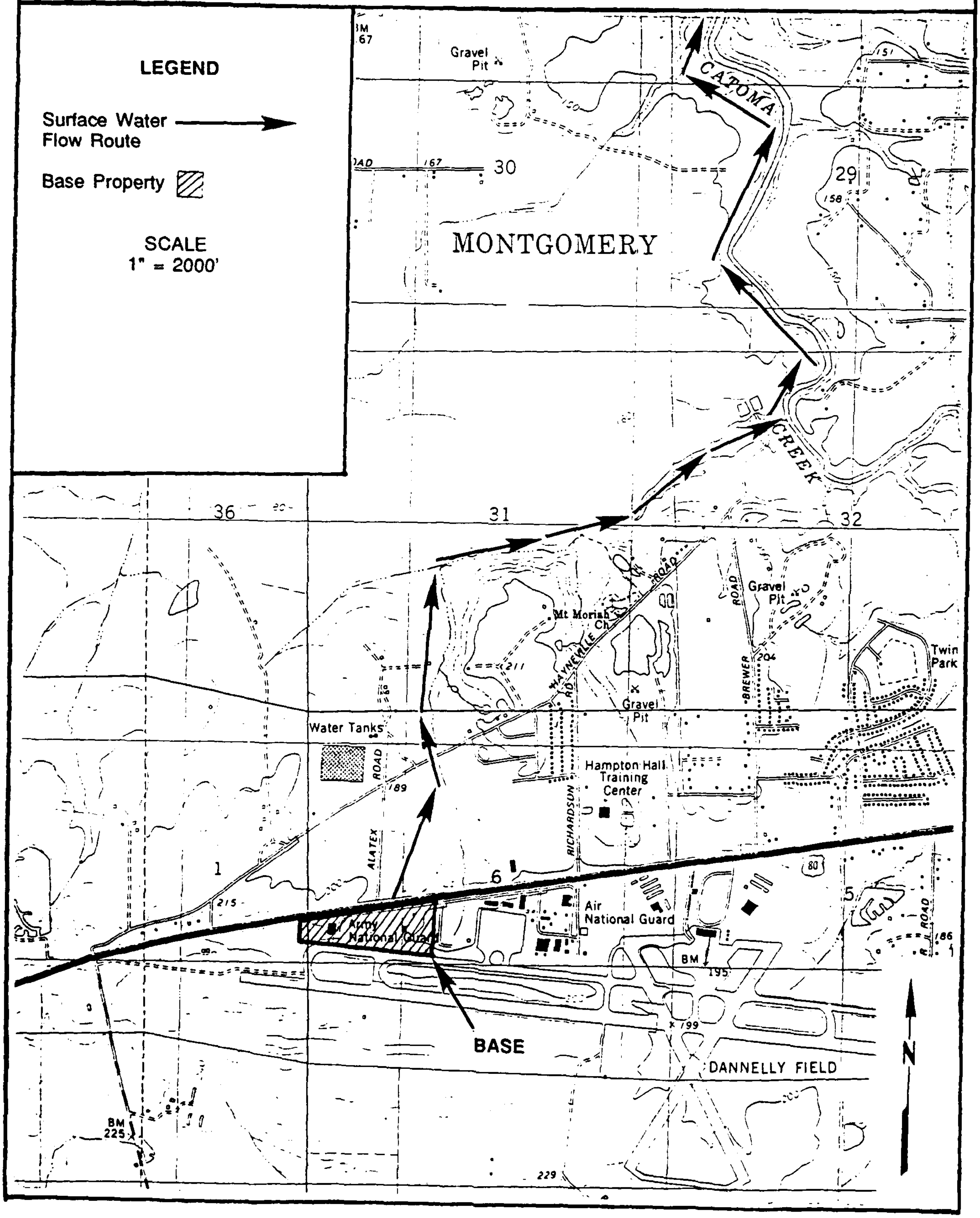
Surface Water Flow Routes at the Base



SciTek Source: USGS 7.5 Minute Series, Cantelous, Alabama, 1981

Figure III.5

Route of Surface Water Flow from the Base Storm Sewer Outfall



Planning Division, the Base is not located within a flood plain associated with 100-year occurrence floods.

2. Groundwater

The Eutaw, Gordo, and Coker Formations are the principal aquifers used for drinking water in Montgomery County. Groundwater in each of these aquifers occurs under confined or artesian conditions.

The Mooreville Chalk, which immediately underlies the soil at the Base, is an aquiclude that prevents hydrological communication and recharge from the shallow, surficial water table. The Eutaw, Gordo, and Coker aquifers produce groundwater from permeable sections of unconsolidated sand and gravel. Each of these aquifers is recharged updip and north of the Base where they crop out. Surface water entering the aquifer moves downgradient and replenishes previously pumped groundwater.

The Eutaw, Gordo, and Coker aquifers have been tapped by wells installed by the City of Montgomery (Knowles et al, 1963). The city's West Field, which supplies water to a large portion of Montgomery, is located approximately 1.25 miles northwest of the Base. The city's wells are screened in the basal portion of the Eutaw Formation and throughout the Gordo and Coker Formations. Two miles northeast of the Base, the city has recently installed two wells. These wells are screened in the Gordo and Coker Formations.

The coefficient of transmissibility and coefficient of storage for aquifers that occur within the Eutaw Formation and the Tuscaloosa Group (Gordo and Coker Formations) were determined by pump tests. These determinations were made by observing the rate of drawdown in water levels during a period of pumping and the rate of recovery after pumping was stopped. The average coefficient of transmissibility, which was computed from pump tests on three wells in the Montgomery West Field, was 50,000 gpd/ft. The average coefficient of storage was 0.0001. Each of the three wells tapped the Eutaw Formation and the Tuscaloosa Group.

Residents in the vicinity of the Base are using private wells for drinking water because the City of Montgomery's water lines are not easily accessible in this location. The areal distribution of these wells in relation to the Base is illustrated in Figure III.6. The known wells in Montgomery, including those shown on Figure III.6, yield from 30 to 400 GPM. Local U.S. Geological Survey (USGS) authorities have stated that most of these private wells are screened within the Eutaw Formation.

A water well is located outside of the Fort Shepherd Armory and near the center of its west wall (Figure III.6). This well has supplied water to this building. No other information on the well is currently available. However, in early 1990, the building's water system is scheduled to be disconnected from the well. When this occurs, the water supply for the Armory and the Base will be entirely municipal water purchased from the City of Montgomery.

The next nearest well to the Base is located at the AL ANG's jet engine test cell. Its location is approximately 2000 feet from the Base's eastern boundary (Figure III.6).

The general direction of groundwater flow in the Eutaw Formation is northwest towards the Alabama River (Figure III.7). Locally, the flow direction is influenced by pumping of the city's West Field. USGS sources in Montgomery indicate that there is insufficient data to determine the flow direction of aquifers below the Eutaw Formation but that these also would be influenced by pumping of the city's well field.

SciTek

Source: Knowles et al, 1960

Figure III.6

Distribution of Water Wells at the Base and in Adjacent Areas

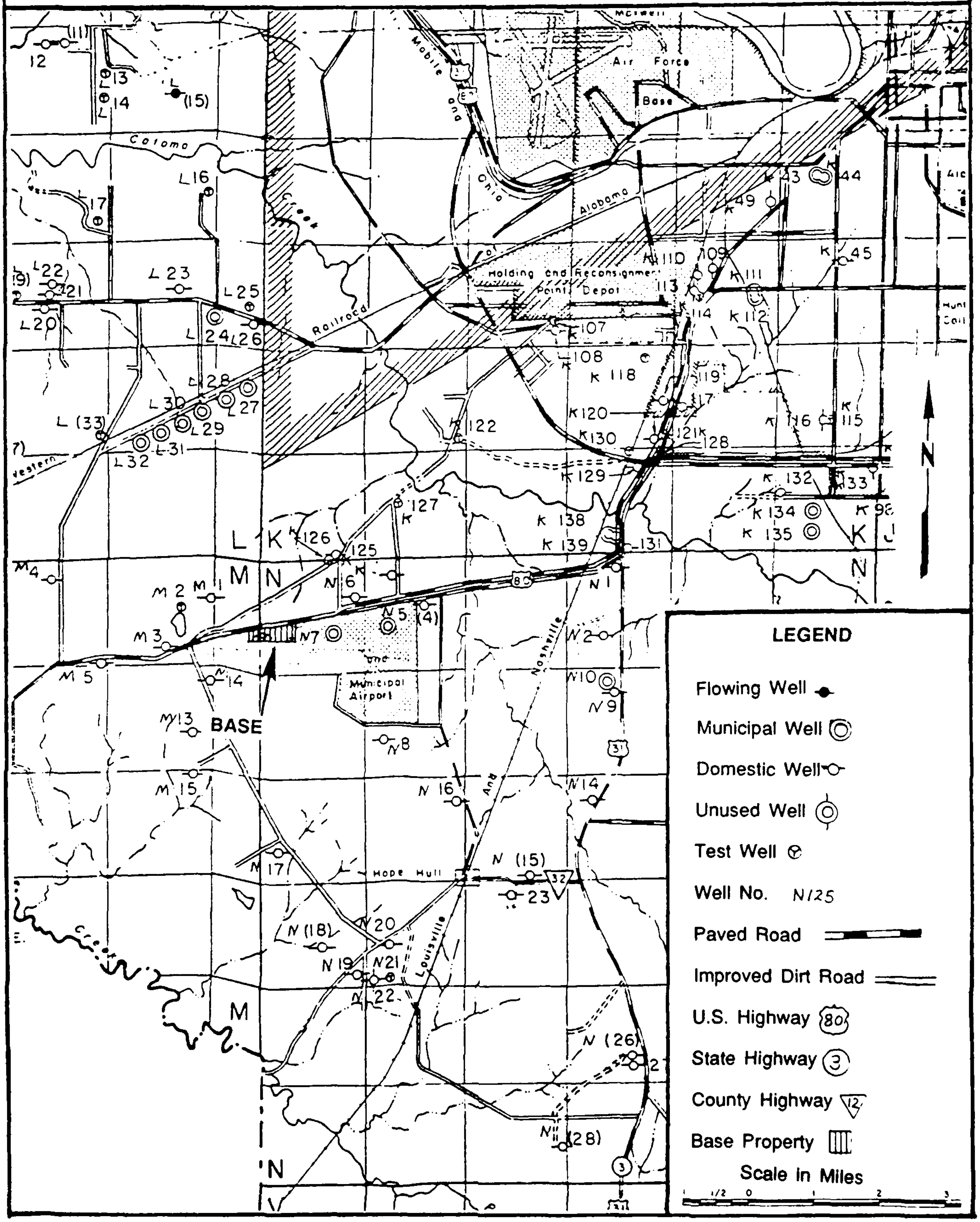
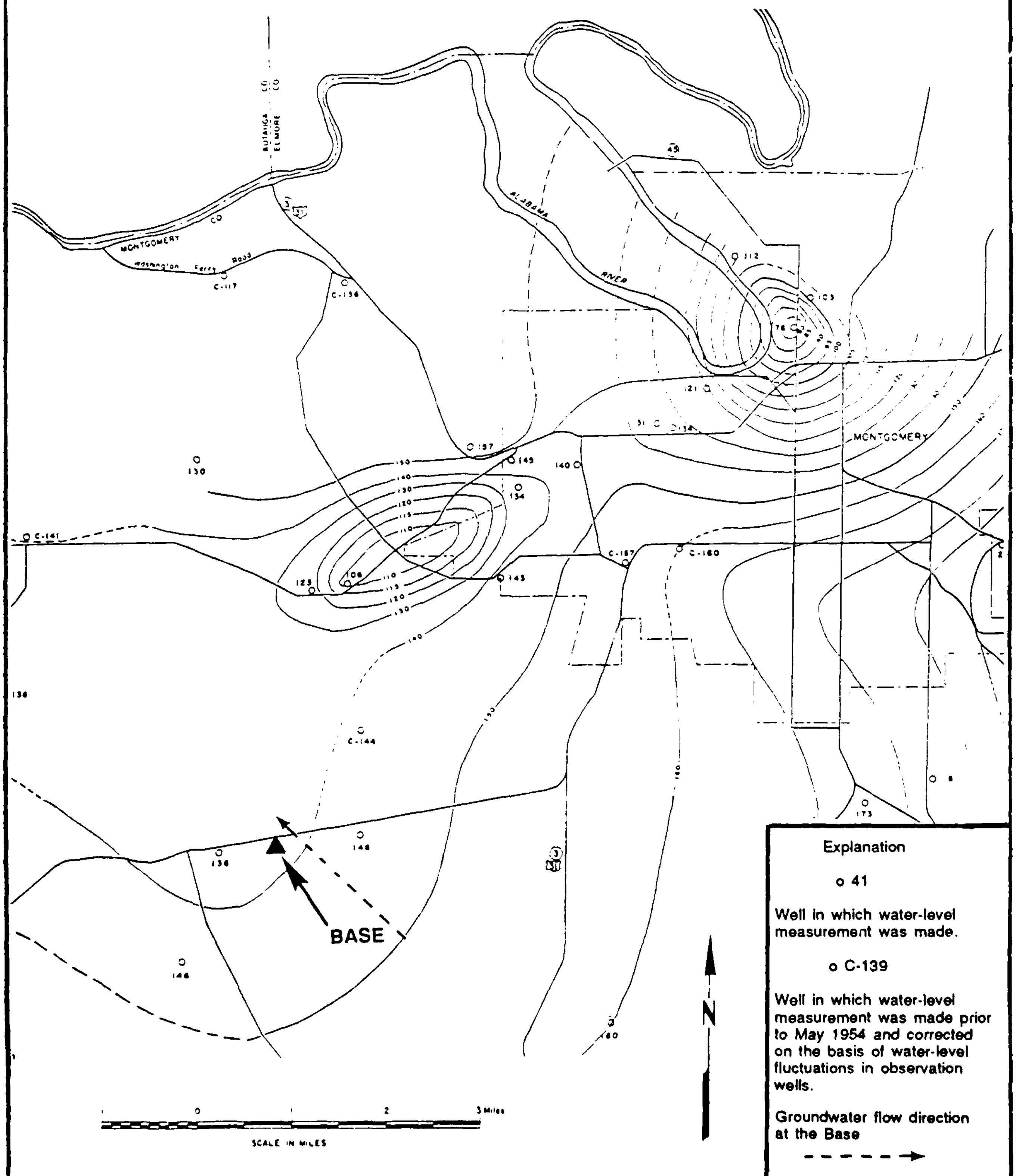


Figure III.7

SciTek

Source: Powell et al, 1957

Approximate Elevation of the Artesian Head in the Eutaw Formation at the Base



Some unconfined groundwater occurs at the Base within soils and parent material overlying the Mooreville Chalk. Soil boring records (Christian Testing Laboratories, 1982) and minor excavations performed by the AL ANG show the water table (24 hours) to be within two feet of the surface at some locations on the Base. Such shallow, unconfined groundwater is the most susceptible to contamination from surface pollutants. In general, risks associated with contamination of shallow groundwater arise from direct consumption of unconfined groundwater from shallow wells, contaminant percolation into deeper aquifers that are used for drinking water, or lateral flow of contaminated groundwater near the surface and subsequent discharge into local streams. The Mooreville Chalk, the uppermost geologic formation underlying the Base, is of insufficient water bearing capacity to serve as an aquifer. No known wells are installed in this formation. The chalk's relative impermeability restricts vertical penetration of shallow groundwater (Knowles et al, 1963). At the Base, contact with the chalk formation occurs between 11 and 20 feet from the land surface. The chalk extends to a depth of 137 feet. According to local USGS sources, water above the Mooreville Chalk is restricted in downward movement and flows laterally, following the gradient of the Mooreville Chalk and local topographic features. Thus, shallow groundwater at the Base flows northward over the chalk and ultimately discharges into local streams that are tributaries of Catoma Creek.

USGS personnel have recently conducted studies regarding the susceptibility of major aquifers in the Montgomery area to surface contamination (Scott et al, 1987). These studies indicate that where the Mooreville Chalk occurs, shallow groundwater is generally restricted from entering deeper underlying aquifers. Some interformational transmission of groundwater does occur in the form of upward leakage of groundwater from the Eutaw Formation into the

Mooreville Chalk. Thus, although inadequate as an aquifer, the Mooreville Chalk is saturated from its base (137 feet below the land surface) to the level of the potentiometric surface of the underlying Eutaw Formation (approximately 65 feet below the land surface) (Knowles et al, 1963). The chalk above the potentiometric surface of the Eutaw Formation is much less saturated.

It is possible for contaminant migration to occur through fracture zones that may exist within the Mooreville Chalk. Whether or not such fracturing is present at the Base cannot be determined from available geologic data. Wells that penetrate the Mooreville Chalk near the Base may also serve as pathways of cross-contamination between the shallow and deeper aquifers. However, given that the hydraulic head of the Eutaw and other aquifers below the Mooreville Chalk is greater than that of shallow groundwater overlying the chalk, downward vertical movement of shallow groundwater into deeper aquifers is restricted even through fractures or improperly grouted well shafts. Significant downward movement of groundwater is likely to occur if the potentiometric surface of the Eutaw aquifer falls below the Mooreville Chalk. The potentiometric surface of the Eutaw aquifer currently lies within the Mooreville Chalk.

Water samples that were collected from wells near the Base have been tested for water quality. The analytical results for some of these wells are shown in Table III.2. The locations of these wells are shown in Figure III.6.

SciTek

Source: Knowles et al, 1960

Table III.2
Water Quality Data for Wells Near the Base

Well	Depth of well (feet)	Date of collection	Water-bearing formation	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$: Total	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25° C)	pH
d N-7	470	10-15-52	Ke	12	0.4	0	1.4	0.4	...	...	256	20	10	10	....	.....	280	9	.....	.....	9.0
N-15	310	12-17-40	Ke	....	.....	....	....	.....	.....	...	254	....	50	33	0.6	.....	...	21	.....	.....	...
N-18	400	11-14-52	Ke	....	.16	....	....	.....	.....	...	261	7	24	40	2.0	1.0	...	6	0	592	8.5
N-26	390	12-18-40	Ke	....	.....	....	....	.....	.....	...	262	....	34	28	.9	.....	...	9	.....	.....	...
N-28	365	11-28-52	Ke	....	.....	....	....	.....	.....	...	278	2	36	58	1.4	.9	...	15	0	663	8.4
b L-27	*119-194	12- 4-53	Ke	11	.....	0.1	....	.....	.....	...	...	....	8	6.4	0.8	.....	193	17	.....	.....	8.4
b L-27	*317-334	12-11-53	Ke	11	.....	0	....	.....	.....	...	...	....	6	11	.6	.....	190	17	.....	.....	8.2
b L-27	*403-490	12-15-53	Kg	14	.....	0	....	.....	.....	...	...	....	4	5.6	.4	.....	126	19	.....	.....	7.7
L-33	*103-123	9-12-52	Ke	....	0.35	....	....	.....	.....	...	261	14	15	11	1.4	0.0	...	7	0	485	8.8
L-33	*125-159	8-23-52	Ke	....	1.6	....	....	.....	.....	...	248	19	10	11	2.0	.8	...	9	0	498	8.9
L-33	*178-229	8-27-52	Ke	....	.47	....	....	.....	.....	...	278	16	34	15	1.6	.3	...	11	0	555	8.8
L-33	*239-292	8-29-52	Ke	....	.51	....	....	.....	.....	...	292	18	14	14	1.8	.1	...	9	0	561	8.8
b K-105	647	3- -49	Ke Kg Kck	18	.....	0.2	....	.....	.....	...	...	....	5	7.0	0.1	.....	213	103	.....	.....	7.7
K-107	271	8- 6-52	Ke	....	0.26	....	....	.....	.....	...	175	6	7	4.5	.4	0.0	...	54	0	307	8.5
K-108	25	2-26-53	Qt	....	.84	....	....	.....	.....	...	15	0	3	3.0	.1	2.8	...	9	0	59.9	5.8
b K-114	*185-231	10-30-52	Ke	32	.....	0	....	.....	.....	...	...	....	12	5.2	.3	.....	101	39	.....	.....	8.3
b K-114	*403-439	11- 4-52	Kg	34	.....	0	....	.....	.....	...	...	....	8	38	.2	.....	405	18	.....	.....	8.3
K-115	*200-235	1- 7-53	Ke	....	2.9	....	....	.....	.....	...	214	0	5	4.0	.1	.0	...	169	0	345	7.0
K-115	*235-280	1- 9-53	Ke	....	.23	....	....	.....	.....	...	136	0	6	3.2	.1	.0	...	98	0	231	7.6

IV. SITE EVALUATION

A. Activity Review

A review of Base records and interviews with personnel were used to identify specific operations in which the majority of hazardous materials and/or hazardous wastes are used, stored, processed, and disposed. Table IV.1 provides a history of waste generation and disposal for operations conducted by shops at the Base. If an item is not listed on the table on a best-estimated basis, that activity or operation produces negligible (less than 1 gallon/year) waste requiring disposal.

Data on the Base's underground storage tanks and oil/water separators (O/WS) are tabulated in Appendix E. A map showing the locations of these facilities is also included in this appendix.

The potable water supply and sanitary sewer service for AASF No. 1 and OMS No. 18 is provided by the Water Works and Sanitary Sewer Board of the City of Montgomery. Fort Shepherd Armory obtains its water from a potable water well. However, by early 1990 this facility is scheduled to be disconnected from the well and connected to the water supply provided by the City of Montgomery

B. Disposal/Spill Site Information, Evaluation, and Hazard Assessment

Twenty-six persons were interviewed to identify and locate potential sites that may have been contaminated by hazardous wastes as a result of past Base operations. Four potentially contaminated sites were identified through the interviews. These site identifications were followed-up by visual field examinations of the sites.

Table IV.1

Hazardous Wastes Disposal Summary: Alabama Army National Guard Base, Dannelly Field Municipal Airport, Montgomery, Alabama

Bldg.	Maintenance Operations	Possible Hazardous Wastes	Estimated Quantity (gal/yr)	Method of Disposal 1960 1970 1980 1989
AASF No. 1	Aircraft Maintenance	PD-680 (Type II Solvent)	50	|-------AWR-------|----------CONTR----------|
		Battery Acid	10	|----DRMO-----|------------NLU-------------|
		Strippers (MEK, MIK)	3	|-----NIU-----|------------PROC------------|
		Synthetic Turbine Oil	100	|-----NIU-----|----FTA-----|-----CONTR-----|
		JP-4	200	|-----NIU-----|--------FTA--------|-CONTR--|
		Acetic Acid	2	|-----NIU-----|----------DRMO--------------|
		Hydraulic Oil	100	|--NIU--|-DRMO--|----------CONTR-----------|
		AVGAS	1[illegible]	|--------FTA--------|--------PROC----------|
		Gunk	200	|------AWR------|FTA|---------NLU----------|
		Mineral Spirits	150	|------AWR------|----------CONTR-----------|
		Toluene	3	|------UNK------|-------SAN-------|-CONTR--|
OMS No. 18	Vehicle Maintenance	Engine Oil	500	|-----UNK-----|-----DRMO------|---CONTR----|
		Sulfuric Acid	150	|-----UNK-----|----------DRMO--------------|
		JP-4	1[illegible]	|-----UNK-----|-----DRMO------|---CONTR----|
		Ethylene Glycol	200	|-----UNK-----|-----------GND/SAN----------|
		Lubricating Oil	2	|-----UNK-----|----------RAGS/TRASH--------|
		Hydraulic Oil	100	|-----UNK-----|-----DRMO------|---CONTR----|

Table IV.1 (continued)

Bldg.	Maintenance Operations	Possible Hazardous Wastes	Estimated Quantity (gal/yr)	Method of Disposal 1960 - 1970 - 1980 - 1989
OMS No. 18 (continued)	Vehicle Maintenance (continued)	Transmission Fluid	100	|-----UNK-----|-----DRMO------|---CONTR----|
		Paint Containers (Residual)	15 cont.	|-----UNK-----|-----------TRASH------------|
		Paint Thinner	150	|-----UNK-----|----------GND/SAN-----------|
		Brake Fluid	50	|-----UNK-----|------------SAN-------------|
		Diesel Fuel	50	|-----UNK-----|----------GND/SAN-----------|
		Bearing Grease	40	|-----UNK-----|--------RAGS/TRASH----------|
		MOGAS	15	|-----UNK-----|------------SAN-------------|
Fort Shepherd Armory	Weapons Maintenance	Mineral Spirits	10	|---------------PROC------ -------|--NLU--|

KEY:

AWR - Disposed of during use through drainage system at Old Aircraft Wash Rack.
CONTR - Disposed of by a contractor.
DRMO - Defense Reutilization and Marketing Office
FTA - Disposed of at the fire training area on airport property.
GND - Disposed of on the ground.
NIU - Material was not in use at this time.
NLU - Material is no longer used.
PROC - Material used in process (i.e. evaporation).
RAGS/TRASH - Wiped on rags and rags disposed of in general trash that goes to city landfills.
SAN - Disposed of via the sanitary sewer system.
UNK - Disposal method is unknown.

NOTE: From 1973 - 1976, the shops at the Base were not operating because of construction. Consequently, no wastes requiring disposal were generated at the Base. Operations during this period were conducted at Maxwell AFB in Montgomery.

Each of these sites was rated by application of the United States Air Force (USAF) HARM (Appendix C), and since the potential for contaminant migration exists at these four sites, each is recommended for further investigation under the IRP program. Copies of completed HARM forms and an explanation of the factor rating criteria used for site scoring are contained in Appendix D.

The potential exists for contaminant migration at each of the four rated sites. Contaminants that may have been released at these sites have the potential to be transported by groundwater and surface water. The seasonal high water table, which is 0 to 10 feet below the ground surface at the Base, has the highest risk for groundwater contamination. If the shallow groundwater becomes contaminated by hazardous wastes, then, under certain circumstances, the deeper aquifers may also be contaminated by groundwater migration. Released contaminants that are exposed on the ground surface have the potential to be transported by surface water migration into Catoma Creek and eventually into the Alabama River.

Locations for the four rated sites are provided on Figure IV.1. The following items are descriptions of the four potential sites identified at the Base:

Site No. 1 - Old Aircraft Wash Rack Drainage Area (HAS - 77)

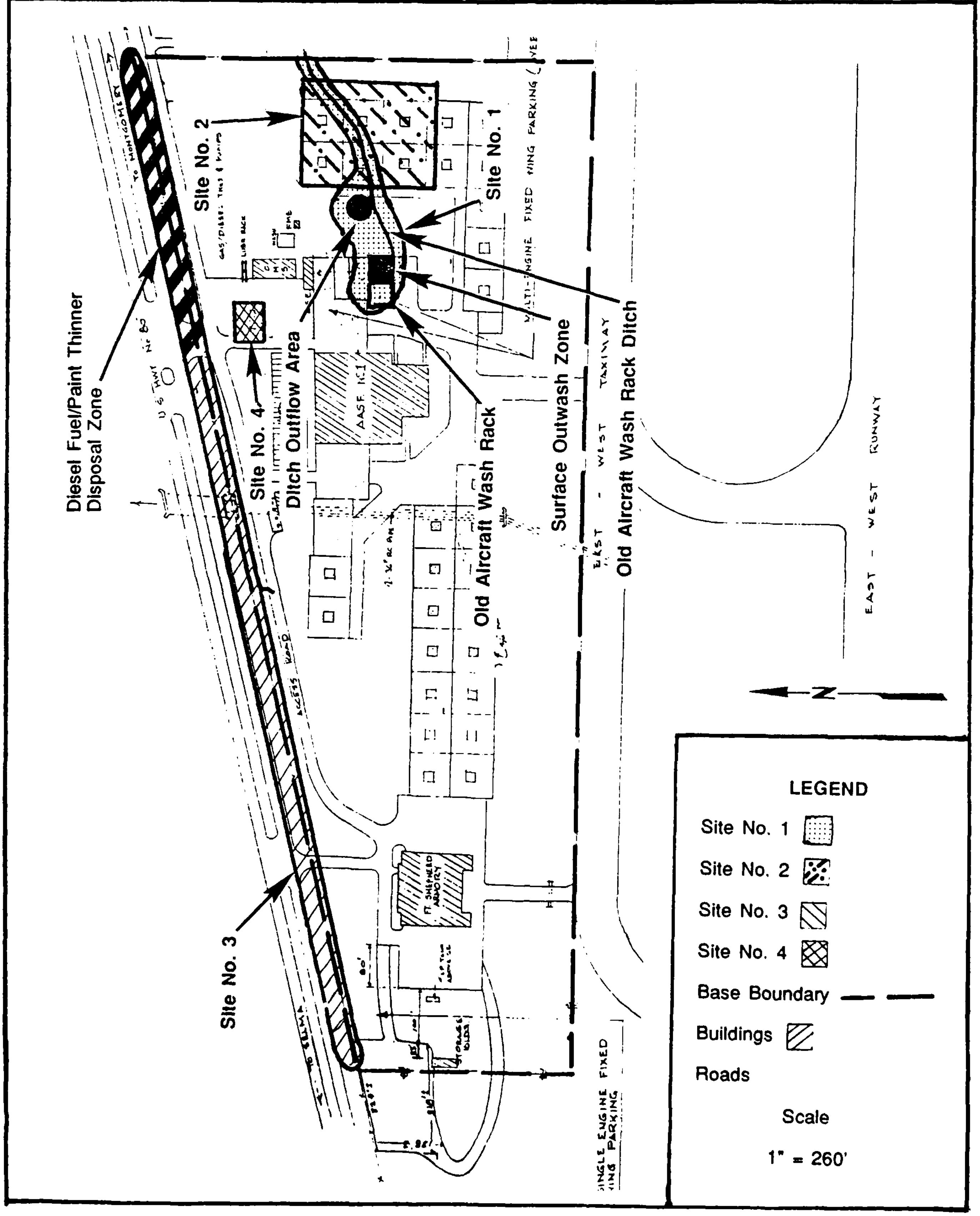
From 1960 to 1973, the Old Aircraft Wash Rack was in operation at the northeast corner of the pavement adjacent to the east side of old AASF No. 1. Site No. 1 is a surface drainage area once associated with activities at this wash rack.

AASF No. 1 was expanded during the period 1973-1976. Most activities, including aircraft washing, were done at Maxwell Air Force Base

SciTek

Source: State of Alabama Military Department, 1979

Figure IV.1
Potential Sites at the Base



because of the construction. Building plans included abandonment of the Old Aircraft Wash Rack and construction of a new rack on the west side of new AASF No. 1.

Either during or after expansion of AASF No. 1, the paved area on the facility's east side was extended. The east extension covered the Old Aircraft Wash Rack. Currently, the Old Aircraft Wash Rack's location is under the east central portion of the pavement. Aerial photographs obtained from the AL ANG indicate that it was square in shape and measured approximately 50-70 feet on each side. Site No. 1 begins at the east edge of the Old Aircraft Wash Rack and extends east-northeast across AL ARNG property and onto the adjacent property of the AL ANG. The approximate locations of the Old Aircraft Wash Rack and Site No. 1 are shown on Figure IV.1.

Site No. 1 consists of three surface drainage features. These are the Surface Outwash Zone, the Old Aircraft Wash Rack Ditch, and the Ditch Outflow Area.

The Surface Outwash Zone is a large area of soil adjacent to the east side of the Old Aircraft Wash Rack. This area is indicated by a large, dark, irregular stain on a 1972 aerial photograph. This stain may reflect surface movement of water and contaminants from the rack into the adjacent soil.

The Old Aircraft Wash Rack Ditch initially extended approximately 170 feet east-northeast from the rack's southeast corner to the Ditch Outflow Area. One interviewee stated that this ditch was three to four feet wide and three feet deep. Since no storm or sanitary sewer drains were ever installed at the Old Aircraft Wash Rack, most of the rinse water, cleaning agents, fuel, solvents, and residual oil from aircraft cleaning operations drained from the rack via this unlined ditch.

Rinse water draining through the Old Aircraft Wash Rack Ditch flowed onto the ground surface in the Ditch Outflow Area. An interviewee reported that this area was approximately 30 feet in diameter and constantly damp because of frequent aircraft cleaning.

Between 1960 and 1972, the Old Aircraft Wash Rack Ditch was extended further to the east-northeast from the Ditch Outflow Area to another drainage ditch at the AL ANG. When this occurred, drainage to the Ditch Outflow Area probably ceased. Rinse water flow through the extended ditch passed into the AL ANG's drainage ditch and proceeded north under Highway 80 to an unnamed, minor tributary of Catoma Creek and into Catoma Creek.

During 13 years of cleaning operations at the Old Aircraft Wash Rack, at least one aircraft was washed each day. In addition to water and detergents, a one gallon, 50-50 mix of Gunk and mineral spirits was used to wash each aircraft. One 55 gallon drum of mixed Gunk and mineral spirits was used every month. These solvents and waste oil were stored at the Old Aircraft Wash Rack.

AVGAS was used to wash aircraft engines at the rack. This was done by hosing them down with fresh fuel pumped directly from tank trucks.

Given 13 years of frequent aircraft cleaning and the use of 55 gallons of Gunk and mineral spirits per month in the cleaning process, 8580 gallons of solvents may have contaminated the soil in the Surface Outwash Zone, along the full length of the Old Aircraft Wash Rack Ditch, and in the Ditch Outflow Area. Additional contamination by AVGAS and oil cleaned from aircraft may also have occurred.

During the extensive earthmoving and construction activities related to construction of new AASF

No. 1, the portion of Site No. 1 on the Base was disturbed. This is evident from aerial photographs taken during the three year construction period. Thus, if contaminated soil was present at Site No. 1, a portion of it was probably redistributed on-site by heavy equipment. With possible soil contamination at Site No. 1, there is also a potential for groundwater contamination. Consequently, a Hazard Assessment Score (HAS) was calculated for this potential site.

Site No. 2 - Old Fire Training Area (FTA) (HAS - 71)

During the period 1953-1959, the AL ANG was the sole user of an FTA located on the east end of the Base between the current AASF No. 1 pavement and the East Boundary Fence.

Interviewees from the Base and the AL ANG could not precisely locate the FTA on a current map of the Base. One Base interviewee who had once been employed by the AL ANG had been involved in activities that required frequent trips to the FTA location during the 1950s. He thought that the FTA was located in the vicinity of the Old Aircraft Wash Rack Ditch and immediately east of the Ditch Outflow Area. (See description of Site No. 1, this section). An aerial photograph taken between 1965 and 1973 does show a large, elongate feature immediately east of the Ditch Outflow Area, but it is impossible to determine what this feature is from the photograph alone. The FTA was reportedly filled in conjunction with the construction of old AASF No. 1 around 1959-1960. The available evidence does, however, indicate that the FTA was located at some point in the area shown on Figure IV.1.

The FTA was a circular pit about 50 feet in diameter. Soil had been mounded around the pit to form a high rim, and the depth from the rim to the bottom of the pit was about 15 feet. An aircraft fuselage was placed in the pit for use as a simulator during fire training exercises. Interviewees did not recall flotation of fuel on a water blanket during the exercises.

Fresh product JP-4 and some AVGAS were used as fuels for the training burns. Approximately 50-100 gallons of fuel were used for each burn. Garbage may have also been burned in the pit. An average of the high and low estimates of JP-4 and AVGAS used at the FTA is 75 gallons per burn.

Estimates of the training burn frequency ranged from once every two weeks to once per month. Assuming the burning of 75 gallons of JP-4 and AVGAS once every two weeks for 6 years and assuming that 70% of this fuel actually burned, the remaining 30% (3510 gallons) may have contaminated the soil and groundwater at this site. Consequently, a HAS was calculated for the site.

Site No. 3 - North Boundary Fence Line (HAS - 63)

A galvanized steel fence runs along the entire north and east boundaries of the Base. The North Boundary Fence is approximately 2200 feet long and parallels Highway 80. Site No. 3 is the area along the entire length of this fence (Figure IV.1).

From the early 1970s until about 1985, off-spec JP-4 was poured along the North Boundary Fence to kill weeds. This was done one or two times per year.

Personnel at OMS No. 18 poured diesel fuel and paint thinner along a section of this fence to kill weeds and to dispose of these materials. The focus of this disposal was the section of fence from the natural gas meters just north of OMS No. 18 to the boundary of the AL ANG (Diesel Fuel/Paint Thinner Disposal Zone). Use of these materials as herbicides occurred primarily between 1971 and 1982, but the frequency of their use is unknown. Evidence for more recent disposal of petroleum products along this section of fence was observed during the site visit. Waste oil appeared to have been poured on the ground at one point on the fence line.

No estimates are available for the quantities of JP-4, diesel fuel, and paint thinner disposed of along the North Boundary Fence during the periods indicated. Since there is a potential for soil and groundwater contamination from disposal of these wastes, a HAS was calculated for the site. For calculation purposes, a small quantity (1100 gallons or less) of these wastes is assumed to have been disposed of on the fence line.

Site No. 4 - OMS POL Area (HAS - 59)

The OMS POL Area is located about 75 feet west of OMS No. 18 (Figure IV.1), which is the center of vehicle maintenance activity at the Base. Two underground storage tanks (USTs) of steel construction were in use at the OMS POL Area. A 1000-gallon tank contained diesel fuel, and a 2000-gallon tank contained MOGAS.

In 1984 evidence of a leak in the diesel fuel tank was first observed. Measurements of liquid levels in the tank were repeatedly higher than expected, indicating that water was leaking into the tank. The exact nature of this leak, its date of first occurrence, and its duration are not precisely known.

Approximately one month after the leak was discovered, the tank was removed and replaced with a 1000-gallon fiberglass UST. The contractor filled the excavated area with a quantity of concrete sufficient to hold the new tank in place and with the original soil. The excess soil was hauled to an unknown location, and the excess concrete was poured to form a pad adjacent to the north side of OMS No. 18. The date "November 1984," when the UST replacement occurred, was written into the southwest corner of this new concrete pad.

In July or August of 1989, higher than expected liquid level measurements were obtained from the new fiberglass UST. Water appeared to be leaking into the tank. The exact nature, time of first occurrence, and duration of this second leak are unknown. As much fuel as possible was pumped from this tank and the MOGAS tank shortly after the apparent leak was discovered. The USTs at the OMS POL Area have not been used since summer of 1989.

Whether or not diesel fuel leaked out of these tanks into the surrounding soil is unknown. If the soil was contaminated, there is a potential for groundwater contamination. For the purpose of calculating a HAS for this potential site, a small quantity (1100 gallons or less) of diesel fuel is assumed to have leaked from the older tank and its replacement.

C. Critical Habitats/Endangered or Threatened Species

According to current records maintained by the Alabama Department of Conservation and Natural Resources, Alabama Natural Heritage Program, no endangered or threatened species of flora or fauna have been identified within a 1-mile radius of the potential sites identified at the Base. There are no designated critical habitats in this area.

D. Other Pertinent Facts

- Trash and non-hazardous solid wastes are disposed of by an outside contractor.
- Spill response is coordinated by the 187th TFG, AL ANG.

- All O/WS are connected to the sanitary sewer. The O/WS at the current aircraft wash rack has a manual bypass valve which allows water to discharge to the storm drainage ditch.

- The Water Works and Sanitary Sewer Board of the City of Montgomery treats the Base's sanitary sewage.

- During the period 1973-1976, Base operations were conducted at Maxwell AFB. This was necessary because of construction of new AASF No. 1.

V. CONCLUSIONS

Information obtained through interviews with Base personnel, reviews of records, and field observations was used to identify possible spill or disposal sites on the Base property. Four potentially contaminated sites were identified.

The following sites exhibit the potential for contaminant migration through surface water, soil, and/or shallow groundwater:

Site No. 1 - Old Aircraft Wash Rack Drainage Area (HAS-77)

Site No. 2 - Old Fire Training Area (FTA) [HAS-71]

Site No. 3 - North Boundary Fence Line (HAS-63)

Site No. 4 - OMS POL Area (HAS-59)

VI. RECOMMENDATIONS

The PA identified four potentially contaminated sites. As a result, additional work under the IRP is recommended for these sites to confirm the presence or absence of contamination.

GLOSSARY OF TERMS

ALLUVIUM - All detrital deposits resulting from operations of modern rivers including the sediments laid down in river beds, flood plains, lakes, fans at the foot of mountain slopes, and estuaries. (DGT)*

AQUICLUDE - A saturated geologic unit incapable of transmitting significant quantities of water under ordinary hydraulic gradient. (FC)*

AQUIFER - Stratum or zone below the surface of the earth capable of producing water as from a well. (DGT)*

AREAL - Of, relating to, or involving an area. (WID)*

ARGILLACEOUS - Applied to all rocks or substances composed of clay minerals, or having a notable portion of clay in their composition, as shale, slate, etc. (DGT)*

ARTESIAN - Refers to groundwater under sufficient hydrostatic head to rise above the aquifer containing it. (DGT)*

BASEMENT COMPLEX - A series of rocks generally with complex structure beneath the dominantly sedimentary rocks. In many places, they are igneous and metamorphic rocks of either Early or Late Precambrian but in some places may be much younger, as Paleozoic, Mesozoic, or even Cenozoic. (DGT)*

CHALK - A very soft, white to light gray, unindurated limestone composed of the tests of floating microorganisms and some bottom dwelling forms (ammonoids and pelecypods) in a matrix of finely crystalline calcite. (DGT)*

COASTAL PLAIN - Any plain which has its margin on the shore of a large body of water, particularly the sea, and generally represents a strip of recently emerged sea bottom. (DGT)*

COEFFICIENT OF STORAGE - The volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in the component of head normal to that surface. (P)*

COEFFICIENT OF TRANSMISSIBILITY - The number of gallons of water a day that will be transmitted through a strip of the aquifer 1-mile wide under a hydraulic gradient of 1 foot per mile. (P)*

CONTAMINANT - Includes, but is not 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 deformations in such organisms or their offsprings, except that the term "contaminant" shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under:

(a) any substance designated pursuant to Section 311(b)(2)(A) of the Federal Water Pollution Control Act,

(b) any element, compound, mixture, solution, or substance designated pursuant to Section 102 of this Act,

(c) any hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under the Solid Waste Disposal Act has been suspended by Act of Congress),

(d) any toxic pollutant listed under Section 307(a) of the Federal Water Pollution Control Act,

(e) any hazardous air pollutant listed under Section 112 of the Clean Air Act, and

(f) any imminently hazardous chemical substance or mixture with respect to which the Administrator has taken action pursuant to Section 7 of the Toxic Substance Control Act and shall not include natural gas of pipeline quality or mixtures of natural gas and such synthetic gas.

NOTE: Petroleum products are covered in other regulations. Wastes from petroleum products do not become RCRA hazardous wastes unless they fall under any of the USEPA guidelines for identifying hazardous wastes:

(1) Listed hazardous wastes from certain specific and non-specific sources.

(2) Listed acutely hazardous wastes.

(3) Listed wastes that contain materials and products based on the criteria for toxicity.

(4) Wastes that meet any of four characteristics of hazardous waste - i.e., ignitability, reactivity, corrosivity, and extraction procedure toxicity (EP toxicity). (SARA)*

CONTAMINATION - The existence of biological, radiological, chemical, or other substances which have been identified as or may present a hazard to health or may render some portion of the environment unsuitable for use.

CRETACEOUS - The third and latest (144 - 66 million years ago) of the periods included in the Mesozoic Era, also the system of strata deposited in the Cretaceous Period. (DGT, WM)*

CRITICAL HABITAT - For a threatened or endangered species, the geographical area occupied by a species on which are found those physical or biological features that are essential to the conservation of the species and which may require special management considerations or protection.

Also, specific areas outside the geographical area occupied by the species at the time it is listed (Section 4 of the Endangered Species Act), upon determination by the Secretary of the Interior that such areas are essential for the conservation of the species. (ESA)*

CRYSTALLINE BASEMENT COMPLEX - A series of crystalline rocks, generally with complex structure, beneath the dominantly sedimentary rocks. In many places, they are igneous and metamorphic rocks of either Early of Late Precambrian, but in some places may be much younger, as Paleozoic, Mesozoic, or even Cenozoic. (DGT)*

DELTAIC COMPLEX - A sequence of sedimentary rocks that were deposited in a system of terrestrial river deltas; characteristic sedimentary structures include lenticular river channels, bars, etc.

DOWNGRADIENT - The downslope flow of groundwater.

ENDANGERED SPECIES - Any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta as determined by the Secretary of the Interior to constitute a pest whose protection under the Endangered Species Act would present an overwhelming and overriding risk to man. (ESA)*

FALL LINE - Line of demarcation that separates the flat Coastal Plain Physiographic Province from adjacent upland provinces.

FORMATION - The primary unit of formal mapping or description. Most formations possess certain distinctive or combinations of distinctive lithic features. Boundaries are not based on time criteria. Formations may be combined into groups or subdivided into members. (DGT)*

FOSSILIFEROUS - Containing organic remains. (DGT)*

GLAUCONITE - A green mineral, closely related to the micas and essentially a hydrous potassium iron silicate. Commonly occurs in sedimentary rocks of marine origin. Also used as a name for a rock of high glauconite content. (DGT)*

GLAUCONITIC - Containing glauconite.

GROUNDWATER - That part of the subsurface water which is the zone of saturation. (DGT)*

GUNK - A trademark for a family of different chemical products manufactured by the Radiator Specialty Company of Charlotte, North Carolina. While these products have specific names, their users may refer to any one of them colloquially by this name.

HAZARD ASSESSMENT RATING METHODOLOGY (HARM) - A system adopted and used by the United States Air Force to develop and maintain a priority listing of potentially contaminated sites on installations and facilities for remedial action based on potential hazard to public health and environmental impacts. (DEQPPM)*

HAZARD ASSESSMENT SCORE (HAS) - The score yielded by using the Hazard Assessment Rating Methodology.

HAZARDOUS WASTE - A solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

(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. (RCRA)*

HOLOCENE - Recent; that period of time (0.01 million years ago - Present) since the last ice age (Wisconsin in America; Wurm in Europe); also the series of strata deposited during that epoch. (DGT, WM)*

HYDROLOGICAL - An adjective term referring to hydrology, the science dealing with the waters of the earth, their distribution on the surface and underground, and the cycle involving evaporation, precipitation, flow to the seas, etc. (WNW)*

INSTALLATION RESTORATION PROGRAM (IRP) - The DoD program for identifying the location of and releases of hazardous materials from past disposal sites and minimizing their associated hazards to public health.

LITHOLOGY - The physical character of a rock, generally as determined megascopically or with the aid of a low-power magnifier. The microscopic study and description of rocks. (DGT)*

MICA - A group of minerals that crystallize in thin, somewhat flexible, translucent or colored, easily separated layers, resistant to heat and electricity. (W)*

MICACEOUS - Having the physical characteristics of mica.

MIGRATION - Contaminant movement through pathways such as soil, air, surface water, and groundwater.

NET PRECIPITATION - Total precipitation minus evaporation. (FR)*

PERMEABILITY - Capacity of a rock, soil, or unconsolidated sediment to transmit a fluid over a given period of time.

PHYSIOGRAPHIC PROVINCE - A region of similar structure and climate that has had a unified geomorphic history. (DGT)*

PLEISTOCENE - The earlier (2.0 - 0.01 million years ago) of two epochs comprising the Quaternary Period. Also, the series of sediments deposited during this epoch. (DGT, WM)*

POTENTIOMETRIC SURFACE - Surface to which water in an aquifer would rise by hydrostatic pressure. (DGT)*

QUATERNARY - The younger of the two geologic periods or systems in the Cenozoic Era. It is subdivided into the Pleistocene and Holocene (or Recent) epochs or series and comprises all geologic time or rocks from the end of the Tertiary to and including the Holocene (2 million years ago until the present). (DGT, WM)*

SEDIMENTARY - Descriptive term for rock formed of sediment, especially: (1) Clastic rocks, as conglomerate, sandstone, and shales, formed of fragments of other rock transported from their sources and deposited in water. (2) Rocks formed by precipitation from solution, as rock salt and gypsum, or from secretions of organisms, as most limestone. (DGT)*

STRATIGRAPHY - The arrangement of rocks in layers or strata.

SURFACE WATER - Water exposed on ground surface, i.e., lakes, streams, rivers, etc.

SURFICIAL - Characteristic of, pertaining to, formed on, situated at, or occurring on the earth's surface; especially consisting of unconsolidated residual, alluvial, or glacial deposits lying on the bedrock. (DGT)*

TERRACE - Relatively flat, horizontal, or gently inclined surfaces, sometimes long and narrow, which are bound by a steeper ascending slope on one side and by a steeper descending slope on the opposite side. (DGT)*

TERTIARY - The older of the two geologic periods comprising the Cenozoic Era; also the system of strata deposited during that period. (DGT)*

THREATENED SPECIES - Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. (ESA)*.

TOXICITY - A relative property of a chemical agent and refers to a harmful effect on some biologic mechanism and the condition under which this effect occurs.

UNCONFORMITY - A surface of erosion that separates younger strata from older rocks. (DGT)*

UPDIP - The upslope direction (toward the anticlinal axis) of dipping rock strata within structurally deformed rocks.

UPGRADIENT - A hydraulically upslope direction.

WATER TABLE - The surface on which the fluid pressure in the pores of a porous medium is exactly atmospheric. The location of this surface is revealed by the level at which water stands in a shallow opening along its length and penetrating the surficial deposits just deeply enough to encounter standing water in the bottom. (FC)*

WETLAND - Land transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes, (2) the substrate is predominantly undrained hydric soil, and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year. (C)*

WILDERNESS AREAS - Large tracts of public land maintained essentially in its natural state and protected against introduction of intrusive artifacts (as roads and buildings). (W)*

* Source Codes:

C	-	Cowardin et al, 1979.
DEQPPM	-	Defense Environmental Quality Program Policy Memorandum, 1980.
DGT	-	Dictionary of Geological Terms, 1976.
ESA	-	Endangered Species Act, 1973.
FC	-	Freeze and Cherry, 1979.
FR	-	Federal Register (July 16) 1982: 31224.
P	-	Powell et al, 1957.
RCRA	-	Resource Conservation and Recovery Act, 1976.
SARA	-	Superfund Amendments and Reauthorization Act, 1986.
W	-	Webster's Ninth Collegiate Dictionary, 1985.
WID	-	Webster's Third International Dictionary, 1981.
WM	-	Wicander and Monroe, 1989.
WNW	-	Webster's New World Dictionary, 1980.

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Driscoll, Fletcher G. Groundwater and Wells. Second Edition. St. Paul, Minnesota: Johnson Division, 1986.

Freeze, R. Allan and John A. Cherry. Groundwater. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1979.

Knowles, D. B., H. L. Reade, Jr., and J. C. Scott. Geology and Ground-Water Resources of Montgomery County, Alabama, Part A. Geological Survey Water-Supply Paper 1606. Washington, D.C.: U.S. Government Printing Office, 1963.

Knowles, D. B., H. L. Reade, Jr., and J. C. Scott. Geology and Ground-Water Resources of Montgomery County, Alabama. Bulletin 68, Part B. Geological Survey of Alabama. Alexander City, Alabama: Outlook Publishing Company, 1960.

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Kuhl, Eric A. and Lata R. Venkateshwara. Installation Restoration Program Phase I - Records Search for 187th Tactical Fighter Group, Alabama Air National Guard, Dannelly Field Municipal Airport, Montgomery, Alabama. Rockville, Maryland: The Hazardous Materials Technical Center, July 1987.

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Powell, W. J., H. L. Reade, and J. C. Scott. Interim Report on the Geology and Ground-Water Resources of Montgomery, Alabama and Vicinity. Information Series - 3, Geological Survey of Alabama, 1957.

Scott, John C., Riley H. Cobb, and Rick D. Castleberry. Geohydrology and Susceptibility of Major Aquifers to Surface Contamination in Alabama; Area 8. Water-Resources Investigations Report 86-4360. United States Geological Survey, 1987.

State of Alabama, Military Department. Alabama Army National Guard Aviation Facility, Dannelly Field, Montgomery, Alabama. Site Map, December 8, 1979.

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United States Congress. Resource Conservation and Recovery Act of 1976. Public Law 94-580. Enacted on October 21, 1976.

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Appendix A

Resumes of Search Team Members

TRACY C. BROWN
Environmental Analyst

EDUCATION

M.A., The Universi'y of Tennessee, Knoxville, 1982.

B.A., The University of Tennessee, Knoxville, 1976 (with Highest Honors).

Austin Peay State University, 1971 - 1973.

Current Certificate, [Hazardous Waste Operations Training, 40 CFR 1910.120], Roane State Community College, Waste Management Training Center, April 1989.

QUALIFICATIONS

Environmental Investigation/Remediation, Environmental Compliance, Regulatory Analysis, and Assessment/Mitigation of Adverse Environmental Impacts.

Under the U.S. Department of Defense, Installation Restoration Program (IRP) and the U.S. Department of Energy, Hazardous Waste Remedial Actions Program (DOE-HAZWRAP) [Martin Marietta Energy Systems, Inc.], participated in Preliminary Assessments (PA) aimed at assessing past hazardous waste disposal practices and identifying/documenting hazardous waste disposal sites at Air National Guard bases nationwide. Reviewed base records, used aerial photographs, surveyed base property, and interviewed numerous Guard personnel. Gathered information pertinent to using the United States Air Force's Hazard Assessment Rating Methodology (HARM) by contacting local, state, and federal agencies. Used the HARM to rate potential hazardous waste disposal sites. Coauthored PA reports.

Substantially revised and amended the Spill Prevention, Control, and Countermeasures (SPCC) Plan for the Y-12 nuclear weapons plant (U.S. Department of Energy/Martin Marietta Energy Systems, Inc.), a large, physically complex defense support installation located in Oak Ridge, Tennessee. Led the overall technical effort; including research, regulatory analysis and compliance, planning, organization, writing, and coordination of project activities with the concurrent engineering inspection and certification activities of a subcontractor.

Performed a variety of environmental impact assessment and mitigation activities (Phases I, II, and III) involving archaeological and historic resources.

Research and Information Skills

Demonstrated strong scientific investigation, research, and development skills on federally funded projects. Adept at collecting information and data through field observations, surveys, and library resources; keeping detailed, three-dimensional records; compiling data; and focusing on details. Proficient at research design; performing interdisciplinary research; foreseeing and solving research-related problems; comparing, analyzing, and synthesizing information; assuring research quality; and attaining objectives.

Communications and Advising Skills

Authored a combined total of more than thirty environmental documents, training manuals, scientific reports, and journal articles. Assisted with writing major research proposals and participated actively in company marketing efforts. Experienced technical editor. Expert at advising, gathering information through interviews, and consulting with specialists.

Knowledge Areas

Familiar with many federal regulations under the Clean Water Act (CWA), Resource Conservation and Recovery Act (RCRA), Toxic Substances Control Act (TSCA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) [Superfund] and the Superfund Amendments and Reauthorization Act (SARA). Strong general science background, especially in earth science, life sciences, and archaeology/anthropology.

RAY S. CLARK
Civil/Environmental Engineer

EDUCATION

Graduate Courses (Environmental Engineering), The University of Tennessee, Knoxville, 1987 - 1988.

B. S. Degree (Civil Engineering/Environmental Engineering Emphasis), The University of Tennessee, Knoxville, 1988.

RCRA/CERCLA Seminar, Treatment Alternatives for Hazardous Waste, 1988.

Current Certificate, [Hazardous Waste Operations Training, 40 CFR 1910.120], Roane State Community College, Waste Management Training Center, April 1989.

EXPERIENCE

Civil/Environmental Engineer, Science & Technology, Inc., Oak Ridge, Tennessee, 1988 - Present.

Working under the U.S. Department of Defense, Installation Restoration Program (IRP) and the U.S. Department of Energy, Hazardous Waste Remedial Actions Program (HAZWRAP) [Martin Marietta Energy Systems, Inc.], participated in Preliminary Assessment (PA) record searches aimed at identifying hazardous waste disposal sites on Air National Guard bases. Reviewed base civil engineering, environmental, and historical documents relevant to hazardous waste generation, storage, treatment, and disposal; PCB - contaminated items; environmental incidents; and the chemical eradication of pests. Surveyed and inventoried data on underground storage tanks and oil/water separators. Examined aerial photographs, performed field surveys, and participated in interviews with base personnel as part of a comprehensive effort to assess past, on-base hazardous waste disposal practices and to identify/document potential past hazardous waste disposal sites. Contacted local, state, and federal agencies to obtain additional data pertinent to using the United States Air Force's Hazard Assessment Rating Methodology (HARM). Rated potential hazardous waste disposal sites using the HARM. Coauthored the PA reports.

Assisted with revising the Spill Prevention, Control, and Countermeasures (SPCC) Plan for the Y-12 nuclear weapons plant (Oak Ridge), one of the nation's largest and most physically complex defense research and development facilities.

Technician, Clark Drilling Services, Knoxville, Tennessee, 1980-1988.

Installed and developed hazardous waste monitoring wells. Conducted on-site inspections of monitoring wells.

CERTIFICATIONS

Engineer in Training (E.I.T.), April 1988.

PROFESSIONAL ORGANIZATIONS

American Society of Civil Engineers

JACK D. WHEAT
Geologist/Hydrogeologist

EDUCATION

B.S. (Geology), Tennessee Technological University, 1977.

Seminar, Types of Radioactive Nuclides and the Transmitters of Radioactive Contaminants, 1987.

RCRA/CERCLA Seminar, Treatment Alternatives for Hazardous Waste, 1988.

Current Certificate, [Hazardous Waste Operations Training, 40 CFR 1910.120], Roane State Community College, Waste Management Training Center, April 1989.

EXPERIENCE

Geologist/Hydrogeologist, Science & Technology, Inc., 1988 - Present

Preliminary Assessment (PA), Phase I of the Department of Defense Installation Restoration Program (IRP). Primary contributions include the geology and hydrogeology of designated military installations and the susceptibility of principal groundwater aquifers to contamination from surface pollutants.

Geological Assistant, Robert Stansfield Consulting Geologist, 1987

Drilling and installation of monitoring wells to further identify potential groundwater contaminants. Monitoring wells were installed and developed at EPA superfund sites. OSHA and EPA regulations concerning safety, work procedures, and protection requirements were followed at EPA superfund sites. The EPA standards for postdrilling decontamination of contaminated site equipment were also utilized at superfund sites.

Field Hydrogeologist, Oak Ridge National Laboratory (ORNL), February 1987 - May 1987

Logged soil cuttings in the field and collected soil samples at specified intervals for soil borings at SWSA 6 and along the proposed DOE-Bethel Valley LLW pipeline route. Installed monitoring wells at SWSA 6 and selected LLW borings to evaluate potential groundwater contamination. Supervised on-site drilling procedures and personnel safety requirements. Compiled individual LLW boring reports, which included soil sample descriptions, zones of groundwater saturation, and monitoring well schematic logs. For the ORNL Environmental Sciences Division, developed a work plan for evaluating the groundwater conduction potential of pipe trench backfill.

Consulting Petroleum Geologist, 1980 - 1986

Logged samples of well cuttings collected during exploration drilling of oil and natural gas wells. Supervised on-site drilling procedures that included the cementing of surface casing to prevent the contamination of groundwater aquifers and the construction of lined retaining pits as a remediation measure for potential oil spills and/or to prevent the release of drilling fluids into the environment. Compiled exploration drill site reports that included sample descriptions, descriptions of penetrated oil or gas pay zones, and the potential of these pay zones to produce commercial oil or natural gas. Compiled geologic reports for selected areas. These reports covered general geology, formation stratigraphy, potential pay zones for oil or natural gas, and subsurface maps, including structure contour maps and isopach maps. Analyzed geophysical logs to evaluate oil and natural gas pay zones.

Geologist, Petroleum Development Corporation, 1977 - 1980

Logged samples of well cuttings collected during exploration drilling of oil and natural gas wells. Supervised installation and cementing of surface casing. Prepared geologic maps to select areas for oil and natural gas exploration. Drafted maps showing previously drilled or permitted locations. Analyzed geophysical logs to evaluate oil and natural gas pay zones.

CERTIFICATIONS

Licensed Professional Geologist, State of North Carolina, License No. 911

Licensed Professional Geologist, State of Tennessee, License No. TN 0513

RON E. MATHIS, MANAGER
Environmental/Waste Operations Group

EDUCATION

Graduate Studies in Geology, Vanderbilt University, 1979 - 1981.

B.S., Geology, University of Tennessee, Nashville, 1979.

Hazardous Waste Operations Update Training, Roane State Community College, Waste Management Training Center, February 1989.

CERCLA Response Training, December 1987.

Bore Hole Geophysics Short Course, Well Services, Crossville, Tennessee.

EXPERIENCE

Mr. Mathis is the manager of the Environmental/Waste Operations Group. He has extensive experience in geology/hydrogeology, including field investigations, research investigations, and project supervision. His work includes field and well site geology; site characterization and evaluations; stratigraphic studies, mapping, planning groundwater monitoring programs; and supervision of the installation and development of groundwater monitoring wells. His duties also include preparation of sampling plans, chain of custody, and QA/QC plans for handling of surface water, groundwater, and soil samples.

Mr. Mathis was recently assigned as Deputy Project Manager for the RI/FS at Eielson Air Force Base, Alaska. He also assisted in the preparation of a report detailing the hydrology/hydrogeology of the East Fork Poplar Creek in Oak Ridge, Tennessee and developing a QA/QC groundwater sampling program and a groundwater supply plan. Mathis also recently acted as Deliverable Coordinator for a RCRA Part B Application for a DOE facility.

Mathis has conducted geologic and hydrogeologic investigations for private and industrial clients. Upon design approval, he has conducted the necessary well site geology and supervised the drilling and sampling of the wells, and installation of casing and downhole equipment, and the development of the wells. He has taken numerous soil and water samples.

Mathis has received health and safety training for hazardous sites and is in a medical monitoring program.

CERTIFICATIONS

Certified Professional Geologist, State of Florida, 1989, PG 688
Registered Professional Geologist, State of Tennessee, 1989, TN 0318

PROFESSIONAL ORGANIZATIONS

Association of Ground Water Scientists and Engineers

Appendix B

Outside Agency

Contact List

OUTSIDE AGENCY CONTACT LIST

1) Alabama Air National Guard
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Civil Engineering
P.O. Box 250284
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2) Alabama Department of Conservation and Natural Resources
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64 North Union Street
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3) Alabama Highway Department
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1409 Coliseum Blvd.
Montgomery, Alabama 36130
(205) 242-6078

4) Alabama State Military Department
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Montgomery, Alabama 36193-4701
2LT Wayne Sartwell
(205) 271-7427

5) Montgomery Airport Authority
Dannelly Field Municipal Airport
P.O. Box 2339
Montgomery, Alabama 36103-2339
Joseph T. Guastella
(205) 281-5040

6) Publication Sales Office
Geological Survey of Alabama
P.O. Box O
Tuscaloosa, Alabama 35486-9780
(205) 349-2852 (Ext. 303)

OUTSIDE AGENCY CONTACT LIST (continued)

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Soil Conservation Service
4510 South Court Street
Montgomery, Alabama 36105
David J. Barrow
(205) 832-7257

8) United States Geological Survey
Water Resources Division
2721 Gunter Park Drive West
Montgomery, Alabama 36109
John C. Scott
(205) 223-7511

9) Water Works and Sanitary Sewer
Board of the City of Montgomery
22 Bibb Street
P.O. Box 1631
Montgomery, Alabama 36102
(205) 240-1600

Appendix C

USAF Hazard Assessment Rating Methodology

USAF HAZARD ASSESSMENT RATING METHODOLOGY

The DoD has developed a comprehensive program to identify, evaluate, and control hazardous waste disposal practices associated with past waste disposal techniques 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, December 11, 1981).

Accordingly, the USAF has sought to establish a system to set priorities for taking further action at sites based upon information gathered during the PA phase of the IRP.

PURPOSE

The purpose of the site rating model is to assign a ranking to each site where there is suspected contamination from hazardous substances. This model will assist the ARNG in setting priorities for follow-up site investigations.

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

DESCRIPTION OF THE MODEL

Like the other hazardous waste site ranking models, the USAF'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 needs.

The model uses data readily obtained during the Preliminary Assessment portion of the IRP. Scoring judgment 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 worst hazards at the site. Sites are given low scores only if there are clearly no hazards. 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 presented in this appendix. The site rating form and the rating factor guidelines are provided at the end of this appendix.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: (1) possible receptors of the contamination, (2) the waste and its characteristics, (3) the potential pathways for contaminant migration, and (4) any effort that was made to contain the waste resulting from a spill.

The receptors category rating is based on four rating factors: (1) the potential for human exposure to the site, (2) the potential for human ingestion of contaminants should underlying aquifers be polluted, (3) the current and anticipated use of the surrounding area, and (4) the potential for adverse effects upon important biological resources and fragile natural settings. The potential for human exposure is evaluated on the basis of the total population within 1000 feet of the site, and the distance between the site and the base boundary. The potential for human ingestion of contaminants is based on the distance between the site and the nearest well, the groundwater use of the uppermost aquifer, and population served by the groundwater supply within 3 miles of the site. The uses of the surrounding area are determined by the zoning within a 1-mile radius. Determination of whether or not critical environments exist within a 1-mile radius of the site predicts the potential for adverse effects from the site upon important biological resources and fragile natural settings. Each rating factor is numerically evaluated (0-3) and increased by a multiplier. The maximum possible score is also computed. The factor score and maximum possible scores are totaled, and the receptors subscore computed as follows: receptors subscore = (100 X factor subtotal/maximum score subtotal).

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 solids are reduced.

The pathways category rating is based on evidence of contaminant migration along one of three pathways: surface water migration, flooding, and groundwater migration. 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 the three possible routes is used. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The scores for each of the three categories are added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites with 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 score for the other three categories.

HAZARD ASSESSMENT RATING FORM

NAME OF SITE

LOCATION ____________________

DATE OF OPERATION OR OCCURRENCE ____________________

OWNER/OPERATOR ____________________

COMMENTS/DESCRIPTION ____________________

SITE RATED BY Science & Technology, Inc.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1000 ft. of site		4		12
B. Distance to nearest well		10		30
C. Land use-zoning within 1-mile radius		3		9
D. Distance to installation boundary		6		18
E. Critical environments within 1-mile radius of site		10		30
F. Water quality of nearest surface water body		6		18
G. Groundwater use of uppermost aquifier		9		27
H. Population served by surface water supply within 3 miles downstream of site		6		18
I. Population served by groundwater supply within 3 miles of site		6		18
		Subtotals	________	180

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

II. WASTE CHARACTERISTICS

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

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

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

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

________ x ________ = ________

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

________ x ________ =

III. PATHWAYS

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

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

Subscore

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

1. Surface water migration

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

Subtotals ________ 108

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

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

Subscore (100 x factore score/3)

3. Groundwater migration

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

Subtotals ________ 114

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

C. Highest pathway score

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

Pathways subscore

IV. WASTE MANAGEMENT PRACTICES

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

Receptors
Waste Characteristics
Pathways

Total ________ divided by 3 = ________

Gross Total Score

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

Gross Total Score x Waste Management Practices Factor = Final Score

________ x ________ = [ ]

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

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

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

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

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

Multiply Point Rating Persistence Criteria	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

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, groundwater, 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	0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to a 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 (thunderstorms)	<1.0 inch 0-5 0	1.0 to 2.0 inches 6-35 30	2.1 to 3.0 inches 36-49 60	>3.0 inches >50 100	8

B-2 Potential for Flooding

Rating Factors	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1

B-3 Potential for Groundwater Contamination

Rating Factors	0	1	2	3	Multiplier
Depth to groundwater	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 ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay 10^{-2} to 10^{-4} cm/sec	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high groundwater level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean groundwater level	8
Direct access to groundwater (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-B-3, then leave blank for calculation of factor score and maximum possible score.

Appendix D

Site Hazard Assessment Rating Forms and Factor Rating Criteria

HAZARD ASSESSMENT RATING FORM

NAME OF SITE Old Aircraft Wash Rack Drainage Area (Site No. 1)

LOCATION East of AASF No. 1

DATE OF OPERATION OR OCCURRENCE 1960 - 1974

OWNER/OPERATOR Alabama Army National Guard

COMMENTS/DESCRIPTION

SITE RATED BY Science & Technology, Inc.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1000 ft. 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 installation boundary	3	6	18	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Groundwater use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
		Subtotals	111	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 62

II. WASTE CHARACTERISTICS

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

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

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

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

100 x 0.9 = 90

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

90 x 1.0 = 90

III. PATHWAYS

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

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

Subscore 80

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

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	72	108

Subscore (100 x factor score subtotal/maximum score subtotal) 67

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. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	2	8	16	24
Direct access to groundwater	3	8	24	24
		Subtotals	84	114

Subscore (100 x factor score subtotal/maximum score subtotal) 74

C. Highest pathway score

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	62
Waste Characteristics	90
Pathways	80

Total 232 divided by 3 = 77

Gross Total Score

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

Gross Total Score x Waste Management Practices Factor = Final Score

77 x 1.0 = **77**

HAZARD ASSESSMENT RATING FORM

NAME OF SITE Old Fire Training Area (FTA) (Site No. 2)

LOCATION East of AASF No. 1

DATE OF OPERATION OR OCCURRENCE 1953 - 1959

OWNER/OPERATOR Alabama Army National Guard is Present Owner

COMMENTS/DESCRIPTION

SITE RATED BY Science & Technology, Inc.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1000 ft. 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 installation boundary	3	6	18	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Groundwater use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
Subtotals			111	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 62

II. WASTE CHARACTERISTICS

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

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

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

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

80 x 0.9 = 72

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

72 x 1.0 = 72

III. PATHWAYS

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

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

Subscore 80

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

1. Surface water migration

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

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

Subscore (100 x factor score/3) 0

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	2	8	16	24
Direct access to groundwater	3	8	24	24
Subtotals			84	114

Subscore (100 x factor score subtotal/maximum score subtotal) 74

C. Highest pathway score

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	62
Waste Characteristics	72
Pathways	80

Total 214 divided by 3 = 71
Gross Total Score

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

Gross Total Score x Waste Management Practices Factor = Final Score

71 x 1.0 = 71

HAZARD ASSESSMENT RATING FORM

NAME OF SITE North Boundary Fence Line (Site No. 3)

LOCATION North and East Boundaries of the Base

DATE OF OPERATION OR OCCURRENCE Early 1970s - 1985

OWNER/OPERATOR Alabama Army National Guard

COMMENTS/DESCRIPTION

SITE RATED BY Science & Technology, Inc.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1000 ft. 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 installation boundary	3	6	18	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Groundwater use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18

Subtotals 111 180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 62

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 0.9 = 54

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

54 x 1.0 = 54

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 3 potential pathways: Surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

1. Surface water migration

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

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

Subscore (100 x factor score/3) 0

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	2	8	16	24
Direct access to groundwater	3	8	24	24
		Subtotals	84	114

Subscore (100 x factor score subtotal/maximum score subtotal) 74

C. Highest pathway score

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

Pathways subscore 74

IV. WASTE MANAGEMENT PRACTICES

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

Receptors 62
Waste Characteristics 54
Pathways 74

Total 190 divided by 3 = 63
Gross Total Score

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

Gross Total Score x Waste Management Practices Factor = Final Score

63 x 1.0 = 63

HAZARD ASSESSMENT RATING FORM

NAME OF SITE OMS POL Area (Site No. 4)

LOCATION West of OMS No. 18

DATE OF OPERATION OR OCCURRENCE In 1984 and In 1989

OWNER/OPERATOR Alabama Army National Guard

COMMENTS/DESCRIPTION

SITE RATED BY Science & Technology, Inc.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1000 ft. 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 installation boundary	3	6	18	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Groundwater use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
		Subtotals	111	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 62

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) M

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

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

50 x 0.8 = 40

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

40 x 1.0 = 40

III. PATHWAYS

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

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

Subscore 0

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

1. Surface water migration

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

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

Subscore (100 x factor score/3) 0

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	2	8	16	24
Direct access to groundwater	3	8	24	24
Subtotals			84	114

Subscore (100 x factor score subtotal/maximum score subtotal) 74

C. Highest pathway score

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

Pathways subscore 74

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	62
Waste Characteristics	40
Pathways	74

Total 176 divided by 3 = 59
Gross Total Score

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

Gross Total Score x Waste Management Practices Factor = Final Score

59 x 1.0 = **59**

Alabama Army National Guard
Dannelly Field Municipal Airport
Montgomery, Alabama

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

The following is an explanation of the HARM factor rating criteria for each of the four potential sites:

I. Receptors

A. Population within 1000 feet of site.

Site Nos. 1-4, Factor Rating 3.
The population within 1000 feet of all sites is greater than 100. The Base population is several hundred persons on weekends.

B. Distance to Nearest Well.

Site Nos. 1-4, Factor Rating 3.
There is a well located on AL ARNG property within 3000 feet of the sites.

C. Land Use - Zoning (Within 1-mile radius).

Site Nos. 1-4, Factor Rating 3.
Residential areas are located within one mile of these sites.

D. Distance to Installation Boundary.

Site Nos. 1-4, Factor Rating 3.
All sites are within 1000 feet of the Base boundary.

E. **Critical Environments (within 1-mile radius).**

Site Nos. 1-4, Factor Rating 0.
Endangered species, threatened species, recharge areas, or wetlands have not been identified within a 1-mile radius of the Base.

F. **Water Quality/Use Designation of Nearest Surface Water Body.**

Site Nos. 1-4, Factor Rating 1.
Catoma Creek and its tributaries are used for fishing.

G. **Groundwater Use of Uppermost Aquifer.**

Site Nos. 1-4, Factor Rating 2.
The uppermost aquifer is used for drinking water near the Base. Municipal water is available at the Base and in its immediate vicinity.

H. **Population Served by Surface Water Supplies Within 3-miles Downstream of Site.**

Site Nos. 1-4, Factor Rating 0.
Surface water supplies are not used as sources of drinking water within 3-miles downstream of these sites.

I. **Population Served by Aquifer Supplies Within 3-miles of Site.**

Site Nos. 1-4, Factor Rating 3.
Montgomery's West Well Field is located within 1.5 miles of the Base. This well field supplies a large portion of water to the City of Montgomery.

II. Waste Characteristics

Site No. 1

A-1: Hazardous Waste Quantity - Factor Rating L (Large). It is estimated that a large quantity (greater than 85 drums) of solvents, cleaning compounds, and fuels were released at this site over its 14 years of use.

A-2: Confidence Level - Factor Rating C (Confirmed). This site was confirmed through interviews with Base personnel.

A-3: Hazard Rating - Factor Rating H (High). This site was given a high hazard rating because of the low flash point and high toxicity of some of the materials used there.

Site No. 2

A-1: Hazardous Waste Quantity - Factor Rating M (Medium). A medium quantity (between 20 and 85 drums) of flammable liquids is estimated to have been used at this site during its six years of use.

A-2: Confidence Level - Factor Rating C (Confirmed). This site was confirmed through interviews with Base and AL ANG personnel.

A-3: Hazard Rating - Factor Rating H (High). JP-4, which reportedly was used at this site, has an ignitability rating of 3, which corresponds to a high HARM rating.

Site No. 3

A-1: Hazardous Waste Quantity - Factor Rating S (Small). Although the precise amount released at this site is unknown, it is believed that only a small amount (less than 20 drums) of material has been released.

A-2: Confidence Level - Factor Rating C (Confirmed). This site was confirmed through interviews with Base personnel.

A-3: Hazard Rating - Factor Rating H (High). This site was assigned a high hazard rating because of the toxicity and low flashpoint of the materials released.

Site No. 4

A-1: Hazardous Waste Quantity - Factor Rating S (Small). A small quantity (less than 20 drums) was assigned to this site because the amount released is unknown.

A-2: Confidence Level - Factor Rating C (Confirmed). This site was confirmed through interviews with Base personnel.

A-3: Hazard Rating - Factor Rating M (Medium). Diesel fuel has a Sax toxicity rating of 2, which corresponds to a medium hazard rating.

B. Persistence Multiplier for Point Rating.

Site Nos. 1-3 were assigned a persistence multiplier of 0.9 based on the presence of JP-4, organic solvents, and thinners. JP-4 and many solvents correspond to the HARM category of "Substituted and Other Ring Compounds."

A persistence multiplier of 0.8 was assigned to Site No. 4 because of the potential presence of diesel fuel. Diesel fuel is classified under the HARM category of "Straight Chain Hydrocarbons."

C. Physical State Multiplier.

A physical state multiplier of 1.0 was applied to all sites because the substances released were liquids.

III. Pathways Category

A. Evidence of Contamination.

Site Nos. 1-2 were given a score of 80 (Indirect Evidence) because the sites are greatly suspected of being a source of contamination.

Site Nos. 3-4 were given a score of zero due to the absence of stained soil or stressed vegetation.

B-1 Potential for Surface Water Contamination.

- Distance to Nearest Surface water: Factor Rating 3. Site Nos. 1-4 are located within 500 feet of a drainage ditch or storm sewer.
- Net Precipitation: Factor Rating 2. The average annual net precipitation is 7.12 inches for Site Nos. 1-4.
- Surface Erosion: Factor Rating 1. There is slight erosion of soil at Site Nos. 1-4.
- Surface Permeability: Factor Rating 2. The surface permeability at these sites ranges from 10^{-6} to 10^{-4} cm/sec.
- Rainfall Intensity Based on 1-Year, 24-Hour Rainfall: Factor Rating 2. The rainfall intensity in the Base area is approximately 2.75 inches.

B-2 Potential for Flooding. Factor Rating 0. Site Nos. 1-4 lie beyond the 100-year flood plains of any rivers, creeks, or streams.

B-3 Potential for Groundwater Contamination.

- Depth to Groundwater: Factor Rating 3. The shallow water table in the Base area is 0 to 10 feet below the land surface.
- Net Precipitation: Factor Rating 2. See B-1.
- Soil Permeability: Factor Rating 1. The soil permeability at these sites ranges from 10^{-6} to 10^{-4} cm/sec.
- Subsurface Flows: Factor Rating 2. The bottoms of Site Nos. 1-4 are frequently submerged.
- Direct Access to Groundwater: Factor Rating 3. A High Risk factor rating was assigned to Site Nos. 1-4 because of the possible fracture zones in the Mooreville Chalk and the numerous water wells in the immediate vicinity.

IV. Waste Management Practices Factor

A multiplier of 1.0 is applied to all sites because none of these sites have any form of contaminant containment.

Appendix E

Underground Storage

Tank Inventory

Underground Storage Tank Inventory, Alabama Army National Guard, Dannelly Field Municipal Airport, Montgomery, Alabama

Associated Building	Year Installed	Capacity Gallons	Tank Contents	Tank Construction	Status
AASF #1	1975	25,000	JP-4	Steel, (1)	Active
AASF #1	1975	1,000	AVGAS, (2)	Steel	Abandoned in 1977
AASF #1	1975	500	Fuel Oil	Steel	Abandoned in 1978
AASF #1	1975	1,000	Waste Oil, (3)	Steel	Active
Armory	Unknown, (4)	1,000	Unleaded Gasoline	Unknown	Active
Armory	Unknown, (4)	1,000	Unleaded Gasoline	Unknown	Active
OMS	1984	1,000	Diesel, (2)	Fiberglass	Abandoned in 1989
OMS	1974	2,000	MOGAS, (2)	Steel	Abandoned in 1989
OMS	1975	1,000	Waste Oil, (3)	Steel	Active
OMS	1971	500	Waste Oil	Steel	Active

NOTES

No tanks have cathodic protection.

(1) Tank has an epoxy-coated interior.

(2) Tank is believed to be nearly empty.

(3) Tank is waste oil holding tank for an oil/water separator.

(4) Armory was constructed in 1965.

SciTek Source: State of Alabama Military Department, 1979

Location of Oil/Water Separators and Underground Storage Tanks at the Base