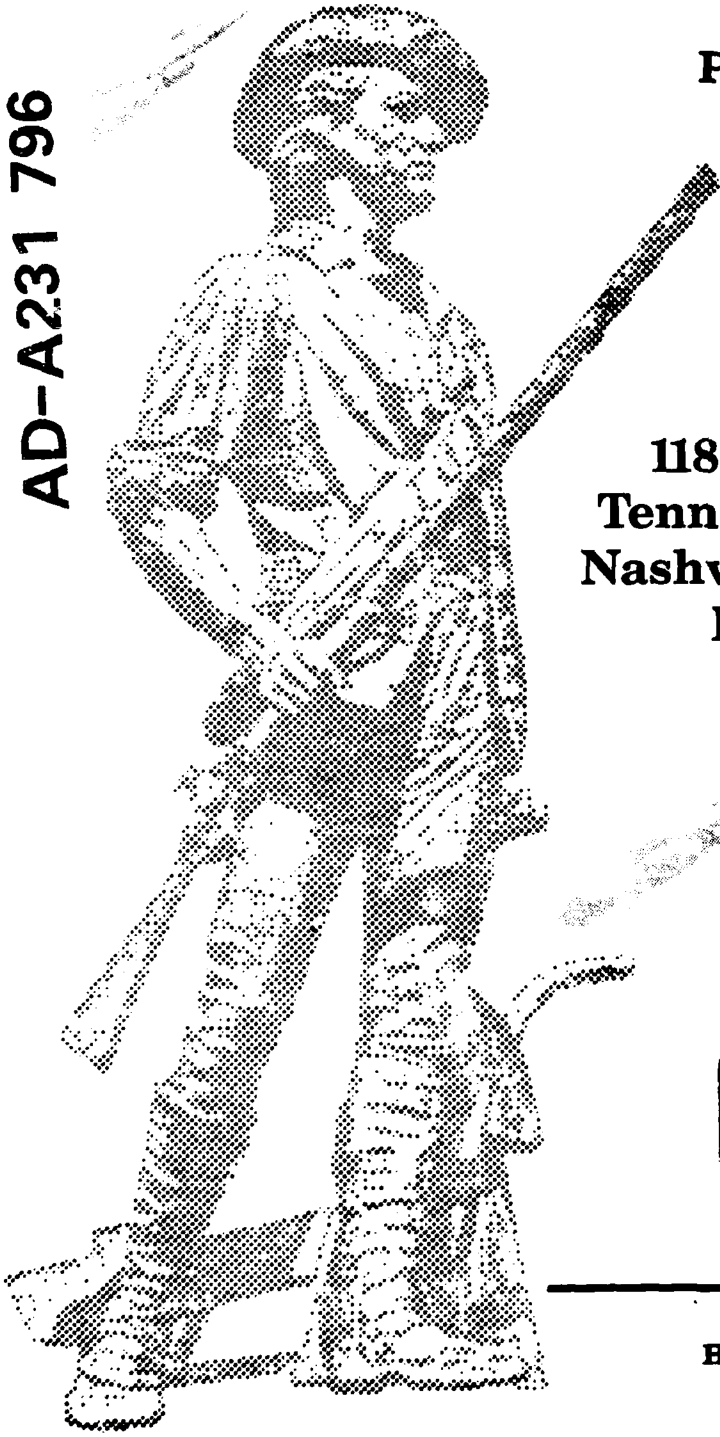
INSTALLATION RESTORATION PROGRAM

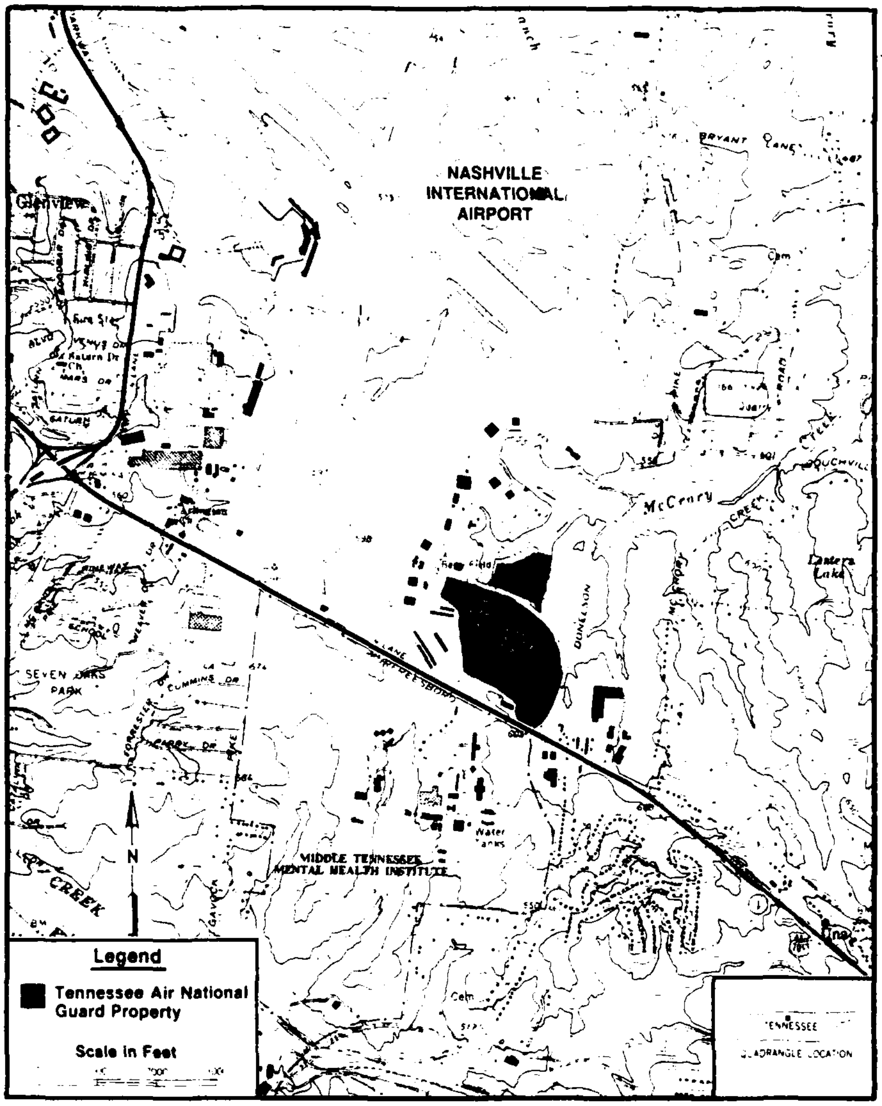


Preliminary Assessment

118th Tactical Airlift Wing
Tennessee Air National Guard
Nashville International Airport
Nashville, Tennessee

Hazardous Materials Technical Center

December 1988



This report has been prepared for the National Guard Bureau, Andrews Air Force Base, Maryland by the Hazardous Materials Technical Center for the purpose of aiding in the implementation of the Air Force Installation Restoration Program.

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INSTALLATION RESTORATION PROGRAM
PRELIMINARY ASSESSMENT

FOR

118th TACTICAL AIRLIFT WING
TENNESSEE AIR NATIONAL GUARD
NASHVILLE INTERNATIONAL AIRPORT
NASHVILLE, TENNESSEE

December 1988

Prepared for

National Guard Bureau
Andrews Air Force Base, Maryland 20310

Prepared by

Hazardous Materials Technical Center
The Dynamac Building
11140 Rockville Pike
Rockville, Maryland 20852

Contract No. DLA 900-82-C-4426

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A. Introduction

The Hazardous Materials Technical Center (HMTC) was retained in June 1988 to conduct the Installation Restoration Program (IRP) Preliminary Assessment (PA) of the 118th Tactical Airlift Wing, Tennessee Air National Guard, Nashville, Tennessee, (hereinafter referred to as the Base), under Contract No. DLA-900-82-C-4426. The Preliminary Assessment included:

- an onsite visit, including interviews with 25 past and present Base employees conducted by HMTC personnel during 20-24 June 1988;
- the acquisition and analysis of pertinent information and records on hazardous material use and hazardous waste generation and disposal at the Base;
- the acquisition and analysis of available geologic, hydrologic, meteorologic, and environmental data from pertinent Federal and State agencies; and
- the identification of a site on the Base that is potentially contaminated with hazardous materials/hazardous wastes (HM/HW).

B. Major Findings

Past Base operations involved the use and disposal of materials and wastes that were subsequently categorized as hazardous. Base shops that use and dispose of HM/HW include Aircraft Maintenance; Vehicle Maintenance; Facilities Maintenance; Petroleum, Oil, and Lubricant (POL) Management; Photography Lab; Corrosion Control; Aerospace Ground Equipment (AGE) Maintenance ; and Nondestructive Inspection (NDI). Waste oils, paint, solvent, thinner, fuel, methyl ethyl ketone (MEK), battery acid, batteries, ethylene glycol, photographic chemicals, PD-680 solvent, carbon remover, varsol, engine fluids, and carburetor cleaner are generated by these activities.

Interviews with past and present Base personnel and a field survey resulted in the identification of one site at the Base that is potentially contaminated with HM/HW. This site was assigned a Hazard Assessment Score (HAS) according to the U.S. Air Force Hazard Assessment Rating Methodology (HARM).

Site No. 1 - Hazardous Waste Accumulation Area (HAS-50)

The Base Hazardous Waste Accumulation Area, is located at the northern most part of the Base property and adjacent to the Base boundary. The accumulation area is enclosed by a chain link fence and subdivided into a northern and southern area by an interior chain link fence. The northern portion of the enclosure fence also serves as the Base's boundary fence. The accumulation area contains no structures to prevent the elements from affecting the waste material or containers. The accumulation area also lacks a containment structure to prevent fluids from leaving the area. The northern portion of the accumulation area has a concrete pad which is surrounded by a gravel berm while the southern portion is partially paved with asphalt. The remaining portions of these areas have a dirt or gravel surface. Since 1971 the accumulation area has been used to store waste oil, solvents, fuel, parts cleaner, paint strippers/thinners, and hydraulic fluid until disposed. Also in the past a part of the area has been used for changing automotive oil in vehicles. During the site visit, 32 55-gallon drums containing waste oil products, mixed liquids, and solvents were observed in different parts of the accumulation area. Four drums are used for containing used motor oil and have been stored at the site for a long period of time and show signs of expansion and degradation. Various areas, the perimeter fence on the eastern side of the accumulation area and where the drums are located, show visible signs of spillage or leakage. In some of these areas, the vegetation is under stress or dead.

C. Conclusions

At the identified site, the potential exists for contamination of soils, surface water, or groundwater and subsequent contaminant migration.

D. Recommendations

Further IRP investigation is recommended for this identified site.

I. INTRODUCTION

A. Background

The 118th Tactical Airlift Wing (TAW), Tennessee Air National Guard (hereinafter referred to as the Base) is located at the Nashville Metropolitan Airport, Nashville, Tennessee. Past operations at the Base involved the use and disposal of materials and wastes that subsequently were categorized as hazardous. Consequently, the National Guard Bureau has implemented its Installation Restoration Program (IRP). The IRP consists of the following:

- o Preliminary Assessment (PA) - to identify past spill or disposal sites posing a potential and/or actual hazard to public health or the environment.
- o Site Investigation/Remedial Investigation/Feasibility Study (SI/RI/FS) - to acquire data via field studies, for the confirmation and quantification of environmental contamination that may have an adverse impact on public health or the environment and to select a remedial action through preparation of a feasibility study.
- o Research, Development and Demonstration (RD & D) - if needed, to develop new technology for accomplishment of remediation.
- o Remedial Design/Remedial Action (RD/RA) - to prepare designs and specifications and to implement site remedial action.

B. Purpose

The purpose of this Preliminary Assessment is to identify and evaluate suspected problems associated with past hazardous waste handling procedures, disposal sites, and spill sites on the Base. Personnel from the Hazardous Materials Technical Center (HMTC) visited the Base, reviewed existing environmental information, analyzed Base records concerning the use and generation of hazardous material/hazardous waste (HM/HW), and conducted interviews with past and present Base personnel familiar with past hazardous materials management activities.

A physical inspection was made of various facilities and of the suspected site. Relevant information collected and analyzed as a part of the Preliminary Assessment included the history of the Base, with special emphasis on the history of the shop operations and their past HM/HW management procedures; local geologic, hydrologic, and meteorologic conditions that may affect migration of contaminants; and the ecologic settings that indicate environmentally sensitive habitats or evidence of environmental stress.

C. Scope

The scope of this Preliminary Assessment is limited to Base operations and includes:

- An onsite visit;
- The acquisition of pertinent information and records on hazardous materials use, hazardous wastes generation, and disposal practices at the Base;
- The acquisition of available geologic, hydrologic, meteorologic, critical habitat, land use, and utility data from various Federal and State agencies;
- A review and analysis of all information obtained; and
- The preparation of a report to include recommendations for further actions.

The onsite visit and interviews with past and present Base personnel were conducted during the period 20-24 June 1988. The Preliminary Assessment was conducted by Dr. Naichia Yeh, Ph.D, Task Manager/Environmental Scientist; Mr. Mark Johnson, P.G./Program Manager; and Ms. Janet Emry, Hydrogeologist. Other HMTC personnel who assisted with the Preliminary Assessment include Mr. Raymond G. Clark, Jr., P.E./Department Manager. Personnel from the Air National Guard Support Center who attended the Preliminary Assessment include Mr. Salvador Orochena (Project Officer), and Mr. Gregory P. Krisanda. The Point of Contact (POC) at the Base was Capt. Michael W. Barker (Assistant Base Civil Engineer).

D. Methodology

A flow chart of the Preliminary Assessment Methodology is presented in Figure 1. This methodology ensures a comprehensive collection and review of pertinent site-specific information and is used in the identification and assessment of potentially contaminated hazardous waste spill/disposal sites.

The Preliminary Assessment begins with a site visit to the Base to identify all shop operations or activities on the installation that may use hazardous materials or generate hazardous wastes. Next, an evaluation of both past and present HM/HW handling procedures is made to determine whether any environmental contamination has occurred. The evaluation of past HM/HW handling practices is facilitated by extensive interviews with past and present employees familiar with the various operating procedures at the Base. These interviews also define the areas on the Base where any HM/HW, either intentionally or inadvertently, may have been used, spilled, stored, disposed of, or otherwise released into the environment.

Historic records contained in the Base files are collected and reviewed to supplement the information obtained from interviews. Using this information, a list of past waste spill/disposal sites on the Base is identified for further evaluation. A general survey tour of the identified sites, the Base, and the surrounding area is conducted to determine the presence of visible contamination and to help assess the potential for contaminant migration. Particular attention is given to locating nearby drainage ditches, surface water bodies, residences, and wells.

Detailed geologic, hydrologic, meteorologic, land use, and environmental data for the area of study is also obtained from the POC, and from appropriate Federal and State agencies. A list of agencies contacted is in Appendix B. Following a detailed analysis of all the information obtained, areas are identified as suspect areas where HM/HW disposal and/or spills may have occurred. Where sufficient information is available, sites are assigned a Hazard Assessment Score (HAS) using the U.S. Air Force Hazard Assessment Rating

PRELIMINARY ASSESSMENT
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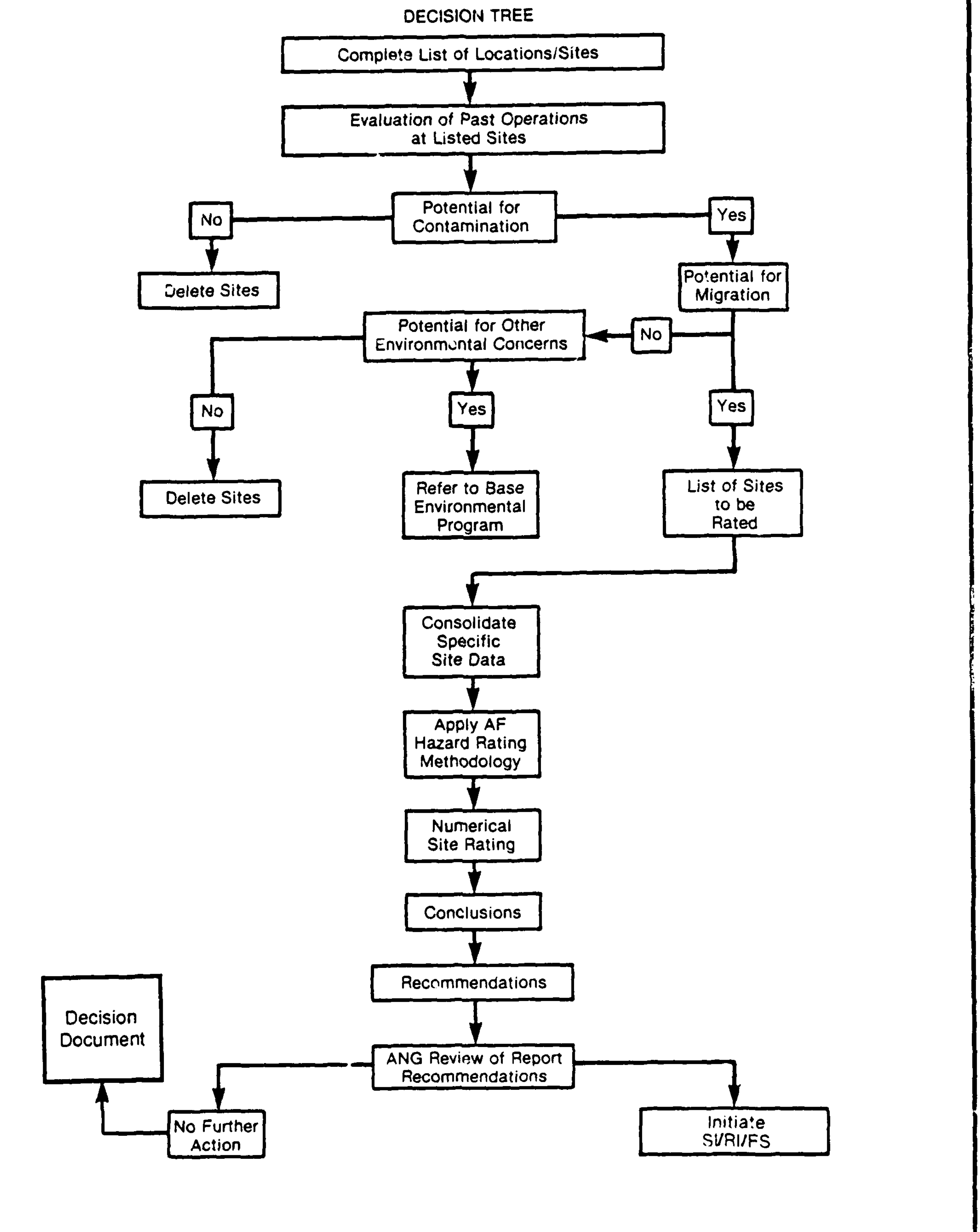
Figure 1.

Preliminary Assessment Methodology Flow Chart



Methodology (HARM) (Appendix D). However, the absence of a HAS does not necessarily negate a recommendation for further IRP investigation, but rather may indicate a lack of data. The HAS is computed from the data included in the Factor Rating Criteria. (Appendix E).

II. INSTALLATION DESCRIPTION

A. Location

The Base is located at the Nashville International Airport. The airport is located in Davidson County, Tennessee, about 4 miles southeast of the Nashville business sector. This area has not been divided into Townships and Sections. Davidson County lies along the banks of the Cumberland River, which traverses the central portion of the State. The Base has approximately 350 full time employees. During the weekend, the Base population increases up to 1,400.

Immediately north and west of the Base is Nashville International Airport. The area south and east of the Base is used for residential and commercial development.

Figure 2 shows the location and current boundaries of the Base property covered by this Preliminary Assessment.

B. History of Base Operations

The 118th TAW, Tennessee's first Air National Guard unit, is an outgrowth of a World War I unit, the 105th Aero Squadron of the American Expeditionary Force, organized in 1917 at Kelly Field, San Antonio, Texas. The 105th was one of the first 19 observation squadrons designated in the post war era. Following the war, in 1919, a group of veterans from this original unit met to organize an air element functioning as part of the Tennessee National Guard. The group gained Federal recognition on 4 December 1921 as a unit of the 30th "Old Hickory" Division. During that period, the unit maintained and operated J-N6 and D-R45 aircraft. In 1935, the 105th moved to the newly-constructed Berry Field airport, located south of the city of Nashville, Tennessee.

In 1940, the unit was ordered to Federal duty and left Nashville for a four-year tour. The unit was equipped with O-52, B-34, and B-25 aircraft.

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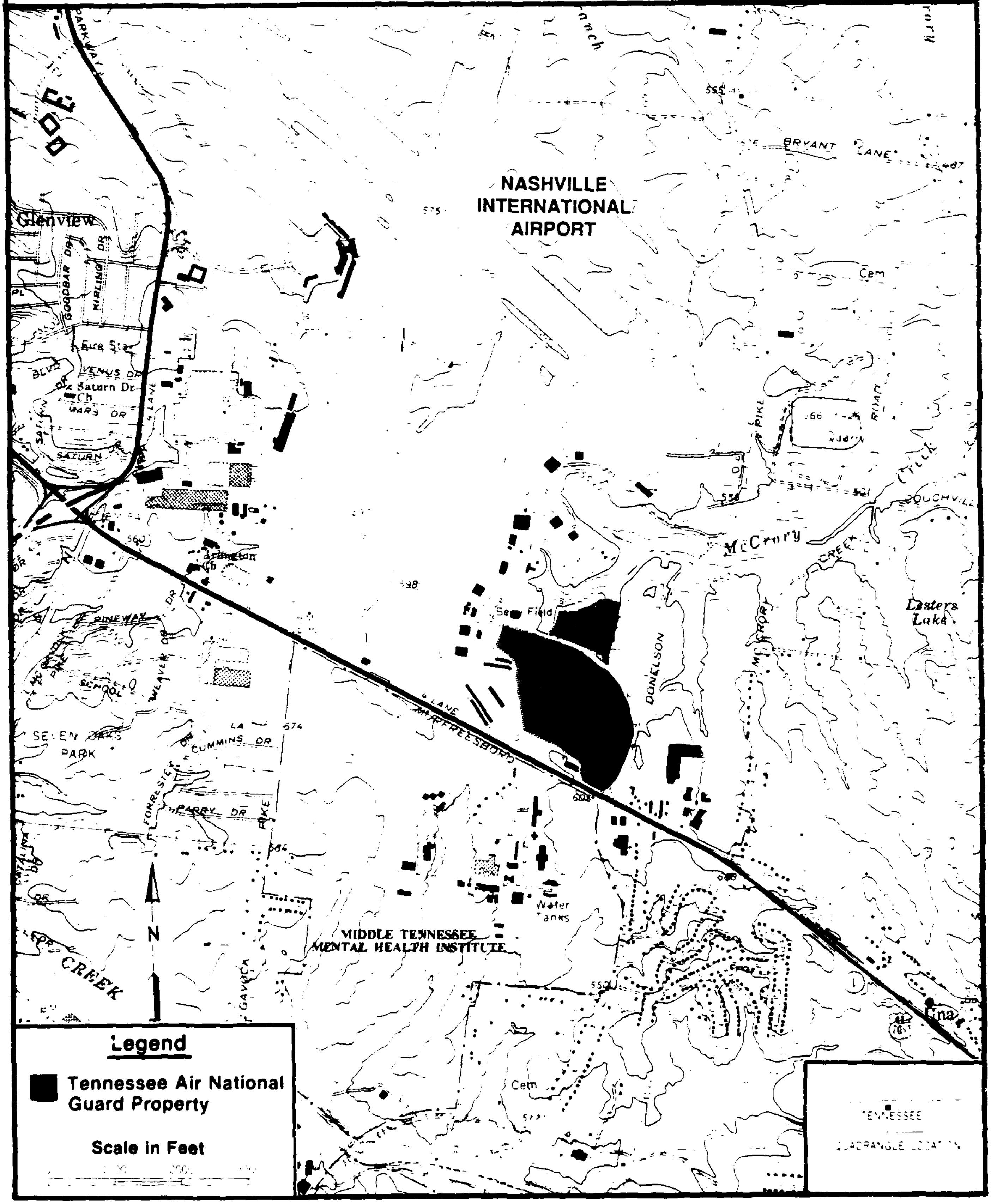
Source: U.S.G.S.
7.5 minute Series
Antioch and
Nashville East
Tennessee, 1983

Figure 2.

Location Map of the 118 TAW, Tennessee Air National Guard, Nashville International Airport, Nashville, Tennessee.



During World War II, members of the unit were scattered throughout several continents. After World War II, the members of the 105th returned to Nashville, as part of the Tennessee Air National Guard. The 105th was redesignated a fighter unit and received the F-47 and B-26 aircraft. The F-47s were gradually replaced by F-51s.

The entire Tennessee Air National Guard was called upon to augment the regular Air Force during the Korean crisis. The 105th was activated as part of the Air Defense Command on 1 March 1951. After the Korean recall in December 1952, the 105th was reorganized as a Tactical Reconnaissance Squadron. On 1 January, the 105th was designated the 118th Tactical Reconnaissance Wing and was returned to State control. The 118th started receiving first-line aircraft; the F-51s were replaced with jet aircraft such as T-33 and RF-80. By August 1956, the 118th was furnished with FR-84F aircraft.

On 1 April 1961, the mission of the 118th was changed from tactical reconnaissance to air transport under the Military Air Transport Service and was designated the 118th Air Transport Wing. The unit then changed aircraft from the RF-84F to the C-97. Six years later, the 118th converted from C-97s to C-124s.

On 26 March 1971, the Wing was reassigned from Military Airlift Command to Tactical Airlift Command and given a tactical airlift mission under the 9th Air Force. At the present, the 118th Tactical Airlift Wing maintains and operates C-130 aircraft.

III. ENVIRONMENTAL SETTING

A. Meteorology

The meteorological data presented below is from local climatological data for the Nashville, Tennessee area compiled by the National Oceanic and Atmospheric Administration (NOAA). The climate of the Nashville, Tennessee area is characterized by warm, humid summers and mild winters. Rainfall in Nashville predominantly occurs between April and September. The mean annual temperature is 60°F; winters average 40°F and summers average 78°F.

Nashville has an average annual precipitation of 48.31 inches. According to the method outlined in the Federal Register (47 FR 31224), a net precipitation value of 11.31 inches per year is obtained by subtracting the mean annual lake evaporation, 37 inches, from the average annual precipitation. Maximum rainfall intensity, based on a 1-year, 24-hour rainfall, is approximately 3 inches (47 FR 31235).

B. Geology

Most of southeastern Davidson County is comprised of gently rolling hills. The north and west sections of Davidson County are included in the Highland Geologic Province, a region of the county that is undulating-to-hilly, with well-drained soils and visible limestone. The area where the Base is now located was gently rolling hills in the past. The landscape is now generally flat due to construction during past years. Elevation is 590 feet along the southern perimeter of the Base. The elevation slightly decreases toward the north to 550 feet at the northern boundary.

The Nashville Basin, the geological segment on which the City of Nashville and the Base are situated, is an oval-shaped lowland about 50 to 60 miles wide and 80 to 90 miles long. The innermost part of the basin is nearly flat with an average elevation of about 600 feet. The outer basin, where the Base is located, has considerably more relief owing to the numerous rounded hills that dot the landscape. Throughout the Central Basin, karst features such as caves, sinkholes, and sparse drainage are common. The Basin is also characterized by a thin soil cover over most of the low-lying areas.

As shown in Figure 3 and described in the stratigraphic column in Figure 4, the Base is underlain by the Hermitage Formation to a depth of 50 to 90 feet. This formation is medium-light to dark-gray and brownish-gray in color. The Hermitage Formation is composed of four major units. The surfacial unit is a granular phosphatic limestone, which contains calcarenite and brown phosphate pellets. This unit ranges in thickness from 9 to 20 feet. It is coarse-grained, medium-bedded, and cross-bedded. Underlying the surface layer is a coquina facies. This unit is composed of limestone with disseminated silt and shale partings. The unit is medium-bedded and is characterized by numerous fossils of the brachiopod Resseralla fertilis. The thickness of this unit varies from 0 to 10 feet. Below the coquina facies is a laminated argillaceous limestone facies with a thickness ranging from 50 to 70 feet. This unit is sandy, very fine- to medium-grained, and laminated- to thin-bedded with thin shale partings. At the base of the Hermitage Formation is the Curdsville Limestone Member. This unit is 9 to 10 feet thick and characterized by a fine- to medium-grained, thin-bedded fossiliferous limestone with thin shale partings.

The Carters Limestone underlying the Hermitage Formation is formed by two major members and is medium light-gray to brownish-gray and yellowish-brown in color. This unit is generally very fine-grained to cryptocrystalline, except for some beds in the lower member which range up to coarse-grained. The upper member is limestone with a thickness of approximately 10 feet. This member is thinly bedded with thin shale partings. The lower member is also limestone with a thickness ranging from 40 to 80 feet. This member is medium- to thick-bedded, with minor amounts of magnesian limestone as small irregular mottlings and thin bands, and thin lenses of chert locally.

Underlying the Carters Limestone, the Lebanon Limestone has a maximum exposed thickness of 60 feet. This unit is medium-gray to medium dark-gray and

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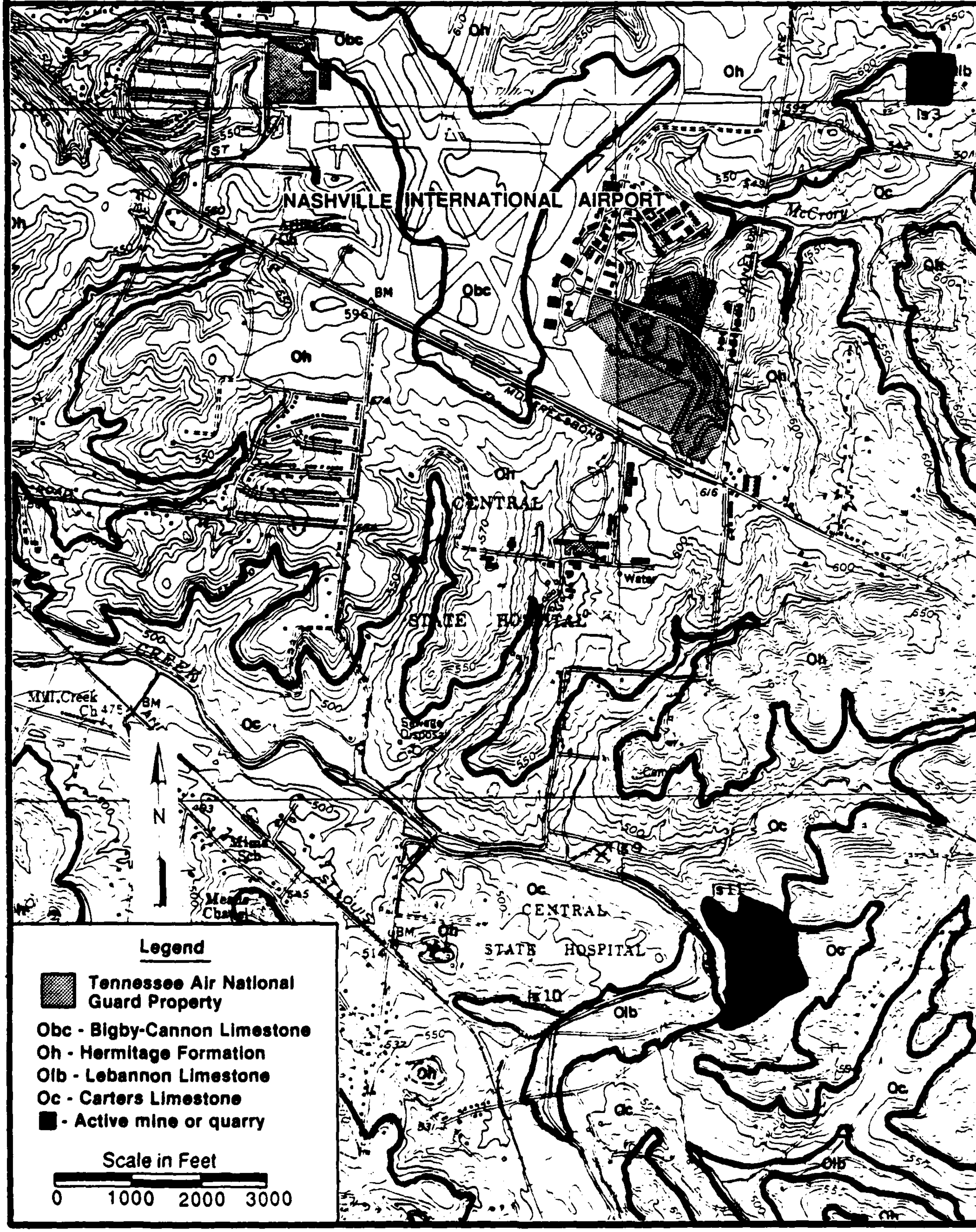
Source: State of Tennessee Geologic Map of the Antioch Quadrangle, Tennessee.

Figure 3.

Geologic Map of the 118 TAW, Tennessee Air National Guard and Vicinity.



HMTC

Source: Geological Map of the Antioch Quadrangle, Tennessee; State of Tennessee, 1964.

Figure 4.
Stratigraphic Units at the 118 TAW, Tennessee Air National Guard and Vicinity.

Era	System	Group or Formation	Description
Paleozoic	Ordovician	Hermitage	Granular phosphatic limestone facies; calcarenite, medium light- to brownish-gray, crossbedded, with brown phosphate pellets; thickness 0-20 feet Coquina facies; limestone with disseminated silt and shale partings, medium- to brownish-gray, medium-bedded, numerous fossil brachiopods; thickness 0-10 feet Laminated argillaceous limestone facies; sandy, medium- to dark-gray, very fine- to medium-grained, laminated to thin-bedded with thin shale partings; thickness 50 to 70 feet Curdsville Limestone Member; medium- to dark-gray, fine- to medium-grained, thin-bedded with thin shale partings, fossiliferous; thickness 0-10 feet
		Carters	Upper member; limestone, medium light-gray to brownish-gray and yellowish-brown, very fine-grained to cryptocrystalline, thin bedded with thin shale partings; thickness approximately 10 feet Bentonite; green (fresh) to white and yellow (weathered) sticky clay. Thickness 6 to 12 inches Lower member; limestone, medium light-gray to brownish-gray and yellowish-brown, cryptocrystalline to very fine-grained with some beds ranging up to coarse-grained, medium to thick-bedded, with minor amounts of magnesian limestone and thin lenses of chert; thickness 40 to 80 feet
		Lebanon	Limestone; medium-gray to medium dark-gray and brownish-gray to yellowish-brown, cryptocrystalline to very fine-grained with some beds ranging up to coarse-grained, thin-bedded with thin shale partings, fossiliferous; maximum exposed thickness 60 feet

brownish-gray to yellowish-brown in color. Its texture can be described as cryptocrystalline to very fine-grained with some beds ranging up to coarse-grained. The unit contains fossils and is thinly bedded with thin shale partings.

C. Soils

According to the U.S. Soil Conservation Service Soil Survey of Davidson County, Tennessee, the soils at the Base are composed of mainly Stiversville-Urban land, with small sectors of Maury-Urban Land and Hampshire silt loams. Figure 5 delineates the occurrence of these soils in the vicinity of the Base. The permeability of this group is moderately rapid (1.41×10^{-3} to 4.23×10^{-3} cm/sec).

Stiversville-Urban Land is characterized by sloping, low lying ridges, moderately steep side slopes, narrow valleys, and well drained soils. It is composed of 43 percent Stiversville soils, which have a dark brown loam upper layer, reddish-brown clay loam lower layer, and fragments of limestone.

Maury-Urban Land consists of undulating to rolling, well drained soils. About 40 percent of Maury soils have a dark brown silt loam surface layer and a reddish-brown silty clay loam subsoil.

Hampshire Silt Loam is a deep, sloping, well drained soil found on the tops and sides of low hills. The surface layer is five inches of brown silt loam. The subsoil extends to 45 inches and is composed of stony, brown silty-clay loam and strong brown to yellowish-brown firm clay.

According to an aerial photo of the Base, approximately 80% of the Base property is artificially covered. Soil boring data show that the Base is underlain by yellowish-brown, reddish-brown, or brown silty clay, which agrees well with the above soil descriptions.

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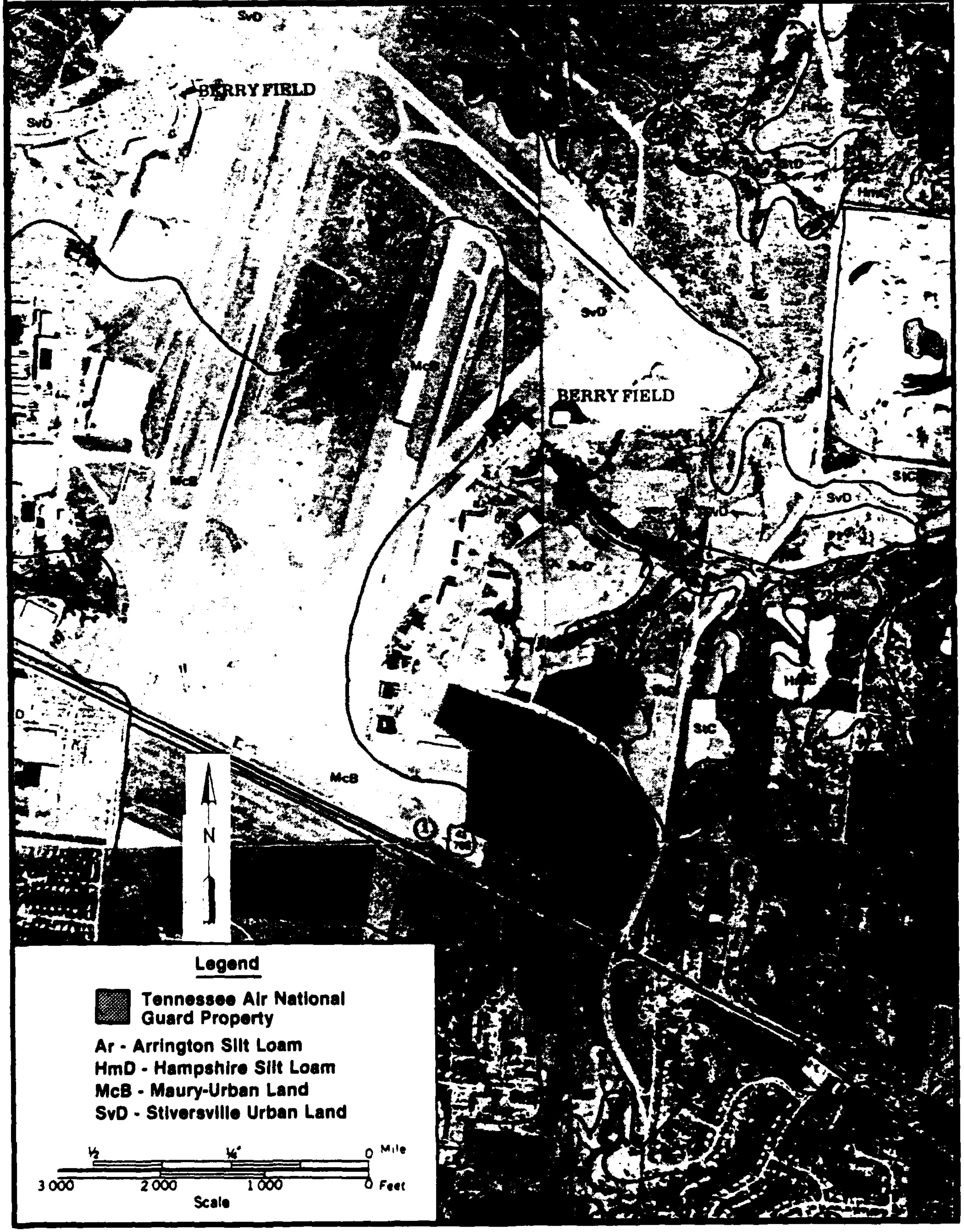
Source: U.S.D.A. Soil Survey of Davidson County, Tennessee.

Figure 5.

Soil Map of the 118 TAW, Tennessee Air National Guard and Vicinity.



D. Hydrology

Surface Water

The greater part of Davidson County is drained by the Cumberland River, which follows a meandering westward course through Nashville and receives the tributary drainage of Mansker, Whites, and Little Marrowbone Creeks from the north, and of Stone River and Mill Creek from the south (Piper, 1932).

The Base is in the watershed of McCrory Creek and Mill Creek. Surface runoff from the Base is collected by the storm sewer system and discharged to McCrory Creek (Figure 6). The confluence of McCrory Creek and the Stone River is approximately 4.5 miles northeast of the Base. The confluence of Mill Creek and the Cumberland River is about 4 miles northwest of the Base. Lesters Lake is about 1.0 miles east of the Base, and the J. Percey Priest Reservoir is about 2.5 miles east of the Base. The confluence of the Stone and Cumberland Rivers is about 5.5 miles north of the Base. Population served by surface water supplies within three miles downstream of the Base is well over 1,000. The Cumberland River provides potable water to both the City of Nashville and the Base. The water is of good quality, although it is very hard. According to the Flood Insurance Rate Map published by the National Flood Insurance Program, the Base is above the 100-year flood plain.

Groundwater

Groundwater in the Metropolitan Region of Nashville, Tennessee occurs chiefly in solution-enlarged openings in the carbonate rocks that underlie the immediate area. These openings, which constitute less than 0.5 percent of the total rock volume, are widespread in their occurrence but irregularly distributed in the subsurface. The largest and most productive openings appear to be concentrated in the massively bedded formations.

In the Central Basin, depressions in the bedrock structure and low flat areas are two features most closely related to the locations of large-capacity wells. Records of large-capacity wells in Davidson County shows that the depth

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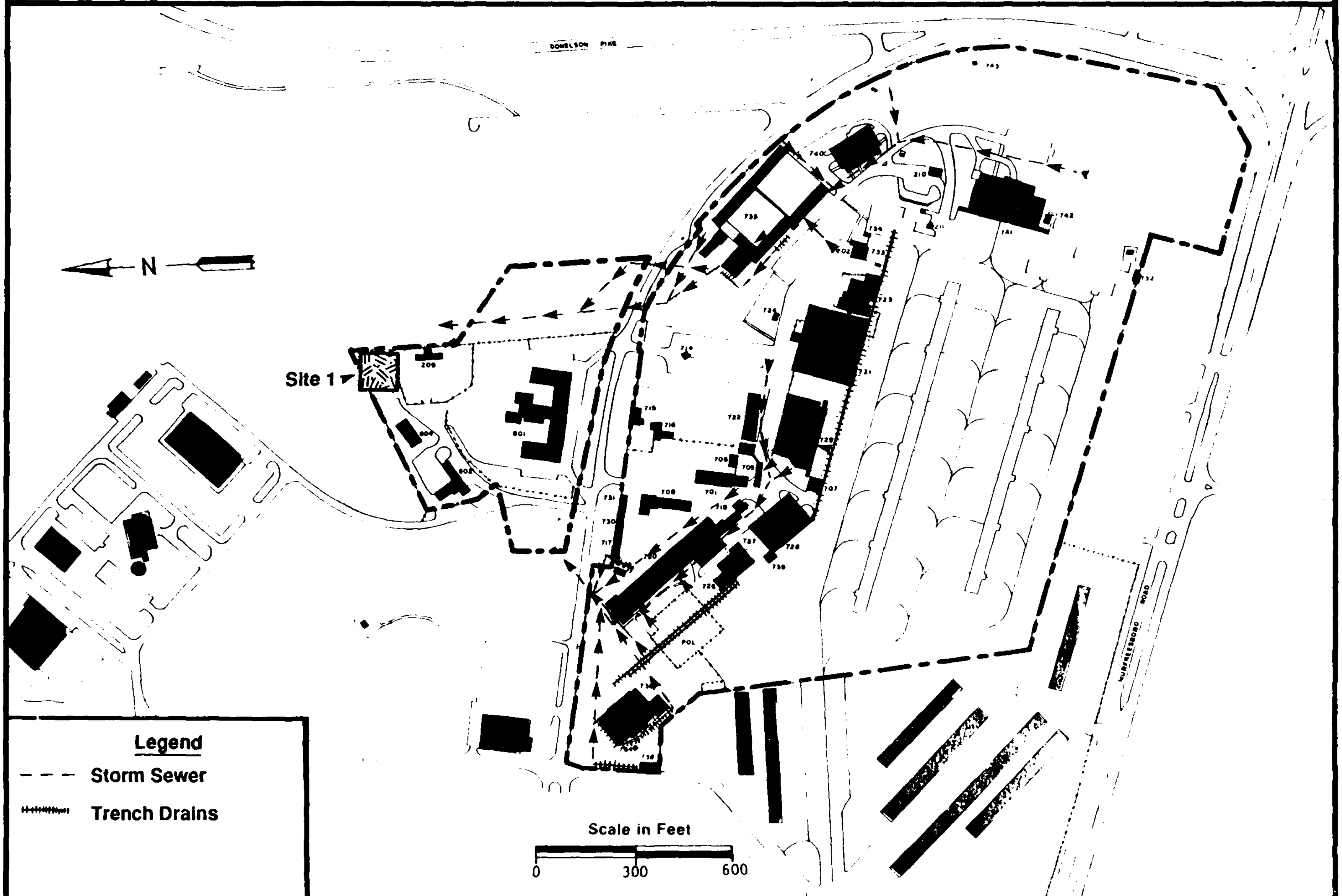
Source: Tennessee Air National Guard Base Utility Map

Figure 6.
Storm Drainage Map, 118 TAW, Tennessee Air National Guard, Nashville International Airport, Nashville, Tennessee.



of the principal water-bearing bed is 60 to 110 feet. The static groundwater level in the vicinity of Nashville is about 510 feet above sea level.

Large numbers of springs are found in this area. Most springs are perennial, which indicates the existence of sizeable groundwater reservoirs. These springs are either the contact type or the overflow type. Contact type springs are positioned near the bottom of the reservoir or aquifer from which their flow is derived. Characteristically, these springs are located near the bottom of steep slopes, and they generally exhibit considerable variation in their rate of flow with time.

Overflow type springs are fed from vertical openings through which groundwater rises to the land surface from depths beneath the spring orifice. In essence, these springs constitute natural-flowing wells that reflect the presence of a sizeable artesian conduit system. In general, this type of spring exhibits less variability than the contact type (Rima, 1979).

Figure 7 shows the potential availability of large groundwater resources in the region and vicinity of the Base. The Base is not in an area with high potential availability of large groundwater resources, and there are no wells within three miles of the Base boundary. Since the Base and City of Nashville obtain their drinking water from surface waters, groundwater is basically used for other purposes, such as commercial, industrial, or irrigation. Shallow groundwater flow in the vicinity of the Base is to the north or northeast, toward McCrory Creek and its tributaries.

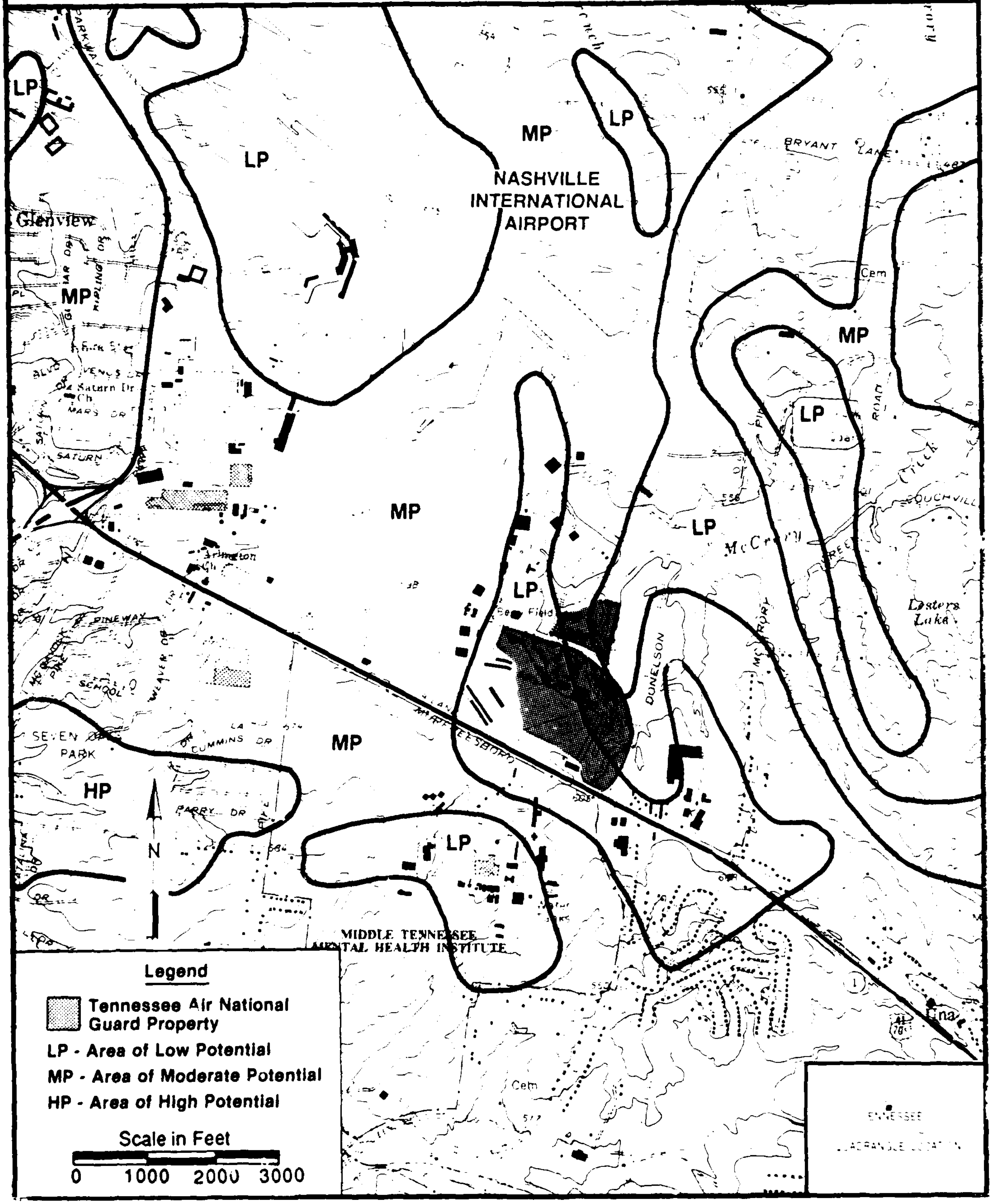
E. Critical Environments

The Base lies within the watershed of Mill Creek and McCrory Creek. The Tennessee Wildlife Resources Agency considers the watershed to be of high value to aquatic life. An endangered species that may exist within a 1-mile radius of the Base is the Nashville Crayfish (*Orconectes phoupi*). This species is found in Sims Branch, which begins on the airport and flows northwest into Mill Creek. There are no other endangered or threatened species of flora within a 1-mile radius of the Base. Furthermore, there are no other critical environments within a 1-mile radius of the Base.

Source: U.S.G.S. Ground-Water Resources in the Metropolitan Region of Nashville, Tennessee

Figure 7.

Potential Groundwater Resources Map of the 118 TAW, Tennessee Air National Guard and Vicinity.



IV. SITE EVALUATION

A. Activity Review

A review of Base records and interviews with Base personnel resulted in the identification of specific shops at the Base in which the majority of industrial chemicals are handled and hazardous wastes are generated. A total of 25 past and present Base personnel with an average of 23 years of tenure at the Base were interviewed. These personnel were representative of the following Base shops: Civil Engineering; Aircraft Maintenance; Facilities Maintenance; Vehicle Maintenance; Corrosion Control; Aerospace Ground Equipment (AGE) Maintenance; Petroleum, Oils, and Lubricants (POL) Management; Photography Lab; Nondestructive Inspection (NDI); Paint Shops; and Propulsion Shop. Table 1 provides estimates of the quantities of waste currently being generated by these shops and describes the past and present disposal practices for the wastes. Based on information gathered, any shop that is not listed in Table 1 has been determined to produce negligible quantities of wastes requiring disposal. For the time periods not covered in Table 1, there is either no information available or quantities of wastes requiring disposal were negligible.

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

The Base inspection of 20 to 24 June 1988 identified one site for consideration as an IRP site. This site is designated Site No. 1 and called the Hazardous Waste Accumulation area. Also, it was determined that the material at the site has a potential for migration. Figure 8 illustrates the location of the identified site.

The identified site was assigned a HAS according to HARM (Appendix D). This site received a receptors score of 42, a waste characteristics score of 36, a pathway score of 80, and waste management practices factor of 0.95. The final HAS for the site is 50. A completed Hazardous Assessment Rating Form is found

Table 1. Hazardous Material/Hazardous Waste Disposal Summary: 118 TAW, Tennessee Air National Guard, Nashville International Airport, Nashville, Tennessee

Shop Name and Location	Hazardous Waste/ Used Hazardous Material	Current Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1950 1960 1970 1980 1988
Aerospace Ground Equipment (AGE) Maintenance Bldg. No. 702	Engine Oil	250	'-----FTA------'-------------DRMO------------'
	Hydraulic Oil	80	'-----FTA------'-------------DRMO------------'
	Paint Strippers/Thinners		'-----FTA------'-------------DRMO------------'
	JP-4		'-----FTA------'-------------DRMO------------'
	PD-680 (type 2)	100	'-----FTA------'-------------DRMO------------'
	Parts Cleaner		'-----FTA------'-------------DRMO------------'
	Turbine Oil	50	'-----FTA------'-------------DRMO------------'
	Trichloroethylene (TCE)	10	'-----FTA------'-------------DRMO------------'

KEY:

CONTR - Contractor
DRMO - Disposed of through the Defense Reutilization and Marketing Office, formerly DPDO prior to 1987.
EVAP - Evaporates in process.
FTA - Disposed of in Fire Training Area.
GRND - Disposed of on ground.
NEUTR SAN - Neutralized and disposed of through sanitary sewer.
OWS - Oil/Water Separator then to holding tank.
SAN - Disposed of in drain leading to sanitary sewer.
SIL REC - Sent for silver recovery offbase.
STORM - Disposed of in drains leading to storm sewer.
* - Based on current usage.

Table 1. Hazardous Material/Hazardous Waste Disposal Summary: 118 TAW, Tennessee Air National Guard, Nashville International Airport, Nashville, Tennessee (Continued)

Shop Name and Location	Hazardous Waste/ Used Hazardous Material	Current Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1950 — 1960 — 1970 — 1980 — 1988
Vehicle Maintenance (Motor Pool) Bldg. No. 715	Engine Oil	125	'-----FTA------'------------CONTR------------'
	Sulfuric Acid	50	'----STORM-----'-----------NEUTR SAN-----------'
	JP-4	50	'----STORM-------'----------OWS/DRMO-----------'
	Ethylene Glycol	30	'----STORM---------'---------CONTR------------'
	Hydraulic Oil	50	'-----FTA------'------------CONTR------------'
	Transmission Fluid	25	'-----FTA--------'-----------CONTR------------'
Fuels Management Bldg. No. 702	JP-4	200	'-------------FTA------------'

KEY:

CONTR - Contractor
DRMO - Disposed of through the Defense Reutilization and Marketing Office, formerly DPDO prior to 1987.
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Table 1. Hazardous Material/Hazardous Waste Disposal Summary: 118 TAW, Tennessee Air National Guard, Nashville International Airport, Nashville, Tennessee (Continued)

Shop Name and Location	Hazardous Waste/ Used Hazardous Material	Current Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1950 1960 1970 1980 1988
Nondestructive Inspection (NDI) Bldg. No. 707	Penetrant	10	----DRMO---- (1960–1988)
	Emulsifier	20	----DRMO---- (1960–1988)
	Developer	120	----NEUTR SAN---- (1960–1988)
	Fixer	40	----SIL REC---- (1960–1988)
	PD-680	10	----FTA---- (1960–c.1978); ----DRMO---- (c.1978–1988)
	Kerosene Cutting Oil	20	---CONTR--- (1970–c.1978); ----DRMO---- (c.1978–1988)
	Trichloroethane	10	---EVAP--- (1970–c.1978)

KEY:

CONTR - Contractor
DRMO - Disposed of through the Defense Reutilization and Marketing Office, formerly DPDO prior to 1987.
EVAP - Evaporates in process.
FTA - Disposed of in Fire Training Area.
GRND - Disposed of on ground.
NEUTR SAN - Neutralized and disposed of through sanitary sewer.
OWS - Oil/Water Separator then to holding tank.
SAN - Disposed of in drain leading to sanitary sewer.
SIL REC - Sent for silver recovery offbase.
STORM - Disposed of in drains leading to storm sewer.
* - Based on current usage.

Table 1. Hazardous Material/Hazardous Waste Disposal Summary: 118 TAW, Tennessee Air National Guard, Nashville International Airport, Nashville, Tennessee (Continued)

Shop Name and Location	Hazardous Waste/ Used Hazardous Material	Current Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1950 — 1960 — 1970 — 1980 — 1988
Corrosion Control Bldg. No. 702	Solvents/PD-680 (type 2)	660	'---STORM--'-----OWS/DRMO------'
	Thinners	240	'---STORM--'-------DRMO--------'
	Paint Strippers	125	'---STORM--'-------DRMO--------'
	Lacquer	15	'---STORM--'-------DRMO--------'
	Aliphatic Naptha	120	'---STORM--'-------DRMO--------'
	Acids	10	'---STORM--'-----NEUTR SAN-----'
Paint Shops Bldg. No. 737	Solvents	50	'---STORM--'-------DRMO--------'
	Thinners	200	'---STORM--'-------DRMO--------'
	Strippers (MEK)	60	'---STORM--'-------DRMO--------'
	Stripper Residue	60	'---STORM--'------OWS/DRMO-----'

KEY:

CONTR - Contractor
DRMO - Disposed of through the Defense Reutilization and Marketing Office, formerly DPDO prior to 1987.
EVAP - Evaporates in process.
FTA - Disposed of in Fire Training Area.
GRND - Disposed of on ground.
NEUTR SAN - Neutralized and disposed of through sanitary sewer.
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* - Based on current usage.

Table 1. Hazardous Material/Hazardous Waste Disposal Summary: 118 TAW, Tennessee Air National Guard, Nashville International Airport, Nashville, Tennessee (Continued)

Shop Name and Location	Hazardous Waste/ Used Hazardous Material	Current Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1950 1960 1970 1980 1988
Photo Lab Bldg. No. 802	Developer	100	(1970–1988) ---SAN---
	Fixer	50	(1970–1988) ---SIL REC---
Propulsion Shop Bldg. No. 728	PD-680 (type 2)	40	(c. 1970–1988) ---CONTR/DRMO---
	JP-4	25	(c. 1970–1988) ---CONTR/DRMO---
	Synthetic Turbine Oil	200	(c. 1970–1988) ---CONTR/DRMO---
	7808 Oil	10	(c. 1970–1988) ---CONTR/DRMO---
	Hydraulic Oil	20	(c. 1970–1988) ---CONTR/DRMO---
	Engine Oil	20	(c. 1970–1988) ---CONTR/DRMO---
	Varsol	25	(c. 1970–1988) ---CONTR/DRMO---

KEY:

CONTR - Contractor
DRMO - Disposed of through the Defense Reutilization and Marketing Office, formerly DPDO prior to 1987.
EVAP - Evaporates in process.
FTA - Disposed of in Fire Training Area.
GRND - Disposed of on ground.
NEUTR SAN - Neutralized and disposed of through sanitary sewer.
OWS - Oil/Water Separator then to holding tank.
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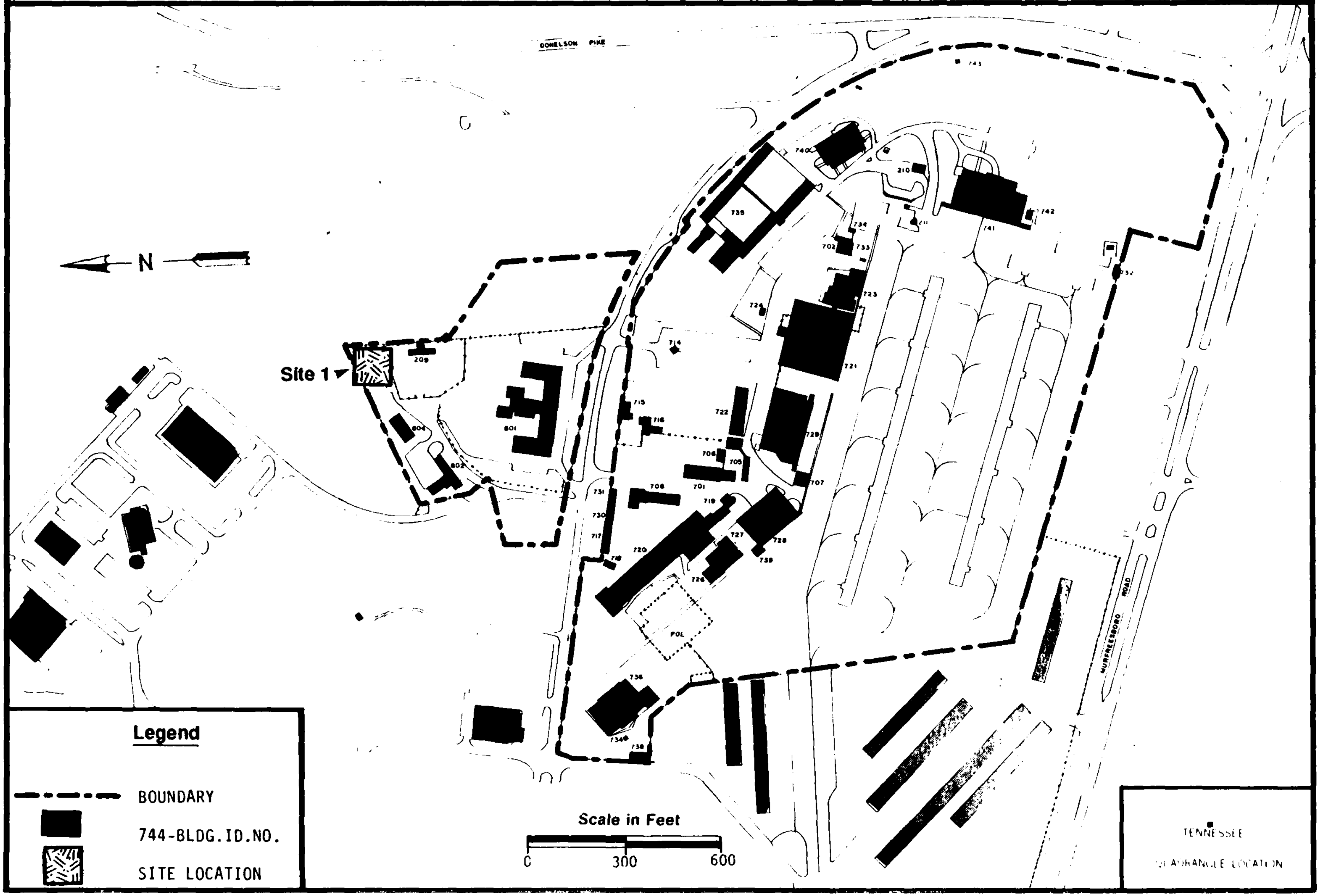
SIL REC - Sent for silver recovery offbase.
STORM - Disposed of in drains leading to storm sewer.
* - Based on current usage.

HMTC

Source: Tennessee Air National Guard Base Utility Map

Figure 8.
Location of Sites at 118 TAW, Tennessee Air National Guard, Nashville International Airport, Nashville, Tenessee.



in Appendix E. The objective of this assessment is to provide a relative ranking of sites suspected of contamination from hazardous substances. The final rating score reflects specific components of the hazard posed by a specific site: possible receptors of the contamination (e.g., population within a specified distance of the site and/or critical environments within a 1-mile radius of the site); the waste and its characteristics; and the potential pathways for contaminant migration (e.g., surface water, groundwater, flooding). A description of the site follows.

<u>Site No. 1 - Hazardous Waste Accumulation Area</u> (HAS-50)

This site is a waste accumulation area located at the northern-most part of Base property (see Figure 6) and adjacent to the Base boundary. The closest surface water is a storm sewer outlet, which is within 600 feet of the site. The accumulation area is enclosed by a chain link fence and subdivided into a northern and southern area by an interior chain link fence. The northern portion of the enclosure fence also serves as the Base's boundary fence. The accumulation area contains no structures to shelter the waste material or containers from the elements. The accumulation area also lacks a containment structure to prevent fluids from leaving the area. The northern portion of the accumulation area has a concrete pad which is surrounded by a gravel berm while the southern portion is partially paved with asphalt. The remaining portions of these areas have a dirt or gravel surface. Because this area is mostly paved, permeability and surface erosion are considered to be minimal.

Since 1971, the accumulation area has been used to store waste oil, solvents, fuel, parts cleaner, paint strippers and thinners, and hydraulic fluid. Also, in the past a part of the area has been used for changing automotive oil in vehicles. During the site visit, 32 55-gallon drums containing waste oil products, mixed liquids, and solvents were observed in different parts of the accumulation area. Four drums are used for containing used automobile oil and have been stored at the site for a long period of time and show signs of expansion and degradation. Both the perimeter fence on the eastern side of the accumulation area and the drum storage area show visible signs of spillage and leakage. In some of these areas, the vegetation is stressed or dead. Because the area is used primarily for storage and to change automotive fluids, a "small" quantity (less than 1,000 gallons) of waste is assumed to have been released at the site. The site was scored on the basis of diesel fuel, which is both ignitable (flash point between 80°F and 140°F) and toxic (Sax's level 3 toxicity).

C. Other Pertinent Information

- A review of installation records resulted in the identification of 19 underground storage tanks (USTs) at the Base. The locations and characteristics of the USTs are listed in Appendix C. All USTs are currently in use. No evidence of leakage has been detected.

- Seven oil/water separators (OWSs) are in use at the Base; these are located at Building Nos. 716, 728, 729, 734, 736, 740, and 741. All of the Base OWSs are connected to the Base sanitary sewer system. The OWSs and their associated holding tanks are listed in the underground storage tank inventory (Appendix C).

- There are no PCB transformers, radioactive landfills, or disposal areas on the Base.

- No fire training has been performed on Base property. All past and present fire training activities are performed on Nashville International Airport property.

V. CONCLUSIONS

Information obtained through interviews with 25 past and present Base personnel, review of Base records, and field observations has resulted in the identification of one potentially contaminated disposal and/or spill site on Base property. This site is:

Site No. 1 - Hazardous Waste Accumulation Area (HAS-50)

This site is potentially contaminated with HM/HW and exhibits the potential for contaminant migration to groundwater and surface water. Therefore, it was assigned a HAS according to HARM.

VI. RECOMMENDATIONS

In accordance with applicable regulations, further IRP investigation is recommended for the identified site.

GLOSSARY OF TERMS

AQUICLUDE - A confining bed that prevents the flow of water to or from an adjacent aquifer.

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

ARGILLACEOUS - A sedimentary rock containing an appreciable amount of clay.

BRACHIOPOD - Any solitary marine invertebrate, commonly attached to a substratum but may also be free.

CALCARENITE - A limestone consisting of more than 50% detrital clacite particles of sand size.

CHERT - A hard, extremely dense or compact sedimentary rock.

CONTAMINANT - As defined by Section 101(f)(33) of Superfund Amendments and Reauthorization Act of 1986 (SARA) shall include, but not be limited to any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformation in such organisms or their offspring; 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, liquefied natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas).

COQUINA - A porous light-colored limestone consisting of loosely aggregated shells and shell fragments.

CRITICAL HABITAT - The specific areas within the geographical area occupied by the species cn which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management consideration or protection.

CRYPTOCRYSTALLINE - The texture of a rock consisting of crystals that are too small to be recognized under the ordinary microscope.

DISCHARGE - The release of any waste stream or any constituent thereof to the environment which is not covered.

DOWNGRADIENT - A direction that is hydraulically downslope; the direction in which groundwater flows.

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 determined by the secretary to constitute a pest whose protection would present an overwhelming and overriding risk to man.

FACIES - The aspect, appearance, and characteristics of a rock unit which differentiates the unit from adjacent or associate units.

FLASH POINT - The lowest temperature at which the vapors of combustible liquids, especially fuels, will ignite.

GROUNDWATER - Refers to the subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated.

HARM - Hazard Assessment Rating Methodology - 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, welfare, and environmental impacts. (Reference: DEQPPM 81-5, 11 December 1981.)

HAS - Hazard Assessment Score - The score developed by using the Hazardous Assessment Rating Methodology (HARM).

HAZARDOUS MATERIAL - Any substance or mixture of substances having properties capable of producing adverse effects on the health and safety of the human being. Specific regulatory definitions also found in OSHA and DOT rules.

HAZARDOUS WASTE - A solid or liquid waste that, 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 or incapacitating reversible illness, or

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

IGNITABILITY - The ability of a substance to burn or catch fire.

KARST - A topography formed on limestone, gypsum and other rocks by dissolution.

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

PARTINGS - A plane or surface along which a rock is readily separated or is naturally divided into layers.

PERENNIAL SPRING - A spring that flows continuously throughout the year.

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

SOIL PERMEABILITY - The characteristic of the soil that enables water to move downward through the profile. Permeability is measured as to the number of inches per hour that water moves downward through the saturated soil.

Terms describing permeability are:

Very Slow - less than 0.06 inches per hour (less than 4.24×10^{-5} cm/sec)

Slow - 0.06 to 0.20 inches per hour (4.24×10^{-5} to 1.41×10^{-4} cm/sec)

Moderately Slow - 0.20 to 0.63 inches per hour (1.41×10^{-4} to 4.45×10^{-4} cm/sec)

Moderate - 0.63 to 2.00 inches per hour (4.45×10^{-4} to 1.41×10^{-3} cm/sec)

Moderately Rapid- 2.00 to 6.00 inches per hour (1.41×10^{-3} to 4.24×10^{-3} cm/sec)

Rapid - 6.00 to 20.00 inches per hour (4.24×10^{-3} to 1.41×10^{-2} cm/sec)

Very Rapid - more than 20.00 inches per hour (more than 1.41 x 10^{-2} cm/sec)

(Reference: U.S.D.A. Soil Conservation Service)

SURFACE WATER - All water exposed at the ground surface, including streams, rivers, ponds, and lakes.

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

TOXICITY - The degree of intensity of a poison; toxicity can be evaluated using the rating scheme of Sax (1984):

Sax's Toxicity Ratings

0 = no toxicity (None)

Substances that cause no harm under any conditions or substances that cause toxic effects under the most unusual conditions o by overwehlming doses.

1 = slight toxicity (Low)

Substances that produce changes in the human body which are readily reversible and which will disappear following termination of exposure.

2 = moderate toxicty (Moderate)

Substances that may produce irreversible as well as reversible changes in the human body. These changes are not of such severity as to threaten life or to produce serious physical impairment.

3 = severe toxicity (High)

Substances that produce irreversible changes in the human body. These changes are of such severity to threaten human life or cause death.

TOPOGRAPHY - The general conformation of a land surface, including its relief and the position of its natural and manmade features.

TOWNSHIP - The unit of survey of the U.S. Public Land Survey, representing a piece of land that is bounded on the east and wet by meridians approximately 6 miles apart and on the north and south by parallels six miles apart, and that is normally divided into 36 sections. Townships are located with references to a principal meridian and base line, and are normally numbered consecutively north and south from the base line (e.g. "township 14 north"). Used in conjunction with range.

UPGRADIENT - A direction that is topographically or hydraulically upslope.

WATER TABLE - The upper limit of the portion of the ground that is wholly saturated with water.

WETLANDS - Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

WILDERNESS AREA - An area unaffected by anthropogenic activities and deemed worthy of special attention to maintain its natural condition.

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Piper, A.M. Groundwater in North Central Tennessee. U.S. Government Printing Office, 1932.

Yeh, N. Electronic Hazardous Assessment Rating System. Remedial Assessment, Compliance, and Engineering Dept., Dynamac Corp., Rockville, Maryland, 1988.

APPENDIX A

Resumes of HMTC Preliminary Assessment Team

NAICHIA YEH

EDUCATION

Ph.D., Environmental Sciences, The University of Texas at Dallas, 1987
M.S., Environmental Sciences, The University of Texas at Dallas, 1984
B.S., Physics, National Taiwan Normal University, 1978

EXPERIENCE

Nine years of combined academic and technical experience in hazardous waste management and in supplying technology-based solutions to environmental problems, including environmental assessment and evaluation of the nature and the potential environmental impacts of hazardous waste. Has extensive knowledge in computer-aided modeling methodology.

EMPLOYMENT

Dynamac Corporation (1987-present): Environmental Scientist

Conducts preliminary assessments of suspected hazardous materials/hazardous waste sites at military installations in order to identify, and evaluate potentially hazardous waste disposal sites. Also, quantifies contamination at these sites and analyzes the data in order to determine both short-term and long-term public health effects as well as future risks that may result from exposure to the site contaminants.

Provides technical information consultation to clients with inquiries regarding state-of-the-art technology, current regulations, and hazards associated with usage of hazardous materials. Also provides guidance on proper transportation and disposal methods of hazardous wastes, safe storage and handling for hazardous materials, and hazards associated with chemicals and substances.

Provides computerized management services support for environmental contracts to the Hazardous Materials Management Division of the Dynamac Corporation. Conducts scientific data processing and data analysis, and develops databases for managing work assignments and contracts.

Developed an electronic hazardous assessment rating system which is a fully computerized version of the U.S. Air Force Hazardous Assessment Rating System. Designed a technical inquiry data base system to keep track of the technical inquiry service requests received by the Hazardous Materials Technical Center operated by Dynamac Corporation. Implemented an efficient methodology for preparing the project expense reports to support program management functions.

The University of Texas at Dallas (1985-1987): Research Assistant

Participated in an environmental assessment and design project which involved the evaluation of the nature and potential impact of hazardous waste. This project included the design of field and laboratory programs for the collection of data used with computer-aided modeling, site assessment of the proposed hazardous waste facilities, field sampling and hazardous waste characterization, zoning of the polluted site, design of the remedial cleanup program, and the conceptual design of the hazardous waste disposal plan based on the onsite investigation and computer modeling results.

The University of Texas at Dallas (1984-1985): Computer Laboratory Consultant

Instructed students in microcomputer applications and computer programming languages. Conducted scientific data processing and data analysis. Developed a regression analysis program with Lotus 1-2-3. The program integrates five regression mechanisms and takes full advantage of Lotus 1-2-3's keyboard macro and graphic abilities.

The University of Texas at Dallas (1983): Teaching Assistant

Taught numerical analysis and applied mathematics in environmental engineering.

Peitou High School (1979, 1982): Science Teacher

Taught physics, mathematics, computer sciences, and environmental education.

ROC Army (1980-1981): Research Scientist

Conducted environmental surveys and evaluations.

HARDWARE

IBM 360/370., IBM 4341, IBM 4381, IBM PC/XT/AT, IBM PS/2 and compatibles, TI Professional, TI 59, TI 990, and Apple computer family

SOFTWARE

Wylber, Music, CMS, SAS, MS-DOS, CP/M, and various PC-based software systems such as Lotus 1-2-3, DBaseIII+, plus different graphics and data communication utilities; languages used include FORTRAN, BASIC, PL/I, and Pascal

RAYMOND G. CLARK, JR.

EDUCATION

Completed graduate engineering courses, George Washington University, 1957
B.S., Mechanical Engineering, University of Maryland, 1949

SPECIALIZED TRAINING

Grad. European Command Military Assistance School, Stuttgart, 1969
Grad. Army Psychological Warfare School, Fort Bragg, 1963
Grad. Sanz School of Languages, D.C., 1963
Grad. DOD Military Assistance Institute, Arlington, 1963
Grad. Defense Procurement Management Course, Fort Lee, 1960
Grad. Engineer Officer's Advanced Course, Fort Belvoir, 1958

CERTIFICATIONS

Registered Professional Engineer: Kentucky (#4341); Virginia (#8303); Florida (#36228)

EXPERIENCE

Thirty-one years of experience in engineering design, planning and management including construction and construction management, environmental, operations and maintenance, repair and utilities, research and development, electrical, mechanical, master planning and city management. Over six years' logistical experience including planning and programming of military assistance materiel and training for foreign countries, serving as liaison with American private industry, and directing materiel storage activities in an overseas area. Over two years' experience as an engineering instructor. Extensive experience in personnel management, cost reduction programs, and systems improvement.

EMPLOYMENT

Dynamac Corporation (1986-present): Program Manager/Department Manager

Responsible for activities relating to Preliminary Analysis, Site Investigations, Remedial Investigations, Feasibility Studies, and Remedial Action for the Installation Restoration Program for the U.S. Air Force, Air National Guard, Bureau of Prisons, and the U.S. Coast Guard, including records search, review and evaluation of previous studies; preparation of statements of work, feasibility studies; preparation of remedial action plans, designs and specifications; review of said studies/plans to ensure that they are in conformance with requirements; review of environmental studies and reports; preparation of Air Force Installation Restoration Program Management Guidance; and preparation of Part B permits.

Howard Needles Tammen & Bergendoff (HNTB) (1981-1986): Manager

Responsible, as Project Manager, for: design of a new concourse complex at Miami International Airport to include terminal building, roadway system, aircraft apron, drainage channel relocation, satellite building with underground pedestrian tunnel, and associated underground utility corridors, to include subsurface aircraft fueling systems, with an estimated construction cost of $163 million; a cargo vehicle tunnel under the crosswind runway with an estimated construction cost of $15 million; design and construction of two large corporate jet aircraft hangars; and for the hydrocarbon recovery program to include investigation, analysis, design of recovery systems, monitoring of recovery systems, and planning and design of residual recovery systems utilizing biodegradation. Participated, as sub-consultant, in Air Force IRP seminar.

HNTB (1979-1981): Airport Engineer

Responsibilities included development of master plan for Iowa Air National Guard base; project initiation assistance for a new regional airport in Florida; engineering assistance for new facilities design and construction for Maryland Air National Guard; master plan for city maintenance facilities, Orlando, Florida; in-country master plan and preliminary engineering project management for Madrid, Spain, International Airport; and project management of master plan for Whiting Naval Air Station and outlying fields in Florida.

HNTB (1974-1979): Design Engineer

Responsibilities included development of feasibility and site selection studies for reliever airports in Cleveland and Atlanta; site selection and facilities requirements for the Office of Aeronautical Charting and Cartography, NOAA; and onsite mechanical and electrical engineering design for terminal improvements at Baltimore-Washington International Airport, Maryland.

HNTB (1972-1974): Airport Engineer

Responsible for development of portions of the master plan and preliminary engineering for a new international airport for Lisbon, Portugal, estimated to cost $250 million.

Self-employed (1971-1972): Private Consultant

Responsible for engineering planning and installation of a production line for multimillion-dollar contract in Madrid, Spain, to fabricate transmissions and differentials for U.S. Army vehicles.

U.S. Army, Corps of Engineers (1969-1971): Chief, Materiel & Programs

Directed materiel planning and military training programs of military assistance to the Spanish Army. Controlled arrival and acceptance of materiel by host government. Served as liaison/advisor to American industry interested in conducting business with Spanish government. Was Engineer Advisor to Spanish Army Construction, Armament and Combat Engineers, also the Engineer Academy and Engineer School of Application.

Corps of Engineers (1968-1969): Chief, R&D Branch, OCE

Directed office responsible to Chief of Engineers for research and development. Developed research studies in new concepts of bridging, new explosives, family of construction equipment, night vision equipment, expedient airfield surfacing, expedient aircraft fueling systems, water purification equipment and policies, prefabricated buildings, etc. Achieved Department of Army acceptance for development and testing of new floating bridge. Participated in high-level Department Committee charged with development of a Tactical Gap Crossing Capability Model.

Corps of Engineers (1967-1968): Division Engineer

Facilities engineer in Korea. Was fully responsible for management and maintenance of 96 compounds within 245 square miles including 6,000+ buildings, 1 million linear feet of electrical distribution lines, 18 water purification and distribution systems, sanitary sewage disposal systems, roads, bridges, and fire protection facilities with real property value of more than $256 million. Planned and developed the first five-year master plan for this area. Administered $12 million budget and $2 million engineer supply operation. Was in responsible charge of over 500 persons. Developed and obtained approval for additional projects worth $9 million for essential maintenance and repair. Directed cost reduction programs that produced more than $500,000 savings to the United States in the first year.

Corps of Engineers (1963-1967): Engineer Advisor

Engineer and aviation advisor to the Spanish Army. Developed major modernization program for Spanish Army Engineers, including programming of modern engineer and mobile maintenance equipment. Directed U.S. portion of construction, testing and acceptance of six powder plants, one shell loading facility, an Engineer School of Application, and depot rebuild facilities for engineer, artillery, and armor equipment. Planned and developed organization of a helicopter battalion for the Spanish Army. Responsible for sales, delivery, assembly and testing of 12 new helicopters in country. Provided U.S. assistance to unit until self-sufficiency was achieved. Was U.S. advisor to Engineer Academy, School of Application and Polytechnic Institute.

Corps of Engineers (1960-1963): Deputy District Engineer

Responsible for planning and development of extensive construction projects in the Ohio River Basin for flood control and canalization, including dam, lock, bridge, and building construction, highway relocation, watershed studies, real estate acquisitions and dispositions. Was contracting officer for more than $75 million of projects per year. Supervised approximately 1,300 personnel, including 300 engineers. Planned and directed cost reduction programs amounting to more than $200,000 per year. Programmed and controlled development of a modern radio and control net in a four-state area.

Corps of Engineers (1959-1960): Area Engineer

Directed construction of a large airfield in Ohio as Contracting Officer's representative. Assured that all construction (runway, steam power plant, fuel transfer and loading facilities, utilities, buildings, etc.) complied with terms of plans and specifications. Was onsite liaison between Air Force and contractors.

Corps of Engineers (1958-1959): Chief, Supply Branch

Managed engineer supply yard containing over $21 million construction supplies and engineer equipment. Directed in-storage maintenance, processing and deprocessing of equipment. Achieved complete survey of items on hand, a new locator system and complete rewarehousing, resulting in approximately $159,000 savings in the first year.

Corps of Engineers (1957-1958): Student

U.S. Army Engineer School, Engineer Officer's Advanced Course.

Corps of Engineers (1954-1957): Engineer Manager

Managed engineer construction projects and was assigned to staff and faculty of the Engineer School. Was in charge of instruction on engineer equipment utilization, management and maintenance. Directed Electronic Section of the school. Coordinated preparation of five-year master plan for the Department of Mechanical and Technical Equipment.

Corps of Engineers (1949-1954): Engineer Commander

Positions of minor but increasing importance and responsibility in engineering management, communications, demolitions, construction administration and logistics.

PROFESSIONAL AFFILIATIONS

Member, National Society of Professional Engineers
Fellow, Society of American Military Engineers
Member, American Society of Civil Engineers
Member, Virginia Engineering Society
Member, Project Management Institute

HARDWARE

IBM PC

SOFTWARE

Lotus 1-2-3, D Base III Plus, Framework, Project Scheduler 5000, Harvard Project Manager, Volkswriter, Microsoft Project

MARK D. JOHNSON

EDUCATION

B.S., Geology, James Madison University, 1980

EXPERIENCE

Eight years' technical and management experience including geologic mapping, subsurface investigations, foundation inspections, groundwater monitoring, pumping and observation well installation, geotechnical instrumentation, groundwater assessment, preparation of Air Force Installation Restoration Program Guidance, preparation of statements of work for environmental field monitoring and feasibility studies for the Air Force and the Air National Guard, development of environmental field monitoring programs, and preparation of Preliminary Assessments for the Air National Guard.

EMPLOYMENT

Dynamac Corporation (1984-present): Senior Staff Scientist/Geologist

Primarily responsible for developing and managing technical support programs relevant to CERCLA related activities for the Air Force, Air National Guard, Department of Justice and Coast Guard. These activities include Statements of Work for Site Investigations (SI), Remedial Investigations (RI), and Feasibility Studies (FS); assessing groundwater at hazardous waste disposal/spill sites for the purpose of determining rates and extents of contaminant migration and for developing SI and RI programs and identifying remedial actions; reviewing SI, RI and FS contractor work plans for various government clients, developing technical and contractual requirements for SI, RI and FS projects, managing the development and preparation of Preliminary Assessments, and assisting clients in the development of their environmental management programs, which included preparation of the Air Force's Installation Restoration Program Management Guidance document.

Bechtel Associates Professional Corporation (1981-1984): Geologist

Performed the following duties in conjunction with major civil engineering projects including subways, nuclear power plants and buildings: prepared geologic maps of surface and subsurface facilities in rock and soil including tunnels, foundations and vaults; assessed groundwater conditions in connection with construction activities and groundwater control systems; monitored the installation of permanent and temporary dewatering systems and observation wells; monitored surface and subsurface settlement of tunnels; and participated in subsurface investigations.

Schnabel Engineering Associates (1981): Geologist

Inspected foundations and backfill placement.

PROFESSIONAL CREDENTIALS

Registered Professional Geologist, South Carolina, #116, 1987

PROFESSIONAL AFFILIATIONS

Association of Engineering Geologists
National Water Well Association/Association of Ground Water Scientists and Engineers

JANET SALYER EMRY

EDUCATION

M.S., geology, Old Dominion University, 1987
B.S. (cum laude), geology, James Madison University, 1983

EXPERIENCE

Three years' technical experience in the fields of hydrogeology and environmental science, including drilling and placement of wells, well monitoring, aquifer testing, determination of hydraulic properties, computer modeling of aquifer systems, and field and laboratory soils analysis.

EMPLOYMENT

Dynamac Corporation (1987-present): Staff Scientist/Hydrogeologist

Responsibilities include Preliminary Assessments, Site Investigations, Remedial Investigations, Feasibility Studies, and Emergency Responses to include providing geological and hydrological assessments of hazardous waste disposal/spill sites, determination of rates and extents of contaminant migration, and computer modeling of groundwater flow and contaminant transport. Projects are for the U.S. Air Force and Air National Guard Installation Restoration Program.

Froehling and Robertson, Inc. (1986-1987): Geologist/Engineering Technician

Performed both field and laboratory engineering soils tests.

The Nature Conservancy (1985-1986): Hydrogeologist

Investigated groundwater geology of the Nature Conservancy's Nags Head Woods Ecological Preserve in Dare County, North Carolina. Study included installing wells, monitoring water table levels, determination of hydraulic parameters through a pumping test, stratigraphic test borings, and computer modeling.

Old Dominion University (1983-1985): Teaching Assistant, Department of Geological Sciences

Taught laboratory classes in Earth Science and Historical Geology.

PROFESSIONAL AFFILIATIONS

Geological Society of America
National Water Well Association/Association of Ground Water Scientists and Engineers

PUBLICATION

Impact of Municipal Pumpage Upon a Barrier Island Water Table, Nags Head and Kill Devil Hills, North Carolina. In: Abstracts with Programs, Geological Society of America, Vol. 19, No. 2, February 1987.

APPENDIX B

Outside Agency Contact List

OUTSIDE AGENCY CONTACT LIST

1. Department of Geology
   Tennessee Department of Conservation
   701 Broadway
   Nashville, TN 37219

2. Department of Health & Environment
   Tennessee Dept. of Conservation
   Terra Bldg. 5th Fl., 150 9th Ave. N.
   Nashville, TN 37219

3. Division of Water Supply
   Tennessee Department of Health and Environment
   110 Capital Tower
   510 Gay Street
   Nashville, TN 37219

4. Tennessee Wildlife Resource Agency
   Ellington Agriculture Center
   P.O. Box 40747
   Nashville, TN 37204

5. National Oceanic and Atmospheric Administration
   6001 Executive Boulevard
   Rockville, MD 20853

6. U.S. Geological Survey
   12201 Sunrise Valley Drive
   Reston, VA 22092

7. U.S. Soil Conservation Service
   U.S. Department of Agriculture
   Washington, DC 20250

APPENDIX C

Underground Storage Tank Inventory

Underground Storage Tank Inventory

TANK IDENTIFICATION NUMBER

	1	2	3	4	5	6	7	8	9	10
Location (Building No.)	715	715	716	720	721	726	726	726	726	726
Capacity (gallons)	10,000	10,000	500	1,000	10,000	25,000	25,000	25,000	25,000	10,000
Contents	Diesel	MOGAS	Waste Oil	Heating Oil	Heating Oil	JP-4	JP-4	JP-4	JP-4	Diesel
Year Installed	1958	1984	1976	1977	1957	1957	1957	1957	1957	1957
Material of Construction	Steel (riveted)	Steel (riveted)	Concrete (organic)	Fiberglass	Fiberglass	Steel (welded)	Steel (welded)	Steel (welded)	Steel (welded)	Steel (welded)
Coatings A. Interior B. Exterior	A. uncoated B. bitumen	A. uncoated B. bitumen	A. uncoated B. uncoated	A. uncoated B. uncoated	A. uncoated B. uncoated	A. uncoated B. uncoated	A. uncoated B. uncoated	A. uncoated B. uncoated	A. uncoated B. uncoated	A. uncoated B. uncoated
Cathodic Protection	None	None	None	None	None	None	None	None	None	None
Status of Tank (Year abandoned)	In use	In use	In use	In use	In use	In use	In use	In use	In use	In use
Remarks	None	None	Oil/Water Separator Holding Tank	None	None	None	None	None	None	None

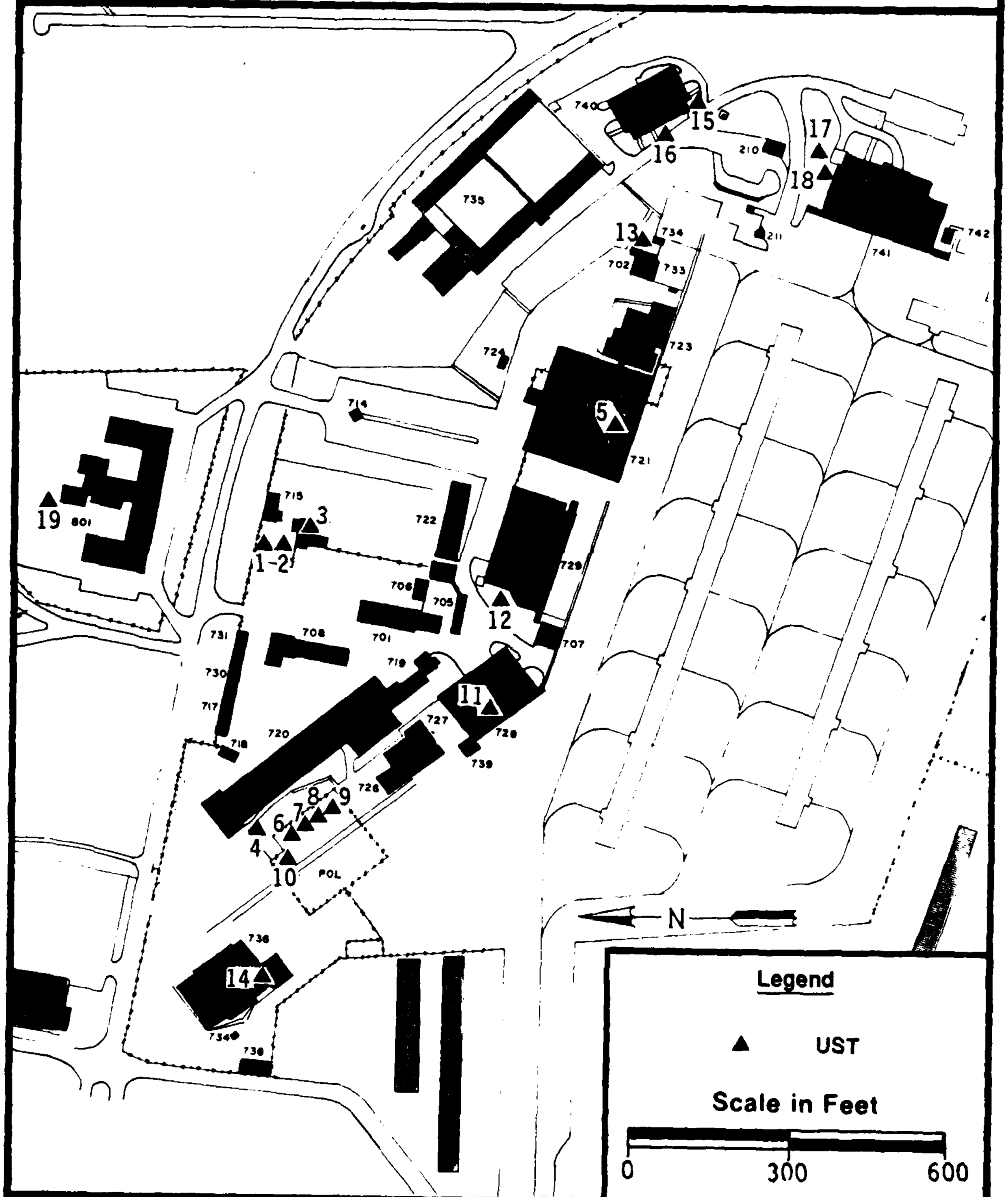
Underground Storage Tank Inventory

TANK IDENTIFICATION NUMBER

	11	12	13	14	15	16	17	18	19
Location (Building No.)	728	729	734	736	740	740	741	741	801
Capacity (gallons)	500	500	1,000	500	280	35	5,000	10,000	10,000
Contents	Waste Oil	Waste Oil	Waste Oil	Waste Oil	Waste Oil	Mixed Waste	Waste Oil	Heating Oil	Heating Oil
Year Installed	1962	1965	1971	1975	1983	1983	1985	1985	1977
Material of Construction	Concrete (organic)	Concrete (organic)	Concrete (organic)	Concrete (organic)	Steel (welded)	Steel (welded)	Steel (welded)	Steel (welded)	Fiberglass
Coatings A. Interior B. Exterior	A. uncoated B. uncoated	A. uncoated B. uncoated	A. uncoated B. uncoated	A. uncoated B. uncoated	A. uncoated B. uncoated	A. uncoated B. uncoated	A. uncoated B. uncoated	A. uncoated B. uncoated	A. uncoated B. uncoated
Cathodic Protection	None	None	None	None	None	None	Sacrificial Anode	Sacrificial Anode	None
Status of Tank (Year abandoned)	In use	In use	In use	In use	In use	In use	In use	In use	In use
Remarks	Oil/Water Separator Holding Tank	Oil/Water Separator Holding Tank	Oil/Water Separator Holding Tank	Oil/Water Separator Holding Tank	Oil/Water Separator Holding Tank	None	Oil/Water Separator Holding Tank	None	None

HMTC Source: BCE 118 TAW, Tennessee Air National Guard.

Location Map of Underground Storage Tanks at the 118 TAW, Tennessee Air National Guard, Nashville, Tennessee.



APPENDIX D

USAF Hazard Assessment Rating Methodology

USAF HAZARD ASSESSMENT RATING METHODOLOGY

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

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

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

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air National Guard in setting priorities for follow-on site investigations.

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

DESCRIPTION OF MODEL

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

The model uses data readily obtained during the 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 the 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 according to the method presented in the flow chart (Figure 1 of this report). The site rating form and the rating factor guideline 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: possible receptors of the contamination, the waste and its characteristics, the potential pathways for contaminant migration, and any efforts that were made to contain the wastes resulting from a spill.

The receptors category rating is based on four rating factors: the potential for human exposure to the site, the potential for human ingestion of contaminants should underlying aquifers be polluted, the current and anticipated uses of the surrounding area, and 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 1,000 feet of the site, and the distance between the site the 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 score subtotal/maximum score subtotal).

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

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways: 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 can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE
LOCATION
DATE OF OPERATION/OCCURRENCE
OWNER/OPERATOR
COMMENTS/DESCRIPTION
RATED BY

I. RECEPTORS

RATING FACTOR	FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET 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 :		6		18
G. GROUND WATER USE OF UPPERMOST AQUIFER :		9		27
H. POPULATION (WITHIN 3 MILES) SERVED BY				
DOWN STREAM SURFACE WATER :		6		18
GROUND WATER :		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 (S=SUSPECT, C=CONFIRM) ( )
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) ( )

FACTOR SUBSCORE A ( )
<FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX>

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
( )( ) = ( )

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
( )( ) = ( )

III. PATHWAY

RATING FACTOR		FACTOR RATING	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 <100> EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE <LESS THEN 80> EXISTS, PROCEED TO B.

( )

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING. AND PROCEED TO C.

1. SURFACE WATER MIGRATION

RATING FACTOR		FACTOR RATING	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	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
2. FLOODING			1		3

SUBSCORE (100 x FACTOR SCORE /3) :

3. GROUND WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DEPTH TO GROUND WATER	:		8		24
NET PRECIPITATION	:		6		18
SOIL PERMEABILITY	:		8		24
SUBSURFACE FLOWS	:		8		24
DIRECT ACCESS TO GROUND WATER	:		8		24
SUBTOTALS					114

SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.

( )

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 x	FINAL SCORE
( )	( )	=
		=========

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels				Multipl
	0	1	2	3	
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 or economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Ground-water use of uppermost aquifer	Not used, other sources readily available	Commercial, industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-50	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

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

Logic based on the 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	M
80	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
	L	S	M
50	L	C	L
	M	S	H
	S	C	M
	S	S	H
40	M	S	M
	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

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

C. Physical State Multiplier

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

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (including drainage ditches and storm sewer.)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay (>10^{-2} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay (<10^{-6} cm/sec)	6
Rainfall intensity based on 1-year 24-hour rainfall (Number of thunderstorms)	<1.0 inch (0-5)	1.0 to 2.0 inches (6-35)	2.1 to 3.0 inches (36-49)	>3.0 inches (>50)	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 Ground Water 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	8
Soil permeability	Greater than 50% clay (<10^{-6} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay (>10^{-2} cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8

B.3 Potential for Ground Water Contamination -Continued

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
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

Spills:

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

Surface Impoundments:

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

Fire Protection Training Areas:

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

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

APPENDIX E

Site Factor Rating Criteria and Hazardous Assessment Rating Forms

118th Tactical Airlift Wing
Tennessee Air National Guard
Tennessee International Airport
Nashville, Tennessee

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

1. RECEPTORS CATEGORY	RATING SCALE LEVELS	NUMERICAL VALUE
Population within 1,000 feet of site:		
Site No. 1	Over 100	3
Distance to nearest well:		
Site No. 1	Over 3 miles	0
Land use/zoning within 1 mile radius:	Residential	3
Distance to Base boundary:		
Site No. 1	Within 1,000 feet	3
Critical environments within 1 mile:	Natural Area	1
Water quality use of nearest surface water body:	Agricultural or Industrial use	0
Groundwater use of uppermost aquifer:	Commercial, Industrial or Irrigation	1
Population served by surface water supply within 3 miles downstream of site:	Over 1,000	3
Population served by groundwater supply within 3 miles of site:	None	0

118th Tactical Airlift Wing
Tennessee Air National Guard
Tennessee International Airport
Nashville, Tennessee

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

2. WASTE CHARACTERISTICS	RATING SCALE LEVELS	NUMERICAL VALUE
Quantity:		
Site No. 1	Small	S
Confidence Level:		
Site No. 1	Suspected	S
Hazard Rating:		
<u>Toxicity</u>		
Site No. 1	Sax level 3	3
<u>Ignitability</u>		
Site No. 1	Flash point between 80°F and 140°F	2
<u>Radioactivity</u>		
Site No. 1	At or below background level	0
Persistance Multiplier:		
Site No. 1	Substitute & other ring compound	0.9
Physical State Multiplier:		
Site No. 1	Liquid	1.0

118th Tactical Airlift Wing
Tennessee Air National Guard
Tennessee International Airport
Nashville, Tennessee

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

3. PATHWAYS CATEGORY	RATING SCALE LEVELS	NUMERICAL VALUE
Surface Water Migration:		
Distance to nearest surface water		
Site No. 1	501 ft to 2,000 ft	2
Net precipitation	11 inches	2
Surface erosion	Slight	1
Surface permeability	$<10^{-6}$ cm/sec	3
Rainfall intensity	2.1" to 3.0"	2
Flooding:	Beyond 100 year flood plain	0
Groundwater Migration:		
Depth to groundwater	50′ to 500′	1
Net precipitation	11 inches	2
Soil permeability	1.41×10^{-3} to 4.23×10^{-3} cm/sec	2
Subsurface flow	Bottom of site > 5′ above high ground water level	0
Direct access to groundwater	Moderate risk	2

4. WASTE MANAGEMENT PRACTICES CATEGORY

Practice:		
Site No. 1	Limited containment	0.95

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE HAZARDOUS WASTE ACCUMULATION AREA (SITE 1)
LOCATION TENNESSEE AIR NATIONAL GUARD, NASHVILLE
DATE OF OPERATION/OCCURRENCE 1971 TO PRESENT
OWNER/OPERATOR 118TH TAW
COMMENTS/DESCRIPTION
RATED BY HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	3	4	12	12
B. DISTANCE TO NEAREST WELL	:	0	10	0	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	3	3	9	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	1	10	10	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	0	6	0	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	1	9	9	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	3	6	18	18
GROUND WATER	:	0	6	0	18
	SUBTOTALS			76	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 42

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (S)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (S)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (40)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(40)(0.9) = (36)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(36)(1) = (36)

III. PATHWAY

RATING FACTOR		FACTOR RATING	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 <100> EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE <80 OR LESS> EXISTS, PROCEED TO B.
(80)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	2	6	12	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	3	6	18	18
RAINFALL INTENSITY	:	2	8	16	24
SUBTOTALS				70	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					65

2. FLOODING

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
FLOODING		0	1	0	3
SUBSCORE (100 x FACTOR SCORE /3)	:				0

3. GROUND WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DEPTH TO GROUND WATER	:	1	8	8	24
NET PRECIPITATION	:	2	6	12	18
SOIL PERMEABILITY	:	0	8	0	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	2	8	16	24
SUBTOTALS				36	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					32

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.
(80)

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(42)
WASTE CHARACTERISTICS	(36)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(53)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x	WASTE MANAGEMENT PRACTICES FACTOR x		FINAL SCORE
(53)	(0.95)	=	50

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