INSTALLATION RESTORATION PROGRAM

PRELIMINARY ASSESSMENT

HEADQUARTERS, 101ST AIR REFUELING WING MAINE AIR NATIONAL GUARD BANGOR INTERNATIONAL AIRPORT BANGOR, MAINE

DECEMBER 1988

AIR NATIONAL GUARD

HAZWRAP SUPPORT CONTRACTOR OFFICE
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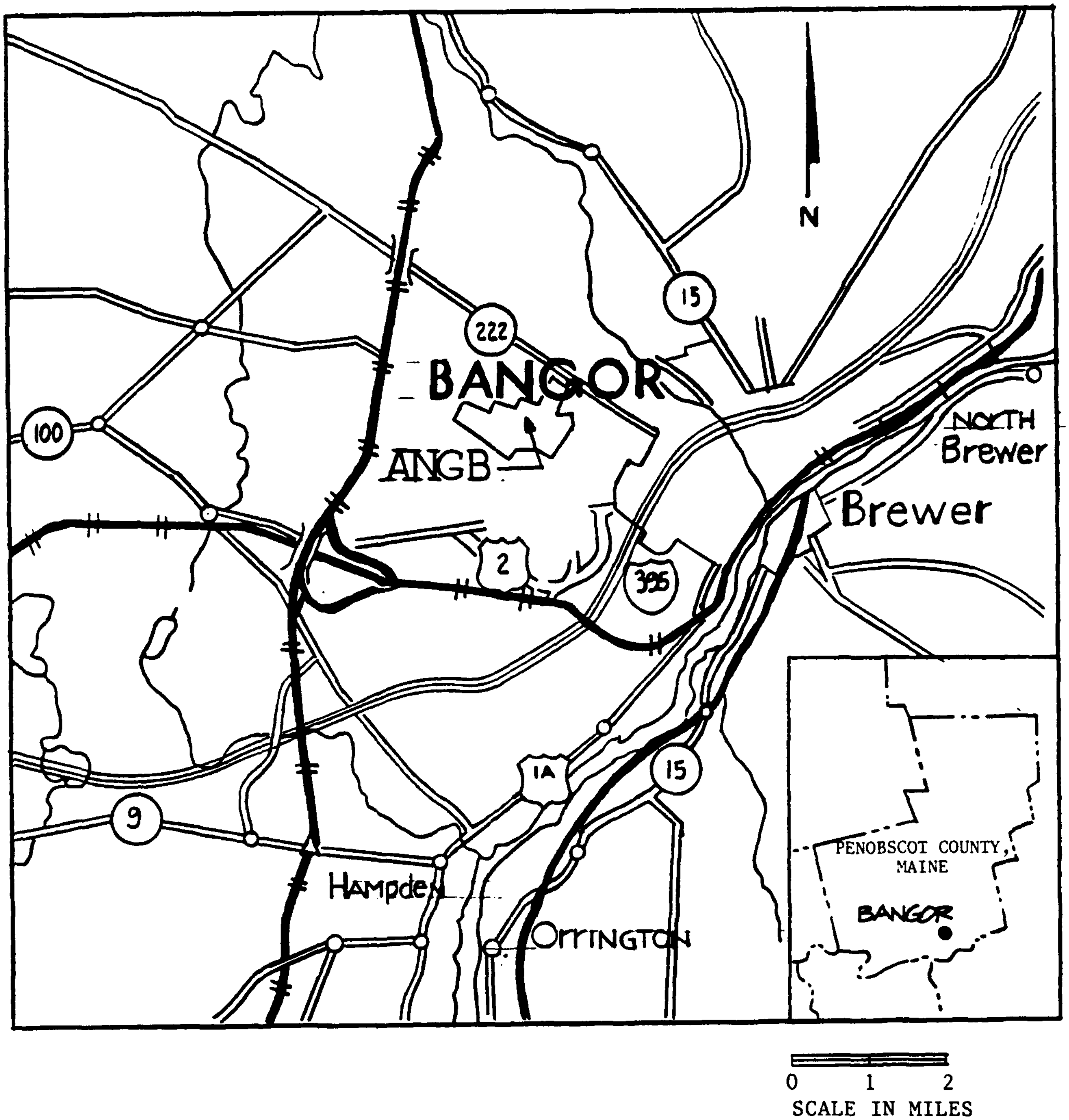

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575 Oak Ridge Turnpike
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EXECUTIVE SUMMARY

A. INTRODUCTION

PEER Consultants, P.C., was retained by the Hazardous Waste Remedial Action Program (HAZWRAP) Support Contractor Office in March 1988 to conduct an Installation Restoration Program (IRP) Preliminary Assessment (PA) of the 101st Air Refueling Wing, Air National Guard Base (ANGB), Bangor International Airport, Bangor, Maine, under Contract No. DE-AC05-870R21705. The Preliminary Assessment included:

- an on-site visit, including interviews with 14 Maine ANGB employees conducted by PEER personnel on May 9 through May 11, 1988;

- the acquisition and analysis of pertinent information and records on past hazardous materials use and past hazardous waste generation and disposal at the Maine Air National Guard Base (ANGB);

- the acquisition and analysis of available geologic, hydrologic, meteorologic, and environmental data from pertinent federal, state, and local agencies; and

- the identification of sites on the Maine ANGB that may be potentially contaminated.

B. MAJOR FINDINGS

The major operations of the 101st Air Refueling Wing that have used and disposed of hazardous materials/hazardous waste include aircraft maintenance, ground vehicle maintenance, fire department training, and petroleum, oil, and lubricant (POL) management and distribution. The operations involve such activities as corrosion control, nondestructive inspection (NDI), fuel cell maintenance, and engine maintenance. Varying quantities of waste oils, recovered fuels, spent cleaners, strippers, and solvents were generated and disposed of by these activities.

Interviews with 14 Bangor ANGB personnel, analysis of pertinent information and records, and a field survey resulted in the identification of two disposal/spill sites on or near the ANGB. The two sites are potentially contaminated with hazardous materials and/or hazardous waste and were assigned a score according to the U.S. Air Force Hazard Assessment Rating Methodology (HARM). The two potentially contaminated sites are as follows:

Site No. 1 - Drainage Ditch

Site No. 2 - Light Duty Ramp and Perimeter

C. CONCLUSIONS

The two potentially contaminated sites identified are referenced as Sites 1 and 2. These sites have been further evaluated and given a HARM score.

Site No. 1 - Drainage Ditch (HARM Score - 68)
The main drainage ditch runs through the north central area of the Base and exits the ANGB between Building 420 and the main gate. The ditch collects effluent from an oil/water separator, runoff from the light duty ramp as well as general drainage from the Base. In the past, it was the practice to allow fuels, oils, solvents, and other contaminants to drain into the ditch. It was noted that some environmental stress has occurred in the ditch.

Site No. 2 - Light Duty Ramp (HARM Score - 55)
The light duty ramp is located next to the main hangar. Aircraft washing was conducted on the ramp, which was served by a storm drain directed toward the main ditch (Site No. 1). Fuels, oils, and other potential contaminants may have been spilled and/or dumped on and along the perimeter of the ramp. The entire perimeter of the ramp is included.

D. RECOMMENDATIONS

Because of the potential for contaminant migration, it is recommended that the next phase in the IRP process, the Site Investigation (SI), be implemented. This phase is recommended for all of the identified sites as described in the PA.

I. INTRODUCTION

A. BACKGROUND

The Maine Air National Guard (ANG) is located at the Bangor International Airport, in Penobscot County, Bangor, Maine (hereinafter referred to as the Base or the ANGB). The ANGB is a part of what was formerly known as Dow Air Force Base. The ANGB has continued to be in service, and over the years the types of military aircraft based and serviced there have varied. Both past and present operations have involved use of hazardous materials and disposal of hazardous waste. Because of the use of hazardous materials and disposal of hazardous waste, the Department of Defense (DoD) has implemented its Installation Restoration Program (IRP).

THE INSTALLATION RESTORATION PROGRAM

The DoD is a comprehensive program designed to:

- o Identify and fully evaluate suspected problems associated with past hazardous waste disposal and/or spill sites on DoD installations, and

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

During June 1980, DoD issued a Defense Environmental Quality Program Policy Memorandum (DEQPPM 80-6) requiring identification of past hazardous waste disposal sites on DoD installations. The policy was issued in response to the Resource Conservation and Recovery Act of 1976 (RCRA) and in anticipation of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA, Public Law 96-510) commonly known as "Superfund." In August 1981, the President delegated certain authority specified under CERCLA to the Secretary of Defense via Executive Order (EO 12316). As a result of EO 12316, DoD revised the IRP by issuing DEQPPM 81-5 on December 11, 1981, which reissued and amplified all previous directives and memoranda.

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

The most important changes effected by SARA include the following:

- Section 120 of SARA provides that federal facilities, including those in DoD, are subject to all the provisions of CERCLA/SARA concerning site assessment, evaluation under the National Contingency Plan (NCP) [40 CFR 300], listing on the National Priorities List (NPL), and removal/remedial actions. DoD must therefore comply with all the procedural and substantive requirements (guidelines, rules, regulations, and criteria) promulgated by the USEPA under Superfund authority.

- Section 211 of SARA also provides continuing statutory authority for DoD to conduct its IRP as part of the Defense Environmental Restoration Program (DERP). This was accomplished by adding Chapter 160, Sections 2710-2707 to Title 10 United States Code (10 USC 160).

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

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

Preliminary Assessment (PA)

The PA consists of a records search and interview sessions conducted with present and past employees to identify and evaluate past disposal and/or spill sites that might pose a potential and/or actual hazard to public health, welfare, or the environment.

Site Inspection/Remedial Investigation/Feasibility Study (SI/RI/FS)

The SI consists of field activities designed to confirm the presence or absence of contamination at the sites identified as a result of the PA. The RI consists of field activities designed to quantify the types and extent of contamination present in support of the Feasibility Study (FS), including migration pathways.

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

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

- o Long-term monitoring - Evaluations do not detect sufficient contamination to justify costly remedial actions. Long-term monitoring may be recommended to detect or monitor future contamination.

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

Remedial Design/Remedial Action (RD/RA)

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

Research and Development (R&D)

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

Immediate Action Alternatives

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

B. PURPOSE

The purpose of the PA is to identify and evaluate suspected problems associated with past hazardous waste handling procedures, disposal sites, and spill sites on the Base and to assess the potential for the migration of hazardous contaminants. PEER Consultants, P.C., visited the Base, reviewed existing environmental information, analyzed the Base records to determine past waste handling and disposal practices, and conducted interviews with Base personnel who were familiar with these activities. Relevant information collected and analyzed as a part of the PA included the history of the Base, with special emphasis on the history of the shop operations and their past hazardous materials/hazardous waste management procedures; the local geologic, hydrologic, and meteorologic conditions that may affect migration of contaminants; local land use, public utilities, and zoning requirements that affect the potentiality for exposure to contaminants, and the ecological settings that indicate environmentally sensitive habitats or evidence of environmental stress.

C. SCOPE

The scope of this PA is limited to the property situated within the boundaries of the Base and property which is, or has been, 100 percent controlled by the Base and included the following:

- an on-site visit;

- the acquisition of pertinent information and records on hazardous materials use and past hazardous waste generation and disposal practices at the Base in order to establish the source and characteristics of hazardous waste or spills;

- the acquisition of available geologic, hydrologic, meteorologic, land use and zoning, critical habitat and utility data from various federal, state, and local agencies in order to establish potential pathways and receptors of hazardous waste or spills;

- a review and analysis of all information obtained; and

- the preparation of a report, to include support recommendations for further actions.

The on-site visit, interviews with Base personnel, and meetings with local agency personnel were conducted from May 9 to May 12, 1988. The PEER PA team consisted of the following individuals (resumes are included as Appendix A):

- Mr. Tom Webb, Senior Project Manager
- Mr. William Osburn, Environmental Engineer
- Mr. Anthony Wagner, Geologist
- Mr. Harlan Faulk, Environmental Engineering Technician

Individuals from the ANGB who assisted in the PA included Captain Scott Young, 101st Civil Engineering Squadron; MSgt Ken Emfinger, 101st Clinic (SGPB); and selected members of the 101st AREFW. Also assisting were Larry Janssen, Martin Marietta Energy Systems, Inc.; and Basit Ghori, the

Headquarters Air National Guard Support Center (ANGSC) Project Officer of the Maine ANGB. Also present at the meeting were Gary Hinkle and Hank Lowman (ANGSC), and Major Everett Foster, National Guard Bureau Public Affairs (NGBPA).

D. METHODOLOGY

A flowchart of the PA methodology is presented in Figure I-A. This methodology ensures, to the greatest extent possible, 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 PA began with a site visit to the Base to identify all shop operations or activities that may have used hazardous materials or generated hazardous waste. Next, an evaluation of past and present hazardous materials/hazardous waste handling procedures at the identified locations was made to determine whether environmental contamination may have occurred. The evaluation of past hazardous material/hazardous waste handling practices was facilitated by extensive interviews with 14 ANGB employees, having an average tenure of 24 years and a familiarity with operating procedures at the Base.

Historical records contained in the Base files were collected and reviewed to supplement the information obtained from interviews. Using the information outlined, a list of waste spill/disposal/storage sites on the Base was identified for further evaluation. A general survey tour of the identified sites, the Base, and the surrounding area was conducted to determine the presence of visible contamination and to help the PEER survey team assess the potential for contaminant migration. Particular attention was given to locating nearby drainage ditches, surface water bodies, residences, and wells in order to establish potential pathways for migration of the hazardous waste or spills.

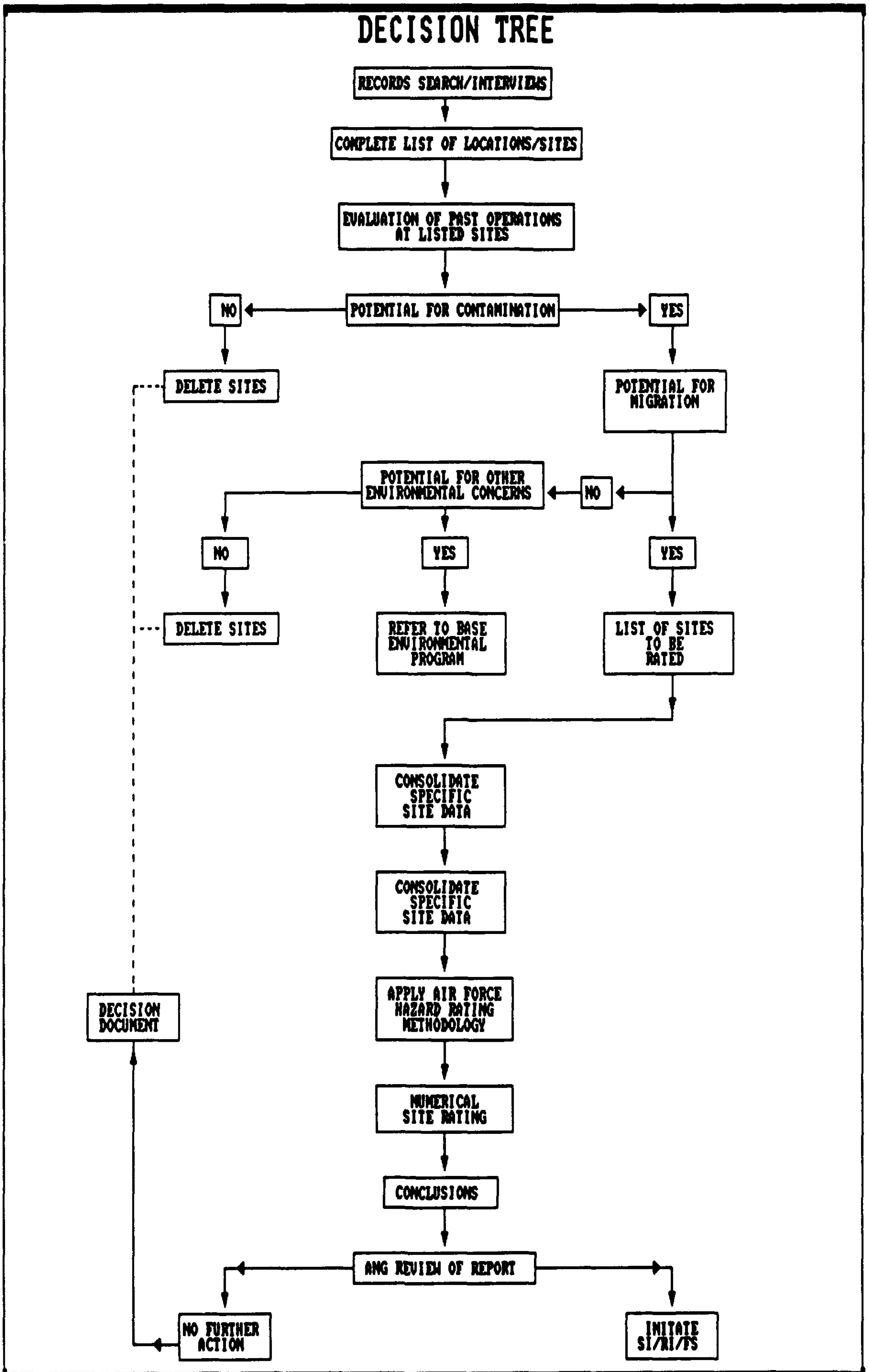

Figure I-A Preliminary Assessment Methodology Flowchart

Detailed geological, hydrological, meteorological, development (land use and zoning), and environmental data for the area of study were also obtained from appropriate federal, state, and local agencies as identified in Appendix B for the purpose of establishing receptors of hazardous waste or spills.

Using the process shown in Figure I-A, a decision was then made, based on all the above information, regarding the potential for hazardous materials contamination and migration to receptors. If potential for contamination was identified, the potential for migration of the contaminant was assessed based on site-specific conditions. If there was potential for contaminant migration, the site was evaluated using the Hazard Assessment Rating Methodology (HARM). A discussion of the HARM system is presented in Appendix C. Appendix D contains the HARM rating forms for the potentially contaminated sites. Appendix E contains the factor rating criteria for the USAF HARM. A list of Underground Storage Tanks (USTs) is presented in Appendix F.

II. INSTALLATION DESCRIPTION

A. LOCATION

Bangor ANGB is located 4 miles northwest of downtown Bangor, Maine, in Penobscot County. The Base occupies 314 acres of land. The Base operation has a population of 980 military personnel and 272 technicians. The 101st Air Refueling Wing is stationed at the Base. Figure II-A shows the location and boundaries of the Base.

The Bangor ANGB is surrounded by residential, agricultural, and wetland areas. Residential areas are found northwest and southeast of the Base. The Airport Mall is located in this residential area north of the Base across Union Street. Agricultural areas are found north of the Base. To the west are found wetlands, namely Hermon Bog.

B. ORGANIZATION AND HISTORY

The Maine ANGB traces its origin back to the World War II era. The primary mission of the ANGB is the same as that of the U.S. Air Force, which is to defend the U.S. against any would-be aggressor. The mission assigned to the ANGB includes air refueling, electronics systems and maintenance, and administrative support.

The 101st Fighter Group was established on January 28, 1942, and was activated on March 2, 1942, as the Headquarters and Headquarters Squadron, 311th Light Bombardment Group. It was activated at Will Rogers Field, Oklahoma City, Oklahoma, with four bomber squadrons: the 382nd, 383rd, 384th, and 385th. The 382nd squadron was to be redesignated the 528th Bomber Squadron and later the 132nd Fighter Squadron.

After the inactivation of the units on January 6, 1946, the 311th Group and the 528th Squadron were allotted to the National Guard Bureau, effective May 24, 1946. Concurrently, the 311th Group was redesignated the 101st Fighter Group.

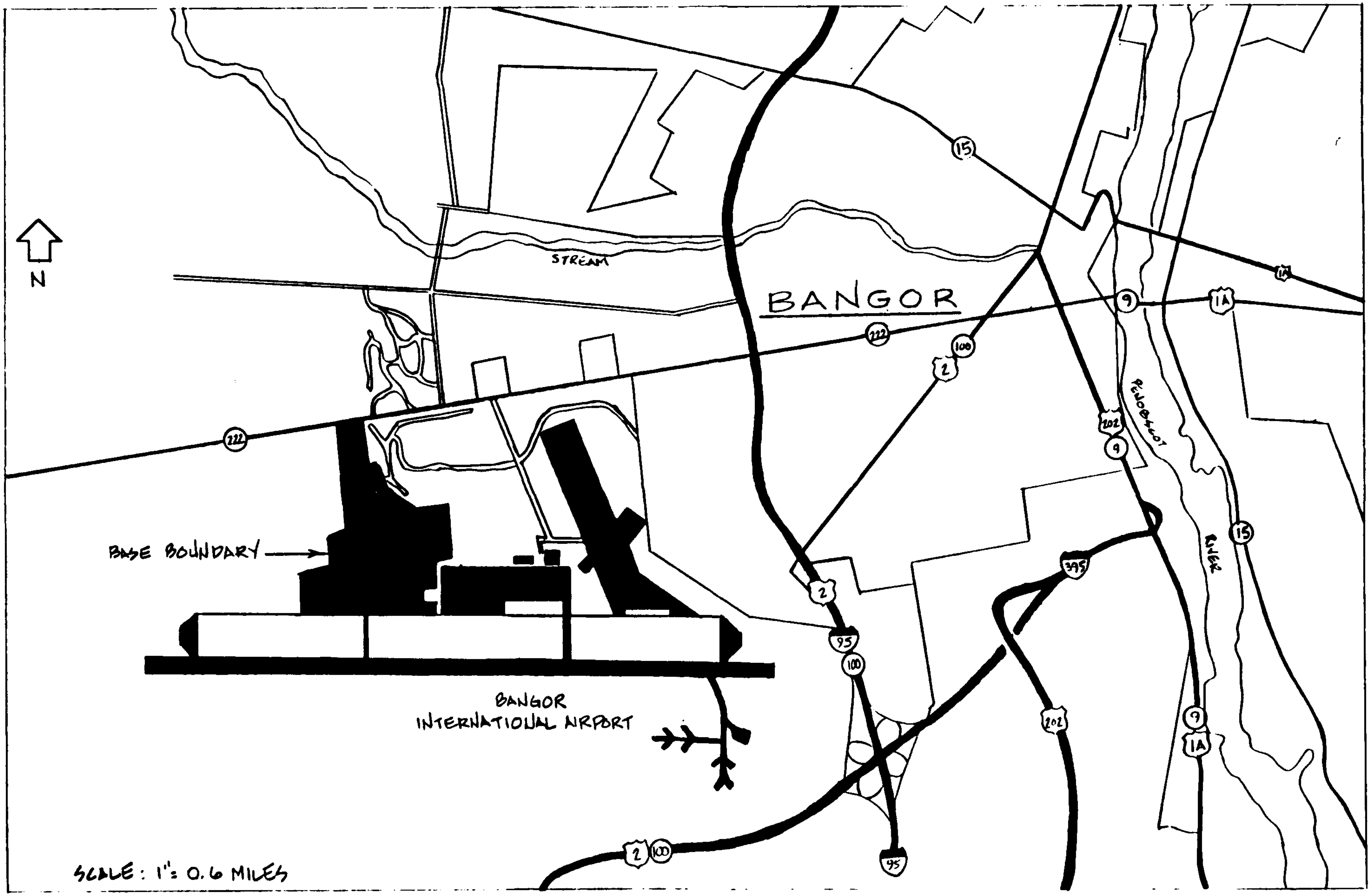

Figure II-A: Base Location and Boundaries (from AAA, 1988)

The Headquarters, 101st Fighter Group, was the first ANGB unit to be organized in Maine. The group was federally recognized on February 4, 1947, and stationed at Camp Keyes, Augusta, Maine.

Additional units of the 101st Fighter Group were organized and federally recognized on February 5, 1947, and stationed at Dow Air Force Base, Bangor, Maine.

The F-47 Thunderbolt, or Jug, was the Maine ANGB's first airplane. They began to arrive early in 1947. A switchover to F-80Cs occurred a year later. The F-80C was the first jet-type aircraft assigned to the ANGB. It went on active duty in 1951. The B-25 and B-26 were both assigned to the ANGB for use as low target aircraft and in general support of the squadron. The B-25 was phased out in 1958 and the B-26 was used only prior to Korea.

In late April 1951, all units of the 101st Fighter Wing located at Dow AFB, with the exception of the 132nd Fighter Squadron (Jet) and the 132nd Weather Station, moved to a new location at Grenier AFB, Manchester, New Hampshire.

Effective August 2, 1951, the Headquarters Squadron 101st Fighter Group, Headquarters 101st Maintenance and Supply Group, 101st Medical Group, and all of the 101st support squadrons moved to Larson AFB, Moses Lake, Washington.

In order to facilitate reorganization of the returning ANGB units, the National Guard Bureau authorized each state to form a State Headquarters. Headquarters Maine Air National Guard was organized and federally recognized on March 19, 1952, and stationed at Camp Keyes, Augusta, Maine.

On September 1, 1960, the 101st Fighter Group, located in New Hampshire, with its 133rd Air Transport Squadron (redesignated from 133rd Fighter Interceptor on April 1, 1960) was renamed and reorganized to Headquarters 157th Air Transport Group.

The Headquarters 101st Fighter Group was released from the state of New Hampshire and reassigned and reactivated in the state of Maine under the 101st Air Defense Wing on December 1, 1960.

On September 30, 1966, units of the 101st Wing of Dow AFB included Headquarters (HQ), 101st Air Defense Wing and HQ, 101st Fighter Group.

Changes continued to occur, and on April 1, 1976, their gaining command changed from the Air Defense Command (ADC) to the Strategic Air Command (SAC), resulting in units receiving federal recognition, one of which included the HQ 101st Air Refueling Wing.

By the first of February 1987, the 101st Air Refueling Wing at Bangor ANGB consisted of nine units. These include:

- HQ 101st Air Refueling Wing
- 132nd Air Refueling Squadron
- 101st Civil Engineering Squadron
- 101st Combat Support Squadron
- 101st Consolidated Aircraft Maintenance Squadron
- 101st Resource Management Squadron
- 101st Information Systems Flight
- 101st Security Police Flight
- 101st USAF Clinic

There have been no significant events or changes of organization between 1987 and the present time (Table II-A).

Table II-A

Summary of Organizational Structure and Historical Events Affecting Maine ANGB

January 1942	101st Fighter Group established.
March 1942	101st Fighter Group was activated at Will Rogers Field, Oklahoma City, Oklahoma.
March 1945	Arrival of B-26--used only prior to Korea.
May 1946	311th Group and the 528th Squadron were allotted to the National Guard Bureau, and the 311th Group was redesignated the 101st Fighter Group.
February 1947	101st Fighter Group was organized and federally recognized with a station at Dow AFB, Bangor, Maine.
1947	Arrival of ANGB's first airplane, the F-47 Thunderbolt or Jug.
August 1948	132nd Fighter Squadron was converted to jet aircraft and was redesignated the 132nd Fighter Squadron, Jet.
December 1948	First Air Defense Command transferred to the Continental Air Command.
October 1950	Major organizational change--the "Wing-Base" organization was standardized throughout the Air Force and would provide for the assignment of a single Tactical Group.
1951	F-80 aircraft went on active duty.
August 1951	101st Fighter Group moved to Larson AFB, Moses Lake, Washington, for a permanent change of station.
February 1952	101st Wing and its units at Larson AFB became inactivated.
March 1952	Maine ANGB was organized and federally recognized, and stationed at Camp Keyes, Augusta, Maine.
1953	Arrival of F-51 Mustang, used as an interim aircraft.
1954	Converted to F-94A and B aircraft. Arrival of T-33 (T-Bird) aircraft.

Table II-A (continued)

Summary of Organizational Structure and Historical Events Affecting Maine ANGB

October 1954	101st Motor Vehicle and 101st Supply Squadron were reorganized to provide for a recent USAF change in petroleum, oil, and lubrication (POL) activities. These functions were transferred from the 101st Motor Vehicle Squadron to the 101st Supply Squadron.
1957	F-94 replaced by F-89D.
1959	F-89D Scorpion aircraft was phased out.
1968	C-54M aircraft replaced C-47 as the primary aerial carrier of personnel and supplies.
July 1969	F-89J aircraft, which carried the MB-1 missile, left Maine ANGB. Arrival of F-102A Delta Dagger aircraft.
October 1969	Arrival of F-101 "Voodoo" aircraft.
November 1969	F-102 aircraft were passed on to the 125th Fighter Interceptor Group, Florida ANGB.
October 1971	C-54M aircraft transferred out.
April 1976	F-101 aircraft transferred out. HQ, 101st Air Refueling Wing was one of the units to receive federal recognition.
June 1976	Transferred last T-33 aircraft to Tyndall AFB--T-33 had been used for 22 years at ANGB.
February 1987	101st Air Refueling Wing at Maine ANGB consisted of nine units.

III. ENVIRONMENTAL SETTING

A. METEOROLOGY

Bangor, Maine, lies within the temperate climatic zone, which accounts for its cool and humid climate. In general, this location produces long winters with much snow and short summers. The average annual precipitation is 40 inches per year, according to the U.S. Soil Conservation Service and the Bangor International Airport Weather Station. Rainfall during the warm months is evenly distributed, except for July and August, which may be dry. By calculating net precipitation according to the method outlined in the Federal Register (47 FR 31224, July 16, 1982), a net precipitation value of 18.0 inches per year is obtained. The maximum rainfall intensity, based on a 1-year frequency, 24-hour duration rainfall, is 2.5 inches (estimated from Figure 8, 47 FR 31235, July 16, 1982).

B. GEOLOGY

1. Geomorphology

The Maine ANGB, in Southern Penobscot County, lies within the New England Upland subdivision of the New England Physiographic Province. This province is a northern extension of Appalachian geology, except that all of New England bears an imprint of glaciation, whereas only the northern end of the Appalachian Highlands was glaciated. Much of New England may be described as a plateau-like upland that gradually rises from the coast to inland areas. New England is surmounted at numerous locations by mountain ranges or individual peaks.

The New England Upland is an area of complex geology and structure that was dissected to a mature stage by fluvial processes and later subjected to severe glaciation. Continual glaciations during the Pleistocene Epoch have modified the previous land surface both erosionally and depositionally. Altitudes of the uplands range from less than 500 feet at its seaward margin to approximately 1200 feet in the inland areas. The ANGB, at 175 feet, is somewhat lower in elevation than the average due to its location in the Penobscot River Basin.

The method of deposition (glaciation) increases the porosity and permeability of the soils. This determines where aquifers are located, which in turn increases the potential of groundwater contamination due to high permeabilities and porosities of the soils. Depositional modifications are where aquifers are normally found.

The most important erosional modification due to glaciation has been the rounding off of the bedrock topography by ice scouring, which results in what is called glacial topography. Another erosional feature observed is the numerous glacial lakes that occur in small basins. These lakes are an important source of water in New England.

Depositional modifications include drumlins, moraines, eskers, till, and outwash plains. Drumlins, which are hills with an elliptical base in which glacial till has accumulated, are important depositional features. The long axis of the drumlins stand parallel to the direction in which the ice sheet moved. Drumlins are visible to the northeast, northwest, and west of the Base. Their form and alignment suggest a south-southeast trend of the long axes, indicating that the glacier moved out of the north-northwest. Eskers are winding, ridged ice-contact features. They range in shape from a single, narrow, sinuous ridge to a complex, intertwined maze of branching and joining ridges. Till consists of fine to very coarse or bouldery deposits that accumulate beneath a glacial ice sheet. Till may be horizontally continuous or patchy. Till thickness tends to be highly variable, depending on the underlying topography. All of the soils in this area developed from till origins, although some have seen further influence in marine or lacustrine environments. Groups A and C soils (Table III-A) are considered to be marine/lacustrine material. They are listed separately because of their differences in permeability and clay contents. Group B soils are considered to be glacial till materials. Outwash is debris deposited by meltwater streams beyond active glacier ice. Some forms of outwash include outwash aprons, marginal plains, and outwash plains. Moraines are depositional features whose

Table III-A

Properties of Soils Series*

Nomenclature	Series	Permeability (In./Hr.)	Clay (%)	Water Capacity (In./In.)
Group A				
BxB	Biddeford	0.2-0.6	20-27/35-55	.24-.34
BoA	Biddeford	0.2-0.6	20-27/35-55	.24-.34
Group B				
HvB	Howland	0.6-2.0	2-10	.18-.28
TkB, TkC	Thorndike	0.6-2.0	5-10	.12-.22
ThB, ThC, ThD, ThE	Thorndike	0.6-2.0	5-10	.12-.24
DxA, DxB, DxC	Dixmont	0.6-2.0	4-10	.16-.24
BnC	Bangor	0.6-2.0	4-10	.15-.25
BmB, BmC, BmD	Winnecook	0.6-2.0	5-10	.15-.25
Group C				
BuA, BuB, BuC	Buxton	0.2-2.0	15-30/35-55	.18-.28
ScB, SuB	Scantic	0.2-2.0	15-40/35-55	.24-.34
BaB, BaC	Burnham	0.2-2.0	10-18	.20-.32
Md	Dumps	No Data	No Data	No Data

*From soil conservation data sheets provided by the Soil Conservation Service, Bangor, Maine.

forms are independent of the underlying topography and which are constructed by the accumulation of glacial drift. There are several types of moraine, such as (1) terminal moraines, constructed at the farthest point of advance of the ice, (2) lateral moraines, formed at the edges of glaciers, and (3) medial moraines, formed when two valley glaciers coalesce.

The glacial drift produced on the New England Upland is relatively thin but can reach depths of up to 200 feet. It tends to be discontinuous, due to the hilly nature of the underlying topography, and stony. This is because the resistant rocks of New England were not readily degraded and were therefore transported within the glacier itself. Upon the retreat of the glaciers, the rocks and boulders were deposited within the till. Depending on the distance transported and the relative resistance of the rock to degradation, particle size of the glacial till can range from clay- and silt-sized particles to large boulders.

2. Stratigraphy and Structure

The structural and stratigraphic history of Maine is one of metamorphosed Paleozoic sedimentary rocks or volcanics that were subjected to folding, faulting, and igneous intrusion followed by denudation by fluvial action and later by continental glaciation. The bedrock geology at the ANGB is composed of Silurian-Ordovician calcareous sandstones with interbedded sandstone and impure limestones of the Vassalboro Formation, beneath which lies an unnamed formation of volcanic rocks, Ordovician in age (Figure III-A).

The ANGB lies within the northeast trending Kearsarge-Central Maine Synclinorium. This broad regional syncline is terminated approximately 4 miles to the southeast of the Base by a reverse fault that puts the Vassalboro Formation in lateral contact with Devonian-Ordovician mafic and felsic volcanics. Rocks southeast of the fault have been carried upward relative to the rocks northwest of the fault. This relationship is depicted in Figure III-B, a northwest-southeast cross-section through the fault. Geologic

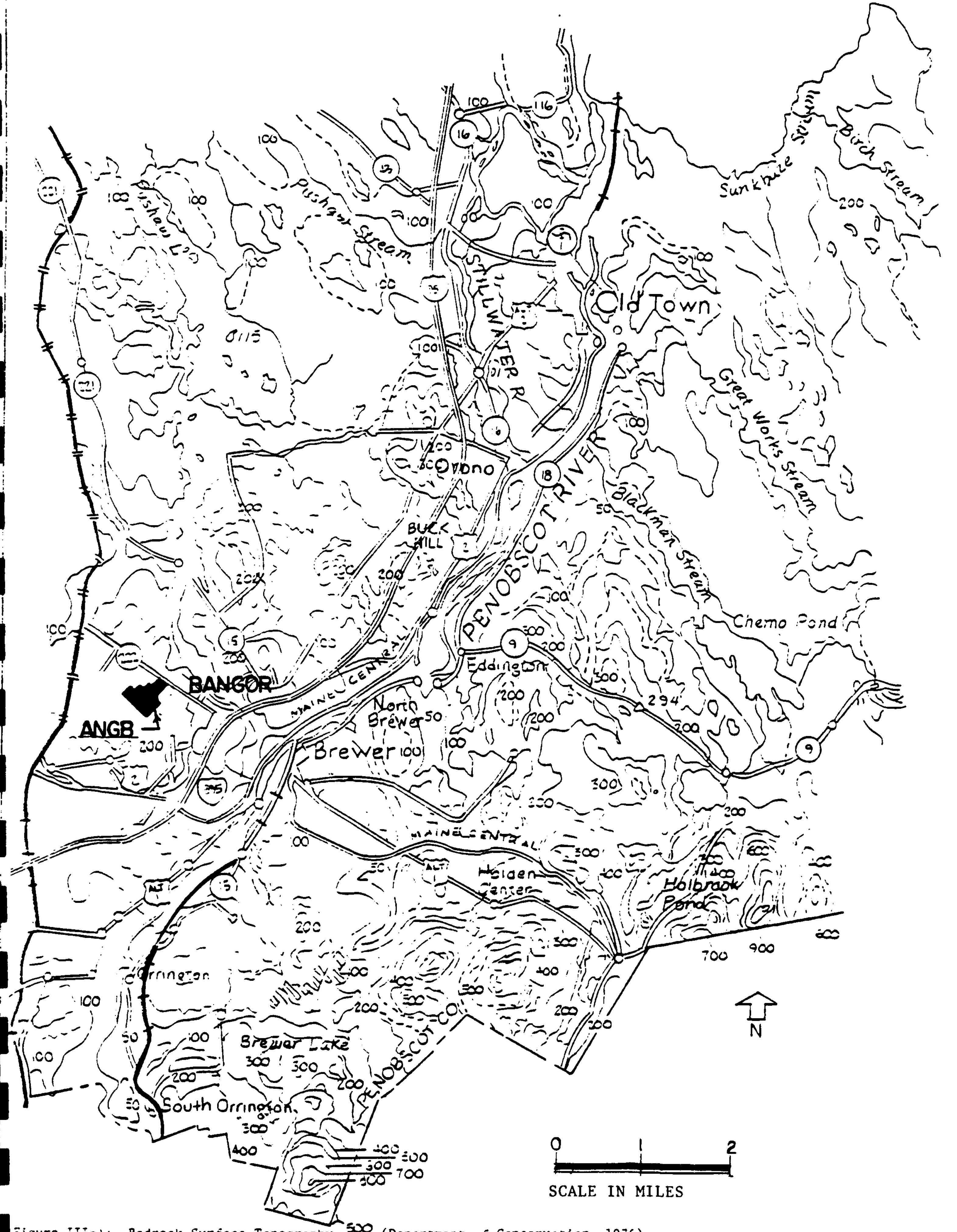

Figure III-A: Bedrock Surface Topography (Department of Conservation, 1976)

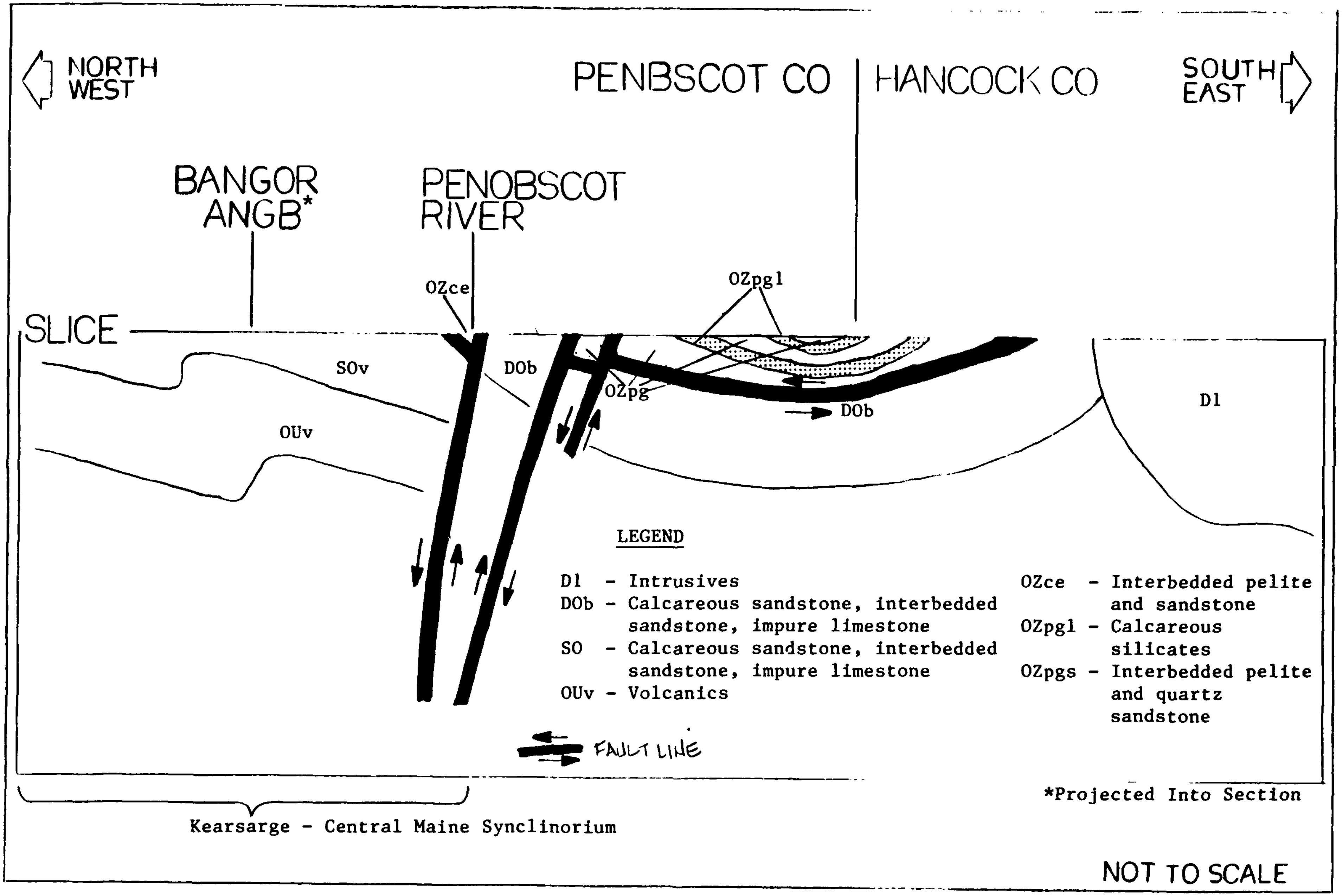

Figure III-B: Geologic cross-section (After Osberg, 1985) materials from the Devonian through Tertiary periods were removed by glaciation in the synclinorium.

Quaternary sands, gravels, silts, clays, and till lie unconformably above the bedrock. The Quaternary glacial deposits left behind as the ice retreated formed a flat-to-gently-sloping surface with occasional moraines, eskers, and drumlins of till.

The surficial geology of the ANGB is comprised of two units: glacial marine deposits and glacial till (Figure III-C). The glacial marine deposits of the Presumpscot Formation occupy the east side of the Base and stretch westward in a broad band. The Presumpscot Formation consists of silt, clay, and sand that form the flat-to-gently-sloping topography common to the Base. These sediments were washed out of the Late Wisconsinan Glacier and accumulated on the ocean floor when the relative sea level was higher than at present.

The glacial till that is developed on the rest of the ANGB is a heterogeneous mixture of sand, silt, clay, and gravel in a poorly stratified sequence. These materials were directly deposited by glacial ice. Permeability is variable, depending on location. Till generally overlies bedrock but sometimes overlying material includes fluvio-glacial sand and gravel outwash.

The Base topography is gently rolling with small hills and descends into the marsh south of the runway. Otherwise, the ANGB is relatively flat due to site excavations during Base construction. The topography of the area is presented in Figure III-D.

C. HYDROGEOLOGY

1. Surface Water

The area occupied by the Air National Guard, the Army National Guard, and the Bangor International Airport (including the runways at the airport) falls within the boundaries of a second-order watershed (Figure III-E). Within

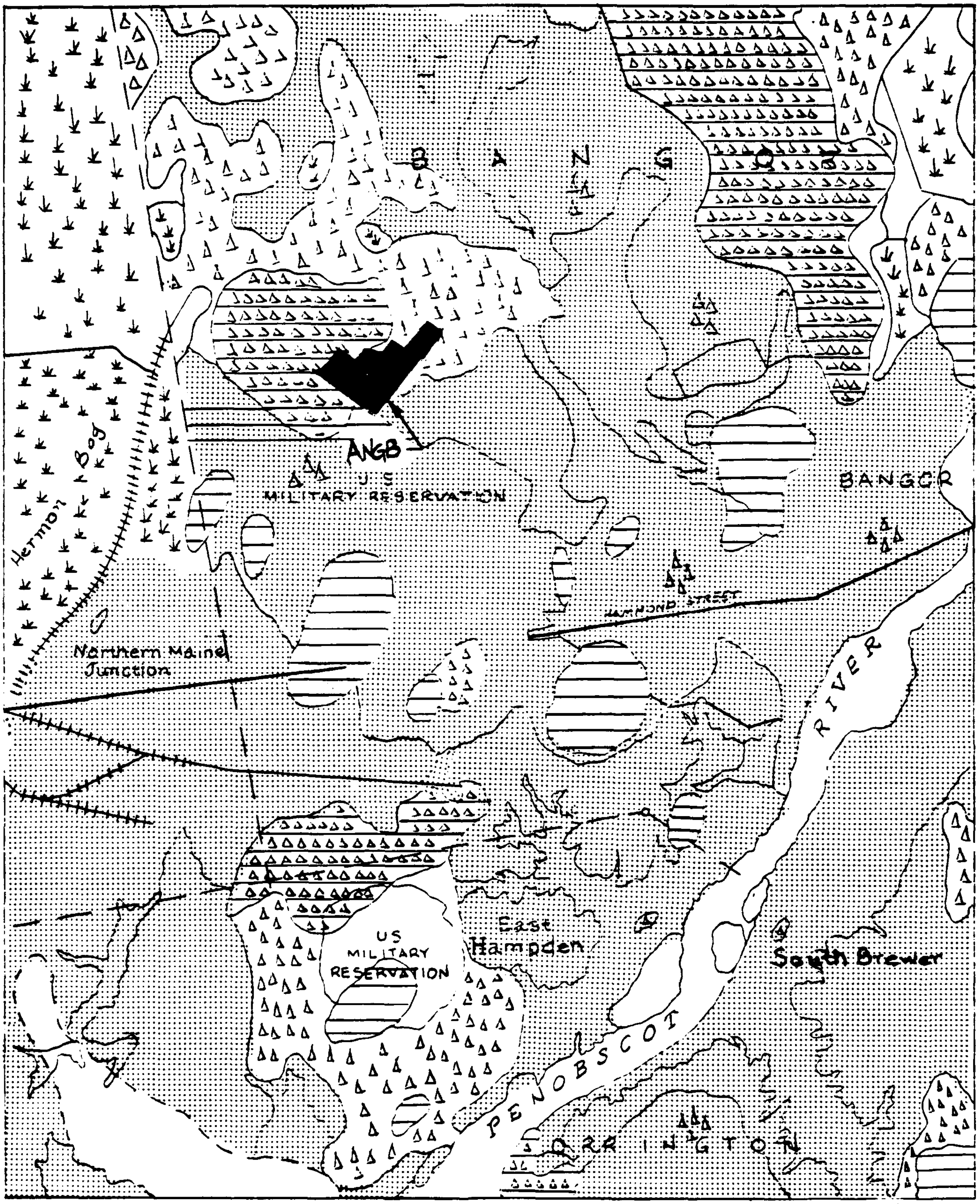

Figure III-C. Surficial Geology of a Portion of the Bangor Quadrangle (Source: Thompson, 1977)

SCALE

1 MILES 0

LEGEND

- Glacial Till
- Glacial Marine Deposits
- Glacial Stream Deposits
- Swamp and Tidal Marsh Deposits
- Areas of Many Outcrops
- Glacial Till with Outcrops

Figure III-D: Surface Topography of the Area (U.S. Geological Survey, 1978)

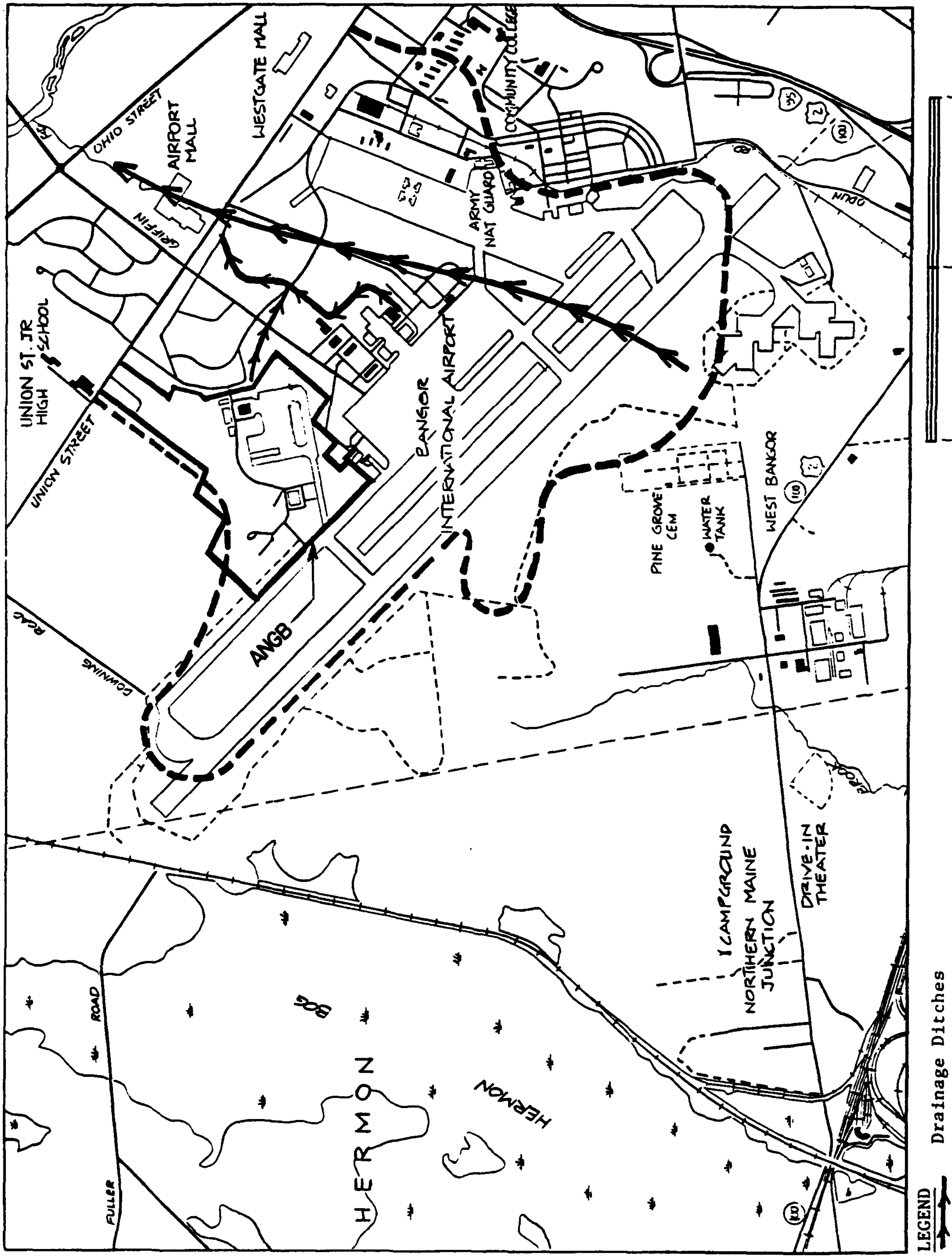

Figure III-E: Location of Watershed and drainage ditches (MEANGB, 1988) this watershed, surface runoff ultimately travels northeasterly through a series of drainage ditches, exiting the vicinity of the airport and the ANGB beneath the Airport Mall. Airport drainage ditches empty into a natural stream northeast of the Airport Mall and finally discharge to the Kenduskeag Stream. This southerly flowing stream flows to the Penobscot River in southeast Bangor, approximately 3.5 miles southeast of the Base.

Within the watershed a series of interconnected ditches, swales, and culverts carry surface runoff and storm sewer discharges from the ANGB to a larger drainage ditch that serves the entire watershed. This main ditch is located southeast of the center of the watershed, drains northeasterly, and is about 4300 feet long aboveground with an additional 3000 feet belowground through a culvert (Figure III-E). Contaminants from facilities of the ANGB [including the fire training area (FTA)], Bangor International Airport, the Army National Guard, and other industrial operations are carried via the ditch to the Kenduskeag Stream. EPA documents are on file as responses to contamination of the ditch.

Approximately 1 1/4 miles north and west of the main runway and the ANGB is an extensive area classified in the National Wetlands Inventory as Palustrine. This area, known as Hermon Bog, is covered throughout by forests, shrubs, reeds, and grasses. Hermon Bog is a discharge area saturated with water throughout the year. Drainage from the north end of the runway is outside the watershed mentioned previously. This area drains to Hermon Bog, then southward to the Souadabscook Stream which, like Kenduskeag Stream, empties into the Penobscot River. Effluent from Hermon Bog reaches the Penobscot River approximately 5 miles south of the ANGB.

2. Groundwater

Groundwater resources in Maine are plentiful and widely used. The two most important groundwater occurrences are (1) water contained in the fracture bedrock and (2) water contained in the tills and stream sediments. The bedrock at the ANGB, as previously discussed, is composed of calcareous sandstones and limestones. The depth to bedrock at the ANGB, based on numerous soil borings and probes representative of the area, averages slightly greater than 4 feet. No significant amount of groundwater has been found occurring in the bedrock at the ANGB. However, there is evidence in two soil borings, performed in June 1983 by Maine Test Borings, of faulting and fracturing. Highly fractured bedrock may contain large quantities of water.

Due to the usually low permeability (less than .06 centimeters/hour) of bedrock as compared to the permeability in surface deposits and soils, shallow groundwater flow tends to follow the slope of the bedrock surface. The direction of this flow is at right angles to bedrock surface contour lines from high to low elevations. The direction of shallow groundwater flow at the ANGB has been assumed to be to the northeast, following the path of surface runoff. A review of the drainage divide reveals that part of the former Fire Training Area may drain westerly toward Shaw Brook and eventually into Souadabscook Stream, which empties into the Penobscot River approximately 5 miles downstream of the Kenduskeag Stream. Aquifers are located on the Souadabscook Stream where it flows into the Penobscot River.

The ANGB, Bangor International Airport, and the immediate area obtain drinking water from the city of Bangor. The city obtains fresh water from Floods Pond, located approximately 16 miles east-southeast of the ANGB in adjacent Hancock County. Residential areas along Route 222 north of the Union Street Junior High School obtain water from fractures intersecting bedrock wells (well depths to 300 feet) and possibly from small sand and gravel aquifers. The nearest significant sand and gravel aquifers are located just over 3 miles southwest of the ANGB at the southern end of Hermon Bog. Another smaller sand and gravel aquifer is located along the Penobscot River near Hampden, Maine. Because of the drainage pattern and surface runoff at the north end of the runway, any contaminant source at this location may possibly affect these aquifers. In addition, numerous bedrock wells are located within a 3-mile radius in all directions of the ANGB (Figure III-F). Flow along fractures is difficult to predict or determine and may occur at right angles to bedrock topography and dip.

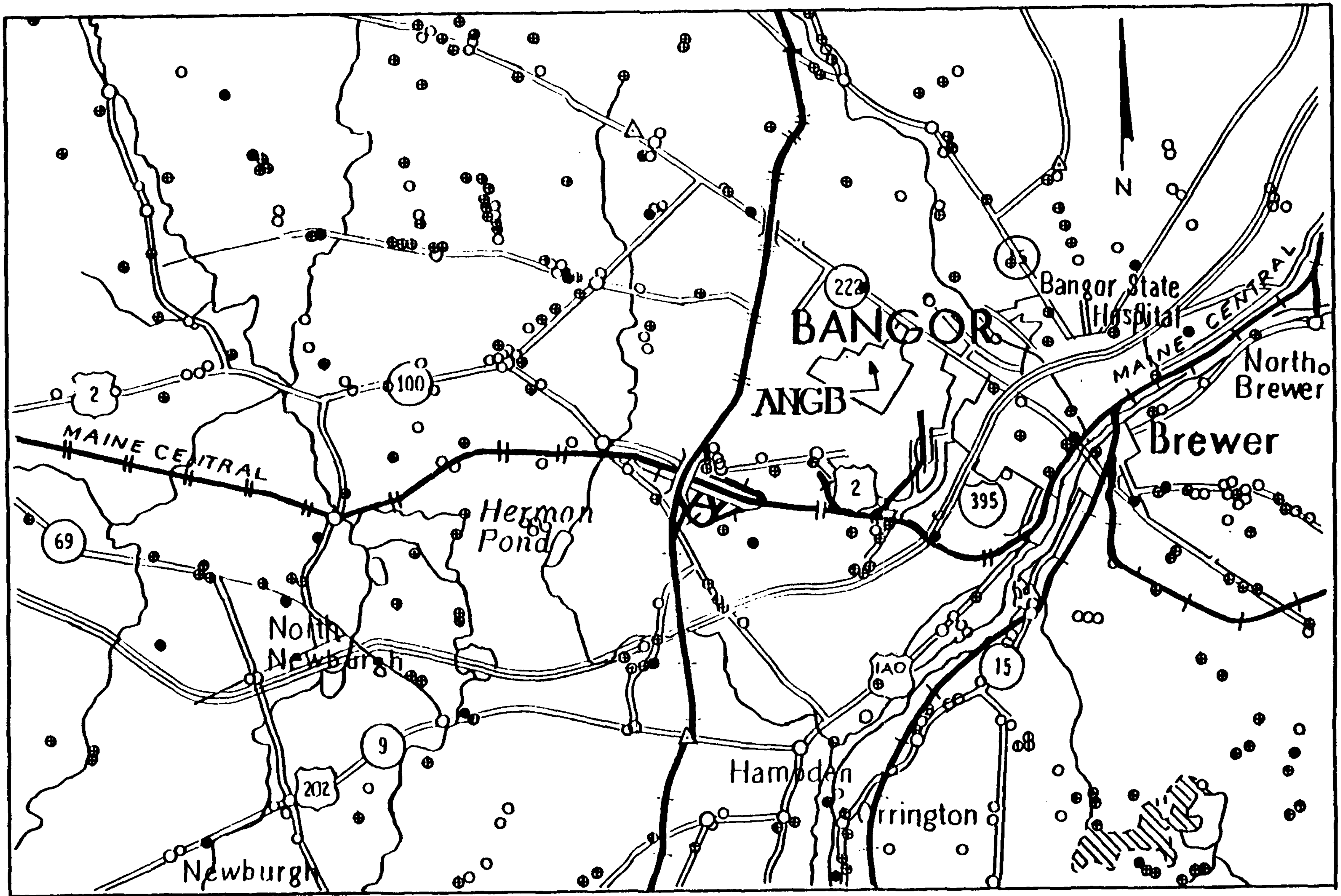

Figure III-F: Location of Bedrock Wells in a portion of Southern Penobscot County. (Caswell, 1976)

LEGEND ○ = 1-100 feet deep ⊕ = 101-300 feet deep ● = 301 feet and greater in depth

D. SOILS

The soils present at the ANGB are represented by several different soil series (see Table III-A). Due to the number and complexity of soil series present in the Bangor ANGB area, soil series were regrouped on the basis of similar permeabilities. Figure III-G is a map showing the regrouped soil series. Group A consists of the Biddeford Series. Group B consists of the Howland, Thorndike, Dixmont, Bangor, and Winnecook Series. Group C consists of the Buxton, Scantic, and Burnham Series.

Although the U.S. Department of Agriculture (USDA) Soil Conservation Service maps do not detail the types of soils on the ANGB, construction borings performed by Wright-Pierce Engineers in the western part of the Base indicate that the soils are glacial till. Most of the borings are in a sandy gravel or cobbly soil. Figure III-H shows representative samples of the soil boring logs. The borings are from the T-9 project and a road expansion/renovation project. Figure III-I shows the soil boring locations.

Series Md, defined by the USDA Soil Conservation Service as dumps, are areas of smoothed or uneven accumulations of soils and general refuse at depths of 0 to 60 inches. Slopes are from 0 to 20 percent. These soils consist of combinations of the following series: Biddeford, Howland, Thorndike, Dixmont, Bangor, Winnecook, Buxton, Scantic, and Burnham. Soil maps provided by the soil conservation service do not show which soils are present on the ANGB itself. The series listed are located on the perimeter of, and in close proximity to, the ANGB.

The Biddeford Series, a silt loam with 0 to 3 percent slopes, is a very deep, very poorly drained soil on lowlands. This series formed in lacustrine or marine sediments. The surface layer is a very stony silt loam 0 to 4 inches thick and gray in color. The subsoil consists of a sequence as follows: (1) 4 to 10 inches--mottled, olive gray silty clay, (2) 10 to 23 inches--dark gray, and (3) 23 to 33 inches--gray silty clay loam.

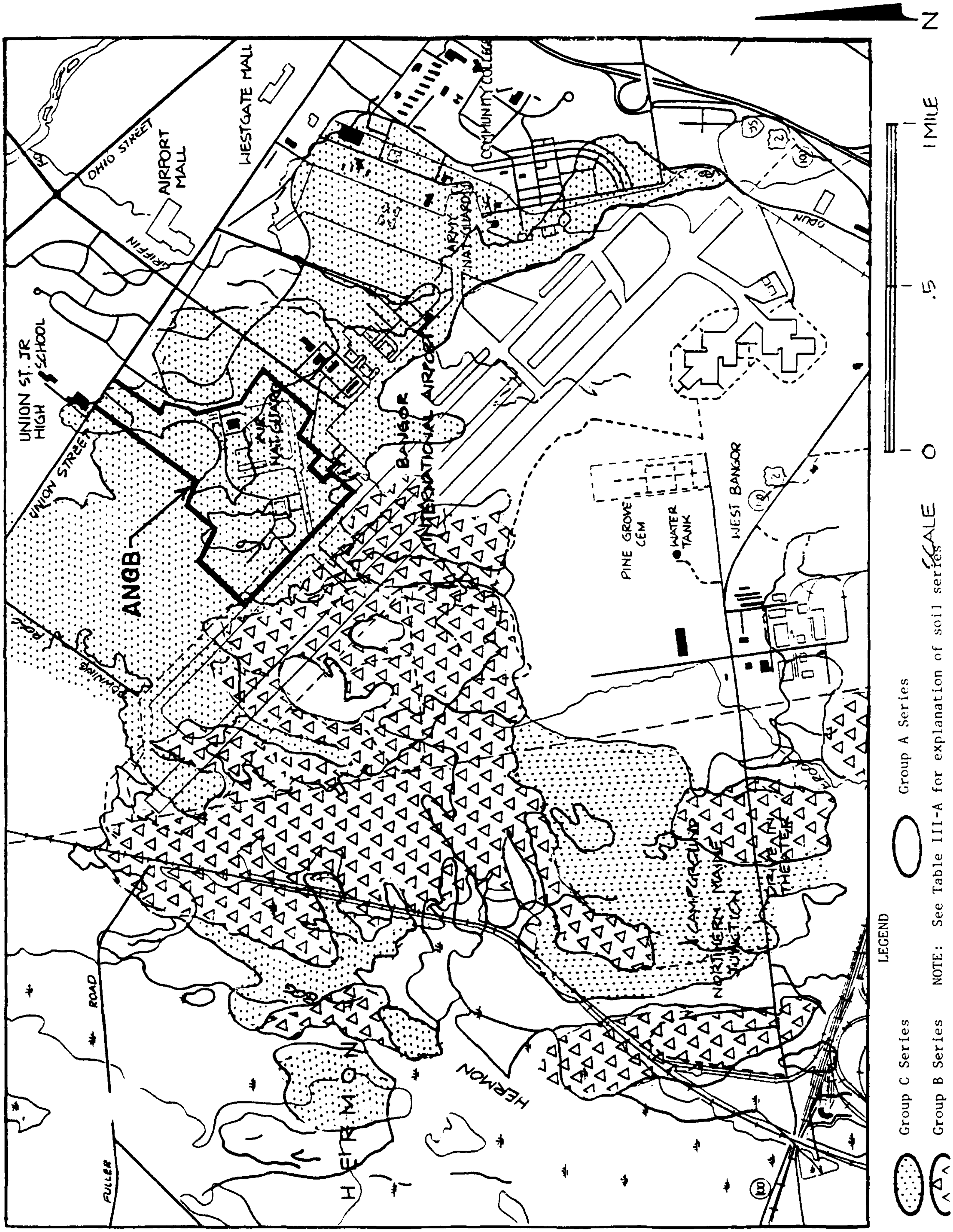

Figure III-G: Soils Map (Department of Conservation, 1977)

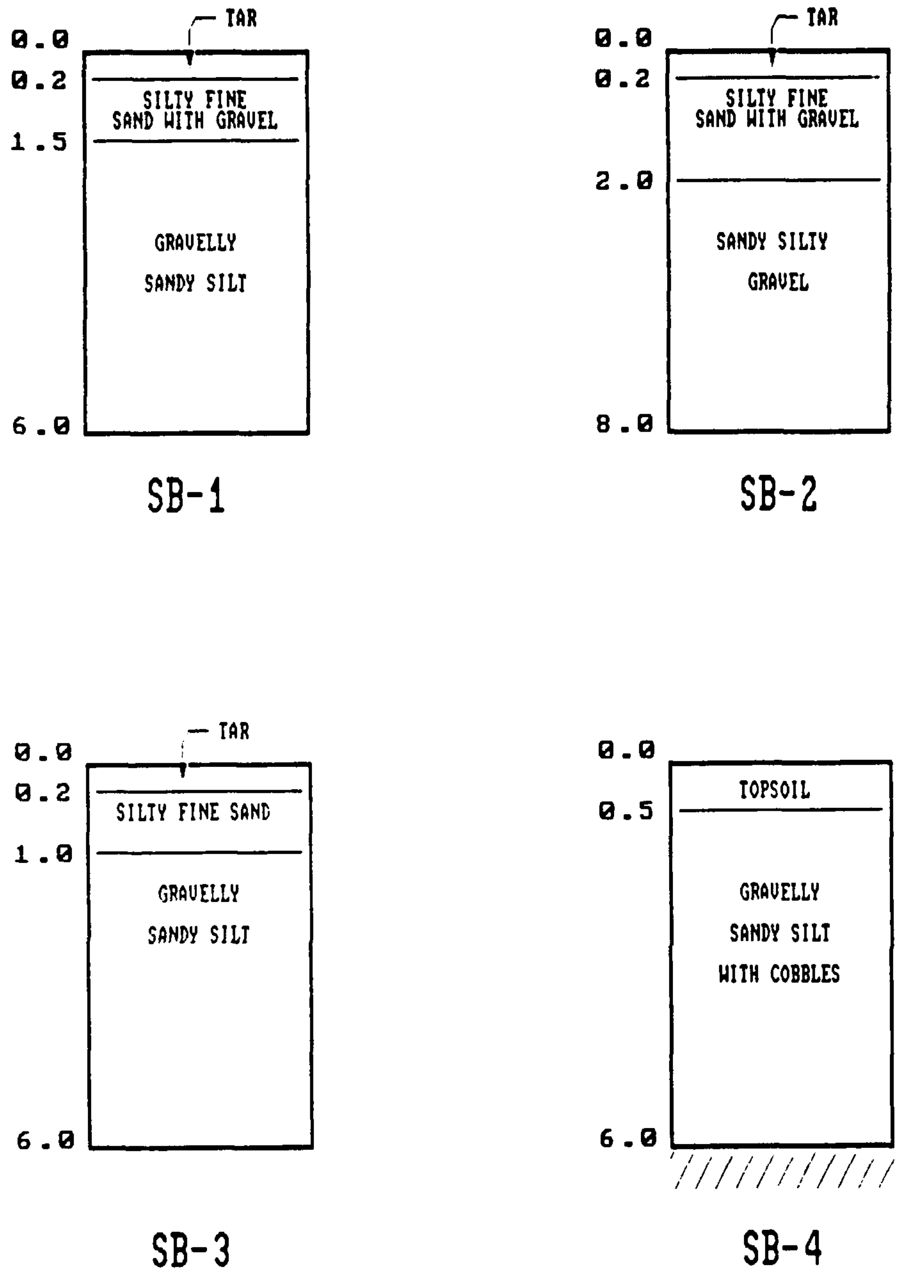

FIGURE III-H: REPRESENTATIVE SOIL BORING LOGS

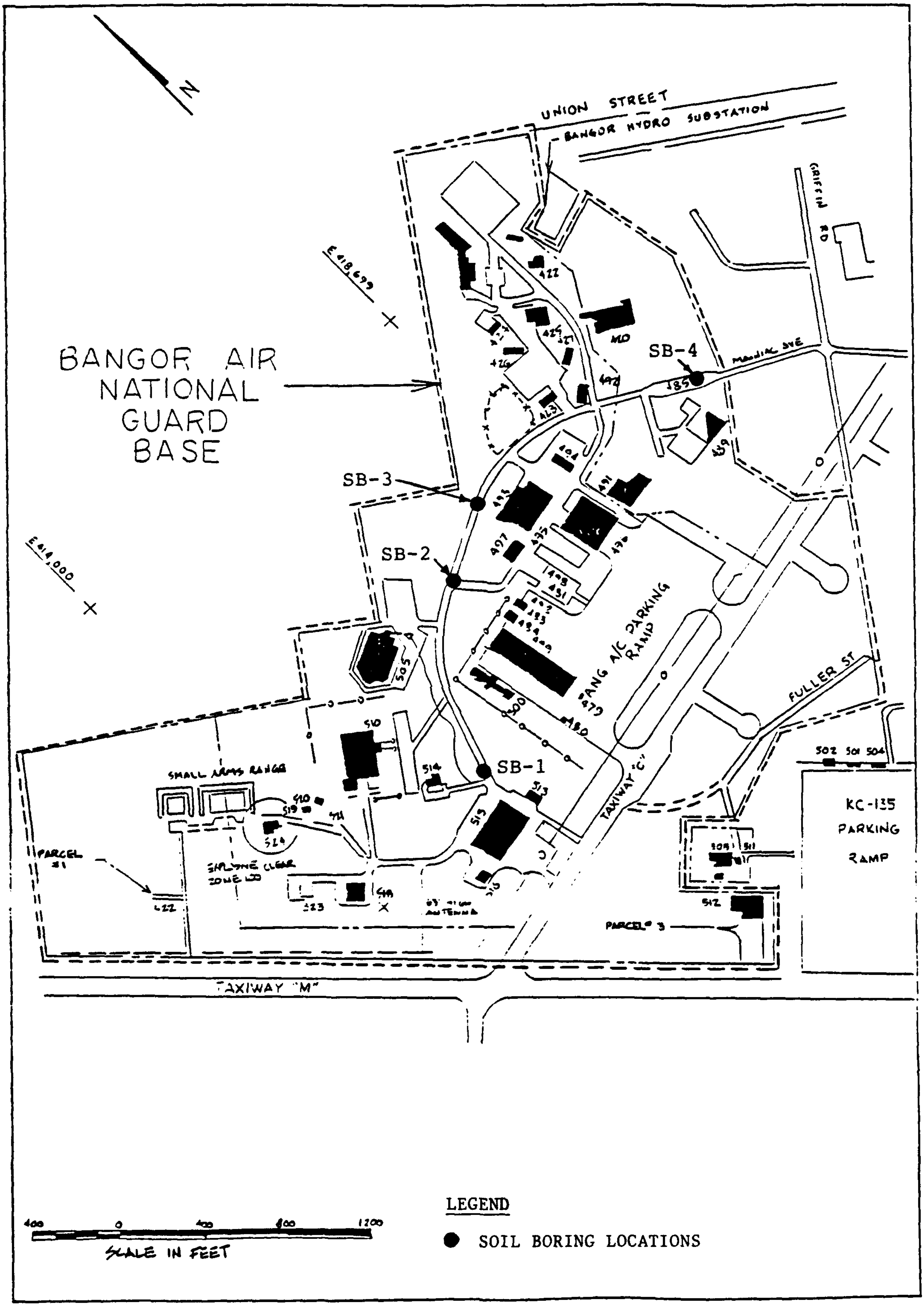

FIGURE III-I: SOIL BORING LOCATIONS

The Biddeford silt loam has a low permeability (from 0.2 to 0.6 centimeters/hour) and moderate-to-low water capacity. The soil series exhibits low acidity. The water table is seasonal with a water table at +1.0 feet above ground surface to -0.5 feet below ground surface in depth from early winter to late summer. The shrink-swell potential is low to moderate.

The Howland Series, a stony silt loam with 0 to 25 percent slopes, is a very deep, poorly drained soil on uplands. This series is formed in compact glacial till. The surface layer is a silt loam 0 to 6 inches in depth and has a very dark brown color. The subsoil consists of a sequence as follows: (1) 6 to 26 inches--dark reddish-brown, yellowish-brown, and light olive brown silt loam that is mottled below 10 inches and (2) 26 to 60 inches--very firm light olive gray silt loam.

The Howland silt loam is of moderate permeability (from 0.6 to 2.0 inches/hour) with a moderate-to-low water capacity. The soil series is moderately acidic. The water table is seasonal with a perched water table of 1.0 to 2.0 feet below ground surface in winter and spring. The shrink-swell potential is low.

The Thorndike Series, a silt loam with 2 to 45 percent slopes, is a shallow, somewhat excessively drained soil on uplands. This series formed in a thin mantle of glacial till mainly derived from slate and phyllite. The surface layer of the Thorndike silt loam is, in typically wooded areas, 0 to 2 inches in depth with a grayish-brown color. The subsoil consists of a sequence as follows: (1) 2 to 17 inches--dark reddish-brown, dark brown, and light olive brown slaty silt loam and (2) 17+ inches--fractured bedrock.

The Thorndike silt loam is moderately permeable (from 0.6 to 2.0 inches/hour) with moderate-to-low water capacity. The soil series exhibits moderate-to-low acidity. The water table is apparent at a depth of 6.0+ feet below ground surface with little seasonal variation. The shrink-swell potential is low.

The Dixmont Series, a coarse silt loam with 0 to 25 percent slopes, is a very deep, very well to somewhat poorly drained soil on uplands. This series formed in glacial till. The surface layer of the Dixmont silt loam is 0 to 5 inches thick and dark grayish-brown in color. The subsoil consists of a sequence as follows: (1) 5 to 9 inches--dark reddish-brown silt loam, (2) 9 to 21 inches--mottled brown to dark brown and grayish-brown silt loam, and (3) 21 to 60 inches--mottled olive gray silt loam.

The Dixmont silt loam is moderately permeable (from 0.6 to 2.0 inches/hour) with a moderate to low water capacity. The soil series exhibits moderate-to-low acidity. The water table is seasonal with a perched water table at a depth of 1.0 to 2.0 feet below ground surface in winter through early summer. The shrink-swell potential is low.

The Bangor Series, a stony silt loam with 0 to 25 percent slopes, is a very deep, well-drained soil on uplands. This series formed in glacial till. The surface layer of the Bangor silt loam is 0 to 5 inches in depth with a dark grayish-brown color. The subsoil consists of a sequence as follows: (1) 5 to 27 inches--brown to dark brown silt loam and (2) 27 to 60 inches--firm olive silt loam.

The Bangor silt loam is moderately permeable (from 0.6 to 2.0 inches/hour) with a moderate-to-low water capacity. The soil series exhibits moderate-to-low acidity. The water table is not seasonal and is apparent at a depth of 6.0 feet or more below ground surface. The shrink-swell potential is low.

The Winnecook Series, a silt loam with 2 to 45 percent slopes, is a moderately deep, well-drained soil on uplands. This series formed in glacial till derived from mainly phyllite and slate. The surface is a silt loam 9 inches thick and a dark yellowish-brown color. The subsoil consists of a sequence as follows: (1) 9 to 28 inches--brown, yellowish-brown, and dark yellowish-brown very channely silt loam, (2) 28 to 34 inches--light olive brown very channely silt loam, and (3) 34+ inches--fractured phyllite bedrock.

The Winnecook silt loam has a moderate permeability (from 0.6 to 2.0 inches/hour) and moderate-to-low water capacity. The soil series exhibits low acidity. The water table is nonseasonal and at a depth of 6.0 feet or more below ground surface. The shrink-swell potential is low.

The Scantic Series, a fine silt loam with 0 to 8 percent slopes, is a very deep, poorly drained soil on lowlands. This series formed in lacustrine or marine sediments. The surface layer of the Scantic silt loam is 9 inches thick and a dark grayish-brown color. The subsoil consists of a sequence as follows: (1) 9 to 11 inches--olive gray silt loam, (2) 11 to 16 inches--silty clay loam, (3) 16 to 29 inches--silty clay, and (4) 29 to 60 inches--olive gray clay.

The Scantic silt loam has moderate-to-low permeability (from 0.2 to 2.0 inches/hour) with a moderate water capacity. The soil series exhibits low acidity. The seasonal water table is perched at a depth of 0 to 1 foot below ground surface from fall to late spring. The shrink-swell potential is low to moderate.

The Burnham Series, a coarse, gravelly loam with 0 to 3 percent slopes, is a very deep, poorly drained soil on uplands. This series formed in glacial till. Typically, the surface layer is 0 to 18 inches thick with the top 6 inches consisting of a dark brown muck over 12 inches of mottled gray loam. The subsoil consists of a sequence as follows: (1) 12 to 20 inches--gray, gravelly loam and (2) 20 to 60 inches--olive, gravelly loam that is firm to very firm.

The Burnham loam has a moderate-to-low permeability (from 0.2 to 2.0 inches/hour) with a moderate-to-low water capacity. The soil series exhibits low acidity. The water table is seasonal and apparent at +1.0 feet above ground surface to -0.5 feet below ground surface from late fall to midsummer. The shrink-swell potential is low.

The Buxton Series, a fine silt loam with 3 to 25 percent slopes, is a very deep, moderately well-drained soil in lowlands. This series formed in lacustrine or marine sediments. The surface layer of the Buxton silt loam is 0 to 9 inches thick and a dark brown color. The subsoil consists of a sequence as follows: (1) 9 to 12 inches--yellowish-brown silt loam, (2) 12 to 16 inches--light olive gray silty clay loam, (3) 16 to 38 inches--mottled olive gray and olive silty clay, and (4) 38 to 60 inches--mottled olive gray silty clay.

The Buxton silt loam is moderately permeable (from 0.2 to 2.0 inches/hour) with a moderate-to-low water capacity. The soil series exhibits moderate-to-low acidity. The water table is seasonal with a perched water table at a depth of 1.5 to 3.0 feet below ground surface from late winter to spring. The shrink-swell potential is low to moderate.

Hermon Bog consists of the Vassalboro Series and the Lupton Series. The Vassalboro Series consists of very deep, very poorly drained soils in depressions. The soils formed in organic materials derived mainly from herbaceous, woody, and sphagnum plants. Typically, these soils have a very dark brown peat surface layer, 27 inches thick. The underlying material, to a depth of 65 inches, is dark reddish-brown, dark brown, and black peat. Slopes range from 0 to 2 percent.

The Vassalboro peat is a highly permeable (2.0+ inches/hour) material with a moderate-to-high water capacity. The water table is apparent from September to July at depths of +1.0 feet above ground surface to -0.5 feet below ground surface.

The Lupton Series consists of very poorly drained soils formed in woody organic deposits in depressional areas within lake plains, outwash plains, and till plains. The surface layer is black sapric material, 10 inches thick. The substratum is dark reddish-brown and very brown sapric material. Slopes are less than 3 percent.

The Lupton Series has a high permeability (2.0+ inches/hour) and a moderate-to-high water capacity. It has an apparent water table from September to May at a depth of +1.0 feet above ground surface to -1.0 feet below ground surface.

E. CRITICAL HABITATS/ENDANGERED OR THREATENED SPECIES

Uncultivated flora include white pine, oak, and spruce. Wetlands surround the ANGB with Hermon Bog to the west and north, the Kenduskeag Stream to the east, and the Penobscot River to the south. None of these areas are critical habitats, although the Penobscot River is used extensively by bald eagles wintering in Maine. The Penobscot River is tidally influenced, and the eagles, as well as other water fowl, use the entire river from the Bangor Dam to the coast. Alan Hutchinson, of the Department of Fish and Wildlife, states that 20 to 50 bald eagles winter on the Penobscot River each year. They are typically found in a corridor within 250 feet on either side of the river. Ms. Beth Swartz, of the Maine Department of Fish and Wildlife, states that there are no threatened or endangered species within the confines of the Bangor ANGB. The Hermon Bog, although not a critical habitat, is considered a significant habitat by the Nature Conservancy.

Major wildlife species include deer, lynx, bobcat, raccoon, rabbit, water fowl, owl, and various sparrows. Ms. Swartz states that there are no critical habitats or endangered or threatened species within the Bangor ANGB perimeter.

IV. SITE EVALUATION

A. ACTIVITY REVIEW

A review of ANGB records and interviews with ANGB employees resulted in the identification of specific operations within each activity in which industrial chemicals have been handled and hazardous wastes are generated. Table IV-A summarizes the major operations associated with each activity, provides estimates of the quantities of waste generated by these operations, and describes the past and present disposal practices for the wastes. If an operation is not listed in Table IV-A, then that operation has been determined on a "best-estimate" basis to produce negligible (less than 5 gallons per year) quantities of wastes requiring ultimate disposal. For example, an activity may use small volumes of methyl ethyl ketone. Such quantities commonly evaporate during use, and therefore do not present a disposal problem. Conversely, if a particular volatile compound is listed, then the quantity shown represents an estimate of the amount actually disposed of according to the method shown. Table IV-B contains building numbers and names and Figure IV-A shows the building locations.

B. DISPOSAL/SPILL SITE IDENTIFICATION, EVALUATION, AND HAZARD ASSESSMENT

Interviews with 14 ANGB personnel and subsequent site inspections resulted in the identification of 2 potential disposal/spill sites. It was determined that the identified sites are potentially contaminated with hazardous materials/hazardous waste that have a potential for migration; therefore, the sites should be further evaluated. These sites were scored using HARM (see Appendix C). Figure IV-B illustrates the locations of the scored sites. Copies of the completed site hazard assessment rating forms are found in Appendix D. Table IV-C summarizes the HARM Score for each of the scored sites.

Table IV-A. Hazardous Materials/Hazardous Waste Disposal Summary:
BANGOR ANG BASE
Bangor, Maine

Shop	Building No. (Past & Present)	Hazardous Materials/ Hazardous Waste	Estimated Quantities (Gal/Year)	Method of Treatment/Storage/Disposal* 1948 '50 '60 '70 '80 '88
Repair & Reclamation	496	PD-680	70	-----------------FTA**-------------------->DRMO-------------->
Electric & Battery	496	Battery acid	5	--------Neutralized/SD------>DPDO----------->DRMO-------------->
Corrosion Control	496	Paint & paint slops	43	-----------------FTA**-------------------->DRMO---------------
		Paint remover (water soluble)	102	-----------------FTA**-------------------->DRMO---------------
		Aliphatic thinner (MEK & toluene)	160	-----------------FTA**-------------------->DRMO---------------
		Solvents	50	-----------------FTA**-------------------->DRMO---------------
Hydraulic	496	Hydraulic fluid	60	-----------------DPDO--------------------->DRMO---------------
		PD-680	70	-----------------FTA**-------------------->DRMO---------------
Photo Lab		Photographic developer	8	------------------SS---------------------->DRMO---------------
		Fixer	4	------------------SS-----------------------REC----------------
Aircraft Wash Rack	496	PD-680	360	--------NA-----------------OWS/SS-------------------------
		AC cleaning compound	1,700	----------------------SD-----OWS/SS-------------------------
		Oils & grease from engine wheel well cleaning	unknown	----------------------SD-----OWS/SS-------------------------
		PD-680/PS-661/Other solvents	unknown	----------------------SD--------NA

Note: Aircraft washing operations in the present location in Hangar 496 started in 1976 when KC-135s were assigned. Prior to that time planes were washed while parked on the ramp or at the outside wash area on the ramp.

Shop	Building No. (Past & Present)	Hazardous Materials/ Hazardous Waste	Estimated Quantities (Gal/Year)	Method of Treatment/Storage/Disposal* 1948 '50 '60 '70 '80 '88
Fuel Systems	Dock 13	JP-4	2,500	----------------------FTA**-------------------->REC/DRMO/FTA**
		PD-680	20	----------------------FTA**-------------------->DRMO---------
NDI Lab	487	Developer	36	----------------------SD------------------------------------
		Fixer	24	---------------------REC------------------------>REC----------
		1,1,1 Trichloroethane	15	-----------------OWS-SD/FTA**------------------>DRMO--------
		Stripper	50	-----------------OWS-SD/FTA**------------------>DRMO--------

Table IV-A (Continued) Hazardous Materials/Hazardous Waste Disposal Summary:
BANGOR ANG BASE
Bangor, Maine

Aircraft Servicing	Ramps	PD-680	90	FTA**	>DRMO
		Ethylene glycol (aircraft deicer)	18,000	SD	
		*JP-4	36,000	FTA**	N/A

*Note: During the period 1944-1969, 28 F-89 jet aircraft were assigned. When the F-89s were filled with JP-4 fuel, the fuel expanded and vented from the wing tanks at the rate of 25-115 gallons per plane when the fuel tanks were full. The fuel was collected in 55-gallon drums and was dumped or ran out on the ramps and ground.

Aerospace Ground Equipment Maintenance (AGE)	494	Paint Strippers//thinners	20	FTA**	>DRMO
		PD-680	60	FTA**	>DRMO
		Diesel fuel	unknown	FTA**	>REC
		Motor oil	400	FTA**	>DRMO
		Turbine oil	130	FTA**	>DRMO
		Hydraulic fluid	20	FTA**	>DRMO
		Mogas (contaminated)	73	FTA**	
		JP-4 (contaminated)	76	FTA**	>REC
		Sulfuric acid	10	DPDO	>DRMO
Vehicle Maintenance (Motor Pool)	515	PD-680	68	FTA**	>DRMO
		Sulfuric Acid	15	DPDO	>DRMO
		Ethylene glycol	25	SD	>DRMO
		Lubricating oil	50	FTA**	>DRMO
		Hydraulic oil	30	FTA**	>DRMO
		Motor oil	200	FTA**	>DRMO
		Brake fluid	2		>DRMO
		Polyurethane/paint slops	15	FTA**	>DRMO
		Solvent (Safety Kleen)	unknown	FTA**	>DRMO
Engine	497	Jet engine oil, MLT->808	215	FTA**	>DRMO
		PD-680	25	FTA**	>DRMO
		Hydraulic fluid	80	FTA**	>DRMO
		JP-4	25	FTA**	>REC/DRMO/FTA**
POL Operations & Laboratory	464	Sulfuric acid	20	DPDO	>DRMO
		JP-4	315	FTA**	>REC/DRMO/FTA**

*Legend

SD - Storm Drain
FTA** - Fire Training Area (off-base)
OWS - Oil/Water Separator
N/A - Not Applicable
REC - Recycle

Table IV-B
Building Numbers and Names
Bangor Air National Guard Base
Bangor, Maine

Building	Facility
417	Horizon Inn
420	Commissary
421	Women's Dormitory
422	Base Chapel
424	NCO Open Mess
425	Dining Hall
426	Alternate Alert Facility
427	101st USAF Clinic Annex
428	776th Radar Squadron Orderly Room
464 (Dock 13)	Fuel Systems Maintenance
482	Alert Facility
483	Alert Facility
484	Alert Facility
485	Guard Shack
487	NDI Laboratory
489	Security Police
491	Squadron Operations
492	101st USAF Clinic
493	Base Supply/Transportation
494	AGE Maintenance
495	Chemical Storage
496	101st CAMS - Main Hangar/Wash Rack/Shops
497	Engine Shop
498	Base Personnel Office
499	Repair and Reclamation Equipment Storage/Other Storage
500	T-9 Engine Test Facility
501	Flight Line Support Trailer
502	AGE Storage
504	Flight Line Support Trailer
505	Wing Headquarters
508	Control Tower
510	776th Radar Operations
512	Fire Department
513	Civil Engineering - Roads and Grounds
514	FAA Building
515	Civil Engineering - Offices and Shops
516	Telephone Maintenance
518	Refueling Vehicle Maintenance
519	Storage
520	Storage
522	Fuels - Pump Station
523	Storage
524	Hazardous Waste Accumulation

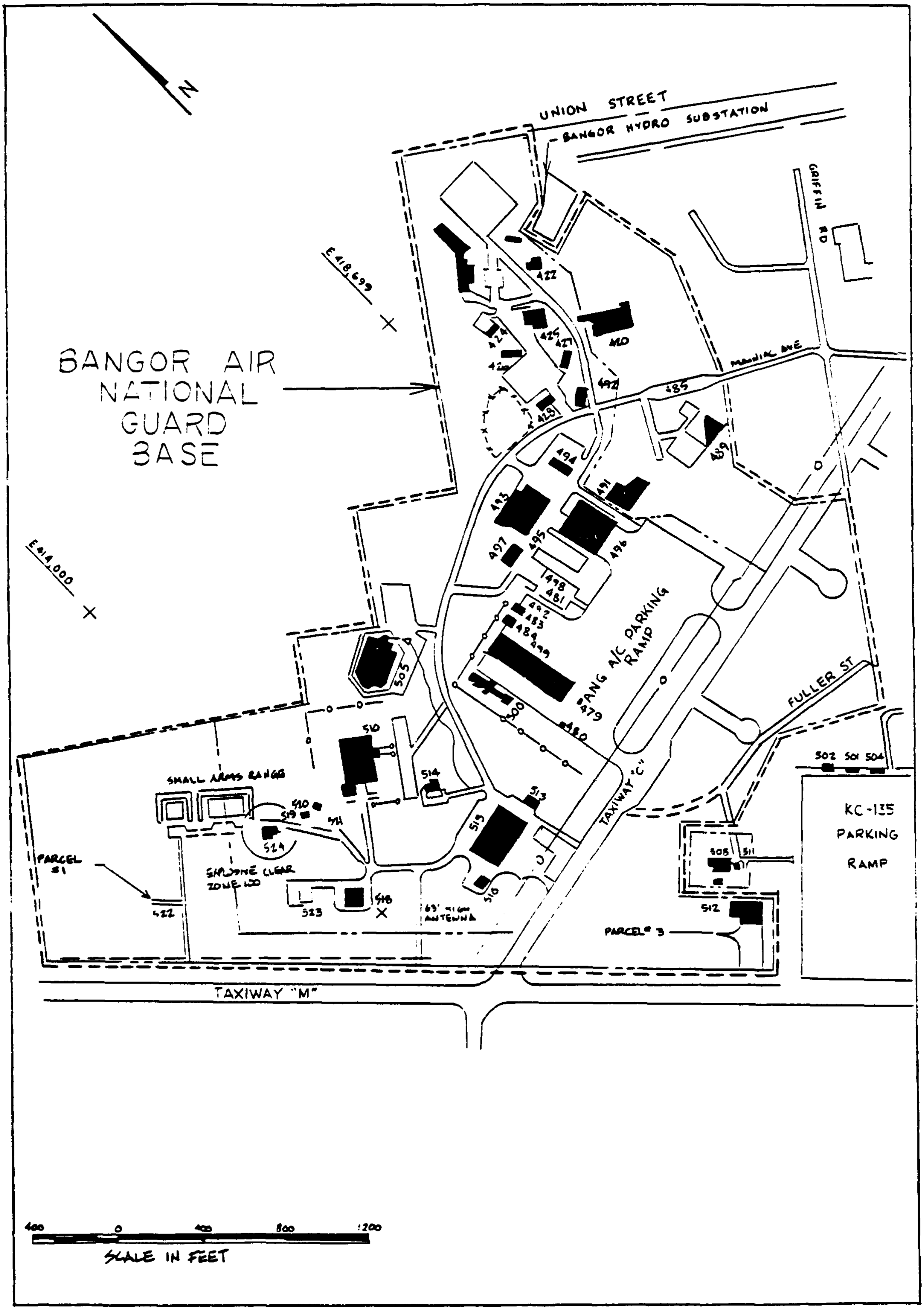

Figure IV-A: Building locations and Numbers (MEANGB, 1988)

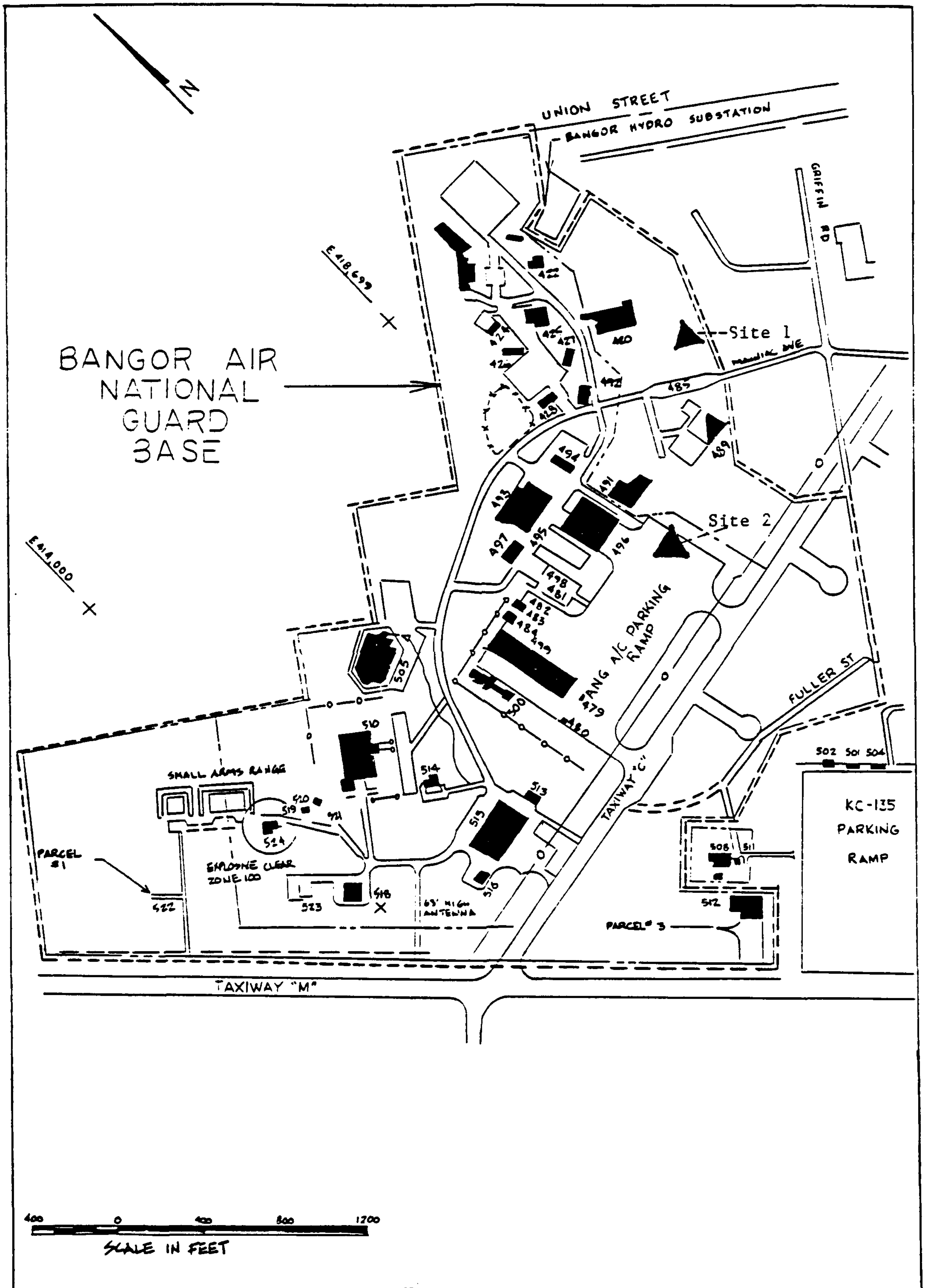

Figure IV-B: Site Map/Location of Sites 1 and 2

Table IV-C

HARM Scores

Bangor Air National Guard Base
Bangor, Maine

Site No.	Site Description	Receptors	Waste Characteristics	Pathway	Waste Mgmt. Practices	Overall Score
1	Drainage Ditch	45.0	80	80	1.0	68.3
2	Light Duty Ramp and Perimeter	30.6	54	80	1.0	55.0

Site No. 1 - Drainage Ditch (HARM Score - 68)

The wash rack and the light duty ramp outside the Main Hangar drain into the drainage ditch. The vehicle wash rack located at the Motor Pool (Building 515) discharged directly into this storm drain system. No OWS was connected to the drainage system at this location. It was reported that steam cleaning of engines occurred at this wash rack. It is reported that 15,000 to 20,000 gallons per year of ethylene glycol antifreeze (deicing fluid) were drained from the ramps to this ditch.

On June 2, 1986, approximately 150 gallons of No. 5 fuel oil were spilled in the boiler room, Building 499. The oil entered the floor drain, which emptied into a ditch just below the building. This ditch flowed into the ANGB drainage ditch. Two barrels of oil (approximately 100+ gallons) were recovered. All oil residues were cleaned up as of June 30, 1986. The recovered oil, hay, contaminated swamp grass, and absorbent containment material were sent to the Fire Training Area (FTA).

Site No. 2 - Light Duty Ramp and Perimeter (HARM Score - 55)

The light duty ramp is located outside of the Main Hangar. Storm drains on this concrete pad drain into the drainage ditch. An outside aircraft wash rack was located on the northeast corner of the pad. Although the wash rack area was diked, there was a drain in the corner for the wash rack. Soaps, solvents, PS-661 (flammable), and even small amounts of gasoline were used to clean the aircraft. The wash rack is now located inside the Main Hangar.

From late 1957 through mid-1969, 28 F-89 aircraft were assigned to the ANGB. When the F-89s were filled with fuel, accidental spills of JP-4 fuel occurred because of heat expansion. This airplane was designed with vents to allow for the overflow. When the aircraft was fueled, 55-gallon drums were placed under each wing to catch the fuel. Normally, 15 to 28 airplanes were parked on the ramp. At times, the barrels would fill up and overflow within 1 day and, at other times, little or no drainage occurred. The barrels were dumped into a cart regularly, and this cart was wheeled to the FTA. Sometimes, the drums were dumped onto, or adjacent to, the ramp. Spills were hosed off the ramp and into the grass.

C. OTHER PERTINENT FACTS

The FTA is located outside of the ANGB boundary and approximately 1000 feet southwest of the airport runway. The present pit is located on the edge of one of the old Dow Air Force Base runways. Abandoned pits were located nearby.

The area had been used for fire training since 1947 by the USAF, the Air National Guard, and the city of Bangor Fire Department. In the past, fire training drills were conducted about 20 times a year and used up to 10,000 gallons per burn. Various flammable liquid wastes that were generated by ANGB operations have been used for fueling the fires, including JP-4 jet fuel, PD-680, motor oils, gasoline, aviation gasoline, paint thinners and strippers, alcohols, and hydraulic oils. It was reported that personnel would dump fuels and liquids at a dump site at the end of the runway instead of taking it to the FTA. Prior to 1975, the fire pits were craters dug out of the ground using bulldozers or front-end loaders. Solid materials, such as fuel filters, tires, etc., were thrown into the pits along with the fuels. There are reports of at least three airplanes buried in the FTA, and they may have been used as part of the fire training exercises. The burn pits were moved regularly in this general area in order to keep fuel from running into the storm drainage system. The quantity of individual pits is unknown; however, it is estimated from the interviews that the FTA has a radius of approximately 1,200 feet from the present fire pit.

From 1968 to 1980, the city of Bangor manned the Airport Fire Station. The Airport Fire Station is now managed by the ANGB. The Bangor Airport Fire Department used the FTA and often conducted joint training exercises with the ANGB personnel. Access to the FTA was uncontrolled. Agencies other than the ANGB also contributed fuels and other materials to these pits. The contributors included the city airport personnel, the Air Force, and Webber Oil, and the ANGB. The city of Bangor and ANGB personnel abandoned the old fire training pits in 1975 by covering them using a bulldozer and/or front-end loader. The present fire pit is no longer used by the ANGB as of June 10, 1988.

Since 1985, only clean JP-4 jet fuel has been used for the fire fighting drills. Presently, exercises are conducted approximately 10 times a year. Maximum fuel used per burn is 500 gallons with an average of 200 gallons.

In accordance with Executive Order EO 12580 promulgated January 1987, this site will be dealt with under other environmental programs.

In the past, the buildings with oil/water separators (OWSs) (Buildings 464, 487, and 496) drained into the OWS first, then the effluent eventually drained into a storm drainage ditch of the old Dow AFB system. Most of the DOW AFB drainage ditch system is outside the property boundary of the ANGB and will not be considered in this report.

Building 496, also called the Main Hangar, has an OWS. Corrosion control operations took place in this building. Paint strippers were used to remove old paint from various aircraft parts before painting. Paint strippers were commonly dumped into the drain and passed through the OWS. The effluent from the OWS now flows into the sanitary sewer since the Main Hangar floor and drainage system were revised in 1976 to accommodate the KC-135s. Before this, the drainage system tied into the storm drain system, which flowed into the drainage ditch that is located outside of the ANGB Boundaries.

There are 46 Underground Storage Tanks (USTs) located at Bangor ANGB. Table IV-D lists the tank identification number, status, date installed, capacity, contents, and the associated building. We recommend that any action taken on these sites be under the EPA UST program.

A records search of the USTs revealed that a 4,000-gallon ammonia tank located under Building 583 was abandoned in place prior to January 1, 1984.

It was reported that a UST was discovered during construction operations at the Security Building, Building 489. The tank was thought to have contained fuel oil. A pinhole leak was observed and groundwater filled the tank up to this hole. No evidence of fuel stains or smells was noticed in the claylike soil around the tank.

Table IV-D

List of Underground Storage Tanks
Bangor ANGB, Bangor, Maine

Tank ID No. (Location)	Status	Date Inst.	Capacity Gallons	Contents	Associated Building
2715-1	Abandoned	1957	20,000	Deicing Solution	POL Pump House
2715-2	Abandoned	1957	20,000	Deicing Solution	POL Pump House
417-1	Active	1985	10,000	No. 2 Fuel Oil	Horizon Inn
420-1	Active	1987	3,000	No. 2 Fuel Oil	Commissary
424-1	Active	1982	275	No. 2 Fuel Oil	NCO Open Mess
425-1	Active	1980	550	No. 2 Fuel Oil	Dining Hall
464-1	Active	1959	20,000	No. 2 Fuel Oil	Dock 13, Fuel Systems Maintenance
464-2	Active	1959	5[illegible]	Oil/Water Separator	Dock 13, Fuel Systems Maintenance
487-1	Active	1959	6,000	No. 2 Fuel Oil	NDI Laboratory
489-1	Active	1986	6,000	No. 2 Fuel Oil	Security Police
491-1	Active	1978	4,000	No. 2 Fuel Oil	Squadron Operations
494-1	Active	1978	2,000	JP-4 Jet Fuel	AGE Maintenance
494-2	Active	1972	250	Waste Oil	AGE Maintenance
494-3	Abandoned	1959	275	Waste Oil	AGE Maintenance
496-1	Active	1955	5,000	No. 2 Fuel Oil	101st CAMS - Main Hangar
496-2	Active	1955	5,000	No. 2 Fuel Oil	101st CAMS - Main Hangar
496-3	Active	1971	250	Waste Oil	101st CAMS - Main Hangar
496-4	Active	1977	1,000	No. 2 Fuel Oil	101st CAMS - Main Hangar
496-5	Active	1977	500	Waste Oil	101st CAMS - Main Hangar
496-6	Active	1977	1,500	Solvent	101st CAMS - Main Hangar
496-7	Active	1970	560	Diesel	101st CAMS - Main Hangar
497-1	Active	1961	2,000	No. 2 Fuel Oil	Engine Shop
498-1	Active	1964	525	No. 2 Fuel Oil	Base Personnel Office
499-1	Active	1970	10,000	No. 2 Fuel Oil	Repair and Reclamation Equipment
505-1	Active	1984	5,070	No. 2 Fuel Oil	Wing Headquarters
510-1	Active	1984	20,000	No. 2 Fuel Oil	776th Radar Operations
510-2	Active	1984	20,000	No. 2 Fuel Oil	766th Radar Operations
512-1	Active	1961	1,500	No. 2 Fuel Oil	Fire Department
512-2	Active	1961	748	Oil/Water Separator	Fire Department
513-1	Active	1985	500	Waste Oil	Civil Engineering-Roads & Grounds

Table IV-D (Continued)

List of Underground Storage Tanks
Bangor ANGB, Bangor, Maine

Tank ID No. (Location)	Status	Date Inst.	Capacity Gallons	Contents	Associated Building
514-1	Active	1957	1,200	No. 2 Fuel Oil	FAA Building
514-2	Active	1957	1,000	Diesel	FAA Building
514-3	Active	1957	500	Water	FAA Building
515-1	Active	1960	10,000	No. 2 Fuel Oil	Civil Engineering-Offices & Shops
515-2	Active	1980	5,000	MOGAS	Civil Engineering-Offices & Shops
515-3	Active	1971	10,000	Diesel	Civil Engineering-Offices & Shops
515-4	Active	1969	10,000	MOGAS	Civil Engineering-Offices & Shops
515-5	Active	1970	800	Waste Oil	Civil Engineering-Offices & Shops
515-6	Active	1971	250	Waste Oil	Civil Engineering-Offices & Shops
516-1	Active	1960	500	No. 2 Fuel Oil	Telephone Maintenance
518-1	Active	1960	2,500	No. 2 Fuel Oil	Refueling Vehicle Maintenance
523-1	Abandoned	1960	4,000	Liquid Ammonia	Storage
526-1	Active	1955	50,000	JP-4 Jet Fuel	POL Pump House
526-2	Active	1955	50,000	JP-4 Jet Fuel	POL Pump House
526-3	Active	1955	50,000	JP-4 Jet Fuel	POL Pump House
526-4	Active	1955	50,000	JP-4 Jet Fuel	POL Pump House

V. CONCLUSIONS

Information obtained through interviews with ANGB personnel, review of ANGB records, field observations, and visits or communication with outside agencies have resulted in the identification of two potentially contaminated sites. These sites consist of the following:

<u>Site No. 1 - Drainage Ditch</u> (HARM Score - 68)

The drainage ditch and storm drainage system have a moderate amount of contamination. It was difficult to give this site a HARM rating because the old DOW Air Force Base storm drainage system joins several users into the same system. Outside agencies near the Base discharge into this same drainage system, making it difficult to determine the extent of the ANGB contamination. The ditch that receives the effluents from the Base was chosen as the center for the HARM evaluation.

Since the storm drainage system flows underneath the Airport Mall and drains into the Kenduskeag Stream, any contaminants flushed into the storm drainage system will follow this conduit and discharge into Kenduskeag Stream. For these reasons, further investigation is recommended.

<u>Site No. 2 - Light Duty Ramp and Perimeter</u> (HARM Score - 55)

The light duty ramp and the perimeter around the ramp have a moderate potential for environmental contamination. A visual inspection of the site revealed no obvious signs of environmental stress.

The quantity of fuels, solvents, and detergents spilled on the ramp and hosed off the pad into the storm drain and the grass is the reason for the recommendation of further site investigation.

VI. RECOMMENDATIONS

Based on the investigation documented in this PA and the HARM scores the identified sites received, it is recommended that further IRP action is necessary.

GLOSSARY OF TERMS

AQUIFER - A geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield economical quantities of water to wells and springs.

CALCAREOUS - Containing calcium carbonate.

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 by 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:

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

2. any element, compound, mixture, solution, or substance designated pursuant to Section 102 of this Act,

3. 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),

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

5. any hazardous air pollutant listed under Section 112 of the Clean Air Act, and

6. 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).

CRITICAL HABITAT - The native environment of an animal or plant which, due either to the uniqueness of the organism or the sensitivity of the environment, is susceptible to adverse reactions in response to environmental changes such as may be induced by chemical contaminants.

DENDRITIC DRAINAGE PATTERN - Characterized by irregular branching in all directions with the tributaries joining the main stream at all angles.

DEVONIAN - The fourth in order of age of the seven periods comprising the Paleozoic era. Also, the system of strata deposited at that time.

ENDANGERED SPECIES - Wildlife species that are designated as endangered by the U.S. Fish and Wildlife Service.

EPOCH - A division of geologic time; when capitalized, it becomes a formal division of geologic time corresponding to a series of rock and a subdivision of a period.

FAULT - A fracture or fracture zone along which there has been displacement of the sides relative to one another parallel to the fracture.

FLUVIAL PROCESS - The process of, or pertaining to, rivers; produced by river action.

FORMATION - The primary unit of formal mapping or description. Most formations possess certain distinctive lithic features.

GEOMORPHOLOGY - That branch of both physiography and geology which deals with the form of the earth, the general configuration of its surface, and the changes that take place in the evolution of land forms.

GLACIATION - Alternation of the earth's solid surface through erosion and deposition by glacier ice.

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 U.S. Air Force to develop and maintain a priority listing of potentially contaminated sites on bases and facilities for remedial action formulated on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, December 1981).

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 are 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:

1. cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or

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

ICE SCOURING - Erosion caused by moving ice, normally glaciers.

IGNEOUS - Formed by solidification from a molten or partially molten state.

IGNEOUS INTRUSION - A body of igneous rock that invades older rock. The invading rock may be a plastic solid or magma that pushes its way into the older rock.

LACUSTRINE - Pertaining to, produced by, or formed in a lake or lakes.

LIMESTONE - A general term for that class of rocks which contain at least 80 percent of the carbonates of calcium or magnesium.

LITHOLOGY - The physical character of a rock, generally as determined megascopically or with the aid of a low power magnifier.

MATURE STAGE - Having reached the maximum vigor and efficiency of action or the maximum development and accentuation of form.

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

ORDOVICIAN - The second of seven Paleozoic periods generally used in North America. Also, the strata of the system of rocks deposited during that period.

PALEOZOIC - One of the eras of geologic time comprising the Cambrian, Ordovician, Silurian, Devonian, Carboniferous (Mississippian and Pennsylvanian), and Permian systems. Also, the erathem of rocks deposited during the Paleozoic era.

PALUSTRINE - Pertaining to materials deposited in a swamp environment.

PERCHED WATER TABLE - Water table above an impermeable bed underlain by unsaturated rocks of sufficient permeability to allow movement of groundwater.

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.

PHYLLITE - An argillaceous rock intermediate in metamorphic grade between slate and schist.

PHYSIOGRAPHIC PROVINCE - Region of similar structure and climate that has had a unified geomorphic history.

POROSITY - The percentage of the bulk volume of a rock or soil that is occupied by interstices, whether isolated or connected.

QUATERNARY - The younger of the two periods or systems in the Cenozoic era. Quaternary is subdivided into Pleistocene and Holocene epochs or series. It comprises all geologic time or rocks from the end of the Tertiary to, and including, the Holocene.

SANDSTONE - A cemented or otherwise compacted detrital sediment composed predominantly of quartz grains, the grades of the latter being those of sand.

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

SHRINK-SWELL POTENTIAL - Refers to clays or soils that alternatively expand and contract.

SILT LOAM - A clastic sediment, most of the particles of which are between 1/16 and 1/256 millimeter in diameter. Composed of a mixture of clay, silt, sand, and organic matter. It is eighty percent or more silt and less than 12 percent clay.

SILURIAN - The third of seven periods of the Paleozoic era; also, the system of rocks deposited during the period.

SLATE - A fine-grained metamorphic rock possessing a well-developed fissility (slaty cleavage).

STRATIGRAPHY - A branch of geology concerned with the form, arrangement, geographic distribution, classification, and mutual relationships of rock strata, especially sedimentary.

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

SYNCLINE - A fold in rocks in which the strata dip inward from both sides toward the axis.

SYNCLINORIUM - A broad regional syncline on which are superimposed minor folds.

TERTIARY - The older of the two geologic periods comprising the Cenozoic era; also, the system of strata deposited during that period.

THREATENED SPECIES - Wildlife species designated as "threatened" by the U.S. Fish and Wildlife Service.

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

VOLCANIC - Of, pertaining to, like, or characteristic of a volcano; characterized by or composed of volcanoes, as a volcanic region, volcanic belt; produced, influenced, or changed by volcanic agencies; made of materials derived from volcanoes, such as a volcanic cone.

WATER TABLE - The upper surface of a zone of saturation.

WETLANDS - An area subject to permanent or prolonged inundation or saturation that exhibits plant communities adapted to this environment.

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

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APPENDIX A

RESUMES OF SEARCH TEAM MEMBERS

THOMAS S. WEBB

EDUCATION B.S. Civil Engineering, University of Wyoming, 1966
B.A. History, Biology, University of Wyoming, 1964

CERTIFICATIONS Certified Safety Executive - 1987
Certified Safety Manager - 1987
Certified Safety Specialist (Industrial Hygiene) - 1987
Certified Industrial Hygiene, Comprehensive Practice (Not Current) - 1975

PROFESSIONAL EXPERIENCE

1/1988-Present PEER CONSULTANTS, P. C.
Oak Ridge, TN
Oak Ridge Regional Manager

Oak Ridge Regional Manager for all PEER activities and program manager of all PEER tasks performed under contracts with DOE and Bechtel National, Inc. Currently providing technical assistance and support to Hazardous Waste Remedial Action programs at both DOE and DoD facilities, DOE Nuclear and Chemical Waste Programs, and Permanent Waste Storage Programs. The above work includes:

Support of regulatory and policy analysis;
Program research and scientific analysis;
Legislative and regulatory tracking;
Quality assurance and control (QA/QC);
Hydrogeological monitoring support;
Review of recently proposed federal regulations regarding hazardous waste management and groundwater protection;
Environmental analyses, health and safety analyses, community relations planning and other tasks related to remedial action planning.

1987-1/1988 **Project Manager**

Senior Project Manager for the following tasks: the New Boston AFS RI/FS and Robins AFB and Newark AFB Spill Prevention and Response Plans. Technical review and engineering support to DOE on Tinker AFB storm drainage system evaluation and Dover AFB, cadmium reduction in the industrial waste stream. Preliminary assessments for 13 Air National Guard Bases.

1966-1987 U. S. AIR FORCE

1984-1987 Directed the activities of the Occupational & Environmental Health Laboratory in providing consultation, technical guidance, and on-site assistance in industrial hygiene, air and water pollution, entomology, health physics, and bioenvironmental engineering at all Air Force bases in the Pacific area including Hawaii, Japan, Korea, Guam, and the Philippines. As director, developed the plans for establishing an asbestos identification and counting capability to support Air Force bases in the Pacific. Had responsibility for managing the administration and budgeting of operating funds for the organization, procurement of equipment and supplies, day-to-day supervision of laboratory personnel, and conducting selected field studies. Personnel directly supervised included chemists, engineers, medical entomologist, and specialized technicians in each functional area.

1979-1984 As Chief, Bioenvironmental Engineer, Headquarters US Air Force, directed the Bioenvironmental Engineering/Occupational Health programs for all Air National Guard facilities in the United States and its territories. Established policy and guidance by writing and revising Air National Guard regulations and by supplementing Air Force publications. From 1981 to 1984 conducted initial hazardous waste site investigations at Volk Field Wisconsin ANG field training site, Suffolk County ANGB, N.Y., Burlington ANGB, NH, and Lincoln ANGB, NE. Supervised all field activities in drilling, placement, and development of monitoring wells used to determine the extent of the plume and quantity of the contaminants under investigation. Personally determined the number of wells required, their location, and both the soil and ground water sampling strategy including analytes. Collected soil and ground water samples, packaged, and shipped them to OEHL for analysis, and interpreted results. Investigations at the above sites resulted in the placement of over seventy-five monitoring wells and the collection of hundreds of soil and ground water samples. Budgeted for and technically directed the Phase IIA Installation Restoration Program at five other ANG bases including Otis ANGB, MA, Buckley ANGB, CO and McEntire ANGB, SC. Was the only full time certified industrial hygienist in the command and personally conducted IH surveys including asbestos identification and evaluation; also assisted in developing plans and specifications for managing or removing asbestos in Air National Guard facilities. Represented the National Guard Bureau (NGB) Surgeon on the Agency Environmental Protection Committee and the NGBs on the DoD Safety and

Occupational Health Policy Council. Served on DoD subcommittees and provided testimony to Congressional committees in area of expertise.

1977-1979 Directed the Bioenvironmental Engineering/Environmental Health program for Clark AB, John Hay AB, and Wallace AS. Evaluated community and work environments and recommended controls to keep occupational and environmental stresses within acceptable limits. Established and conducted the environmental monitoring program for Clark AB.

1974-1977 As the Command Bioenvironmental Engineer, Headquarters AF Reserve, developed occupational health and environmental protection plans, policy, and programs for all AF reserve bases. Also developed and taught a two week training course for all AF Reserve bioenvironmental engineering technicians.

1972-1974 As Chief, Bioenvironmental Engineering, Robins AFB, Georgia, conducted an industrial hygiene program for 18,000 civilian and 5,000 military workers. Performed industrial hygiene evaluations of aircraft operations, paint stripping, industrial radiography, microwave radiation, laser and other industrial facilities.

1966-1972 Has also served as Chief, Bioenvironmental Engineering, Hill AFB, Utah; DaNang AB, Vietnam; and Wright-Patterson AFB, Ohio.

As the bioenvironmental engineer at the above bases, conducted numerous noise surveys for determining noise levels to which base personnel were exposed. Is also thoroughly familiar with land use planning with respect to aircraft noise having conducted such evaluations for both Hill and Robins AFB. These latter evaluations generated Ldn contours for then current aircraft operations, as well as projected contours for future aircraft conversions and modifications.

As the Bioenvironmental Engineer at five Air Force bases over a period of twelve years, collected, prepared, and interpreted results from base water samples submitted for bacteriological and chemical content analysis. As Commander of Operating Location AD USAF Occupational and Environmental Health Laboratory, directly supervised analytical personnel who performed analysis of lead and other metals in water and was directly responsible for appropriate analytical procedures and accuracy of data. In addition, provided consultative services concerning health and environmental effects to bases experiencing abnormally high levels of metals in drinking water. At Wright-Patterson AFB, assisted in all environmental protection evaluations and conducted stack gas monitoring of all coal-fired heating plants on base. At Hill AFB, was one of the principal authors of the Air Force's first Environmental Impact Statements (1970-71).

PUBLICATIONS:

"Exposure to Radio Frequency Radiation from an Aircraft Radar Unit," Aviation, Space, and Environmental Medicine, November 1980

"For a Breath of Clean Air", AF Aerospace Safety Magazine, March 1975

"Baseline Industrial Shop Surveys," AF Medical Service Digest, April 1973

"Knee Problems Observed in Weapons Loading Personnel," AF Medical Service Digest, March 1970

"Lasers - A New Problem for Bioenvironmental Engineers," AF Medical Service Digest, March 1969

"Use of Iodine as a Swimming Pool Disinfectant," AF Medical Service Digest, July 1967

WILLIAM L. OSBURN

EDUCATION B.S. Chemical Engineering, State University of New York, Buffalo, N.Y., 1978
Engineer-In-Training, 1986

CERTIFICATION Certified as an Asbestos Abatement Supervisor, 1988

MEMBERSHIP American Institute of Chemical Engineers

PROFESSIONAL EXPERIENCE

4/1988-Present PEER CONSULTANTS, P.C.
Oak Ridge, TN
Environmental Engineer

Involved with the evaluation of two U. S. Air Force Bases. One project concerns analysis of the performance of an industrial wastewater system. The other project concerns evaluation of the Hazardous Waste Management Program. Both projects were evaluated considering waste minimization, pretreatment, or alternate disposal methods.

1986-1988 INTERNATIONAL TECHNOLOGY CORPORATION
Knoxville, TN
Project Engineer/Consultant

Responsible for engineering activities for several hazardous waste treatment projects for both radioactive and non-radioactive applications. Projects involved incineration and air pollution control equipment, metals removal, carbon adsorption, stripping, filtration/separation, solvent recovery, design of a TSD facility, and waste minimization. Involved with RCRA and TSCA permit applications. Familiar with SARA Title III compliance. Design activities included material and energy balances, P&IDs, process control, equipment specifications, equipment design and hydraulic calculations.

1984-1986 STV/SANDERS & THOMAS, INC.
Oak Ridge, TN
Lead Engineer

Responsible as a Project Engineer/Project Manager for two hazardous radioactive waste management projects for the Department of Energy's Enriched Uranium Recovery Improvements program. One project involved a proprietary Residue Treatment Process designed to enhance uranium recovery, replacing an existing process. The other project concerned a volume reduction process using a two-stage incinerator designed to burn both solid and liquid hazardous wastes. Duties included engineering and design activities involving heat transfer calculations, heat and material balances, P&IDs, process control, and technical specifications. Project management tasks included man-hour projections, cost estimates, and supervision and coordination of various disciplines working on these projects. **DOE "Q" Clearance Classification.**

1984 SELF-EMPLOYED, under contract at QUADREX-HPS
Oak Ridge, TN
Senior Design Engineer

Assisted Plant Engineer in preparation of P&IDs, flowcharts, and equipment fabrication blueprints. Projects engineered included renovation and addition of equipment and processes to remove radioactive contaminants (decontamination). Processes consisted of acid baths (leaching), electropolish line, grit blast line, freon decontamination, acid purification, and water treatment.

1983 Under contract at TECHNOLOGY FOR ENERGY CORPORATION
Knoxville, TN
Senior Project Engineer

Responsible for the development of technical specifications, installation and testing procedures for airborne radiation monitoring instrumentation and equipment. Implemented the development of a liquid radiation monitoring system prototype for nuclear-fueled power plants. Designed the liquid effluent monitoring systems for the Clinch River Breeder Reactor Plant Project. Performed hydraulic calculations, design engineering functions, and developed instrument logic/loop diagrams, as well as

P&IDs. Job required a working knowledge of both HVAC and piping principles, standards and specifications as they relate to critical environmental situations.

1982-1983 LOCKWOOD GREENE ENGINEERS
Oak Ridge, TN
Senior Designer

Performed process design of several operations to improve the efficiency of radwaste reprocessing. These improvements brought the plant up-to-date with the current EPA and RCRA standards. Designed processing equipment according to nuclear criticality safeguard standards. Prepared equipment and piping specifications, conceptual design criteria and reports, as well as health and safety analysis for nuclear material production facility. HVAC design of industrial ventilation system for cell ventilation and hot off-gas piping for radioisotope production plant. Additional areas of responsibility included piping design, cost estimation, equipment decommissioning and demolition and process retrofits.

1982 DANIEL INTERNATIONAL CORPORATION
Hopewell, VA
Engineer I

Prepared equipment specifications and requests for quotations. Performed bid analysis and made recommendations. Prepared equipment requisitions and performed engineering functions, including hydraulic calculations, valve and line sizing, pump selection.

1980-1982 APPLIED ENGINEERING COMPANY
Orangeburg, SC
Process Engineer

Responsibilities included process design and engineering, economic evaluations, development activities and sales support. Project manager for $90,000 chlorine vaporization system. Lead Process Engineer on $1.5 million caustic recovery project: performed design and assisted with fabrication and start-up of double-effect caustic evaporation system. Design engineering included process design of various chemical production plants including natural gas, dimethyl ether, sodium hydroxide, synfuels, gasification and energy-related projects. Familiar with skid-mounted and modular equipment and systems. Experienced in heat exchanger design and rating, hydraulic calculations, process control and corrosion prevention. Computer programs used for process design included ChemShare, Flowtran and GPS; HTRI and B-JAC for heat exchanger design and rating; programmed with FORTRAN and BASIC. Developed computer programs to rate heat exchangers and to calculate the return on investment of capital projects. Transferred to Daniel International Corporation.

1979-1980 AMERICAN STANDARD HEAT TRANSFER DIVISION
Buffalo, NY
Senior Application Engineer

Basic functions included engineering and design of shell and tube, as well as plate and frame exchangers. Rated equipment; prepared specifications and quotations of sales inquiries. Provided technical assistance to field sales and customers. Evaluated inquiry requirements and determined suitability for quotation; adapted standard and engineered equipment to satisfy application. Determined prices for engineered exchangers evaluating special design.

1978-1979 APV COMPANY, INC.
Tonawanda, NY
Sales Application Engineer

Developed process design applications, price estimates of heat exchangers and other process equipment. Prepared company proposals, equipment requisitions, and quotations for various customers. Project Engineer for double-effect pineapple juice evaporator. Performed plant layout, process piping layouts, and system design. Engineering responsibilities included equipment sizing, heat and material balances, hydraulic calculations, process control, P&IDs, materials of construction and gasket (elastometer) selection. Sales responsibilities: created and maintained customer relations, wrote sales letters, cost analysis and marketing surveys.

ANTHONY R. WAGNER

EDUCATION B.A. Geology, University of Colorado, 1977

PROFESSIONAL EXPERIENCE

1987-Present PEER CONSULTANTS, P.C.
Oak Ridge, TN
Geologist

Task Manager on Preliminary Assessment (PA) assignments for Air National Guard Bases under the Installation Restoration Program (IRP). Tasks involved leading a team of geologists, civil engineers, and technicians in researching sites, site evaluations, conducting interviews, rating potentially contaminated sites under the Air Force HARM system and EPA's HRS system, and making recommendations for further action. Have provided technical and research assistance on U. S. Air Force hazardous waste sites programs. Knowledgeable in the location and removal of underground storage tanks, and contributed to a Remedial Investigation Report/Plan for East Fork Poplar Creek at the Y-12 Plant in Oak Ridge, Tennessee.

1987 ARDAMAN AND ASSOCIATES
Sarasota, FL
Engineering Technician

Responsibilities included geologic investigations such as soil borings and analysis, auger and rotary rig drilling for subsurface investigations, hydrogeologic investigations and foundation studies.

1980-1987 EMERALD EXPLORATION CONSULTANTS, INC.
Austin, TX
Senior Geologist

Project management including seismic and magnetotelluric crew supervision, seismic data processing supervision, data interpretation, technical report writing, and project proposal and budget management for government and private sector projects. Traveled extensively throughout the U.S. and China.

1978-1980 KENWILL, INC.
Maryville, TN
Geologist

Responsibilities evolved around the Central Tennessee oil and gas prospect evaluation from initial planning stages through well completion, coal and mineral exploration and reserve estimation studies including surface and underground geologic mapping, and laboratory duties for quality control at a limestone mine.

PROFESSIONAL REGISTRATION Licensed Professional Geologist, State of North Carolina - License Number 526

CERTIFICATION OSHA 29 CFR1910.120(e) as provided by SARA, Health and Safety Training for Hazardous Waste Activities

PROFESSIONAL MEMBERSHIPS National Water Well Association/Association of Ground Water Scientists and Engineers

American Association of Petroleum Geologists

Society of Exploration Geophysicists

PUBLICATIONS High Resolution Seismic Surveys and Their Applications to Coal Exploration and Mine Development: Case Histories, 1984, (abstract), AAPG Bull., V. 68, No. 7.

The Application of High Resolution Seismology to the Delineation of Faulting and Coal Seam Thickness: A Continuing Case History, 1984. In Proceedings of the 1984 Rocky Mountain Coal Symposium, Bismarck, North Dakota.

HARLAN T. FAULK

EDUCATION: A. S., Business Management, Lansing Community College, Lansing, MI, 1982
Bioenvironmental Engineering Technician, USAF School of Aerospace Medicine, 1955, Advanced Principles 1965.

CERTIFICATION Certified in Asbestos Practices and Procedures for Contractors, Supervisors and Project Designers by EPA approved course, 1987

Certified for Field Monitoring, Sampling, and Safety Aspects of Hazardous Materials at Hazardous Waste Sites by EPA approved course, 1988

PROFESSIONAL EXPERIENCE

2/1988-Present

PEER CONSULTANTS, P. C.
Oak Ridge, TN
Environmental Engineering Technician/Industrial Hygienist

Provides technical and research assistance for preliminary assessments (PA), for Air National Guard Bases under the Air Force's Installation Restoration Program (IRP). Collects data during PA's at IRP sites. Reviews Health and Safety Plans for completeness and makes appropriate recommendations for changes when required for U. S. Air Force's RI/FS. Develops sampling techniques and conducts sampling of asbestos containing materials for bulk and airborne analyses. Prepares and ships samples to the laboratory for analysis. For the Department of Energy, reviews Notices of Intent (NOI) to remove asbestos for regulatory compliance, writes letters to the regulators as needed to forward the NOI to the appropriate state regulator. Provides technical assistance concerning hazardous waste management practice at Travis AFB, California under the DOE HAZWRAP program. Develops environmental sampling and monitoring plans, project QA/QC plans, and environmental equipment requirements. Orders sampling equipment and supplies to conduct environmental sampling at RI/FS sites. Uses the equipment and supplies to collect samples, decontaminate sampling equipment and sample containers, and preserve samples to meet EPA protocols. Conducts field surveys for environmental contamination, (chemical and radiological) noise, and physical hazards at hazardous waste sites. Writes detailed reports of findings for inclusion in total project report.

1982-1987

DEPARTMENT OF THE AIR FORCE (CIVILIAN)
Selfridge Air National Guard Base
Mt. Clemens, MI
Industrial Hygiene/Environmental Manager

Implemented, managed and administered a bioenvironmental engineering (industrial hygiene/environmental monitoring) program. Assessed water, air, and ground pollution monitoring requirements. Identified and evaluated potential pollution sources, developed sampling strategies, and maintained or revised base supplements to Air Force regulations concerning pollution monitoring. Provided pollution data requested by federal, state, or local agencies. Assisted in the implementation of the Installation Restoration Program (IRP); provided technical and analytical assistance for the IRP. Provided technical assistance in support of the Resource Conservation and Recovery Act (RCRA). Provided guidance for implementation of the base RCRA programs; reviewed plans for location and construction of hazardous waste accumulation points and storage facilities; arranged for analysis of hazardous waste; and provided technical assistance in the training of hazardous waste facility managers and employees. Under the general guidance of Air Force Standards, OSHA, and EPA requirements, formulated environmental health policies, bioenvironmental engineering management plans, wrote base environmental monitoring regulations, and planned and directed the programs. Researched and developed programs for a new method of detection and control of hazards and environmental stresses. Supervised and conducted sampling programs to assess the base's impact on the environment using EPA protocols; evaluated plans and specifications of proposed construction projects for environmental impact and appropriate workplace environmental conditions. Member of the Base Environmental Protection Committee. Designed and implemented a computerized bioenvironmental engineering program.

1955-1974 **UNITED STATES AIR FORCE (ACTIVE DUTY)**
Various Worldwide Assignments
Bioenvironmental Engineering Technologist

Implementation of Air Force environmental/industrial hygiene programs, including industrial hygiene/environmental surveillance: sampling, ventilation, lighting, radiation and asbestos monitoring; community health programs such as waste/hazardous waste disposal, potable water and waste water analysis, and collection of laboratory specimens. Special Accomplishment: January 1967-June 1970, assigned to the USAF Occupational and Environmental Health Lab, McClellan AFB, CA: Assisted in the development of specialized pollution survey equipment; conducted chemical analysis of potable water, for RCRA compliance: waste water, soil, industrial waste, industrial products, air and other industrial hygiene samples using special analytical procedures and equipment.

APPENDIX B

OUTSIDE AGENCY CONTACT LIST

Appendix B

OUTSIDE AGENCY CONTACT LIST

Maine Geological Survey
Department of Conservation
State House Station No. 22
Augusta, ME 04333
(207) 289-2801

Department of the Interior
Fish and Wildlife Service
One Gateway Center, Suite 700
Newton, MA 02158

U.S. Department of Agriculture
Soil Conservation Service
Field Office, 89 Hillside Avenue
Bangor, ME 04401
(207) 947-6622

Maine Department of Environmental Protection (DEP)
Hogan Road
Bangor, ME 04401
(207) 941-4570

Maine Department of Fish and Wildlife
P.O. Box 1298
Bangor, ME 04401
(207) 941-4474

APPENDIX C

USAF HAZARD ASSESSMENT RATING METHODOLOGY

Appendix C

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, December 11, 1981).

Accordingly, the U.S. 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 (PA) 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 USAF's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DoD program needs.

The model uses data readily obtained during the Preliminary Assessment portion (Phase I) 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 evaluatin- and setting restrictions on excess DoD properties.

Site scores are developed using the appropriate ranking factors according to the method presented in the flowchart (Figure I-A of this report). The site rating form is provided at the end of this appendix, and the factor rating criteria is furnished as Appendix E.

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

The receptors category rating is based on four rating factors: (1) the potential for human exposure to the site, (2) the potential for human ingestion of contaminants should underlying aquifers be polluted, (3) the current and anticipated uses of the surrounding area, and (4) the potential for adverse effects upon important biological resources and fragile natural settings. The potential for human exposure is evaluated on the basis of the total population within 1000 feet of the site, and the distance between the site and the base boundary. The potential for human ingestion of contaminants is based on the distance between the site and the nearest well, the groundwater use of the uppermost aquifer, and population served by the groundwater supply within 3 miles of the site. The uses of the surrounding area are determined by the zoning within a 1-mile radius. Determination of whether or not critical environments exist within a 1-mile radius of the site predicts the potential for adverse effects from the site upon important biological resources and fragile natural settings. Each rating factor is numerically evaluated (from 0 to 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 steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The 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 normalilzed to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites with no contaminant are not reduced. Scores for sites with limited contaminant 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 METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land use/zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Groundwater use of uppermost aquifer	Not used, other sources readily available	Commercial industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available, commercial, industrial, or irrigation; no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-15	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

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

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records
- o Knowledge of types and quantities of wastes generated by shops and other areas on base

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

Rating Factors	Rating Scale Levels: 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability, and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

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

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

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

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

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

B. Persistence Multiplier for Point Rating

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

C. Physical State Multiplier

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

III. PATHWAYS CATEGORY

A. Evidence of Contamination

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

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

B-1 Potential for Surface Water Contamination

Rating Factors	0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to a mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($>10^{-6}$ cm/sec)	6
Rainfall intensity based on 1-year, 24 hour rainfall (thunderstorms)	<1.0 inch	1.0 to 2.0 inches	2.1 to 3.0 inches	>3.0 inches	8

B-2 Potential for Flooding

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

B-3 Potential for Groundwater Contamination

Rating Factors	0	1	2	3	Multiplier
Depth to groundwater	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay 10^{-2} to 10^{-4} cm/sec	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high groundwater level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean groundwater level	8

III. PATHWAYS CATEGORY - (Continued)

Direct access to groundwater (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

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

B. Waste Management Practices Factor

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

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

Guidelines for fully contained:

Landfills:

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

Surface Impoundments:

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

Spills:

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

Fire Protection Training Areas:

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

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

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE ______

LOCATION ______

DATE OF OPERATION OR OCCURRENCE ______

OWNER/OPERATOR ______

COMMENTS/DESCRIPTION ______

SITE RATED BY ______

I. RECEPTORS

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

Subtotals ______ ______

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

II. WASTE CHARACTERISTICS

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

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

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

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

______ x ______ = ______

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

______ x ______ = ______

III. PATHWAYS

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

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

Subscore ______

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

1. Surface water migration

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

Subtotals ______ ______

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

2. Flooding

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

Subscore (100 x factor score/3) ______

3. Groundwater migration

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

Subtotals ______ ______

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

C. Highest pathway subscore

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

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

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

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

______________ x ______________ = ______

APPENDIX D

SITE HAZARDOUS ASSESSMENT RATING FORMS

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Drainage Ditch (Site 1)

LOCATION

DATE OF OPERATION OR OCCURRENCE Ongoing

OWNER/OPERATOR City of Bangor, Maine/Bangor International Airport

COMMENTS/DESCRIPTION Covered/uncovered culvert and ditch. Ditch is earthen with reeds and grass.

SITE RATED BY C. C. Weiland/K. E. Owens

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 ft. of site	3	4	12	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	10
F. Water quality of nearest surface water body	0	6	0	18
G. Groundwater use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	2	6	12	18
		Subtotals	81	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 45.0

II. WASTE CHARACTERISTICS

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

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

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

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

80 x 1.0 = 80

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

80 x 1.0 = 80

III. PATHWAYS

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

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

Subscore 80

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

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	44	108

Subscore (100 x factor score subtotal/maximum score subtotal) 40.7

2. Flooding

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

Subscore (100 x factor score/3) 0

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	2	8	16	24
Direct access to groundwater	1	8	8	24
		Subtotals	76	114

Subscore (100 x factor score subtotal/maximum score subtotal) 66.7

C. Highest pathway subscore

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

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	45
Waste Characteristics	80
Pathways	80

Total 205 divided by 3 = 68.3 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

68.3 x 1.0 = 68

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Light Duty Ramp and Perimeter (Site 2)

LOCATION Northeast side of runway - ANG Facilities

DATE OF OPERATION OR OCCURRENCE Ongoing since 1947

OWNER/OPERATOR Air National Guard

COMMENTS/DESCRIPTION

SITE RATED BY K. E. Owens

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 ft. of site	2	4	8	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	0	6	0	18
G. Groundwater use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	1	6	6	18
		Subtotals	55	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 30.6

II. WASTE CHARACTERISTICS

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

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

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

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

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

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

60 x 0.9 = 54

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

54 x 1.0 = 54

III. PATHWAYS

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

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

Subscore 80

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

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	0	8	0	24
Subtotals			36	108

Subscore (100 x factor score subtotal/maximum score subtotal) 33.3

2. Flooding

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

Subscore (100 x factor score/3) 0

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to groundwater	1	8	8	24
Subtotals			52	114

Subscore (100 x factor score subtotal/maximum score subtotal) 45.6

C. Highest pathway subscore

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

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	30.6
Waste Characteristics	54.0
Pathways	80.0
Total 164.9 divided by 3 =	54.9
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

54.9 x 1.0 = 55

APPENDIX E

USAF HAZARD ASSESSMENT RATING METHODOLOGY

FACTOR RATING CRITERIA

HEADQUARTERS, 101st AIR REFUELING WING
MAINE AIR NATIONAL GUARD
BANGOR INTERNATIONAL AIRPORT
BANGOR, MAINE

USAF HAZARD ASSESSMENT RATING METHODOLOGY (HARM)
FACTOR RATING CRITERIA

1. RECEPTORS CATEGORY

Population within 1,000 feet of site:	
Site No. 1	Greater than 100
Site No. 2	26 to 100
Distance to nearest well:	
Site No. 1	3001 feet to 1 mile
Site No. 2	1 to 3 miles
Land use/zoning within 1 mile radius	1 Residential 2 Residential
Distance to Base Boundary	
Site No. 1	0 to 1000 feet
Site No. 2	1001 feet to 1 mile
Critical Environments within 1 mile	Natural areas
Water quality of nearest surface water body	Recreation, propagation and management of fish and wildlife
Groundwater use of uppermost aquifer	
Site 1	Not used
Site 2	Not used
Population served by surface water supply within 3 miles downstream of site	0
Population served by groundwater supply within 3 miles of site	1 to 50

HEADQUARTERS, 101st AIR REFUELING WING
MAINE AIR NATIONAL GUARD
BANGOR INTERNATIONAL AIRPORT
BANGOR, MAINE

USAF HAZARD ASSESSMENT RATING METHODOLOGY (HARM)
FACTOR RATING CRITERIA

2. WASTE CHARACTERISTICS

Quantity:

Site No. 1	Large:	20 tons or 85 drums
Site No. 2	Medium:	5 to 20 tons, 21 to 85 drums

Confidence Level:

Site No. 1	Confirmed Confidence Level
Site No. 2	Confirmed Confidence Level

Toxicity:

Site No. 1	Sax's Level 1
Site No. 2	Sax's Level 1

Ignitability:

Site No. 1	Flash Point at 140°F
Site No. 2	Flash Point at 140°F

Radioactivity:

Site No. 1	At or Below Background Levels
Site No. 2	At or Below Background Levels

Persistence Multiplier:

Site No. 1	1.0
Site No. 2	0.9

Physical State Multiplier:

Site No. 1	1.0
Site No. 2	1.0

HEADQUARTERS, 101st AIR REFUELING WING
MAINE AIR NATIONAL GUARD
BANGOR INTERNATIONAL AIRPORT
BANGOR, MAINE

USAF HAZARD ASSESSMENT RATING METHODOLOGY (HARM)
FACTOR RATING CRITERIA

3. PATHWAYS CATEGORY

Surface Water Migration:

Distance to Nearest Surface Water:

Site No. 1	501 to 2000 feet
Site No. 2	0 to 500 feet
Net Precipitation:	+5 to +20 inches
Soil Erosion:	None

Surface Permeability:

Site No. 1	less than 10^{-2} centimeters/second
Site No. 2	less than 10^{-2} centimeters/second
Rainfall Intensity:	2.1 to 3.0 inches
Flooding:	Beyond 100-year floodplain

Groundwater Migration

Depth to Groundwater	11 to 50 feet
Net Precipitation	+5 to +20 inches

Soil Permeability:

Site No. 1	less than 10^{-2} centimeters/second
Site No. 2	10^{-2} to 10^{-4} centimeters/second

Subsurface Flow:

Site 1	Bottom of site frequently submerged
Site 2	Bottom of site greater than 5 feet above high groundwater level

Direct Access to Groundwater:

Site 1	Low risk
Site 2	Low risk

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BANGOR, MAINE

USAF HAZARD ASSESSMENT RATING METHODOLOGY (HARM)
FACTOR RATING CRITERIA

4. WASTE MANAGEMENT PRACTICES CATEGORY

Practice:

Site No. 1	No containment
Site No. 2	No containment