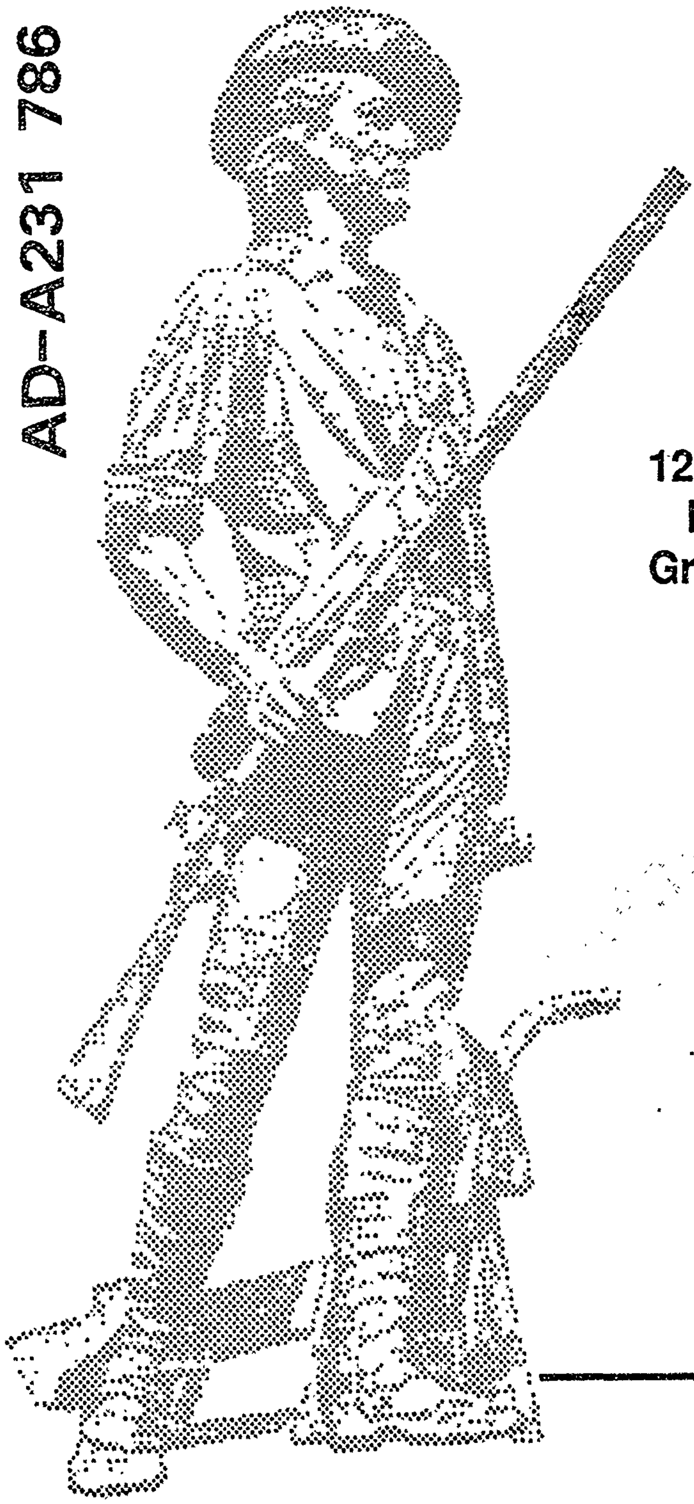
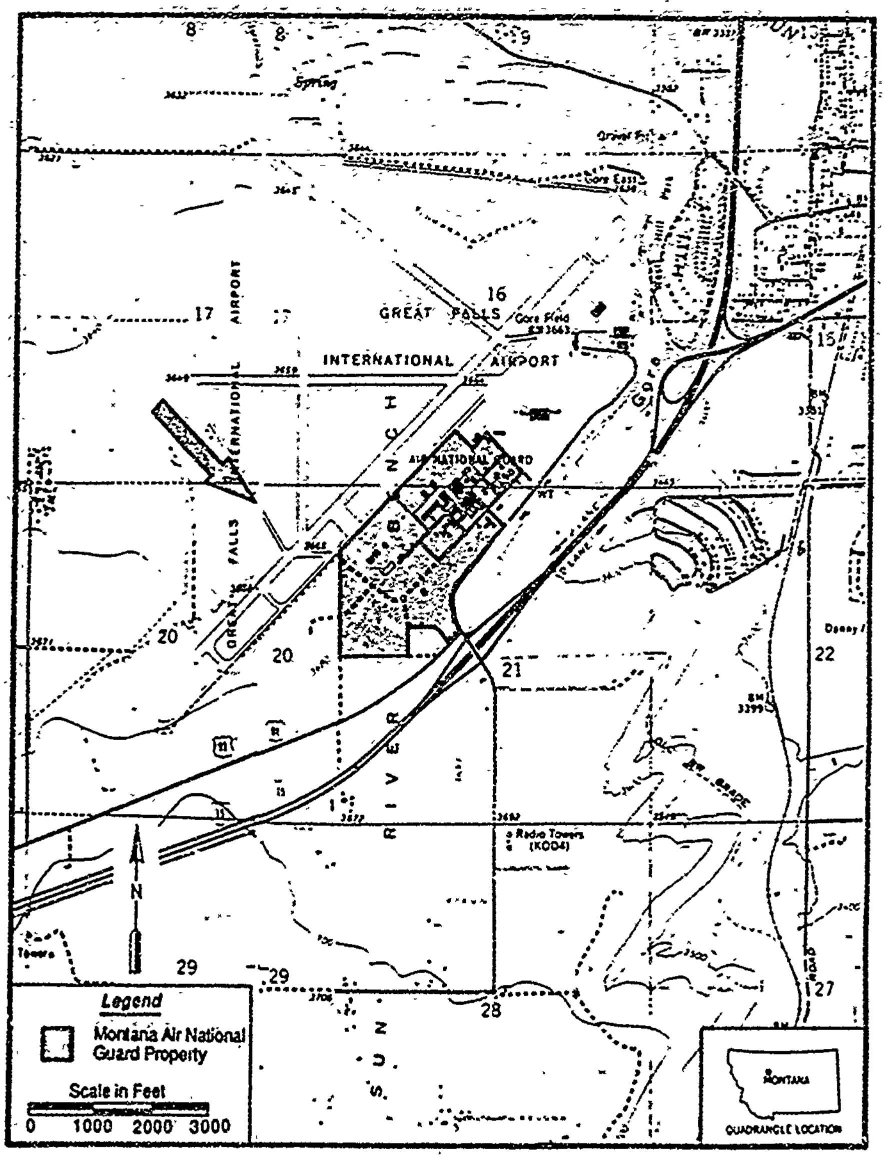
INSTALLATION RESTORATION PROGRAM



Preliminary Assessment

120th Fighter Interceptor Group
Montana Air National Guard
Great Falls International Airport
Great Falls, Montana

Hazardous Materials Technical Center
August 1988



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INSTALLATION RESTORATION PROGRAM
PRELIMINARY ASSESSMENT

FOR

120th FIGHTER INTERCEPTOR GROUP
MONTANA AIR NATIONAL GUARD
GREAT FALLS INTERNATIONAL AIRPORT
GREAT FALLS, MONTANA

August 1988

Prepared for

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Andrews Air Force Base, Maryland 20310

Prepared by

Hazardous Materials Technical Center
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Contract No. DLA 900-82-C-4426

TABLE OF CONTENTS

		Page
	EXECUTIVE SUMMARY	ES-1
I.	INTRODUCTION	I-1
	A. Background	I-1
	B. Purpose	I-1
	C. Scope	I-2
	D. Methodology	I-3
II.	INSTALLATION DESCRIPTION	II-1
	A. Location	II-1
	B. Organization and History	II-1
III.	ENVIRONMENTAL SETTING	III-1
	A. Meteorology	III-1
	B. Geology	III-1
	C. Soils	III-2
	D. Hydrology	III-3
	E. Critical Habitats/Endangered or Threatened Species	III-4
IV.	SITE EVALUATION	IV-1
	A. Activity Review	IV-1
	B. Disposal/Spill Site Identification, Evaluation and Hazard Assessment	IV-1
	C. Other Pertinent Facts	IV-11
V.	CONCLUSIONS	V-1
VI.	RECOMMENDATIONS	VI-1
	GLOSSARY OF TERMS	GL-1
	BIBLIOGRAPHY	BIB-1

Page

APPENDIX A. Resumes of HMTC Preliminary Assessment Team A-1

APPENDIX B. Outside Agency Contact List B-1

APPENDIX C. U.S. Air Force Hazard Assessment Rating Methodology C-1

APPENDIX D. Site Factor Rating Criteria and Hazardous Assessment Rating Forms D-1

LIST OF FIGURES

1. Preliminary Assessment Methodology Flow Chart I-4

2. Location Map of the Montana Air National Guard, Great Falls International Airport, Great Falls, Montana II-2

3A. Site Map of the Montana Air National Guard, Great Falls International Airport, Great Falls, Montana IV-5

3B. Site Map of the Montana Air National Guard, Great Falls International Airport, Great Falls, Montana IV-6

LIST OF TABLES

1. Hazardous Waste Disposal Summary: Montana Air National Guard, Great Falls International Airport, Great Falls, Montana IV-2

2. Site Hazard Assessment Scores (as derived from HARM): Montana Air National Guard, Great Falls International Airport, Great Falls, Montana IV-8

3. Underground Storage Tank Inventory, Montana Air National Guard, Great Falls International Airport, Great Falls, Montana IV-12

EXECUTIVE SUMMARY

A. Introduction

The Hazardous Materials Technical Center (HMTC) was retained in April 1988 to conduct the Installation Restoration Program (IRP) Preliminary Assessment (PA) of the 120th Fighter Interceptor Group, Montana Air National Guard, Great Falls International Airport, Great Falls, Montana, (hereinafter referred to as the Base), under Contract No. DLA-900-82-C-4426. The Preliminary Assessment included:

- o an onsite visit, including interviews with 26 past and present Base employees conducted by HMTC personnel during 25-29 April 1988;
- o the acquisition and analysis of pertinent information and records on hazardous material use and hazardous waste generation and disposal at the Base;
- o the acquisition and analysis of available geological, hydrological, meteorological, and environmental data from pertinent Federal, State, and local agencies; and
- o the identification of sites on the Base that are potentially contaminated with hazardous materials/hazardous wastes (HM/HW).

B. Major Findings

Past Base operations involved the use and disposal of materials and wastes that were subsequently categorized as hazardous. The major operations of the Base that use and dispose of HM/HW include aircraft maintenance; ground maintenance; and petroleum, oil, and lubricant (POL) management and distribution. Varying quantities of waste oils, recovered fuels, spent cleaners, solvents, and acids are generated by these activities.

Interviews with 26 past and present Base personnel with an average of 20 years experience and a field survey resulted in the identification of eight disposal sites at the Base. The eight sites are potentially contaminated with HM/HW and seven sites were assigned a Hazard Assessment Score (HAS) according to the U.S. Air Force Hazard Assessment Methodology (HARM). The volume of waste estimates provided are conservative. They do not take into account biodegradation and evaporation of the waste, which may decrease the amount of contamination remaining in the soil.

Site No. 1 - Current Fire Training Area (HAS-78)

The current fire training area (FTA) has been used since 1968 and includes two blackened areas northwest of the small arms range and power check pad. The main FTA is a circular area approximately 150 feet across. Stained soil, resulting from waste fuel run-off, was observed for approximately 100 feet west of the FTA. The second area is rectangularly shaped and is located immediately northeast of the main area. Stained soil and other materials (cans, wood, metal, and tire debris) used in fire training were observed in this area. Neither area is bermed and vegetation is stressed around their perimeters. Approximately 4,500 gallons/year of fuel has been used for fire training in these areas. Assuming at least 70 percent of the flammable liquid was burned, 27,000 gallons may remain in the soil at this site.

Site No. 2 - Drainage Ditch Off Old Power Check Pad (HAS-65)

A northwest-oriented drainage ditch, which receives runoff from the old power check pad, has been contaminated with POL waste from overflow of an oil/water separator and an underground storage tank located below the pad (constructed in 1975). The overflow drains into a 10-inch pipe which discharges to the ditch approximately 250 feet away. Vegetative stress, dark discolored soil, and a petroleum odor were observed within the ditch during the site visit. Visual signs of contamination occur for a distance of approximately 200 feet along the bottom of the ditch.

Site No. 3 - North Disposal and Fire Training Pit (HAS-67)

An old FTA surrounded by the boundary of a gravel pit was reported to be on airport property north of the abandoned taxiway. The old FTA was used approximately 15 times from 1966 to 1968. Approximately 500 to 600 gallons of contaminated fuel were used for each burn. Two thousand five hundred gallons may remain in the soil assuming at least 70 percent of the flammable liquid was burned. Long before this are was used for fire training, this FTA served as a disposal site for contaminated fuel, which had leaked from F-89 aircraft from 1957 to 1960. The quantity dumped varied between 50 and 100 gallons/day. A conservative estimate leads to a total of over 50,000 gallons.

Site No. 4 - Former Fire Training Area No. 1 (HAS-52)

The Former Fire Training Area No. 1, located on the north corner of the Current Hush House (Building No. 71, constructed in 1987), was used from 1959 to 1963. There was one fire training exercise per month with approximately 1,200 to 1,500 gallons of fuel used for each burn. Assuming at least 70 percent of the flammable liquid was burned, approximately 25,000 gallons of unburned fuel may remain at this site.

Site No. 5 - Former Fire Training Area No. 2 (HAS-52)

This fire training area was located on the west corner of the Alert Aircraft Shelter area and was used from 1964 to 1966. It was used once per month and the quantity of fuel used per burn was approximately 500 to 600 gallons. Waste oil mixtures and other liquid wastes used in both pits included solvents, thinners, and contaminated fuel. Assuming at least 70 percent of the flammable liquid was burned, approximately 6,000 gallons of unburned fuel may remain at this area.

Site No. 6 - Aerospace Ground Equipment (AGE, Building No. 22) Area (HAS-52)

A dry well and a ditch, once used for the disposal of hazardous wastes, were identified. The ditch is located along the fenceline on the southeast side of Building No. 22 and measures approximately 50 feet in length. The ditch, used from 1962 to 1978, received small amounts of different waste oil products. A dry well was once located within 10 feet of the southwest wall of Building No. 22. This dry well, paved over about 10 years ago, was also used from 1962 to 1978. Approximately 20 gallons/week of all liquid wastes generated in the AGE shop were dumped in this dry well, which filled frequently. Approximately 20,000 gallons of all AGE generated liquid wastes were disposed of in this area.

Site No. 7 - Dry Well Off Corrosion Control Building (Building No. 23) (HAS-52)

A drŷ well wȧs located within 10 feet of the northwest wall of Building No. 23. All liquid wastes amounting to more than 20 gallons/week generated by the old motor pool shop were disposed of at this location. This dry well was used from 1955 to 1964 and is currently covered over by grass. The accumulated wastes total approximately 10,000 gallons.

Site No. 8 - Dry Well Off Composite Maintenance Building (Building No. 32) (Unrated)

A dry well was located betwewen Buildings 30 and 32. This dry well, used by the AGE shop during 1971 to 1977, received minimal ammounts of wastes. These wastes may have included engine oil, hydraulic fluid, paint strippers, JP-4, and PD-680. No further waste quantity information is available, therefore no HAS is assigned.

C. Conclusions

Information obtained through interviews with past and present Base personnel resulted in the identification of eight areas that are potentially contaminated with HM/HW. At all of the identified sites, the potential exists for contamination of soils, surface water, or groundwater and subsequent contaminant migration. Seven of these sites were assigned a HAS according to HARM. Site No. 8 was unscored because, according to interviews with Base personnel, minimal amounts of wastes were disposed at this site and no further quantity confirmation is available. However, the potential exists for environmental contamination in this area due to the nature of the waste disposed of at this site.

D. Recommendations

Because of the potential for contamination of soils, groundwater, and surface water at the Base and migration of contaminants to off-Base receptors, further IRP investigation is recommended in accordance with applicable regulations for all of the identified sites.

I. INTRODUCTION

A. Background

The 120th Fighter Interceptor Group (FIG), Montana Air National Guard is located at the Great Falls International Airport, Great Falls, Montana (hereinafter referred to as the Base). The unit was established in 1947. Past operations at the Base involved the use and disposal of materials and wastes that subsequently were categorized as hazardous. Consequently, the National Guard Bureau has implemented its Installation Restoration Program (IRP). The IRP consists of the following:

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

B. Purpose

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

A visual inspection was made of the suspected sites. Relevant information collected and analyzed as a part of the Preliminary Assessment included the history of the Base, with special emphasis on the history of the shop operations and their past HM/HW management procedures; local geological, hydrological, and meteorological conditions that may affect migration of contaminants; local land use, public utilities, and zoning requirements that could affect the potential for exposure to contaminants; and the ecological settings that indicate environmentally sensitive habitats or evidence of environmental stress.

C. Scope

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

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

The onsite visit and interviews with past and present Base personnel were conducted during the period 25-29 April 1988. The Preliminary Assessment site visit was conducted by Dr. Naichia Yeh, Ph.D, Task Manager/Environmental Scientist; Mr. Mark Johnson, Program Manager/P.G.; and Mr. Lance Gladstone, Geologist. Other HMTC personnel who assisted with the Preliminary Assessment include Mr. Raymond G. Clark, Jr., Department Manager/P.E. Personnel from the Air National Guard who assisted in the Preliminary Assessment include Mr. Henry H. Lowman and Ms. Carol Ann Beda. The Point of Contact (POC) at the Base was Lt. Timothy Lohof, Base Environmental and Design Engineer.

D. Methodology

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

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

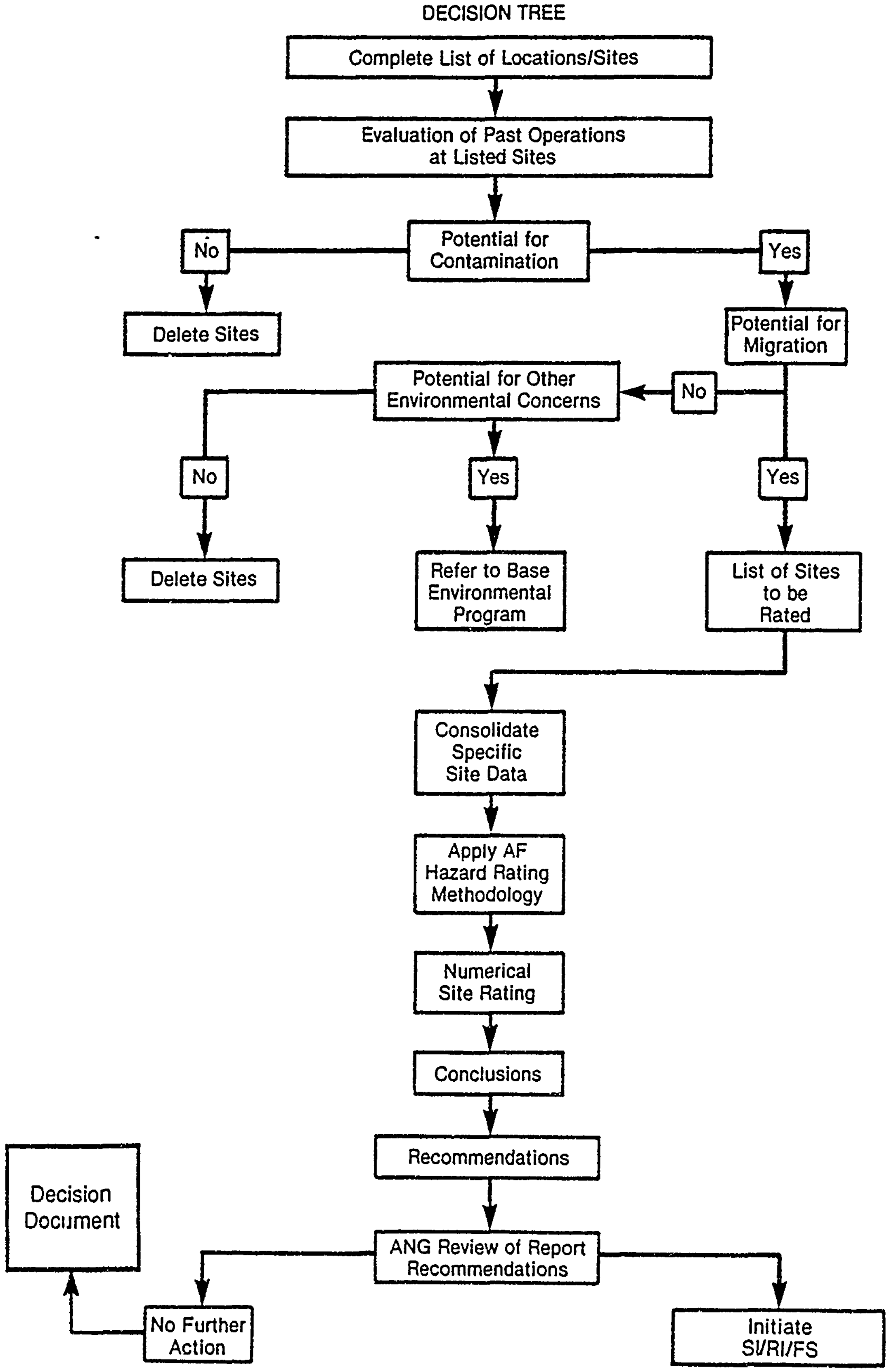
Historic records contained in the Base files are collected and reviewed to supplement the information obtained from interviews. Using this information, a list of past waste spill/disposal sites on the Base is identified for further evaluation. A general survey tour of the identified spill/disposal sites,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

Detailed geological, hydrological, meteorological, developmental (land use and zoning), and environmental data for the area of study is also obtained from the POC, and from appropriate Federal, State, and local agencies. A list of outside agencies contacted is in Appendix B. Following a detailed analysis of all the information obtained, areas are identified as suspect areas where HM/HW

HMTC PRELIMINARY ASSESSMENT INSTALLATION RESTORATION PROGRAM

Figure 1.

Preliminary Assessment Methodology Flow Chart.



disposal may have occurred. Where sufficient information is available, sites are assigned a Hazard Assessment Score (HAS) using the U.S. Air Force Hazard Assessment Rating Methodology (HARM) (Appendix C). However, the absence of a HAS does not necessarily negate a recommendation for further IRP investigation, but rather may indicate a lack of data. The HAS is computed from the data included in the Factor Rating Criteria. (Appendix D).

II. INSTALLATION DESCRIPTION

A. Location

The 120th FIG, Montana Air National Guard, is located at the Great Falls International Airport. The airport is located in Cascade County, Montana, about 3 miles from downtown Great Falls. The Air National Guard (ANG) facilities include over 50 buildings and occupy approximately 125 acres on the southeast corner of the airport.

The area immediately south of the ANG Base is designated for industrial and commercial uses. Part of the open area southwest of the airport is used for active outdoor recreation. The ANG has planned to allocate from the Great Falls International Airport Authority an area of approximately 107 acres north of the Base for proposed missile maintenance and storage facilities.

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

B. Organization and History

The present Montana Air National Guard began as the 186th Fighter Squadron, which was formed under the command of Lt. Col. Willard B. Sperry on 27 June 1947. The unit was equipped with the P-51 "Mustang" aircraft, later designated the F-51.

In April 1951, the 186th was mobilized for the Korean conflict with the F-51, then was reformed at Great Falls International Airport in December of 1952. It became the first Air National Guard unit to be assigned the F-86 "Sabre" in November of 1953.

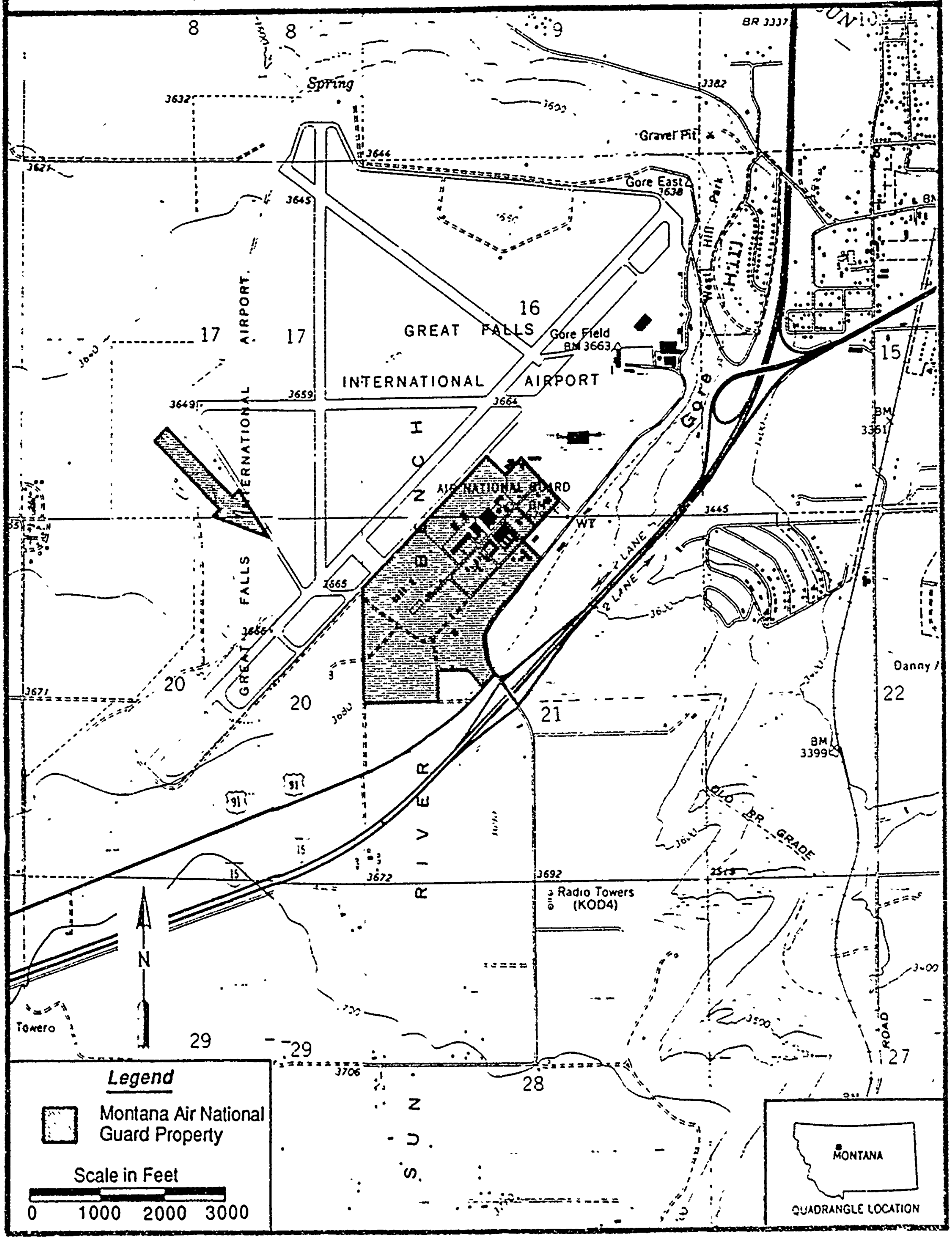
In August of 1955, the unit converted to the F-89C "Scorpion." The 120th Fighter Group came into existence on 16 April 1956. The aircraft was updated to the F-89H 3-1/2 years later. The Base received its first F-89J in March of 1960.

HMTC

Source: U.S.G.S.
7.5 minute Series
Antelope Butte and
Southwest Great Falls,
Montana, 1975.

Figure 2.

Location Map of Montana Air National Guard.



From September 1966 to April 1972, the Base was equipped with the F-102A "Delta Dart." Then the 120th was selected to receive a new aircraft, the F-106A.

In 1984, the unit's mission was expanded when assigned the additional task of operating an Alert Detachment at Davis-Monthan AFB, Tucson, Arizona. Since July 1, 1987, the unit has flown the F-16 "Fighting Falcon."

III. ENVIRONMENTAL SETTING

A. Meteorology

The meteorological data presented below is from local climatological data for the Great Falls, Montana area compiled by the National Oceanic and Atmospheric Administration (NOAA). The climate of Great Falls, Montana area is semi-arid. The mean annual precipitation is about 15 inches. About 70 percent of the annual total normally falls between April and September during the growing season. The mean annual temperature is about 45°F with winters averaging 25°F and summers averaging 66°F.

By calculating the net precipitation according to the method outlined in the Federal Register (47 FR 31224), a net precipitation value of -19 inches per year is obtained. Maximum rainfall intensity, based on a 1-year, 24-hour rainfall, is 1.25 inches (47 FR 31235).

B. Geology

The Base, located in the west-central part of Montana, is situated on a plateau approximately 200 feet higher than the adjacent valley area. The elevation of the Base is 3,674 feet above mean sea level, varying between 300 and 400 feet above the city of Great Falls. The Great Falls township is in a section of rolling plains approximately 70 miles east of the Rocky Mountains. Except for the area north and northeast of the townships, the valley is encircled by mountain ranges. The Highwood and the Big and Little Belt mountain chains are approximately 30 miles away, lying south and east of Great Falls. The Continental Divide is 69 to 100 miles west to northwest of Great Falls.

The bedrock in the Great Falls area is fractural according to well drilling records. Rock units that crop out in this area include the Madison Group of Mississippian age, the Swift Formation and Morrison Formation of Jurassic age, and the Kootenai Formation and Colorado Group of Cretaceous age.

The Madison Group is composed of massive to thin beds of gray, dense limestone with intervals of shale and some chert. The thickness of this formation is generally over 1,000 feet. The Swift Formation, which overlies the Madison Group, is 5 to 20 feet thick in the Great Falls area. This formation is mostly fine-grained, light-gray, cross-bedded quartz sandstone of marine origin and is cemented predominantly with calcite. The Morrison Formation overlies the Swift Formation and is 120 to 180 feet thick. It is composed of varicolored, mainly greenish gray, interbedded shale and siltstone with some discontinuous limestone and sandstone beds. The Kootenai Formation overlies the Morrison Formation and consists of 350 to 400 feet of nonmarine, interbedded, dark-red, purple or greenish-gray shale and siltstone with numerous light gray to buff, discontinuous sandstone beds and a few thin, impure limestone lenses. The Colorado Group, overlying the Kootenai Formation, is a thick sequence of dark-gray, fine grained, marine sedimentary rocks, chiefly shale and siltstone. The thickness of this formation is as much as 1,650 feet in some areas (Schmidt, 1978).

C. Soils

According to the U.S. Department of Agriculture Soil Conservation Service, soils at the Base belong to the Tally-Azaar-Lihen Association. Of this group, about 45 percent is Tally soils, 20 percent Azaar soils, 15 percent Lihen soils, and 20 percent minor soils.

The Tally soils are deep (>40 inches) and are nearly level to steep. They are found on terraces, fans, and foot slopes. Typically the surface layer is dark grayish brown fine sandy loam approximately 7 inches thick. The subsoil is brown and grayish brown, fine, sandy loam. The underlying material is pale brown fine sandy loam and sandy loam.

The Azaar soils are nearly level to undulating, moderately deep (20 to 40 inches), and located on bedrock uplands. Typically the surface layer is dark grayish brown, fine, sandy loam about 7 inches thick. The subsoil is brown fine sandy loam. The underlying material is light gray and grayish brown, silt loam and silty clay loam. Sandstone is at a depth of about 32 inches.

The Lihen soils are deep and nearly level to strongly rolling. They are found on terraces, fans, and uplands. Typically the surface layer is dark grayish brown and dark gray loamy sand 21 inches thick. The underlying material is grayish brown and light grayish brown loamy sand and loamy fine sand. Minor soils in this unit include the Castner, Ervide, and Yetull soils. The Castner Channery loams are shallow over sandstone bedrock. They are in convex areas and at bench edges. The Ervide loamy fine sands are moderately deep. Sandstone is at a depth of about 32 inches. The Yetull loamy sands are deep and calcareous.

This group is characterized as moderately deep and deep, nearly level to steep, well drained fine sandy loams and loamy sands that formed in material deposited over sandstone, in alluvium, and in eolian sand; on terraces, fans, foot slopes, and uplands. Up to a depth of 28 inches, the permeability of this soil is 4.2×10^{-4} cm/sec to 1.4×10^{-3} cm/sec. For the layer between 28 to 60 inches deep, the permeability is 1.4×10^{-3} cm/sec to 4.2×10^{-3} cm/sec (Clark et al., 1982).

D. Hydrology

Surface Water

Great Falls is approximately 150 miles from the headwaters of the Missouri River which originates on the eastern flank of the Continental Divide. Flowing in a northeasterly direction, the river bisects and traverses the Great Falls township from the south to the northeast. It is a vital water body in this area, providing potable water to the city of Great Falls and the Base. The water is of good quality and is moderately hard.

The Base is located near the northeastern edge of the Sun River Bench (Gore Hill), approximately 350 feet above the Sun and Missouri Rivers and therefore is not within the 100-year floodplain. However, there are numerous seeps and springs that issue from water-yielding rocks around the edge of the bench.

The Sun River flows east from its headwaters near the Continental Divide and joins the Missouri River at Great Falls. The confluence of the Sun and Missouri Rivers is approximately 2 miles northeast of the Base. The Base storm runoff drains into the Sun River via a network of swales, ditches, culverts, drop inlets, collector pipes, and trunk lines. Other runoff on the Base flows into sanitary sewers and eventually reaches the City's disposal facility at the Missouri River.

The intake for the city of Great Falls water supply is located on the Missouri River, approximately one mile upstream of the base.

Groundwater

Various aquifers supply water to wells and discharge to springs and streams in the area. These aquifers include permeable limestone at the top of the Madison Group; sandstone of the Swift Formation; sandstone beds in the Morrison Formation; sandstone beds in the Kootenai Formation (particularly the basal sandstone unit); permeable units in the Colorado Group (most importantly, the basal Flood Member of the Blackleaf Formation); and the Quaternary deposits.

Among these aquifers, Quaternary deposits, the Madison Group, and the Kootenai Formation contain the key water supplies in the Great Falls vicinity. The wells in these areas provide domestic or agricultural water resources, and have water levels around 3,300 feet above sea level. The water level in the Quaternary deposits varies from above land surface to approximately 40 feet below land surface. Depth to the top of the Madison-Swift aquifer ranges from 150 to 500 feet in the Great Falls vicinity. In this area, ground and surface waters are closely interwoven. The Missouri and Sun Rivers and their tributaries exchange water with underlying aquifers.

E. Critical Habitats/Endangered or Threatened Species

According to the U.S. Fish and Wildlife Service, there are no critical habitats, wetlands, or wilderness areas within a 1-mile radius of the Base.

Endangered species that may occur in Cascade County include the Rocky Mountain wolf, black-footed ferret, peregrine falcon, and the bald eagle. Only the bald eagle and the peregrine falcon are known to frequent the Great Falls area. Since the airport and its vicinity are urbanized, these species are not known to frequent the Montana Air National Guard Base area.

IV. SITE EVALUATION

A. Activity Review

A review of Base records and interviews with Base personnel resulted in the identification of specific operations at the Base in which the majority of industrial chemicals are handled and hazardous wastes are generated. A total of 26 past and present Base personnel with an average of 20 years experience were interviewed. These personnel were representative of Civil Engineering; Aircraft Maintenance; Facilities Maintenance; Vehicle Maintenance; Corrosion Control; Aerospace Ground Equipment (AGE) Maintenance; Petroleum, Oils, and Lubricants (POL) Management; Photography; Nondestructive Inspection (NDI); Power Production; Flightline; Reproduction and Reclamation; Wheel and Tire Shop; Avionics; Carpentry Shop; Electrical Shop; and Battery Shop Clinic. Table 1 summarizes these major operations, provides estimates of the quantities of waste currently being generated by these operations, and describes the past and present disposal practices for the wastes. In Table 1 listings of HM/HW which were disposed of into the ground were investigated and considered with this report. Based on information gathered, any operation that is not listed in Table 1 has been determined to produce negligible quantities of wastes requiring disposal.

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

Interviews with Base personnel and subsequent site inspections resulted in the identification of eight sites potentially contaminated with HM/HW. It was determined that the Current Fire Training Area (Site 1), Drainage Ditch off the Old Power Check Pad (Site 2), North Disposal and Fire Training Pit Area (Site 3), Old Fire Training Area No. 1 (Site 4), Old Fire Training Area No. 2 (Site 5), AGE (Building No. 22) Area (Site 6), Dry Well Off Corrosion Control Building (Building No. 23) (Site 7), and Dry Well Off Composite Maintenance Building (Building No. 32) (Site 8) are potentially contaminated with HM/HW with a potential for migration, and it is recommended that those sites be further evaluated. Figures 3A and 3B illustrate the locations of the identified sites.

Table 1. Hazardous Material/Hazardous Waste Disposal Summary: Montana Air National Guard, Great Falls International Airport, Great Falls, Montana

Shop Name and Location		Hazardous Waste/ Used Hazardous Material	Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1950 1960 1970 1980 1990
Aircraft Maintenance	25	PD-680	< 60	'----DRMO----'
		Monomethyl Hydrazine	4	'----NEUTR SAN----'
Aerospace Ground Equipment (AGE) Maintenance	21 & 22	Engine Oil	110	'----DW----'----DRMO----'
		Hydraulic Oil	120	'----DW----'----DRMO----'
		Paint Strippers/ Thinners	5	'----DW----'----DRMO----'
		JP-4	50	'----DW----'----DRMO----'
		PD-680	60	'----DW----'----DRMO----'
		Battery Acid	20	'----NEUTR SAN----'----DRMO----'
		7808 Oil	45	'----DRMO----'
Vehicle Maintenance (Motor Pool)	66	Engine Oil/Motor Oil	1,000	'----DRMO----'
		Hydraulic Oil	5	'----DW----'----DRMO----'
		JP-4	100	'----DW----'----DRMO----'
		PD-680	300	'----DW----'----DRMO----'
		Sulfuric Acid	10	'----DW----'----DRMO----'
Fuels Management	15 & 16	JP-4	80	'----STORM----'

KEY:
- DRMO - Disposed of through the Defense Reutilizaton and Marketing Office
- DW - Dry Well
- GRND - Disposed of on ground
- LNDFL - Landfilled offsite
- NEUTR SAN - Neutralized and disposed of through sanitary sewer
- OWS - Oil/Water Separator
- SAN - Disposed of in drains leading to sanitary sewer
- SIL REC - Sent for silver recovery offbase
- STORM - Disposed of in drains leading to storm sewer

Table I. Hazardous Material/Hazardous Waste Disposal Summary: Montana Air National Guard, Great Falls International Airport, Great Falls, Montana (continued)

Shop Name and Location		Hazardous Waste/ Used Hazardous Material	Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1950 1960 1970 1980 1990
Nondestructive Inspection (NDI)	32	Developer	40	'------OWS------'
		Fixer	40	'------SIL REC------'
		TCE	14	------SAN------'------DRMO------'
		Engine Oil	10	'------SAN------'
		Glacial Acetic Acid	1	'------SAN------'
Weapons Maintenance	70, 40 41, & 42	PD-680	60	'----DRMO---'
Corrosion Control	23	Thinners	75	'----DRMO---'
		Paint Strippers	55	'----DRMO---'
		Polyurethane	100	'----DRMO---'
		Paint Container/ Residual	25	'----DRMO---'
		Stripper Residue	150	'----DRMO---'
		Spray Booth Wastewater	3,500	'------SAN------'
Entomology	60	Motor Oil/Engine Oil	40	'------GRND------' ----DRMO---'
		Sulfuric Acid	1	'------NEUTR SAN------'

KEY:
DRMO - Disposed of through the Defense Reutilizaton and Marketing Office
DW - Dry Well
GRND - Disposed of on ground
LNDFL - Landfilled offsite
NEUTR SAN - Neutralized and disposed of through sanitary sewer
OWS - Oil/Water Separator
SAN - Disposed of in drains leading to sanitary sewer
SIL REC - Sent for silver recovery offbase
STORM - Disposed of in drains leading to storm sewer

Table 1. Hazardous Material/Hazardous Waste Disposal Summary: Montana Air National Guard, Great Falls International Airport, Great Falls, Montana (concluded)

Shop Name and Location		Hazardous Waste/ Used Hazardous Material	Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1950 1960 1970 1980 19
Entomology (Continued)		Empty Pesticide Containers		'-----LNDFL-----'
		Turpentine	10	'-----GRND-----'
		Lacquer Thinner	10	'-----GRND-----'
Energy Plant	25	Boiler Feedwater Treatment	2,500	'-----SAN-----'
		Sulfuric Acid	1	'-----NEUTR SAN-----'
Machine Shop	32	Metal Cutting Oil	5	'-----LNDFL-----'
Plumbing Shop	60	Cutting Oil		'-----LNDFL-----'
Photo Lab	25	Developer	120	'-----SAN-----'
		Fixer	120	'---SAN---'-----SIL REC-----'
		Bleach	48	'-----SAN-----'
Propulsion Shop	30 & 35	PD-680	100	'---SAN---'-----GRND-----'---DRMO---'
		Carbon Cleaner	5	'-----GRND-----'
		7080 Oil	75	'-----GRND-----'---OWS---'
		Hydraulic Oil	3	'-----GRND-----'
		1010 Oil	500	'---SAN---'---GRND---'

KEY:
- DRMO - Disposed of through the Defense Reutilizaton and Marketing Office
- DW - Dry Well
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- NEUTR SAN - Neutralized and disposed of through sanitary sewer
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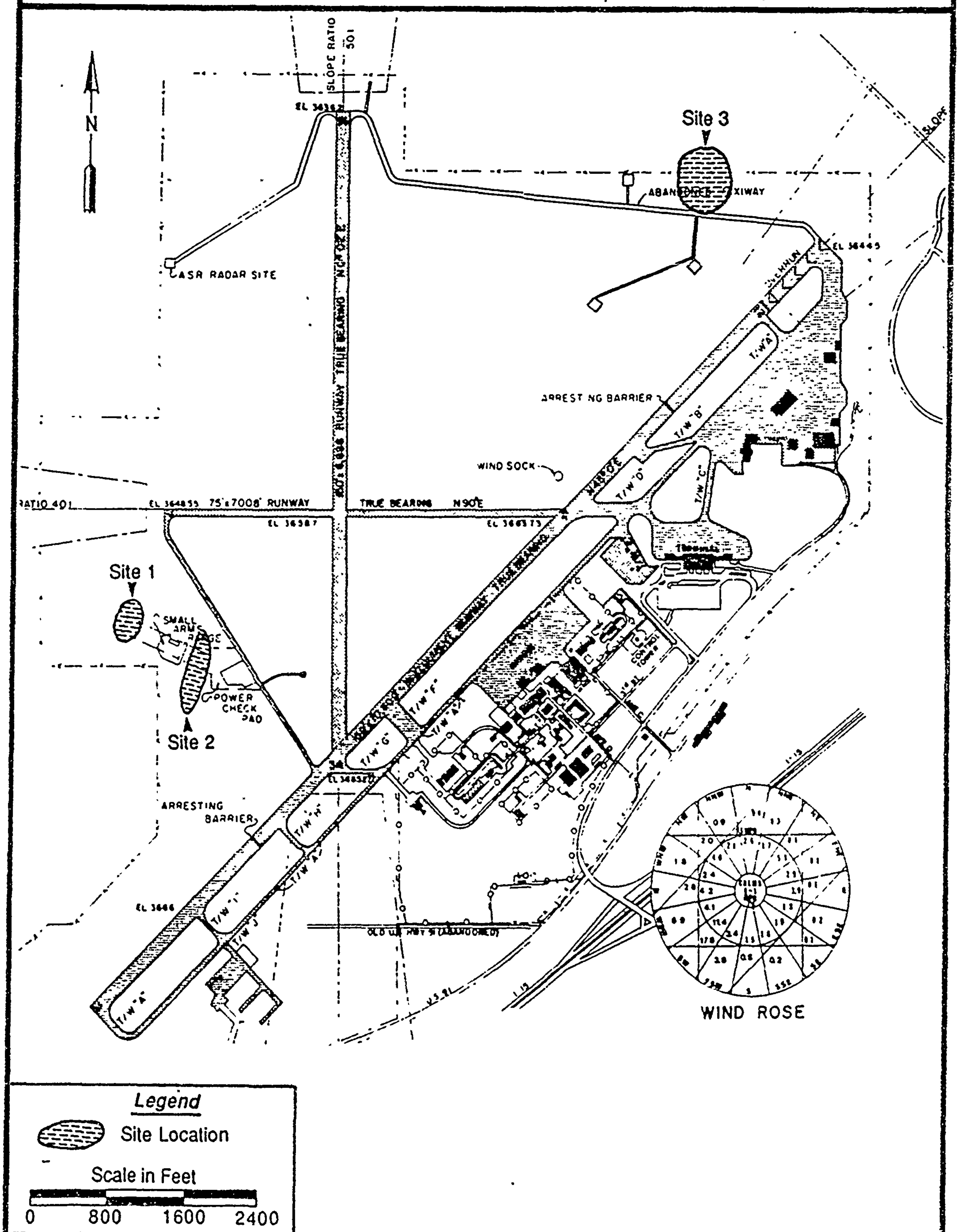
- SAN - Disposed of in drains leading to sanitary sewer
- SIL REC - Sent for silver recovery offbase
- STORM - Disposed of in drains leading to storm sewer

HMTC

Source: Montana Air National Guard Base Map.

Figure 3A.

Location of Sites at Montana Air National Guard, Great Falls International Airport, Great Falls, Montana.

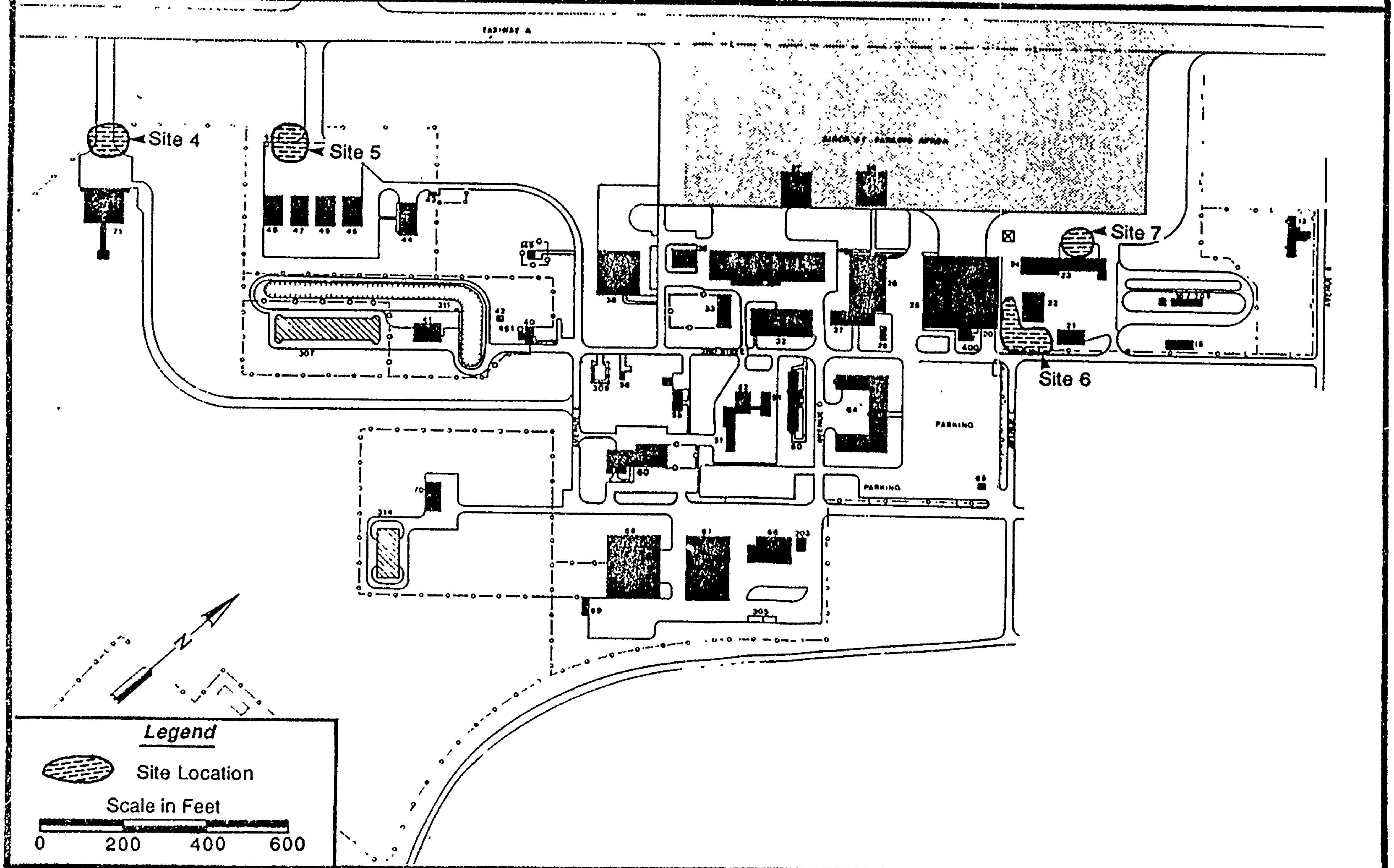


HMTC

Source: Montana
Air National Guard
Base Map.

Figure 3B.

Location of Sites at Montana Air National Guard, Great Falls International Airport, Great Falls, Montana.



Seven of the eight sites were assigned a HAS according to HARM (Appendix C). A summary of the HAS for each scored site is listed in Table 2. Copies of the completed Hazardous Assessment Rating Forms are found in Appendix D. The objective of this assessment is to provide a relative ranking of sites suspected of contamination from hazardous substances. The final rating score reflects specific components of the hazard posed by a specific site; possible receptors of the contamination (e.g., population within a specified distance of the site and/or critical environments within a 1-mile radius of the site); the waste and its characteristics; and the potential pathways for contaminant migration (e.g., surface water, groundwater, flooding). Applicable biodegradation and evaporation of the wastes which may decrease the amount of contamination remaining in the soil, was not taken into account when waste quantities were estimated. Descriptions of all the sites follow.

Site No. 1 - Current Fire Training Area (HAS-78)

The current FTA has been used since 1968 and includes two blackened areas northwest of the small arms range and power check pad. The main FTA is a circular area approximately 150 feet across. Stained soil, resulting from waste fuel run-off, was observed for approximately 100 feet from the FTA towards the west. The second area is rectangularly shaped and is located immediately northeast of the main area. Cans, wood, metal, tire debris, and stained soil were observed in this area. Both areas are neither bermed nor lined and vegetation is stressed around their perimeters. Approximately 4,500 gallons/year of fuel has been used for fire training in the main pit. Assuming 70 percent of the fuel was burned, approximately 30,000 gallons may have seeped into the soil at this site. During the visual inspection, seven drums were stored at the corner of a hut between these two areas, indicating that this area has also served as a temporary waste storage/accumulation point.

A HAS was applied because unlined FTAs lacking proper containment structures often present troublesome sites of contamination on ANG and Air Force Bases.

Table 2. Site Hazard Assessment Scores (as Derived from HARM): Montana Air National Guard, Great Falls International Airport, Great Falls, Montana.

Site Priority	Site No.	Site Description	Receptors	Waste Characteristics	Pathway	Waste Mgmt. Practices	Overall Score
1	1	Current Fire Training Area	63	90	80	1.0	78
2	3	North Disposal and Fire Training Pit	57	63	80	1.0	67
3	2	Drainage Ditch Old Power Check Pad	69	45	80	1.0	65
4	6	Aerospace Ground Equipment (AGE, Building No. 22) Area	60	63	42	0.95	52
5	7	Dry Well Off Corrosion Control Building (Building No. 23)	60	63	42	0.95	52
6	4	Former Fire Training Area No. 1	60	63	42	0.95	52
7	5	Former Fire Training Area No. 2	60	63	42	0.95	52
8	8	Dry Well Off Composite Maintenance Building (Building No. 32)				Unscored	

Site No. 2 - Drainage Ditch Off Old Power Check Pad (HAS-65)

This northwest oriented ditch was identified to have been contaminated with POL waste from overflow of an oil/water separator and an underground storage tank located below the old power check pad, (constructed in 1975). The overflow drains into a 10 inch pipe, which is not connected to pollution control facilities, and discharges to the ditch approximately 250 feet away. Vegetative stress, dark discolored soil, and a petroleum odor were observed within the ditch during the site visit. Running water flows through the Base drainage system only during periods of heavy precipitation. Consequently, small spills and discharges only rarely flow directly offbase, but tend to accumulate within the ditch. Visual signs of contamination occur for a distance of approximately 200 feet along the bottom of the ditch; therefore, it is considered a potential hazardous waste site with high contaminant migration potential, and a HAS is deemed necessary.

Site No. 3 - North Disposal and Fire Training Pit (HAS-67)

This site, situated on the north end of the airport (north of the abandoned taxiway) was an old FTA surrounded by the boundary of a shallow pit. The old FTA was used approximately 15 times from 1966 to 1968. Approximately 500 to 600 gallons of contaminated fuel was used for each burn. Liquids reportedly burned include JP-4, waste oils, and waste thinners and solvents. Over the years, a total of 75,000 to 90,000 gallons of flammable liquids were released by the Base at this location. Assuming 70 percent of these liquids were burned, between 22,500 and 27,000 gallons may have seeped into the soil at this site. Prior to fire training, this FTA served as a disposal pit and received from 1957 to 1960, contaminated fuel leaked from F-89 aircraft. The quantity dumped varied between 50 and 100 gallons/day. The use of an unlined FTA disposal pit for combustion and disposal of hazardous wastes creates a potential for ground and surface water contamination and, therefore, a HAS was applied.

Site No. 4 - Former Fire Training Area No. 1 (HAS-52)

This FTA was located in the area of what is now the north corner of the Hush House and was used from 1959 to 1963. There was one fire training exercise per month with 1,200 to 1,500 gallons of fuel used for each burn. The Base stopped using this FTA in 1964. The pit was paved over as part of construction of the current Hush House which was completed in 1987. Prior to construction, soil boring record did not show significant contamination. Over the years, a total of 7,200 to 9,000 gallons of flammable liquids were released by the Base at this location. Assuming 70 percent of these liquids was burned, between 2,200 and 2,700 gallons may have seeped into the soil at this unlined FTA. Therefore, a HAS was applied.

Site No. 5 - Former Fire Training Area No. 2 (HAS-52)

This FTA, also unlined, was initiated in 1964 when FTA No. 1 was closed. The site was about 400 feet northeast of FTA No. 1 and was used by the Base for fire training exercises from 1964 to 1966. The Base conducted one training exercise per month using approximately 500 to 600 gallons of liquid per exercise. An assumed quantity of unburned liquid is between 5,400 and 6,500 gallons.

Site No. 6 - Aerospace Ground Equipment (AGE, Building No. 22) Area (HAS-52)

Near the AGE building a dry well and a ditch, each formerly used for the disposal of hazardous wastes, were identified. The ditch is located on the southeast of Building No. 22 and measures approximately 50 feet long. The ditch, used from 1962 to 1978, received small amounts of different waste oil products. The dry well was located within 10 feet of the southwest wall of Building No. 22. This dry well, paved around 1978, was also used from 1962 to 1978. Approximately 20 gallons/week of all shop wastes were dumped in this dry well, which filled frequently. This dry well, with brick lining and gravel bottom, was 5 feet in diameter and 6.5 feet in depth. Because the dry well has been paved over, no evidence of contamination was observed. Also, no evidence of waste disposal at the ditch was substantiated during the site survey. But due to the report that approximately 17,000 gallons of liquid waste has been released in this area, a HAS was applied.

<u>Site No. 7 - Dry Well Off Corrosion Control Building (Building No. 23)</u>
(HAS-52)

This dry well was located within 10 feet of the northwest wall of Building 23. All liquid wastes amounting to more than 20 gallons/week from the old motor pool shop were disposed of at this location. This dry well was used from 1955 to 1964 and is currently covered over by grass. Although the site showed no sign of waste disposal during the site inspection, a HAS was applied because large quantities of waste were involved.

<u>Site No. 8 - Dry Well Off Composite Maintenance Building (Building No. 32)</u>
(unrated)

This dry well was located between Building 30 and 32. It received minimal quantities of waste from the AGE shop during 1971 to 1977. These wastes may have included engine oil, hydraulic fluid, paint strippers, thinners, JP-4, and PD-680. Several of these wastes contain compounds that have a high persistence in the environment. No HAS was assigned because no further waste quantity information is available.

C. Other Pertinent Facts

A review of installation record resulted in the identification of 22 underground storage tanks (USTs). Table 3 lists the locations and characteristics of the USTs. All USTs are tested semi-annually. No evidence of leaks has been detected.

It has also been identified that the Base has four PCB transformers. One is located approximately 100 feet west of Building No. 38. Two are located side by side between Buildings 30 and 32. The fourth showed signs of a small

Table 3. Underground Storage Tank Inventory

	TANK IDENTIFICATION NUMBER						
	1	2	3	4	5	6	7
Location (Building #)	Intercep #1 38	Intercep #2 38	Waste Oil 1 38	Diesel #1 15	Mogas #1 66	Waste Oil 2 66	Intercep 3 66
Capacity (gallons)	75	75	500	5,000	10,000	500	720
Contents	Waste Oil	Waste Oil	Waste Oil	Diesel Fuel	Auto Gas	Waste Oil	Waste Oil
Year Installed	1984	1984	1984	1976	1976	1976	1976
Cathodic Protection	None	None	None	None	None	None	None
Coatings A. Interior B. Exterior	None	None	None	A. None B. Paint	A. None B. Paint	A. None B. Paint	None
Material of Construction	Concrete	Concrete	Concrete	Steel	Steel	Concrete	Concrete
Piping	Painted Steel	Cast Iron	Cast Iron	Cast Iron	Cast Iron	Cast Iron	Cast Iron
Status of Tank (Year abandoned)	In Use	In Use	In Use	In Use	In Use	In Use	In Use

Table 3. Underground Storage Tank Inventory (continued)

	TANK IDENTIFICATION NUMBER						
	8	9	10	11	12	13	14
Location (Building #)	JP-4 #1 Storage	JP-4 #2 Storage	JP-4 #3 Storage	JP-4 #4 Storage	JP-4 #5 Storage	JP-4 #6 Storage	Str pit 1
Capacity (gallons)	25,000	25,000	25,000	25,000	25,000	25,000	165
Contents	JP-4	JP-4	JP-4	JP-4	JP-4	JP-4	JP-4
Year Installed	1955	1955	1955	1955	1958	1958	1955
Material of Construction	Steel	Steel	Steel	Steel	Steel	Steel	Concrete
Coatings A. Interior B. Exterior	A. None B. Paint	A. None B. Paint	A. None B. Paint	A. None B. Paint	A. None B. Paint	A. None B. Paint	None
Cathodic Protection	None	None	None	None	None	None	None
Piping	Painted Steel	Painted Steel	Painted Steel	Painted Steel	Painted Steel	Painted Steel	Painted Steel
Status of Tank (Year abandoned)	In Use	In Use	In Use	In Use	In Use	In Use	In Use

Table 3. Underground Storage Tank Inventory (concluded)

	TANK IDENTIFICATION NUMBER						
	15	16	17	18	19	20	21
Location	Str Pit #2 Storage	Str pit #3 Storage	Waste Oil 3 23	Waste Oil 4 P.C. Pad	Intercep 4 P.C. Pad	Tank #1 40	Tank #1 25
Capacity (gallons)	750	165	3,750	300	435	3,000	5,000
Contents	JP-4	JP-4	Waste Oil	Waste Oil	Waste Oil	Diesel	Fuel Oil
Year Installed	1955	1955	1955	1976	1976	1962	1955
Material of Construction	Concrete	Concrete	Concrete	Steel	Concrete	Steel	Steel
Coatings A. Interior B. Exterior	None	None	None	A. None B. Paint	None	A. None B. Paint	A. None B. Paint
Cathodic Protection	None	None	None	None	None	None	None
Piping	Painted Steel	Painted Steel	Cast Iron	Steel	Cast Iron	Painted Steel	Painted Steel
Status of Tank (Year abandoned)	In Use	In Use	In Use	In Use	In Use	In Use	In Use

leak which had occurred in the past and has since dried up. This fourth transformer is located between Buildings No. 21 and 22. The leakage was minor and confined within its concrete pad. No sign of pollutant migration was observed. And the monthly checks have indicated that no additional seepage has occurred.

V. CONCLUSIONS

Information obtained through interviews with 26 past and present Base personnel, review of Base records, and field observations have resulted in the identification of seven potentially contaminated disposal and/or spill sites on Base property. These sites consist of the following:

Site No. 1 - Current Fire Training Area
Site No. 2 - Drainage Ditch Off Old Power Check Pad
Site No. 3 - North Disposal and Fire Training Pit
Site No. 4 - Former Fire Training Area No. 1
Site No. 5 - Former Fire Training Area No. 2
Site No. 6 - Aerospace Ground Equipment (AGE, Building No. 22) Area
Site No. 7 - Dry Well Off Corrosion Control Building (Building No. 23)
Site No. 8 - Dry Well Off Composite Maintenance Building (Building No. 32)

Each of these sites is potentially contaminated with HM/HW and each exhibit the potential for contaminant migration to groundwater and surface water. Seven of these sites were assigned a HAS according to HARM. Site No. 8 was unscored because, according to interviews with Base personnel, minimal amounts of waste were disposed at this site and no further quantity confirmation is available. However, due to the nature of the wastes disposed of at this site, the potential exists for environmental contamination in this area.

VI. RECOMMENDATIONS

Because of the potential for soils, groundwater, and surface water contamination at the Base, further IRP investigations are recommended in accordance with applicable regulations for all the identified sites.

GLOSSARY OF TERMS

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

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

AQUITARD - A confining bed that retards but does not prevent the flow of water to or from an adjacent aquifer.

CONE OF DEPRESSION - A depression of the water table or potentiometer surface surrounding a discharge well which is more or less the shape of an inverted cone.

CONTAMINANT - As defined by Section 101(f)(33) of Superfund Amendments and Reauthorization Act of 1986 (SARA) shall include, but not be limited to any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformation in such organisms or their offspring; except that the term "contaminant" shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under:

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

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

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

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

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

(f) any imminently hazardous chemical substance or mixture with respect to which the administrator has taken action pursuant to Section 7 of the Toxic Substance Control Act;

and shall not include natural gas, liquefied natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas).

CRITICAL HABITAT - The specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of Section 4 of this Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management consideration or protection.

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

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

ENDANGERED SPECIES - Any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the secretary to constitute a pest whose protection would present an overwhelming and overriding risk to man.

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

HARM - Hazard Assessment Rating Methodology - A system adopted and used by the United States Air Force to develop and maintain a priority listing of potentially contaminated sites on installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, 11 December 1981.)

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

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

HAZARDOUS WASTE - A solid or liquid waste that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

a. cause, or significantly contribute to, an increase in mortality or an increase in serious or incapacitating reversible illness, or

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

HYDRAULIC CONDUCTIVITY - The rate at which water can move through a permeable medium.

HYDRAULIC GRADIENT - The difference in head (elevation of water surface) at two points divided by the distance between these two points.

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

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

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

Terms describing permeability are:

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

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

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

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

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

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

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

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

STRATA - Distinguishable horizontal rock layers separated vertically from other layers.

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

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

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

UPGRADIENT - A direction that is topographically or hydraulically upslope.

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

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

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

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APPENDIX A

Resumes of HMTC Preliminary Assessment Team

NAICHIA YEH

EDUCATION

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

EXPERIENCE

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

EMPLOYMENT

Dynamac Corporation (1987-present): Environmental Scientist

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

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

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

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

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

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

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

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

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

Taught numerical analysis and applied mathematics in environmental engineering.

Peitou High School (1979, 1982): Science Teacher

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

ROC Army (1980-1981): Research Scientist

Conducted environmental surveys and evaluations.

HARDWARE

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

SOFTWARE

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

RAYMOND G. CLARK, JR.

EDUCATION

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

SPECIALIZED TRAINING

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

CERTIFICATIONS

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

EXPERIENCE

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

EMPLOYMENT

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

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

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

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

HNTB (1979-1981): Airport Engineer

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

HNTB (1974-1979): Design Engineer

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

HNTB (1972-1974): Airport Engineer

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

Self-employed (1971-1972): Private Consultant

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

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

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

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

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

Corps of Engineers (1967-1968): Division Engineer

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

Corps of Engineers (1963-1967): Engineer Advisor

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

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

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

Corps of Engineers (1959-1960): Area Engineer

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

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

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

Corps of Engineers (1957-1958): Student

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

Corps of Engineers (1954-1957): Engineer Manager

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

Corps of Engineers (1949-1954): Engineer Commander

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

PROFESSIONAL AFFILIATIONS

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

HARDWARE

IBM PC

SOFTWARE

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

LAWRENCE E. GLADSTONE

EDUCATION

B.S., Geophysics, Virginia Polytechnic Institute & State University, 1985

EXPERIENCE

Two years' experience as junior staff scientist for the Hazardous Materials Technical Center of Dynamac Corporation. Experience in hazardous waste management includes conducting Phase I records searches for the Air National Guard's Installation Restoration Program, auditing records of waste management firms awarded disposal contracts by DoD, and preparing RCRA Part B permit applications for the Defense Reutilization and Marketing Service (DRMS).

EMPLOYMENT

Dynamac Corporation (1986-present): Junior Staff Scientist

Performs preliminary assessments of suspected hazardous waste sites at Air National Guard bases under Phase I of the Installation Restoration Program. Duties include searching available records, interviewing past and present employees, observing current waste management practices, and investigating identified spill/disposal sites.

Prepares RCRA Part B permits for hazardous waste storage facilities operated by DRMS.

Prepared Air Force's response to EPA CERCLA 104(e) letters regarding wastes generated by Luke and Altus Air Force Bases which may have been disposed at landfill facilities subsequently identified as Superfund sites requiring remedial action.

Developed closure maintenance plans for landfill cells at Edwards Air Force Base.

Conducted surveillance of hazardous waste contractors for DRMS. Responsibilities included auditing waste records, tracking fate of disposed items, and monitoring contractor operations.

Assisted in development of data base designed to reveal disposal costs of waste generated at Defense Reutilization and Marketing Offices.

U.S. Geological Survey (part-time, 1983-1985): Cartographic Aide

Assisted in quality control process of printing and distributing 7-1/2 minute topographic maps. Checked and corrected map separate registration, organized negative and positive overlays for alignment, and prepared photographic service requests.

MARK D. JOHNSON

EDUCATION

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

EXPERIENCE

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

EMPLOYMENT

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

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

Bechtel Associates Professional Corporation (1981-1984): Geologist

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

Schnabel Engineering Associates (1981): Geologist

Inspected foundations and backfill placement.

PROFESSIONAL CREDENTIALS

Registered Professional Geologist, South Carolina, #116, 1987

PROFESSIONAL AFFILIATIONS

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

APPENDIX B

Outside Agency Contact List

OUTSIDE AGENCY CONTACT LIST

1. U.S. Fish and Wildlife Service
   Office of Endangered Species
   Federal Building, 301 S. Park
   P.O. Box 10023
   Helena, Montana 59620

2. Montana Bureau of Mines & Geology
   Montana College of Mineral Science & Technology
   Butte, Montana 59701

3. National Oceanic and Atmospheric Administration
   6001 Executive Boulevard
   Rockville, Maryland 20853

4. U.S. Geological Survey
   12201 Sunrise Valley Drive
   Reston, Virginia 22092

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

APPENDIX C

USAF Hazard Assessment Rating Methodology

USAF HAZARD ASSESSMENT RATING METHODOLOGY

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

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

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

PURPOSE

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

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

DESCRIPTION OF MODEL

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

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

Site scores are developed using the appropriate ranking factors according to the method presented in the flow chart (Figure 1 of this report). The site rating form and the rating factor guideline are provided at the end of this appendix.

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

The receptors category rating is based on four rating factors: the potential for human exposure to the site, the potential for human ingestion of contaminants should underlying aquifers be polluted, the current and anticipated uses of the surrounding area, and the potential for adverse effects upon important biological resources and fragile natural settings. The potential for human exposure is evaluated on the basis of the total population within 1,000 feet of the site, and the distance between the site and the base boundary. The potential for human ingestion of contaminants is based on the distance between the site and the nearest well, the groundwater use of the uppermost aquifer, and population served by the groundwater supply within 3 miles of the site. The uses of the surrounding area are determined by the zoning within a 1-mile radius. Determination of whether or not critical environments exist within a 1-mile radius of the site predicts the potential for adverse effects from the site upon important biological resources and fragile natural settings. Each rating factor is numerically evaluated (0-3) and increased by a multiplier. The maximum possible score is also computed. The factor score and maximum possible scores are totaled, and the receptors subscore computed as follows: receptors subscore = (100 x factor score subtotal/maximum score subtotal).

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

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

The scores for each of the three categories are added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites with no containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

HAZARDOUS ASSESSMENT RATING FORM

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

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:		4		12
B. DISTANCE TO NEAREST WELL	:		10		30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:		3		9
D. DISTANCE TO INSTALLATION BOUNDARY	:		6		18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:		10		30
F. WATER QUALITY OF NEAREST SURFACE WATER	:		6		18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:		9		27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:		6		18
GROUND WATER	:		6		18
		SUBTOTALS		108	180

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

II. WASTE CHARACTERISTICS

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

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

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

B. APPLY PERSISTENCE FACTOR

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

C. APPLY PHYSICAL STATE MULTIPLIER

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

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF <100 POINTS FOR DIRECT EVIDENCE> OR <80 POINTS FOR INDIRECT EVIDENCE>. IF DIRECT EVIDENCE <100> EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE <LESS THEN 80> EXISTS, PROCEED TO B.

( )

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

1. SURFACE WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DISTANCE TO NEAREST SURFACE WATER	:		8		24
NET PRECIPITATION	:		6		18
SURFACE EROSION	:		8		24
SURFACE PERMEABILITY	:		6		18
RAINFALL INTENSITY	:		8		24
SUBTOTALS					108

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

2. FLOODING — 1 — 3

SUBSCORE (100 x FACTOR SCORE /3) :

3. GROUND WATER MIGRATION

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

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

C. HIGHEST PATHWAY SUBSCORE

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

( )

IV. WASTE MANAGEMENT PRACTICES

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

RECEPTORS	( )
WASTE CHARACTERISTICS	( )
PATHWAYS	( )
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	( )

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x WASTE MANAGEMENT PRACTICES FACTOR x FINAL SCORE

( )( ) = =========

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 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	),001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence or economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Ground-water use of uppermost aquifer	Not used, other sources readily available	Commercial, industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-50	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

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

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

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

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records

  Logic based on the knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A 3 Hazard Rating

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

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

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

II. WASTE CHARACTERISTICS -Continued

Waste Characteristics Matrix

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

Notes:

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

Confidence Level

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

Waste Hazard Rating

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

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

B. Persistence Multiplier for Point Rating

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

C. Physical State Multiplier

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

III. PATHWAYS CATEGORY

A. Evidence of Contamination

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

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

B-1 Potential for Surface Water Contamination

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (including drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay (>10^{-2} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay (<10^{-6} cm/sec)	6
Rainfall intensity based on 1-year 24-hour rainfall (Number of thunderstorms)	<1.0 inch (0-5)	1.0 to 2.0 inches (6-35)	2.1 to 3.0 inches (36-49)	>3.0 inches (>50)	8

B-2 Potential for Flooding

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

B-3 Potential for Ground-Water Contamination

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

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Direct access to groundwater (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

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

B. Waste Management Practices Factor

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

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

Guidelines for fully contained:

Landfills:

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

Spills:

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

Surface Impoundments:

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

Fire Protection Training Areas:

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

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

APPENDIX D

Site Factor Rating Criteria and Hazardous Assessment Rating Forms

120th Fighter Interceptor Group
Montana Air National Guard
Great Falls Air National Guard Base
Great Falls, Montana

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

I. RECEPTORS CATEGORY	RATING SCALE LEVELS	NUMERICAL VALUE
Population within 1,000 feet of site:		
Site No. 1	1 to 25	1
Site No. 2	1 to 25	1
Site No. 3	26 to 100	2
Site No. 4	26 to 100	2
Site No. 5	26 to 100	2
Site No. 6	26 to 100	2
Site No. 7	26 to 100	2
Distance to nearest well:		
Site No. 1	3,000 feet to 1 mile	2
Site No. 2	Below 3,000 feet	3
Site No. 3	1 to 3 miles	1
Site No. 4	1 to 3 miles	1
Site No. 5	1 to 3 miles	1
Site No. 6	1 to 3 miles	1
Site No. 7	1 to 3 miles	1
Land use/zoning within 1 mile radius:	Commercial/Industrial	2
Distance to installation boundary:		
Site No. 1	Below 1,000 feet	3
Site No. 2	Below 1,000 feet	3
Site No. 3	1,001 feet to 1 mile	2
Site No. 4	Below 1,000 feet	3
Site No. 5	Below 1,000 feet	3
Site No. 6	Below 1,000 feet	3
Site No. 7	Below 1,000 feet	3
Critical environments within 1 mile:	None	0
Water quality of nearest surface water body:	Potable water supplies	3
Groundwater use of uppermost aquifer:	Drinking water, municipal water available	2

120th Fighter Interceptor Group
Montana Air National Guard
Great Falls Air National Guard Base
Great Falls, Montana

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

		RATING SCALE LEVELS	NUMERICAL VALUE
1.	RECEPTORS CATEGORY (Cont'd)		
	Population served by surface water supply within 3 miles downstream of site:	Over 100	3
	Population served by groundwater supply within 3 miles of site:	Between 51 and 1,000	2
2.	WASTE CHARACTERISTICS		
	Quantity:		
	Site No. 1	More than 5,000 gallons	L
	Site No. 2	Between 1,100 to 4,675 gallons	M
	Site No. 3	More than 5,000 gallons	L
	Site No. 4	More than 5,000 gallons	L
	Site No. 5	More than 5,000 gallons	L
	Site No. 6	More than 5,000 gallons	L
	Site No. 7	More than 5,000 gallons	L
	Confidence Level:		
	Site No. 1	Confirmed	C
	Site No. 2	Confirmed	C
	Site No. 3	Confirmed	C
	Site No. 4	Confirmed	C
	Site No. 5	Confirmed	C
	Site No. 6	Confirmed	C
	Site No. 7	Confirmed	C
	Hazard Rating:		
	Toxicity		
	Site No. 1	Sax Level 3	3
	Site No. 2	Sax Level 3	3
	Site No. 3	Sax Level 3	3
	Site No. 4	Sax Level 3	3
	Site No. 5	Sax Level 3	3
	Site No. 6	Sax Level 3	3
	Site No. 7	Sax Level 3	3

120th Fighter Interceptor Group
Montana Air National Guard
Great Falls Air National Guard Base
Great Falls, Montana

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

2. WASTE CHARACTERISTICS CATEGORY (Cont'd)	RATING SCALE LEVELS	NUMERICAL VALUE
Hazard Rating: (Continued)		
Ignitability		
Site No. 1	Flash point less than 80°F	3
Site No. 2	Flash point less than 80°F	3
Site No. 3	Flash point less than 80°F	3
Site No. 4	Flash point less than 80°F	3
Site No. 5	Flash point less than 80°F	3
Site No. 6	Flash point less than 80°F	3
Site No. 7	Flash point less than 80°F	3
Radioactivity	At or below background levels	0
Persistance Multiplier:		
Site No. 1	Substituted and other ring compounds	0.9
Site No. 2	Substituted and other ring compounds	0.9
Site No. 3	Substituted and other ring compounds	0.9
Site No. 4	Substituted and other ring compounds	0.9
Site No. 5	Substituted and other ring compounds	0.9
Site No. 6	Substituted and other ring compounds	0.9
Site No. 7	Substituted and other ring compounds	0.9
Physical State Multiplier:		
Site No. 1	Liquid	1.0
Site No. 2	Liquid	1.0
Site No. 3	Liquid	1.0
Site No. 4	Liquid	1.0
Site No. 5	Liquid	1.0
Site No. 6	Liquid	1.0
Site No. 7	Liquid	1.0

120th Fighter Interceptor Group
Montana Air National Guard
Great Falls Air National Guard Base
Great Falls, Montana

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

3. PATHWAYS CATEGORY	RATING SCALE LEVELS	NUMERICAL VALUE
Surface Water Migration:		
Distance to nearest surface water		
Site No. 1	Between 2,001 feet and 1 mile	1
Site No. 2	Less than 500 feet	3
Site No. 3	Between 2,001 feet and 1 mile	1
Site No. 4	Between 501 feet and 2,000 feet	2
Site No. 5	Between 501 feet and 2,000 feet	2
Site No. 6	Between 501 feet and 2,000 feet	2
Site No. 7	Between 501 feet and 2,000 feet	2
Net Precipitation	Below -10 inches	0
Surface erosion:		
Site No. 1	Slight	1
Site No. 2	Slight	1
Site No. 3	Moderate	2
Site No. 4	None	0
Site No. 5	None	0
Site No. 6	None	0
Site No. 7	None	0
Surface permeability		
Site No. 1	4.2×10^{-4} to 1.4×10^{-3} cm/sec	1
Site No. 2	4.2×10^{-4} to 1.4×10^{-3} cm/sec	1
Site No. 3	4.2×10^{-4} to 1.4×10^{-3} cm/sec	1
Site No. 4	Below 10^{-6} cm/sec	3
Site No. 5	Below 10^{-6} cm/sec	3
Site No. 6	Below 10^{-6} cm/sec	3
Site No. 7	Below 10^{-6} cm/sec	3
Rainfall intensity	1.0 to 2.0 inches	1
Flooding:	Beyond 100-year flood plain	0

120th Fighter Interceptor Group
Montana Air National Guard
Great Falls Air National Guard Base
Great Falls, Montana

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

3. PATHWAYS CATEGORY (cont'd)	RATING SCALE LEVELS	NUMERICAL VALUE
Groundwater Migration:		
Depth to groundwater	50 to 500 feet	1
Net precipitation	Below -10 inches	0
Soil permeability		
Site No. 1	4.2×10^{-4} to 1.4×10^{-3} cm/sec	2
Site No. 2	4.2×10^{-4} to 1.4×10^{-3} cm/sec	2
Site No. 3	4.2×10^{-4} to 1.4×10^{-3} cm/sec	2
Site No. 4	4.2×10^{-4} to 1.4×10^{-3} cm/sec	2
Site No. 5	4.2×10^{-4} to 1.4×10^{-3} cm/sec	2
Site No. 6	4.2×10^{-4} to 1.4×10^{-3} cm/sec	2
Site No. 7	4.2×10^{-4} to 1.4×10^{-3} cm/sec	2
Subsurface flow	Bottom of site greater than 5 feet above high groundwater level	0
Direct access to groundwater	High risk	3

4. WASTE MANAGEMENT

PRACTICE:		
Site No. 1	No containment	1.0
Site No. 2	No containment	1.0
Site No. 3	No containment	1.0
Site No. 4	Limited containment	0.95
Site No. 5	Limited containment	0.95
Site No. 6	Limited containment	0.95
Site No. 7	Limited containment	0.95

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE CURRENT FIRE TRAING AREA (SITE 1)
LOCATION MONTANA AIR NATIONAL GUARD, GREAT FALLS, MONTANA
DATE OF OPERATION/OCCURRENCE 1968 TO DATE
OWNER/OPERATOR 120TH FIGHTER INTERCEPTOR GROUP
COMMENTS/DESCRIPTION
RATED BY HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	1	4	4	12
B. DISTANCE TO NEAREST WELL	:	2	10	20	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	2	3	6	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	0	10	0	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	3	6	18	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	2	9	18	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	3	6	18	18
GROUND WATER	:	2	6	12	18
		SUBTOTALS		114	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 63

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 (S=SUSPECT, C=CONFIRM) (C)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

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

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR SUBSCORE B
(100)(0.9) = (90)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(90)(1) = (90)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF <100 POINTS FOR DIRECT EVIDENCE> OR <80 POINTS FOR INDIRECT EVIDENCE>. IF DIRECT EVIDENCE <100> EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE <80 OR LESS> EXISTS, PROCEED TO B.
(80)

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

1. SURFACE WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DISTANCE TO NEAREST SURFACE WATER	:	1	8	8	24
NET PRECIPITATION	:	0	6	0	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	1	6	6	18
RAINFALL INTENSITY	:	1	8	8	24
SUBTOTALS				30	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					28

2. FLOODING

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

3. GROUND WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DEPTH TO GROUND WATER	:	1	8	8	24
NET PRECIPITATION	:	0	6	0	18
SOIL PERMEABILITY	:	2	8	16	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	3	8	24	24
SUBTOTALS				48	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					42

C. HIGHEST PATHWAY SUBSCORE

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

IV. WASTE MANAGEMENT PRACTICES

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

RECEPTORS	(63)
WASTE CHARACTERISTICS	(90)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(78)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x	WASTE MANAGEMENT PRACTICES FACTOR x		FINAL SCORE
(78)	(1)	=	78

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HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE DRAINAGE DITCH OFF OLD POWER CHECK PAD (SITE 2)
LOCATION MONTANA AIR NATIONAL GUARD, GREAT FALLS, MONTANA
DATE OF OPERATION/OCCURRENCE PRIOR TO 1987
OWNER/OPERATOR 120TH FIGHTER INTERCEPTOR GROUP
COMMENTS/DESCRIPTION
RATED BY HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	1	4	4	12
B. DISTANCE TO NEAREST WELL	:	3	10	30	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	2	3	6	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	0	10	0	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	3	6	18	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	2	9	18	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	3	6	18	18
GROUND WATER	:	2	6	12	18
		SUBTOTALS		124	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 69

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 (S=SUSPECT, C=CONFIRM) (S)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (50)
<FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX>

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(50)(0.9) = (45)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(45)(1) = (45)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF <100 POINTS FOR DIRECT EVIDENCE> OR <80 POINTS FOR INDIRECT EVIDENCE>. IF DIRECT EVIDENCE <100> EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE <80 OR LESS> EXISTS, PROCEED TO B.
(80)

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

1. SURFACE WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	0	6	0	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	1	6	6	18
RAINFALL INTENSITY	:	1	8	8	24
SUBTOTALS				38	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					35

2. FLOODING

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

3. GROUND WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DEPTH TO GROUND WATER	:	1	8	8	24
NET PRECIPITATION	:	0	6	0	18
SOIL PERMEABILITY	:	2	8	16	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	3	8	24	24
SUBTOTALS				48	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					42

C. HIGHEST PATHWAY SUBSCORE

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

IV. WASTE MANAGEMENT PRACTICES

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

RECEPTORS	(69)
WASTE CHARACTERISTICS	(45)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(65)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x	WASTE MANAGEMENT PRACTICES FACTOR x		FINAL SCORE
(65)	(1)	=	65

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HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE NORTH DISPOSAL AND FIRE TRAINING PIT (SITE 3)
LOCATION MONTANA AIR NATIONAL GUARD, GREAT FALLS, MONTANA
DATE OF OPERATION/OCCURRENCE 1957 TO 1968
OWNER/OPERATOR 120TH FIGHTER INTERCEPTOR GROUP
COMMENTS/DESCRIPTION
RATED BY HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	2	4	8	12
B. DISTANCE TO NEAREST WELL	:	1	10	10	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	2	3	6	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	2	6	12	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	0	10	0	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	3	6	18	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	2	9	18	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	3	6	18	18
GROUND WATER	:	2	6	12	18
		SUBTOTALS		102	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 57

II. WASTE CHARACTERISTICS

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

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

FACTOR SUBSCORE A (70)
<FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX>

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(70)(0.9) = (63)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(63)(1) = (63)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF <100 POINTS FOR DIRECT EVIDENCE> OR <80 POINTS FOR INDIRECT EVIDENCE>. IF DIRECT EVIDENCE <100> EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE <80 OR LESS> EXISTS, PROCEED TO B.
(80)

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

1. SURFACE WATER MIGRATION

DISTANCE TO NEAREST SURFACE WATER	:	1	8	8	24
NET PRECIPITATION	:	0	6	0	18
SURFACE EROSION	:	2	8	16	24
SURFACE PERMEABILITY	:	1	6	6	18
RAINFALL INTENSITY	:	1	8	8	24
SUBTOTALS				38	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					35

2. FLOODING

FLOODING		0	1	0	3
SUBSCORE (100 x FACTOR SCORE /3)	:				0

3. GROUND WATER MIGRATION

DEPTH TO GROUND WATER	:	1	8	8	24
NET PRECIPITATION	:	0	6	0	18
SOIL PERMEABILITY	:	2	8	16	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	3	8	24	24
SUBTOTALS				48	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					42

C. HIGHEST PATHWAY SUBSCORE

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

IV. WASTE MANAGEMENT PRACTICES

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

RECEPTORS	(57)
WASTE CHARACTERISTICS	(63)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(67)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x	WASTE MANAGEMENT PRACTICES FACTOR x		FINAL SCORE
(67)	(1)	=	67

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE FORMER FIRE TRAINING AREA NO. 1 (SITE 4)
LOCATION MONTANA AIR NATIONAL GUARD, GREAT FALLS, MONTANA
DATE OF OPERATION/OCCURRENCE 1959 TO 1963
OWNER/OPERATOR 120TH FIGHTER INTERCEPTOR GROUP
COMMENTS/DESCRIPTION
RATED BY HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	2	4	8	12
B. DISTANCE TO NEAREST WELL	:	1	10	10	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	2	3	6	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	0	10	0	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	3	6	18	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	2	9	18	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	3	6	18	18
GROUND WATER	:	2	6	12	18
		SUBTOTALS		108	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 60

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 (S=SUSPECT, C=CONFIRM) (S)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (70)
<FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX>

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR SUBSCORE B
(70)(0.9) = (63)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(63)(1) = (63)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF <100 POINTS FOR DIRECT EVIDENCE> OR <80 POINTS FOR INDIRECT EVIDENCE>. IF DIRECT EVIDENCE <100> EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE <80 OR LESS> EXISTS, PROCEED TO B.

(0)

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

1. SURFACE WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	0	6	0	18
SURFACE EROSION	:	0	8	0	24
SURFACE PERMEABILITY	:	3	6	18	18
RAINFALL INTENSITY	:	1	8	8	24
SUBTOTALS				42	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					39

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

3. GROUND WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DEPTH TO GROUND WATER	:	1	8	8	24
NET PRECIPITATION	:	0	6	0	18
SOIL PERMEABILITY	:	2	8	16	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	3	8	24	24
SUBTOTALS				48	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					42

C. HIGHEST PATHWAY SUBSCORE

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

(42)

IV. WASTE MANAGEMENT PRACTICES

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

RECEPTORS	(60)
WASTE CHARACTERISTICS	(63)
PATHWAYS	(42)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(55)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x	WASTE MANAGEMENT PRACTICES FACTOR x		FINAL SCORE
(55)	(0.95)	=	52

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HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE FORMER FIRE TRAINING AREA NO. 2 (SITE 5)
LOCATION MONTANA AIR NATIONAL GUARD, GREAT FALLS, MONTANA
DATE OF OPERATION/OCCURRENCE 1964 TO 1966
OWNER/OPERATOR 120TH FIGHTER INTERCEPTOR GROUP
COMMENTS/DESCRIPTION
RATED BY HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	2	4	8	12
B. DISTANCE TO NEAREST WELL	:	1	10	10	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	2	3	6	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	0	10	0	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	3	6	18	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	2	9	18	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	3	6	18	18
GROUND WATER	:	2	6	12	18
		SUBTOTALS		108	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 60

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 (S=SUSPECT, C=CONFIRM) (S)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (70)
<FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX>

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR SUBSCORE B
(70)(0.9) = (63)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(63)(1) = (63)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF <100 POINTS FOR DIRECT EVIDENCE> OR <80 POINTS FOR INDIRECT EVIDENCE>. IF DIRECT EVIDENCE <100> EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE <80 OR LESS> EXISTS, PROCEED TO B.

(0)

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

1. SURFACE WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	0	6	0	18
SURFACE EROSION	:	0	8	0	24
SURFACE PERMEABILITY	:	3	6	18	18
RAINFALL INTENSITY	:	1	8	8	24
SUBTOTALS				42	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					39

2. FLOODING

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

3. GROUND WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DEPTH TO GROUND WATER	:	1	8	8	24
NET PRECIPITATION	:	0	6	0	18
SOIL PERMEABILITY	:	2	8	16	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	3	8	24	24
SUBTOTALS				48	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					42

C. HIGHEST PATHWAY SUBSCORE

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

(42)

IV. WASTE MANAGEMENT PRACTICES

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

RECEPTORS	(60)
WASTE CHARACTERISTICS	(63)
PATHWAYS	(42)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(55)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x	WASTE MANAGEMENT PRACTICES FACTOR x		FINAL SCORE
(55)	(0.95)	=	52

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HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE AEROSPACE GROUND EQUIPMENT (AGE, BUILDING NO. 22) AREA (SITE 6)
LOCATION MONTANA AIR NATIONAL GUARD, GREAT FALLS, MONTANA
DATE OF OPERATION/OCCURRENCE 1962 TO 1978
OWNER/OPERATOR 120TH FIGHTER INTERCEPTOR GROUP
COMMENTS/DESCRIPTION
RATED BY HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	2	4	8	12
B. DISTANCE TO NEAREST WELL	:	1	10	10	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	2	3	6	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	0	10	0	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	3	6	18	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	2	9	18	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	3	6	18	18
GROUND WATER	:	2	6	12	18
		SUBTOTALS		108	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 60

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 (S=SUSPECT, C=CONFIRM) (S)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (70)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(70)(0.9) = (63)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(63)(1) = (63)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF <100 POINTS FOR DIRECT EVIDENCE> OR <80 POINTS FOR INDIRECT EVIDENCE>. IF DIRECT EVIDENCE <100> EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE <80 OR LESS> EXISTS, PROCEED TO B.
(0)

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

1. SURFACE WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	0	6	0	18
SURFACE EROSION	:	0	8	0	24
SURFACE PERMEABILITY	:	3	6	18	18
RAINFALL INTENSITY	:	1	8	8	24
SUBTOTALS				42	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					39

2. FLOODING

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

3. GROUND WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DEPTH TO GROUND WATER	:	1	8	8	24
NET PRECIPITATION	:	0	6	0	18
SOIL PERMEABILITY	:	2	8	16	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	3	8	24	24
SUBTOTALS				48	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					42

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.
(42)

IV. WASTE MANAGEMENT PRACTICES

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

RECEPTORS	(60)
WASTE CHARACTERISTICS	(63)
PATHWAYS	(42)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(55)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x	WASTE MANAGEMENT PRACTICES FACTOR x		FINAL SCORE
(55)	(0.95)	=	52

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HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE	DRY WELL OFF CORROSION CONTROL BUILDING (BUILDING NO. 23) (SITE 7)
LOCATION	MONTANA AIR NATIONAL GUARD, GREAT FALLS, MONTANA
DATE OF OPERATION/OCCURRENCE	1955 TO 1964
OWNER/OPERATOR	120TH FIGHTER INTERCEPTOR GROUP
COMMENTS/DESCRIPTION	
RATED BY	HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	2	4	8	12
B. DISTANCE TO NEAREST WELL	:	1	10	10	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	2	3	6	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	0	10	0	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	3	6	18	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	2	9	18	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	3	6	18	18
GROUND WATER	:	2	6	12	18
		SUBTOTALS		108	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 60

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 (S=SUSPECT, C=CONFIRM) (S)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (70)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(70)(0.9) = (63)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(63)(1) = (63)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF <100 POINTS FOR DIRECT EVIDENCE> OR <80 POINTS FOR INDIRECT EVIDENCE>. IF DIRECT EVIDENCE <100> EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE <80 OR LESS> EXISTS, PROCEED TO B.
(0)

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

1. SURFACE WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
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SURFACE EROSION	:	0	8	0	24
SURFACE PERMEABILITY	:	3	6	18	18
RAINFALL INTENSITY	:	1	8	8	24
SUBTOTALS				42	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					39

2. FLOODING

FLOODING		0	1	0	3
SUBSCORE (100 x FACTOR SCORE /3)	:				0

3. GROUND WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DEPTH TO GROUND WATER	:	1	8	8	24
NET PRECIPITATION	:	0	6	0	18
SOIL PERMEABILITY	:	2	8	16	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	3	8	24	24
SUBTOTALS				48	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					42

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.
(42)

IV. WASTE MANAGEMENT PRACTICES

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

RECEPTORS	(60)
WASTE CHARACTERISTICS	(63)
PATHWAYS	(42)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(55)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x	WASTE MANAGEMENT PRACTICES FACTOR x		FINAL SCORE
(55)	(0.95)	=	52

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