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Further Action Decision Document for Sites 2, 3, and 4. This document presents the rational for selecting soil remediation and groundwater monitoring as the proper remedial actions at these sites.



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# INSTALLATION RESTORATION PROGRAM

# SITES 2, 3, AND 4

## FINAL
# DECISION DOCUMENT

MINNESOTA AIR NATIONAL GUARD
148th FIGHTER WING

November 1996

*Prepared For:*

Air National Guard
Andrews AFB, Maryland

*Prepared By:*

Montgomery Watson
Wayzata, Minnesota

MONTGOMERY WATSON

## TABLE OF CONTENTS



## LIST OF FIGURES



## LIST OF TABLES

## LIST OF ACRONYMS

| | |
|---|---|
| AFFF | Aqueous film-forming-foam |
| ARAR | Applicable and relevant or appropriate requirements |
| Base | Minnesota Air National Guard Base, Duluth, Minnesota |
| bgs | Below ground surface |
| BTEX | Benzene, toluene, ethylbenzene, xylene |
| DIA | Duluth International Airport |
| DPDO | Defense Property Disposal Office |
| DRMO | Defense Reutilization and Marketing Office |
| DRO | Deisel range organics |
| ES | Engineering-Science, Inc. |
| FS | Feasibility study |
| FTA | Fire training area |
| HRL | Health risk limits |
| IRP | Installation restoration program |
| MCL | Maximum contaminant level |
| MDH | Minnesota Department of Health |
| MERD | Metal enhanced reductive dehalogenation |
| µg/l | Micrograms per liter |
| MPCA | Minnesota Pollution Control Agency |
| NGB | National Guard Bureau |
| NPDES | National pollutant discharge elimination system |
| ppb | Parts per billion |
| RAO | Remedial action objective |
| RI | Remedial investigation |
| SVOC | Semi volatile organic compound |
| TPH | Total petroleum hydrocarbons |
| VOC | Volatile organic compound |
| Weston | Roy F. Weston, Inc. |

# 1.0 INTRODUCTION

The Minnesota Air National Guard Base (Base) at Duluth, Minnesota is located at the Duluth International Airport (DIA) in northern Minnesota. The Base is in St. Louis County approximately seven miles northwest of the City of Duluth. The regional location of the Base is shown on Figure 1.

DIA consists of about 2000 acres of land and related airport structures. The Base occupies buildings on the east side of the airport facility with some additional buildings and functions at other locations.

The airport has been used for military operations since 1948. From 1948 to 1961, the airport was used by the 179th Fighter Squadron, which was part of the 133rd Fighter Wing of the Minnesota Air National Guard. The 148th Fighter Group of the Minnesota Air National Guard was active at the airport from 1961 to 1995 when it was converted to the 148th Fighter Wing.

The purpose of this Decision Document is to present the rationale for the remedial alternatives selected for Sites 2, 3, and 4 at the Minnesota Air National Guard Base at the Duluth International Airport.

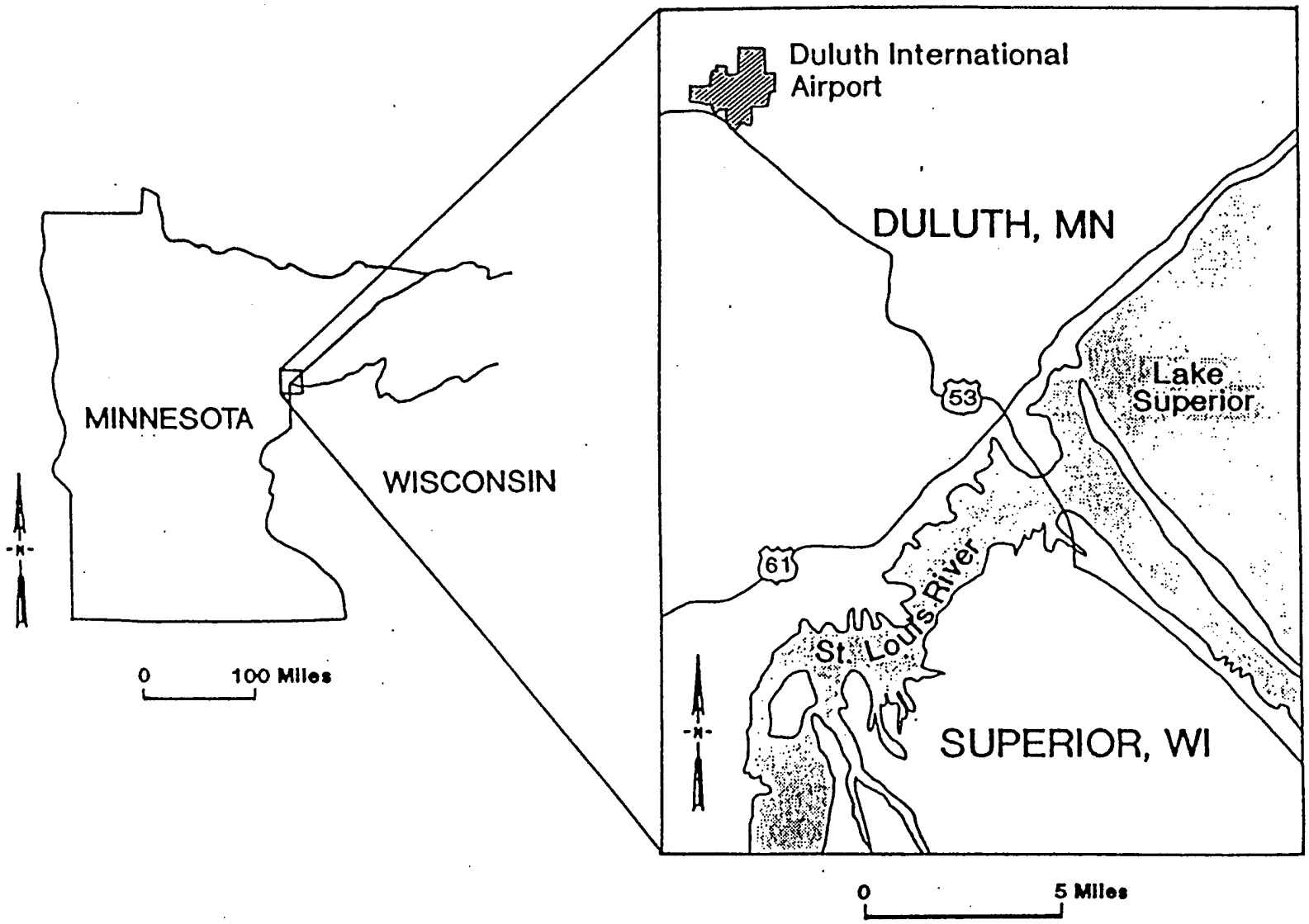
# 2.0 SITE DESCRIPTIONS AND HISTORY

This section presents site descriptions and histories for Sites 2, 3, and 4 at the Base in Duluth, Minnesota. The locations of the sites are shown on Figure 2.

## 2.1 SITE 2

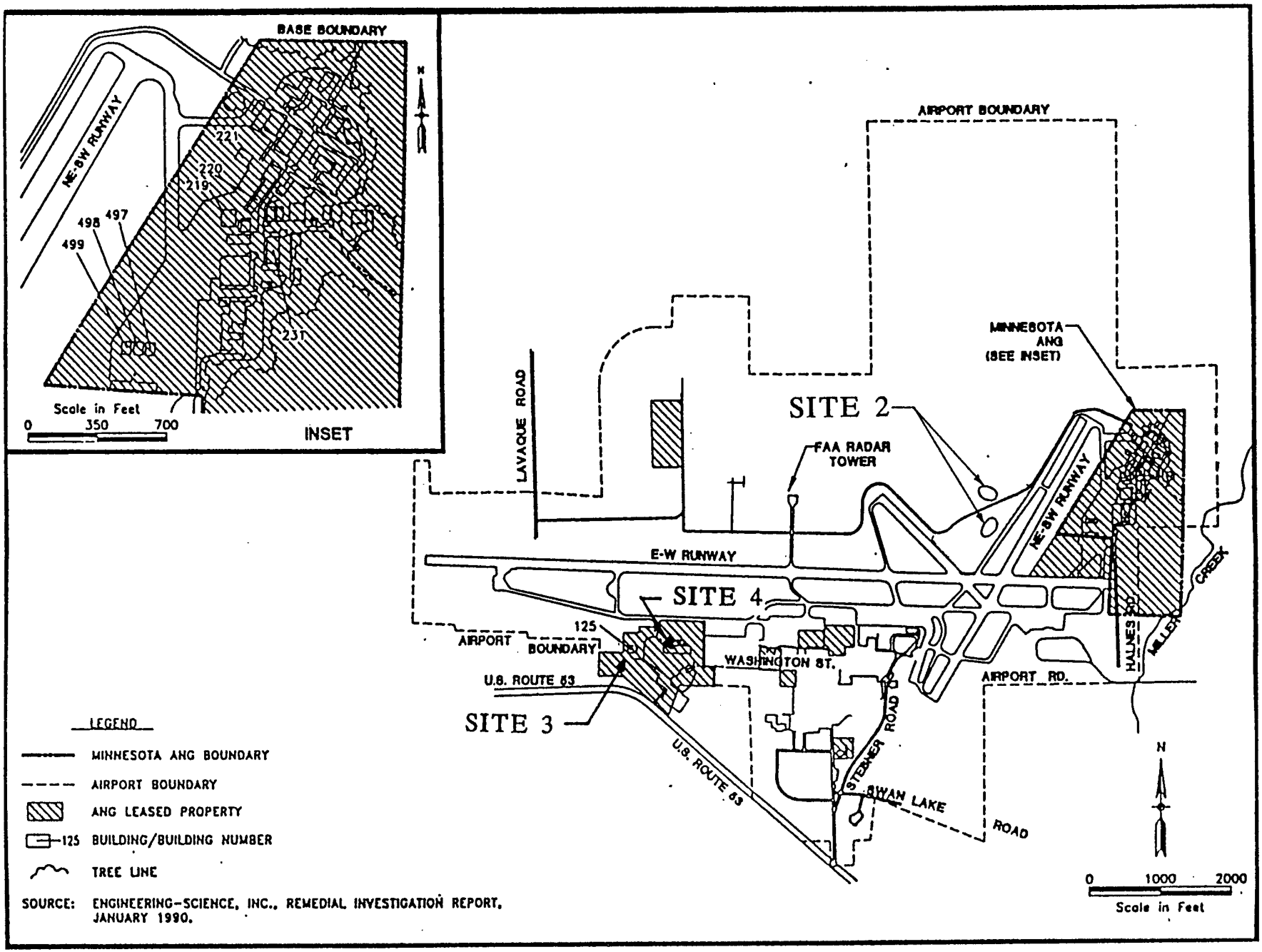
Site 2 consists of two former fire training areas (FTA-1 and FTA-2) which are located in the area between existing Taxiway C and the main Runway 9-27 at DIA. The site covers approximately 50 acres of grassy and lightly wooded areas. These fire training areas were in use from the early 1950s to as late as 1988 when FTA -2 was reportedly used for the last time. The FTAs were each approximately 40 feet wide by 50 feet long and 4 feet deep (Engineering Science, Inc. (ES) 1992).

Based on the results of previous investigative activities at the site, it was determined that soil contamination was not present at FTA-1. The alternatives developed during the Feasibility Study




ES
ENGINEERING-SCIENCE, INC.

| | | |
|---|---|---|
| MONTGOMERY WATSON<br>*Wayzata, Minnesota* | MINNESOTA AIR NATIONAL GUARD<br>DULUTH, MINNESOTA<br>REGIONAL LOCATION MAP | FIGURE<br>1 |

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*Wayzata, Minnesota*

MINNESOTA AIR NATIONAL GUARD
DULUTH, MINNESOTA
SITE LOCATIONS

FIGURE
2

(FS) (ES 1990) recommended a "No-Action" alternative for FTA-1. Minnesota Pollution Control Agency (MPCA) staff have agreed that "No-Further-Action" is required for FTA-1 (MPCA 1991).

Materials burned in the FTAs included JP-4 fuel and drummed materials consisting of waste oils, thinners, and solvents brought from the Defense Reutilization and Marketing Office (DRMO). The fires were extinguished using a protein-based aqueous film-forming foam (AFFF) or chlorobromomethane. It is possible that carbon tetrachloride was also used as an extinguishing agent during the early years of pit operation (ES 1992). All further discussions of Site 2 in this document will only address FTA-2.

## 2.2 SITE 3

Site 3 covers approximately five acres and is located south of the western end of the east-west taxiway and lies west of the access road near the western end of Washington Street. The site consists of paved storage areas, woodland, grassy areas, and roadways. Some regrading of the site has occurred to provide level storage areas and drainage ditches to aid in stormwater drainage (ES 1990).

The site is currently occupied by four buildings and level storage areas as part of the DRMO. Approximately eight employees work at the DRMO facility. However, other workers and the public visit the facility to drop off or pick up excess equipment and supplies (ES 1990).

The contamination source area is a small storage area formerly called the Defense Property Disposal Office (DPDO) Storage Area C. This storage area is approximately 90 feet long and 120 feet wide and consists of a flat surface covered with pea gravel. A drainage ditch borders Storage Area C to the east and north (ES 1992).

From 1965 to 1980, waste petroleum, oils and lubricants, waste solvents, and chemicals were stored on a storage area located to the southwest of the DRMO building. The maximum number of containers stored at any time was 100 55-gallon drums. This site was the location of minor drum leaks in the past. No major spills have been recorded at the site. The storage area is no longer used for the temporary storage of drums (ES 1992).

## 2.3 SITE 4

Site 4 consists of approximately 15 acres located east of Site 3 and north of Washington Street. The site is comprised of grassy areas, roadways, and some marshy areas (ES 1992). The site is occupied by three aboveground storage tanks with a total capacity of approximately 1,000,000 gallons. In addition to the tanks, ancillary equipment and loading and unloading facilities are also present at the site. Two of the tanks are used for the storage of JP-4 fuel. The third tank contained fuel oil #2, however due to the possibility of a release from this tank, it was taken out of service in 1982. The exact location of the suspected leak has not been determined. The tanks are surrounded by a dike which has the capacity to contain 110% of the tankage (ES 1992).

The tanks were constructed in the 1950s. In 1980 a leak was discovered approximately 150 feet away from Tank #3. Fuel oil #2 was observed at a depth of 6-7 feet below ground surface (bgs) during the repair of a waterline. The leak was located approximately 100 feet outside the bermed area for the tanks (ES 1990).

# 3.0 SUMMARY OF INVESTIGATIONS

During the course of the Installation Restoration Program (IRP), several intrusive investigations were conducted to determine the nature and extent of contamination at Sites 2, 3 and 4. This section describes the nature and extent of the investigations at the sites.

In 1983, an IRP Phase II, Stage 1 Problem Confirmation and Quantification Study was undertaken at Sites 2, 3 and 4 (Roy F. Weston, Inc. (Weston) 1984). Seven groundwater monitoring wells were constructed at Site 2. Ten soil borings and two sediment samples were completed at Site 3. At Site 4, four groundwater monitoring wells and 20 temporary well points were constructed and two test pits were dug.

In 1986, an IRP Phase II, Stage 2 investigation was performed at Sites 2, 3 and 4 (Dames & Moore 1987). At Site 2, five additional monitoring wells were installed and sampled, two soil borings were drilled and sampled, three surface soil sites were sampled and three surface water sites were sampled. At Site 3, four monitoring wells were installed and sampled, three soil borings were drilled and sampled, three surface soil sites were sampled and three surface water sites were sampled. At Site 4, four additional monitoring wells were installed and sampled, five soil borings were drilled and sampled, four surface soil sites were sampled, four surface water sites were sampled, and a geophysical survey was conducted.

Between 5 July and 23 September, 1988, the field work for the Remedial Investigation (RI) was conducted. At Sites 2, 3, and 4 a total of seven soil borings were drilled and sampled, 26 monitoring wells were installed and sampled, 19 temporary well points were installed and measured, 55 shallow soil samples were collected, 18 surface water samples were collected, and 19 sediment samples were collected. The results of the 1983, 1986 and 1988 field efforts are presented in detail in the RI report (ES 1990).

In February 1995 one round of groundwater samples was collected from the monitoring wells at Site 2 (MW-1, MW-4, GW-2C, GW-2D, GW-2E). These samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and gross alpha and gross beta.

In April 1995, one round of groundwater samples was collected from seven of the monitoring wells at Site 3. The seven wells sampled were those wells which have historically exhibited the highest concentrations of VOCs and SVOCs. Groundwater samples were analyzed for VOCs by Minnesota Department of Health (MDH) Method 465D, SVOCs by EPA Method 8270, and diesel range organics (DRO) by the Wisconsin DRO Method.

In April 1995, six soil samples were collected from within the bermed area surrounding the aboveground fuel storage tanks. Two soil samples were collected in the vicinity of each of the three aboveground storage tanks. These samples were analyzed for VOCs by MDH 465D and DRO by the Wisconsin DRO Method.

## 4.0 CONTAMINATION ASSESSMENT

This section briefly discusses the nature and extent of contamination at each site, potential human and environmental receptors, and exposure pathways. Table 1 presents the contaminants of concern for soil, groundwater and sediment, their concentrations, and the associated applicable and relevant or appropriate requirements (ARARs).

### 4.1 SITE 2

Due to past practices at the site, soils have been contaminated by various VOCs, benzene, toluene, ethylbenzene, and xylene (BTEX) to depths as great as 12 feet bgs. The most prevalent VOCs detected at the site include tetrachloroethene, 1,2-dichlorobenzene, trichloroethene, and trans-1,2-

TABLE 1

CONTAMINANTS OF CONCERN
MINNESOTA AIR NATIONAL GUARD 148TH FIGHTER WING
DULUTH, MINNESOTA

| Constituent [a] | Maximum Concentration [b] | Results of Recent Sampling [c] | ARARs | | | |
|---|---|---|---|---|---|---|
| | | | Federal MCL [d] (µg/l) | Minnesota HRL [e] (µg/l) | MPCA Soil [f] Clean-up Goal (mg/kg) | Minnesota Aquatic Life Stds. [g] (µg/l) |
| **Site 2 - Groundwater (µg/l)** | | | | | | |
| cis-1,2-Dichloroethene | NA | 230 | 70 | 70 | NA | -- |
| trans-1,2-Dichloroethene | 1200 | 18 | 100 | 100 | NA | -- |
| Trichloroethene | 33 | 2.1 | 5 | -- | NA | -- |
| Vinyl Chloride | 3.1 | BDL | 2 | 0.2 | NA | -- |
| **Site 3 - Soil (mg/kg)** | | | | | | |
| Benzene | 0.9 | -- | -- | -- | 0.5 | -- |
| Trichloroethene | 0.94 | -- | -- | -- | 0.6 | -- |
| Total Petroleum Hydrocarbons | 2700 | -- | -- | -- | 50 | -- |
| **Site 3 - Sediment (mg/kg)** | | | | | | |
| Total Petroleum Hydrocarbons | 2000 | -- | -- | -- | 50 | -- |
| **Site 3 - Groundwater (µg/l)** | | | | | | |
| 1,1-Dichloroethane | 250 | 39 | -- | 70 | NA | -- |
| 1,2-Dichloroethane | 4.4 | ND | 5 | 4 | NA | -- |
| 1,1-Dichloroethene | 58 | 10 | 7 | 6 | NA | -- |
| trans-1,2-Dichloroethene | 450 | 39 | 100 | 100 | NA | -- |
| Tetrachloroethene | 1000 | 770 | 5 | -- | NA | -- |
| 1,1,1-Trichloroethane | 3100 | 390 | 200 | 70 | NA | -- |
| Trichloroethene | 790 | 130 | 5 | -- | NA | -- |
| Vinyl Chloride | 9.1 | 30 | 2 | 0.2 | NA | -- |
| PCB 1242 | 45 | -- | 0.5 | 0.04 | NA | -- |
| Chromium | 710 | -- | 100 | 100 | NA | -- |
| Lead | 30 | -- | 15 | -- | NA | -- |
| **Site 3 - Surface Water (µg/l)** | | | | | | |
| Tetrachloroethene | 10 | -- | -- | -- | NA | 8.9/428[h] |
| 1,1,1-Trichloroethane | 1400 | -- | -- | -- | NA | 263/2628[h] |
| Trichloroethene | 740 | -- | -- | -- | NA | 120/6988h |
| **Site 4 - Soil (mg/kg)** | | | | | | |
| Benzene | 6.2 | -- | -- | -- | 0.5 | -- |
| Total BTEX | 358.2 | -- | -- | -- | 5 | -- |
| Total Petroleum Hydrocarbons | 530 | -- | -- | -- | 50 | -- |
| **Site 4 - Berm Soil (mg/kg)** | | | | | | |
| Total Petroleum Hydrocarbons | -- | 510 | -- | -- | 50 | -- |
| **Site 4 - Sediment (mg/kg)** | | | | | | |
| Benzene | 16 | -- | -- | -- | 0.5 | -- |
| Total BTEX | 1160 | -- | -- | -- | 5 | -- |
| Total Petroleum Hydrocarbons | 7000 | -- | -- | -- | 50 | -- |

TABLE 1

CONTAMINANTS OF CONCERN
MINNESOTA AIR NATIONAL GUARD 148TH FIGHTER WING
DULUTH, MINNESOTA

| Constituent [a] | Maximum Concentration [b] | Results of Recent Sampling [c] | ARARs: Federal MCL [d] (µg/l) | ARARs: Minnesota HRL [e] (µg/l) | ARARs: MPCA Soil [f] Clean-up Goal (mg/kg) | ARARs: Minnesota Aquatic Life Stds. [g] (µg/l) |
|---|---|---|---|---|---|---|
| **Site 4 - Groundwater (µg/l)** | | | | | | |
| Benzene | 22 | -- | 5 | 10 | NA | -- |
| **Site 4 - Surface Water (µg/l)** | | | | | | |
| Benzene | 930 | -- | -- | -- | NA | 114/4487[h] |
| Ethylbenzene | 74 | -- | -- | -- | NA | 68/1859[h] |
| Xylenes | 1020 | -- | -- | -- | NA | 166/1407[h] |

Notes: a: Constituent concentrations for detected compounds as identified in FS (ES 1992)
b: Maximum constituent concentrations are from the FS (ES 1992).
c: Maximum concentration from the 2/4/95 Sites 2 and 10 groundwater sampling event (Twin Ports Testing 1995) or the 4/6/95 Sites 3 and 4 sampling event (Montgomery Watson). During the 4/6/95 sampling event, groundwater samples were collected from Site 3 and soil samples were collected at Site 4.
d: Federal MCLs are the current federal maximum contaminant levels for drinking water as established under the Safe Drinking Water Act (40 CFR Part 141).
e: Minnesota HRLs are the state health risk limits for substances found to degrade Minnesota groundwater as established in the Minnesota Rules Chapter 4717.
f: Cleanup numbers provided by MPCA. Numbers were reportedly derived using MPCA "Procedures For Establishing Soil Cleanup Levels" Version 1. PCB cleanup value from USEPA Guidance on Remedial Actions for Superfund Sites with PCB contamination.
g: Aquatic life standards are those presented in Minnesota Rules Chapter 7050.0222 for Class 2B waters. These standards are presented for general comparison purposes only and are included at the request of the MPCA. Values presented are the chronic standard / maximum standard.
h: Maximum concentration exceeded Minnesota aquatic life chronic standard but not maximum standard.

BEQL: Below Estimated Quantitation Limit
ND: Not Detected
NA: Not applicable
NE: Not established. Although these constituents were detected in soil and sediment, the concentration levels do not exceed action levels for which reason no MPCA cleanup goals were provided (MPCA 1992).
NAv: Not available
Total petroleum hydrocarbons (TPH) - determined by EPA method 418.1 during remedial investigation.
TPH determined using Wisconsin DRO Method for April 1995 sampling event.

dichloroethene. The contaminated soils (6,067 cubic yards) were excavated in 1994 and thermally treated by Earth Burners, Inc. in 1995. Under an agreement between the Duluth Airport Authority and the Base, the remediation of these soils was managed by the Duluth Airport Authority and, therefore, were not considered during development of the remedial alternatives for Site 2. The Base retains overall responsibility for the soils.

Groundwater samples collected as part of the RI indicated the presence of VOCs in monitoring wells (MW-1, MW-2, GW-2E and DANGB-2-MW38) at both FTA-1 and FTA-2. At the time of the groundwater sampling event (July 25, 1988 to September 23, 1988), trans-1,2-dichloroethene, trichloroethene, and vinyl chloride were detected above their respective maximum contaminant level (MCL). Contamination at the site has been documented as separate groundwater contaminant plumes emanating from beneath FTA-1 and FTA-2. These plumes are oriented to the northeast and follow the general groundwater flow direction in the vicinity of Site 2.

There is no significant chemical contamination of sediments at the site. One sediment sample was found to contain low levels (0.26 parts per billion (ppb)) of trichloroethene.

In February 1995 one round of groundwater samples was collected from the monitoring wells at Site 2 (MW-1, MW-4, GW-2C, GW-2D, GW-2E). These samples were analyzed for VOCs, SVOCs, and gross alpha and gross beta. Contaminant levels for previously detected compounds have decreased with exceptions. Benzene concentrations have increased from 1.2 to 2.1 micrograms per liter (µg/l) since the RI sampling event. Cis-1,2-dichloroethene, which was previously not analyzed for, was detected in one of the monitoring wells at 230 µg/l.

The public health risk assessment, included as Section 6 of the RI (ES 1990), listed on-site workers (adults) and nearby residents (adults and children) as potential current use receptors of contaminants at Site 2. The exposure pathways listed for on-site workers are incidental ingestion of surface soils and fugitive dust inhalation. Exposure Pathways for nearby residents include dust inhalation and incidental ingestion of surface soils while visiting the Base. Future use receptors are considered the same as the current use receptors above except that the exposure pathways include incidental ingestion of soils at depth and ingestion of groundwater as drinking water.

## 4.2 SITE 3

There is contamination of both soil and groundwater at Site 3. Soils within the storage area are contaminated by VOCs, total petroleum hydrocarbons (TPH), and pesticides. The dimensions of

Storage Area C are approximately 90 feet by 120 feet. Depth to groundwater at the site is approximately 10 feet. Since groundwater at the site is contaminated by VOCs, it is possible that the entire unsaturated soil column was contaminated.

One sediment sample, outside the storage pad area, was found to contain elevated concentrations of VOC and SVOCs. This sample is located downslope from Storage Area C. The FS estimated that the area of sediment contamination is approximately 2 feet wide by 18 feet long. The estimated depth of sediment contamination is approximately one foot (ES 1992). In the fall of 1995, the contaminated soil at Site 3 (approximately 2,000 cubic yards) was excavated and placed in an aboveground bioremediation cell.

Groundwater beneath the site is contaminated by VOCs and SVOCs. The significant contaminants include 1,1-dichloroethane, trans-1,2-dichloroethene, 1,1,1-trichloroethene, tetrachloroethene, trichloroethene, and vinyl chloride which were all detected above MCLs during the RI (ES 1990). Samples were collected between July 25, 1988 and September 23, 1988. Based on the existing data, a plume of VOC contamination emanates from beneath the storage pad and extends to the northeast following the local groundwater flow direction.

In April 1995, one round of groundwater samples was collected from seven of the monitoring wells at Site 3. The seven wells sampled were those wells which have historically exhibited the highest concentrations of VOCs and SVOCs. Groundwater samples were analyzed for VOCs by MDH Method 465D, SVOCs by EPA Method 8270, and DRO by the Wisconsin DRO Method. Concentrations of 1,1-dichloroethene, trans-1,2-dichloroethene, 1,1-dichloroethane, cis-1,2-dichloroethene, 1,1,1-trichloroethane, trichloroethene, tetrachloroethene, vinyl chloride and DRO were encountered in five of the monitoring wells sampled.

The public health risk assessment, included as Section 6 of the RI (ES 1990), listed on-site workers (adults) and nearby residents (adults and children) as potential current use receptors of contaminants at Site 3. The exposure pathways listed for on-site workers are incidental ingestion of surface soils and fugitive dust inhalation. Exposure pathways for nearby residents include dust inhalation and incidental ingestion of surface soils while visiting the Base. Future use receptors are considered the same as the current use receptors above except that the exposure pathways include incidental ingestion of soils at depth and ingestion of groundwater as drinking water.

## 4.3 SITE 4

Results of the RI indicate contamination of sediments in drainage ditches at this site. Sediment samples collected at the site indicated the presence of fuel oil constituents, BTEX, and lead. Significant levels of these compounds are located in the drainage ditch to the north of the storage tanks. Based on the existing data from the site, it is assumed that the entire length of the north drainage ditch is contaminated. Therefore, the estimated volume of sediment requiring remediation at the site is defined by an area 500 feet long, 5 feet wide, and 1 foot deep or 93 cubic yards (ES 1992). It should be noted that the areal extent of contamination within the drainage ditch has not been determined since clean sediment samples have not been recovered. In addition to the sediments in the north drainage ditch, several "Hot Spots" are located within Site 4. These include the western end of the south drainage ditch and areas near sampling points DANGB-4-MW23, DANGB-4-MW22, and DANGB-4-SL14. The total volume of soil and sediment (in drainage ditches and "hot spots") contaminated by fuel oil and BTEX constituents is approximately 227 cubic yards.

In addition, soils in the area surrounding the fuel storage tanks may be contaminated. Contamination was noted during the collection of a soil sample for geotechnical testing.

In April 1995, six soil samples were collected from within the bermed area surrounding the aboveground fuel storage tanks. Two soil samples were collected in the vicinity of each of the three aboveground storage tanks. These samples were analyzed for VOCs by MDH 465D and DRO by the Wisconsin DRO Method. Detectable concentrations of VOCs are present in two of the soil samples. These samples were collected in the vicinity of the abandoned fuel oil storage tank. The results indicate that concentrations of DRO are prevalent throughout the berms at the site.

The horizontal and vertical extent of contaminated soils has not been determined to date. However, in order for an upcoming project involving the upgrading of fuel tank containment diking to proceed, it is assumed that the top 12 inches of soils within the berms would require excavation and treatment. In addition, the soils which were used for the construction of the berms would be removed and treated. This will result in an additional 4,354 cubic yards of soil from Site 4 to be excavated and treated. The total cubic yards of soil and sediment to be treated at Site 4 is approximately 4,600 cubic yards.

Groundwater contamination from VOCs and TPH has been detected in monitoring wells installed at the site and sampled between July 25, 1988 and September 23, 1988 as part of the RI (ES

1990). Groundwater elevation data derived from these wells indicates that groundwater flow direction is inconclusive, and will be analyzed yearly during the monitoring. The existing FS has assumed that some groundwater discharges to the drainage ditches which exist in the northern and southern portions of the site. Off-site migration of groundwater discharging into the drainage ditches is assumed to be through surface water transport.

The public health risk assessment, included as Section 6 of the RI (ES 1990), listed on-site workers (adults) and nearby residents (adults and children) as potential current use receptors of contaminants at Site 4. The exposure pathways listed for on-site workers are incidental ingestion of surface soils and fugitive dust inhalation. Exposure pathways for nearby residents include dust inhalation and incidental ingestion of surface soils while visiting the Base. Future use receptors are considered the same as the current use receptors above except that the exposure pathways include incidental ingestion of soils at depth and ingestion of groundwater as drinking water.

## 5.0 FEASIBILITY STUDY

The FS and FS Addendum considered several remedial action alternatives for Sites 2, 3 and 4. The final list of alternatives (based on negotiation with the MPCA), is developed and analyzed in the FS Addendum. This section presents the preferred remedial alternatives, as developed in the FS Addendum, for soil and groundwater at Sites 2, 3, and 4.

### 5.1 SITE 2

The preferred alternative for Site 2 groundwater is groundwater monitoring. Recent groundwater sampling has indicated that the chlorinated compounds previously detected in site groundwater have been reduced to concentrations less than MCLs or health risk limits (HRLs). The groundwater monitoring plan would include collecting groundwater samples from the existing monitoring well network on a quarterly basis for a period of two years. This additional data is needed to confirm conditions at the site prior to site closure.

### 5.2 SITE 3

The preferred alternative for Site 3 groundwater is Alternative GW(1) - No Action. Alternative GW(1) consists of additional groundwater monitoring and data review. Based on the available groundwater analytical data, distribution of contaminants in groundwater, and the groundwater

flow field that exists in the vicinity of Site 3, there is minimal risk to the potential down gradient receptors.

The preferred alternative for Site 3 soils is Alternative S(4) - Aboveground Bioremediation. This alternative provides protection to human health and the environment, and meets the RAOs. Alternative is also the most cost effective of the remediation options.

### 5.3 SITE 4

The preferred alternative for Site 4 groundwater is Alternative GW(1) - Groundwater Monitoring. Sampling conducted during the RI (ES 1990) has indicated low levels of VOCs and total petroleum hydrocarbons. The groundwater monitoring plan would include collecting groundwater samples from the existing monitoring well network on a quarterly basis for a period of three years (winter quarter sampling will not be required). This additional data is needed to confirm conditions at the site. In addition, a site review will be performed to assess the site at the conclusion of the monitoring program.

The preferred alternative for Site 4 soils is Alternative S(3) - Incineration. This alternative provides protection to human health and the environment, and meets the RAOs. Although Alternative S(4) - Aboveground Bioremediation would also satisfy the RAOs and protect human health and the environment, there is no location currently available on property owned or leased by the Base to construct the bioremediation cells.

## 6.0 CONCLUSIONS

### 6.1 SITE 2

Based on the investigations conducted at Site 2, it was determined that soil contamination is not present at the FTA - 1 area. MPCA staff have approved a "No-Further-Action" alternative (MPCA 1991) for FTA - 1.

Investigative activities identified VOC contaminated soils and groundwater at FTA-2. As part of an interim response action, 6,067 cubic yards of contaminated soil were excavated and have been thermally treated. Recent groundwater sampling has indicated that the chlorinated compounds previously detected in site groundwater have been reduced to concentrations less than MCLs or

HRLs. Additional groundwater monitoring data is needed to confirm conditions at the site prior to site closure.

## 6.2 SITE 3

Investigations at Site 3 have identified VOC, TPH and pesticide contamination of soil and VOC and SVOC contamination of groundwater. Based on the existing data, a plume of VOC contamination emanates from beneath the storage area and extends to the northeast following the local groundwater flow direction (ES 1990). Recent sampling has confirmed that VOCs are still present in site groundwater at concentrations which exceed MCLs and HRLs. Based on the available groundwater analytical data, distribution of contaminants in groundwater, and the groundwater flow field that exists in the vicinity of Site 3, there is minimal risk to the potential down gradient receptors. Additional groundwater monitoring is recommended. Surface water will be monitored by the base under a separate program.

## 6.3 SITE 4

Sediment samples collected at the site indicated the presence of fuel oil constituents, BTEX, and lead. Significant levels of these compounds are located in the drainage ditch located to the north of the storage tanks. In addition to the sediments in the north drainage ditch, several "hot spots" are located within Site 4 which will require remediation.

Soil samples collected in April 1995 from within the bermed area surrounding the aboveground fuel storage tanks indicate that concentrations of DRO are prevalent throughout the berms at the site. In order for an upcoming project involving the upgrading of fuel tank containment diking to proceed, it is assumed that the top 12 inches of soils within the berms will require excavation and treatment. In addition, the soils which were used for the construction of the berms will be removed and treated.

Groundwater contamination from VOCs and TPH have been detected in monitoring wells installed at the site. However, this contamination is considered low level based on the most recent monitoring data (ES 1992). Additional groundwater monitoring is suggested for groundwater contamination at this site. Surface water will be monitored by the base under a separate program.

# 7.0 DECISION

Based on the findings of the site investigations and analysis of alternatives in the FS and FS Addendum, the following remedial action alternatives will be implemented for Sites 2, 3, and 4 at the Base.

## 7.1 SITE 2

The National Guard Bureau (NGB) will implement a groundwater monitoring program that will include collection of quarterly groundwater samples from the existing monitoring well network for a period of one year. At the end of the monitoring period, the data will be reviewed and the need for further action will be evaluated.

## 7.2 SITE 3

The NGB will remediate contaminated soils at Site 3 using an aboveground bioremediation cell. The treatment residuals will be required to meet MPCA leaching based cleanup goals and permit requirements.

The NGB will conduct quarterly groundwater monitoring at Site 3 for a period of three years (winter quarter monitoring will not be required). Monitoring data will be evaluated by the MPCA on an annual basis. If the monitoring data indicate that a contaminant plume is migrating off site, and is impacting human health and/or the environment at concentrations exceeding specified ARARs, then active groundwater remediation may be required.

## 7.3 SITE 4

The NGB will remediate contaminated soils and sediment at Site 4 by incineration. The incineration process and treatment residuals will be required to meet MPCA leaching based cleanup goals and permit requirements.

The NGB will implement a groundwater monitoring program that will include collection of groundwater samples from the existing monitoring well network on a quarterly basis for a period of three years (winter quarter monitoring will not be required). Monitoring data will be evaluated by the MPCA on an annual basis. If the monitoring data indicate that a contaminant plume is

migrating off site, and is impacting human health and/or the environment at concentrations exceeding specified ARARs, then active groundwater remediation may be required.

Chief, Environmental Division — Date: 20 Nov 96

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Minnesota Pollution Control Agency

[X] Concur with modifications see 11/13/97 letter to Paul Wheeler, ANGRC/CEVR

[ ] Non-Concur (please provide reason)

Signature — Title: Project Manager — Date: 11/13/97

## 8.0 REFERENCES

Engineering-Science, Inc. (ES) 1992. Installation Restoration Program, Proof Final Feasibility Study, Minnesota Air National Guard Base, Duluth International Airport, Duluth Minnesota. August.

Engineering-Science, Inc. (ES) 1990. Installation Restoration Program, Remedial Investigation Report, Minnesota Air National Guard Base, Duluth International Airport, Duluth Minnesota, Volumes 1-7. August.

Dames & Moore, Inc. 1987. Installation Restoration Program Phase II Confirmation/Quantification, Stage 2, Duluth International Airport, Duluth, Minnesota. September.

Minnesota Pollution Control Agency (MPCA). 1991. Letter from James L. Warner, Division Chief, Groundwater and Solid Waste Division, MPCA, to Michael C. Washeleski, Chief, Bioenvironmental Engineering, ANGRC/SGB. August 29, 1991.

Roy F. Weston, Inc., 1984. Installation Restoration Program Final Report, Phase II, Stage 1, Problem Confirmation Study, Duluth International Airport, Duluth, Minnesota. October.

**Minnesota Pollution Control Agency Modifications**
**Installation Restoration Program**
**Sites 2, 3, and 4**
**November 1996 Final Decision Document**
**November 1997**

Site 2:

The text states that ground water contaminant concentrations are below maximum contaminant levels (MCL) and health risk limits (HRLs). This statement is incorrect. Table 1 shows exceedances of MCLs and HRLs.

Site 3 and 4:

Surface water monitoring results (collected by the base under a separate program) shall be evaluated along with ground water monitoring results to determine if applicable or relevant and appropriate requirements for ground water and surface water are exceeded.

Site 4:

Soil remediation is currently proposed for only a portion of the contaminated soil. It is necessary to state that remediation of the remainder of contaminated soil shall coincide with the facility replacement.