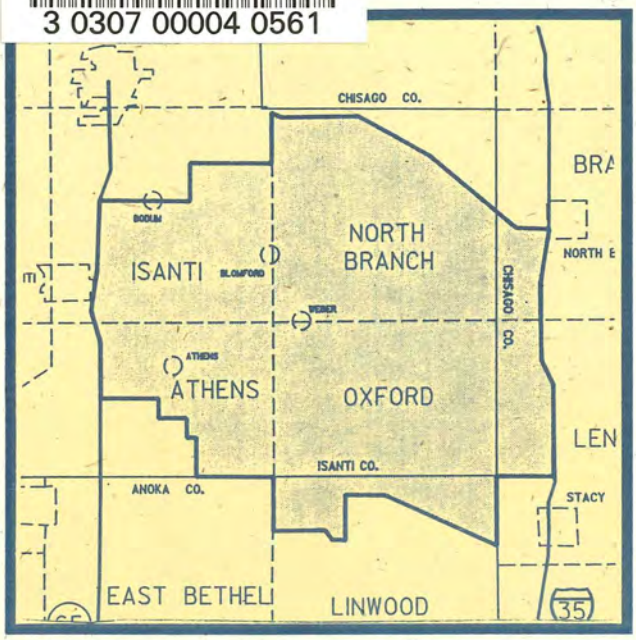
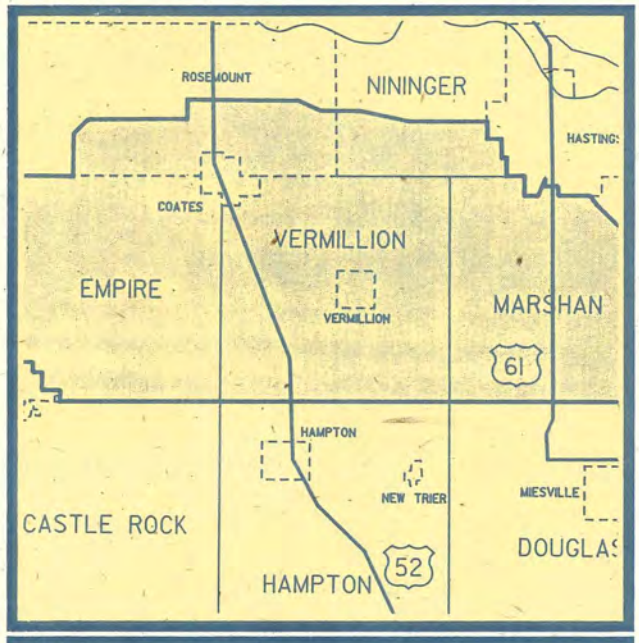
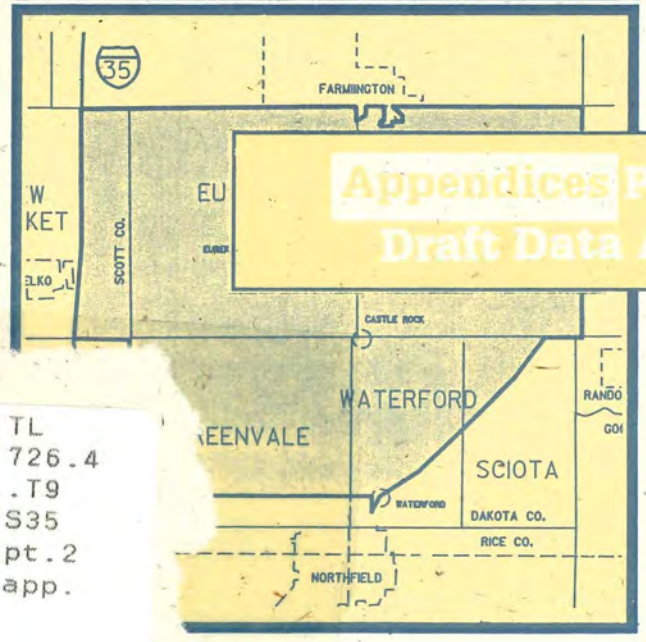
LEGISLATIVE REFERENCE LIBRARY
3 0307 00004 0561







SELECTING A SEARCH AREA FOR A NEW MAJOR AIRPORT

June, 1991

Appendices Part Two: Draft Data Analysis:

The second in a series of reports to the Twin Cities Area

TL
726.4
.T9
S35
pt.2
app.

LEGISLATIVE REFERENCE LIBRARY
645 State Office Building
Saint Paul, Minnesota 55155

Metropolitan Council Members

Mary E. Anderson, chair

Liz Anderson
Susan Anderson
Dirk deVries
Bonnie D. Featherstone
David F. Fisher
Jim Krautkremer
Carol Kummer
Kenneth Kunzman
E. Craig Morris
Esther Newcome
Donald B. Riley
James W. (Jim) Senden
Margaret Schreiner
Sondra R. Simonson
Dede Wolfson

New-Airport Search Area Advisory Task Force

Liz Anderson
Richard Beens, cochair
Keith Boleen
Vernon Boettcher
Beverly Boyd
Wayne Burggraaff
Steve Cramer
Jan DelCalzo
Marilyn Deneen
James Dommel
Steve Empey
Teb Furber
Kathleen Gaylord
Benjamin Griggs
Edward Gutzmann
Chilton Hagan
Larry Hamre
William T. Harper, Sr.
Joseph Harris
Beverly Hauschild
James Hearon, III
Phyllis Hiller
Gene Hollenstein
James Jensen
Mark Karnowski
John Labosky
David Lawrence
Kay Louis
Tom Morin
E. Craig Morris
Josephine Nunn, cochair
Roberta Opheim
John Pidgeon
Gloria Pinke
Mike Podawiltz
Larry Sawyer
Hugh Schilling
John Tschida
Ray Waldron
Marcy Waritz
Robert Worthingon

Selecting a Search Area for a New Major Airport
Part Two: Draft Data Analysis Appendices

June 1991

The Second in a Series of Reports
to the Twin Cities Area

Metropolitan Council
Mears Park Centre, 230 E. Fifth St.
St. Paul, MN 55101
612 291-6359 TDD 291-0904
Data Center 612 291-8140

Publication No. 559-91-088A

The preparation of this document was financed in part through a planning grant from the Federal Aviation Administration (FAA) as provided under section 505 of the Airport and Airway Improvement Act of 1982. The contents do not necessarily reflect the official views or policy of the FAA. Acceptance of this report by the FAA does not in any way constitute a commitment on the part of the United States to participate in any development depicted therein nor does it indicate that the proposed development is environmentally acceptable in accordance with appropriate public laws.

The following consultants and others assisted in the preparation of this report:

Apogee Research, Inc.
Turner Collie & Braden, Inc.
James W. Spensley--Holme Roberts & Owen
Enviroscience
University of Minnesota: Remote Sensing Laboratory

Printed on recycled paper



CONTENTS

Page

APPENDIX A 1

Environmental Characteristics 1
- Physical Environmental Factors 2
- Wetlands 4
- Rivers, Lakes and Ditches 11
- Floodplains 13
- Groundwater/Surficial Geology 21
- Historical, Architectural, Archeological, Cultural Resources 26
- Land Coverage 28
- Parks, Open Space 33
- Pipelines 33
- Hazardous/Solid Waste Sites 38
- Topography 42
- Soils 42

Biological Environmental Factors 43
- Endangered, Threatened, and Special Concern Plants and Animals 47

Airport-Related Environmental Factors 55
- Solid and Hazardous Waste Generation 55
- Air Quality 55
- Water Quality 56

APPENDIX B 59

Search Area Characteristics 59
- Land Use and Population Density Characteristics 59
- Agricultural Lands--Crop Equivalency Ratings 68

APPENDIX C 72

Conceptual Design: Potential New Air Carrier Airport 72

Legislative Background 72
Conceptual Design Plan Parameters 72
Layout Alternatives 73
Alternative Evaluation Criteria 75
Evaluation of Criteria 79
Terminal Configuration 81
Cost 86

APPENDIX A

ENVIRONMENTAL CHARACTERISTICS

This section provides an overview of the environmental issues in the three search areas. This appendix is part of the second report in a series that documents the selection of a single search area. As such, the overall level of detail is more extensive than was used in the initial screening process, but less detailed than what will be required to select a particular site within the selected search area.

Additional information on potential environmental impacts becomes more critical as the decision-making process for the proposed new major airport moves from identification of three search areas to selection of a final search area. While a primary emphasis will be to address the requirements of the Alternative Review Process of the Minnesota Environmental Quality Board, in many cases, the number of variables and the level of detail exceeds that used in comparable search efforts. Selecting the search area for the new Denver airport, for example, was based on the evaluation of significantly fewer environmental factors than have been analyzed here.

The environmental assessment used to identify the three search areas focuses on key factors adopted by the task force and Metropolitan Council in 1990. The factors fit into three environmental categories: physical, environmental, and development as follows:

- Physical Environmental Factors: Wetlands; Rivers, Lakes, Streams and Ditches; Floodplains; Groundwater/Surficial Geology; Historic, Architectural, Archeological and Cultural Resources; Land Coverage (including Agricultural Lands); Parks and Open Space; Pipelines; Hazardous and Solid Waste Sites; Topography; and Soils.

- Biological Environmental Factors: Endangered, Threatened, and Special Concern plants and animals.

- Airport Development/Operation Related Environmental Factors: Hazardous and Solid Waste Generation; Air Quality; and Water Quality.

These environmental considerations vary widely in importance. Some, such as surficial geology or topography, can have significant impact on the cost to construct an airport. Others, most obviously wetlands and endangered or threatened plants and animals, represent values that go beyond a traditional cost-benefit framework.

The impact of each factor cannot be weighted equally. Some factors, such as relocation of a pipeline or design changes to avoid a historical site, can affect the overall cost of constructing an airport. Often these factors involve changes that are relatively straightforward to address. Other factors, such as extent of wetlands and biotic communities, are more difficult to overcome. The location of wetlands, floodplains, and rivers can be altered, but the environmental magnitude of such undertakings pose a considerable constraint.

Noise impacts, one of the most important environmental concerns, is discussed in Section IV of this report and will be analyzed in detail as part of the site selection process once agreement has been reached on a specific search area.

Table 1 provides a comparative assessment of the relative degree of concern that each environmental factor raises for each of the three search areas. In reviewing this table, it is important to remember that other factors need to be considered as part of any search area decision.

A complex mosaic of interlocking federal, state, regional and local laws, policies, regulations and jurisdictional authorities has been established to oversee and protect environmental and environmentally-related resources. In order to make informed decisions regarding the most appropriate search area in which to locate the site for a new airport, both the resources and the policies and regulations surrounding them must be understood.

The geographic-based information on these environmental factors has been mapped for each search area. This Appendix shows the results of the environmental mapping effort. The Appendix includes, where appropriate, a comparison of each environmental factor among the three search areas, as well as the rules and regulations that may affect the selections of a research area. The data presented is at a level of detail sufficient to begin to understand the relative differences among search areas and to assist the task force and the Metropolitan Council in selecting a final search area. Once this selection is accomplished, much more detailed and site-specific environmental analyses must be undertaken before an airport site can be identified.

PHYSICAL ENVIRONMENTAL FACTORS

Each of the candidate search areas have a number of physical characteristics that could affect both the siting and design of a new airport. Of primary concern is the potential impact of a new airport on wetlands. Growing national concern over the depletion of wetlands has resulted in greater and greater scrutiny over the types of activities permitted in and adjacent to these resources. Other water-related physical features -- rivers and their floodplains, lakes, sensitive groundwater recharge areas, as well as land coverage (particularly forests, parks and agricultural lands) and historic, archeological, architectural and cultural resources -- also pose constraints that could limit locational options of a new airport. Topography, soil types and patterns, and existing hazardous waste sites and pipelines can affect siting decisions; not only due to the substantial costs involved with overcoming topographical constraints, building on unstable soil conditions, removing hazardous wastes and pipeline relocation, but also because these features may be important indicators of other more critical environmental resources or problems.

TABLE 1

Comparative Assessment of Enviromental Factors By Search Area

ENVIRONMENTAL FACTOR	ANOKA-ISANTI-CHISAGO	DAKOTA	DAKOTA-SCOTT
PHYSICAL FACTORS			
Wetlands	●	○	◍
Rivers, Lakes, Streams	●	◍	◍
Floodplains	●	○	◍
Groundwater/Surficial Geology	●	◍	◍
Cultural Resources	○	○	○
Land Coverage: Forested Land	◍	○	○
Land Coverage: Agricultrual*	○	◍	●
Parks, Open Space	○	○	○
Pipelines	○	○	○
Hazardous/Solid Waste Sites	○	○	○
Topography	○	○	◍
Soils	●	○	◍
BIOLOGICAL FACTORS			
Rare, Endangered, Threatened Species	◍	○	○
DEVELOPMENT-RELATED FACTORS			
Solid/Hazardous Waste Generation	○	○	○
Air Quality	○	○	○

● Significant Constraint ◍ Moderate Constraint ○ Minor Constraint

* Based on Crop Equivalency Rating (CER).

WETLANDS

Introduction

Recent efforts to strengthen existing wetlands policies, regulations and programs in Minnesota and nationally underscore the importance of considering wetland impacts early in any development project. The intent is to tighten restrictions on the types of activities that can or cannot take place in these areas. Public concern over wetland losses will necessitate careful scrutiny of the wetland impacts associated with the siting of a major new airport. The location and classification of existing wetlands is important to assess wetland losses or alterations and the extent and cost of mitigation measures that may be required if wetland encroachment is to occur. Maps below show the location of all classified wetlands and the implications they may pose on the evaluation of the three search areas.

Data Sources

Two sources were used to identify wetlands within the airport search areas. During the initial investigation, the source of information was the Minnesota Department of Natural Resources. The MDNR maintains county maps showing Protected Waters and Wetlands (PWW0 within Minnesota. The PWW maps show rivers, lakes and large wetlands. For the current effort, information from the National Wetland Inventory (NWI) maps from the U.S. Fish and Wildlife Service, Department of the Interior was added. The inventory provided information on wetland type, extent and location. The NWI maps show all wetlands identified through aerial photographs, but do not delineate them as Minnesota Protected Waters.

Wetlands were identified from NWI and PWW maps. All PWW's were digitized onto base maps for each search area. NWI wetland maps were reproduced for the airport search areas. The NWI maps are the most thorough official maps available for identifying the delineating wetlands. However, they are limited in that they were compiled using aerial photographs and not field investigations.

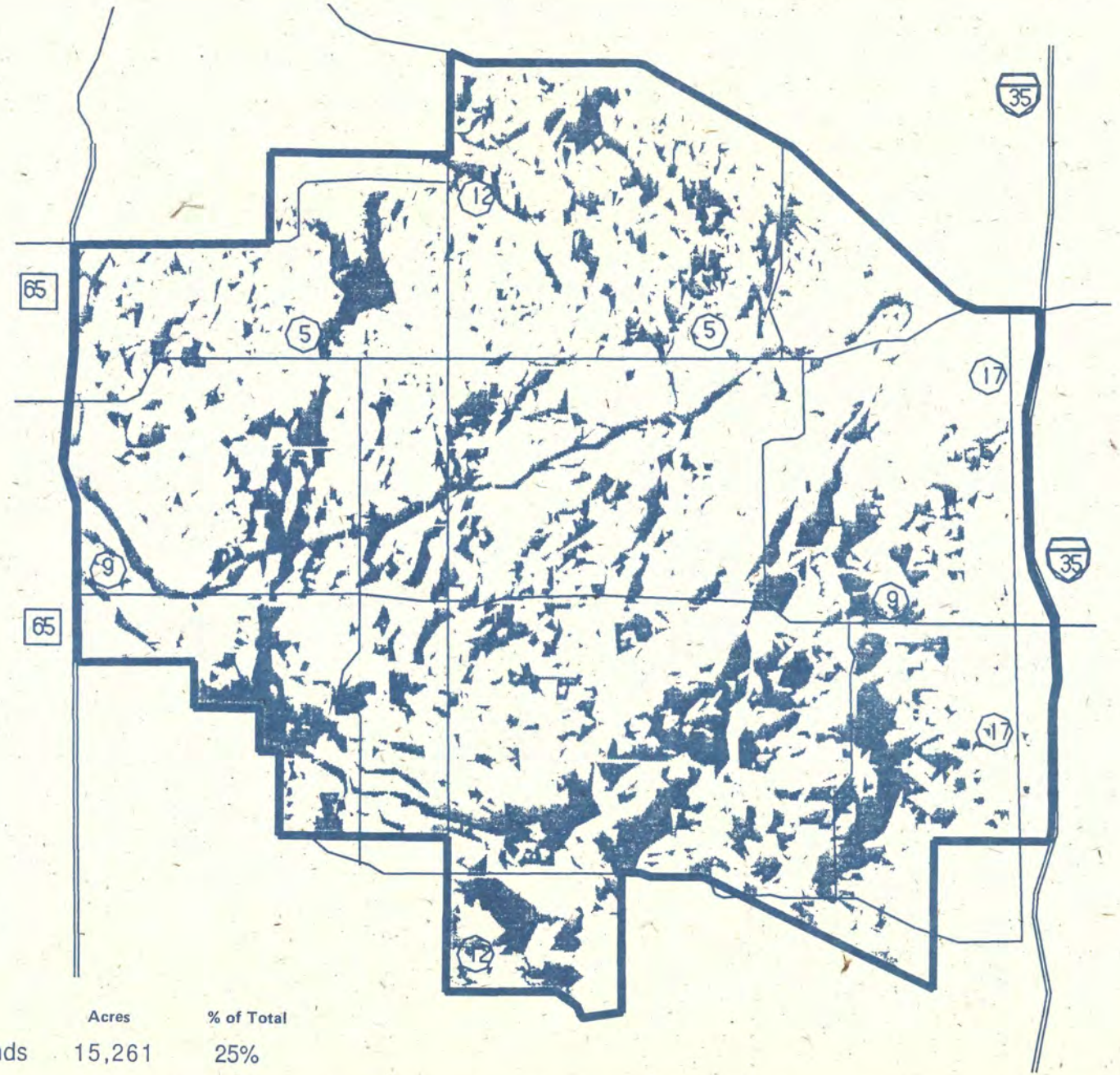
After a single airport search area has been identified, the wetlands must be reviewed separately in the field to verify the maps and provide additional information on their extent, quality and location. A field investigation for wetlands will identify wetlands that were not identified through aerial interpretation and those wetlands that have been filled since the information on the maps was compiled.

Findings

Dakota-Isanti-Chisago Search Area

Significant amounts of classified wetlands make up the northern search area, the Dakota-Isanti-Chisago search area. Of the area's approximately 61,720 acres, 15,260 acres, or close to 25 percent of the search area, is wetlands. (see Figure 1a) Moreover, wetlands appear to be evenly dispersed throughout the entire search area. This is because of the large number of rivers, lakes, and streams within the area.

Dakota Search Area



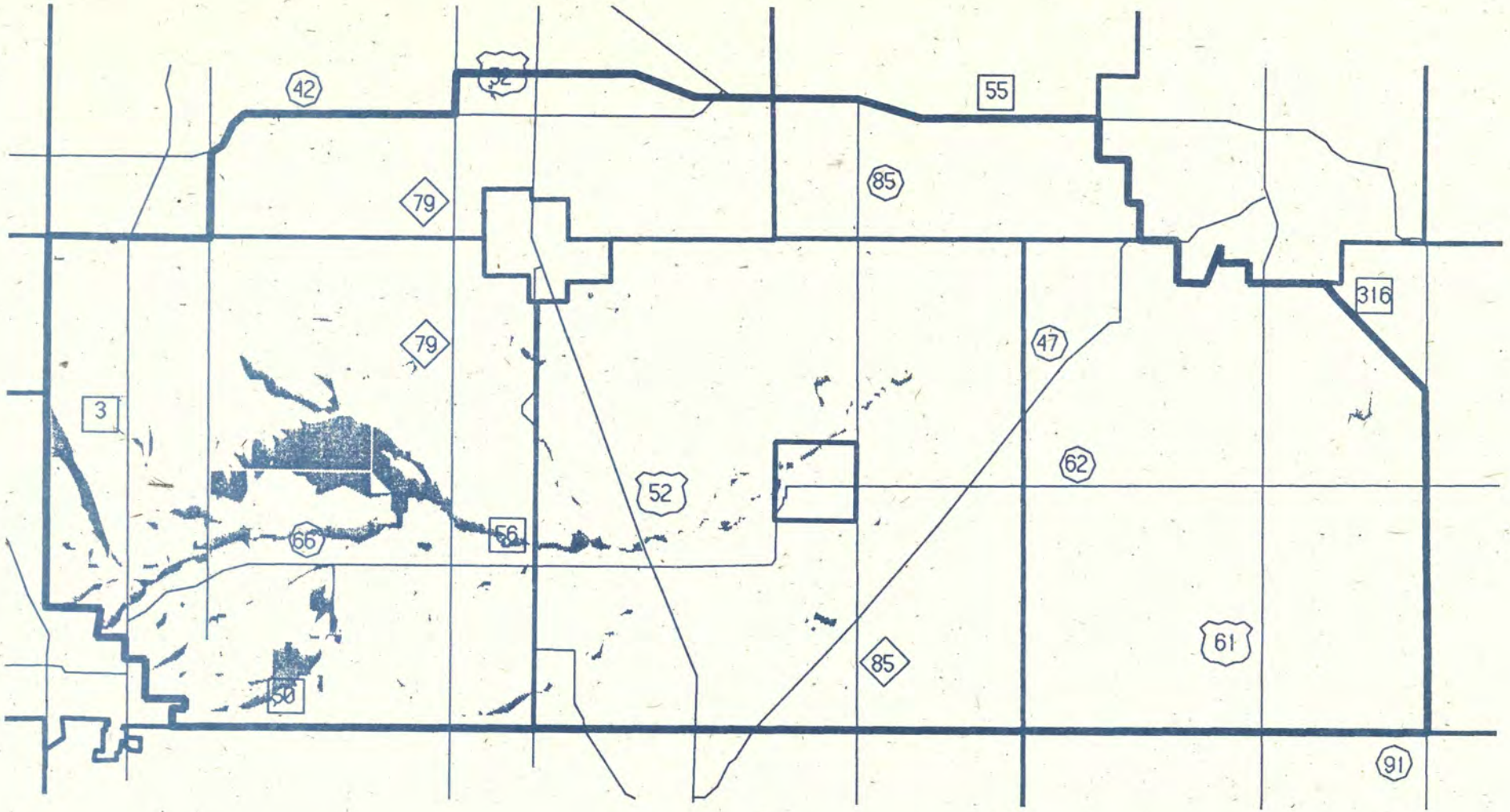
	Acres	% of Total
Designated Wetlands	15,261	25%

Source: U.S. Fish and Wildlife Service, National Wetlands Inventory

METROPOLITAN COUNCIL

Anoka—Isanti—Chisago Search Area

FIGURE 1A **Wetland Areas**



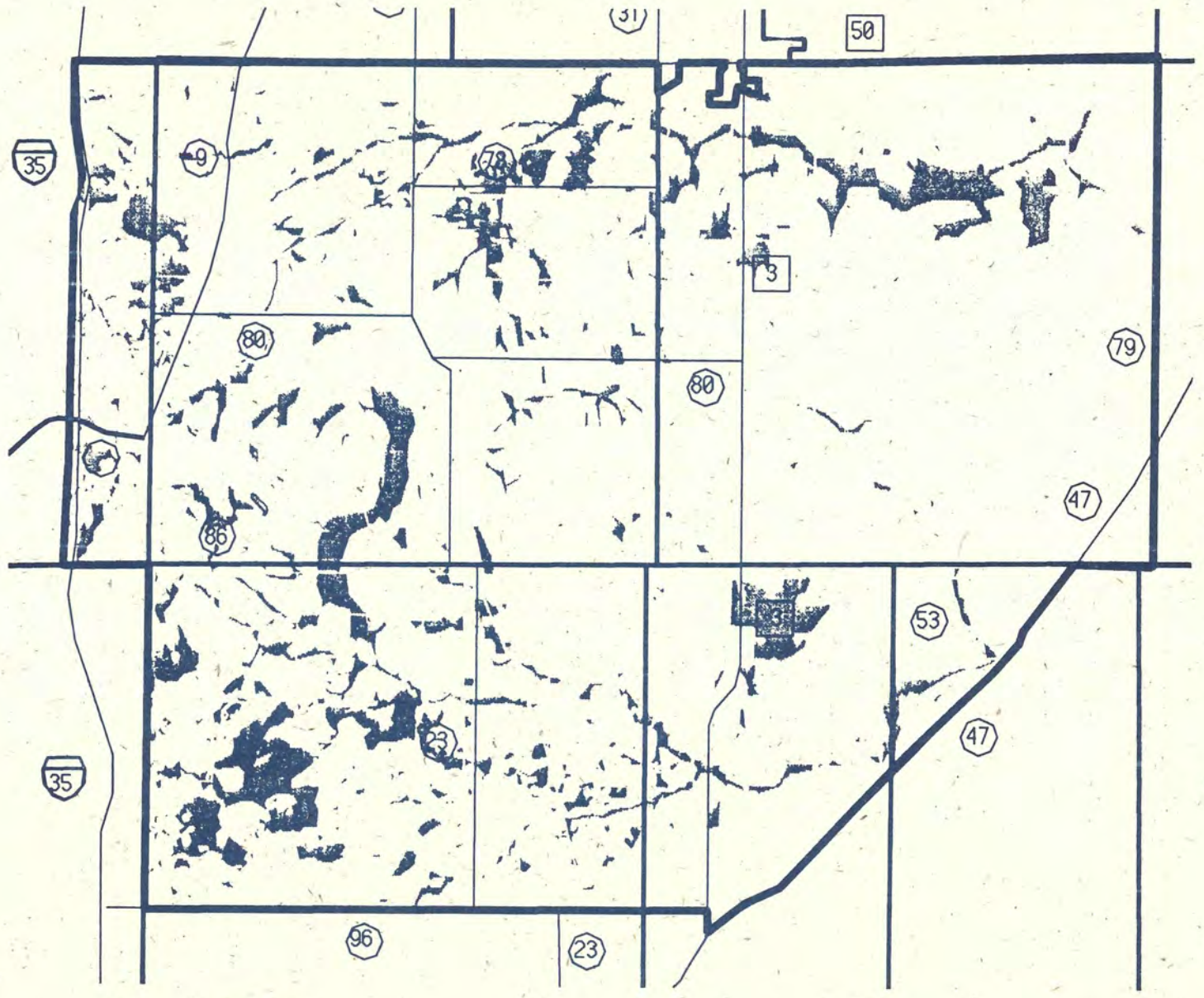
	Acres	% of Total
Designated Wetlands	2,595	3%

Source: U.S. Fish and Wildlife Service, National Wetlands Inventory

METROPOLITAN COUNCIL

Dakota Search Area

FIGURE 1B **Wetland Areas**



	Acres	% of Total
Designated Wetlands	7,903	11%

Source: U.S. Fish and Wildlife Service, National Wetlands Inventory

FIGURE 1C

Dakota–Scott Search Area

Wetland Areas

The Dakota search area encompasses 74,590 acres, with only 2,600 acres classified as wetlands. (see Figure 1b) The wetlands are mostly situated in the southwest region of the area and are part of the Vermillion river system. The Dakota search area has the least amount of wetlands acreage, with approximately 3.5 percent of the total area classified as wetlands.

Dakota-Scott Search Area

The Dakota-Scott search area totals 73,865 acres. Of these, 7,903 acres, or 11 percent, are classified as wetlands. (see Figure 1c) The majority of the wetlands occupy the western and southwestern areas of the search area and are associated with the numerous rivers and streams which drain those areas.

Implications

A maze of interlocking federal, state, regional and local policies, regulations and jurisdictional authorities presently oversee what activities can or cannot take place in and adjacent to wetlands. Both in Minnesota and nationally, efforts have been under way to tighten restrictions on development activities where wetlands exist. It is important to understand of the wetland constraints and opportunities which face the planning and development of a major new airport.

On June 4, 1991, the Governor of the State of Minnesota signed into law the wetlands conservation act of 1991 (H.F. No. 1). The focus of the act is to "achieve no net loss in the quantity, quality, and biological diversity of Minnesota's existing wetlands." The act applies to almost all wetlands in the state. The act establishes various wetland preservation programs and requires the replacement of most wetlands that are drained or filled. The act gives the Minnesota Department of Natural Resources and the Board of Water and Soil Resources several years to adopt rules implementing the act.

Replacement of wetlands must be guided by the following principles in descending order of priority:

1. avoiding the direct or indirect impact of the activity that may destroy or diminish the wetland;

2. minimizing the impact by limiting the degree or magnitude of the wetland activity and its implementation;

3. rectifying the impact by repairing, rehabilitating, or restoring the affected wetland environment;

4. reducing or eliminating the impact over time by preservation and maintenance operations during the life of the activity; and

5. compensating for the impact by replacing or providing substitute wetland resources or environments.

Replacement must be within the same watershed or county as the impacted wetlands except that wetlands impacted by public transportation projects may be replaced statewide. For wetlands located on nonagricultural land, replacement must be in the ratio of two acres of replaced wetland

for each acre of drained or filled wetland. For wetlands located on agricultural land, replacement must be in the ratio of one acre of replaced wetland for each acre of drained or filled wetland.

There are also many federal laws and many federal agencies which relate directly or indirectly to the regulation, conservation, protection, management or enhancement of important wetlands and wetland habitats. All federal agencies have a responsibility to protect, preserve and enhance wetland habitats. Such protection is mandated by Executive Order 11990, Protection of Wetlands, which requires that all agencies:

> "...to the extent permitted by law, shall avoid undertaking or providing assistance for new construction location in wetlands unless the head of the agency finds, (1) that there is no practical alternative to such construction, and (2) that the proposed action includes all practical measures to minimize harm to wetlands which may result from such use."

In addition, most federal agencies that have the responsibility for resource protection and/or development have internal policies which speak to wetland values, conservation and protection. While federal policies are valuable assets in wetlands management, their strength is only realized when there are also strong state and local programs. Minnesota and the Twin Cities metro area are considered to have strong programs.

Of a more general nature, the National Environmental Policy Act (NEPA) and the Minnesota Environmental Policy Act (MEPA) clearly mandate consideration of impacts on important resources. NEPA provides a forum for the public participation in the planning process for all projects of the federal government, including federal permitting and licensing programs. MEPA provides a similar forum for public participation in state and local governmental projects. This participation can have a major influence on selection of airport alternatives and on acceptable mitigation measures. NEPA and MEPA are not regulatory in nature. As a result, any eventual legal requirement for mitigation is usually implemented through applicable regulatory programs.

Section 404 of the Clean Water Act (CWA) has come to be known as the federal "wetland protection act." It provides authority to the Corps of Engineers (COE) to issue permits for the discharge of dredged or fill material into waters of the United States. These waters include all tidal waters, their tributaries, and adjacent wetlands. The COE can exert jurisdiction in isolated waters and wetlands only if degradation of those areas will affect interstate commerce. Some wet meadow, wet pastures, and sand dune areas are not considered wetlands by the COE definition and are not regulated at present.

Since Section 404 applies only to replacement of dredged or fill material, there are a number of activities which are not regulated. These include:

(1) drainage of wetlands;
(2) dredging and excavation;
(3) deposition of material other then dredged or fill material;
(4) removal and/or destruction of plants and/or animals; and
(5) activities in non-wetland areas that may affect wetlands.

Item (3), the exclusion of deposition of non-dredge or fill material from 404 permitting, has been challenged by the Environmental Protection Agency (EPA). In 1986 Memorandum of

Understanding between EPA and the COE, both agencies agreed to an interim program to control the discharge of solid waste material into waters of the U.S.

For Minnesota, the Section 404 permit program is administered by the St. Paul District of the COE. As part of the 1991 wetlands legislation, the Legislature authorized the Minnesota Department of Natural Resources to seek approval from the United States Environmental Protection Agency to administer the Section 404 permit program. The rules adopted by the Minnesota Department of Natural Resources for the administration of the program must be consistent with the requirements of state and federal laws. The program is guided by formally published nationwide regulations and policies (33 CFR Part 320-330) but considerable flexibility is exercised by each COE district. Permit applications are evaluated using three general criteria:

(1) relative extent of public and private need for the proposed activity;
(2) desirability of using appropriate alternative locations and methods to accomplish the objectives of the proposed activity; and
(3) The extent and permanence of the beneficial or determined effects of the proposed activity.

A specific wetland and water dependency policy states that the applicant must provide sufficient information to demonstrate the need to locate the proposed activity in the wetland and the availability of practical alternative sites.

Probably the most rigorous review of permit applications is in evaluating their consistency with the 404(b)(1) guidelines. These guidelines are promulgated by EPA in cooperation with the COE, and a permit cannot be issued unless the proposed activity conforms with the guidelines. The fundamental premise of the guidelines is that discharges will not be allowed which will have"... an unacceptable adverse impact...and...the degradation or destruction of special aquatic sites, such as filling operations in wetlands, is considered to be among the most severe environmental impacts covered by these guidelines."

Currently, the Minnesota Department of Natural Resources coordinates, to some degree, state review on COE 404 permit applications. The state, pursuant to Section 401 of the CWAA, and through a joint agreement with the COE, can certify that proposed actions are consistent with state water quality standards. This certification, if exercised, can essentially provide a veto power to the state on COE 404 permits. Since Minnesota does not have a federally-approved Coastal Zone Management program, and therefore no adopted local CZM plans, there is at present no formal mechanism for local jurisdiction to comment on COE 404 permits. The COE will not however, by policy, issue a permit for any action that has been denied state or local permit and/or approval (33 CFR Part 320).

In short,the direction is to avoid what can be avoided, minimize where possible, and after that, compensate for the damage. Thus the first step in mitigation would be to avoid the impact altogether by, for example, selecting an alternative, non-wetland site. After avoidance, the next step should be to minimize the impacts, and so on. In November 1989, EPA and the Corps reached a landmark agreement that, in essence, states that the Corps, when reviewing 404 permit applications, will follow the wetland protection hierarchy in sequence and will strive to achieve EPA's goal of "no net loss" of wetlands.

Because of Federal law and the recent state wetlands legislation, siting an airport in and around protected wetlands in any of the search areas will be difficult.

The Dakota-Isanti-Chisago search area has 15,260 acres classified as wetlands. As a result development in and around this location will be difficult without disrupting wetlands. The Dakota search area has 3.5 percent of its total acreage classified as wetlands, and the Dakota-Scott area has 11 percent classified as wetlands. Although these search areas have much less total area classified as wetlands, careful review is needed before development occurs.

RIVERS, LAKES, STREAMS AND DITCHES

Introduction

The importance of surface water and its quality is well recognized in Minnesota. The state has an abundance of relatively pollution free water resources. The state has had the foresight to develop programs to protect these resources. Rivers, lakes and streams provide wildlife habitat, drinking water and recreational opportunities. The Department of Natural Resources has developed a classification system to safeguard the use of these resources. The majority of the rivers and streams have been classified and the classifications have been linked to level of allowable development, or land use, within the watersheds. The classifications are as follows:

- Federal Wild and Scenic River,
- Minnesota River Classification,
- Primitive/Semi-Primitive,
- Natural/Rural in Forest,
- Natural in Agriculture,
- Agriculture, and
- Urban.

The river classification system was developed through analysis of specific river resource data coupled with the understanding of the DNR's responsibilities for shoreland management. The description of the various river classes in Minnesota is as follows:

- Primitive/Semi-Primitive is the least developed and represents the poor to moderately accessible and primitive, semi-primitive to natural segments of rivers in the state, occurring in Forested and Transition Land-Use Zones.

- Natural/Rural in Forest is forested, existing in accessible Natural and Rural areas.

- Natural in Agriculture has natural landscape character which is in close association with the river. Although the entire class represents areas that have cultivated uses occupying the largest amounts of acreage, the majority of the segments represented by this class are not intensively cultivated.

- Agriculture river classes have a rural , accessible character in the agricultural zones of the state. Development data shows that both permanent and seasonal onshore dwelling occurrences rank low as compared to other classes. Also, the data indicate that a large proportion

of permanent development occurrences are incidental to the river resource since the occurrences are not river-oriented.

- Urban river class occurs within the state's major urban and urban fringe areas, where varied mixes of recreational, residential, commercial and industrial urban uses are in close proximity to river shore areas and flood plain corridors. As expected, development data for permanent onshore dwelling occurrences ranks this class well above all others.

There is no information available on the presence of ditches within the search area. These will need to be considered in the next phase of the siting process.

Data Sources

- Minnesota Department of Natural Resources
- Minnesota Pollution Control Agency

Findings

Anoka-Isanti-Chisago Search Area

The north search area has a significant amount of surface water resources. There are many rivers and streams traversing the majority of the area along a diagonal running southeast to northwest. The eastern third has a significant number of lakes (See Figure 2a).

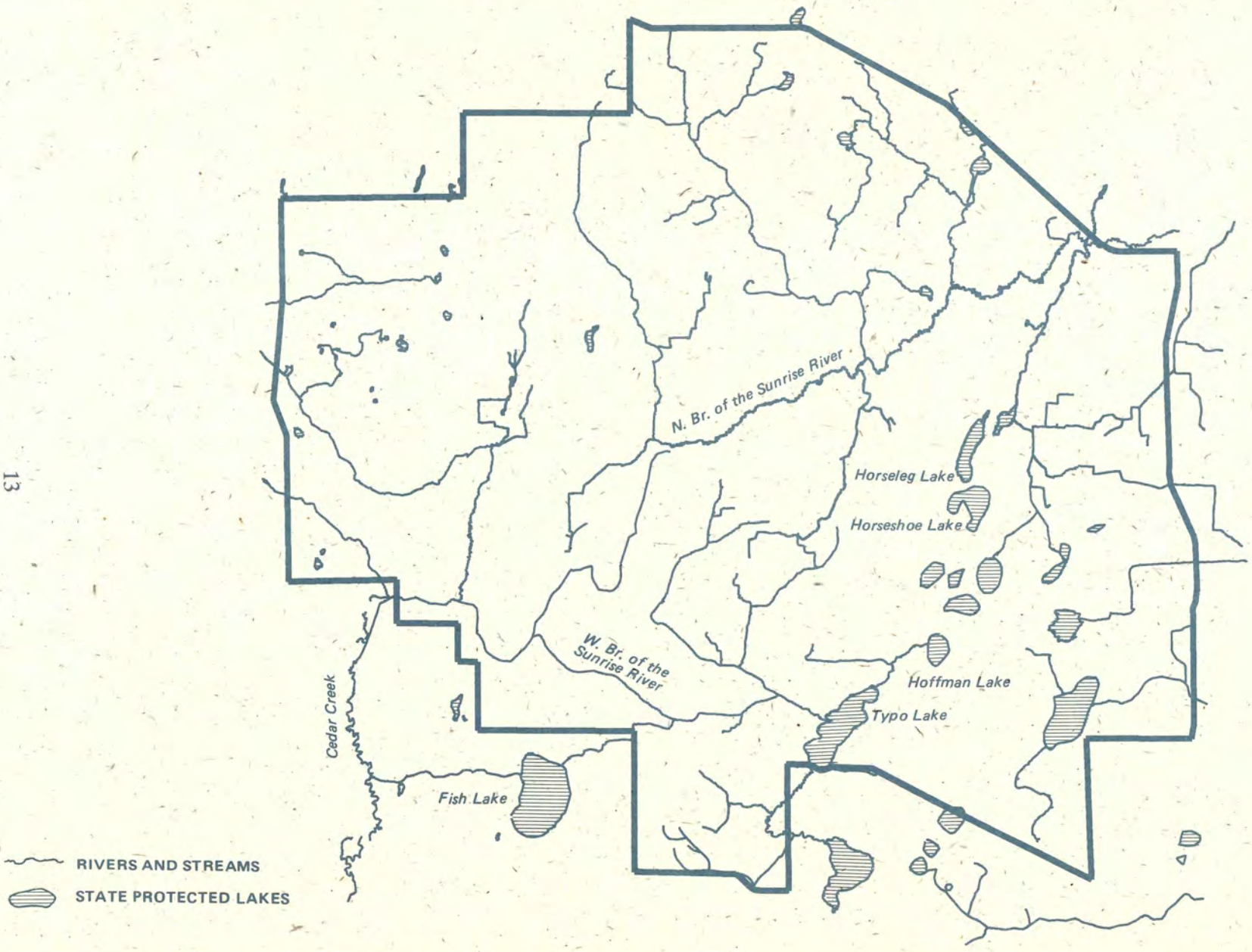
The North Branch of the Sunrise River joins the St. Croix northeast of the search area. The St. Croix is one of Minnesota's Federal Wild and Scenic Rivers. The Federal Wild and Scenic River Act is designed to protect the natural free-flowing, scenic and natural values of designated rivers. Federal assistance in the construction of water resource projects, or any project that is determined to affect the qualities that led to the listing of the river, is prohibited. Any project that could affect the river must be evaluated and approved prior to construction. The projects must be certified that they will neither invade, nor unreasonably diminish, the scenic, recreational, or fish wildlife values inherent in the river. The projects subject to this review are not restricted to those located in close proximity to the river. Land use in the entire watershed may be restricted if appropriate.

Cedar Creek, in the southwest corner of the site, flows into the Rum River, a river designated under the Minnesota River class to be part of the Wild, Scenic, and Recreational Rivers Program.

All of the tributaries of the Mississippi to the west of the site are protected as drinking water supply. The west branch of the Sunrise River in the southern part of the area is also protected as a source for drinking water.

Dakota Search Area

The majority of the rives and streams in the central search area are in the southern half of the area. There are a few areas that are relatively free of significant surface water in the northwestern corner (See Figure 2b). The majority of the streams in this area form the tributaries of the Vermillion River. It is classified as a warm or cool water fisheries river, as are many waters within the state.

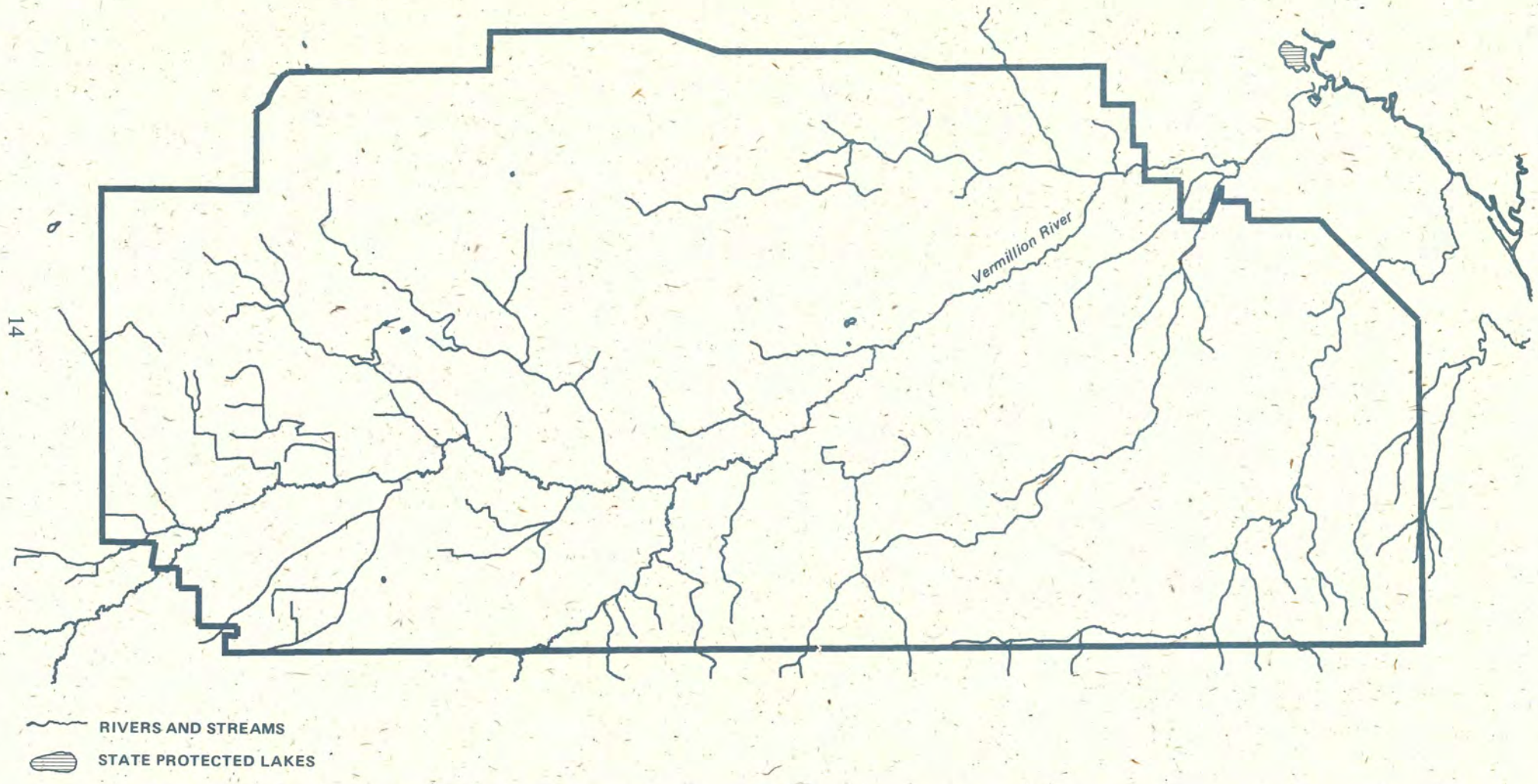


Source: U.S. Geological Survey Topographic Maps

METROPOLITAN COUNCIL

Anoka—Isanti—Chisago Search Area

FIGURE 2A **Rivers, Lakes, and Streams**

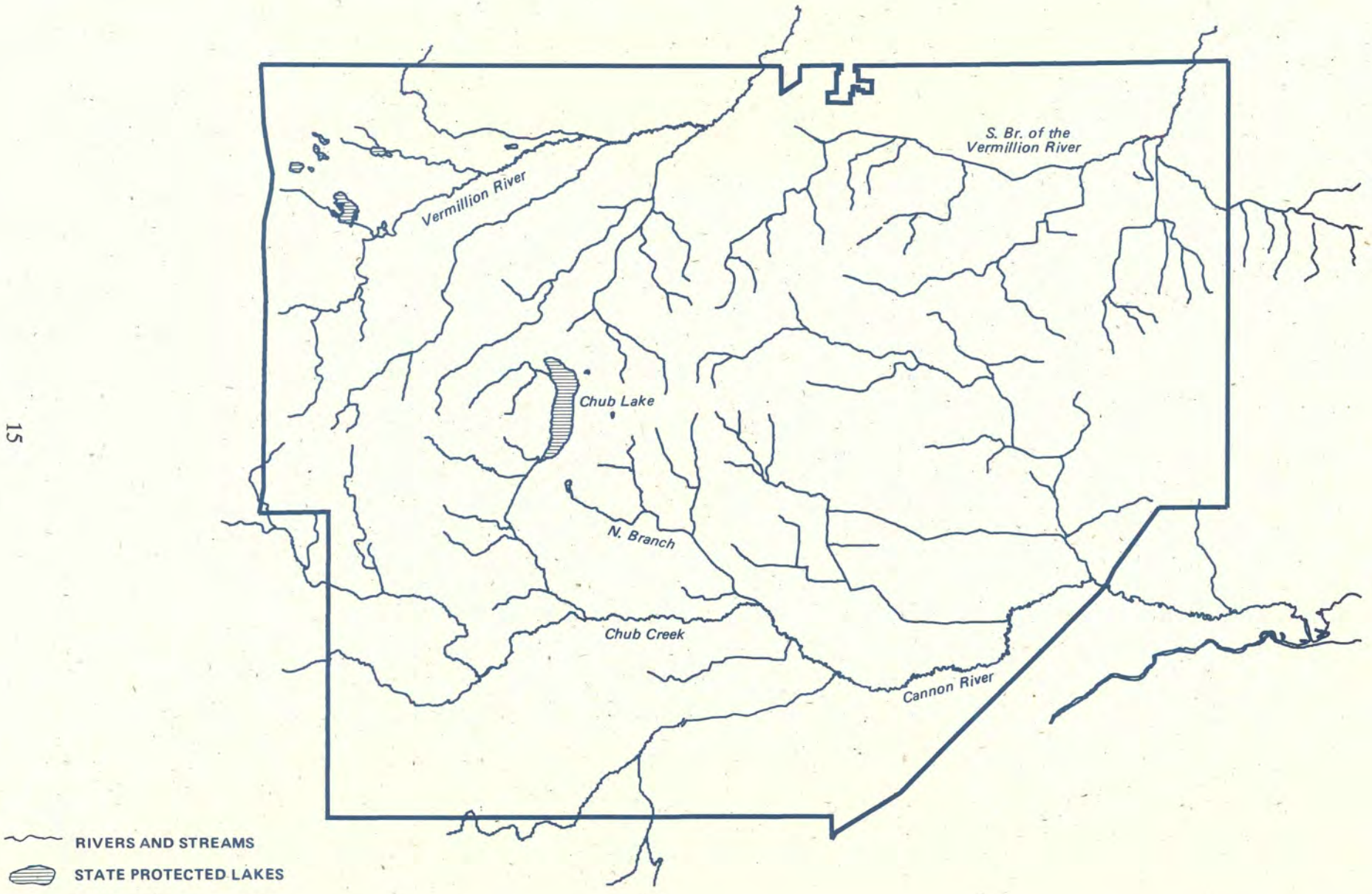


Source: U.S. Geological Survey Topographic Maps

METROPOLITAN COUNCIL

Dakota Search Area

FIGURE 2B **Rivers, Lakes, and Streams**



Source: U.S. Geological Survey Topographic Maps

METROPOLITAN COUNCIL

Dakota–Scott Search Area

FIGURE 2C **Rivers, Lakes, and Streams**

Dakota-Scott Search Area

The South search area has many surface water resources. Rivers, creeks and small streams forming parts of the Vermillion and Cannon River systems cover the majority of the area. This makes the entire area part of a watershed, with any development having the potential for negatively impacting these surface waters (See Figure 2c).

The Cannon River in the southeast corner of the search area is classified as an Outstanding Resource Value River. It and all of its tributaries, which includes all of the streams in the southern portion of the search area, are designated Wild and Scenic under Minnesota's River Classes.

The Vermillion River, in the northwest corner of the area, is classified as a trout stream. It and its tributaries, which comprise the streams in the northern portion of the search area, are considered to be a viable water resource which will have strict development restrictions.

Implications

The majority of the surface water in all three of the search areas are protected for either recreational use or as domestic water supplies. Minnesota has taken steps to ensure the protection of these resources. As a result, surface water protection becomes an important factor in siting the new airport. Issues such as NPDES discharge permit requirements, the need for wastewater and runoff treatment, and minimizing erosion, will need to be considered in the decision-making process.

FLOODPLAINS

Introduction

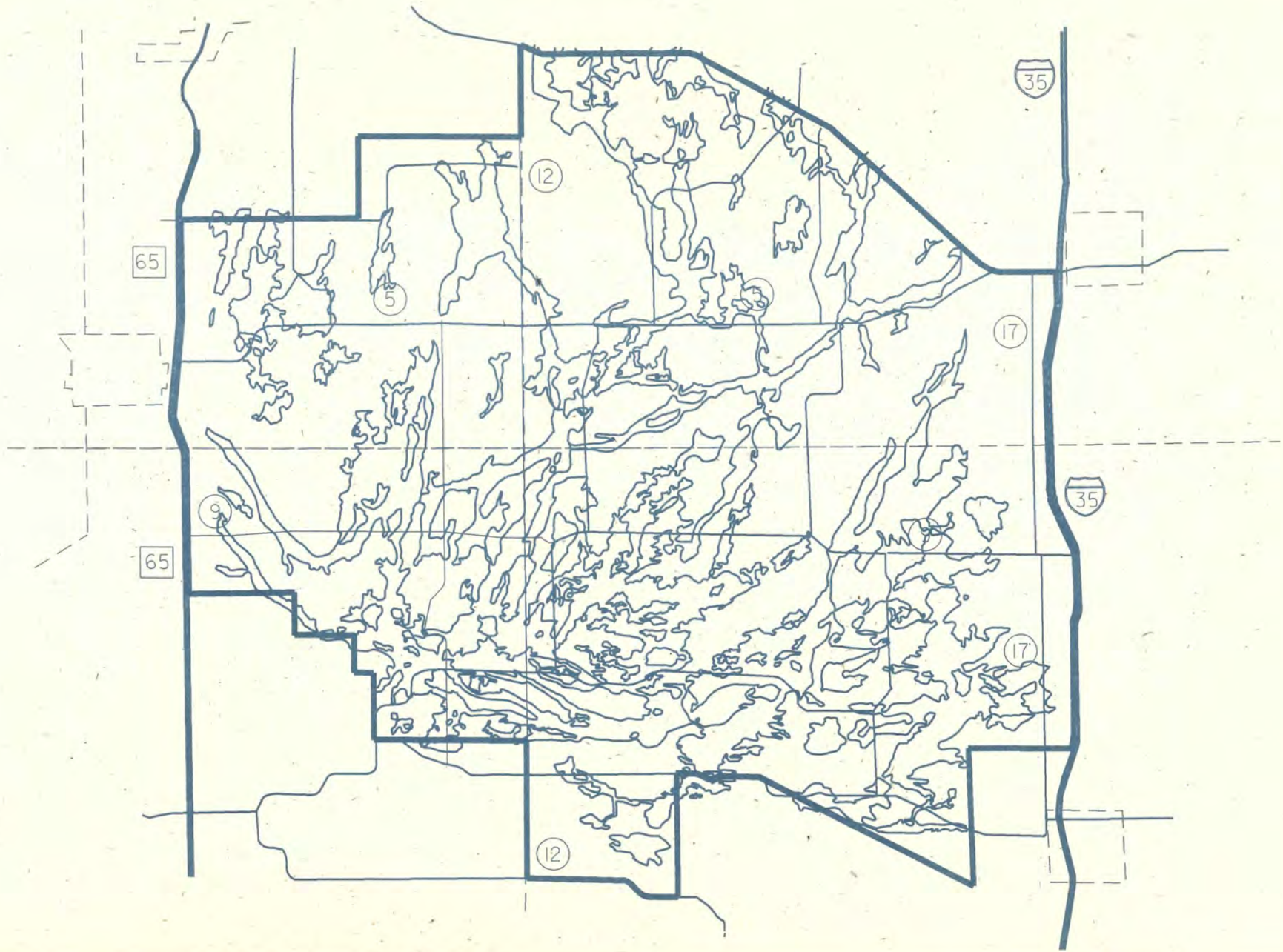
Development of a new airport has the potential of affecting the floodplains in each of the search areas. Generally, development in floodplains should be avoided to minimize the hazard to people and property as well as the losses of natural and beneficial floodplain values. Mitigation measures may be required for new development in floodplain areas if such development is allowed under state and federal regulations. The 100-year flood, which generally is considered the standard, was chosen as the most appropriate screening measure to evaluate floodplain issues.

Data Sources

Floodplains in each of the search areas were mapped using data from the U.S. Department of Urban Development Federal Insurance Administration National Flood Insurance Program from Federal Emergency Management Agency (FEMA) and from Flood Insurance Rate Maps (FIRM). Areas of 100-year flood boundaries were used and the boundaries were digitized onto base maps for each search area. The data from the FIRM maps was the most current and complete available. FIRM maps are periodically updated to reflect changes in flood information.

Findings

Floodplain locations are illustrated for each search area on the following maps. (see figures 3a, 3b and 3c). Because the floodplain is classified as "general floodplain", it follows that these broad areas are flooded during the 100-year flood. The 100-year elevation can not be predicted without

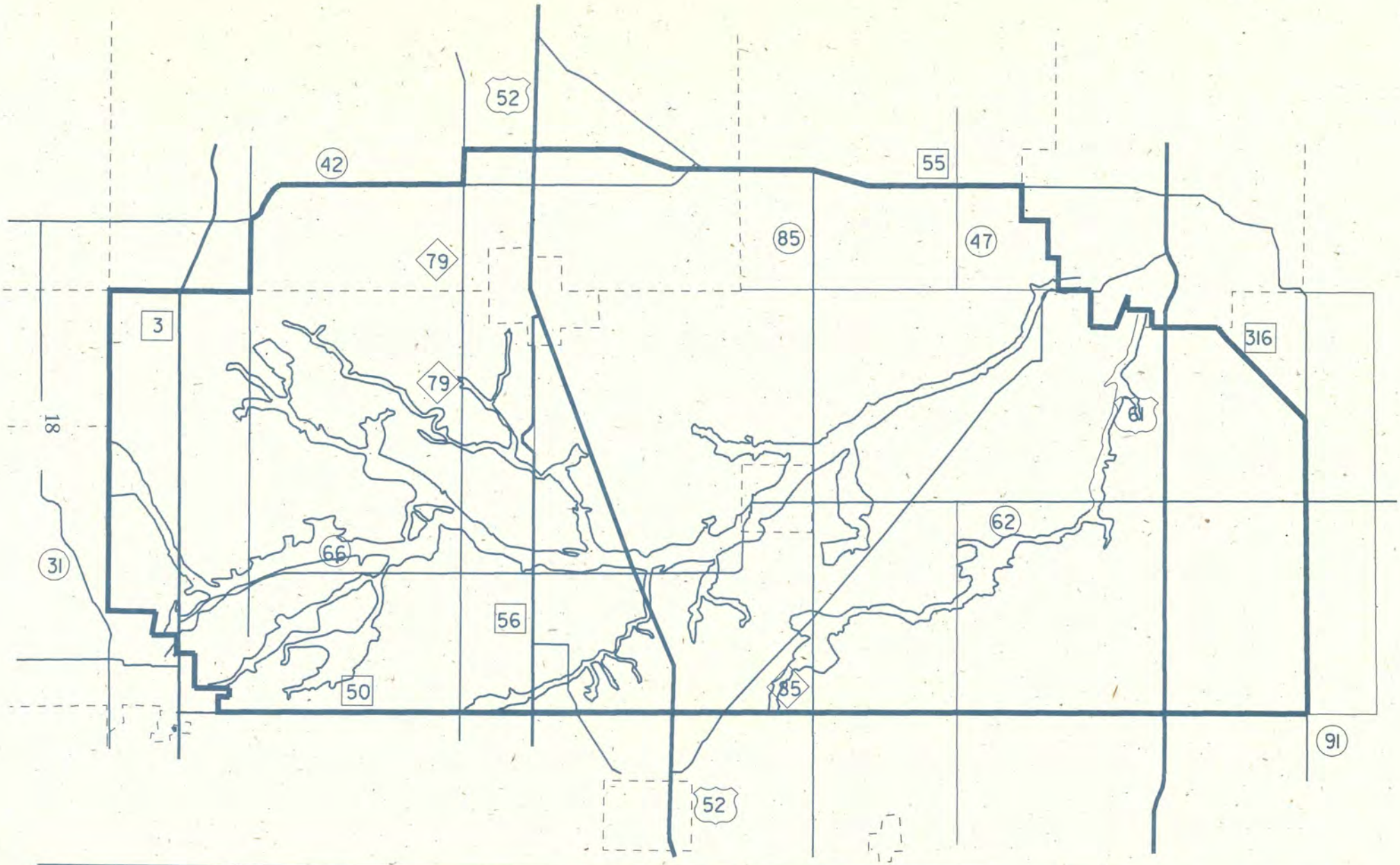


Source: Federal Emergency Management Agency, Flood Insurance Maps

METROPOLITAN COUNCIL

Anoka—Isanti—Chisago Search Area

FIGURE 3A **Floodplains**

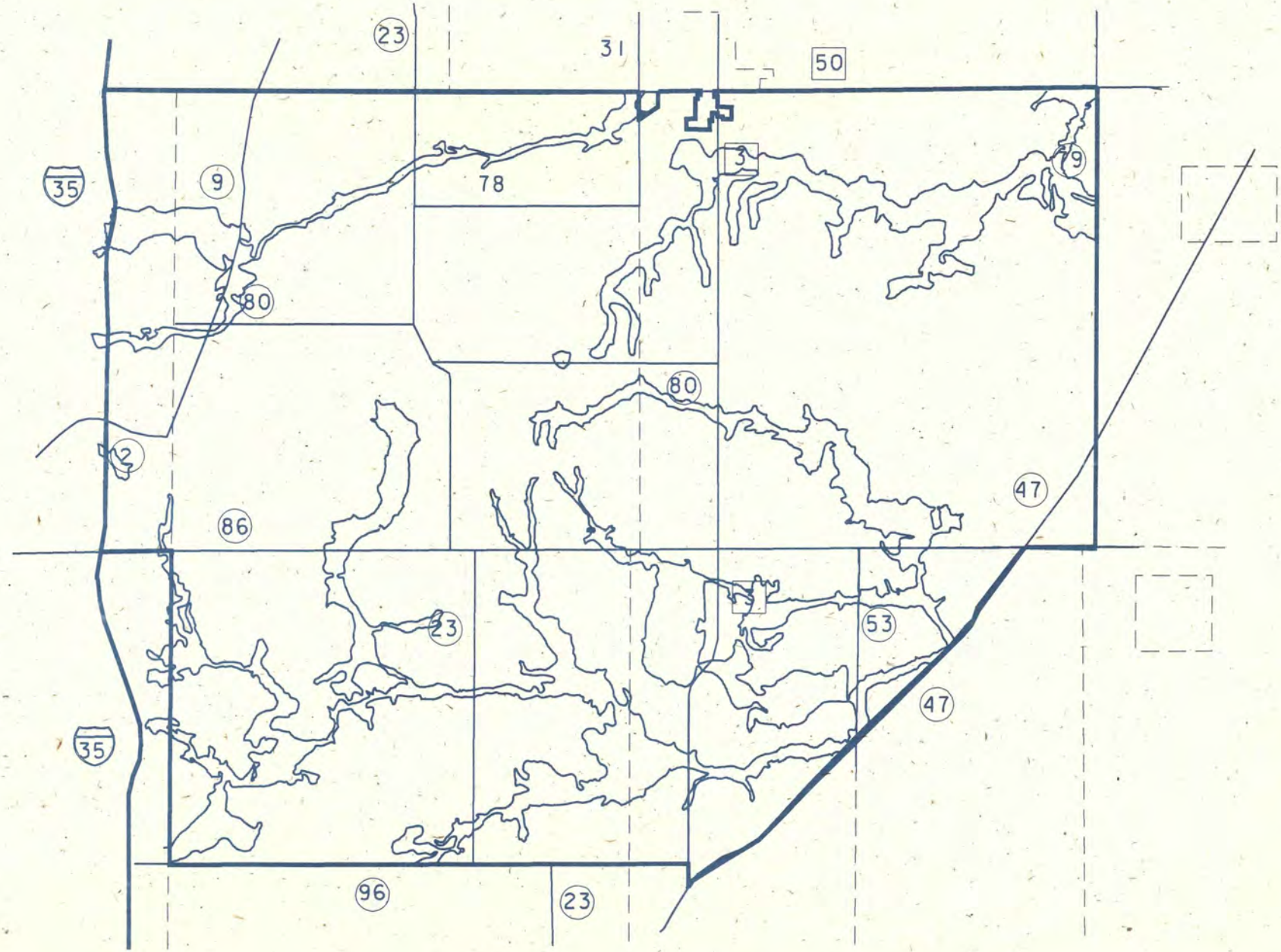


Source: Federal Emergency Management Agency, Flood Insurance Maps

METROPOLITAN COUNCIL

Dakota Search Area

FIGURE 3B **Floodplains**



Source: Federal Emergency Management Agency, Flood Insurance Maps

METROPOLITAN COUNCIL

Dakota–Scott Search Area

FIGURE 3C **Floodplains**

detailed hydraulic studies. Therefore, it is difficult to fully assess the floodplain impacts of siting an airport in any particular search area. It is clear that a project of this magnitude would result in substantial modifications to the floodplains in the search areas. Once a site is established, it will require two complex, hydraulic studies; one prior to initiating development and the other after development.

The natural floodplain is an important part of our water system. It affects storm runoff, water quality, vegetative diversity, wildlife habitat and aesthetic qualities of our lakes and rivers. Any alteration of the floodplain should be carefully evaluated. The intended use should be appropriate to the site selected.

Anoka-Isanti-Chisago Search Area

The Anoka-Isanti-Chisago search area has significant general floodplains dispersed throughout the area that could constrain siting a new airport. The North Branch of the Sunrise River and its tributaries bisects the area from east to west. It is estimated that about 35 percent of the southern half of the search area is general floodplain, and 20-25 percent of the northern half of the search area is general floodplain.

Dakota Search Area

Of the three search areas, the Dakota area would pose the least floodplain constraints for the siting and construction of a new airport. While the Vermillion River and its tributaries bisect the area west to east, there remain ample acreage, particularly in the northern sectors, with limited rivers, lakes, and streams.

Dakota-Scott Search Area

Floodplains account for an estimated 30-35 percent of the total acreage in the Dakota-Scott search area, mostly concentrated in the southern sectors in the area. The Cannon River and Chub Creek, and their tributaries, are the major water resources in the southern sectors. The Department of Natural Resources recommends that drainage patterns be thoroughly analyzed for both areas before and after project construction. Drainage from the southeastern portion of the Dakota-Scott site ultimately flows into the Cannon River, a state designated Wild and Scenic River.

Implications

Floodplain zoning ordinances apply to lakes, as well as streams, and cover all land inundated by the 100-year flood (the flood having a one percent chance of occurring in any single year). The floodway is that part of the floodplain needed to carry-off the 100-year flood. Only minimal encroachments and very limited construction is allowed in it. The area of the floodplain outside of the floodway is called the flood fringe. Development conforming to the community's shoreland zoning standards is generally allowed, but it must be placed on fill or floodproofed high enough to keep it dry during a 100-year flood. The emphasis of the program is to minimize flood damage by promoting non-structural remedies instead of levees, dikes or dams (see Minnesota Statutes Sections 104.01 through 104.07, and Minnesota Rules Part 6120.5000).

GROUNDWATER/SURFICIAL GEOLOGY

Introduction

A summary of surficial geology and groundwater characteristics of the three search areas will assist in determining the potential for environmental impacts due to siting a replacement airport in these areas. It has been well documented that given the appropriate surficial geology, groundwater quality can be affected by land use activities.

This section presents the results of a preliminary analysis of surficial geology and groundwater resources in the three search areas. This information will be used to establish the relative risk to these resources of siting an airport within these areas.

Data Sources

The following sources have been consulted in order to determine the extent of groundwater resources in the three search areas and to establish their interaction with surficial geology:

- Minnesota Department of Natural Resources
- U.S. Department of Interior
- University of Minnesota/Minnesota Geological Survey

Findings

Anoka-Isanti-Chisago Search Area (North)[1]

The North search area is located on the northeastern boundary of the Anoka Sand-Plain aquifer. The majority of the search area overlays the aquifer. The Anoka Sand-Plain is an unconfined aquifer which is glaco-fluvial in origin, and resulted from the retreat of Pleistocene glaciers.

---

[1] Helgesen, J.O. and G.F. Lindholm, *Geology and Water-Supply Potential of the Anoka Sand-Plain Aquifer, Minnesota*, Minnesota Department of Natural Resources, U.S. Department of Interior, St. Paul, Minnesota, 1977.

The Anoka Sand-Plain, within the Anoka-Isanti-Chisago Search area, is bounded on the north by gray silty till. The aquifer is underlain by sandy till, lake deposits (eastern edge), and permeable sandstone (central area). The aquifer itself is mainly glacial outwash composed of very fine to fine sand and varies between 20 and 80 feet thick.

The aquifer is a significant source of potable water with an estimated total storage of 2,000 billion gallons. Theoretical yields vary across the search area from 100 to 1000 gallons per minute. Annual recharge for the entire aquifer is estimated to be 250 billion gallons.

Dakota Search Area (Central)

The majority of the Central search area is located above the Prairie Du Chien-Jordan aquifer. It does not occur in the north east corner (see Figure 4a). The aquifer is composed mainly of dolostone with some areas of sandstone, and is the single major source of potable drinking water in the county.

The aquifer is fairly shallow, ranging from 50 to 400 feet below the surface. It is overlain by glacial till and outwash ranging from sand to gravel in size, which is quite porous. In the eastern two thirds of the search area, this aquifer is not permitted for potable use. It is so shallow that it lacks the minimum required 50 feet of cover within one mile of the well. The Prairie Du Chien-Jordan group is underlain by other water bearing strata, which are used for drinking water.

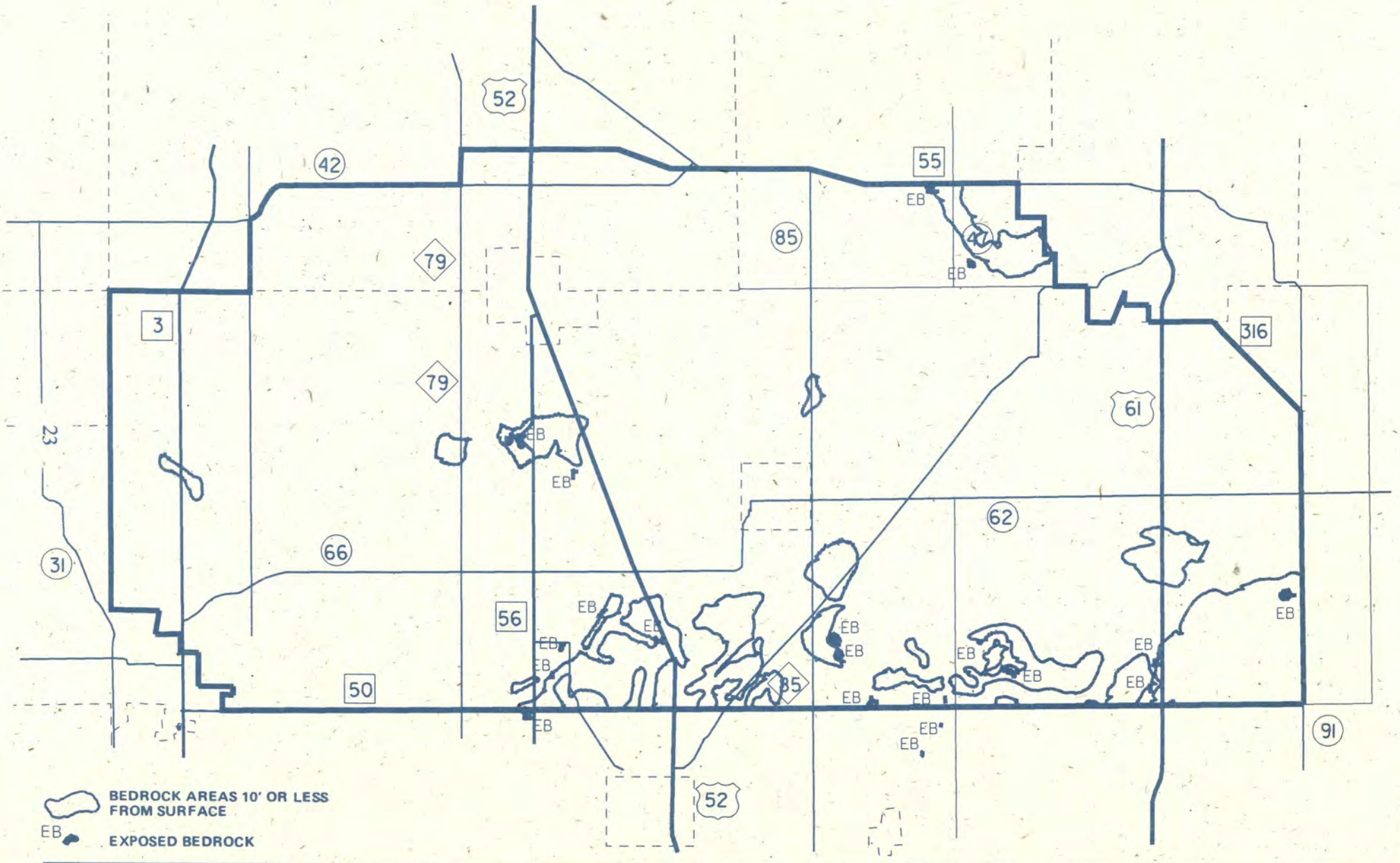
Expected yield is tied directly to rate of recharge and degree of use, and ranges from less than 500 to 2,000 gallons per minute. The majority of the unconsolidated sediments overlaying the aquifer are also saturated and serve as a source of potable water as well.

Dakota-Scott Search Area (South)

The majority of the South search area also overlays the Prairie Du Chien-Jordan aquifer (see figure 4b). The western half has been permitted for potable water use, while the eastern half lacks the minimum 50 feet of cover within one mile of the well to classify for potable use. This water can be used for irrigation of crops, however.

The aquifer in this area is overlain by glacial outwash and till, which varies from sand to loamy texture. There are also layers of saturated unconsolidated sediments, less than 500 feet, that are also used as water supply.

The expected yield is estimated from 500 to 2,000 gallons per minute and is also linked to rate of recharge and degree of use.

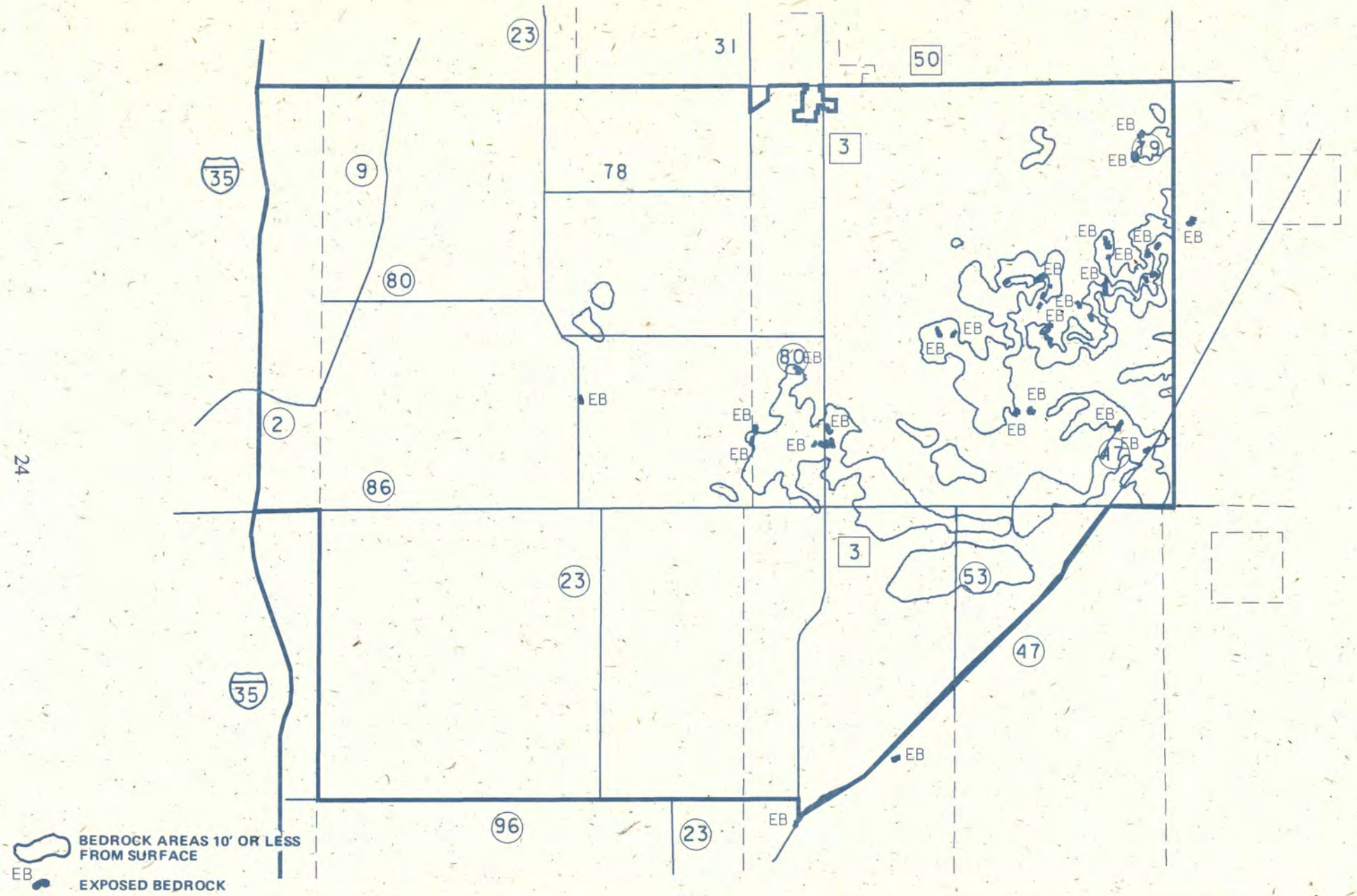


Source: U.S. Department of Agriculture, Soil Conservation Service
Geologic Atlas, Dakota Co.

METROPOLITAN COUNCIL

Dakota Search Area

FIGURE 4A **Surface Bedrock Formations**



METROPOLITAN COUNCIL

Source: U.S. Department of Agriculture, Soil Conservation Service
Geologic Atlas Dakota Co.
Geologic Atlas Scott Co.

Dakota–Scott Search Area

FIGURE 4B **Surface Bedrock Formations**

Implications

Development of the Anoka-Isanti-Chisago search area places at risk a major source of drinking water. Since the Anoka Sand-Plain is unconfined and composed of sand it readily absorbs and transports surface water. This makes it particularly sensitive to land-use activities. Any waterborne contaminant can easily infiltrate the aquifer and be transported throughout the system.

It is also susceptible to storage depletion and diminution of recharge, since it readily interacts with surface water and activities. Any activity that interrupts or reduces annual recharge can greatly impact the use of the aquifer as a source of potable water.

The underlying layers of till and sandstone are also water bearing. They are in direct hydraulic contact with the aquifer, and allow for vertical transport of water and any water borne contaminants. The underlying layers form the northwest flank of the Twin Cities artesian basin, a significant source of drinking water for the Minneapolis/St. Paul metropolitan area.

The siting of the airport in this area (if it overlays the sand-plain) may threaten groundwater quality. Sand has little filtering capacity and quickly absorbs surface water, allowing contaminates to directly enter the water table.

Protecting the recharge capacity of this aquifer is particularly important, since it serves as a source of water for the Twin Cities artesian basin. The large amount of impervious surface necessary for the successful operation of an airport would limit the recharge of the aquifer.

With the increasing future demands on existing water sources in Minnesota the risks inherent in development of an airport over the Anoka Sand-Plain should be carefully considered. Given the complexities of water bearing strata interaction, and the relative fragility associated with short-term storage, hydrologic modeling may be necessary to determine the full impacts of siting an airport in this area.

Since the geology of the Dakota Search Area (Central) and Dakota-Scott Search Area (South) are quite similar, the implications of siting an airport in either of these areas is discussed together with area specific concerns highlighted.

In general terms, the combination of surficial geology and the hydrogeology of the Prairie Du Chien-Jordan aquifer system make these areas particularly susceptible to groundwater contamination.

The aquifer is quite shallow, fairly permeable, with short storage time, and large areas of recharge. This means that the aquifer is very susceptible to contamination. The ability of an aquifer to withstand pollution depends on its ability to absorb and hold contaminants, to transform them into benign substances, to dilute them to levels below standards or acceptable levels of risk, and to control the rate that the contamination spreads. The Prairie Du Chien-Jordan group transports water fairly quickly. It has limited buffering capacity due to composition and lack of storage time and, it is also in direct contact with unconsolidated water bearing strata and other aquifers below.

The ability of the areas above the Prairie Du Chien-Jordan group to withstand pollution depends upon the soil and other unconsolidated layers overlying the aquifer. In areas where the

unconsolidated sediments has the ability to absorb and hold contaminants the aquifer is protected from contamination from surface activities.

The majority of the Central search area has been classified as highly to very highly sensitive to contamination. The aquifer is overlain by unconsolidated sediments ranging from sand to gravel, with little capacity for detaining or treating surface water. In fact, almost the entire search area is considered part of the recharge area for the aquifer, with all surface water that permeates in to the soil becoming part of the available water in the aquifer.

The South search area is more varied in terms of the types of unconsolidated layers overlying the aquifer. Here the aquifer ranges from low-to-moderately sensitive to contamination to very highly sensitive. The eastern edge is more resistant to contamination due to the loamy qualities inherent in the overlying till.

HISTORIC, ARCHITECTURAL, ARCHEOLOGICAL, CULTURAL RESOURCES

Introduction

The need to assess historic, architectural, archeological, and cultural resources (cultural resources) is based on the National Historic Preservation Act of 1966 as amended, and the federal Archaeological and Historic Preservation Act of 1974 as amended. These laws require that a mitigation plan should be developed if significant cultural resources are to be affected by an action that involves federal funding or a federal agency. This plan should include appropriate federal and state agencies and should contain a formal agreement on acceptable mitigation strategies.

An assessment of known cultural resources must be preformed to determine the need for such an agreement. This assessment should include the cultural resources located in the area directly affected by construction, as well as the surrounding area that will be subject to airport related development.

Data Sources

The following sources were used to determine the extent of cultural resources in the three search areas:

Minnesota Historic Society
State Historic Preservation Office
Dakota County

Findings

A list of all sites on the National Register of Historic Places and cemeteries within each search area was compiled. Archeological or burial sites have not been fully explored and will be considered in the next phase.

Implications

Evaluating the specific potential impacts on cultural resources is difficult when the search areas are large. It involves the identification of specific buildings that are eligible for listing under the National Historic Preservation Act, as well as sites that have the potential to yield relevant prehistoric information. While preliminary information on these sites has been compiled, the information needed to identify and plan for appropriate mitigation measures is quite detailed and requires considerable commitment of resources. It is also quite site specific. This assessment is more appropriate for inclusion in the next phase, when siting of the planned facility is to take place.

LAND COVERAGE

Introduction

The proposed site of an airport should be located in association with compatible land uses. Section VI of the Part Two Report, and Appendix C, assess the land use and population density implications of the three search areas. In addition to the impacts on land-use patterns in the three areas, the environmental impacts on the natural cover of each area needs to be addressed. These natural areas that could be potentially affected by the development of an airport include deciduous and coniferous forests, forested wetlands and agricultural lands.

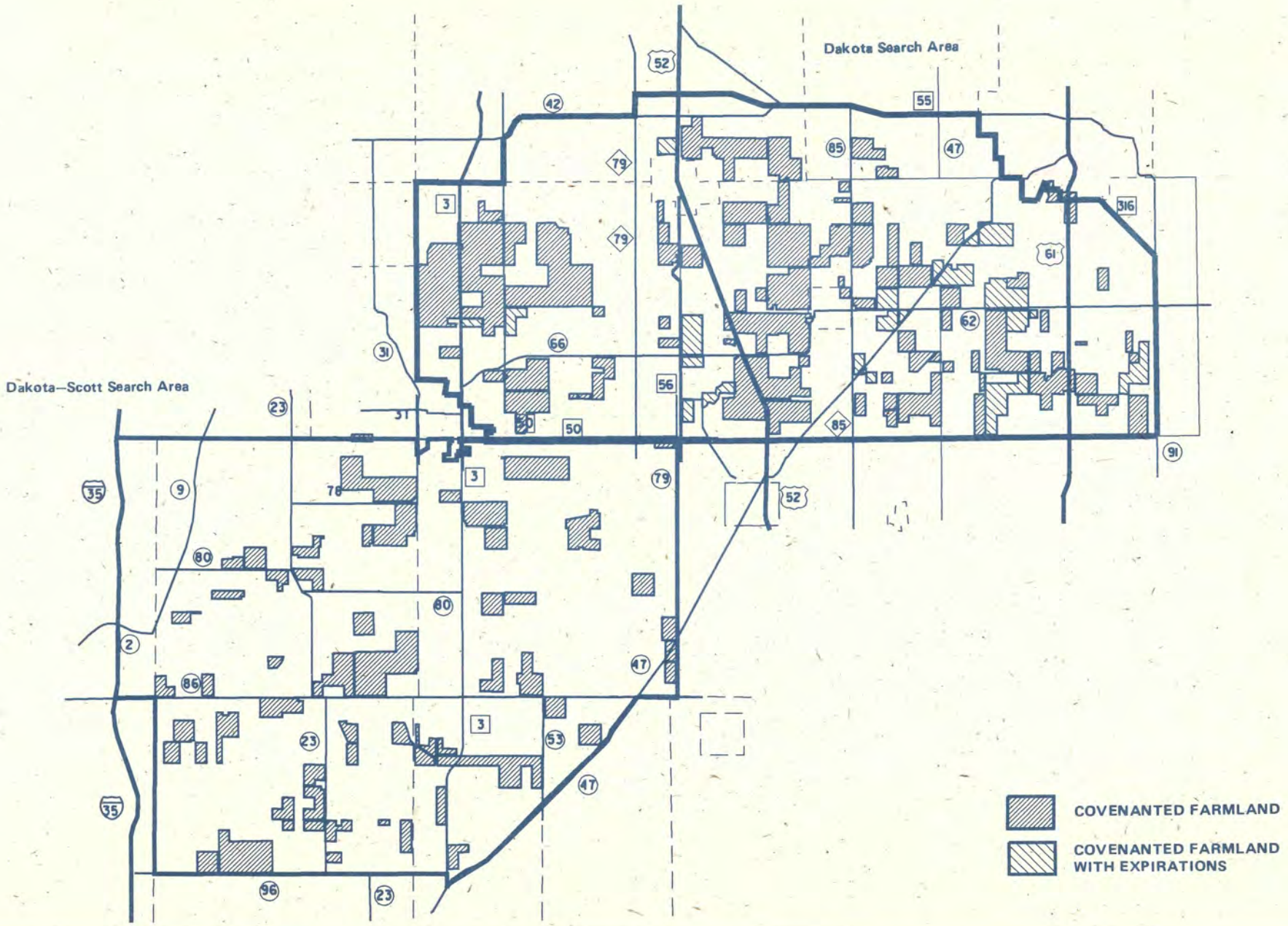
The areas of special concern for the development of an airport are the Dakota and Dakota-Scott search area agricultural land preserves (see figure 5). The importance of these agricultural preserves are discussed in Section VI of the Part Two Report.

Findings

The following maps (figure 6a, 6b and 6c) illustrate the land cover in each of the three search areas. These maps include a listing of the following: deciduous and coniferous forests, forested wetlands, and agricultural lands.

Anoka-Isanti-Chisago Search Area

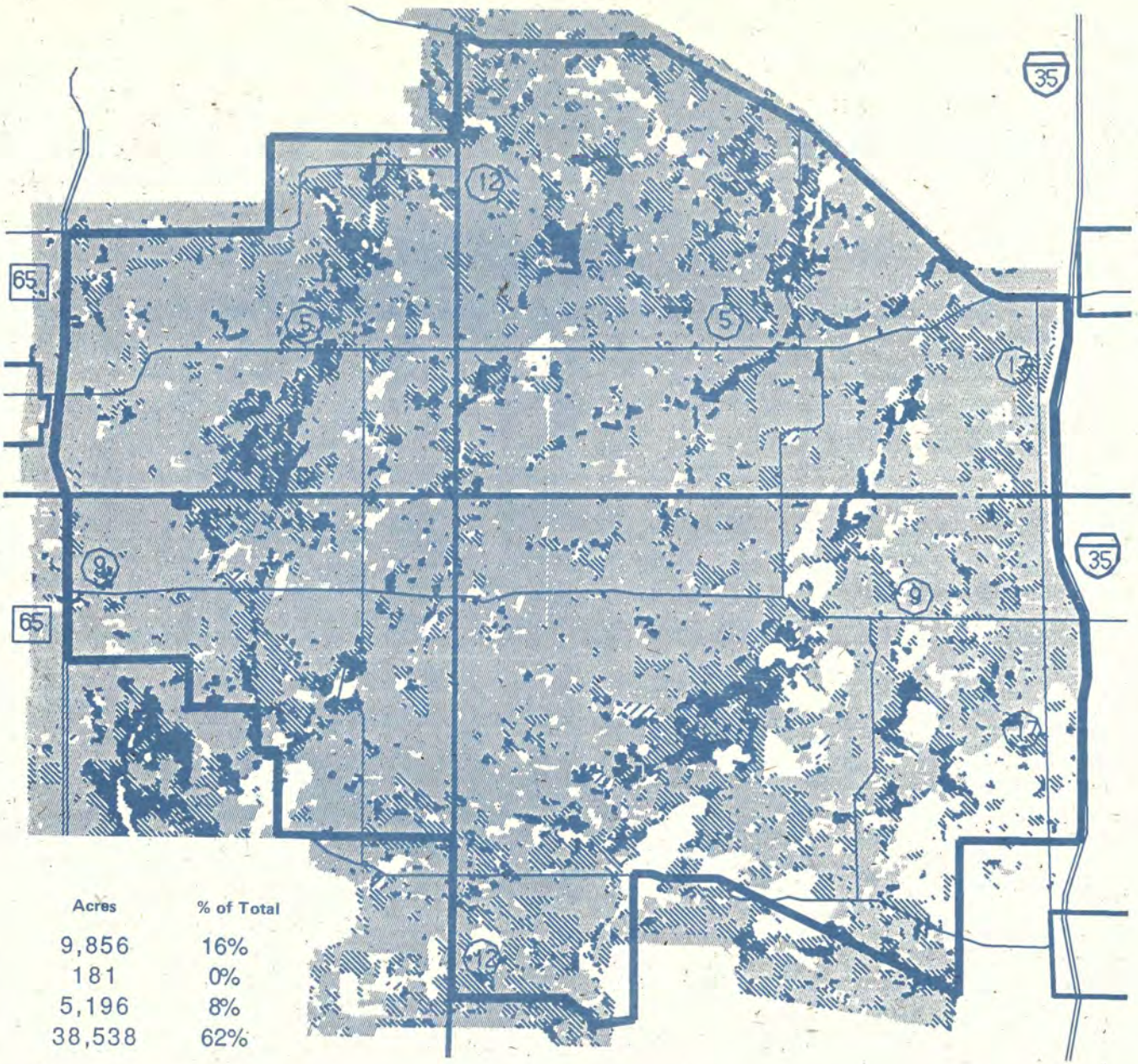
This search area has an estimated 16 percent of deciduous forest, 0 percent coniferous forest and 8 percent are considered forested wetlands. Agricultural lands make up 62 percent of this search area, which is approximately 38,538 acres of the sites 61,720 total acres.



Source: Metropolitan Council
(Applicable Only To Metropolitan Region)

FIGURE 5 **Metropolitan Agriculture Preserves**

METROPOLITAN COUNCIL



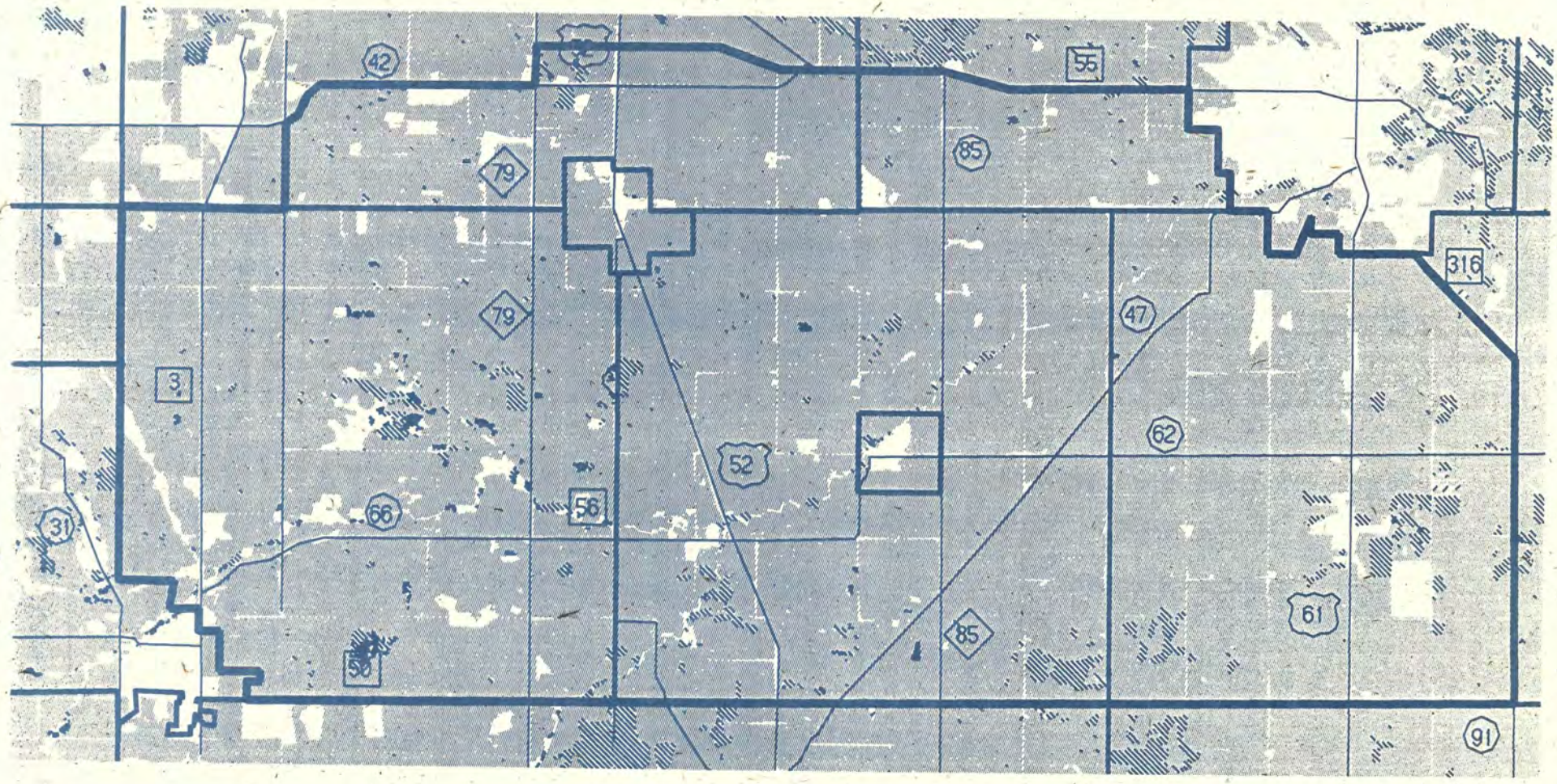
Developed Acreage

Land Cover	Acres	% of Total
Deciduous Forest	9,856	16%
Coniferous Forest	181	0%
Forested Wetlands	5,196	8%
Agricultural Lands	38,538	62%

Source: Remote Sensing Laboratories, University of Minnesota

Anoka—Isanti—Chisago Search Area

FIGURE 6A **Selected Land Cover**



☐ Developed Acreage

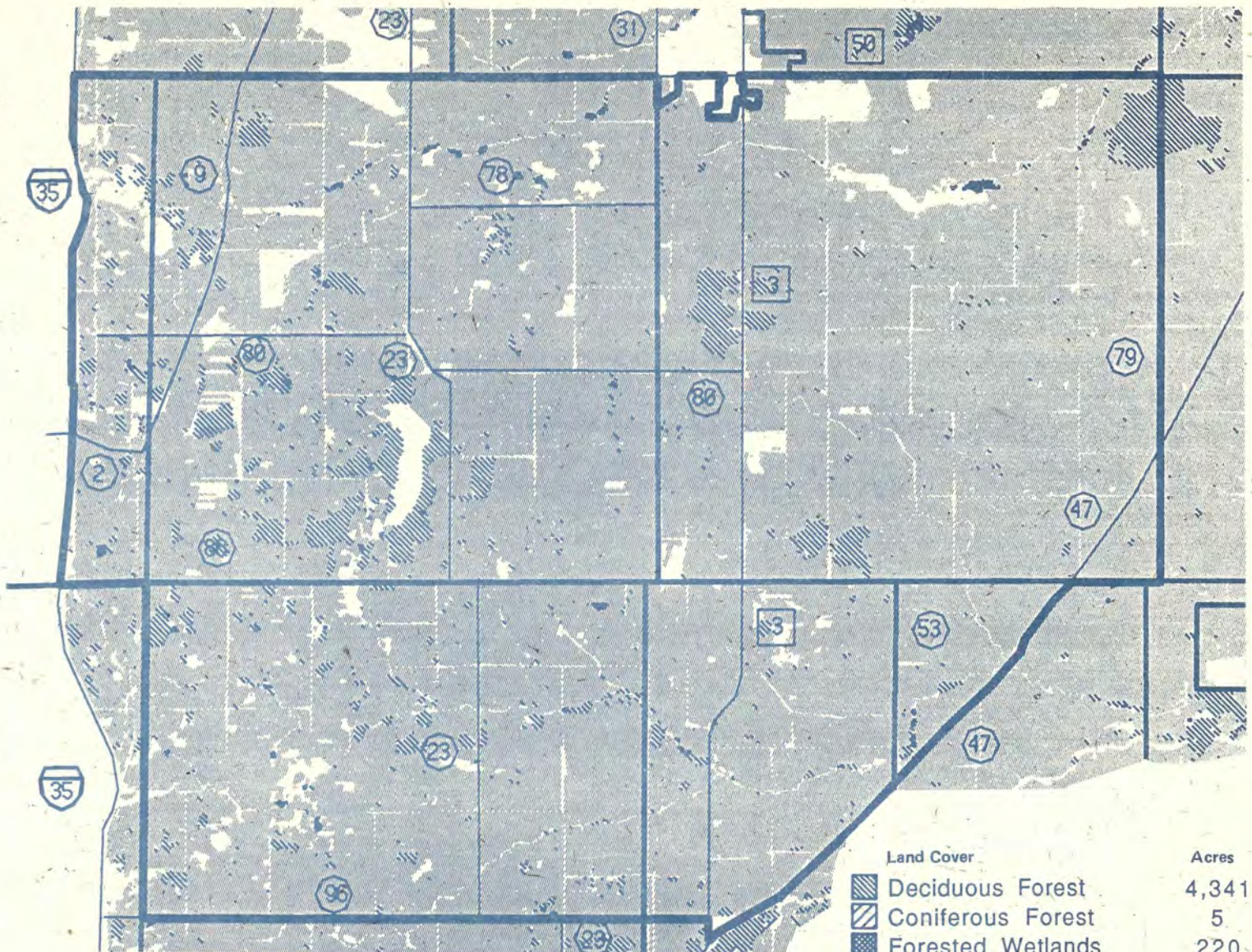
Land Cover	Acres	% of Total
Deciduous Forest	1,998	3%
Coniferous Forest	32	0%
Forested Wetlands	484	1%
Agricultural Lands	66,027	89%

Source: Remote Sensing Laboratories, University of Minnesota

METROPOLITAN COUNCIL

Dakota Search Area

FIGURE 6B **Selected Land Cover**



Land Cover	Acres	% of Total
Deciduous Forest	4,341	6%
Coniferous Forest	5	0%
Forested Wetlands	220	0%
Agricultural Lands	61,720	84%
Developed Acreage		

Source: Remote Sensing Laboratories, University of Minnesota

METROPOLITAN COUNCIL

Dakota–Scott Search Area

FIGURE 6C **Selected Land Cover**

Dakota Search Area

The Dakota search area has 3 percent deciduous forest, 0 percent coniferous forest, and 1 percent is classified as forested wetlands. Some 89 percent of this search area is agricultural lands; 66,027 acres of the 74,590 total acres of the Dakota site. Of these, over 17,000 acres are included as agricultural preserve lands.

Dakota-Scott Search Area

An estimated 6 percent is deciduous forest, with no coniferous forest, or forested wetlands. The agricultural lands occupy 61,720 of the acres out of a total of 73,865 acres, an estimated 84 percent of the area. Some 10,500 acres of the search area are agricultural preserve lands.

Implications

The Dakota and Dakota-Scott search areas pose the largest concern with respect to agricultural lands and the development of an airport because they lie within the Metropolitan Council's jurisdiction. The Metropolitan Council has advocated agricultural preserves for farmland in the metropolitan area. The agricultural preserve idea was to maintain agriculture, and requires a local zoning maximum of one house per 40 acres.

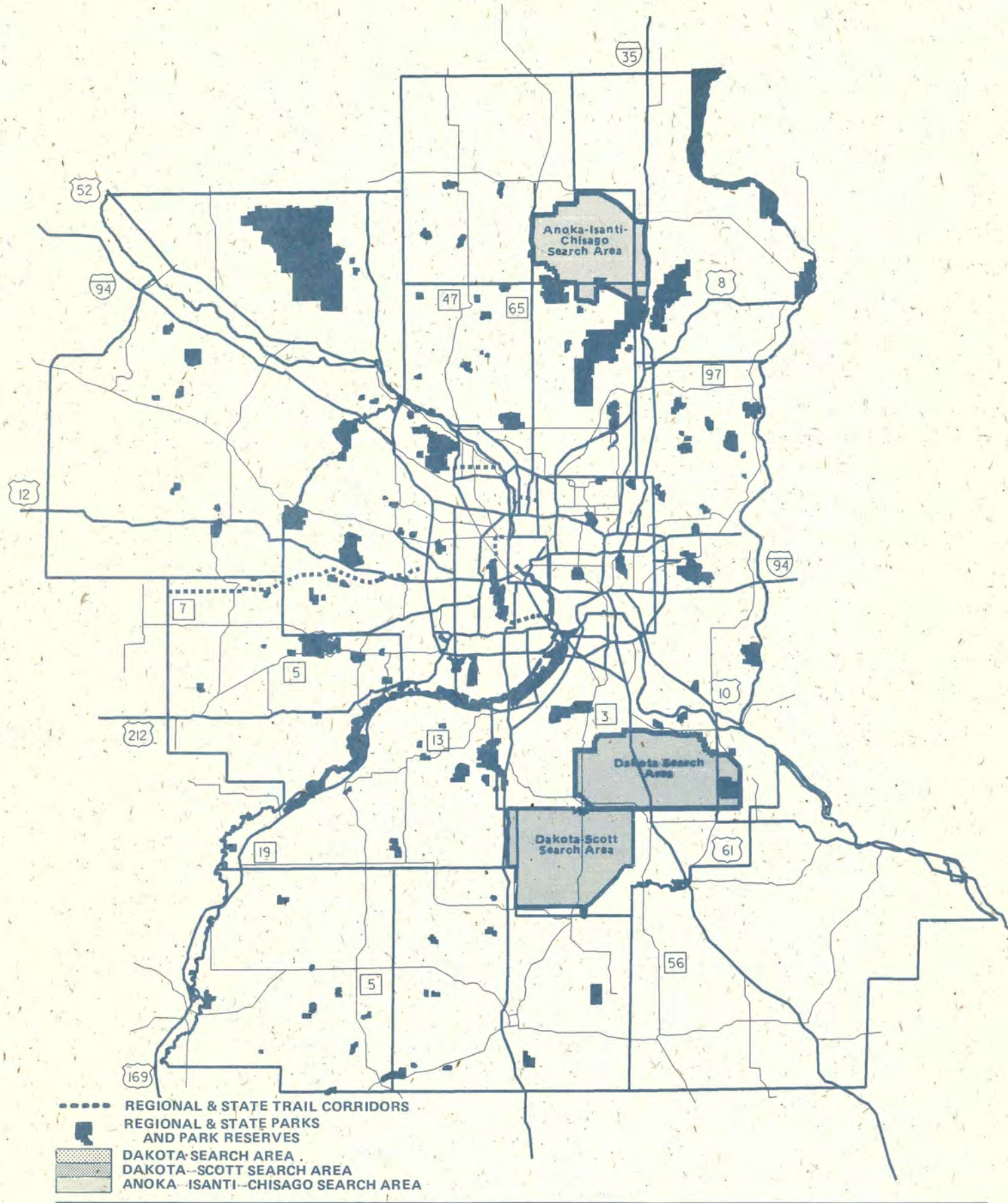
PARKS, OPEN SPACE

The location of designated parks and open spaces and their impact on siting decisions for the three search areas are discussed in Section VI of the Part Two Report (see figure 7).

PIPELINES

The location of existing or proposed pipeline networks will become important after a final search area is selected. Specific airport siting decisions within that search area could be affected by the location of these facilities. figures 8a, 8b and 8c depict the location of existing oil, gas and ammonia pipelines within the search areas.

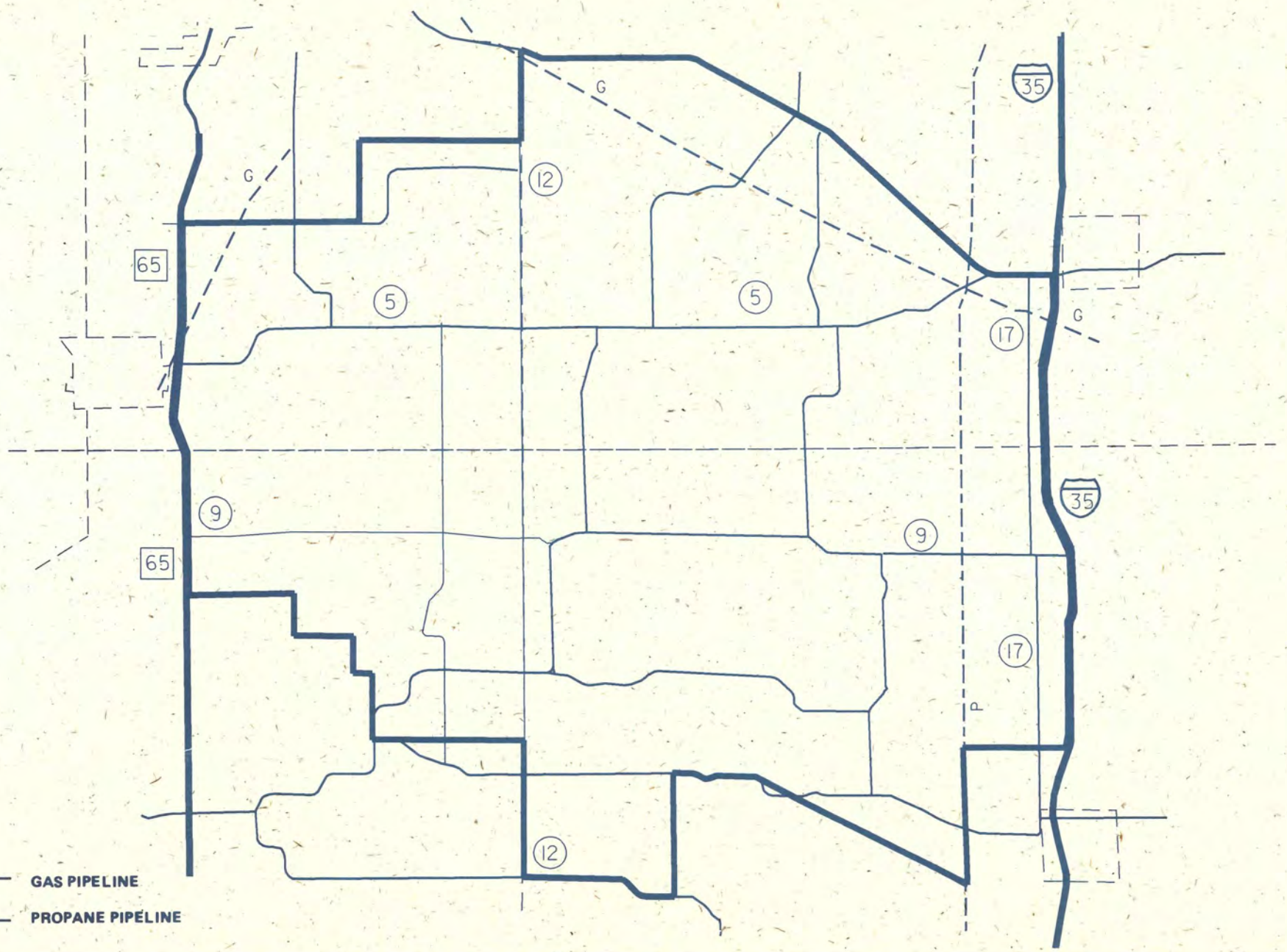
For the purposes of the environmental assessment being conducted during this phase of the project, the implications for the three search areas can be considered similar. When a final search area is selected, site design considerations and/or pipeline relocation costs must be evaluated.



METROPOLITAN COUNCIL

Source: Metropolitan Council
Minnesota Department of Transportation

FIGURE 7 - **Parks and Nature Preserves**

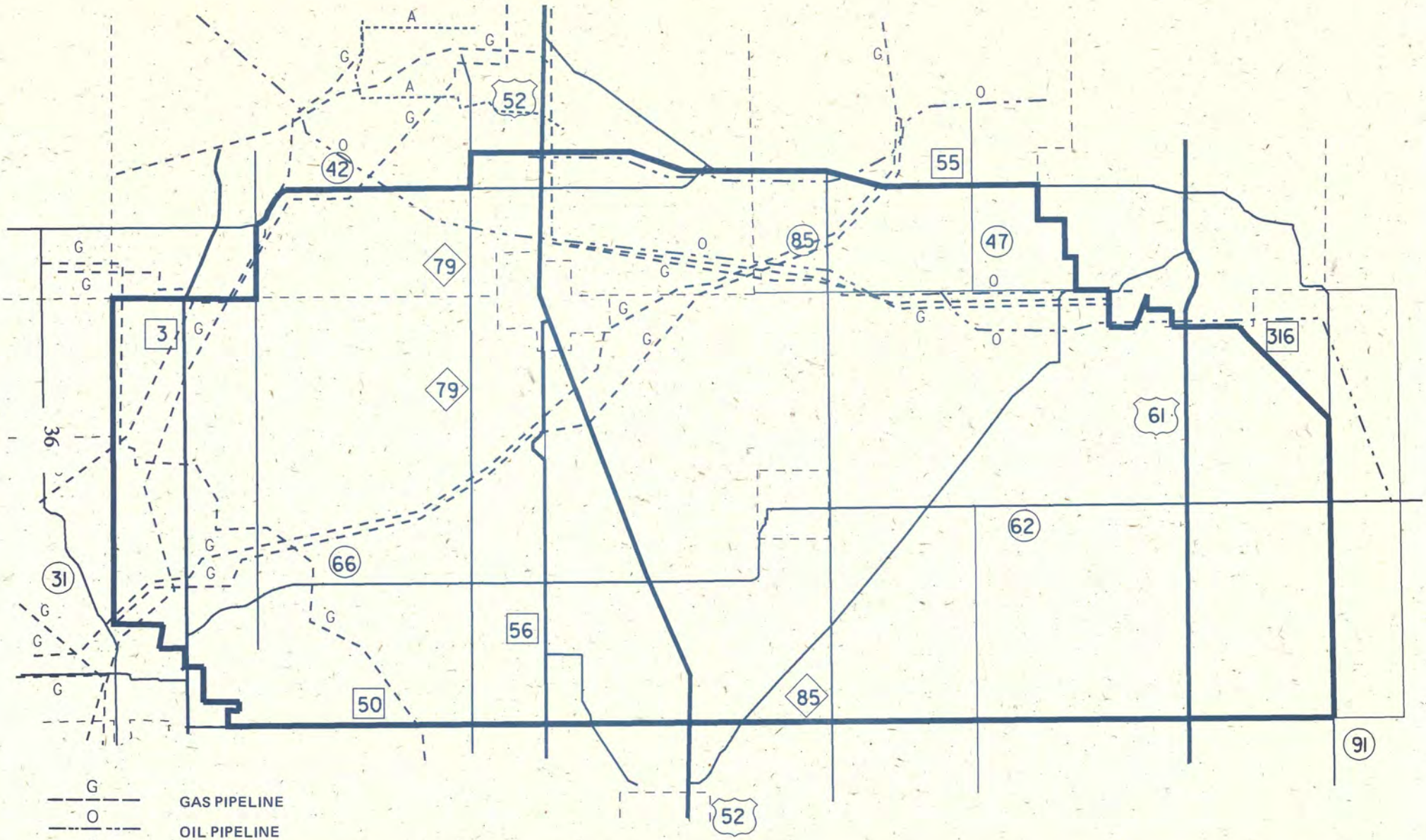


Source: Metropolitan Council
Minnesota Department of Transportation

METROPOLITAN COUNCIL

Anoka—Isanti—Chisago Search Area

FIGURE 8A **Pipelines**

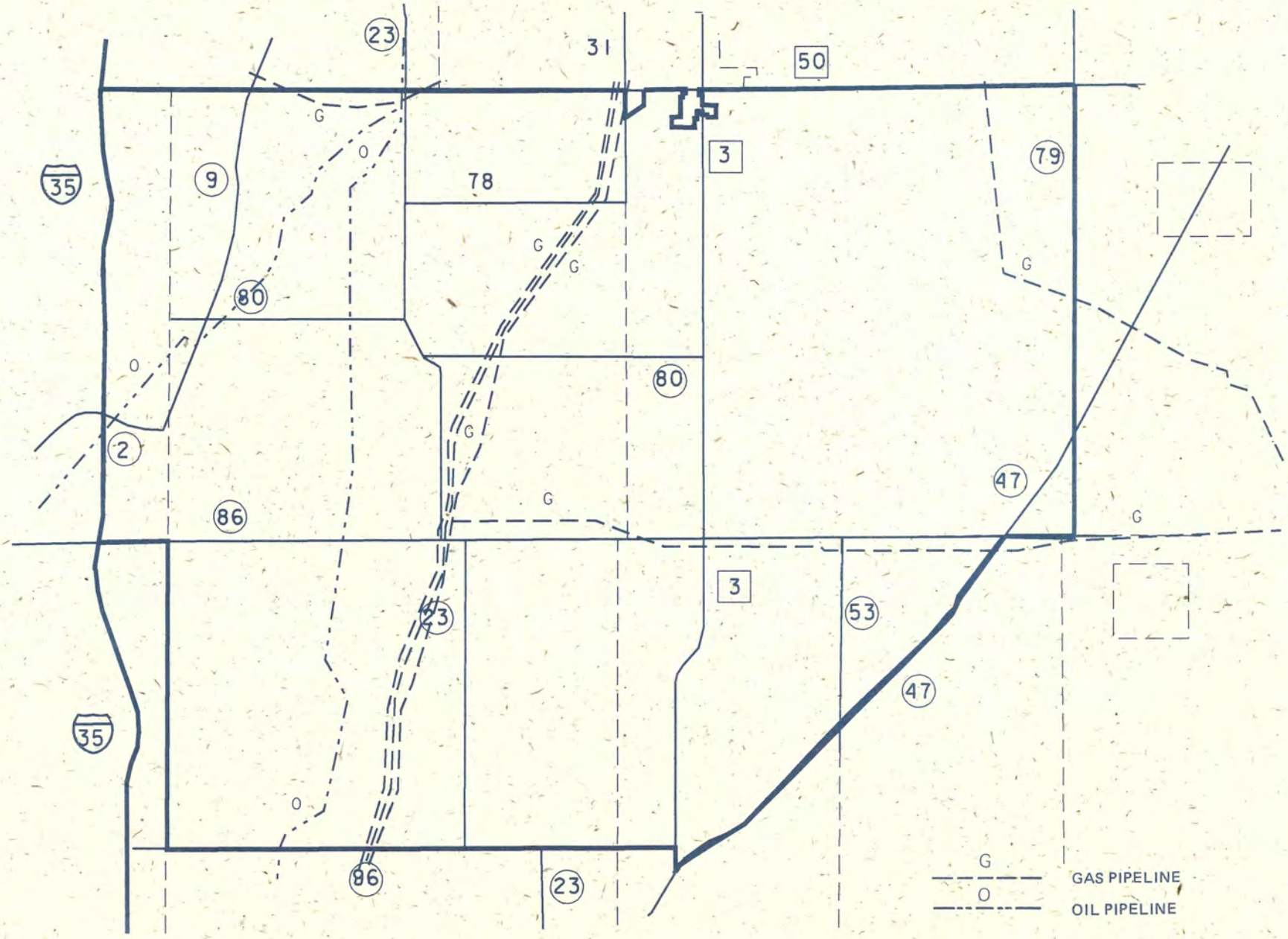


METROPOLITAN COUNCIL

Source: Metropolitan Council
Minnesota Department of Transportation

Dakota Search Area

FIGURE 8B **Pipelines**



Source: Metropolitan Council
Minnesota Department of Transportation

Dakota–Scott Search Area

FIGURE 8C **Pipelines**

HAZARDOUS/SOLID WASTE SITES

Introduction

The location of hazardous and solid waste sites can pose problems for the development of an airport. The very high costs associated with cleaning up a hazardous waste site could dramatically increase the costs of airport development. Also, identifying the location of existing or planned solid waste disposal sites will be necessary to evaluate the impact of a new airport on regional solid waste disposal capacity. Therefore, reported hazardous and solid waste sites have been identified, mapped, and classified (see figures 9a, 9b, and 9c).

Data Sources

The sources used for mapping the hazardous and solid waste sites include: Environmental Protection Agency (EPA), Minnesota Pollution Control Agency (MPCA), and county environmental records. EPA and MPCA databases were searched for known hazardous and solid waste sites in each search area. Counties were contacted and files were reviewed for hazardous and solid waste sites. Information from the above sources was located on maps and then digitized onto base maps of the airport search areas. Although these sources are the most complete, they are in no way all inclusive. Unreported spills are very common. A field investigation including borings and sampling of suspected waste sites on an airport site is needed before a final site is selected.

Findings

Anoka-Isanti-Chisago Search Area

Two sites have been delineated; a sanitary landfill located in the northern section of the search area, and a waste site which is in the southeastern part of the search area.

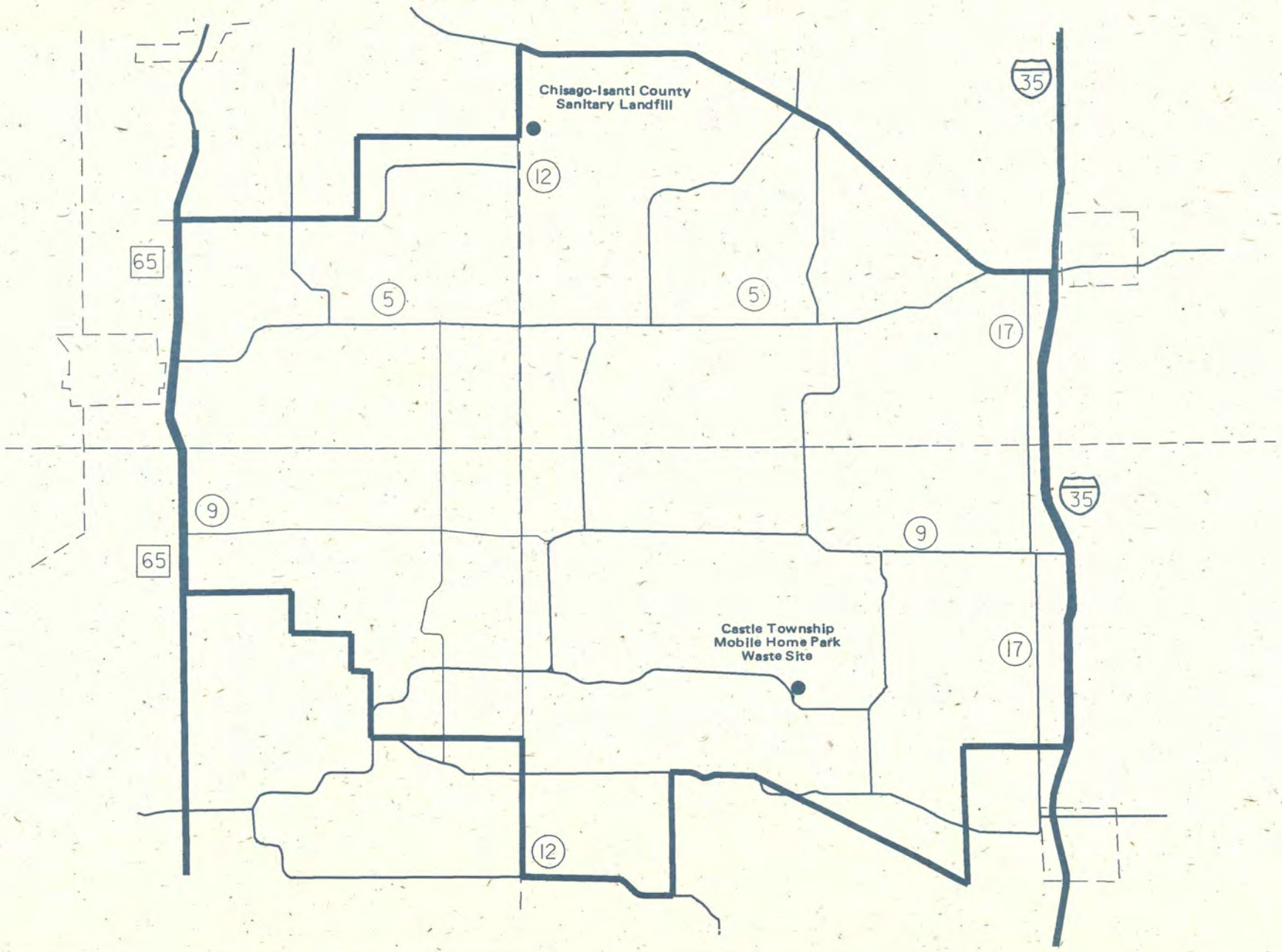
Dakota Search Area

There are an estimated 20 sites located in this search area, all of which are west of Hwy 85. There are five solid waste dump sites, four spill and/or oil sites, a wastewater treatment plant, an organic conversion compost site, a feedlot surface impoundment site, and two research/experimental sites. Most of these sites are located in the northwestern part of the search area.

Dakota-Scott Search Area

The facilities in this search area are primarily farmland-related. There are an estimated twelve sites in the Dakota-Scott search area and they include: an oil spill in the northwest, a gasoline spill, a PCB leak, and fuel oil in the north, a propane leak in the northwest central area, a feedlot surface impoundment, base sewage lagoon, and a mill elevator in the eastern section, and a herbicide mix spill, pesticide site, and feedlot surface impoundment in the southern part of the search area.

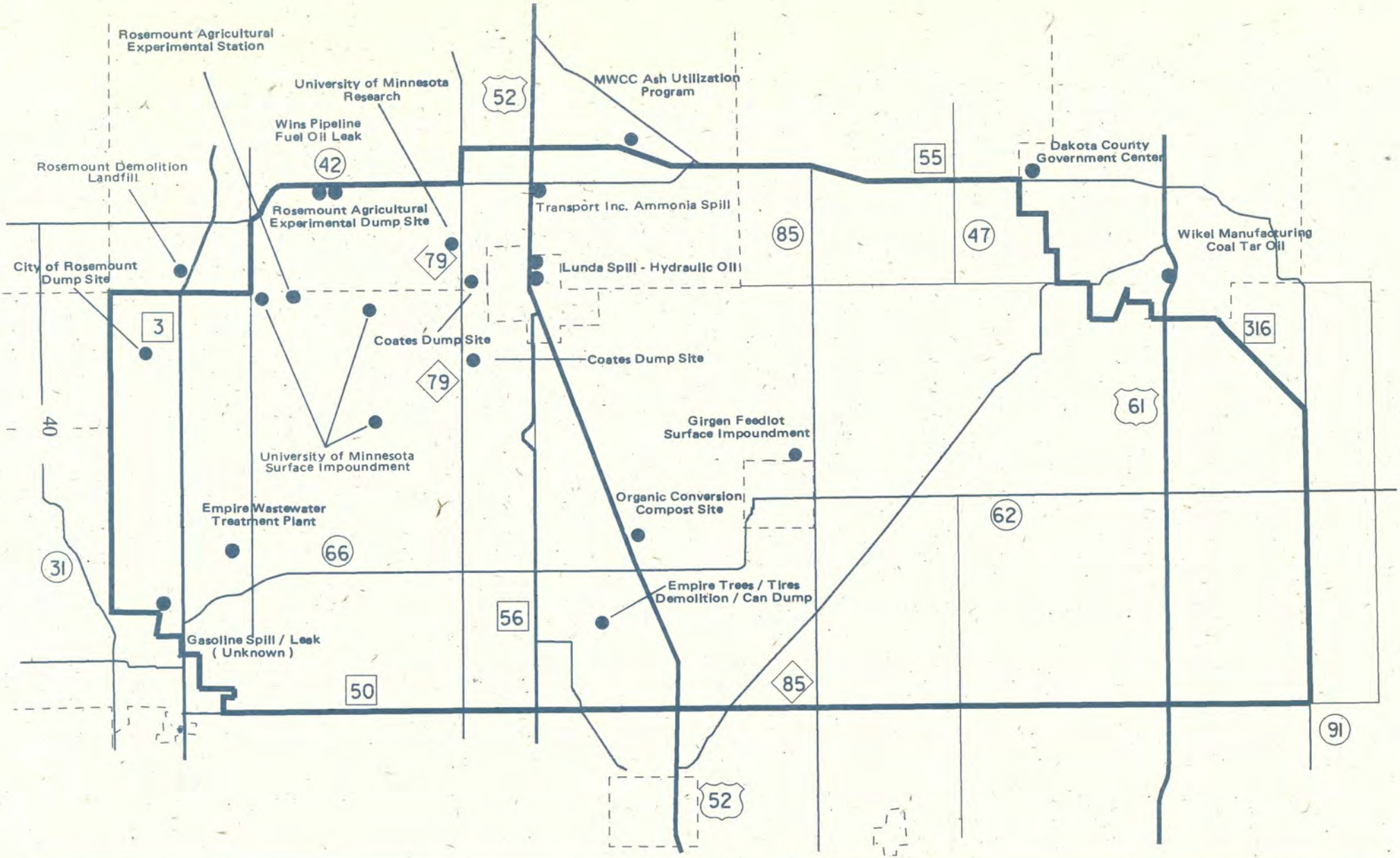
Implications



Source: Environmental Protection Agency
Minnesota Pollution Control Agency
Various county environmental records

Anoka—Isanti—Chisago Search Area

FIGURE 9A **Waste Disposal Facilities**

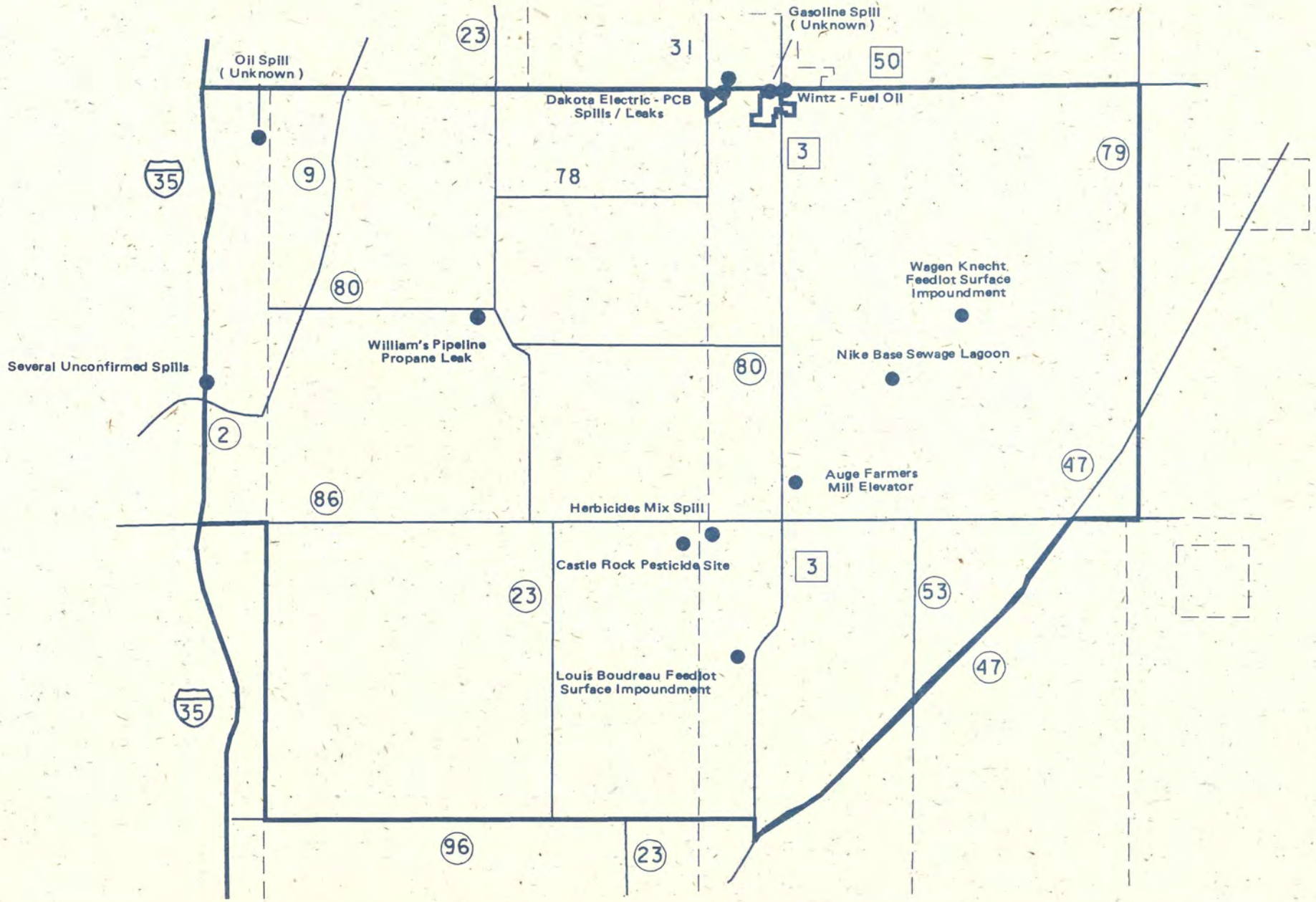


Source: Environmental Protection Agency
Minnesota Pollution Control Agency
Various county environmental records

METROPOLITAN COUNCIL

Dakota Search Area

FIGURE 9B **Waste Disposal Facilities**



Source: Environmental Protection Agency

Dakota–Scott Search Area

The goal of public policy for hazardous waste management is to protect human health and the environment at the lowest cost to the nation. The U.S. has chosen to pursue this goal by assigning different responsibilities to federal, state, and local governments and the private sector. The federal government sets broad national guidelines and initiates programs, but leaves the implementation to the states. Local jurisdictions preside over the traditional land-use based issues, including facility siting. The private sector must comply with these regulations and finance, build, and operate waste management facilities.

The cleanup of uncontrolled waste sites is an issue that evokes a passionate interest in the American public. The siting of a new airport in an area where hazardous and or solid waste sites exist will mean increased costs to the airport for cleanup activity.

TOPOGRAPHY

Given the size of the search areas, topographical assessments are not critical at this stage of the screening process. Detailed topographical analysis will be undertaken during later phases of the project, when a search area has been selected and a site identified. Topography is primarily a cost factor. The Dakota-Scott area has the most significant topographical features, although none that would preclude its selection as a search area.

SOILS

Introduction

Soil type and classification play a role in determining the alternative uses of a site, the ability of the site to tolerate contamination, and the potential impacts on water quality of developing the site in the area. If soils are permeable they can serve as a filter removing some contaminants. If soils are not permeable or are prone to erosion, then disturbing vegetation, or increasing the amount of surface runoff, can dramatically impact water quality.

The soil type of most concern to search area evaluation is that with high organic content. The soils in the search areas were evaluated and the occurrences of peat were mapped. This section outlines the amount of peat in the search areas.

Data Sources

The following source has been consulted in order to determine the impact that different soils will have on locating a replacement airport in the three search areas:

U.S. Department of Agriculture Soil Conservation Soil Surveys of Dakota, Scott, Anoka, Isanti and Chisago Counties in Minnesota.

Findings

The Soil Conservation Survey maps were used to evaluate soils within the search areas based on their suitability for the construction of an airport. Soils of concern, in this case peat, were digitized and overlaid on maps of the search areas. This allows the areas to be compared. Further investigation by soil scientists or engineers will be necessary prior to final site selection.

Anoka-Isanti-Chisago Search Area (North)

The north search area has by far the highest percentage of high organic soils. Approximately one third of the area is covered in peat, and it is widely distributed across the area. The peat is found along the Sunrise River, around ponds and streams and in areas with known wetlands (see Figure 10a)

Dakota Search Area (Central)

The central search area is relatively free of peat. The one occurrence is on the western edge of the search area along a tributary of the Vermillion River (see figure 10b)

Dakota-Scott Search Area (South)

The south search area has some large areas of peat, but they are widely distributed leaving the majority of the area free for possible siting. The peat is found mainly in the southwest/southwest central and the northeast part of the search area. It is associated with several rivers and tributary streams (see Figure 10c).

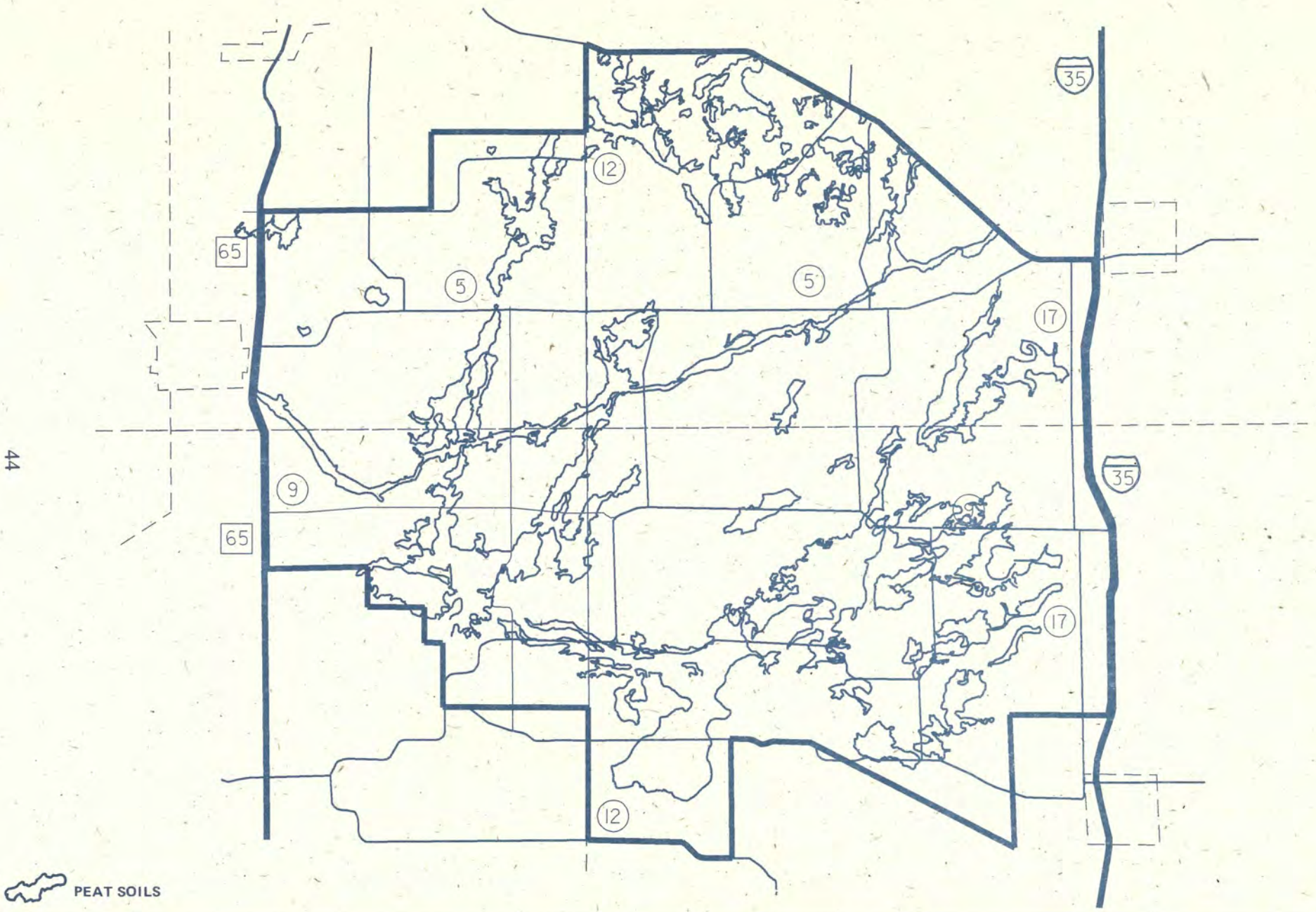
Implications

Organic soils such as peat are considered unstable as a foundation for major construction. Therefore, if a site within these areas were chosen, considerable expense would be involved in removing the organic soils and replacing them with more stable fill. In addition, organic soils are often associated with wetlands, surface water, and areas of aquifer recharge and indicate other environmental concerns in these areas.

The soil in the remaining portions of the search areas should be evaluated in terms of the soil's potential for erosion. This has considerable impact on long-term site stability and water quality.

BIOLOGICAL ENVIRONMENTAL FACTORS

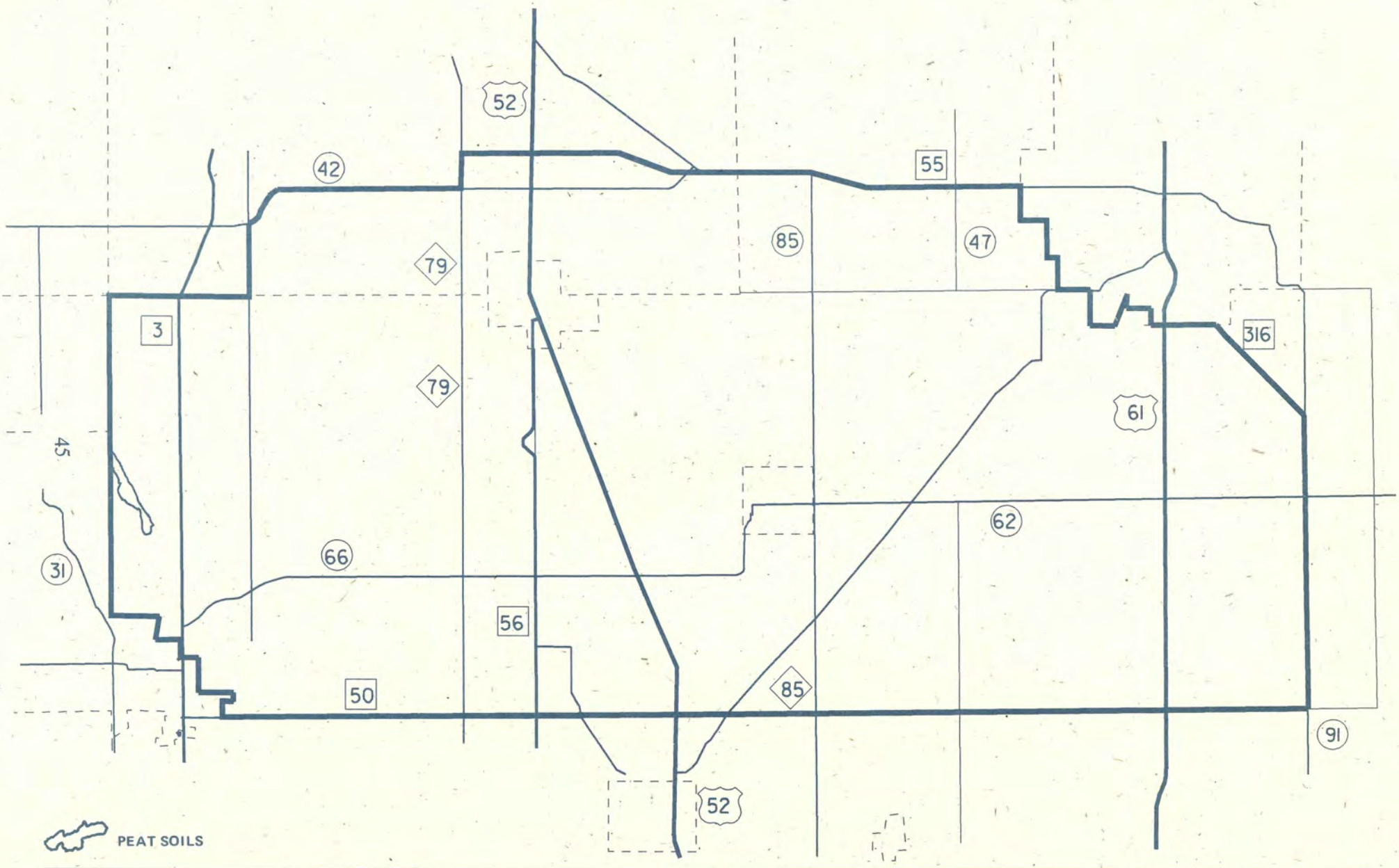
The existence of critical biological resources will have a major affect on siting decisions. A host of federal and state laws exist that severely limit development activities near these resources. This



Source: U.S. Department of Agriculture, Soil Conservation Service

Anoka—Isanti—Chisago Search Area

FIGURE 10A **Organic Soils**

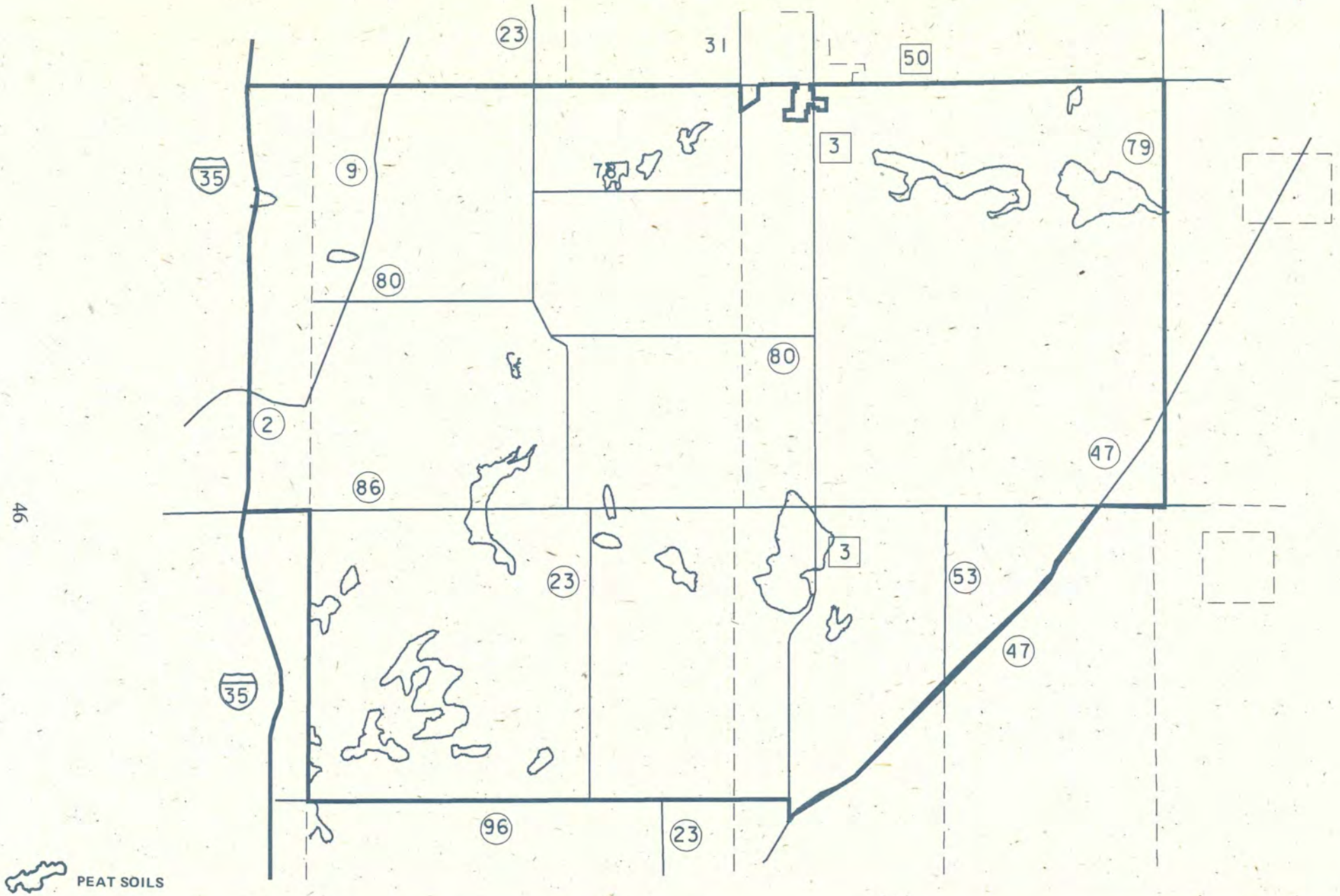


Source: U.S. Department of Agriculture, Soil Conservation Service
Geologic Atlas, Dakota Co.

METROPOLITAN COUNCIL

Dakota Search Area

FIGURE 10B **Organic Soils**



Source: U.S. Department of Agriculture, Soil Conservation Service
Geologic Atlas Dakota Co.
Geologic Atlas Scott Co

METROPOLITAN COUNCIL

Dakota—Scott Search Area

FIGURE 10C **Organic Soils**

evaluation focuses on the general location of protected plant and animal species (endangered or threatened) in each of the search areas.

ENDANGERED, THREATENED, AND SPECIAL CONCERN PLANTS AND ANIMALS

Introduction

The purpose of biological investigation in this phase of the airport siting study is to determine known locations of special concern, threatened and endangered species of plants and wildlife which are found in the three search areas. Federal and state regulations and policies protecting these resources and habitats are significant, and will be critical to decisions for siting a new airport.

Data Sources

The Minnesota Department of Natural Resources (MDNR) Natural Heritage database was used to delineate the special concern, threatened and endangered (RTE) species for the three search areas. Each listed occurrence of RTE species and natural communities in the search areas was identified and digitized to form the accompanying figures. They are listed according to their state status as: Special Concern, Threatened, or Endangered.

The biotic communities listed as RTE in the state of Minnesota are protected by the Federal Endangered Species Act of 1973 (Public Law 93-205), and/or Minnesota Statute 84.0895 as amended. This Act defines an endanger species as, "...any species which is in danger of extinction throughout all or a significant portion of its range..." A threatened species is one which is "...likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range..."

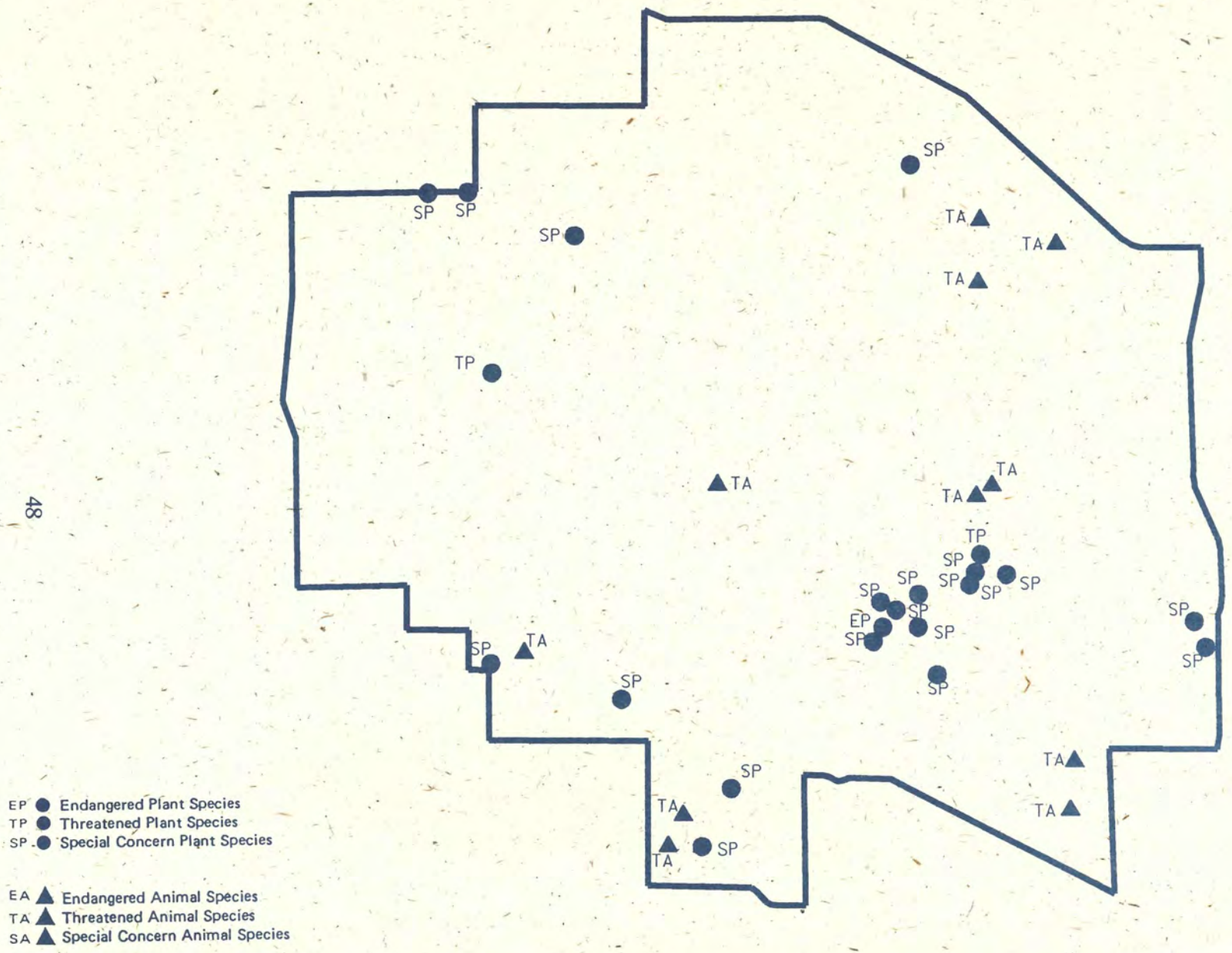
The MDNR Natural Heritage Database is the most comprehensive source of information on RTE species and natural communities available in Minnesota. However, this source is not complete. It contains only those findings that have been reported to the MDNR. A more thorough County Biological Survey is currently being conducted. Unfortunately, the surveys for the counties within the airport search areas are not yet complete.

County Biological Surveys are limited in that a ground search of the entire county is not conducted. Aerial photographs are reviewed to identify potential sites for RTE species and other natural communities. Occurrences of RTE species and natural communities listed on the Natural Heritage Database are investigated on the ground to determine if the RTE occurrence remain.

Findings

Anoka-Isanti-Chisago Search Area

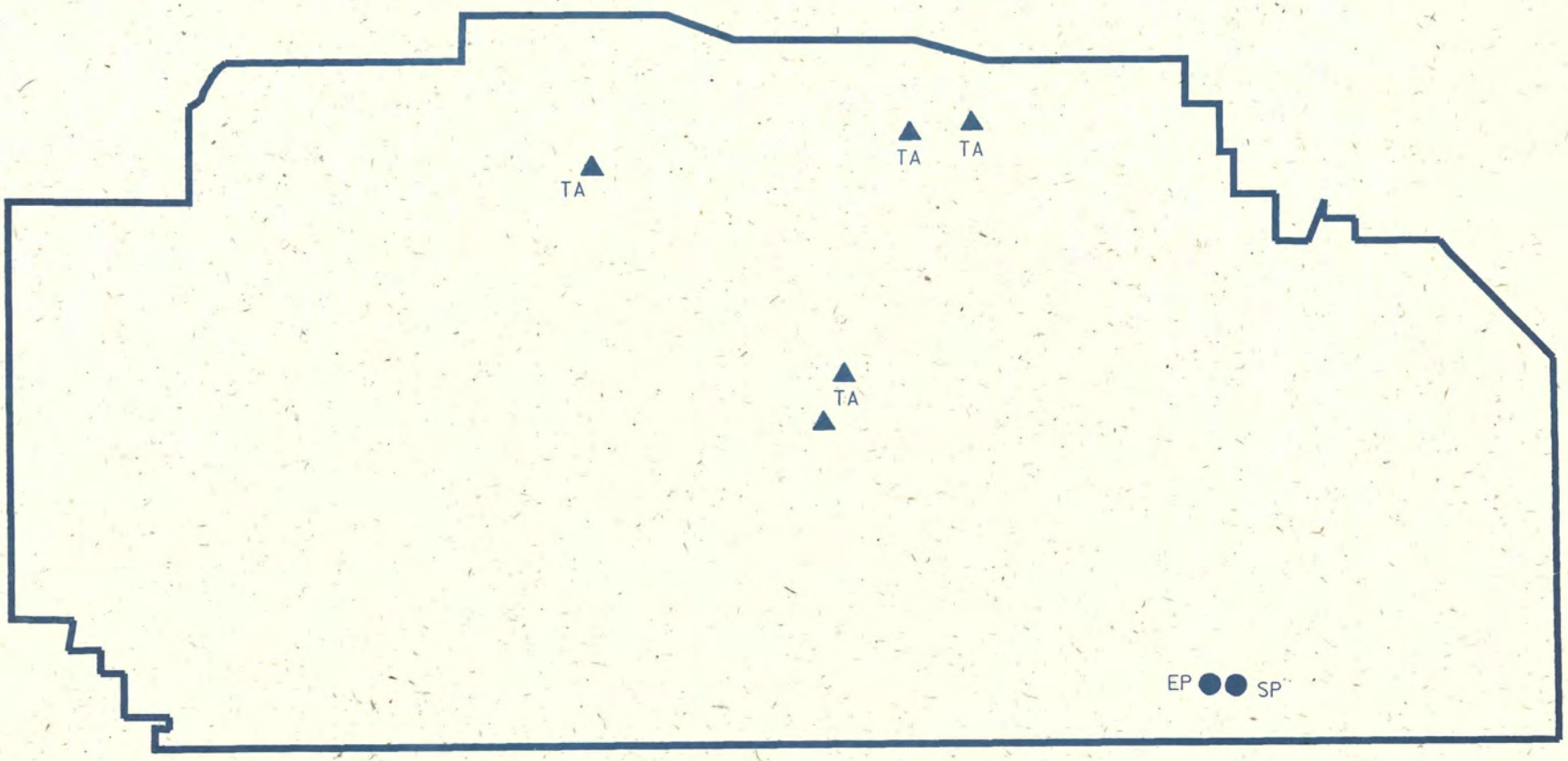
The Anoka-Isanti-Chisago search area contains a large number of biotic communities, and a large number of birds and water fowl (see figure 11a and 12a). The majority of the biotic communities are located in the south central region of the search area, with a large number of the communities made up of plants of special concern. Also, dispersed throughout the area are threatened animal communities and endangered and special concern plants. The biotic communities are found primarily in association with wetlands and lakes. The search area is outside of but close to the



Source: Minnesota Department of Natural Resources

Anoka—Isanti—Chisago Search Area

FIGURE 11A **Biotic Communities**



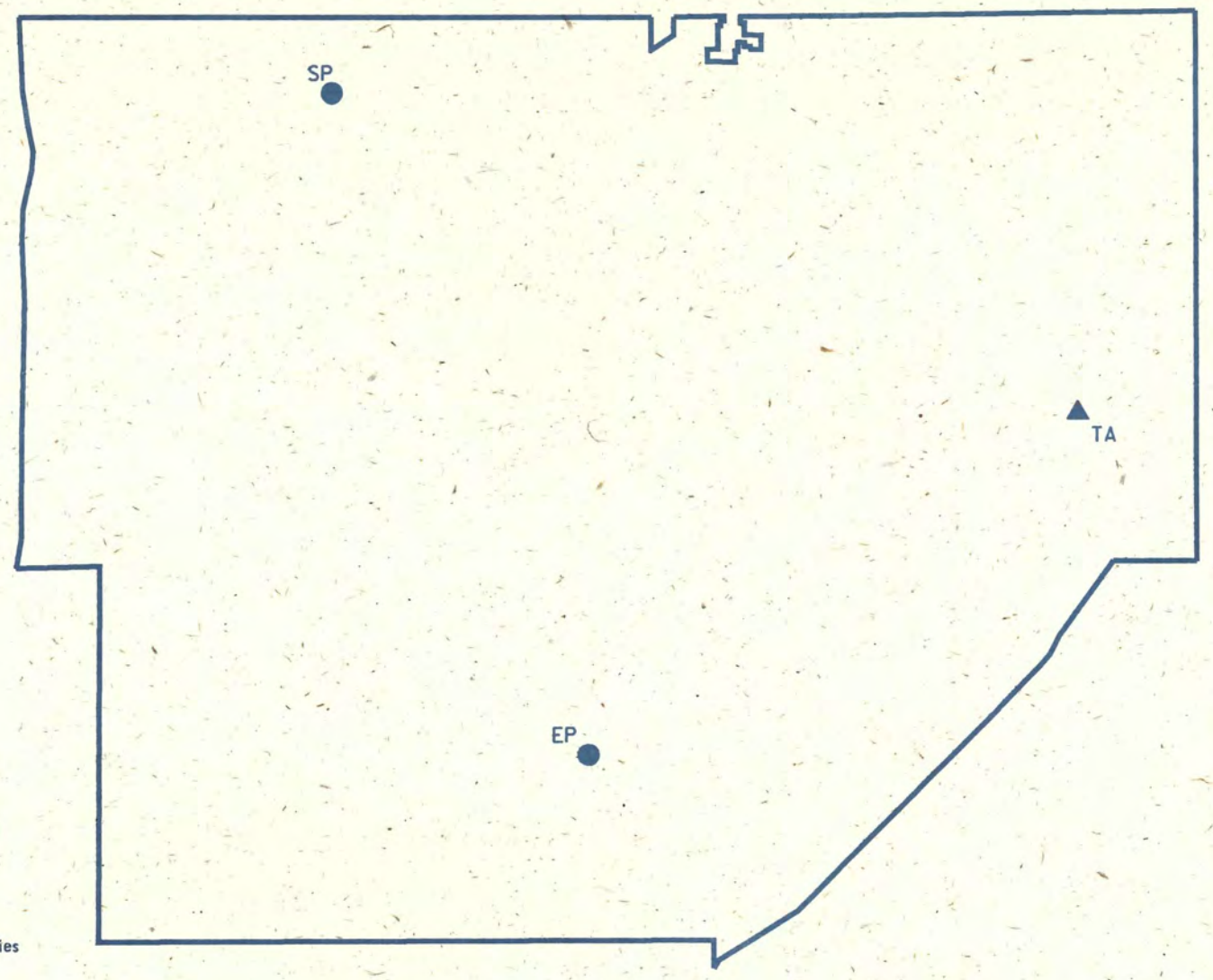
EP ● Endangered Plant Species
TP ● Threatened Plant Species
SP ● Special Concern Plant Species

EA ▲ Endangered Animal Species
TA ▲ Threatened Animal Species
SA ▲ Special Concern Animal Species

Source: Minnesota Department of Natural Resources

Dakota Search Area

FIGURE 11B **Biotic Communities**



EP ● Endangered Plant Species
TP ● Threatened Plant Species
SP ● Special Concern Plant Species

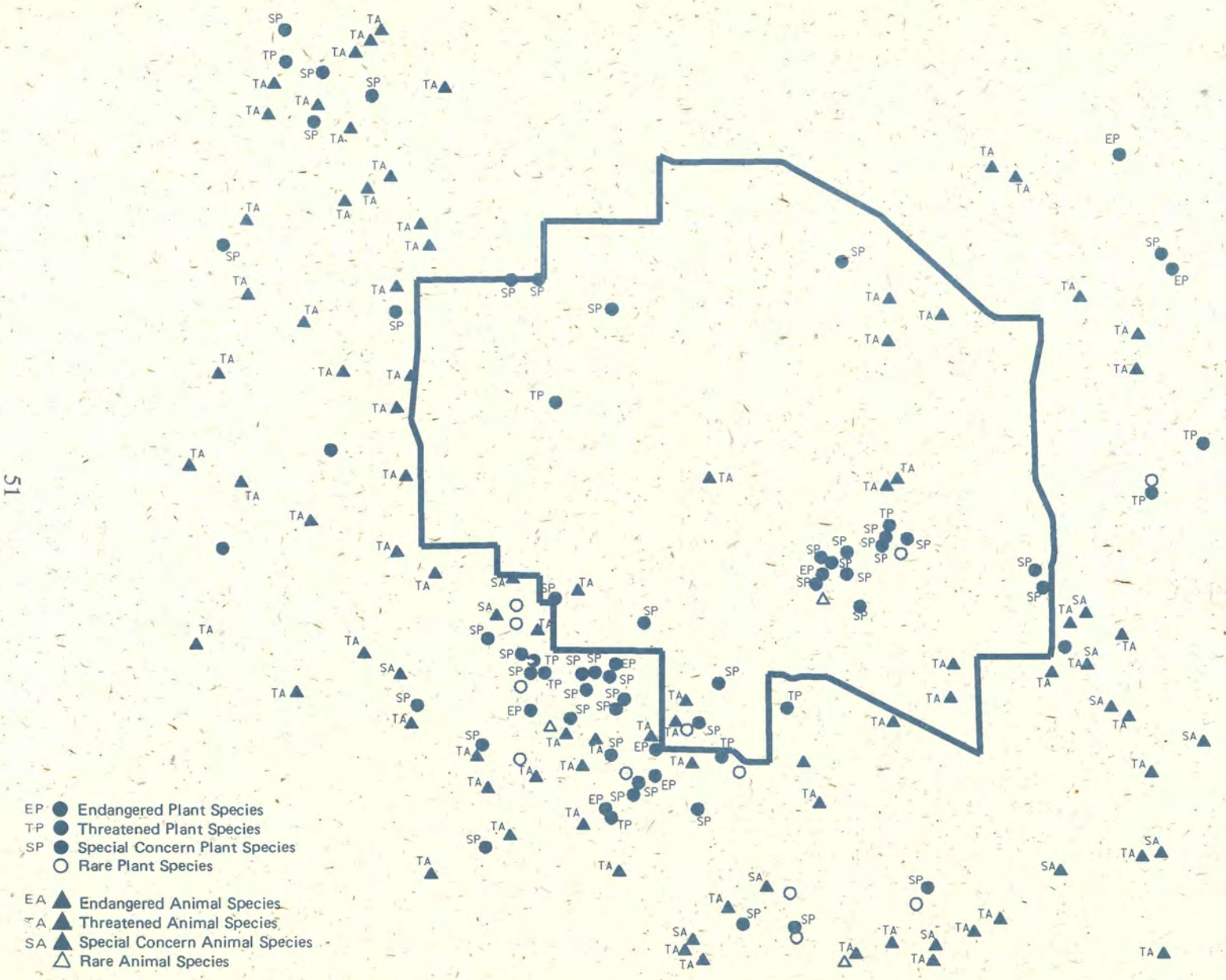
EA ▲ Endangered Animal Species
TA ▲ Threatened Animal Species
SA ▲ Special Concern Animal Species

Source: Minnesota Department of Natural Resources

METROPOLITAN COUNCIL

Dakota–Scott Search Area

FIGURE 11C **Biotic Communities**

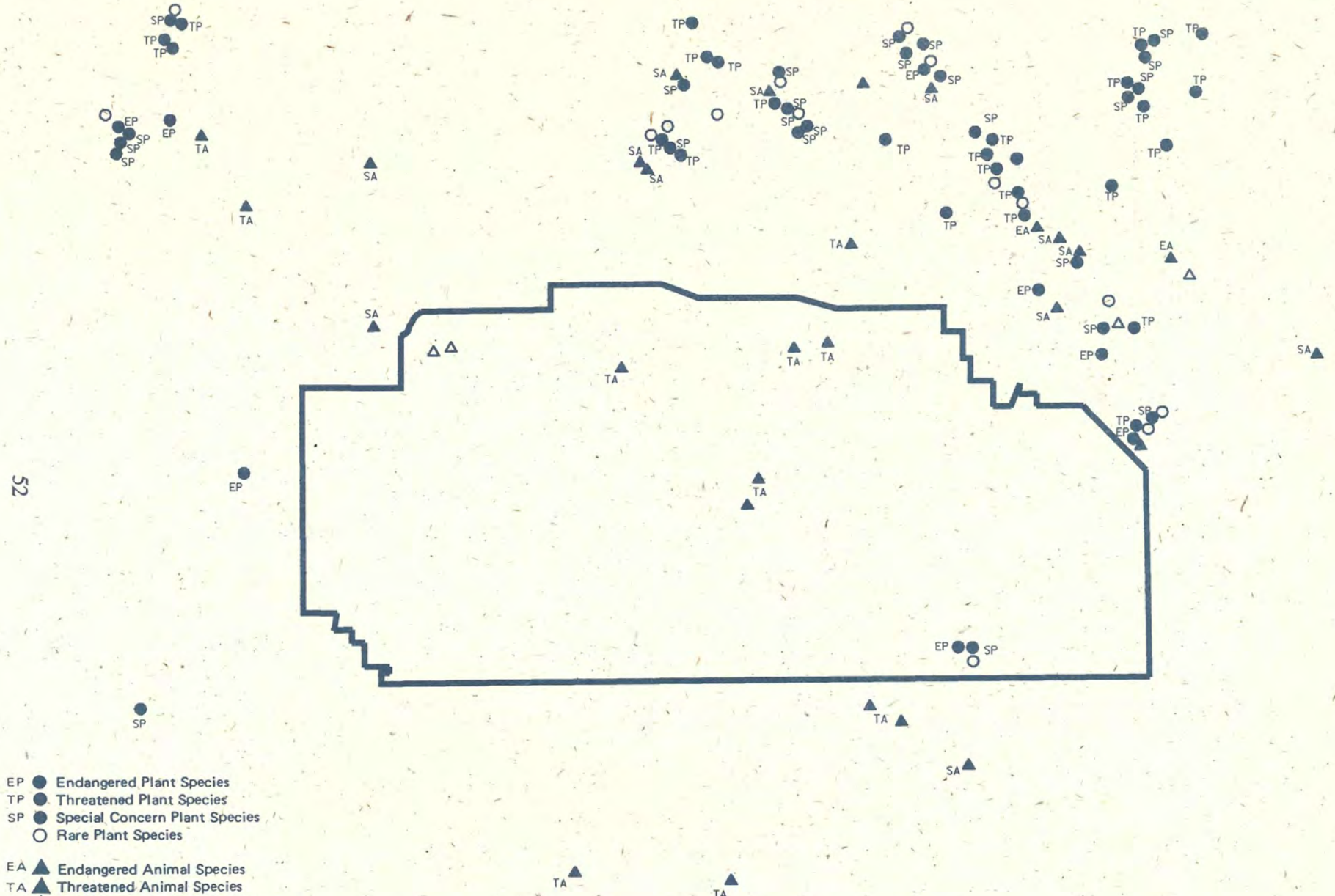


Source: Minnesota Department of Natural Resources

METROPOLITAN COUNCIL

Anoka—Isanti—Chisago Search Area

FIGURE 12A **Biotic Communities Within Five Miles of Search Area**

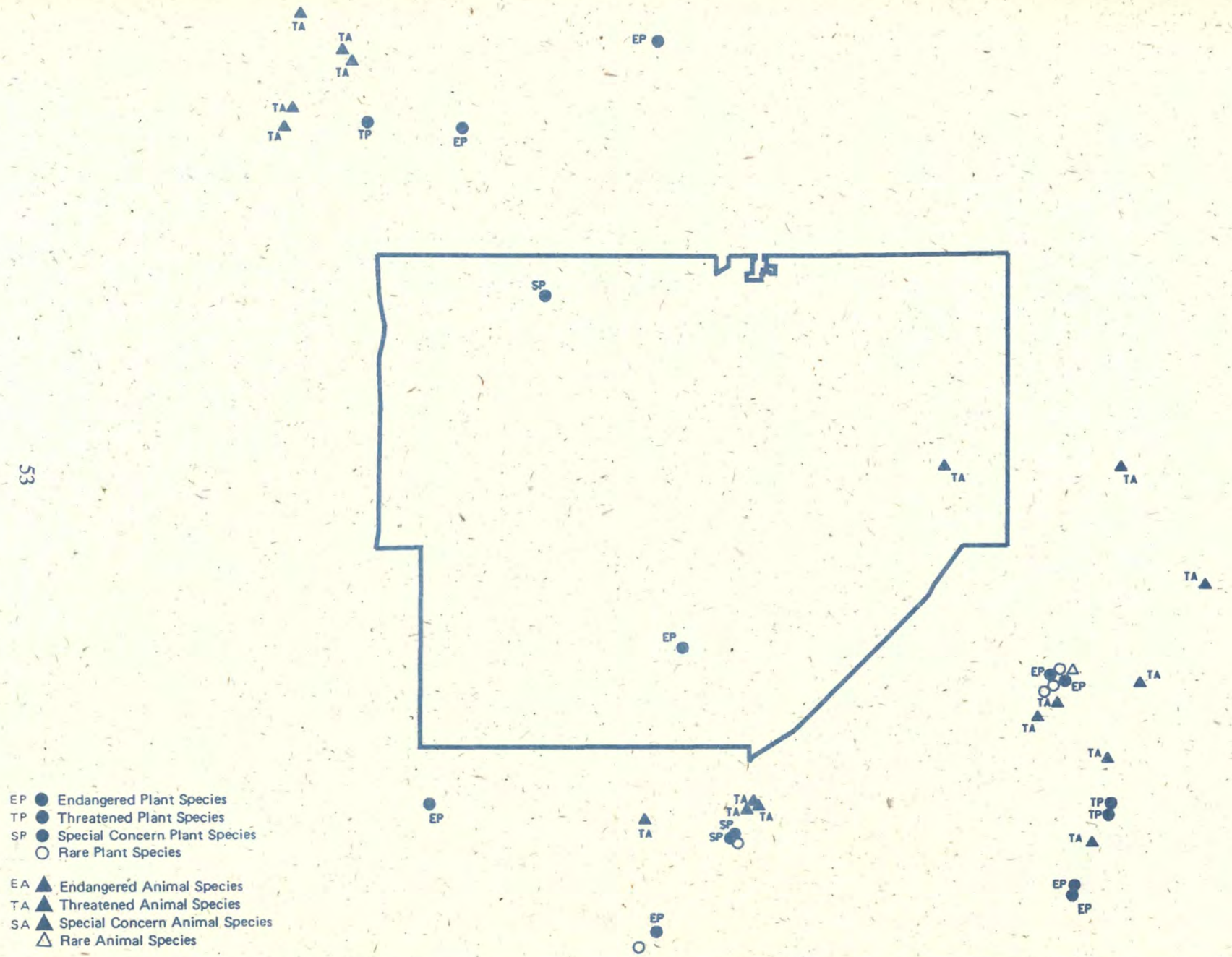


Source: Minnesota Department of Natural Resources

METROPOLITAN COUNCIL

Dakota Search Area

FIGURE 12B **Biotic Communities Within Five Miles of Search Area**



Source: Minnesota Department of Natural Resources

METROPOLITAN COUNCIL

Dakota–Scott Search Area

FIGURE 12C **Biotic Communities Within Five Miles of Search Area**

Carlos Avery State Wildlife Management Area to the south, and the University of Minnesota's Cedar Creek National History Area to the south and west. Also to the south is the Anoka and Isanti Counties Game Refuge. Two other smaller wildlife refuges are nearby. One is to the south and the other, the Athens State Wildlife Area, is just outside the area's western boundary. A small wildlife area lies within the southern part of the search area.

There is a small but viable population of Blandings turtles throughout the search area, especially in the two southern townships. The southeast quarter of Oxford Township is a turkey habitat. Significant pheasant habitat is located throughout all four townships. This area has low land brush coupled with woodland and provides excellent winter deer cover. Sensitive natural habitats and special concern plant and animal species exist in the search area as well. A number of high quality natural areas were identified by the survey in Oxford Township. Bald eagles and sand hill cranes are present and adjacent to the search area. As a result, the Department of Natural Resources would most likely oppose the destruction of a high quality natural area for airport construction.

The Minnesota Department of Natural Resources has a great concern that a new airport not be located within the Carlos Avery or other major wildlife management areas. The MDNR believes the airport would be extremely incompatible with wildlife refuges. Birds are especially vulnerable to air traffic and may be either struck in flight or driven from nests and resting areas. Therefore, flights over waterfowl refuges is not acceptable. In addition, MDNR is concerned about the added pressures on Carlos Avery and other Wildlife Management Areas resulting from the increases in human population and development that will surely come with a major airport.

Dakota-Search Area

The Dakota search area has few biotic communities (see figures 11b and 12b). Included are three threatened animal communities, an endangered plant community, and a threatened plant community. The area contains the Bellwood State Game Refuge near its eastern border, and Spring Lake Park and the Hastings Wildlife Management Area are located just to the north of the area.

Dakota-Scott Search Area

Few biotic communities are located in the Dakota-Scott search area, although the Carlton College State Game Refuge is located just to the south.

The Vermillion River runs through the northwest corner of the Dakota-Scott area. It is a designated trout stream by the Department of Natural Resources. DNR has concern about any major development in the area because of potential impacts on the stream from large impervious surface areas, which increase peak flows of hot runoff during the summer months. Trout are dependent on cool water temperatures throughout the year.

Another major concern in regard to the Dakota-Scott search area is potential impacts on the Loggerhead shrike, a marine turtle (Lanius Ludovicianus) which is a state threatened species and a candidate for federal listing. There are recent nesting records from this area, but since the comprehensive biological survey of the Dakota and Scott Counties is in progress, further information on the shrike and other species is not yet available.

AIRPORT RELATED ENVIRONMENTAL FACTORS

In addition to the physical and biological environmental features intrinsic to each search area, there are a number of potentially serious environmental impacts that could result from the construction and operation of a major new airport. Noise impacts are of particular concern and will be analyzed in detail as part of the site selection process. The generation and disposal of solid and hazardous wastes are important factors for a major airport. Local air quality impacts of a new airport need to be evaluated when an airport site is selected. The evaluation looked at existing non-attainment areas in each of the search areas to highlight areas potentially sensitive to additional air pollution. Water pollution concerns during both the construction phase of a new airport as well as during the operational life of the airport have also been addressed.

SOLID AND HAZARDOUS WASTE GENERATION

The development of a new airport at any site will bring with it an increased hazardous and solid waste stream. Once the location for the airport has been chosen, site-specific planning for the minimization, containment, collection and disposal of wastes can be undertaken in detail.

AIR QUALITY

Introduction

In general, air quality concerns in Minnesota, and the rest of the country, are divided into two major issues. First, concern over the federal criteria pollutants, largely those that are precursors to smog, and second, concern over toxic air pollution. These pollutants were targeted in the 1970 Clean Air Act and were addressed through the establishment of standards. The areas that meet these standards are said to be in attainment, while those that fail to meet the standards are considered non-attainment areas.

Under the Federal Clean Air Act every state must identify non-attainment areas and devise a plan that will assure that the area reaches attainment within a set time period.

Toxic air pollutants are also of concern in Minnesota. Minnesota has a program that targets the control of toxic air pollution from existing sources, based on risk assessment for carcinogens and ambient standards for noncarcinogens. Over 100 toxics are currently regulated through the issuance of construction and renewable operational permits.

This section describes the current level of air pollution in the search areas.

Data Sources

U.S. Environmental Protection Agency - list of non-attainment areas

Findings

Anoka-Isanti-Chisago Search Area (North)

The North search area is currently in attainment for all federal criteria pollutants (see Figure 13).

Dakota Search Area (Central)

A small portion of the Central search area is in attainment for carbon monoxide. Several of the towns in the northern portion of the search area are in non-attainment, based on the population and amount of commuting to Minneapolis/St. Paul. The entire area is in attainment for all other criteria pollutants, or listed as "not classified" (see Figure 13).

Dakota-Scott Search Area (South)

The majority of the South search is in attainment for CO. A small section on the eastern edge is in designated non-attainment. The entire area is in attainment for all other criteria pollutants, or listed as "not classified" (see Figure 13).

Implications

The air quality of the search area selected as the site will be affected 1) by the construction of the facility, 2) then by the operations of the airport and the increase in traffic associated with its use, and 3) the secondary development that could follow the opening of the facility. Since the air quality in almost all of the search areas, in terms of criteria pollutants, can be classified as in attainment - or better than the national standards -- the consequences of siting an airport may lead some of the areas into non-attainment status. Dakota County would be especially sensitive to reclassification, as the majority of its northern population centers are already in non-attainment.

Concern also should be given to those areas that are between the Twin Cities and the search area. Since the majority of the users of the new airport would be from the metropolitan areas, the main route from the cities to the new airport will be subject to an increase in air pollution.

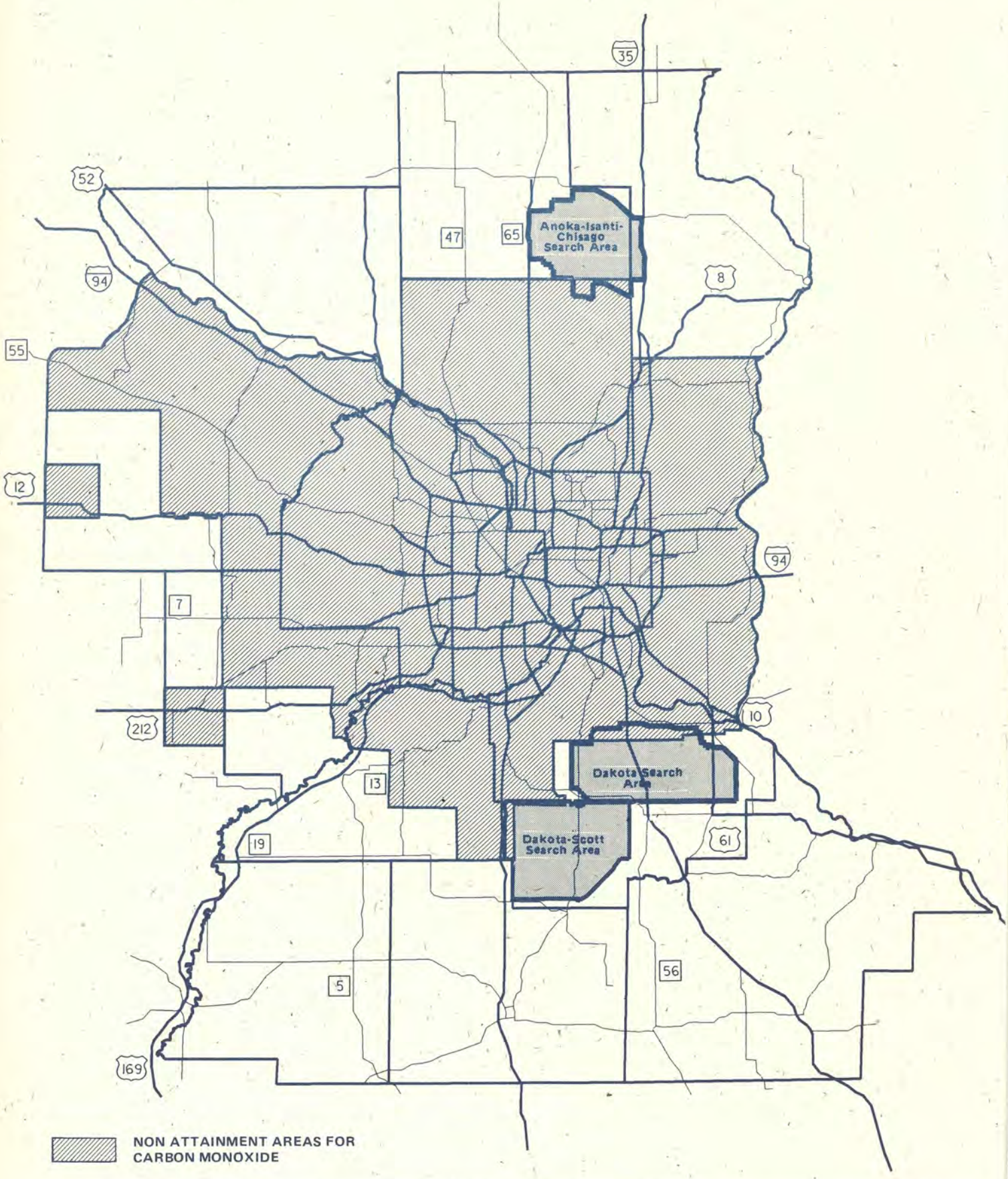
With the 1990 amendments to the Federal Clean Air Act, more attention will be focused on achieving attainment in non-attainment areas and on the control of toxic air pollution. The new airport will be subject to the air toxic control program due to the amount of solvents and petroleum products in use, as well as provisions of a State Implementation Plan to reduce criteria pollutants. This could limit road construction, secondary development, and require the installation of technologies or procedure changes to limit toxic air emission. This could have a significant impact on the operating costs of any new airport.

WATER QUALITY

Airport development activities and on-going facility operations can potentially affect the quality of water resources in and around any airport site. For example:

- Temporary water pollution during construction generally results from ineffective control of surface runoff. This produces erosion, siltation and sedimentation;

- During regular airport operations, water pollution problems can occur from: leaks and spills from tank trunks and hoses in apron service areas;



Source: U.S. Environmental Protection Agency
State of Minnesota

FIGURE 13 **Air Quality**

METROPOLITAN COUNCIL

leaks and spills in areas where repairs and maintenance operations are conducted; leaks, spills and ruptures around fuel storage areas above and below ground; accidental ruptures and spills of fuel and oil from aircraft; loose debris; and rubber tire deposits;

- Water pollution problems can become more complex during winter months if de-icers are used to clear taxiways, runways, and apron areas or to de-ice or wash aircraft.

Through proper construction techniques and proper design and maintenance of stormwater and sanitary sewage systems, significant adverse impacts to water quality can be avoided at any airport. Moreover, a number of federal stipulations are in place that require on-site control and retention to minimize water pollution problems.

During construction, temporary and permanent erosion controls, as recommended by the FAA and the Soil Conservation Service, can be employed to minimize water pollution. These measures, including the use of sediment basins, berms, diversion ditches, sodding, and mulching are all proven techniques to control construction-related pollution problems.

Stormwater runoff containing potential pollutants and other waste materials are normally routed, contained, and treated on site before being released into adjacent waterways. All air carrier airports are required to develop and maintain a Spill Prevention Control and Countermeasure Plan to ensure that fuel spillage problems or leaks do not adversely impact the safety of people or the existing water quality. New requirements by the Environmental Protection Agency regarding stormwater National Pollutant Discharge Elimination System (NPDES) permits could also play a role in minimizing water quality impacts.

Water quality certification is required under the 1982 Airport Act for approval of an Airport Improvement Program application for projects involving new airport location, runway location, or major runway extension. Once a site has been selected for development, the detailed environmental assessment of the site needs to be coordinated with the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service, as well as other public agencies, to ensure that proper steps are taken to secure required permits and incorporate adequate controls into the planning and design process for the protection of water quality in the area.

In summary, the three search areas should be considered similar in their impact on water quality. The requirements of temporary and permanent erosion controls coupled with petroleum waste and general storm water runoff control measures will greatly reduce the impacts on water quality no matter which search area and, ultimately, which site is chosen for the new airport.

APPENDIX B

SEARCH AREA CHARACTERISTICS

This appendix describes (1) the land-use and population density characteristics and (2) the characteristics of the agricultural lands in each of the three search areas.

LAND USE AND POPULATION DENSITY CHARACTERISTICS

• ANOKA-ISANTI-CHISAGO SEARCH AREA

Land Use Characteristics

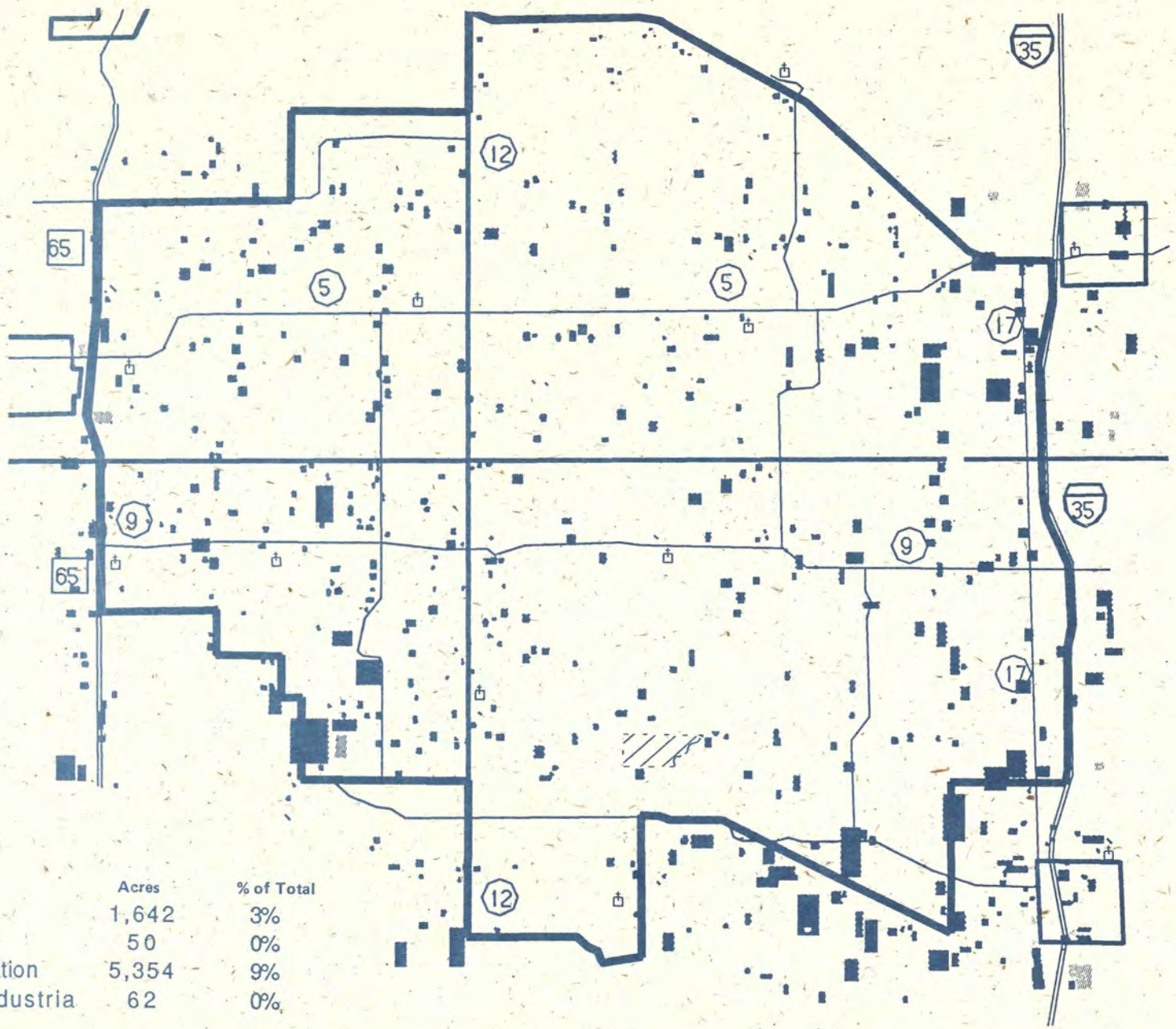
The Anoka-Isanti-Chisago sarch area is approximately 102 square miles, or 61,720 acres (see Figure 1). It is located north of the Twin Cities primarily in Isanti County. Agricultural uses and farming occupies over half, or 62 percent, of the total land in this area.

Only 50 acres of this search area--less than 1 percent of the total area--is currently designated for public land use. Eight cemeteries are found in this search area.

Commercial land use is relatively small with less than 1 percent--approximately 62 acres--currently being used for commercial or industrial purposes. The majority of the commercial-industrial land use is found along the northerly Hwy. 65 corridor. Another small pocket of commercial-industrial land use is found in the southwest along the Anoka County-Isanti County border.

Parks and recreation cover approximately 9 percent of this search area, with 5, 354 acres designated as this land-use type. Over 15,000 acres, or 25 percent of this search area, is designated wetlands. Wetlands are located throughout the area, but have a higher concentration in the northern portion of this search area. Forested wetlands comprise slightly more than 8 percent of this total wetland area. The Anoka and western Isanti county portions of the search area, and including the adjacent Cedar Creek Natural History Area of the University of Minnesota, have significant numbers of wetlands and biotic communities.

The southeastern portion of the search area has several lakes. There are a significant number of lakes and streams associated with Carlos Avery Wildlife Management Area in the Anoka County portions of the sector. Also to the south is the Anoka and Isanti Counties Game Refuge. Two other smaller wildlife areas are nearby. One is to the south and the other, the Athens State Wildlife Area, is just outside the area's western boundary. A small wildlife refuge lies within the southern portion of the search area.



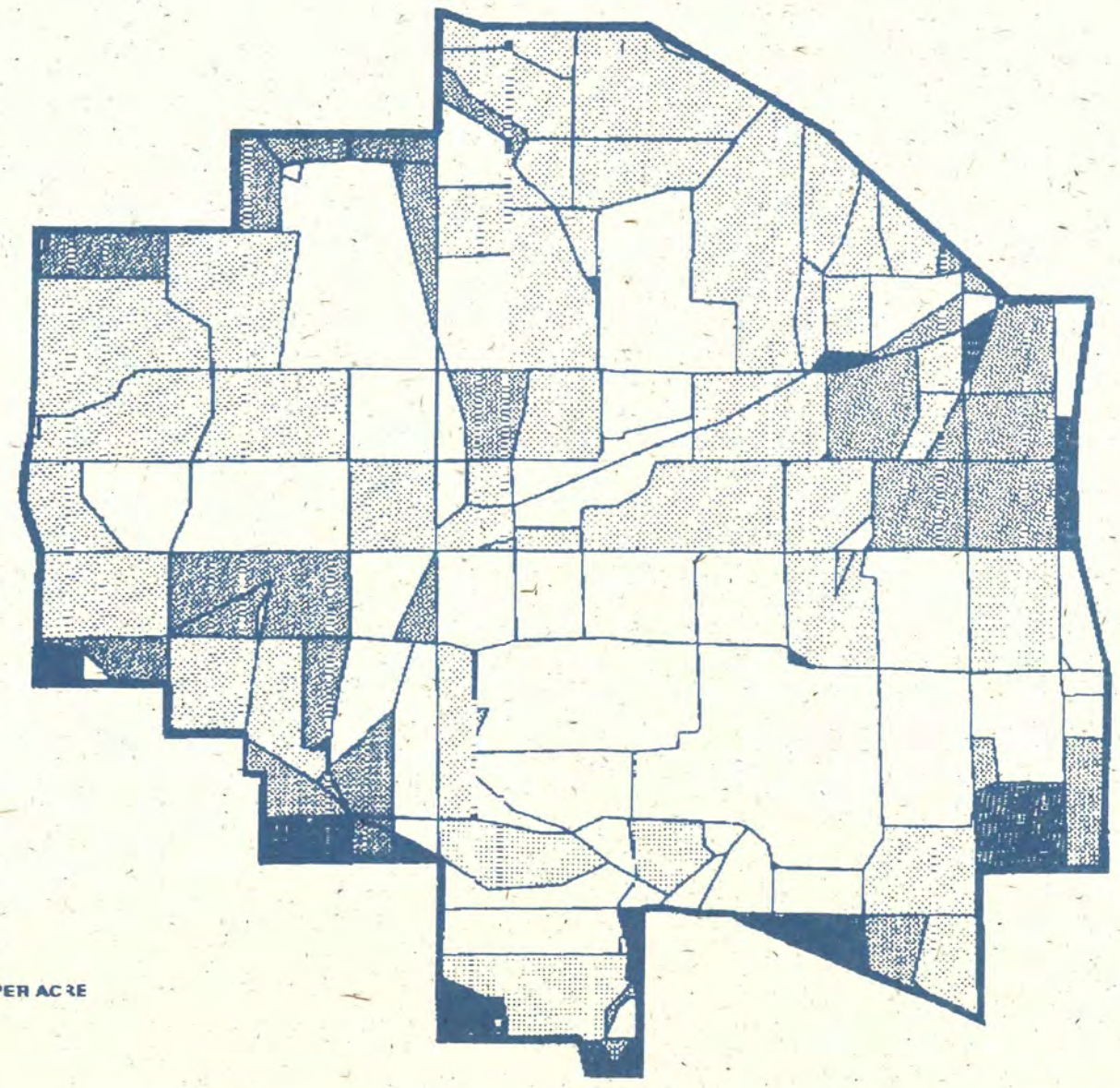
Land Use	Acres	% of Total
Residential	1,642	3%
Public	50	0%
Parks & Recreation	5,354	9%
Commercial/Industria	62	0%
Cemeteries		

Source: Digitized From 1990 Aerial Photographs
Cemetery Locations From County & Private Sources

METROPOLITAN COUNCIL

Anoka–Isanti–Chisago Search Area

FIGURE 1 **Selected Land Uses**



HOUSING UNITS PER ACRE

0 – 9
10 – 19
20 – 49
50 +

Source: 1990 U.S. Census

METROPOLITAN COUNCIL

FIGURE 2 Anoka–Isanti–Chisago Search Area
Household Densities
(1990 Census Block Data)

Population Density

Approximately 3 percent of the search area, or 1,642 acres, is residential land use. High rural densities--more than 20 households per square mile--are found to the west of the search area along Hwy. 65 (see Figure 2). The remainder of the search area has 10 to 20 households per square mile, with concentrations of higher population densities along Interstate Hwy. 35 to the east and throughout the Anoka County portion along the southern border of the search area.

• DAKOTA SEARCH AREA

Land Use Characteristics

The Dakota search area is approximately 115 square miles, or 74,590 acres (see Figure 3). It is located southeast of the Twin Cities in Dakota County. This search area is primarily farmland. Approximately 89 percent of the total area is used for agricultural purposes.

About 3 percent of the total search is divided among a number of commercial-industrial areas. These areas are located throughout the search area, but have a greater tendency to be located along the Vermillion River that bisects the search area. There is a concentration of commercial-industrial land use in the northwest where the corporate limits of Apple Valley, Rosemount, and Lakeville have a common point and in the south west corner of the search area where the Vermillion River crosses the boundary of the search area close to the corporate limits of Farmington.

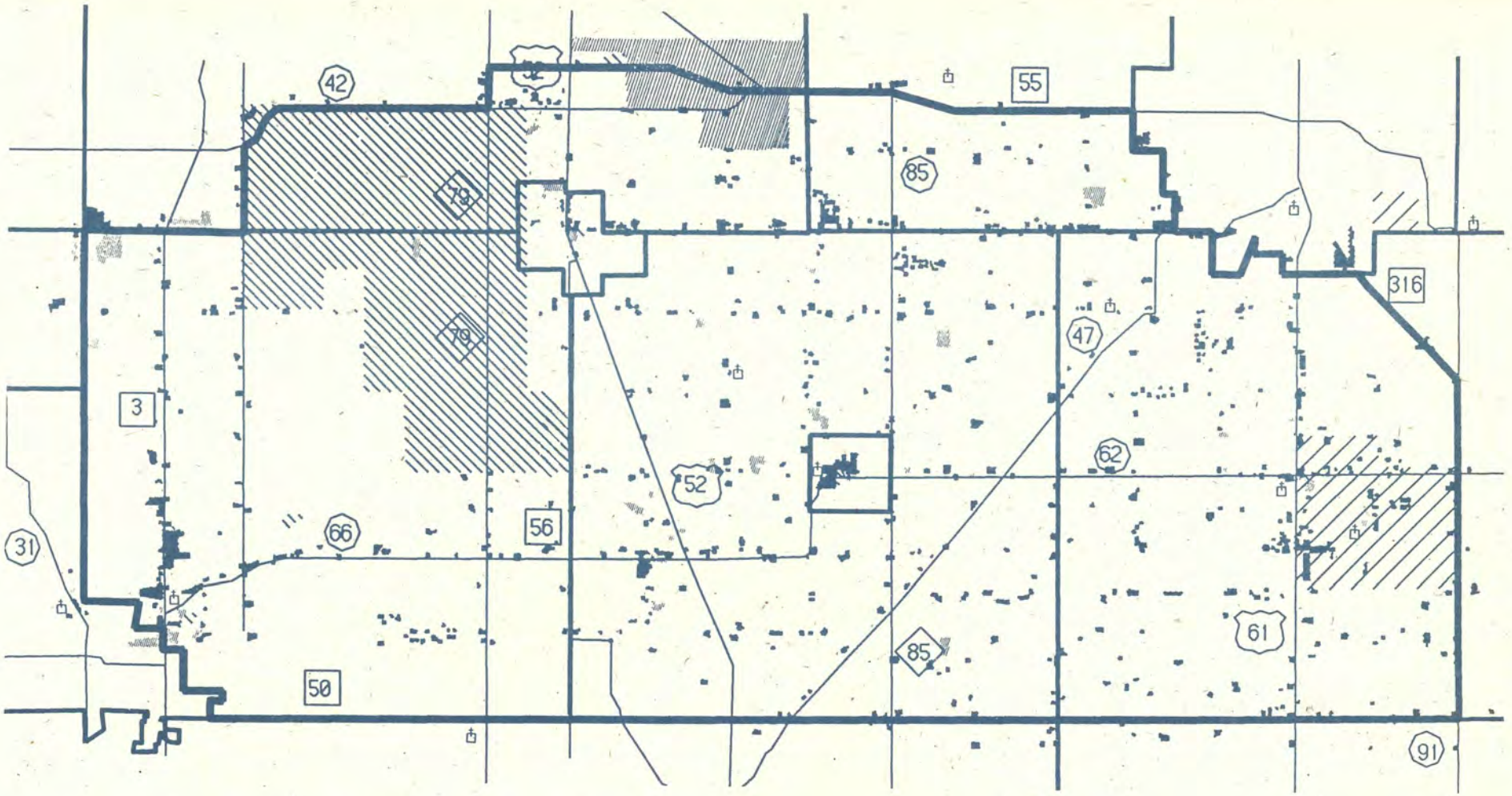
This area has very few wetlands and biotic communities. Only 3.5 percent of the total area is designated wetlands. Less than 1 percent of the search area is forested wetlands. The majority of the wetlands are found in the southwest corner of the search area. No lakes of substantial size exist within the area. However, the area is traversed by the Vermillion River and the northern portions of the area are close to the Mississippi and Lower St. Croix Rivers.

Parks and recreation comprise just over 7 percent of the total land use in this search area. The area has about 2,000 acres, roughly 3 percent of the total search area acreage, of deciduous forest. The Bellwood State Game Refuge is located near the search area's eastern border. Spring Lake Park and the Hastings Wildlife Management Area are located just to the north of the search area.

Approximately 11 percent of this search area's total land area is for public use. The majority of this land belongs to the University of Minnesota and is located west of Coates, south of County Road 42, and north of County Road 66. There are five cemeteries in this search area.

Population Density

Slightly over 1 percent of the Dakota search area is residential. The rural population densities are greatest along the northern portion of the area along the Hwy. 55 corridor (see Figure 4). Rural densities are high along Hwy. 3 and the western edge of the search area. The remainder of the area has relatively low population density--between 10 to 50 households per square mile--with the exception of three concentrations of population with densities over 50 housing units per acre located along the Vermillion River.



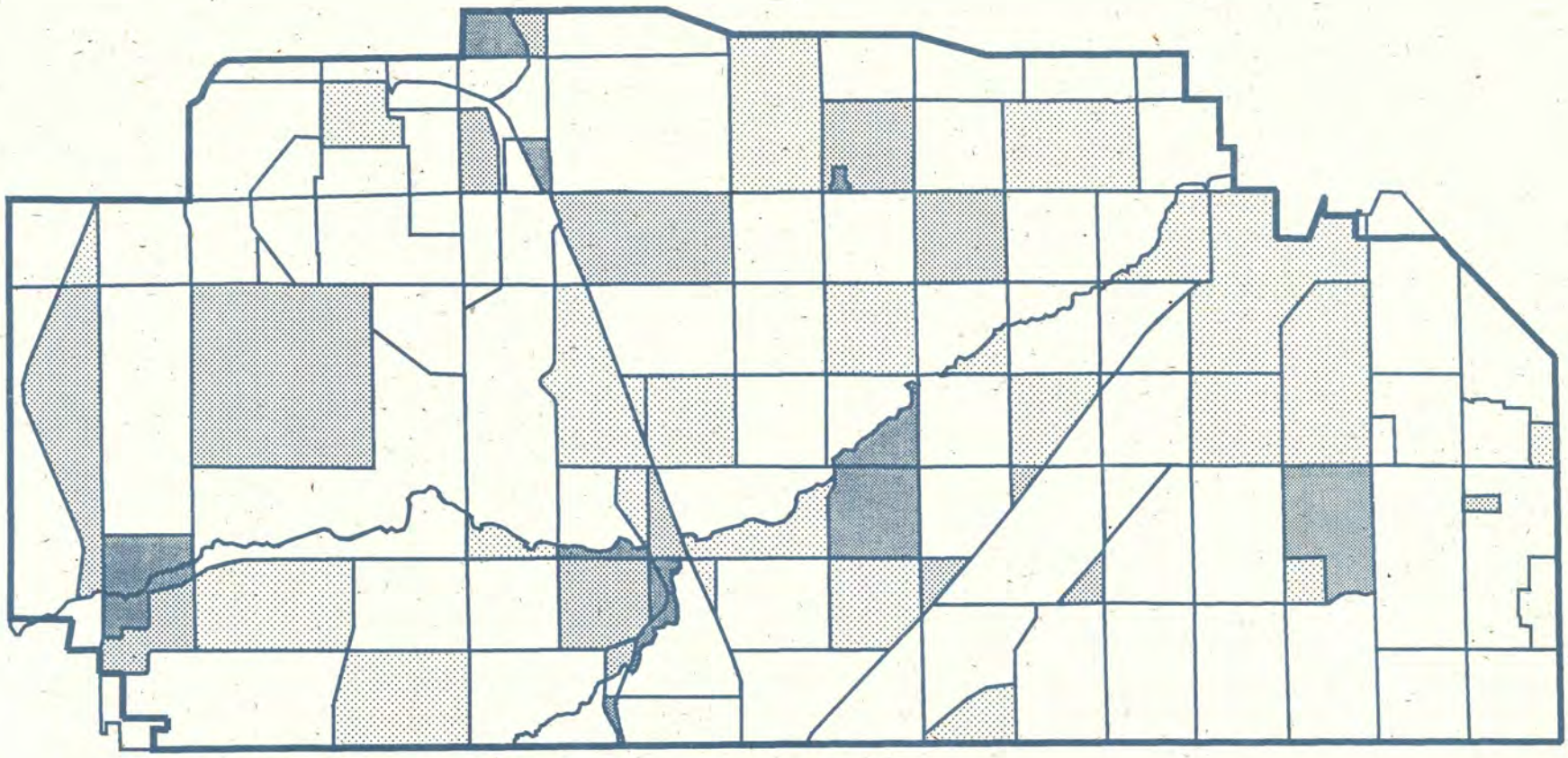
Land Use	Acres	% of Total
Residential	1,026	1%
Public	8,064	11%
Parks & Recreation	5,374	7%
Commercial/Industria	1,985	3%
Cemeteries		

Source: Digitized From 1990 Aerial Photographs
Cemetery Locations From County & Private Sources

METROPOLITAN COUNCIL

Dakota Search Area

FIGURE 3 **Selected Land Uses**



HOUSING UNITS PER ACRE

0 – 9
10 – 19
20 – 49
50 +

Source: 1990 U.S. Census

METROPOLITAN COUNCIL

FIGURE 4 Dakota Search Area
Household Densities
(1990 Census Block Data)

- **DAKOTA-SCOTT SEARCH AREA**

Land Use Characteristics

The Dakota-Scott search area is 113 square miles, or 73,865 acres (see Figure 5). It is located south of the Twin Cities primarily in Dakota County. This search area is primarily farmland. Agricultural lands comprise 84 percent of the total search area's acreage.

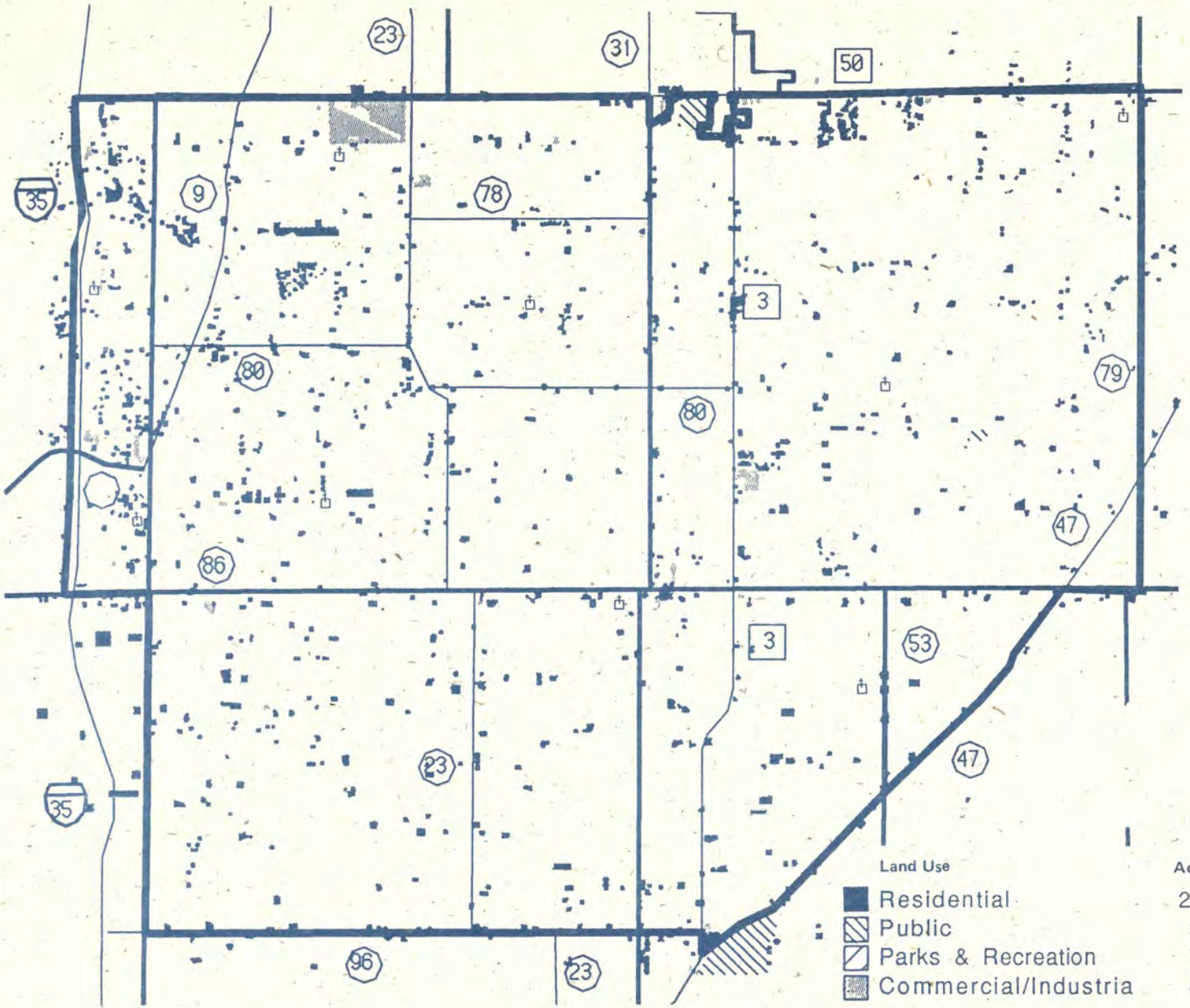
Limited commercial and industrial development has occurred along the main transportation arterials in the area including: Hwy. 50, Hwy. 3 and I-35. However, less than 1 percent of the total acres in this area are designated commercial or industrial. The largest single area of commercial-industrial development surrounds the Airlake Park Airport where County Road 23 intersects Hwy. 50.

This area has about .5 percent of its total area designated for public use.
There are at least nine cemeteries in the Dakota-Scott search area.

Parks and recreation land comprise slightly over 1 percent of the total search area. Designated wetlands cover just under 11 percent of the total area including 220 acres of forested wetlands. The wetlands and hilly areas increase in number in the western portion of the search area. This search area has few wetlands and relatively few lakes. Chub Lake and Rice Lake are the two largest lakes in this area. The Vermillion River traverses the northwestern section of the area and the Chub Creek crosses the southern portion. Few biotic communities are located in the area, although the Carlton College State Game Refuge is located immediately to the south of the search area.

Population Density

This search area has only 3.5 percent of it total area used for residential purposes.
Rural population densities are high--20 housing units and above--where Hwy. 50 intersects County road 3 and the Soo Railroad Line in the northern portion of the search area (see Figure 6). The household densities are 20 housing units and above around Rice Lake and Chub Lake. Concentrations of housing densities of greater than 10 units per acre are found between the Soo Railroad Line and I-35 and between the Soo Railroad Line and County Road 3. Moving southeasterly towards the borders of the search area, the population densities decline while the intensity of agricultural land use increases.



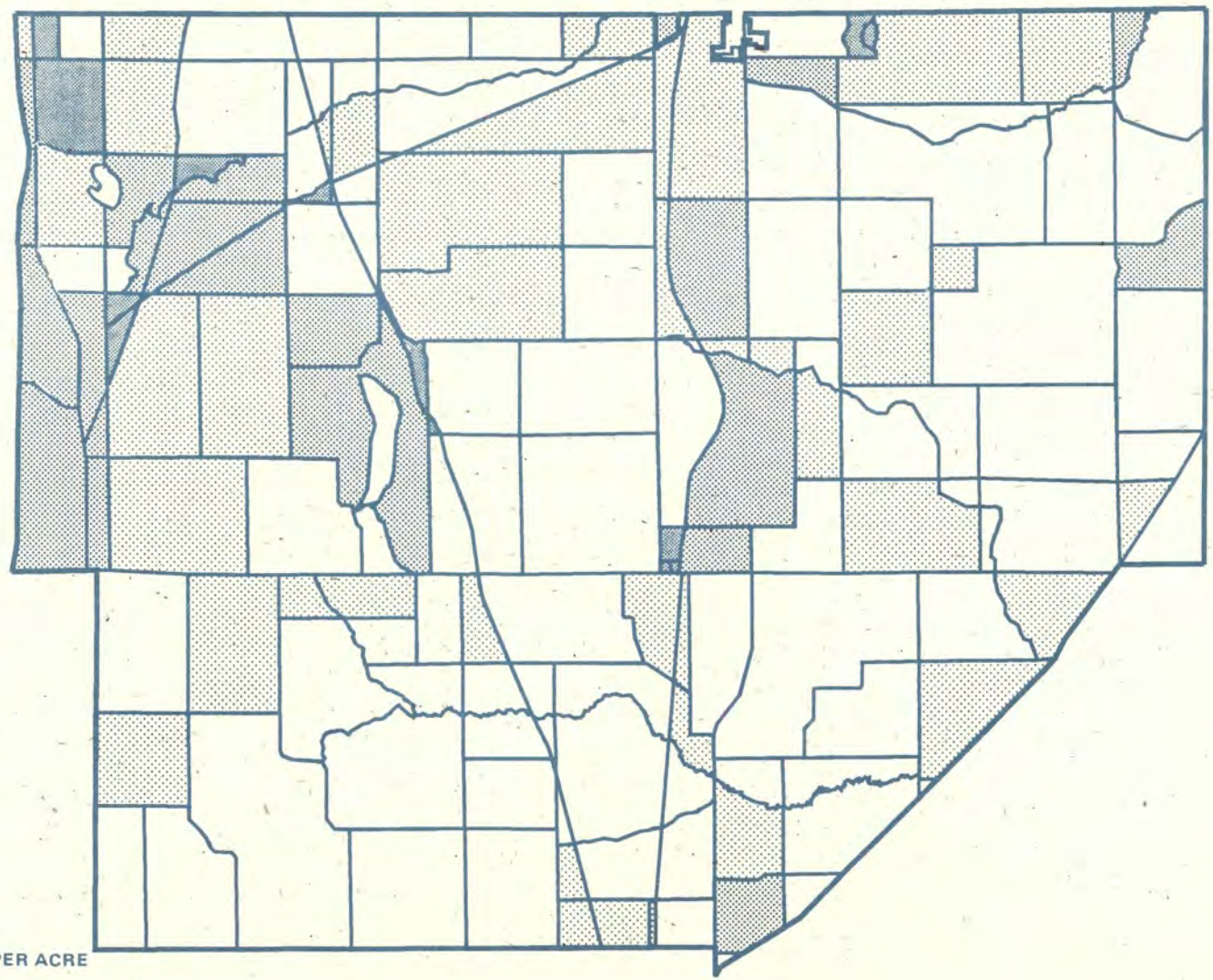
Land Use	Acres	% of Total
Residential	2,554	3%
Public	385	1%
Parks & Recreation	778	1%
Commercial/Industria	451	1%
Cemeteries		

Source: Digitized From 1990 Aerial Photographs
Cemetery Locations From County & Private Sources

METROPOLITAN COUNCIL

Dakota–Scott Search Area

FIGURE 5 **Selected Land Uses**



HOUSING UNITS PER ACRE

0 – 9
10 – 19
20 – 49
50 +

Source: 1990 U.S. Census

METROPOLITAN COUNCIL

Dakota–Scott Search Area

FIGURE 6 **Household Densities**
(1990 Census Block Data)

AGRICULTURAL LANDS--CROP EQUIVALENCY RATINGS

The general crop productivity of agricultural land in the three search areas was evaluated based on the Crop Equivalency Rating (CER). It is based on *Crop Equivalent Rating Guide for Soils of Minnesota*,[1] which rates the relative net economic return per acre of soil. The percentage of each soil association by search area was calculated using the soil survey's of Isanti, Anoka, Chisago and Dakota counties and the Scott County General Soil Map. If soil associations consisted of more than one soil type, an average CER was calculated. Values for CER ranged from 30 to 100, with 100 being the highest valued land in the search area. CER values for Minnesota soils range from 5 to 100. A weighted average CER for each of the three search areas is shown in Table 1.

TABLE 1

Summary of Crop Equivalency Ratings
By Search Area

Search Area	Weighted Average Crop Equivalency Rating (CER)
Anoka-Isanti-Chisago	48.1
Dakota	66.5
Dakota-Scott	81.2

The three search areas consist of several soil associations whose utility for crop and pasture agriculture vary widely. As a result, these soil associations vary greatly in their productivity and usefulness as agricultural land. Tables 1 through 3 summarize the soil associations' general soil characteristics, importance to agriculture in Minnesota, averaged CER and the percentage of the soil association within each search area.

The Anoka-Isanti-Chisago search area has the lowest average CER rating of 48.1. This area is typified by poorly drained soil dominated by sand. The Hayden/Bluffton soil association represents 31 percent of the total area and has the highest CER of 65. The largest soil association, Zimmerman/Lino, occupies 60 percent of the search area, but has the lowest CER, 40.5, in the area.

The Dakota search area had an average CER rating of 66.5. Its largest soil association area--Waukegan/Wadens/Hawick--occupies 67 percent of the search area and has a CER of 70. The Marshan/Cylinder soil and the Ostrander/Kinger/Maxfield soil associations have the highest CER ratings of approximately 84 percent. However, combined these areas only reperesent 11 percent of the entire area.

[1] Rust, R. H., Hanson, L. D.; Crop Equivalent Rating Guide for Soils of Minnesota. Agricultural Experiment Station, University of Minnesota. Miscellaneous Report 132-1975.

Based on the average CER values, the Dakota/Scott search area was found to have the highest crop productivity. The average value of the CER was effected by the consistently high CER values throughout the search area. In particular, the Lester/Blooming/Merton soil association, which covers 40 percent of the entire search area has a CER rating of 92. Only 11 percent of the entire area was rated below 50.

TABLE 2
ANOKA-ISANTI-CHISAGO - SEARCH AREA CER

Soil Association	Soil Characteristics[2]	CER	% Of Area
Zimmerman/Lino	Level to sloping, excessively to poorly drained soils that are dominated by fine sands. This association is easily worked and responds well to improved management practices. (Anoka Sand Plain)	40.5	60.%
Hayden/Bluffton	Undulating to rolling, well to poorly drained soils that are dominated by sand and silty loams and silty clay loams. Dairying is the principal type of farming on these soils.	65.0	31.%
Zimmerman/Isanti/ Lino	Nearly level to undulating, excessively drained soils that are dominated by fine sands throughout. Some areas are farmed.	41.0	8.%
Rifle/Isanti	Nearly level, very poorly drained soils formed in organic material and fine sand. Small parts are farmed; a major portion of this association is unsuitable for agriculture.	40.5	1.%
Average CER Total		**48.1**	**100.%**

[2] USDA SCS Soil Survey of Isanti County, Minnesota

TABLE 3
DAKOTA - SEARCH AREA CER

Soil Association	Soil Characteristics[3]	CER	% Of Area
Waukegan/ Wadena/ Hawick	Level to very steep, well drained and excessively drained soils formed in silty and loamy sediments over sandy outwash; on outwash plains and terraces. Most of this soil association is used for cultivated crop land.	70.0	67.%
Hubbard/Sparta/ Plainview	Level to moderately steep, excessively drained soils formed in sandy sediments; on outwash plains and terraces. Most of this soil association is used for cultivated crop land.	34.3	7.%
Marshan/Cylinder	Nearly level, poorly drained and somewhat poorly drained soils formed in silty and loamy sediments over sandy outwash; on outwash plains and terraces. Most of this soil association is used for cultivated crop land; some areas are in permanent pasture.	84.0	9.%
Ostrander/Kinger/ Maxfield	Nearly level to sloping, well drained, somewhat poorly drained, and poorly drained soils formed in silty and loamy sediments and loamy glacial till; on uplands. Most of this soil association is used for cultivated crop land; some is used for pasture.	84.5	2.%
Ostrander/Carmi/ Burkhardt	Gently sloping to moderately steep, well drained and somewhat excessively drained soils formed in loamy sediments and in the underling loamy or sandy glacial drift; on uplands. Most of this soil association is used for cultivated crop land.	60.0	2.%
Tallula/Port Byron/Bold	Nearly level to steep, well drained soils formed in loess; on uplands. Most of these soils are well suited for cultivated crops.	63.5	3.%
Etter/Rockton/ Copaston	Nearly level to sloping, well drained silts formed in loamy sediments over sandstone or limestone bedrock; on uplands and terraces. Small grains or hay are primarily grown on these soils. Wooded areas are found on steep slopes.	48.0	9.%
Kingsley/ Mahtomedi	Gently sloping to very steep, well drained and excessively drained soils formed in loamy and pitted outwash plains. Most of this association is well suited for residential development and woodlands.	50.0	1.%
Average CER Total %		**66.5**	**100.%**

[3] USDA SCS Soil Survey of Dakota County, Minnesota.

TABLE 4
DAKOTA-SCOTT - SEARCH AREA CER[4]

Soil Association	Soil Characteristics	CER	% Of Area
Waukegan/Wadena/ Hawick	Level to very steep, well drained and excessively drained soils formed in silty and loamy sediments over sandy outwash; on outwash plains and terraces. Most of this soil association is used for cultivated crop land.	70.0	16.%
Marshan/Cylinder	Nearly level, poorly drained and somewhat poorly drained soils formed in silty and loamy sediments over sandy outwash; on outwash plains and terraces. Most of this soil association is used for cultivated crop land; some areas are in permanent pasture.	84.0	15.%
Lester/Blooming/ Merton	Gently sloping to moderately steep, well drained to somewhat poorly drained soils formed in loamy and silty sediments and loamy glacial tell; on uplands. Most of this association is used for cultivated crops, some is wooded.	92.0	44.%
Ostrander/Kinger/ Maxfield	Nearly level to sloping, well drained, somewhat poorly drained, and poorly drained soils formed in silty and loamy sediments and loamy glacial till; on uplands. Most of this soil association is used for cultivated crop land; some is used for pasture.	84.5	13.%
Tallula/Port Byron/Bold	Nearly level to steep, well drained soils formed in loess; on uplands. Most of these soils are well suited for cultivated crops.	63.5	1.%
Etter/Rockton/ Copaston	Nearly level to sloping, well drained slits formed in loamy sediments over sandstone or limestone bedrock; on uplands and terraces. Small grains or hay are primarily grown on these soils. Wooded areas are found on steep slopes.	48.0	11.%
Average CER Total %		**81.2**	**100.%**

[4] USDA SCS Soil Survey of Scott and Dakota Counties, Minnesota.

APPENDIX C

CONCEPTUAL DESIGN: POTENTIAL NEW AIR CARRIER AIRPORT[1]

The conceptual design chosen for a new air carrier airport to serve the twin cities of Minneapolis-St. Paul satisfies two goals. It has sufficient capacity to meet the region's air transportation needs for a 30-year period and it is consistent with the *Metropolitan Development Guide* of the Metropolitan Council. The following is a discussion of the major issues relating to the design and financing plans for a new replacement airport.

LEGISLATIVE BACKGROUND

Legislation passed by the Minnesota State Legislature mandates the Metropolitan Council and the Metropolitan Airports Commission (MAC) to take specific actions related to airport development in the Twin Cities Metropolitan area.

In 1986, the State Legislature mandated the Metropolitan Council to make a determination of the long-term adequacy of MSP to meet the needs of the Twin Cities Metropolitan area through the year 2020. In addition, the Legislature directed MAC to prepare a ten-year development plan for Minneapolis-St. Paul International Airport (MSP).

Results of these two efforts were presented to the State Legislature, and in response, the Metropolitan Airport Planning Act was passed in 1989. Under this Act, the Metropolitan Council and MAC are charged with pursuing a "dual-track" process, which involves planning for capacity improvements at MSP while keeping open the alternative for building a replacement airport. One of the results expected from this planning process is development of a conceptual design for a new air carrier airport.

With regard to a new airport, the Metropolitan Airport Planning Act of 1989 calls for the MAC, in consultation with the Metropolitan Council, to a prepare a study of facility requirements, airport functioning, and conceptual design for a new air carrier airport. The conceptual design study and plan are to describe and satisfy air transportation needs for a prospective 30-year period and be consistent with the *Metropolitan Development Guide*.

CONCEPTUAL DESIGN PLAN PARAMETERS

The conceptual design plan was undertaken by the MAC using several basic parameters:

- One forecast of future aviation demand will be used for airport planning;
- MSP will close if the new airport is built;

---

[1]Based on *New Air Carrier Airport Conceptual Design and Study Plan*, Metropolitan Airports Commission, prepared by TRA Airport Consulting, et al., (January, 1991) and analysis by Apogee Research and Turner, Collie, and Braden.

- All facilities currently existing at MSP will be provided at the new airport;
- The new airport will be designed with sufficient capacity to accommodate the levels of demand forecast beyond the year 2020, and do so in a safe and efficient manner;
- The new airport will maximize environmental protection while minimizing community disruption; and
- The new airport will be designed to minimize land area requirements.

LAYOUT ALTERNATIVES

Each of the alternatives considered satisfied the conceptual design parameters. The alternative airfield layouts are depicted in Figure 1. The following briefly describes each of the alternatives:

- **Alternative P-2** -- Four parallel runways are oriented in the northeast-southwest direction to align with predominant winds. The runways closest to the terminal area are separated by 8,000 feet. The third parallel runway is located 5,000 feet from the nearest runway to provide triple simultaneous independent instrument approaches. The fourth runway is 2,500 feet from its neighboring runway to assure independence from wake turbulence, while minimizing taxi distances and providing for simultaneous, independent departures in Instrument Flight Rule (IFR) conditions.
- **Alternative T-1** -- This alternative has six runways (four parallel and two crosswind) located around the terminal area. The separation between the inner two of the four runways in the primary direction of operation is 8,000 feet and 5,000 feet between the northern parallel runways and 4,300 feet between the southern runways. The two runways in the secondary direction are located on either side of the terminal area, in a manner that is designed to provide maximum flexibility for airspace operation, consistent with minimum taxiing distances.
- **Alternative L**[2]--The runways (three parallel and two crosswind) are in the primary and secondary directions on the same side of the terminal area. This orientation minimizes the stagger (or offset) between the runway thresholds and focuses aircraft operations in two of the quadrants around the airport. Runway locations again seek to minimize the taxiing distance.

Criteria used in the evaluation of these alternatives were:

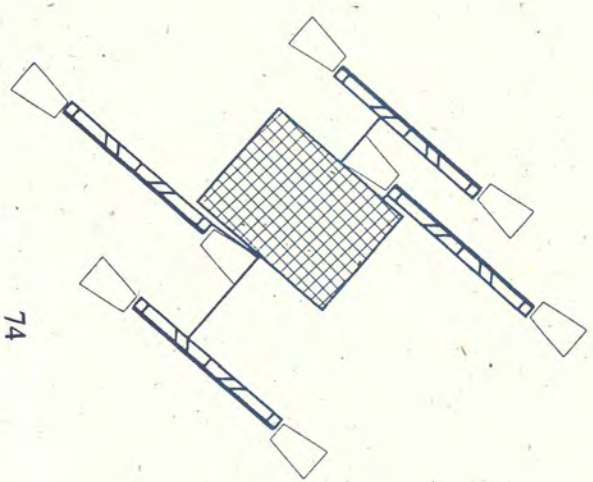
- Operational efficiency,

---

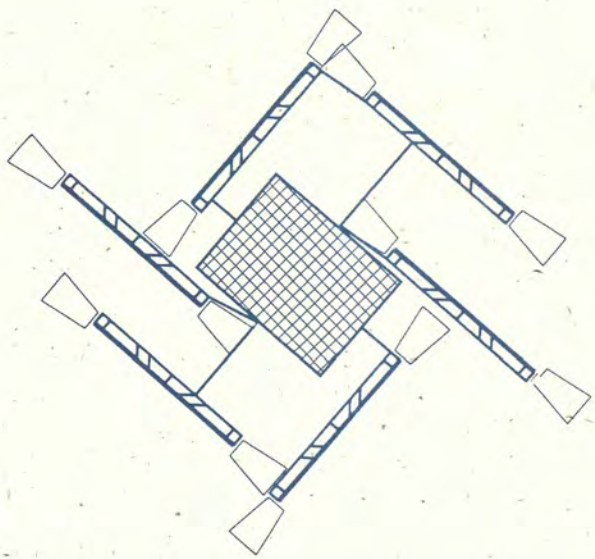
[2]Initially, there were two "L" alternatives. Alternative L-1 located the terminal area equidistant from the primary and secondary runways and between both and had an average taxi distance of 13,800 feet per operation. Alternative L-2 located the terminal area between the primary runways to better integrate terminal area operations with these runways and had an average taxi distance of 12,500 feet per operation. There was not enough difference in L-1 and L-2 to carry both forward. Therefore, alternative L-2 was selected because of its superior taxiing characteristics.

FIGURE 1

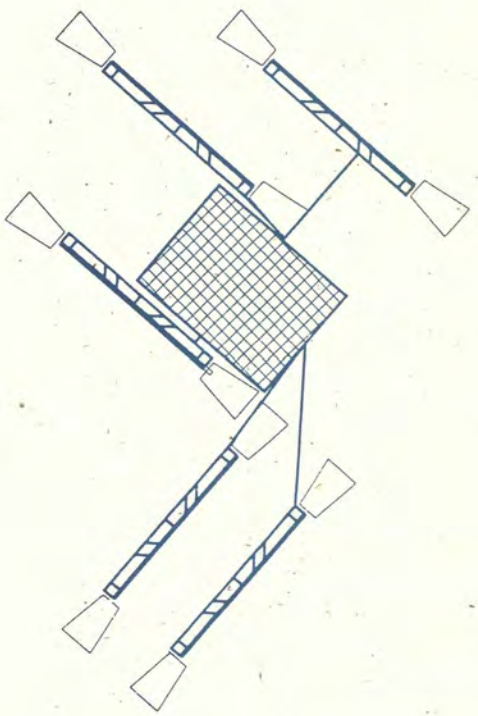
Airfield Alternative P-2



Airfield Alternative T-1



Airfield Alternative L



- Land impacts, and
- Cost.

Using these criteria, airfield Alternative T-1 was selected. The following were the primary reasons supporting this choice:

- The layout provides a high level of capacity in all four directions;
- The converging runway layout minimizes the taxiing distance;
- Arrival and departure runways are segregated, thus minimizing delay;
- Crosswind conditions during winter wind conditions is high; and
- The operating theory underlying this layout is similar to the one being used at the new airport in Denver and has FAA approval.

ALTERNATIVE EVALUATION CRITERIA

As listed above, three primary criteria were used in evaluation each of the design alternatives. Each of these primary criteria was subdivided using specific criteria summarized below.

Criterion 1. Operational Efficiency

This criterion is used to determine how well the airfield layout functions: It considers ground and airspace operations and wind and weather conditions.

- Ground Operations

  There are three measures of ground operations:

  - **Runway delay**, which measures the average airfield delay by reporting the average per operation and annual delay cost. During evaluation of the airfield alternatives one goal was an airfield layout that provides sufficient runway capacity to accommodate projected demand and keeps aircraft delay to a minimum.
  - **Runway crossings** were measured by the number and character of runway crossings. As the number of runway crossings increases, the efficiency of airfield operations decreases. In normal operating procedures, aircraft on active runways have priority. Taxiing aircraft are subject to delay. Absent ground detection radar, there is the possibility, when visibility is limited, of unauthorized aircraft entering active runways. Thus, an airfield configuration that minimizes crossings is preferable.
  - **Taxi distance** is measured by the weighted average taxi distance per aircraft, which is calculated by measuring the distance that either an arriving or departing aircraft will have to taxi to or from a given runway, the distribution of demand in each operating configuration, and the annual percentage that each operating configuration is used.

- Airspace Operations

  There are two basic measures of airspace operations:

  - **Flight path distance**, which depends on the location of the origin and destination airports, the layout of the enroute airspace, the orientation and use of runways at a new airport, and the configuration of the terminal area airspace. A four-corner arrival/departure airspace gate system was used to measure flight path distances for each airfield layout alternative. The four arrival/departure gates were located 30 miles northeast, northwest, southeast, and southwest of the centroid of the alternative airfield layouts.[3] Arrival and departure flight paths were established for each airspace gate. Flights paths for arriving aircraft included a seven-mile final approach segment.[4] Departure flight paths included a two-mile course segment on runway heading before any turns, and where necessary, a five-mile base leg. Aircraft demand was distributed to each of the flight paths consistent with the runway use distribution employed in the taxiway distance calculations. Aircraft flight distance and the distribution of demand to each flight path in each operating configuration were combined to provide the weighted average flight distance.

  - **Flight path interactions** were measured by the number and character of flight path interactions, which possess the potential for conflict and should be avoided. Normally, terminal area airspace arrival and departure routes are separated procedurally from one another, so aircraft using these routes are not in conflict. Both lateral and vertical separations are used to achieve this. At the airport it is desirable to organize the use of the runways so that an aircraft executing a missed approach does not interact with another aircraft using an active runway. The is purpose of this criterion was to identify operating configurations for a given airfield layout which may require greater flight path distances to resolve potential airspace interactions.

- Wind and Weather

  The airfield layout must have the ability to accommodate all wind directions and weather conditions. Wind analysis indicated that a southeast-northwest runway alignment provides maximum wind coverage for all weather conditions throughout the Twin Cities Metropolitan area.[5] It is desirable to have crosswind runway capabilities when prevailing winds out of the northeast combine with snow and/or icy conditions.[6] Otherwise, the airport would be closed for three to four days a year (actually composed of many partial days). The cost of closing for this amount of time is unacceptable for a hub airport. Therefore, the analysis focused on the ability of each airfield layout to operate in all wind and weather conditions.

---

[3]The orientation of the airspace gates was established to facilitate traffic flows in the prevailing northwest and southeast wind directions.

[4]Where necessary, a ten-mile downwind leg and a five-mile base leg were included.

[5]This assumes a maximum 20-knot crosswind component.

[6]These conditions are present during approximately one percent of the year.

Criterion 2. Land Impact

An airfield configuration should meet all aeronautical standards and minimize the land impacted. For the evaluation of airfield configuration alternatives, "land impact" refers to all land required for airfield operations and all property within the *Ldn 65* contour and *State of Minnesota Safety Zones A and B.*

- Land Use Safety Zones

Airport safety zoning was established to balance the safety of persons on the ground, those travelling on the aircraft, and public interest in maintaining existing land uses. Minimum zoning standards of public airports as to airspace, land use safety, and noise sensitivity have been set forth under the Minnesota Statutes for both developed and undeveloped land.

Airport zones depend on their spatial relationship to the airport structure and land use safety zones are established with relation to the airport and its runways. There are three defined land use safety zones (see Figure 2):

- *Safety Zone A* is the equivalent of two thirds the actual or planned runway length in the approach zone of a runway;
- *Safety Zone B* is the equivalent of one third the actual or planned runway length beyond Safety Zone A in the approach zone of a runway; and
- *Safety Zone C* is an area beyond Safety Zone B that is determined by swinging arcs from the center to the end of each runway and connecting the arcs with lines tangent to these arcs. For precision instruments, the radius of the arc is 10,000 feet. For non-precision instruments, runways have visibility limits as low as three-quarters of a mile (or 6,000 feet for all other runways).

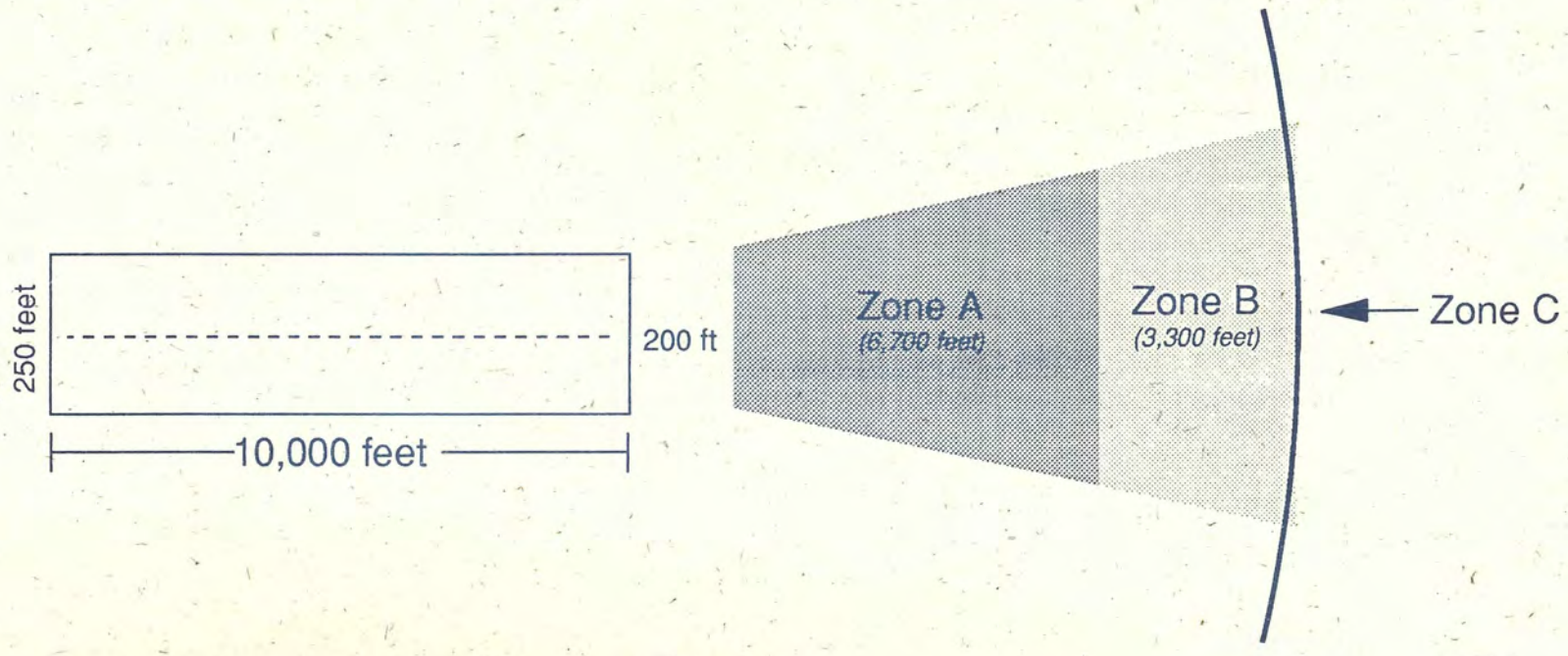
Land-use restrictions by zone. These restrictions are applied primarily to ensure the safety of aircraft operations from the airport. The safety zones also limit the population and building density in the runway approach area, which ensures that sufficient open space is available to protect property and life in case of an accident.

For all three safety zones, no land-use operation is allowed that will interfere with radio or electronic communication between the airport and aircraft (or the electronic or radio facilities at the airport). Any land use that would make it difficult for pilots to distinguish between airport lights and other lights is also prohibited. Furthermore, glare or obstruction that would impair the pilots vision or otherwise endanger the landing, maneuvering, or take-off of an aircraft is not allowed in any of these zones.

Land use safety zones become more restrictive as their proximity to the airport facility decreases. In Safety Zone A, buildings, temporary structures, exposed transmission lines, or similar structural hazards are prohibited. In addition, any structure that involves a large group of people is prohibited. Agricultural uses, non-spectator light outdoor recreation facilities, cemeteries and parking lots are allowable structures in this zone.

FIGURE 2

LAND-USE SAFETY ZONES



Note: This figure is not drawn to scale.

In Safety Zone B, one structural plot containing any number of structures can be located on no less than three acres and bring together no more than 15 people at any one time. Minimum ratios for the structural plot size to the total site area have been set. Places of public or semi-public assembly such as churches, hospitals, schools, theaters, stadiums, hotels, trailer courts, and campgrounds are not allowed in zone B.

When considering an airport site in a previously developed urban area, airport safety zones must strike a balance between existing land uses and safety. The determination of whether a structure is allowed to stand or be acquired, altered, or removed depends on several demographic criteria the characteristics of the neighborhood, population density, age, economic and political stability, and proximity and similarity to surrounding communities. Some specific land uses are a hazard to the people on the ground and air travellers. A principal residence within Safety Zone A or B within a specified distance of the airport infrastructure would be prohibited.

Any land use that is determined to be a danger to the safe operation of an aircraft is considered a hazard. Land uses contributing to the following are key factors in determining the existence of a hazard:

- The collision of two or more aircraft;
- An explosion, fire, or release of harmful fumes, gases, or substances in the case of an accident;
- The increase of persons injured in the case of an accident; and
- The limitation of clear areas for emergency landings.

Factors associated with the operation of the airport, such as type of aircraft, flight patterns, and other similar factors, are also considered. When a land use is determined to be unacceptable, the cost of acquisition, alteration, or removal is weighed against the redesign of the airport.

Criterion 3. Estimated Construction Cost

Each alternative was also evaluated on its total cost of construction, which included all airfield pavement. Construction cost was measured by applying unit costs to individual facilities. The more runways and taxiways required for a specific concept, the higher the overall cost.

EVALUATION OF CRITERIA

After narrowing and redefining each of the alternative airfield configurations, a detailed evaluation of each alternative was conducted. Results of this evaluation, presented in Table 1, suggest that:

- **Alternative P-2** average annual delays of one minute or less can be achieved with four runways and minimal land impacts of the three alternatives. The disadvantage of Alternative P-2 is that it does not provide full coverage in all wind and weather conditions. In addition, flight path distances are the highest of the three alternatives.
- **Alternative T-1** has many benefits over the Alternatives P-2 and L, provided that it can be developed on a site that can accommodate a full six-runway layout. The

benefits of having the lowest average taxi and average flight path distances and full wind and weather coverage easily offset the costs of the required sixth runway. This alternative provides excellent capacity in all four directions. Converging runways result in the least air travel and taxi distances of all the alternatives. During winter weather conditions, the runway layout provides full coverage. Finally, the theory underlying the operation of this alternative is similar to that which the FAA has approved for the new international airport in Denver, which is currently under construction.

- **Alternative L** works best when the high-capacity, high-efficiency operating configurations to and from the northwest and to and from the southwest can be used a majority of the time. This is not possible in the Minneapolis-St. Paul area because the distribution of wind and weather patterns requires the use of other less efficient operating modes a high percentage of the time (40 percent annually). The use of these less efficient configurations tends to increase average taxi and flight path distances. In addition, the physical layout results in a higher land impact.

TABLE 1
EVALUATION OF AIRFIELD ALTERNATIVES

Criteria	Alternative P-2	Alternative T-1	Alternative L
Criterion 1. Operational Efficiency			
Ground Operations			
Runway Delays	1.0 min/op	0.9 min/op	0.9 min/op
Runway Crossings	No crossings	No crossings	One crossing
Taxi Distance	8,500 ft/op	7,400 ft/op	9,900 ft/op
Airspace Operations			
Flight Path Distance	34 miles/op	31 miles/op	34 miles/op
Flight Path Conflicts	None	None	One
Wind and Weather	Does not cover all conditions	Full coverage	Full coverage
Criterion 2. Land Impact	12,000 - 16,000 acres	15,000 - 28,000 acres	16,000 - 29,000 acres
Criterion 3. Estimated Construction Cost	$225 million	$330 million	$280 million

TERMINAL CONFIGURATION

Five terminal configurations were evaluated (see Figure 3). Each of these is summarized below.

- **Alternative 1** This is a centralized configuration. There is a central processor unit (CPU) (the terminal) which houses ticketing and baggage claim on different levels. Concourses off the CPU accommodate international traffic. All other gates are located in three satellite concourses. An underground people-mover system links the CPU with the satellites.

- **Alternative 2** This is another configuration which links together a CPU and satellite concourses with an underground people-mover system. There is one large satellite with four piers which is sufficient in size to accommodate all operations of Northwest Airlines (NWA) and the international carriers. All other aircraft gates are located in a second satellite.

- **Alternative 3** This configuration combines elements of centralized processing with piers. The CPU is directly linked to two piers. An underground people-mover is also provided. Additional gates are provided in concourses located immediately adjacent to the CPU.

- **Alternatives 4A and 4B** These two alternatives are identical except for the manner in which they accommodate regional carriers. Both are centralized configurations. In each, the CPU is linked to the two satellites via an underground people-mover, which is a loop instead of an out-and-back system as in the other alternatives. The satellite closest to the CPU is of sufficient size to accommodate all of NW's operations. The regional carriers are located in a concourse attached to the CPU in Alternative 4A. In Alternative 4B, the regionals are accommodated in the satellite most distant to the CPU, which has been enlarged for this purpose.

Criteria employed in the terminal configuration evaluation process were:

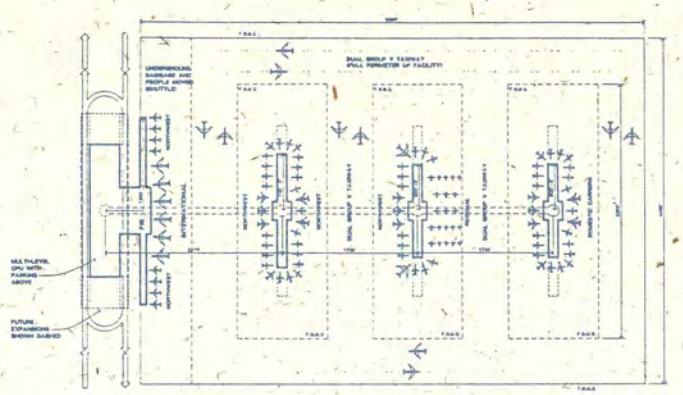
- Passenger convenience,
- Operational efficiency,
- Ease of construction,
- Expandability, and
- Cost.

Application of these evaluation criteria to the alternative led to the choice of Alternative 4B for the following reasons (see Table 2):

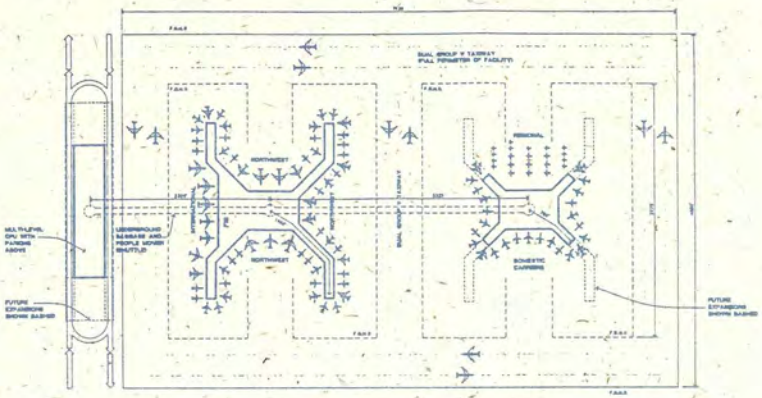
- Passenger access between automobile parking and passenger processing facilities is convenient;
- Walking distances for passengers are the least of all the alternatives;

FIGURE 3

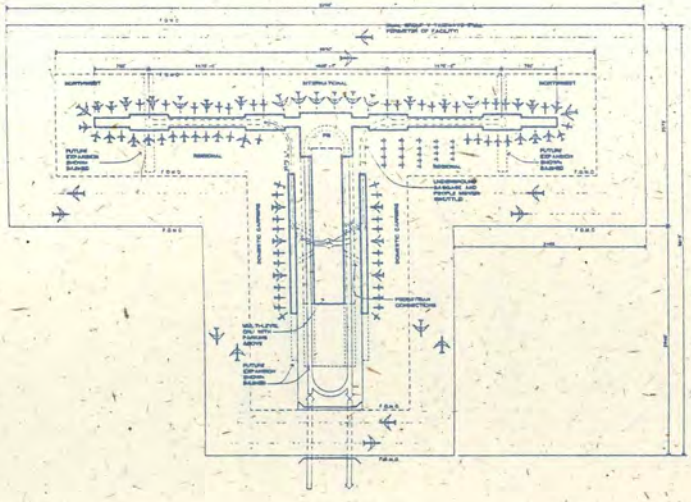
Terminal Area Alternative A



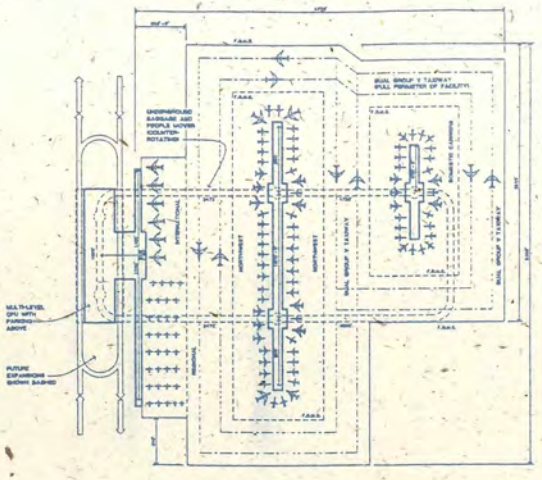
Terminal Area Alternative B



Terminal Area Alternative C



Terminal Area Alternative D-1



Terminal Area Alternative D-2

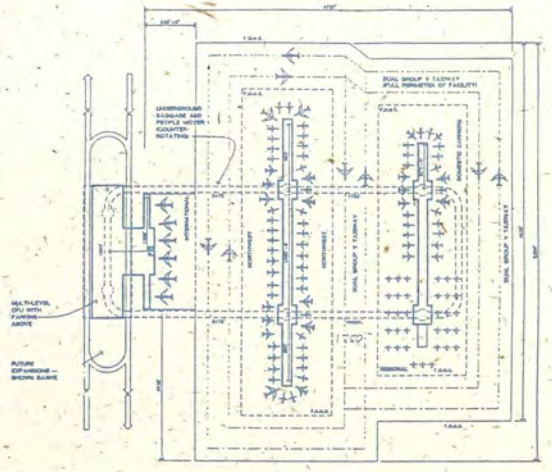
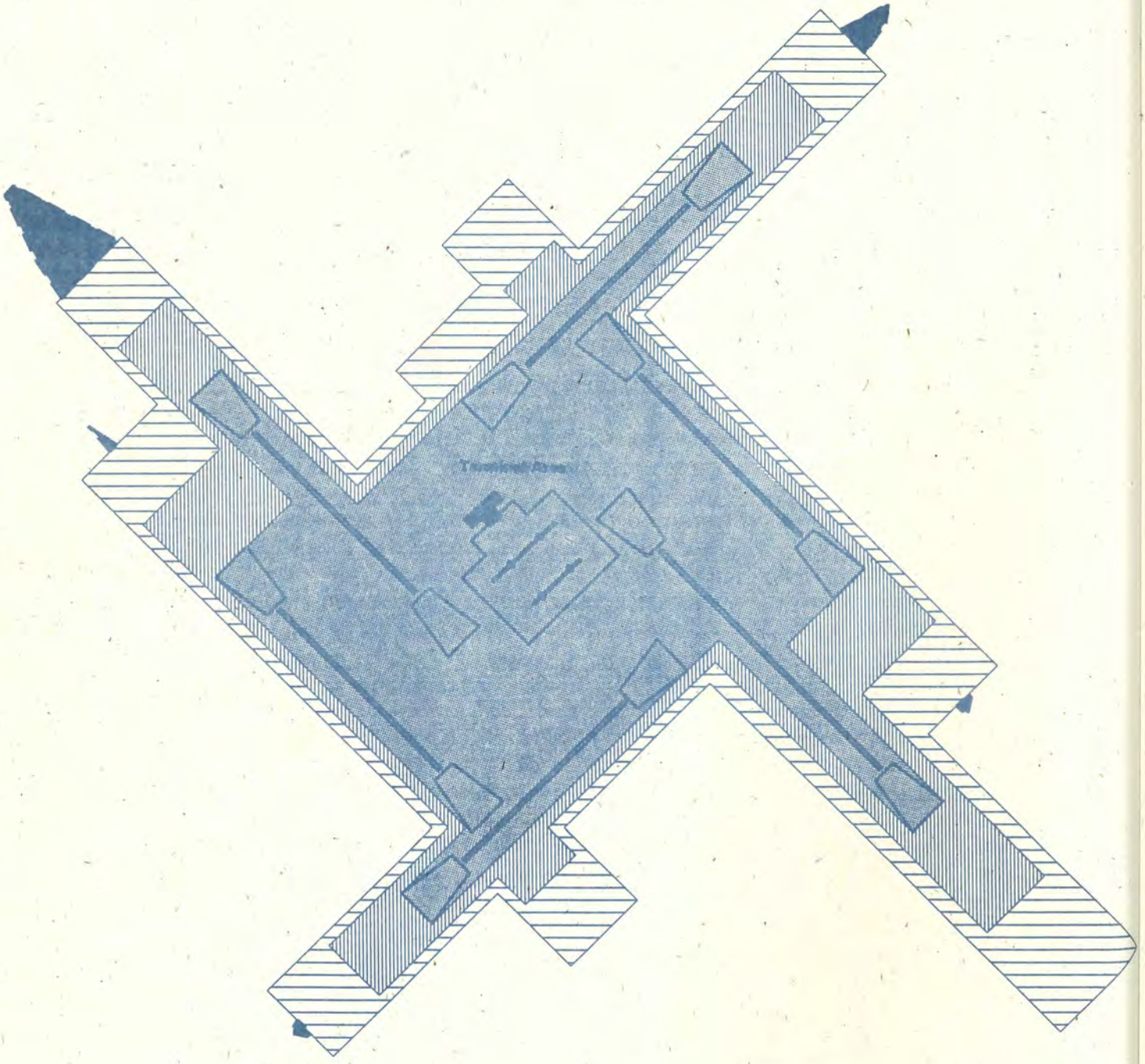


TABLE 2

SUMMARY OF TERMINAL CONFIGURATION ALTERNATIVE EVALUATION

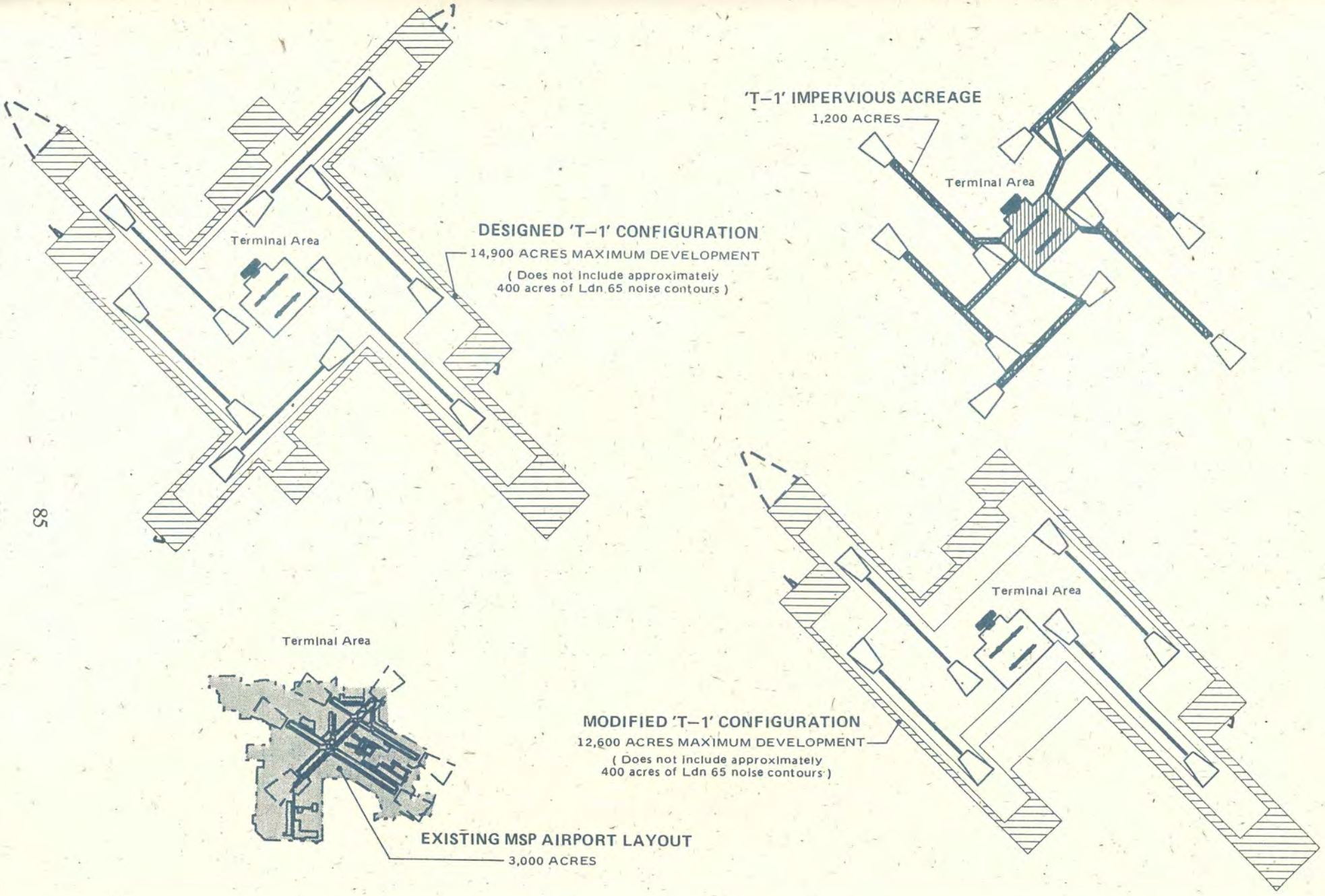
Factor	Alternative 1	Alternative 2	Alternative 3	Alternative 4A	Alternative 4B	Minneapolis-St. Paul Int'l. Airport
Passenger Convenience						
A. Maximum O&D Passenger Walking Distance	1,500 ft.	1,450 ft.	1,150 ft.	2,200 ft.	1,700 ft.	2,400 ft.
B. O&D Passenger Time	10 min. 30 sec.	10 min. 30 sec.	9 min. 30 sec.	9 min.	9 min.	8 min.
C. Maximum Connecting Passenger Walking Distance	2,230 ft.	2,900 ft.	1,750 ft.	3,560 ft.	3,060 ft.	4,650 ft.
D. Connecting Pax Time	15 min. 30 sec.	15 min. 30 sec.	23 min. 30 sec.	12 min. 30 sec.	12 min. 30 sec.	15 min.
E. Automobile Parking	Above CPU	Above CPU	Above CPU	Above CPU	Above CPU	Adjacent to CPU
Operational Efficiency						
A. Hub Transfer	Yes, but not efficient	Yes	Yes	Yes	Yes	NA
B. Baggage Transfer	Below grade	Below grade	Below grade	Below grade	Below grade	NA
C. International Integration	Yes	Yes	Yes	Yes	Yes	NA
D. Regional Integration	Yes	Yes	Yes	Yes	Yes	NA
E. Aircraft Circulation	Flow through	Some dead-ends	Dead-ends	Flow through	Flow through	NA
F. Gate Use Flexibility	No restrictions	Limited	Limited	No restrictions	No restrictions	NA
G. Surface Access	Two directions	Two directions	One direction	Two directions	Two directions	NA
Implementation						
A. Airside Construction	No problems	No problems	No problems	No problems	No problems	NA
B. Landside Construction	No problems	No problems	No problems	No problems	No problems	NA
Expandability/Phasing						
A. Gates	Expandable	Expandable	Expandable	Expandable	Expandable	NA
B. Pax Processing Facilities	Expandable	Expandable	Expandable	Expandable	Expandable	NA
C. Phasing	No problems	No problems	No problems	Expandable	Expandable	NA
Construction Cost	$602 million	$732 million	$713 million	$686 million	$706 million	NA



ACREAGE INCLUDING RUNWAY
FAA PROTECTION ZONES - 7,500 AC.
ACREAGE INCLUDING STATE
PROTECTION ZONE "A" - 10,800 AC.
ACREAGE INCLUDING STATE
PROTECTION ZONE "B" - 14,900 AC.
ACREAGE INCLUDING Ldn 65
NOISE CONTOURS - 15,300 AC.

Source: New Air Carrier Airport Conceptual Design Study and Plan, January 1991, Metropolitan Airports Commission by TRA Airport Consulting, et al.

FIGURE 4 **New Airport Conceptual Design Alternative T-1**



METROPOLITAN COUNCIL

Source: Turner Collie & Braden, Inc.

FIGURE 5 **Alternative Airport Layout Acreage Requirements**

- Time spent by passengers traversing the terminal is minimal;
- The terminal layout provides direct and readily understandable routes between aircraft gates for domestic, regional, and international connecting passengers;
- Aircraft maneuvering in the terminal area is unconstrained; and
- Separation of airside and landside facilities (in satellite concourses and the CPU, respectively) allows phased project implementation.

Figures 4 and 5 depict the combined airfield and terminal designed configuration with safety zones A and B and the Ldn 65 contour.

COST

Construction and land acquisition costs of the new replacement airport for the Twin Cities depend on the location of the airport site. Preliminary cost estimates for building the ultimate six-runway Alternative T-1 complex range from $3.7 to $4.1 billion (see Table 3). The actual development costs will be refined at the site selection level and they will reflect phasing of facilities to meet operational needs.

Table 3
COST ESTIMATE

	Project Costs (millions $)
Site Acquisition	$94.4 - $288.6
Site Preparation	$300.0
Airside Facilities	
Runways	$120.0
Taxiways	200.0
Aprons	200.0
Navigational Aids	40.0
Perimeter Road	15.0
Total	**$575.0**
Landside Facilities-Terminal Area	
Terminal Building	$341.9
Automated People-Mover System	182.4
Total	**$524.3**
Landside Facilities - Surface Access	
Public Access Roadways	$287.1 - $387.2
Service Roads	45.3
Total	**$332.4 - $432.5**
Landside Facilities - Parking	
Public and Employee Parking	$137.6 - $196.4
Public Transportation Parking	23.5
Total	**$161.1 - $219.9**
Support Facilities	
Airline Maintenance and Support	$694.8
Air Cargo	57.7
Military	100.0
Fuel Storage and Distribution	23.1
General Aviation	15.4
Rental Car Storage and Service	13.8
Airport Support	23.1
Federal Services	26.9
Total	**$954.8**
Utility Infrastructure	
Water Supply and Distribution	$20.0
Wastewater Collection and Treatment	20.0
Stormwater Retention and Treatment	25.0
Total	**$65.0**
Total (excluding Land Acquisition)	$2,912.6 - $3,071.5
Total plus Fees and Contingency at 25%	$3,640.7 - $3,839.4
Land Acquisition	$94.4 - $288.6
TOTAL PROJECT COST	**$3,735.1 - $4,128.0**

TL 726.4 .T9 S35 pt.2 app.

Selecting a search area for a new major airport

TL 726.4 .T9 S35 pt.2 app.

Selecting a search area for a new major airport

DATE	ISSUED TO

LEGISLATIVE REFERENCE LIBRARY
645 State Office Building
Saint Paul, Minnesota 55155



METROPOLITAN COUNCIL

Printed on recycled paper

