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TRUNK HIGHWAY 77/INTERSTATE 494 IMPROVEMENTS

TH 77 (Cedar Avenue) from 70th Street to 86th Street
and
I-494 from west of 12th Avenue to east of 34th Avenue
Bloomington and Richfield, Minnesota

S.P. 2758 and 2785

M-5405( ) and IR-494-4( )

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Submitted in Accordance with:
42 U.S.C. 4332(2)(c)
and
Minnesota Statute 116D.01 et. seq.

Submitted by:
U.S. Department of Transportation,
Federal Highway Administration
Minnesota Department of Transportation

Cooperating Agencies:
Federal Aviation Administration
Minnesota Pollution Control Agency
Metropolitan Council of the Twin Cities and City of Bloomington

1-5-87
Date of Approval

Mn/Dot E.E. Ofstead, Assistant Commissioner
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1-26-87
Date of Approval

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ABSTRACT: This document describes and evaluates the alternatives associated with improving the TH 77 (Cedar Avenue) and I-494 interchange area. The project is located in Hennepin County, in the cities of Bloomington and Richfield.

Comments on this DEIS are due by March 23, 1987, and should be directed to Mr. Duane Brown at the above address.

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1.0

Summary

1.0 SUMMARY

1.1 DESCRIPTION OF PROPOSED ACTION AND NEED

This project proposes to improve approximately 1.9 miles of Trunk Highway 77 (Cedar Avenue) and approximately 2.7 miles of Interstate 494 surrounding the interchange of the two highways within the cities of Bloomington and Richfield, Minnesota. The immediate project area extends along TH 77 from the north of 70th Street in Richfield to south of 86th Street in Bloomington, and along I-494 from west of 12th Avenue South to east of 34th Avenue South. I-494 divides the cities of Richfield and Bloomington west of TH 77. East of TH 77, I-494 forms the border between Bloomington and the Minneapolis-St. Paul International Airport. The project is located in Hennepin County, which includes the City of Minneapolis and most of the Minneapolis suburban area.

The project includes the addition of one lane in each direction to the defined sections of TH 77 and I-494; three new interchanges on TH 77 at Killebrew Drive, 81st Street and 75th Street; upgraded interchanges along I-494 at TH 77, 12th Avenue, 24th Avenue, and 34th Avenue; and a separated roadway system providing access from TH 77 and I-494 to the arterial streets serving the former Metropolitan Stadium site. The stadium site is located in the southeast quadrant of the TH 77/I-494 interchange. The project is proposed to be constructed in at least two phases.

The project is needed because of existing and forecast capacity deficiencies on TH 77 and I-494 in the project area, and because of inadequate traffic movement between the regional highway system and development sites in the Airport South District. Portions of the project have been identified as highway improvement needs in the Metropolitan Council Transportation Policy Plan and improvements are needed to help attain regional transportation and development goals identified in the Metropolitan Council Metropolitan Development Guide. Specific problem areas which need to be addressed include:

- The segment of TH 77 between 70th and 86th Streets can not adequately accommodate existing traffic or future traffic expected to be generated by the Airport South District and other parts of the metropolitan area without improvements.

- The expressway design of the segment of TH 77 between I-494 and 86th Street is incompatible with the freeway design of TH 77 to the north and south.

- The segment of TH 77 between 86th Street and I-494 has a higher than average accident rate because of the existing at-grade access.

- The segment of I-494 between 12th and 24th Avenues will not be able to accommodate future traffic from the Airport South District or from other parts of the metropolitan area without improvements. The current design of the TH 77/I-494 interchange and the spacing of interchanges between 12th Avenue and 24th Avenue limits the capacity of this segment of I-494.

- The 24th Avenue/I-494 interchange needs upgrading and new interchanges are needed on TH 77 to efficiently move traffic between the non-regional roadways in the Airport South District and the TH 77/I-494 regional highway system.

- A non-regional route alternative to I-494 for traffic from the Airport South District is needed. Connecting 79th Street under TH 77, would provide an alternative route to I-494 for short to medium length trips to and from the Airport South District.

1.2 OTHER GOVERNMENTAL ACTIONS

The section of the regional transportation system in the south Minneapolis suburban area has been and continues to be the focus of intense governmental study activity. Two previous environmental impact statements have been prepared for related projects in the Airport South area of Bloomington. As part of the Airport South Transportation and Environmental Management Study, a generic EIS was prepared in 1984-85 according to the regulations of the Minnesota Environmental Quality Board Review Program. The government agencies participating in the study included the City of Bloomington, Metropolitan Council, Hennepin County, Minnesota Department of Transportation, Metropolitan Airports Commission, Metropolitan Transit Commission, Minnesota Pollution Control Agency and Minnesota Environmental Quality Board.

A state EIS was also prepared for the development proposal selected by the City of Bloomington for the former stadium site. That document, the Mall of America and Fantasyworld EIS, was prepared by Bloomington and found adequate by the Minnesota Environmental Quality Board on April 17, 1986.

The EIS for TH 77/I-494 in some cases builds on data presented in the previous environmental documents, plus the November 18, 1986 Transportation Plan for Airport South District. The transportation needs cited in the previous documents are consistent with the transportation improvements described in this EIS.

The Minnesota Department of Transportation, Metropolitan Council and Federal Highway Administration (FHWA) are currently directing the preparation of an environmental study for the proposed future widening of I-35W, the north-south freeway approximately two miles west of TH 77. Work on that study began in the spring of 1986.

The Metropolitan Council is also directing a study of the I-494 corridor, in an effort to assess needed improvements west of TH 77. That study is expected to define transportation and land use strategies for the I-494 corridor.

The Metropolitan Airports Commission (MAC) is planning to extend runway 4/22 at the Minneapolis-St. Paul (MSP) International Airport. An environmental study is being prepared for the runway extension, which is programmed for construction in 1987. The Commission also plans to build a southwest cargo facility in the 24th Avenue interchange area. Traffic analyses of I-494 will take the MAC's plans into account.

1.3 MAJOR ALTERNATIVES CONSIDERED

Four alternatives are examined in this EIS:

- Alternative 1: Year 2005 Development with Roadway Improvements and Travel Demand Management (Build Plus TDM Alternative). Alternative 1 is illustrated on Figure 3.2.A in Section 3 of this document.

  This alternative represents the proposed ultimate project and was selected for study because it uses 2005 as the analysis year, assumes a high level of development and associated traffic in the project area, and combines roadway construction with TDM. Travel demand management activities, designed to maximize the use and efficiency of the present highway system, are described in Appendix A. TDM is a potentially cost-effective approach encouraged by the Metropolitan Council.

  The year 2005 is used as the analysis year because reliable social and economic data is available as a basis for traffic forecasting, and a twenty year horizon is traditionally used for highway planning.

- Alternative 1A: Stage I Roadway Improvements with Travel Demand Management.

  This alternative, illustrated on Figure 3.2.B in Section 3, represents the proposed first stage of the ultimate project, which would be designed to meet traffic needs up to 1995. Construction of the first stage project is planned to begin by 1987 and be sufficiently complete to open to traffic by 1989. It is anticipated that the total project would not be constructed until after 1995. This alternative would be consistent with the 2005 design concept for the interchange area (Alternative 1), but would not preclude alternatives for the future upgrading of I-494.

- Alternative 2: Year 2005 Development with No Roadway Improvements and No Travel Demand Management (No-Build Alternative).

- Alternative 3: Year 2005 Development with Travel Demand Management Measures Only (TDM Alternative).

  This alternative was selected because in addition to the federal requirement that a TDM alternative be studied, TDM can be cost-effective and environmentally sensitive.

All alternatives assume the phased development of the Mall of America and Fantasyworld or its traffic equivalent as described in the MAFEIS.

1.4 ENVIRONMENTAL IMPACTS

The proposed action has the potential to result in environmental impacts.

1.4.1 Alternative 1

1.4.1.1 Beneficial Impacts

Land Use/Economic Development. Alternative 1 would allow the full development of the Airport South District, in accordance with local and regional land use and economic development plans and forecasts.

Transportation. Roadway improvements and elimination of the at-grade Killebrew Drive intersection would reduce or eliminate existing capacity and safety deficiencies and facilitate smoother project area and through traffic flow to the year 2005.

Water Quality. Drainage system improvements would increase storm sewer capacity to the 50-year storm capacity from the present 10 year storm capacity. Alternative 1 would provide more potential containment of hazardous spills.

Noise. Under Alternative 1, traffic noise levels at the residential receivers are projected to decrease.

1.4.1.2 Adverse Impacts

Established Business. Alternative 1 would alter the landscaped setback of approximately 28 businesses, remove frontage road access from approximately 27 businesses, affect the parking lots of approximately 15 businesses, require a new access road for up to four parcels, and remove approximately two buildings.

Neighborhood Land Use. The residential neighborhoods north of 77th Street and west of TH 77 would receive increased commercial and residential traffic as a result of removing the north I-494 frontage road.

Air Transportation. Under Alternative 1, the highest ramp in the TH 77/I-494 interchange would not have a 17-foot clearance area beneath the approach surface of the proposed extension of Minneapolis-St. Paul International Airport Runway 4/22 as defined by Federal Aviation Administration Regulations, Part 77. Trucks and, potentially, light standards on that ramp would penetrate the 50:1 approach surface for the extended runway.

Construction. Temporary changes would occur in traffic patterns and traffic congestion would increase during construction. Air quality, noise levels, water quality during wet weather conditions, and patronage of project area businesses would also potentially be negatively affected during construction.

1.4.2 Alternative 1A

1.4.2.1 Beneficial Impacts

Land Use/Economic Development. Alternative 1A would accommodate the development of the Mall of America and Fantasyworld and a major portion of the Airport South District, as well as development in other parts of the metropolitan area, consistent with the Metropolitan Council development goals.

Transportation. Roadway improvements and elimination of the at-grade Killebrew Drive intersection would reduce existing capacity and safety deficiencies and facilitate smoother project area and through-traffic flow to the year 1995.

Water Quality. Drainage system improvements would increase storm sewer capacity to the 50-year storm from the present 10-year storm capacity. Alternative 1A would provide more potential containment of hazardous spills.

Noise. Under Alternative 1A, traffic noise levels at the residential receivers are projected to decrease.

1.4.2.2 Adverse Impacts

Established Business. Alternative 1A would alter the landscaped setback of approximately six businesses, remove frontage road access from approximately seven businesses, alter the parking lots of approximately four businesses, and possibly require removing one building.

Construction. Temporary changes would occur in traffic patterns and traffic congestion would increase during construction. Air quality, noise levels, water quality during wet weather conditions, and patronage of project area businesses would also potentially be negatively affected during construction.

1.4.3 Alternatives 2 and 3

1.4.3.1 Beneficial Impacts

The beneficial impacts of Alternatives 2 and 3 (both no-build alternatives) are that they avoid the negative impacts of the build alternatives and save the cost of the project, estimated at approximately $189 million for Alternative 1 and $82 million for Alternative 1A.

1.4.3.2 Adverse Impacts

Land Use/Economic Development. Alternatives 2 and 3 are inconsistent with local and regional land use and economic development plans.

Transportation. Existing capacity and safety deficiencies on TH 77 and I-494 would worsen. Access to the project area and other parts of the metropolitan area including access to local neighborhoods and businesses as well as to the Minneapolis-St. Paul International Airport would be substantially impaired as traffic volumes increased. Traffic congestion would last for several hours each day and some portion of the highway traffic could be expected to shift to other routes.

Air Quality. Under Alternatives 2 and 3, potential violations of the eight-hour CO standards are forecast at the I-494/24th Avenue interchange area and at the I-494/TH 77 interchange area.

1.5 AREAS OF CONTROVERSY

Two areas of controversy have been identified: the future upgrading of I-494 west of the project area, and the addition of two more lanes (one in each direction) on TH 77 north of 70th Street.

- o Future I-494 Upgrading

  I-494 is projected to be over-capacity by 2005 even without development of the Mall of America and Fantasyworld or an equivalent development on the Met Stadium site. The Metropolitan Council is presently directing a study of the I-494 corridor between I-35E on the east and I-394 on the west. The corridor study will address the need for additional roadway capacity in the corridor, the potential for adding the additional capacity needed, and the impacts on growth in the corridor. The study will define and develop a consensus on the transportation and land use strategies for the corridor.

  Alternative 1 provides additional capacity consistent with I-494 improvements recently completed east of the study area, and assumes the addition of at least one lane in each direction to I-494 west of the project area. Alternative 1A does not require or assume additional lanes on I-494 west of the project area, but does not preclude future alternatives for I-494 or Alternative 1.

- o Two Additional Lanes on TH 77

  The analysis of Alternative 1 in this EIS assumes the addition of two lanes on TH 77 north of 70th Street in Richfield, for a total of six lanes from I-494 to CSAH 62. Alternative 1A does not require or assume the two additional lanes. The additional two lanes are not presently programmed by the Minnesota Department of Transportation. Cedar Avenue north of CSAH 62 tapers to two driving lanes on the newly-constructed bridge over Lake Nokomis in the City of Minneapolis.

The analysis of Alternative 1 was conducted assuming that I-494 was upgraded to a minimum of 4 lanes in each direction, and that TH 77 was upgraded north of I-494 to a minimum of 3 lanes in each direction, since without these additional improvements, it would not be possible to deliver the 2005 forecast traffic volumes used as the basis for the Alternative 1 design of TH 77 and I-494 in the project area. Alternative 1A (Stage I improvements), was designed using

1995 volumes, since they represent approximately the maximum hourly traffic volumes which could be accomodated without further upgrading on TH 77 and I-494.

The first stage TH 77/I-494 improvements could proceed whether or not the two issues are resolved. Subsequent stages will require the resolution of these issues.

1.6 PERMITS/APPROVALS REQUIRED

Permits and approvals will be required from the agencies listed below:

AGENCY	PERMIT/APPROVAL	Alt. 1	Alt. 1A
Federal Highway Administration	Change in Access Approval	X	X
Minnesota Pollution Control Agency	Indirect Source Permit	X	
Minnesota Department of Natural Resources	Work in Protected Waters Permit	X	
City of Bloomington	Plan Approval	X	X
City of Richfield	Plan Approval	X	X
AGENCY	**PERMIT/APPROVAL**		
Metropolitan Airports Commission	Plan Approval	X	
Federal Aviation Administration	Notice of Proposed Construction (Form 7460-1)	X	X
	Land Release	X	X
	Waiver from 50:1 Glide-slope	X	
Twin Cities Metropolitan Council	Interchange Additions/ Revisions Approval	X	X
	Controlled-Access Facility Changes	X	X

2.0

Purpose of and Need For Action

2.0 PURPOSE OF AND NEED FOR ACTION

This section describes the proposed improvements, history of the project, its role in the regional transportation system, existing roadway design deficiencies, existing and anticipated travel characteristics in the project area, and summarizes why the proposed highway improvements are needed.

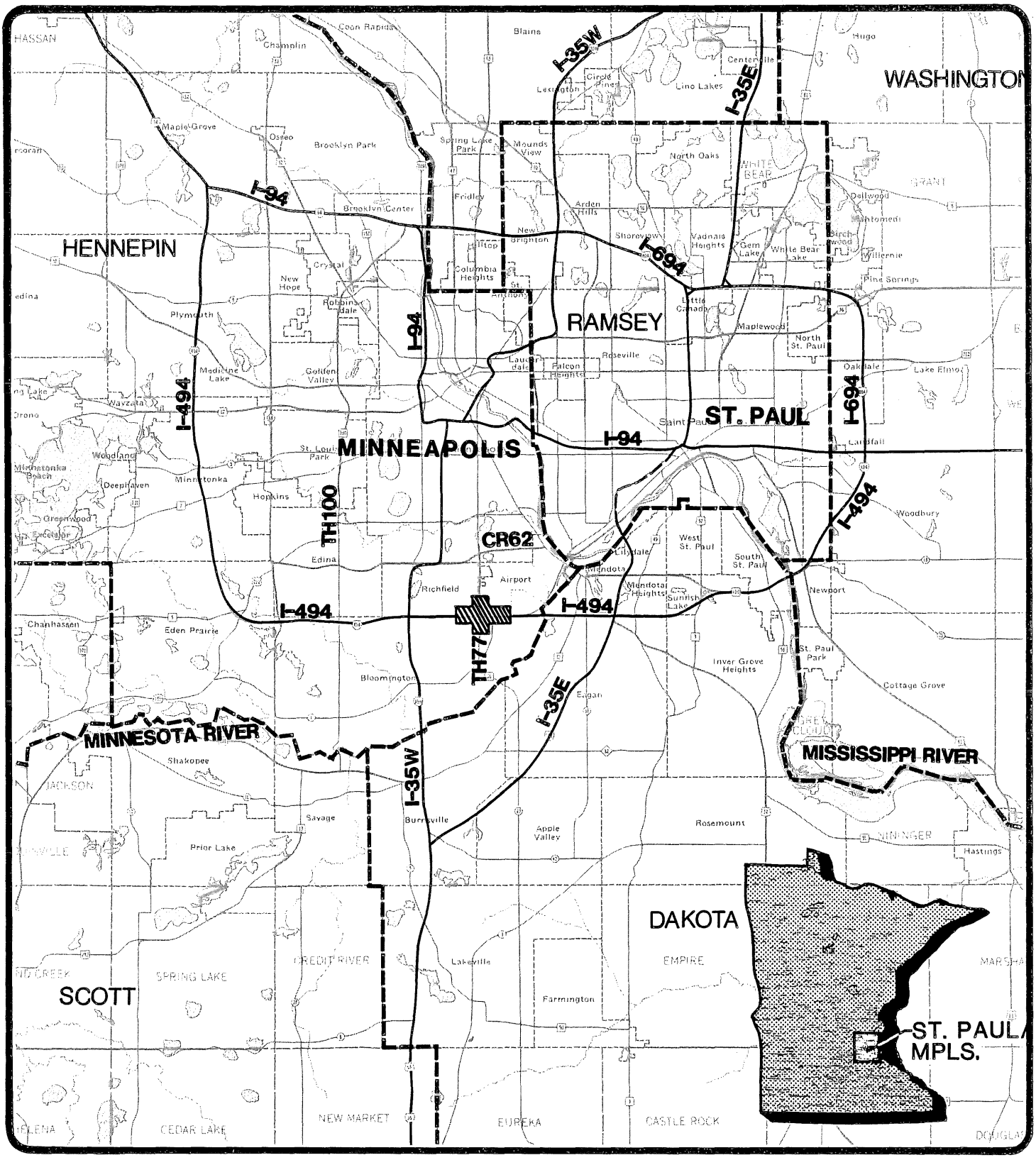
2.1 INTRODUCTION

2.1.1 Project Location and Description

The proposed project involves the improvement of (1) approximately 1.9 miles of Cedar Avenue, Trunk Highway 77 (TH 77), from north of 70th Street in the City of Richfield to south of 86th Street in the City of Bloomington, and (2) approximately 2.7 miles of I-494 from west of 12th Avenue South to east of 34th Avenue South. I-494 forms the border between the cities of Bloomington and Richfield west of TH 77, and between Bloomington and the airport east of TH 77. Both of these roadways are in Hennepin County, Minnesota. Their location is illustrated by Figures 2.1.A, 2.1.B, and 2.1.C.

The project proposes to improve the defined section of TH 77 and I-494 as follows:

- Improvements to the mainline freeways:
  - Two additional lanes to provide six lanes on TH 77 between 70th and 86th Streets, and
  - Two additional lanes to provide eight lanes on I-494 between 12th and 34th Avenues.
- New interchanges on TH 77 at:
  - Killebrew Drive,
  - 81st Street, and
  - 75th Street.
- Upgraded interchanges on I-494 at:
  - TH 77,
  - 12th Avenue,



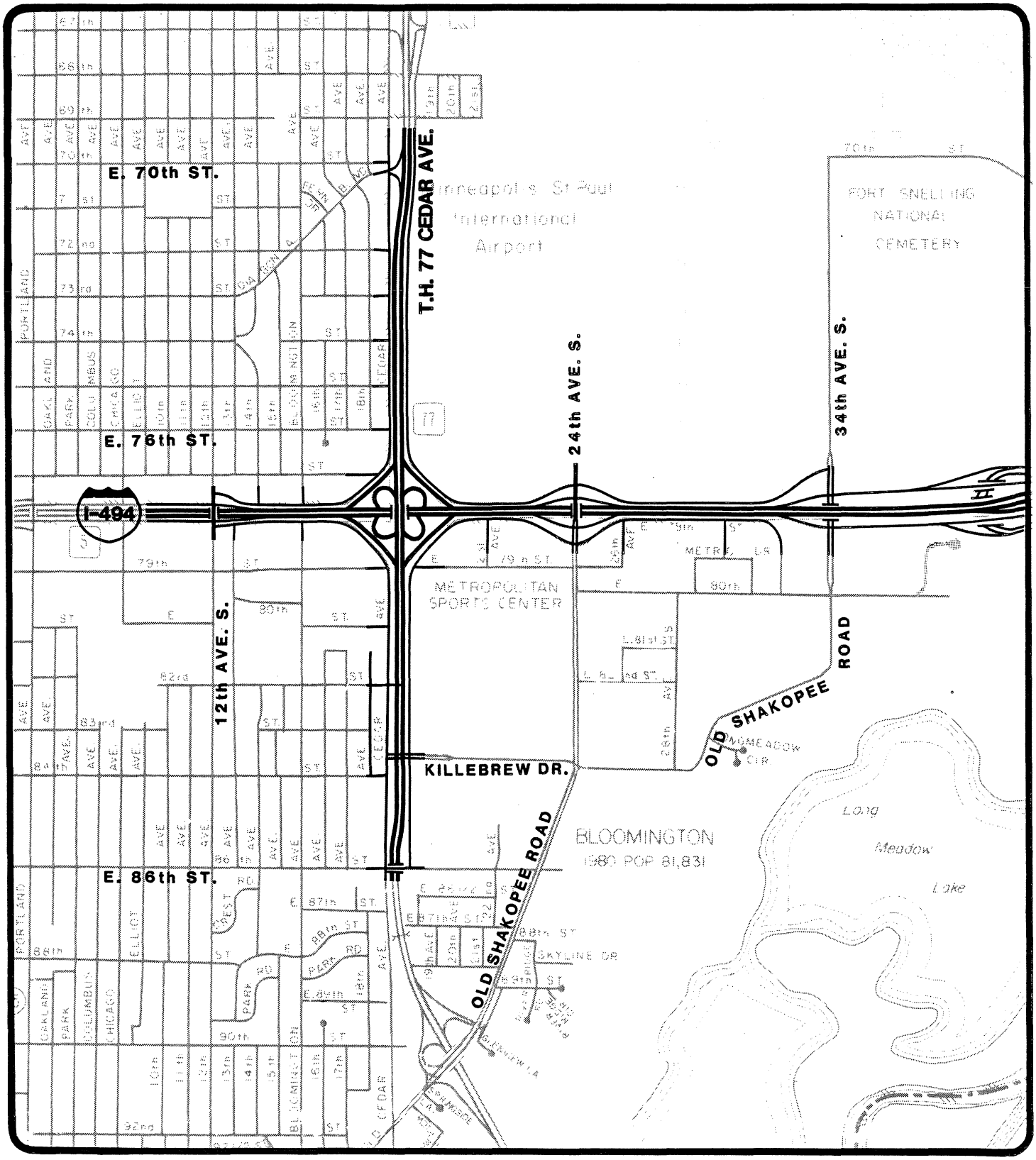
T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 2.1.A

State and Regional Location Map

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BRW



T.H. 77/I-494 IMPROVEMENT PROJECT

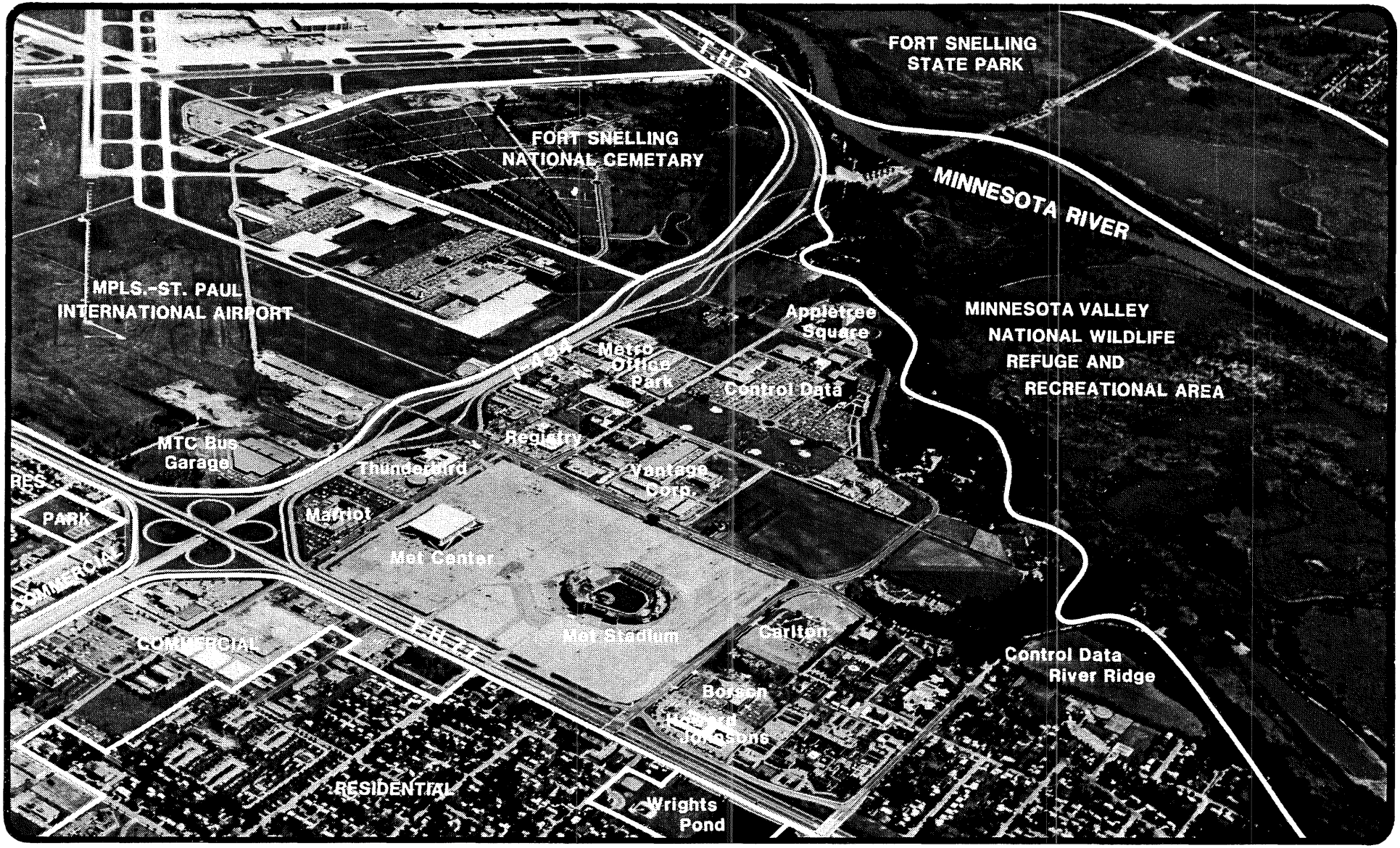
FIGURE 2.1.B

Project Area

N

0' 2,000'

BRW



T.H.77/I-494 IMPROVEMENT PROJECT

FIGURE 2.1.C

Aerial View of Project Area

NOTE: Aerial Photograph Taken in 1983

BRW

- 24th Avenue, and
- 34th Avenue.

- o Direct access from I-494 to arterial streets serving the former Metropolitan Stadium site.

- o An underpass below TH 77 at 79th Street.

- o Collector-distributor roads on I-494 from 12th Avenue to 34th Avenue.

- o A road connecting 24th Avenue with TH 77 through Metropolitan Airports Commission (MAC) property at approximately 75th Street.

Figure 2.1.D illustrates the general roadway improvements proposed in the project area. Figure 2.1.E illustrates the transportation analysis area encompassing the project area. The transportation analysis area defines the limits of the area affected by the traffic impacts related to this project.

The project is proposed to be completed in two stages. First stage improvements concentrate on TH 77, and are proposed to be completed by 1989. Improvements to I-494 would be completed in a subsequent stage, probably after 1995. First stage and ultimate improvements are described and illustrated in more detail in Section 3.0 of this DEIS.

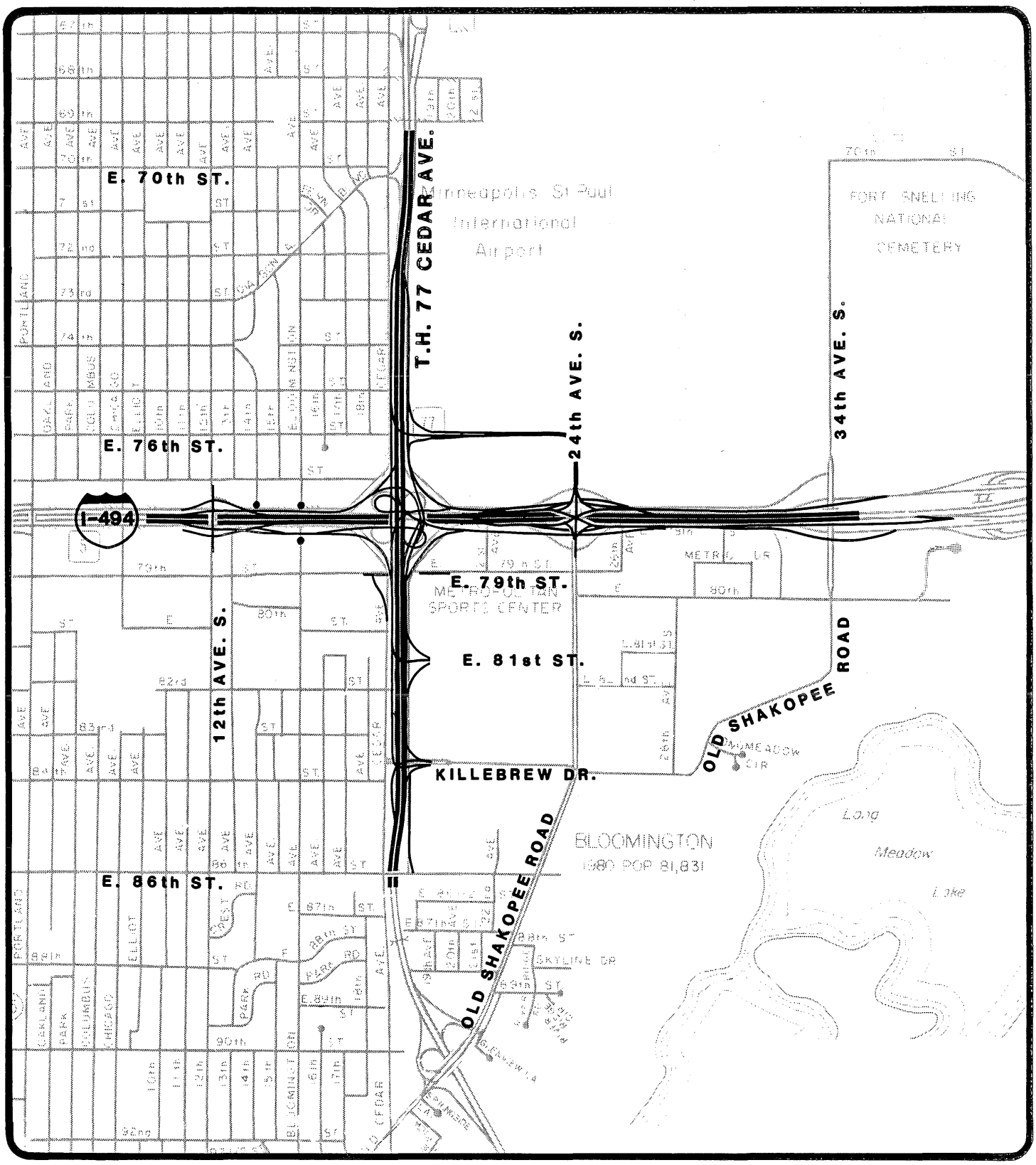
The preferred roadway improvement design concept was developed in conjunction with the Transportation Plan for the Airport South District (BRW, Inc., November 18, 1985). This document had extensive review and input by the Minnesota Department of Transportation (Mn/DOT). The roadway improvement design concept would accomplish the following:

1. Eliminate the remaining at-grade access to TH 77 between I-35E and CSAH 62, the north and south points of the transportation analysis area.

2. Eliminate the short weaving sections on I-494 between 12th Avenue and TH 77, between the loops of the TH 77/ I-494 interchange and between TH 77 and 24th Avenue by braiding the on and off ramps to the interchanges.

3. Provide additional arterial access to the Airport South District by connecting 79th Street under TH 77.

4. Improve the access to the Airport South District from the regional highway system by providing new interchanges at Killebrew Drive, 81st Street, and 75th Street and upgrading the interchanges at 12th Avenue and 24th Avenue.



T.H. 77/I-494 IMPROVEMENT PROJECT

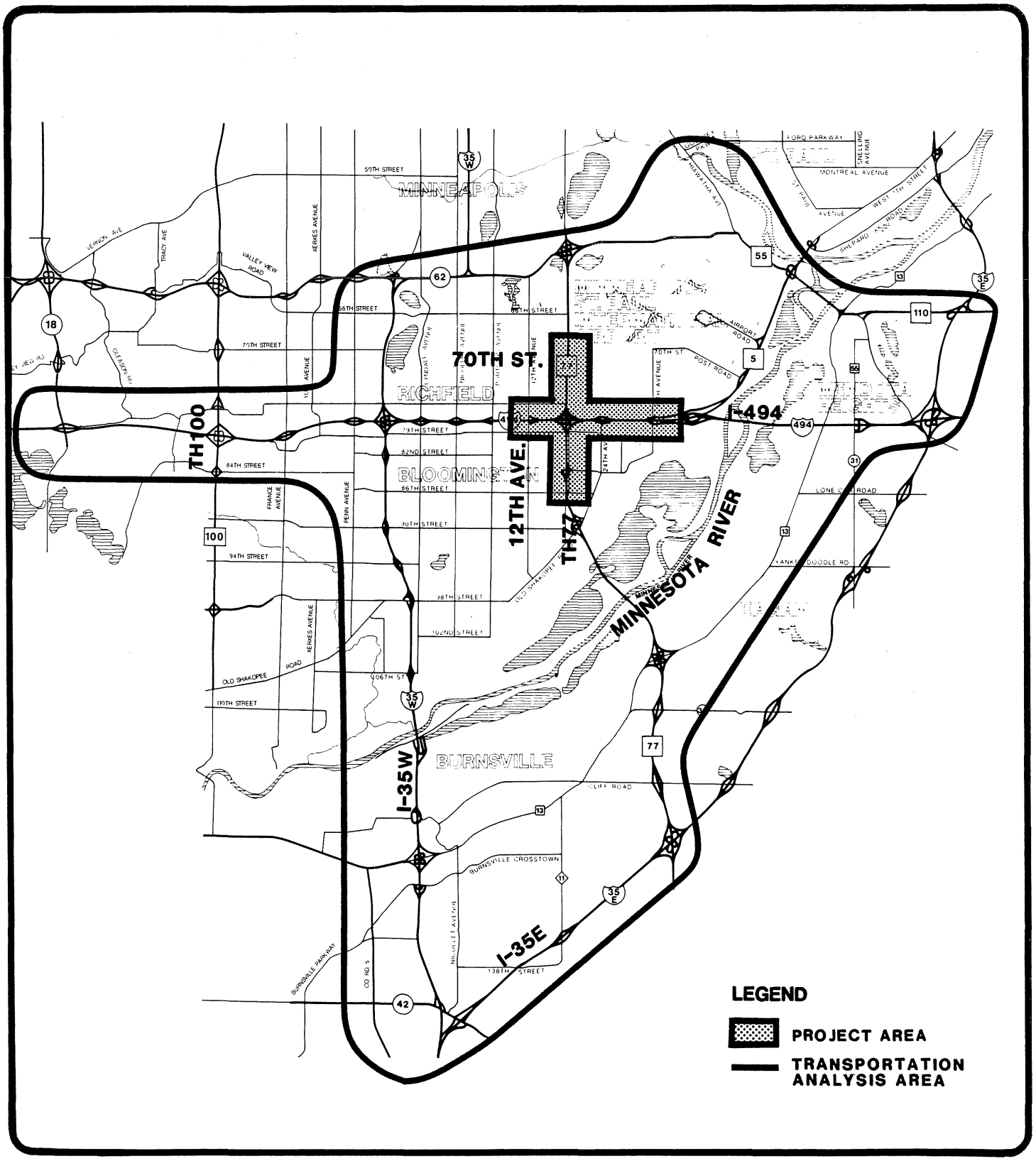
FIGURE 2.1.D

Proposed T.H.77/I-494 Improvements

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0' 2,000'

BRW



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 2.1.E

Project Area & Transportation Analysis Area

N

0' 12,000'

BRW

5. Maintain a functional TH 77 west frontage road from 79th to 86th Streets and hold the west curb line of the existing TH 77 west frontage road.

6. Maintain the integrity of the TH 77 and I-494 mainlines by providing a separate roadway system for collection and distribution of traffic between the interchanges.

7. Utilize existing I-494 frontage road space for interchange traffic facilities.

The design concept for the highway improvements is still in preliminary design and will be further refined during preliminary and final design for the project.

2.1.2 Project Background

The Minnesota Department of Transportation has planned to upgrade TH 77 to a full controlled-access freeway for the past 22 years. In 1979, the upgrading of TH 77 from I-35E to Killebrew Drive was completed and opened to traffic, including a new six-lane bridge over the Minnesota River. The project terminated at an at-grade intersection at Killebrew Drive. TH 77 was not upgraded to freeway design standards in front of the Metropolitan Stadium as part of the project because of funding constraints and because development plans for the stadium site were not resolved.

When the Metropolitan Sports Facilities Commission decided to build a new multi-purpose domed stadium in downtown Minneapolis and abandon Met Stadium in Bloomington, it made the 100-acre stadium site available for development. Following this decision, the City of Bloomington convened an Urban Land Institute (ULI) Advisory Board composed of developers, property managers, consultants and planners to complete an evaluation of the stadium site's development potential. The eight member ULI panel recommended that the city consider the creation of a large-scale, mixed-use urban development containing hotels, office space, unique complementary retail, restaurant and entertainment facilities, and specialized uses including an international trade center.

In 1980, Bloomington completed its comprehensive plan. The Bloomington Comprehensive Plan included a detailed physical development plan for the Aiport South District of the City of Bloomington. Some of the development concepts contained in the district plan were based on the ULI study. The plan also proposed several transportation improvements to serve the anticipated development.

In late December, 1980, the Metropolitan Council completed its review of the Bloomington Comprehensive Plan. Generally, the plan was found to be in conformance with regional policies and no plan modifications were required. However, the Council could not concur with the transportation improvements proposed in the plan without assurance that they were not in reality modifying the regional plan. The Council recognized the need for a more detailed study of the transportation system serving the Airport South District and agreed to participate in a joint study with the Metropolitan Airports Commission, Bloomington and other affected parties to determine what improvements would be needed to adequately serve the area in the future. As a result, the Airport South Transportation and Environmental Management Study was initiated in October, 1982.

While no specific development proposal existed at that time, the city decided to gain the required environmental permits on a generic basis for the anticipated development. An Airport South Generic Environmental Impact Statement (ASGEIS) was prepared in 1983 and 1984, and was found adequate by the Minnesota Environmental Quality Board on November 20, 1984. In 1984, the city bought the 100 acre Met Stadium site from the Metropolitan Sports Facilities Commission. In January, 1985, the Minnesota Pollution Control Agency issued an Indirect Source Permit (ISP) for an additional 19,100 parking spaces in the area by 1995, subject to certain roadway improvements and implementation of certain travel demand management strategies. As of December, 1985, the City of Bloomington had authorized construction of approximately 3,020 parking spaces under provisions of the ISP.

As part of the Airport South Study and Generic EIS, a preferred plan for upgrading TH 77 between 86th Street and I-494 was identified. In addition, Mn/DOT, Hennepin County and the City of Bloomington were developing a plan for upgrading the 24th Avenue/I-494 interchange as a Federal Aid Urban (FAU) project. Hennepin County had already identified the need for expanding the 24th Avenue overpass from two lanes to four before the Airport South Generic EIS identified this as a necessary improvement. The Indirect Source Permit was granted based on, among other considerations, the improvements at 24th Avenue.

Also at this time, interchange improvements at 34th Avenue were being completed as part of the project extending I-494 across the Minnesota River into Eagan and upgrading TH 5 near the airport. The Airport South Generic EIS indicated that the proposed roadway improvements at 24th Avenue and Killebrew Drive, and those underway at 34th Avenue, would

provide the capacity needed to serve forecast traffic from the Airport South District. I-494, however, was forecast to be over capacity.

In 1985, the city solicited proposals for developers and selected Triple Five Corporation of Edmonton, Alberta, Canada, to develop the Metropolitan Stadium site. The development proposal of Triple Five Corporation was significantly larger than the development analyzed in ASGEIS. The transportation plan to service the Airport South area was therefore updated to reflect the new development proposal. The Transportation Plan for the Airport South District, completed on November 18, 1985, hereafter referred to as the Airport South Transportation Plan, provides detailed technical documentation of the assumptions, analysis, evaluation of alternatives, and development of a preferred transportation plan for the Airport South District. This Airport South Transportation Plan provides the framework for the proposed project. The information contained in the Airport South Transportation Plan has been used in both the site specific EIS for the Mall of America and Fantasyworld and this roadway EIS.

The following complementary activities have also been or are being completed:

- o A site specific EIS has been prepared and approved for the Mall of America and Fantasyworld proposed by the Triple Five Corporation on the former Met Stadium site.

- o A request for modification of the Airport South District ISP to accommodate the Mall of America and Fantasyworld project has been made to the MPCA.

- o An application for Federal Aid Urban (FAU) funds has been made for the 24th Avenue/I-494 interchange improvements and FAU funding for a portion of the interchange improvements has been approved.

- o An Indirect Source Permit application for the roadway improvements will be prepared.

Bloomington supported the passage of state legislation to fund a portion of TH 77 improvements through a loan from the city to Mn/DOT. The loan will be repaid from the State Trunk Highway Fund in ten annual installments beginning at the completion of the project or 1990, whichever occurs later.

2.2 ROLE OF PROJECT IN REGIONAL TRANSPORTATION SYSTEM

2.2.1 Functional Classification of Roadways in the Metropolitan Highway System Plan.

Figure 2.2.A shows the Metropolitan Council's (year) 2000 Metropolitan Highway System plan, developed to meet the transportation needs of the Twin Cities metropolitan area. In this plan, TH 77 is classified as a major arterial from CR 42 in Apple Valley to CR 62 in Minneapolis. The major function served by TH 77 is to provide access for the rapidly growing communities south of the Minnesota River (Apple Valley, Burnsville and Eagan) to the Minneapolis-St. Paul International Airport, the City of Minneapolis, and the rest of the regional highway system. TH 77 serves as an alternative route for I-35W, which currently has major capacity deficiencies between the Minnesota River and I-494.

I-494 is classified as an interstate freeway and is a circumferential route around the Twin Cities, designed to serve long distance trips with a relatively high level of mobility. I-494 provides access to the airport and to a rapidly growing commercial strip from TH 169 in Eden Prairie to and across the Minnesota River through Eagan.

2.2.2 Relevant Plans and Policies

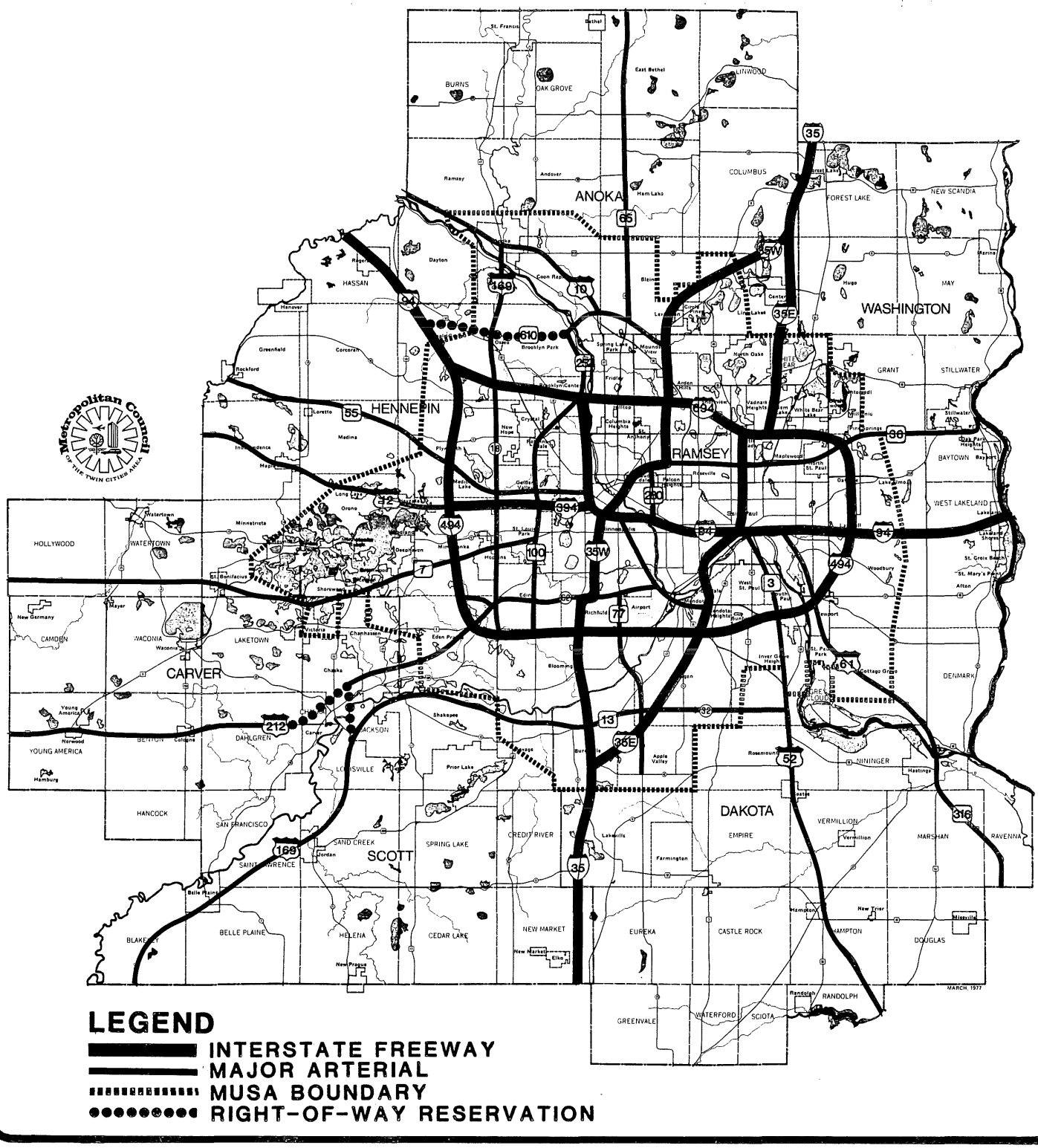
The Transportation section of the Metropolitan Development Guide prepared by the Metropolitan Council contains policies concerning the provision of transportation services to the metropolitan area which will help attain the regional transportation goals identified in the guide. The transportation policies which this project meets are identified below, along with a discussion of how this project implements these policies.

2.2.2.1 General Policies

Policy 1 - Transportation facilities should be planned, designed and operated to promote and serve development that is consistent with the Development Framework chapter of the Metropolitan Development Guide.

The proposed development is consistent with the Metropolitan Development Framework, and the Metropolitan Council has approved Bloomington's development projections for the area.

Policy 4 - Citizen and public involvement should be promoted in the formulation of transportation policy and implementation decisions.



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 2.2.A

2000 Metropolitan Highway System Plan

Source: Metropolitan Council

BRW

The design concept for the roadway improvements was developed with significant citizen and public involvement. Numerous public meetings were held during the preparation of the Airport South Transportation Plan, the Airport South Generic EIS, the metropolitan significance review for the Mall of America/Fanstasyworld, and the Mall of America/ Fantasyworld EIS.

Policy 6 - Safety standards must be a major consideration in the planning, design, operation and maintenance of transportation facilities and services.

The removal of the signalized intersection at Killebrew Drive and TH 77 will greatly enhance the safety of the area. All of the proposed improvements will be designed to meet current state and federal design standards, except where appropriate design exceptions are approved, which will improve the overall safety of the entire area.

Policy 7 - Consistency with state, federal and regional environmental plans, policies and standards should be a major consideration in the planning, design and operation of transportation projects and facilities.

In addition to this EIS presently being prepared for the roadway improvements, the environmental impacts of the roadway improvements have been addressed in the Airport South Generic EIS and the Mall of America/Fantasyworld EIS.

Policy 8 - Transportation planning and investment should provide for the efficient regional movement of goods and the incorporation of goods movement systems into the design of major activity centers.

The proposed improvements would improve the operational characteristics of I-494 and TH 77. Both are significant components of the regional goods movement system because of their functional classification and because of their proximity and access to MSP Airport.

Policy 9 - Transportation facilities should be planned, designed and operated to function in a manner compatible with adjacent land use; in those instances where the function of a facility and adjacent land use have become incompatible, affected agencies and local units of government should establish a program to mitigate this incompatibility.

The planned land use is one of the major reasons for the proposed improvements and the resultant geometric design.

Policy 10 - Transportation facilities should be planned, designed and operated to minimize the disruption of neighborhoods.

A major decision was made early in the planning for the proposed improvements that no access would be provided from TH 77 to the residential areas west of TH 77 in both Bloomington and Richfield. No right-of-way would be taken from the west side of TH 77, in order to minimize the disruption of these neighborhoods.

2.2.2.2 Urban Service Area Policies

Policy 14 - The transportation system should be planned, designed and operated to encourage higher vehicle occupancies. Major travel segments of the metropolitan highway system should be planned for 1.6 persons per auto and 35 percent of the peak-hour person-travel from the suburban subregions to the metro centers on fixed-route transit.

Transit and travel demand management are considered to be integral elements of the proposed improvements. On-site improvements are proposed to encourage transit and higher vehicle occupancies as well as reduced peak hour travel.

Policy 17 - All day express transit service should be provided to the metro centers from the suburban subregions, commensurate with demand, with priority access and movement along the freeways, expressways and other high-volume travel corridors.

AND

Policy 18 - Subregions should be linked to one another with transit service when the need has been demonstrated and the service can be provided in a cost-efficient manner.

The upgrading of transit service to this area has been considered in both the proposed roadway improvements as well as the on-site development improvements.

Policy 24 - Transportation terminals should be incorporated within major activity centers for sub-regional transit, taxis, and airport services. The terminals should be attractive, climatized, convenient, clearly signed, and contain transit information and schedules.

A transit center is proposed as a element of the Mall of America/Fantasyworld development which would have access to the regional highway system at Killebrew Drive, 81st Street, and 24th Avenue.

Policy 31 - Multi-passenger strategies should be generally promoted at the regional level and specifically encouraged at the subregional/local level by:

- o Establishing ongoing ridesharing programs that are cost-effective.

- o Fostering a close partnership between the public and private sectors in the provision of ridesharing services.

- o Targeting selected problem areas, congested corridors or subregions.

Through local zoning ordinances, the City of Bloomington has promoted ridesharing and a public and private partnership in providing the ridesharing services. These efforts will be further enhanced by the proposed roadway improvements.

Both TH 77 and I-494 in the project area are listed in the Metropolitan Development Guide as having major deficiencies. The Guide identifies the segment of TH 77 from I-494 to 90th Street as deficient due to the at-grade Killebrew Drive intersection. A grade separation at Killebrew Drive is assumed in order to provide additional capacity in the TH 77 corridor to help relieve I-35W. I-494 from TH 77 to CSAH 1, specifically the 24th Avenue/I-494 interchange and the TH 77/I-494 interchange, is also identified as a metropolitan highway need in the Metropolitan Council Transportation Policy Plan.

This project is consistent with Bloomington's Comprehensive Plan as approved by the Metropolitan Council. The Killebrew Drive interchange is part of Bloomington's adopted 1985-89 Capital Improvements Program. State legislation was passed in 1985 allowing Bloomington to issue bonds to cover the state's share of the project cost. The city will be repaid from the trunk highway fund starting in 1990.

The 24th Avenue interchange is also part of Bloomington's adopted 1985-89 Capital Improvements Program and part of Hennepin County's Capital Improvements Program.

2.2.3 System Linkage

TH 77 provides an alternative route to I-35W between I-35E and CSAH 62 for trips between Minneapolis and the rapidly growing areas of Burnsville, Apple Valley and Eagan. TH 77 is constructed to freeway standards north of I-494 to CSAH 62 and south of the project area to I-35E. The Minnesota River bridge has just been reconstructed as a six-lane freeway river crossing. TH 77 in the project area is a non-freeway "link" with at-grade signalized and unsignalized intersections. The capacity and congestion problems already present will increase substantially when the Airport South property redevelops and other increases in traffic occur on TH 77.

2.2.4 Governmental Authority Directing The Action

The Minnesota Department of Transportation (Mn/DOT) and the Federal Highway Administration (FHWA) are joint lead agencies in the development of this project. Recent state legislation provided a stronger role for the City of Bloomington, by allowing the city to provide financing for the project and to serve as consultant to Mn/DOT in the preparation of engineering plans and environmental documents. The Federal Aviation Administration (FAA), the Minnesota Pollution Control Agency (MPCA), the Metropolitan Council and the City of Bloomington serve as cooperating agencies. The MPCA and Metropolitan Council have been involved in the scoping process, traffic forecasts, and other pre-EIS activities. The project has also been closely coordinated with the Metropolitan Airports Commission.

Mn/DOT is the Responsible Governmental Unit, as specified in the MEQB environmental review process rules governing projects of this type and is also the project proposer.

2.2.5 Modal Interrelationships

The improvements proposed with this project will facilitate the smooth flow of traffic to Minneapolis-St. Paul International Airport, complementing air and surface airport transportation. The Metropolitan Airports Commission currently uses a portion of Met Center's parking area for a park and ride lot, connected to the airport by shuttle bus.

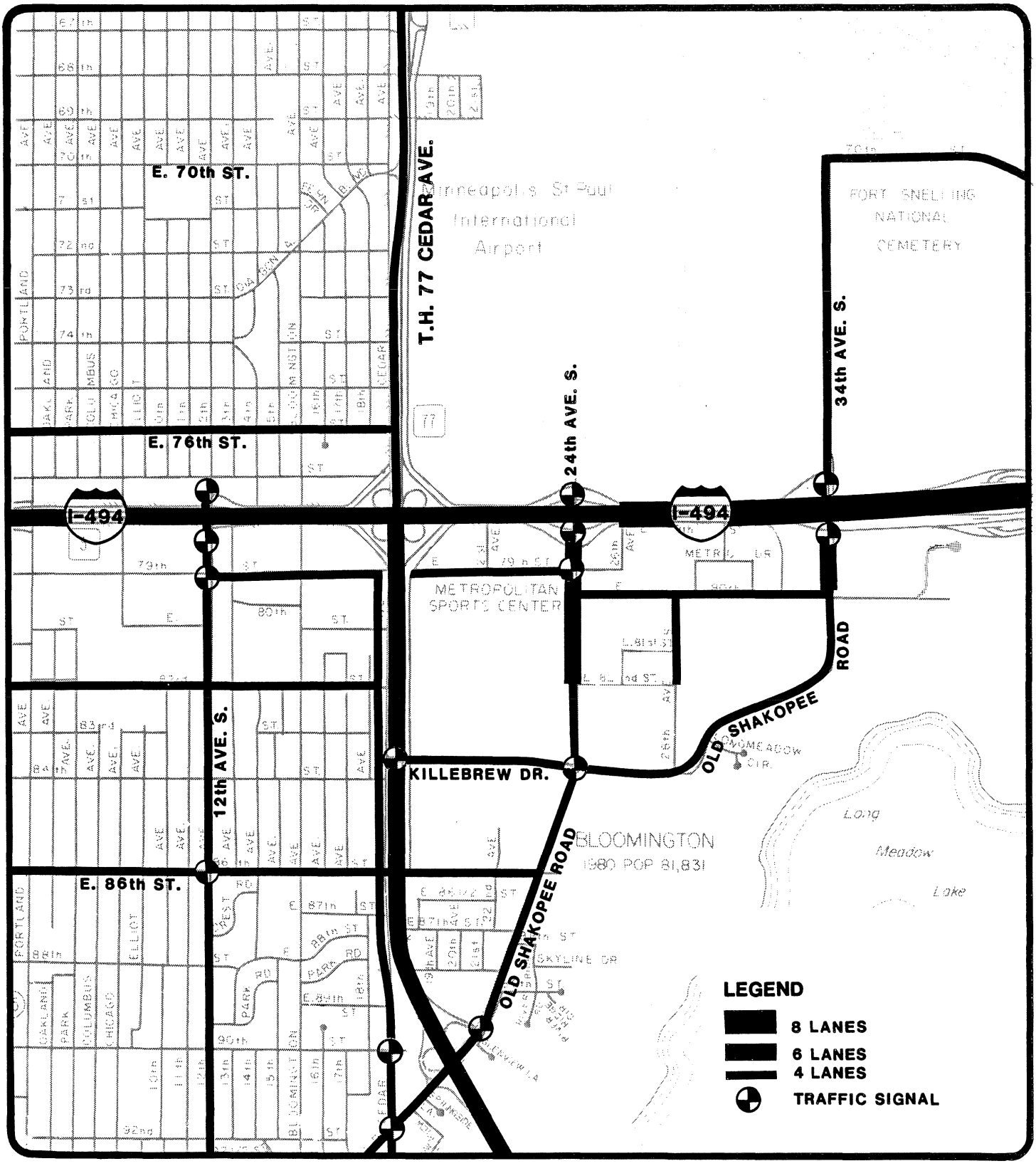
Transit service in the project area presently is limited to the bus system run by the Metropolitan Transit Commission (MTC). A park and ride lot is located on the Met Sports Center lot. The proposed improvements will greatly facilitate the ability to enter and exit the entire southeast quadrant, including the park and ride facilities. The MTC also has a bus garage and maintenance facility north of I-494 between TH 77 and 24th Avenue. The proposed improvements would improve access to this facility.

2.3 EXISTING CONDITIONS AND ROADWAY DEFICIENCIES

2.3.1 Existing Facility

The physical characteristics and functional classification of TH 77 (Cedar Avenue), I-494, and other connecting roadways in the project area are illustrated by Figures 2.3.A and 2.3.B, and defined below.

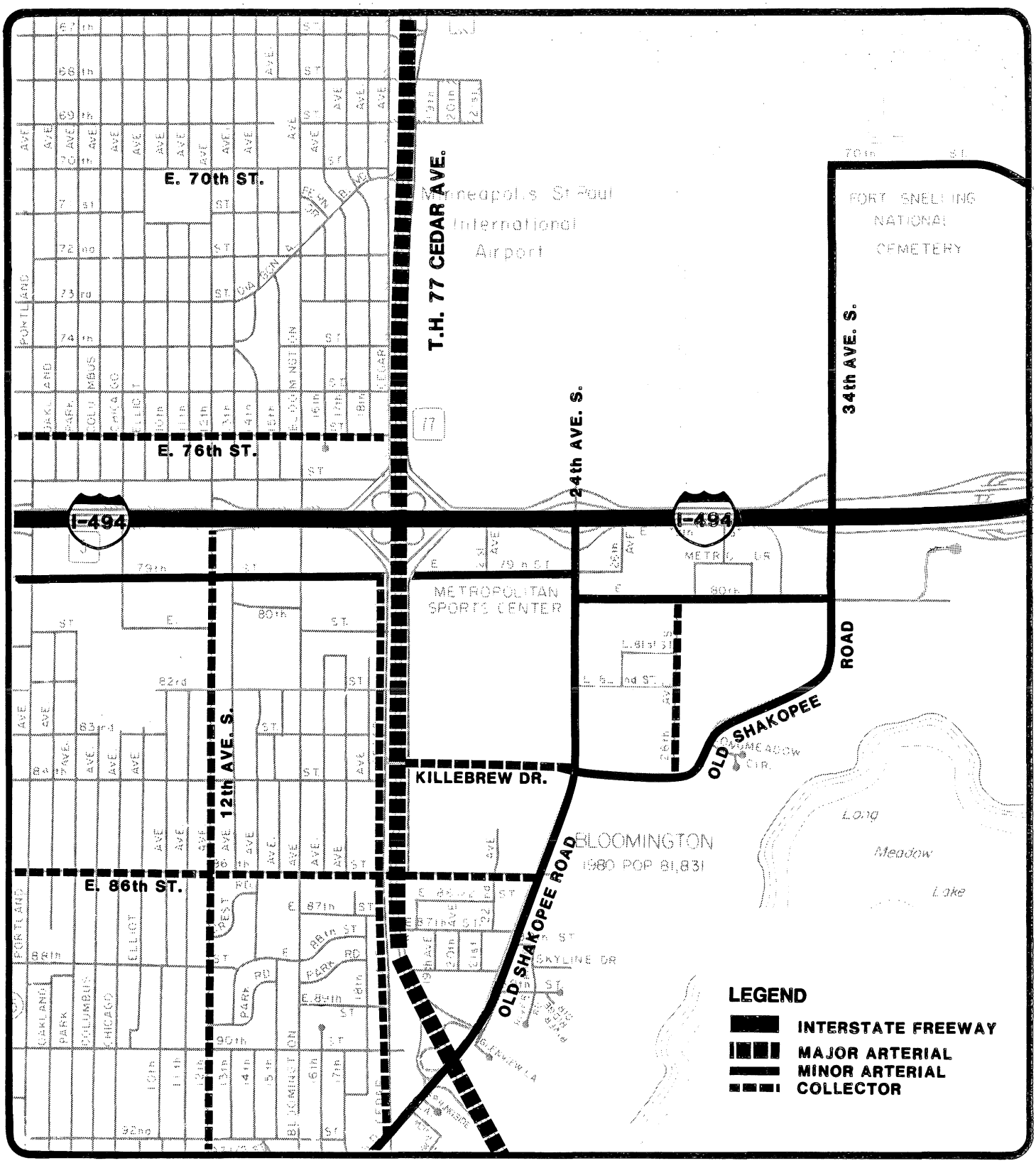
- o TH 77 (Cedar Avenue)
  - TH 77 north of I-494 is a four-lane, major arterial freeway with frontage roads. There is a cloverleaf interchange at I-494.



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 2.3.A

Physical Characteristics of Existing Roadways



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 2.3.B

Functional Classification of Roadways in Project Area

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0' 2,000'

BRW

- TH 77 between I-494 and 86th Street is a six-lane major arterial expressway with frontage roads, three unsignalized at-grade intersections on the east side between 79th Street and Killebrew Drive, a signalized intersection at Killebrew Drive, and an overpass at 86th Street.

- TH 77 south of 86th Street is a six-lane major arterial freeway with complete access control and a folded diamond interchange at East Old Shakopee Road.

o I-494

- I-494 west of 24th Avenue is a six-lane interstate freeway with frontage roads, a half-diamond interchange at 12th Avenue, a full cloverleaf interchange at TH 77, and a diamond interchange at 24th Avenue.

- I-494 east of 24th Avenue is an eight-lane interstate freeway with a full-directional interchange at TH 5 and a diamond interchange at 34th Avenue which were completed in 1984.

o 24th Avenue

- 24th Avenue South (CSAH 1) is a six-lane divided minor arterial from its signalized diamond interchange with I-494 to 82nd Street.

o 34th Avenue

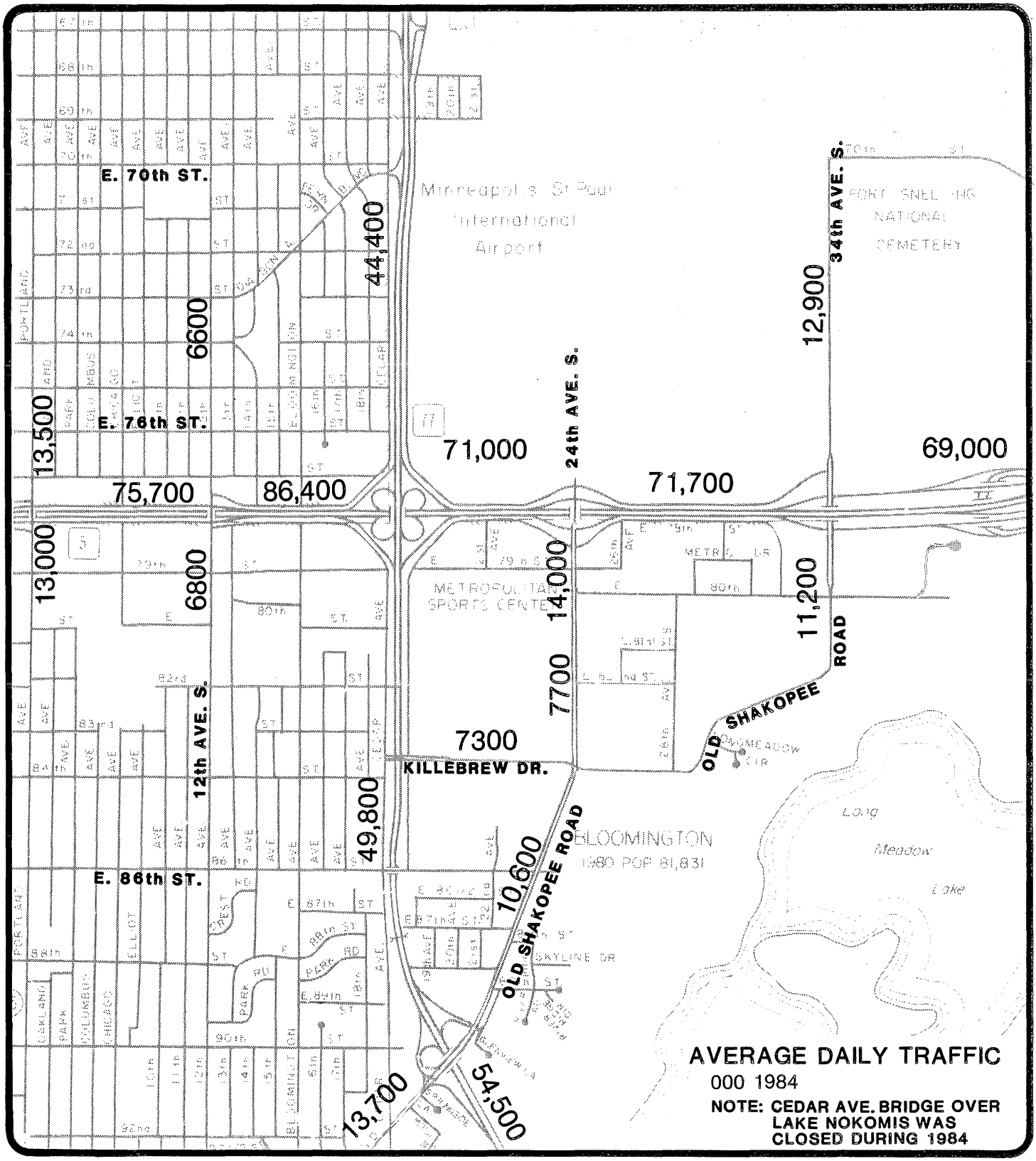
- 34th Avenue is a six-lane divided minor arterial from its signalized diamond interchange with I-494 to 80th Street.

o Other Roadways

- Four-lane roadways include the TH 77 eastern frontage roads, Old Cedar Avenue, 28th Avenue between 80th and 82nd Streets, 34th Avenue, 80th Street, 82nd Street, Killebrew Drive, 86th Street, and Old Shakopee Road.

2.3.2 Traffic Volumes and Level of Service

Figure 2.3.C shows the 1984 Average Daily Traffic (ADT) in the project area. The traffic volumes shown are from Mn/DOT's 1985 Street Series maps of the metropolitan area. Volumes shown on Cedar Avenue (TH 77) north of I-494 may be lower than average due to construction which closed Cedar from Nokomis Parkway to East Minnehaha Parkway in 1984.



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 2.3.C

1984 Average Daily Traffic

N

0' 2,000'

BRW

Capacity analyses of 1985 peak hour traffic volumes at the TH 77 and Killebrew Drive intersection determined the level of service to be F in the AM peak hour and E in the PM peak hour. Level of service F also exists at the 24th Avenue/ I-494 interchange. Definitions of the various levels of service are included in the Appendix.

2.3.3 Traffic Safety and Other Roadway Deficiencies

Table 2.3.A shows the accident history at the TH 77/ Killebrew intersection from 1982 to 1984. The accident rate on TH 77 between 86th Street and I-494 in 1984 was 3.7 accidents per million vehicle miles travelled (MVMT). The 1984 ADT on this segment of TH 77 was 49,800. In comparison, I-35W has a accident rate of 1.3 per MVMT. Highway 12's accident rate is 4.3 per MVMT. It was estimated that the interchange at Killebrew Drive would reduce overall accidents by 74% and personal injury accidents by 78%.

TABLE 2.3.A
ACCIDENT HISTORY AT TH 77/KILLEBREW INTERSECTION

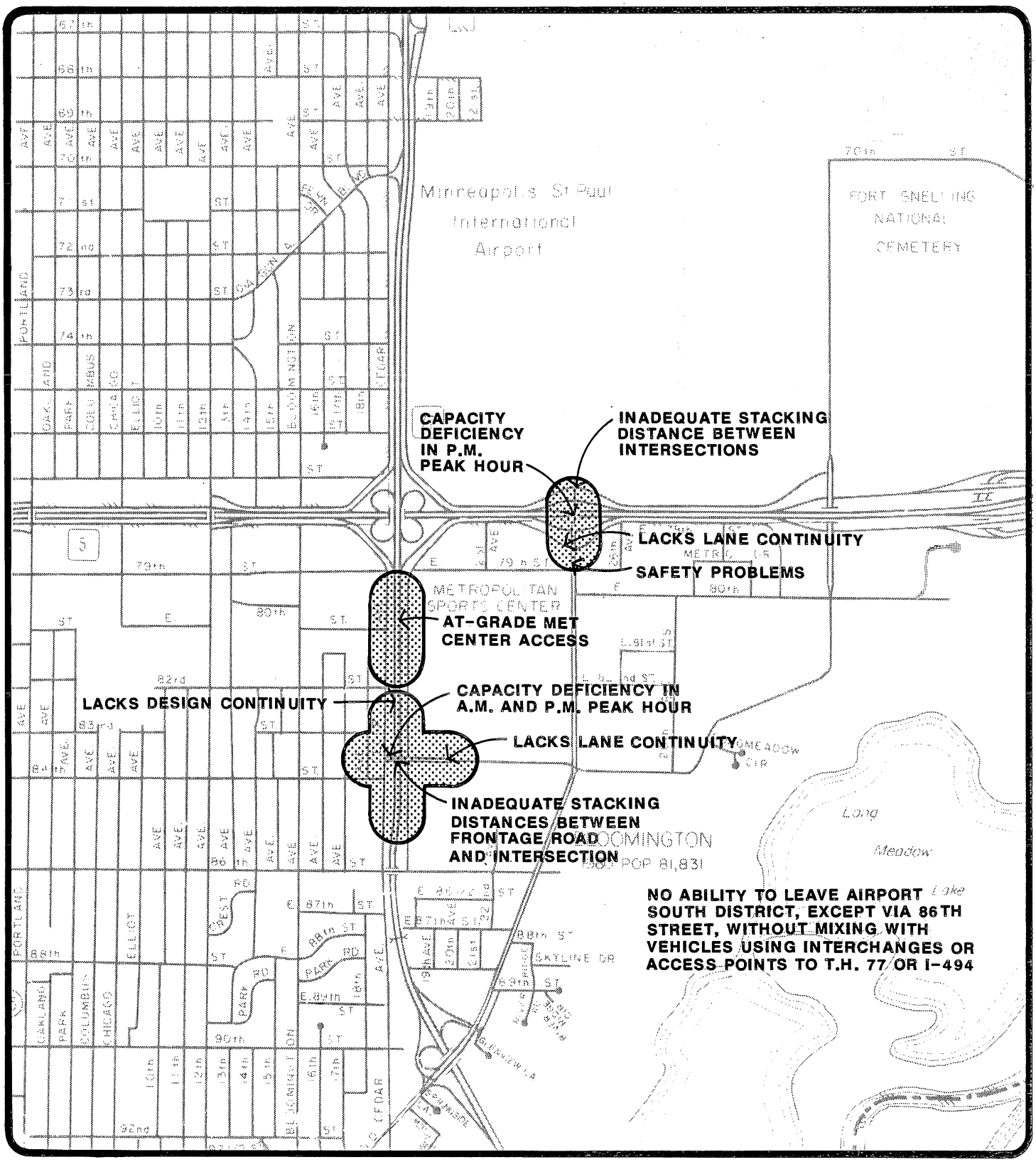
YEAR	NO. OF FATAL ACC.	NO. OF PI ACC.	NO. OF PD ACC.
1982	0	7	11
1983	0	7	15
1984	0	11	20

PI - Personal Injury
PD - Property Damage

Other existing roadway deficiencies, shown on Figure 2.3.D, include:

- Lack of design continuity on TH 77. TH 77 from I-494 to Killebrew Drive should be upgraded from expressway to freeway standards to provide the same type of design that exists on the rest of TH 77 between I-35E and CSAH 62.

- Lack of lane continuity on the Killebrew Drive approach to TH 77 and on 24th Avenue between the east-bound I-494 freeway ramps and 79th Street;



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 2.3.D
Existing Roadway System Deficiencies

BRW

- Inability to leave the Airport South District, other than at 86th Street, without mixing with vehicles at the intersections or access points to TH 77 and I-494. The only access points to the regional highway system which currently have excess capacity are the Old Shakopee Road/TH 77 interchange and the 34th Avenue/ I-494 interchange.

- Inadequate stacking distances between frontage roads and the mainlines.

2.3.4 Transit Service

Bus routes operated by the Metropolitan Transit Commission currently serving the project area are illustrated on Figure 2.3.E.

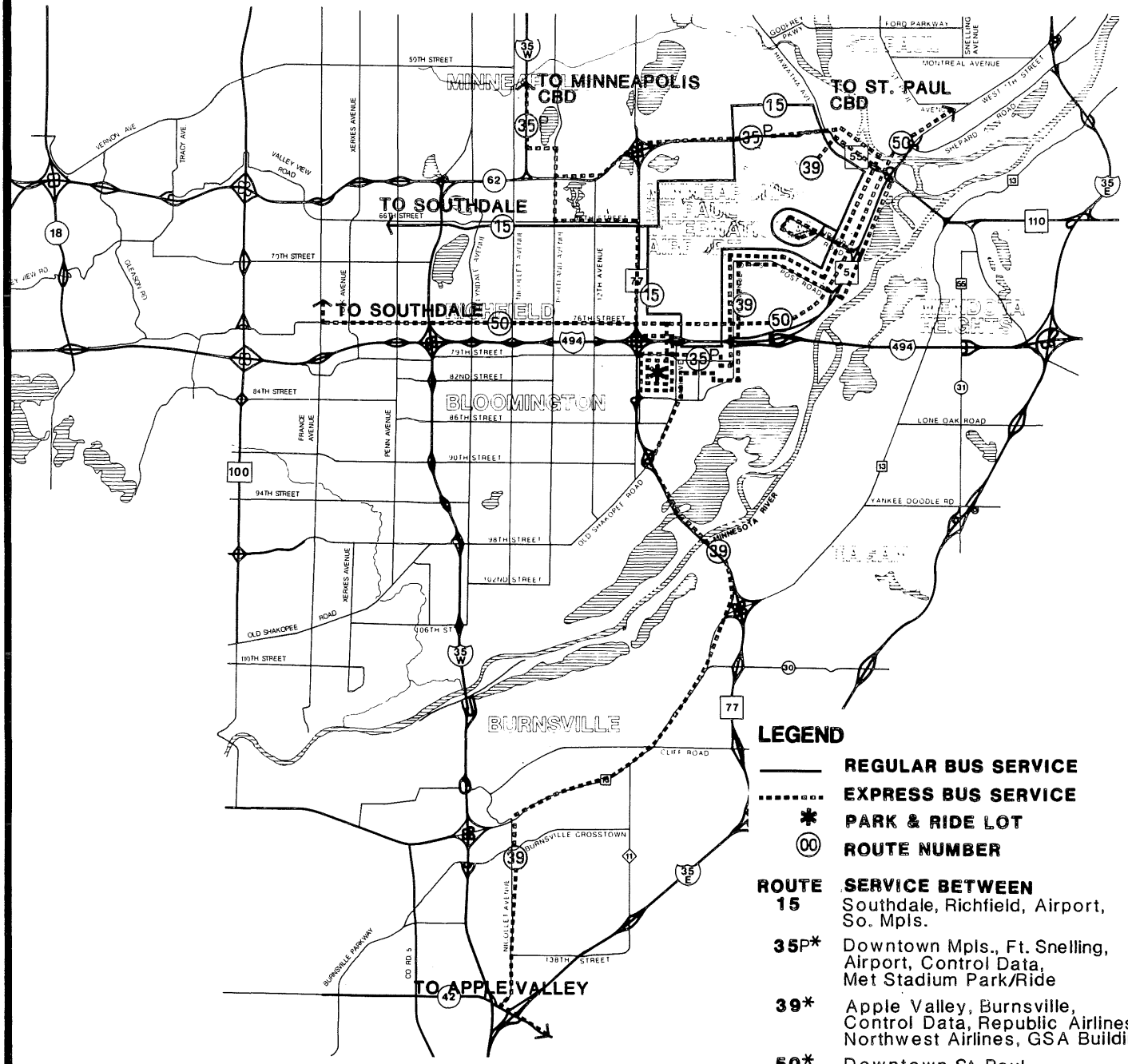
- Minneapolis Route 15, 66th Street Crosstown. Route 15 presently provides three PM peak period (3:30 to 6:00 PM) trips on weekdays. Peak period ridership on Route 15 to the Airport South area has remaind relatively stable in recent years.

- Route 35P, Minneapolis Freeway Express. Route 35P provides express route service between downtown Minneapolis and Airport South with selected intermediate stops at key traffic generators. Route 35P service operates only during the peak times on weekdays, and provides four PM peak period trips to Airport South and four PM peak period trips from Airport South.

- Route 39, Apple Valley-Burnsville-Airport South Area Express. Route 39 is the only survivor of a series of bus routes implemented between 1976 and 1978 to connect the large residential concentrations south of the Minnesota river with major suburban employment centers in central Bloomington, and along the I-494 strip between Hwy 100 on the west and the airport on the east.

- Route 50, St. Paul - Southdale Express. Route 50 provides two PM peak period trips between downtown St. Paul and Southdale Regional Shopping Center, with stops at the park and ride lot on the Met Stadium site and in Richfield.

- Local Routes between the airport and Southdale - Routes 78, 88 and 89 provide service between the Hubert H. Humphrey charter terminal, where a shuttle carries passengers to the main airport terminal, and Southdale.



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 2.3.E

Existing Transit Service

N

0' 12,000'

BRW

The MTC also operates an express commuter route (Route 77) between Eagan and downtown Minneapolis. Although Route 77 buses do not presently stop in the project area, a bus pullover along TH 77 between 86th Street and I-494 has been discussed as a possible future transit stop.

To date no light rail transit system (LRT) serves the project area or any other area of the Twin Cities. The Hiawatha Avenue Location and Design Study, conducted for TH 55 northeast of the project area, recommended LRT between downtown Minneapolis and the airport, with a future extension to the Met Stadium site. Hiawatha Avenue is one of three corridors being considered for LRT by the Metropolitan Council, the City of Bloomington and Hennepin County, and is the only corridor near the TH 77/I-494 project area.

2.4 FUTURE TRAVEL DEMAND

2.4.1 Travel Forecast Assumptions

The traffic forecasts for TH 77 and I-494 are based on the work that was done for the Airport South Generic EIS, the Transportation Plan for the Airport South District, and the Draft and Final Environmental Impact Statements for the Mall of America and Fantasyworld. The traffic forecasts have received extensive analysis and have been reviewed and accepted by the Minnesota Department of Transportation and the Metropolitan Council.

The TH 77 and I-494 traffic forecasts are made up of two components--background traffic and site generated traffic. Separate analyses were conducted and separate forecasts were developed for each component. The background traffic is the traffic expected on the project area roadways with zero traffic generated in the Airport South District. The site traffic is the traffic that has an origin or destination in the Airport South District. (All references to "site" in this EIS refers to the entire Airport South District and not just to the Mall of America and Fantasyworld, unless specifically stated.) The analysis and assumptions behind these forecasts are documented in detail in the Transportation Plan for the Airport South District and the Environmental Impact Statement for the Mall of America and Fantasyworld. This DEIS summarizes the major assumptions and identifies any assumptions which are different from those previously made. For persons interested in more background on the traffic forecasts, the Mall of America and Fantasyworld Draft and Final EIS's are available from the City of Bloomington for review.

2.4.1.1 Background Traffic

The background traffic forecasts for this project are based on background traffic forecasts developed by the Minnesota Department of Transportation for the Mall of America/ Fantasyworld EIS.

The Mall of America and Fantasyworld background traffic forecasts were for the year 2000 with a growth factor applied to reach year 2005 forecasts. Based on historical traffic counts and projected growth between 1985 and 2000, it was determined that a growth factor of two percent per year was appropriate.

The 2005 daily and PM peak hour background traffic forecasts obtained by applying the two percent annual growth factor to the year 2000 forecast background traffic are presented in Tables 2.4.A and 2.4.B respectively. The cordon points referenced in these tables refer to the cordon locations illustrated on Figure 2.4.A. In order to develop background traffic forecasts for the intermediate years of 1990 and 1995, 1985 background traffic was estimated and a straight line growth rate between 1985 and 2005 was assumed. The results of this analysis for each analysis year are presented in the following sections.

2.4.1.2 Airport South Site Generated Traffic

The basic steps used to develop the forecasts of site generated traffic on the proposed roadway system were the following:

- o Estimate baseline trip generation of projected Airport South development.
- o Estimate reductions in baseline traffic which result from mixed-use development characteristics, travel demand management and transit usage.
- o Distribute trips according to direction of approach.
- o Assign trips to minimum travel time routes between site and approach route.

The distribution and assignment of site generated trips is carried out using a computer model of the proposed roadway system. The trip distribution assumptions that were used are documented in the Mall of America/Fantasyworld DEIS and are shown in Table 2.4.C. Analyses of the various runs of the regional travel model indicated very little variation in

TABLE 2.4A

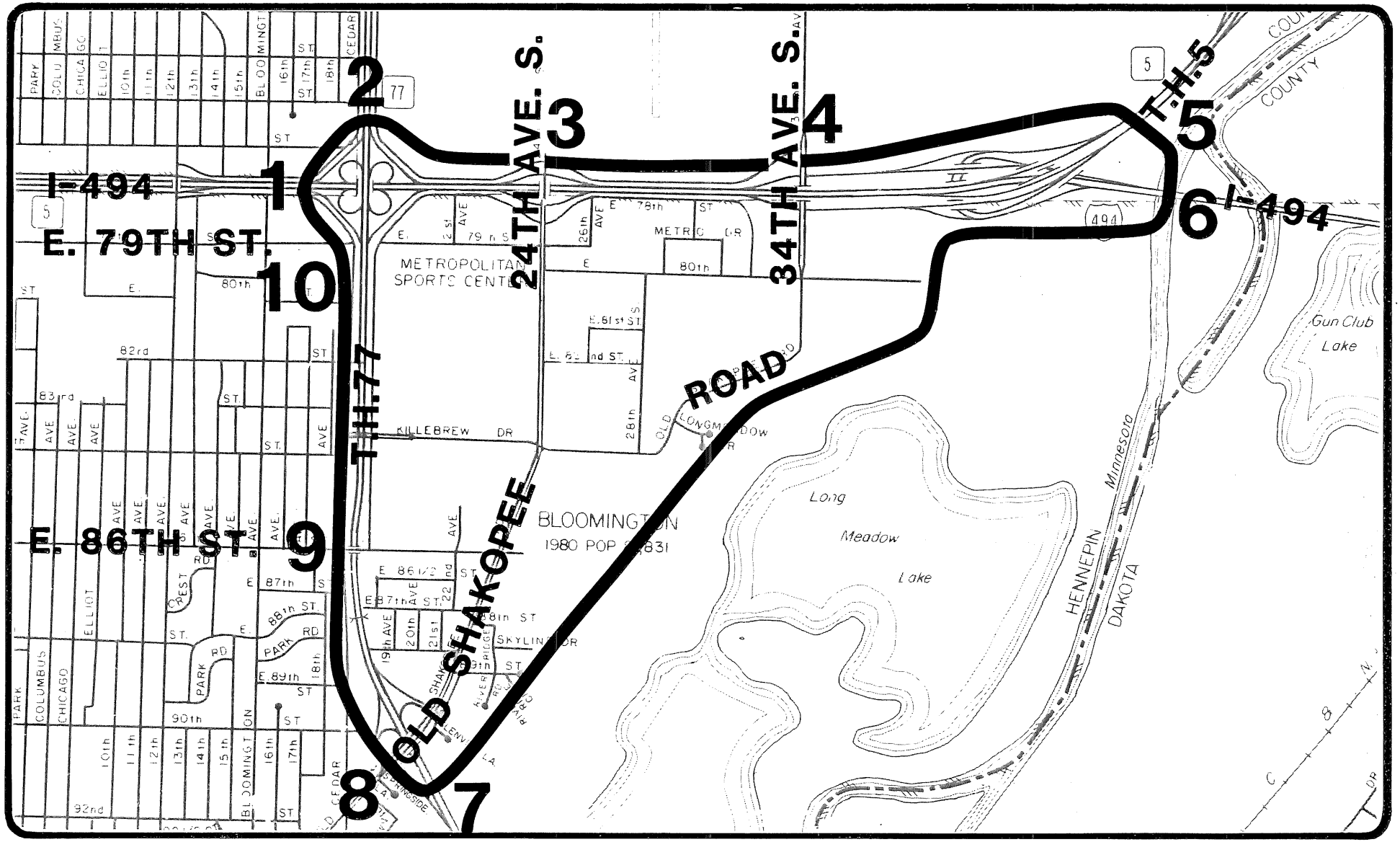
BACKGROUND POINT TO POINT TRIP TABLE FOR 2005
AVERAGE WEEKDAY TRAFFIC

		To Cordon Points:										
		1	2	3	4	5	6	7	8	9	10	TOTAL
	1	0	4118	1690	1901	19747	26083	8976	158	0	0	62673
	2	4118	0	53	106	2640	3168	10771	1056	0	0	21912
	3	1690	53	0	0	686	475	317	53	0	0	3273
From	4	1901	106	0	0	1162	950	475	158	0	0	4751
Cordon	5	19747	2640	686	1162	0	3696	3590	792	0	0	32313
Points:	6	26083	3168	475	950	3696	0	0	528	0	0	34901
	7	8976	10771	317	475	3590	0	0	2323	1584	0	28036
	8	158	1056	53	158	792	528	2323	0	0	0	5068
	9	0	0	0	0	0	0	1584	0	0	0	1584
	10	0	0	0	0	0	0	0	0	0	0	0
TOTAL		62673	21912	3274	4752	32313	34900	28036	5068	1584	0	194512

TABLE 2.4B

BACKGROUND POINT TO POINT TRIP TABLE FOR 2005
P.M. PEAK HOUR TRAFFIC

		To Cordon Points:										
		1	2	3	4	5	6	7	8	9	10	TOTAL
	1	0	470	100	135	1565	2655	1065	20	0	0	6010
	2	315	0	5	10	250	300	1275	120	0	0	2275
	3	265	10	0	0	105	75	50	10	0	0	515
From	4	235	15	0	0	140	115	60	20	0	0	585
Cordon	5	1965	260	40	80	0	350	440	95	0	0	3230
Points:	6	1975	290	25	65	315	0	0	55	0	0	2725
	7	635	765	20	30	220	0	0	195	115	0	1980
	8	15	90	5	10	55	40	250	0	0	0	465
	9	0	0	0	0	0	0	190	0	0	0	1[illegible]
	10	0	0	0	0	0	0	0	0	0	0	0
TOTAL		5405	1900	195	330	2650	3535	3330	515	115	0	17975



T.H.77/I-494 IMPROVEMENT PROJECT

FIGURE 2.4.A

Background Traffic Cordon Points

0' 2,000'

BRW

the approach direction distribution. Assuming that the background traffic is a given, the two variables in the traffic forecasts for the proposed road system are the amount of development in the Airport South District and the effects of travel demand management, transit use and mixed-use on trip generation rates. All of the alternatives in this EIS assume the same level of development in the Airport South District as defined in the FEIS for the Mall of America and Fantasyworld.

TABLE 2.4.C
RECOMMENDED YEAR 2000 APPROACH DIRECTION DISTRIBUTION
FOR SITE GENERATED TRAFFIC

Aproach Route	Direction of Approach	Percent
I-494	West	23.4
TH 77	North	18.3
TH 77 E. Frontage Road	North	0.0
24th Avenue	North	0.8
34th Avenue	North	1.1
TH 5	Northeast	11.3
I-494	East	16.9
TH 77	South	13.2
Old Shakopee Road	Southwest	4.8
Old Cedar Avenue	South	0.0
East 86th Street	West	2.7
East 84th Street	West	0.0
East 79th Street	West	7.5
TOTAL		100.0

Travel demand management, transit use, and mixed-use development characteristics are assumed to vary depending on the roadway alternative being considered. The specific assumptions for background traffic and site generated traffic for 1990, 1995 and 2005 are outlined in the following sections.

2.4.2 1990 Traffic Forecasts

Forecast 1990 daily and PM peak hour background traffic, presented in Tables 2.4.D and 2.4.E, represents straight line growth between estimated 1985 background traffic and forecast 2005 background traffic. The forecast site generation is based on existing 1986 Airport South development

TABLE 2.4D

BACKGROUND POINT TO POINT TRIP TABLE FOR 1990
AVERAGE WEEKDAY TRAFFIC

		To Cordon Points:										
		1	2	3	4	5	6	7	8	9	10	TOTAL
	1	0	3955	1022	1825	17799	10796	8619	152	0	0	44168
	2	3955	0	32	101	2535	2405	9518	1014	0	0	19559
	3	1022	32	0	0	415	250	192	51	0	0	1962
From	4	1825	101	0	0	1115	913	456	152	0	0	4563
Cordon	5	17799	2535	415	1115	0	1899	3354	761	0	0	27878
Points:	6	10796	2405	288	913	1899	0	0	507	0	0	16806
	7	8619	9518	192	456	3354	0	0	2231	1521	0	25890
	8	152	1014	51	152	761	507	2231	0	0	0	4867
	9	0	0	0	0	0	0	1521	0	0	0	1521
	10	0	0	0	0	0	0	0	0	0	0	0
TOTAL		44168	19559	2000	4563	27878	16769	25890	4867	1521	0	147216

TABLE 2.4E

BACKGROUND POINT TO POINT TRIP TABLE FOR 1990
P.M. PEAK HOUR TRAFFIC

		To Cordon Points:										
		1	2	3	4	5	6	7	8	9	10	TOTAL
	1	0	470	63	135	1693	1185	1065	20	0	0	4631
	2	315	0	1	10	250	236	1170	120	0	0	2102
	3	168	6	0	0	64	45	31	10	0	0	324
From	4	235	15	0	0	140	115	60	20	0	0	585
Cordon	5	1620	260	25	80	0	185	429	95	0	0	2694
Points:	6	768	230	14	65	165	0	0	55	0	0	1297
	7	635	420	13	30	213	0	0	195	115	0	1621
	8	15	90	5	10	55	40	250	0	0	0	465
	9	0	0	0	0	0	0	190	0	0	0	190
	10	0	0	0	0	0	0	0	0	0	0	0
TOTAL		3756	1491	121	331	2580	1806	3195	515	115	0	13911

plus 640,000 square feet of additional office space and the following additional Mall of America/Fantasyworld development.

- o 2.7 million square feet of gross leasable retail floor area.
- o 700,000 square feet of recreational/amusement floor area.

The forecast site trip generation which is shown in Table 2.4.F is based on a low level of travel demand management and transit use.

The forecast site generated traffic is distributed and assigned to the existing road system based on the approach direction distribution shown in Table 2.4.C. The sum of the site traffic and background traffic on each link produces the total traffic forecast for that link. The resulting 1990 forecast average weekday traffic is shown on Figure 2.4.B.

2.4.3 1995 Traffic Forecasts

The forecast 1995 daily and PM peak hour background traffic is presented in Tables 2.4.G and 2.4.H. The forecast 1995 site generated traffic is based on development alternative 2A in the Mall of America/Fantasyworld FEIS, and assumes a low to moderate level of travel demand management and transit use. The forecast site trip generation is presented in Table 2.4.I. The 1995 forecast average weekday traffic is also shown on Figure 2.4.B.

2.4.4 2005 Traffic Forecast

The 2005 forecast background traffic was presented in Tables 2.4.A and 2.4.B. The 2005 forecast site generated traffic is based on development alternative 3A in the Mall of America/ Fantasyworld FEIS and assumes a moderate level of travel demand management and transit use. The forecast site trip generation is presented in Table 2.4.J. The 2005 forecast average weekday traffic is shown on Figure 2.4.B.

2.5 SUMMARY OF NEEDS AND PROJECT OBJECTIVES

The proposed project is needed because of existing and forecast problems on TH 77 and I-494 in the project area, and because of inadequate traffic movement between the regional highway system and development sites in the Airport South District.

TABLE 2.4.F
1990 SITE TRIP GENERATION

BASELINE TRIP GENERATION OF 1990 DEVELOPMENT ADJUSTED FOR MIXED-USE DEVELOPMENT AND LOW TRANSIT USE AND TDM
DESIGN WEEKDAY

PREPARED BY BRW, INC.
JULY 23, 1986

GENERATOR	TOTAL DAILY PERSON TRIP ENDS	AIR AND TOUR BUS		WALKING TRIPS		AUTOMOBILE			TOTAL DAILY VEHICLE TRIP ENDS	PERCENT P.M. PEAK HOUR	P.M. PEAK HOUR LOCAL TRANSIT			P.M. PEAK HOUR TRIP ENDS	ADJUSTED P.M. PEAK HOUR TRIP ENDS	INBOUND	OUTBOUND
		PERSON TRIP ENDS	VEHICLE TRIP ENDS	PERCENT	PERSON TRIP ENDS	PERSON TRIP ENDS	VEHICLE OCCUPANCY	VEHICLE TRIP ENDS			PERCENT	PERSON TRIP ENDS	VEHICLE TRIP ENDS				
RETAIL VISITOR	78,800	4,100	312	6.85%	4,916	62,784	1.6	39,240	39,552	7.20%	0.00%	0	0	2,848	2,762	1,605	1,157
AMUSEMENT VISITOR	38,250	2,700	341	6.85%	2,619	32,931	1.6	20,582	20,923	7.20%	0.00%	0	0	1,506	1,461	849	612
RET/AMUSE EMPL.	17,190	0	0	0.00%	0	17,190	1.2	14,325	14,325	15.00%	0.00%	0	0	2,149	2,084	625	1,459
N OF A/F RESIDENTIAL	0	0	0	5.00%	0	0	1.1	0	0	11.00%	0.00%	0	0	0	0	0	0
N OF A/F OFFICE	0	0	0	5.00%	0	0	1.1	0	0	15.00%	0.00%	0	0	0	0	0	0
N OF A/F HOTEL	0	0	0	44.44%	0	0	1.3	0	0	6.70%	0.00%	0	0	0	0	0	0
SUB-TOTAL N OF A/F	127,240	6,800	653		7,534	112,906		74,147	74,800			0	0	6,503	6,308	3,079	3,229
OTHER OFFICE	58,120	0	0	0.00%	0	58,120	1.1	52,836	52,836	15.00%	0.00%	0	0	7,925	7,212	1,442	5,770
OTHER HOTEL	33,907	0	0	22.22%	7,534	26,373	1.3	20,287	20,287	6.70%	0.00%	0	0	1,359	1,237	618	618
MET CENTER	6,700	0	0	0.00%	0	6,700	2.0	3,350	3,350	4.00%	0.00%	0	0	134	134	80	54
CARLTON	3,200	0	0	0.00%	0	3,200	2.0	1,600	1,600	5.00%	0.00%	0	0	80	80	48	32
S. F. RESIDENTIAL	2,145	0	0	0.00%	0	2,145	1.1	1,950	1,950	10.00%	0.00%	0	0	195	183	123	60
M. F. RESIDENTIAL	5,808	0	0	0.00%	0	5,808	1.1	5,280	5,280	11.00%	0.00%	0	0	581	546	382	164
SUB-TOTAL REST OF A.S.	109,880	0	0		7,534	102,346		85,303	85,303			0	0	10,274	9,392	2,694	6,698
TOTAL AIRPORT SOUTH	237,120	6,800	653		15,068	215,252		159,451	160,104			0	0	16,777	15,700	5,773	9,927

NOTE: ADJUSTED PM PEAK HOUR TRIP ENDS ASSUME OFFSET PEAK HOUR REDUCTIONS AS SHOWN IN TABLE 24.

VALUES IN TABLE DO NOT REFLECT 5% INTERNAL VEHICLE TRIPS.

TABLE 2.4G

BACKGROUND POINT TO POINT TRIP TABLE FOR 1995
AVERAGE WEEKDAY TRAFFIC

		To Cordon Points:										
		1	2	3	4	5	6	7	8	9	10	TOTAL
	1	0	4009	1245	1850	18449	15892	8738	154	0	0	50337
	2	4009	0	39	103	2570	2659	9936	1028	0	0	20344
	3	1245	39	0	0	506	325	233	51	0	0	2399
From	4	1850	103	0	0	1131	925	463	154	0	0	4626
Cordon	5	18449	2570	506	1131	0	2498	3433	771	0	0	29357
Points:	6	15892	2659	350	925	2498	0	0	514	0	0	22838
	7	8738	9936	233	463	3433	0	0	2262	1542	0	26606
	8	154	1028	51	154	771	514	2262	0	0	0	4934
	9	0	0	0	0	0	0	1542	0	0	0	1542
	10	0	0	0	0	0	0	0	0	0	0	0
TOTAL		50337	20344	2424	4626	29357	22813	26606	4934	1542	0	162982

TABLE 2.4H

BACKGROUND POINT TO POINT TRIP TABLE FOR 1995
P.M. PEAK HOUR TRAFFIC

		To Cordon Points:										
		1	2	3	4	5	6	7	8	9	10	TOTAL
	1	0	470	75	135	1650	1675	1065	20	0	0	5090
	2	315	0	3	10	250	258	1205	120	0	0	2161
	3	200	8	0	0	78	55	38	10	0	0	389
From	4	235	15	0	0	140	115	60	20	0	0	585
Cordon	5	1735	260	30	80	0	240	433	95	0	0	2873
Points:	6	1170	250	18	65	215	0	0	55	0	0	1773
	7	635	535	15	30	215	0	0	195	115	0	1740
	8	15	90	5	10	55	40	250	0	0	0	465
	9	0	0	0	0	0	0	190	0	0	0	190
	10	0	0	0	0	0	0	0	0	0	0	0
TOTAL		4305	1628	146	330	2603	2383	3241	515	115	0	15266

TABLE 2.4.I
1995 SITE TRIP GENERATION

BASELINE TRIP GENERATION OF ALTERNATIVE 2A ADJUSTED FOR MIXED-USE DEVELOPMENT AND LOW TRANSIT USE AND TDM+2/3(MOD-LOW)
DESIGN WEEKDAY

PREPARED BY BRW, INC.
JULY 23, 1986

GENERATOR	TOTAL DAILY PERSON TRIP ENDS	AIR AND TOUR BUS		WALKING TRIPS		AUTOMOBILE			TOTAL DAILY VEHICLE TRIP ENDS	PERCENT P.M. PEAK HOUR	P.M. PEAK HOUR LOCAL TRANSIT			P.M. PEAK HOUR TRIP ENDS	ADJUSTED P.M. PEAK HOUR TRIP ENDS	INBOUND	OUTBOUND
		PERSON TRIP ENDS	VEHICLE TRIP ENDS	PERCENT	PERSON TRIP ENDS	PERSON TRIP ENDS	VEHICLE OCCUPANCY	VEHICLE TRIP ENDS			PERCENT	PERSON TRIP ENDS	VEHICLE TRIP ENDS				
RETAIL VISITOR	90,500	4,556	312	13.40%	12,126	73,818	1.6	46,136	46,448	7.20%	0.67%	36	1	3,323	3,224	1,873	1,351
AMUSEMENT VISITOR	53,330	3,008	341	13.40%	7,146	43,176	1.6	26,985	27,326	7.20%	0.67%	21	1	1,955	1,897	1,102	795
RET/AMUSE EMPL.	23,562	0	0	0.00%	0	23,562	1.3	18,597	18,597	15.00%	1.33%	47	2	2,754	2,672	801	1,870
M OF A/F RESIDENTIAL	0	0	0	5.00%	0	0	1.1	0	0	11.00%	1.33%	0	0	0	0	0	0
M OF A/F OFFICE	0	0	0	5.00%	0	0	1.2	0	0	13.67%	1.33%	0	0	0	0	0	0
M OF A/F HOTEL	23,400	0	0	44.44%	10,399	13,001	1.4	9,511	9,511	7.00%	0.67%	6	0	662	602	301	301
SUB-TOTAL M OF A/F	190,792	7,564	653		29,671	153,557		101,229	101,882			110	4	8,695	8,394	4,077	4,317
OTHER OFFICE	60,852	0	0	0.00%	0	60,852	1.2	52,144	52,144	13.67%	1.33%	111	4	7,038	6,404	1,281	5,123
OTHER HOTEL	39,932	0	0	22.22%	8,873	31,059	1.4	22,721	22,721	7.00%	0.67%	15	1	1,580	1,438	719	719
MET CENTER	6,700	0	0	0.00%	0	6,700	2.0	3,350	3,350	4.00%	0.00%	0	0	134	134	80	54
CARLTON	3,200	0	0	0.00%	0	3,200	2.0	1,600	1,600	5.00%	0.00%	0	0	80	80	48	32
S. F. RESIDENTIAL	2,145	0	0	0.00%	0	2,145	1.1	1,950	1,950	10.00%	1.33%	3	0	193	181	121	60
M. F. RESIDENTIAL	6,105	0	0	0.00%	0	6,105	1.1	5,550	5,550	11.00%	1.33%	9	0	603	567	397	170
SUB-TOTAL REST OF A.S.	118,934	0	0		8,873	110,061		87,315	87,315			137	5	9,627	8,804	2,646	6,158
TOTAL AIRPORT SOUTH	309,726	7,564	653		38,544	263,618		188,543	189,196			247	10	18,322	17,198	6,724	10,474

NOTE: ADJUSTED PM PEAK HOUR TRIP ENDS ASSUME OFFSET PEAK HOUR REDUCTIONS AS SHOWN IN TABLE 24.

VALUES IN TABLE DO NOT REFLECT 5% INTERNAL VEHICLE TRIPS.

TABLE 2.4.J
2005 SITE TRIP GENERATION

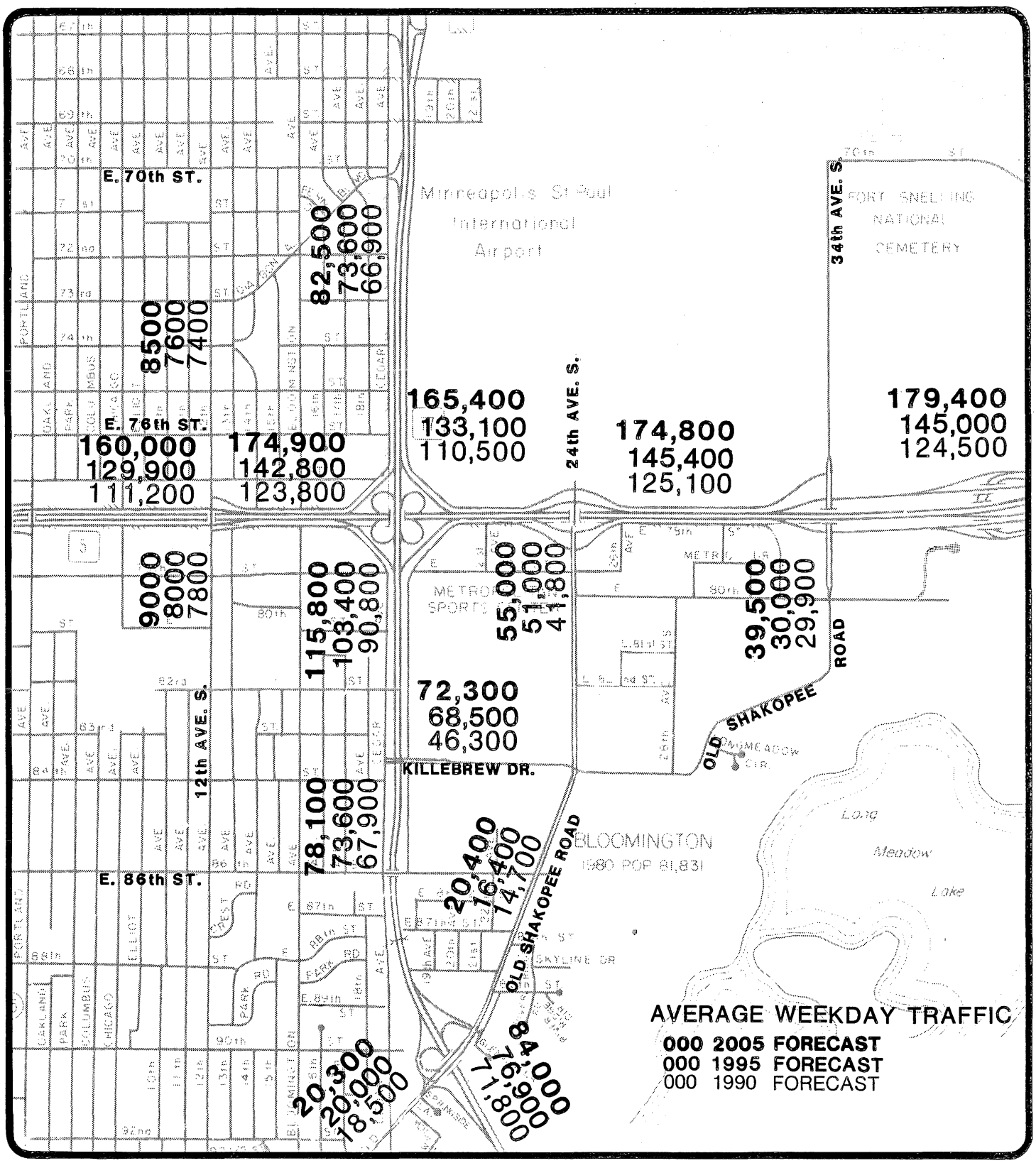
BASELINE TRIP GENERATION OF ALTERNATIVE 3A ADJUSTED FOR MIXED-USE DEVELOPMENT AND MODERATE TRANSIT USE AND TDM
DESIGN WEEKDAY

PREPARED BY BRW,INC.
JULY 23, 1986

GENERATOR	TOTAL DAILY PERSON TRIP ENDS	AIR AND TOUR BUS		WALKING TRIPS		AUTOMOBILE			TOTAL DAILY VEHICLE TRIP ENDS	PERCENT P.M. PEAK HOUR	P.M. PEAK HOUR LOCAL TRANSIT			P.M. PEAK HOUR TRIP ENDS	ADJUSTED P.M. PEAK HOUR TRIP ENDS	INBOUND	OUTBOUND
		PERSON TRIP ENDS	VEHICLE TRIP ENDS	PERCENT	PERSON TRIP ENDS	PERSON TRIP ENDS	VEHICLE OCCUPANCY	VEHICLE TRIP ENDS			PERCENT	PERSON TRIP ENDS	VEHICLE TRIP ENDS				
RETAIL VISITOR	90,500	4,556	312	17.90%	16,200	69,745	1.6	43,590	43,902	7.20%	1.00%	50	2	3,132	3,038	1,765	1,273
AMUSEMENT VISITOR	53,330	3,008	341	17.90%	9,546	40,776	1.6	25,485	25,826	7.20%	1.00%	29	1	1,842	1,787	1,038	749
RET/AMUSE EMPL.	23,562	0	0	0.00%	0	23,562	1.3	18,125	18,125	15.00%	2.00%	71	3	2,667	2,587	776	1,811
M OF A/RESIDENTIAL	7920	0	0	5.00%	396	7,524	1.1	6,840	6,840	11.00%	2.00%	17	1	738	716	501	215
M OF A/F OFFICE	9,240	0	0	5.00%	462	8,778	1.2	7,315	7,315	13.00%	2.00%	23	1	933	849	170	679
M OF A/F HOTEL	29,250	0	0	44.44%	12,999	16,251	1.4	11,608	11,608	6.70%	1.00%	11	0	770	701	351	351
SUB-TOTAL M OF A/F	213,802	7,564	653		39,602	166,636		112,963	113,616			201	8	10,082	9,678	4,601	5,077
OTHER OFFICE	72,336	0	0	0.00%	0	72,336	1.2	60,280	60,280	13.00%	2.00%	188	8	7,687	6,995	1,399	5,596
OTHER HOTEL	54,557	0	0	22.22%	12,123	42,434	1.4	30,310	30,310	6.70%	1.00%	28	1	2,012	1,831	915	915
MET CENTER	6,700	0	0	0.00%	0	6,700	2.0	3,350	3,350	4.00%	0.00%	0	0	134	134	80	54
CARLTON	3,200	0	0	0.00%	0	3,200	2.0	1,600	1,600	5.00%	0.00%	0	0	80	80	48	32
S. F. RESIDENTIAL	2,145	0	0	0.00%	0	2,145	1.1	1,950	1,950	10.00%	2.00%	4	0	191	180	120	59
M. F. RESIDENTIAL	12,705	0	0	0.00%	0	12,705	1.1	11,550	11,550	11.00%	2.00%	28	1	1,246	1,171	820	351
SUB-TOTAL REST OF A.S.	151,643	0	0		12,123	139,520		109,040	109,040			249	10	11,350	10,391	3,383	7,008
TOTAL AIRPORT SOUTH	365,445	7,564	653		51,725	306,156		222,003	222,656			449	18	21,433	20,069	7,984	12,085

NOTE: ADJUSTED PM PEAK HOUR TRIP ENDS ASSUME OFFSET PEAK HOUR REDUCTIONS AS SHOWN IN DEIS TABLE 4.1.21.A.

VALUES IN TABLE DO NOT REFLECT 5% INTERNAL VEHICLE TRIPS.



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 2.4.B

Forecast Average Weekday Traffic

N

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Specifically, the previously described segments of TH 77 and I-494 should be improved for the following reasons:

- o TH 77 between 70th and 86th Streets cannot with its present design accommodate its share of existing traffic or traffic expected to be generated by the Airport South District and other parts of the Metropolitan Area in the years 1995 or 2005.

- o The improvements to TH 77 which include the elimination of the existing at-grade access on TH 77 between 86th Street and I-494 will improve traffic safety and reduce accidents.

- o The expressway design of TH 77 between I-494 and 86th Street is incompatible with the TH 77 freeway design both north of I-494 and south of 86th Street. This intervening segment of highway should be brought up to freeway standards to aid traffic flow and safety.

- o I-494 is proposed to be improved from 12th to 24th Avenues because it cannot adequately handle the traffic expected from the Airport South District and other portions of the metropolitan area in 1995 and 2005 with its current design, particularly with its current interchanges at TH 77 and at 24th Avenue.

- o Several improvements need to be made to the 24th Avenue and Killebrew Drive interchanges with the regional highway system in order to move traffic from the non-regional roadways in the Airport South District to TH 77 and I-494. These proposed improvements warrant improving the segments of TH 77 and I-494 which stem from those interchanges.

- o A connection of 79th Street under TH 77 is needed to provide an alternative to I-494 for the short to medium length trips to and from the Airport South District.

2.6 PROJECT SCHEDULE

The environmental review, preliminary and detailed design, and the initial construction of the proposed improvements to TH 77 and I-494 are anticipated to occur according to the following schedule.

ITEM	TARGET DATE	DATE COMPLETED
Federal Notice of Intent to Prepare an EIS	8/85	8/28/85
EIS Preparation, Availability, and Scoping Meeting Notice	9/85	9/9/85
Draft Study Outline and Scoping Document Approved	9/85	9/9/85
Scoping Meeting Held	9/85	9/26/85
Transportation Plan for Airport South District Completed	11/85	11/13/85
Final Study Outline and Scoping Decision Document Approved	6/86	6/86
Draft EIS Approved	1/87	
DEIS Public Hearing Held	2/87	
Final EIS Approved	4/87	
EIS Adequacy Determination Made	4/87	
Federal Record of Decision	5/87	
FHWA Change in Access Approval	5/87	
Final Geometric Layout and Study Report	5/87	
Detailed Design and Right-of-Way Acquisition Begins	6/87	
Plans, Specifications and Estimates	7/87	
Mn/DOT informs EQB of Intent to Start Construction	8/87	
Initial Construction Contract let on First Stage Improvements	Summer, 1987	

3.0

Alternatives

3.0 ALTERNATIVES

3.1 SCOPING OF ALTERNATIVES

3.1.1 Alternatives Considered

Six alternatives were considered in the Draft Study Outline and Scoping Decision Document (Mn/DOT, September, 1985). These alternatives are described below and summarized in Table 3.1.A.

- Alternative 1: 2000-B Forecast with No Roadway Improvements and No Travel Demand Management (TDM)

  Under this alternative, there would be only limited new development in the Airport South District, the Mall of America and Fantasyworld (or traffic equivalent) would not be built, there would be no service improvements to I-494 nor TH 77, and there would be no Airport South District travel demand management. The Year 2000-B socio-economic forecast of the Metropolitan Council would be used as the basis of traffic forecasts for the Airport South District.

- Alternative 2: Year 2005 Development with Roadway Improvements and TDM

  Alternative 2 would include the year 2005 development projections for the Airport South District using the proposed Mall of America and Fantasyworld development (or traffic equivalent) on the Metropolitan Stadium site. Roadway improvements and travel demand management measures would be those judged necessary to provide a satisfactory level of service (minimum level=D) to the development site. (Travel demand management and level of service are defined in the Appendix.)

- Alternative 3: Year 2005 Development with No Roadway Improvements and No TDM

  Alternative 3 would include year 2005 development projections for the Airport South District including the proposed Mall of America and Fantasyworld (or traffic

TABLE 3.1.A
SUMMARY OF PROJECT ALTERNATIVES INITIALLY STUDIED

ALTERNATIVE	ROADWAY IMPROVEMENTS	TRAVEL DEMAND MANAGEMENT	LAND DEVELOPMENT
1	No	No	Year 2000-B Socio-Economic Forecast
2	Yes	Yes	MA & F Plus Remainder of ASD
3	No	No	MA & F Plus Remainder of ASD
4	Yes	No	MA & F Plus Remainder of ASD
5	No	Yes	MA & F Plus Remainder of ASD
6	Yes	Yes	Year 2000 Development from ASGEIS

MA & F = Mall of America and Fantasyworld
ASD = Aiport South District
ASGEIS = Airport South Generic Environmental Impact Statement

equivalent) on the Metropolitan Stadium site. There would be no regional service improvements and no travel demand management measures assumed.

- Alternative 4: Year 2005 Development with Roadway Improvements Only

  This alternative would utilize year 2005 development projections for the Airport South District including the proposed Mall of America and Fantasyworld (or traffic equivalent) on the former stadium site. Roadway improvements would be those judged necessary to provide a satisfactory level of service to the development sites. However, there would be no travel demand management measures assumed.

- Alternative 5: Year 2005 Development with Travel Demand Management Measures Only

  Alternative 5 would assume 2005 development in the Airport South District including the Mall of America and Fantasyworld (or traffic equivalent), but would not assume any roadway service improvements on TH 77 or I-494 other than travel demand management measures.

- Alternative 6: Year 2000 Development from Airport South Generic EIS (ASGEIS) with Roadway Improvements and Travel Demand Management Measures

  Alternative 6 would utilize the year 2000 development assumptions used in the Airport South Generic Environmental Impact Statement with the roadway improvements and travel demand management measures necessary to provide acceptable service.

All alternatives involving new highway locations were dismissed from further consideration because of the major social, economic, and environmental impacts that would result from constructing a new highway corridor in a heavily developed area.

3.1.2 Alternatives Dismissed

Three alternatives from the original list of six were dismissed for the following reasons:

- Alternative 1: 2000-B Forecast with No Roadway Improvements and No Travel Demand Management (TDM)

  Alternative 1 was dismissed because all alternatives to be included in the EIS were required to utilize the same land development assumptions. This is an EIS on highway improvements, thus only transportation options

should be considered. The assumed land development must be the Mall of America (or traffic equivalent) because that is the land development action proposed for the former Metropolitan Stadium site and represents the level of development in the project area currently permitted by zoning and local and regional comprehensive plans. The year 2005 was selected as the analysis year because reliable social and economic data is available as a basis for traffic forecasting and a twenty year horizon is traditionally used for highway planning.

- Alternative 4: Year 2005 Development with Roadway Improvements Only

  Alternative 4 was dismissed because the Transportation Plan for the Airport South District demonstrated the importance of using TDM to provide adequate capacity and safety on the regional highway system in the vicinity. An alternative without TDM is inconsistent with Metropolitan Council policies. The use of TDM also lessens environmental effects such as air pollution, noise, and land acquisition.

- Alternative 6: Year 2000 Development from ASGEIS with Roadway Improvements and Travel Demand Management

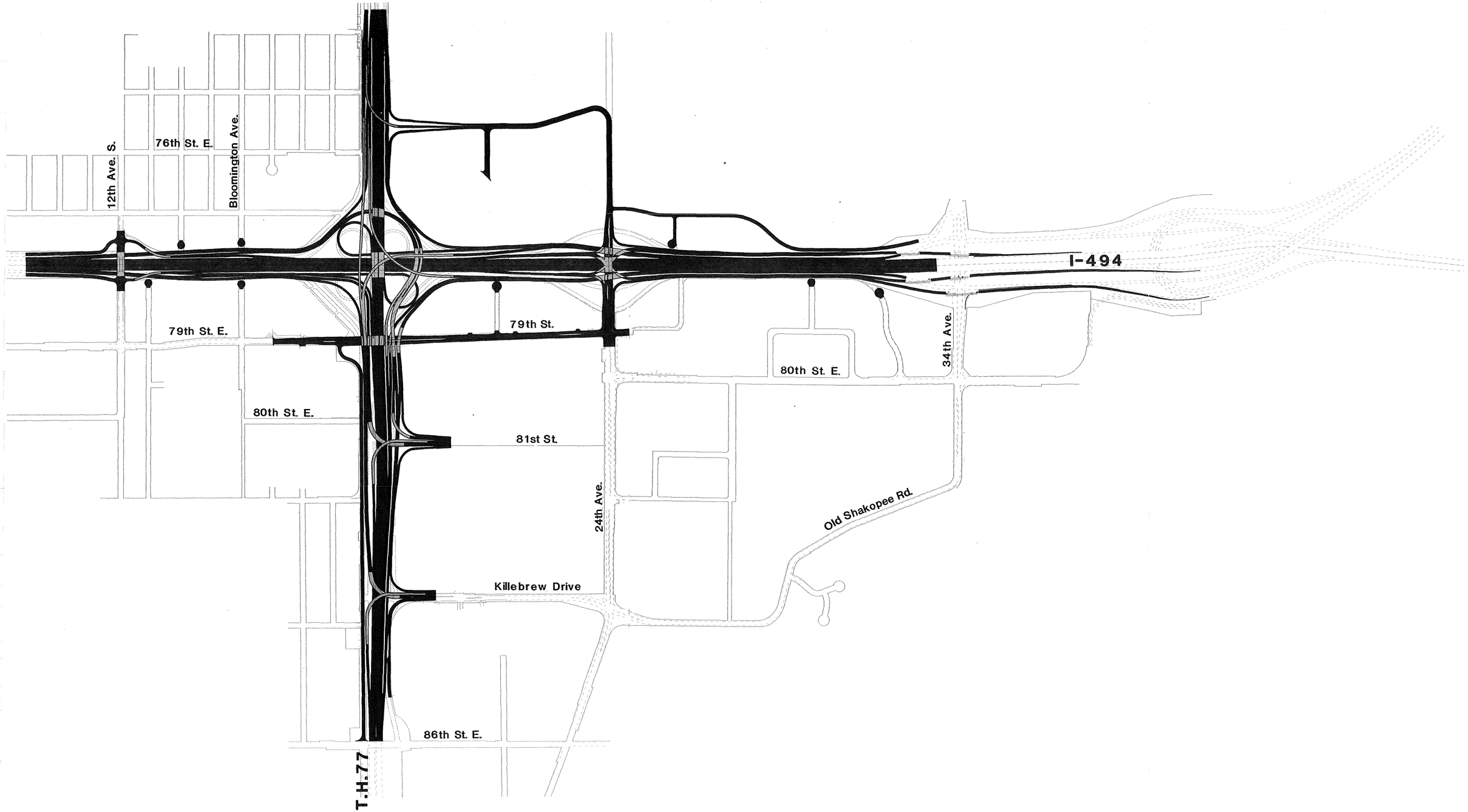
  Alternative 6 was dismissed because it does not assume the construction of the Mall of America and Fantasyworld (or traffic equivalent) and does not use 2005 as the analysis year.

3.2 DESCRIPTION OF REMAINING ALTERNATIVES

This section describes the project alternatives selected for further study by Mn/DOT and the Federal Highway Administration in the Final Study Outline and Scoping Decision Document (Mn/DOT, December, 1985). These alternatives, formerly numbers 2, 3 and 5 from the initial list, have been renumbered for study in the EIS. Public and agency comments were considered in the selection process.

3.2.1 Alternative 1: Year 2005 Development with Roadway Improvements and Travel Demand Management (Build Plus TDM Alternative)

Alternative 1 includes the year 2005 development projections for the Airport South District including the proposed Mall of America and Fantasyworld development (or traffic equivalent) on the former Metropolitan Stadium site. The roadway improvements are described in the following text and illustrated in Figure 3.2.A.



T.H.77/I-494 IMPROVEMENT PROJECT

FIGURE 3.2.A

2005 Design Concept Alternative 1

NOTE: Map is for illustration of design concept plan only. Concept plan is subject to revision without notice.

N

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BRW

- TH 77 would be upgraded to a six lane freeway facility from 86th Street to north of 70th Street, eliminating the remaining at-grade accesses on TH 77 between I-35E and CSAH 62.

- Two new interchanges would be constructed on TH 77 south of I-494 at Killebrew Drive and at 81st Street, which would provide access between TH 77 and the area east of TH 77. No access would be provided from these interchanges to the area west of TH 77.

- A new interchange would be constructed on TH 77 north of I-494 at approximately 75th Street, which would provide access to and from the north on TH 77 for the area east of TH 77. No access would be provided from this interchange to the area west of TH 77.

- Collector-distributor roads would be constructed along TH 77 from 86th Street to approximately 72nd Street, which would collect and distribute traffic to the three new interchanges along TH 77.

- A tunnel under TH 77 would be constructed at 79th Street, connecting 79th Street east and west of TH 77.

- A compressed diamond interchange would be constructed at 24th Avenue, providing six lanes of capacity over I-494.

- I-494 from 34th Avenue to west of 12th Avenue would be upgraded to an eight lane facility with auxiliary lanes between on and off ramps.

- Collector-distributor (C-D) roads would be constructed along I-494 between 24th Avenue and 12th Avenue which collect and distribute traffic to TH 77 and the three new interchanges along TH 77. The C-D road ramp connections to I-494 would be braided with the 24th Avenue and 12th Avenue ramp connections to I-494.

- A new four-level interchange would be constructed at the TH 77/I-494 interchange providing direct ramps for the northbound TH 77 to westbound I-494 movement (2nd level), the movement from westbound I-494 to the 81st Street and Killebrew interchange (3rd level), and the southbound TH 77 to eastbound I-494 movement (4th level). The eastbound I-494 to northbound TH 77 movement and westbound I-494 to southbound TH 77 movement would be provided by loops off of the C-D roads.

- o A new road would be constructed connecting 24th Avenue with the 75th Street interchange through Metropolitan Airports Commission (MAC) property. The north I-494 frontage road between 24th Avenue and 34th Avenue would be relocated through MAC property.

A moderate level of transit usage and travel demand management (TDM) are assumed. The TDM assumptions used for Alternative 1 are indicated in Table 3.2.A.

TABLE 3.2.A
TRAVEL DEMAND MANAGEMENT ASSUMPTIONS

LAND USE	VEHICLE OCCUPANCY	PEAK HOUR PERCENT
Office	1.2	13
Hotel	1.4	7
Residential	1.1	11
Retail/Amusement- Emp.	1.3	15
Retail/Amusement - Visitors	1.6	7.2

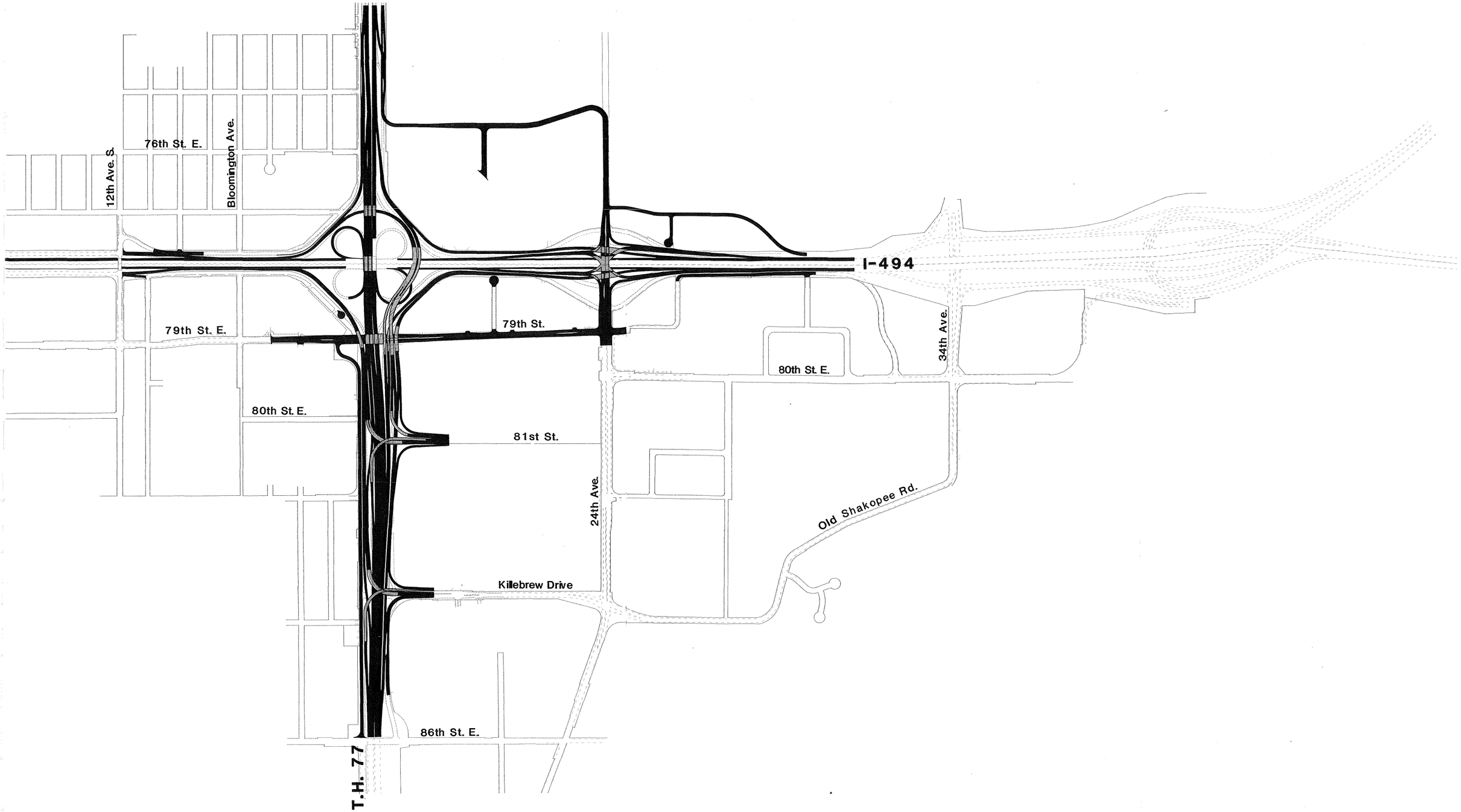
Source: Technical Report #1: Transportation Plan for Airport South District, BRW, Inc., January, 1985.

This alternative was selected for study in this EIS because it uses 2005 as the analysis year, assumes a high level of development and associated traffic in the project area, and combines roadway construction with TDM. TDM is a potentially cost-effective approach which is encouraged by the Twin Cities Metropolitan Council.

3.2.2 Alternative 1A: Stage I Roadway Improvements with Travel Demand Management

The construction of Alternative 1 would be staged. The proposed first stage construction, which is shown on Figure 3.2.B, would be consistent with Alternative 1 and consistent with the existing capacity restraints on I-494. It also would not preclude other alternatives for future upgrading of I-494. The reasons for staging the construction include the following:

- o The scope and complexity of the project requires that the project be divided into logical segments and staged over a number of years in order to maintain traffic flow through the area as well as to the Airport South District during construction.



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 3.2.B

Stage 1 Improvements Alternative 1A

NOTE: Map is for illustration of design concept plan only. Concept plan is subject to revision without notice.

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0' 1000'

BRW

- Immediate improvements are necessary to resolve current capacity deficiencies in the area and provide adequate regional access to the Mall of America/Fantasyworld or similar project on the old Metropolitan Stadium site. To implement the entire project at once would require upgrading I-494 west of 12th Avenue and delay any construction for a significant number of years, while traffic problems in the area would continue to get worse.

The proposed first stage construction would include the following elements of the ultimate project.

- Upgrading of TH 77 to a six lane freeway facility from 86th Street, to I-494, eliminating the remaining at-grade accesses on TH 77 between I-35E and CSAH 62.

- New interchanges on TH 77 south of I-494 at Killebrew Drive and 81st Street, which would provide access between TH 77 and the area east of TH 77.

- Partial access to north TH 77 north of I-494 at approximately 75th Street from locations east of TH 77.

- Collector-distributor roads along TH 77 from 86th Street to approximately 75th Street.

- Connection of 79th Street east and west of TH 77 by construction of a tunnel under TH 77.

- A compressed diamond interchange at 24th Avenue.

- The direct ramp from northbound TH 77 to westbound I-494.

- A new road connecting 24th Avenue with the east TH 77 frontage road at approximately 75th Street through MAC property.

- Relocation of the north I-494 frontage road between 24th Avenue and 34th Avenue.

Subsequent stages would include all the work on I-494 and the TH 77 improvements north of I-494. It is expected that all of the I-494 work would be done in one stage and that the remaining TH 77 improvements could be either a separate construction stage or part of the I-494 improvements.

Because the construction of Stage I improvements is all that is currently being proposed and because the impacts of the first stage construction differ from the impacts of the ultimate improvements (Alternative 1), Stage I construction

has been defined as a sub-alternative (1A) to document the impacts of the first stage construction. Year 1995 traffic forecasts were used for the design of the Stage I improvements, since additional roadway improvements would be required on I-494 and TH 77 outside the project area to serve traffic demand after 1995.

3.2.3 Alternative 2: Year 2005 Development with No Roadway Improvements and No Travel Demand Management (No-Build Alternative)

Alternative 2 assumes that all of the development forecast for the Airport South District occurs, but no regional service improvements are made to the nearby sections of TH 77 and I-494 and no travel demand management measures are implemented. The year 2005 development includes the proposed Mall of America and Fantasyworld (or traffic equivalent) on the former Metropolitan Stadium site.

3.2.4 Alternative 3: Year 2005 Development with Travel Demand Management Only (TDM Alternative)

Alternative 3 assumes the year 2005 development in the Airport South District including the proposed Mall of America and Fantasyworld (or traffic equivalent) on the former Metropolitan Stadium site. There would be no regional service improvements to nearby sections of TH 77 and I-494 other than those associated with travel demand management measures. The TDM assumptions would be those stated in Table 3-2.

This alternative fulfills the federal requirement for a transportation system management alternative, which can be cost-effective and environmentally sensitive.

4.0

Affected Environment

4.0 AFFECTED ENVIRONMENT

4.1 SOCIAL AND ECONOMIC ENVIRONMENT

4.1.1 Regional Population and Households

Table 4.1.A indicates the population and number of households in the Twin Cities metropolitan area for the years 1980, 1990, and 2000. Population is expected to grow by nearly ten percent, and households by approximately eighteen percent, during the 1980's. Between 1990 and 2000, the regional population is expected to increase another five percent and households eight percent.

TABLE 4.1.A
FORECAST OF METROPOLITAN AREA POPULATION
AND HOUSEHOLD GROWTH, 1980-2000

YEAR	POPULATION	HOUSEHOLDS
1980	1,985,000	721,444
1990	2,180,000	850,000
% Change 1980-1990	9.8	17.8
2000	2,290,000	920,000
% Change 1990-2000	5.0	8.2

Source: Draft Metropolitan Development and Investment Framework, Metropolitan Council of the Twin Cities, October, 1985.

Fifty-six percent of the 1980-2000 Metro Area population growth is forecast to occur in Hennepin and Dakota Counties (Table 4.1.B). The proposed highway improvement project is located in southeastern Hennepin County. Dakota County is

situated just south of the Minnesota River, approximately two miles from the project area, as illustrated by Figure 2.1.A.

TABLE 4.1.B
FORECAST POPULATION GROWTH BY COUNTY, 1980-2000

COUNTY	1980	1990	2000	CHANGE 1980-2000	% CHANGE 1980-2000
Anoka	196,107	235,000	252,000	55,893	28.5
Carver	37,054	43,000	46,000	8,946	24.1
Dakota	194,295	244,000	275,000	80,705	41.5
Hennepin	941,403	999,000	1,032,000	90,597	9.6
Ramsey	459,685	469,000	475,000	15,315	3.3
Scott	43,784	58,000	65,000	21,216	48.4
Washington	113,545	136,000	147,000	33,455	29.4

Source: Draft Metropolitan Development and Investment Framework, Metropolitan Council of the Twin Cities Area, October, 1985.

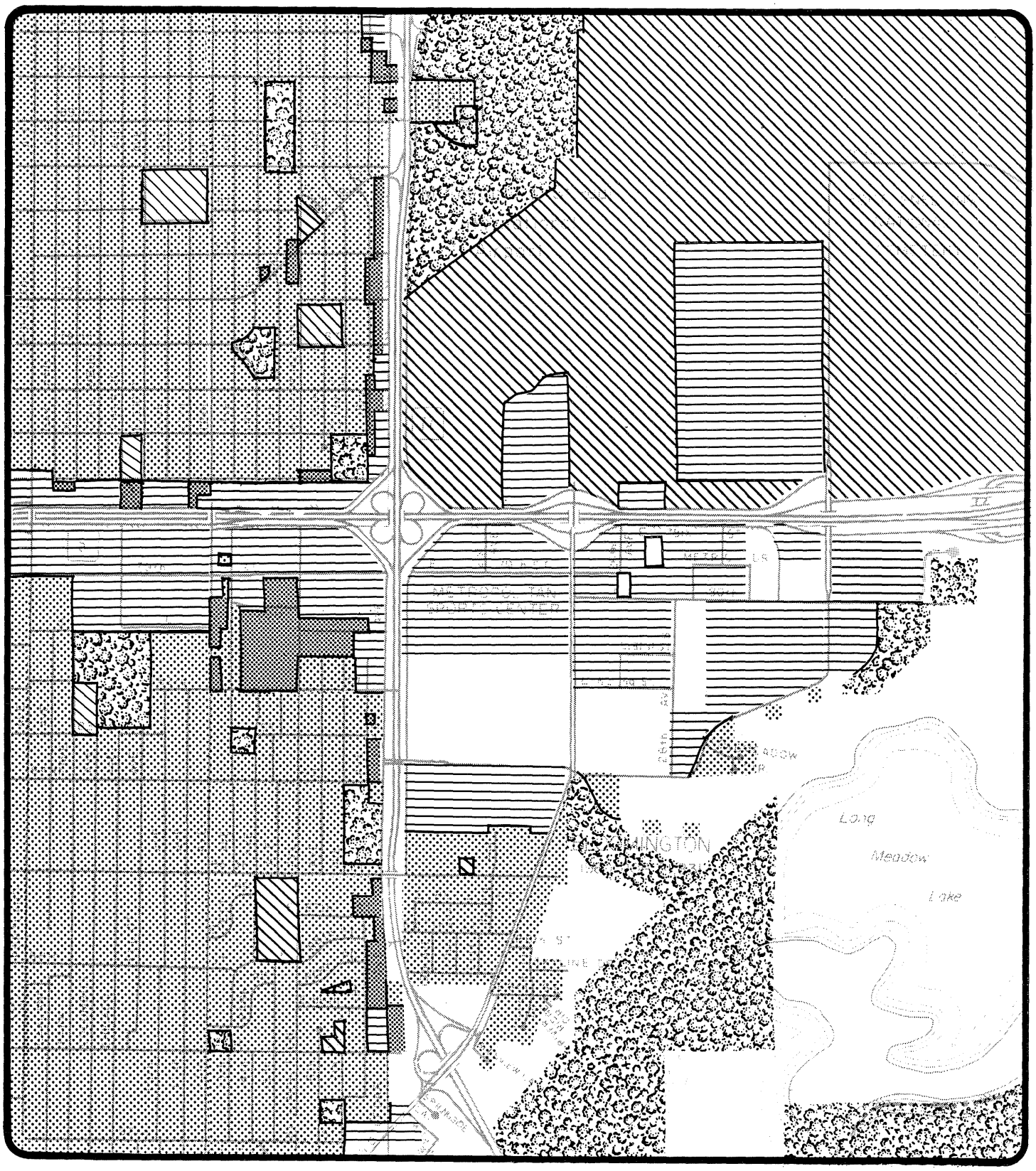
4.1.2 Project Area Neighborhoods

The subject segments of TH 77 and I-494 are located adjacent to or near several residential areas, as illustrated by Figure 4.1.A, Existing Land Use. These residential neighborhoods in the Cities of Richfield (north of I-494, primarily west of TH 77) and Bloomington (south of I-494) are composed principally of low-density, detached housing with a small amount of high-density housing along TH 77. These neighborhoods are nearly fully developed and experienced most of their growth in the 1950's (Richfield) and 1960's (Bloomington).

Selected social and economic characteristics of these neighborhoods from the 1980 U.S. Census are presented in Table 4.1.C. Figure 4.1.B identifies the census tracts referenced in Table 4.1.C.

4.1.3 Public Services and Facilities

The major public utilities are shown on Figure 4.1.C and are described below.



T.H. 77/I-494 IMPROVEMENT PROJECT

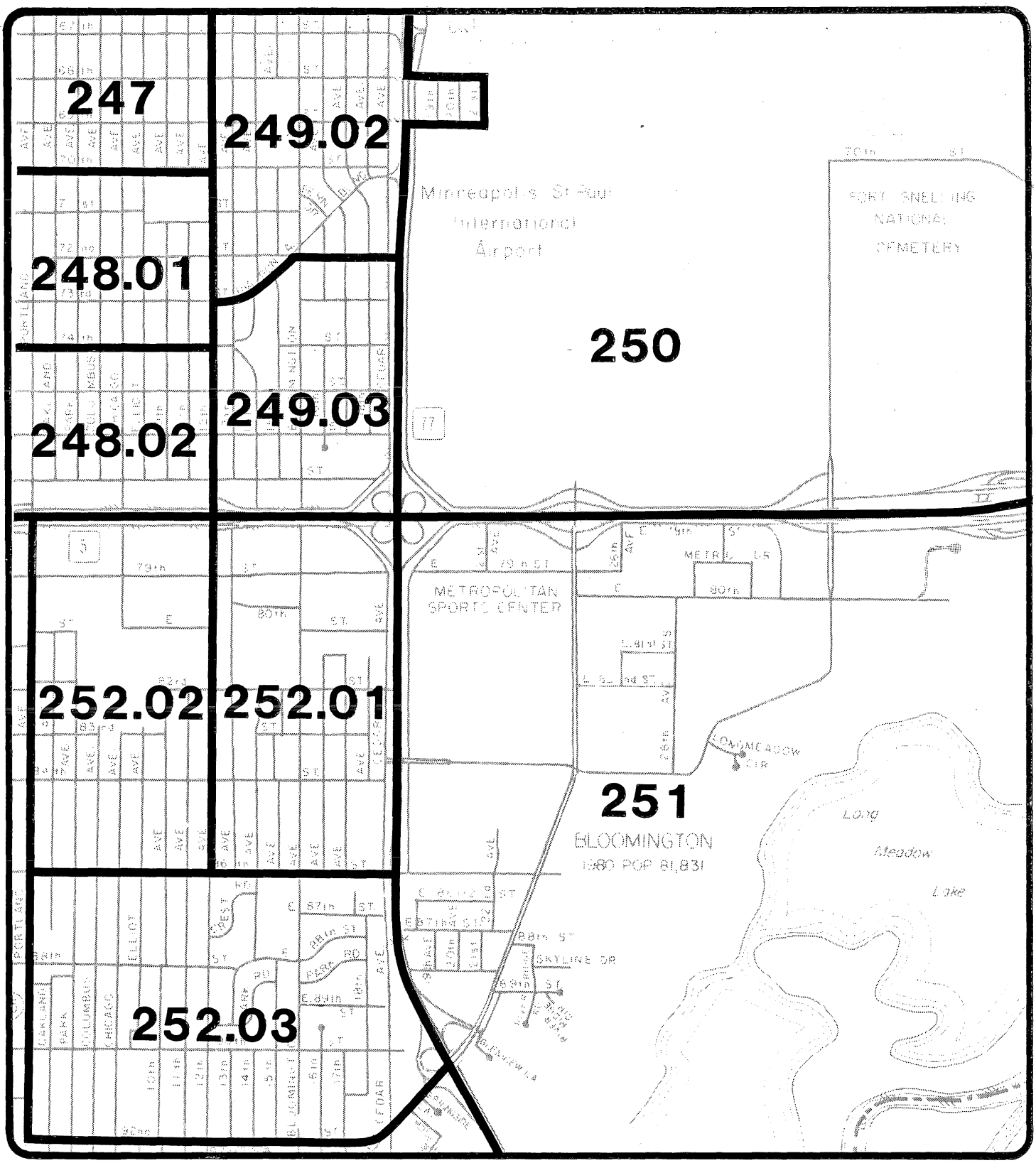
FIGURE 4.1.A
Existing Land Use

- Low Density Res.
- High Density Res.
- Commercial/Industrial
- Parks
- Other Public
- Undeveloped

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0' 2,000'

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T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 4.1.B

Project Area Census Tracts

N

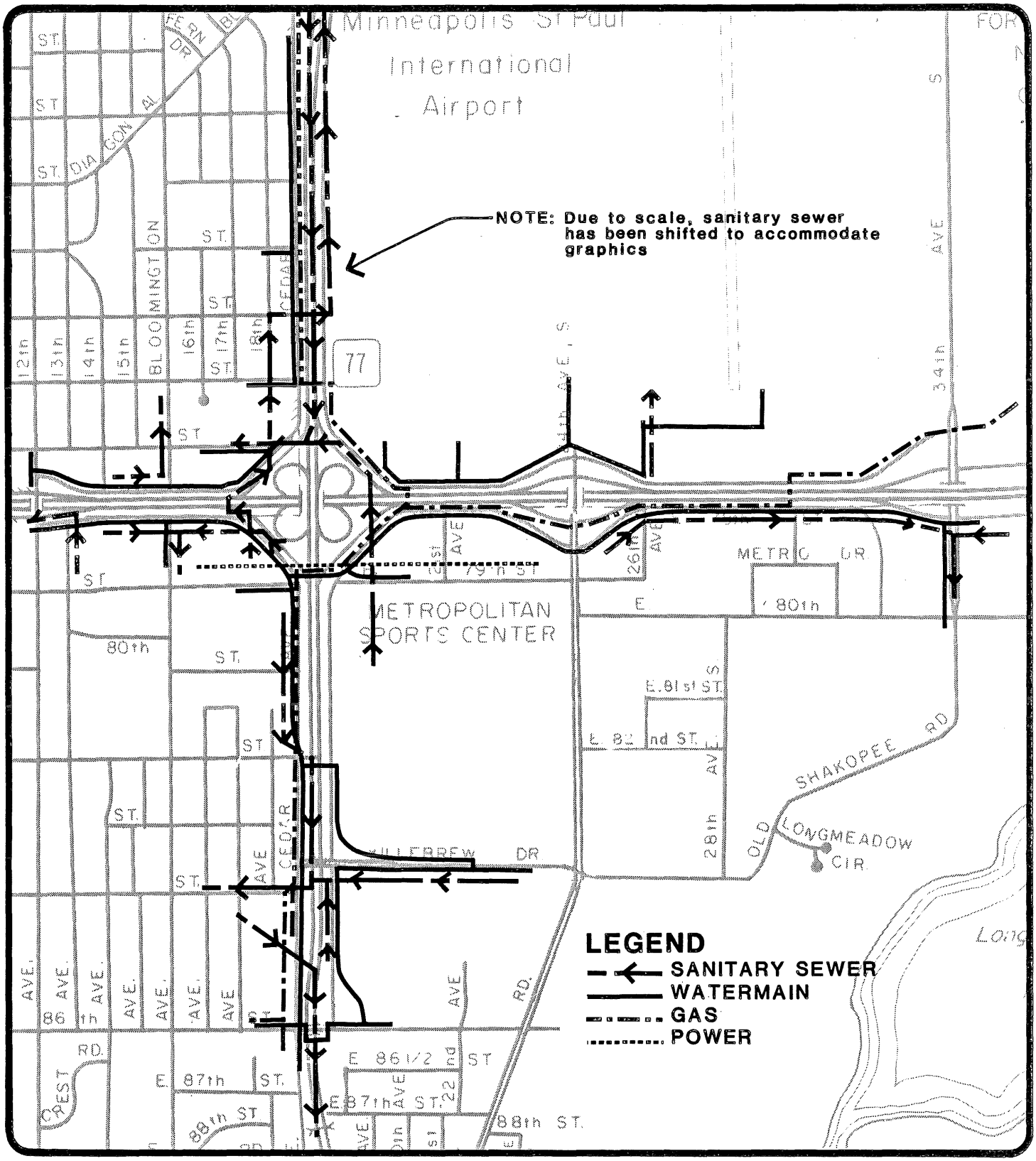
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TABLE 4.1.C
SOCIAL AND ECONOMIC CHARACTERISTICS OF NEARBY NEIGHBORHOODS

CHARACTERISTIC	TRACT 249.01	TRACT 249.02	TRACT 249.03	TRACT 251	TRACT 252.01	TRACT 252.03
1. Population	2487	2635	2272	2097	2551	2407
2. Non-White Persons (%)	3.6	1.7	5.6	.04	6.3	6.3
3. Number of Households	916	970	850	1116	909	997
4. Number of Families	705	765	599	393	666	634
5. Average Household Income	$21897	$24338	$22972	$23082	$21446	$21575
6. Average Family Income	$23692	$26852	$26208	$28612	$22740	$25094
7. Households Below Poverty Level (%)	4.3	2.1	3.2	5.7	2.3	3.2
8. Persons Unemployed 15+ Weeks	48	14	40	65	59	66
9. Housing Units	150	965	885	1146	947	1031
10. Average Number Persons/Unit	2.67	2.73	2.56	1.82	2.69	2.33
11. Detached Units	737	778	486	247	444	531
12. Units in 5+ Unit Building	145	165	347	832	270	386
13. Number Rental Units	367	497	712	1392	1208	388
14. Median Rent	$267	$254	$308	$329	$347	$332
15. Households Paying 35+ % of Income in Rent (%)	4.7	3.1	13.2	16.4	15.6	11.4

Source: 1980 U.S.Census of Population and Housing, Summary Tape File 3.



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 4.1.C

Major Public Utilities in the Project Area

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4.1.3.1 Water Distribution

All properties in the project area are served by the municipal water systems of Richfield, Bloomington, and the Metropolitan Airports Commission. A Richfield water line runs under TH 77 at 69th Street and a Bloomington line crosses TH 77 at 79th, 82nd and 86th Streets. There are water lines under all frontage roads except those along the former Metropolitan Stadium site and Rich Acres Golf Course. There are no water wells, storage and pressure towers, or other special water system facilities in the project area.

4.1.3.2 Sanitary Sewer

All land parcels in the project area are served by the sanitary sewer systems of Richfield, Bloomington, and the Metropolitan Airports Commission. There are sewer lines which cross TH 77 at Diagonal Boulevard, 77th Street, and Killebrew Drive. An eighteen-inch line runs from the former site of the Metropolitan Stadium under I-494 and TH 77 to Richfield. There is a lift station in Richfield at 74th Street and 14th Avenue and another in Bloomington at 84th Street and 17th Avenue. A pair of force mains owned by the Metropolitan Waste Control Commission (MWCC) extend from the latter lift station and cross under I-494 into Richfield at 16th Avenue. Finally, there is a 36-inch gravity line which runs from that lift station across the north end of Wright's Pond, then south along TH 77.

4.1.3.3 Surface Water Drainage

The surface water drainage system is described under Section 4.2.6, Water Resources.

4.1.3.4 Natural Gas

A 20-inch high-pressure natural gas feeder main (20-inch north of 76th Street, 16-inch south of 76th) runs through the project area under the west frontage road of TH 77, except in the vicinity of the TH 77/I-494 interchange where it is located on the east side of TH 77. A 10-inch gas main ties into the 16-inch main near the I-494/TH 77 interchange. It runs east along the south side of 494 to Metro Parkway, where it crosses to the north side. Smaller gas lines are located under several frontage roads.

4.1.3.5 Police and Fire Services

Police and fire services are provided by the two municipalities and the Metropolitan Airports Commission. The only station in the project area is the Bloomington Fire Station #3,

located at 86th Street and 20th Avenue. The nearest Richfield fire station is located at 6700 Portland Avenue, approximately two miles from TH 77. Bloomington operates a volunteer fire department while Richfield has a full-time squad.

4.1.3.6 Schools

Public educational services are provided in the project area by Richfield Public Schools (District #280) and Bloomington Public Schools (District #271). The only elementary school in the project area is Centennial Elementary at 74th Street and Bloomington Avenue in Richfield. The nearest Bloomington school is Northgate Elementary at 82nd Street and Park Avenue, approximately 1.3 miles southwest of the TH 77/I-494 interchange.

4.1.4 Economic Conditions

The TH 77 - I-494 project area is in a major regional concentration of retail and service businesses and industry. Most of this commercial activity exists or will be expanded in the City of Bloomington, particularly in the Airport South District, which is bounded by I-494, TH 77, and the Minnesota River. The types of activities anticipated for this location in the Bloomington Comprehensive Plan are the following:

- Development of the former Metropolitan Stadium site and adjacent land as a high-intensity, mixed-use area. The actual development plan for this site involves the Mall of America and Fantasyworld, a 9,500,000 square foot retail, entertainment, hotel, office and residential complex.

- Development of the areas adjacent to the interchanges of TH 77 and I-494 with service-oriented mixed-use businesses. Activities in these locations would be less diverse and of a smaller scale than the high-intensity areas.

- Development of a sizable portion of the remaining Airport South District as employment-oriented mixed-use areas. Businesses in these locales would be primarily offices; research and development or manufacturing would be clearly subordinate.

- Development of the Minnesota Valley National Wildlife Refuge Headquarters and Visitors Center plus the addition of approximately 1,400 acres for wildlife habitat in the Minnesota River Valley.

A summary of the development potential of Bloomington's Airport South District is presented in Table 4.1.D.

TABLE 4.1.D
EXISTING AND ANTICIPATED DEVELOPMENT IN THE AIRPORT SOUTH DISTRICT

LAND DEVELOPMENT	EXISTING 1985	ANTICIPATED 1985-2005	TOTAL 2005
Office and Retail Space (1,000's of square feet)	3,937	7,517	11,454
Hotel Rooms	2,898	4,265	7,163
Housing Units	1,120	2,200	3,320

Source: City of Bloomington Planning Division, September, 1985.

The City of Richfield Comprehensive Plan would allow the continuation and enhancement of commercial activity along the TH 77 and I-494 frontage roads. However, this would amount to only a relatively small additional amount of activity compared to the Bloomington potential.

The Metropolitan Airports Commission plans for the continuation of the airline maintenance facilities and the Metropolitan Transit Commission garage on its property along the north side of I-494 east of TH 77, and plans to expand the air cargo businesses in this area.

4.1.5 Land Use Planning and Zoning

4.1.5.1 Existing Land Use

The subject sections of TH 77 and I-494 are bordered by a variety of land uses as illustrated by Figure 4-1, Existing Land Use. The northwest quadrant (north of I-494, west of TH 77) consists of the City of Richfield and contains principally low-density residential development. However, immediately bordering the west side of TH 77 are a number of three-story apartment buildings, and immediately north of I-494 are several retail and industrial businesses. Washington Park is located just northwest of the TH 77 - I-494 interchange.

The southwest quadrant is also dominated by low-density housing. However, commercial and office development exists

southwest of the interchange of the two highways, high-density housing along the west side of TH 77, and high-density housing south of the business-office area. Wright's Pond Park is adjacent to TH 77 between 84th and 86th Streets.

The northeast quadrant is dominated by the Minneapolis-St. Paul International Airport. The Rich Acres Golf Course and Rich Acres Park are on airport land leased by the City of Richfield from the Metropolitan Airports Commission. Along the north side of I-494 are the MTC bus garage, an air cargo business, a medical clinic, and the Republic and Northwest Airlines hangars and air cargo operations. Fort Snelling National Cemetary is located east of 34th Avenue between I-494 and 70th Street. Additionally, there are two small enclaves of single-family housing along TH 77.

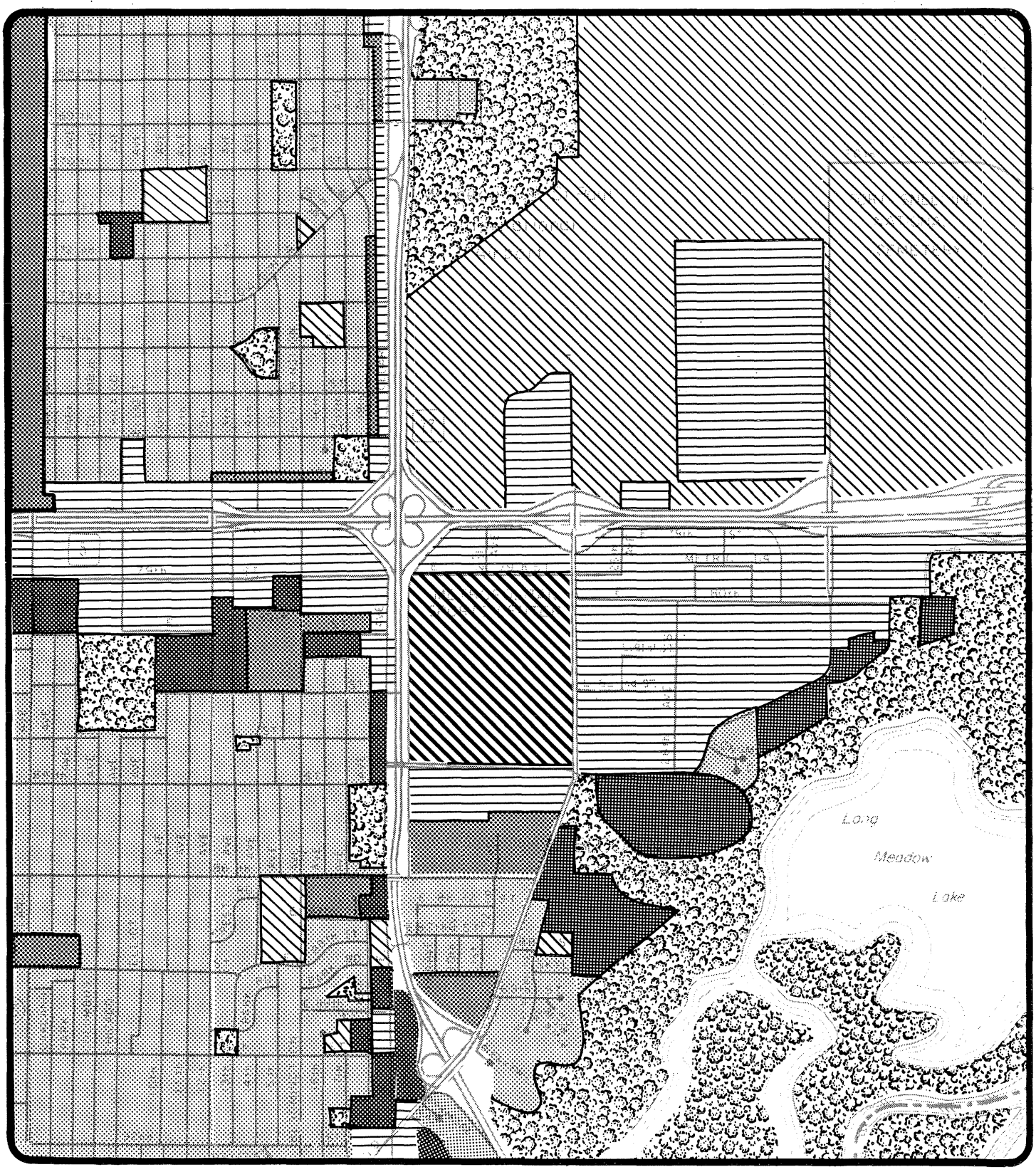
The southeast quadrant is the most heavily commercial of the four. This area, known as the Airport South District, contained 3.9 million square feet of office and retail space, 2,600 hotel rooms, and 1,120 housing units in 1985. Also included is the former site of Metropolitan Stadium, an eighty-acre site which is the location of the proposed Mall of America and Fantasyworld. Just east of that site is an undeveloped forty-acre tract which is also proposed to be occupied by the Mall of America and Fantasyworld. The Minesota Valley National Wildlife Refuge and other open space exists below the river bluffs.

4.1.5.2 Planned Land Use and Zoning

There are very few major changes in land use planned in the project area. The land use plans of the two municipalities and the Metropolitan Airports Commission, shown by Figure 4.1.D, Planned Land Use, reflect the existing pattern very closely. The principal alterations would be in the southeast quadrant and include the high-intensity mixed-use development of the former Metropolitan Stadium site and high-density housing on undeveloped land along the river bluffs. The present zoning is consistent with the land use plans of the two communities and includes the designation of the former Metropolitan Stadium site for high-density mixed use development. The Minnesota Valley National Wildlife Refuge plans to expand and improve its land holdings in the river valley.

4.1.5.3 Regional Land Use Plans

The 1978 Development Framework of the Twin Cities Metropolitan Council designated the project area as part of the Fully Developed Policy Area. Those policies supported the enlargement of commercial and residential investment and



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FIGURE 4.1.D
Planned Land Use

- Low Density Res.
- Medium Density Res.
- High Density Res.
- Commercial/Industrial
- High Density Mixed
- Park
- Other Public

N

0' 2,000'

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job creation in this location in conjunction with adequate highway and transit planning. Public investments which supported the redevelopment of the fully developed area would be given priority.

The 1986 Draft Metropolitan Development and Investment Framework identified this vicinity as one of several Regional Commercial-Industrial Concentrations. Thus, Metropolitan policies would favor the continuation and enhancement of this location as a major regional business concentration; highways and transit service should be provided at a level sufficient to continue this area's growth; local commitments to develop support roads and undertake transportation system management techniques would be required; and increased sewer capacity to serve development and redevelopment would be given priority.

4.2 PHYSICAL ENVIRONMENT

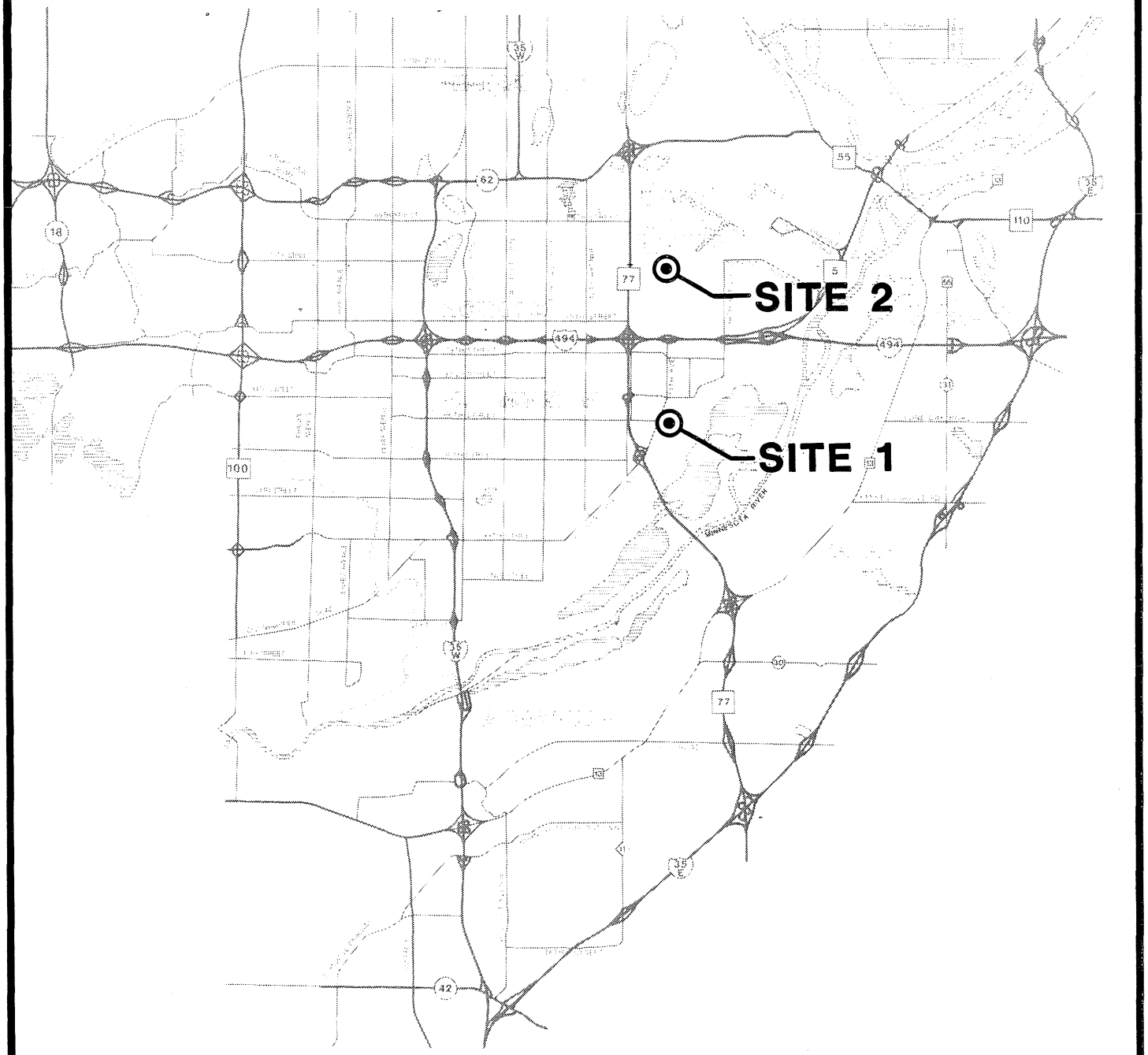
4.2.1 Air Quality

A fifteen square mile area along Snelling and University Avenues is designated as a non-attainment area for carbon monoxide (CO). Portions of the seven-county area are also designated non-attainment for total suspended particulates (TSP). There is no known major point source of air pollution within the project area.

No violations of the state or federal ambient air quality standards for CO have been monitored in the project area. CO monitoring was conducted at two sites in the project area in November, 1982. The purpose of this monitoring was to determine ambient background CO concentrations to be used in the air quality analyses of the Airport South District. The monitoring sites are shown in Figure 4.2.A. Site 1 was located at the Control Data Corporation facility at 88th Street and River Ridge Road. Site 2 was located on the Rich Acres Golf Course on the west side of TH 77 north of I-494. The maximum monitored concentrations at these sites are shown below (Table 4.2.A).

TABLE 4.2.A
MAXIMUM MONITORED CO CONCENTRATIONS (PPM), November, 1982

	SITE 1	SITE 2
Maximum 1-Hour Concentration (PPM)	7.0	7.2
Maximum 8-Hour Concentration (PPM)	3.7	5.8



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FIGURE 4.2.A

Carbon Monoxide Monitoring Sites

⊙ SITE 1 – CONTROL DATA

⊙ SITE 2 – RICH ACRES GOLF COURSE

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0' 12,000'

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These CO concentrations are mainly a product of motor vehicle activity in the metropolitan area but are also influenced by the proximity of the Minneapolis-St. Paul International Airport and CO emissions from aircraft operations. The monitoring sites were purposely located as far from the major roadways in the study area as possible to minimize the effects of the local CO sources, consistent with the purpose of determining background CO concentrations.

4.2.2 Noise

4.2.2.1 Introduction

This section describes the existing noise environment in both the TH 77/I-494 project area and the transportation analysis area. The general methodology followed to determine noise impacts of the roadway improvements includes:

- Identify noise sensitive receiver sites affected by the roadways.
- Determine existing noise levels at the noise sensitive receivers.
- Predict future levels with projected volumes on the proposed roadway alignments.
- Compare existing and future noise levels at noise sensitive receivers to determine changes in levels.
- Compare future levels to state noise standards and federal noise abatement criteria for various uses in the study area.

Existing noise levels are included in Section 5.3 where the comparisons are presented.

Analysis of the noise impact of the project was conducted on two levels. The noise level contour representing L_{10} 70 dBA is located in the transportation analysis area. In the project area, noise levels are presented at specific noise sensitive locations.

4.2.2.2 Noise Standards and Criteria

Traffic noise impacts are assessed by comparing predicted traffic noise levels to state noise standards, federal noise abatement criteria, and existing noise levels. A noise impact occurs when the standards or criteria are exceeded or when predicted traffic noise levels substantially exceed existing noise levels.

The state noise standards[1/] specify noise level limits for various land use classifications. The following table documents the state noise standards for both daytime (7 AM - 10 PM) and nighttime (10 PM - 7 AM) conditions.

TABLE 4.2.B
STATE NOISE STANDARDS

NOISE AREA CLASSIFICATION	GENERAL LAND USE TYPE	SOUND LEVEL (dBA) DAY (0700-2200) L_{50}	DAY (0700-2200) L_{10}	NIGHT (2200-0700) L_{50}	NIGHT (2200-0700) L_{10}
1	Residential	60	65	50	55
2	Commercial	65	70	65	70
3	Industrial	75	80	75	80

The standards for Noise Area Classification (NAC)-1 apply to residential areas and other uses intended for overnight sleeping (hotels, motels, mobile homes). The NAC-1 standards also apply to schools, churches, medical services and picnic areas. The nighttime standards are only applicable in areas intended for overnight sleeping. The NAC-1 daytime standards apply during nighttime hours at other NAC-1 uses not intended for overnight sleeping. The NAC-2 standards are applicable to certain NAC-1 land uses if the following criteria are met:

- o The building noise attenuation is at least 30 dBA.
- o The building has year-around indoor climate control.
- o The building has no facilities for outdoor activities.

It should be noted that the state noise standards are for a one-hour period and apply in outdoor areas.

Table 4.2.C shows the Federal Noise Abatement Criteria.[2/] As shown in the table, the criteria are in terms of the L_{eq} and the L_{10} hourly noise descriptors. For this analysis, the L_{10} descriptor has been used to identify impacts. The criteria for activity category E are in terms of interior noise levels and are applied where there are no exterior activities to be affected by the traffic noise. All other criteria are in terms of exterior noise levels.

4.2.2.3 Existing Environment

In order to accurately analyze the noise impacts the proposed roadway improvements will have on the surrounding land

TABLE 4.2.C
FEDERAL NOISE ABATEMENT CRITERIA

HOURLY A-WEIGHTED SOUND LEVEL - DECIBELS (dBA) 1/

ACTIVITY CATEGORY	L_{eq} (h)	L_{10}(h)	DESCRIPTION OF ACTIVITY CATEGORY
A	57 (Exterior)	60 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	70 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	75 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	--	Undeveloped lands.
E	52 (Interior)	55 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

1/ Either L_{10}(h) or L_{eq} (h) (but not both) may be used on a project.

uses, an inventory of current conditions has been completed. While this analysis addresses only roadway related noise, it should be noted that the majority of the project area and much of the transportation analysis area is impacted by aircraft noise from the Minneapolis-St. Paul International Airport. The noise exposure zones shown in Figure 4.2.B. reflect current and future airport operations.[3] In general, noise impacts from the airport decrease from north to south on TH 77, while on I-494 the impacts extend in both the east and west directions. The majority of the project area falls within Zones 1 and 2. The four noise exposure zones are described as follows:

- Zone 1 - Noise exposure in this area is considered severe and permanent. The area is affected by both takeoffs and landings.

- Zone 2 - Noise exposure is considered to be serious and generally sustained. The area is affected by takeoffs and, by a slightly lesser degree, landings.

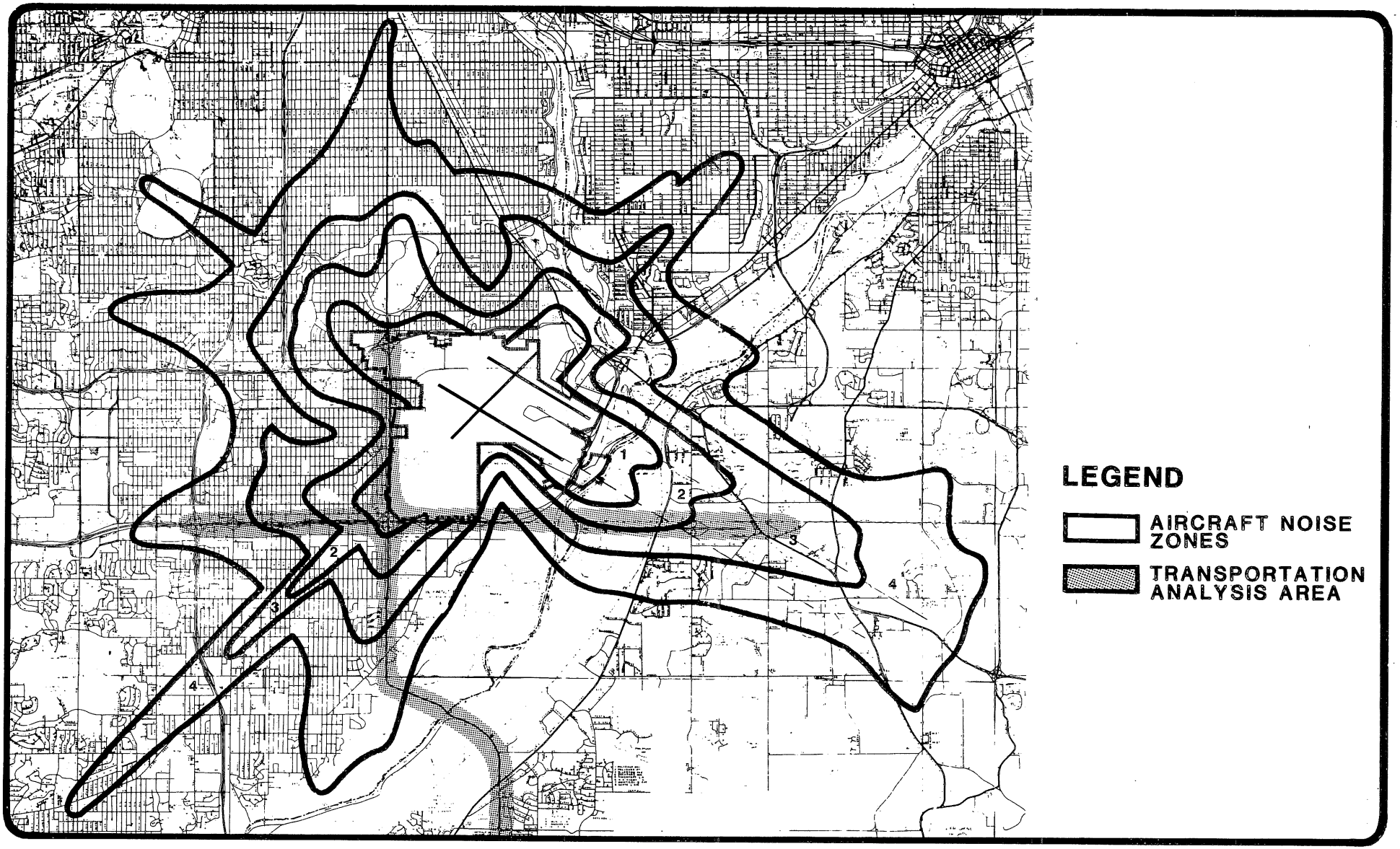
- Zone 3 - The intensity of aircraft noise within this area is significant and generally sustained.

- Zone 4 - Aircraft noise exposure is moderate. Noise is related mainly to takeoffs.

4.2.2.4 Noise Sensitive Receivers

A total of 28 noise sensitive receivers were located in the project area. Most of these receivers, shown in Figures 5.3.A to 5.3.C and 5.3.K, in Section 5.3, were located in the single and multi-family residential areas adjacent to the west side of TH 77 between CSAH 62 and Old Shakopee Road. As shown in Figure 4.1.A in the land use section of this document, most of the area east of TH 77 and adjacent to I-494 is developed as commercial or industrial uses. Because most activities associated with these commercial and industrial uses occur indoors, they are less susceptible than residential uses to the effects of roadway noise. Table 4.2.D, documents the land use at each receiver site chosen in the study area and the applicable state noise standards and federal noise abatement criteria.

It should be noted that the state NAC-2 standards most likely apply in lieu of the NAC-1 standards at the hotel sites analyzed (receivers N23, N24, N26, N27). These hotels have climate control and do not have facilities for outdoor activities. No measurements have been conducted to determine the building noise attenuation, although due to the proximity of the Minneapolis-St. Paul International Airport it is likely that the building attenuation criterion is also



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FIGURE 4.2.B

Aircraft Noise Zones
Minneapolis-St. Paul International Airport

Source: Metropolitan Council Guidelines for Land Use Compatibility with Aircraft Noise, March 1983.

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met. Thus, it is assumed that the NAC-2 standards are applicable at these receivers. Similarly due to the lack of exterior activities, the Federal Noise Abatement Criteria for activity category E which are in terms of interior noise levels are applicable at these receivers. However, interior noise levels could not be predicted due to lack of measurements of building noise attenuation.

Existing noise levels at receivers in the project area were determined using the methodology described in Section 5.3. Estimated existing traffic noise levels are documented in Section 5.3.1. At all receivers modeled, the state nighttime standards are exceeded in the existing condition by at least 9 dBA. The maximum exceedance occurs at Receiver N19 (16.7 dBA).

Noise monitoring was done at the N19 site, south of I-494 along TH 77. Because airport noise will affect existing and future noise levels at sensitive receivers in the project area, levels attributable to roadway sources have been determined through modeling. Monitoring was completed only for the purpose of comparison to predicted levels. Table 4.2.E, documents the levels monitored and predicted at receiver N19.

TABLE 4.2.E
COMPARISON OF MONITORED AND MODELED L_{10} LEVELS

SITE	TIME	MONITORED	MODELED
N19	Day	70, 72	74.3
N19	Night	72	71.7

The modeled and monitored levels are relatively close for both the nighttime and daytime levels. Modeled daytime level is likely the result of higher overall traffic volumes and higher truck traffic assumed in the model. The monitored hours of 1240-1340 and 1410-1510 would be expected to have less traffic than the modeled hour representing the peak traffic hour of 1600-1700. This comparison of monitored to modeled values indicates the accuracy to which the noise model represents actual levels.

4.2.3 Park and Recreation Areas

There are eight public parks or recreation areas adjacent to or near the project area. Each is described below and located on Figure 4.2.C, Park and Recreation Areas. In addition to the park areas described below, Fort Snelling

TABLE 4.2.D

NOISE SENSITIVE RECEIVER SITES

Receiver	Land Use	Federal L10 Criteria (Exterior)	State Noise Standards			
			Day		Night	
			L10	L50	L10	L50
N1	Res.	70.0	65.0	60.0	55.0	50.0
N2	Res.	70.0	65.0	60.0	55.0	50.0
N3	Res.	70.0	65.0	60.0	55.0	50.0
N4	Res.	70.0	65.0	60.0	55.0	50.0
N5	Res.	70.0	65.0	60.0	55.0	50.0
N6	Res.	70.0	65.0	60.0	55.0	50.0
N7	Res.	70.0	65.0	60.0	55.0	50.0
N8	Res.	70.0	65.0	60.0	55.0	50.0
N9	Res.	70.0	65.0	60.0	55.0	50.0
N10	Res.	70.0	65.0	60.0	55.0	50.0
N11	Res.	70.0	65.0	60.0	55.0	50.0
N12	Golf	70.0	65.0	60.0	55.0	50.0
N13	Comm.	75.0	70.0	65.0	70.0	65.0
N14	Comm.	75.0	70.0	65.0	70.0	65.0
N15	Comm.	75.0	70.0	65.0	70.0	65.0
N16	Res.	70.0	65.0	60.0	55.0	50.0
N17	Res.	70.0	65.0	60.0	55.0	50.0
N18	Res.	70.0	65.0	60.0	55.0	50.0
N19	Res.	70.0	65.0	60.0	55.0	50.0
N20	Res.	70.0	65.0	60.0	55.0	50.0
N21	Res.	70.0	65.0	60.0	55.0	50.0
N22	Res.	70.0	65.0	60.0	55.0	50.0
N23	Hotel	70.0 **	70.0	65.0	70.0	65.0
N24	Hotel	70.0 **	70.0	65.0	70.0	65.0
N25	MIC	75.0	70.0	65.0	70.0	65.0
N26	Hotel	70.0 **	70.0	65.0	70.0	65.0
N27	Hotel	70.0 **	70.0	65.0	70.0	65.0
N28	Clinic	70.0	65.0	60.0	55.0	50.0

Note: * - No Level Determined

** - Due to a Lack of Exterior Acitivities, the L10 55 dBA Interior Criterion Applies Interior Noise Levels have not been Predicted.

State Park is located approximately 2.5 miles east of the project area, in the Minnesota River Valley near Fort Snelling National Cemetery and the airport.

4.2.3.1 Wright's Pond Park

Wright's Pond Park is located immediately west of TH 77 and just south of 84th Street in Bloomington. This neighborhood-scale park is 13.5 acres in size and contains baseball fields, two tennis courts, a picnic shelter, children's play equipment, open play area, and a pond.

4.2.3.2 Washington Park

Washington Park, owned and maintained by the City of Richfield, is located south of E. 76th Street between 17th and 18th Avenue (just northwest of the interchange of TH 77 and I-494). This neighborhood park is seven acres in size and contains tennis courts, softball fields, a basketball court, children's play equipment, and an ice skating area.

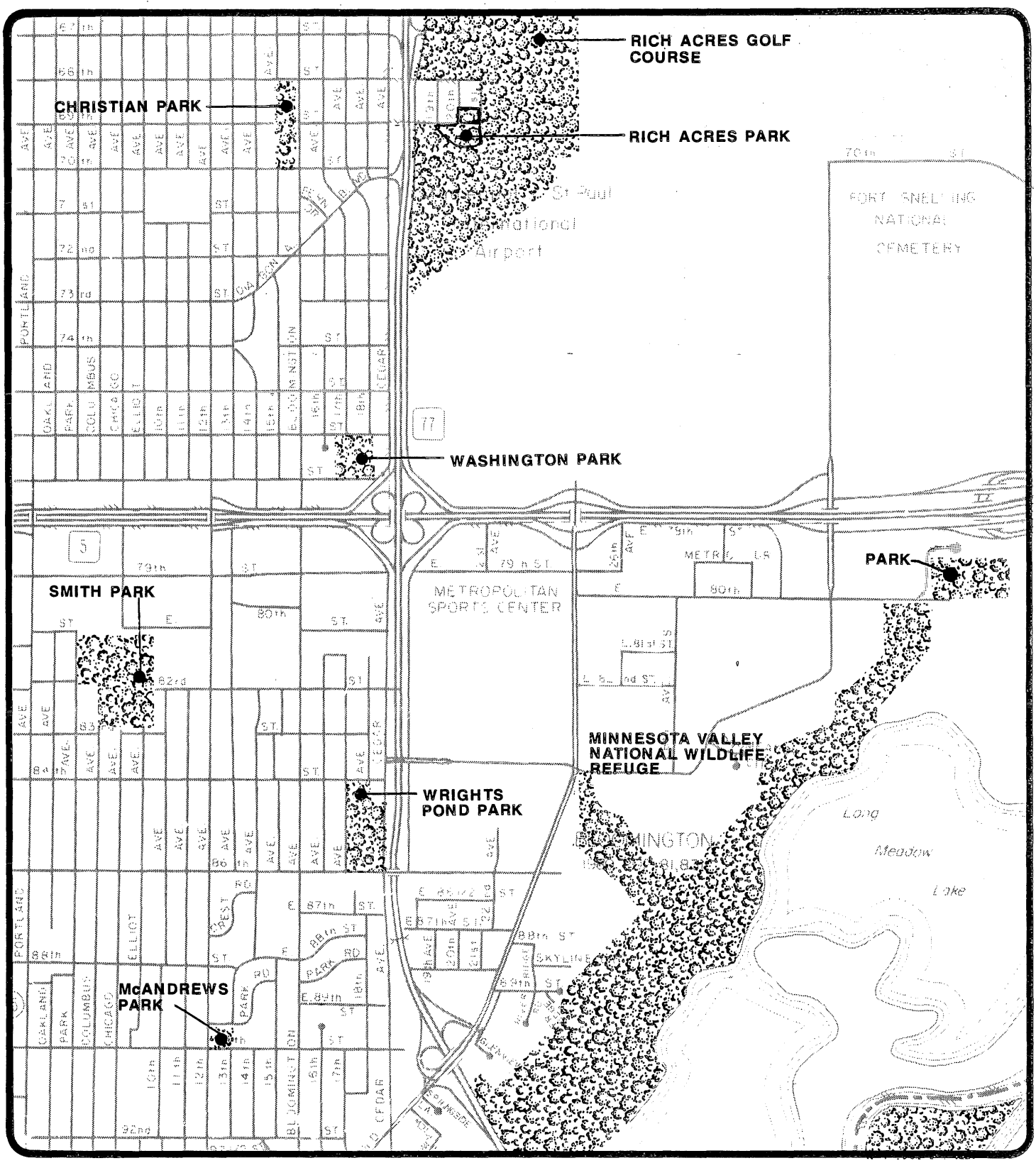
4.2.3.3 Rich Acres Golf Course

The Rich Acres Golf Course is located immediately east of TH 77 between 69th Street and the Metropolitan Transit Commisssion bus garage northeast of the TH 77 and I-494 interchange. The golf course was developed on land owned and used as a noise buffer by the Metropolitan Airports Commission. The land is leased to the City of Richfield for use as a municipal golf course, unless or until it is required for airport purposes due to changes in the airport master plan or changes in clearance and approach requirements. The property includes an eighteen-hole course, a nine-hole par-three course, a clubhouse, parking lot, driving range, maintenance building, tree nursery, community gardens, and ten ballfields. Access is via a driveway which extends from 69th Street near 21st Avenue.

The complex was built in 1979 and since that time has experienced very heavy usage. In 1984, there were approximately 50,000 rounds of golf played on the eighteen-hole course and 25,000 rounds played on the par-three course. In addition, the driving range registered the second-highest revenue in the Twin Cities.

4.2.3.4 Rich Acres Park

This two-acre park is situated on both sides of 68th Street between 20th and 21st Avenues, adjacent to the golf course. Rich Acres functions as a neighborhood park for a portion of



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FIGURE 4.2.C
Park and Recreation Areas

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0' 2,000'

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Richfield located east of TH 77. It includes a softball field, half-court basketball court, ice skating area, sliding hill, wooden play structure, asphalt path, and ponding area.

4.2.3.5 Christian Park

Christian Park is located between 68th and 70th Streets and Bloomington and 15th Avenues in the City of Richfield. It functions as a neighborhood playground and contains childrens' play equipment, ball fields, and open area on six acres of land.

4.2.3.6 Smith Park

Smith Park, located at 82nd Street and Park Avenue, is twenty-five acres in size including a seven acre pond. This neighborhood playground contains area for field sports plus play equipment.

4.2.3.7 McAndrews Park

This is a two-acre playlot located at 90th Street and 12th Avenue.

4.2.3.8 Minnesota Valley National Wildlife Refuge and Recreation Area

Land for a National Wildlife Refuge is being assembled by the U.S. Fish and Wildlife Service and the Minnesota Department of Natural Resources almost exclusively below the Minnesota River bluffs. Currently in place are a headquarters building near the eastern terminus of 80th Street, several interpretive displays, parking areas, and several hiking trails around Long Meadow Lake. None of the existing or planned refuge is adjacent to the project area; the closest parcel is approximately 2,400 feet (one-half mile) away and includes the refuge headquarters and the site of the planned interpretive center. The refuge is planned to eventually include approximately 24,000 acres of land, stretching 72 miles from Fort Snelling to LeSueur, Minnesota.

4.2.4 Minneapolis-St. Paul (MSP) International Airport

MSP International Airport, located in the northeast quadrant of the project area, serves all commercial air traffic to the Twin Cities metropolitan area. The airport is bounded on the south by I-494 and TH 5, on the west by TH 77, on the north by CR 62 and on the east by TH 55. Access to the main passenger terminal is located off TH 5 to the south. I-494 and TH 77 are both important regional access routes to the airport. See Figure 4.2.D.

The air cargo terminals are located along both 24th Avenue and 34th Avenue, with access to I-494 via the existing interchanges at 24th Avenue and 34th Avenue. The international charter terminal, Northwest kitchen facilities and former Republic main building and hangar also have access at 34th Avenue.

The Metropolitan Airports Commission (MAC) maintenance and office buildings are located along 28th Avenue just south of CR 62, with access to CR 62 via an interchange at 28th Avenue. Access to this area is also provided off TH 77 at 66th and 63rd Streets. Access to U.S. government property is provided off TH 55 on the east side of the airport.

The airport has three runways. Two of the runways extend from northwest to southeast (11R/29L and 11L/29R) and flank the main passenger terminal building. The other runway (4/22) extends from northeast to southwest.

Both the Federal Aviation Administration (FAA) and Mn/DOT's Aeronautics Division stipulate clearance areas for the air navigation. The FAA's definitions and clearance standards are contained in FAR Part 77, Subpart C. Mn/DOT standards are contained in the Minnesota Rules, Chapter 8800. Standards which apply to this project include the following:

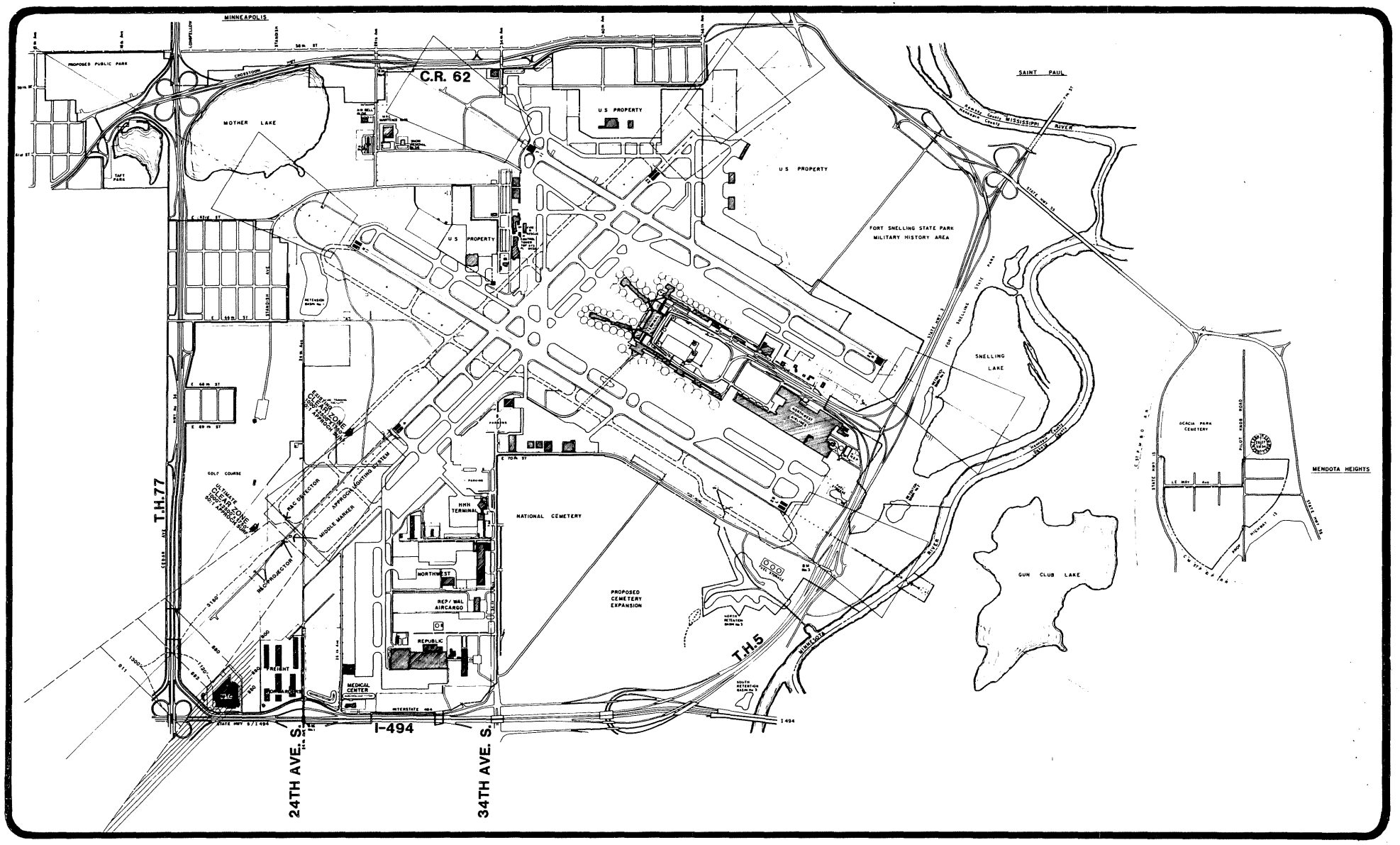
- Clear Zone (FAA) - Imaginary surface on the ground, beginning 200 feet from end of runway. Extends 2,500 feet on a line 500 feet each side of runway center line. Airport owner has control of land within clear zone through ownership or easement.

- Approach Surface (FAA & Mn/DOT) - Imaginary surface longitudinally centered on the extended runway centerline at each end of a runway. Inclines upward and outward at a slope of 50:1 for a horizontal distance of 10,000 feet for precision instrument runways, expanding uniformly to a width of 4,000 feet. Continues upward and outward for an additional horizontal distance of 40,000 feet at a slope of 40:1, expanding to an ultimate width of 16,000 feet.

- Approach Zone (Mn/DOT) - Land directly under an imaginary approach surface defined above.

- Safety Zones (Mn/DOT) - Land use and height restrictions apply.

  A - In the approach zones of a runway, extends outward from the end of the primary surface a distance equal to two-thirds the runway length or planned runway length.



T.H.77/I-494 IMPROVEMENT PROJECT

FIGURE 4.2.D

Airport Layout Plan
Minneapolis–St. Paul International Airport

Source: Metropolitan Airports Commission TKDA

0' 2,600'

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B - In the approach zones of a runway, extends outward from Safety Zone A a distance equal to one-third the runway length or planned runway length.

C - All land enclosed within the perimeter of the horizontal zone (below an imaginary horizontal surface 150 feet above airport reference elevation) which is not included in Zones A and B.

The Metropolitan Airports Commission currently plans to lengthen runway 4/22. This would move the "clear zone" at the southwest end of the runway towards the TH 77/I-494 interchange. The ultimate "clear zone" would overlap a section of TH 77 north of I-494 within the project area. Based on the 50:1 approach surface, the elevation of the clear zone where it overlaps TH 77 is approximately 50 feet above the existing grade on TH 77 (Figure 4.2.D). The TH 77/I-494 interchange is also within a safety zone, restricting structure elevations to less than 100 feet above the airport reference elevation of 830.

In addition to the extension of runway 4/22, the Airports Commission anticipates expansion of the air cargo terminal area on 24th Avenue to the east along 28th Avenue. This is expected to increase traffic demand from the north at the 24th Avenue/I-494 interchange.

4.2.5 Visual Environment

The affected visual environment has been strongly shaped by the existing major roadways. Adjacent sites and land uses have been developed in response to these major urban highways.

4.2.5.1 TH 77 Corridor

The TH 77 roadway has been developed at essentially the same grade as its adjacent land uses. The visual character is somewhat one-sided in that the western land use activities fronting the highway currently have a view across the road toward the open spaces on the highway's east side. The open spaces are composed of a golf course and open areas of large commercial or industrial properties. Generally, medium density three story apartments form the western visual edge of the road, except between 75th and 82nd Street where low-rise office structures predominate.

At the highway's overpass interchange at I-494, longer vistas to and beyond the major commercial destinations are possible. Major front parking areas of the Marriott Hotel are effectively screened from the intersection by shrubbery

screens and lowered parking areas. Beyond this intersection, the grade crossing at Killebrew Drive allows visibility of Howard Johnsons Motor Lodge and adjacent office buildings.

4.2.5.2 I-494 Corridor

Interstate 494 is depressed below grade at its intersections with 12th Avenue, TH 77, 24th Avenue, and 34th Avenue. The road forms a channel of open space at these interchanges with buildings along both frontage roads being able to view across the space. Between these interchanges, the road's vertical alignment returns to grade. East of TH 77, occasional small groves of mature trees and foliage, located predominantly on adjacent property, provide needed visual relief from the concrete surfaces and sod embankments.

4.2.6 Water Resources

The discussion of water resources has been divided into four major categories: surface water hydrology and hydraulics, floodplains, groundwater and water quality. A list of references cited follows Section 4 of this document.

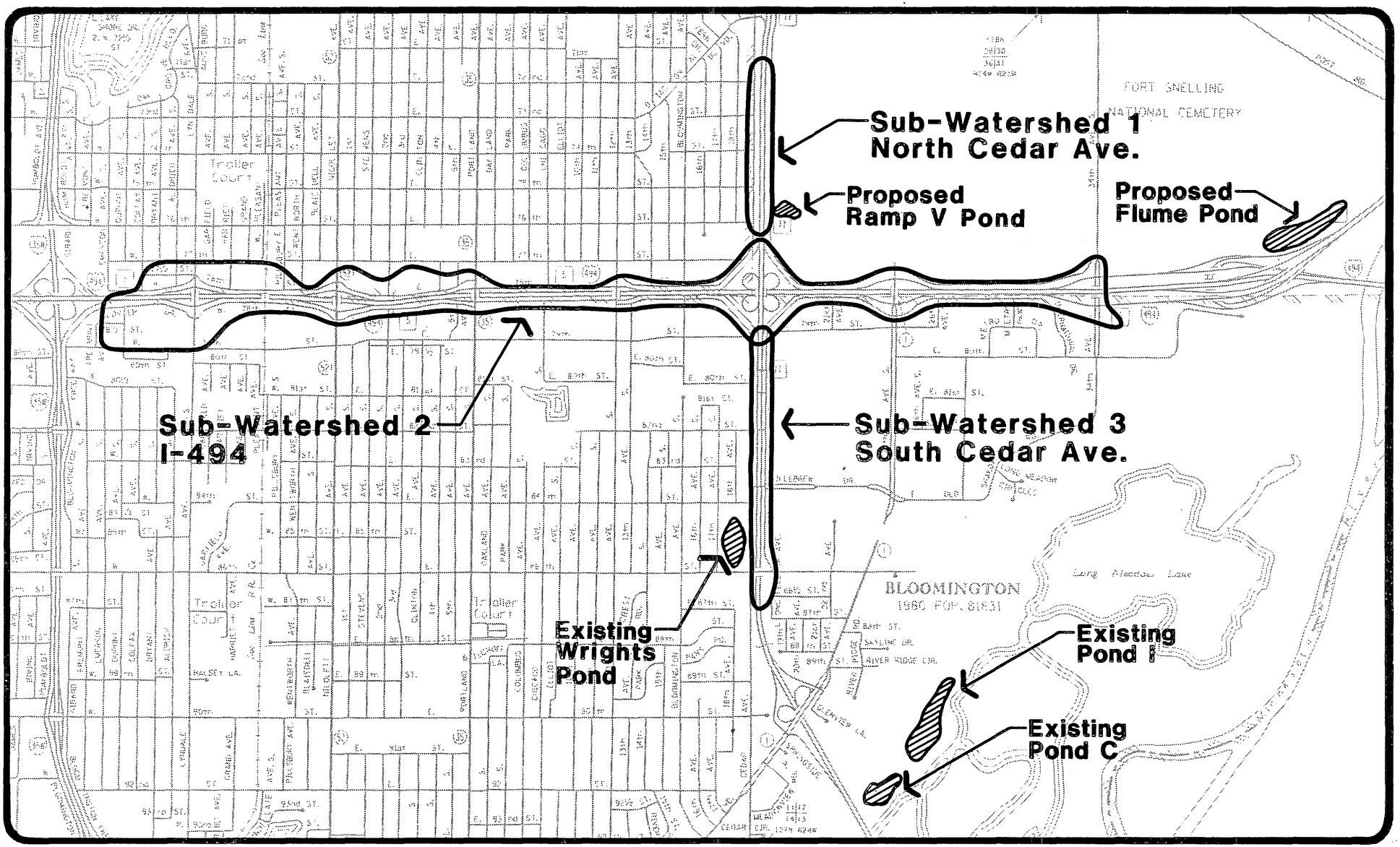
4.2.6.1 Surface Water Hydrology and Hydraulics

The surface water or stormwater drainage system in the study area primarily consists of open channels, storm sewer pipe and ponding areas. Table 4.2.F identifies existing storm water detention ponds in the study area.

TABLE 4.2.F
EXISTING STORM WATER DETENTION PONDS IN STUDY AREA

POND	ACREAGE	STORAGE VOLUME AC - FEET
Wright's Pond	4.55	20
Pond C	5	25
Pond 1	17.5	200

The proposed improvements affect the three sub-watersheds shown in Figure 4.2.E: sub-watershed 1, the north Cedar Avenue sub-watershed; sub-watershed 2, the I-494 sub-watershed; and sub-watershed 3, the south Cedar Avenue sub-watershed. Each sub-watershed is described below in more detail. All stormwater runoff generated along I-494 and TH 77 right-of-way within sub-watersheds 1 and 2 is directed to the east and discharges into the Minnesota River. Runoff



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FIGURE 4.2.E

Sub-Watersheds and Stormwater Detention Ponds

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from TH 77 right-of-way south of I-494, sub-watershed 3, flows south to Pond C. Pond C discharges to Long Meadow Lake, which ultimately discharges into the Minnesota River.

Sub-watershed 1 contains a portion of TH 77, Old Cedar Avenue and the frontage road, all of which are located north of the I-494/TH77 interchange. Sub-watershed 1 is bounded by an area between East 71st and East 72nd Streets on the north, Minneapolis-St. Paul International Airport on the east, the City of Richfield on the west and the I-494/TH 77 interchange on the south. Sub-watershed 1 contains an approximately 4,000-foot-long section of TH 77, and is approximately 28 acres in size.

The existing drainage in sub-watershed 1 consists of overland flow and pipe flow. The drainage in sub-watershed 1 is through a storm sewer system which runs in the ditch between the northbound and southbound lanes of TH 77. The storm sewer system starts at East 72nd Street and continues flowing south through a 30-inch-diameter pipe, eventually connecting into the I-494 84-inch diameter trunk sewer system.

Sub-watershed 2 covers that portion of I-494 between I-35W on the west and 34th Avenue South on the east. This sub-watershed extends to the west about two miles beyond 12th Avenue South, the western end of the project area. This sub-watershed contains about 3.75 miles (19,800 feet) of I-494, and is about 300 acres in size.

Existing drainage in sub-watershed 2 is overland flow or gutter flow to the inplace trunk storm sewer system under I-494, which runs from west to east along the south side of the eastbound traffic lanes. The storm sewer starts just to the east of I-35W and runs along the entire length of the sub-watershed. At the east, the storm sewer crosses the south area airport storm sewer and continues to the northeast, where it eventually combines with the north area airport storm sewer before discharging into a 12-foot flume. The flume discharges directly into the Minnesota River.

The trunk storm sewer within the project area is an 84 inch-diameter reinforced concrete pipe, designed for a storm with a return frequency of less than 10 years.

Runoff from sub-watershed 1 enters the I-494 trunk sewer system at the I-494/TH77 interchange.

Sub-watershed 3 contains that portion of TH 77 located south of the I-494/TH 77 interchange. Sub-watershed 3 includes Old Cedar Avenue and existing TH 77 from East 79th Street south to East 87th Street. This area is about 45 acres in

size. Sub-watershed 3 also contains the western one-half (about 70 acres) of the Met Stadium site. Sub-watershed 3 contains an approximately 4,500-foot-long portion of TH 77 and is approximately 115 acres in size.

The northern portion of sub-watershed 3 (between East 79th Street and East 82nd Street) does not have an existing storm sewer system. Runoff from this area and the western edge of Met Center is overland flow to the existing ditches. The runoff is then conveyed to an area located near the northeast corner of the Cedar Avenue and Killebrew Drive intersection. There are two storm sewer outlets from this area. One outlet connects into the 36-inch-diameter outlet to the Killebrew Drive storm sewer system; the other into the 30-inch diameter outlet to the TH 77 trunk storm sewer, which flows south on TH 77.

Runoff from south of East 82nd Street is collected by the TH 77 trunk storm sewer system. The controlled discharge from Wright's Pond also outlets into the TH 77 trunk storm sewer at about 86th Street. Although Wright's Pond was designed and constructed as a stormwater detention facility, it became designated as a protected wetland as well during the DNR's state-wide inventory completed several years previously. Wright's Pond has a 60-inch diameter outlet.

Both the Killebrew Drive and TH 77 storm sewer systems discharge into the Minnesota Department of Transportation's Detention Pond C. Pond C is located north of the new Cedar Avenue Bridge between Cedar Avenue and Long Meadow Lake. Pond C has a surface area of about five acres and a pond volume of about 25 acre-feet.

4.2.6.2 Floodplains

There are no designated floodplains in the project area. The south end of the project area is approximately one mile north of the Minnesota River Valley, the closest floodplain to the project area. The approximate roadway elevation of the southern-most end of the highway in the study area is 805 NGVD (National Geodetic Vertical Datum). This elevation is about 88.3 feet above the 100-year flood protection elevation of 716.7 NGVD for the Minnesota River.

Pond C receives storm water runoff from the project area. This pond is located in the Minnesota River valley at the outlet to the Cedar Avenue storm sewer system. Pond C has an overflow spillway elevation of 723.0 NGVD, approximately 6.3 feet above the 100-year flood protection elevation of 716.7 NGVD.

4.2.6.3. Groundwater

This section summarizes key elements of the groundwater discussion and augments and updates the specific data presented in the Airport South Generic EIS and the Mall of America and Fantasyworld EIS. This data supercedes that presented in the two previous EIS's.

Introduction. Water enters the groundwater system as infiltration following rainfall or snowmelt. In the upland areas, this infiltration water moves down to the groundwater system in the unconsolidated surficial drift and/or bedrock aquifers. Because in nature the systems must be in balance, water moving into the groundwater system must be balanced by water moving out. This may take the form of flows to other, deeper aquifers or lateral flow in the aquifers to surface outlets.

The Minnesota River to the south of the study area is one discharge point for groundwater. Water from both the bedrock aquifers beneath the site and from the surficial drift soils discharges to the river in the form of springs or as general seepage to recharge the river.

The uppermost bedrock beneath the site consists of Prairie du Chien dolomite and Jordan sandstone. The boring at the old stadium site showed only about 34 feet of the dolomite with the normal thickness (about 95 feet) of sandstone. These two rock formations comprise the most heavily used groundwater aquifer in the Twin Cities area. Well records at the Minnesota Geological Survey for several wells in the study area show that the static water level (the potentiometric (sic) head) for wells finished in the aquifer is at about elevation 735 to 755. This corresponds to data given in Norvitch (1973) that shows that the Prairie du Chien-Jordan aquifer potentiometric (sic) heads in the area should be above river level with gradients for flow towards the river.

The area near Killebrew Drive and Cedar Avenue (generally on the alluvial terrace) is a recharge area where water is infiltrating and moving downward to the underlying aquifer. Because the underlying Superior Lobe tills are less permeable, water perches on these cohesive soils, creating the first encountered water table in the sands. However, the Superior Lobe tills are permeable, and water is continually moving downward to recharge deeper soil layers and the Prairie du Chien-Jordan aquifer.

Information from historic soil borings as well as work done specifically for this project indicate that the first encountered water table beneath the site is at approximately elevation 795 to 805, depending on the location and the time

the levels were recorded. It is apparent that the first encountered water table is significantly higher than the potentiomentric (sic) head in the underling bedrock aquifer (about 800 versus 745), and that there is an available gradient for downward flow for recharge to the underlying soil and rock strata.

Data Collection. Data was collected for the study from four sources. First, the files of the Minnesota Geological Survey were reviewed for well log information. The information obtained from these logs consisted primarily of bedrock and static water level data.

The second source of information was available soil borings and reports from the City of Bloomington, the Minnesota Department of Transportation, and the Minnesota North Stars Corporation. The soil borings taken were intended to provide information for building and road construction and as such were finished in the surficial drift soils. In most cases, very accurate logs of soil types and depth to groundwater were kept. This data is summarized in Table 4.2.G.

TABLE 4.2.G
MISCELLANEOUS GROUNDWATER LEVELS IN STUDY AREA

Location and Data Source	Elevation Range
Cedar and 85th (Mn/DOT)	800
Cedar and 86th (Mn/DOT)	796 - 801
Cedar and 88th (Mn/DOT)	799 - 800
Howard Johnson's (City files)	799 - 800
Bor Son Office Bldg. (City files)	799 - 800
Met Center (Mn. North Stars)	804
Met Stadium (before construction)	806

The third source of information came from five on-site soil borings and piezometer installations. These piezometers were placed generally to the north, south, and east of the Killebrew Drive-Cedar Avenue intersection. They were finished just into the first encountered groundwater table and indicate on a time basis the level of the surficial drift water table. Table 4.2.H shows the groundwater elevations and other piezometer data for the five points. The location of the wells and the location of the uppermost existing springs located in the ravine running from the Killebrew Drive/24th Avenue intersection to Long Meadow Lake are shown on Figure 4.2.F.

The fourth source of information came from eight on-site soil borings performed in September of 1985. These borings were performed as part of the preliminary design and intended to provide geotechnical design information as well as groundwater elevations. Table 4.2.I is a summary of the groundwater elevations from the boring logs. The location of the borings is shown in Figure 4.2.F.

Interpretation of Groundwater Data. Based on the piezometer information shown in Table 4.2.H, the groundwater elevations shown in Table 4.2.I, and other boring and well data, the first encountered groundwater in the area may range in elevation from 797 near East 86th Street to 808 near I-494. With the low point in roadway construction at about 804.5 on the northbound CD road at East 81st Street, and elevation 808 at the tunnel at East 79th Street just south of I-494, it will be necessary to construct a permanent dewatering system in the sub-grade to keep the sub-grade in an unsaturated condition and to avoid frost heaving of the pavement.

Groundwater fluctuation over time in the sandy soils can be quite large. Because the permeable surface sands in the study area allow for rapid infiltration of large amounts of water while the underlying Superior Lobe tills slow the rate of downward water movement, periods of heavy rainfall will result in higher groundwater levels. The information in Table 4.2.6-C shows the effects of a period of heavy rainfall on the groundwater levels. During late May and early June, 1984, considerable rainfall fell in the east Bloomington area (2.29 inches in May and 7.95 inches in June). Groundwater levels rose an average of 3.75 feet at the five piezometers during the 20-day study period. The information in Table 4.2.I was affected by 0.48 inches of rain the day before the first borings were done and 0.16 inches the first day of the borings. Groundwater elevations shown in Tables 4.2.H and 4.2.I can be considered to be representative of moderately high conditions, with the average groundwater elevation from three to five feet lower.

4.2.6.4 Water Quality

The Minnesota Pollution Control Agency classifies Minnesota's intrastate and interstate waters into seven categories:

1. Domestic Consumption
2. Fisheries and Recreation
3. Industrial Consumption
4. Agriculture and Wildlife
5. Navigation and Waste Disposal

TABLE 4.2.H
DATA COLLECTED FROM PIEZOMETERS 1/

Well Number	W1	W2	W3	W4	W5
Depth of well	23 ft.	28 ft.	28 ft.	28 ft.	28 ft.
Top of well elevation	818.80	815.21	810.22	817.83	810.23
Elevation of water in well on (Date):					
May 18, 1984	798.80	799.21	798.22	798.83	797.23
May 23, 1984	800.30	799.21	799.72	799.83	800.23
May 30, 1984	801.05	802.10	800.47	801.08	801.23
June 12, 1984	804.05	801.71	800.72	802.08	802.48
Change during time interval					
May 18 - 23	+1.50	0.00	+1.50	+1.00	+3.00
May 23 - 30	+0.75	+2.89	+0.75	+1.25	+1.00
May 30 - June 12	+3.00	-0.39	+0.25	+1.00	+1.25
May 18 - June 12	+5.25	+2.50	+2.50	3.25	+5.25

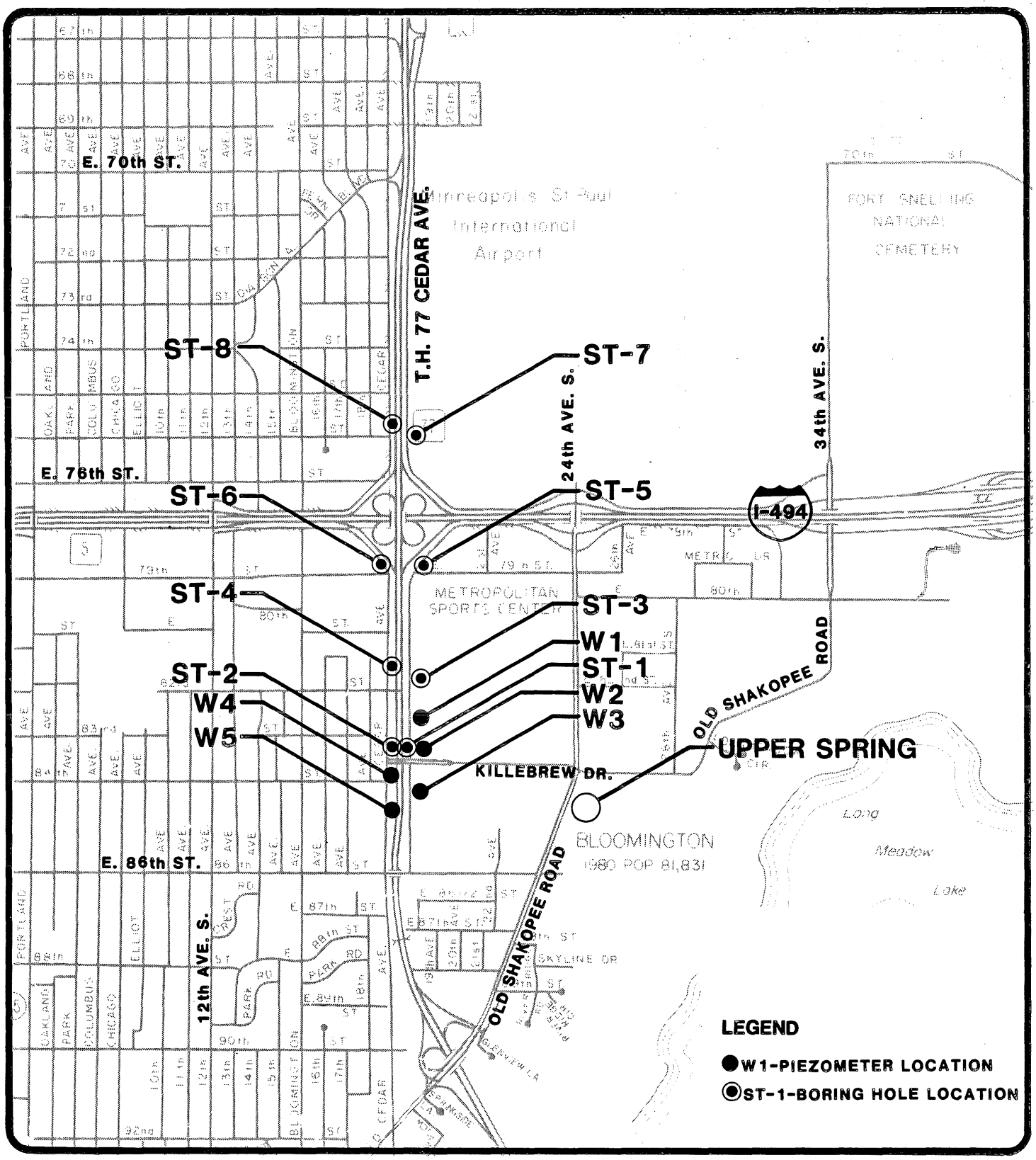
1/ 2.29 inches of rain fell in May 1984 and 7.95 inches in June 1984.

TABLE 4.2.I
DATA COLLECTED FROM SOIL BORINGS

Boring Number	Groundwater 1/ 2/ Elevation	Comments
ST-1	801.1	Near Killebrew Drive
ST-2	801.1	Near Killebrew Drive
ST-3	803.5	Near E. 81st Street
ST-4	805.3	Near E. 81st Street
ST-5	808.0	Near E. 79th Street
ST-6	808.3	Near E. 79th Street
ST-7	807.3	Near E. 76th Street
ST-8	806.8	Near E. 76th Street

1/ Borings taken between 9-9-85 and 9-11-85.

2/ The study area received 0.48" of rainfall on 9-8-85 and 0.16" on 9-9-85.



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FIGURE 4.2.F

Piezometer & Boring Hole Locations

N

0' 2,000'

BRW

6. Other Uses
7. Limited Resource Value Waters

Each of these groups has a required water quality that must be met before being used for its intended purpose. The MPCA has further subdivided each of the six groups into four subgroups: A, B, C and D. Subgroup A will have the highest water quality; Subgroup D will have the lowest.

The MPCA has adopted and the United States EPA has approved standards for each of the groups and subgroups listed above. The standards are given in Minnesota Rules 7050.0220, Specific Standards of Quality and Purity for Designated Classes of Intrastate Water of the State, and Minnesota Rules 7055.0120, Specific Standards of Quality and Purity for Designated Classes of Interstate Water.

The MPCA has classified all the waters in the state according to the requirements in the Rules identified above. The classifications of intrastate and interstate waters form Rules 7050.0300 and 7055.0250, respectively. Tables 1A, 2A and 3A in Appendix B of this DEIS identify the water quality requirements of the water body classifications present in the study area.

Table 4.2.J identifies the classification of receiving waters in the study area. Existing Ponds C and 1, and the proposed Ramp V and Flume ponds, are or would be owned by Mn/DOT. The ponds will be used for a single purpose only over the life of the highway: as either a treatment basin, a wetland area, or a dry pond. With this fact in mind, the classification of these ponds recommended by this EIS can most accurately be limited to 4A, 4B, 5 and 6 waters (agriculture and wildlife, navigation and waste disposal, and other uses). If this limitation on classification is accepted and agreed to, there would be no traffic related pollutants and corresponding water quality criteria that would apply to the ponding areas in the study area.

The present water quality of the existing water bodies impacted by the project should be compared to MPCA's standards for the appropriate classification of water body. Existing water quality data, which does not reflect the Mall of America and Fantasyworld project in the Airport South District, is available for Pond C, Long Meadow Lake and the Minnesota River. Data is not available for Wright's Pond or Pond 1. Tables 1B, 2B, 3B, 4B, 5B and 6B in Appendix B present the available data. These tables also include sediment sampling data for Pond C and Long Meadow Lake.

TABLE 4.2.J
RECOMMENDED WATER QUALITY CLASSIFICATION OF RECEIVING WATERS

Minnesota River[1/]	2C, 3B, 3C, 4A, 4B, 4B, 5 and 6
Long Meadow Lake[2/]	2B, 2C, 3B, 3C, 4A, 4B, 5 and 6
Wright's Pond[2/]	4A, 4B, 5 and 6
Pond C[2/]	4A, 4B, 5 and 6
Pond 1[2/]	4A, 4B, 5 and 6
Proposed Ramp V Pond[2/]	4A, 4B, 5 and 6
Proposed Flume Pond[2/]	4A, 4B, 5 and 6

1/ Interstate Waters - Minnesota Rules 7055.0250
2/ Intrastate Waters - Minnesota Rules 7050.0300

Pond C. A comparison of Pond C's existing condition (Table 1B) with the appropriate standards for Pond C's classification(s) (Table 3A, Appendix B) indicates that its water quality is low but generally within MPCA requirements. The high end (90th percentile) of the data can be considered to be poor quality and exceeding MPCA requirements.

Long Meadow Lake. The comparison for Long Meadow Lake existing water quality data (Table 2B, 3B, 4B and 5B) to the appropriate water quality requirements (Table 2A in Appendix B) indicates an existing water quality of moderately low to low quality, and that it is minimally acceptable within the MPCA water quality requirements for most pollutants, and acceptable for the remaining pollutants. However, nitrogen and phosphorus concentrations were found to be high.

The Carlson Trophic State Index can be used to indicate the nutrient status of Long Meadow Lake. Table 2B shows the phosphorus concentrations during the months the lake was monitored to average 0.18 mg/l of phosphorus ((0.23 + 0.13)/2). The Carlson Trophic State Index is calculated using the following formula:

$$TSI = 4.14 + 14.43 \, LN \, (TP)$$

Where: TSI = Trophic State Index
TP = Total Phosphorus
LN = Natural Log

Long Meadow Lake has a TSI phosphorus value of 79. In general, TSI values from 0 to 40 indicate the lake is nutrient poor or oligotrophic, and generally implies good water quality. TSI values from 40 to 50 indicate that moderate nutrient concentrations are available in the lake

and that water quality is becoming degraded from nutrients at a moderate rate. Index values from 50 to 100 indicate that the lake has an excessive amount of nutrients and water quality is generally considered to be poor.

The samples used to calculate the TSI were collected in either early spring or fall, and should not be considered representative of the entire year. The typically poor water quality months of June, July and August are not represented in this data. Consequently the data likely indicates better water quality than an annual average would.

Minnesota River. The comparison for the Minnesota River water quality data (Table 6B) to the appropriate water quality requirements (Table 1A) shows the existing water quality to be low to poor quality. Pollutant concentrations in the river are typically equal to or greater than the specified MPCA requirements for the river's classification(s).

4.2.7 Wetlands

The project area includes one protected wetland, Wright's Pond. Several other wetlands are located south of the project area. The potentially affected wetlands are important because all but Wright's Pond are generally within the recently-created Minnesota Valley National Wildlife Refuge (MVNWR). A list of references cited follows Section 4 of this document. A description of wetlands affected by stormwater runoff from the project area follows the background discussion on the use of wetlands as water treatment facilities.

4.2.7.1 Background: Wetlands as Water Treatment Facilities

Stormwater runoff from streets, highways, and urban areas enters the Minnesota River valley in numerous places. Several storm sewers empty into the Long Meadow Lake unit of the MVNWR, south of the project area. A detailed description of stormwater impacts is given in the Airport South EIS. The U.S. Fish and Wildlife Service has in the past proposed diverting existing storm sewer outlets to other locations within the valley because of concern about ongoing impacts to Long Meadow Lake from the pollutants carried in stormwater. (See USDOI 1982 and Airport South and Mall of America EIS's.) In the case of one of the storm sewers, the proposal was accepted and the diversion has been constructed (see discussion of Pond 1 in Section 4.2.7.2).

When the MVNW Refuge was created, its master plan recognized that conflicts would occur because of the difficulty in maintaining natural areas in close proximity to high intensity urban land uses.[4/] Buffer zones along the refuge's edges were envisioned as the solution. The proposals to divert stormwater flow from Long Meadow Lake have been made

to address this policy. These proposals envision taking advantage of the perceived natural ability of a wetland to remove pollutants from water flowing through it. In order for decision makers to realistically address the proposals and their consequences, it is necessary to review the merits of using wetlands to treat stormwater and to review the kinds of impacts that can occur to a natural wetland when used for such purposes. This review is also helpful in understanding the kinds of ongoing impacts that may already be occurring in the river bottom wetlands, and to understand whether the proposed project will add to them.

It has long been recognized by researchers that wetlands are dynamic, highly productive systems that are capable of altering pH, dissolved constituent concentrations, turbidity, and chemical content of runoff. The dissolved constituents that are typically associated with highway runoff are as follows: nutrients (primarily nitrogen and phosphorous), heavy metals, suspended solids including organic sediment, hydrocarbons, refractory chemicals, and high cation and anion concentrations.5/

In recent years, natural and artificial wetlands have been increasingly used as water treatment facilities because of their ability to improve water quality and thus reduce impacts to lakes and streams.6/ The highest removal rates for suspended solids, nitrogen, and phosphorus reported in the literature have been close to 100 percent. Wetlands are used for water treatment in the Twin Cities metro area.7/ A good example near the project area is the Hogback Ridge Pond (Pond 1) which was specifically designed to discharge into a cattail marsh.

On the other hand, many other recent reports have noted that removal percentages vary widely depending on type of wetland, pollutant loading rates and water flow. Other researchers have noted a decrease in the wetland's ability to remove pollutants after three or four years of use, and that wetlands can sometimes become exporters of suspended solids and nutrients.7/ Another major problem of wetland treatment is the accumulation of biologically active metals such as cadmium and lead in wetland sediments.8/

The demonstrated ability of wetlands to remove pollutants has led to a recent increase in use of natural wetlands and construction of artificial wetlands for this purpose.9/ Research into environmental impacts of such use has lagged behind, however, and impacts are less well understood.9/ Much of the research that has been done on environmental impacts to wetlands from nutrients, metals, and other pollutants found in highway runoff has been in response to use of

wetlands for tertiary treatment of sewage. The kinds of constituents in sewage treatment effluent that cause concern about impacts to wetlands are generally similar to the kinds of constituents that cause concern about stormwater runoff. Amounts of nutrients are often lower in highway runoff, while heavy metals and biological oxygen demand are similar and suspended solids are higher.10/

Research to date on a wide variety of wetlands has identified a number of types of impacts that have occurred or are suspected to occur from intentional or casual use of wetlands for water treatment. These are identified in Table C-1, Wetland Literature Review in the Appendix. Many of these reports concern long-term effects on wetlands that have generally not been addressed in studies of wetlands as treatment facilities.9/

4.2.7.2 Wetlands Affected by Stormwater Runoff

Wetlands are illustrated on Figures 4.2.G and 4.2.H.

Wright's Pond is located within the project area on the west side of Highway 77 north of 86th Street (Figure 4.2.C). It is immediately adjacent to Highway 77. Wright's Pond was created as a stormwater detention pond and was later designated as a DNR-protected wetland. It presently receives stormwater from two storm drains which serve approximately 2,600 acres of residential and commercial development.

Wright's Pond is surrounded by aquatic vegetation, including arrowhead, bulrush, and cattail. Duckweed grows on the surface in areas sheltered from wind by vegetation. Clumps of trees occur at several places along the shoreline, including willows, cottonwoods, silver maple, and ash. The shoreline is generally soft and mucky.

Bloomington's municipal park maintenance practices involve annual clearing and cutting of the wetland edge vegetation, including cutting some of the marsh vegetation such as cattails.

The vegetation in and around Wright's Pond enhances its current dual function as a recreational pond and as a treatment facility for stormwater from a relatively large urban area to the west and north. The pond presently collects urban pollutants, some of which accumulate in its sediments. During a site visit on September 3, 1986, an oil sheen was observed on the area immediately adjacent to the stormwater inlet on the southwestern side of the pond.

Long Meadow Lake is a large and complex riverine wetland within the congressionally-authorized boundaries of the Minnesota Valley National Wildlife Refuge (Figure 4.2.G). It is bounded on the northwest by the river bluffs and on the southeast by a natural levee (Figure 4.2.H). It receives spring flows and runoff along the bluff, which, in conjunction with the levee, sets off its aquatic environment from that of the river. Its outlet is on a marshy riverbank area about one-half mile upstream from the Interstate 494 crossing of the Mississippi. This is also the area where floodwaters back into the wetland on a nearly annual basis. During higher flows, floodwater enters the wetland in several places along the levee.

Long Meadow Lake varies in size and depth depending on precipitation and river levels. In the last few years it has maintained higher levels during summer months because of abundant precipitation and high river levels. It is 1,188 acres in size when its water level is at elevation 696 feet and about 1.5 feet in depth.[11]

Reflecting its status as a wetland, Long Meadow Lake has high nutrient levels. Its Carlson Trophic Level Index of 79 (see Section 4.2.6.4) indicates that it is hypereutrophic. This level is similar to that of most other shallow water bodies (four feet or less) listed in a survey of the trophic status of 1,087 Minnesota lakes.[12] Because of its high nutrient levels, it is highly productive of plant growth.

Long Meadow Lake contains a diverse number of plant and animal species and is an important element of the Minnesota Valley National Wildlife Refuge Master Plan. Over the long-term, the species composition of its wetland community changes in response to aquatic conditions, as do all wetlands. It has been dry in the past on rare occasions, and in 1982, about 80 percent of the wetland contained emergent vegetation. Consistently high water conditions and floods have opened up more of the wetland since then.[13] The biochemical environment of the wetland is also constantly changing because of the constant inflow of spring water, urban stormwater runoff, and the periodic inflow of river floodwaters. The wetland's water quality is poor with respect to human uses (see Section 4.2.6.4) but its macrophytic plant species diversity and composition does not indicate that its aquatic vegetation has been damaged with respect to wildlife.

Stormwater runoff from the project area presently enters Long Meadow Lake from Mn/DOT's Detention Pond C. MVNWR manages the area around the pond as part of the refuge, but the pond's primary purpose is to serve as a detention pond.[13]



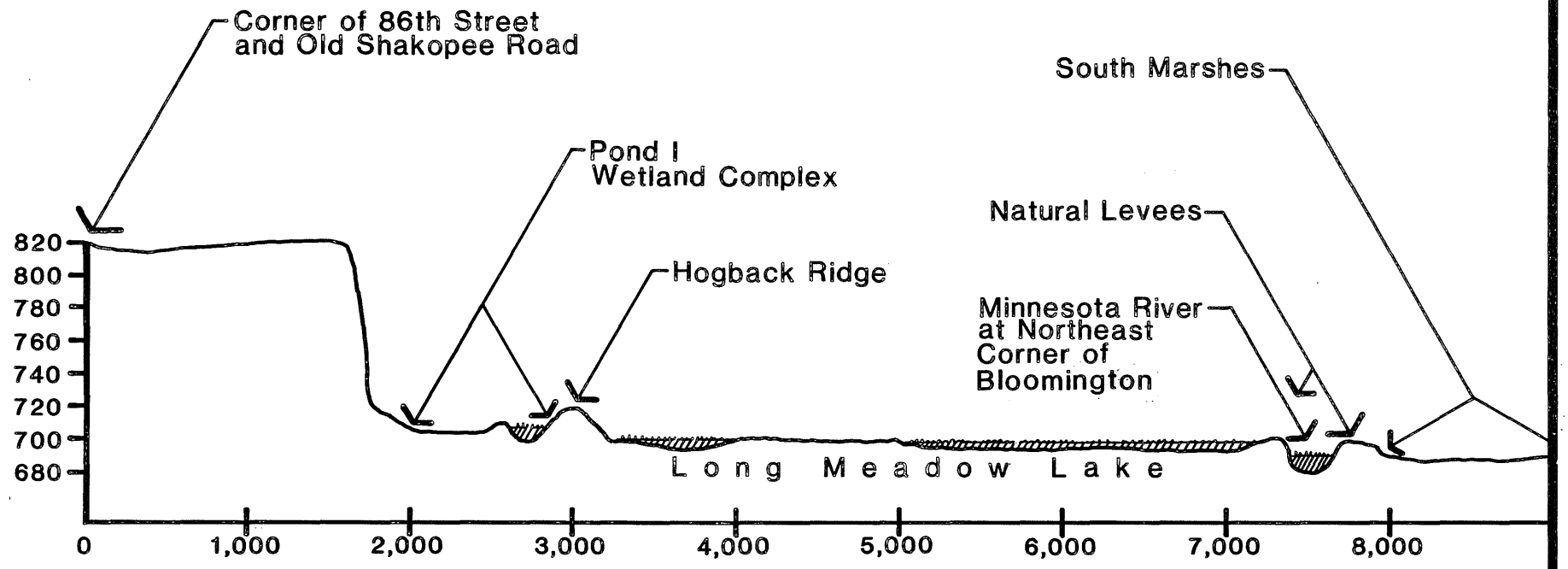
Minnesota Valley National Wildlife Refuge.

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FIGURE 4.2.G

Ponds and Wetlands

BRW



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FIGURE 4.2.H

Profile of Minnesota River Valley Across Long Meadow Lake

0' 1,000'

BRW

Hogback Ridge (Pond 1 Wetland Complex) is a natural feature owned by the MVNWR that previously was mined for gravel, leaving a water-filled pit which has been fished in the past. The wetland complex located on and near it consists of the approximately 20-acre pond (Pond 1) on the ridge and a cattail marsh wetland to the northwest, also about 20 acres in size. The wetland complex is at a higher elevation than Long Meadow Lake.

The Refuge's objectives are to manage the Hogback Ridge area for recreational and wildlife use. A connector trail between the Minnesota Valley State Trail and the Minneapolis park system, known as the Hogback Ridge Trail, is presently being completed.

The complex recently began serving a dual purpose as a stormwater retention pond for a small urban area above the bluffs and as a study and education area on stormwater treatment by wetlands. The stormwater is directed into the mined-out pond in the center of the ridge, and then passes through the cattail marsh between the ridge and the bluff before entering Long Meadow Lake.

During studies for the Airport South EIS, the U.S. Fish and Wildlife Service and others proposed connecting Pond C to Pond 1 to reduce problems projected to occur in the future with the ability of Pond C to contain pollutants from stormwater runoff.14/

Kidder Marsh is a wetland located between old Cedar Avenue and Highway 77 along the bluff. The U.S. Fish and Wildlife Service has proposed that it be used as a treatment facility for Pond C outflow. It is owned by and within the boundaries of the MVNWR.

Kidder Marsh is fed by bluff runoff and springs and is dominated by emergent vegetation. Much of the northeastern end close to TH 77 is brush filled with no open water. The southwestern end contains open water and an outlet under old Cedar Avenue which drains into Long Meadow Lake.

Kidder Marsh contains a wide variety of wetland plants. Some portions contain open water, while others contain dense cattail stands, or thick willow and dogwood patches. Still others, especially the upper portion near TH 77, contain wet sedge and grass patches.

The Bass Ponds area encompasses a group of small ponds at the base of a large ravine that deeply incises the river bluff at the south end of 24th Street. The ponds were originally established about 60 years ago and were used by the Izaak Walton League.15/ The ponds are fed by a small creek

which originates at a large spring near the top of the ravine at the 789-foot elevation. Little data is available on flow rates, but the U.S. Fish and Wildlife Service reports that the creek flow in the ravine just above the Bass Ponds is about five cubic feet per second.15/

The Bass Ponds are managed by the MVNWR for environmental education and as a wildlife management demonstration area. The area is considered to be a unique feature of the refuge's Long Meadow Lake Unit.

4.2.8 Geology and Soils

The project site is located on a broad flat plain that parallels the north side of the Minnesota River valley. All along the Minnesota River, particularly in the reach from Mankato to Fort Snelling, alluvial terraces such as this are present.

The terraces were formed during the Pleistocene Period, when there were at least four separate major glacial advances through the Minneapolis-St. Paul area. Each subsequent glacial advance usually obliterated landforms formed by the earlier events. The last major glaciation, the Wisconsin Period, deposited the soils that are now present in the study area.

Prior to the Wisconsin advances, valleys existed in the bedrock beneath the site. The Minnesota River follows the approximate course of one of these valleys. Other preglacial valleys connected from the north. These valleys are discussed in some detail in Schwartz (1936) and subsequent publications. The glacial advances buried the valleys and the adjacent uplands beneath ice laden with soil and rock debris. The ice advance that buried this area was likely the Superior Lobe. This ice lobe advanced from the north-northeast and deposited the characteristic reddish, relatively sandy tills that can be seen locally in St. Paul, Eagan, Mendota Heights, and Burnsville. The Superior Lobe extended to just south of the study area, leaving a prominent terminal moraine in Eagan and Burnsville to the south of the Minnesota River valley.

The Superior Lobe advance was followed by the larger Des Moines Lobe. This ice advance moved into Minnesota from the northwest and extended well into central Iowa. The Des Moines Lobe probably did not cover the study area, although all of central Minnesota west of Minneapolis was covered. A sublobe from the main ice advance (the Grantsburg sublobe) extended easterly into the west part of Wisconsin, although it stayed to the north of this area. The drift from the Des Moines Lobe is yellow or gray and normally much less permeable with higher clay content.

When the Des Moines Lobe in southern, central and western Minnesota wasted, tremendous amounts of runoff waters were generated. One principal stream conveying water from the wasting glacier was the Minnesota River (also referred to as Glacial River Warren). It is likely that the river was a broad shallow meandering stream that deposited the prominent valley train sands that are evident in the terraces.

As the Des Moines Lobe retreated into northwestern Minnesota, a huge lake (Lake Agassiz) formed in front of the ice in a landlocked area along the Red River in Minnesota and North Dakota. The natural outlet for this lake to the north was still blocked by ice. Eventually, the water rose in the lake until a southerly outlet developed at Brown's Valley, Minnesota. The overflow was apparently relatively low in sediment content, and because of river gradient changes downstream, the river degraded to lower stands forming lower terraces and eventually cut to below present levels. The previously formed benches were left high above the river valley.

The terrace in the study area, at about elevation 810 to 820, can be traced to the west and southwest along the north side of the river valley. As one goes upstream, the elevation gets somewhat higher due to the stream gradient. There are also higher benches in the Eden Prairie area and lower benches evident in Shakopee and Savage. Each bench is representative of a maintained level of the river as it progressively eroded downward.

Soil borings in the area uniformly detect alluvial sands at depths of 25 to 50 feet. From the descriptions of the soils beneath these depths [brown or reddish silty loams with some fat clays, with some comments about varved conditions], it was concluded that the underlying soils are Superior Lobe tills which have been reworked and redeposited in some locations by water action. (Soil Exploration Company, 1980 and Mn/DOT, miscellaneous borings - 1977 and 1978).

Bedrock beneath the site is at depths of over 250 feet. A driller's log at Metropolitan Stadium shows the bedrock subcrop to be Jordan Sandstone or Prairie du Chien Group Dolomite at a depth of 280 feet.

The proposed improvements to I-494 and TH 77 will not have any significant environmental impacts on the geological features of the study area for any of alternatives being considered by this study. Some of the proposed bridge structures are proposed to be on pile foundation, which may be either friction or bearing piles. In either case there will be no impact on the geological features.

The information available concerning the soils of the study area is limited to that determined from boring logs for various improvements along I-494 and TH 77, summarized above. The Hennepin County Soil Survey prepared by the United States Department of Agriculture, Soil Conservation Service includes mapping in the I-494/TH 77 study area only in an area northeast of the I-494/TH 77 interchange. This area contains primarily loamy sands. The remainder of the study area was either not mapped or classified as cut and fill soils.

As indicated in various geotechnical reports for the study area, the soils are capable of supporting the roadway pavements and other minor structures. There are no peaty or highly organic soils in the study area that would adversely affect design, engineering or construction of the proposed improvements.

The proposed improvements on I-494 and TH 77 will not have any significant environmental impact on the soil resources of the study area.

4.2.9 Historic and Archaeological Resources

The State Historic Preservation Office (SHPO) was contacted to determine the presence and location of any prehistoric or historic sites on or eligible for inclusion on the National Register of Historic Places. No archaeological or historic sites were identified within or adjacent to the project area boundaries, although a group of burial mounds previously described in the Airport South Generic EIS is known to exist south and east of Old Shakopee Road.

The SHPO determined that because the project is contained almost entirely within previously-disturbed construction limits, no further archaeological or historical investigation would be recommended. That determination was confirmed again in July of 1986, when the project boundary along I-494 was extended to 34th Street. Letters documenting project clearance are included in Appendix D.

4.3 REFERENCES FOR SECTION 4.0

1/ Minnesota Rules Chapter 7010 Noise Pollution Control Rules.

2/ Chapter I, Title 23, Code of Federal Regulations, Part 772 Procedures for Abatement of Highway Traffic Noise and Construction Noise.

3/ Guidelines for Land Use Compatibility with Aircraft Noise, Metropolitan Council, 1984.

4/ Minnesota Valley National Wildlife Refuge. 1982a. "Record of Decision: Master Plan for the Minnesota Valley National Wildlife Refuge." U.S. Fish and Wildlife Service, Region 3, Twin Cities, Minnesota.

Minnesota Valley National Wildlife Refuge, 1982b. "Environmental assessment for storm water sewer system." Bloomington, Minnesota.

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7/ Brown, R.G. 1985. "Effects of wetlands on quality of runoff entering lakes in the Twin Cities Metropolitan Area, Minnesota." U.S. Geological Survey. Water Investigations Report 85-4170.

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King County 1986a. "The use of wetlands for stromwater storage and nonpoint pollution control: A review of the literature." Prepared by the Resource Planning Section, King County Department of Planning and Community Development, Seattle, WA.

King County 1986b. "Viability of freshwater wetlands for urban surface water management and nonpoint pollution control: an annotated bibliography." Prepared by the Resource Planning Section, King County Department of Planning and Community Development, Seattle, WA.

11/ Baseline Hydrological Study of MVNWR by Jones Environmental Consulting Services, 1979-80.

12/ Heiskary, 1985.

13/ Worthington, T.C. 1986b. Personal communication (August 5) with Paul Stolen, BRW, Inc., Minneapolis, Minnesota.

14/ City of Bloomington 1984, Worthington 1985a.

15/ USDI, 1982.

5.0

Environmental Consequences and Potential Mitigation Measures

5.0 ENVIRONMENTAL CONSEQUENCES AND POTENTIAL MITIGATION MEASURES

5.1 TRANSPORTATION IMPACTS

5.1.1 Capacity of the Regional Highway System

The capacity of the regional highway system is one of the major issues relative to this project. This issue first came up in 1980, when the Metropolitan Council completed its review of the Bloomington Comprehensive Plan and asked for a more detailed study of the transportation system serving the Airport South District, to determine what improvements were needed to adequately serve this area in the future. One of the major findings of this study was that traffic demand on I-494 west of TH 77 would exceed the capacity of the existing highway between the years 1992 and 1997, depending on the application of various TSM techniques such as ramp metering and travel demand management.

In the EIS completed for the Mall of America/Fantasyworld proposed for the former Metropolitan Stadium site, an analysis was completed of the regional highway system within the transportation analysis area identified on Figure 2.1.E. This analysis identified the segments of the regional highway system which were forecast to have peak hour levels of service less than "D" by 1995 and by 2005. The segments of the regional highway system in the transportation analysis area where capacity or over capacity conditions were forecast by 1995 included:

- o I-494 from CR 18 to TH 77
- o I-35W from the Minnesota River to CSAH 62
- o TH 77 from I-494 to CSAH 62
- o CSAH 62 from TH 77 to I-35W
- o I-35W from CSAH 62 to the north

The forecast demand for the year 2005 affects the same segments of the regional highway system, but greater portions of each segment are forecast to operate at level of service "F". This analysis is not reproduced for this EIS, since the travel demand forecasts for the regional system are not significantly affected by the proposed project.

That is, it is the development which causes the traffic demand and the same level of development is assumed for all of the roadway alternatives.

A separate study of the I-494 corridor is currently being conducted to determine future transportation needs in the I-494 corridor and how to satisfy those needs. In order not to preclude alternatives that may be recommended in that study, it is proposed to implement this project in at least two stages. The first stage improvements which were described in Section 3.0 would involve only minimal construction on I-494. The ultimate improvements involve upgrading of I-494 in the project area. They also assume future upgrading of I-494 to the west, since without upgrading, I-494 west of the project area can not deliver the traffic demand used as the basis for the design of the ultimate improvements in the project area.

Although the proposed improvements in the project area do not resolve capacity deficiencies on the regional highway system outside the project area, they would eliminate or reduce the existing capacity deficiencies identified in the project area. The capacity of TH 77 and I-494 in the project area would be increased significantly even with only the first stage improvements. Some of the specific reasons for this increase in capacity include:

- The elimination of the at-grade intersection on TH 77 at Killebrew Drive would significantly increase the capacity for through traffic on TH 77 and reduce delays to through traffic.

- The increased capacity on TH 77 and the improved access to the Airport South District from TH 77 would reduce the traffic demand on I-494 in the project area.

- The construction of the direct ramp for northbound TH 77 to westbound I-494 traffic would increase the capacity of I-494 in the project area. This is currently one of the critical bottlenecks in this area.

- Braiding of the 24th Avenue ramps with the TH 77 ramps to and from I-494 would eliminate two short weaving areas on I-494 in the project area and therefore increase the capacity of this segment of I-494.

- The connection of 79th Street under TH 77 would provide an alternative to I-494 for the short to medium trips from the Airport South District and provide capacity on an alternative route that is not currently available.

- o The upgrading of the 24th Avenue/I-494 interchange and the new interchanges on TH 77 would increase the capacity and accessibilty to the Airport South District.

- o The new road connecting 24th Avenue north of I-494 with TH 77 would also provide an alternative route to the north on TH 77 and discourage the use of I-494 between 24th and TH 77 for this movement.

5.1.1.1 Forecast Traffic Demand

The forecast traffic demand for each of the alternatives is shown in Table 5.1.A. The same level of development is assumed for both the build and no-build alternatives and the only difference between the forecast for each alternative is the level of travel demand management assumed. For the Alternative 1 and 1A traffic demand forecasts, no transit use or TDM was assumed for 1990, a low to moderate level of transit and TDM was assumed for 1995, and a moderate level of transit and TDM was assumed for 2005. No transit use or TDM was assumed for the no-build, no TDM alternative (Alternative 2) for 1990, 1995, or 2005. A high level of TDM was assumed for Alternative 3 (no-build with TDM), in 1995 and 2005. No transit or TDM was assumed for Alternative 3 in 1990. Therefore the forecasts for 1990 are the same for all the alternatives. The travel demand assumptions apply only to the traffic generated in the Airport South District, and the background traffic demand forecasts are the same for all of the alternatives.

There is approximately a 3 percent difference in the forecast 2005 ADT's between the high and low TDM alternatives (Alternatives 2 and 3), and approximately an 8 percent difference in the forecast 2005 P.M. peak hour trip ends. Because there are not significant differences in the forecast traffic demand between alternatives, the identified deficiencies on the regional highway system in the transportation analysis area are expected to exist under either the build (Alternatives 1 and 1A) or no-build (Alternatives 2 and 3) conditions.

5.1.1.2 Capacity Restraints

The forecast traffic volumes for each alternative were assigned to the proposed road system for each alternative. An analysis was conducted of the road system for each alternative based on the forecast P.M. peak hour volumes. In the case of the no-build alternatives, the volumes that were assigned to the road system were the volumes that could potentially be accommodated during a one-hour time period (capacity restrained forecast) rather than the actual demand forecast. These volumes were determined by starting with the 1995 forecast traffic volumes and reassigning volumes to

TABLE 5.1.A
PROJECT AREA FORECAST TRAFFIC DEMAND

		Alt 1 & 1A		Alt 2		Alt. 3	
		Daily Trip Ends	P.M. Trip Ends	Daily Trip Ends	P.M. Trip Ends	Daily Trip Ends	P.M. Trip Ends
1990	Background	294,436	28,318	294,436	28,318	294,436	28,318
	Site*	152,100	14,915	152,100	14,915	152,100	14,915
	Total	446,536	43,233	446,536	43,233	446,536	43,233
1995	Background	325,970	31,532	325,970	31,532	325,970	31,532
	Site*	179,735	16,300	185,317	17,667	170,274	14,219
	Total	505,705	47,832	511,287	49,199	496,244	45,751
2005	Background	389,024	35,950	389,024	35,950	389,024	35,950
	Site*	211,434	19,100	221,860	21,723	202,698	17,278
	Total	600,458	55,050	610,884	57,673	591,722	53,228

* Note: Site refers to all of Airport South. Values in table assume 5% of site generated traffic is internal traffic and does not use the project area roadways.

the ramps where excess capacity existed, while maintaining the approach direction distribution, directional split and background traffic assumptions. The resulting traffic forecast is the same for both of the no-build alternatives since they are capacity restrained forecasts rather than demand forecasts. Demand forecasts have little or no meaning without improvements to the existing roadways since the forecast demand will not be reached unless improvements are made to the existing roadways. The excess demand will be diverted to other roadways or other hours of the day.

The 2005 forecast traffic volumes were used to design Alternative 1, the ultimate roadway plan. The analysis of Alternative 1 was conducted assuming that I-494 was upgraded to a minimum of 4 lanes in each direction, and that TH 77 was upgraded north of I-494 to CR 62 to a minimum of 3 lanes in each direction. Without these additional improvements, it would not be possible to deliver the volumes used as the basis for the ultimate design of TH 77 and I-494 in the project area. Alternative 1A (Stage I improvements) was designed using 1995 volumes, since they represent approximately the maximum hourly traffic volumes which could be accomodated without further upgrading on TH 77 and I-494. The Stage I improvements were designed assuming that TH 77 north of I-494 remains a four-lane facility and that I-494 west of 12th Avenue remains a six-lane facility.

The results of the capacity analysis of the alterantives are summarized below by alternative.

Alternative 1. In the ultimate plan, TH 77 would have adequate capacity to serve the forecast 2005 peak hour volumes without congestion or delay. Two areas of congestion would still exist on I-494, however. These areas are the 34th Avenue off-ramp from westbound I-494 in the AM peak hour, and the 34th Avenue on-ramp to eastbound I-494 in the PM peak hour.

Alternative 1A. In Stage I the only congestion forecast on TH 77 is at the northern limits of the project where the proposed improvements tie back into the existing facility. The major congestion points on I-494 within the project area will be between 12th Avenue and TH 77 and between the loops of the TH 77/I-494 cloverleaf interchange.

Alternatives 2 and 3. With the no-build alternatives, the major congestion points on TH 77 include the Killebrew Drive/TH 77 intersection and the TH 77 /I-494 Interchange. Backups from the Killebrew Drive/TH 77 intersection will produce delays and congestion at both the Old Shakopee Road/

TH 77 interchange and the TH 77/I-494 interchange. Congestion would be expected on I-494 at all of the interchanges in the project area and on I-494 west of 12th Avenue.

5.1.1.3 Hours of Congestion

The beneficial impacts of increased capacity on TH 77 and I-494 in the project area are not clearly demonstrated by the preceeding analysis, since this analysis relates only to the conditions which could be expected during the peak hour within the project area. Since the no-build alternative would not satisfy all of the forecast peak hour demand, some of the forecast demand would be forced to other routes and or be forced to travel during non-peak hour time periods either before or after the typical peak hour. This would result in congestion on other routes outside the project area and/or congestion within the project area for more hours each day. It is difficult to estimate how much traffic would divert to other routes or the impact of this diversion on congestion levels on other routes and increases in travel time for the motorist. Data from the MnDOT traffic management center indicates that average delays of about 8 minutes at ramp meters are required to divert traffic to other routes. This could be considered as the minimum average increase in travel time that a motorist would experience if diverted to another route.

To quantify the capacity implications of the alternatives, an analysis was done to define the number of hours that congested conditions were likely to exist in order to serve the forecast demand for each alternative. This analysis assumed a.) that none of the forecast traffic demand was diverted to other routes, and b.) that all of the traffic which could not be served in the peak hour moved to the hours before and after the normal peak.

The capacity of each of the alternatives was defined based on the analysis discussed in the previous section. The volumes which were analyzed in the previous section represent the volumes which reach or slightly exceed the capacity of that system. The congestion areas represent the points where that system is likely to break down first. The capacity of the alternative is defined by the number of peak hour trip ends into and out of that system. This can be determined by drawing an imaginary cordon line around the project area and adding up the total peak hour traffic crossing that cordon line. The traffic crossing the cordon line can be divided into background traffic and site generated traffic. The table below indicates the results of this analysis.

TABLE 5.1.B
ESTIMATED CAPACITY OF TH 77/I-494 PROJECT AREA ROADWAYS
BASED ON TRIP ENDS AT CORDON LOCATIONS

	Existing	Stage I (Alt 1A)	Ultimate (Alt 1)
Background	28,000	31,000	36,000
Site	14,000	16,000	19,000
TOTAL	42,000	47,000	55,000

These capacities can be compared directly with the forecast traffic demand presented in Table 5.1.A to identify the ability of the road system under each alternative to serve the forecast traffic. Using typical hourly distributions for background and site generated daily traffic, it is possible to determine the number of hours each day where the forecast demand would exceed the capacity of the road system if the traffic demand which cannot be accommodated during a given hour is shifted to the next earlier or later hour. The results of this analysis are presented in Table 5.1.C and are discussed below by alternative.

TABLE 5.1.C
FORECAST HOURS OF CONGESTION ON I-494 AND
TH 77 IN PROJECT AREA

	Alt. 1	Alt.1A	Alt. 2	Alt. 3
1990	0	0	3	2
1995	0	2	4	3
2005	2	5	9	8

Alternative 1. With the ultimate plan for TH 77 and I-494 there would be approximately 2 hours per day of congestion, (one in the A.M. and one in the P.M) in the year 2005, which would be limited to the identified locations on I-494.

Alternative 1A. If only Stage I improvements are made, significant congestion is expected on I-494 by 1995 and by the year 2005 will occur for approximately 5 hours per day.

Alternative 2. The analysis indicates that under the no-build alternative with no TDM there would be 3 hours of congestion on the regional highways in the project area by 1990 which would increase to about 9 hours per day by the year 2005.

Alternative 3. With the no-build and a high level of TDM, it would be possible to eliminate one hour of congestion on the regional highways in the project area. However, by the year 2005 there would still be 8 hours of congestion per day on the project area roadways.

5.1.1.4 Mitigation Measures

As indicated in the preceding analyses some congestion is forecast on I-494 even with implementation of the 2005 design concept. The number of areas affected and the number of hours per day that congestion would exist in these areas increases as the level of roadway improvements decreases. More hours of congestion are expected with the no-build alternative than with Stage I improvements, and Stage I improvements will have more hours of congestion than the 2005 design concept.

The critical element affecting the design of the project area roadways is the extent to which TH 77 and I-494 can be or will be upgraded outside the project area. The forecast 2005 traffic demand can not be delivered by the existing roadway system unless I-494 west of the project area is upgraded.

Metering of on-ramps to I-494 from the interchanges serving the Airport South District would help to minimize mainline congestion through the project area. The preliminary design of the proposed improvements includes provisions for ramp metering. Ramp metering at other interchanges on I-494 within the transportation analysis area would also help minimize mainline congestion on I-494. Ramp metering would divert traffic from the Airport South District to ramps or roads where excess capacity exists, preserve the integrity of mainline traffic operations, and act as an incentive for ridesharing and moving travel to off-peak hours.

5.1.2 Changes in Travel Patterns and Accessibility

Alternative 1. The major changes to travel patterns and accessibility would occur with Alternative 1, the ultimate plan for improving TH 77 and I-494. Under this plan the north and south frontage roads along I-494 would be removed from 12th Avenue to 34th Avenue, requiring businesses which currently have access to these frontage roads to reorient their access to the street behind them or to an adjacent north-south street. Access could be provided to most of the

businesses affected, but in some cases the replacement access would not be comparable to the existing access. These access changes are fully described in Section 5.4.3.

Another access change in the ultimate plan is the elimination of access from TH 77 to the area west of TH 77 at Killebrew Drive. This access policy was established in the Bloomington Comprehensive Plan and was incorporated into the design of the proposed improvements. This change in access would primarily affect the area west of TH 77 between 86th Street and I-494. Although the future access may be slightly less convenient than the existing access, this area would have access to I-494 at 12th and Portland Avenues and at 24th Avenue via the 79th Street extension. Access to TH 77 would be provided at the existing interchange at Old Shakopee Road and at new interchanges at Killebrew or 81st via 86th Street or 79th Street.

Alternative 1 would also eliminate the ability of TH 77 traffic to exit at 24th Avenue via I-494, since the TH 77 ramps to and from the east on I-494 would be grade separated from the 24th Avenue ramps to and from the west on I-494. This change should not create any significant impacts, since TH 77 traffic could get to this area by exiting at Killebrew Drive, 81st Street, or 75th Street.

Alternative 1 would improve the accessibility for the entire Airport South District of Bloomington and for the air cargo terminal area of MSP International Airport. The plan would also improve accessibility to the MTC bus garage located north of I-494 between 24th and TH 77. The connection of 79th Street under TH 77 would provide improved access for the Marriot and Thunderbird Motels and the Metropolitan Sports Center.

The interchange at 81st Street would improve access to the Met Center and the proposed Mall of America as well as to other parts of the Airport South District. The new interchange at Killebrew Drive would increase the capacity for access to and from TH 77 at this location, providing a more direct route for traffic now using other interchanges due to capacity restraints at the existing intersection.

Alternative 1 would not cause any major changes in travel patterns since it only involves upgrading of routes which already exist. However, the increased capacity on TH 77 would probably divert traffic from I-35W to TH 77 until I-35W is upgraded.

Alternative 1A. The Stage I plan would not have many of the negative affects on property access which would occur under Alternative 1, since it would not remove all of the frontage roads along I-494 between 12th and 34th Avenue.

The only frontage road which would be removed is between 24th Avenue and TH 77. On the north side of I-494, this frontage road would be replaced by an east/west road between 24th and TH 77 at approximately 75th Street. On the south, access would be provided by 79th Street, which would also be connected under TH 77 as in Alternative 1.

Other changes in accessibility and travel patterns which would occur under the ultimate plan would also occur under the Stage I plan. Both alternatives eliminate access to the west side of TH 77 at Killebrew Drive, eliminate the ability of TH 77 traffic to exit at 24th Avenue via I-494, provide new interchanges at 81st and Killebrew, and increase the mainline capacity on TH 77, potentially diverting traffic from I-35W.

Alternatives 2 and 3. The no-build alternatives would have negative impacts on accessibility and travel patterns due to the capacity limitations of the existing road system. As traffic volumes increase, access at the existing intersections and interchanges would become more congested and cause traffic to divert to other routes. This is expected to occur with or without TDM in the Airport South District.

5.1.3 Consistency With the Metropolitan Transportation Plan

Both TH 77 and I-494 in the project area are listed as Metropolitan Highway Needs in the Metropolitan Council Transportation Development Guide/Policy Plan. The segment of TH 77 identified in the Policy Plan is between I-494 and 86th Street. The specific need identified is a new interchange to replace the existing at-grade intersection at Killebrew Drive and TH 77, to increase the capacity of TH 77 and relieve I-35W. The segment on I-494 identified in the Policy Plan is between TH 77 and 24th Avenue, and the need identified is to upgrade the interchange area.

Alternatives 1 and 1A. Both Alternatives 1 and 1A address these needs by upgrading the TH 77 and 24th Avenue interchange areas on I-494 and providing new interchanges on TH 77 at Killebrew Drive and 81st Street.

Alternatives 2 and 3. The two no-build alternatives would be inconsistent with the Transportation Policy Plan since they do not address the needs identified in the policy plan.

5.1.4 Transit Service

An increase in transit service to the Airport South District is anticipated with the increased density of development and higher employment levels forecast in the District. In the Airport South District Generic EIS, a comprehensive analysis

was conducted of the transit service improvements needed to meet the moderate goals of one to two percent transit use. This analysis indicated that this goal could be met by implementation of the Sub-region 3 transit routes, a slight increase in frequency of bus trips on the existing transit routes serving the area, and stops in the area by existing express routes on TH 77 and I-494.

In addition to providing transit service to the Airport South District, both TH 77 and I-494 are used to provide transit service to other portions of the metropolitan area. The reduction of traffic congestion and delay on TH 77 and I-494 would have a beneficial impact on transit service to this area as well as other parts of the metropolitan area.

The other area where the project could potentially impact transit service is in relation to the MTC bus garage located north of I-494 between TH 77 and 24th Street. The proposed improvements would have some impact on the access and circulation to the bus garage because of changes in the frontage road and access to 24th Avenue and TH 77. The specific impacts of each alternative are summarized below.

Alternative 1. In the 2005 design concept, the north I-494 frontage road in front of the MTC bus garage would be removed and replaced by a road at approximately 75th Street connecting TH 77 and 24th Street. Access to the bus garage would be provided off this road. This would change circulation patterns for buses but would not require any internal changes in the bus garage. Access to and from the north on TH 77 would be improved by the direct access interchange at 75th Street. Access from the south on TH 77 would also be provided directly from the 75th Street interchange. Access to the south on TH 77 would be slightly less direct than today but would be available at the interchanges on TH 77 at Old Shakopee Road, Killebrew Drive, and 81st Street. Access to I-494 would be relatively unchanged by the project. Overall this alternative would produce beneficial impacts on transit service by increasing the capacity of I-494 and TH 77 and improving access to the area.

Alternative 1A. The changes in access to the MTC bus garage are much the same as in Alternative 1 except that access from the north on TH 77 and access from the south on TH 77 is not provided at 75th Street. Access from the north on TH 77 to the bus garage with Stage I improvements would be the same as existing. To access the MTC bus garage from the south on TH 77, buses would have to use the Old Shakopee Road, Killebrew Drive, or 81st Street interchange to 24th Avenue. The increased capacity on TH 77 and I-494 would have a positive impact on transit service in this area.

Alternatives 2 and 3. The no-build alternatives would have a negative impact on transit service because of their limited capacity and the higher congestion levels expected.

5.1.5 Impacts on Minneapolis-St. Paul International Airport

The project could impact the airport by requiring relocation of the north I-494 frontage road east and west of 24th Avenue, and by penetrating the 50:1 approach surface at the southwest edge of the proposed runway 4/22 extension. The project would also serve the increased traffic volumes already expected as a result of plans to expand the air cargo terminal facilities in the 24th Avenue interchange area. The Metropolitan Airports Commission (MAC) has been consulted about the location and design of the proposed roadway on MAC property. A determination will be required from the FAA that this land and other airport land that may be needed for highway improvements are not needed for aeronautical activities. This determination will be based on plans on file with the FAA. The design and location of roads on airport property will be coordinated with the MAC and FAA so that the roads are not located on land which is needed for aeronautical purposes. The impacts of each alternative are discussed below, followed by potential mitigation measures.

5.1.5.1 Alternative 1:

Under this alternative, the north I-494 frontage road west of 24th Avenue bordering the northeast quadrant of the TH 77/I-494 interchange would be removed. Access to the MTC bus garage and that corner of the airport property would be provided by creating an extension of 24th Avenue directly west of its current terminus two blocks north of I-494 and continuing west to TH 77, then north into the existing east frontage road. The extension would include an access drive directly south to the MTC garage. Hennepin County's jurisdiction over 24th Avenue, which is also CSAH 1, ends at I-494, where it extends north into MAC jurisdiction. The new access road would cross the clear zone of the proposed runway extension, but the airport owner (MAC) would continue to control the land within the clear zone through easements.

This alternative would also require realignment of the north I-494 frontage road east of 24th Avenue. The proposed realignment of this frontage road as well as the design of other roads on MAC preoperty are being coordinated with MAC. Although not as a result of this project, the northwest corner of the runway extension clear zone would also overlap Cedar Avenue near 73rd Street within the TH 77/I-494 project area. Runway clear zones at MSP extend across other highways, including TH 5 and CR 62. It is assumed that the airport owner would control the affected area of TH 77, as it controls the other highway/clear zone areas.

Another potential impact of Alternative 1 on the airport is related to the approach surface of the proposed extension of runway 4/22. Alternative 1 proposes a four level directonal interchange at TH 77 and I-494. The highest ramp, which serves the southbound TH 77 to eastbound I-494 movement, would be at elevation 893.6 at the highest point of its vertical curve. The highest point on this ramp would be located along the southeast edge of the southwest runway 4/22 approach surface. The deck (roadway) surface of the highest point of the ramp - elevation 893.6 - would be approximately fourteen feet below the bottom of the 50:1 approach surface, estimated to be at elevation 907.6.

Federal Aviation Administration (FAA) requirements call for seventeen feet of vertical clearance between the roadway surface of an interstate highway and the bottom of the 50:1 approach surface. A truck approximately fourteen feet high traveling on the highest ramp could penetrate the approach surface. Typical highway lighting standards, if used on the ramp bridge deck, could also penetrate the approach surface.

The 75th Street interchange located north of the TH 77/I-494 interchange, would also be beneath the approach surface. The elevation of the approach surface is at approximately elevation 887 above the high point of the ramp over TH 77 which is at elevation 854. The resulting 33-foot clearance would be adequate for lighting this ramp at its highest point and for trucks using the ramp.

The FAA has been included as a cooperating agency on this project and FAA Form 7460-1, "Notice of Proposed Construction or Alteration," has been submitted. The purpose of this form is to allow the FAA to make a determination whether the fourth level ramp of the proposed TH 77/I-494 interchange is a "hazard" or "obstruction." There is an existing obstruction, the Metro Financial Center located approximately 1,500 feet farther from the runway, which intrudes approximately 18 feet into the approach surface. A line drawn from the top of this building to a point 200 feet from the end of the proposed runway extension would be 26.4 feet above the highest point of the fourth level ramp.

To help mitigate the impacts of Alternative 1, the use of low-height lighting on the fourth level ramp bridge deck is proposed to avoid penetrating the approach surface. A request for land release for the 24th Avenue/ frontage road extension would also be required from the FAA. That request is expected to be submitted by the airport owner, the Metropolitan Airports Commission. Traffic analysis of I-494 would take into account plans for expanded air cargo facilities in the 24th Avenue area.

5.1.5.2 Alternative 1A

Alternative 1A would also require relocating the north I-494 frontage road east and west of 24th Avenue. The proposed relocation and impacts would be as described previously under Alternative 1.

This alternative would also take into account MAC plans for expanded air cargo terminal facilities in the 24th Avenue interchange area.

Alternative 1A proposes roadway improvements which would not conflict with FAA or Mn/DOT air transportation clearance requirements. Construction of Alternative 1A would require the submission of FAA Form 7460-1 and a request for land release in the 24th Avenue interchange area, described previously under Alternative 1.

5.1.5.3 Alternative 2

Under the no build alternative, no impacts would occur to airspace or clearance zones at the airport. Roadway improvements would not be constructed to handle either the increased traffic expected at 24th Avenue as a result of air cargo terminal expansion, or the general increase in I-494 traffic volumes, including trips to and from the airport. The general impact of Alternative 2 would be increased traffic congestion along TH 77 and I-494 in the airport vicinity, slowing down all traffic including airport traffic.

No mitigation measures are proposed for Alternative 2.

5.1.5.4 Alternative 3

Implementation of Alternative 3 could be expected to reduce somewhat the level of traffic congestion projected along the I-494 corridor as a result of redevelopment of the Met Stadium site and general commercial growth. Traffic would continue to increase in the area, resulting in delays for trips to and from the airport.

TDM measures would not affect traffic using the 24th Avenue interchange to reach the expanded air cargo terminal area. Future congestion at that interchange would not be relieved by Alternative 3.

No mitigation measures are proposed for Alternative 3.

5.1.6 Bicyclist and Pedestrian Traffic

There are currently no bicycle or pedestrian trails or paths along either I-494 or TH 77 in the project area. There are

several bicycle and pedestrian trails in the Minnesota Valley National Wildlife Refuge. A pedestrian and bicycle path is incorporated into the I-494 bridge over the Minnesota River, connecting the trails on each side of the river with each other. Pedestrian access is provided across TH 77 at Old Shakopee Road, at about 90th Street on a pedestrian bridge, and at 86th Street. Although it is possible for pedestrians to cross TH 77 at Killebrew Drive, the present design does not encouraged it. Pedestrian access across I-494 is provided at 24th and 34th Avenues. A potential regional trail corridor identified in the Metropolitan Development Guide runs along 24th Avenue from Killebrew Drive north to CSAH 62, crossing I-494 and MSP International Airport. This potential trail would also cross runway 4/22. A second potential regional trail corridor runs along I-494 from 24th Avenue to TH 5.

Alternatives 1 and 1A. Under the build alternatives, both TH 77 and I-494 would be controlled access facilities with no at-grade crossings. The proposed design for TH 77 and I-494 would not include any bicycle or pedestrian trails along the routes. Pedestrian and bicycle trails could be developed parallel to TH 77 along any of the city streets west of TH 77, and along 24th Avenue east of TH 77. Pedestrian and bicycle paths would be provided parallel to I-494 along 79th Street and 80th Street. Pedestrians would be able to cross TH 77 at 79th Street.

There would be no pedestrian crossing of TH 77 at either the 81st Street or Killebrew interchanges. Under the current plan, pedestrian access across TH 77 would be provided at either 86th Street or at 79th Street. An intermediate crossing could be provided directly to the Mall of America at about 82nd Street if desired. The 24th Avenue interchange would be designed to accommodate pedestrian crossing of I-494.

Alternatives 2 and 3. The no-build alternatives would not result in any change to the existing situation. Pedestrians and bicyclists can currently cross I-494 at 12th Avenue, 24th Avenue, or 34th Avenue. Pedestrians can currently cross TH 77 at Old Shakopee Road, 86th Street, Killebrew Drive, and at approximately 90th Street on a pedestrian bridge.

5.2 AIR QUALITY IMPACTS

The air quality impacts of the proposed project have been addressed by modeling future traffic flow to predict carbon monoxide (CO) concentrations in the project area and in the transportation analysis area. The air quality analysis is based on the traffic forecasts contained in Section 5.1,

Transportation Impacts. Total expected CO concentrations are the sum of local CO, determined by modeling, and background CO, which was determined by monitoring in the project area. Impacts are determined by comparing the forecast CO concentrations to the state and federal ambient air quality standards for CO, shown in Table 5.2.A. These standards are set at levels to protect the most sensitive segments of the population and are not to be exceeded more than once per year. Impacts occur when the forecast CO concentrations exceed the state or federal standards. This section documents the air quality prediction methodology, assumptions used to forecast CO concentrations, and the resulting future CO concentrations.

TABLE 5.2.A
AMBIENT AIR QUALITY STANDARDS FOR CO (PPM)

	1-HOUR	8-HOUR
State	30	9
Federal	35	9

5.2.1 Modeling Methodology

The following models have been used to forecast future carbon monoxide (CO) concentrations from local sources:

- Guidelines for Air Quality Maintenance, Planning and Analysis, Volume 9 (Revised): Evaluating Indirect Source (EPA -405/4-78-001) was used to determine traffic flow characteristics and resultant baseline CO emission rates.

- The MOBILE3 Mobile Source Emissions Model was used to adjust the baseline emissions to the project year, temperature, vehicle mix, and percentage of cold starts.

- CALINE3 - A Versatile Dispersion Model for Predicting Air Pollutant Levels Near Highways and Arterial Streets (FHWA/CA/TL-79/23) was used to disperse the calculated emissions from the highway sources to the selected receptor sites.

5.2.1.1 Background Concentrations

Background CO concentrations were determined through analysis of the CO monitoring conducted in the project area and documented in Section 4.2.1. The monitored concentrations

were adjusted to worst-case conditions based on comparisons to concentrations monitored at permanent CO monitors operated by the MPCA. Future background CO concentrations were estimated based on expected decreases in average CO emission rates and expected increases in vehicle miles of travel. The resulting background CO concentrations utilized in this study are shown in Table 5.2.B. These background concentrations represent CO from remote sources not included in the modeling analysis. The background concentrations are added to the modeled local CO concentrations to determine total expected CO concentrations.

TABLE 5.2.B
BACKGROUND CO CONCENTRATIONS (PPM)

YEAR	1-HOUR	8-HOUR
1982	8.9	5.8
1990	5.9	3.9
1995	5.4	3.5
2000	5.5	3.6

5.2.1.2 Vehicle Type Mix

The vehicle type mix was obtained from Transportation Analysis M295 prepared by Mn/DOT for the Airport South area. This data was supplemented with truck counts from an automatic traffic recorder on I-494 between TH 77 and 24th Avenues. The percentage of diesel vehicles was taken from EPA estimates of future diesel vehicle use contained in the MOBILE3 model. Table 5.2.C shows the resulting vehicle type mix used in the analysis.

5.2.1.3 Cold/Hot Starts

Vehicles which have had their engines turned off and restarted after a period of time emit CO at a higher rate than warmed-up (stabilized) vehicles. The MOBILE3 emission model considers three modes of vehicle operations:

- o Cold Start - the first 505 second (8.4 minutes) of operation following a minimum four hour engine off period.
- o Hot Start - a minimum ten minute engine off period is followed by a hot start operating mode lasting one to eight minutes depending on temperature and the length of time the engine was turned off.
- o Stable - vehicles which are fully warmed-up.

TABLE 5.2.C
VEHICLE TYPE MIX
(PERCENTAGE OF VEHICLES)

	LDGV	LDGT1	LDGT2	HDGV	LDDV	LDDT	HDDV	MC
1995	66.8	7.8	5.3	2.4	14.2	1.9	1.6	0
2005	65.2	7.7	5.2	2.4	15.8	2.1	1.6	0

LDGV - Light duty gas vehicle
LDGT1 - Light duty gas vehicle < 6001 lbs.
LDGT2 - Light duty gas vehicle 6001-8500 lbs.
HDGV - Heavy duty gas vehicle
LDDV - Light duty diesel vehicle
LDDT - Light duty diesel truck
HDDV - Heavy duty diesel truck
MC - Motorcycle

This analysis assumes 20% of vehicles operating in a cold start mode, 10% of vehicles operating in a hot start mode, and the remainder of vehicles stabilized.

5.2.1.4 Meteorology

Meteorological assumptions for this analysis are representative of worst-case fall or winter conditions. The emission rate estimates are based on an ambient temperature of 20°F. The dispersion estimates utilize a wind speed of 1.0 meters per second and atmospheric stability class D. A variety of wind directions are modeled at each location in order to determine the worst case combination of wind direction, roadway configuration, and receptor location.

5.2.1.5 8-Hour Persistence

The analysis methodology utilizes PM peak hour traffic volumes and worst case meteorological conditions to predict peak 1-hour CO concentrations. In order to estimate 8-hour concentrations, a persistence factor is used. This persistence factor is intended to correct for both reduced traffic and the lack of persistence of worst case meteorology during an 8-hour period. Persistence factors of 0.6 to 0.7 are suggested by EPA Volume 9.

The Mall of America and Fantasyworld Draft EIS estimated hourly traffic for each hour of the day. The peak hour occurred between 4:00 and 5:00 PM and contributed 10.76 percent of the daily traffic. The 8-hour period between 11:00

AM and 7:00 PM was identified as the peak 8-hour traffic period. Average hourly traffic during this 8-hour period is 7.29 percent of total daily traffic. The resulting ratio of average 8-hour traffic to peak hour traffic is 0.68. Data from Automatic Traffic Recording (ATR) Station 302 located on I-494 at 24th Avenue also indicates a peak hour from 4:00 to 5:00 p.m. and a peak 8-hour traffic period from 11:00 a.m. to 7:00 p.m. The ratio of average 8-hour traffic to peak hour traffic at this station is 0.72. Thus, to correct for traffic volumes only, a persistence factor of approximately 0.7 would be appropriate.

The persistence factor should also account for wind speeds in excess of 1.0 meters per second, the directional variability of the wind, variations in atmospheric stability, and changes in temperature. These variables could further reduce the persistence factor. For example, an average wind speed of 1.1. meters per second would result in a correction factor of 0.91. Combined with the traffic correction, a total persistence factor of 0.64 (0.7 x 0.91 = 0.64) would result.

Another indicator of the appropriate persistence factor is the CO monitoring data collected in the Airport South area. The worst case 1982 background CO concentrations were determined to be 8.9 PPM 1-hour average and 5.8 PPM 8-hour average. The ratio of these values is 0.65.

Based on these comparisons, it can be concluded that a persistence factor of 0.65 would realistically adjust peak 1-hour CO concentrations to peak 8-hour CO concentrations and correct for both traffic and meteorological variations. In order to assure a worst-case analysis, a 0.7 persistence factor is used, which is consistent with the methodology used in the State EIS for the Mall of America and Fantasyworld.

Under Alternatives 2 and 3 and to a lesser extent, Alternatives 1 and 1A, the peak hour traffic demand is expected to meet or exceed the capacity of the road system. As discussed in Section 5.1.1.3, the excess traffic demand will either be diverted to alternative routes or will be forced to occur in the hours before and after the peak hour. If no diversion of traffic occurs, the ratio of average 8-hour traffic to peak hour traffic will increase. Since this ratio is an indicator of the 8-hour persistence factor, the methodology used to compute 8-hour average concentrations must account for this affect.

Table 5.1.C shows the forecast hours of congestion associated with each alternative. Based on the expected hourly distribution of background and site-generated traffic, this

table can be refined to reflect the number of hours of congestion (capacity operations) expected to occur during the 8-hour period from 11:00 AM to 7:00 PM, which is the peak 8-hour period considered in the air quality analysis. This refinement is shown in Table 5.2.D.

TABLE 5.2.D
FORECAST HOURS OF CONGESTION ON I-494 AND TH 77 IN PROJECT AREA

ALTERNATIVE	1		1A		2		3	
TIME PERIOD	AM	PM	AM	PM	AM	PM	AM	PM
1990	0	0	0	0	1	2	1	1
1995	0	0	1	1	1	3	1	2
2005	1	1	1	4	1	8	1	7

The congestion expected in the PM period is a result of the Mall of America and the hourly distribution of retail traffic which is minimal during the AM hours. This information is used as follows to compute peak 8-hour average CO concentrations:

Let N = Number of hours of capacity operations during peak 8-hour period.
Let C = Peak 1-hour CO concentration.
Let P = Persistence factor.

Then:

$$8\text{-Hour CO Concentration} = [(N \times C) + ((8 - N) \times C \times P)]/8$$

This equation computes a weighted 8-hour average concentration using the predicted peak 1-hour CO concentrations weighted by the number of hours of capacity traffic operations. Where no hours of capacity operation are expected, the equation reduces to:

$$8\text{-Hour CO Concentration} = C \times P$$

which is consistent with the methodology used in the State EIS for the Mall of America.

It should be emphasized that this is a conservative methodology for predicting 8-hour CO concentrations. The persistence factor is essentially used only to correct for the lack of persistence of traffic. Thus, the predicted 8-hour CO concentrations are representative of those which would be

expected if the worst-case meteorological conditions assumed for the peak 1-hour analysis were to persist for eight consecutive hours.

5.2.1.6 Traffic Operations

Vehicle cruise speeds were estimated based on design speeds, volume to capacity ratios, and resulting level of service. The level of service analysis is shown in Figure 5-1 through 5-8. The CO analysis accounts for areas of traffic congestion by reducing vehicle speeds and raising the resulting CO emission rates.

At signalized intersections, queue lengths, delay times, and resulting excess CO emission rates were computed using the procedures given in Volume 9. These procedures require detailed estimates of signal operations which were calculated based on the following assumptions:

- Through lane capacity of 1,800 vehicles per hour of green time (VPHG).
- Turn lane capacity of 1,600 VPHG.
- Signal cycle times of 120 seconds.
- Amber intervals of 3 seconds.
- Optimal signal phasing including protected turn phases where necessary.
- Green time distributed to each phase based on lane geometry and forecast PM peak hour traffic volumes.

5.2.1.7 Analysis Areas

Analyses of future CO concentrations have been completed in the project area and at selected locations in the transportation analysis area consistent with the Final Study Outline and Scoping Decision. Within the project area, comprehensive CO modeling was conducted for TH 77 from south of Killebrew Drive to north of the I-494 interchange, and for I-494 from west of the TH 77 interchange to east of the 24th Avenue interchange. This project area was divided into three logical analysis areas as described below due to modeling constraints. Also described below are the two analysis areas in the transportation analysis area.

- Area A - TH 77 at Killebrew Drive and 81st Street. This analysis area includes TH 77 from south of Killebrew Drive to just south of the I-494 interchange.

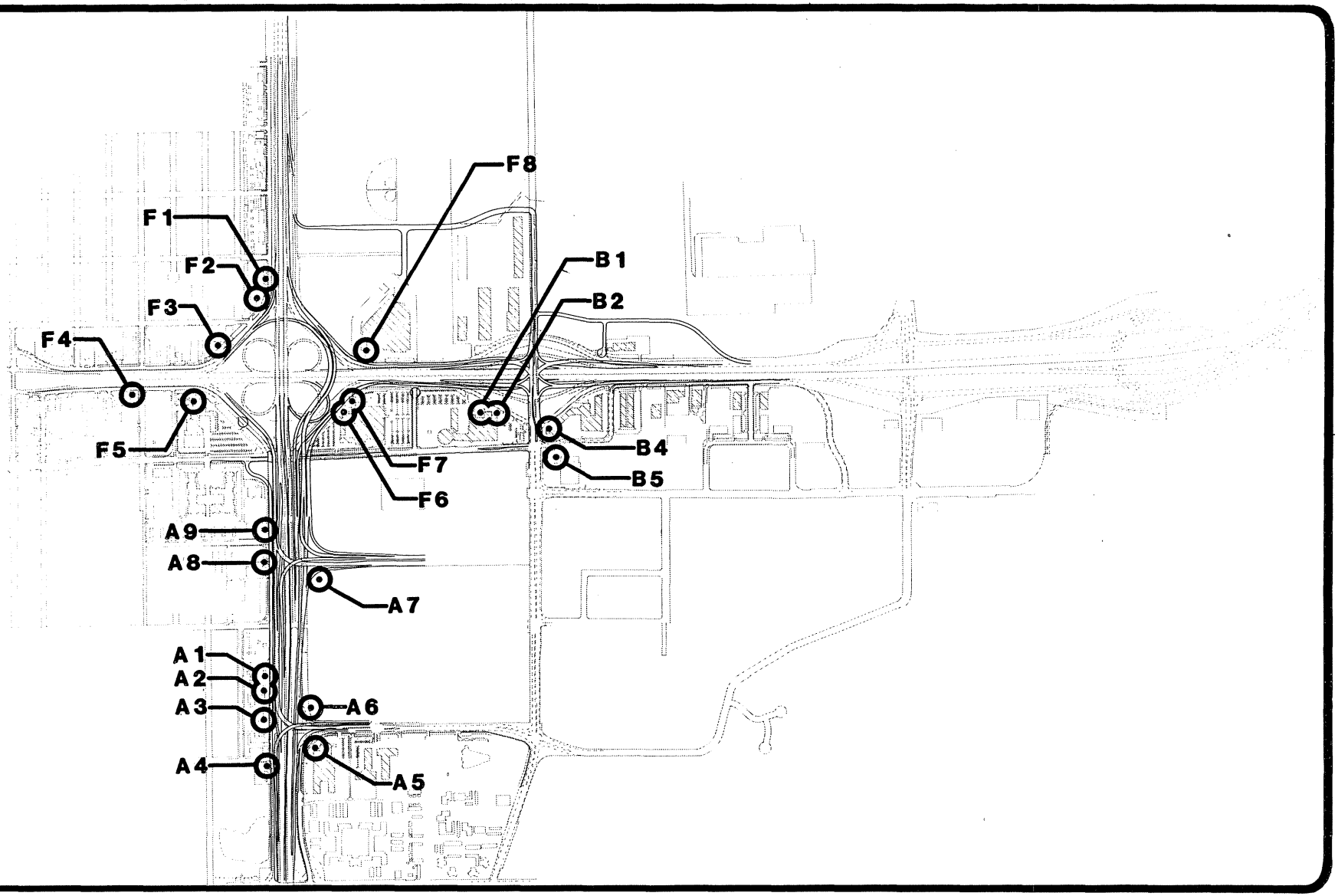
All ramps, loops, and collector-distributor roads were modeled. Nine receptor sites, designated A1 through A9 and representing residential and commercial uses, have been analyzed in this area. These receptor sites are shown on Figure 5.2.A.

- Area B - 24th Avenue at I-494 and 79th Street. This analysis area includes I-494 from east of the TH 77 interchange to east of 24th Avenue, and 24th Avenue from north of I-494 to south of 79th Street. Vehicle queuing at 79th Street and the I-494 ramp terminals was modeled. Five receptor sites designated B1 through B5 have been analyzed in this area. The receptor sites represent commercial uses. Receptor site B3 is not analyzed for either Alternative 1 or 1A since the gas station represented by this receptor would be taken to widen 24th Avenue. The receptor sites are shown on Figure 5.2.A.

- Area D - I-494 at Nicollet Avenue. This analysis area was selected to represent typical conditions on I-494 in the transportation analysis area. The analysis area includes I-494 from east of Nicollet Avenue to east of Lyndale Avenue, the Nicollet Avenue overpass, and the ramps to and from I-494. Signalized intersections are assumed at the ramp terminals and ramp meters are assumed on the entrance ramps. The geometrics, traffic control, and relative receptor locations at this full-diamond interchange are very similar to those at the I-494/Penn Avenue interchange and I-494/Lyndale Avenue interchange. The half-diamond interchanges at Portland Avenue and Twelfth Avenue also have similar geometrics. The analysis at this location is presented for 1995 to represent capacity operations on I-494. The five receptor sites shown on Figure 5.2.B and designated D1 through D5 have been analyzed in this area.

- Area F - I-494 interchange with TH 77. This analysis area includes the entire I-494/TH 77 interchange with all of the ramps, loops, and collector-distributor roads. This area falls between Areas A and B. Eight receptor sites, designated F1 through F8, have been analyzed in this area. The receptor sites, shown on Figure 5.2.A represent residential and commercial developments in the vicinity of the interchange.

- Area G - TH 77 interchange with CSAH 62. The interchange of TH 77 and CSAH 62 (the Crosstown) is a cloverleaf interchange within the transportation analysis area. The seven receptor sites shown in Figure 5.2.C and designated G1 through G7 represent residential development and a park.



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 5.2.A

Area A,B&F
CO Receptor Sites

0' 1,500'

BRW

5.2.1.8 Analysis Years

For the project area modeling, Alternative 1A was modeled with 1990 and 1995 traffic volumes. The 1990 volumes represent the year after expected completion of the Stage I improvements, while the 1995 volumes represent the design year of the Stage I improvments. Alternative 1 was modeled with 2005 traffic volumes which are the design year volumes for the ultimate improvements. For Alternatives 2 and 3, analyses were conducted using 1995 and 2005 traffic volume forecasts.

Areas D and G are located within the transportation analysis area. Area D was modeled for 1995 to represent the approximate year of capacity traffic operations on I-494. Area G was modeled for 2005 to represent the approximate year of capacity traffic operations at the TH 77/Crosstown interchange.

5.2.2 Analysis Results

The results of the CO analysis are presented in Tables 5.2.E through 5.2.O. Each table contains the analysis results for a particular analysis area, one or more alternatives, and each of the years analyzed. The results are discussed below, first for the analysis areas in the transportation analysis area and then by alternative for the analysis areas in the project area.

5.2.2.1 Transportation Analysis Areas

The two locations analyzed in the Transportation Analysis Area have the same results regardless of the alternative in the project area. The analysis results for I-494 at Nicollet Avenue (Area D) and the TH77/CR62 interchange (Area G) are shown in Tables 5.2.K and 5.2.O, respectively.

In Area D, I-494 at Nicollet, peak hour 1995 traffic demand forecasts indicated over capacity operations on I-494 in both directions. Based on the volume to capacity ratio, a peak hour operating speed of 10 MPH was assumed and used in the peak hour modeling together with the peak hour demand volume forecast. This resulted in a maximum predicted peak hour concentration of 17.8 PPM at receptor D1. Following the methodology discussed previously for computing 8-hour average concentrations, this peak hour concentration would indicate a potential violation of the 8-hour standard. However, this methodology essentially assumes average operating speeds of 10 MPH on I-494 for eight consecutive hours. The volume to capacity ratio for the average hourly traffic for the peak 8-hour period indicated average operating speeds of approximately 30 MPH which is representative of capacity operations. Thus, a second analysis was



T.H.77/I-494 IMPROVEMENT PROJECT

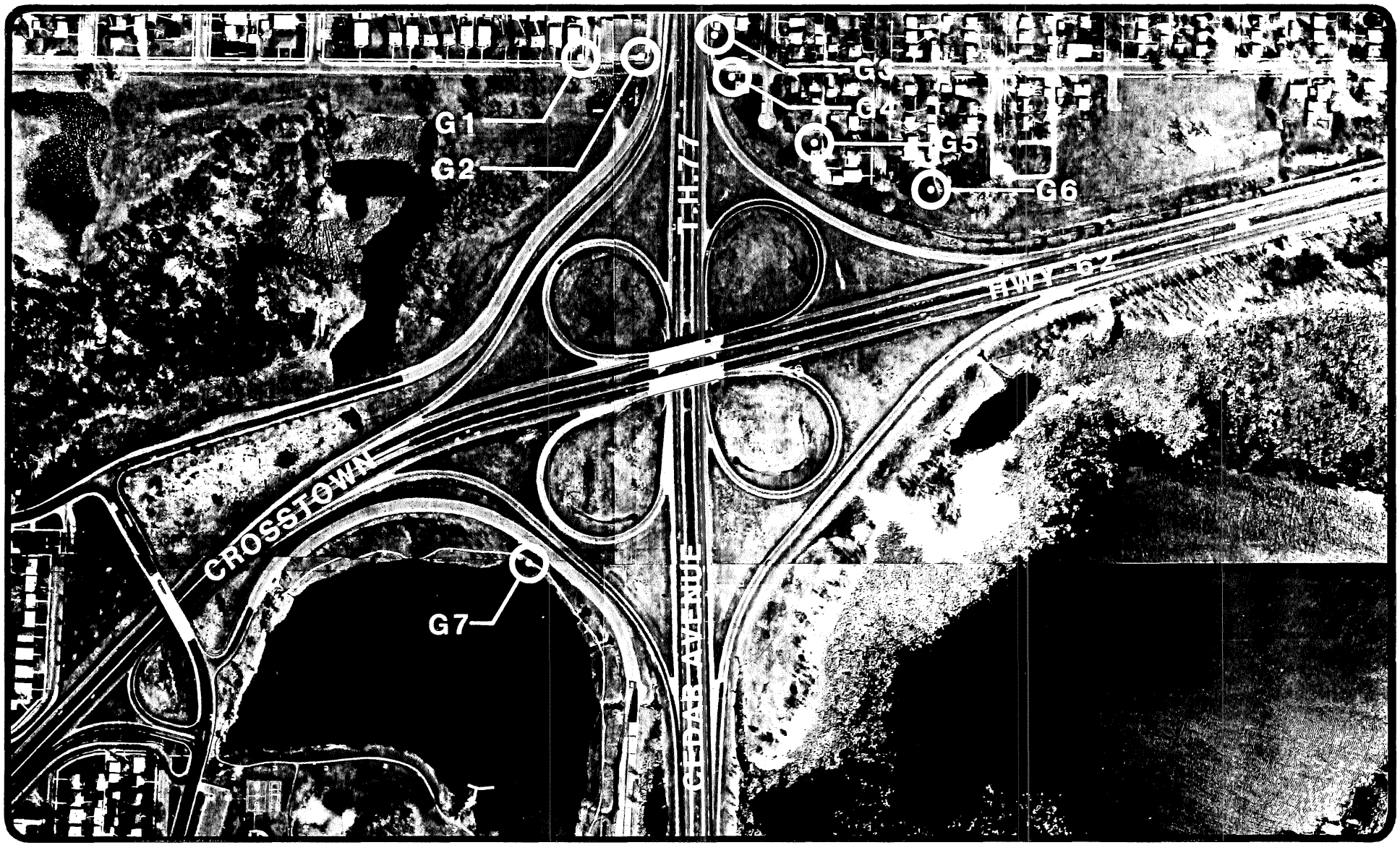
FIGURE 5.2.B

Area D
CO Receptor Sites

N

0' 700'

BRW



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 5.2.C

Area G
CO Receptor Sites

0' 400'

BRW

TABLE 5.2.E
PREDICTED CO CONCENTRATIONS (PPM)
TH77 AT 81ST STREET AND KILLEBREW - AREA A
ALTERNATIVES 1, 1A

	1990	1995	2005	
1-HOUR BACKGROUND CO =	5.9	5.4	5.5	PPM
8-HOUR BACKGROUND CO =	3.9	3.5	3.6	PPM

		WIND DIRECTION									
YEAR	RECEPTOR	10		90		110		280		345	
		1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
1990	A1	6.4	4.3	6.4	4.3	6.5	4.3	5.9	3.9	5.9	3.9
	A2	6.5	4.3	6.7	4.5	6.8	4.5	5.9	3.9	5.9	3.9
	A3	6.4	4.3	6.6	4.4	6.5	4.3	5.9	3.9	5.9	3.9
	A4	6.7	4.5	6.4	4.3	6.4	4.3	5.9	3.9	5.9	3.9
	A5	6.2	4.1	5.9	3.9	5.9	3.9	6.2	4.1	6.8	4.5
	A6	5.9	3.9	6.0	4.0	6.5	4.3	6.6	4.4	6.5	4.3
	A7	6.3	4.2	5.9	3.9	5.9	3.9	6.4	4.3	6.5	4.3
	A8	6.3	4.2	5.9	3.9	5.9	3.9	6.4	4.3	6.5	4.3
	A9	6.5	4.3	6.9	4.6	6.5	4.3	5.9	3.9	5.9	3.9
	MAXIMUM	6.7	4.5	6.9	4.6	6.8	4.5	6.6	4.4	6.8	4.5
1995	A1	5.8	3.8	5.9	3.9	6.0	3.9	5.4	3.5	5.4	3.5
	A2	6.0	3.9	6.2	4.1	6.4	4.2	5.4	3.5	5.4	3.5
	A3	5.9	3.9	6.3	4.2	6.1	4.0	5.4	3.5	5.4	3.5
	A4	6.2	4.1	5.8	3.8	5.8	3.8	5.4	3.5	5.4	3.5
	A5	5.8	3.8	5.4	3.5	5.4	3.5	5.7	3.7	6.5	4.3
	A6	5.4	3.5	5.5	3.6	6.0	3.9	6.1	4.0	6.1	4.0
	A7	5.9	3.9	5.5	3.6	5.4	3.5	5.9	3.9	6.2	4.1
	A8	5.9	3.9	5.5	3.6	5.4	3.5	5.9	3.9	6.2	4.1
	A9	5.9	3.9	6.5	4.3	6.1	4.0	5.4	3.5	5.4	3.5
	MAXIMUM	6.2	4.1	6.5	4.3	6.4	4.2	6.1	4.0	6.5	4.3
2005	A1	5.9	3.9	6.0	4.0	6.1	4.0	5.5	3.6	5.5	3.6
	A2	6.1	4.0	6.5	4.3	6.7	4.4	5.5	3.6	5.5	3.6
	A3	6.1	4.0	6.5	4.3	6.3	4.2	5.5	3.6	5.5	3.6
	A4	6.4	4.2	5.9	3.9	5.9	3.9	5.5	3.6	5.5	3.6
	A5	6.0	4.0	5.5	3.6	5.5	3.6	5.8	3.8	6.8	4.5
	A6	5.5	3.6	5.6	3.7	6.3	4.2	6.4	4.2	6.2	4.1
	A7	6.0	4.0	5.6	3.7	5.5	3.6	6.0	4.0	6.3	4.2
	A8	6.0	4.0	5.6	3.7	5.5	3.6	6.0	4.0	6.3	4.2
	A9	6.1	4.0	6.8	4.5	6.3	4.2	5.5	3.6	5.5	3.6
	MAXIMUM	6.4	4.2	6.8	4.5	6.7	4.4	6.4	4.2	6.8	4.5

TABLE 5.2.F
PREDICTED CO CONCENTRATIONS (PPM)
TH 77 AT KILLEBREW AND 81ST STREET - AREA A
ALTERNATIVE 2

	1995	2005
1-HOUR BACKGROUND CO =	5.4	5.5 PPM
8-HOUR BACKGROUND CO =	3.5	3.6 PPM

		WIND DIRECTION									
YEAR	RECEPTOR	10		90		110		280		345	
		1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
1995	A1	7.4	5.1	7.9	5.5	8.3	5.9	5.4	3.5	5.4	3.5
	A2	8.7	6.2	8.6	6.1	10.0	7.2	5.4	3.5	5.5	3.6
	A3	8.3	5.9	10.1	7.3	10.2	7.4	5.4	3.5	5.5	3.6
	A4	8.8	6.3	9.0	6.4	8.8	6.3	5.4	3.5	5.5	3.6
	A5	7.8	5.5	5.6	3.7	5.4	3.5	8.2	5.8	9.8	7.1
	A6	5.6	3.7	7.5	5.2	10.0	7.2	7.7	5.4	8.1	5.7
	A7	5.4	3.5	5.4	3.5	5.4	3.5	7.6	5.3	6.8	4.6
	A8	6.6	4.5	8.5	6.0	8.5	6.0	5.4	3.5	5.4	3.5
	A9	5.9	3.9	6.8	4.6	6.9	4.7	5.4	3.5	5.4	3.5
	MAXIMUM	8.8	6.3	10.1	7.3	10.2	7.4	8.2	5.8	9.8	7.1
2005	A1	7.1	5.2	7.4	5.5	7.5	5.6	5.5	3.6	5.5	3.6
	A2	8.1	6.2	7.9	6.0	9.2	7.3	5.5	3.6	5.6	3.7
	A3	7.6	5.7	9.3	7.4	9.4	7.5	5.5	3.6	5.5	3.6
	A4	8.1	6.2	7.8	5.9	7.8	5.9	5.5	3.6	5.6	3.7
	A5	7.5	5.6	5.7	3.8	5.5	3.6	7.2	5.3	9.2	7.3
	A6	5.7	3.8	7.3	5.4	9.5	7.6	7.4	5.5	7.6	5.7
	A7	5.5	3.6	5.5	3.6	5.5	3.6	7.1	5.2	6.8	4.9
	A8	6.6	4.7	7.8	5.9	7.8	5.9	5.5	3.6	5.5	3.6
	A9	6.0	4.1	6.8	4.9	6.9	5.0	5.5	3.6	5.5	3.6
	MAXIMUM	8.1	6.2	9.3	7.4	9.5	7.6	7.4	5.5	9.2	7.3

TABLE 5.2.6
PREDICTED CO CONCENTRATIONS (PPM)
TH 77 AT KILLEBREW AND 81ST STREET - AREA A
ALTERNATIVE 3

	1995	2005	
1-HOUR BACKGROUND CO =	5.4	5.5	PPM
8-HOUR BACKGROUND CO =	3.5	3.6	PPM

		WIND DIRECTION									
YEAR	RECEPTOR	10		90		110		280		345	
		1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
1995	A1	7.4	5.1	7.9	5.4	8.3	5.7	5.4	3.5	5.4	3.5
	A2	8.7	6.1	8.6	6.0	10.0	7.1	5.4	3.5	5.5	3.6
	A3	8.3	5.7	10.1	7.1	10.2	7.2	5.4	3.5	5.5	3.6
	A4	8.8	6.1	9.0	6.3	8.8	6.1	5.4	3.5	5.5	3.6
	A5	7.8	5.4	5.6	3.7	5.4	3.5	8.2	5.7	9.8	6.9
	A6	5.6	3.7	7.5	5.1	10.0	7.1	7.7	5.3	8.1	5.6
	A7	5.4	3.5	5.4	3.5	5.4	3.5	7.6	5.2	6.8	4.6
	A8	6.6	4.4	8.5	5.9	8.5	5.9	5.4	3.5	5.4	3.5
	A9	5.9	3.9	6.8	4.6	6.9	4.7	5.4	3.5	5.4	3.5
	MAXIMUM	8.8	6.1	10.1	7.1	10.2	7.2	8.2	5.7	9.8	6.9
2005	A1	7.1	5.1	7.4	5.4	7.5	5.5	5.5	3.6	5.5	3.6
	A2	8.1	6.1	7.9	5.9	9.2	7.2	5.5	3.6	5.6	3.7
	A3	7.6	5.6	9.3	7.3	9.4	7.4	5.5	3.6	5.5	3.6
	A4	8.1	6.1	7.8	5.8	7.8	5.8	5.5	3.6	5.6	3.7
	A5	7.5	5.5	5.7	3.8	5.5	3.6	7.2	5.2	9.2	7.2
	A6	5.7	3.8	7.3	5.3	9.5	7.5	7.4	5.4	7.6	5.6
	A7	5.5	3.6	5.5	3.6	5.5	3.6	7.1	5.1	6.8	4.9
	A8	6.6	4.7	7.8	5.8	7.8	5.8	5.5	3.6	5.5	3.6
	A9	6.0	4.1	6.8	4.9	6.9	4.9	5.5	3.6	5.5	3.6
	MAXIMUM	8.1	6.1	9.3	7.3	9.5	7.5	7.4	5.4	9.2	7.2

TABLE 5.2.H
PREDICTED CO CONCENTRATIONS (PPM)
24TH AVENUE AT I-494 AND 79TH STREET - AREA B
ALTERNATIVES 1, 1A

	1990	1995	2005	
1-HOUR BACKGROUND CO =	5.9	5.4	5.5 PPM	PPM
1-HOUR BACKGROUND CO =	3.9	3.5	3.6 PPM	

WIND DIRECTION

YEAR	RECEPTOR	10		30		315		350	
		1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
1990	B1	8.6	5.8	8.4	5.6	6.9	4.6	8.6	5.8
	B2	8.2	5.5	7.9	5.3	7.9	5.3	8.6	5.8
	B3	NA	NA	NA	NA	NA	NA	NA	NA
	B4	9.1	6.1	9.4	6.4	10.2	6.9	9.7	6.6
	B5	10.1	6.8	9.1	6.1	11.9	8.1	10.5	7.1
	MAXIMUM	10.1	6.8	9.4	6.4	11.9	8.1	10.5	7.1
1995	B1	8.8	6.0	8.7	5.9	6.6	4.4	8.8	6.0
	B2	8.4	5.7	8.3	5.6	7.9	5.3	8.7	5.9
	B3	NA	NA	NA	NA	NA	NA	NA	NA
	B4	8.8	6.0	8.8	6.0	10.1	7.0	9.5	6.5
	B5	9.5	6.5	8.1	5.5	11.3	7.9	10.0	6.9
	MAXIMUM	9.5	6.5	8.8	6.0	11.3	7.9	10.0	6.9
2005	B1	9.2	6.3	9.1	6.3	7.2	4.9	9.3	6.4
	B2	8.7	6.0	8.5	5.8	8.5	5.8	9.0	6.2
	B3	NA	NA	NA	NA	NA	NA	NA	NA
	B4	7.4	5.0	7.1	4.8	10.0	6.9	9.0	6.2
	B5	8.2	5.6	7.6	5.1	11.0	7.7	9.2	6.3
	MAXIMUM	9.2	6.3	9.1	6.3	11.0	7.7	9.3	6.4

NA - NOT APPLICABLE. THIS RECEIVER WILL BE TAKEN FOR ROADWAY EXPANSION.

TABLE 5.2.1
PREDICTED CO CONCENTRATIONS (PPM)
I-494 AT 24TH STREET - AREA B
ALTERNATIVE 2

	1995	2005
1-HOUR BACKGROUND CO =	5.4	5.5 PPM
8-HOUR BACKGROUND CO =	3.5	3.6 PPM

		WIND DIRECTION							
YEAR	RECEPTOR	10		30		315		355	
		1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
1995	B1	8.8	6.3	9.6	6.9	9.1	6.5	8.4	5.9
	B2	9.3	6.7	9.9	7.2	8.8	6.3	8.9	6.3
	B3	11.2	8.2	13.9	10.4	8.1	5.7	9.3	6.7
	B4	8.1	5.7	8.1	5.7	12.9	9.6	9.6	6.9
	B5	9.7	7.0	8.8	6.3	12.9	9.6	11.7	8.6
	MAXIMUM	11.2	8.2	13.9	10.4	12.9	9.6	11.7	8.6
2005	B1	8.5	6.6	9.1	7.2	8.7	6.8	8.1	6.2
	B2	9.0	7.1	9.4	7.5	8.4	6.5	8.5	6.6
	B3	10.7	8.8	12.8	10.9	7.9	6.0	8.3	6.4
	B4	7.9	6.0	8.0	6.1	12.3	10.4	9.4	7.5
	B5	9.2	7.3	8.5	6.6	12.1	10.2	11.7	9.8
	MAXIMUM	10.7	8.8	12.8	10.9	12.3	10.4	11.7	9.8

TABLE 5.2.J
PREDICTED CO CONCENTRATIONS (PPM)
I-494 AT 24TH STREET - AREA B
ALTERNATIVE 3

	1995	2005
1-HOUR BACKGROUND CO =	5.4	5.5 PPM
8-HOUR BACKGROUND CO =	3.5	3.6 PPM

		WIND DIRECTION							
YEAR	RECEPTOR	10		30		315		355	
		1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
1995	B1	8.8	6.1	9.6	6.8	9.1	6.4	8.4	5.8
	B2	9.3	6.5	9.9	7.0	8.8	6.1	8.9	6.2
	B3	11.2	8.0	13.9	10.1	8.1	5.6	9.3	6.5
	B4	8.1	5.6	8.1	5.6	12.9	9.3	9.6	6.8
	B5	9.7	6.8	8.8	6.1	12.9	9.3	11.7	8.4
	MAXIMUM	11.2	8.0	13.9	10.1	12.9	9.3	11.7	8.4
2005	B1	8.5	6.5	9.1	7.1	8.7	6.7	8.1	6.1
	B2	9.0	7.0	9.4	7.4	8.4	6.4	8.5	6.5
	B3	10.7	8.6	12.8	10.6	7.9	5.9	8.3	6.3
	B4	7.9	5.9	8.0	6.0	12.3	10.1	9.4	7.4
	B5	9.2	7.2	8.5	6.5	12.1	9.9	11.7	9.6
	MAXIMUM	10.7	8.6	12.8	10.6	12.3	10.1	11.7	9.6

TABLE 5.2.K
PREDICTED CO CONCENTRATIONS (PPM) 1995
I-494 AT NICOLLET AVENUE - AREA D
ALTERNATIVES 1, 1A, 2, 3

1-HOUR BACKGROUND CO = 5.4 PPM
8-HOUR BACKGROUND CO = 3.5 PPM

	WIND DIRECTION							
RECEPTOR	30		70		110		165	
	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
D1	5.4	3.5	5.5	3.5	17.8	8.7	11.7	5.9
D2	5.4	3.5	5.5	3.6	8.7	5.8	8.4	4.9
D3	5.4	3.5	5.8	3.9	7.6	5.6	10.2	6.8
D4	9.2	5.3	11.0	6.3	5.6	3.6	5.4	3.5
D5	11.0	7.3	10.9	7.8	6.9	5.0	5.4	3.5
MAXIMUM	11.0	7.3	11.0	7.8	17.8	8.7	11.7	6.8

TABLE 5.2.L
PREDICTED CO CONCENTRATIONS (PPM)
I-494/TH 77 INTERCHANGE - AREA F
ALTERNATIVES 1, 1A

	1990	1995	2005	
1-HOUR BACKGROUND CO =	5.9	5.4	5.5	PPM
8-HOUR BACKGROUND CO =	3.9	3.5	3.6	PPM

		WIND DIRECTION											
YEAR	RECEPTOR	80		180		190		280		340		355	
		1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
1990	F1	9.3	6.3	9.7	6.6	8.8	5.9	5.9	3.9	5.9	3.9	6.4	4.3
	F2	8.2	5.5	9.7	6.6	9.3	6.3	5.9	3.9	5.9	3.9	6.1	4.0
	F3	11.8	8.0	9.9	6.7	9.1	6.1	5.9	3.9	5.9	3.9	5.9	3.9
	F4	10.4	7.1	5.9	3.9	5.9	3.9	7.8	5.2	8.7	5.9	8.4	5.6
	F5	8.9	6.0	5.9	3.9	5.9	3.9	7.0	4.7	7.6	5.1	7.6	5.1
	F6	6.7	4.5	5.9	3.9	5.9	3.9	8.5	5.7	10.0	6.8	7.8	5.2
	F7	6.9	4.6	5.9	3.9	5.9	3.9	8.9	6.0	9.3	6.3	7.6	5.1
	F8	5.9	3.9	7.6	5.1	7.6	5.1	9.3	6.3	6.0	4.0	5.9	3.9
	MAXIMUM	11.8	8.0	9.9	6.7	9.3	6.3	9.3	6.3	10.0	6.8	8.4	5.6
1995	F1	8.6	5.9	9.3	6.4	8.4	5.7	5.4	3.5	5.4	3.5	5.9	3.9
	F2	7.6	5.1	9.2	6.3	8.9	6.1	5.4	3.5	5.4	3.5	5.6	3.6
	F3	10.4	7.2	9.7	6.7	9.2	6.3	5.5	3.6	5.4	3.5	5.4	3.5
	F4	11.4	7.9	5.4	3.5	5.4	3.5	7.6	5.1	9.6	6.6	9.8	6.7
	F5	10.0	6.9	5.4	3.5	5.4	3.5	7.9	5.3	8.4	5.7	8.2	5.6
	F6	6.9	4.6	5.4	3.5	5.4	3.5	9.3	6.4	10.5	7.3	8.7	5.9
	F7	7.4	5.0	5.4	3.5	5.4	3.5	9.8	6.7	10.0	6.9	8.6	5.9
	F8	5.5	3.6	9.0	6.2	8.9	6.1	8.7	5.9	5.5	3.6	5.4	3.5
	MAXIMUM	11.4	7.9	9.7	6.7	9.2	6.3	9.8	6.7	10.5	7.3	9.8	6.7
2005	F1	6.0	4.0	6.1	4.0	6.0	4.0	5.5	3.6	5.5	3.6	5.5	3.6
	F2	5.9	3.9	6.1	4.0	6.2	4.1	5.5	3.6	5.5	3.6	5.5	3.6
	F3	6.2	4.1	6.5	4.3	6.5	4.3	5.5	3.6	5.5	3.6	5.5	3.6
	F4	7.6	5.1	5.5	3.6	5.5	3.6	6.8	4.6	7.2	4.9	7.3	4.9
	F5	6.7	4.5	5.5	3.6	5.5	3.6	6.5	4.3	6.9	4.6	6.8	4.6
	F6	5.9	3.9	5.5	3.6	5.5	3.6	6.9	4.6	6.9	4.6	6.6	4.4
	F7	6.1	4.0	5.5	3.6	5.5	3.6	7.1	4.8	6.9	4.6	6.8	4.6
	F8	5.5	3.6	7.0	4.7	6.9	4.6	5.9	3.9	5.5	3.6	5.5	3.6
	MAXIMUM	7.6	5.1	7.0	4.7	6.9	4.6	7.1	4.8	7.2	4.9	7.3	4.9

TABLE 5.2.M
PREDICTED CO CONCENTRATIONS (PPM)
I-494/TH 77 INTERCHANGE - AREA F
ALTERNATIVE 2

	1995	2005	
1-HOUR BACKGROUND CO =	5.4	5.5	PPM
1-HOUR BACKGROUND CO =	3.5	3.6	PPM

		WIND DIRECTION											
YEAR	RECEPTOR	80		180		190		280		340		355	
		1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
1995	F1	8.0	5.6	9.8	7.1	8.2	5.8	5.4	3.5	5.4	3.5	5.7	3.7
	F2	7.4	5.1	9.4	6.8	8.5	6.0	5.4	3.5	5.4	3.5	5.5	3.6
	F3	6.6	4.5	9.5	6.8	9.6	6.9	5.4	3.5	5.4	3.5	5.4	3.5
	F4	14.9	11.2	5.4	3.5	5.4	3.5	5.4	3.5	13.0	9.7	13.1	9.8
	F5	12.1	8.9	5.4	3.5	5.4	3.5	7.3	5.0	11.6	8.5	11.4	8.4
	F6	6.7	4.6	5.4	3.5	5.4	3.5	11.2	8.2	9.8	7.1	8.7	6.2
	F7	7.7	5.4	5.4	3.5	5.4	3.5	12.9	9.6	10.2	7.4	8.9	6.3
	F8	5.4	3.5	9.5	6.8	9.4	6.8	7.7	5.4	5.6	3.7	5.4	3.5
	MAXIMUM	14.9	11.2	9.8	7.1	9.6	6.9	12.9	9.6	13.0	9.7	13.1	9.8
2005	F1	7.9	6.0	9.3	7.4	7.9	6.0	5.5	3.6	5.5	3.6	5.8	3.9
	F2	7.2	5.3	9.1	7.2	8.2	6.3	5.5	3.6	5.5	3.6	5.6	3.7
	F3	6.6	4.7	9.2	7.3	9.3	7.4	5.5	3.6	5.5	3.6	5.5	3.6
	F4	13.2	11.3	5.5	3.6	5.5	3.6	5.6	3.7	12.6	10.7	12.7	10.7
	F5	11.6	9.7	5.5	3.6	5.5	3.6	7.2	5.3	11.1	9.2	10.9	9.0
	F6	6.7	4.8	5.5	3.6	5.5	3.6	10.8	8.9	9.3	7.4	8.5	6.6
	F7	7.5	5.6	5.5	3.6	5.5	3.6	12.2	10.3	9.8	7.9	8.9	7.0
	F8	5.5	3.6	9.2	7.3	9.0	7.1	7.6	5.7	5.6	3.7	5.5	3.6
	MAXIMUM	13.2	11.3	9.3	7.4	9.3	7.4	12.2	10.3	12.6	10.7	12.7	10.7

TABLE 5.2.N
PREDICTED CO CONCENTRATIONS (PPM)
I-494/TH 77 INTERCHANGE - AREA F
ALTERNATIVE 3

	1995	2005
1-HOUR BACKGROUND CO =	5.4	5.5 PPM
1-HOUR BACKGROUND CO =	3.5	3.6 PPM

YEAR	RECEPTOR	WIND DIRECTION											
		80		180		190		280		340		355	
		1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
1995	F1	8.0	5.5	9.8	6.9	8.2	5.7	5.4	3.5	5.4	3.5	5.7	3.7
	F2	7.4	5.1	9.4	6.6	8.5	5.9	5.4	3.5	5.4	3.5	5.5	3.6
	F3	6.6	4.4	9.5	6.7	9.6	6.8	5.4	3.5	5.4	3.5	5.4	3.5
	F4	14.9	10.9	5.4	3.5	5.4	3.5	5.4	3.5	13.0	9.4	13.1	9.5
	F5	12.1	8.7	5.4	3.5	5.4	3.5	7.3	5.0	11.6	8.3	11.4	8.2
	F6	6.7	4.5	5.4	3.5	5.4	3.5	11.2	8.0	9.8	6.9	8.7	6.1
	F7	7.7	5.3	5.4	3.5	5.4	3.5	12.9	9.3	10.2	7.2	8.9	6.2
	F8	5.4	3.5	9.5	6.7	9.4	6.6	7.7	5.3	5.6	3.7	5.4	3.5
	MAXIMUM	14.9	10.9	9.8	6.9	9.6	6.8	12.9	9.3	13.0	9.4	13.1	9.5
2005	F1	7.9	5.9	9.3	7.3	7.9	5.9	5.5	3.6	5.5	3.6	5.8	3.9
	F2	7.2	5.2	9.1	7.1	8.2	6.2	5.5	3.6	5.5	3.6	5.6	3.7
	F3	6.6	4.7	9.2	7.2	9.3	7.3	5.5	3.6	5.5	3.6	5.5	3.6
	F4	13.2	11.0	5.5	3.6	5.5	3.6	5.6	3.7	12.6	10.4	12.7	10.5
	F5	11.6	9.5	5.5	3.6	5.5	3.6	7.2	5.2	11.1	9.0	10.9	8.8
	F6	6.7	4.8	5.5	3.6	5.5	3.6	10.8	8.7	9.3	7.3	8.5	6.5
	F7	7.5	5.5	5.5	3.6	5.5	3.6	12.2	10.0	9.8	7.7	8.9	6.9
	F8	5.5	3.6	9.2	7.2	9.0	7.0	7.6	5.6	5.6	3.7	5.5	3.6
	MAXIMUM	13.2	11.0	9.3	7.3	9.3	7.3	12.2	10.0	12.6	10.4	12.7	10.5

TABLE 5.2.0
PREDICTED CO CONCENTRATIONS (PPM)
TH 77/CR 62 INTERCHANGE - AREA 6
ALTERNATIVES 1, 1A, 2, 3

2005

1-HOUR BACKGROUND CO = 5.5 PPM
8-HOUR BACKGROUND CO = 3.6 PPM

	WIND DIRECTION									
RECEPTOR	45		170		190		220		240	
	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
G1	5.5	3.6	6.2	4.1	5.7	3.7	5.5	3.6	5.5	3.6
G2	5.6	3.7	7.1	4.8	5.8	3.8	5.6	3.7	5.5	3.6
G3	5.5	3.6	7.5	5.1	7.3	4.9	6.1	4.0	6.1	4.0
G4	5.5	3.6	7.9	5.4	8.1	5.5	5.8	3.8	5.7	3.7
G5	5.5	3.6	7.8	5.3	8.9	6.1	8.3	5.7	6.8	4.6
G6	5.5	3.6	6.5	4.3	6:7	4.5	7.7	5.2	7.4	5.0
G7	8.0	5.4	5.5	3.6	5.5	3.6	5.5	3.6	5.5	3.6
MAXIMUM	8.0	5.4	7.9	5.4	8.9	6.1	8.3	5.7	7.4	5.0

done with I-494 operating speeds at 30 MPH. This second analysis was used as the basis for the 8-hour concentrations shown in Table 5.2.K. The maximum predicted 8-hour concentration is 8.7 PPM.

The characteristics of traffic flow in an over capacity situation are highly variable. LOS F operations which are indicated by volume to capacity ratios greater than 1.0 are unstable. The speed/volume relationship noted in both Guidelines for Air Quality Volume 9 (page 24) and the 1985 Highway Capacity Manual (page 3-5) shows that as volumes approach the capacity of the facility, operating speeds are reduced. With LOS F operations, speeds are further reduced and the traffic volume which can be accomodated is also reduced. The peak hour analysis assumed volumes in excess of capacity with speeds reduced to 10 MPH to represent a worst-case peak 1-hour air quality impact. For the peak 8-hour period, the demand volume is approximately equal to the capacity of I-494. The 8-hour analysis assumed traffic volumes equal to capacity which would result in average operating speeds of approximately 30 MPH. A recent study[1/] of traffic operations under forced flow conditions found minimum operating speeds during peak times of approximately 20 MPH upstream of a traffic bottleneck. (References cited are listed at the end of Section 5.0.) The study also found that speeds were reduced at the location of the bottleneck but that the capacity was not significantly reduced.

In Area G, TH77 at CR 62, the maximum predicted year 2005 CO concentrations are 8.9 PPM 1-hour average and 6.1 PPM 8-hour average. These values are well below the air quality standards. The major difference between this analysis area and analysis Area D is the distance from the mainline highways to the receptor sites. This increased distance results in more dispersion of the CO generated by the traffic on the mainlines.

5.2.2.1 Alternatives 1 and 1A

Under build Alternatives 1 and 1A, no violations of CO standards are forecast. The maximum predicted concentrations are forecast at receptor B5 in the vicinity of the I-494/24th Avenue (Area B) interchange (Table 5.2.H). The maximum 1-hour concentration of 11.9 PPM at this receptor is forecast for 1990 as is the maximum 8-hour average concentration of 8.1 PPM. The maximum predicted 1-hour concentration is less than half of the 1-hour standard. The maximum predicted 8-hour concentration is approximately 90% of the standard. Comparable concentrations are predicted in the vicinity of the I-494/TH77 interchange (Area F, Table 5.2.L). Along TH77 south of I-494 (Area A), 8-hour average concentrations

are predicted to be approximately 50% of the standard (Table 5.2.E). The predicted concentrations generally show a decrease from 1990 to 1995 and an increase from 1995 to 2005. In all cases, the predicted concentrations for Alternatives 1 and 1A are less than or equal to those predicted for either Alternative 2 or 3.

5.2.2.3 Alternative 2

Under Alternative 2, potential violations of the 8-hour standard of 9 PPM are forecast in Area B (I-494/24th Avenue) and in Area F (I-494/TH77). The maximum predicted 8-hour concentration of 11.3 PPM is predicted at receptor F4 in 2005. In Area B, the maximum predicted 8-hour concentration is 10.9 PPM at receptor B3. No violations of the 8-hour standard are forecast in Area A. The 1-hour standard is not forecast to be exceeded in any of the areas analyzed.

As discussed previously, the 8-hour average concentrations are computed from the peak hour concentrations and are representative of peak hour operational conditions. In the project area, which includes analysis Areas A, B, and F, the analysis methodology was refined to reflect hours of expected congestion or capacity operations in the peak 8-hour period. This is a conservative prediction methodology which accounts for little if any variation in meteorological conditions during the 8-hour period. Thus, 8-hour concentrations predicted to be in excess of standards indicate the potential for air quality violations but are conservatively high estimates of future CO concentrations.

5.2.2.4 Alternative 3

The CO analysis results for Alternative 3 are very similar to those discussed under Alternative 2. Potential violations of the 8-hour standard are forecast in Areas B and F. Peak forecast concentrations are generally approximately 0.3 PPM less than those forecast under Alternative 2. This is a result of the reduction in travel demand and resulting number of hours of congestion caused by implementation of travel demand management strategies. No violations of the 8-hour standard are forecast in Area A. The 1-hour standard is not forecast to be exceeded in any of the analysis areas.

5.2.3 Consistency With State Implementation Plan

This project is in an area where the State Implementation Plan (SIP) is required to contain transportation control measures. The SIP was approved by the Environmental Protection Agency on June 16, 1980. The Metropolitan Planning Organization passed a resolution on December 19, 1985, certifying that their transportation planning process

fulfills all applicable federal requirements; Mn/DOT concurred on December 20, 1985. Portions of the project (24th Avenue interchange) were included in the Transportation Improvement Plan accepted by the FHWA on December 8, 1985. The entire project will be in the Transportation Improvement Plan to be submitted to FHWA for approval in December, 1986.

5.3 NOISE

Traffic noise impacts have been evaluated in two distinct noise analyses. Within the project area, traffic noise levels associated with each alternative are predicted at the noise sensitive receiver sites identified in Section 4.2.2. The predicted future noise levels are compared to existing noise levels, state noise standards, and federal noise abatement criteria to determine impacts. Within the transportation analysis area, future traffic volume forecasts are used to develop noise contours. These contours show the geographic area impacted by traffic noise from I-494 and TH 77.

For both analyses, traffic noise levels were predicted using the STAMINA 2.0[2/] highway traffic noise prediction model. The levels predicted do not consider the impacts airport noise and other noise sources have on the receivers.

5.3.1 Methodology

5.3.1.1 Project Area Methodology

Within the project area each of the corridors was divided into several segments at points of significant changes in vehicle mix, traffic volume, and horizontal and/or vertical alignment. Within this area, both noise levels at receivers and noise contours were determined.

Peak daytime noise levels are based on peak hour volumes. Peak nighttime noise levels were determined to occur between 6:00 AM to 7:00 AM. This hour accommodates volumes significantly higher than any other hour in the 10:00 PM to 7:00 AM nighttime period. Vehicle mixes of cars, medium trucks and heavy trucks vary throughout the corridor by roadway segment and hour. The vehicle mix assumptions used in this analysis are as follow:

- On I-494[3/]
  - 6:00 AM - 7:00 AM 1.0 percent medium trucks, 3.7 percent heavy trucks
  - 5:00 PM - 6:00 PM Peak Hour 1.0 percent medium trucks, 2.4 percent heavy trucks.

- On TH 77 north of I-494[4]

  - 6:00 AM - 7:00 AM 0.7 percent medium trucks, 0.6 percent heavy trucks.
  - 5:00 PM - 6:00 PM peak hour 0.8 percent medium trucks, 0.6 percent heavy trucks.

- On TH 77 South of I-494[5]

  - 6:00 AM - 7:00 AM 2.8 percent medium trucks, 1.8 percent heavy trucks.
  - 5:00 PM - 6:00 PM 2.4 percent medium trucks, 1.6 percent heavy trucks.

Truck volumes on the ramps into and out of the Mall of America/Fantasyworld were obtained from the Draft Environmental Impact Statement[6] prepared for that development.

5.3.1.2 Transportation Analysis Area Modeling Methodology

In the transportation analysis area, noise level contours representing L_{10} 70 dBA were determined. The L_{10} 70 dBA noise level is the Federal Noise Abatement Criteria level for Activity Category B which includes residences, parks, schools, and churches. The L_{10} 70 dBA contour along TH 77 from CSAH 62 to I-35E and along I-494 from I-35W to I-35E was determined in response to the Final Study Outline and Scoping Decision. The distance from the edge of the roadway to the L_{10} 70 dBA contour was determined for the noisiest hour of the day which was defined as the lesser of either the forecast year 2005 PM peak hour traffic volume or the traffic volume which would result in Level of Service (LOS) C operations. These conditions result in the highest traffic volumes at the highest average speed.

In two areas, TH 77 north of I-494 and I-494 west of TH 77, the year 2005 PM peak hour traffic forecast is at or above the capacity of the facility. In these areas, two conditions were modeled:

- Condition 1 - Expanded Roadways. Under this condition, it is assumed that the roadway cross-sections are expanded to accommodate the forecast 2005 traffic volumes.

- Condition 2 - Existing Roadways. Under this condition, it is assumed that the existing roadway cross-sections remain and LOS C traffic volumes are modeled.

5.3.2 Results and Conclusions

5.3.2.1 Transportation Analysis Area

Noise level contours for the regional roadway system are displayed in Figures 5.3.A through 5.3.N. Because I-494 and TH 77 would be the major sources of roadway noise affecting the sensitive receivers, cross street volumes were not included in the noise level predictions. Thus, the contours displayed at cross streets and ramp areas in the figures are estimates of the L_{10} 70 dBA contour.

Table 5.3.A compares the L_{10} 70 dBA contour distances resulting from the two conditions modeled. Condition 1 assumes that roadways are expanded to accommodate forecast year 2005 traffic while condition 2 assumes LOS C traffic on existing roadways. The noise contours shown on Figure 5.3.A through 5.3.N represent condition 1 assumptions.

Condition 1 best represents the Alternative 1 ultimate roadway improvements since these improvements assume expansion of I-494 west of TH 77 and TH 77 north of I-494. However, these roadway expansions outside the project area could occur with Alternative 1A, Alternative 2 or Alternative 3 also. The year 2005 forecasts for the transportation analysis area are substantially the same for all alternatives and thus result in similar noise impacts in the transportation analysis area. The noise impacts outside the project area are independent of the project alternatives.

5.3.2.2 Alternative 1

Results of traffic noise analyses within the project area are documented in Table 5.3.B. The table shows predicted future and existing L_{10} and L_{50} levels at sensitive receivers for both daytime and nighttime volumes. Noise levels for existing volumes and roadway alignments at several receivers were obtained from the Airport South Draft and Final EIS.[7] Table 5.3.C compares the predicted noise levels to the applicable state standards, federal criteria, and existing noise levels. At most of the receivers along TH 77 north and south of I-494, existing daytime traffic noise levels are significantly higher than state standards. At two receivers (N2 and N5) north of I-494 and at all the reported receivers south of I-494, the federal criteria are exceeded. At these receivers along TH 77, future daytime levels, due to realignment or shielding of the receivers from the mainline by depressing it or by constructing retaining walls, are lowered to under or just slightly over the daytime standard.



T.H.77/I-494 IMPROVEMENT PROJECT

FIGURE 5.3.A

Noise Sensitive Receiver Sites

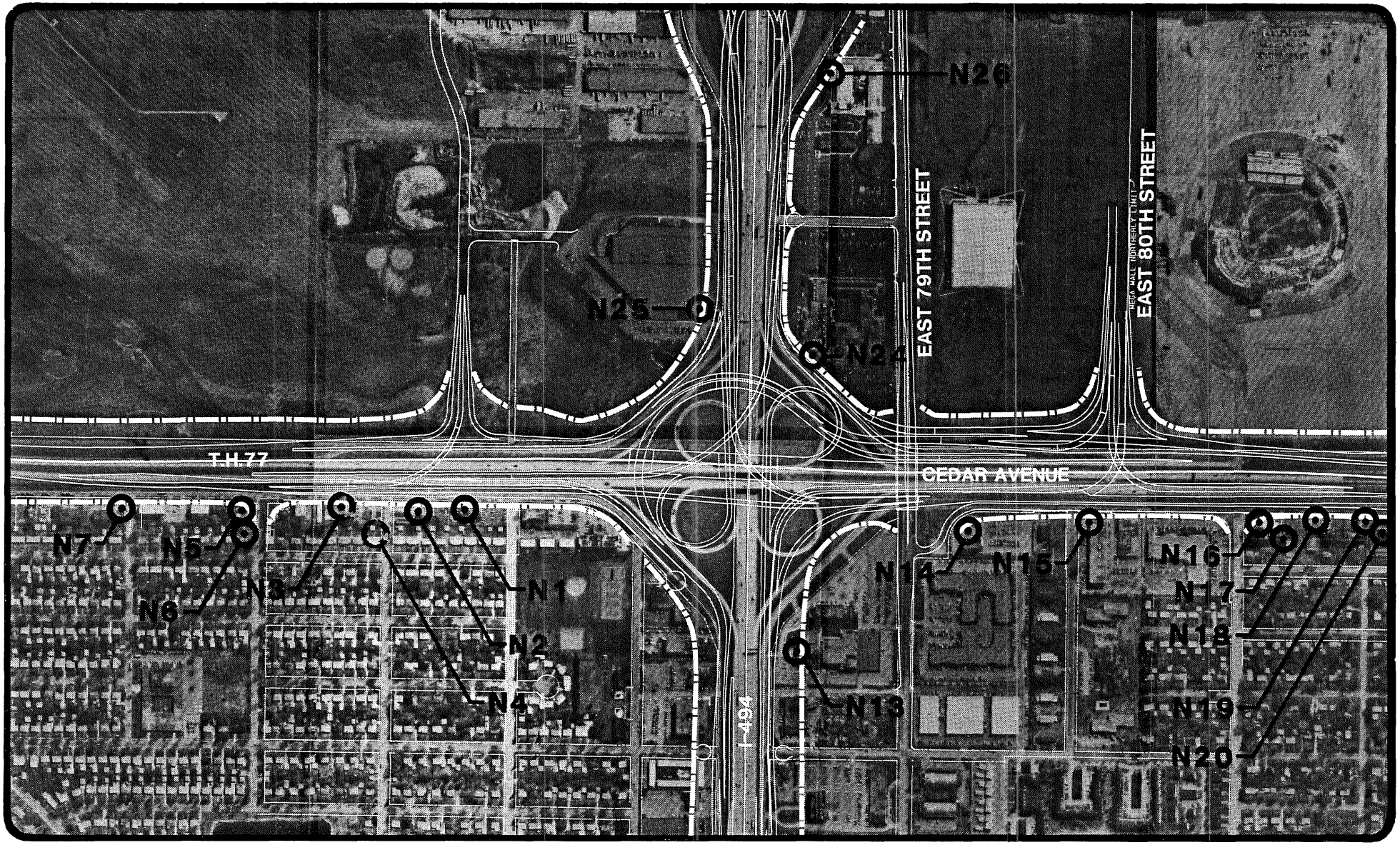
RECEIVER

L_{10} 70dBA CONTOUR

N

0' 700'

BRW



T.H.77/I-494 IMPROVEMENT PROJECT

FIGURE 5.3.B

Noise Sensitive Receiver Sites

RECEIVER

L_{10} 70dBA CONTOUR

N

0' 700'

BRW



T.H.77/I-494 IMPROVEMENT PROJECT

FIGURE 5.3.C

Noise Sensitive Receiver Sites

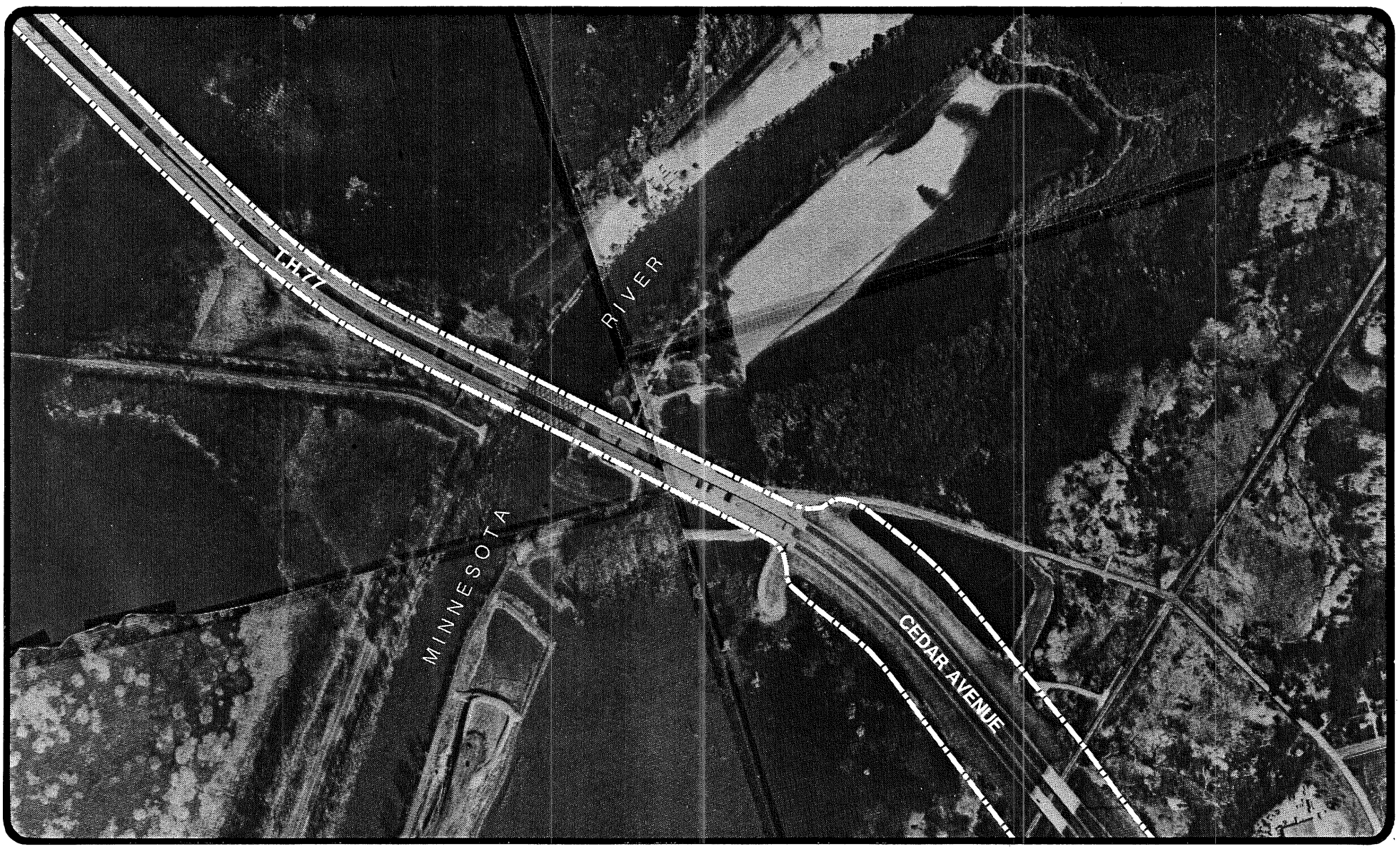
RECEIVER

L_{10} 70dBA CONTOUR

N

0' 700'

BRW



T.H.77/I-494 IMPROVEMENT PROJECT

FIGURE 5.3.D

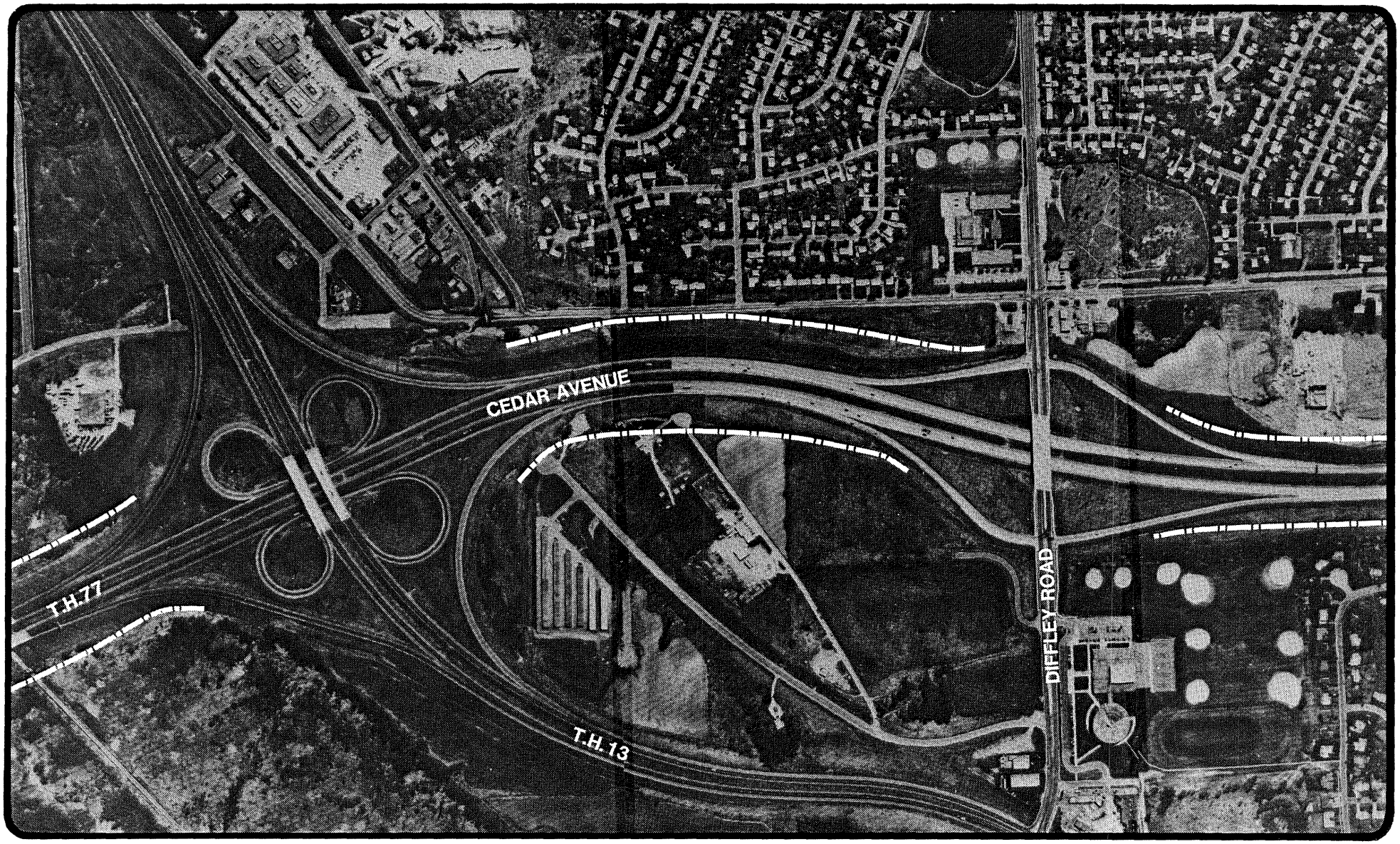
Noise Sensitive Receiver Sites

L_{10} 70dBA CONTOUR

N

0' 700'

BRW



T.H.77/I-494 IMPROVEMENT PROJECT

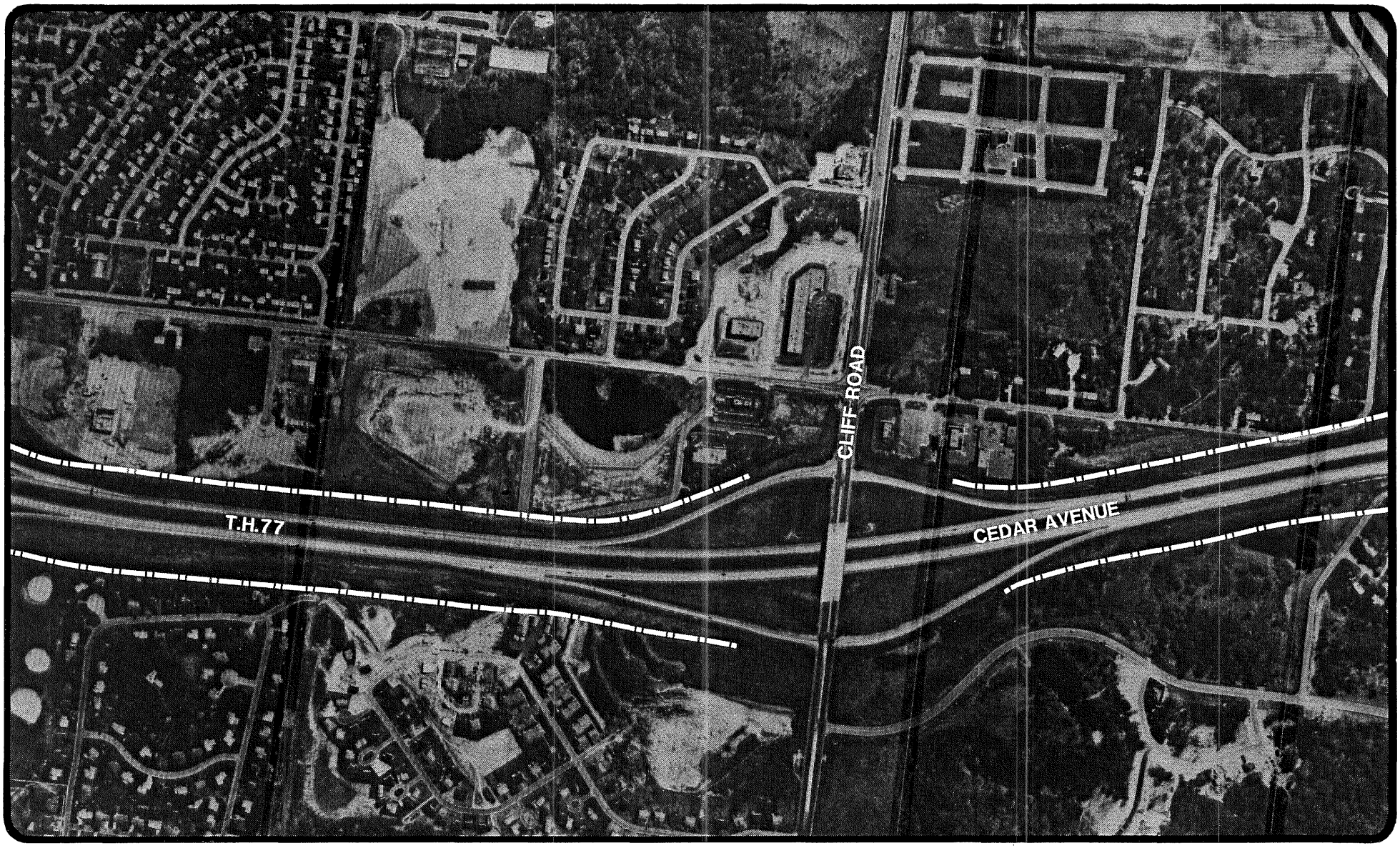
FIGURE 5.3.E

Noise Sensitive Receiver Sites

L_{10} 70dBA CONTOUR

0' 100'

BRW



T.H.77/I-494 IMPROVEMENT PROJECT

FIGURE 5.3.F

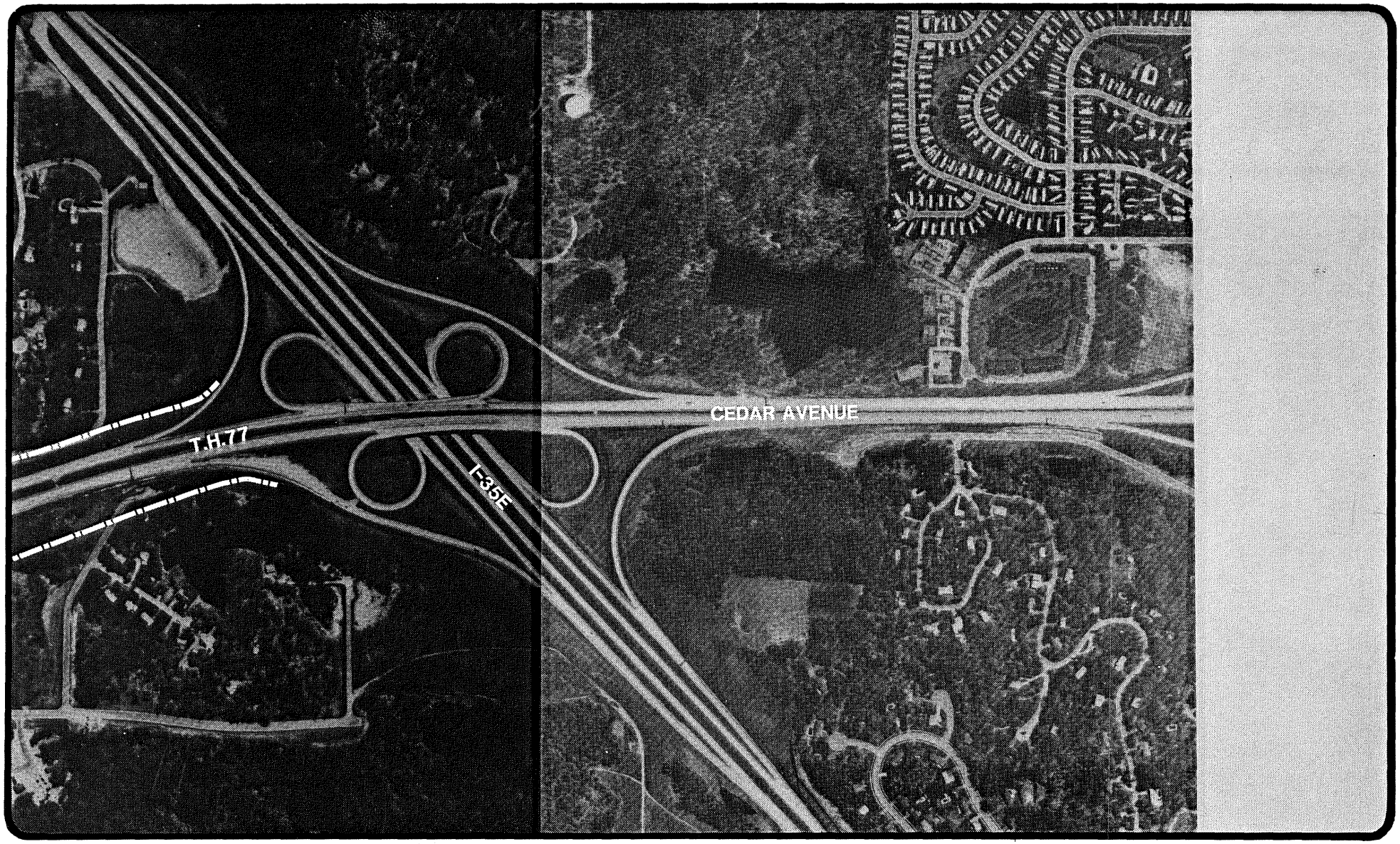
Noise Sensitive Receiver Sites

L 70dBA CONTOUR

N

0' 700'

BRW



T.H.77/I-494 IMPROVEMENT PROJECT

FIGURE 5.3.G

Noise Sensitive Receiver Sites

L_{10} 70dBA CONTOUR

N

0' 700'

BRW



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 5.3.H

Noise Sensitive Receiver Sites

L_{10} 70dBA CONTOUR

N

0' 700'

BRW



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 5.3.I

Noise Sensitive Receiver Sites

L_{10} 70dBA CONTOUR

N

0' 700'

BRW



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 5.3.J

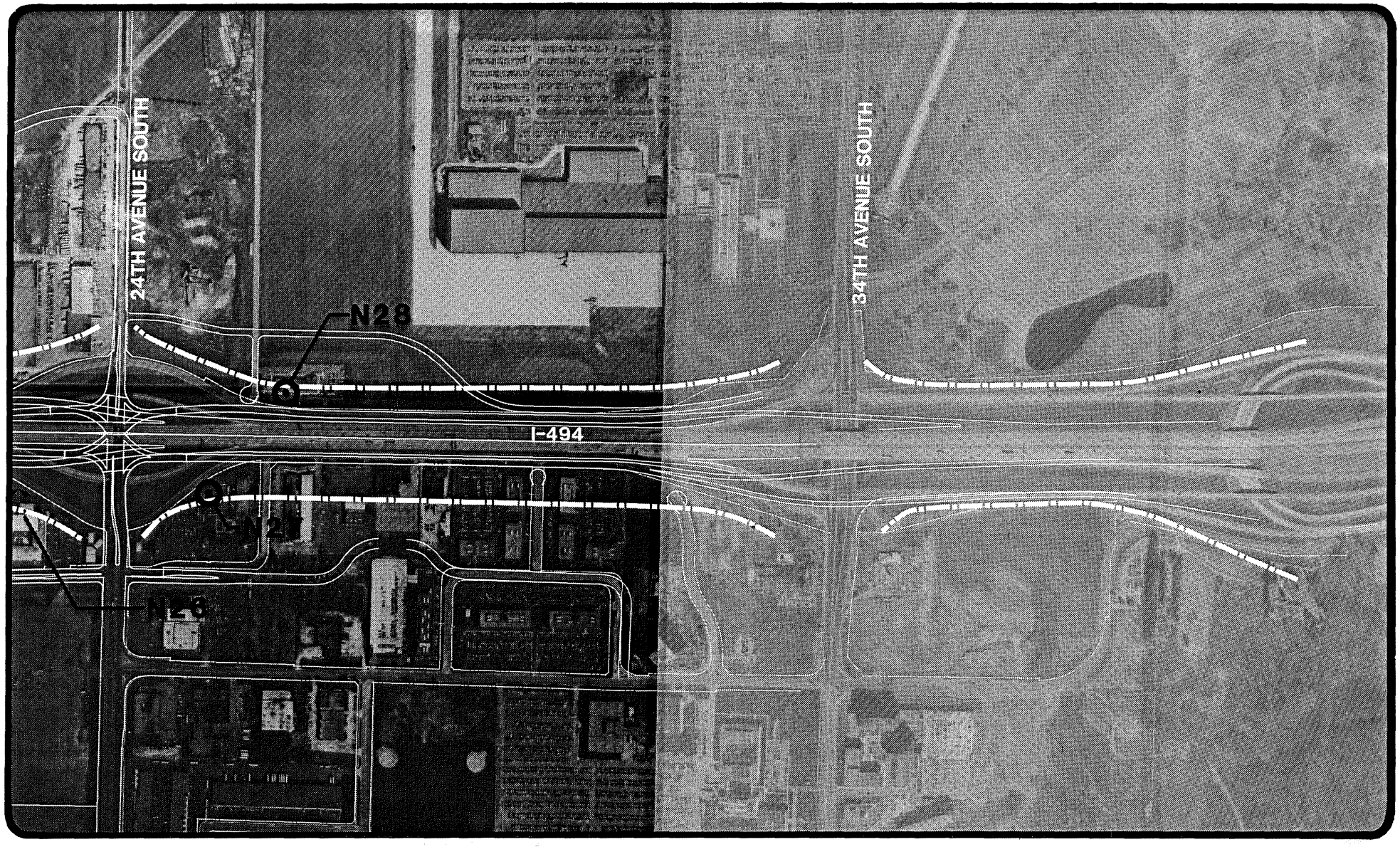
Noise Sensitive Receiver Sites

RECEIVER

L 70dBA CONTOUR

0' 700'

BRW



T.H.77/I-494 IMPROVEMENT PROJECT

FIGURE 5.3.K

Noise Sensitive Receiver Sites

RECEIVER

L 70dBA CONTOUR

0' 700'

BRW



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 5.3.L

Noise Sensitive Receiver Sites

L_{10} 70dBA CONTOUR

N

0' 700'

BRW



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 5.3.M

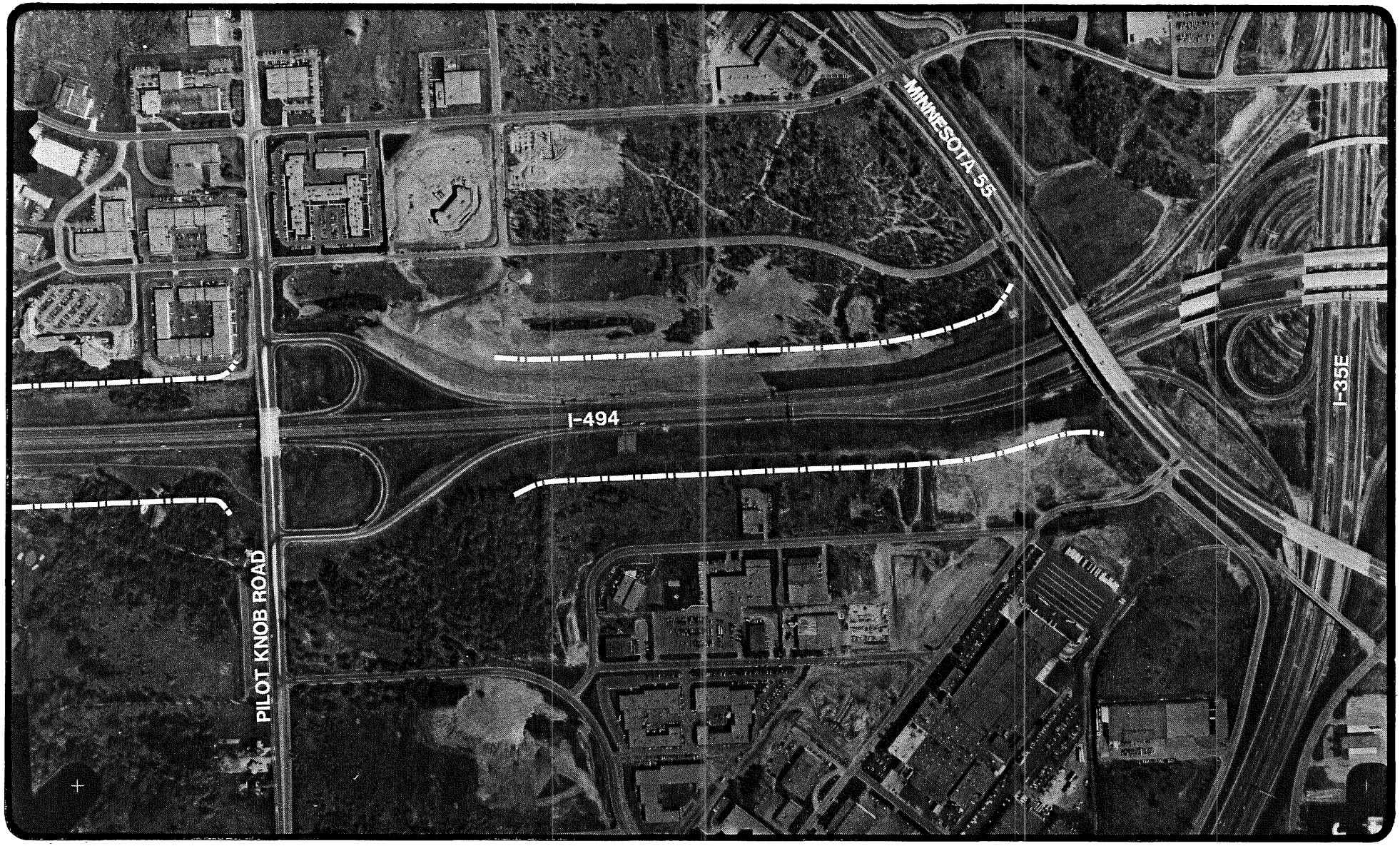
Noise Sensitive Receiver Sites

L_{10} 70dBA CONTOUR

N

0' 700'

BRW



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 5.3.N

Noise Sensitive Receiver Sites

L_{10} 70dBA CONTOUR

N

0' 700'

BRW

TABLE 5.3.A

COMPARISON OF DISTANCE TO L10 70 dBA FOR 2005 PM PEAK HOUR
AND LOS C TRAFFIC

Segment	Condition 1 2005 PM Peak Hour Traffic Distance to L10 70dBA* NS	SS	Condition 2 LOS C Traffic Distance to L10 70 dBA* NS	SS
I-494				
I35W-Nicolett Ave.	280	285	230	232
Nicolett Ave.-Portland Ave.	277	281	228	233
Portland Ave.-TH 77	278	281	230	232
Highway 5-Minn. River	232	228	232	228
Minn. River-Highway 31	230	235	230	235
Highway 31-I35E	225	225	225	225

Segment	Condition 1 2005 PM Peak Hour Traffic Distance to L10 70dBA* ES	WS	Condition 2 LOS C Traffic Distance to L10 70 dBA* ES	WS
TH 77				
Highway 62-Diagonal Blvd.	153	150	125	126
OSR-Highway 13	180	200	180	200
Highway 13-Diffley Rd.	130	158	130	158
Diffley Rd.-Cliff Rd.	130	158	130	158
Cliff Rd.-I35E	130	158	130	158

EB = Eastbound NS = North Side
WB = Westbound SS = South Side
NB = Northbound ES = East Side
SB = Southbound WS = West Side

* - Distances are from edge of pavement.

TABLE 5.3.B
PREDICTED NOISE LEVELS (dBA)
ALTERNATIVE 1

Receiver	Land Use	Federal L10 Criteria	State Noise Standards				Existing Noise Levels					Future Noise Levels				Receiver
			Day		Night		Day		Night			Day		Night		
			L10	L50	L10	L50	L10	L50	L10	L50		L10	L50	L10	L50	
N1	Res.	70.0	65.0	60.0	55.0	50.0	69.5	65.1	67.8	62.7	1	66.0	61.9	63.6	58.2	N1
N2	Res.	70.0	65.0	60.0	55.0	50.0	70.3	65.7	68.6	63.4	2	66.0	59.9	63.3	55.8	N2
N3	Res.	70.0	65.0	60.0	55.0	50.0	71.8	66.9	70.1	64.5	3	63.1	59.2	60.7	56.1	N3
N4	Res.	70.0	65.0	60.0	55.0	50.0	66.5	63.1	65.1	61.2	4	62.9	58.8	60.4	55.2	N4
N5	Res.	70.0	65.0	60.0	55.0	50.0	71.2	66.5	69.5	64.0	5	67.0	63.4	64.8	59.9	N5
N6	Res.	70.0	65.0	60.0	55.0	50.0	66.6	63.0	65.1	60.9	6	64.0	61.1	61.7	57.8	N6
N7	Res.	70.0	65.0	60.0	55.0	50.0	71.3	66.5	69.6	64.1	7	64.9	62.5	62.4	59.0	N7
N8	Res.	70.0	65.0	60.0	55.0	50.0	70.3	65.8	68.6	63.4	8	65.5	63.1	62.8	59.4	N8
N9	Res.	70.0	65.0	60.0	55.0	50.0	69.7	65.4	68.1	63.1	9	69.3	66.4	66.5	61.8	N9
N10	Res.	70.0	65.0	60.0	55.0	50.0	67.1	62.8	65.7	60.4	10	67.7	64.5	65.2	60.3	N10
N11	Res.	70.0	65.0	60.0	55.0	50.0	67.1	62.6	65.7	60.1	11	67.0	64.5	65.2	60.2	N11
N12	Golf	70.0	65.0	60.0	55.0	50.0	66.6	63.1	65.6	61.3	12	70.3	66.8	67.6	63.1	N12
N13	Comm.	75.0	70.0	65.0	70.0	65.0	68.7	65.1	68.4	64.7	13	66.9	62.1	65.1	59.4	N13
N14	Comm.	75.0	70.0	65.0	70.0	65.0	72.7	67.8	70.3	64.5	14	69.0	64.3	65.4	59.1	N14
N15	Comm.	75.0	70.0	65.0	70.0	65.0	72.6	67.8	70.1	64.4	15	67.0	62.4	63.6	57.8	N15
N16	Res.	70.0	65.0	60.0	55.0	50.0	74.1	69.9	71.4	66.1	16	67.3	63.1	64.6	59.4	N16
N17	Res.	70.0	65.0	60.0	55.0	50.0	69.3	65.7	67.2	62.9	17	65.4	61.8	62.6	58.4	N17
N18	Res.	70.0	65.0	60.0	55.0	50.0	73.9	68.5	71.2	64.8	18	67.5	62.9	64.5	59.2	N18
N19	Res.	70.0	65.0	60.0	55.0	50.0	74.3	69.9	71.7	66.4	19	67.4	62.9	64.2	59.1	N19
N20	Res.	70.0	65.0	60.0	55.0	50.0	73.5	68.4	70.9	64.8	20	67.0	62.7	64.2	59.2	N20
N21	Res.	70.0	65.0	60.0	55.0	50.0	72.8	69.0	70.4	65.9	21	66.2	62.0	63.5	58.8	N21
N22	Res.	70.0	65.0	60.0	55.0	50.0	73.3	68.9	70.8	66.0	22	67.5	62.6	65.5	60.5	N22
N23	Hotel	70.0 **	70.0	65.0	70.0	65.0	71.3	67.2	70.6	65.9	23	70.1	66.9	69.2	65.3	N23
N24	Hotel	70.0 **	70.0	65.0	70.0	65.0	66.7	64.0	67.2	64.1	24	69.6	61.7	65.5	56.8	N24
N25	MTC	75.0	70.0	65.0	70.0	65.0	68.2	65.0	68.3	64.9	25	70.7	64.1	66.7	59.5	N25
N26	Hotel	70.0 **	70.0	65.0	70.0	65.0	64.2	61.7	65.9	62.4	26	68.2	65.8	67.4	64.1	N26
N27	Hotel	70.0 **	70.0	65.0	70.0	65.0	67.5	63.9	67.8	64.1	27	69.1	67.9	67.9	64.6	N27
N28	Clinic	70.0	65.0	60.0	55.0	50.0	69.5	65.0	69.9	65.7	28	72.5	69.9	70.8	66.8	N28

Note: * - No Level Determined
** - L10 70 dBA is the Exterior Criterion at these uses.
Due to a Lack of Exterior Acitivities, the L10 55 dBA Interior Criterion Applies.

TABLE 5.3.C
NOISE IMPACT ANALYSIS
ALTERNATIVE 1

Receiver	Standard Exceeded: Existing		Future		Change in Noise Levels (dBA) (Future - Existing) Day		Night	
	Federal	State	Federal	State	L10	L50	L10	L50
N1	N	Y	N	Y	-3.5	-3.2	-4.2	-4.5
N2	Y	Y	N	Y	-4.3	-5.8	-5.3	-7.6
N3	Y	Y	N	N	-8.7	-7.7	-9.4	-8.4
N4	N	Y	N	N	-3.6	-4.3	-4.7	-6.0
N5	Y	Y	N	Y	-4.2	-3.1	-4.7	-4.1
N6	N	Y	N	N	-2.6	-1.9	-3.4	-3.1
N7	Y	Y	N	N	-6.4	-4.0	-7.2	-5.1
N8	Y	Y	N	Y	-4.8	-2.7	-5.8	-4.0
N9	N	Y	N	Y	-0.4	1.0	-1.6	-1.3
N10	N	Y	N	Y	0.6	1.7	-0.5	-0.1
N11	N	Y	N	Y	-0.1	1.9	-0.5	0.1
N12	N	Y	N	N	1.6	0.6	0.2	0.7
N13	N	N	N	N	-1.8	-3.0	-3.3	-5.3
N14	N	Y	N	N	-3.7	-3.5	-4.9	-5.4
N15	N	Y	N	N	-5.6	-5.4	-6.5	-6.6
N16	Y	Y	N	Y	-6.8	-6.8	-6.8	-6.7
N17	N	Y	N	Y	-3.9	-3.9	-4.6	-4.5
N18	Y	Y	N	Y	-6.4	-5.6	-6.7	-5.6
N19	Y	Y	N	Y	-6.9	-7.0	-7.5	-7.3
N20	Y	Y	N	Y	-6.5	-5.7	-6.7	-5.6
N21	Y	Y	N	Y	-6.6	-7.0	-6.9	-7.1
N22	Y	Y	N	Y	-5.8	-6.3	-5.3	-5.5
N23	Y **	Y	Y **	Y	-1.2	-0.3	-1.4	-0.6
N24	N	N	N	N	2.9	-2.3	-1.7	-7.3
N25	N	N	N	Y	2.5	-0.9	-1.6	-5.4
N26	N	N	N	N	4.0	4.1	1.5	1.7
N27	N	N	N	N	1.6	4.0	0.1	0.5
N28	N	Y	Y	Y	3.0	4.9	0.9	1.1

Note: ** - L10 70 dBA exterior ctiterion exceeded.
Due to a lack of exterior acitivities, the L10 55 dBA interior critia apply.
Y = Yes, standard exceeded.
N = No, standard not exceeded.

At all receivers modeled, the state nighttime standards are exceeded in the existing condition by at least 9 dBA. Noise levels are highest at receiver N19, south of I-494, where the standards are exceeded by 16.7 dBA. As displayed in Table 5.3.C, future nighttime levels are lowered substantially from the existing, but still exceed the state 55 dBA L_{10} level by at least 5.4 dBA. The hour modeled, 6:00 AM - 7:00 AM, is the beginning of rush hour traffic. As described in the Airport South Draft EIS,[8] volumes on TH 77 in the remainder of the nighttime period are at most 63% of the 6:00 AM - 7:00 AM volume. A 50% reduction in traffic would result in a 3 dBA reduction in traffic noise levels. Based on the relationship of nighttime traffic from 10:00 PM - 6:00 AM on TH 77 to that in the 6:00 AM - 7:00 AM hour, the noise levels predicted for many of the receivers would approximately meet the state standard during the other nighttime hours.

5.3.2.3 Alternative 1A

Roadway designs for Alternatives 1 and 1A in the vicinity of residential receivers along TH 77 are virtually identical.

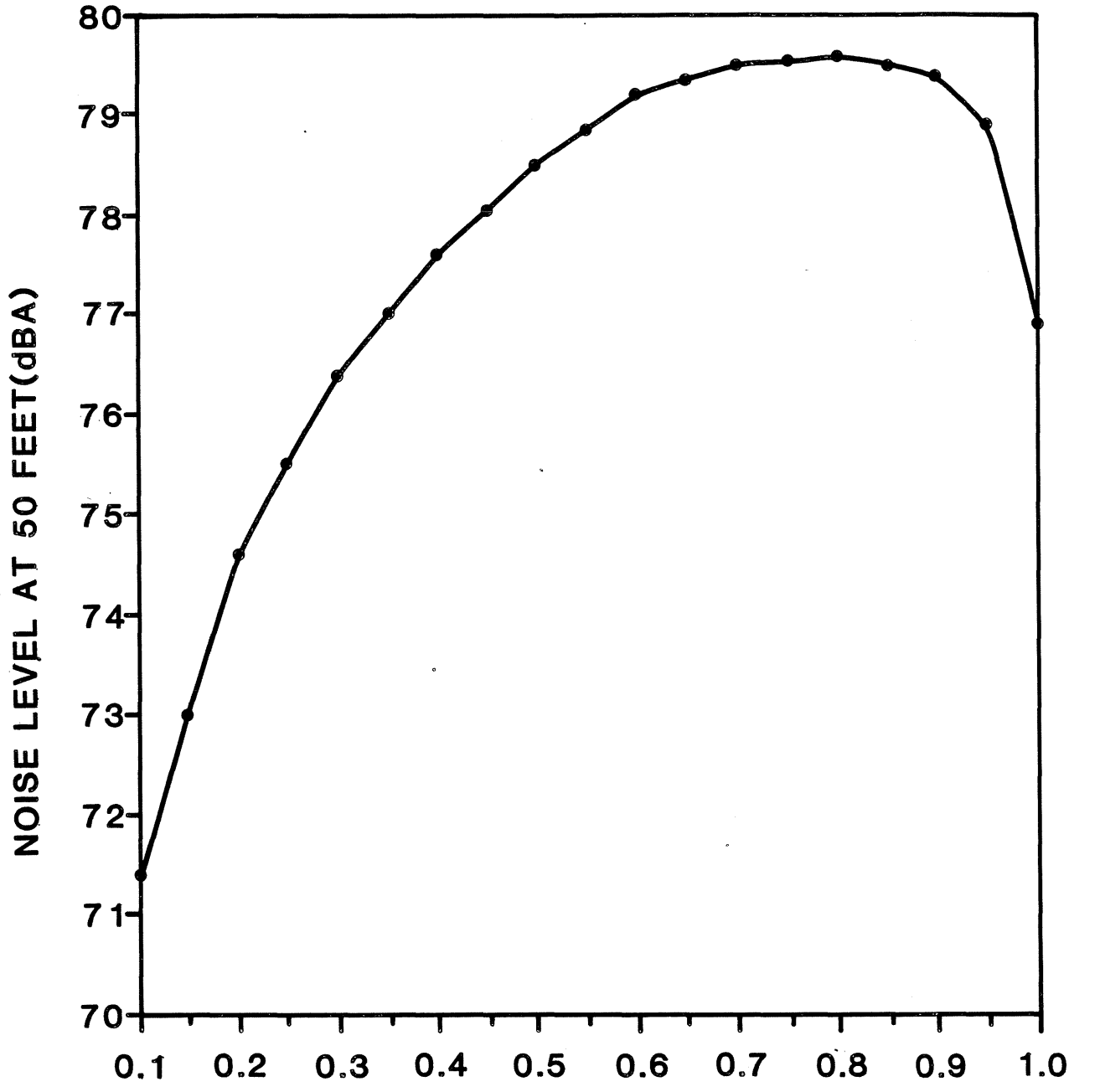
Traffic volume forecasts for these alternatives would also be comparable. For these reasons, the noise levels reported under Alternative 1 would also apply to Alternative 1A.

5.3.2.4 Alternative 2

For Alternative 2, 1995 PM peak hour traffic volumes were modeled on the existing regional roadway system, using many of the same assumptions used in Section 4.2.2 of this document. The 1995 volumes input into the model represent the capacity of the regional roadway system in the project area. Thus, PM peak traffic noise levels presented for 1995 under the no-build condition would be the same as those predicted for 2005, because an increase in traffic volumes would not be possible without building more capacity by adding lanes.

Due to the increase in traffic congestion caused by added traffic volumes from existing levels, vehicle speeds used in the STAMINA 2.0 model were reduced from the existing levels. A reduction in speed from 50 mph to 30 mph results in a reduction of automobile noise of approximately 8 dBA, and a reduction of medium and heavy truck noise of 7 and 6 dBA respectively at 50 feet from a roadway source.

Somewhat off setting this reduction would be an increase in traffic noise level caused by the added vehicles. On the average, a 50 percent increase in traffic volumes result in an increase in noise level of 3 dBA. A representation of the net effect of these two conditions is displayed in Figure 5.3.0, which shows that when the volume to capacity



T.H. 77/I-494 IMPROVEMENT PROJECT

FIGURE 5.3.O

Comparison of Noise Level to Volume/Capacity Ratio

BRW

ratio (v/c) of a road exceeds .85, the effect of the reduction in speed becomes greater than the effect of increased traffic, and noise levels begin to decline.

The results of the noise analysis at the 28 receivers in the project area are documented in Table 5.3.D. Also included in the table is a comparison of 1995 PM peak hour levels to existing modeled levels. While the results show a decline in noise levels for the 1995 capacity condition, the entire picture of future noise in the project area is not complete. The v/c ratios in the hours preceeding and following the peak hour will be lower than those in the peak, and the travel speeds would be higher. Therefore, the noise levels in these periods with lower v/c ratios would likely be greater than those in the peak hour. The net effect of the no-build condition would be peak noise levels approximately equal to existing peak noise levels.

5.3.2.5 Alternative 3

As described previously, average daily traffic (ADT) and PM peak hour volumes in the project area decrease only slightly (three percent and eight percent, respectively), between Alternative 2 and Alternative 3. In order to cause a significant increase in traffic noise levels (> 3 dBA), traffic volumes on the source roadway would have to double. The increase in traffic volumes from Alternative 3 to Alternative 2 would not be sufficient to cause a 3 dBA incraese in traffic noise levels. Thus, the noise level analysis completed for Alternative 2 would yield essentially identical results as an analysis of Alternative 3. For this reason no further analysis of Alternative 3 was completed.

5.3.3 Mitigation Measures

The proposed project incorporates noise mitigation into its design by depressing the mainline roadways and shielding receiver sites with retaining walls and berms used to support various ramps. No additional noise mitigation measures are proposed for the following reasons:

- Traffic noise levels at the residential receivers are projected to decrease as a result of the proposed roadway improvements.

- The project area falls within the zone of serious noise impact of the Minneapolis-St. Paul International Airport. The airport is a primary source of noise in the project area with noise levels in excess of 70 dBA during the busiest hours.

TABLE 5.3.D
PREDICTED PM PEAK TRAFFIC HOUR NOISE LEVELS (dBA)
ALTERNATIVES 2 AND 3

RECEIVER	LAND USE	EXISTING NOISE LEVELS L10	EXISTING NOISE LEVELS L50	FUTURE NOISE LEVELS L10	FUTURE NOISE LEVELS L50	FUTURE - EXISTING L10	FUTURE - EXISTING L50
N1	Res.	69.5	65.1	69.3	65.2	-0.2	0.1
N2	Res.	70.3	65.7	70.0	65.5	-0.3	-0.2
N3	Res.	71.8	66.9	69.9	65.4	-1.9	-1.5
N4	Res.	66.5	63.1	64.9	61.9	-1.6	-1.2
N5	Res.	71.2	66.5	69.2	69.2	-2.0	-2.7
N6	Res.	66.6	63.0	65.0	61.9	-1.6	-1.1
N7	Res.	71.3	66.5	69.4	65.2	-1.9	-1.3
N8	Res.	70.3	65.8	68.4	64.4	-1.9	-1.4
N9	Res.	69.7	65.4	67.0	63.2	-2.7	-2.2
N10	Res.	67.1	62.8	65.9	61.3	-1.2	-1.5
N11	Res.	67.1	62.6	65.9	61.0	-1.2	-1.6
N12	Golf	66.6	63.1	66.2	66.2	-0.4	-3.1
N13	Comm.	68.7	65.1	66.0	63.3	-2.7	-1.8
N14	Comm.	72.7	67.8	66.5	63.2	-6.2	-4.6
N15	Comm.	72.6	67.8	66.3	62.8	-6.3	-5.0
N16	Res.	74.1	69.9	66.9	63.1	-7.2	-6.8
N17	Res.	69.3	65.7	63.8	60.7	-5.5	-5.0
N18	Res.	73.9	68.5	67.3	63.4	-6.6	-5.1
N19	Res.	74.3	69.9	67.4	63.5	-6.9	-6.4
N20	Res.	73.5	68.4	67.1	63.3	-6.4	-5.1
N21	Res.	72.8	69.0	66.8	63.0	-6.0	-6.0
N22	Res.	73.3	68.9	67.6	63.5	-5.7	-5.4
N23	Hotel	71.3	67.2	64.9	61.5	-6.4	-5.7
N24	Hotel	66.7	64.0	66.1	62.9	-0.6	-1.1
N25	MTC	68.2	65.0	67.6	64.5	-0.6	-0.5
N26	Hotel	64.2	61.7	63.8	61.2	-0.4	-0.5
N27	Hotel	67.5	63.9	65.8	63.0	-1.7	-0.9
N28	Clinic	69.5	65.0	68.1	64.9	-1.4	-0.1

5.4 LAND USE AND COMMUNITY DEVELOPMENT IMPACTS

5.4.1 General Land Use and Neighborhood Impacts

5.4.1.1 Alternative 1

This alternative would allow continued development of the Airport South District and nearby commercial, industrial, or residential areas in accordance with local land use plans and forecasts. The potential effect on developed areas would be relatively minor, and the pattern of community development in Bloomington, Richfield, and on the Metropolitan Airports Commission property could be expected to proceed as planned. The west curb line of the west frontage roads along TH 77 both in Richfield and Bloomington would be held and would not be extended into either city's residential neighborhoods. No neighborhoods would be severed; neighborhood or community cohesion would not be affected.

The major adverse effects of this alternative would involve the removal of several existing frontage roads and access points and the acquisition of private land for additional right-of-way along I-494. Section 5.4.3, Impacts on Established Business, describes these impacts and their mitigation measures in detail.

The low-density residential neighborhood north of 77th Street and west of TH 77 would be adversely affected by increased commercial and residential traffic resulting from the removal of the north I-494 frontage road. Also, boulevard landscaping and fencing behind the Mr. Steak and the Ground Round restaurants would be partially removed for the creation of new access driveways.

Alternative 1 would eliminate access at Killebrew Drive to the residential neighborhood west of TH 77. Elimination of this access point is consistent with the Bloomington City Council's policy of prohibiting access from TH 77 to the neighborhood to prevent increased traffic impacts. The area would continue to be accessible from 12th Avenue and Old Shakopee Road.

Implementation of Alternative 1 would result in increased traffic on both TH 77 and I-494. Although most of the residential areas along TH 77 are buffered, the neighborhoods along Old Shakopee Road at the south end of the project area would experience some increase in traffic. Traffic, air quality and noise impacts have been identified in previous sections of this document.

5.4.1.2 Alternative 1A

The construction of just Stage I would accommodate the development of the Mall of America and Fantasyworld but would not allow the Airport South District to achieve its full development potential.

The principal adverse effects of Alternative 1A would be the loss of land and parking on the west side of the Metropolitan Stadium property and the loss of the I-494 south frontage road between TH 77 and 24th Avenue.

5.4.1.3 Alternative 2

Land use and development in the nearby residential neighborhoods outside of the Airport South District would probably not be affected by Alternative 2. This alternative, however, would be inconsistent with local and regional development plans for the Airport South District. Access to this area, including neighborhood access, would be substantially constrained, as average weekday and peak-hour volumes on I-494 would exceed that highway's capacity as soon as the Mall of America and Fantasyworld opened. The total development possible in the Airport South District or the surrounding area might be reduced as a result of traffic constraints and delays.

There is no mitigation measure other than highway improvements which could be applied to Alternative 2 to reduce its adverse impact on neighborhood access and on land use and development in the Airport South District.

5.4.1.4 Alternative 3

Alternative 3 would also be inconsistent with local and regional plans for the Airport South District. Local as well as regional access to this area would be substantially constrained, as average weekday and peak-hour volumes on I-494 would exceed that highway's capacity as soon as the Mall of America and Fantasyworld opened. The impact of this alternative on land use and development would be approximately the same as that of Alternative 2.

There is no mitigation measure which could be applied to Alternative 3 to reduce its impact on neighborhood access and on land use and development in the Airport South District.

5.4.2 Impacts on Community Services

5.4.2.1 Alternative 1

Alternative 1 would have no effect on police or fire services nor on schools. The following utilities would be affected. Refer also to Figure 4-2.

- o TH 77:
  - Gas main in the vicinity of the TH 77/I-494 interchange.
  - Water and gas main crossings at the 79th Street underpass.
  - Storm sewers in the east frontage road between 82nd and 85th Streets.
  - Water line crossing at 82nd Street, under the east frontage road between 82nd Street and Killebrew Drive, and under Killebrew Drive.
- o I-494:
  - Sanitary sewer and water lines under the south frontage road from 13th Avenue to I-494.
  - Sanitary sewer and water lines under the south frontage road between I-494 and 24th Avenue.
  - Sanitary sewer, water, and gas lines under the south frontage road from 26th Avenue to 34th Avenue.
  - Gas line under the north frontage road from 26th Avenue to 34th Avenue.

5.4.2.2 Alternative 1A

Alternative 1A would have no effect on police or fire services nor on schools. The following utilities would be affected.

- o I-494:
  - Sanitary sewer and water lines under the south frontage road between TH 77 and 24th Avenue.
- o TH 77:
  - Gase main in the vincinity of the TH 77/I-494 interchange.

- Water and gas main crossings at the 79th Street underpass.

- Storm sewers in the east frontage road between 82nd and 85th Streets.

- Water line crossing at 82nd Street, under the east frontage road between 82nd Street and Killebrew Drive, and under Killebrew Drive.

5.4.2.3 Alternative 2

Alternative 2 would affect the movement of police or fire vehicles at certain times as a result of the expected traffic congestion. There would be no effect on utility lines.

5.4.2.4 Alternative 3

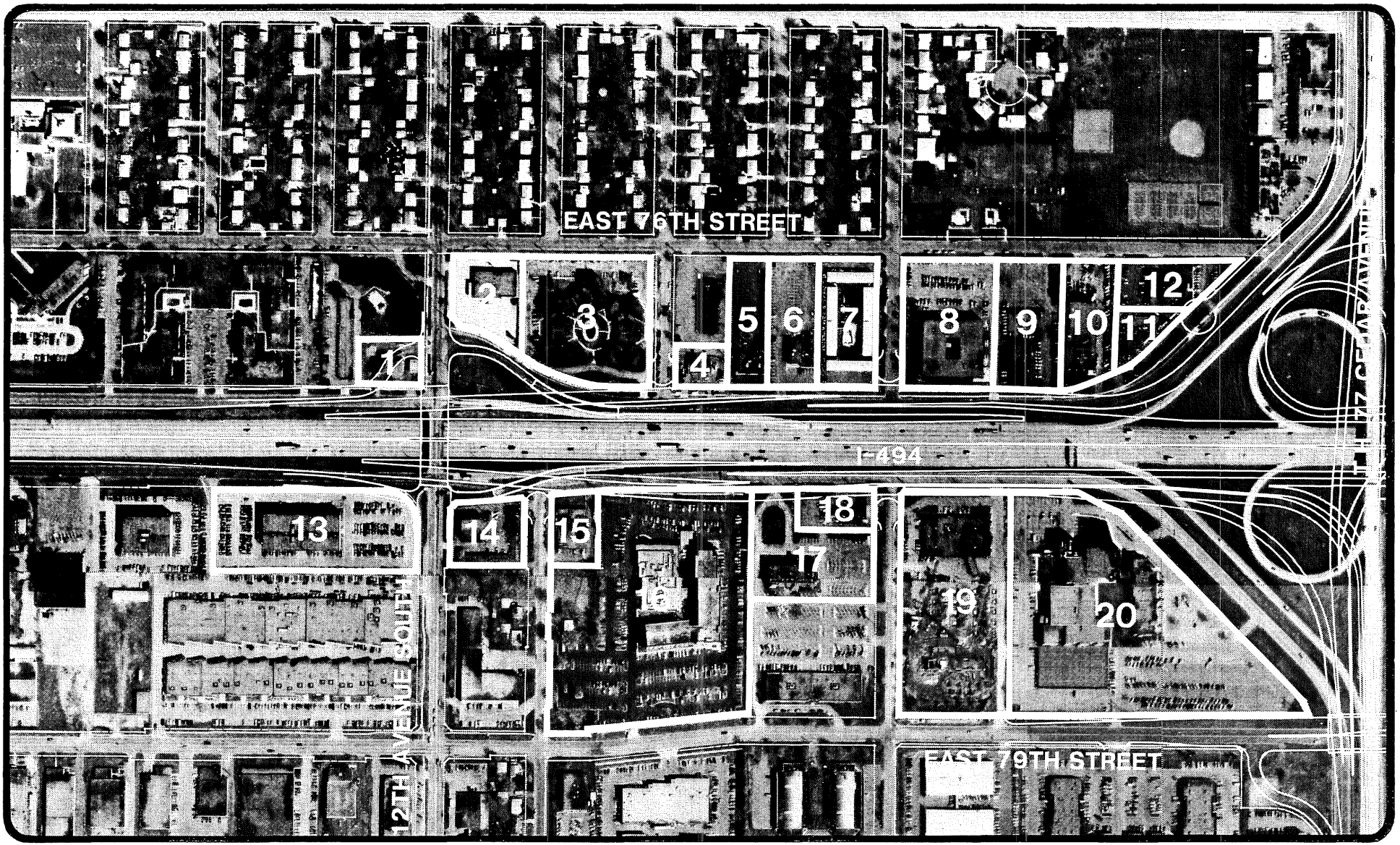
The TDM alternative would affect the movement of police or fire vehicles at certain times as a result of the expected traffic congestion. There would be no effect on utility lines.

5.4.3 Impacts on Established Business

5.4.3.1 Alternative 1

There would be a number of adverse effects on existing businesses under Alternative 1. Approximately 28 land parcels would have their landscaped setback altered, approximately 27 would have their frontage road access completely removed, approximately fifteen parking lots would be affected, approximately four parcels would need a new access road, three buildings may have to be removed, and some businesses would be visually impacted. Each of these impacts is described in more detail in the following section. Refer also to Figures 5.4.A to 5.4.D. The right-of-way estimates given in the following sections are only approximations based on preliminary plans. Final right-of-way determinations can only be made after final geometric layout and design. Future plans for upgrading I-494 west of the project area may result in substantial changes to Alternative 1 and the resulting impacts.

I-494 North Side: 12th Avenue to TH 77 (See Figure 5.4.A). The impacts on existing businesses in this section would be the removal of one complete building, the loss of frontage road access, the loss or alteration of landscaped setback areas, and/or the loss of parking spaces as a result of the construction of a loop road carrying traffic from northbound



T.H.77/I-494 IMPROVEMENT PROJECT

FIGURE 5.4.A

Business Impacts
I-494: 12TH AVENUE TO T.H.77

[8] IMPACT DESCRIPTION REFERENCE NUMBER (SEE TEXT)

N

0' 400'

BRW

TH 77 to westbound I-494. All land parcels would continue to have access either from 77th Street and/or a perpendicular local street. An alternative which has been considered in this area is moving the 12th Avenue exit and entrance ramps to I-494, to Portland Avenue. This would substantially reduce the right-of-way needs in the segment so that virtually no additional right-of-way would need to be acquired. The removal of the frontage roads would still be necessary, however. The numbers next to the following affected sites refer to the identification numbers on Figure 5.4.A.

1. Phillips 66 Gasoline Station (West of 12th Avenue):

   - Entire site would be taken.

2. Former Robert Hall Clothing Store (now vacant):

   - Frontage road access removed.
   - Access available via 12th Avenue.

3. Apartment Complex:

   - Frontage road access removed.
   - Possible loss of up to twenty feet of property across the southeastern edge of the property for right-of-way.
   - Access from 14th Avenue via the existing on-site circulation drive.

4. American International Rent-a-Car:

   - Frontage road access removed.
   - Possible loss of up to approximately 25 feet of property across southern edge for right-of-way.
   - Loss of approximately half of the 28 possible parking spaces in the front setback.
   - Access available from 14th Avenue.

5. Mr. Steak:

   - Frontage road access removed.
   - Loss of up to approximately 25 feet of property across the southern edge of the site for right-of-way.
   - Possible loss of all parking (10 spaces) in the front setback area. (There are approximately 110 parking spaces on the site presently.)
   - Access available from 77th Street (to rear of building). Currently, there is no access from 77th Street.

6. Ground Round Restaurant:

- Loss of frontage road access.
- Loss of approximately 30 feet of property along the southern edge of the site for right-of-way.
- Probable loss of half of front parking (11 spaces). (There are approximately 124 parking spaces on the site presently.)
- Access available from 77th Street (to rear of building). Currently, there is no access from 77th Street.

7. 7700 Apartments:

- Loss of thirty-foot strip of property across the southern edge of the site.
- Loss of approximately thirteen parking spaces.
- No access changes. (Access is from Bloomington Avenue which would lose access from the frontage road but still have access to 77th Street.)

8. Farmer's Home Group Office Building:

- Loss of frontage road access.
- Loss of ten to thirty feet of southern edge of site.
- Access available via Bloomington Avenue and 77th Street.

9. Stadium Office Park:

- Loss of frontage road access.
- Loss of appproximately ten feet of southern edge of site.
- No loss of parking.
- Access would be via 77th Street.

10. Metro Sales Office Building:

- Loss of frontage road access.
- Loss of approximately ten feet of property across the southwest corner of the site for right-of-way.
- Continued access from 77th Street.

11. Travel Company Office Building:

- Loss of one frontage road access point.
- Continued access from the frontage road and 77th Street.

12. Normark Corporation Office Building:

- Loss of a small piece of land for a portion of a cul-de-sac.

I-494 South Side: 12th Avenue to TH 77 (See Figure 5.4.A). Impacts in this section would result from the construction of a ramp to carry eastbound I-494 traffic onto southbound TH 77 and, secondly, from the construction of a collector-distributor road along the south side of I-494. The impacts would include the loss of a business, the loss or alteration of landscaped setback area, the loss of frontage road access and the loss of parking spaces. Access to land parcels would continue to be available via 79th Street and/or perpendicular local streets. The right-of-way needs and impacts on parking and circulation in this area could be substantially reduced by the relocation of the 12th Avenue ramps to and from I-494, to Portland Avenue. However, the removal of the frontage road would still be necessary.

13. Control Data Office Building (just west of 12th):

    - Loss of approximately 6,000 square feet of landscaped setback and parking lot for right-of-way at corner of 12th Avenue and frontage road.
    - Loss of approximately fifteen parking spaces.
    - No access changes.

14. Friendly Host Motel:

    - Loss of frontage road access.
    - Access from 13th Avenue.
    - Loss of approximately five feet of parking/circulation drive across the northern edge of the site.
    - Continued access from 12th and 13th Avenues.

15. Office Building (Unnamed):

    - Loss of frontage road access.
    - Loss of approximately 250 square feet of front yard for right-of-way.
    - No parking loss.
    - Continued access from 13th Avenue (to rear of building).

16. Rodeway Inn:

    - Loss of frontage road access.
    - Loss of current landscaped setback.
    - Potential loss of approximately 25 parking spaces.
    - Access from 79th Street and 13th Avenue (rear and side of building).

17. Eddie Webster's:

- Loss of frontage road access.
- Access via existing driveway from 79th Street and from Bloomington Avenue (rear and side of building).
- Loss of approximately fifty feet of landscaped setback.

18. Air Conditioning and Radiator Service:

- Probable loss of building for right-of-way (northern sixty feet of site taken).

19. Metro Financial Center:

- Loss of frontage road access.
- Accesss via Bloomington Avenue and existing driveway from 79th Street (front and side of building).

20. Decathlon Athletic Club:

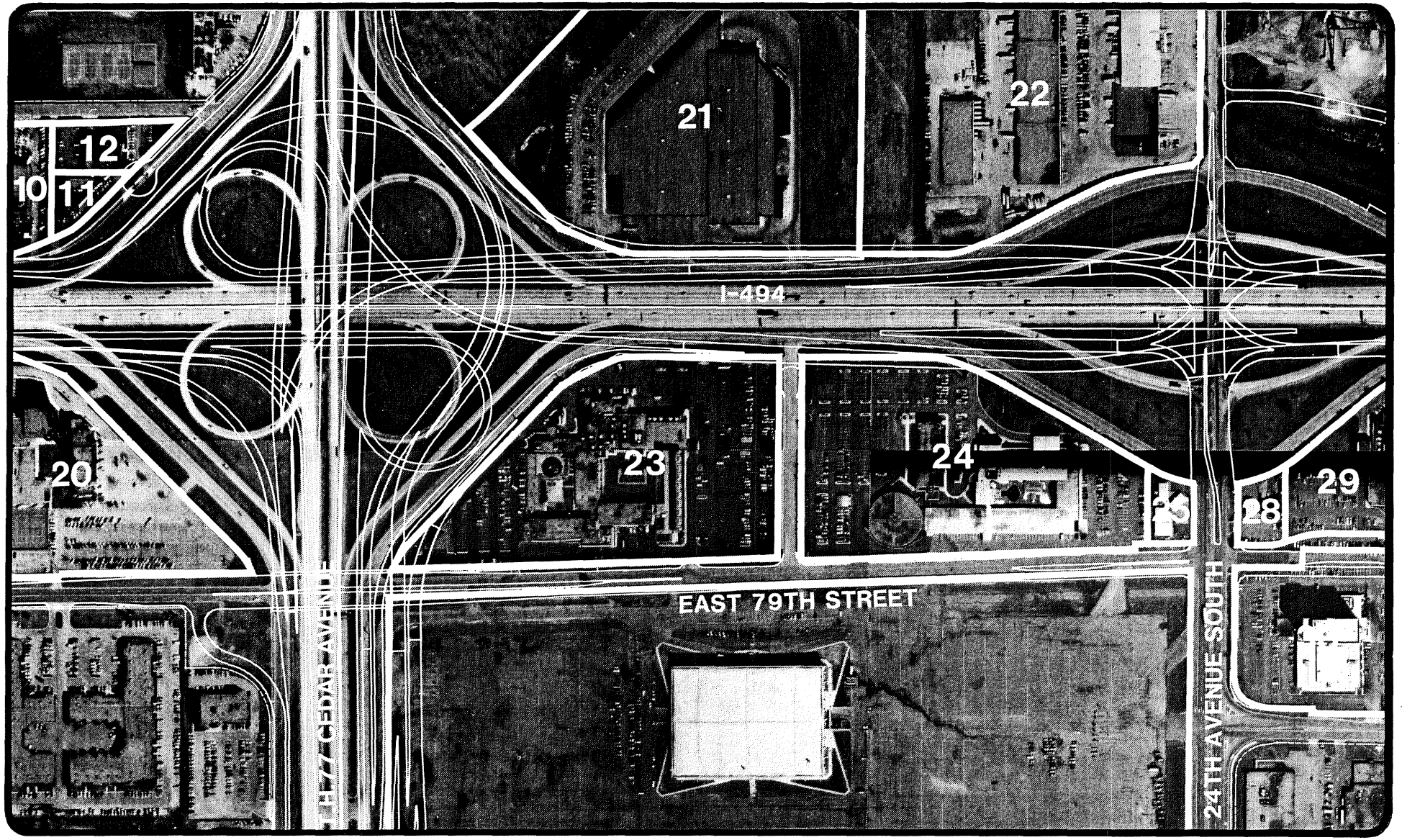
- Loss of 494 and TH 77 frontage road access.
- Continued access from 79th Street (rear of building).
- Loss of approximately thirty-foot strip of land along northern edge of site.
- Loss of approximately twelve parking spaces.

I-494 North Side: TH 77 to 24th Avenue (See Figure 5.4.B). Impacts in this section would include the construction of the 24th Avenue extension north and east of the MTC bus garage and Air Cargo City and the removal of a portion of the I-494/TH 77 frontage road.

Additional impacts would result from the construction of a collector-distributor road along the north side of I-494 and include the loss of frontage road access and/or landscaped setback area. Alternative access would be provided by the 24th Avenue extension.

21. MTC Bus Garage:

- Loss of frontage road access.
- New access from proposed 24th Avenue - TH 77 connector road.
- Possible loss of up to forty feet on south for right-of-way, leaving eighty feet for bus maneuvering area in front of building.



T.H.77/I-494 IMPROVEMENT PROJECT

FIGURE 5.4.B

Business Impacts
I-494: T.H.77 TO 24TH AVENUE

[8] IMPACT DESCRIPTION REFERENCE NUMBER (SEE TEXT)

N

0' 400'

BRW

22. Air Cargo City:

- Loss of frontage road access.
- Continued 24th Avenue access.
- Access from proposed 24th Avenue - TH 77 connector.
- Loss of approximately forty feet across southwest corner of site.
- Loss of a strip of land up to ten feet wide by fifty feet long in the southeast corner of the site.

I-494 South Side: TH 77 to 24th Avenue (See Figure 5.4.B). Impacts in this section would result from the construction of ramps and loops for the TH 77/I-494 interchange and the 24th Avenue interchange and also by the construction of collector-distributor roads along the south side of I-494. These impacts would include loss of frontage road access, the loss or alteration of landscaped setback, the loss of parking spaces, and visual impacts resulting from the height and size of the TH 77/I-494 interchange ramps and loops. Access would continue to be available via 79th Street and Thunderbird Road as well as a remaining portion of the frontage road.

23. Marriott Inn:

- Loss of frontage road access.
- Loss of approximately a 35-foot wide strip of land along northern edge of the site, approximately a 20-foot wide strip along the northwest, and up to approximately a 150-foot wide strip in the southwest corner of the site for right-of-way.
- Loss of approximately forty to fifty parking spaces (the number of spaces lost would depend on the exact revisions to the parking area).
- Access would continue from 79th Street and Thunderbird Road (rear and side of building).
- Visual impact resulting from elevated interchange ramps. Height of ramps to northwest would impair views from the highway and would impact views from motel.

24. Thunderbird Motel:

- Loss of frontage road access points.
- Loss of approximately a forty-foot wide strip of land across the northern edge of the site.
- Loss of approximately sixty parking spaces.
- Access via 79th Street and Thunderbird Road.

25. Amoco Gasoline Station:

- Possible loss of building for right-of-way (eastern forty feet of site may be taken).

I-494 North Side: 24th Avenue to 34th Avenue (See Figure 5.4.C). Impacts in this section result from the improvements to the 24th Avenue interchange, the construction of the collector-distributor road along the north side of I-494 and relocation of the north I-494 frontage road. There would be the loss or alteration of landscaped setback and one instance of frontage road access loss.

26. Airport Clinic:

- Loss of frontage road access.
- Continued access from 26th Avenue.
- Possible loss of up to approximately twenty feet of south property for right-of-way.

27. Northwest Airlines/Metropolitan Airports Commission:

- Loss of up to fifty feet along south edge of site for right-of-way plus a sixty-foot strip diagonally across the property for new frontage road behind the Airport Clinic.

I-494 South Side: 24th Avenue to 34th Avenue (See Figure 5.4.C). This section would involve impacts resulting from the construction of the 24th Avenue interchange as well as the construction of a collector-distributor road along the south side of I-494. Impacts would include the loss of frontage road access, the need for a new access road along rear property lines where there is none presently, the loss or alteration of landscaped setback area, and the loss of parking spaces.

28. Mobil Gas Station:

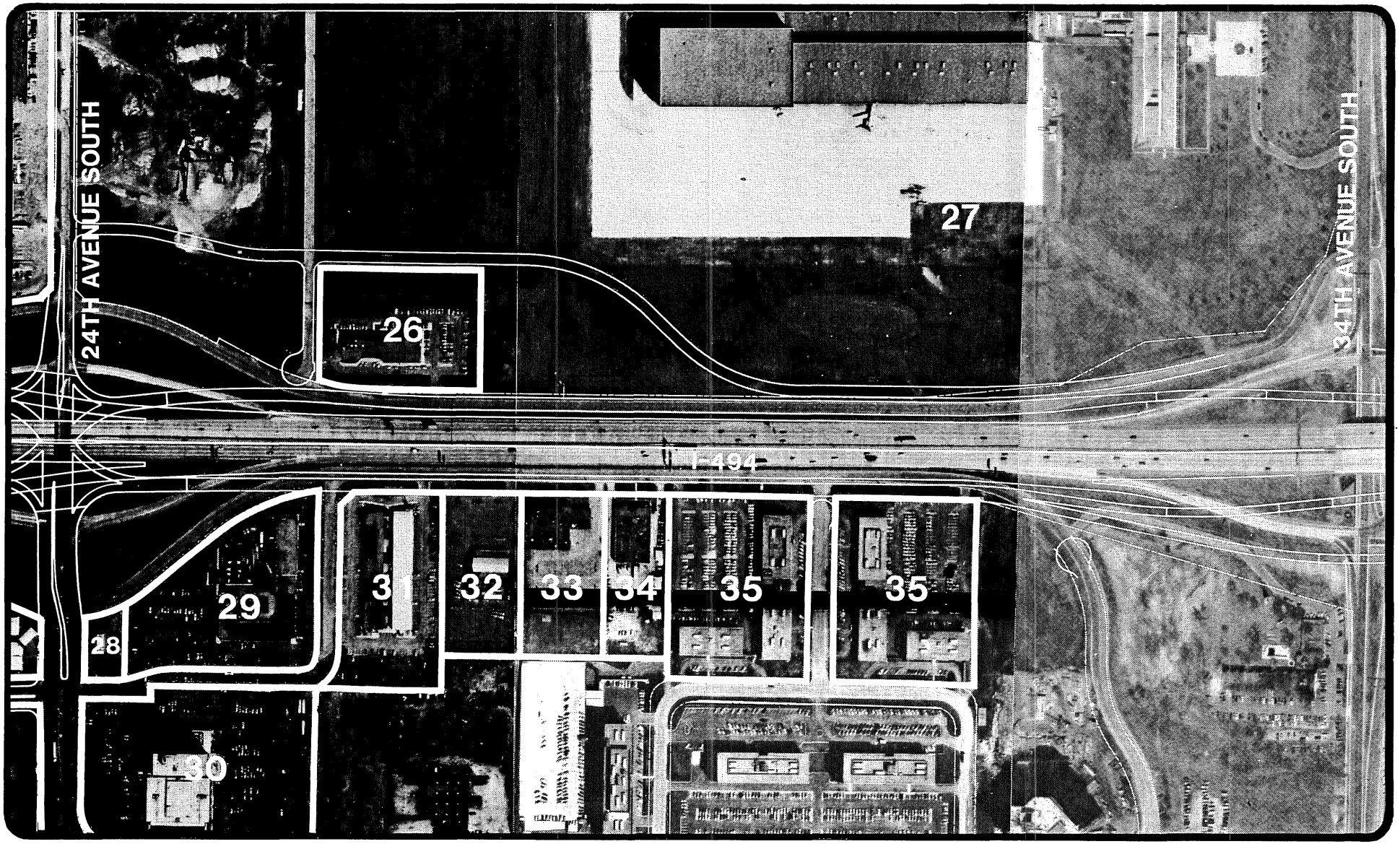
- Possible loss of access from 24th Avenue.

29. Sheraton Motel:

- Loss of approximately 200 square feet of landscaped setback in the northeast corner of the site.
- Loss of approximately ten parking spaces.

30. Registry Motel

- Possible loss of some parking in the northeast corner of site as a result of widening at 79th Street/24th Avenue intersection.



T.H.77/I-494 IMPROVEMENT PROJECT

FIGURE 5.4.C

Business Impacts
I-494: 24TH AVENUE TO 34TH AVENUE

[8] IMPACT DESCRIPTION REFERENCE NUMBER (SEE TEXT)

N

0' 400'

BRW

31. Exel Inn:

- Loss of frontage road access.
- Loss of a ten- to twenty-foot strip of land across the northern edge of the site.
- Loss of some landscaped front setback.
- Access could be possible from a suggested extension of 79th Street to Metro Drive. This driveway could serve the Sheraton Motel, the Registry Motel, Exel Inn, the VFW hall, an unnamed office building, and T.O. Plastics. Creation of such a driveway would involve cross-easements among nine landowners.

32. VFW Hall:

- Loss of frontage road access.
- Same access as the Exel Inn (see above).
- Loss of approximately ten to fifteen feet of property along the northern edge of the site.

33. Office Building (Unnamed):

- Loss of frontage road access.
- Similar access as the Exel Inn.
- Loss of approximately ten to twenty feet of front setback for right-of-way.

34. T.O. Plastics:

- Loss of frontage road access.
- Same access as the Exel In.
- Loss of approximately fifteen to 25 feet of front setback.

35. Metro Office Park:

- Loss of frontage road access.
- Continued access via Metro Parkway.
- Loss of approximately ten to twenty feet of front setback.
- Loss of approximately ten feet of landscaped setbacks both west and east of Metro Parkway.

TH 77 West Side: 70th Street to I-494. There would be no impacts to existing businesses in this section.

TH 77 East Side: 70th Street to I-494. There would be no impacts to existing businesses in this section.

TH 77 West Side: I-494 to 86th Street (See Figure 5.4.D).

20. Decathlon Athletic Club:

- Possible loss of a strip of land used as parking lot up to ten feet wide by 500 feet long in the southeast corner of the site due to proposed widening of 79th Street.

TH 77 East Side: I-494 to 86th Street (See Figure 5.4.D). This section would be affected by the construction of a collector-distributor road and the 81st Street and Killebrew interchange.

36. Met Sports Center:

- Loss of frontage road access.
- Access via new 81st Street, 24th Avenue, and 79th Street.
- Loss of approximately 100 to 120 feet of property along the western edge of the site for right-of-way.
- Loss of a triangular piece of property up to 200 feet in width in the southwest corner of the site.
- Loss of approximately 300-400 parking spaces.

37. Howard Johnsons

- Frontage road on west side of site changed to one-way.
- Access to Killebrew Drive would be moved. Possible that access to Killebrew would be provided through Bor-Son office access to Killebrew Drive.

5.4.3.2 Alternative 1A

The adverse effects on existing businesses would be substantially less under Alternative 1A. One building may be removed, approximately six land parcels would have their landscaped setback altered, approximately seven would have their frontage road access removed, and approximately four parking lots would be affected. Each of these impacts is described in greater detail below. As with Alternative 1, the right-of-way estimates given are only approximate and the numbers next to each of the following sites refer to the identification numbers on Figures 5.4.A to 5.4.D.

I-494 North Side: 12th Avenue to TH 77. There would be no impacts on existing businesses in this section as a result of Alternative 1A. A portion of the frontage road would be rebuilt but inside the existing right-of-way.



T.H.77/I-494 IMPROVEMENT PROJECT

FIGURE 5.4.D

BUSINESS IMPACTS
T.H.77: I-494 TO KILLEBREW DRIVE

[8] IMPACT DESCRIPTION REFERENCE NUMBER (SEE TEXT)

0' 400'

BRW

I-494 South Side: 12th Avenue to TH 77. There would be no impacts to existing businesses in this section during Stage I.

I-494 North Side: TH 77 to 24th Avenue. Alternative 1A impacts in this section would include the construction of the 24th Avenue connector north and east of the MTC bus garage and Air Cargo City and the removal of a portion of the I-494/TH 77 frontage road.

21. MTC Bus Garage:

- Loss of frontage road access.
- New access from proposed 24th Avenue - TH 77 connector road.

22. Air Cargo City:

- Loss of frontage road access.
- Continued 24th Avenue access.
- Access from proposed 24th Avenue - TH 77 connector.
- Possible loss of a strip of land up to ten feet wide by fifty feet long in the southeast corner of the site.

I-494 South Side: TH 77 to 24th Avenue (See Figure 5.4.B). Impacts in this section would result from the construction of a ramp to carry northbound TH 77 traffic to eastbound I-494, the construction of the 24th Avenue interchange, and the construction of a collector-distributor road along TH 77. These impacts would include loss of frontage road access, loss or alteration of landscaped setback, and loss of parking spaces. Access would continue to be available via 79th Street and Thunderbird Road as well as a remaining portion of the frontage road.

23. Marriott Inn:

- Loss of frontage road access.
- Loss of approximately a twenty-foot wide strip of land along the northwest edge of the site and a strip up to 100-feet wide along the southwest edge of the site.
- Loss of approximately twenty to thirty parking spaces in the southwest corner of the site.
- Access would continue from 79th Street and Thunderbird Road (rear and side of building).

24. Thunderbird Motel:

- Loss of frontage road access.
- Access via 79th Street and Thunderbird Road.

25. Amoco Gasoline Station:

- Possible loss of building for right-of-way (easterly forty feet of site taken).

I-494 North Side: 24th Avenue to 34th Avenue (See Figure 5.4.C).

26. Airport Clinic:

- Loss of frontage road access.
- Continued access from 26th Avenue.

27. Northwest Airlines/Metropolitan Airports Commission:

- Loss of a strip of land up to sixty feet in width for a realigned frontage road behind the Airport Clinic.

I-494 South Side: 24th to 34th Avenue (See Figure 5.4.C). This section would involve impacts resulting from the construction of the 24th Avenue interchange.

28. Mobil Gas Station:

- Possible loss of access from 24th Avenue.

29. Sheraton Inn:

- There would be no impacts to the Sheraton Inn during Stage I. (A city improvement will have already removed the frontage road and built a substitute access drive on the south and east sides of the Sheraton Inn.)

30. Registry Hotel:

- Possible widening of the 79th Street/24th Avenue intersection may require a piece of right-of-way in northeast corner of site.

31. Exel Inn:

- Loss of a strip of landscaped setback approximately ten feet wide across the northern end of the property.

32. VFW Hall:

- Loss of a strip of landscaped setback approximately ten feet wide across the northern end of the property.

33. Office Building (Unnamed):

- There would be no impacts to this building during Stage I.

34. T.O. Plastics:

- There would be no impacts to T.O. Plastics during Stage I.

35. Metro Office Park:

- There would be no impacts to Metro Office Park during Stage I.

TH 77 West Side: 70th Street to I-494. There would be no impacts to existing businesses in this section.

TH 77 East Side: 70th Street to I-494. There would be no impacts to existing businesses in this section.

TH 77 West Side: I-494 to 86th Street (See Figure 5.4.D).

24. Decathlon Athletic Club:

- Possible loss of a strip of land used as parking lot up to ten feet wide by 500 feet long in the southeast corner of the site due to proposed widening of 79th Street.

TH 77 East Side: I-494 to 86th Street. This section would be affected by the construction of a collector-distributor road and the 81st Street and Killebrew interchange.

36. Met Sports Center:

- Loss of frontage road access.
- Access via new 81st Street, 24th Avenue, and 79th Street.
- Loss of approximately 100 to 120 feet of property along the western edge of the site for right-of-way.
- Loss of a triangular piece of property up to approximately 200 feet in width in the southwest corner of the site.
- Loss of approximately 300-400 parking spaces.

37. Howard Johnsons

- Frontage road on west side of site changed to one-way.
- Access to Killebrew Drive would be moved. Possible that access to Killebrew Drive would be provided thorugh Bor-Son office access to Killebrew Drive.

5.4.3.2 Alternative 2

Existing businesses may be adversely affected by Alternative 2 because I-494 and TH 77 may be highly congested for a substantial portion of the day, resulting in impaired access to and from the commercial areas. Access would be especially difficult for businesses south of I-494 and east of TH 77.

There would be no mitigation measures available for the adverse effects of Alternative 2 on existing businesses.

5.4.3.4 Alternative 3

The impacts on existing businesses under Alternative 3 would be substantially the same as those of Alternative 2.

There would be no mitigation measures available for the adverse effects of Alternative 3 on existing businesses.

5.4.4 Social Impacts

5.4.4.1 Alternatives 1 and 1A

No measurable social impacts would result from either Alternative 1 or 1A. There would be no displacement of residents; there would be no neighborhoods severed; no changes in neighborhood or community cohesion are expected; no ethnic or socio-economic group would be isolated; there would be no change in established travel patterns either for motorists, bicyclists, or pedestrians which would noticeably affect social interaction, community identification, or access to community facilities or services; no recreation areas would be permanently affected; no schools or school attendance boundaries would be affected; and long-term community and neighborhood vitality should not be influenced.

5.4.4.3 Alternatives 2 and 3

No social impacts would result from either Alternative 2 or Alternative 3.

5.5 ECONOMIC IMPACTS

5.5.1 Project Costs and Revenue Sources

The total construction cost for the ultimate project is estimated to be approximately $189 million including right-of-way. The estimated construction cost for the first stage improvements including right-of-way, engineering, capitalized interest and contingencies is approximately $82 million. Cost estimates are subject to change as the design concept is refined during the preliminary design phase.

A bill was approved by the Minnesota Legislature which provides a means of financing improvements to Trunk Highway 77 from 86th Street to Interstate 494, including ramps and interchanges and construction of the 24th Avenue/I-494 interchange. The Commissioner of Transportation is authorized to enter into an agreement with the City of Bloomington to construct those highway improvements. The city is given the lead responsibility, including the authority to design improvements and acquire right-of-way. The cost of the highway construction would be paid to the city under an agreement with the Commissioner of Transportation whereby the city would be repaid in ten equal annual installments commencing after completion of the highway improvements or 1990, whichever occurs later in time. No interest would be included with the repayment. The city would receive money from the Metropolitan Fiscal Disparities Pool between the years 1988 and 1999 to offset the interest charges on indebtedness used to pay for the construction of the highways. Then, between the years 2000 and 2009, the amounts advanced out of the Fiscal Disparities Pool for interest payments between 1988 and 1999 would be repaid to the Pool in equal annual payments.

5.5.2 Employment

The proposed Stage I project is expected to support the following employment activity during the period of construction.

TABLE 5.5.A
EMPLOYMENT SUPPORTED BY STAGE I PROJECT

TOTAL JOBS	CONSTRUCTION JOBS
1,618	864

Source: Economic model of the Minnesota Department of Energy and Economic Development, 1986.

The total number of jobs includes direct jobs (those directly related to the construction project) and indirect jobs (those generated when income from direct jobs is spent). The construction jobs would be temporary. All jobs are expressed as full-time equivalents. In addition, the improvements would permit the development of the proposed Mall of America and other development in the Airport South District which could potentially create more than 6,000 construction jobs and more than 10,000 permanent full-time equivalent jobs.

5.6 PARK AND RECREATION AREA IMPACTS

None of the alternatives would have any direct impact on the development, use, or maintenance of any existing or planned park or recreation area. No land will be taken from any existing or planned park, recreation area, or wildlife refuge, nor will there be any temporary construction easements needed on park land.

However, noise levels may be slightly higher at Rich Acres Golf Course, Wright's Pond Park, and Washington Park as a result of increased traffic on the nearby highways and/or the highway being slightly closer to the park. Rich Acres Golf Course is used as a noise buffer for the International Airport. Section 5.3 contains a detailed description of the expected noise impacts.

5.7 RELOCATION IMPACTS

5.7.1 Project Impacts

None of the alternatives would require the relocation of any household. However, in the ultimate plan two automobile service stations and one business specializing in automobile air conditioning and radiator repair would need to be relocated as a result of right-of-way acquisition. The service stations are located in the northwest quadrant of the 12th Avenue/I-494 interchange and in the northwest quadrant of the 24th Avenue and 79th Street intersection. The repair service is located south of I-494 between 12th Avenue and TH 77.

5.7.2 Mn/DOT Relocation Policy and Practice

The City of Bloomington will aquire the right-of-way necessary for the Stage I improvements. No determination has been made on when or who would acquire right-of-way needed for the ultimate improvements. The acquisition of right-of-way by the City of Bloomington would be in conformance within the policies and practices of the Minnesota

Department of Transportation regarding relocation of residences and businesses for highway construction purposes which are summarized below.

- o Private property cannot be acquired or damaged for public purposes without payment of fair compensation.
- o No one will be displaced by a construction project unless and until adequate replacement housing has already been provided or has been built and made available to all affected persons, regardless of race, color, religion, sex or national origin.
- o When relocation is required, Mn/DOT will make every effort to provide a minimum of 90 days notice (and in most cases 120 days) prior to the date that the move is required.
- o Mn/DOT will assist in locating and moving into suitable replacement housing.
- o Owners of small businesses and farms may be eligible for additional moving/relocating assistance from the Small Business Administration and the Farmers Home Administration.
- o In accordance with state law, Mn/DOT may acquire property by gift, direct purchase, or eminent domain proceedings.

5.8 ENERGY IMPACTS

Differences in operating consumption between the project alternatives are not expected to be significant. The energy requirements to construct the build alternatives are discussed in Section 5.19 of this document.

5.8.1 Alternatives 1 and 1A

Post-construction operating energy requirements of the proposed facility should be less with either Alternative 1 or 1A. Construction of either Stage I or ultimate development improvements would increase highway capacity, thus increasing the number and speed of vehicles passing through the project area. However, eliminating the at-grade intersection at Killebrew Drive would eliminate the stop-and-go pattern and ramp back-ups which currently characterize the area. Traffic flow would improve, and with it, vehicular energy efficiency.

5.8.2 Alternative 2

Alternative 2 would result in increased traffic congestion on TH 77 and I-494 as the Airport South District redevelops and new development continues to locate in the 494 corridor east and west of the project area. As congestion increases on the major arterials, some traffic can be expected to shift to other roadways including low speed arterials, collectors and residential streets. Vehicular energy consumption would increase with both stop-and-go conditions and longer, more circuitous routes.

5.8.3 Alternative 3

This alternative proposes travel demand management (TDM) techniques to reduce the number of vehicles using the highways. Like Alternative 2, Alternative 3 proposes no roadway improvements. A no-build situation is expected to result in increased congestion on TH 77 and I-494 with redevelopment in the southeast quadrant and continuing development in the 494 corridor. Probable spill-over to more circuitous routes will also increase vehicular energy consumption. TDM techniques, including emphasis on high occupancy vehicles and measures to improve traffic flow, would reduce vehicular energy use over Alternative 2, but would still result in more energy use than either Alternative 1 or 1A.

5.9 VISUAL IMPACTS

5.9.1 Alternative 1

The existing visual environment is currently shaped and dominated by the corridor's roadway elements. Thus, any changes to the elements of the roadscape will have relatively smaller visual impacts, both positive and negative, than if the planned improvements were being constructed as an entirely new road. Because the road creates open space, any new improvements which change the open space quality will have some visual impact. Several fly-over access/egress ramps are proposed for the major intersections along TH 77 which will have a visual impact on adjacent land uses.

In addition, due to the road's increased complexity, added directional signs will increase the amount of visual information drivers will need to process and respond to. The following discussion focuses on intersections in more detail, first along TH 77 and then along I-494.

5.9.1.1 75th Street Interchange

Improvements at this interchange include a minor widening of the overall road width and a fly-over ramp from southbound

TH 77. This ramp will block the view of open space across the freeway from single family and apartment residential units on the west side of TH 77. This impact will adversely affect portions of two residential blocks. The view of the adjacent landscape from the fly-over will be enhanced due to the ramp's elevation and overview opportunities.

5.9.1.2 TH 77/I-494 Interchange

At this interchange, the major visual impact will be the result of two fly-over ramps. The first is a third level ramp connecting westbound I-494 to southbound TH 77, carrying drivers to Met Center and the Mall of America. The second is a fourth level fly-over ramp connecting southbound TH 77 with eastbound I-494 and access at 24th Avenue. Both ramps will obstruct views to the northwest from the Marriott Hotel. The highest portions of the fly-overs occur near the center of the interchange, which will tend to help mitigate negative visual impact. The north-east collector/ distributor road will replace the existing frontage road, moving closer to the Marriott's northwest main entry. This road will open views to the Marriott parking if screening shrubs are not replaced. The fly-over ramps will permit longer views toward destinations the ramps service.

5.9.1.3 79th Street

This street, currently discontinuous at TH 77, will become an underpass connecting both sides of the freeway. To accommodate the underpass, the intersecton of the west frontage road and 79th Street will be shifted slightly to the west within the existing right-of-way.

5.9.1.4 81st Street

Two fly-over ramps, connecting the southbound collector/ distributor roads on TH 77 with 81st Street, visually impact the low-rise office buildings on the road's west side.

5.9.1.5 Killebrew Drive

Two fly-over ramps similar to those at 81st Street will be constructed at Killebrew Drive. The ramps will obstruct the eastward view of the apartment buildings north of 84th Street. In both the 81st Street and Killebrew Drive situations, the fly-overs occur near the center of the intersection, which helps to mitigate their visual impact. TH 77 will be lowered through the Killebrew Drive and 81st Street interchange, which could obstruct the visibility of adjacent land uses from TH 77 travelers.

5.9.1.6 Interchange Upgrades - 12th Avenue and 24th Avenue

Improvements to upgrade these interchanges have little visual impact. The horizontal and vertical alignments of on/off ramps are not substantially changed. At 24th Avenue the added collector/distributor roads are depressed below existing grade, mitigating visual impact. This scheme of depressed roads fits into the overall pattern of I-494 depressed under the north south roads.

5.9.2 Alternative 1A

The major difference between Stage I and the ultimate plan occurs in the area of the TH 77/I-494 interchange. In Stage I this interchange will remain as a two level interchange as opposed to the four level interchange proposed in the ultimate plan. Therefore, the major visual impact described in Alternative 1 at this interchange would not occur in Stage I. The other visual impacts described in Alternative 1 would be essentially the same for Alternative 1A since this alternative would involve essentially the same improvements as Alternative 1 at the other interchanges.

5.9.3 Alternative 2

Alternative 2 would not change the existing highway configuration or intersection/interchange system, resulting in no visual impacts.

5.9.4 Alternative 3

Alternative 3 would not change the existing highway configuration or intersection/interchange system, resulting in no visual impacts.

5.10 WATER RESOURCE IMPACTS

Impacts on water resources are discussed under four major categories: surface water hydrology and hydraulics, floodplains, groundwater and water quality. Potential mitigation measures are described within each category, and summarized at the end of the water quality discussion.

All impacts described are for Alternative 1. The impacts for Alternatives 1A, 2 and 3 are the same as those for Alternative 1, unless noted otherwise.

5.10.1 Surface Water Hydrology and Hydraulics

The existing drainage patterns within the study area would not be significantly affected because the study area is an established, well developed urban area, the sub-watersheds

encompass only the area of the improved highways, and there is no relocation of any of the major roadways. Improvements would be limited to those necessary to provide a complete drainage system for the proposed improved highway (additional catchbasins, manholes, trunk storm sewer, detention basins, etc.) and those necessary to increase the capacity of any existing storm sewer to that of the peak discharge from the design storm. All of the proposed improvements to the existing storm drainage system are non-significant in terms of changed drainage patterns and represent an improvement to the storm drainage system in the study area. See Table 5.10.A for a summary of the surface water drainage impacts. Table 5.10.B is a summary of both existing and proposed storm water detention ponds in the study area.

5.10.1.1 Proposed Drainage Plans

Sub-watershed 1. In sub-watershed 1, Alternatives 1 and 1A would widen existing TH 77 and replace the existing ditches with curb and gutter.

The proposed drainage plan in sub-watershed 1 would require improvements to the existing storm sewer system and construction of a new detention pond, the Ramp V pond. The Ramp V pond would not be required for Alternative 1A. The storm sewer starts at the low point between East 72nd Street and Diagonal Boulevard, and flows south to the existing I-494 storm sewer system. The Ramp V pond would be located east of Cedar Avenue and south of the proposed Ramp V which provides access to the new road between TH 77 and 24th Avenue on MAC property. The Ramp V pond would discharge into the existing I-494 storm sewer system. The Ramp V pond would be designed to store peak runoff, therefore reducing peak flow in the downstream system. The pond would have a required storage volume of 4 to 6 acre-feet and a surface area of 1 to 2 acres.

The proposed improvements to the storm sewer system would be designed for the 50-year storm. The proposed Ramp V pond would be designed for runoff volume from the 100-year storm.

The proposed drainage plan in sub-watershed 1 has no significant impact on the receiving waters or existing drainage patterns of the study area.

Sub-watershed 2. Because the existing storm sewer system is designed to convey less than a 10-year frequency storm, the trunk storm sewer would need to be upgraded to convey the 50-year frequency design storm, required by Mn/DOT for interstate highways. The required improvement would be the

TABLE 5.10.A
SURFACE WATER DRAINAGE IMPACTS

SUB-WATERSHED	ALTERNATIVE	TYPE OF IMPACT	MITIGATIVE MEASURES	REMARKS
1	1	Insufficient sewer capacity	Yes	Increase capacity of storm sewer to 50-year frequency storm and provide Ramp V detention pond.
	1A	Insignificant	None	No improvements.
	2 & 3	Insignificant	None	No improvements.
2	1	Insufficient sewer capacity and no existing spill containment	Yes	Construct a parallel storm sewer on I-494 for 50-year frequency storm and construct Flume Pond.
	1A	Insignificant	None	No improvements.
	2 & 3	Insignificant	None	No improvements.
3	1 & 1A	Insufficient sewer capacity	Yes	Provide and increase capacity of storm sewer to 50-year frequency storm. Increase capacity of Pond C.
	2 & 3	Insignificant	None	No improvements.

TABLE 5.10.B
STORMWATER DETENTION PONDS IN STUDY AREA

POND	ACREAGE	STORAGE VOLUME AC - FEET	NEW OR EXISTING	REMARKS
Ramp V Pond	1-2	4 - 6	New	Ramp Pond V would reduce peak discharges into I-494 trunk storm sewer system.
Flume Pond	*	*	New	Flume Pond would be a treatment pond for the detention/capture of spills and first flush runoff.
Wright's Pond	4.55	20	Existing	Wright's pond would accommodate the runoff volume from the northern portion of the Met Stadium site.
Pond C	5	25	Existing	Need to increase capacity due to increase volume runoff.
Pond 1	17.5	200	Existing	Remains unchanged, is not impacted by the project.

* To be determined during final design.

construction of a parallel trunk storm sewer of approximately the same size. The exact size and outlet configuration would be determined during final design.

A detention pond, the Flume Pond, would need to be constructed near the outlet of the I-494 trunk storm sewer, under Alternative 1 only. The pond could be located in the northeast quadrant of the I-494/34th Avenue interchange, upstream of the storm sewer outlet into the flume to the Minnesota River. This detention pond would function primarily as a treatment basin for the detention and potential capture of any hazardous spills that may occur along I-494. It would also receive the first flush of any highway related pollutants carried with the initial storm water runoff. The pond would be designed to route and store the runoff volume from the 10-year design storm. There would be an overflow by-pass around the pond for peak discharges greater than that from the 10-year storm.

Sub-watershed 1, which discharges into the trunk storm sewer under I-494 as described above, would be routed through the Ramp V pond, which would have a controlled outlet. The controlled outlet would minimize the impact of sub-watershed 1 on the I-494 trunk storm sewer.

The proposed drainage plan in sub-watershed 2 has no significant impact on the receiving waters or existing drainage patterns of the study area.

Sub-watershed 3. The proposed drainage system for sub-watershed 3 would consist of removing the ditches and culverts between East 79th and East 86th Streets, and then constructing three separate storm sewer lines to drain this northerly area of the sub-watershed. The first storm sewer line would start at the East 79th Street tunnel and flow southerly under the proposed northbound traffic lanes, connecting into the existing 60-inch-diameter trunk sewer near East 86th Street. The drainage area for this storm sewer is about 40 acres.

The second proposed storm sewer line would drain an approximately 40-acre portion of the Met Stadium site north of 81st Street. The storm line would flow from east to west across TH 77 to the west frontage road (Old Cedar Avenue) at about 80th Street. From this point, the sewer line would flow from north to south under Old Cedar Avenue, and eventually into Wright's Pond. The runoff diverted from the Met Stadium site by this second storm sewer line has been allowed for in the original design of Wright's Pond, which has a surface area of 4.55 acres and a pond volume of 28 acre-feet.

The third proposed storm sewer line would drain the low points of the northbound collector-distributor (CD) road under the new interchanges at East 81st Street and Killebrew Drive. This sewer line would start at East 81st Street and flow south under the northbound CD road to Killebrew Drive, then east into the Killebrew Drive storm sewer system. The drainage area for this storm sewer is about 5 acres.

The runoff generated from the southwest portion of the Met Stadium site between East 81st Street and Killebrew Drive (approximately 30 acres) would discharge into the Killebrew Drive storm sewer system.

Each of the proposed storm sewer lines would be designed for the 50-year frequency storm. The capacity of the existing storm sewer outlets at TH 77 and Killebrew Drive would not be exceeded upon completion of the final design.

The runoff conveyed by each of the three storm sewer lines would eventually be discharged into Pond C. This drainage pattern is similar to the existing drainage pattern. The proposed improvements would not have a significant impact on drainage patterns in sub-watershed 3.

5.10.1.2 Runoff Volumes

Although the proposed improvements would not affect runoff drainage patterns, increased area of impervious surface resulting from the project would result in an increase in runoff volumes.

Table 5.10.C identifies the sub-watershed tributary area specifically impacted by the roadway improvements. Table 5.10.C also shows the Soil Conservation Service runoff curve numbers for existing and future conditions that were used to calculate the increased volume of runoff due to the roadway improvements.

Table 5.10.D is a summary of the runoff volumes from the one-inch rainfall, the one-year 24-hour frequency storm (2.4 inches of rainfall) and the 100-year 24-hour frequency storm (5.9 inches of rainfall). Table 5.10.D also shows the percentage impact of the increased runoff due to the roadway improvements on the 24 hour discharge volume of the Minnesota River. These percentage increases are very small.

The ASGEIS indicated that there was a six percent increase in annual runoff to Long Meadow Lake from the Airport South District. This six percent increase can also be construed to apply to the single storm event. Therefore, as shown in the ASGEIS, the single storm one-inch rainfall which has 15.6 acre-feet of runoff after development, would have a

TABLE 5.10.C
DRAINAGE AREAS AND RUNOFF CURVE NUMBERS

	ACREAGE	TOTAL TRIBUTARY ACRES	EXISTING CONDITION CURVE NUMBER	FUTURE CONDITION CURVE NUMBER
Sub-watershed 1 [1]	29			
Sub-watershed 2 [1]	300	329	87	91
Sub-watershed 3	45[2]	45	87	94

[1] Sub-watershed 1 and 2 have the same outlet.
[2] Acreage only includes storm sewer tributary area of TH 77 improvements.

TABLE 5.10.D
STORMWATER RUNOFF VOLUMES FOR SELECTED RAINFALL EVENTS

		RUNOFF VOLUME IN ACRE-FEET		
		1" RAINFALL	2.4" RAINFALL 1-YR. STORM	5.9" RAINFALL 100-YR STORM
Sub-Watershed 1 & 2 (329 Ac)	Existing	6.0	33.7	121
	Proposed	9.9	41.7	133
	Increase	3.9	8.0	12
Sub-Watershed 3 (45 Ac)	Existing	0.8 (28)[3]	4.6 (210)[3]	16.6 (870)[3]
	Proposed	1.9	6.6	19.5
	Increase	1.1	2.0	2.9
Total Runoff Volume Increase (Ac-Feet)		0.5	10.0	14.9
Minnesota River Discharge (cfs)		2,000[1]	5,000[1]	117,000[2]
Minnesota River Runoff Volume in 24 Hours (Acre-Feet)		4,000	9,900	232,100
Increased Runoff Percent Impact on Minnesota River		0.1%	0.1%	0.006%

[1] Assumed discharge in Minnesota River.
[2] Minnesota River Discharge at Jordan-Minnesota after 101-year storm in April, 1965.
[3] Runoff volume in acre-feet from the tributary area to Pond C. Assumed: Area = 2,600 acres, CN = 83.

0.88 acre-foot increase in runoff because of the development. The total increase in runoff to the Minnesota River from the Airport South District and from the highway improvements would be about 5.9 acre-feet. This would be an increase of less than 0.2 percent of the volume of water discharged by the Minnesota River in 24 hours (Table 5.10.D).

Before the increased runoff from sub-watershed 3 reaches the Minnesota River, it must pass through Pond C and Long Meadow Lake. This increase runoff when flood routed through Pond C and Long Meadow Lake may require an increased volume less than the increased runoff from sub-watershed 3 shown in Table 5.10.D. As a mitigative measure to this increased flood volume after routing, Pond C may need to be increased in volume either by excavation or raising the overflow weir crest. Long Meadow Lake would need no increase in volume, because during less frequent (100-year) storms Long Meadow Lake would be flooded by the Minnesota River; and because the increased volume of less than 15 acre-feet would be less than 0.5 percent of the total volume of Long Meadow Lake, without taking any flood routing into account.

For Alternates 1 and 1A, it can be concluded that the increased runoff from the roadway improvements would not have a significant impact on the flood storage routing of Pond C and Long Meadow Lake, or on the runoff volume of the ultimate receiving water, the Minnesota River. There would be no increase in runoff from Alternates 2 and 3. The increased runoff from sub-watershed 3 should be flood routed through Pond C to determine whether an increase in volume would be required.

5.10.2 Floodplains

The proposed highway improvements would not significantly impact floodplains near the project area. As stated in Section 4.2.6, there are no floodplains in the immediate project area. Elevations at the south end of the project and at Pond C are well above the 100-year flood protection elevation of the Minnesota River, approximately one mile south of the project area.

The floodplain analysis was completed in accordance with Executive Order 11988 - Floodplain Management, dated 5-24-77; United States Department of Transportation Order 5650.2, dated 4-23-79; and United States Department of Transportation Guidelines dated 11-15-79, detailed in 44 FR 67578 on 11-26-79. The DOT documents identify policies and guidelines established to aid planning programs for public facilities in or near floodplains. For each of the four alternates considered, this analysis determined that there

was no longitudinal encroachment, no significant encroachment, no support of incompatible floodplain development, and that the natural and beneficial floodplain values are preserved.

If floodplain wetlands such as Kidder Marsh or the cattail marsh adjacent to Pond 1 were used as treatment facilities in the future, the impact of flooding situations on the ability of the wetland to treat stormwater should be addressed. According to the USEPA, it has not yet been determined whether wetland treatment systems in floodplains conflict with Executive Order 11988 (USEPA 1983).

5.10.3 Groundwater

The project proposes to improve sections of both I-494 and TH 77. The improvements to I-494 do not involve any actions that could potentially have a long term impact on the groundwater of the study area. The minimum roadway elevation of I-494 in the study area is approximately 816 NGVD (National Geodetic Vertical Datum) at the I-494/TH 77 interchange. Groundwater elevation at this location is approximately 806 to 808 NGVD. With the existing and proposed roadway elevation about eight feet or more above groundwater, the only potential groundwater impacts would be localized, temporary dewatering for the construction of a bridge footing.

The improvements to TH 77, however, do involve actions that could potentially impact the groundwater of the study area. The Airport South Generic EIS and the Mall of America - Fantasyworld EIS identified concern over the impact of a lowered road grade on groundwater, and on the springs located east of TH 77 in a ravine running from the Killebrew Drive/24th Avenue intersection to Long Meadow Lake. When these two environmental impact statements were prepared, the lowest roadway elevation was anticipated to be approximately 800 NGVD. The groundwater elevation along TH 77 between East 79th Street and East 86th Street is between 798 NGVD and 804 NGVD. A roadway elevation anticipated to be within the seasonal range of the groundwater elevation would imply some permanent lowering of the groundwater.

Subsequent to the preparation of the ASGEIS and the MAFEIS, more detailed preliminary design of TH 77 has been undertaken. This preliminary design has determined that the low points of proposed TH 77 can be raised to those shown in Table 5.10.E. These low points are a minimum of 4.5 feet higher than those identified in the ASGEIS and the MAFEIS. Because of the raised roadway grade, no significant long term impacts on groundwater are anticipated. No lowering of

the long term static groundwater elevation would be required. However, a sub-grade drainage system would be needed below the pavement to keep the sub-grade dry during times of seasonally high groundwater. The sub-grade drainage system would be about 4.5 feet below the pavement, or, at the lowest point, at about elevation 800 NGVD, which is approximately the long term static groundwater elevation. See Section 4.2.6.3.

TABLE 5.10.E
PROPOSED MINIMUM HIGHWAY ELEVATIONS

Proposed Highway Lowpoint	Elevation 1/
Mainline Cedar Avenue at East 75th Street (Proposed MAC Road)	826.5
East 79th Street Tunnel	808.0
Mainline Cedar Avenue at East 81st Street	805.0
Northbound CD Road at East 81st Street	804.5
Mainline Cedar Avenue at Killebrew Drive	805.5
Northbound CD Road at Killebrew Drive	806.0
Southern Termini of project at East 86th Street	807.0

1/ Elevations taken from preliminary design as of August 1986. Elevations are subject to change.

The area of special concern is the possible impact of permanent dewatering along TH 77 on the springs located along the Minnesota River bluffs. The deep eroded ravine just east of 24th Avenue at 86th Street contains many springs discharging at various elevations along the ravine walls. Field crews established the elevation of the highest spring in the ravine as 789. The location of the ravine and the highest spring is shown in Figure 4.2.F.

With groundwater levels in the surficial drift ranging from 797 to 804, there is potential flow laterally toward the bluffs. However, flows will also continue to move downward. A review of the piezometer data indicates the absence of a strong gradient towards the spring. This is supported by information from borings for the Howard Johnson Motel and the Bor-Son office building just to the east on Killebrew Drive. Table 4.2.G in Section 4.2.6 summarizes miscellaneous groundwater level information in the study area.

Dewatering systems along Cedar Avenue can be expected to control groundwater levels in the range of 798 to 800. Therefore, there should be no major impact on the springs in the ravine near 24th Street, for two reasons.

- o The groundwater level information indicates that the first encountered water table is relatively flat, with no strong gradient towards the bluffs except near them. The absence of steep horizontal gradients in the surficial sands indicates that the bulk of infiltration is probably moving vertically downward to deeper aquifers, since gradients must be present for the water to move laterally.

- o Seepage in the ravine near 24th Avenue occurs at many different elevations, the highest at 789. Others have been noted at about elevations 766, 737, with many small seeps between 735 and 720. The lower seeps may be due to water that infiltrates downward through the surface sands, recharging deeper layers in the Superior Lobe tills or the bedrock aquifers. It should be noted that the potentiometric (sic) head in the underlying Prairie du Chien-Jordan aquifer in the study area is about at elevation 734 (Unique well number 205574, located at the Control Data Corporation). Therefore, the lower seeps may be created by water movement from the bedrock aquifers.

If portions of TH 77 were dewatered to much lower elevations, the impact on the higher seeps could increase. In the present plan, the groundwater control elevation is not estimated to be significantly different from dry period groundwater levels.

From the information and data presented above, it can be concluded that the proposed improvements to I-494 and TH 77 within the study area for all the alternates being considered would not have a significant impact on the groundwater or groundwater-fed springs in the study area.

This conclusion can be drawn from the following facts:

- o None of the proposed improvements to I-494 includes any lowering of the existing roadway elevations.

- o The lowest point in the proposed vertical alignment of TH 77 would be approximately at elevation 804.5 NGVD at East 81st Street, with a permanent sub-grade drainage system at 800.0 NGVD.

- o The normal static groundwater elevation along TH 77 between I-494 and the East 86th Street is estimated to be between 796 and 801 NGVD.

- o The elevation of the highest spring in the ravine near 24th Street is 789 NGVD, or seven to twelve feet below the estimated normal static groundwater elevation.

- o The most prominent springs are about one-half mile east of TH 77, parallel with the Minnesota River. The identified groundwater gradient is from north to south towards the Minnesota River, which would situate the springs out of the zone of influence of the drawdown cone from any potential permanent dewatering.

5.10.4 Water Quality

The discussion of water quality impacts is divided into sections covering categories of project impacts, comparisons to water quality requirements, existing water quality, and to the Airport South and Mall of America EIS's, and mitigation measures.

5.10.4.1 Categories of Project Impacts

Erosion and Sedimentation. Under natural conditions, erosion is generally controlled by vegetation and hard cover. Construction strips away this natural protection, thus increasing the potential for erosion. Construction impacts are covered in Section 5.19 of this document.

Deicing Salts. Minnesota has adopted a "bare pavement policy" to provide safe driving conditions on snow and ice-covered roadways. Sand alone cannot yield desired results. Deicing salts, primarily sodium chloride, are utilized by Mn/DOT in conjunction with abrasives. This mixture increases the effectiveness of the abrasive when applied to the roadway, keeps the abrasive from freezing, and eases handling of the mixture with mechanical equipment.

Based on a 3-year average, application rates of deicing salts and abrasives on TH 77 in the study area have been 31.93 tons per pass mile.[9/10/] The mixture is 14.17 tons of salt and 17.76 tons of sand per pass mile on TH 77. The 3-year average annual application of the salt and sand mixture to I-494 has been at a rate of 36.37 tons per pass mile. The mixture is composed of 16.20 tons of salt and 20.17 tons of sand per pass mile.

The number of pass miles within sub-watershed 3 and sub-watershed 1 and 2 drainage areas will increase by about 125 percent and 40 percent respectively. With the dry pavement policy, the amount of salt applied to the roadway would increase by the same percentages if the rate of application remains constant following the proposed improvement.

When mixed with water in the environment, salt (sodium chloride) readily disassociates into positively charged sodium ions (Na+) and negatively charged chloride ions (Cl-). The positively charged sodium ions are readily combined with negatively charged soil particles and are bound within the soil. The negatively charged chloride ion is not attracted to soils and therefore moves freely through the environment without binding to other compounds. Because of this characteristic, dilution is usually required to mitigate the chloride problem.

Salt also changes the osmotic balance of the soils adjoining the roadways. This imbalance in the soil increases the susceptibility of plants to drought. In addition, salts tend to make the soils alkali, reducing vegetative productivity, resulting in leaf margin burn.

Because salt and salt abrasive mixtures are applied to the roadways in the winter, the salt applied is generally retained in the snow near the roadway and, therefore, during spring run-off chloride concentrations are usually high. As spring run-off progresses, dilution of the salt concentrations occurs. Salt concentrations in the retention area receiving only highway run-off can be expected to be moderately high. When adjacent land area is also drained to the ponding sites, the concentrations will be lower due to the increase in the volume of water available for dilution. The ultimate receiving waters, the Minnesota River in this case, will have chloride concentrations that are quite minimal when further dilution by the river is considered.

State-of-the-art predictive procedures for chloride concentrations presently are lacking. No research has been done which presents a methodology to accurately predict chloride concentration from highway run-off. Because of this, any attempt to predict chloride concentrations can only be considered to be a "best guess." Since the factors affecting chloride concentrations--the amount of snowfall, the rate of spring snowmelt, chloride loss to storm sewer due to melting before spring runoff and the salt application rate--are all variable from season to season, the only way to arrive at a "best guess" prediction is to assume a value for each of these main items and for other, less important factors. The assumptions made for the calculation of the values shown in Table 5.10.F are as follows:

- The average total spring snowmelt is equivalent to four inches of run-off over the entire area tributary to the ponds during the spring melt.

- The rate of snowmelt is such that complete mixing takes place before discharge to the ponding area.

TABLE 5.10.F
PROJECTED SUB-WATERSHED CHLORIDE CONCENTRATIONS

	EXISTING PASS MILES	EXISTING PROJECTED CHLORIDE CONCENTRATIONS (mg/l)	PROPOSED PASS MILES	PROPOSED PROJECTED CHLORIDE CONCENTRATIONS (mg/l)	CHLORIDE CONCENTRATION INCREASE (mg/l)
Sub-watersheds 1 and 2	22.5	2,450[1/]	31.5	3,430[1/]	980
Sub-watershed 3	4.3	2,960[2/]	9.6	6,670[2/]	3,710

1/ Projected chloride concentration being discharged into the Minnesota River through the MAC Flume.

2/ Projected chloride concentration being discharged into Pond C due to highway runoff only.

- o The salt applied on the roadway is 44 percent of the average annual application rate of salt-abrasive mixture.

- o No chlorides are lost to the groundwater.

- o No chlorides are lost to runoff due to melting before the spring runoff.

Because of the current state of predictive procedures for chloride concentrations, the data presented in Tables 5.10.F and 5.10.G primarily indicate order of magnitude and the effect of dilution on chloride concentrations, based on reasonable conservative assumptions.

TABLE 5.10.G
PROJECTED MINNESOTA RIVER CHLORIDE CONCENTRATIONS

Sub-watershed 1 and 2	
Incremental Chloride Concentration	980 mg/l
Background Chloride Concentration in Minnesota River 4/	80 mg/l
Chloride Concentration in Minnesota River after increment 1/2/3/	93 mg/l
Sub-watershed 3	
Incremental Chloride Concentration	3,710 mg/l
Background Chloride Concentration in Pond C 5/	247 mg/l
Projected Chloride Concentration in Pond C from entire watershed 1/	306 mg/l
Projected Chloride Concentration in Long Meadow Lake	7/
Background Chloride Concentration in Minnesota River 4/	78 mg/l
Chloride Concentrations in Minnesota River after increment 1/2/6/	80 mg/l

1/ Computed by flow weighted averages method.
2/ Assumes 10,000 cfs discharge into Minnesota River.
3/ Assumes 150 cfs discharge from Sub-watersheds 1 and 2.
4/ See Table 6B in Appendix.
5/ See Table 1B in Appendix
6/ Assumes 100 cfs discharge from Pond C.
7/ Because Long Meadow Lake is subject to flooding in the spring from the Minnesota River, cannot reasonably be determined or may not be applicable depending on flood stage.

The water quality standards for chloride concentrations are 100 mg/l for the Minnesota River and Long Meadow Lake and none for any of the stormwater detention ponds in the study area, including Pond C. Table 5.10.G indicates that the projected chloride concentration in the Minnesota River downstream of the study area will be about 93 mg/l if all the assumptions in the analysis are correct. This projected chloride concentration is less than the MPCA standard of 100 mg/l for the Minnesota River.

The high chloride concentrations in the spring runoff and in the ponding areas only occur during the spring runoff period when there are relatively high volumes of runoff for dilution. Therefore, in general terms it can be concluded that elevated chloride concentration will only occur during the spring runoff and that chlorides in the highway runoff will not significantly impact surface water quality.

Like surface water, groundwater chloride concentrations will be minimally affected. The frozen ground during part of the spring run-off and the highway run-off to the ponding areas through the storm sewer system will reduce the amount of chlorides which can enter the groundwater.

Traffic Related Pollutants. As development takes place in the study area, surface water quality can be expected to steadily decrease. This results mainly from the large number of pollutants that are generated by man. The major pollutants are fertilizers and pesticides from lawn and garden care, litter, oil and greases from cars, pathogenic organisms from human and animal wastes, heavy metals, and suspended or dissolved solids. All of these pollutants are considered to have non-point sources and therefore are impossible to totally eliminate from surface waters. Through effective control measures some or most of the pollutants in surface water run-off can be controlled.

Unlike run-off from developed urban areas which contain a wide variety of pollutants, highway run-off has a limited number of associated pollutants. These pollutants can either be related or unrelated to traffic. The unrelated pollutants are found in surface water run-off from developed areas because, like their descriptive name, they are unrelated to traffic. The pollutants that are unrelated to traffic originate from adjacent land uses and to a much smaller extent, the local geology. The largest percentage of the unrelated pollutants found in highway run-off are litter and other solid matter and pathogenic organisms.

Because this EIS is concerned with the effect of the proposed highway improvements upon the environment, only the traffic-related pollutants will be dealt with in this water

quality analysis. Coliform, fecal coliform, and fecal streptococci are important parameters in the assessment of water quality, but they are not included in this study because there is no known relationship between motor vehicles and bacteria or pathogens.

Because of their origin, traffic-related pollutants will be proportional to the total volume of traffic using the highway. The pollutants may come either directly from motor vehicles or indirectly as a result of motor vehicles. Many of the indirect pollutants are products of the local geology and abraded material from the roadway itself. These products are largely inorganic in nature. Other indirectly-related pollutants are BOD (biological oxygen demand), COD (chemical oxygen demand), magnetic fraction, chloride, nitrogen, volatile solids, and phosphorous. The chloride is mainly a result of salt applications and was discussed in a separate section of this EIS. The traffic-related phosphorous and nitrogen are commonly found in low levels and are principally due to soil and plant material deposited or carried onto the roadway by motor vehicles.

Less than five percent of the traffic pollutants originate directly from traffic. These pollutants, which include heavy metals, are the most important to consider in surface water run-off because of their potential toxicity. Deposits of lead are almost entirely due to the settling out of the lead in automobile emissions from the use of leaded fuels. A small percentage of the lead does result from the lead oxide which is used in tires. As the use of unleaded fuels in motor vehicles increases, traffic-related concentrations of lead in receiving waters will decrease. Zinc, which is used in tires and motor oils, will also be deposited directly by motor vehicles. Other metals, including copper, nickel and chromium result from the wear of metal plates, bearings, bushings, and other moving parts on the car. Nearly all of the copper results from brake wear. In addition, asbestos is also produced by brake lining wear. Smaller amounts of asbestos are produced from clutch wear. Rubber resulting from tire wear is also considered a traffic-related pollutant along with petroleum products, such as greases and oils, and n-paraffins from leaks and spills of automobile lubricants, hydraulic fluids, and antifreeze.

Some of the pollutants do exhibit a seasonal variation in their accumulation levels. Most of the pollutants that are directly related to traffic, such as the greases and oils, are at uniform levels throughout the year. However, lead

and zinc, which are a result of tire wear, can be expected to be slightly greater during warmer weather because of the higher rate of tire wear during warmer weather. Similarly, volatile solids, BOD, and COD are also slightly higher during the summer and fall.

To provide a means of quantifying pollutants from highway run-off, a study was carried out in the Washington D.C. metropolitan area by Shaheen.[11] This study compiled loading rates due to strictly traffic-related sources. Because the pollutants listed are due entirely to traffic, the author of the study concludes that the pollutant rates will be rather uniformly applicable. However, because of local geology and land use, the rates of deposition of volatile solids, BOD, COD, phosphorous, and nitrogen will show some variation.

Because the sub-watersheds have some adjacent urban land uses within the sub-watershed, quantification of the pollutants from the adjacent land uses is required to accurately project pollutant concentrations. Pollutant loading rates for residential, commercial and industrial areas as reported by Sator[12] represent the current most accepted information on this topic.

The data contained in the above two studies were used to project pollutant concentrations from the sub-watersheds of the study area. A computer model that utilizes this data was developed by BRW, Inc. and used to compute the pollutant loadings and concentrations from the sub-watersheds. The computed pollutant loadings and concentrations are shown in Tables 5.10.H and 5.10.I. (This computer model is detailed in and verified against a measured drainage area in the Water Resources Report for TH 169 and TH 252 prepared for Mn/DOT, State Projects 0217-01, 2771-01 and 2748-25.)

Table 5.10.H shows the projected traffic related pollutant concentrations from the 1-year, 24-hour wash off storm for runoff from sub-watersheds 1 and 2, north Cedar Avenue sub-watershed and the I-494 sub-watershed. This runoff would be conveyed to the east to the proposed Flume pond, then into the Minnesota River.

5.10.4.2 Comparison to Water Quality Requirements

Flume Pond and Pond C, as indicated in Section 4.2.6, can best be classified as intrastate 4A, 4B, 5 and 6 bodies of water. Therefore, the water quality requirements of Table 3A of Appendix B apply. If this recommended classification is followed, no water quality requirement would apply to the traffic related pollutants listed in Table 5.10.H.

TABLE 5.10.H
PROJECTED POLLUTANT CONCENTRATIONS FROM 1-YEAR, 24-HOUR STORM
SUB-WATERSHEDS 1 AND 2

	EXISTING CONDITIONS		PROPOSED IMPROVEMENTS		INCREASE	
	Mg/L	LBS.	Mg/L	LBS.	Mg/L	LBS.
Total Solids	275	25,140	285	32,440	10	7,300
Volatile Solids	18.6	1,707	17.2	1,947	(1.4)	240
BOD	1.37	125	1.07	121	(0.3)	(4.0)
COD	10.8	993	13.2	1,495	2.4	502
Total Phosphates	0.17	15.6	0.18	19.8	0.01	4.2
Nitrates	0.015	1.39	0.020	2.23	0.005	0.84
Nitrites	0.0007	0.07	0.001	0.19	0.0003	0.12
Grease	0.01	1.13	0.03	3.12	0.02	1.99
Kjeldahl-N	0.70	63.9	1.24	140.0	0.54	76.1
Petroleum	0.28	25.8	0.63	71.6	0.35	45.8
N-Paraffins	0.2	18.1	0.44	50.3	0.24	32.2
Rubber	0.41	37.5	0.92	104.2	0.51	66.7
Lead	1.06	97.3	2.15	243.3	1.09	146.0
Chromium	0.026	2.39	0.025	2.82	(0.001)	0.43
Copper	0.050	4.67	0.044	5.15	(0.006)	0.48
Nickel	0.019	1.67	0.035	3.95	0.016	2.28
Zinc	0.27	24.3	0.34	38.8	0.07	14.5

TABLE 5.10.I
PROJECTED POLLUTANT CONCENTRATIONS FROM 1-YEAR, 24-HOUR STORM
SUB-WATERSHED 3

	EXISTING CONDITIONS		PROPOSED IMPROVEMENTS		INCREASE	
	Mg/L	LBS.	Mg/L	LBS.	Mg/L	LBS.
Total Solids	119	1,491	146	2,644	27	1,153
Volatile Solids	6.6	82.9	7.8	141.6	1.2	58.7
BOD	0.33	4.3	0.38	6.9	0.05	2.6
COD	6.0	74.4	7.6	136.4	1.6	62.0
Total Phosphates	0.070	0.90	0.088	1.45	0.018	0.55
Nitrates	0.014	0.18	0.014	0.28	0.0	0.10
Nitrites	0.0009	0.01	0.001	0.02	0.0001	0.01
Grease	0.015	0.20	0.020	0.40	0.005	0.20
Kjeldahl-N	0.64	8.0	0.85	15.4	0.21	7.4
Petroleum	0.35	4.4	0.47	8.5	0.12	4.1
N-Paraffins	0.25	3.1	0.33	6.0	0.08	2.9
Rubber	0.51	6.4	0.68	12.4	0.17	6.0
Lead	1.15	14.5	1.55	28.0	0.40	13.5
Chromium	0.010	0.13	0.012	0.23	0.002	0.10
Copper	0.019	0.25	0.022	0.40	0.003	0.15
Nickel	0.019	0.24	0.021	0.45	0.002	0.21
Zinc	0.15	1.9	0.20	3.6	0.05	1.70

Wright's Pond is also classified as an intrastate 4A, 4B, 5 and 6 body of water. Similarly, if this recommended classification is followed, no water quality requirements would apply to the traffic-related pollutants listed in Table 5.10.H.

Wright's Pond receives runoff from about 2,000 feet of the west frontage road and about 800 feet of the southbound CD road. This very small area of sub-watershed 3 results in minimal incremental increases in runoff and pollutant concentrations due to the highway improvements. Based on this information it can be concluded that the proposed highway improvements do not adversely impact water quality in Wright's Pond.

The Minnesota River is classified as an interstate 2C, 3B, 3C, 4A, 4B, 5 and 6 body of water. Therefore, the water quality requirements of Table 1A of Appendix B apply. Of the traffic-related pollutants listed only chromium, copper and oil (grease and petroleum) have an associated water quality requirement listed. Of these three pollutants only copper has a projected concentration before discharge to the Minnesota River that is in excess of part of the associated requirement of 0.01 mg/l. The other half of the copper requirement is "or not greater than 1/10 of the 96 hour TLM value." This half of the requirement is very hard to evaluate because it is a function of the type of wildlife and aquatic life that utilizes the receiving water. Because of this second half of the copper water quality requirements, it is virtually impossible for this EIS to determine whether or not the copper water quality requirement is met.

The projected pollutant concentrations shown in Table 5.10.H are those in the runoff from sub-watersheds 1 and 2 as the runoff leaves the sub-watershed. They are not the pollutant concentrations in the Minnesota River downstream of the point of discharge of sub-watersheds 1 and 2.

Chromium and oil (grease and petroleum) have concentrations less than the water quality requirement for the Minnesota River before discharge to the Minnesota River. The projected copper concentration after the proposed improvements in sub-watersheds 1 and 2 is less than the projected copper concentration for existing conditions. Based on these facts, it can be concluded that the increase in pollutant mass loadings (shown in Table 5.10.H) does not adversely impact water quality in the Minnesota River.

Long Meadow Lake, is classified as an intrastate 2B, 2C, 3B, 3C, 4A, 5 and 6 body of water. Therefore, the water quality requirements of Table 2A. Of the three pollutants listed in

Table 2A, only copper has a projected concentration before discharge to Pond C, which discharges to Long Meadow Lake, that is slightly in excess of part of the the associated requirement of 0.01 mg/l. As indicated above, the other half of the copper requirement, "or not greater than 1/10 of the 96 hour TLM valve," makes it virtually impossible for this EIS to determine whether or not the copper water quality requirement is met.

The projected pollutant concentrations shown in Table 5.10.I are those in the runoff from the 45 acre sub-watershed 3 as the runoff enters Pond C. They do not include the pollutant loadings from the remaining 2,600 plus acres that are tributary to Pond C from Richfield and Bloomington, and from the airport south district. They are only the traffic related pollutant concentrations from the proposed improvements to TH 77 within sub-watershed 3.

Chromium and oil (grease and petroleum) concentrations in the discharge to Pond C which discharges to Long Meadow Lake are less than the water quality requirements for Long Meadow Lake. The incremental copper concentration of 0.003 mg/l is about 15 percent of the existing copper concentration before TH 77 improvements. In addition, the buffering effect of the remaining 2,600 acres tributary to Pond C has not been accounted for in the reduction of the incremental copper concentration that will be realized in Long Meadow Lake. Based on these facts, it can be concluded that mass loadings (shown in Table 5.10.I) do not adversely impact surface water quality in Long Meadow Lake.

In summary, comparison of projected pollutant concentrations to the appropriate MPCA water quality requirements indicates that none of the projected pollutant concentrations shown in Tables 5.10.H and 5.10.I will exceed the appropriate MPCA water quality requirements for receiving waters.

5.10.4.3 Comparison to Existing Water Quality

Pond C and Long Meadow Lake. A comparison of the projected pollutant concentrations to the existing water quality of Pond C, Long Meadow Lake and the Minnesota River, recognizing any buffering effect, supports the finding that the projected pollutant concentrations in the stormwater runoff do not significantly impact the water quality of the receiving waters.

The projected pollutant concentrations from sub-watershed 3 (Table 5.10.I) can be compared with the existing water quality data for Pond C and Long Meadow Lake, since this sub-watershed discharges to Pond C and Long Meadow Lake. The existing water quality data for Pond C is shown in

Table 1B in Appendix B. Of the traffic-related pollutants identified in Table 5.10.I, only the heavy metals, lead, chromium, copper, nickel and zinc, have projected pollutant concentrations in excess of existing levels. When the buffering effect of the remainder of the tributary area to Pond C, about 2,600 acres, is considered the heavy metals will have concentrations that are much lower.

The existing water quality data for Long Meadow Lake is shown in Tables 2B, 3B, 4B and 5B. Of the traffic-related pollutants identified in these tables and in Table 5.10.I, the projected pollutant concentrations from subwatershed 3 before discharge to Pond C are typically slightly higher than the existing pollutant concentrations of Long Meadow Lake.

Minnesota River. The existing water quality data for the Minnesota River is shown in Table 6B in Appendix B. Of the traffic-related pollutants identified in Table 6B and Tables 5.10.H and 5.10.I, the projected pollutant concentrations before discharge to the receiving water are typically lower than or about equal to the existing water quality of the Minnesota River.

This comparison of projected traffic-related pollutant concentrations to existing surface water quality of the receiving waters shows that the projected pollutant concentration due to increased traffic volumes on the highway is generally lower than or equal to the existing water quality.

Wright's Pond and Flume Pond. There is no existing water quality data for Wright's Pond or the proposed Flume pond.

5.10.4.4 Comparison to Airport South Generic EIS and Mall of America-Fantasyworld EIS

The water quality pollutants analyzed as part of this EIS are those traffic-related pollutants that come directly from motor vehicles or indirectly as a result of motor vehicles as discussed earlier in this section. These pollutants are listed in Table 5.10.H and 5.10.I. The Airport South Generic EIS (ASGEIS) and the Mall of America-Fantasyworld EIS (MAFEIS) analyzed only five water quality pollutants: total suspended solids, total phosphorus, total Kjeldahl nitrogen, chlorides, and oil and grease. These pollutants are those most prevalent in surface water runoff from urban areas. These five pollutants are also traffic-related pollutants. However, traffic-related phosphorus and nitrogen are commonly found in low levels in highway stormwater runoff.

Table 5.10.J shows the pollutant concentrations from the five pollutants studied in the ASGEIS and MAFEIS and their corresponding concentrations as determined therein. Also shown is the concentration of these five pollutants as determined in this EIS.

The projected pollutant concentrations for total solids, phosphorus, nitrogen and grease and oil determined in the ASGEIS/MAFEIS (for the 2,603 acre Pond C watershed) are greater than the projected pollutant concentrations for the same pollutants as determined in this EIS (for the 45 acre Pond C sub-watershed which includes primarily TH 77 between E 79th Street and E 86th Street). This is to be expected because these four are primarily urban land use pollutants. Total solids originate from litter, erosion, sand applied to street, miscellaneous construction activities, etc. Phosphorus and nitrogen originate from lawn fertilizing and decaying organic matter. Oil and grease originate from spillage from cars on city streets and to a larger extent from parking lots and driveways.

Chlorides originate primarily from salt applications to streets. Salt application on city streets is typically a function of city policy and ice and snow accumulation, and is usually in quantities considerably less per pass mile than that used on highways. See Section 5.10.4.1 for further discussion of deicing salts. As determined by this EIS, the projected chloride concentration from sub-watershed 3 is considerably greater than that from the Pond C watershed (2,603 acres) as determined in ASGEIS/ MAFEIS.

5.10.4.5 Water Quality Mitigative Measures

The mitigative measures necessary because of the proposed improvements' impact on water quality are summarized below.

Erosion and sedimentation. Mitigative measures are the effective use of erosion control practices during construction detailed in Section 5.19. Other erosion control measures needed to limit offsite erosion would be incorporated into the construction plans. No mitigative measures would be needed to control erosion after construction is completed.

Deicing salts. Mitigative measures are not needed or proposed for this project. The chloride concentrations from deicing salts in the receiving waters do not exceed the MPCA water quality requirements for the receiving waters. The high chloride concentrations are temporary during the spring runoff.

TABLE 5.10.J
CAMPARISON TO WATER QUALITY POLLUTANTS
ANALYZED IN ASGEIS[1]/ AND MAFEIS[2]/

	ASGEIS/ MAFEIS[3]/ (Mg/l)	Table 5.10.I this EIS[4]/ (Mg/l)
Total Solids	210	146
Total Phosphorus	0.55	0.09
Total Kjeldahl Nitrogen	2.5	0.85
Chlorides	75	6,670[5]/
Oil & Grease	3.0	0.49

1/ ASGEIS - Airport South Generic EIS

2/ MAFEIS - Mall of America Fantasyworld EIS

3/ Data is from Table 1 of Appendix Report 9.6, Surface Water Quality, of ASGEIS - Proposed Conditions Pond C Watershed 2,603 acres.

4/ Projected pollutant concentrations for Sub-watershed 3 - highway runoff only tributary to Pond C - 45 acrs.

5/ Projected chloride concentration for highway drainage from sub-watershed 3 - see Section 5.9.4.2 for more information.

Traffic related pollutants. These measures also, to a limited extent, mitigate the effects of increased storm water runoff.

The mitigative measure for sub-watershed 1 is the construction of Ramp V pond as discussed in Section 5.10.1. This pond, in addition to controlling the peak discharge from the sub-watershed, would serve as a settling basin for solids and litter and a containment area for spills.

The mitigative measure for sub-watershed 2 is the construction of the Flume pond as discussed previously. It would serve the same purpose as the Ramp V pond.

Potential mitigative measures for sub-watershed 3 include the enlargement of existing Pond C and re-direction of the existing Pond C outlet.

- o Enlargement of Pond C

  Enlarging Pond C has been proposed as an option to handle the flood routing of increased runoff volumes described in Section 5.10.1. If Pond C is enlarged it will have longer settling times for solids and more aquatic growth to filter and utilize pollutants and nutrients. However, both of these positive effects are likely to be inconsequential because of the small, if any, volume increase required. The enlargement of Pond C should therefore be based on flood volume needs rather than potential water quality mitigation.

- o Redirection of Pond C Outlet

  The existing Pond C outlet could be redirected from Long Meadow Lake to the west side to TH 77 into Kidder Marsh. This marsh is owned by and proposed to be used as a treatment facility for Pond C discharge by the Minnesota Valley National Wildlife Refuge (MVNWR). Doing this will divert the pollutant loadings from Long Meadow Lake to Kidder Marsh. Although the incremental pollutant loadings due to the increased traffic in sub-watershed 3 are very small, the redirected outlet discharge will help alleviate water quality concern in Long Meadow Lake.

  However, shifting the pollutant loadings to Kidder Marsh can be expected to have a negative impact on the marsh. The potential benefits to Long Meadow Lake and negative impacts to Kidder Marsh are examined in Section 5-11. This redirecting outlet can only be implemented if the required easements or rights-of-way and permits can be obtained from MVNWR.

Because of the small incremental pollutant loading due to this project, the many sources of water to Long Meadow Lake that discharge pollutants, and the potential negative impacts on Kidder Marsh, these mitigative measures for subwatershed 3 should not be considered as part of this project. The pollutant loading from Pond C can be attributed to the entire Pond C drainage area. These mitigative measures to improve the water quality of Long Meadow Lake would most appropriately be a combined effort by Richfield, Bloomington, Mn/DOT and the Fish and Wildlife Service. A separate study considering all of the possitive and negative aspects should be undertaken before mitigation is undertaken.

5.11 WETLAND IMPACTS

As currently envisioned, the proposed project would not involve construction in any of the wetlands described in Section 4.2.7. However, there would be an incremental increase of less than 1 percent in stormwater runoff to Pond C and thus to Long Meadow Lake directly attributable to the project. This runoff, especially from highways, can contain toxic pollutants such as lead, cadmium, and certain hydrocarbons.[13/] Pond C also currently contains heavily polluted sediments and is likely to be a source of pollutants to Long Meadow Lake, especially during heavy rainfall events (see Table 5.11.A).[14/] In addition, as described previously the U.S. Fish and Wildlife Service and others have proposed at different times that Kidder Marsh and the Pond 1 wetland complex receive stormwater runoff from Pond C to reduce impacts to Long Meadow Lake.

As discussed in Section 4.2.7, Long Meadow Lake is of high environmental significance as a public wetland resource. Impacts from highway runoff should, therefore, receive careful attention. By nature, wetlands are complex, difficult to understand, and constantly changing. Impacts to them are generally difficult to predict, even though they have received intensive study. In addition, wetlands vary widely in type and internal dynamics, often making site-specific research necessary to obtain definitive projections of impact.

5.11.1 Alternatives 1 and 1A

Potential impacts to wetlands from both build alternatives would consist of: (1) impacts associated with direct and indirect effects of runoff during construction and from highways during the operating life of the highways, (2) impacts caused by construction of facilities in the Minnesota river bottom to mitigate runoff impacts, such as additional detention ponds or treatment facilities; and

(3) impacts associated with enlargement or maintenance of Pond C, such as dredging and disposal of contaminated sediments when Pond C fills.

5.11.1.1 Long Meadow Lake

The proposed project would cause an incremental increase in stormwater runoff to Pond C and to Long Meadow Lake, and subsequent increase in the amounts of nutrients, trace metals such as lead and zinc, and organic compounds that enter these waters.

The amount of pollutants in runoff entering Pond C and subsequently Long Meadow Lake can be expected to increase as traffic flow increases. Traffic will increase even if the highway is not upgraded, but the highest rates of traffic will occur when traffic reaches the capacity of the ultimate design concept. The amounts of pollutant increase attributable to the proposed project are difficult to predict but are likely to be low (Table 5.10.I).

There is not enough information available to determine if the highest impact risk to the Long Meadow Lake wetland complex would occur with the proposed design. There is evidence that pollutant concentrations in Pond C stormwater overflow, which sometimes enters Long Meadow Lake, are presently high enough to cause chronic toxic effects to plants and invertebrates, and that toxic pollutants such as heavy metals can accumulate in Long Meadow Lake sediments. The proposed project will contribute pollutants to Pond C, but they are likely to be a small percentage of those entering it from other sources. There is not enough information to determine the percentage increase over the present levels nor to determine the significance of the present and projected impacts.

During storm events, the receiving water for Pond C overflow is Long Meadow Lake. Storm flows into Pond C through its two storm drains would likely increase the pollutant materials entering Long Meadow Lake even if the stormwater did not contain pollutants, because of re-suspension and flushing of sediments caused by increased turbulence in the pond during heavy rainfall events.[15] Therefore, a relatively small increase in runoff volume could cause a disproportionate pollutant release from Pond C.

According to preliminary data collected by the U.S. Fish and Wildlife Service, Pond C sediments are contaminated with lead and cadmium.[16] Pond C sediments also contain more polynuclear aromatic hydrocarbons (PAH) than do other sampled water bodies in this same study. This data is presented in Table 5.11.A. Cadmium, lead, and each of the PAH compounds are listed by the EPA as toxic (40 CFR 261.33).

TABLE 5.11.A

Comparison of toxic material concentrations in sediments of wetlands, ponds, and lakes within the boundaries of the Minnesota Valley National Wildlife Refuge (ppm)[1/][2/].

Metals	Long Meadow Lake (4)	Pond C (1)	Pond 1 (1)	Louisville Swamp (2)	Chaska Lake (2)	Rice Lake West (2)	Grass Lake (2)	Blue Lake (3)	Fisher Lake (1)	Black Dog Lake (6)
Cadmium	0.4 - 0.6	2.2	0.4	0.4 - 0.7	0.6	0.4 - 1.0	0.5 - 0.9	0.7	1.2	0.3 - 2.0
Chromium	13.0 - 15.0	36.0	31.0	10.0 - 16.0	14.0 - 15.0	15.0 - 18.0	13.0 - 17.0	8.3 - 16.3	13.0	11.0 - 48.0
Copper	16.0 - 19.0	62.5	38.1	14.0 - 20.0	19.0 - 20.0	20.0 - 21.0	19.0 - 21.0	9.2 - 28.6	20.0	15.0 - 121.0
Nickel	15.0 - 19.0	30.0	31.0	15.0 - 20.0	21.0	20.0	19.0 - 21.0	10.0 - 20.0	16.0	13.0 - 26.0
Lead	25.0 - 34.0	330.0	20.0	14.0 - 15.0	15.0 - 16.0	15.0 - 17.0	16.0 - 19.0	9.0 - 18.0	23.0	10.0 - 72.0
Total Toxic Polycyclic Aromatic Hydrocarbons[3/]	0.05 - 0.11	14.6	0.04	- - - - - - - - - - - - - - - - - - Not Sampled - - - - - - - - - - - - - - - - - -						0.04 - 0.35

1/ Source: Preliminary test results of an ongoing study by the U.S. Fish and Wildlife Service. See Smith 1986.

2/ Number of samples are given in parentheses.

3/ Seven of 14 polycyclic aromatic hydrocarbons detected in the samples are listed as toxic by the EPA (40 CFR 261), including napthalene, fluoranthene; 1,2 benzanthrace, benzo(b)fluoranthrene, benzo(k)fluoranthrene, benzo(a)pyrene, and dibenzo (a,h)anthracene.

The precise cumulative effects of these materials on Long Meadow Lake are not known. The wetland presently receives stormwater from several other storm drains and is exposed to floodwaters nearly every spring. On the other hand, it is partially spring fed with generally high quality water.[17] The complexity that results from these and other factors does not allow precise prediction of impacts and their significance.

It is reasonable to expect that the types of impacts that have occurred in wetlands studied elsewhere are presently occurring in Long Meadow Lake. For example, aquatic plant species that grow in Long Meadow Lake such as duckweed are known to take up significant quantities of lead, zinc, chromium, and cadmium even when the concentration of these materials in water is very low.[18] This plant is eaten in significant quantities by waterfowl. The author of this study concluded that the source of the heavy metals for other plants was probably sediment. The extent to which the accumulation in plants causes metals to be concentrated in fish, waterfowl and other birds using Long Meadow Lake is not known. Presently, however, people are advised by the Minnesota Department of Health to use caution in eating fish caught in the lower Minnesota River because of toxic contaminants.[19]

There is also preliminary evidence that stormwater is presently degrading the aquatic environment around Long Meadow Lake stormwater outlets. According to a study currently being sponsored by the U.S. Fish and Wildlife Service, abundance and diversity of invertebrates is lower at these outlets than elsewhere in the wetland.[20]

The water quality analysis in this EIS projected the increase in pollutant loadings to Pond C from the subwatershed in which the proposed project is located. This subwatershed is about 45 acres, while the total Pond C watershed is about 2,600 acres. In order to determine the extent to which this increase would cause impacts in Long Meadow Lake, Table 5.11.B presents a comparison of known toxicity to wetland species of pollutants currently entering Long Meadow Lake from Pond C (1980-81 data). It should be emphasized that the lowest toxicity values in the table tend to be those that cause chronic effects rather than acute effects, and that the Pond C discharges are maximum concentrations (hourly samples composited for 24 hours) of both suspended and dissolved pollutants. This comparison indicates that, except for nickel, the maximum values for each pollutant in Pond C effluent equal or exceed the lowest toxicity values, especially for invertebrates, but that most

TABLE 5.11.B

Comparison of Pond C Pollutants to Wetland Species Toxicity Range.

	Range of Toxicity to Wetland Species (ppm)[1/]				Maximum observed Concentrations in Pond C discharges (ppm)[2/]		
	Plants	Aquatic Invertebrates	Aquatic Vertebrates	Bioaccum-ulation	90th Percentile	Maximum	Comments
Cadmium	0.005 - 0.1	0.005 - 4.9	0.017 - 80	Yes	0.0022	0.0160	Marsh plants readily concentrate. Exhibits synergism with other metals. Toxic effects in waterfowl related to reproduction and other sublethal effects.
Chromium	5 - 20	0.016 - 148	2 - 300	Yes	0.0048	0.023	Concentrated by roots of marsh plants, but does not apparently readily transfer. Concentrates in duckweed.
Copper	<0.2 - 10	0.0024 - 32	0.009 - 1.25	No	0.0135	0.0210	Relatively nontoxic in chemically combined state, extremely toxic when in chemically reactive state.
Aluminum	1 - 20	6.7	0.07 - 133	No	0.960	2.200	Little data available.
Lead	5 - 20	0.3 - 64	0.4 - 75	Yes	0.0500[3/]	0.270	Usually unavailable in soils, 10 ppm results in greatly decreased production in aquatic plants. Concentrates in duckweed.
Nickel	Not Available	0.51 - 64	4.6 - 9.8	No	0.0100[3/]	0.022	---

1/ Source: Ranges are the toxicity levels to wetland species reported in literature as summarized in Kaczynski, 1985. Bioaccumulation is also discussed in Mudroch and Capobianco 1979. Results include wide variety of indicator species, wetlands, and test conditions. Little is known about effects of toxicity and food chain accumulation to birds and mammals.

2/ This data was taken from Table 1B in Appendix ___ and consists of total concentrations. Each sample was a daily composite of hourly samples taken whenever Pond C was discharging to Long Meadow Lake over a one year period in 1980 - 81. "90th percentile" means that 90 percent of the daily samles were less than the amount shown.

3/ This value may be high because some of the values in the analysis may be less than the detection limit.

of the time, concentrations in Pond C discharges are less than the lowest toxicity values. These concentrations indicate that, on occasion, Pond C may currently be causing some adverse effects to Long Meadow Lake plants and invertebrates.

Table 5.10.I indicates that lead loading from a 24-hour storm from the subwatershed containing the proposed project would increase from a projected existing level of 14.5 pounds to 28 pounds. The lead contributions from the rest of the watershed are not known, therefore, it is not possible to determine the percentage increase of lead to Pond C from the proposed project. This percentage is likely to be low, however, because the rest of the watershed contains a large area of streets and other pavement which is likely to contribute substantial quantities of lead and other pollutants to Pond C.

Generally speaking, it is not possible to further determine the impacts to Long Meadow Lake from the discharge of stormwater through Pond C without detailed site studies, and therefore not possible to predict the impacts of the proposed project. However, researchers studying the use of wetlands have cautioned against using wetlands specifically because of the type of impacts that might occur, and have instead advocated using artificial wetlands.21/ Other researchers have noted that artificial wetlands constructed as part of projects generating pollutants are becoming more prevalent.22/ A discussion of the pros and cons of using wetlands for water treatment is given in Section 4.2.7. A list of impacts that occur as a result is given in Appendix C (Table C-1).

According to the EPA, no standardized system for monitoring impacts to natural wetlands has been developed and only two states, Florida and Michigan, have developed legislation specific to the use of wetlands for water treatment.23/

5.11.1.2 Hogback Ridge/Pond 1, Wetland Complex

Under the project construction alternatives, runoff assessments to Pond 1 would not be affected.

5.11.1.3 Kidder Marsh

The U.S. Fish and Wildlife Service has proposed that Kidder Marsh used for treatment of Pond C stormwater.24/ If a diversion of Pond C were to occur in this manner, there would be a reduction in the amount of pollutants entering Long Meadow Lake and likely would be a reduction in impacts

to invertebrates and plants in the area of the Pond C outlet. However, the capacity of Kidder Marsh to treat stormwater is not known, nor it it known how long such capacity could be sustained. It is likely that over the long term, nutrients and other pollutants flowing through the marsh and into Long Meadow Lake would increase at least a slight extent over the amounts currently existing, and that trace metals and hydrocarbons would accumulate in marsh sediments. If the capacity of the marsh to retain pollutants was over-taxed, however, eventually the entry of Pond C pollutants to Long Meadow Lake would merely be shifted from the Pond C outlet to the Kidder Marsh outlet. This adverse effect could be monitored and perhaps prevented by establishing a baseline data base before Pond C is diverted to Kidder Marsh. This would consist of vegetation mapping, water quality sampling, and sediment and vegetation sampling for various pollutants such as heavy metals.

In the near future, a substantial reduction in the quantity of pollutants entering Long Meadow Lake over that presently occurring would be expected if Kidder Marsh were used for treatment of Pond C water.

Use of Kidder Marsh as a treatment facility is likely to cause changes in the marsh. The most likely changes are an increase in the size of the open water area, and changes in species diversity, with a decrease in species diversity quite likely. The types of impacts that could occur are described in more detail in Section 4.2.7 and in Table C-1 in Appendix C. Because of the potential seriousness of impacts to the MVNWR, the use of Kidder Marsh for a treatment facility, if it were to occur, should be accompanied by collection of a sufficient baseline data base and periodic monitoring schedule to determine whether it will begin to export pollutants to Long Meadow Lake.

5.11.1.4 Bass Ponds

No impacts are expected to occur to the Bass Ponds because no disruption of springs that feed the ponds is expected.

5.11.1.5 Wright's Pond

Stormwater runoff to Wright's Pond would increase by a small amount under the proposed design with the addition of a new third storm sewer emptying into it. Urban pollutants from the Mall of America site and highway runoff from a small section of TH 77 would therefore enter Wright's Pond in increased amounts.

No data is available to determine the present effects of stormwater on Wright's Pond. However, based on the literature survey of potential impacts described in Section 4.2.8.1 and in Table C-1, it is likely that the large drainage area above Wright's Pond will tax the wetland's ability to treat stormwater. Over the long term, this is also likely to cause changes in its vegetation, and bioaccumulation of pollutants in vegetation, and, perhaps, bioaccumulation of pollutants in wildlife, such as waterfowl, that use it. It is unlikely that the small amount of additional runoff from the proposed project would increase the level of these impacts.

5.11.2 Alternative 2

The amount of pollutants entering Pond C and Long Meadow Lake would continue to increase as traffic flow increases even if the highway improvements are not constructed. Insufficient information is available to compare this amount to that projected for Alternative 1. However the potential impacts described for Alternative 1 could also occur in the No-Build alternative.

5.11.3 Alternative 3

This alternative would involve somewhat less traffic than foreseen with the build alternatives. Consequently, there would be less pollutants entering Pond C and Long Meadow Lake. The differences in traffic projected however is not likely to result in much difference between the alternatives.

5.11.4 Mitigation Measures

Proposals to use Minnesota Valley National Wildlife Refuge wetlands such as the Pond 1 wetland complex or Kidder Marsh for treatment of Pond C stormwater overflow should be carefully weighed to determine if impacts to them are acceptable to resource managers.

It is likely that Pond C pollutants are flushed into Long Meadow Lake during heavy rains, and it is likely that solutions such as diverting Pond C's outlet to a wetland or to the Minnesota River should be considered in the future. There are likely to be vegetation changes if a marsh receives this flow, whether it is Pond 1 wetland or Kidder Marsh, but impacts to Long Meadow Lake would be reduced.

5.12 WILD AND SCENIC RIVER IMPACTS

No designated Wild and Scenic Rivers are affected by the project.

5.13 COASTAL ZONE IMPACTS

No coastal zones are affected by the project.

5.14 HISTORIC AND ARCHAEOLOGICAL IMPACTS

There are no historic, architectural, archaeological or cultural resources in the project area.

5.15 THREATENED AND ENDANGERED SPECIES

The proposed design for roadway improvements does not directly involve construction in any wildlife habitat, but, as described in Section 5.11, will incrementally cause additional runoff into Pond C, located within important wildlife habitat. Rare, threatened, and endangered species in this area were studied during the preparation of the Airport South Generic Environmental Impact Statement. These studies found that one species listed as federally threatened, the bald eagle, uses the area each winter and spring and has been observed feeding on dead fish in Long Meadow Lake and on Black Dog Lake within a mile of Pond C. (See Appendix 9.7, City of Bloomington, 1984). This report also listed two other species of fish-eating birds, the White Pelican and Osprey, as potentially occurring in the area. These species are state-listed in the "Special Concern" category.

Carp were observed in Pond C during studies for this EIS. It is likely that fish inhabiting this pond will become contaminated with toxic trace metals, and polycyclic aromatic hydrocarbons, materials commonly found in highway runoff. These materials are known to concentrate in fish flesh and in birds that eat fish. It is also possible that fish kills will occur in Pond C from freezeouts or directly from highway spills of toxic material or shock loading from highway runoff. Therefore, a route exists whereby bald eagles and other fish-eating birds could ingest contaminated fish. This possibly also exists under Alternatives 2 and 3 and the increased risk from the project is not significant.

Surveys of plant species completed for the Airport South Generic EIS did not indicate that any rare, threatened, or endangered plants were at risk from the project. No surface disturbance is occurring from this proposal where any of the species have been found in the past.

5.16 PRIME AND UNIQUE AGRICULTURAL LANDS

No prime or unique agricultural lands are affected by the project. Because right-of-way will be acquired, the project

has been processed according to the requirements of the federal Farmland Protection Policy Act. The U.S. Department of Agriculture, Soil Conservation Service, has documented that compliance is complete (Appendix E).

5.17 STREAM MODIFICATIONS

No modifications of any streams will occur from the project.

5.18 WILDLIFE IMPACTS

Over the long term, impacts to wildlife using Pond C and the Long Meadow Lake wetland could occur if vegetation picks up heavy metals or other toxic contaminants. As discussed in Section 5.11, there is some risk that this will occur. Waterfowl and fish-eating birds are the most likely wildlife that could be affected. The risk to wildlife exists with or without the proposed project. The following measures could mitigate potential impacts from Pond C:

(1) Fish inhabiting Pond C could be removed by use of a suitable selective poison to prevent the possibility of eagles ingesting fish contaminated with toxic highway runoff.

(2) Pond C could be fenced and signed to prevent fishing and other such use by people.

(3) If Pond C is enlarged, its sediments should be analyzed for toxic materials and be placed in an appropriate landfill.

5.19 CONSTRUCTION IMPACTS

Construction of either of the build alternatives would result in unavoidable adverse impacts including construction noise, dust, traffic delay and detours, and temporary water quality deterioration. Limiting and/or rerouting traffic through the area can be expected to have a detrimental economic impact on businesses in the project area.

5.19.1 Traffic

It is currently proposed to construct the TH 77 portion of the Stage I project (Alternative 1A) in two phases. In the first phase, the easterly half of the proposed improvements would be constructed while maintaining traffic flow on the existing roadways to the west. A minimum of two lanes of traffic in each direction would be maintained. Access to the east from TH 77 would be maintained at a signalized intersection in the area of Killebrew Drive. In the second phase, the traffic would be diverted to the new roadways on

the east while the westerly half of the proposed improvements would be constructed. Again, a minimum of two lanes of traffic in each direction would be provided on TH 77, with access to the east from TH 77 provided at a signalized intersection in the area of Killebrew Drive. The construction would require approximately two years to complete and would result in additional delays and congestion on TH 77 during the construction period.

The 24th Avenue interchange improvements would also be constructed in two phases to maintain access to I-494 at this interchange during construction. The construction of the 24th Avenue interchange and the directional ramp to I-494 from TH 77 northbound would at times require the closure of one lane in each direction on I-494, reducing the capacity of I-494. This would result in additional traffic delays and congestion on I-494.

A specific roadway staging plan has not been developed to address construction of subsequent stages necessary to implement the ultimate plan. Most of the construction in subsequent stages would be limited to I-494, although new bridges over I-494 to serve TH 77 would also be required. The construction of subsequent stages would likely require restricting traffic flow on both I-494 and TH 77 and would cause additional congestion and traffic delays during construction.

Traffic safety would also be affected during the construction phase of both the Stage I and ultimate proposed projects. Construction would result in changing roadway conditions and changes in signing to warn drivers of the changed roadway conditions. In addition, temporary or detour roads would often be constructed to lower standards than the proposed improvements. The potential traffic safety impact would be minimized through the use of traffic maintenance plans and proper construction zone signing.

5.19.2 Air Quality

Construction of the roadway improvements proposed under Alternatives 1A and 1 will have a temporary negative impact on air quality. Construction operations have the potential to impact air quality in three areas:

- Temporary lane closures and other reductions in traffic capacity will cause vehicle delays resulting in additional emissions of vehicle-related pollutants including carbon monoxide.

- Construction vehicles and equipment will exhaust a variety of combustion-related pollutants.

- o Construction and grading activities will disrupt the existing ground cover, resulting in the generation of fugitive dust emissions.

The phasing of the Stage I improvements is discussed in the previous section. During the construction period, additional traffic congestion will occur on both TH 77 and I-494. This will be offset to some extent by diversions of traffic to alternative routes to avoid the construction delays. Air quality will be adversely affected in the vicinity of the construction where traffic queues and reduced operating speeds occur. This will be a temporary and unavoidable adverse impact.

Construction equipment emissions are not expected to cause significant air quality problems. Construction equipment will be dispersed over a relatively large construction area and any single piece of equipment will not result in significant pollutant concentrations. The majority of construction equipment is diesel-powered with minor carbon monoxide emissions.

The generation of fugitive dust will be minimized through adherance to Mn/DOT construction specifications and MPCA regulations. Dust control measures may include watering, application of calcium chloride, and street sweeping. Temporary or detour roads would be paved. Paving and replacement of vegetation will be done as soon as possible after site preparation.

5.19.3 Noise

Noise would be generated by construction equipment used in the improvements of TH 77 and I-494. Noise levels due to construction activities in the project area would vary depending on the types of equipment in use, the location of the equipment, and the operating mode. During a typical work cycle, construction equipment may be idling, preparing to perform tasks, or operating under a full load. It may be congregated in a specific location or spread out over a larger area. Some TH 77 and I-494 construction activities would take place close to existing noise sensitive land uses. For example, the construction zone of the TH 77/Killebrew Drive interchange would be quite close to the residents on the west side of TH 77. Other construction activities would take place at some distance from noise sensitive receivers which will minimize construction noise impacts.

Table 5.19.A shows peak noise levels monitored at 50 feet from a variety of types of construction equipment. These pieces of equipment are mainly associated with site grading

and site preparation, generally the noisiest phase of construction. The actual noise levels which may be experienced near a construction zone will depend on:

- o Distance between construction equipment and receiver;
- o Types of equipment in use;
- o Percent of time the equipment attains the peak noise level; and
- o Noise control features incorporated in the equipment.

TABLE 5.19.A
TYPICAL CONSTRUCTION EQUIPMENT NOISE LEVELS AT 50 FEET

Equipment Type	No. Mfrs. in Sample	Total No. Of Models in Sample	Peak noise Level (dBA) Range	Average
Backhoes	5	6	74-92	83
Front Loaders	5	30	75-96	85
Dozers	8	41	65-95	85
Graders	3	15	72-92	84
Scrapers	2	27	76-98	87

Source: Reagan, Jerry A. and Charles A. Grant, Highway Construction Noise: Measurement, Prediction and Mitigation, Special Report HEV-21, U.S. Department of Transportation, FHWA, Office of Environmental Policy, Washington D.C., 1977.

Construction activities do have the potential to cause noise in excess of the State Noise Standards on an intermittent and temporary basis.

5.19.4 Erosion and Sedimentation

During construction, the sedimentation of the eroded soil particles and the increase in turbidity of any receiving water can be a problem. When the eroding agent is water, problems include:

- o An increase in suspended solids in water supplies, causing higher turbidity and less desirable water;
- o An accumulation of sediments in ponding areas which results in decreased storage capacity;

- o Contamination and plugging of soil voids which reduce the groundwater recharge process;

- o Covering of existing vegetation, thus eliminating some plant growth;

- o Reduced photosynthesis of bottom vegetation in lakes, rivers, and ponds due to decreased light penetration from the increased water turbidity; and

- o "Suffocation" of sensitive fish due to the plugging of their gills with suspended materials.

The best method to reduce erosion is to minimize the area of soil exposed and the period of construction. This can be accomplished through construction of temporary and permanent erosion control structures, proper construction scheduling of the required grading, and immediate follow-up with turf establishment including topsoil, soil, seed and mulch. Payment for erosion control in the construction contract should be made separately to assure installation and maintenance during construction.

The Minnesota Department of Transportation currently uses different erosion control devices on its construction projects. These devices may consist of hay or straw bale ditch checks, bale diversions to protect storm sewer inlets, temporary earthern drainage diversions, special sod placement, sodded flumes, and temporary perforated standpipes on culverts and drop inlets. All of these devices are detailed on Mn/DOT standard plan sheets.

Mn/DOT's "Standard Specifications for Highway Construction" relating to erosion control would be strictly adhered to during construction. Among other things, the specifications call for the quick installation of erosion control devices, provide the engineer with the authority to limit the exposed surface area, and require the contractor to install temporary erosion control devices during the earthwork operations.

Since topsoil is usually more resistant to erosion than other types of subsoils, it would be placed over all disturbed areas as soon as practical. Quick-growing grass types are planned to stabilize the soil, followed by a protective mulch material. Mulch provides a temporary means of protection and improves the growing conditions. On areas not initially covered with topsoil, mulch would be applied to reduce erosion until topsoil is applied.

Other protective measures such as mulch with tacking material and excelsior blanket mulch are planned for areas where the steep slope does not allow typical mulch applications.

Erosion and sedimentation due to highway-related construction is dependent on many different variables, including the extent of disturbed area, erosion control practices, soil type, disturbed land slope, intensity of rainfall, etc. Because these factors make the prediction of amounts and impacts little better than an educated guess, no attempt was made to quantify the potential extent of erosion and sedimentation.

The existing water quality data for turbidity and total dissolved solids presented in Appendix B can be used as a basis for determining the effectiveness of erosion control practices incorporated into the project. The applicable water quality requirements for the receiving waters of the study area are contained in Section 4.2.6. Table 5.19.B is a summary of the various alternates and the associated impacts.

5.19.5 Water Quality

Water from dewatering operations including effluents from construction activities would be discharged when the effluent complies with applicable water quality and effluent standards. Dewatering would be performed using well points where feasible and practical.

A Disposal System Permit would be obtained from the MPCA prior to any hydraulic dredging or tunnelling, or other activity which includes an effluent possibly containing potential pollutants. Dredging and tunnelling activities are not anticipated to be required.

A construction spill prevention, containment and contingency plan would be developed by the contractor. In the event of an accidental spill of paint, cleaning materials, debris, oil, or other potential pollutants into the waters of the State, the incident would be promptly reported to appropriate agencies. The contractor would be required to take immediate and appropriate action to recover the lost materials.

5.19.6 Disposal and Borrow

The disposition of solid wastes generated by clearing the construction operations is a common problem associated with road construction projects. The latest specifications of the Minnesota Department of Transportation shall apply.

TABLE 5.19.B
EROSION AND SEDIMENTATION IMPACTS

	IMPACTS	MITIGATIVE MEASURES
Alternate 1: Ultimate Design	Construction Only	Effective erosion control practices would be incorporated into the project, and paid for separately in the construction contract.
Alternate 1A: Stage 1 Improvements	Construction Only	Effective erosion control practices would be incorporated into the project, and paid for separately in the construction contract.
Alternate 2: No Build	None	None
Alternate 3: No Build with Travel Demand Management	None	None

Stable material may be disposed of by burying in roadway embankment, and combustible material disposed of in a landfill. Off-site disposal would be at publicly controlled dumpsites, or at sites arranged for and secured by the contractor which would not create a public nuisance or result in unsightly conditions. Borrow material which may be required would be identified in contract special provisions. Disposal would be done in accordance with Mn/DOT specifications and according to a disposal plan satisfactory to the project engineer.

5.19.7 Energy

Energy would be required to construct the build alternatives. Alternative 1A, which proposes Stage I construction only, would require less construction and therefore less construction energy than Alternative 1, which proposes ultimate development. Alternatives 2 and 3 propose no roadway improvements and therefore would use no construction energy.

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3/ Hourly vehicle type data based on ADT for 1985, Mn/DOT.

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5/ Draft and Final EIS for Airport South District, City of Bloomington and BRW, Inc., 1985.

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9/ One pass mile equals one driving lane one mile long.

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21/ Richardson and Nichols, 1985; Reed and Kubik, 1985; Sloey et. al., 1978; Benforado, 1981; Guntenspergen and Stearns, 1985; and King County, 1986a.

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6.0

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Daniel Cook, PE	B.S. & M.S. Civil Engineering	7 Years	Water Resources, Hydraulics
Stephanie Eiler	B.A. Liberal Arts	6 Years	EIS Coordination and Editing
Anthony Heppelmann, PE	B.A. Economics B.S. Civil Engineering	6 Years	Project Engineer, Roadway Alternatives, EIS Editing
Jean Hoffmeister	B.A., B.S., & M.S. Communications	15 Years	EIS Production
Joseph Hudak	B.S. Anthropology M.A. Archaeology	15 Years	Historic and Archaeological Resources
Richard Nau	B.S. Forestry	7 Years	Air Quality and Traffic Noise
Kian Sabeti, EIT	B.S. Civil Engineering	1 Year	Hydraulics, Water Resources
David Showalter, AICP, AIA	B.A.,Architecture M.A., City Planning	16 Years	Visual Analysis
Paul Stolen	B.S. Wildlife Mgmt. M.S. Wildlife Biology	14 Years	Wetland Impacts
Franklin Svoboda	B.S. Wildlife Management	20 Years	Fisheries, Vegetation, Wetlands, Wildlife, Agricultural Impacts
William Troe	B.S. & M.A. Transportation Planning	1 Year	Traffic Noise Computer Modeling
William Weber, AICP	B.A. & M.A. Sociology and Urban Planning	8 Years	Land Use, Parks/ Recreation; Social and Economic Analysis, Community Plans

NAME	EDUCATION	EXPERIENCE	RESPONSIBILITY
Michael Brienzo	B.G.S. & M.A. Transportation Planning	1 Year	Traffic Analysis
Richard P. Wolsfeld, PE, AICP	B.S. Civ. Eng./M.S. Traffic Engineering and Urban Planning	19 Years	Project Manager, Roadway Alternatives, EIS Editing
Eugene A. Hickok and Associates			
Mark A. Miller	B.S. Aquatic Biology	7 Years	Water Quality
Peter Willenbring, PE	B.S. Civil Engineering	8 Years	Water Quality
City of Bloomington			
Russell Langseth, PE	B.S. Civil Engineering	37 Years	Bloomington Project Manager
Richard E. Mussett	B.S., M.A. Urban Planning	14 Years	Bloomington Project Coordinator
Minnesota Department of Transportation			
Frank Pafko	B.S. Fisheries	11 Years	EIS Review
Gerald Larson	M.A. Sociology	10 Years	EIS Review
Cheryl Heide	M.S. Housing	8 Years	EIS Review
James O'Connor	B.C.E.	12 Years	Noise & Air Quality Review
Norm Mellen	B.C.E.	11 Years	Air Quality Review
Scott Carlstrom	B.S. Forestry M.S. Hydrology	11 Years	Water Quality Review
Del Gerdes	B.C.E., M.S.	18 Years	EIS Review
Federal Highway Administration			
Stephen J. Bahler	B.S. Civil Engineering	17 Years	Review and Coordination
Alan Friesen, PE	B.S. Civil Engineering	17 Years	Review and Approval

NAME	EDUCATION	EXPERIENCE	RESPONSIBILITY
James W. McCutcheon, PE	B.S. M.S Engineering	32 Years	Floodplains, Structures
Wallace O. Oien	B.S. Civil Engineering	22 Years	Right-of-Way Impacts
Ronald A. Shriver	B.S. Civil Engineering	25 Years	Transportation Planning Review
Federal Aviation Administration			
Glen A. Orcutt	B.A. History M.A. Urban Planning/ Public Administration	11 Years	Coordination, Evaluation and Review

7.0

Comments and Coordination

7.0 COMMENTS AND COORDINATION

7.1 SCOPING PROCESS

In September, 1985, the Minnesota Department of Transportation prepared and circulated a Draft Study Outline and Scoping Decision Document to all parties on the Minnesota Environmental Quality Board (EQB) EAW Distribution List. The Scoping Decision Document was prepared following the requirements of Mn/DOT's Alternative State Environmental Review Process and the Federal Highway Administration's environmental review regulation 23 CFR 771. A public meeting was held on September 26, 1985, to receive comments on the Draft Document. The time and place were announced in the EQB Monitor, the Federal Register, and local newspapers. No members of the public nor agency representatives attended.

Written comments were accepted on the Draft Study Outline and Scoping Document from September 9 to October 9, 1985. Those comments were used in writing the Final Study Outline and Scoping Decision Document. The agencies listed below submitted written comments which are available for public inspection at the office of the Mn/DOT Assistant District Engineer.

- U.S. Department of the Interior.
- U.S. Environmental Protection Agency.
- U.S. Army Corps of Engineers.
- Metropolitan Council of the Twin Cities.
- Minnesota Pollution Control Agency.
- Minnesota Department of Natural Resources.
- Minnesota Historical Society.
- Regional Transit Board.
- Metropolitan Airports Commission.
- City of Minneapolis.
- City of Richfield.

The Final Study Outline and Scoping Decision Document, completed in June, 1986, was also circulated to all parties on the EQB list.

7.2 SUMMARY OF EARLY COORDINATION COMMENTS

Several commentors requested that the project limits be extended to include CSAH 62 on the north, I-35E on the south, I-35E or TH 5 on the east and CR 18 or I-35W on the west. In response to the need for a system-wide assessment of project impacts, a transportation analysis area was identified which extends to the above boundaries (Figure 2.1.E). The project limits have been extended on both the north and west, to north of 70th Street on TH 77, and to east of 34th Avenue on I-494.

Comments received from the Fish and Wildlife Service (FWS) of the Department of Interior recommended that project design and construction avoid altering wetlands. The FWS suggested wetland information to be included in the EIS. FWS comments also requested that threatened or endangered species and LAWCON funds used, if any, be identified.

The Corps of Engineers identified Wright's Pond in Bloomington as a protected wetland, and requested notification if it will be affected by the project.

The Metropolitan Council's comments identified transportation, economic and parkland issues to be addressed in the EIS. The Council's comments reflect concern that substantial indirect effects on Fort Snelling State Park and the Minnesota Valley National Wildlife Refuge be identified.

The Minnesota Pollution Control Agency (PCA) requested that the project be evaluated for consistency with the regional transportation assumptions used in the State Implementation Plan, and that worst-case years for traffic and air quality match and use Indirect Source Permit requirements. The PCA requested that discrepancies be resolved between the TDM strategies in the Airport South Generic EIS and in the TH 77/I-494 Scoping Decision Document. The PCA also noted that the project will not be exempt from state noise standards.

The Minnesota Department of Natural Resources requested that groundwater impacts be evaluated, and that surface runoff quantities be considered in conjunction with runoff from the entire Airport South District. The DNR requested that the EIS identify which mitigation measures described in the Airport South Generic EIS will be applied. Water quality issues have been added to the detailed analysis section, a change from the original Draft Study Outline and Scoping Decision Document.

The Regional Transit Board requested that impacts on the transit system be examined in detail. The TH 77/I-494 EIS builds on the previous Airport South Generic EIS, which includes an in-depth discussion of transit in the project area.

Comments from the Metropolitan Airports Commission included a request that airport background traffic and the southwest cargo area planned in the vicinity of the 24th Avenue interchange be considered in capacity analysis.

The City of Minneapolis commented on the rationale behind separate EIS's for the Mall of America and Fantasyworld and the TH 77/I-494 highway improvements. Their comments express concern over the timing of both the Mall development and the highway improvements, and concern for potential impacts outside the study area. Alternative 1 includes staged improvements, addressing the timing issue. Impacts on areas outside the immediate project area have been addressed previously in both the Airport South Generic EIS and the Mall of America and Fantasyworld EIS.

The City of Richfield commented on the need for accurate information on traffic volume projections within and west of the project area, levels of service on I-494, and impacts on land use, parks, and commercial and industrial development in Richfield. Many of Richfield's concerns will also be addressed in the I-494 Corridor Study currently being directed by the Metropolitan Council.

7.3 PUBLIC HEARING

A public hearing to discuss the major design features of the project and the content of the DEIS will be held towards the end of the DEIS comment period following the publication of the document. Currently, the public hearing is expected to be held in February, 1987.

7.4 COOPERATING AGENCIES

The Minnesota Department of Transportation and the Federal Highway Administration are joint lead agencies on this project. The Federal Aviation Administration, Minnesota Pollution Control Agency, Metropolitan Council and the City of Bloomington serve as cooperating agencies, reviewing sections of the draft and final EIS in their areas of expertise. The City of Bloomington has been actively involved as well in the development of the project. Although not a cooperating agency, the Metropolitan Airports Commission (MAC) has been kept advised of the project to coordinate with MAC plans for the southwest quadrant of the airport.

7.5 AGENCIES AND ORGANIZATIONS RECEIVING COPIES OF THE DEIS

Federal Agencies

U.S. Department of Agriculture
  Soil Conservation Service
U.S. Department of the Army, Corps of Engineers,
  St. Paul District
U.S. Department of Commerce
U.S. Department of Health and Human Services
U.S. Department of Housing and Urban Development
U.S. Department of the Interior
  Fish and Wildlife Service
  National Park Service
  Office of Environmental Project Review
U.S. Department of Transportation
  Federal Aviation Administration
  Second Coast Guard District
  Urban Mass Transportation Administration
Advisory Council on Historic Preservation
Defense Civil Preparedness Agency
Environmental Protection Agency
Federal Energy Administration
Federal Power Commission
Council on Environmental Quality

State Agencies

Minnesota Department of Agriculture
Minnesota Department of Energy and Economic Development
Minnesota Department of Health
Minnesota Department of Natural Resources
Minnesota Environmental Quality Board
Minnesota Historical Society
Minnesota Pollution Control Agency
Minnesota State Planning Agency

Regional Agencies

Metropolitan Council of the Twin Cities
Metropolitan Airports Commission
Regional Transit Board
Metropolitan Transit Commission
Metropolitan Waste Control Commission

Counties

Hennepin County Department of Transportation
Dakota County Department of Transportation

Cities

Bloomington
Richfield
Minneapolis

Libraries

Environmental Conservation Library, Minneapolis
Legislative Library, St. Paul
Hennepin County Library, Bloomington and Richfield Branches

Other

Minnesota Valley National Wildlife Refuge

8.0

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Appendix

APPENDIX A

Levels of Service
Travel Demand Management Measures

Levels of Service

The concept of Levels of Service (LOS) is defined as a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers. A level-of-service definition generally describes these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety.

Six levels of service are defined for each type of facility for which analysis procedures are available. They are given letter designations, from A to F, with level-of-service A representing the best operating conditions and level-of-service F the worst.

In general, the various levels of service are defined as follows for uninterrupted flow facilities:

- Level of Service A represents free flow. Individual users are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speed and to maneuver within the traffic stream is extremely high. The general level of comfort and convenience provided to the motorist, passenger, or pedestrian is excellent.

- Level of Service B is in the range of stable flow, but the presence of other users in the traffic stream begins to be noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within the traffic stream from LOS A. The level of comfort and convenience provided is somewhat less than at LOS A, because the presence of others in the traffic stream begins to affect individual behavior.

- Level of Service C is in the range of stable flow, but marks the beginning of the range of flow in which the operation of individual users becomes significantly affected by interactions with others in the traffic stream. The selection of speed is now affected by the presence of others, and maneuvering within the traffic stream requires substantial vigilance on the part of the user. The general level of comfort and convenience declines noticeably at this level.

- Level of Service D represents high-density but stable flow. Speed and freedom to maneuver are severely restricted, and the driver or pedestrian experiences a generally poor level of comfort and convenience. Small

increases in traffic flow will generally cause operational problems at this level.

- Level of Service E represents operating conditions at or near the capacity level. All speeds are reduced to a low but relatively uniform value. Freedom to maneuver within the traffic stream is extremely difficult, and it is generally accomplished by forcing a vehicle to "give way" to accommodate such maneuvers. Comfort and convenience levels are extremely poor, and driver frustration is generally high. Operations at this level are usually unstable because small increases in flow or minor perturbations within the traffic stream will cause breakdowns.

- Level of Service F is used to define forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point exceeds the amount which can traverse the point. Queues form behind such locations. Operations within the queue are characterized by stop-and-go waves, and they are extremely unstable. Vehicles may progress at reasonable speeds for several hundred feet or more, then be required to stop in a cyclic fashion. Level-of-service F is used to describe the operating conditions within the queue, as well as the point of the breakdown. It should be noted, however, that in many cases operating conditions of vehicles discharged from the queue may be quite good. Nevertheless, it is the point at which arrival flow exceeds discharge flow which causes the queue to form, and level-of-service F is an appropriate designation for such points.

Travel Demand Management

Travel demand management (TDM) refers to those types of activities designed to maximize the utilization and energy efficiency of the present system. These activities may include ridesharing, high-occupancy vehicle lanes, increased transit usage, ramp metering, staggered work hours, traffic signal timing optimization, etc. Mn/DOT has the ability to exercise more control over those activities which involve changes to the highway system, such as ramp metering, as opposed to off-highway activities such as staggered work hours. TDM activities which only involve changes to the highway system are traditionally referred to as Transportation System Management (TSM). In the Airport South Generic EIS, TDM was proposed to be used to meet the Airport South study's goals for transit use, auto occupancy, and percent of daily traffic in the peak hour for the three scenarios described below.

- o No Travel Demand Management - a continuation of existing transit service levels; no formalized carpool/vanpool arrangements; and no staggered or flexible work hour arrangements.

- o Moderate Travel Demand Management - on-site transportation coordinators, participation in regional ride-matching, setting aside parking spaces for carpools/vanpools, corporate promotion of ridesharing and transit, informational centers, transit funding, and carpool loading areas.

- o High Travel Demand Management - All of the above plus participation in Rideshare Agency's (RSA's) ride-matching services by contract, financial incentives to employees, employer's task force, low-interest loans for the purchase of vans, and parking charges for ride-alone commuters.

APPENDIX B

Water Quality Data

TABLE 1A
MINNESOTA INTERSTATE WATER QUALITY REQUIREMENTS
FOR 2C, 3B, 3C, 4A, 4B, 5 AND 6 WATERS

Dissolved Oxygen	Not less than 5 mg/l[1/] at all times (instantaneous minimum concentration)
Temperature	5°F. above natural in streams and 3°F above natural in lakes, based on monthly average of the maximum daily temperature except in no case should it exceed the daily average temperature of 90°F.
Bicorbonates (HCO_3)	5 milliequivalents per liter
Ammonia (N)	0.04 mg/l (un-ionized as N)
Chlorides	100 mg/l
Chromium (Cr)	0.05 mg/l
Copper (Cu)	0.01 mg/l or not greater than 1/10 the 96 hour TLM value.
Hydrogen Sulfide	0.02 mg/l
Cyanides (CN)	0.02 mg/l
Boron	0.5 mg/l
Oil	10 mg/l and none in such quantities as to produce a visible color film on the surface, impart an oil order to water or an oil taste to fish and invertebrates, coat the banks or bottoms of the water course or taint any of the associated biota, or to become effective toxicants according to the criteria recommended.
Hardness	250 mg/l
pH Value	6.5 - 8.5
Specific Conductance	1,000 microhms per centimeter
Sulfates (SO_4)	10 mg/l applicable to water used for production of wild rice during periods when the rice may be susceptable to damage by high sulfate levels.

TABLE 1A (CONT.)
MINNESOTA INTERSTATE WATER QUALITY REQUIREMENTS
FOR 2C, 3B, 3C, 4A, 4B, 5 AND 6 WATERS

Phenols	0.01 mg/l and none that could impart odor or taste to fish flesh or other fresh-water edible products such as crayfish, clams, prawns and like creatures. Where it seems probable that a discharge may result in tainting of edible aquatic products, bioassays and taste panels will be required to determine if tainting is likely or present.
Total Residual Chlorine	0.005 mg/l
Total Dissolved Salts	700 mg/l
Total Salinity	1,000 mg/l
Sodium (Na)	60% of total cations as millequivalents per liter
Turbidity Value	25
Fecal Coliform Organisms	200 organisms per 100 ml[2/] as logarithmic mean measured in not less than five samples in any calendar month, nor shall more than 10% of all samples taken during any calendar month individually exceed 2,000 organisms per 100 ml (applied only between March 1 and October 31)
Radioactive Material	Not to exceed the lowest concentration permitted to be discharged to an uncontrolled environment as prescribed by the appropriate authority having control over their use.
Unspecific Toxic Substances	None at levels harmful either directly or indirectly.

1/ mg/l (milligrams per liter)
2/ ml (milliliter)

TABLE 2A
MINNESOTA INTRASTATE WATER QUALITY REQUIREMENTS
FOR 2B, 2C, 3B, 3C, 4A, 4B, 5 AND 6 WATERS

Dissolved Oxygen	Not less than 5 mg/l[1/] at all times (instantaneous minimum concentration)
Temperature	5°F. above natural in streams and 3°F above natural in lakes, based on monthly average of the maximum daily temperature except in no case should it exceed the daily average temperature of 86°F.
Bicorbonates (HCO_3)	5 milliequivalents per liter
Ammonia (N)	0.04 mg/l (un-ionized as N)
Chlorides	100 mg/l
Chromium (Cr)	0.05 mg/l
Copper (Cu)	0.01 mg/l or not greater than 1/10 the 96 hour TLM value.
Hydrogen Sulfide	0.02 mg/l
Cyanides (CN)	0.02 mg/l
Boron	0.5 mg/l
Oil	0.5 mg/l and none in such quantities as to produce a visible color film on the surface, impart an oil order to water or an oil taste to fish and invertebrates, coat the banks or bottoms of the water course or taint any of the associated biota, or to become effective toxicants according to the criteria recommended.
Hardness	250 mg/l
pH Value	6.5 - 8.5
Specific Conductance	1,000 microhms per centimeter
Sulfates (SO_4)	10 mg/l applicable to water used for production of wild rice during periods when the rice may be susceptable to damage by high sulfate levels.

TABLE 2A (Cont.)
MINNESOTA INTRASTATE WATER QUALITY REQUIREMENTS
FOR 2B, 2C, 3B, 3C, 4A, 5 AND 6 WATERS

Phenols	0.01 mg/l and none that could impart odor or taste to fish flesh or other fresh-water edible products such as crayfish, clams, prawns and like creatures. Where it seems probable that a discharge may result in tainting of edible aquatic products, bioassays and taste panels will be required to determine if tainting is likely or present.
Total Residual Chlorine	0.005 mg/l
Total Dissolved Salts	700 mg/l
Total Salinity	1,000 mg/l
Sodium (Na)	60% of total cations as millequivalents per liter
Turbidity Value	25
Fecal Coliform Organisms	200 organisms per 100 ml[2/] as logarithmic mean measured in not less than five samples in any calendar month, nor shall more than 10% of all samples taken during any calendar month individually exceed 2,000 organisms per 100 ml (applied only between March 1 and October 31)
Radioactive Material	Not to exceed the lowest concentration permitted to be discharged to an uncontrolled environment as prescribed by the appropriate authority having control over their use.
Unspecific Toxic Substances	None at levels harmful either directly or indirectly.

1/ mg/l (milligrams per liter)
2/ ml (milliliter)

TABLE 3A
MINNESOTA INTRASTATE WATER QUALITY REQUIREMENTS
FOR 4A, 4B, 5 AND 6 WATERS

Bicarbonates (HCO_3)	5 milliequivalents per liter
Boron (B)	0.5 mg/l
pH Value	6.0 - 8.5
Specific Conductance	1,000 micromhos per centimeters
Total Dissolved Salts	700 mg/l
Sodium (Na)	60% of total cations as milliequivalents per liter
Slufates (SO_4)	10 mg/l, applicable to water used for production of wild rice during periods when the rice may be susceptible to damage by high sulfate levels.
Radioactive Materials	Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled environment as prescribed by the appropriate authority having control over their use.
Total Salinity	1,000 mg/l
Unspecified Toxic Substances	None at levels harmful either directly or indirectly.
Hydrogen Sulfide	0.02 mg/l

T.H. 77 & Minnesota River

Pond Discharges

TABLE 1B
Existing Water Quality
Data - Pond C

	Flow Weighted Average	Mean	Median	10th %	90th %	Minimum	Maximum
Ammonia Nitrogen	.492	.525	.199	.019	1.62	.010	2.160
Organic Nitrogen	1.72	1.60	1.57	.940	2.21	.720	3.03
Kjeldahl	2.21	2.13	1.90	1.22	3.35	.900	5.12
Nitrite	<0.75	<0.79	.035	<.019	.098	<.008	2.02
Nitrate+Nitrate	1.01	.808	.560	.090	1.90	.020	3.20
Nitrate	.932	.737	.508	.027	1.80	.000	3.18
Total Nitrogen	3.22	1.92	2.77	1.67	4.32	.920	5.67
Calcium	88.9	127	106	49.6	239	38.0	360
Magnesium	33.9	51.4	38.8	18.2	115	13.0	152
Hardness	123	178	142	70.0	350	51.0	512
Alkalinity	73.4	108	93.0	49.6	203	10.0	250
Bicarbonate	<25.1	<38.7	<10	<10	120	<10	234
Carbonate	56.2	101	88.5	10.6	203	1.00	250
Chloride	65.0	96.4	71.0	9.4	247	2.00	412
Sodium	35.4	48.3	19.0	8.13	155	5.20	229
Sulfate	17.6	23.5	18.0	9.32	42.6	5.00	59.3
Potassium	3.68	4.21	2.91	1.99	8.73	1.50	9.90
Floride	<.127	<.146	<.105	<.088	.238	<.010	.450
Silica	6.68	8.99	7.92	4.20	15.7	2.70	22.0
Phosphorous	.427	.388	.295	.070	.780	.020	2.60
Boron	<.114	<.135	.090	<.029	.260	<.008	1.30
Selenium (ug/l)	<1.35	<1.81	<1	<1	2.60	<1	13.0
MBAS	.100	.115	.100	.050	.214	.005	.540
Cyanide	.009	.010	.006	<.001	.020	<.001	.040
BOD-5day	16.1	16.1	9.03	2.60	31.9	1.00	120
COD	47.7	43.8	43.3	18.0	69.0	4.00	99.0
COLOR	84.9	51.5	40.4	24.9	69.0	20.0	.300
TOC	18.1	16.7	17.0	7.70	25.0	5.00	37.0
TSS	89.8	47.0	34.8	16.5	84.0	5.00	266
TDS	427	458	297	169	742	8.00	7896
SVS	20.0	16.3	14.0	5.0	25.0	1.00	110
TVS	96.3	98.8	80.8	42.0	177	2.00	306
DVS	76.8	83.9	68.1	26.0	168	-0-	306
Total Solids	492	495	338	196	761	30.0	8162
Free Carbon Dioxide	<5.06	<5.84	<1	<1	17.8	<1	46.0
Chromium (ug/l)	3.17	3.50	2.80	1.10	4.80	.500	23.0
Copper (ug/l)	6.97	6.55	4.58	2.30	13.50	.600	21.0
Iron (ug/l)	987	746	502	170	1708	70.0	3800
Lead (ug/l)	<54.0	<48.4	<50.0	<5.0	<50.0	<2.10	270
Zinc (ug/l)	<33.31	<29.0	<20.0	<9.0	66.0	<4.00	140
Nickel (ug/l)	<9.61	<9.08	<10.0	<4.40	<10.0	<3.30	22.0
Manganese (ug/l)	217	254	239	100	415	20.0	720
Cadmium (ug/l)	1.17	1.19	.682	.250	2.20	.080	16.0
Mercury (ug/l)	<.312	<.277	<.200	<.100	.300	<.100	5.00
Aluminum (ug/l)	587	400	280	36.5	960	7.00	2200
Barium (ug/l)	71.2	97.6	72.0	41.2	181	15.0	390
Arsenic (ug/l)	<3.55	<3.67	<2.00	<1.00	7.82	<1.00	12.0

All concentrations are mg/l unless noted otherwise.
All analyses are for total concentrations (suspended & dissoved) unless noted otherwise.

Water samples collected by Mn/DOT from February, 1980 to February, 1981.

TABLE 2B

SUMMARY - EXISTING SURFACE WATER QUALITY - LONG MEADOW LAKE

Parameter	1975 and 1976			1980**				
	Sample Size, n	Average Concentration	Sample Range	50% Range	Sample Size, n	Average Concentration	Sample Range	50% Range
Total Phosphorus (mg/l)	1/	0.23	0.04-0.70	0.08-0.26	11	0.13	0.08-0.22	0.09-0.16
Total Kjeldahl Nitrogen (mg/l)	1/	1.5	0.21-3.4	0.85-1.8	10	1.3	0.75-2.1	1.07-1.8
Suspended Solids (mg/l)	17	25	0-204	1-23	11	16	6-28	13-16
Chlorides (mg/l)	17	55	23-79	47-66	11	47	31-86	38-47
Oil and Grease (mg/l)	17	1	0-2	0-0	11	6	1-32	1- 1

*Sampled September 1975, December 1975, March 1976 and April 1976. See Table 3B.

**Sampled April 1980 and November 1980 by Mn/DOT.

TABLE 3B
EXISTING WATER QUALITY DATA, LONG MEADOW LAKE

	Date	Time	Air Temperature (Deg. C)	Temperature (Deg. C)	Dissolved Oxygen (mg/l)	Dissolved Oxygen % Saturation	pH (Units)	Specific Ductance (Microhms)	Dissolved Solids (mg/l)	Dissolved Solids (Tons per Ac-Ft)	Suspended Solids (mg/l)	Turbidity (JTU)	Dissolved Calcium (Ca) (mg/l)	Dissolved Sodium (Na) (mg/l)	Bicarbonate HCO_3 (mg/l)	Dissolved Chloride (Cl) (mg/l)	Total Kjeldahl Nitrogen (N) (mg/l)	Suspended Kjeldahl Nitrogen (N) (mg/l)	Dissolved Kjeldahl Nitrogen (N) (mg/l)	Total Nitrite Plus Nitrate (N) (mg/l)	Dissolved Nitrite Plus Nitrate (N) (mg/l)	Total Nitrogen (N) (mg/l)	Total Phosphorus (P) (mg/l)	Dissolved Phosphorus (P) (mg/l)	Total Organic Carbon (C) (mg/l)	Dissolved Silica (SiO_3) (mg/l)	Oil and Grease (mg/l)
Site 1	Sep. 17, 1975	1210	19.0	16.5	8.0	84	7.5	818	489	0.67	0	1	--	24	--	64	0.76	0.24	0.52	1.1	1.1	1.9	0.10	0.06	5.3	22.0	0
	Dec. 2, 1975	1340	6.0	.0	5.5	39	7.3	825	512	.70	7	2	110	21	267	51	1.2	.00	1.3	.03	.02	1.2	.03	.03	16.0	8.9	0
	Mar. 10, 1976	1000	-3.0	.0	.6	4	7.1	704	421	.57	5	4	80	30	356	57	1.3	.20	1.1	.01	.00	1.3	.61	.58	11.0	11.0	2
	Apr. 14, 1976	1015	16.0	19.0	9.6	105	7.9	600	358	.49	7	3	75	16	327	32	1.3	.42	.88	.00	.00	1.3	.21	.10	10.0	.7	0
Site 2	Sep. 17, 1975	1250	19.0	17.0	11.3	119	7.7	730	433	.59	0	2	--	20	--	51	.91	.10	.81	.63	.45	1.5	.14	.07	8.0	15.0	1
	Dec. 2, 1975	1306	7.0	.0	9.0	63	7.5	900	576	.78	11	4	120	29	271	79	.21	.00	.21	1.1	1.1	1.3	.05	.00	11.0	19.0	0
	Mar. 10, 1976	1100	-3.0	.0	4.5	32	7.2	870	512	.70	46	12	94	33	393	69	3.4	2.5	.87	.22	.20	3.6	.70	.13	18.0	14.0	1
	Apr. 14, 1976	1130	26.0	20.0	7.3	82	7.7	745	431	.59	27	12	87	20	345	48	2.3	1.0	1.3	.15	.15	2.5	.26	.06	12.0	4.5	0
Site 3	Sept. 17, 1975	1630	20.0	20.0	12.2	137	8.1	620	391	.53	0	2	--	18	--	45	2.4	1.6	.81	.01	.01	2.4	.07	.01	11.0	.5	0
	Dec. 2, 1975	1220	7.0	.0	11.5	81	7.4	850	537	.73	23	5	120	25	318	65	.77	.00	.77	.21	.15	.98	.04	.02	15.0	12.0	0
	Mar. 10, 1976	1200	-2.0	.0	2.9	20	7.2	767	485	.66	61	11	93	28	374	63	3.1	2.7	.39	.06	.06	3.2	.40	.00	22.0	16.0	1
Site 4	Sept. 17, 1975	1410	20.0	19.0	13.9	153	8.1	640	406	.55	0	1	--	18	--	47	1.0	.24	.76	.02	.02	1.0	.08	.01	8.8	1.1	1
	Dec. 2, 1975	1130	5.0	.0	11.9	84	7.5	810	506	.69	5	2	110	26	201	66	2.2	.50	1.7	.15	.15	2.4	.06	.04	21.0	10.0	0
	Mar. 10, 1976	1300	1.0	1.0	1.5	11	7.0	634	408	.55	204	32	84	21	390	23	1.8	1.0	.78	.02	.01	1.8	.43	.04	8.9	21.0	2
Site 5	Sept. 17, 1975	1525	20.0	19.0	3.7	41	7.7	590	371	.50	12	5	--	27	--	40	.76	.16	.60	.01	.01	.77	.10	.02	9.8	.6	0
	Dec. 2, 1975	1100	5.0	.0	12.1	85	7.5	845	521	.71	1	2	110	27	373	69	.85	.00	.85	.12	.10	.97	.04	.03	21.0	8.3	0
	Mar. 10, 1976	1430	-1.0	1.0	3.2	23	7.1	798	519	.71	12	8	97	32	407	69	1.3	.83	.47	.01	.01	1.3	.51	.12	11.0	12.0	1

TABLE 4B
EXISTING WATER QUALITY DATA, LONG MEADOW LAKE

Chemical characteristics of bottom material from Long Meadow Lake.

	Date	Total aluminum in bottom material (ug/g)	Total arsenic in bottom material (ug/g)	Total cadmium in bottom material (ug/g)	Organic carbon in bottom material (C) (g/kg)	Total chromium in bottom material (ug/g)	Total copper in bottom material (ug/g)	Total lead in bottom material (ug/g)	Total mercury in bottom material (ug/g)	Total nitrogen in bottom material (N) (mg/kg)	Oil and grease in bottom material (mg/kg)	Total phosphorus in bottom material (mg/kg)	Total zinc in bottom material (ug/g)
Site 1	Sep.17, 1975	7500	11	2	101	27	19	80	---	11400	3000	350	98
	Dec. 2,	2700	10	2	99	5	36	30	0.0	8400	2800	170	60
Site 2	Sept.17, 1975	7300	11	2	87	52	19	80	.0	10400	3000	300	96
	Dec. 2, 1975	3100	11	2	84	4	56	60	.0	8500	2600	92	62
Site 3	Sep.17, 1975	8500	12	2	86	82	18	40	.0	9910	3000	290	86
	Dec. 2 1975	4400	13	4	80	5	55	130	.0	8400	2400	100	90
Site 4	Sep.17, 1975	8100	10	2	76	14	19	30	.0	8560	3000	350	83
	Dec. 2, 1975	3600	11	2	97	3	46	60	.0	10000	2400	92	60
Site 5	Sep.17, 1975	9600	10	2	77	9	19	40	.0	8880	3000	240	90
	Dec. 2, 1975	3200	12	2	100	4	48	70	.0	10800	2100	110	68

TABLE 5B
EXISTING WATER QUALITY DATA, LONG MEADOW LAKE

		pH in units	total alkalinity mg/l	ortho phosphate mg/l	total phosphate mg/l	nitrite nitrogen µg/l	nitrate nitrogen µg/l	sulfate mg/l	suspended solids mg/l	chloride mg/l
.ong Meadow	1a	7.4	242	0.43	0.43	19	72	28.4	35.4	57.4
.ong Meadow	1b	7.6	160	0.18	0.55	4	8	15.8	30.6	74.0
.ong Meadow	1c	7.2	200	0.26	0.38	8	67	102.8	60.7	26.6
.ong Meadow	2a	7.7	252	0.22	0.29	24	61	23.6	34.6	40.3
.ong Meadow	2b	7.8	163	0.12	0.58	6	17	16.4	30.0	56.8
.ong Meadow	2c*	7.2	175	1.02	1.11	6	60	123.4	396.0	69.1
.ong Meadow	3a	7.5	305	0.03	0.19	9	51	17.6	14.8	62.6
.ong Meadow	3b	7.8	161	0.15	0.50	6	8	17.0	25.8	50.5
.ong Meadow	3c	7.3	143	0.65	0.80	8	39	79.7	55.0	17.0
.ong Meadow	4a	7.6	182	0.38	0.46	17	57	13.6	15.4	48.6
.ong Meadow	4b	7.8	173	0.13	0.27	9	17	17.0	26.2	52.9
.ong Meadow	4c	8.1	170	0.77	0.87	24	32	103.8	21.5	13.1

From Base Line Hydrological Study of the Minnesota Valley National Wildlife Refuse and Recreation Area, 1979-1980

TABLE 5B (continued)

		Ammonia nitrogen µg/l	total Kjeldahl nitrogen µg/l	biological oxygen mg/l	dissolved oxygen mg/l	chlorophyl A µg/l
Long Meadow	1a	816.0	1224	2.00	6.30	8.5
Long Meadow	1b	189.0	579	2.89	8.74	5.7
Long Meadow	1c	745.0	1200	5.16	8.42	17.2
Long Meadow	2a	367.0	740	2.00	6.60	7.1
Long Meadow	2b	111.0	480	3.10	9.08	4.9
Long Meadow	2c*	726.0	1860	5.55	8.43	16.7
Long Meadow	3a	382.0	413	<2.00	6.40	15.7
Long Meadow	3b	304.0	622	3.08	9.07	8.1
Long Meadow	3c	766.0	1580	5.62	8.43	17.4
Long Meadow	4a	516.0	860	<2.00	6.50	6.0
Long Meadow	4b	31.2	111	3.09	9.08	4.1
Long Meadow	4c	356.0	582	5.60	8.42	13.3

TABLE 6B

EXISTING WATER QUALITY DATA MINNESOTA RIVER

The following data is from the Minnesota Pollution Control Agency STORET Retrieval System for routine water quality monitoring program data.

STORET RETRIEVAL DATE 78/01/04
MINNESOTA POLLUTION CONTROL AGENCY
ROUTINE WATER QUALITY MONITORING PROGRAM DATA

MNMN--7---06E60 MPCA400 MI-7
44 49 37.0 093 13 55.0 3
MINNESOTA R.SH-36 IN BLOOMINGTON
27053 MINNESOTA
MAJ BASIN: UPPER MISS 070692
MIN BASIN: MINNESOTA RIVER
21MINN 04001004
0000 FEET DEPTH CLASS 00

/TYPA/AMBNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00900 TOT HARD CACO3 MG/L	00410 T ALK CACO3 MG/L	00076 TURB TRBIDMTR HACH FTU	00095 CNDUCTVY AT 25C MICROMHO	00940 CHLORIDE CL MG/L	00605 ORG N N MG/L	00610 NH3-N TOTAL MG/L	00615 NO2-N TOTAL MG/L	00620 NO3-N TOTAL MG/L	00665 PHOS-TOT MG/L P
73/07/17	10 00		390	250	27.0	720	43		0.200		4.500	0.230
73/09/18	13 50		250	250	28.0	670	39	1.500	0.520	0.030	0.240	0.350
73/10/05	14 40			200	70.0	530	54	2.500	0.330	0.060	6.100	0.420
73/11/02	14 00		330	250	25.0	620	28	1.900	0.200K	0.020	4.300	0.430
73/12/04	12 15		310	210	19.0	620	25	1.600	0.200K	0.040	8.200	0.260
74/01/17	14 00		450	340	5.1	960	33	1.500	0.660	0.050	4.600	0.330
74/02/06	10 00		470	320	4.5	880	35	1.400	0.460	0.050	3.400	0.280
74/03/05	13 00		380	230	17.0	730	29	1.900	0.500	0.050	3.700	0.510
74/04/18	15 00		350	230	60.0	680	23	2.100	0.200K	0.680	8.400	0.060
74/05/23	15 30		420	260	28.0	680	22	2.000	0.200K	0.040	7.500	0.310
74/06/21	17 15		380	210	43.0	660	26	0.300K	0.200	0.060	7.200	0.390
74/07/15	14 00		350	230	33.0	390	29	2.500	0.200K	0.080	2.100	0.330
74/08/15	14 00		330	210	36.0	600	40	1.600	0.420	0.390	0.800	0.360
74/09/20	13 45		300	230	39.0	620	44	2.100	0.380	0.010	0.990	0.450
74/10/10	13 30		330	310	34.0	730	54	1.600	0.960	0.610	0.350	0.450
74/11/15	13 15		360	300	22.0	730	40	1.400	0.370	0.050	1.100	0.400
74/12/16	14 05		410	320	4.9	470	50	1.000	6.000	0.680	1.800	0.380
75/01/24	10 25		430	330	1.7	870	67	0.660	1.100	0.050	1.100	0.370
75/02/11	15 15		460	350	5.0	900	49	0.580	0.900	0.070	1.300	0.390
75/03/17	13 15		370	190	9.0	870	51	0.710	0.840	0.040	0.930	0.430
75/04/18	12 30		300	170	86.0	490	27	2.700	0.520	0.010	12.000	0.870
75/05/02	13 30		280	150	28.0	520	24	2.100	0.210	0.010	8.500	0.320
75/06/05	14 15		360	240	38.0	610	26	1.900	0.200K	0.060	1.800	0.430
75/06/19	14 20		390	240	50.0	580	29	3.100	0.200K	0.150	5.800	0.480
75/07/03	11 45			210	84.0	590	23	2.800	0.200K	0.040	6.300	0.840
75/08/06	12 20		400	270	33.0	590	31	3.700	0.350	0.080	0.100K	0.530
75/09/10	12 35		395	290	25.0	810	37	1.300	0.360	0.150	0.420	0.400
75/10/08	12 00		380	290	23.0	830	43	1.600	0.330	0.050	0.120	0.350
75/11/06	11 45		420	320	23.0	860	70	1.100	0.200K	0.030	0.190	0.427
75/12/09	13 30		440	320	6.4	890	59	0.770	0.520	0.020	1.300	0.281

STORET RETRIEVAL DATE 78/01/04
MINNESOTA POLLUTION CONTROL AGENCY
ROUTINE WATER QUALITY MONITORING PROGRAM DATA

MNMN--7---06E60 MPCA400 MI-7
44 49 37.0 093 13 55.0 3
MINNESOTA R.SH-36 IN BLOOMINGTON
27053 MINNESOTA
MAJ BASIN: UPPER MISS 070692
MIN BASIN: MINNESOTA RIVER
21MINN 04001004
0000 FEET DEPTH CLASS 00

/TYPA/AMBNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00910 CALCIUM CACO3 MG/L	00930 SODIUM NA,DISS MG/L	00935 PTSSIUM K,DISS MG/L	00945 SULFATE SO4-TOT MG/L	00950 FLUORIDE F,DISS MG/L	01027 CADMIUM CD,TOT UG/L	01042 COPPER CU,TOT UG/L	01045 IRON FE,TOT UG/L	01051 LEAD PB,TOT UG/L	01055 MANGNESE MN UG/L
73/07/17	10 00		200.0	26.00	7.00		0.30	10K	10K	770	10K	86.0
73/09/18	13 50		120.0	34.00	6.00	50	0.28	10K	10K	4300	10K	220.0
73/10/05	14 40			17.00	4.00	62	0.51	10K	16	8200	10K	27.0
73/11/02	14 00		230.0	27.00	6.00	100	0.32	10K	10K	2200	12	180.0
73/12/04	12 15		200.0	20.00	17.00	130	0.33	10K	10K	3100	10K	11.0
74/01/17	14 00		290.0	35.00	5.70	140	0.36	10K	10K	590	10K	200.0
74/02/06	10 00		320.0	28.00	6.70	160	0.34	10K	17	210	10K	130.0
74/03/05	13 00		230.0	29.00	6.60	120	0.28	10K	10K	1700	42	150.0
74/04/18	15 00		280.0	32.00	4.20	130	0.34	10K	10K	6800	10K	320.0
74/05/23	15 30		250.0	18.00	3.00	150	0.39	10K	10K	2600	10K	110.0
74/06/21	17 15		250.0	7.30	3.70	150	0.43	10K	10K	2000	10K	190.0
74/07/15	14 00		150.0	21.00	4.50	140	0.30	10K	10K	2100	10K	10.0K
74/08/15	14 00		170.0	28.00	5.00	140	0.24	10K	10K	4100	10	290.0
74/09/20	13 45		200.0	35.00	6.90	120	0.26	10K	10K	3100	16	390.0
74/10/10	13 30		180.0	36.00	4.90	12	0.26	10K	73			1000.0
74/11/15	13 15		220.0	37.00	8.20	140	0.31	10K	10	2400	10K	260.0
74/12/16	14 05		260.0	38.00	5.00	170	0.45	10K	10K	10K	10K	180.0
75/01/24	10 25		220.0	49.00	7.90	150	0.27	10K	10	750	10K	220.0
75/02/11	15 15		380.0	38.00	9.50	160	0.33	10K	10K	310	10K	300.0
75/03/17	13 15		240.0	48.00	9.80	190	0.29	10K	10K	630	10K	280.0
75/04/18	12 30		190.0	10.00	4.40	90	0.25	10K	10K	20000	11	
75/05/02	13 30		190.0	10.00	5.00	100	0.28	10K	20	1900	10K	230.0
75/06/05	14 15		230.0	15.00	5.10	120	0.33	10K	10K	4800	10K	140.0
75/06/19	14 20		240.0	12.00	4.00	93	0.41	10K	11	5400	10K	140.0
75/07/03	11 45			13.00	4.30	94	0.31	10K	11	13000	16	290.0
75/08/06	12 20		210.0	31.00	6.00	120	0.32	10K	10K	3100	10K	230.0
75/09/10	12 35		225.0	45.00	6.40	110	0.34	10K	10K	2600	10K	170.0
75/10/08	12 00		210.0	38.00	6.40	100	0.23	10K	10K	1600	10K	170.0
75/11/06	11 45		240.0	41.00	6.80	118	0.22	10K	10K	1600	17	220.0
75/12/09	13 30		260.0	54.00	7.50	120	0.26	10K	10K	440	10K	200.0

STORET RETRIEVAL DATE 78/01/04
MINNESOTA POLLUTION CONTROL AGENCY
ROUTINE WATER QUALITY MONITORING PROGRAM DATA

MNMN--7---06E60 MPCA400 M1-7
44 49 37.0 093 13 55.0 3
MINNESOTA R.SH-36 IN BLOOMINGTON
27053 MINNESOTA
MAJ BASIN: UPPER MISS 070692
MIN BASIN: MINNESOTA RIVER
21MINN 04001004
0000 FEET DEPTH CLASS 00

/TYPA/AMBNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	01067 NICKEL NI,TOTAL UG/L	01092 ZINC ZN,TOT UG/L	01147 SELENIUM SE,TOT UG/L	01002 ARSENIC AS,TOT UG/L	71900 MERCURY HG,TOTAL UG/L	38260 MBAS MG/L	32730 PHENOLS TOTAL UG/L	31679 FECSTREP MF M-ENT /100ML	00955 SILICA DISOLVED MG/L	01034 CHROMIUM CR,TOT UG/L
73/07/17	10 00		10K	10	2K	10K	0.1	0.17				
73/09/18	13 50		10K	20	5K	10K	0.1	0.10K				
73/10/05	14 40		13	52	2K	10K	1.4	0.10K				
73/11/02	14 00		10K	25	3	10K	0.8	0.10K				
73/12/04	12 15		10K	14	5	10K	0.9	0.40				
74/01/17	14 00		10K	16	5K	10K	0.1K	0.75				
74/02/06	10 00		10K	70	5K	10K	1.4	0.79				
74/03/05	13 00		10K	25	2K	10K	0.2	0.30				
74/04/18	15 00		10K	74	4	10K	0.3	0.10K				
74/05/23	15 30		10K	27	2	10K	0.5	0.19				
74/06/21	17 15		18	20	4	10K	0.3	0.10K				
74/07/15	14 00			18	2K	10K	0.1K	0.10K	3		12.0	3
74/08/15	14 00		10K	34				0.30				
74/09/20	13 45		11	14				0.10K				
74/10/10	13 30		10K	95				0.19				
74/11/15	13 15		10K	19	2K	10K	0.5	0.12				
74/12/16	14 05		10K	14								
75/01/24	10 25		10K	24	2K	10K	0.1K			9K		
75/02/11	15 15		10K	13								
75/03/17	13 15		16	13								
75/04/18	12 30		23	79	3	10K	0.1K			1300		
75/05/02	13 30		10K	19								
75/06/05	14 15		10K	95								
75/06/19	14 20		13	11								
75/07/03	11 45		17	57	3	10K	0.4			800		
75/08/06	12 20		10K	10K								
75/09/10	12 35		10K	22								
75/10/08	12 00		10K	27	2K	4	0.1K			160		
75/11/06	11 45		10K	17								
75/12/09	13 30		10K	22								

STORET RETRIEVAL DATE 78/02/24
MINNESOTA POLLUTION CONTROL AGENCY
ROUTINE WATER QUALITY MONITORING PROGRAM DATA

MNMN--7---C6E60 MPCA400 MI-7
44 49 37.C 093 13 55.0 3
MINNESOTA R.SH-36 IN BLOOMINGTON
27053 MINNESOTA
MAJ BASIN: UPPER MISS 070692
MIN BASIN: MINNESOTA RIVER
21MINN 04001004
0000 FEET DEPTH CLASS 00

/TYPA/AMBNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00556 OIL-GRSE FREON-GR MG/L	00720 CYANIDE CN-TOT MG/L	00745 SULFIDE TOTAL MG/L	01007 BARIUM BA,TOT UG/L	01501 ALPHA TOTAL PC/L	01502 ALPHA-T ERROR PC/L	03501 BETA TOTAL PC/L	03502 BETA-T ERROR PC/L	39300 P,P' DDT WHL SMPL UG/L	39365 DDE WHL SMPL UG/L
73/07/17	10	00					10	7	13	8		
74/07/15	14	00	0.80	0.005K	0.01K	140	10	6	14	4		

STORET RETRIEVAL DATE 76/04/21
ROUTINE WATER QUALITY MONITORING PROGRAM DATA
VOLUME NINE

/TYPA/AMBNT/STREAM

MNMN--7---06E60 MPCA400 M1-7
44 49 37.C 093 13 55.0 3
MINNESOTA R.SH-3C IN BLOOMINGTON
27053 MINNESOTA
MAJ BASIN: UPPER MISS 070692
MIN BASIN: MINNESOTA RIVER
21MINN
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00011 WATER TEMP FAHN	00010 WATER TEMP CENT	00300 DO MG/L	CC310 BOD 5 DAY MG/L	31505 TOT COLI MPN CONF /100ML LOG	31615 FEC COLI MPN ENED /100ML LOG	31679 FECSTREP MF M-ENT /100ML LOG	00095 CNDUCTVY AT 25C MICROMHC	00500 RESIDUE TOTAL MG/L	00530 RESIDUE TOT NFLT MG/L
75/10/08	1200		61.0	16.1	8.0	6.5	1700	80	160	830	580	54.0
75/11/06	1145		54.0	12.2	10.0	5.5	330	170		660	610	56.0
75/12/09	1330		32.0	0.0	12.7	4.8	220	20		890	600	11.0
76/01/21	1435		32.0	0.0	8.9	4.4	50	20	9	960	630	8.4
76/02/24	1300		35.6	2.0	10.5	5.6	460	20		800	580	24.0
76/03/24	1220		47.3	8.5	11.4	4.6	1100	20		550	560	140.0
76/04/22	1450		59.0	15.0	9.1	5.0	2200	20	200	690	550	22.0
76/05/12	1430		63.3	17.4	8.0	7.1	490	20		750	600	61.0
76/06/10	1255		78.8	26.0	4.2	6.7	490	20		560	560	66.0
76/06/24	1345		68.0	20.0	5.5	12.0	3300	220		800	630	91.0
76/07/09	1350		81.5	27.5	5.0	8.0	3500	230	180	660	470	66.0
76/07/23	1430		72.5	22.5	5.9	5.1	790	140		790	570	64.0
76/08/05	1330		76.1	24.5	5.8	11.5		1100		740	560	70.0
76/08/18	1445		77.9	25.5	6.6	11.0		170		820	580	72.0
76/09/01	1200		71.6	22.0	6.5	5.7		490		780	690	140.0
76/09/16	1315		67.1	19.5	6.8	2.1		230		850	600	50.0
76/10/14	1445		59.0	15.0	8.8	17.0		70		860	590	81.0
76/11/12	1345		38.3	3.5	11.7	3.0		20		930	600	40.0
76/12/06	1500		40.1	4.5	12.0	3.4		50		1000	680	25.0
77/01/18	1130		36.5	2.5	8.3	3.1		50		1100	700	16.0
77/02/17	1300		38.3	3.5	7.9	3.3		20		1100	690	21.0
77/03/24	1220		41.0	5.0	11.3	4.8		20		400	500	220.0
00/00/00												
STATION	NUMBER		22.0	22.0	22.0	22.0	12	22	4	22	22	22.0
	MAXIMUM		81.5	27.5	12.7	17.0	3500	1100	200	1100	700	220.0
	MINIMUM		32.0	0.0	4.2	2.1	50	20	9	400	470	8.4
	MEAN		56.0	13.3	8.4	6.5	705	63	85	805	597	63.6
99/99/99												

STORET RETRIEVAL DATE 78/04/21
ROUTINE WATER QUALITY MONITORING PROGRAM DATA
VOLUME NINE

/TYPA/AMBNT/STREAM

MNMN--7---06E00 MPCA400 MI-7
44 49 37.0 093 13 55.0 3
MINNESOTA R.SH-36 IN BLOOMINGTON
27053 MINNESOTA
MAJ BASIN: UPPER MISS 070692
MIN BASIN: MINNESOTA RIVER
21MINN
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00076 TURB TRBIDMTR HACH FTU	00605 ORG N N MG/L	00610 NH3-N TOTAL MG/L	00615 NO2-N TOTAL MG/L	00620 NO3-N TOTAL MG/L	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-TOT MG/L P	00940 CHLORIDE CL MG/L	00400 PH SU	00910 CALCIUM CACO3 MG/L
75/10/08	1200		23.00	1.60	0.33	0.050	0.120		0.3500	43.0	8.1	210
75/11/06	1145		23.00	1.10	0.20	0.030	0.190		0.4270	70.0	8.2	240
75/12/09	1330		6.40	0.77	0.52	0.020	1.300		0.2810	59.0	8.2	260
76/01/21	1435		5.60	0.75	0.98	0.070	1.100		0.3510	47.0	7.9	280
76/02/24	1300		13.00	0.99	0.74	0.040	1.400		0.3840	54.0	7.8	220
76/03/24	1220		82.00	2.00	0.81	0.150	4.000		0.6320	62.0	8.0	190
76/04/22	1450		23.00	1.20	0.20	0.030	0.260		0.2660	25.0	8.3	200
76/05/12	1430		32.00	1.60	0.20	0.010	0.010		0.3220	38.0	8.3	200
76/06/10	1255		23.00	1.20	0.90	0.110	0.050		0.4770	41.0	7.9	180
76/06/24	1345		25.00	0.30	1.60	0.030	0.690		1.3100	47.0	8.0	210
76/07/09	1350		26.00	1.90	1.00	0.020	0.190		0.5570	45.0	8.3	130
76/07/23	1430		23.00	1.50	0.33	0.150	0.240		0.4560	55.0	8.0	170
76/08/05	1330		30.00	1.30	1.30			0.170	0.5600	57.0	8.1	
76/08/18	1445		30.00	1.90	0.20			0.280	0.4810	55.0	8.5	
76/09/01	1200		54.00	1.90	0.46			0.300	0.5590	69.0	8.3	
76/09/16	1315		15.00	1.60	0.59			0.600	0.5610	71.0	8.1	
76/10/14	1445		35.00	1.90	0.24			0.650	0.5520	69.0	8.1	190
76/11/12	1345		22.00	1.60	0.86			0.670	0.4490	72.0	8.0	230
76/12/06	1500		18.00	0.95	1.10			0.720	0.4040	77.0	8.1	
77/01/18	1130		14.00	0.81	1.90			0.940	0.4370	83.0	7.8	270
77/02/17	1300		16.00	0.92	1.90			1.000	0.4270	82.0	8.0	
77/03/24	1220		82.00	1.90	0.85			1.500	0.5040	19.0	7.9	
00/00/00												
STATION	NUMBER		22.00	22.00	22.00	12.000	12.000	10.000	22.0000	22.0	22.0	15
	MAXIMUM		82.00	2.00	1.90	0.150	4.000	1.500	1.3100	83.0	8.5	280
	MINIMUM		5.60	0.30	0.20	0.010	0.010	0.170	0.2660	19.0	7.8	130
	MEAN		28.23	1.35	0.78	0.059	0.796	0.683	0.4885	56.4	8.1	212
99/99/99												

STORET RETRIEVAL DATE 78/04/21
ROUTINE WATER QUALITY MONITORING PROGRAM DATA
VOLUME NINE

/TYPA/AMBNT/STREAM

MNMN--7---06E60 MPCA400 MI-7
44 49 37.0 093 13 55.0 3
MINNESOTA R.SH-36 IN BLOOMINGTON
27053 MINNESOTA
MAJ BASIN: UPPER MISS 070652
MIN BASIN: MINNESOTA RIVER
21MINN
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00920 MGNSIUM CACO3 MG/L	00900 TOT HARD CACO3 MG/L	00410 T ALK CACO3 MG/L	00945 SULFATE SO4-TOT MG/L	00950 FLUORIDE F,DISS MG/L	00930 SODIUM NA,DISS MG/L	00935 POTSSIUM K,DISS MG/L	00680 T ORG C C MG/L	00335 COD LOWLEVEL MG/L	01042 COPPER CU,TOT UG/L
75/10/08	1200		170	380	290	100	0.23	38.00	6.40	7.8	39.0	10
75/11/06	1145		180	420	320	118	0.22	41.00	6.80	10.5	39.0	10
75/12/09	1330		180	440	320	120	0.26	54.00	7.50	7.9	26.0	10
76/01/21	1435		200	480	330	170	0.31	48.70	7.00	7.2		10
76/02/24	1300		160	380	260	120	0.23	41.00	6.70	9.7		10
76/03/24	1220		100	290	130	110	0.23	14.00	5.20	9.7		10
76/04/22	1450		160	360	210	160	0.22	22.00	5.80			10
76/05/12	1430		180	380	210	170	0.25	36.00	6.00	10.0		10
76/06/10	1255		160	340	220	140	0.27	51.00	9.20	7.5		10
76/06/24	1345		170	360	270	150	0.28	55.00	7.90	7.5		10
76/07/09	1350		140	270	160	110	0.26	45.00	6.20	7.5		10
76/07/23	1430		160	330	240	92	0.30	48.00	6.60	7.5		10
76/10/14	1445		160	350	260	120	0.26	66.00	6.80	6.0		10
76/11/12	1345		160	290	390	120	0.22	68.00	6.50			
77/01/18	1130		180	450	383	140	0.30	70.00	7.10	3.7		10
00/00/00												
STATION	NUMBER		15	15	15	15	15.00	15.00	15.00	13.0	3.0	14
	MAXIMUM		200	480	390	170	0.31	70.00	9.20	10.5	39.0	10
	MINIMUM		100	270	130	92	0.22	14.00	5.20	3.7	26.0	10
	MEAN		164	369	269	129	0.26	46.65	6.78	7.9	34.7	10
99/99/99												

STORET RETRIEVAL DATE 78/04/21
ROUTINE WATER QUALITY MONITORING PROGRAM DATA
VOLUME NINE

MNMN--7---06E60 MPCA400 MI-7
44 49 37.0 093 13 55.0 3
MINNESOTA R.SH-3& IN BLOOMINGTON
27053 MINNESOTA
MAJ BASIN: UPPER MISS 070692
MIN BASIN: MINNESOTA RIVER
21MINN
0000 FEET DEPTH CLASS 00

/TYPA/AMBNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	01027 CADMIUM CD,TOT UG/L	01067 NICKEL NI,TOTAL UG/L	01092 ZINC ZN,TOT UG/L	01055 MANGNESE MN UG/L	01051 LEAD PB,TOT UG/L	01045 IRON FE,TOT UG/L	71900 MERCURY HG,TOTAL UG/L	01002 ARSENIC AS,TOT UG/L	01147 SELENIUM SE,TOT UG/L	32730 PHENOLS TOTAL UG/L
75/10/08	1200		10	10	27	170	10	1600	0.10	4.2	2.0	
75/11/06	1145		10	10	17	220	17	1800				
75/12/09	1330		10	10	22	200	10	440				
76/01/21	1435		10	10	27	280	10	420	0.10	5.5	3.4	
76/02/24	1300		10	10	19	72	10	690				
76/03/24	1220		10	10	26	310	10	5500				
76/04/22	1450		10	10	23	220	10	110	0.38	2.9	1.4	
76/05/12	1430		10	10	13	160	10	1700				
76/06/10	1255		10	10	13	170	10	1000				
76/06/24	1345		10	11	23	220	10	2200				
76/07/09	1350		10	10	12	230	10	1600	0.11	6.7	1.0	
76/07/23	1430		10	10	19	230	10	2000	0.10	6.5	1.7	
76/10/14	1445		10	10	29	220	10	2100	0.10	3.3		
77/01/18	1130		10	10	11	210	10	950	0.18		2.0	
00/00/00												
STATION	NUMBER		14	14	14	14	14	14	7.00	6.0	6.0	
	MAXIMUM		10	11	29	310	17	5500	0.38	6.7	3.4	
	MINIMUM		10	10	11	72	10	110	0.10	2.9	1.0	
	MEAN		10	10	20	208	11	1579	0.15	4.8	1.9	
99/99/99												

STORET RETRIEVAL DATE 83/03/14
MINNESOTA POLLUTION CONTROL AGENCY
ROUTINE WATER QUALITY MONITORING DATA - VOLUME 11

/TYPA/AMBNT/STREAM

612 MPCA650 MI-3.5
44 52 45.0 093 11 32.0 3
MINNESOTA R. AT FT. SNELLING PK.
27053 MINNESOTA HENNEPIN
MAJ BASIN: UPPER MISS 070492
MIN BASIN: MINNESOTA RIVER
21MINN 810314
0000 FEET DEPTH CLASS 00 CSN-RSP 0584247-0474092

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00310 BOD 5 DAY MG/L	31615 FEC COLI MPNECMED /100ML	31616 FEC COLI MFM-FCBR /100ML	00530 RESIDUE TOT NFLT MG/L	00400 PH SU	00665 PHOS-TOT MG/L P	00625 TOT KJEL N MG/L	00095 CNDUCTVY AT 25C MICROMHO
80/10/27	11	00	7.0	12.4	6.20	230		36.0	7.50	0.229	2.100	820
81/01/30	11	10	0.0	11.0	1.20	20K		2.8	7.60	0.330	2.480	1100
81/03/24	12	20	12.5	19.3	6.70	70		5.2	8.50	0.300	2.070	780
81/04/27	13	30	13.0	13.2	10.00	40		39.0	7.80	0.219	2.100	750
81/05/26	13	20	18.0	8.8	4.90	60		46.0	8.10	0.263	2.220	810
81/06/29	09	45	22.0	5.1	1.80			600.0	7.30	0.752	2.890	240
81/07/29	10	45	22.0	6.6	1.70	230		220.0	7.90	0.364	1.490	580
81/08/24	14	55	24.0	9.0	3.90	330		85.0	7.90	0.283	2.250	750
81/09/29	11	10	15.0	11.3	6.30	50		55.0	8.30	0.352	2.300	800
81/10/28	10	00	6.0	13.3	3.30	220		46.0	8.10	0.249	1.700	960
82/01/26	11	00	0.0	6.7	2.50	5400		4.0	7.70	0.340	2.790	1100
82/03/30	13	00	5.0	11.5	1.70	230		310.0	7.80	0.507	2.590	620
82/04/28	16	35	14.0	11.0	4.00	170		110.0	8.10	0.261	1.720	820
82/05/27	14	00	17.0	8.1	1.80	130		130.0	8.20	0.242	1.580	849
82/06/28	16	10	24.0	7.8	2.90	80		150.0	8.40	0.307	1.730	900
82/07/29	14	45	27.0	6.3	2.40	230		100.0	8.30	0.322	1.500	850
82/08/25	16	25	26.0	6.0	5.90	260		82.0	7.70	0.382	2.400	780
82/09/23	16	35	17.0	10.7	3.40	80		64.0	8.40	0.274	1.820	880

STORET RETRIEVAL DATE 83/03/14
MINNESOTA POLLUTION CONTROL AGENCY
ROUTINE WATER QUALITY MONITORING DATA - VOLUME 11

612 MPCA650 MI-3.5
44 52 45.0 093 11 32.0 3
MINNESOTA R. AT FT. SNELLING PK.
27053 MINNESOTA HENNEPIN
MAJ BASIN: UPPER MISS 070492
MIN BASIN: MINNESOTA RIVER
21MINN 810314
0000 FEET DEPTH CLASS 00 CSN-RSP 0584247-0474092

/TYPA/AMBNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-TOT MG/L P	00625 TOT KJEL N MG/L	00610 NH3+NH4- N TOTAL MG/L	00605 ORG N MG/L	00910 CALCIUM CACO3 MG/L	00920 MGNSIUM CACO3 MG/L	00410 T ALK CACO3 MG/L	00940 CHLORIDE TOTAL MG/L	32730 PHENOLS TOTAL UG/L
80/10/27	11 00		2.14	0.229	2.100	0.820	1.280	230.0	160.0	280	51.0	
81/01/30	11 10		1.51	0.330	2.480	1.700	0.780	286.0	200.0	370		
81/03/24	12 20		0.59	0.300	2.070	0.540	1.530	208.0	151.0	240		
81/04/27	13 30		1.48	0.219	2.100	0.760	1.340	200.0	160.0	220		
81/05/26	13 20		6.10	0.263	2.220	0.570	1.650	250.0	150.0	260		
81/06/29	09 45		7.10	0.752	2.890	0.220	2.670	140.0	74.0	150		
81/07/29	10 45		9.60	0.364	1.490	0.130	1.360	190.0	110.0	200		
81/08/24	14 55		5.90	0.283	2.250	0.230	2.020	270.0	140.0	270		
81/09/29	11 10		2.80	0.352	2.300	0.580	1.720	230.0	160.0	280		
81/10/28	10 00		11.00	0.249	1.700	0.210	1.490					
82/01/26	11 00		3.10	0.340	2.790	1.950	0.840					
82/03/30	13 00		7.56	0.507	2.590	0.580	2.010					
82/04/28	14 35		7.20	0.261	1.720	0.200	1.520					
82/05/27	14 00		9.20	0.242	1.580	0.200	1.380					
82/06/28	16 10		7.20	0.307	1.730	0.220	1.510					
82/07/29	14 45		5.20	0.322	1.500	0.230	1.270					
82/08/25	16 25		0.24	0.382	2.400	0.820	1.580					
82/09/23	16 35		7.90	0.274	1.820	0.240	1.580					

DATE FROM TO	TIME OF DAY	DEPTH FEET	00945 SULFATE SO4-TOT MG/L	01002 ARSENIC AS,TOT UG/L	01027 CADMIUM CD,TOT UG/L	01034 CHROMIUM CR,TOT UG/L	01042 COPPER CU,TOT UG/L	71900 MERCURY HG,TOTAL UG/L	01051 LEAD PB,TOT UG/L	01067 NICKEL NI,TOTAL UG/L	01092 ZINC ZN,TOT UG/L
80/10/27	11 00			2	0.1	1	2	0.2	1	4	5
82/06/28	16 10			4	0.1	3	5	0.1K	2	6	16

STORET RETRIEVAL DATE 85/04/15
MINNESOTA POLLUTION CONTROL AGENCY
ROUTINE WATER QUALITY MONITORING PROGRAM DATA - VOLUME 12

612 MI-3.5
44 52 45.0 093 11 32.0 3
MINNESOTA R. AT FT. SNELLING PK.
27053 MINNESOTA HENNEPIN
MAJ BASIN: UPPER MISS 070492
MIN BASIN: MINNESOTA RIVER
21MINN 810314 07020012001 0001.380 ON
0000 FEET DEPTH CSN-RSP 0584247-0870747

/TYPA/AMBNT/STREAM/TISSUE

DATE FROM TO	TIME OF DAY	DEPTH FEET	00008 LAB IDENT. NUMBER	00010 WATER TEMP CENT	00300 DO MG/L	00310 BOD 5 DAY MG/L	31615 FEC COLI MPNECMED /100ML	00530 RESIDUE TOT NFLT MG/L	00400 PH SU	00095 CNDUCTVY AT 25C MICROMHO	00630 NO2&NO3 N-TOTAL MG/L	00665 PHOS-TOT MG/L P
82/10/26	16	30	127493	9.0	9.8	1.90	50	230.00	8.20	990	12.00	0.297
83/01/20	10	30	127559	0.0	13.0	1.60	5400	22.00	8.20	1100	9.20	0.167
83/03/15	13	20	127613	2.0	11.3	1.85	110	76.00	8.10	710	8.80	0.252
83/04/25	15	15	127702	13.0	10.9	1.70	20K	110.00	8.30	850	9.60	0.152
83/05/25	13	40	127774	17.0	8.9	2.40	20	120.00	8.30	900	7.50	0.211
83/06/27	16	20	127839	23.0	6.7	1.90	230	130.00	8.30	840	9.30	0.380
83/07/25	16	40	127978	28.0	6.2	2.20	170	95.00	8.20	850	5.80	0.307
83/08/22	14	50	127047	26.0	6.9	3.80	170	46.00	8.20	700	0.15	0.252
83/09/27	14	15	127120	17.5	13.7	5.00	50	43.00	8.40	760	1.03	0.305
83/10/18	10	00	127169	10.5	11.4	5.00	220	37.00	8.40	780	2.00	0.321
84/01/30	10	30	127267	0.0	7.2	1.90	17000	5.20	7.80	1000	0.11	0.299
84/03/26	14	30	127336	4.0	12.8	3.70	730	360.00	8.00	860	6.50	0.652
84/04/27	11	00	127408	15.0	9.1	3.60	20	84.00	8.30	820	6.20	0.247
84/05/30	14	46	127479	18.5	7.8	2.70	80	140.00	8.20	880	6.20	0.305
84/06/25	15	00	127528	24.0	4.7	1.60	130	22.00	8.00	710	8.60	3.680
84/07/27	12	30	127594	26.0	5.5	2.80	230	150.00	8.10	860	3.20	2.300
84/08/31	14	10	127670	24.0	9.1	6.00	230	46.00	8.10	820	0.26	0.411
84/09/28	13	10	127741	13.0	8.9	5.10	170	37.00	8.10	880	0.16	0.304

DATE FROM TO	TIME OF DAY	DEPTH FEET	00625 TOT KJEL N MG/L	00610 NH3+NH4- N TOTAL MG/L	00605 ORG N N MG/L	00940 CHLORIDE TOTAL MG/L	32730 PHENOLS TOTAL UG/L
82/10/26	16	30	1.860	0.240	1.620		
83/01/20	10	30	1.370	0.320	1.050		
83/03/15	13	20	1.560	0.240	1.320		
83/04/25	15	15	1.430	0.140	1.290		
83/05/25	13	40	1.700	0.140	1.560		
83/06/27	16	20	1.900	0.160	1.740		
83/07/25	16	40	1.560	0.280	1.280		
83/08/22	14	50	1.970	0.800	1.170		
83/09/27	14	15	2.000	0.500	1.500		
83/10/18	10	00	1.770	0.390	1.380		
84/01/30	10	30	1.180	0.450	0.730		
84/03/26	14	30	2.520	0.460	2.060		
84/04/27	11	00	2.130	0.260	1.870		
84/05/30	14	46	1.790	0.140	1.650		
84/06/25	15	00	1.990	0.360	1.630		
84/07/27	12	30	1.910	0.200	1.710		
84/08/31	14	10	1.650	0.180	1.470		
84/09/28	13	10	2.100	0.800	1.300		

APPENDIX C

Wetland Data

TABLE C-1
LITERATURE REVIEW: TYPES OF IMPACTS TO WETLANDS ASSOCIATED WITH USE OF WETLANDS FOR DISPOSAL OF STORMWATER OR WASTEWATER.

IMPACT	SOURCE
1. Decrease in functional ability of wetland to process suspended solids.	USEPA 1983, Godfrey et al 1985.
2. Decrease in ability of wetland to remove nutrients from inflowing water.	USEPA 1983, Nichols 1983, Richardson 1985, Gutenspergen and Stearns 1985.
3. Changes in species composition and dominance including shifts from flowering plant communities to those dominated by algae and other single-celled plants.	Benforado 1981, Gutenspergen and Stearns 1981, Mudroch and Capobianco 1979.
4. Alteration of wetland hydrology and subsequent effects on the nutrient and solids processing capability of the wetland.	USEPA 1983, Bayley 1985, Hemond and Nuttle 1985, Kadlec 1985.
5. Alteration of pH and subsequent damage to wetland soils.	Richardson et al 1978, Guntenspergen and Stearns 1985.
6. Accumulation of toxic trace metals in sediments, concentration by plants and animals, and introduction into the food chain.	Giblin 1985, Mudroch and Capobianco 1979, Liston and Maher 1986, Tilton and Kadlec 1979.
7. Accumulation of toxic long-lasting organic compounds in plants and animals.	USEPA 1983, Shiaris 1985, Richardson and Nichols 1985.
8. Export of sediments from wetlands subsequent adverse impacts on receiving waters.	Brown 1985, USEPA 1983, Kadlec and Kadlec 1979.
9. Excessive growth rates of plants and changes in rates of accumulation of organic material.	Guntenspergen and Stearns 1981, Sloey et al 1978.
10. Increase in aquatic invertebrate populations, that cause phosphorus to be released from sediments to water.	USEPA 1983, Nalepa and Quigley 1980.
11. Effects on habitats of fish using wetlands.	USEPA 1983, Brennan 1985.
12. Adverse effects on rare and uncommon species due to loss of habitat diversity abd tendency for monocultures to develop in wetlands receiving high-nutrient waters.	USEPA 1983, Guntenspergen and Stearns 1983.
13. Effects on plant health and wildlife health from changes that improve habitats for disease orgamisms.	USEPA 1983, Friend 1985.
14. Overloading and stress on wetlands structure and functioning.	Hodson et al 1985, USEPA 1983.

APPENDIX D

State Historic Preservation Office Clearance

BRW

PLANNING
TRANSPORTATION
ENGINEERING
ARCHITECTURE

BENNETT, RINGROSE, WOLSFELD, JARVIS, GARDNER, INC. • THRESHER SQUARE • 700 THIRD STREET SOUTH • MINNEAPOLIS, MN 55415 • PHONE 612/370-0700

July 24, 1986

Mr. Ted Lofstrom
Environmental Assessment Officer
State Historic Preservation Office
Minnesota Historical Society
Fort Snelling History Center
St. Paul, Minnesota 55111

Mr. Les Peterson
Highway Archaeologist
Minnesota Historical Society
Fort Snelling History Center
St. Paul, Minnesota 55111

RE: TH 77 and I-494 Improvements:
TH 77 Between 70th and 86th Streets
I-494 Between 12th and 34th Streets
Also: SP 2758 (TH 77)
SP 2785 (I-494)
MHS Referral File Number: Y-798

Dear Ted and Les:

Thank you for reviewing with me your files and records concerning the above referenced project.

The purpose of this letter is to confirm and update all of our files that the project referenced above, including the currently planned extension of the construction limits to 34th Street, will not have any affect on historically or architecturally significant properties because none are present. This opinion was confirmed in our meeting of July 17, 1986.

Thank you both again, and please do no hesititate to contact me if I may be of any assistance to you.

Sincerely,

BENNETT-RINGROSE-WOLSFELD-JARVIS-GARDNER, INC.

G. Joseph Hudak
Staff Archaeologist

cc: C.P. Kachelmyer
Preliminary Design Engineer
Mn/DOT

D. Brown
Mn/DOT District 5

T. Heppelmann
BRW, Inc.

DAVID J. BENNETT DONALD W. RINGROSE RICHARD P. WOLSFELD PETER E. JARVIS LAWRENCE J. GARDNER THOMAS F. CARROLL ARNOLD J. ULLEVIG
CRAIG A. AMUNDSEN DONALD E. HUNT MARK G. SWENSON JOHN B. McNAMARA GARY J. ERICKSON DONALD L. CRAIG

MINNEAPOLIS DENVER BRECKENRIDGE PHOENIX

MINNESOTA HISTORICAL SOCIETY
FOUNDED IN 1849
Fort Snelling History Center, St. Paul, MN 55111 • (612) 726-1171

January 6, 1986

Mr. G. Joseph Hudak
BRW
Thresher Square
700 3rd Street South
Minneapolis, MN 55415

Dear Mr. Hudak:
RE: TH 77 and I-494 Improvements:
TH 77 between 70th and 86th Streets
I-494 Between 12th and 24th Streets
Also: SP 2758 (TH 77)
SP 2785 (I-494)

MHS Referral File Number: Y-798

This is to confirm our conversation of last week regarding the above-referenced projects. It is staff opinion that they will not have any affect on historically or architecturally significant properties because none are present. There are no eligible buildings or structures within the project, and unreported archaeological sites are unlikely, because of a "low-probability" setting and the fact that the rights-of-way have been thoroughly disturbed by the existing roads.

If you have any questions, please don't hesitate to contact me, at 726-1171.

Thank you for your participation in this important effort to preserve Minnesota's heritage.

Sincerely,

Ted Lofstrom
Environmental Assessment Officer

TL/fr

cc: Les Peterson
Highway Archaeologist
Minnesota Historical Society

APPENDIX E

Federal Farmland Protection Act Clearance

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request: August 22, 1986
Name Of Project: T.H. 77/I-494 Improvements	Federal Agency Involved: Federal Highway Administration
Proposed Land Use: Highway Upgrade	County And State: Hennepin County, Minnesota
PART II *(To be completed by SCS)*	Date Request Received By SCS

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply – do not complete additional parts of this form).*	Yes ☐	No ☒	Acres Irrigated	Average Farm Size
Major Crop(s)	Farmable Land In Govt. Jurisdiction: Acres: %		Amount Of Farmland As Defined in FPPA: Acres: %	
Name Of Land Evaluation System Used	Name Of Local Site Assessment System		Date Land Evaluation Returned By SCS	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating: Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly Approximately	26			
B. Total Acres To Be Converted Indirectly	-			
C. Total Acres In Site Approximately	390			
PART IV *(To be completed by SCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide And Local Important Farmland				
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value				
PART V *(To be completed by SCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*				

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use					
2. Perimeter In Nonurban Use					
3. Percent Of Site Being Farmed					
4. Protection Provided By State And Local Government					
5. Distance From Urban Builtup Area					
6. Distance To Urban Support Services					
7. Size Of Present Farm Unit Compared To Average					
8. Creation Of Nonfarmable Farmland					
9. Availability Of Farm Support Services					
10. On-Farm Investments					
11. Effects Of Conversion On Farm Support Services					
12. Compatibility With Existing Agricultural Use					
TOTAL SITE ASSESSMENT POINTS	160				
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100				
Total Site Assessment *(From Part VI above or a local site assessment)*	160				
TOTAL POINTS *(Total of above 2 lines)*	260				

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE
219 E FRONTAGE ROAD
WACONIA, MN 55387

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

AN EQUAL OPPORTUNITY EMPLOYER

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Penalty for private use $300

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AUG 28 1986
B.R.W.

ERW
Thresher Square
700 3rd St. So.
Mpls MN
55415

ATTN
Anthony Heppelmann

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