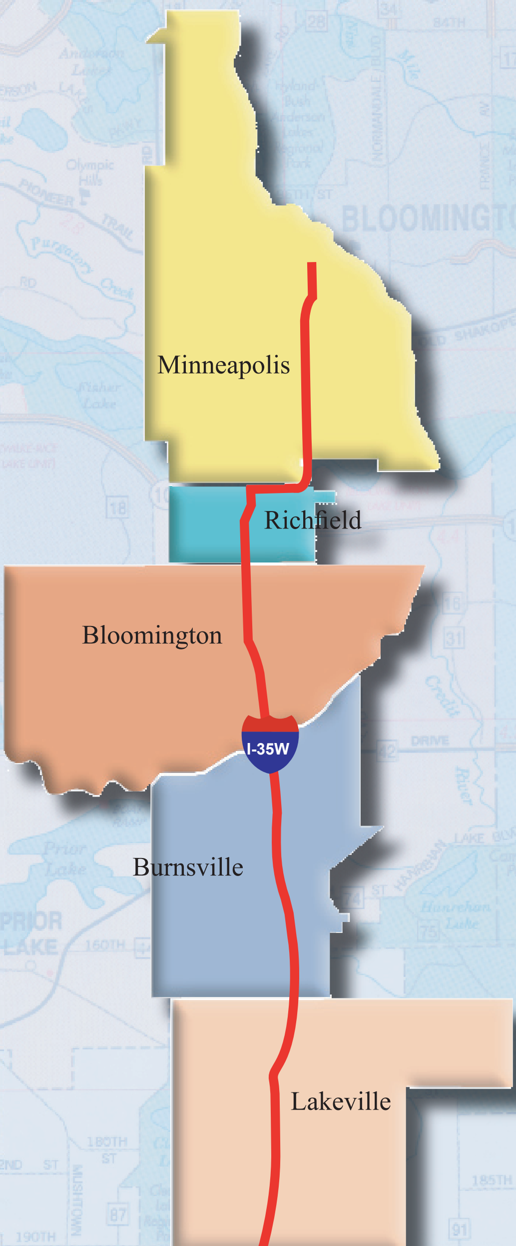
35W Bus Rapid Transit Study

Lakeville, Burnsville, Bloomington, Richfield and Minneapolis



Final Report

Submitted to the
Minnesota Department of Transportation
by the URS Consulting Team

January 2005

URS

35W Bus Rapid Transit Study

Lakeville, Burnsville,
Bloomington, Richfield and Minneapolis

January 14, 2005

Submitted to:
The Minnesota Department of Transportation

The primary author of this report is the URS Consulting Team, led by Project Manager Mark E. Ryan with contributions from Mn/DOT Project Managers Thomas O'Keefe and John Griffith and the Technical Advisory Committee members listed below:

Lisa Cerney, City of Minneapolis
Robert Morgan, City of Minneapolis
Gene Franchett, Dakota County
Derek Crider, Hennepin County
Lezlie Vermillion, Scott County
John Griffith, Mn/DOT
Lisa Freese, Mn/DOT
Mike Schadauer, Mn/DOT
Nancy Daubenberger, Mn/DOT
Paul Czech, Mn/DOT
Tom O'Keefe, Mn/DOT
Tim Anderson, FHWA
Adam Harrington, Metro Transit
Connie Kozlak, Metropolitan Council
Tom Thorstenson, Metro Transit
Mike Abegg, Minnesota Valley Transit Authority

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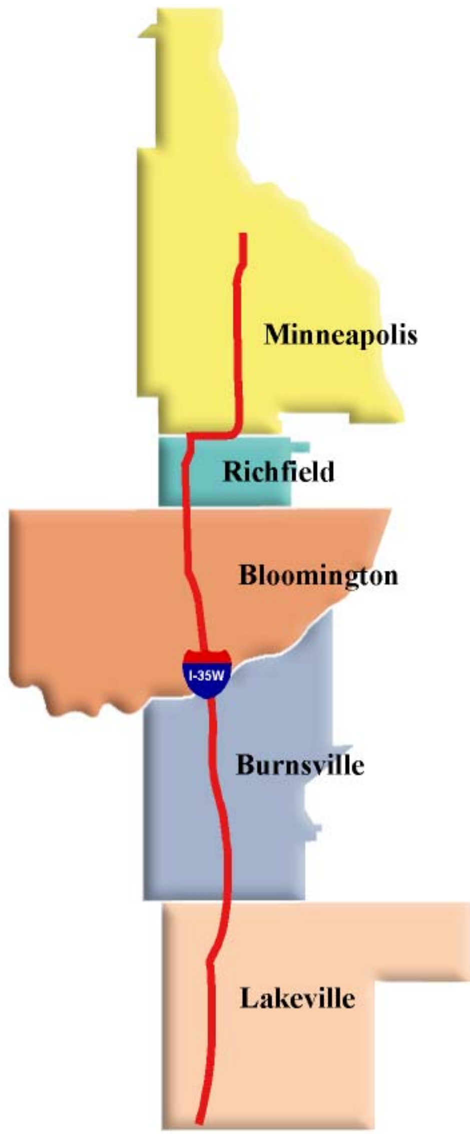
EXECUTIVE SUMMARY

Introduction

The I-35W Corridor between Downtown Minneapolis and Lakeville is one of the most heavily traveled in the Twin Cities, serving approximately 180,000 vehicles per day at Lake Street in south Minneapolis. It is also one of the busiest transit corridors in the region, serving approximately 15,000 bus riders per day. Over the next 25 years, the corridor is expected to experience significant levels of employment and population growth, resulting in very strong travel demand throughout the corridor.



As a result, there is a growing interest in improving public transit service in the corridor that includes exploring the feasibility of providing Bus Rapid Transit (BRT) service. This interest led the State Legislature to pass a bill in 2003 requiring the Minnesota Department of Transportation, (Mn/DOT) to study[1] the feasibility of BRT in the corridor and make recommendations for its implementation. The legislation is reprinted in Appendix A of this report.

The interest in improving public transit services in the corridor is also consistent with the Metropolitan Council's recently adopted Transportation Policy Plan that identified I-35W as one of three bus rapid transit corridors and with the State's desire to move forward on construction of major transitway corridors in the metro area.

This study coincides with a number of improvements that are underway or planned in the 35W Corridor including the following:

- Preliminary design is underway for reconstructing the Highway 62/35W interchange that includes 35W between 66th Street and 42nd Street. This project will include a shared BRT/HOV lane in each direction between 66th Street and 42nd Street.

[1] Mn/DOT hired the consulting firm of URS to assist with this study.

- Planning and discussions are underway for freeway improvements on I-35W, north of 42nd Street to improve access at Lake Street and a new interchange at 38th Street.
- Improvements are planned for the I-494 / I-35W Interchange.
- Metro Transit introduced restructured services in the 35W corridor in late 2004.

Bus Rapid Transit

University of Minnesota Transitway

One increasingly popular way of meeting peoples travel needs is by providing BRT service. While BRT features vary from city to city, all BRT buses offer frequent and quick service with travel times that can be as fast or faster than traveling alone in your car. Typically, BRT buses operate on roads and highways that are designed to give them an advantage equal to or greater than cars traveling along the same route. This may be accomplished by operating in exclusive lanes or with other vehicles operating in High Occupancy Vehicle (HOV) lanes.

In the Twin Cities, a range of BRT features are being used in the I-35W Corridor and other corridors as well. These features include:

- Buses operating on bus shoulder lanes.
- The University of Minnesota's Transitway that connects the Minneapolis and St. Paul campuses.
- Traffic signal priority on the University of Minnesota's Transitway.
- Bus stations located immediately adjacent to the shoulders of I-35W at Lake Street.
- Special lanes that allow buses and High Occupancy vehicles (HOVs) to bypass ramp meters.
- An Automatic Vehicle Location (AVL) system used by Metro Transit.
- A region-wide "Go - To Card" for electronic payment of fares, (under development).

Development of BRT Alternatives for the I-35W Corridor

To help guide the study's effort and develop a workable implementation plan, the following set of guiding principles were developed:

- Allow Buses to Operate at Posted Speeds
- Maximize Freeway Capacity
- Minimize Impacts on Right-of-Way
- Make Transit a Competitive Choice to Autos
- Utilize Existing Resources to the Greatest Extent Possible

The study team considered a number of BRT elements and their appropriateness for the I-35W Corridor including:

- Transitway Configuration
- Station Design Alternatives
- Fare Collection Options
- Bus Type / Design
- Passenger Information Systems
- BRT Operational Options
- Traffic Management
- Signal Priority

Key Findings

The main question that was posed at the outset of the study was – *Is it feasible to implement BRT in the I-35W Corridor?"* The answer is yes – the I-35W Corridor is an excellent candidate to deploy a robust BRT system.

This positive outlook for BRT in the I-35W Corridor is based on the following:

- <u>Significant levels of transit service and investment already existing in the I-35W Corridor.</u> With close to 15,000 passengers served per day in the I-35W Corridor, a solid base of transit riders already exists. This strong ridership along with established providers in the corridor and Metro Transit's plans for service expansion provide a solid foundation for transit.

- <u>Buses will be able to operate at posted speeds in the peak hour.</u> With the proposed service plan and recommended investments in BRT infrastructure, buses will be able to operate at posted speeds during the peak hour. These speeds are expected to offer significant travel time savings for people who choose the BRT service.

- <u>The corridor will experience significant growth in employment and population.</u> Over the next 25 years, employment in Downtown Minneapolis is expected to increase by 50,000 jobs and employment along the I-494 Corridor is expected to increase by 10,000. Additionally, many other areas south of the Minnesota River are also expected to see significant growth in population

- Forecasts indicate that ridership demand will almost triple over the next 25 years. As part of the study, the Metropolitan Council conducted a regional transit ridership forecast based on the methodology used for the region's Transportation Policy Plan. The results indicate that by introducing a BRT system that allows buses to operate at posted speeds, ridership demand is projected to be 43,000 passengers per day.

- BRT serves more people without adding freeway lanes. The proposed service levels make a significant contribution to the number of people who can be served during the peak hour of traffic volume. When comparing the projected number of BRT passengers in one hour with the number of people (single-occupant vehicles) in one general-purpose lane, BRT ridership equates to over three general-purpose lanes in one peak hour.

- Several planned highway projects provide an opportunity to incorporate BRT infrastructure. Mn/DOT is currently in the preliminary design phase for reconstructing the Highway 62/35W interchange. As a result of collaboration with the Cities of Minneapolis and Richfield, Metro Transit and the Metropolitan Council, Mn/DOT's design plans provide for a continuous shared BRT/HOV lane between 66th Street and 42nd Street and also provide space and a shell for an on-line BRT station at 46th Street. With other highway improvements planned for the I-35W Corridor, the experience with the Highway 62/35W Interchange Project serves as an excellent model for incorporating BRT infrastructure in these future highway projects.

Service Recommendation

The study concluded that the following elements should be incorporated into a BRT system for the I-35W Corridor:

- Buses operating at posted speeds in a shared BRT/HOV lane. In reviewing different alternatives, it was found that buses operating in a shared BRT/HOV lane will be as effective as other options while requiring the least amount of land and having the lowest capital cost. The key to making this approach a success is to manage the lanes through policy and enforcement to insure that buses are able to consistently operate at posted speeds.

- On-line stations at Lake Street, 46th Street and in the vicinity of I-494. At least three on-line BRT stations located in the median of the freeway are recommended. This configuration allows buses to remain on the corridor and save valuable time when they stop and make connections with local routes. An important design feature at the stations is to allow buses to pass each other while passengers are boarding at the station. Potential additional sites for on-line stations include 38th Street, 66th Street and 98th Street.

- Provide a mix of express, station-to-station and local service. The proposed service plan calls for express service to be provided that will originate at points along the corridor and upon entering the corridor, provide a direct, non-stop trip to their destination. Station-to-station service is also recommended which will be comprised of buses operating up and down the corridor and stopping at specific stations to allow people to make connections with local bus service. The precursor to this service was initiated recently with Metro Transit's 535 route. Local service will also play an important role and provide a connection between neighborhoods and BRT park and ride lots and BRT stations.

- Completion of a shared BRT/HOV lane to Downtown Minneapolis. A shared BRT/HOV lane provides buses with the means to operate at posted speeds throughout the corridor, which is critical to the success of BRT service.

- Utilize the existing fleet. BRT deployment in the I-35W Corridor can proceed by utilizing the region's existing bus fleet. Many bus manufacturers are marketing specialized vehicles that have the look and feel of rail vehicles. While these types of vehicles provide a unique identity for BRT and may attract additional riders, the cost can be 2 to 3 times greater than purchasing a standard transit bus.

- New service to Lakeville including a park and ride lot just north of County Road 50. The City of Lakeville will experience significant population growth during the next 25 years and expanding service to Lakeville will be an important step towards serving the travel needs of the entire corridor.

The graphic on the following page depicts a simulation of how the BRT system could operate at an on-line station. Also, accompanying this report in Appendix B is a CD that provides a video simulation of BRT operations on I-35W at 46th Street.

Implementation Strategy

Successfully implementing BRT in the I-35W Corridor requires working closely with planned highway projects to insure that BRT infrastructure is incorporated. In addition to the Highway 62/35W Interchange Project, other projects include highway improvements north of 46th Street and the I-35W / I-494 Interchange project.

A two-phase approach is recommended for deployment of BRT in the I-35W Corridor with each tied directly to the completion of specific highway projects. Phase I is tied to the Highway 62/35W Interchange Project and Phase II is tied to the completion of the improvements north of 46th Street and the I-494 / I-35W Interchange Project.

Another element critical to the success of BRT is to provide the necessary level of investment to support the increased ridership demand that the corridor will experience. This investment includes capital for BRT infrastructure and annual funding to pay for operating, maintenance and administrative costs.

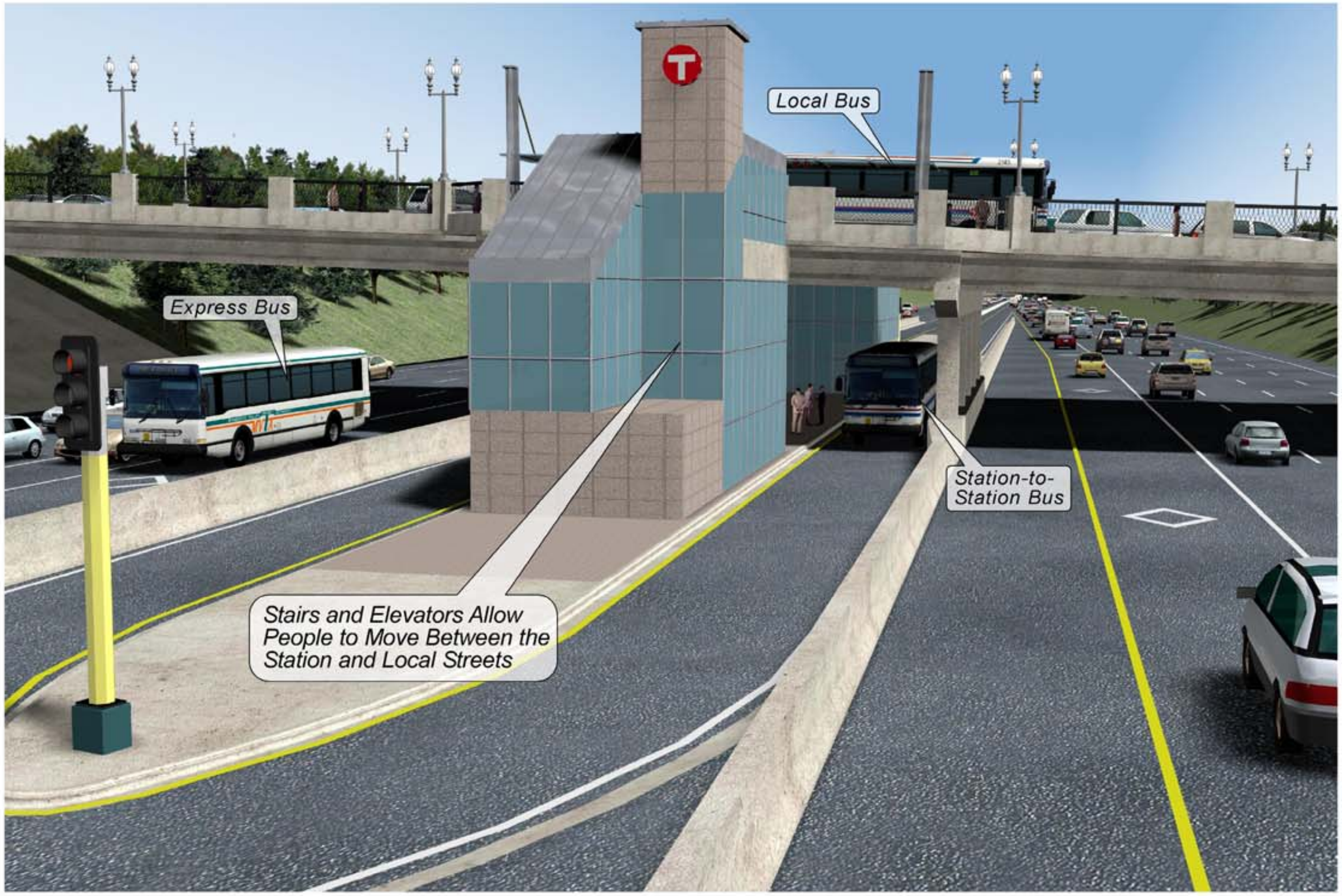


Figure 31
I-35W BRT Corridor Study
Station Simulation
January 2005
URS

Estimated Costs

The annual subsidy to pay for operating, maintenance and administrative costs associated with serving 43,000 passengers per day is estimated to be $33 million and assumes 35% of the total cost ($51 million) is funded through passenger fares. This compares with an estimated annual subsidy today of approximately $16 million.

Summarized below are the estimated capital costs associated with implementing BRT service in the I-35W Corridor. It is important to note that the costs identified here are for investments that are not currently planned and require new funding commitments.

All Costs are Expressed as Year 2004 Dollars

Capital Cost Item[1]	Estimated Cost
PHASE I	
Buses[2]	
4 Buses	$ 1,180,000
On-Line BRT Stations	
46th Street BRT Station	$ 5,000,000
Park and Ride Sites	
440 Space Surface Parking & I-35 Access at Lakeville North	$ 2,000,000
Bus Shoulders	
4.2 Miles of Bus Shoulders Between Highway 13 and CO RD 46	$ 1,500,000
PHASE II	
Buses[2]	
61 Buses *(In additon to those added under Phase I)*	$ 17,995,000
On-Line BRT Stations	
Lake Street BRT Station	$ 5,000,000
I-494 Corridor BRT Station	$ 5,000,000
LONG-TERM VISION	
Buses[2]	
61 Buses *(In addition to those added under Phases I & II)*	$ 17,995,000
Potential Additional Costs	
Parking Structure at Lakeville North	
Interchange Improvements at CO RD 50 & I-35, *if Warranted*	
Pedestrian Connection & On-Line Station at Lakeville North	
Improvements for Buses at CO RD 70 & I-35 Park & Pool Lot	
Additional Park and Ride Sites	
Additional On-Line Transit Stations (38th, 66th & 98th Streets)	
Improved Transit Facilities in Downtown Minneapolis	

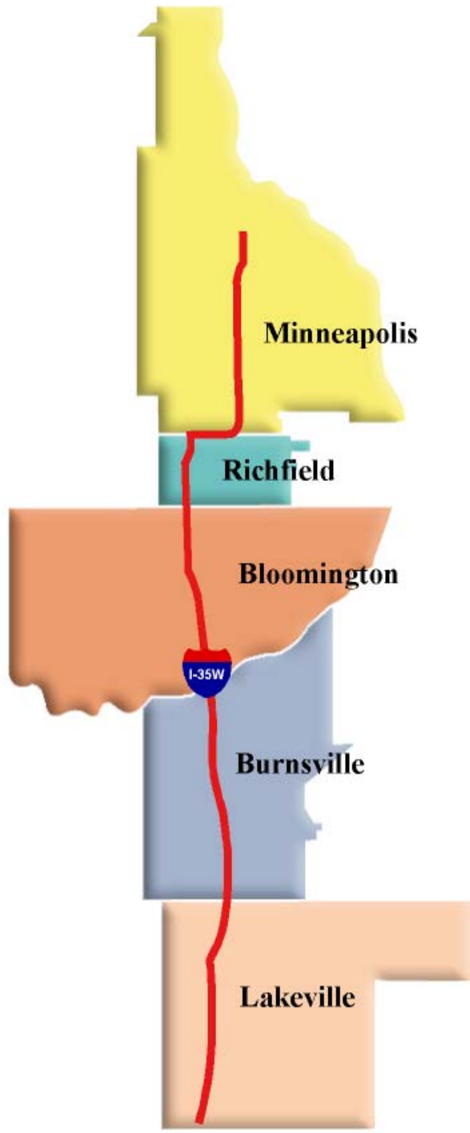
[1] *Costs of HOV lane construction are included in highway projects programmed in the Metropolitan Council's 20-Year Transportation Plan and Mn/DOT's 20-Year Transportation System Plan.*

[2] *Bus Numbers Reflect Express and Station-to-Station Buses*

CHAPTER 1.0 – PROJECT OVERVIEW

I-35W Corridor

The I-35W Corridor between Downtown Minneapolis and Lakeville is one of the most heavily traveled in the Twin Cities, serving approximately 180,000 vehicles per day at Lake Street in south Minneapolis. It is also one of the busiest transit corridors in the region, serving approximately 15,000 bus riders per day. Over the next 25 years, the corridor is expected to experience significant levels of employment and population growth, resulting in very strong travel demand throughout the corridor.



As a result, there is a growing interest in improving public transit service in the corridor that includes exploring the feasibility of providing Bus Rapid Transit (BRT) service. This interest led the State Legislature to pass a bill in 2003 requiring the Minnesota Department of Transportation, (Mn/DOT) to study[1] the feasibility of BRT in the corridor and make recommendations for its implementation. The legislation is reprinted in Appendix A of this report.

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[1] Mn/DOT hired the consulting firm of URS to assist with this study.

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University of Minnesota Transitway

In the Twin Cities, a range of BRT features are being used in the I-35W Corridor and other corridors as well. These features include:

- Buses operating on bus shoulder lanes.
- The University of Minnesota’s Transitway that connects the Minneapolis and St. Paul campuses.
- Traffic signal priority on the University of Minnesota’s Transitway.
- Bus stations located immediately adjacent to the shoulders of I-35W at Lake Street.
- Special lanes that allow buses and High Occupancy vehicles (HOVs) to bypass ramp meters.
- An Automatic Vehicle Location (AVL) system used by Metro Transit.
- A region-wide “Go - To Card” for electronic payment of fares, (under development).

Advanced technologies often associated with BRT include:

- Up-to-the minute electronic traveler information to alert commuters when the next vehicle is approaching.
- Automated pre-board fare collection methods to speed fare transactions.
- Traffic Signal preemption systems giving BRT vehicles a green light at busy intersections upon detection of an approaching vehicle.

CHAPTER 1.0 – PROJECT OVERVIEW

BRT is quickly becoming the mode of choice for commuters in a number of metropolitan areas throughout Europe, Australia, South America, the U.S. and Canada. North American cities currently operating or planning to operate BRT systems include:

- Boston, MA
- Charlotte, NC
- Cleveland, OH
- Eugene, OR
- Hartford, CT
- Houston, TX
- Miami, FL
- New York, NY
- Pittsburgh, PA
- Seattle, WA
- Ottawa, Ontario
- Vancouver, British Columbia

During the course of the study, the Federal government released an informative document on BRT. The report was published in August 2004 by the Federal Transit Administration and is titled, Characteristics of Bus Rapid Transit for Decision-Making. A copy of the report can be found on the Internet at http://www.fta.dot.gov/documents/CBRT-decisionmaking.pdf.

Guiding Principles

To help guide the direction of the study and provide technical assistance, a Technical Advisory Committee was formed and met over the course of the study to discuss key elements. Members of this working group included the following:

Lisa Cerney, City of Minneapolis
Robert Morgan, City of Minneapolis
Gene Franchett, Dakota County
Derek Crider, Hennepin County
Lezlie Vermillion, Scott County
John Griffith, Mn/DOT
Lisa Freese, Mn/DOT
Mike Schadauer, Mn/DOT
Nancy Daubenberger, Mn/DOT
Paul Czech, Mn/DOT
Tom O'Keefe, Mn/DOT
Tim Anderson, FHWA
Adam Harrington, Metro Transit
Connie Kozlak, Metropolitan Council
Tom Thorstenson, Metro Transit
Mike Abegg, Minnesota Valley Transit Authority

To help guide the study's effort and develop a workable implementation plan, the following set of guiding principles were developed:

- Allow Buses to Operate at Posted Speeds
- Maximize Freeway Capacity
- Minimize Impacts on Right-of-Way
- Make Transit a Competitive Choice to Autos
- Utilize Existing Resources to the Greatest Extent Possible

Mn/DOT representatives and members of the consulting team also held a number of meetings with staff from the affected cities, State Legislators, and the I-35W Solutions Alliance. Additionally, public open houses were conducted in Minneapolis and Burnsville. A summary of the comments from the open houses can be found in Appendix C.

Report Organization

This report provides an overview of current and future conditions in the I-35W Corridor (Chapter 2), discusses alternative BRT elements (Chapter 3), describes the benefits, costs and challenges for BRT in the corridor (Chapter 4) and presents a phased plan for implementing BRT (Chapter 5). Additionally, Appendix D contains an earlier report produced as part of this study that provided guidance to Mn/DOT on the requirements of a bus transitway as it passes through the I-35W/Highway 62 Interchange.

CHAPTER 2.0 – CURRENT AND FUTURE CONDITIONS

Transit Services and Facilities in the I-35W Corridor

The I-35W Corridor is one of the most heavily traveled in the Twin Cities and serves 14,000 - 15,000 transit riders per weekday[1]. Most transit users travel to work in Downtown Minneapolis making the I-35W Corridor the region's most heavily used corridor for express bus service. Three public transit operators operate daily scheduled service in the I-35W Corridor – Metro Transit, Minnesota Valley Transit Authority, (MVTA) and the City of Prior Lake's Laker Lines service.

There are several existing features in the I-35W Corridor that improve travel times and convenience for transit users. These features include the following:

- Shoulder Bus Lanes – In several stretches of I-35W, buses are permitted to operate on the shoulders of the freeway. By State Law, buses are permitted to travel up to 35 MPH, but not more than 15 MPH faster than existing traffic conditions. During rush hour, this often provides buses with a faster travel time then automobiles.
- High Occupancy Vehicle (HOV) Lanes – Between 66th Street and Highway 13, HOV lanes exist that are also used by buses. In most instances, buses using HOV lanes experience faster travel times than single occupant vehicles.
- Ramp Meter Bypass Lanes – At several entrance ramps to I-35W, buses can take advantage of dedicated lanes that allow car poolers to by pass ramp meters and directly enter the freeway.
- On-Line Bus Stops at Lake Street – Two bus stops (north and south bound) are located just off the shoulder of I-35W and Lake Street. The bus stops are connected to Lake Street via a set of stairs, which allows passengers to transfer between buses operating on I-35W and local routes operating on Lake Street.
- Bus Stops Immediately Adjacent to I-35W - Bus stops are located immediately adjacent to the entrance/exit ramps at 46th Street, Diamond Lake Road, 66th Street, 82 Street and 98th Street. The location of these bus stops minimizes the amount of travel that the buses travel on local roads before they re-enter the freeway.
- Park and Ride Parking Spaces – There are over 2,100 parking spaces immediately adjacent to I-35W where people can park and catch a bus. Approximately 700 of these spaces were made available in December 2004. An additional 2,100 parking spaces are located on other regional corridors with bus service using I-35W.

Transit Passengers

Based on data gathered for Metro Transit's Central South Transit Study, the number of people using public transit service in the I-35W Corridor is concentrated in the morning peak period (6:00 AM – 9:00 AM) and during the evening peak period (3:00 PM – 6:00 PM). Seventy-five percent of all I-35W Corridor transit passengers travel through the corridor during these peak periods.

[1] Sum of Average Trip Ridership by Hour as provided by Metro Transit.

Transit ridership outside of these peak periods falls off dramatically. Tables 1 and 2 show the distribution of transit passengers, by hour, as they travel through the I-35W Corridor.

Another characteristic of transit service in the I-35W Corridor is the high concentration of bus volumes north of Highway 62 as bus routes come together on I-35W to complete (or begin) their trip.

During the morning commute, northbound routes originate in a number of different locations, then become concentrated on I-35W north of Highway 62. Approximately 33% of all trips in the corridor originate south of Highway 62, with another 31% of the trips entering the Corridor from westbound Highway 62. Approximately 7% of all trips enter the corridor from eastbound Highway 62 and approximately 29% of all trips during the morning peak hour enter the corridor north of Highway 62. Figure 1 on page 2-5 depicts the northbound bus volume, north of Highway 62, during the morning peak hour.

The distribution of southbound bus volume in the afternoon is similar to the morning bus volume and is shown in Figure 2 on page 2-6.

Park and Ride Facilities

There are over 2,100 parking spaces immediately adjacent to I-35W where people can park and catch a bus. These sites are summarized below:

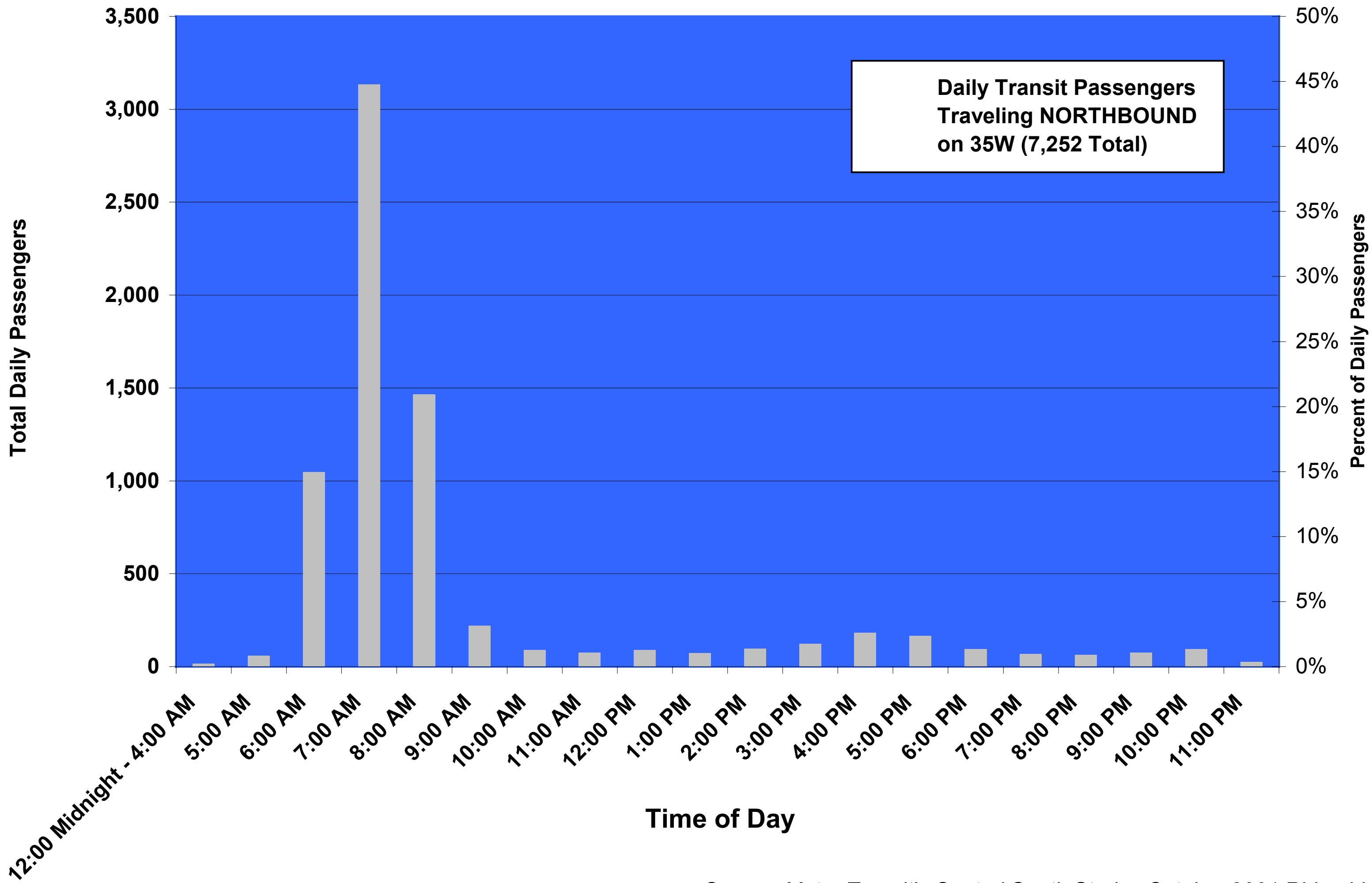
- 76th Street/I-494 Access, Richfield *(New in December, 2004)*.........635 Spaces
- 98th Street Access, Bloomington *(85 New in December, 2004)*........205 Spaces
- Burnsville Transit Station ....1,260 Spaces
- 62nd Street and Nicollet Avenue, Minneapolis ....19 Spaces

Figure 3 on page 2-7 was prepared by Metro Transit as part of their Central South Study that included the I-35W Corridor. The graphic depicts the distribution of vehicles that park in various park and ride lots in the southern metro area.

An additional 2,450 parking spaces are located on other regional corridors with bus service using I-35W as follows:

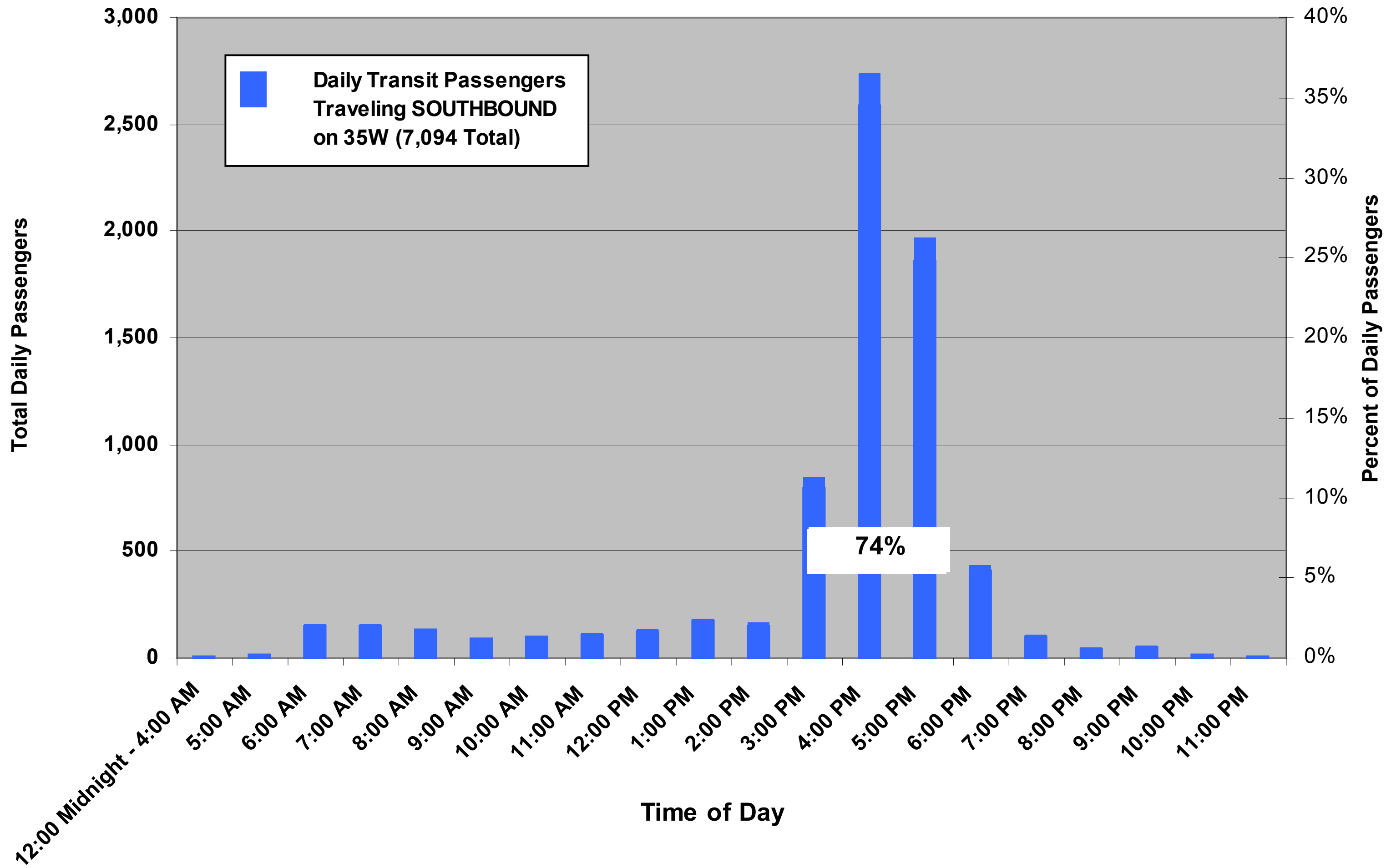
- Apple Valley – Palomino Hills .... 304 Spaces
- Apple Valley Transit Station ....450 Spaces
- Eagan Transit Station...750 Spaces
- Eagan Blackhawk Park and Ride...283 Spaces
- Burnsville Heart of the City ....350 Spaces
- Savage Park and Ride ....195 Spaces
- Woodlake Lutheran Church, Richfield.......................................30 Spaces
- Richfield Municipal Pool..25 Spaces
- City of Prior Lake Municipal Parking Lot..................................65 Spaces

Table 1. Distribution by Hour of Transit Passengers Traveling NORTHBOUND on I-35W

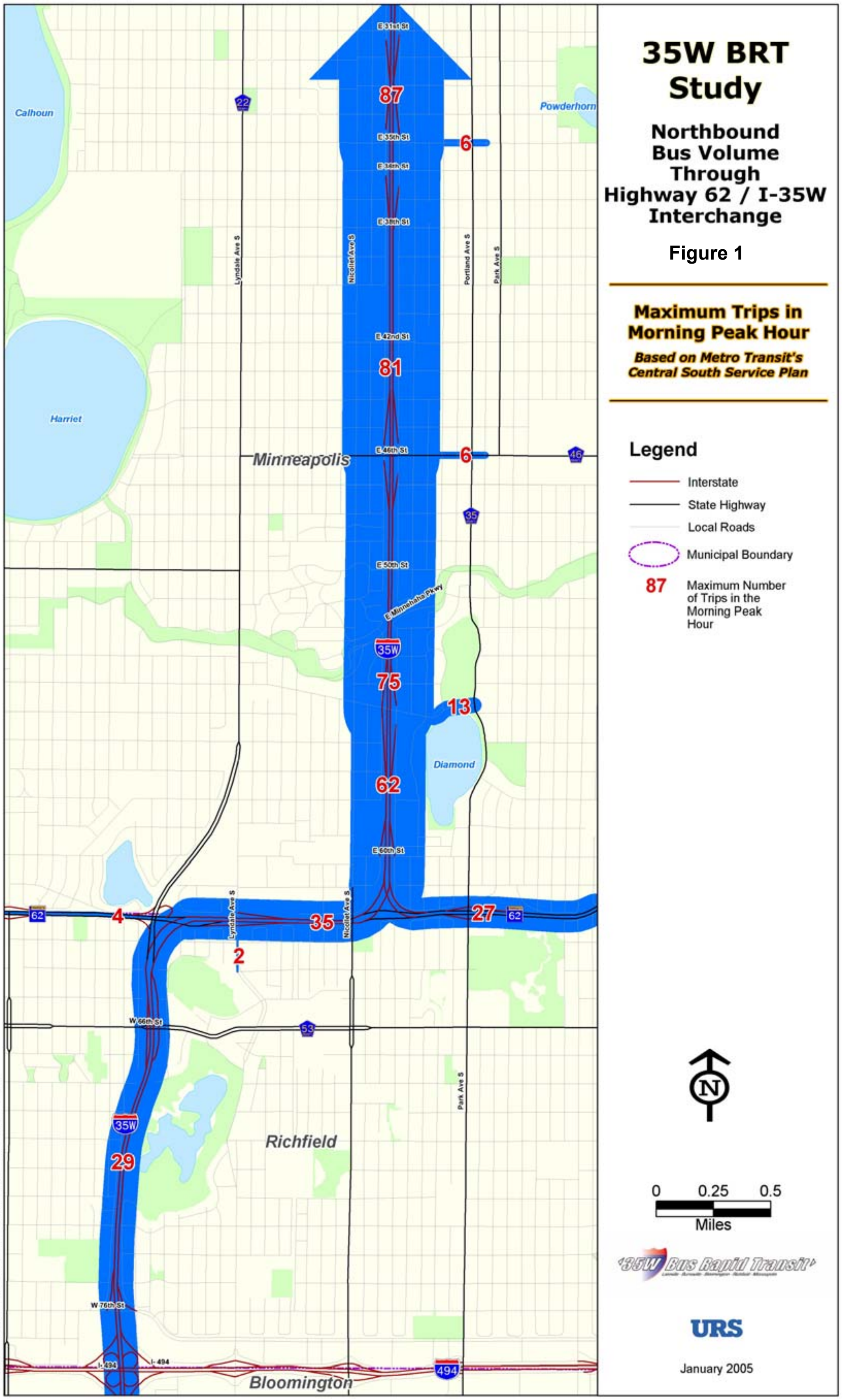


Source: Metro Transit's Central South Study: October 2001 Ridership

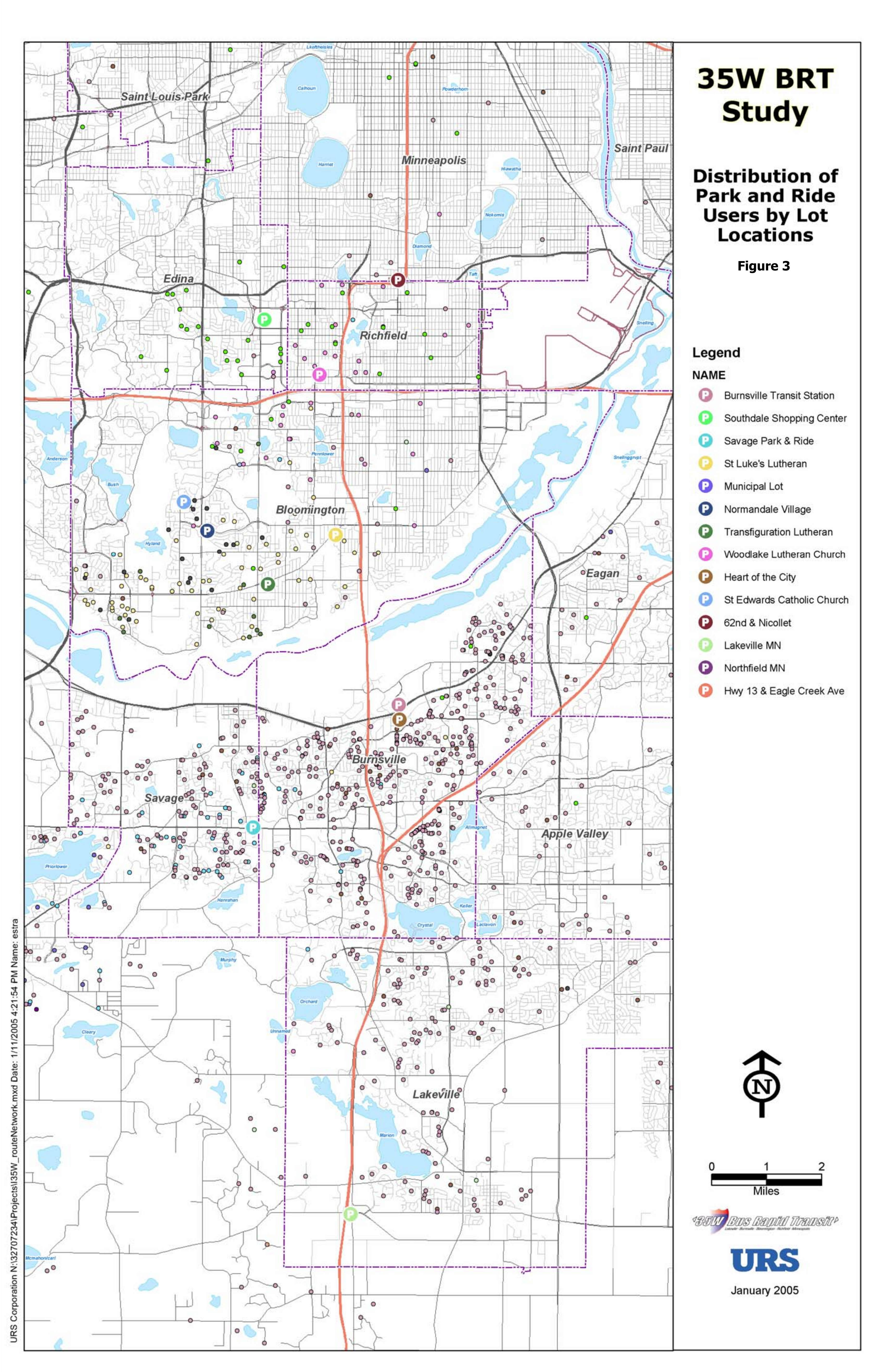
Table 2. Distribution by Hour of Transit Passengers Traveling SOUTHBOUND on I-35W



Source: Metro Transit's Central South Study: October 2001 Ridership


35W BRT Study
Northbound Bus Volume Through Highway 62 / I-35W Interchange
Figure 1
Maximum Trips in Morning Peak Hour
Based on Metro Transit's Central South Service Plan
Legend
Interstate
State Highway
Local Roads
Municipal Boundary
87
Maximum Number of Trips in the Morning Peak Hour
0
0.25
0.5
Miles
35W Bus Rapid Transit
URS
January 2005
Calhoun
Harriet
Powderhorn
Diamond
Minneapolis
Richfield
Bloomington
E 31st St
E 35th St
E 36th St
E 38th St
E 42nd St
E 46th St
E 50th St
E Minnehaha Pkwy
E 60th St
W 66th St
W 76th St
Lyndale Ave S
Nicollet Ave S
Portland Ave S
Park Ave S
I-494
87
6
81
6
75
13
62
4
35
27
2
29

35W BRT Study
Southbound Bus Volume Through Highway 62 / I35W Interchange
Figure 2
Maximum Trips in One Evening Peak Hour
Based on Metro Transit's Central South Service Plan
Legend
Interstate
State Highway
Local Roads
Municipal Boundary
82
Maximum Number of Trips in the Morning Peak Hour
0
0.25
0.5
Miles
35W Bus Rapid Transit
URS
January 2005
E 31st St
82
Calhoun
22
Powderhorn
4
E 35th St
E 36th St
E 38th St
Lyndale Ave S
Nicollet Ave S
Portland Ave S
Park Ave S
78
E 42nd St
Harriet
E 46th St
6
Minneapolis
46
35
72
E 50th St
E Minnehaha Pkwy
35W
11
E Diamond Lake Rd
Diamond
61
E 60th St
2
62
4
34
27
62
28
W 66th St
53
Park Ave S
Richfield
35W
W 76th St
I-494
I- 494
494
Bloomington


35W BRT Study
Distribution of Park and Ride Users by Lot Locations
Figure 3
Legend
NAME
Burnsville Transit Station
Southdale Shopping Center
Savage Park & Ride
St Luke's Lutheran
Municipal Lot
Normandale Village
Transfiguration Lutheran
Woodlake Lutheran Church
Heart of the City
St Edwards Catholic Church
62nd & Nicollet
Lakeville MN
Northfield MN
Hwy 13 & Eagle Creek Ave
Saint Louis Park
Minneapolis
Saint Paul
Edina
Richfield
Bloomington
Eagan
Burnsville
Savage
Apple Valley
Lakeville
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Miles
35W Bus Rapid Transit
URS
January 2005
URS Corporation N:\32707234\Projects\I35W_routeNetwork.mxd Date: 1/11/2005 4:21:54 PM Name: estra

In the fall of 2003, Metro Transit, Metropolitan Council and MVTA conducted a region-wide license plate survey of vehicles at park and ride lots. They survey included the Burnsville Transit Station, (located on Highway 13, just off of I-35W) which is the largest park and ride lot in the I-35W Corridor. The survey results are based on the home address of the vehicle's registered owner and are listed in Table 3.

Table 3. License Plate Survey Results

License Plate Survey Results*

Fall 2003 - Burnsville Transit Station

City of Vehicle Registration	Percentage	Approximate Number
Burnsville	39%	497
Lakeville	14%	178
Savage	13%	166
Other Metro	6%	76
Outstate	6%	76
Prior Lake	5%	64
Shakopee	5%	64
Other Scott County	5%	64
Eagan	3%	38
Apple Valley	2%	25
Farmington	1%	13
Rosemount	<1%	5
Mendota Heights	<1%	4
Other Dakota County	<1%	4
	100%	1,274

** Information Provided by MVTA*

The survey findings suggest that over ½ of all people who park at the Burnsville Transit Station reside in communities that are outside of MVTA's service area.

<u>Service Changes Ahead</u>

Metro Transit has recently concluded a comprehensive study of transit services in the southern metropolitan area that includes the I-35W Corridor. Known as the "Central South Study", there were four primary opportunities identified to improve the productivity and efficiency of public transit services in the study area as follows:

- Speed up the system – service is slow due to closely spaced bus stops and slow fare collection.
- Improve service frequency – Given a choice, people will choose more frequent service within reasonable distances.
- Simplify the route structure – The current system is too complex and confusing to existing and potential new riders.
- Enhance midday and weekend service – Increasingly, people need to travel outside the traditional rush hour commute periods.

CHAPTER 2.0 – CURRENT AND FUTURE CONDITIONS

Metro Transit's Central South Study plan calls for express bus service improvements in the I-35W Corridor as follows:

Restructure service to provide all-day, high frequency service along the corridor, allowing customers to drive to park-and-ride lots and catch the next trip rather than having to plan for a specific trip. Convert the local portions of some south Bloomington express routes to shuttles connecting residents with express service. Some local service extensions of express routes will remain where ridership is highest. Stations (some with park-and-ride lots) will provide transit center access to the express service at Bloomington South Transit Center (98th Street), 82nd Street, Southtown, Best Buy headquarters, 76th Street, 66th Street, 46th Street and Lake Street.

The planned implementation will have two phases. Phase one will introduce the stations, connecting services and limited park and ride lots. The long-term Phase Two would bring extensive exclusive bus lanes, additional (38th Street) or relocated stations (such as at 82nd Street), expanded and additional park–and-rides together with increased frequency to meet the "show up and ride" doctrine.

The graphic on the following page is from Metro Transit's Central South Study and depicts the final plan for bus service in the Central South area. The complete Central South report can be found at: http://www.metrotransit.org/improvingTransit/centralSouthFinalPlan.asp

Traffic Conditions

This section presents a discussion on the current and expected future vehicle traffic operations along the I-35W Corridor during the northbound AM peak hour commute. Mn/DOT has recently completed or are currently completing preliminary roadway layout plans for the future reconstruction of various pieces of I-35W between 90th Street and downtown Minneapolis. As part of the layout development process, detailed traffic modeling and analysis has been completed evaluating existing and forecast 2030 conditions. This BRT Study utilizes the results of the past modeling efforts to document traffic operations within the I-35W Corridor. For the segments of I-35, south of 90th Street, a freeway capacity analysis was completed as will be discussed in the following section.

Roadway Characteristics

I-35W serves a large geographic region of commuters traveling between the southern suburbs and Minneapolis. The Minnesota River traverses east/west, introducing a physical barrier between the southern suburbs and Minneapolis. The three primary river crossings, which serve the majority of the southern suburbs with destination or origins within Minneapolis, are I-35W, TH 169 and TH 77. I-35W is approximately 26 miles in length between CR 70 and downtown Minneapolis. Within this Corridor there are three major system-to-system interchanges (TH 13, I-494 and TH 62), which serve as primary connections to and from east/west locations.

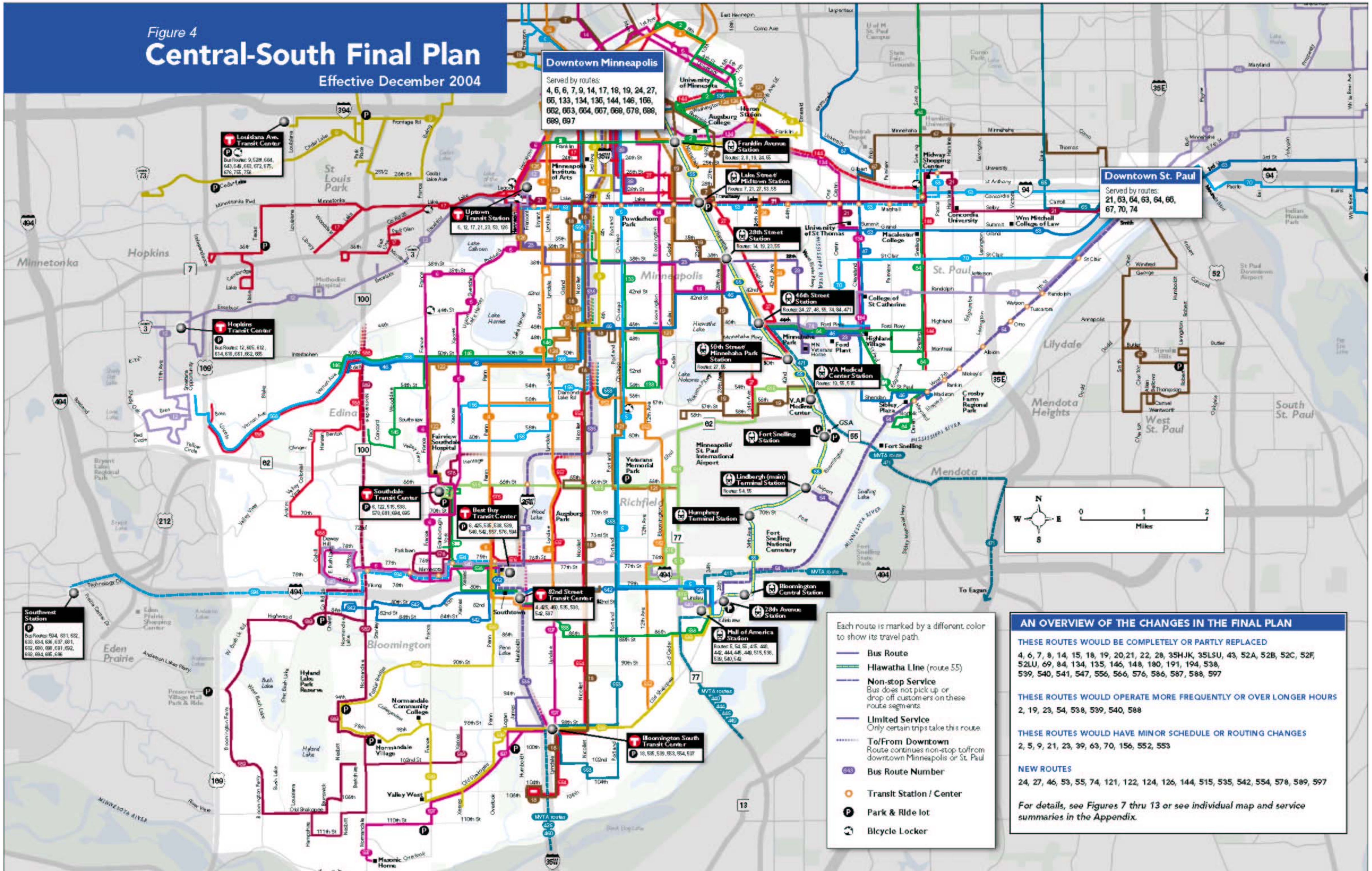


Figure 4
Central-South Final Plan
Effective December 2004
Downtown Minneapolis
Served by routes:
4, 5, 6, 7, 9, 14, 17, 18, 19, 24, 27, 65, 133, 134, 135, 144, 146, 156, 652, 653, 654, 657, 658, 678, 688, 689, 697
Downtown St. Paul
Served by routes:
21, 53, 54, 63, 64, 65, 67, 70, 74
Each route is marked by a different color to show its travel path.
Bus Route
Hiawatha Line (route 55)
Non-stop Service
Bus does not pick up or drop off customers on these route segments.
Limited Service
Only certain trips take this route
To/From Downtown
Route continues non-stop to/from downtown Minneapolis or St. Paul
Bus Route Number
Transit Station / Center
Park & Ride lot
Bicycle Locker
AN OVERVIEW OF THE CHANGES IN THE FINAL PLAN
THESE ROUTES WOULD BE COMPLETELY OR PARTLY REPLACED
4, 6, 7, 8, 14, 15, 18, 19, 20,21, 22, 28, 35HJK, 35LSU, 43, 52A, 52B, 52C, 52F, 52LU, 69, 84, 134, 135, 146, 148, 180, 191, 194, 538, 539, 540, 541, 547, 556, 566, 576, 586, 587, 588, 597
THESE ROUTES WOULD OPERATE MORE FREQUENTLY OR OVER LONGER HOURS
2, 19, 23, 54, 538, 539, 540, 588
THESE ROUTES WOULD HAVE MINOR SCHEDULE OR ROUTING CHANGES
2, 5, 9, 21, 23, 39, 63, 70, 156, 552, 553
NEW ROUTES
24, 27, 46, 53, 55, 74, 121, 122, 124, 126, 144, 515, 535, 542, 554, 578, 589, 597
For details, see Figures 7 thru 13 or see individual map and service summaries in the Appendix.
Minneapolis
St. Paul
Richfield
Bloomington
Edina
Hopkins
Minnetonka
St Louis Park
Eden Prairie
Mendota Heights
West St. Paul
South St. Paul
Lilydale
Mendota
To Eagan
N
W
E
S
0
1
2
Miles

CHAPTER 2.0 – CURRENT AND FUTURE CONDITIONS

The following generalizes the existing roadway characteristics between CR 70 and downtown Minneapolis. Existing key roadway features are graphically illustrated in Figures 5 through 11.

Existing

- I-35/I-35W is a four-lane freeway (two-lanes in each direction) between CR 70 and Burnsville Parkway. A short segment of I-35 immediately south of the I-35W/35E split to approximately CSAH 46 provides a six-lane cross-section.
- Beginning (northbound) and ending (southbound) in the vicinity of Burnsville Parkway a peak period HOV lane is provided. The HOV lane is the leftmost travel lane in both directions extending northbound to 82nd Street and beginning southbound at 66th Street. Through out this segment, the general roadway cross-section provides two through travel lanes and the HOV lane.
- The TH 62/I-35W Crosstown Commons Interchange provides two through travel lanes for I-35W traffic; however, significant lane changing and weaving patterns are forced throughout the interchange.
- North of TH 62, I-35W is a six-lane freeway (three lanes in each direction) to 46th Street.
- Between 46th Street and downtown Minneapolis, four travel lanes are provided in both the northbound and southbound directions.
- Posted speeds throughout the corridor range from 55 mph north of 90th Street, 65 mph between 90th Street and CSAH 42 and 70 mph south of CSAH 42.
- A truck-climbing lane is provided on the uphill grade in the northbound direction of I-35W, between the river bridge and the 106th Street entrance ramp.
- Interchange density throughout the I-35W Corridor ranges from less than one per mile south of the I-35W/35E split to an increase of nearly two interchanges per mile approaching downtown Minneapolis.
- Mn/DOT is in the preliminary design phase for several improvement projects within the I-35W Corridor. For each of these improvements, preliminary freeway and interchange layouts have either been completed or in the process of being completed. Estimated project completion dates are highly dependent upon future funding; however, the improvements are expected to be completed many years prior to the 2030 study horizon for this BRT study.

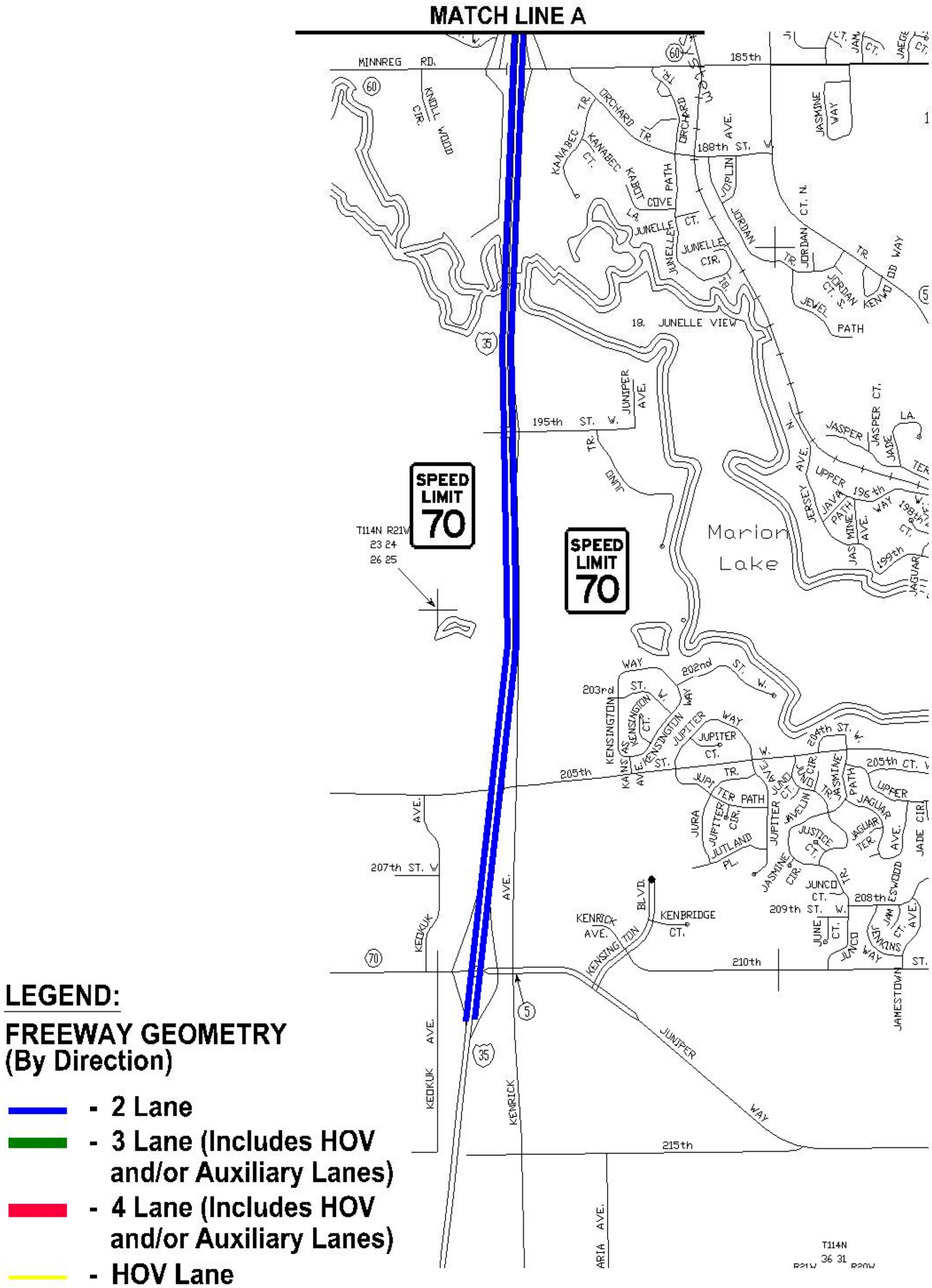


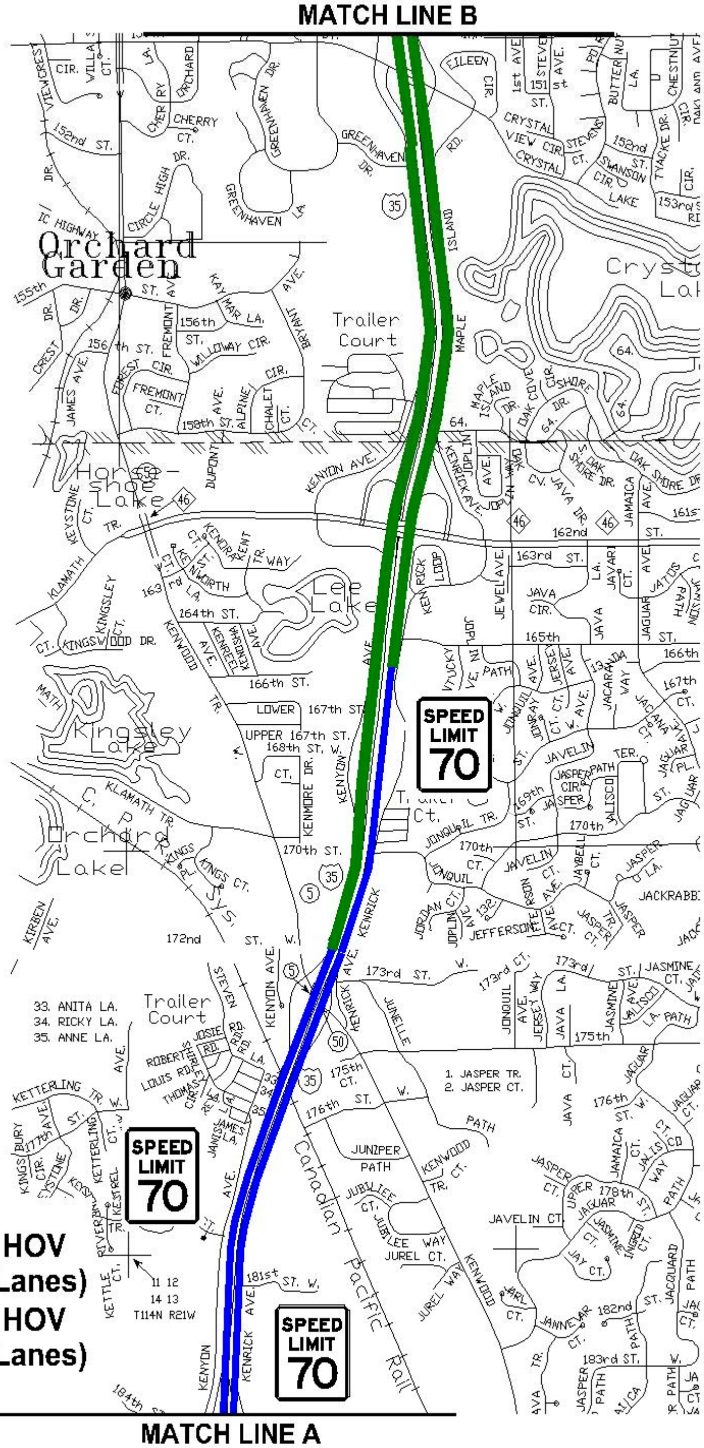
Figure 5

I-35W Bus Rapid Transit
Lakeville - Burnsville - Bloomington - Richfield - Minneapolis

URS

North
Scale: 1" = 2000'

Roadway Geometrics
2004 Existing Conditions



LEGEND:

FREEWAY GEOMETRY (By Direction)

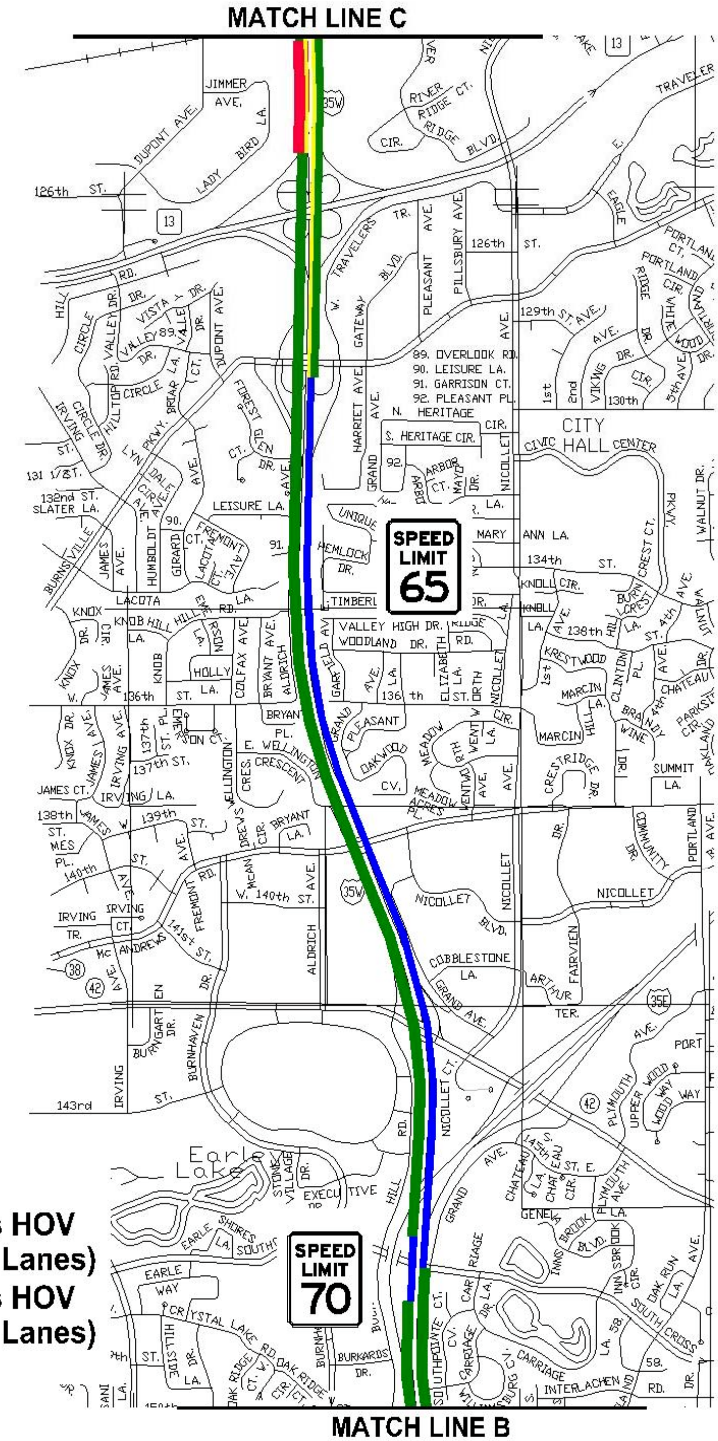
- 2 Lane
- 3 Lane (Includes HOV and/or Auxiliary Lanes)
- 4 Lane (Includes HOV and/or Auxiliary Lanes)
- HOV Lane

I-35W Bus Rapid Transit
Lakeville - Burnsville - Bloomington - Richfield - Minneapolis

URS

North
Scale: 1" = 2000'

Figure 6
Roadway Geometrics 2004 Existing Conditions



LEGEND:

FREEWAY GEOMETRY (By Direction)

- 2 Lane
- 3 Lane (Includes HOV and/or Auxiliary Lanes)
- 4 Lane (Includes HOV and/or Auxiliary Lanes)
- HOV Lane

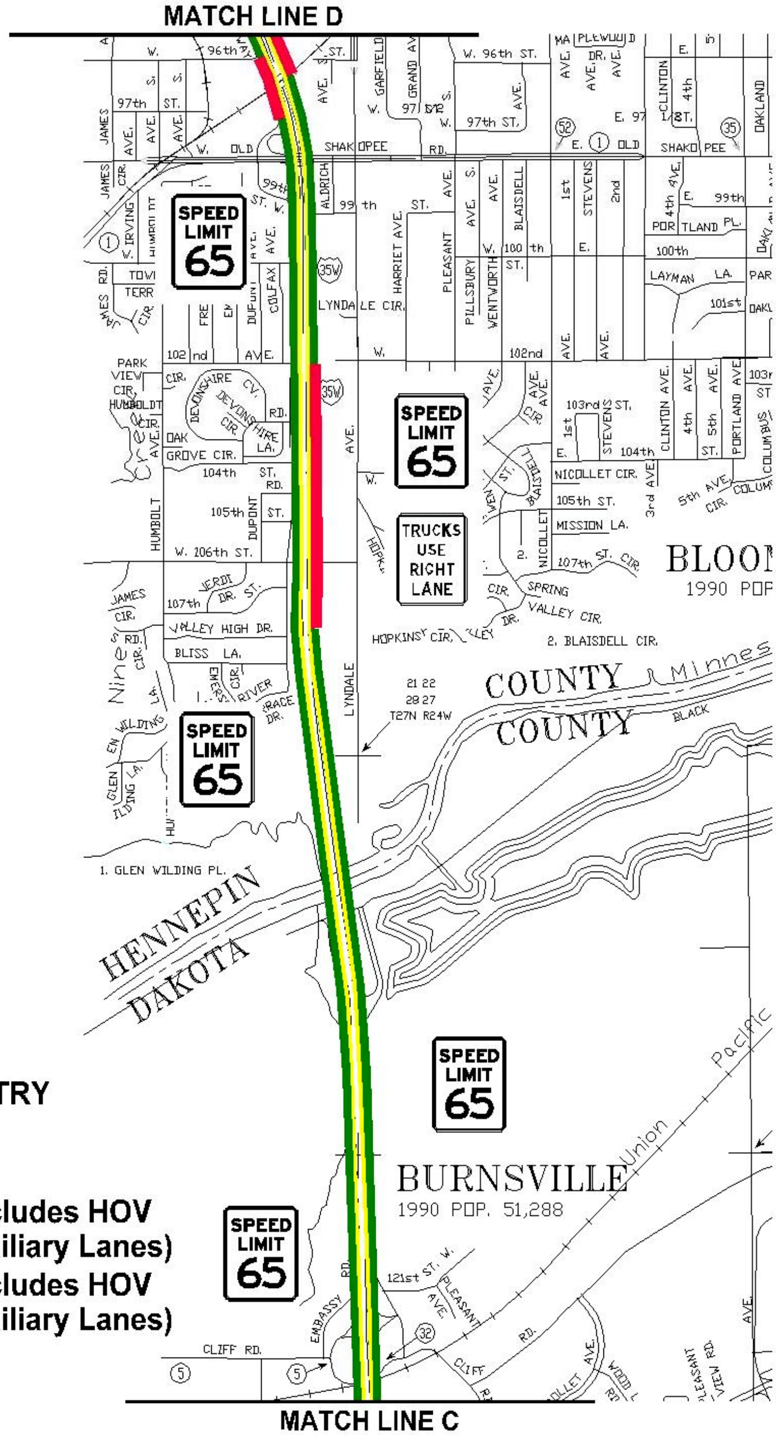
I-35W Bus Rapid Transit
Lakeville - Burnsville - Bloomington - Richfield - Minneapolis

URS

North
Scale: 1" = 2000'

Figure 7

Roadway Geometrics 2004 Existing Conditions



LEGEND:

FREEWAY GEOMETRY (By Direction)

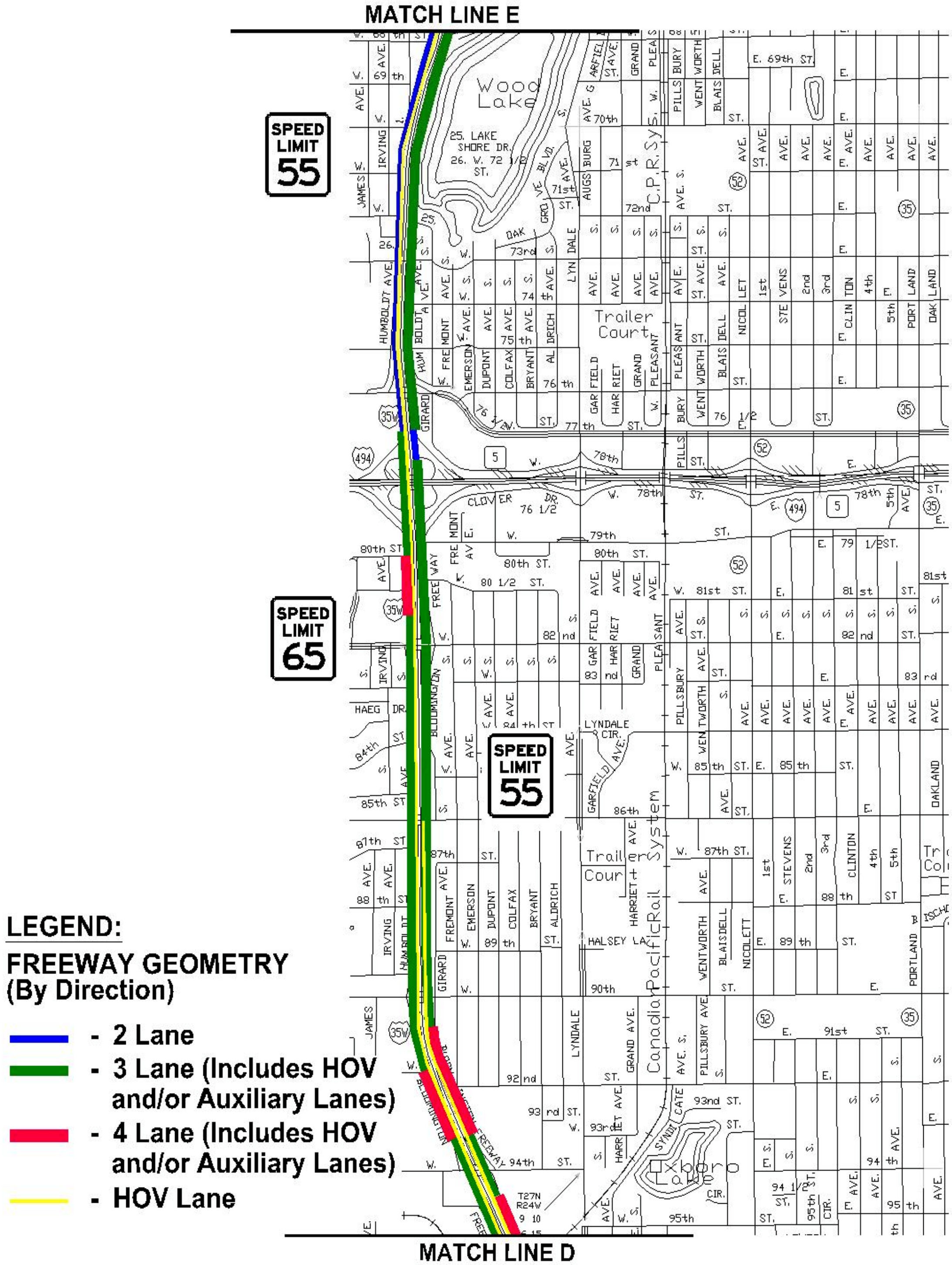
- 2 Lane
- 3 Lane (Includes HOV and/or Auxiliary Lanes)
- 4 Lane (Includes HOV and/or Auxiliary Lanes)
- HOV Lane

I-35W Bus Rapid Transit
Lakeville - Burnsville - Bloomington - Richfield - Minneapolis

URS

North
Scale: 1" = 2000'

Figure 8
Roadway Geometrics 2004 Existing Conditions



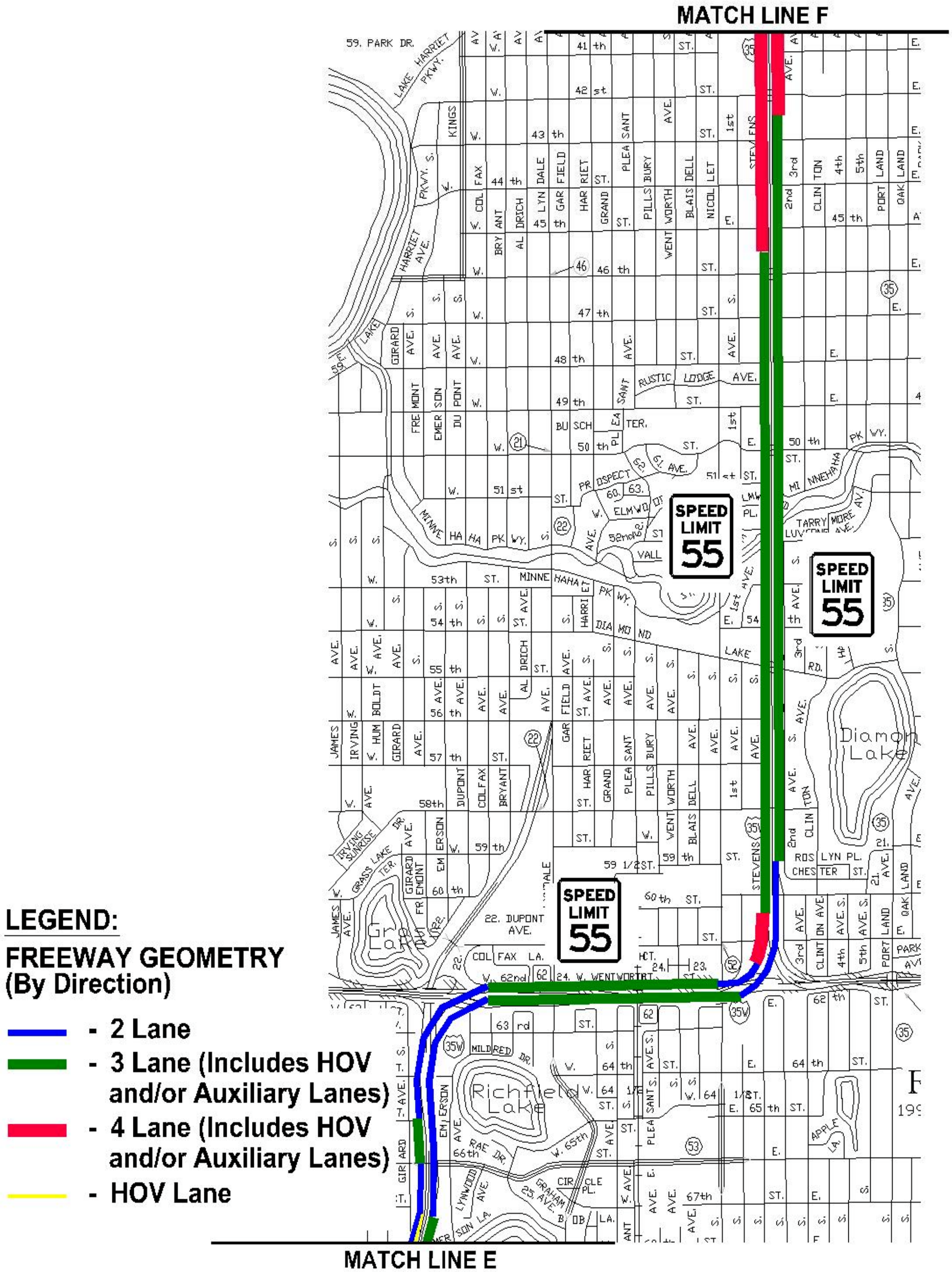
I35W Bus Rapid Transit
Lakeville - Burnsville - Bloomington - Richfield - Minneapolis

URS

North
Scale: 1" = 2000'

Figure 9

**Roadway Geometrics
2004 Existing Conditions**



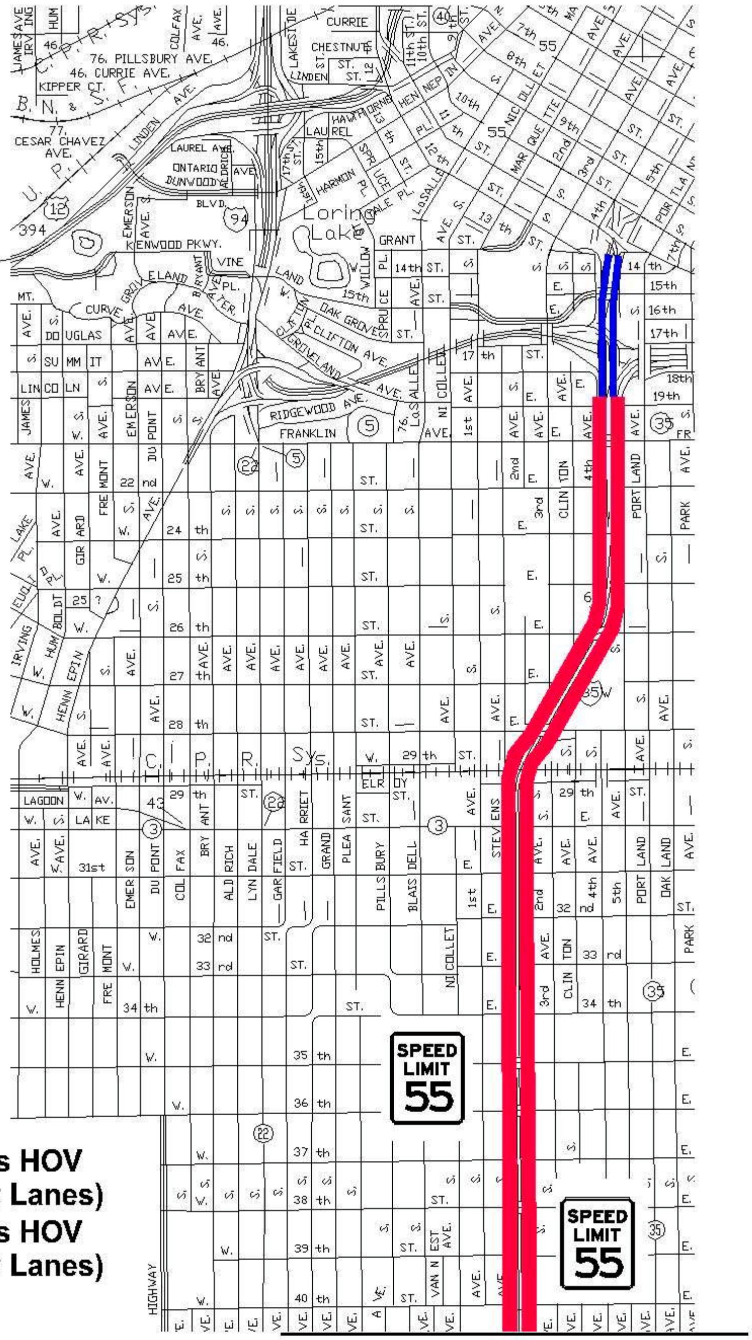
35W Bus Rapid Transit
Lakeville - Burnsville - Bloomington - Richfield - Minneapolis

URS

North
Scale: 1" = 2000'

Figure 10

Roadway Geometrics
2004 Existing Conditions



LEGEND:

FREEWAY GEOMETRY (By Direction)

- 2 Lane
- 3 Lane (Includes HOV and/or Auxiliary Lanes)
- 4 Lane (Includes HOV and/or Auxiliary Lanes)
- HOV Lane

35W Bus Rapid Transit — Lakeville - Burnsville - Bloomington - Richfield - Minneapolis

URS

North
Scale: 1" = 2000'

Figure 11

Roadway Geometrics 2004 Existing Conditions

The following generalizes the future roadway characteristic changes between CR 70 and downtown Minneapolis. Key roadway features are graphically illustrated in Figures 12 through 18.

Future 2030

- No improvement projects are currently planned between CR 70 and 90th Street.
- The I-494/I-35W interchange is a full-directional style interchange including northbound/southbound collector-distributor ramps and additional auxiliary lanes.
- In the northbound direction of I-35W, the overall number of through travel lanes for single-occupancy drivers is not expected to change between 90th Street and the Crosstown Commons Interchange.
- In the southbound and northbound directions, an auxiliary lane between the Highway 62 Interchange and new I-494/I-35W interchange is planned.
- The Crosstown Commons Interchange will be reconstructed to remove the weaving movements. Between the Crosstown Commons Interchange and downtown Minneapolis, reconstruction of I-35W to include the relocation/removal of interchanges (i.e., removal of 35th Street and 36th Street access and provision of a new interchange at 38th Street) and additional access at Lake Street is planned.
- Shared BRT/HOV lanes are expected to be added between 82nd Street and Downtown Minneapolis. The addition provides a continuous shared BRT/HOV lane between Burnsville Parkway and Minneapolis.
- The CSAH 70 interchange project is programmed for 2007 and lead by Dakota County and the City of Lakeville. This project will change this interchange to a "half-diamond" configuration, with ramps and loops to the south. To date, Mn/DOT has not committed any funding to this project.
- The CSAH 50 interchange is planned for reconstruction, and a concept has been adopted, but no dollars have been programmed by Mn/DOT for this interchange within the next 10 years.

<u>Previous I-35W Corridor Modeling Studies</u>

As part of the preliminary layout development for the planned freeway/interchange improvements between 90th Street and downtown Minneapolis, detailed traffic modeling using CORSIM (Corridor Simulation) was completed. The CORSIM models were used to replicate existing conditions and to test various alternative designs under forecast 2030 volume conditions. The traffic modeling and preliminary layouts are developed concurrently and meet both Mn/DOT and FHWA standards for interchange and freeway reconstruction.

The most notable requirement with respect to traffic operation is that the future freeway system layouts are to maintain acceptable operations throughout the system under the forecast design hour volumes. However, exceptions are granted where feasible improvement measures cannot be made. Measures of Effectiveness (MOE) outputs from the CORSIM models include vehicle average speed, freeway density and level of service.

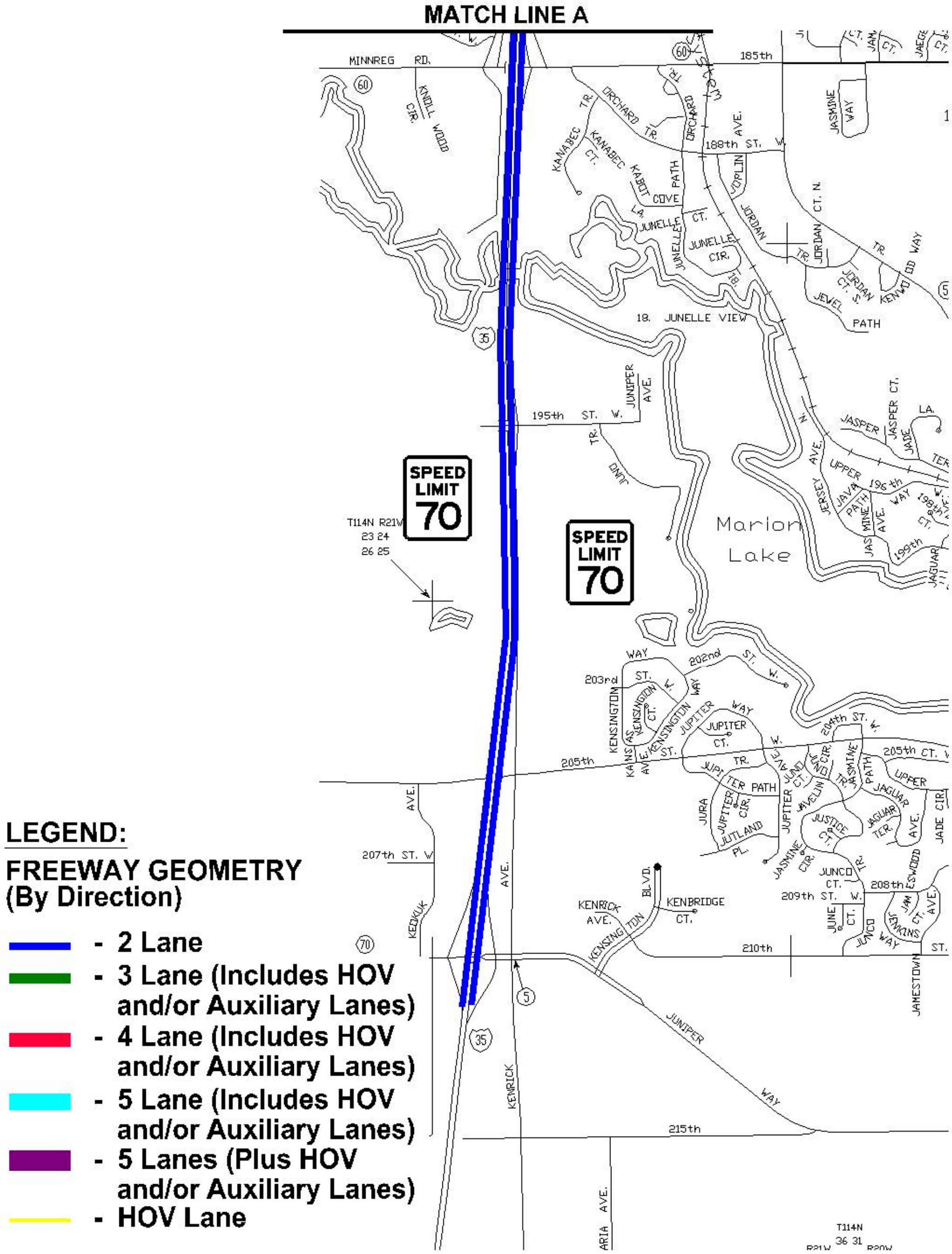


Figure 12

Roadway Geometrics 2030 Future Conditions

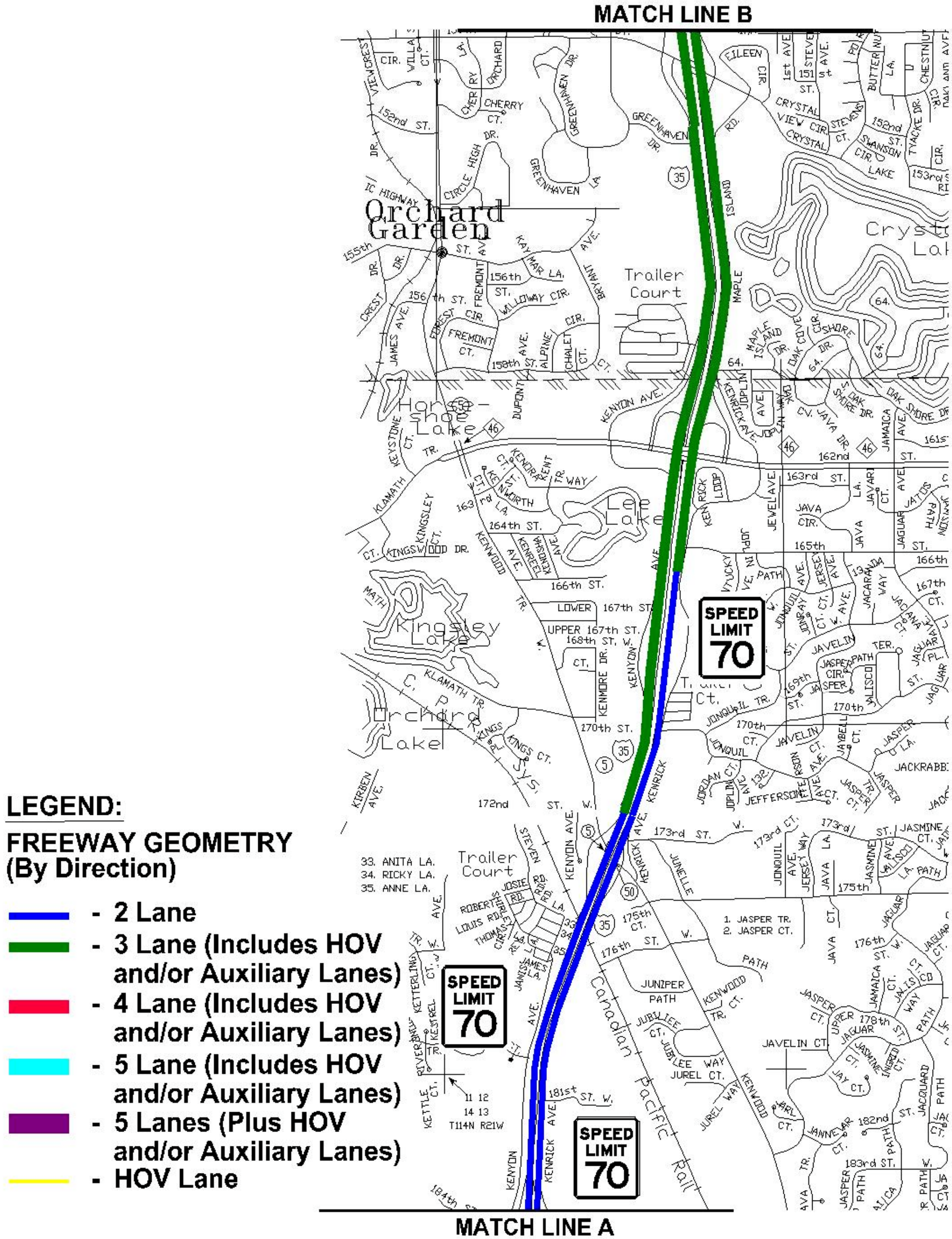


Figure 13

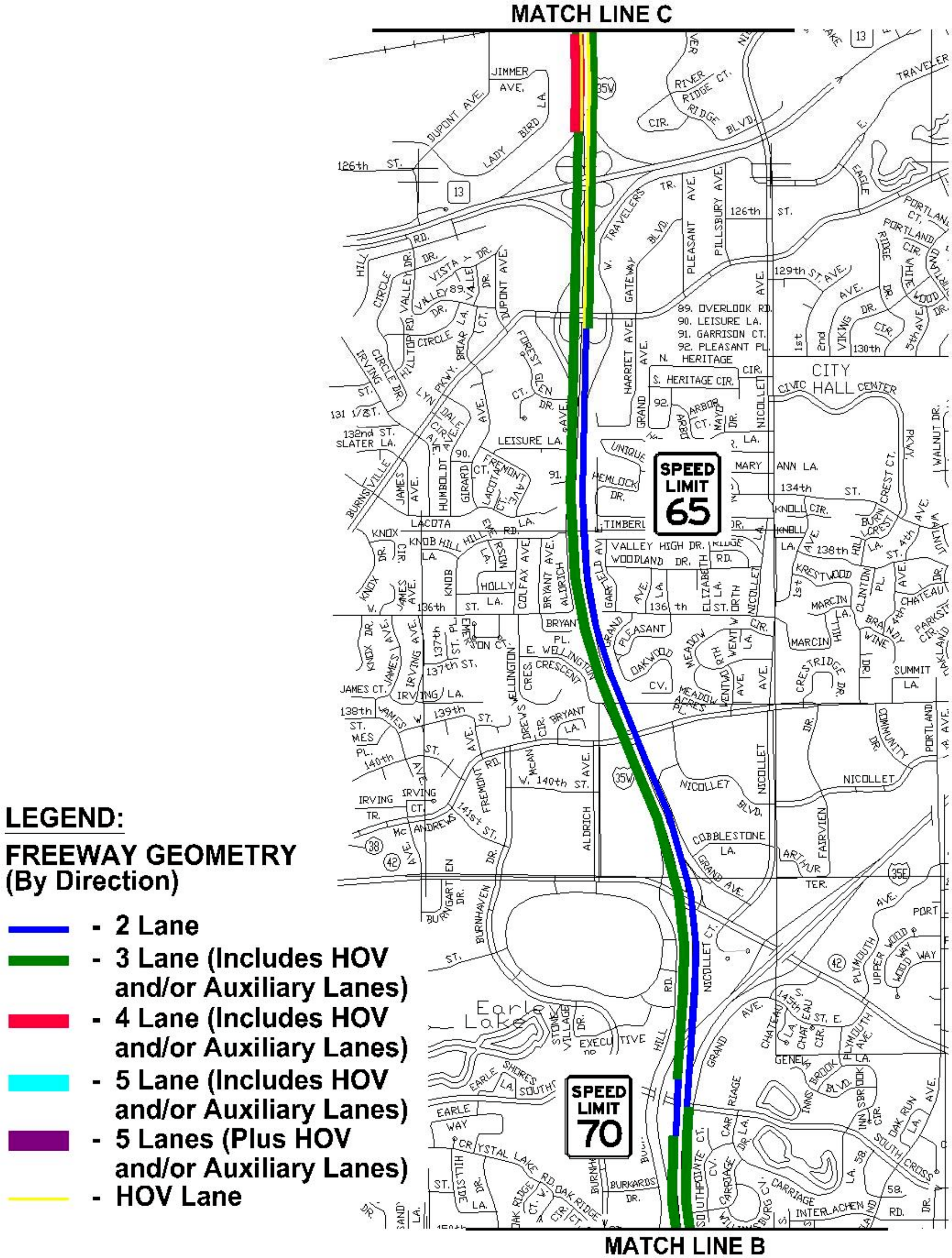
35W Bus Rapid Transit — Lakeville - Burnsville - Bloomington - Richfield - Minneapolis

URS

North

Scale: 1" = 2000'

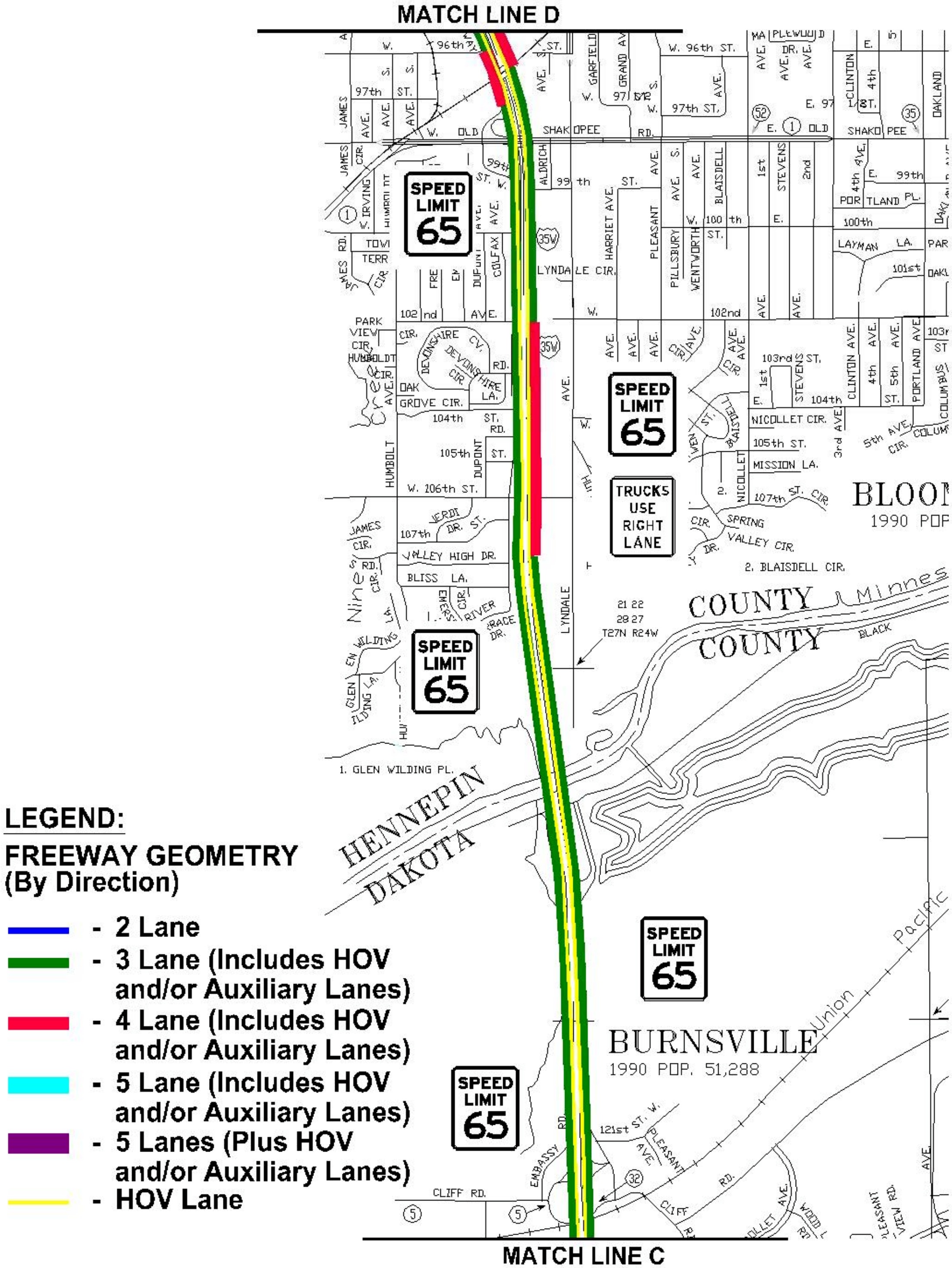
Roadway Geometrics
2030 Future Conditions



North
Scale: 1" = 2000'

Figure 14

Roadway Geometrics 2030 Future Conditions



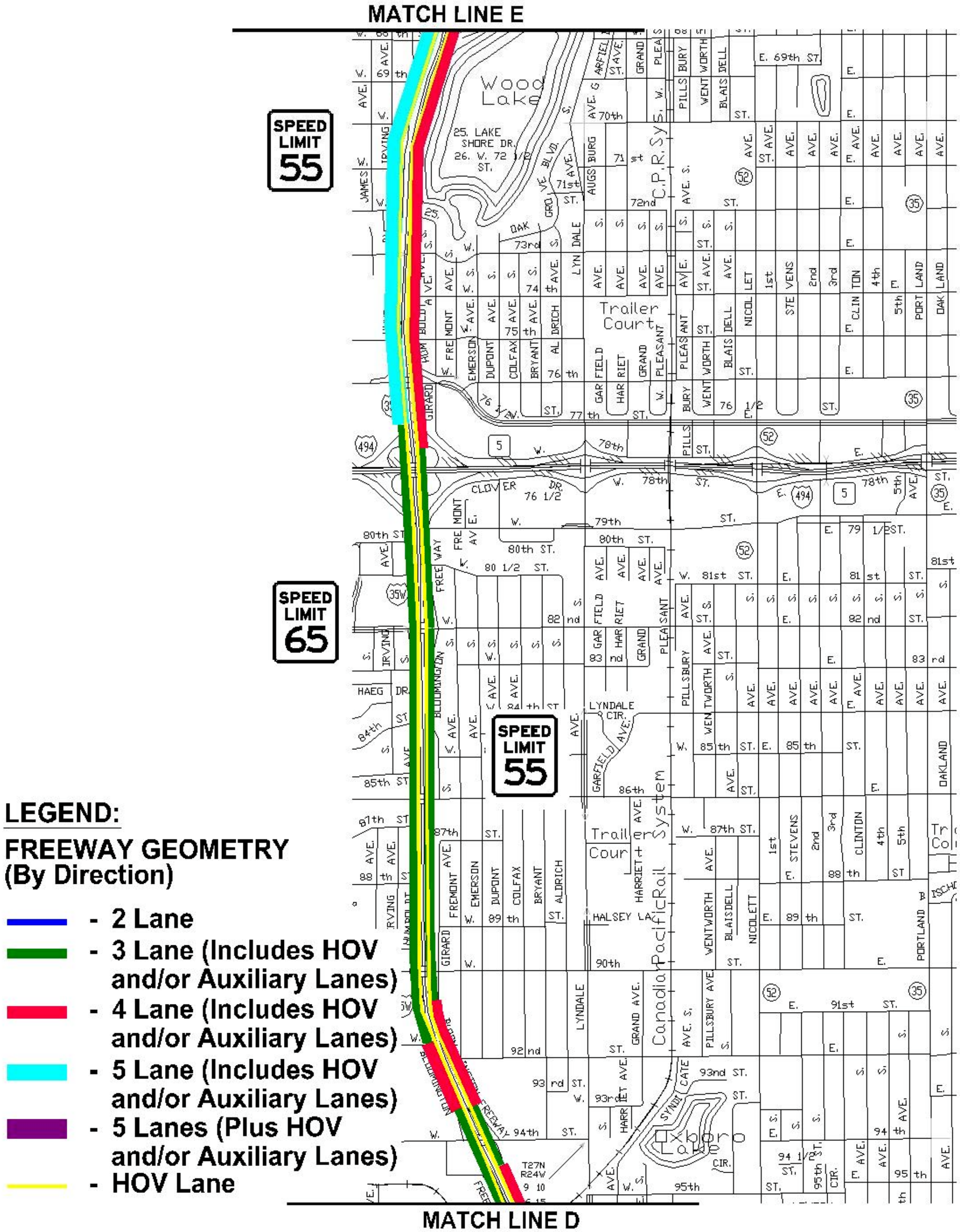
35W Bus Rapid Transit
Lakeville - Burnsville - Bloomington - Richfield - Minneapolis

URS

North
Scale: 1" = 2000'

Figure 15

Roadway Geometrics
2030 Future Conditions

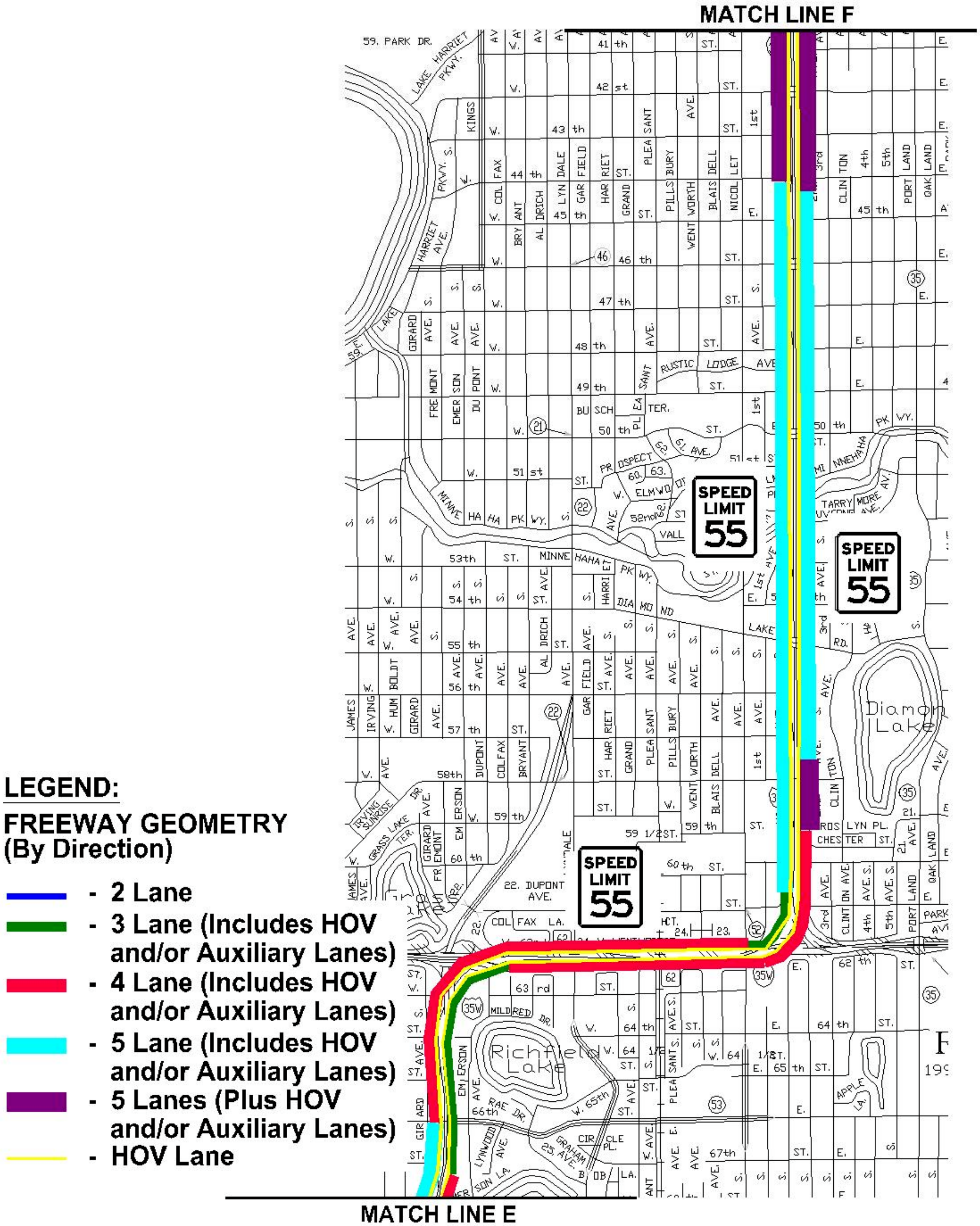


35W Bus Rapid Transit
Lakeville - Burnsville - Bloomington - Richfield - Minneapolis

URS

North
Scale: 1" = 2000'

Figure 5
Roadway Geometrics 2030 Future Conditions



35W Bus Rapid Transit
Lakeville - Burnsville - Bloomington - Richfield - Minneapolis

URS

North
Scale: 1" = 2000'

Figure 17
Roadway Geometrics
2030 Future Conditions

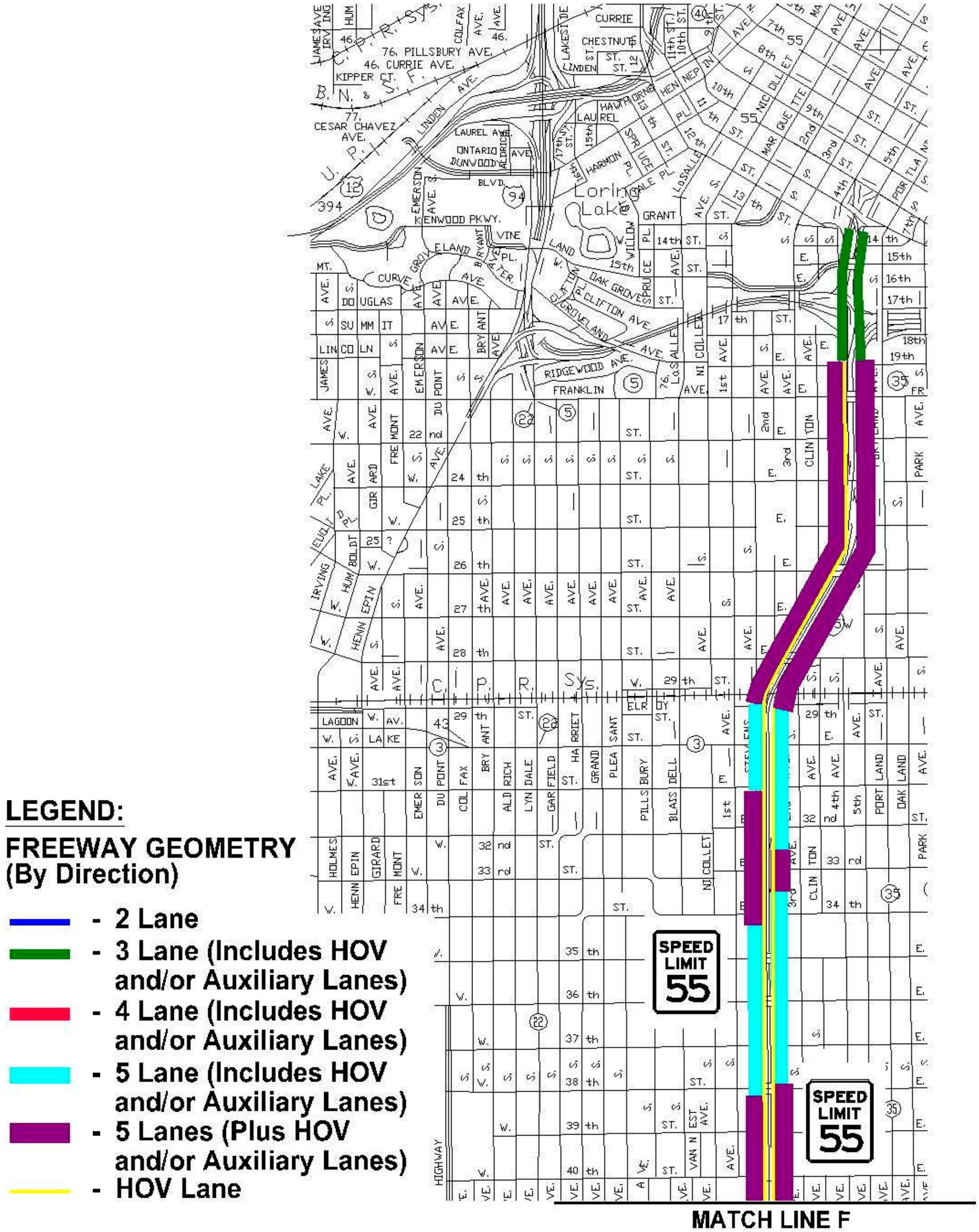


Figure 18

Roadway Geometrics 2030 Future Conditions

Significant effort and funding is invested into the CORSIM model development and analysis. As such, the results of these previous studies were utilized in documenting the existing and future traffic conditions along I-35W for this BRT Study. The previous CORSIM Studies are as follows:

- The Lake Street Access CORSIM model developed by SEH. The model limits extended from the Crosstown Interchange through I-35W/Washington Avenue. In addition, the segments of I-94 between the Lowry Tunnel and east of Hiawatha Avenue were also included.
- The Crosstown Commons Interchange CORSIM model developed by SRF Consulting Group. The Crosstown Interchange Model incorporated the SEH Lake Street model limits, but extended it southward to I-35W/82nd Street interchange and also extended eastward/westward along TH 62.
- The I-494 CORSIM model developed by URS Corporation. The model limits extend between Eden Prairie and Bloomington along I-494 and between 90th Street and 66th Street along I-35W.

<u>Traffic Volumes</u>

Existing and forecast 2030 traffic volumes used in the previous CORSIM studies are documented below. Existing traffic volumes between Crystal Lake Road and 90th Street were obtained from the Mn/DOT Traffic Management Center (TMC) system loop detectors. South of Crystal Lake Road, the existing and forecast 2035 traffic volumes were obtained from the CSAH 60 and CSAH 70 Interstate Access Request studies being prepared by SRF Consulting Group.

For the northbound direction of I-35W between Crystal Lake Road and 90th Street, forecast 2030 AM peak hour traffic volumes were developed using the Metropolitan Council Regional Travel Demand Model. Table 4 below presents the existing AM peak hour and forecast 2030 AM peak hour traffic volumes at key segments along the northbound direction of I-35W.

Table 4. Northbound I-35W AM Peak Hour Traffic Volumes

Segment			Existing (AM Peak Hour)	Forecast 2030 (AM Peak Hour)
CR 70	to	CSAH 60	2,649	3,431
CSAH 60	to	CSAH 50	3,769	4,321
CSAH 50	to	CSAH 46	4,356	5,007
CSAH 46	to	I-35W/I-35E Split	5,504	6,460
I-35W/I-35E Split	to	CSAH 42	3,124	3,491
CSAH 42	to	Bursnville Parkway	3,748	4,278
Bursnville Parkway	to	TH 13	4,449	5,197
TH 13	to	Cliff Road	4,562	5,827
Cliff Road	to	106th Street	4,996	6,471
106th Street	to	98th Street	4,896	6,163
98th Street	to	94th Street	4,628	5,921
94th Street	to	90th Street	4,628	6,092
90th Street	to	82nd Street	4,452	7,030
82nd Street	to	I-494	4,250	4,394
I-494	to	66th Street	3,366	4,949
66th Street	to	61st Street	5,114	4,963
61st Street	to	Diamond Lake Road	6,083	7,881
Diamond Lake Road	to	46th Street	6,723	8,472
46th Street	to	36th Street	7,822	9,070
36th Street	to	31st Street	8,951	9,693
31st Street	to	Downtown Exit	8,346	9,666
Downtown Exit	to	I-94 Westbound	4,542	5,313
I-94 Westbound	to	Downtown Entrance	2,729	3,233

Source:
1. W 66th Street to Downtown existing and forecast volumes obtained from CORSIM modeling completed by SRF Consulting Group. Forecast volumes shown in Table are year 2030.
2. W 90th Street to W 66th Street existing and forecast volumes obtained from CORSIM modeling completed by URS Corporation. Forecast volumes shown in Table are year 2037.
3. 90th Street to Crystal Lake Road existing volumes obtained from MN/DOT TMC loop detector reports. Forecast 2030 volumes developed by URS Corporation using Met Council Regional Travel Demand Model.
4. CR 70 to Crystal Lake Road existing and forecast volumes obtained from the CSAH 60 and CR 70 IAR being prepared by SRF Consulting Group. Forecast volumes shown in Table are year 2035 (no change in lane geometrics).

Traffic Operation Analysis

In order to quantify the quality of existing and forecast traffic conditions, a traffic operation analysis is completed. The ability for the freeway facility to process existing and the forecast traffic volumes is dependent upon many factors (i.e., magnitude of mainline and ramp volumes, interchange density, freeway lane geometrics, interchange ramp entrance and exit locations, weaving movements, HOV provisions, ramp metering, etc.). The analysis process includes determining freeway density and level of service for each of the varying segments along the I-35W Corridor.

Analysis Tools

The approach to the traffic operation analysis included the use of two distinctly different analysis tools. An analysis of I-35W between CR 70 and 90th Street was completed using the methodologies documented in the *Highway Capacity Manual (HCM), 2000 Edition.* This methodology is a macroscopic analysis and only considers the immediate characteristics of the segment under review. In other words, the methodology cannot account for the upstream effect of a bottleneck or other type of congested location.

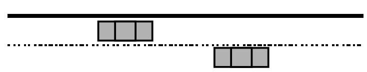
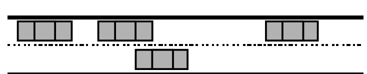
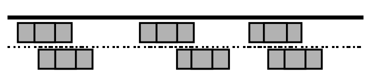
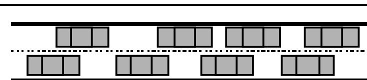
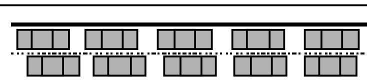
However, the HCM analysis does provide quantitative indication to the location of congestion source points. In the absence of other resources, the HCM methodologies are widely accepted and provide an appropriate analysis for planning level and feasibility studies.

As mentioned earlier, the traffic operation analysis for the segments of I-35W between 90th Street and 66th Street and between 66th Street to downtown Minneapolis were completed prior to the I-35W BRT study using CORSIM. CORSIM provides a time step based microscopic simulation over the entire roadway network. The impacts of congested locations are simulated through the system, yielding an effective analysis of upstream and downstream locations. Due to the extensive effort and cost to complete CORSIM models; CORSIM is typically not used for this type of feasibility study. However, since the results from the prior modeling efforts were readily available, they were incorporated for use within this BRT study.

Level of Service

The results of the analysis are presented in the form of a letter grade (A-F) that provides a qualitative indication of the operational efficiency or effectiveness. The letter grade assigned to traffic operations analysis results is referred to as Level of Service (LOS). The level of service (LOS) analyses consisted of mainline LOS, ramp LOS, and weave area LOS. By definition, LOS A conditions represent high-quality operations and LOS F conditions represent very poor operations. Table 5 shows a graphical interpretation of LOS.

Table 5. General Level of Service Description

Level of Service		Description
A		FREE FLOW. Low volumes and no delays.
B		STABLE FLOW. Speeds restricted by travel conditions, minor delays.
C		STABLE FLOW. Speeds and maneuverability closely controlled due to higher volumes.
D		STABLE FLOW. Speeds considerably affected by change in operating conditions. High density traffic restricts maneuverability, volume near capacity.
E		UNSTABLE FLOW. Low speeds, considerable delay, volume at, or slightly over capacity.
F		FORCED FLOW. Very low speeds, volumes exceed capacity, long delays with stop-and-go traffic.

SOURCE: URS Corporation

Mainline LOS is calculated based on density measured in passenger cars per mile per lane (pc/mi/ln). The HCM refers to these segments as “Basic” freeway segments. As with all capacity analyses trucks and recreational vehicles are converted to passenger car equivalents. Table 6 displays the mainline level of service standards.

Table 6.
Mainline Level of Service

LOS	- (pc/mi/ln)
A	<= 11
B	18
C	26
D	35
E	45
F	> 45

SOURCE: HCM 2000

LOS at ramp junctions is determined based on density measured in passenger cars per mile per lane (pc/mi/ln). The HCM refers to these segments as “Ramp” freeway segments. Ramp level of service is calculated for both entrance and exit ramps. A merge analysis is conducted for the entrance ramp location and a diverge analysis is conducted for the exit ramp locations. Ramp analyses determine the level of service in the area of influence of either the merge or diverge area along the mainline segment. Table 7 displays the level of service standards for ramp junctions.

Table 7.
Ramp Level of Service

LOS	Density (pc/mi/ln)
A	10
B	20
C	28
D	35
E	> 35
F	Exceeds Limits

SOURCE: HCM 2000

Weave area level of service is determined by density (pc/mi/ln). The I-35W Corridor consists of several weave areas as defined by the Highway Capacity Manual. Weaving according to the HCM is, “…the crossing of two or more traffic streams traveling in the same general direction along a significant length of highway, without the aid of traffic control devices. Weaving areas are formed when a merge area is closely followed by an exit ramp and the two are joined by and auxiliary lane.” Table 8 displays the weave level of service according to the Highway Capacity Manual.

Table 8.
Weave Level of Service

LOS	Density (pc/mi/ln)
A	10
B	20
C	28
D	35
E	43
F	> 43

SOURCE: HCM 2000

Existing Traffic Conditions

A summary of the AM peak hour LOS results for the I-35W Corridor traffic operation analysis are shown in Tables 9 and 10 on the following pages.

Table 9. Existing AM Peak Hour LOS [1] – CR 70 to 90th Street

Segment		Freeway Facility Type (HCM)	Length (feet)	Actual Volume (vph)	Density (vplpmi)	LOS
From	To					
I-35 Mainline	CR 70 Entrance Ramp	Basic	2,300	2028	13.5	B
CR 70 Entrance Ramp		Ramp	1,500	2649	23.7	C
		Basic	7,460	2649	17.7	C
	CSAH 60 Exit Ramp	Ramp	1,500	2649	26.5	C
CSAH 60 Exit Ramp	CSAH 60 Entrance Ramp	Basic	2,520	2609	17.4	C
CSAH 60 Entrance Ramp		Ramp	1,500	3769	32.2	D
		Basic	830	3769	27.0	D
	CSAH 50 Exit Ramp	Ramp	1,500	3769	33.7	D
CSAH 50 Exit Ramp	CSAH 50 Entrance Ramp	Basic	2,050	3621	25.4	D
CSAH 50 Entrance Ramp		Ramp	1,500	4356	36.9	**E**
		Basic	1,540	4356	35.7	**E**
		Basic	1,000	4356	19.8	C
	CSAH 46 Exit Ramp	Ramp	1,500	4356	22.2	C
CSAH 46 Exit Ramp	CSAH 46 Entrance Ramp	Basic	1,620	4268	19.2	C
CSAH 46 Entrance Ramp		Ramp	1,500	5592	29.9	D
		Basic	100	5592	26.5	D
	Crystal Lake Road Exit Ramp	Ramp	1,500	5592	26.2	D
Crystal Lake Road Exit Ramp		Basic	1,960	5504	25.9	D
	I-35E Exit Ramp	Ramp	1,500	5504	30.3	D
I-35E Exit Ramp	CSAH 42 Entrance Ramp	Basic	4,225	3124	23.3	C
CSAH 42 Entrance Ramp		Ramp	1,500	3748	33.6	D
		Basic	3,540	3748	33.6	D
	Burnsville Parkway Exit Ramp	Ramp	1,500	3748	21.2	C
Burnsville Parkway Exit Ramp	Burnsville Parkway Entrance Ramp	Basic	1,530	3668	20.5	C
Burnsville Parkway Entrance Ram	TH 13 EB Exit Ramp	Weave	945	4069	42.0	**E**
TH 13 EB Exit Ramp	TH 13 EB Entrance Ramp	Basic	1,000	3937	69.6	**F**
TH 13 EB Entrance Ramp	TH 13 WB Exit Ramp	Weave	380	4449	44.0	**F**
TH 13 WB Exit Ramp	TH 13 WB Entrance Ramp	Basic	925	4161	30.1	D
TH 13 WB Entrance Ramp	Cliff Road Exit Ramp	Weave	1,590	4562	31.8	D
Cliff Road Exit Ramp	Cliff Road Entrance Ramp	Basic	1,615	4510	54.7	**F**
Cliff Road Entrance Ramp		Ramp	800	4968	44.0	**E**
		Basic	635	4968	31.8	D
	Black Dog Road Exit Ramp	Ramp	800	4968	31.8	D
Black Dog Road Exit Ramp	Black Dog Road Entrance Ramp	Basic	1,365	4960	31.7	D
Black Dog Road Entrance Ramp		Ramp	1,500	4996	32.3	D
		Basic	1,525	4996	32.3	D
	106th Street Exit Ramp	Ramp	1,500	4996	27.2	C
106th Street Exit Ramp	106th Street Entrance Ramp	Basic	1,745	4688	16.9	B
106th Street Entrance Ramp		Ramp	1,500	4896	18.8	B
		Basic	290	4896	23.7	C
	98th Street Exit Ramp	Ramp	1,500	4896	25.6	C
98th Street Exit Ramp	98th Street Entrance Ramp	Basic	1,790	4512	23.2	C
98th Street Entrance Ramp	94th Street Exit Ramp	Weave	845	4628	20.6	C
94th Street Exit Ramp	94th Street Entrance Ramp	Basic	1,920	4360	22.7	C
94th Street Entrance Ramp	90th Street Exit Ramp	Weave	750	4628	21.5	C

Note:
1. CR 70 to 90th Street LOS results are based on an HCS 2000 capacity analysis completed by URS Corporation.

Table 10. Existing AM Peak Hour LOS [1,2] –90th Street to Downtown Minneapolis

Segment From	Segment To	Freeway Facility Type (HCM)	Length (feet)	Simulated Volume (vph)	Actual Volume (vph)	Density (vplpmi)	LOS
90th Street Exit Ramp	90th Street Entrance Ramp	Basic	872	4,177	4,176	22.2	C
90th Street Entrance Ramp		Ramp	1499	4,455	4,452	24.2	C
		Basic	910	4,452	4,452	27.3	D
	W 82nd Street Exit Ramp	Ramp	1499	4,449	4,452	24.6	C
W 82nd Street Exit Ramp	W 82nd Street Entrance Ramp	Basic	1456	4,023	4,031	21.8	C
W 82nd Street Entrance Ramp	I-494 EB Exit Ramp	Weave	620	4,250	4,250	18.3	B
I-494 EB Exit Ramp	I-494 EB Entrance Ramp	Basic	702	3,711	3,700	21.6	C
I-494 EB Entrance Ramp	I-494 WB Exit Ramp	Weave	518	3,974	3,989	18.9	B
I-494 WB Exit Ramp	I-494 WB Entrance Ramp	Basic	675	2,947	2,970	21.9	C
I-494 WB Entrance Ramp	W 76th Street Entrance Ramp	Ramp	1002	3,158	3,201	18.6	B
W 76th Street Entrance Ramp		Ramp	1505	3,318	3,366	18.2	B
		Basic	2161	3,319	3,366	19.8	C
	W 66th Street Exit Ramp	Ramp	1503	3,318	3,366	19.7	B
W 66th Street Exit Ramp	TH 121 NB Exit Ramp	Ramp	2140	3,129	3,103	25.3	C
TH 121 NB Exit Ramp	W 66th Street Entrance Ramp	Basic	273	2,436	2,406	19.1	C
W 66th Street Entrance Ramp		Ramp	1777	2,647	2,619	20.5	C
	TH 62 EB Entrance Ramp	Basic	657	2,643	2,619	24.1	C
TH 62 EB Entrance Ramp	Lyndale Avenue Entrance Ramp	Ramp	1378	4,380	4,231	30.6	D
Lyndale Avenue Entrance Ramp	TH 62 EB Exit Ramp	Weave	1874	5,180	5,114	37.6	E
TH 62 EB Exit Ramp	TH 62 WB Entrance Ramp	Basic	950	3,964	3,964	51.1	F
TH 62 WB Entrance Ramp	60th Street Entrance Ramp	Ramp	1426	5,841	5,863	49.9	E
60th Street Entrance Ramp	Diamond Lake Road Exit Ramp	Weave	1154	6,013	6,083	37.8	E
Diamond Lake Road Exit Ramp	Diamond Lake Road Entrance Ramp	Basic	2341	5,885	6,023	49.5	F
Diamond Lake Road Entrance Rar		Ramp	1495	6,521	6,723	39.7	E
		Basic	1130	6,524	6,723	33.7	D
	46th Street Exit Ramp	Ramp	1500	6,524	6,723	31.4	D
46th Street Exit Ramp	46th Street Entrance Ramp	Basic	2183	6,428	6,613	33.7	D
46th Street Entrance Ramp		Ramp	1500	7,564	7,822	28.2	D
		Basic	1282	7,572	7,822	28.6	D
	36th Street Exit Ramp	Ramp	1500	7,550	7,822	26.0	C
36th Street Exit Ramp	35th Street Entrance Ramp	Basic	2751	7,354	7,707	27.4	D
35th Street Entrance Ramp	31st Street Exit Ramp	Weave	715	8,535	8,951	28.7	D
31st Street Exit Ramp	Bus Stop Exit Ramp	Ramp	993	7,940	8,346	25.3	C
Bus Stop Exit Ramp	Bus Stop Entrance Ramp	Basic	630	7,935	8,346	25.8	C
Bus Stop Entrance Ramp		Ramp	1235	7,923	8,346	24.6	C
		Basic	1644	7,918	8,346	26.9	D
	I-35W NB Exit Ramp	Ramp	1063	7,903	8,346	27.4	C
I-35W NB Exit Ramp		Basic	591	4,275	4,542	23.4	C
	I-94 WB Exit Ramp	Ramp	1227	4,214	4,542	35.1	E
I-94 WB Exit Ramp	Downtown Mainline Entrance	Basic	982	2,729	2,884	13.3	B

Notes:
1. W 66th Street to Downtown Entrance Ramp LOS and average speeds are based on CORSIM modeling completed by SRF Consulting Group. Model scenario Existing AM
Filename: D:\URS 9_10_04\Existing\11 MOEs\[Freeway MOE AM.xls]freeway MOE

2. W 90th Street to W 66th Street LOS average speeds are based on CORSIM modeling completed by URS Corporation. Model Scenario is the Existing AM peak period.
Filename: T:\32707211\traffic\Corsim\11 MOEs\[AM 2001 MOE - Final - Mar2004.xls]Mainline & Ramp MOE Table

The following highlights key areas of existing traffic congestion during the morning northbound commute:

- Minor slow downs in the vicinity of CSAH 50 occur regularly. Pronounced back-ups do not occur. The congestion is generally isolated at the CSAH 50 interchange.
- The traffic analysis identifies a congestion source point (i.e., LOS E or F) at the Cliff Road entrance ramp and at each of the ramps to/from TH 13. In reality the congestion beginning at the Cliff Road entrance ramp propagates to TH 13, which exacerbates the already poor interchange operations. Stop and go traffic continues upstream to CSAH 42 as a result of the Cliff Road and TH 13 interchanges. This condition could not be evaluated using the HCM procedures. Detailed traffic simulation would be required to replicate this condition.

- Significant congestion is found daily through the Crosstown Commons Interchange. TH 62 is impacted the most by the poor interchange operations. I-35W congestion is generally limited to segment beginning near 66th Street and continuing northbound to 60th Street. Although the LOS between 60th Street and 46th Street is reported as LOS D. Congestion and slower moving traffic is typical throughout the AM peak period along this segment. Once northbound of 46th Street, an additional lane begins, relieving congestion, and providing average speeds near the posted limit.

Forecast 2030 Traffic Conditions

A summary of the AM peak hour LOS results for the forecast 2030 I-35W Corridor traffic operation analysis are shown in Tables 11 and 12 on the following pages. Again, the expected traffic conditions assume the major improvement projects and forecast traffic volumes identified previously.

Table 11. 2030 AM Peak Hour LOS [1] – CR 70 to 90th Street

Segment		Freeway Facility Type (HCM)	Length (feet)	Forecast Volume (vph)	Density (vplpmi)	LOS
From	To					
I-35 Mainline	CR 70 Entrance Ramp	Basic	2,300	2364	15.8	B
CR 70 Entrance Ramp		Ramp	1,500	3431	29.6	D
		Basic	7,460	3431	23.6	C
	CSAH 60 Exit Ramp	Ramp	1,500	3431	33.2	D
CSAH 60 Exit Ramp	CSAH 60 Entrance Ramp	Basic	2,520	2313	15.5	B
CSAH 60 Entrance Ramp		Ramp	1,500	4321	39.0	E
		Basic	830	4321	44.3	E
	CSAH 50 Exit Ramp	Ramp	1,500	4321	52.4	E
CSAH 50 Exit Ramp	CSAH 50 Entrance Ramp	Basic	2,050	3940	72.5	F
CSAH 50 Entrance Ramp		Ramp	1,500	5007	39.3	E
		Basic	1,540	5007	44.1	E
		Basic	1,000	5007	21.7	C
	CSAH 46 Exit Ramp	Ramp	1,500	5007	24.1	C
CSAH 46 Exit Ramp	CSAH 46 Entrance Ramp	Basic	1,620	4804	20.2	C
CSAH 46 Entrance Ramp		Ramp	1,500	6736	37.5	E
		Basic	100	6736	34.4	D
	Crystal Lake Road Exit Ramp	Ramp	1,500	6736	30.5	D
Crystal Lake Road Exit Ramp		Basic	1,960	6460	32.2	D
	I-35E Exit Ramp	Ramp	1,500	6460	48.2	E
I-35E Exit Ramp	CSAH 42 Entrance Ramp	Basic	4,225	3491	73.5	F
CSAH 42 Entrance Ramp		Ramp	1,500	4278	46.9	E
		Basic	3,540	4278	47.9	F
	Burnsville Parkway Exit Ramp	Ramp	1,500	4278	41.6	E
Burnsville Parkway Exit Ramp	Burnsville Parkway Entrance Ramp	Basic	1,530	4188	71.5	F
Burnsville Parkway Entrance Ramp	TH 13 EB Exit Ramp	Weave	945	4855	89.4	F
TH 13 EB Exit Ramp	TH 13 EB Entrance Ramp	Basic	1,000	4431	81.9	F
TH 13 EB Entrance Ramp	TH 13 WB Exit Ramp	Weave	380	5197	59.0	F
TH 13 WB Exit Ramp	TH 13 WB Entrance Ramp	Basic	925	4876	62.4	F
TH 13 WB Entrance Ramp	Cliff Road Exit Ramp	Weave	1,590	5827	90.2	F
Cliff Road Exit Ramp	Cliff Road Entrance Ramp	Basic	1,615	5750	67.5	F
Cliff Road Entrance Ramp		Ramp	800	6439	44.0	E
		Basic	635	6439	31.8	D
	Black Dog Road Exit Ramp	Ramp	800	6439	31.8	D
Black Dog Road Exit Ramp	Black Dog Road Entrance Ramp	Basic	1,365	6431	31.7	D
Black Dog Road Entrance Ramp		Ramp	1,500	6471	32.3	D
		Basic	1,525	6471	32.3	D
	106th Street Exit Ramp	Ramp	1,500	6471	44.0	E
106th Street Exit Ramp	106th Street Entrance Ramp	Basic	1,745	5949	20.4	C
106th Street Entrance Ramp		Ramp	1,500	6163	21.6	C
		Basic	290	6163	39.7	E
	98th Street Exit Ramp	Ramp	1,500	6163	39.7	E
98th Street Exit Ramp	98th Street Entrance Ramp	Basic	1,790	5763	34.8	D
98th Street Entrance Ramp	94th Street Exit Ramp	Weave	845	5921	23.9	C
94th Street Exit Ramp	94th Street Entrance Ramp	Basic	1,920	5619	32.2	D
94th Street Entrance Ramp	90th Street Exit Ramp	Weave	750	6092	28.6	D

Notes:
1. CR 70 to 90th Street LOS results are based on an HCS 2000 capacity analysis completed by URS Corporation.

Table 12. 2030 AM Peak Hour LOS [1,2,3] – 90th Street to Downtown Minneapolis

Segment From	Segment To	Freeway Facility Type (HCM)	Length (feet)	Simulated Forecast Volume (vph)	Forecast Volume (vph)	Density (vplpmi)	LOS
90th Street Exit Ramp	90th Street Entrance Ramp	Basic	1872	5,299	6,567	45.9	F
90th Street Entrance Ramp	W 82nd Street Exit Ramp	Ramp	1792	5,761	7,030	30.9	D
W 82nd Street Exit Ramp		Basic	622	5,218	6,349	30.1	D
	I-494 EB and WB Exit Ramp	Ramp	1450	5,220	6,349	30.7	D
I-494 EB and WB Exit Ramp	W 82nd Street Entrance Ramp	Basic	2555	3,345	4,038	27.6	D
W 82nd Street Entrance Ramp		Ramp	785	3,690	4,394	31.1	D
	I-494 EB Entrance Ramp	Basic	475	3,689	4,394	33.1	D
I-494 EB Entrance Ramp	I-494 WB Entrance Ramp	Ramp	1537	4,253	4,968	25.2	C
I-494 WB Entrance Ramp	W 76th Street Entrance Ramp	Ramp	1636	4,617	5,327	27.5	C
W 76th Street Entrance Ramp		Ramp	990	4,951	5,671	30.8	D
		Basic	704	4,949	5,671	31.3	D
	W 66th Street Exit Ramp	Ramp	1364	4,945	5,671	30.2	D
W 66th Street Exit Ramp	TH 121/TH 62 Exit Ramp	Ramp	1373	3,468	3,467	13.4	B
TH 121/TH 62 Exit Ramp	W 66th Street Entrance Ramp	Basic	1995	2,854	2,849	15.9	B
W 66th Street Entrance Ramp	TH 62 EB Entrance Ramp	Ramp	1762	3,189	3,179	16.5	B
TH 62 EB Entrance Ramp		Ramp	1612	4,963	4,951	15.4	B
	TH 62 WB Entrance Ramp	Basic	2420	4,963	4,951	20.9	C
TH 62 WB Entrance Ramp	60th Street Entrance Ramp	Ramp	1354	7,617	7,636	20.7	C
60th Street Entrance Ramp	Diamond Lake Road Exit Ramp	Weave	700	7,881	7,904	18.3	B
Diamond Lake Road Exit Ramp	Diamond Lake Road Entrance Ramp	Basic	2880	7,770	7,799	23.3	C
Diamond Lake Road Entrance Ramp		Ramp	1501	8,472	8,544	24.6	C
		Basic	541	8,472	8,544	25.1	C
	46th Street Exit Ramp	Ramp	1501	8,477	8,544	23.1	C
46th Street Exit Ramp	46th Street Entrance Ramp	Basic	2778	8,083	8,311	28.9	D
46th Street Entrance Ramp	38th Street Exit Ramp	Weave	2327	9,070	9,415	31.9	D
38th Street Exit Ramp	38th Street Entrance Ramp	Basic	2685	8,731	9,192	33.9	D
38th Street Entrance Ramp	31st Street Exit Ramp	Weave	2105	9,693	10,271	30.9	D
31st Street Exit Ramp	Bus Stop Exit Ramp	Basic	435	9,274	9,859	28.5	D
Bus Stop Exit Ramp	28th Street Exit Ramp	Ramp	1475	9,258	9,859	26.9	C
28th Street Exit Ramp	Lake Street/Bus Stop Entrance Ramp	Basic	1543	8,788	9,396	28.4	D
Entrance Lake St	I-35W NB Exit Ramp	Weave	3242	9,666	10,311	23.9	C
I-35W NB Exit Ramp	I-94 WB Exit Ramp	Ramp	1284	5,313	5,563	30.9	D
I-94 WB Exit Ramp	Downtown Mainline Entrance	Basic	982	3,233	3,438	26.6	D

Notes:
1. Assumes the reconstruction of the I-494/I-35W interchange, the I-35W/TH 62 Interchange, reconstruction of I-35W between TH 62 and Downtown, and the new Lake Street entrance ramp.
2. W 66th Street to Downtown Entrance Ramp average speeds are based on CORSIM modeling completed by SRF Consulting Group. Model scenario referred to by SRF as the 2-lane, Lyndale Access Alternative
Filename: D:\URS 9_10_04\Future\11 MOEs\[Freeway MOE AM.xls]freeway MOEs
3. W 90th Street to W 66th Street average speeds are based on CORSIM modeling completed by URS Corporation. Model Scenario is the 2037 AM peak period, spring 2004 level 1 layout.
Filename:T:\32707211\traffic\Corsim\11 MOEs\Projected\2037\[AM 2037 build MOE - April2004-final-169revised.xls]Mainline & Ramp MOE Table

The following highlights key areas of expected future traffic congestion during the morning northbound commute:

- The volume demand approaching 90th Street is expected to exceed the available capacity of the existing number of northbound travel lanes. However, this volume would be somewhat metered by the capacity limitation upstream at the Cliff Road interchange and river bridge crossing. Because of this metering effect, acceptable operations are expected between 90th Street and the Crosstown Commons Interchange.

- By year 2030, traffic congestion is expected between CSAH 50 and CSAH 60. The length and duration of the back up can't be quantified without more detailed analysis; however, longer delays could be expected.
- As mentioned previously, the three primary river crossings, which serve the majority of the southern suburb population with destination or origins within Minneapolis, are I-35W, TH 169 and TH 77. Even though roadway capacities serving the southern regions have already been reached, the population still continues to grow. As such, the traffic volume demand is also expected to continue to grow because there are limited alternative routes, which further adds to the northbound congestion. The analysis indicates significant congestion between the I-35W/35E split and Cliff Road. Although the analysis doesn't quantify the level of back up generated, it would be expected to extend south of the split.

Corridor Demographics

The I-35W Corridor contains areas of high employment and population concentrations that are significant contributors to the demand for transit service. Maps that depict current and year 2030 employment, population and land use are found on pages 2-39 and 2-40.

Employment

Following is a summary of projected changes in employment patterns along the I-35W corridor between the existing Census data (2000) and Year 2030. Employment data by Traffic Assignment Zones (TAZ) are from the Metropolitan Council and presented on Figures 19 and 20:

- Employment in downtown Minneapolis is projected to increase by approximately 50,000 jobs from 125,000 to 178,000 (43 percent growth).
- Employment along the I-494 Corridor is expected to increase by 10,000.
- Otherwise, most of the increases in employment are projected to occur south of the Minnesota River, in parts of Burnsville, Apple Valley, Lakeville and New Market Township.
- In Burnsville, employment increase is expected to occur in the vicinity of the I-35W and I-35E junction, from 5,900 to 9,600 (63 percent growth).
- In Lakeville, the highest employment increases are anticipated along I-35W between 185th Street SW and 210th Street SW, from 1,400 to 4,300 jobs (212 percent growth).
- Employment in New Market Township west of I-35W is expected to increase over threefold, from 430 to 1,650.
- Overall, changes in employment density south of the Minnesota River are expected to be concentrated in the Cities of Burnsville and Apple Valley.

Population

As with the employment patterns discussed in the previous section, data from the Metropolitan Council are presented by TAZ in Figures 19 and 20. The following statements summarize the expected changes in population along the I-35W corridor between 2000 and 2030.

- In Richfield, population along I-494 between I-35W and TH 77 is expected to increase in 2030 by 14 percent.
- Population density in other areas north of the Minnesota River is expected to remain relatively unchanged, although population within selected TAZs are expected to grow, such as around Lakes Calhoun and Harriet in Minneapolis (11 percent) and along the Mississippi River in downtown Minneapolis (nearly triple).
- Most of the increases in population are expected to occur south of the Minnesota River in Savage, Burnsville, Lakeville and New Market Township.
- A portion of Savage within two miles of the I-35W corridor around Hanrahan Lake is expected to increase its population over seven-fold, from 600 to 4,500.
- Population density along the I-35W corridor is expected to increase. In year 2030, the densest areas are expected to extend to the northern half of Lakeville and eastward to Cedar Avenue in Apple Valley.
- Lakeville's population is expected to increase significantly by 2030. This growth is expected to be concentrated in an area bounded by Dodd Boulevard, Cedar Avenue and 200th Street SW, which is projected to experience population growth from 440 to 10,840 in the year 2030.
- New Market Township's population in 2030 is expected to increase approximately fourfold, from 3,900 to 14,700.
- The population density of Apple Valley near its western boundary with Lakeville is expected to increase, comparable to the current density in the area of Bloomington along I-35W and Old Shakopee Road.

Land Use

The land use data presented in Figures 19 and 20 are from the Metropolitan Council, and summarized by TAZ. Between 2000 and 2030, land use categories have been modified to include either an expansion of a category (e.g. Single Family Residential to include Rural Residential, Seasonal/Vacation, Single Family Detached and Manufactured Housing Parks) or an aggregation of a category.

The following statements address general land use changes in the I-35W corridor as presented in Figures 19 and 20.

- Commercial and Retail development will continue to be concentrated along major highways such as the I-35W corridor.
- Similar to changes in population and employment, much of the projected land use changes are expected to occur south of the Minnesota River.

- In 2030, Commercial and Retail development will extend south of the I-35W and I-35E junction to Burnsville and Lakeville.
- Over half of the land classified as Agricultural and Farmstead in 2000 south of the Minnesota River will be developed for Residential and Commercial uses in 2030.
- Lakeville is projected to have a significant increase in land to be used for Single- and Multi-Family residences.

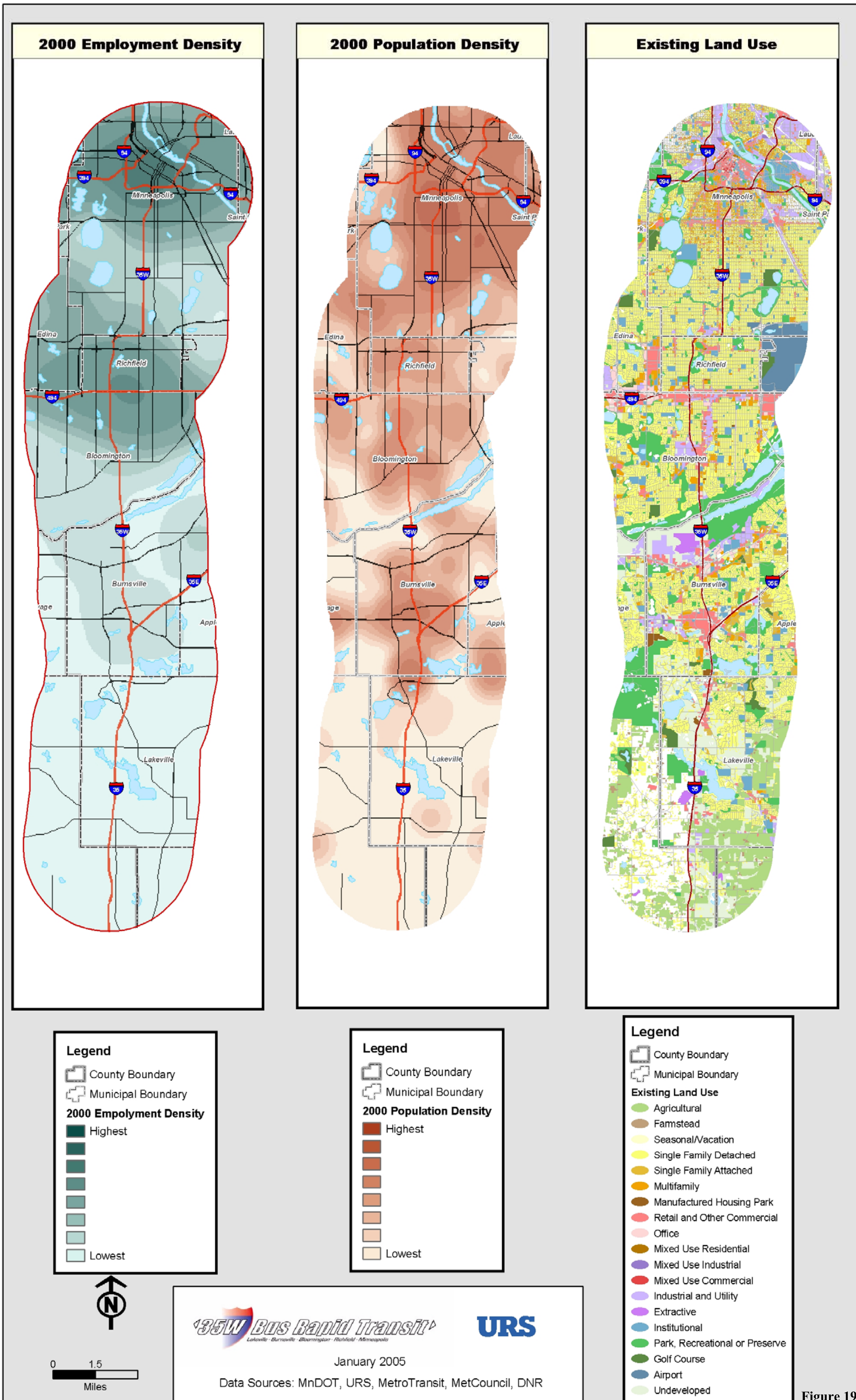


Figure 19

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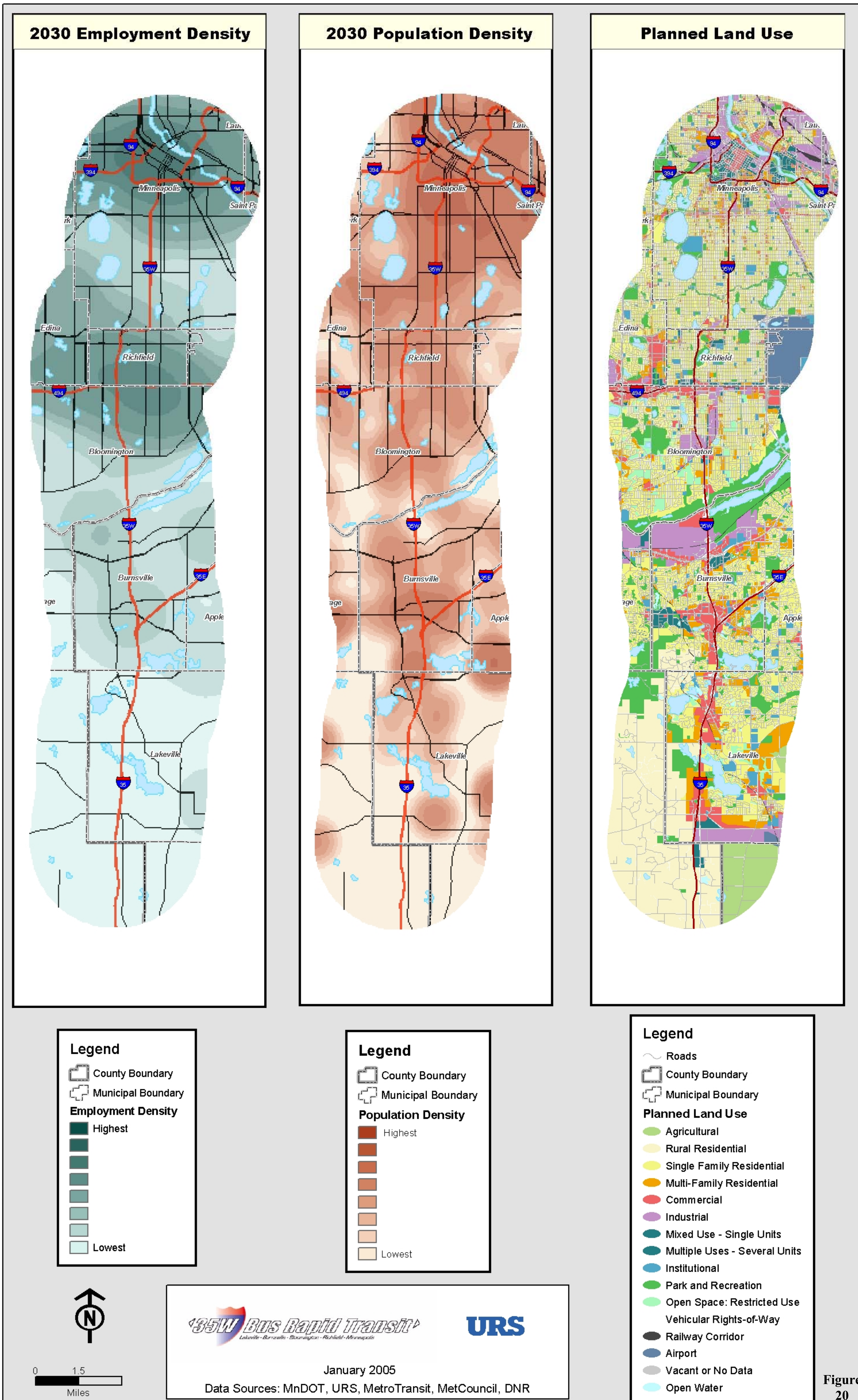

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CHAPTER 3.0 – ALTERNATIVE BRT ELEMENTS

Transitway Configuration

Five alternatives were considered for the transitway operating on I-35W. The alternatives included three design options (see Figure 21 on the following page) and two options for how a BRT lane could be managed. The design alternatives were developed following the desired guidelines found in the Geometric Design Code for Transit Facilities on Highways and Streets – Phase I (Interim Guide)[1]. Each alternative is described below.

Design Options

Design Option 1 - 14' Barrier-Free Lanes

Under this alternative, a separate 14' BRT lane in each direction is established that runs in the center of the freeway. A 2' barrier and a 13' enforcement lane separates the northbound and southbound lanes from each other on each side. Each 14' BRT lane is immediately adjacent to the general-purpose lanes on the rest of the freeway. There is no barrier separating the BRT lane from the general-purpose lanes. The wider 14' lane includes a 2' buffer adjacent to the general–purpose lane.

Bus stations are located between the northbound and southbound BRT lanes and provide vertical access to local bus routes and neighborhoods via stairs and an elevator.

Design Option 2 –Shoulder Running Buses

This option is similar to the current practice of running buses on the 10-foot freeway shoulders in the Twin Cities area. It provides a 13-foot outside shoulder to allow more width to buffer adjacent traffic and to reduce impacts on drainage structures along the shoulder. Buses can only operate on this shoulder at a speed of 15 MPH over the speed of traffic in the general-purpose lanes up to a maximum of 35 MPH[2]. Under this alternative, only authorized buses are allowed to operate in the shoulders in accordance with Minnesota Sate Law. Bus stations are located at the sides of the freeway, either immediately adjacent or just off entrance/exit ramps.

Design Option 3 – Barrier Separated Lanes

The barrier-separated lane option creates a BRT lane that runs in the center of the freeway, similar to Option 1, however the BRT lanes are separated from the general purpose freeway lanes by a 2' barrier.

[1] This guide was prepared in July 2002 for the American Association of State Highway and Transportation Officials (AASHTO) Standing Committee on the Highways. The guide was prepared as part of NCHRP Project 20-7, Task 135 under the National Cooperative Highway Research Program, Transportation Research Board.
[2] Minnesota Statutes, Chapter 169.306 Use of Shoulders by buses.

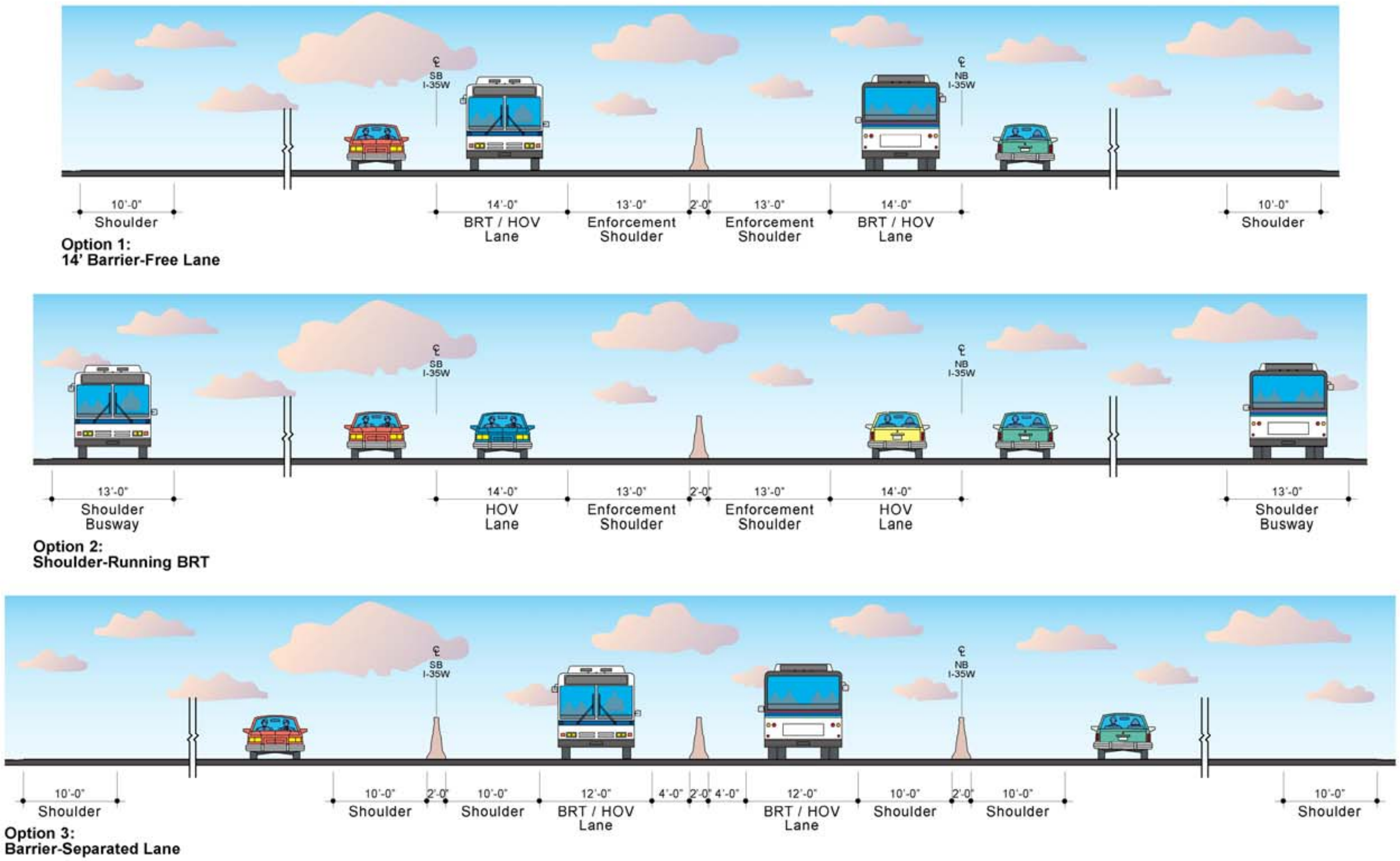

Figure 21
I-35W BRT Corridor Study
BRT Typical Sections

A 2' barrier with 4' shoulders on either side separates the northbound and southbound lanes of the transitway. Buses operate in a 12' lane that is separated from the general-purpose lanes by a 2' barrier and a 10' shoulder on both sides of the barrier.

As with Option 1, bus stations are located between the northbound and southbound BRT lanes and provide vertical access to local bus routes and neighborhoods via stairs and an elevator.

Lane Management Options

In addition to design options for operating BRT service, two options were considered for how the lane could be managed – exclusively as a BRT lane or as a BRT lane shared with High Occupancy Vehicles (HOV).

It is important to note that since Minnesota Law allows only authorized buses to operate in the shoulder, (Design Option 2 – *Shoulder Running Buses*), only *Design Option 1 – Barrier Free Lane*s and *Design Option 3 – Barrier Separated Lanes* were considered for lane management options.

BRT Only Lane

Under this option, only buses would be allowed to operate in the BRT lane. If this option were selected, people who car pool (HOV's) would be required to make their trip in the general-purpose lanes and would receive no preferential treatment for sharing a ride.

Shared BRT/HOV Lane

Buses and HOV's would operate together in a specially marked lane under this option. This option provides preferential treatment for people who choose to share a ride.

Station Design Alternatives

On-Line Stations

Generally, it is assumed that each BRT station will be designed similarly, with relatively uniform layouts with consistent system-wide materials and finishes. Summarized in the sections on the following pages is a description of the key elements to be considered for the on-line stations proposed for the I-35W Corridor. Figures 22 through 25 depict key elements, amenities, and bus operations for an on-line station proposed for 46th Street that can serve as a prototype for on-line stations throughout the corridor.

Fare Collection

Automatic fare vending machines could be located on both the bridge deck and the lower, freeway-level platform within the "paid fare zone," defined as the bridge deck waiting area beyond the turnstiles, the stairs and elevators, and the entire BRT platform.

Weather Protection

On both sides of the bridge deck, a canopy, extending to within two feet of the curb, protects those disembarking or waiting to board local feeder buses. Climate-controlled, vertical enclosures connect these canopied outdoor areas and enclosures with the BRT platform below. The walls are glass helping to ensure a safe, secure and comfortable environment for BRT patrons. The enclosures are heated and air-conditioned. Included within each are a stair and elevator connecting the bridge deck and the BRT platform. At the platform level maintenance and storage spaces are located, an electrical and mechanical equipment room, and - at certain designated stations - an operators' restroom and break room.

Between the two vertical enclosures, the open-air, BRT platform, is covered by the bridge deck above. Regularly spaced, glass-paneled windscreens with overhead, patron-activated radiant heaters provide additional shelter. Baffled screens atop the outboard BRT bus lane barriers, adjacent to and extending about 100 feet beyond both ends of the platform, will further block wind and ambient road spray.

Another facility design option is to fully enclose the BRT platform. It too would be heated and air conditioned, eliminating the need for windscreens and individual heaters. Sliding doors, positioned to open upon the doors of both standard and articulated buses, would allow access to waiting BRT buses. On-going mechanical operations and maintenance of the sliding doors, window-wall cleaning, and heating/cooling utility costs associated with an enclosed platform are a concern, however.

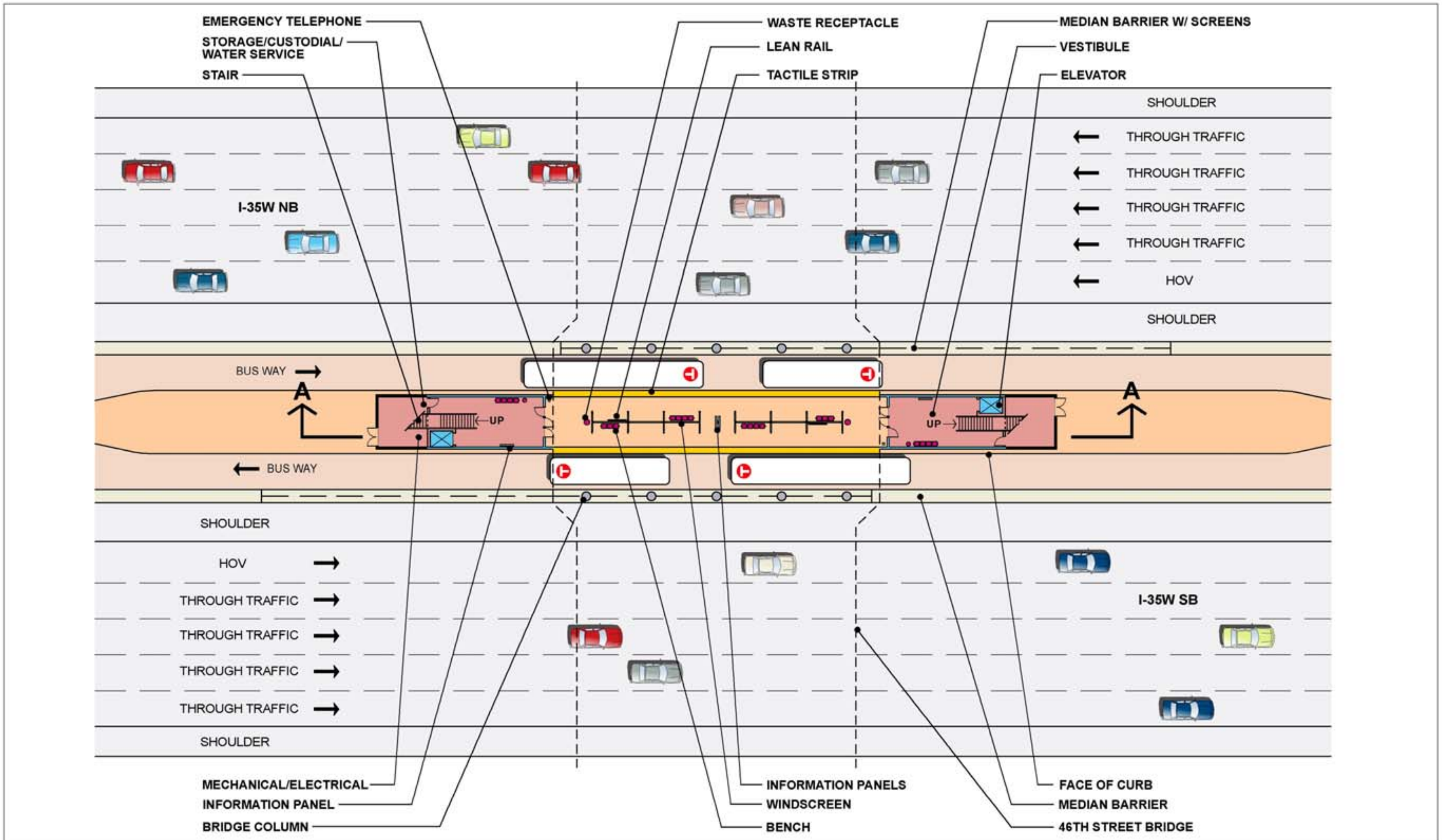

Figure 22
I-35/46th Street BRT Station Site *
Platform Level: Open Air with Windscreens

*Prepared as part of Metro Transit Project, Spring 2004

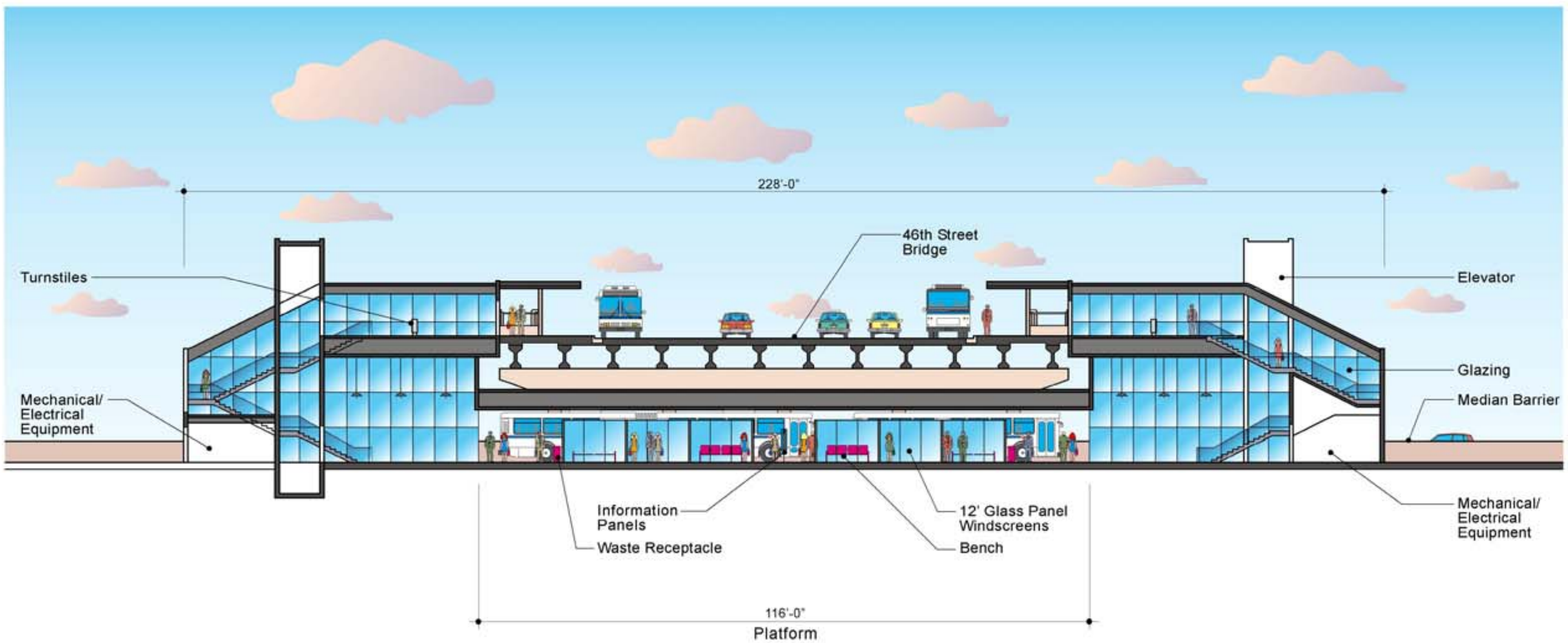

Figure 23
I-35/46th Street BRT Station Site *
Platform Level: Open Air with Windscreens

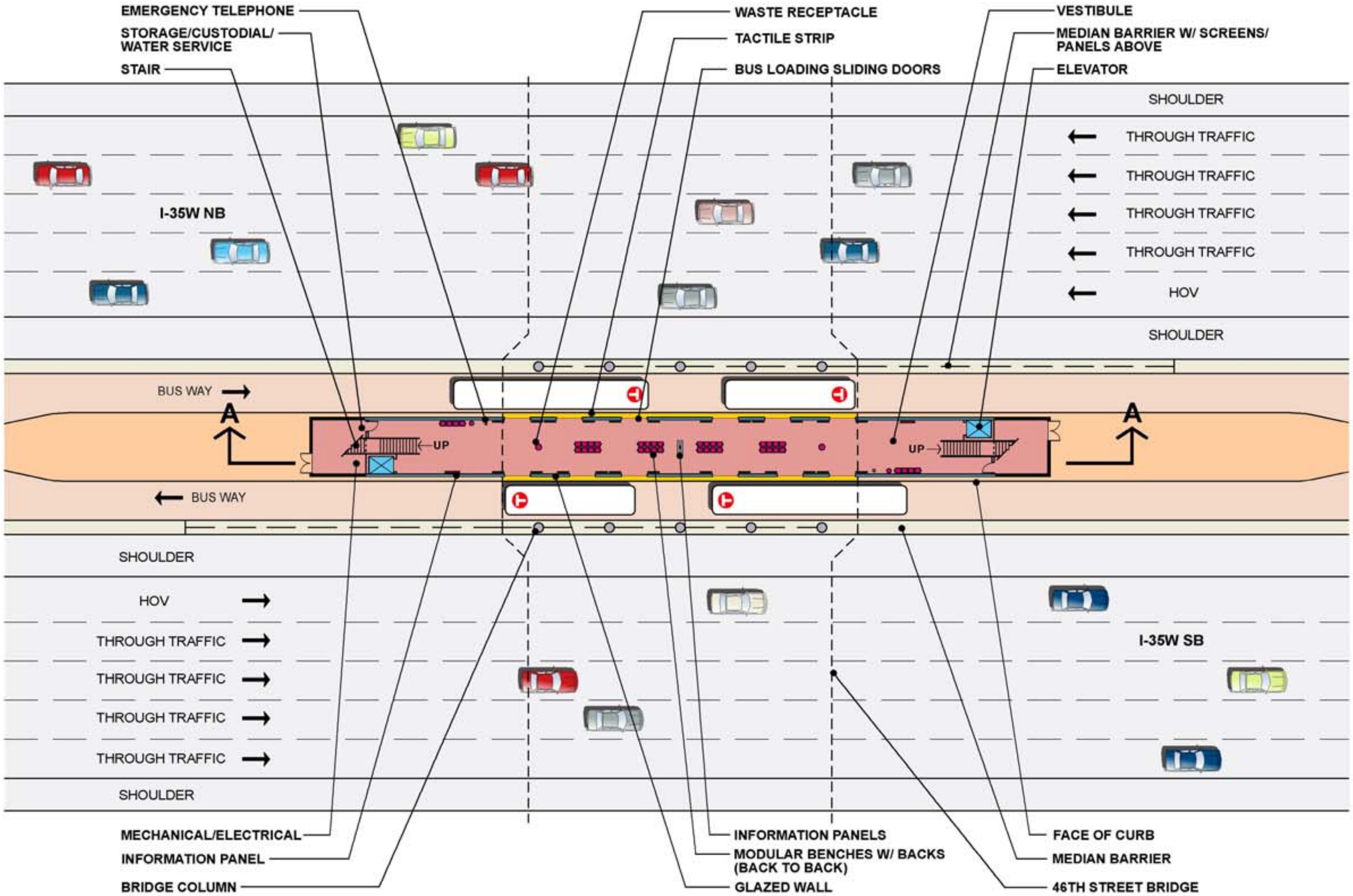

Figure 24
I-35/46th Street BRT Station Site *
Platform Level: Full Enclosure

*Prepared as part of Metro Transit Project, Spring 2004

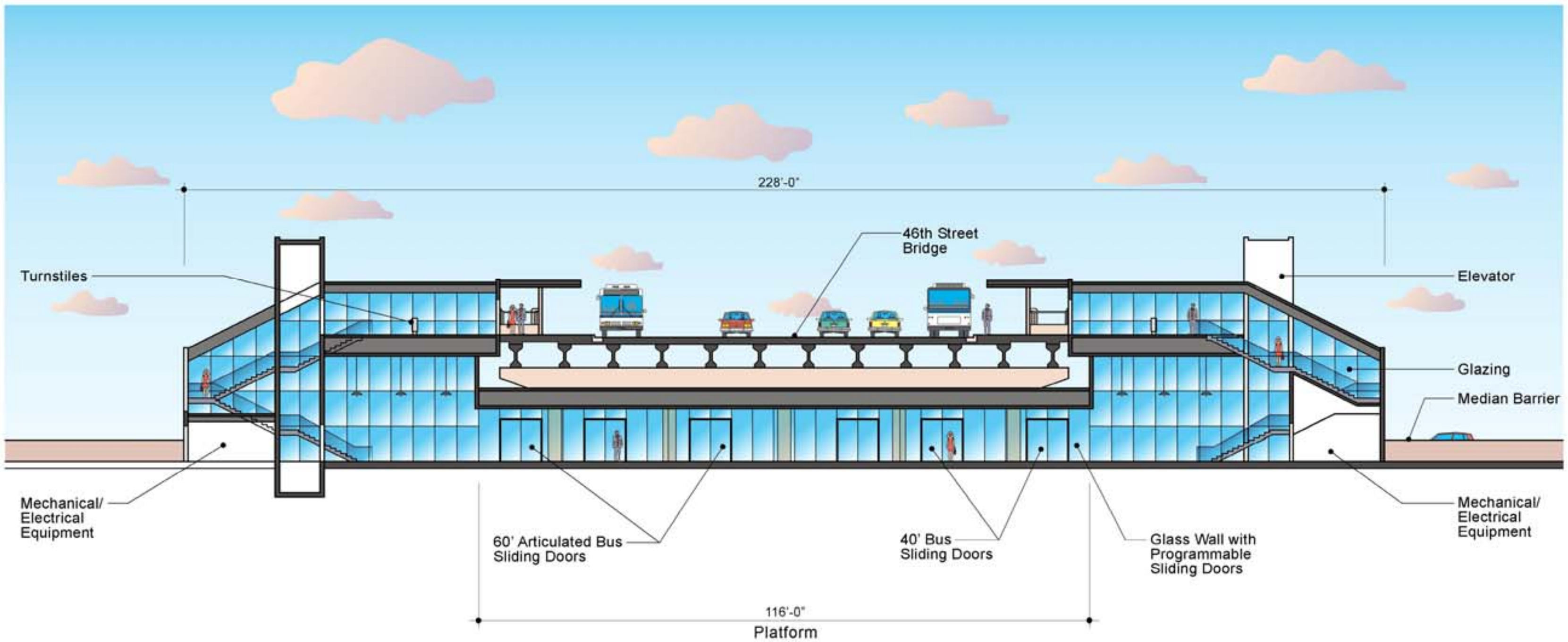

Figure 25
I-35/46th Street BRT Station Site *
Platform Level: Full Enclosure

January 2005
0 5 10 20 Feet

*Prepared as part of Metro Transit Project, Spring 2004

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Furnishings

Although accommodations between stations may vary somewhat, it can be expected that BRT can offer similar in amenity levels to the LRT system such that stations will have a baseline of standard and consistent items of furnishing and finishes. These items may include:

- Litter receptacles
- Benches and leaning rails
- Bicycle racks and lockers
- Tactile warning strip at platform edges
- Variable message signs for advanced vehicle locations, etc.
- Vicinity maps, bus routes and schedules, and information panels
- Closed circuit television
- Newspaper boxes
- Emergency telephones
- Public art opportunities
- Ticket vending machines

<u>Operations</u>

The BRT platform is approximately six inches high above the traveling surface. It is a center platform, accommodating low-floor buses and direct, level boarding for all patrons, including those in wheel chairs. It is approximately 115 feet in length (from enclosure to enclosure), which provides enough room for one standard bus and one articulated bus to park along the curb at the same time. Length of the platform is a reflection of the width of the reconstructed bridge deck above. Platform width is a function of standard measures of pedestrian passage and shelter: the curb-to-curb platform width of 20 feet could accommodate two two-foot tactile warning strips at the edge, two six-foot pedestrian lanes (this width will allow individuals in wheelchairs to pass one another or allow two heavily clothed individuals to pass one another easily), and four-foot wide windscreens.

Paved areas for maintenance vehicles, temporary parking for authorized transit personnel, and bus breakdowns and temporary bus storage are located at both ends of the platform, beyond the enclosures.

Consistent with overall design of the BRT system along the I-35W Corridor, continued boarding and unloading from the right side of the bus requires that, before stopping at the platform, and upon leaving the platform, all buses must cross over the opposing BRT bus lane.

Existing bridge decks will be widened to accommodate increased pedestrian circulation and bicycle parking, as well as the addition of two twelve-foot, exclusive, curbside feeder bus drop-off and pickup lanes. There is no provision for automobile drop-off and pickup.

Lakeville North Park and Ride

The proposed Lakeville North Park and Ride is located within a five-acre site formerly used by Mn/DOT as a truck weigh station. The site is currently used by individuals who park and car pool and is located east of I-35W, between County Road 50 and County Road 46, in Burnsville. Although there is available land immediately east and west of I-35W, the site to the east was chosen as the best proposed BRT station site, due to its location in relation to existing and estimated future BRT patrons. Geography, existing roads and sidewalks, local bus routes, and development trends on the east side of I-35W all support greater ridership potential. In addition, the configuration of the available parcel favors more compact construction and shorter walking distances, and bus access from the County Road 46 and County Road 50 interchanges is comparatively shorter and less circuitous.

The east edge of the site abuts Kenrick Avenue. Nearby businesses and land uses include the Mn/DOT maintenance yard, the Harley Davidson Distributor, and the Thompson Communities trailer park, as well as a large number of single-family residences. Graphics and pictures from the site and proposed stages of development are shown in Figures 26 through 29.

Facilities

The first phase of the proposed development includes a surface park-and-ride area with approximately 440 spaces, a nine-car drop-off and ride area, a one-way feeder bus and BRT bus parking area, which accommodates at least four buses, and a passenger transfer plaza, which includes appropriate furnishings, such as a ticket vending machine, litter receptacles, seating, maps and BRT information panels, security television, variable message signs indicating bus arrival times, and at least two enclosed and heated passenger shelters.

Operations

There are three proposed points of vehicular access along Kenrick Avenue. Those on foot may access the site from the northeast by crossing Kenrick Avenue via the existing sidewalk. Additional sidewalks are suggested along Kenrick Avenue to the south.

Both northbound and southbound BRT buses may exit I-35W at County Road 50 or County Road 46 to access the station site via Kenrick Avenue. BRT buses leaving the station site are provided a slip lane so they may quickly return to I-35W. Southbound BRT buses return to I-35W via Kenrick Avenue and either the County Road 50 or County Road 46 interchange.


Figure 26
I-35/Co. Rd. 50 BRT Preliminary Study
Existing Conditions
January 2005
Legend:
Proposed Station Sites Including One or More of the Following:
• Bus Parking
• Drop-Off/Pick-Up
• Park-and-Ride
Parcel Boundaries
Existing Traffic Signal
NORTH
0 200 400 800 Feet
URS
Burnsville
Lakeville
Crystal Lake
Lee Lake
Kinsley Lake
Orchard Lake
162nd Street W.
165th Street W.
160th Street W.
172nd Street W.
175th Street W.
176th Street W.
Kenwood Trail
Klamath Trail
Jonquil Trail
Jonquil Avenue
Kenyon Avenue
Kenrick Avenue
Jackson Landscape Supply
Celebration Church
3.5 Acre Vacant Park-and-Ride: 60 Spaces
3 - Lanes Southbound
Gander Mountain
HOM Furniture
AmericInn
Cracker Barrel Restuarant
Strip Commercial (Under Construction)
Gopher Mini Storage
Harley Davidson Sales & Service
3 - Lanes Northbound
Project Site: 5.0 Acre Vacant Park-and-Ride: 60 Spaces
MnDOT Lakeville Truck Station
2 - Lanes Northbound
Connelly Community Trailor Park
Fleet Farm
35
46
5
50

Project Site Looking West

Looking East to Project Site

Figure 27

I-35/Co. Rd. 50 BRT Preliminary Study

Ground Level Panoramic Photographs of Site Area

January 2005

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Figure 28
I-35W BRT Corridor Study
I-35/Co. Rd. 50 BRT Station Site Plan
January 2005
Lower 167th Street W.
Upper 167th Street W.
168th Street W.
Celebration Church
NB BRT Freeway Entrance
35
BRT Bus Parking (4 Curbside Spaces)
Kenyon Avenue
Kenmore Drive
Park-and-Ride: (440 Spaces)
167th Street W.
166th Street W.
Kentucky Avenue
Drop-Off and Pick-Up (9 Spaces)
MnDOT Lakeville Truck Station
Park-and-Ride
Joplin Way
Kenrick Avenue
Connelly Community Trailor Park
Jonquil Trail
Potential Future Development:
• Multi-Level Parking Structure
• I-35/County Road 50 Interchange Improvements (as necessary)
• Center-Running (I-35) Northbound and Southbound Busway with Center Platform and Pedestrian Skyway
• Transit-Oriented Development (TOD)
NORTH
0 50 100 200 Feet
URS

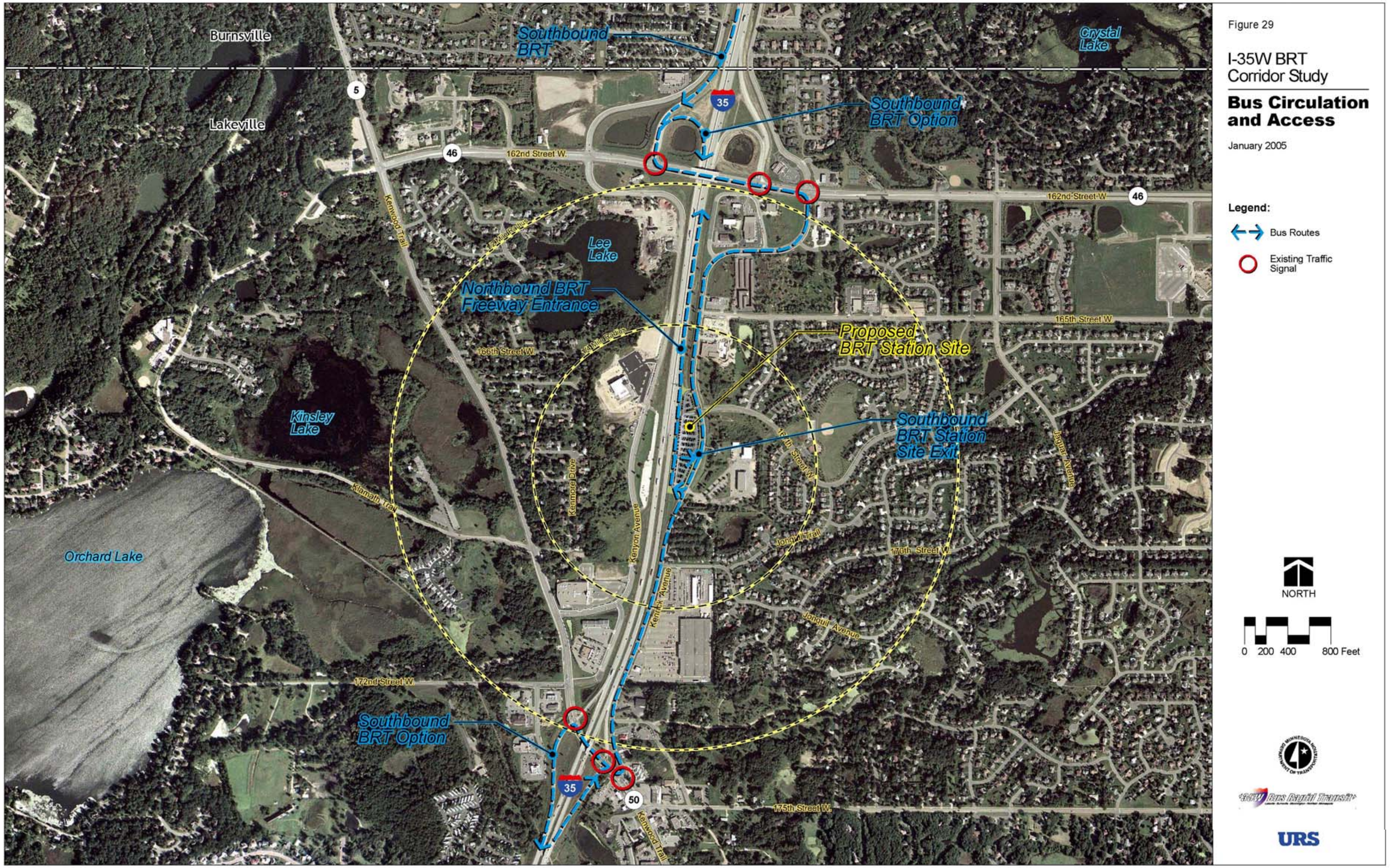
Figure 29
I-35W BRT Corridor Study
Bus Circulation and Access
January 2005
Legend:
Bus Routes
Existing Traffic Signal
Southbound BRT
Southbound BRT Option
Northbound BRT Freeway Entrance
Proposed BRT Station Site
Southbound BRT Station Site Exit
Southbound BRT Option
Burnsville
Lakeville
Lee Lake
Kinsley Lake
Orchard Lake
Crystal Lake
162nd Street W
165th Street W
170th Street W
172nd Street W
175th Street W
Kenwood Trail
Kenyon Avenue
35
46
5
50
NORTH
0 200 400 800 Feet
URS

Future Phases of Development

At some point in the future, if ridership demand dictates, this site could be reconfigured as a multi-level parking structure. The addition of a parking structure at this location may trigger interchange improvements at County Road 50 and I-35W, and would need to be explored prior to making a decision on expanding this site. Other potential features for this site in the long term include a pedestrian bridge that extends to a new center platform in the median of I-35W, which may be appropriate if BRT service is provided to points south of this site.

Fare Collection Options

Payment of fares is one part of the BRT system that can be designed to reduce an individual's travel time by making fare payment a quicker transaction. Under a traditional bus fare payment system, individuals board a bus and present the driver with payment, which can take the form of cash, individual trip cards, monthly "all-you-can-ride" cards or transfers from another route.

One option for fare collection is the introduction of "Go-To Cards", which are plastic cards with an embedded microchip that records a stored value. Go-To cards only need to be brought in close proximity to a reader that automatically deducts the correct passenger fare. An audible sound indicates that the correct fare has been deducted.

With Go-To cards, the amount of time that a driver needs to validate and record passenger fares is reduced.

Metro Transit is currently developing a Go-To card system that will be used throughout the region to pay passenger fares for bus and rail services.

Another option that could easily be incorporated into the proposed BRT stations along I-I-35W is a barrier enforced payment system that requires patrons to pay for their trip upon entering the station. Under this type of system, individuals approach a station and are able to purchase tickets from a machine in advance of entering the station. Once a person has their fare payment (e.g. purchased ticket, individual trip cards, monthly "all-you-can-ride" cards or transfers from another route), they proceed to a turnstile or gate that allows them to enter once a valid fare payment is presented. The fare payment is validated by the turnstile or gate mechanism, then returned to the patron once they pass through.

Under this type of a fare payment system, bus drivers are no longer be responsible for verifying correct fare payment. This allows for faster boarding by eliminating the need for drivers to verify each passenger's fare. Another advantage that this system offers is that patrons can board a bus using all doors, instead of the current practice of using the front door only and walking single file past the driver. This type of system also serves improves the safety and security of I-35W BRT stations by only permitting individuals with paid fares to enter the station and platform waiting area.

Bus Type/Design

Existing Vehicles

Providers in the Twin Cities operate a range of vehicles which includes 60' articulated buses, motor coaches for longer trips, 40' transit buses which comprise the core of the region's bus fleet and smaller shuttle buses that operate in neighborhoods. The region's transit fleet also contains "low-floor" buses, which have floors approximately 14" above the pavement allowing easy access for people getting on and off the bus.

Twin Cities' Regional Transit Fleet

60' Standard Articulated Bus

40' Standard Transit Bus

Motor Coach for Longer Commuter Trips

Neighborhood Shuttle

Specialized Vehicles

In recent years, several bus manufacturers have begun to produce specialized vehicles for BRT operations that have the look and feel of rail vehicles. Aerodynamic styling, enhanced interiors, additional doors, integration of technology and larger windows distinguish these specialized vehicles from traditional buses. These vehicles provide a unique look that can help give a BRT system its own identify separate from local bus operations. For many communities, this unique identity is an important element for attracting riders to BRT service.

Civis by Irisbus

The cost of specialized vehicles range from $950,000 - $1.6 million per bus. This compares with $500,000 - $650,000 for standard articulated buses (60' long) to 40' transit buses that cost approximately $300,000 each.

NABI – 60 BRT

The composition of the fleet for the BRT system will have a significant impact on the overall capital cost of deploying BRT in the I-35W Corridor. As a result, the study team looked at how and if the existing bus fleet could be utilized or if it was necessary to purchase the more expensive, specialized buses.

For express bus service, the existing fleet will function very well as there will be no appreciable change in express bus function under a BRT system. As ridership grows and vehicle maintenance and reliability can be assured, it may be appropriate to increase the number of 60' articulated buses operating in the I-35W Corridor.

Articulated buses can transport approximately 50% more passengers than a standard 40" transit bus, which results in lower operating costs per passenger.

Buses that provide service stopping at each of the on-line BRT stations, a design feature can be implemented that permits the existing fleet to operate this service. As noted in the Station Design section found on page 3-4, the recommended station configuration has a bus travel pattern whereby the buses crossover and approach the BRT station platform from the left-hand side. This crossover feature allows people to board buses from the right-hand side that is consistent with the current regional fleet.

The conclusion of the study team is that deployment of BRT in the I-35W Corridor can proceed by utilizing the region's existing bus fleet and it is not necessary to purchase the more expensive, specialized vehicles.

Passenger Information Systems

The I-35W Corridor presents an opportunity to provide new and emerging technology that can enhance the travel experience of BRT patrons. Summarized below and on the following page is an overview of potential ways to provide enhanced information to passengers and are worth considering for the I-35W Corridor.

Existing Infrastructure

Metro Transit currently has an Automatic Vehicle Locating (AVL) system on its entire fleet of buses and software to track all active AVL devices. AVL technology offers the ability to provide passengers with real-time transit information, through dynamic displays, kiosks at major bus stops and through the Internet.

Metro Transit is also conducting tests with the University of Minnesota on an AVL-based signal priority system for transit vehicles. This system would increase the duration of a green light if a bus were within a certain range so that buses can improve schedule adherence. The priority system would not change lights as emergency preemption systems would, but would lengthen a green light to provide more time for a bus to pass through an intersection. The AVL-based system would allow communities to deny transit priority while still keeping emergency preemption.

Additionally, Metro Transit is currently testing specially designed cards as an electronic form of payment. Beginning in the Winter of 2004-05, both Metro Transit and MVTA expect to be using the new "Go-To cards".

Passenger Information Alternatives

Providing real-time information to BRT patrons is an added level of service that helps distinguish today's bus service from future BRT service in the I-35W Corridor. Current and accurate information can be supplied to individual stations for people who are waiting for a bus and it can also be made available to people in advance of their trip to help them plan their travel. This information can help decrease the anxiety of travelers by letting them know which route to take and how long they can expect to wait for their next bus.

This information can be given to travelers before they leave, en-route to a transit station, while waiting for the next bus, and on the bus itself.

Real-time bus location information is provided through a Global Positioning System (GPS) using Automatic Vehicle Location (AVL) technology on buses. GPS coordinates are fed into bus location prediction algorithms to provide real time information on possible bus delays.

Following are existing applications that could be used to enhance a passenger's experience with BRT. Each summary description also includes an estimated cost.

- Dynamic Bus Stop Signs are one of the most prominent pieces of passenger information equipment currently in use. Signs posted at stations inform waiting passengers of the expected arrival of the next bus, current time, and any information regarding delays in service. Signs can also be posted outside the platform or in a park-and-ride parking lot to tell arriving passengers bus arrival information so that they can make more informed choices before entering the platform area. This information allows passengers to decrease the time they spend waiting for a bus and relieves anxiety of not knowing when the next bus will arrive. Costs range from \$2,000 - \$5,000 per sign. Other costs to consider include installation costs, maintenance and power supply.

- Interactive Information Kiosks can provide a variety of information to users. Kiosks allow users to make more informed decisions about their overall trip. Besides real-time next bus information that can be displayed on dynamic bus stop signs, the kiosks can provide transit route information regarding routes that link to the route or routes that do not link directly to the route. Trip planning features can also be provided, allowing passengers to plan the most efficient trip. The kiosks

can also be linked to event databases to provide detailed trip planning for special events or information about activities passengers near a passenger's destination. Kiosks can be placed near ticket vending machines to help passengers plan their trip before they purchase a ticket. Estimated costs include $10,000 - $50,000 per kiosk. Other costs to consider include installation costs, maintenance and power supply. It is important to note that kiosks can also provide an opportunity to generate revenue through partnerships with advertisers who may be willing to pay a fee to have their product or service publicized.

- Text Messaging Alert Systems can be use to send real-time information to subscribers through either email accounts or wireless personal information systems such as cell phones, pagers, or Blackberries. Next bus and incident or delay information can also be sent to users when they may not be near a BRT station or at a computer. This allows users to be aware of any unplanned changes in service before they arrive at a station. The estimated cost to integrate this feature into an existing system is $100,000 - $200,000.

- On-Board Information Displays can be installed on buses to provide information to passengers regarding the next stop, transit connections, and bus destinations. These displays help passengers depart at the correct stop and are especially useful to riders who do not use the bus very often. Signs can be coupled with sound recordings to convey the same information to passengers with visual impairments or obstructed views. Automated audio and visual information allow the driver to devote more of her attention to driving the bus. Estimated costs are $7,000 per sign.

BRT Operational Options

Under this section, BRT operational considerations are presented and discussed as they relate to alternatives for configuring the BRT transitway and alternatives for operating BRT service in the I-35W Corridor.

Transitway Configuration

As noted previously, five alternatives were considered for the transitway operating on I-35W. In this section each of the alternatives is assessed in light of:

- Bus Operating Speeds
- Station Location
- Buses Entering/Exiting the Transitway

Design options considered for the transitway are shown in Figure 21 on page 3-2.

Operating Speeds

Under Design Option 1 – *Barrier-Free Lanes* buses are expected to operate near or at the posted speed for I-35W . This is a critical element to successful BRT service as one of the most important characteristics of BRT service is that it offers people quick service with travel times as fast or faster then traveling alone in their car.

Under Design Option 2 – *Shoulder Running Buses,* Minnesota State Law limits bus speeds to 15 MPH over the speed of traffic in the general-purpose lanes up to a maximum of 35-MPH[3]. While this provides a significant advantage over stop and go traffic today, it is not as attractive when compared with buses that are operating at the posted speed under the barrier-free or barrier separated options. Potential vehicle conflicts may also occur at entrance and exit. An additional concern with Design Option 2 is that the shoulders may not be available at certain times due to major weather events (e.g. snowstorm) or disabled vehicles parked on the shoulder. While Design Option 2 represents the current practice on I-35W , the barrier-free and barrier separated options offer significantly better operating speeds and reliability.

Design Option 3 – *Barrier Separated Lanes* are expected to operate near or at the posted speed for I-35W . This is a critical element to BRT service as one of the most important characteristics of BRT service is that it offers people quick service with travel times as fast or faster then traveling alone you their car.

Lane Management Options - Another consideration for operating speeds is the operation of BRT in a shared lane with High Occupancy Vehicles (HOV's) or in a lane exclusive to buses. If only buses were permitted to operate in the BRT lane, then buses would easily be able to operate at the posted speed limits. This attributable to the fact that currently a maximum of 87 buses operate in one hour in a lane that can accommodate up to 2,000 vehicles. Even accounting for growth in the number of buses over time, there would be a significant amount of unused capacity in the BRT only lane, under this scenario.

By introducing HOV's to the BRT lane, the unused capacity is taken up by the HOV's and the freeway is more fully utilized. However, this does run the risk of slowing the bus operating speeds. While it is clear that some number of HOV's can be added to the BRT lane (e.g. 1,500 per hour) and operating speeds can be maintained, the number of HOV's

[3] Minnesota Statutes, Chapter 169.306 Use of Shoulders by buses.

permitted into the BRT lane should be managed to insure that buses are able to operate at the posted speeds.

Bus Station Locations

Design Option 1 – *Barrier-Free Lanes* would operate in a center running configuration, whereby buses operate on either side of the median in the center of the freeway. This configuration requires bus stations to be located in the center of the freeway with vertical access provided to local bus routes via stairs and an elevator.

This configuration is consistent with the current design plans that are being considered for a bus station north of the I-35W /Highway 62-interchange area at Lake Street. Under this configuration, as buses approach the station, they would move off the BRT lane into an exclusive lane as they enter the station. Just prior to entering the stations, buses would shift to the left allowing them to arrive at the station from the left-hand side. This shift is necessary to permit passenger loading from the right-hand side of the buses, which is how all metro area buses are currently designed. Figure 30 depicts how buses would enter and exit the station.

Another advantage with this center running configuration is its consistency with the design plans for the I-35W /Highway 62-interchange project, which includes space to accommodate a center bus station at 46th Street. Additionally, center bus stations are consistent with conceptual plans for a bus station proposed at Lake Street and I-35W.

Design Option 2- *Shoulder Running Buses* would not be able to take advantage of center bus stations. For this option, two separate stations would need to be built (vs. one under the center running options) at each stop to accommodate the buses operating on the right-hand shoulders. In addition to the added expense of building two stations at each stop, passengers would experience additional time for transferring to local bus routes compared with transferring at one central station.

Design Option 3 – *Barrier Separated Lanes* would operate in a center running configuration, whereby buses operate on either side of the median in the center of the freeway. This configuration requires bus stations to be located in the center of the freeway with vertical access provided to local bus routes via stairs and an elevator – identical to Design Option 1.

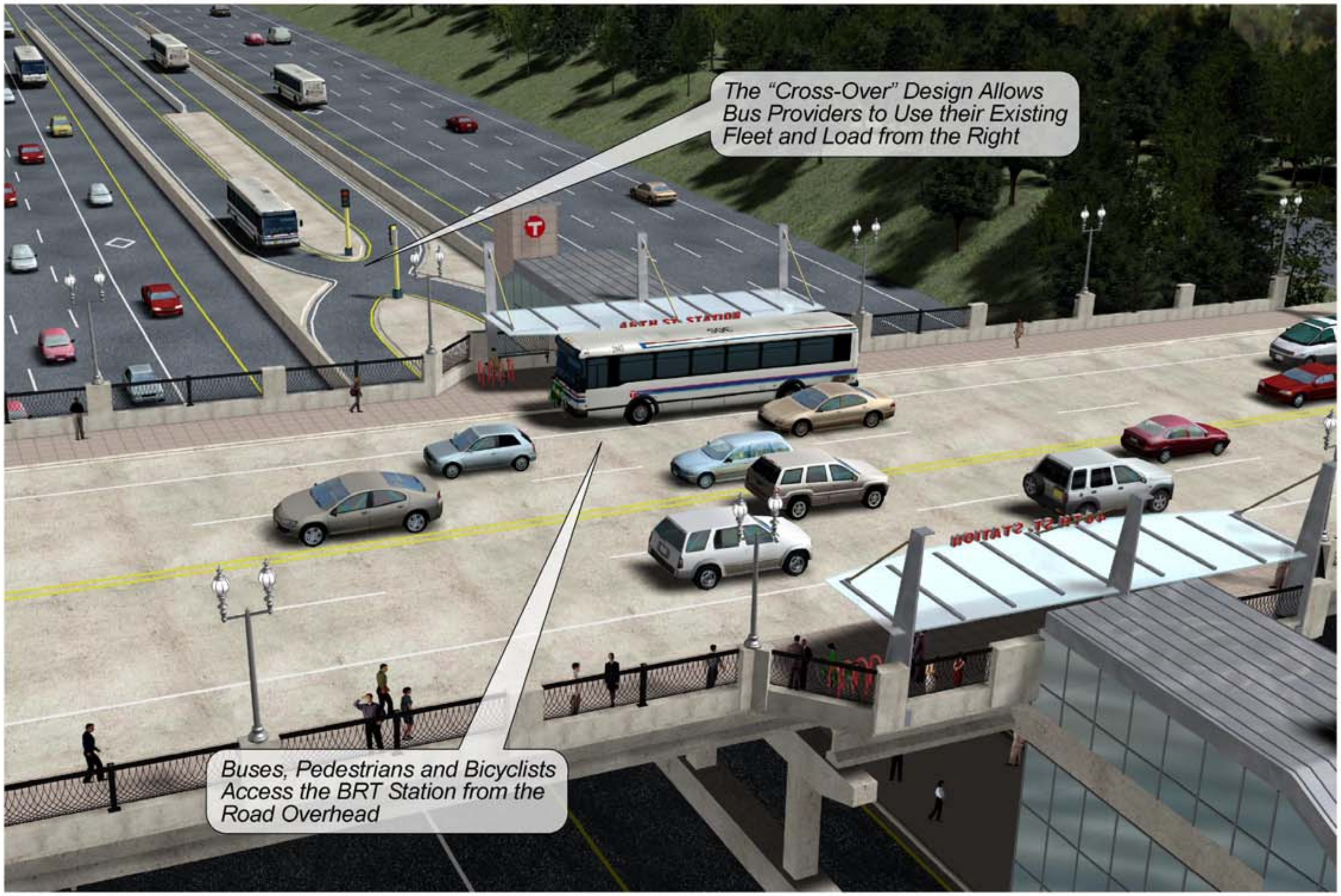

Figure 30
I-35W BRT Corridor Study
Station Simulation

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Entering/Exiting the BRT Lanes

An important distinction under Design Option 1 – *Barrier-Free Lanes* is that buses can enter and exit the BRT lane at any point throughout the interchange area. As illustrated in Figures 31 and 32, buses join I-35W in a number of places throughout the corridor. The absence of barriers allows buses to shift from the general-purpose lanes and into a BRT lane at any point throughout the interchange area. This flexibility allows buses to take advantage of the benefits of the BRT lanes much sooner then if the buses were prevented from entering the BRT lane due to a barrier.

Under Design Option 2- *Shoulder Running Buses*, buses would have generally good access to and from the shoulder running bus lane throughout the interchange area. This option does not provide as much flexibility as is found under Design Option 1, as buses may be restricted in their movements in and around the entrances and exits to ramps. Another factor that could limit the ability of buses to exit/enter the BRT lanes is the presence of vehicles that use the shoulder when their vehicle is broken down or when the shoulder is unavailable due to weather events.

Under Design Option 3 – *Barrier Separated Lanes* buses would only be able to access the BRT lane where gaps are created in the barriers allowing vehicles to enter and exit the barrier-separated lanes at designated locations. Based on AASHTO guidelines[4], an opening of approximately 2,000' is required to allow vehicles to enter/exit a barrier-separated roadway. Following this guideline, there would limited opportunities to provide for openings in the I-35W Corridor and no opportunity to provide for an opening in the I-35W/Highway 62-interchange area.

Service Options

A successful BRT operation in the I-35W Corridor will be comprised of three distinct types of service, (1) Express Service, (2) Station-to-Station Service; and, (3) Local Service.

Figure 31 depicts how each of the three services will interact at a typical BRT station and how connections can be made between service.

Express Service

This service will focus on serving commuters who travel along the I-35W Corridor and work in Downtown Minneapolis. Express service will be concentrated in the morning and evening peak travel periods and provide a direct, non-stop trip from various points

[4] This guide was prepared in July 2002 for the American Association of State Highway and Transportation Officials

along the corridor to Downtown Minneapolis. As demand grows throughout the corridor, express service may be expanded to other destinations and offered outside of the peak commuting periods.

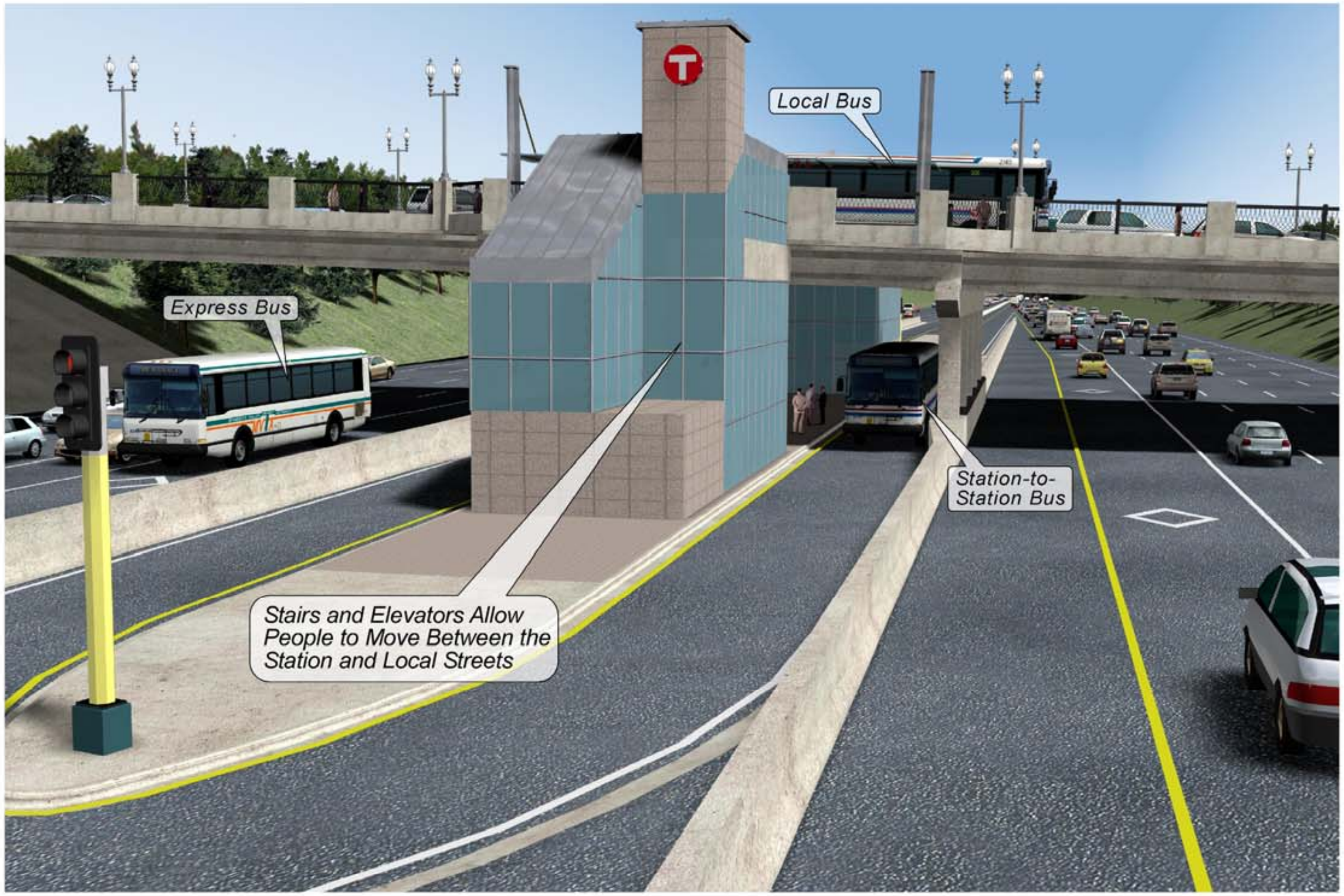

Figure 31
I-35W BRT Corridor Study
Station Simulation

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As is the current practice, passengers should expect to pay a premium for this direct, non-stop service.

Locations where express routes are expected to enter the I-35W Corridor include the following:

- 162nd Street (Expanded Service to Lakeville)
- Highway 13 (Burnsville Transit Station)
- 98th Street
- 82nd Street
- 76th Street
- Highway 62 (Cedar Avenue Service)
- Diamond Lake Road (54th Street)
- 46th Street
- 35th/36th Street (38th Street when built)

Express service can also provide a "reverse commute" service. For example, during the morning rush hour when buses enter Downtown Minneapolis and after all passengers disembark, many buses will turn around and "deadhead" back to the start of the route to make another trip Downtown. If demand warrants, these deadhead trips could transport passengers from downtown to the "beginning" of the route to destinations such as Best Buy's World Headquarters or the Burnsville Transit Station.

Infrastructure that is critical to the success of express service is a transitway that allows buses to operate at posted speeds for the duration of the trip and sufficient park and ride lots that are convenient for people to reach and provides relatively quick access to I-35W.

Station-to-Station Service

Another important service that is critical to the success of BRT in the I-35W Corridor is station-to-station service. A similar service has recently been introduced by Metro Transit in the I-35W Corridor (Route 535). Buses providing station-to-station service stop at each of the stations along the I-35W Corridor resulting in longer trip times when compared with express service. However, by stopping at each station, passengers are able to connect with local routes to complete their trip.

Infrastructure that is critical to the success of station-to-station service includes stations that are immediately adjacent to the BRT transitway and provide convenient and easy access to bus routes operating on local streets.

The distinction between station-to-station service and express service is depicted in Figure 32.

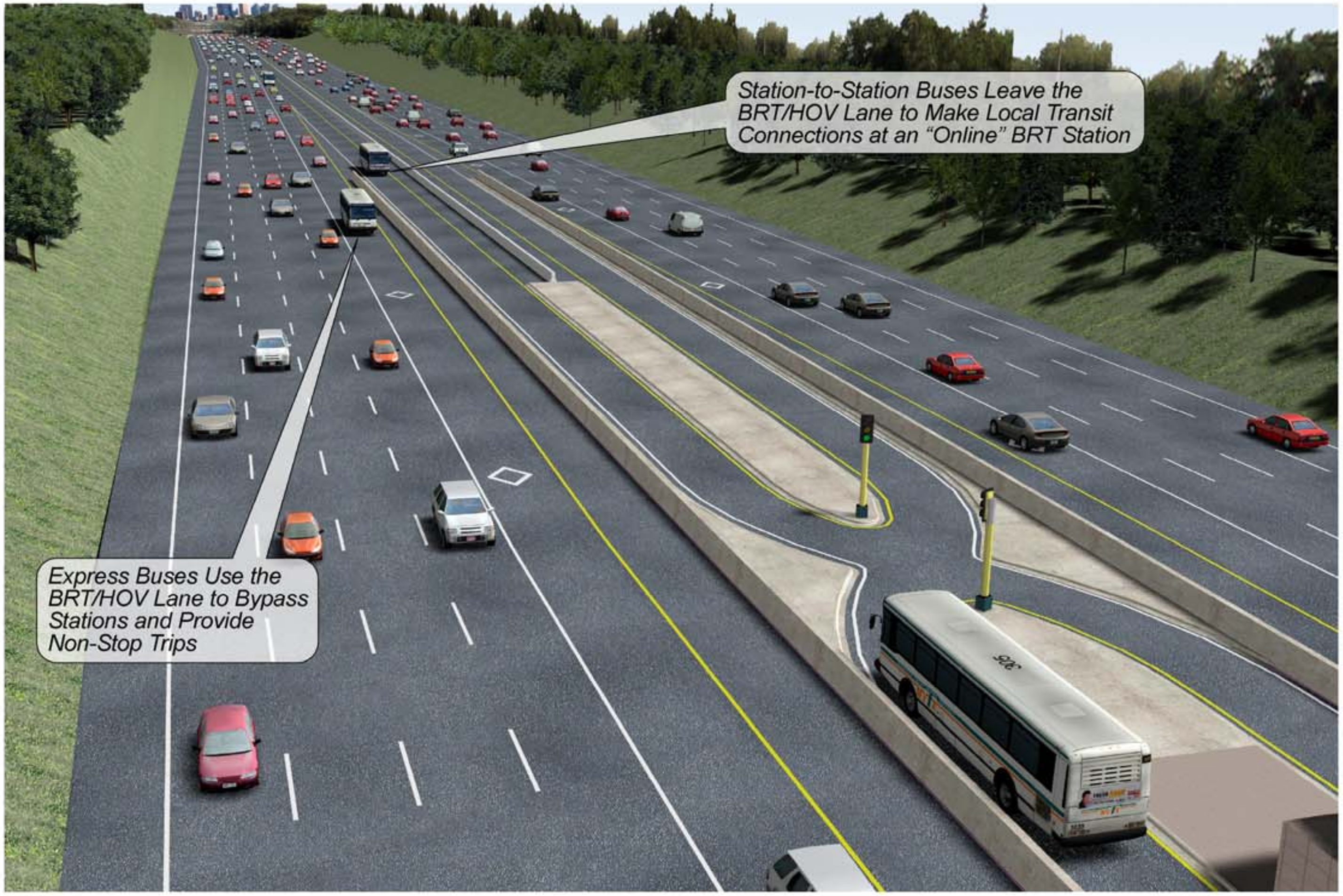


Figure 32
I-35W BRT Corridor Study
Station Simulation
January 2005
URS

Local Service

The previous two types of service focused on moving individuals north and south through the I-35W Corridor. Local bus service provides an opportunity for people to travel by bus to destinations that are not immediately on the corridor. Local routes focus on serving multiple destinations in neighborhoods throughout the metro area. As noted earlier, individuals can make convenient transfers to the station-to-station service at stations along the I-35W Corridor.

Infrastructure that is critical to the success of local service is very similar to what is necessary for the station-to-station service - stations that are immediately adjacent to the BRT transitway and provide convenient and easy access to the bus routes operating on the I-35W Corridor.

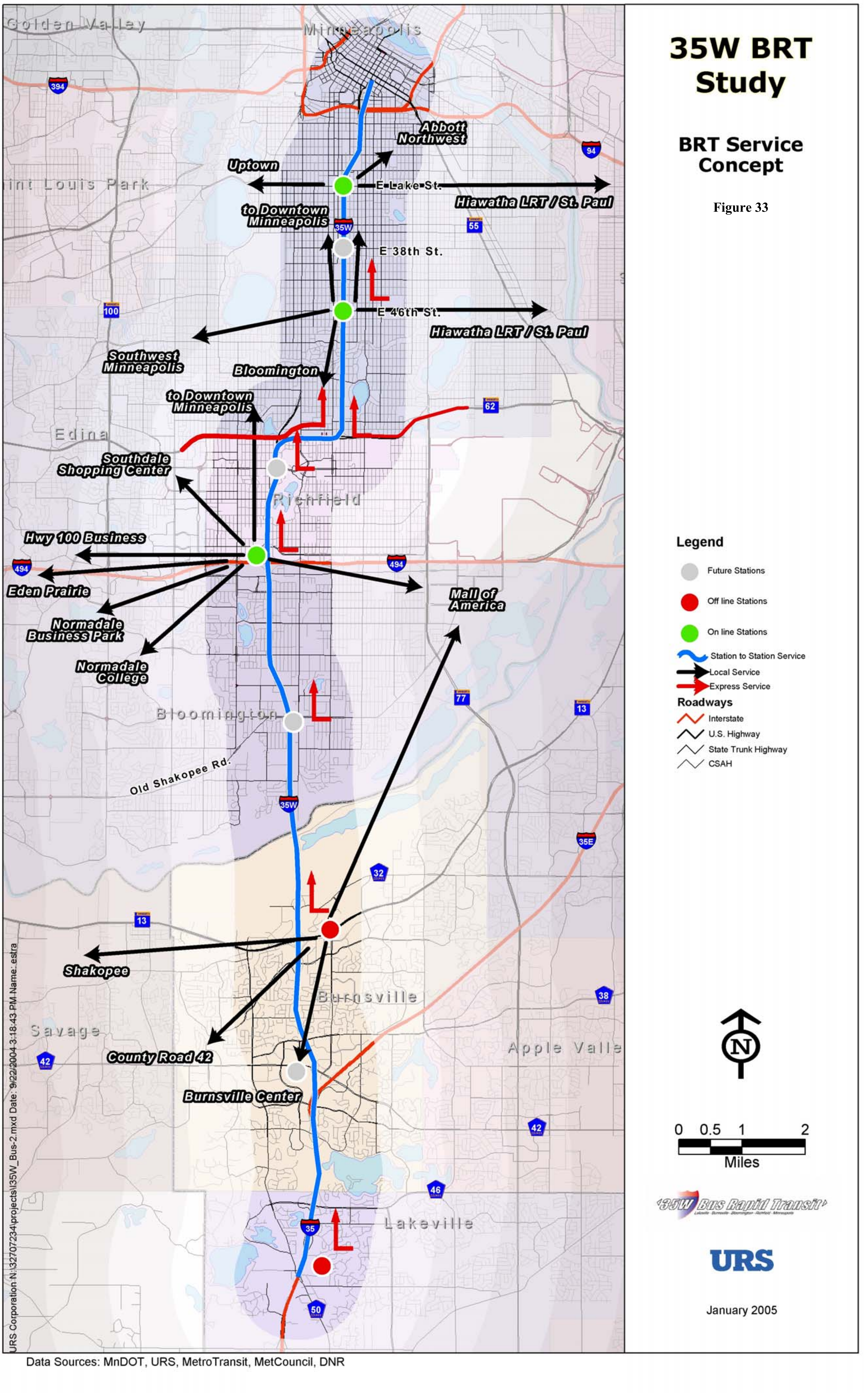
Figure 33 depicts the different routes and service concepts for the I-35W Corridor.

Traffic Management/Signal Priority

For some BRT systems, the ability to manipulate traffic signals to maintain running times is very important to the system's success. Generally, under these types of systems, traffic signals are equipped with a device that is activated by an approaching bus. As an authorized bus approaches an intersection, the bus sends a message to the device that either turns the traffic light green or extends the green light until the bus has cleared the intersection. After the bus has cleared the intersection, the traffic signal returns to its regular operation.

In the Twin Cities, transit buses operating at the University of Minnesota are utilizing transit signal priority. Buses operating on the University's transitway, which connects the Minneapolis and St. Paul campuses, employ a traffic signal priority system that results in very few stops on the trip between the campuses.

Traffic Signal Priority on
University of Minnesota's Transitway


35W BRT Study
BRT Service Concept
Figure 33
Legend
Future Stations
Off line Stations
On line Stations
Station to Station Service
Local Service
Express Service
Roadways
Interstate
U.S. Highway
State Trunk Highway
CSAH
Miles
URS
January 2005
Minneapolis
Golden Valley
Uptown
Abbott Northwest
E Lake St.
Hiawatha LRT / St. Paul
to Downtown Minneapolis
E 38th St.
E 46th St.
Southwest Minneapolis
Bloomington
Edina
Southdale Shopping Center
Richfield
Hwy 100 Business
Eden Prairie
Normadale Business Park
Normadale College
Mall of America
Old Shakopee Rd.
Shakopee
Burnsville
Savage
County Road 42
Burnsville Center
Apple Valle
Lakeville
Data Sources: MnDOT, URS, MetroTransit, MetCouncil, DNR

In many cities throughout the region, a traffic signal priority system is in place. Under this system, emergency vehicles are equipped with devices that will change the traffic signal in favor of the approaching emergency vehicle that allows them to enter the intersection on a green light.

Signal priority and traffic management strategies are most effective for BRT systems that operate on arterial roadways. The system proposed for the I-35W Corridor will operate primarily on the Interstate which affords little opportunity to utilize a traffic signal priority system. The best opportunities to consider traffic signal priority are on the local roadways, immediately adjacent to I-35W.

CHAPTER 4.0 – BENEFITS, COSTS AND CHALLENGES

Benefits

By implementing BRT service in the I-35W Corridor, there are a number of benefits that are expected to be realized. These include reduced travel times, increased transit ridership, improved air quality, expanded freeway capacity and an overall increase in mobility.

Each of the benefits is discussed in greater detail below and on the following pages.

<u>Travel Time Savings</u>

By establishing a BRT system that allows buses to operate at posted speeds on a consistent basis, it is expected that individuals will experience improved travel times when compared with buses traveling at slower speeds in general purpose lanes.

To quantify the anticipated travel time savings, estimated travel times were developed for the "with BRT" scenario. Under this scenario it is assumed that buses will operate at the posted speeds throughout the I-35W Corridor. These estimated travel times were then compared with the travel times experienced today and provided by Metro Transit.

Comparisons were made from six points along the I-35W Corridor, ranging from a trip of 4.1 miles from 46th Street to 2nd Avenue and 7th Street in Downtown Minneapolis to a trip of 20.25 miles from the proposed Lakeville North Park and Ride site to Downtown Minneapolis.

Anticipated travel times savings, per one-way trip, range from 8 minutes for trips closest to Downtown Minneapolis to over 12 minutes for trips originating at the proposed Lakeville North Park and Ride site. Table 13 on the following page outlines the anticipated speed and travel time associated with today's bus travel times and the anticipated travel times with BRT in 2030 from six I-35W Corridor access points.

<u>Transit Ridership</u>

To measure the impact on ridership levels between the two scenarios (with BRT and without BRT), the Metropolitan Council conducted a regional transit ridership forecast based on the methodology used for the region's Transportation Policy Plan. The I-35W BRT Study Team provided information on individual routes, service frequency and bus operating speeds. The routes selected for the ridership forecasting included all routes that operate on I-35W, regardless of their point of origin. This includes routes that enter the corridor from Highway 62, routes originating south of Highway 62 and routes that enter from south Minneapolis.

Table 13.

I-35W Express Bus Speeds and Estimated Travel Times

I - 35 Access Point	Total Miles*	Existing Travel Times and Speed *From Metro Transit* Estimated Average Speed MPH	Estimated Average Travel Time Minutes	Year 2030 With BRT Speed Advantage *Assumes Buses Operate at Posted Speeds* Estimated Average Speed MPH	Estimated Average Travel Time Minutes	Estimated Time Savings With BRT Minutes
46th Street	4.10	19.00	13.00	49.00	5.00	8.00
Diamond Lake Road	5.20	22.00	14.20	51.00	6.20	8.00
76th Street	8.70	27.00	19.30	53.00	10.00	9.30
98th Street	11.60	32.00	21.80	56.00	12.50	9.30
Burnsville Transit Station	15.80	36.00	26.30	58.00	16.30	10.00
162nd Street	20.25	37.00	32.80	60.00	20.40	12.40

** Distance and Time for 35W Portion to 2nd Avenue and 7th Street in Minneapolis*

For bus operating speeds, the "with BRT" scenario assumed that buses would be operating at the posted speed limits throughout the I-35W Corridor. Under the "without BRT" scenario, buses would not have a speed advantage and would be operating at the slower speeds experienced by general-purpose traffic.

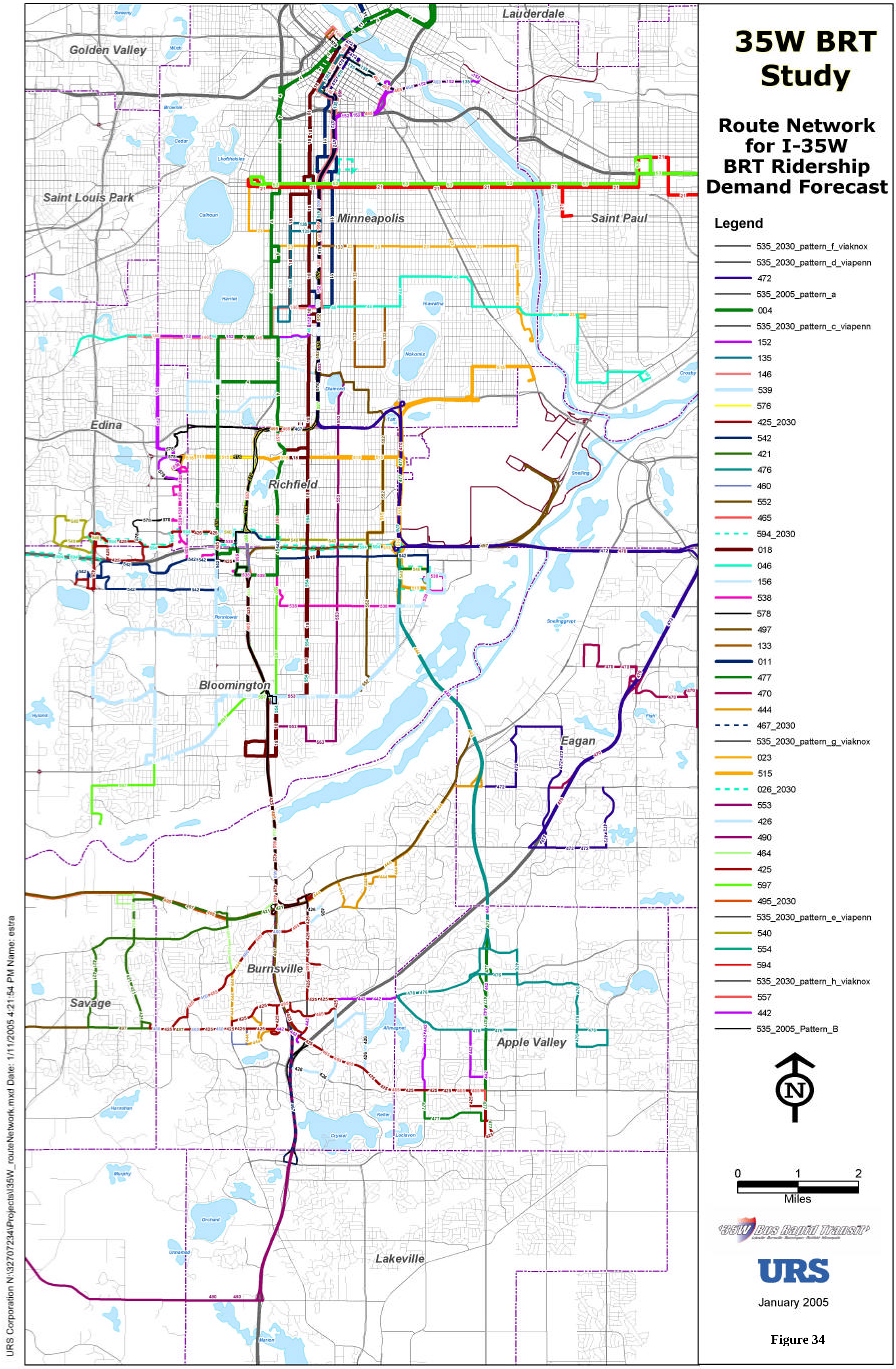
Average trip frequencies by time of day for each of the routes were developed by Metro Transit and are summarized by route in Tables 14 and 15. Figure 34 on page 4-5 depicts the individual routes that were part of the Metropolitan Council's ridership forecast.

Table 14.
Average Trip Frequencies for Travel Demand Forecast
As Expressed in Minutes

Express Routes	Entry Point to I-35W	Morning Peak *Northbound*	Afternoon Peak *Southbound*
133	35th/36th/38th Streets	30	30
135	35th/36th/38th Streets	30	30
146	46th Street	15	15
152	46th Street	45	45
156	54th Street	20	20
425	Highway 13	90	90
460	Highway 13	5	5
464	Highway 62	30	30
470	Highway 62	15	15
472	Highway 62	20	20
476	Highway 62	15	15
477	Highway 62	7	7
490	Prior Lake	45	45
495	County Road 46	45	45
552	54th Street	30	30
553	54th Street	20	20
554	98th Street	20	20
557	76th Street	30	30
576	76th Street	15	15
578	76th/66th Streets	30	30
597	98th Street	15	15

Table 15.
Average Trip Frequencies for Travel Demand Forecast
As Expressed in Minutes

Local Routes	Intersection with I-35W	Eastbound				Westbound			
		Morning	Midday	Afternoon	Evening	Morning	Midday	Afternoon	Evening
4	82nd Street	30	30	30	30	30	30	30	30
11	46th Street	15	30	15	30	15	30	15	30
18	98th Street	15	30	15	30	15	30	15	30
21	Lake Street	2	10	8	10	2	10	8	10
23	38th Street	12	15	12	30	12	15	12	30
46	46th Street	20	30	20	30	20	30	20	30
53	Lake Street	12	10	8	12	12	10	8	12
421	Highway 13	45	-	45	-	45	-	45	-
426	Highway 13	30	-	30	-				
427	Highway 13	30	-	30					
442	County Road 42	60	60	60	*limited*	60	60	60	*limited*
444	Burnsville Parkway	20	30	20	60	20	30	20	60
515	66th Street	15	15	15	20	15	15	15	20
538	98th Street	30	30	30	30	30	30	30	30
539	98th Street	30	30	30	30	30	30	30	30
540	I-494	15	30	15	30	15	30	15	30
542	I-494	20	30	15	30	20	30	15	30
		Northbound				**Southbound**			
Station-to-Station		Morning	Midday	Afternoon	Evening	Morning	Midday	Afternoon	Evening
535 Pattern C	NA	30	30	30	30	30	30	30	30
535 Pattern D	NA	60	60	60	60	60	60	60	60
535 Pattern E	NA	60	60	60	60	60	60	60	60


35W BRT Study
Route Network for I-35W BRT Ridership Demand Forecast
Legend
535_2030_pattern_f_viaknox
535_2030_pattern_d_viapenn
472
535_2005_pattern_a
004
535_2030_pattern_c_viapenn
152
135
146
539
576
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421
476
460
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594_2030
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557
442
535_2005_Pattern_B
0 1 2
Miles
URS
January 2005
Golden Valley
Lauderdale
Saint Louis Park
Minneapolis
Saint Paul
Edina
Richfield
Bloomington
Eagan
Burnsville
Savage
Apple Valley
Lakeville
URS Corporation N:\32707234\Projects\I35W_routeNetwork.mxd Date: 1/11/2005 4:21:54 PM Name: estra
Figure 34

Express and Station-to-Station Routes

As noted earlier, the ridership forecast model produced results for two different scenarios, (1) Year 2030 without BRT and (2) Year 2030 with BRT. It is important to note that the results from the model reflect the transit ridership demand that is anticipated based on the inputs of frequency and operating speeds. Ridership demand is expressed as linked daily trips, meaning an individual who transfers between routes to complete their one-way trip is considered one trip.

For the "no BRT" scenario, the model results indicate that in the year 2030, approximately 16,000 additional linked trips could be made daily in the I-35W Corridor when compared with today's daily ridership of approximately 14,500. This doubling of ridership, without any speed advantage underscores the exceptionally strong demand for transit anticipated in the I-35W Corridor.

Under the "with BRT" scenario, (faster operating speeds and associated amenities), daily linked trips increase by approximately 12,500 over the Year 2030, "no BRT" scenario, bringing the total daily linked passenger trips to approximately 43,000. This represents an increase of approximately 28,000 when compared with today's transit ridership in the I-35W Corridor.

A closer look at the growth in ridership attributable to faster BRT speeds and associated amenities, (12,500 increase over "no-BRT" scenario), reveals that approximately 10,000 of the additional daily linked passengers are new riders who switch from other modes of transportation, while approximately 2,500 are riders who switched over from other bus routes.

Local Routes

In addition to forecasting ridership for the express and station-to-station routes, ridership modeling was completed for local routes.

Under the "no BRT" scenario, the model results indicate that in the year 2030, approximately 30,000 additional linked trips could be made on local routes serving the I-35W Corridor. With a ridership today of approximately 47,000 passengers per day, this additional demand could push daily ridership for local routes serving the I-35W Corridor, to 77,000.

Under the "with BRT" scenario, (faster operating speeds and associated amenities), daily linked trips increase by approximately 5,000 over the Year 2030, "no BRT" scenario, bringing the total daily linked passenger trips to approximately 82,000.

Summary

In summary, the I-35W Corridor is expected to experience significant growth in transit ridership demand over the next 25 years. With the presence of BRT service (buses operating at faster speeds and associated amenities), ridership demand for express and station-to-station service is expected to almost triple, to approximately 43,000 in the year 2030. Ridership on local routes serving the I-35W Corridor is also expected to increase 75% to approximately 82,000 daily linked passenger trips per day.

Table 16 summarizes the results from the ridership forecasting:

Table 16.

Ridership Demand Forecast

Daily Linked Passenger Trips

Service Type	Year 2004 Existing 2004	Year 2030 Without BRT	Year 2030 With BRT
Express & Station-to-Station Service	14,500	30,500	43,000
Local Service	47,000	77,000	82,000

Increased Mobility

Under the proposed service plan for BRT in the I-35W Corridor, the combination of express service, station-to-station service and local service will provide individuals with more transit options than what presently exists. Specific opportunities for increased mobility are as follows:

- Individuals who use the station-to-station service are expected to experience significant improvements in mobility. This enhancement of Route 535 service will provide relatively quick trips on I-35W and convenient transfers to local routes at one of the proposed BRT stations along the I-35W Corridor.
- The proposed expansion of express service in the I-35W Corridor will also provide increased mobility options for individuals in the southern portion of the metro area. For example, individuals can catch a bus at the proposed Lakeville North Park and Ride and take a quick trip to the proposed I-494 BRT station and transfer to a local route to complete their trip along I-494. Under the proposed new express service, individuals will now have increased choices for commuting to Downtown Minneapolis.

- Reverse commuting options will also exist and provide expanded transit options. For example, individuals who live in Minneapolis can commute to jobs in the southern metro area either by taking an express trip back to its point of origin (e.g. 494/Best Buy, Burnsville Transit Station) and connecting to local service or using the Station-to-Station service for connections to local routes.

Expanded Freeway Capacity

The number of vehicles that a freeway lane can accommodate in one hour is limited. Additionally, the number of freeway lanes that can be built are also limited.

The proposed BRT service makes a significant contribution to the number of people who can be served during the peak hour of traffic volume. In comparing the number of people served by BRT with the number of people traveling in one general purpose lane, BRT is expected to serve the equivalent of over 3 lanes of single occupant vehicle (SOV) traffic in the peak hour as described below:

- A general-purpose lane can accommodate approximately 2,000 vehicles per hour. Assuming there is slightly more than 1 person in each vehicle (1.1), a single general-purpose lane accommodates approximately 2,200 people in one hour.

- HOV lanes can accommodate approximately 1,500 vehicles per hour and at 2 people per vehicle, this results in an HOV Lane serving approximately 3,000 people per hour.

- As noted earlier, today during the peak hour approximately 87 buses travel through the I-35W Corridor. With a seated capacity of 45 passengers, this results in the transit routes having the capacity to serve approximately 3,900 people during one hour.

- Based on the ridership forecast presented previously, it is anticipated that daily ridership could climb to approximately 43,000 passengers under the “with BRT” scenario for the I-35W Corridor. With ½ of the ridership traveling in each direction (21,500) and approximately 35% of passengers traveling in the peak hour (compared with 43% today), this results in approximately 7,600 people using transit during the peak hour.

When comparing the number of transit passengers in one hour (7,600) with the number of people using one general-purpose travel lane, (2,200) forecast transit ridership during the peak hour equates to over 3 general-purpose lanes (7,600 / 2,200 = 3.4).

Air Quality

To measure the impact on air quality, results from the Metropolitan Council's Travel Demand Model were reviewed to determine what, if any, change occurred in Vehicle Miles Traveled (VMT) in the year 2030 under two scenarios. The first scenario is referred to as "with BRT" and reflects buses operating at posted speeds throughout the I-35W Corridor. The second scenario is referred to as "without BRT" and reflects buses operating at reduced speeds without the advantage of a BRT lane and associated facilities.

The results of the model indicate that under the "without BRT" scenario, it is estimated that there would be 46.42 billion VMT throughout the region in the year 2030. Under the "with BRT" scenario, the model estimated that there would be 46.38 billion VMT in the year 2030, approximately 42 million miles fewer than the "without BRT" scenario. This reduction in VMT is attributable to the increase in the number of people who use bus service resulting in fewer miles driven in cars.

To quantify the change in air quality, emissions associated with VMT were calculated. Ambient air quality is a function of many factors, including climate, topography, meteorological conditions and the production of airborne pollutants by natural or artificial sources. Major airborne pollutants measured for this assessment of air quality included the following:

- Carbon Monoxide – Carbon monoxide (CO) is an odorless, colorless gas formed by the burning of fuels containing carbon. Motor vehicles are the principal source of CO emissions in urban areas. Maximum concentrations usually occur near intersections and other areas of traffic congestion, and they decrease rapidly with distance from the source.

- Oxides of Nitrogen – Oxides of nitrogen (NO_X) are another precursor to the formation of ozone. They are produced as the result of high-temperature fuel combustion and subsequent atmospheric reactions. Major sources of NO_X include diesel engines, power plants, refineries and other industrial operations.

- Volatile Organic Compounds – Volatile organic compounds (VOC) are a key component in the formation of ozone. These hydrocarbons are emitted or evaporate into the atmosphere from a variety of sources, particularly the storage and combustion of fuels in motor vehicles.

- Particulate Matter – Particulate matter enters the air from industrial operations, vehicular traffic and other sources, including fireplaces. Most of the particulate matter generated by motor vehicles consists of resuspended road dust. Measurements of particulate matter concentrations include TSP (total suspended particulates), PM_{10} (particles with a diameter less than or equal to 10 micrometers), and $PM_{2.5}$ (particles with a diameter less than or equal to 2.5 micrometers).

For the purposes of this analysis, air quality impacts are defined as the incremental change in Year 2030 regional emissions of CO, VOC, NO_X and PM_{10} when comparing the with and without BRT alternatives. The relative differences in regional pollutant levels between the two options are attributed entirely to changes in daily vehicular emissions. Differences in vehicular emissions are a direct function of the change in VMT and pollutant emission rates.

The specific steps in the air quality analysis included the following:

- Identify the impact of each alternative on the Year 2030 regional VMT.
- Estimate Year 2030 average pollutant emission rates for CO, VOC, NO_X and PM_{10}.
- Determine the relative regional pollutant emissions for each option by applying the emission rates to the corresponding changes in regional VMT.
- Compare the relative pollutant emissions to identify potential regional air quality impacts.

The change in regional VMT for each of the two alternatives was derived from the Twin Cities Regional Travel Demand Model (based on the Year 2000 Travel Behavior Inventory update). Model runs are based on Year 2030 socioeconomic forecasts that reflect the most recent projections, disaggregated to the model traffic analysis zone level. Year 2030 emission rates for CO, VOC, NO_X and PM_{10} were estimated using the U.S. Environmental Protection Agency (U.S. EPA) MOBILE 6 model with selected parameters adjusted to reflect assumed conditions in the Twin Cities.

Generally, the resultant change in pollutants is small when compared to the entire region's emission inventory; however, operating a full BRT system does results in a decrease of emissions. This is directly attributed to the reduction in VMT due to individuals choosing the improved transit service over driving their automobiles. The table on the following page summarizes the results of the Year 2030 regional air quality analysis.

Table 17. Changes in Criteria Pollutant and Precursor Emissions (Year 2030)

Regional VMT/Year (millions)[1]		Emission Factor (g/mi)[2]				Annual Emissions (tons)[3]								Change in Emissions (tons per year)			
						No BRT				BRT Alternative				Reduction of Emissions Associated with BRT Alternative			
No BRT	BRT Alternative	CO	NOx	VOC	PM-10	CO	NOx	VOC	PM-10	CO	NOx	VOC	PM-10	CO	NOx	VOC	PM-10
46,422	46,380	13.775	0.375	0.36	0.08	703,486	19,151	18,385	4,086	702,848	19,134	18,368	4,082	-638	-17	-17	-4

1 - Source: Vehicles from updated Regional Travel Demand Model (based on Year 2000 TBI)
2 - Source: MOBILE 6
*3 - Calculation: Annual Emissions = VMT * 1,000,000 * Emission Factor / 909,000 g/ton*
4 - Calculation: Change in Emissions = BRT Alternative Emissions – No BRT Emissions

Costs

The cost for implementing the proposed BRT service in the I-35W Corridor was separated into annual operating costs and capital costs. Each of these costs is described in great detail in the sections below.

Annual Operating Costs

As noted previously, there is already a significant transit investment in the I-35W Corridor. The current annual cost to operate service in the I-35W Corridor is approximately $24 million with an estimated 35% of the cost recovered from passenger fares and the balance, $16 million, subsidized with public funds. The amount of subsidy per passenger varies by provider and ranges from $1.97 to $4.75 per passenger. The blended or average subsidy per passenger in the I-35W Corridor today is $4.38 per passenger, which reflects a high percentage of passengers transported at the $4.75 subsidy rate.

In projecting annual operating costs in the Year 2030, an estimated subsidy per passenger was established at $3.35 (in year 2004 dollars) and reflects the following expectations:

- Approximately ½ of the passengers will be transported at each of the subsidy rates, resulting in a lower average subsidy rate of $3.35 per passenger.
- The growth of ridership in the corridor will result in lower costs per passengers.

For the Year 2030 scenario "without BRT" (buses operate at slower speeds in general purpose lanes), daily ridership is expected to increase by approximately 16,000 for a total of 30,500 passengers per day. With an estimated 255 days of operation each year, this results in annual ridership of approximately 7.8 million passengers. At a subsidy of $3.35 per passenger this results in an annual subsidy of approximately $26 million. With passenger fares covering approximately 35% ($14 million) of the cost to operate the service, the total cost to provide BRT service is estimated at $40 million annually. Following is a summary of the estimated annual costs:

Table 18.

Year 2030 "Without BRT"
Estimated Annual Operating Costs
As Expressed in Year 2004 Dollars

Annual Ridership		7,800,000
Subsidy per Passenger	$	3.35
Annual Subsidy	$	26,130,000
Passenger Fares Collected (35%)	$	14,000,000
Estimated Annual Operating Costs	$	40,130,000

For the Year 2030 scenario "with BRT" (buses operate at posted speeds), it is expected that since buses will be operating at faster speeds and able to complete their routes sooner, that fewer buses and drivers will need to be deployed. The impact of these improved operations will be most noticed during the AM and PM peak commuting periods, where fewer buses and drivers will be needed to meet the full schedule. As a result, it will cost less to provide the service. To reflect this improved service efficiency the subsidy per passenger under the "with BRT" scenario has been reduced by approximately 10% to $3.00 per passenger.

Under the "with BRT" scenario, approximately 43,000 daily passengers are expected which represents an increase of 28,000 over today's daily ridership. With an estimated 255 days of operation each year, this results in annual ridership of approximately 11 million passengers. At a subsidy of $3.00 per passenger this results in an annual subsidy of approximately $33 million. With passenger fares covering approximately 35% ($18 million) of the cost to operate the service, the total cost to provide BRT service is estimated at $51 million annually. Following is a summary of the estimated annual costs:

Table 19.

Year 2030 "With BRT"
Estimated Annual Operating Costs
As Expressed in Year 2004 Dollars

Annual Ridership		11,000,000
Subsidy per Passenger	$	3.00
Annual Subsidy	$	33,000,000
Passenger Fares Collected (35%)	$	18,000,000
Estimated Annual Operating Costs	$	51,000,000

<u>Capital Costs</u>

There are a number of infrastructure improvements that are recommended to fully support BRT operations in the I-35W Corridor. Each is described in greater detail below and on the following pages. Additionally, the Implementation Plan Chapter (Chapter 5.0) describes the recommended phasing for each of these capital investments.

It is important to note that the costs identified here are for investments that are not currently planned and require new funding commitments. Specifically, the construction of the shared BRT/HOV lane is not itemized here, as it is already included in Mn/DOT's future plans for the corridor.

Bus Fleet

Providing an adequate number of buses represents a significant investment in BRT infrastructure for the I-35W Corridor.

The estimate for the number of buses required to provide BRT service is focused on the maximum number of buses that are expected to be in service at one time. This maximum demand for buses occurs during the morning and afternoon peak periods when most passengers are expected to use the BRT service.

As noted before, today approximately 87 bus trips are provided during the peak hour each day. Assuming buses only make one trip during the peak hour, then the minimum number of buses that are required to provide service is 87. To account for an adequate number of spare buses, an 18% spare ratio[1] is applied to the 87 buses resulting in a total of 103 buses that are required to meet today's peak hour demand in the I-35W Corridor.

Under the "without BRT" scenario (buses operate at slower speeds in general purpose lanes), 30,500 passengers are expected each day, (15,250 each direction). With the increase in service levels and addition of all-day service, it is expected that ridership will be spread more than it is today (43% concentrated in the peak hour). To account for this expected increase in ridership during the non-rush hour, an estimate of 35% of all passengers traveling during the peak hour, (approximately 5,400 passengers) was used to calculate the number of passengers transported during the peak hour. Using an average of 37[2] passengers per bus in the peak hour, 146 buses would be required, again assuming that all buses are only able to make one trip during the peak hour. Factoring in an 18% spare factor, a total of 173 buses are estimated to meet the ridership forecast demand for Year 2030 "without BRT". This represents an increase of 70 buses over today's fleet.

Under the Year 2030 scenario "with BRT" (buses operate at posted speeds), 43,000 passengers are expected each day, (21,500 each direction). Using the estimate of 35% of all passengers traveling during the peak hour in the I-35W Corridor, approximately 7,600 passengers would be transported during the peak hour. Using an average of 37 passengers per bus in the peak hour, 204 buses would be required assuming that all buses are only able to make one trip during the peak hour.

However as noted earlier, with the faster bus operating speeds it is expected that routes will be completed sooner and that fewer buses will be needed to meet the full schedule. To account for this improvement in operations, it is assumed that under the "with BRT" scenario' 5% of the buses will be able to complete two trips during the peak hour. As a result, this reduces the number of buses required from 204 to 194. Accounting for an 18% spare factor, a total of 229 buses are estimated to meet the ridership forecast demand for Year 2030 "without BRT". This represents an increase of 126 buses over today's fleet.

[1] Current spare ratio used by Metro Transit.
[2] Metro Transit statistics indicate that during the peak hour on I-35W each bus averages 37 passengers.

Summarized below are the computations used to estimate the number of buses required for service in the I-35W Corridor today, and in Year 2030 under the "without BRT" and "with BRT" scenarios.

Table 20.
Estimated Peak Hour Buses Required With & Without BRT in 2030

	Peak Hour Hour Bus Trips	Buses Able to Make 2 Trips	Buses Required	18% Spare Factor	Fleet Required	Change From 2004
Year 2004	87	0.00%	87	16	103	-
"Without BRT"	146	0.00%	146	27	173	70
"With BRT"	204	5.00%	194	35	229	126

To calculate the cost of new buses, cost figures were used from a recent procurement by MVTA in which they purchased standard, 40-foot transit buses at a price of $295,000 each. The estimated bus costs are summarized in the table below.

Table 21.
Estimated Bus Costs With & Without BRT in 2030

Costs are Expressed in Year 2004 Dollars

Scenario	Additional Buses Over Year 2004 Level	New Bus Cost*	Total Estimated Cost
"Without BRT"	70	$ 295,000	$ 20,650,000
With BRT	126	$ 295,000	$ 37,170,000

* *Cost Estimate for a Standard 40' Transit Bus*

It is important to note that the useful life of a transit bus is generally expected to be 12 years. Therefore, buses will need to be replaced every 12 years, as is the current practice.

On-Line BRT Stations

A review of the proposed service plan suggests that three locations will see significant levels of local bus service and are strong candidates for locating on-line BRT stations where people can transfer between the BRT station-to-station service and local routes. The on-line BRT stations are recommended for Lake Street, 46th Street and at a site to be determined that serves the I-494 Corridor (American Boulevard and 76th Street).

A second tier of sites that should be monitored to determine the need for on-line stations are 98th Street, 66th Street and 38th Street.

The table below summarizes the number of daily trips that are expected to be made by local bus routes at specific locations that intersect the I-35W Corridor.

Table 22.

Anticipated Year 2030 Trip Levels for Local Routes

Daily Trips - Sorted by Highest Volume Station to Lowest

Station Location	Daily EB Trips	Daily WB Trips	TOTAL Daily Trips
Best Buy (76th)	214	213	427
Lake Street	212	208	420
46th Street	103	110	213
American Blvd.	102	102	204
98th Street	62	64	126
38th Street	62	62	124
66th Street	61	61	122
Burnsville Center	46	47	93
Burnsville Transit Station	45	45	90

Previously, URS completed work for Metro Transit that included developing a conceptual design and cost estimates for an on-line BRT station at 46th Street. Based on the work previously completed and a further review under this study, the estimated cost for each on-line station is between $4 and $5 million. The lower end estimate is for an on-line BRT station that incorporates an open-air platform with windscreens and the upper end estimate is for a BRT station with a platform that is fully enclosed. BRT station features are more fully discussed in the Station Design Alternatives section of Chapter 3.

Park and Ride Sites

There are a number of park and ride sites that will need to be developed over the next 25 years to support the level of ridership forecast for the I-35W Corridor. As noted earlier in the Transit and Services Facilities section in Chapter 2, there are approximately 2,450 parking spaces immediately adjacent to the I-35W Corridor to support the approximate 15,000 daily ridership in the I-35W Corridor.

With ridership expected to triple by the year 2030 (to 43,000 per day) additional park and ride sites will be necessary to support this increased level of ridership. An increase in park and ride spaces proportionate to the increase in ridership would result in an increase of approximately 4,800 additional parking spaces. As service is added to the I-35W Corridor, locations for additional sites should be studied further. This is particularly true for the area around I-494 and I-35W where 635 parking spaces currently in place at the Best Buy park and ride lot will be eliminated due to the reconstruction of the I-494/I-35 interchange.

One potential site that was examined in greater detail by the consulting team is located in Lakeville, between County Roads 46 and 50. This site, which has been dubbed "Lakeville North Park and Ride", is described in greater detail in the Station Design section found in Chapter 3.

Initially, it is recommended that this site be developed as a 440-space park and ride facility with surface parking and a slip ramp that provides buses with direct access to 35W. The estimated cost to develop this as a 440-space park and ride site is $2 million. It is important to note that this cost <u>does not</u> include any land acquisition costs, as this site is a former truck weigh station that is owned by Mn/DOT.

If ridership demand dictates, this site could be reconfigured as a multi-level parking structure. The addition of a parking structure at this location may trigger interchange improvements at County Road 50 and I-35W, and would need to be explored prior to making a decision on expanding this site. Other potential features for this site in the long term include a pedestrian bridge that extends to a new center platform in the median of I-35W, which may be appropriate if BRT service is provided to points south of this site.

If BRT service were ever extended to County Road 70 and I-35, a park and ride lot could be established in this vicinity. Currently the City of Lakeville is pursuing the advanced acquisition of property for a park and pool lot at this interchange. If bus service were expanded to this site, it could be reconfigured to accommodate bus traffic and direct access to I-35.

Bus Shoulders

Currently, there are no bus shoulders in place for I-35W, south of Highway 13. As noted in the Future Traffic Conditions section found in Chapter 2, the area south of Highway 13 is expected to experience several segments with very low speeds and long delays (level of service F). Presently, there are no plans or funding available for extending the shared BRT/HOV in this area or for implementing shoulder lanes for buses.

A planning level cost estimate was prepared with the assistance of Mn/DOT staff for providing bus shoulder lanes in the 4.2-mile section between the end of the shared BRT/HOV lane at Highway 13 and County Road 46. Based on a cost of $120,000 per mile (each direction) and to account for adjustments at overpasses and interchanges in between and other unforeseen costs, the total estimated cost to provide bus shoulder lanes for this 4.2 miles stretch is $1.5 million. Table 22 summarizes each of the capital costs anticipated with the deployment of BRT in the I-35W Corridor.

Table 23. Anticipated Capital Costs

All Costs are Expressed as Year 2004 Dollars

Capital Cost Item[1]		**Estimated Cost**
Buses[2]		
Year 2030 'Without BRT" *70 Additional Buses*	$	20,650,000
Year 2030 'With BRT" *126 Additional Buses*	$	37,170,000
On-Line BRT Stations		
Lake Street BRT Station	$	5,000,000
46th Street BRT Station	$	5,000,000
I-494 Corridor BRT Station	$	5,000,000
Park and Ride Sites		
440 Space Surface Parking & I-35 Access at Lakeville North	$	2,000,000
Bus Shoulders		
4.2 Miles of Bus Shoulders Between Highway 13 and CO RD 46	$	1,500,000
Potential Additional Costs		
Parking Structure at Lakeville North		
Interchange Improvements at CO RD 50 & I-35, *if Warranted*		
Pedestrian Connection & On-Line Station at Lakeville North		
Improvements for Buses at CO RD 70 & I-35 Park & Pool Lot		
Additional Park and Ride Sites		
Additional On-Line Transit Stations (38th, 66th & 98th Streets)		
Improved Transit Facilities in Downtown Minneapolis		

[1]*Costs of HOV lane construction are included in highway projects programmed in the Metropolitan Council's 20-Year Transportation Plan and Mn/DOT's 20-Year Transportation System Plan.*

Challenges

Deployment of a full BRT system in the I-35W Corridor faces a number of challenges that must be addressed if the system is to be successful. A number of challenges have surfaced during the course of this study and are summarized here.

<u>Enforcement and Management of the BRT/HOV Lane</u>

Critical to the success of BRT service in the I-35W Corridor is for the buses to be able to consistently operate at the posted speeds throughout the corridor. By operating at the posted speeds, buses are expected to have an advantage over vehicles that travel in the general-purpose lanes that face delays attributed to high traffic volumes during the peak travel periods.

Maintaining posted speeds for bus travel in the shared BRT/HOV lane can be accomplished through two avenues:

- *Mn/DOT Management of the Lanes*. Establishment of a policy that ensures that buses will operate at posted speeds is an important step that can be taken by Mn/DOT. This policy should be reviewed periodically to insure that HOV and other use of the lane does not interfere with bus operating speeds.
- *HOV Enforcement*. Effective enforcement of the HOV lanes to insure that only authorized vehicles travel in the shared BRT/HOV lane is critical. If enforcement is not effective, then it is possible that the presence of unauthorized vehicles will slow BRT operating speeds. It is important to note that effective enforcement of the shared BRT/HOV lane was a frequent comment that was heard at the public open houses held for the study.

<u>Ability of Downtown Minneapolis to Handle Additional Bus Traffic</u>

The trip through Downtown can be a very slow process during the peak periods as buses from corridors throughout the region descend on Downtown and travel many of the same streets, often stopping at each block to discharge passengers. During the evening rush hour transit passengers face a similar delay as buses follow each other, single file and pickup passengers. With the number of peak hour buses more than doubling from just the I-35W Corridor alone, the prospects of travel times improving in Downtown Minneapolis is bleak.

The City of Minneapolis is very much aware of this situation and is actively seeking ways to improve transit flow in Downtown Minneapolis. Most notably the City is about to initiate work on a Ten-Year Action Plan that will address transit flow in Downtown.

Location of an On-Line Station Serving the I-494 Corridor

There is a significant amount of bus activity serving the I-494 Corridor today and it is expected to continue to grow in the future. Presently and in the foreseeable future, buses need to leave the I-35W transitway and exit at 76th street to allow passengers to get on or off the bus, then re-enter the I-35W transitway to complete their trip. This circuitous routing adds a significant amount of time to the trips and makes the transit service a less attractive option.

Planning is currently underway for the I-494 /I-35W interchange project and now is an excellent time to consider incorporating an on-line BRT station into the redesign of the interchange. Initial discussions with Mn/DOT, Metro Transit and the Cities of Richfield and Bloomington are encouraging and talks should continue towards finding a suitable location.

Funding and Operations to the City of Lakeville

An underlying assumption in this study is that service will be provided to the City of Lakeville. However, at this point, the City of Lakeville does not currently receive or provide any transit services. The City is currently exploring its options for transit services, however at this point no decisions have been made.

Funding

Securing the necessary funding for transit services in the region is an ongoing challenge as federal funds have become less available and state and local funds are limited. Even without BRT improvements in the I-35W Corridor, a significant investment will need to be made to provide the level of service necessary to meet the forecasted ridership demands.

In the absence of adequate levels of transit service, it is expected that more people will be forced to travel in their automobiles, resulting in increased traffic volumes during the peak travel periods and associated travel delays.

CHAPTER 5.0 – IMPLEMENTATION PLAN

This chapter outlines a step-by-step, phased approach for implementing BRT service in the I-35W Corridor. Two implementation phases are presented and described along with an overall long-term (25+ Years) vision for BRT in the I-35W Corridor.

Keys to Implementation

There are a few key steps that should be followed to facilitate the implementation of BRT service in the I-35W Corridor. Following is a brief summary of each.

Build on Existing Services and Facilities

As noted throughout the report, a significant investment in transit is already in place throughout the I-35W Corridor resulting in service to approximately 15,000 passengers per day. This includes shoulder bus lanes, HOV lanes, ramp meter bypass lanes and park and ride lots. Metro Transit, MVTA and the City of Prior Lake are established providers in the corridor and provide a valuable service to their respective clientele. Figure 35 depicts current conditions in the corridor.

As BRT is implemented in the Corridor the message should be that this is an enhancement to existing services to meet the growing travel demands brought on by the high concentrations of population and employment growth in the I-35W Corridor.

Incorporate BRT Infrastructure in Current and Future I-35W Projects

As noted earlier in the report, there are a number of improvements that are underway or planned in the I-35W Corridor including the following:

- Preliminary design is underway for reconstructing the Highway 62/I-35W interchange that includes I-35W between 66th Street and 42nd Street.
- Planning and discussions are underway for freeway improvements on I-35W, north of 42nd Street.
- Improvements are planned for the I-494 / I-35W Interchange.
- Improvements are programmed for the County Road 70 / I-35 Interchange.

Each of these improvement projects provides an opportunity to incorporate BRT infrastructure.

An excellent example of how this can be accomplished is found with the Highway 62/I-35W interchange project. During the planning and preliminary design phases, Mn/DOT worked closely with representatives from the Cities of Minneapolis and Richfield, Metro Transit and the Metropolitan Council on how to incorporate transit amenities into the reconstruction of the interchange.

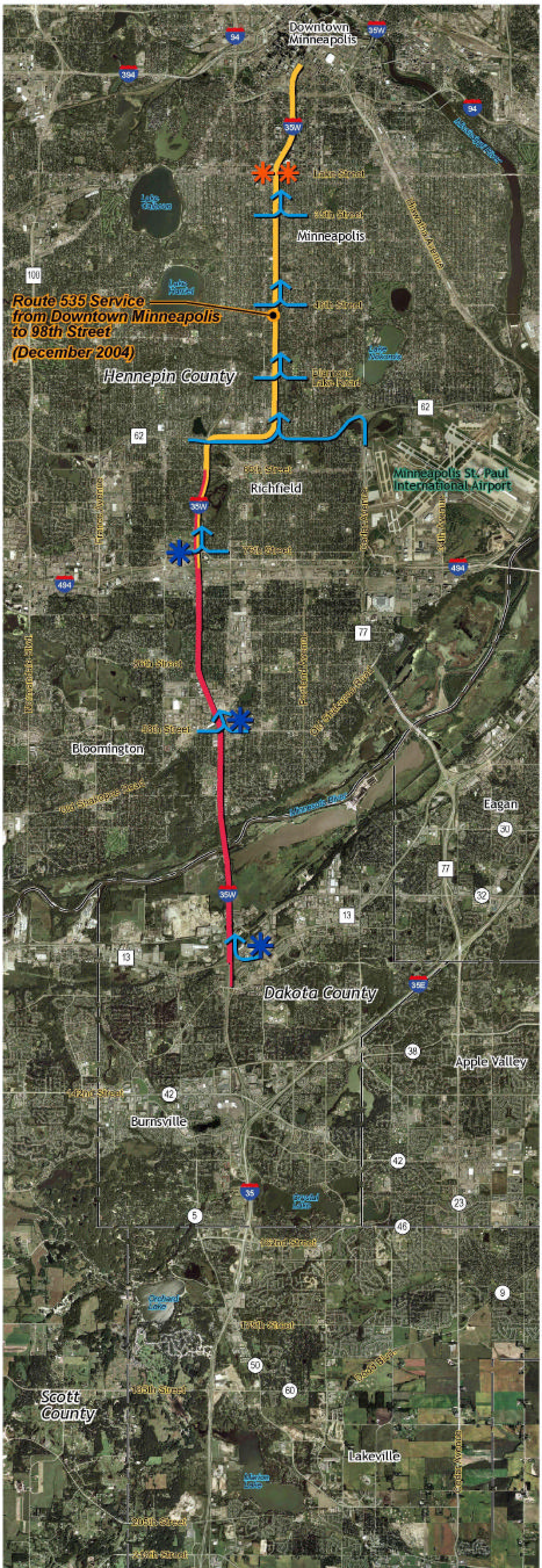

Figure 35

I-35W BRT Corridor Study

Current Conditions

January 2005

Legend:

- Center-Running Shared Bus/HOV Lanes
- Buses Operating on Shoulders (where available)
- Lake Street Side Stations
- Existing Park-and-Ride Sites
- Buses Entering Corridor

NORTH

0 .5 1 Mile

0 2000 4000 8000 Feet

URS

The result is that Mn/DOT's design plans provide for a continuous shared BRT/HOV lane between 66th Street and 42nd Street and provide space and a shell for an on-line BRT station at 46th Street. With input from the City of Minneapolis, Metro Transit and the Metropolitan Council have developed a conceptual design for the station at 46th Street. With the space set aside and the shell for the station provided by Mn/DOT, the next step is to secure funding to complete the station.

This cooperative approach between jurisdictions and cities demonstrates how BRT infrastructure can be effectively incorporated into highway projects and serves as a model for other projects in the I-35W Corridor.

Secure Funding

As noted in the challenges section, securing the necessary funding for transit services in the region is an ongoing challenge as federal funds have become less available and State and local funds are limited. A significant investment in transit will need to be made to provide the level of service necessary to meet the forecasted ridership demands in the I-35W Corridor.

Expanded Service Coverage

To adequately serve the I-35W Corridor, service will need to be expanded both in terms of frequency and geographic coverage. Consistent with Metro Transit's Central South Study, service should be provided to the level that patrons are able to arrive at their park and ride or BRT station and catch the next trip in a relatively short time, rather than planning for a specific trip at a specific time.

Currently service is not provided to Lakeville, which is expected to see a 20 fold increase in population by the Year 2030. Expanding service to Lakeville will be an important step towards serving travel needs throughout the entire corridor. This is particularly important as forecast travel conditions for I-35W south of Highway 13 are expected to be very low speeds and long delays, (level of service F).

Phase I

The first phase for implementing BRT in the I-35W Corridor focuses on two areas of the corridor (1) I-494 to 42nd Street, and (2) Lakeville, as depicted on Figure 36.

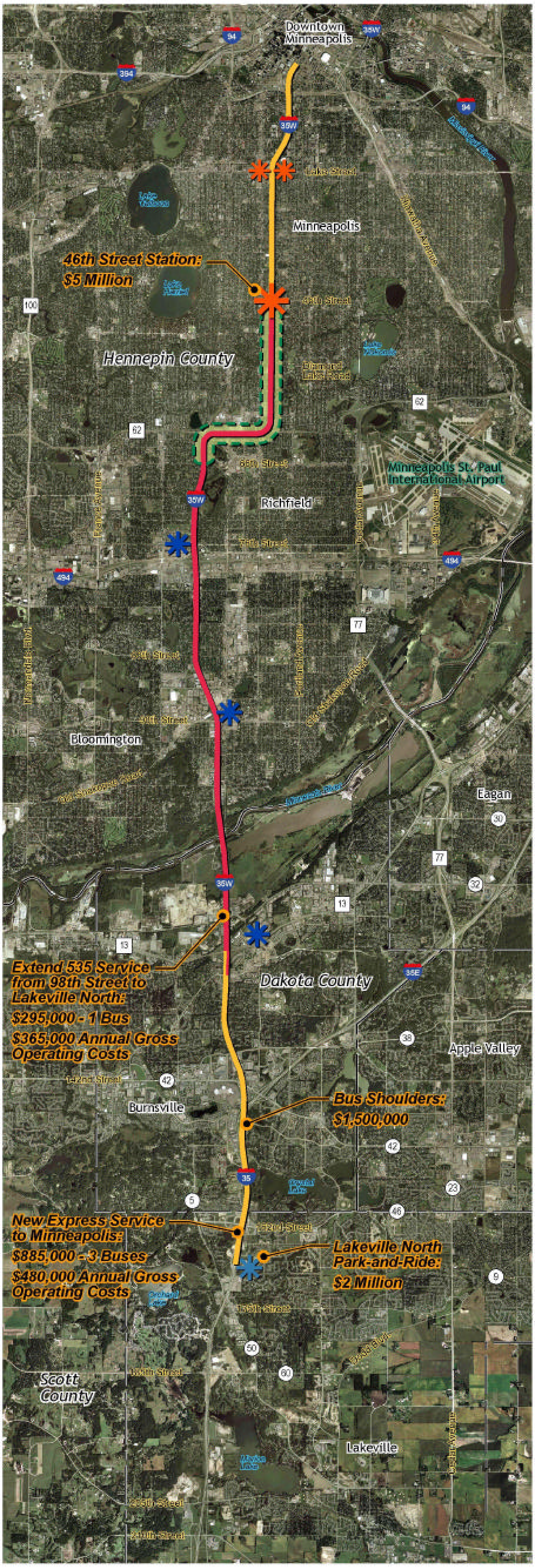

Figure 36

I-35W BRT Corridor Study

Phase I BRT System and Associated Costs

January 2005

Legend:

- Center-Running Shared Bus/HOV Lanes
- Buses Operating on Shoulders (where available)
- Center Transit Station
- Lake Street Side Stations
- Existing Park-and-Ride Sites
- New Park-and-Ride Site
- Highway 62 / 35W Interchange Project

* All Costs are Expressed in Year 2004 Dollars

NORTH

0 .5 1 Mile

0 2000 4000 8000 Feet

URS

Phase I: I-494 to 42nd Street

The improvements for the portion of I-35W between I-494 and 42nd Street are directly tied to the completion of the Highway 62/I-35W Interchange Project and includes the following capital investments:

- Completion of a continuous shared BRT/HOV Lane between I-494 and 42nd Street. With this segment now open, buses can operate at posted speeds between Highway 13 in Burnsville and 42nd Street in Minneapolis. The cost for this improvement is part of the Highway 62/I-35W Interchange Project
- Completion of the 46th Street BRT station estimated at $5 million. The space and shell for the station are provided as part of the Highway 62/I-35W Interchange Project, however funding is needed to complete the station.

Phase I: Expansion of Service to Lakeville

The second element of the Phase I implementation is the expansion of service to the City of Lakeville. This element is not dependent on any highway projects and could be implemented at any time. Recommendations for this element include the following capital investments:

- Construct a park and ride surface parking with approximately 440 parking spaces on the site of the former Mn/DOT Weigh Station, just north of County Road 50. Estimated cost is $2 million. This improvement will serve as the anchor for expanded service to the City of Lakeville.
- Provide bus shoulders for a 4.2-mile section between Highway 13 and County Road 46. Estimated cost is $1.5 million. Assuming that service is now provided to Lakeville at the park and ride noted above, improvements should be made to the freeway shoulders to permit buses to gain a speed advantage over vehicles traveling in general purpose lanes. It is possible that further study of this area may reveal other options for bus operations including establishment of an interim shared bus/HOV lane in the median.
- Four additional buses to operate the new service to Lakeville. Estimated total cost is $1.2 million.

In addition to capital investments for the Lakeville element, there are annual operating costs that will be required to pay for the new service to Lakeville as follows:

- Extend station-to-station (Route 535) service from 98th Street to the new Lakeville Park and Ride site. Estimated gross annual operating cost is $365,000. One additional bus ($295,000) is also required and the cost is noted in the capital investment section above. Service would be provided all-day at 60-minute intervals.

- Add express service between Lakeville and Minneapolis. Estimated gross annual operating cost is $480,000. Three additional buses (@ $295,000 each) are also required and the cost is noted in the capital investment section above. The express service is expected to be provided during a 3-hour period in the morning and a 3-hour period in the afternoon, providing approximately 7 one-way trips during each period.

Phase II

As with Phase I, there are a number of recommended improvements that are directly tied to planned highway improvement projects and includes the following capital investments:

- Completion of a continuous shared BRT/HOV Lane between 42nd Street and downtown Minneapolis. This is recommended to be included as part of the I-35W improvement project that will focus on highway improvements north of 42nd Street. Similar to the Highway 62/I-35W Interchange Project, the cost for this improvement is part of the I-35W Improvement Project. With this segment now open, buses can operate at posted speeds between Highway 13 in Burnsville and Downtown Minneapolis.
- Completion of the Lake Street BRT station, estimated at $5 million. The space and shell for the station are recommended with the proposed improvements at Lake Street and the new interchange at 38th Street.
- Completion of a BRT station serving the I-494 corridor. Estimated cost is $5 million. The space and shell for the station are recommended to be provided as part of the I-494/I-35W Interchange Project. As noted in the Challenges section, a site for an on-line BRT station has not yet been selected. Initial discussions with Mn/DOT, Metro Transit and the Cities of Richfield and Bloomington are encouraging and talks should continue towards finding a suitable location.
- An additional 61 buses (over 2004 level) are expected to support an expanded bus operation serving 30,000 passengers per day. At a cost of $295,000 each, the total estimated cost is $18 million.

It is important to note that as a result of the redesign of the I-494/I-35W Interchange, the current park and ride site serving this area (Best Buy site) will be removed. As part of the planning for a BRT station serving the I-494 Corridor, efforts should also be made to explore potential sites for relocating this park and ride lot.

In addition to the capital costs associated with this phase, there is expected to be an increase in transit service to meet the growth in ridership demand.

The following estimated annual operating costs are based on riderhsip levels of 30,000 passengers per day and are summarized below.

- An expanded bus operation to serve a total of 30,000 passengers per day is expected to result in a total annual subsidy (for all service in the corridor) of approximately $23 million. This is based on a subsidy per passenger of $3.00, 255 days of service and 35% of the cost recovered through passenger fares. . It is estimated that approximately 61 additional buses will be required (over and above the existing fleet) at a cost of $295,000 each. The cost of the buses is noted in the capital cost section above. Annual operating costs and estimation of bus requirements are described in greater detail in Chapter 4

Figure 37 on the following page depicts the improvements recommended for Phase II.

Long-Term Vision

The long-term vision of the corridor consists of a center running, shared BRT/HOV lane that runs the length of the corridor with on-line BRT stations at key locations to provide convenient connections between local routes and the station-to-station service.

Under the long-term vision for the I-35W Corridor, it is expected that approximately 43,000 passenger could be served each day. To support this level of service, there will need to be a significant investment to fund the annual operating costs as summarized below.

- An expanded bus operation to serve 43,000 passengers per day is expected to result in a total annual subsidy (for all service in the corridor) of approximately $33 million. This is based on a subsidy per passenger of $3.00, 255 days of service and 35% of the cost recovered through passenger fares.
- It is estimated that approximately 126 additional buses will be required (over and above the existing fleet). At a cost of $295,000 each the total investment in buses is estimated at $37.1 million. Annual operating costs and estimation of bus requirements are described in greater detail in Chapter 4

Potential additional capital investments if ridership warrant includes the following:

- Parking Structure at Lakeville North
- Interchange Improvements at CO RD 50 and I-35, (if warranted)
- Pedestrian Connection & On-Line Station at Lakeville North
- Improvements for Buses at CO RD 70 & Lakeville Park and Pool Lot
- Additional Park and Ride Sites
- Additional On-Line Stations

Specific capital improvements are discussed in greater detail in Chapter 4.0. Figure 38 on page 5 -12 depicts the long-term vision for BRT in the I-35W Corridor and the table on page 5-13 summarizes the estimated costs to implement BRT.

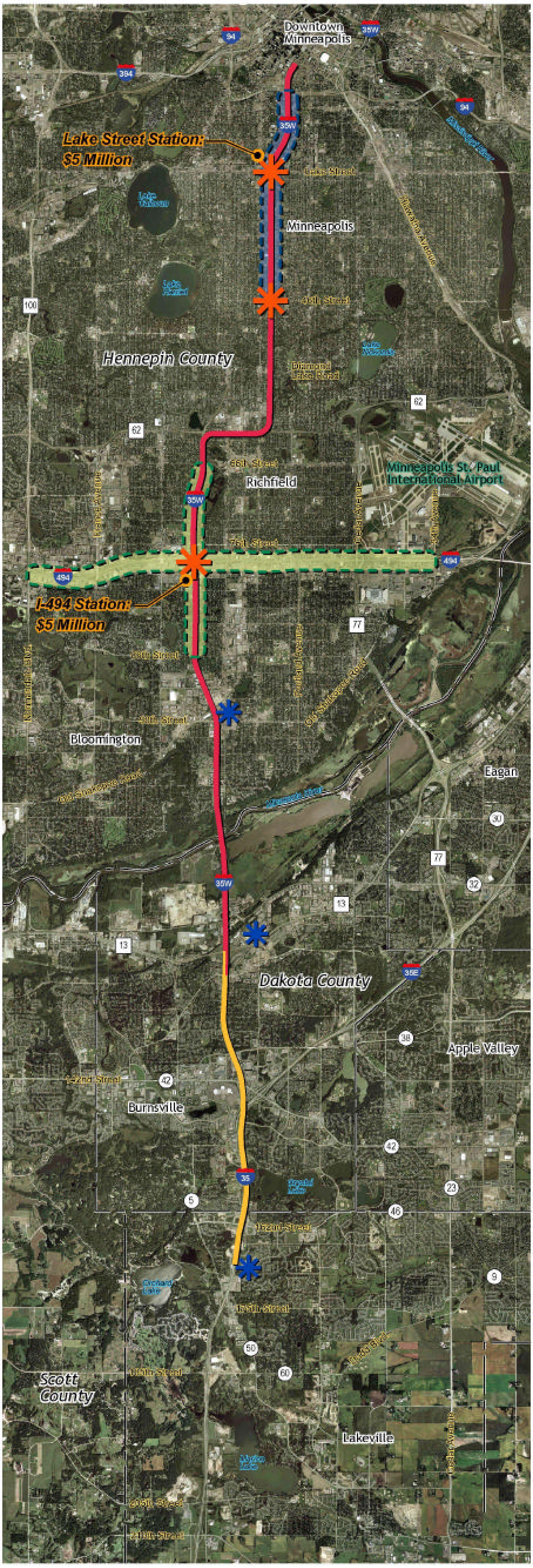

Figure 37

I-35W BRT Corridor Study

Phase II BRT System and Associated Costs

January 2005

Legend:

- Center-Running Shared Bus/HOV Lanes
- Buses Operating on Shoulders (where available)
- Center Transit Station
- Park-and-Ride Sites
- 35W Improvement Project
- 494 Improvement Project

Anticipated 35W BRT Ridership Demand:
30,000 Passengers per Day

Estimated Annual Subsidy:
$23 million

61 Additional Buses:
(over Phase I)
$18 million

* All Costs are Expressed in Year 2004 Dollars

NORTH

0 .5 1 Mile

0 2000 4000 8000 Feet

URS

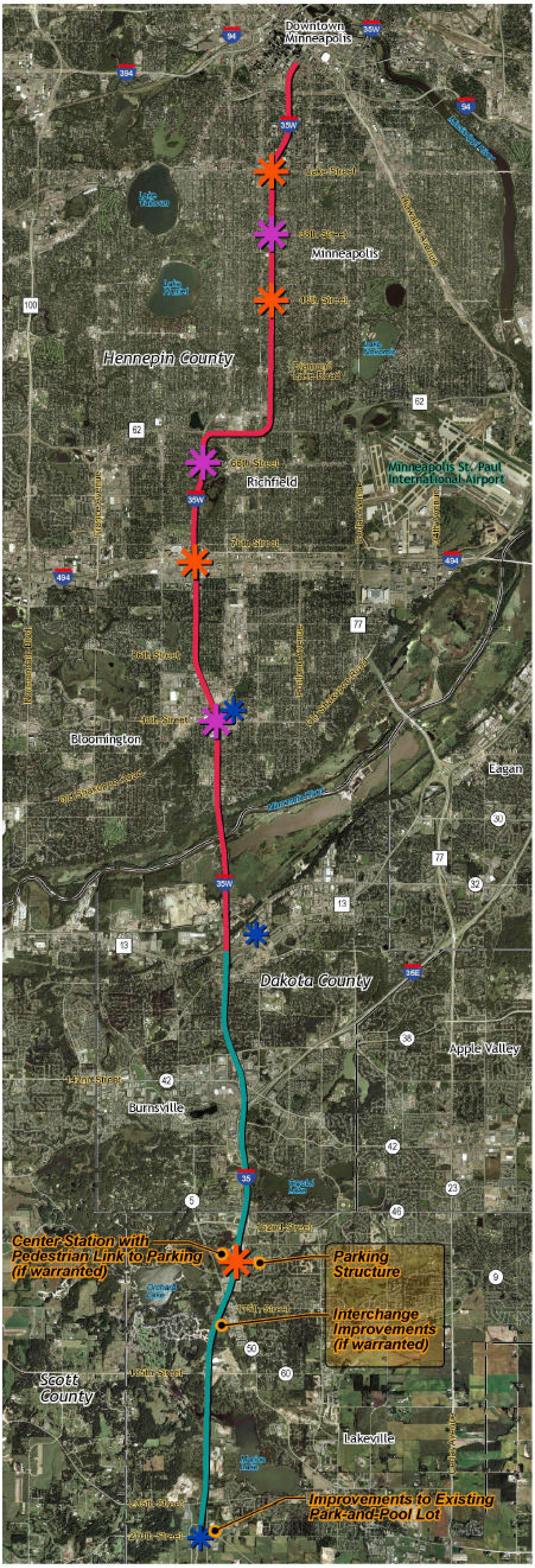

Figure 38

I-35W BRT Corridor Study

Long-Term Vision BRT System and Associated Costs

January 2005

Legend:

- Center-Running Shared Bus/HOV Lanes
- Recommended Center-Running Shared Bus/HOV Lanes as Part of Future Freeway Expansion (Not Part of Current Plans)
- Center Transit Stations
- Potential Center Transit Station Sites
- Park-and-Ride Sites

Anticipated 35W BRT Ridership Demand:
43,000 Passengers per Day

Estimated Annual Subsidy:
$33 million

126 Additional Buses: (over 2004)
$37.1 million

* All Costs are Expressed in Year 2004 Dollars

NORTH

0 .5 1 Mile

0 2000 4000 8000 Feet

URS

Summarized below in Table 24 are the estimated capital costs associated with implementing BRT service in the I-35W Corridor under the phased approach. It is important to note that the costs identified here are for investments that are not currently planned and require new funding commitments.

Table 24. Anticipated Capital Costs by Phase

All Costs are Expressed as Year 2004 Dollars

Capital Cost Item[1]		Estimated Cost
PHASE I		
Buses[2]		
4 Buses	$	1,180,000
On-Line BRT Stations		
46th Street BRT Station	$	5,000,000
Park and Ride Sites		
440 Space Surface Parking & I-35 Access at Lakeville North	$	2,000,000
Bus Shoulders		
4.2 Miles of Bus Shoulders Between Highway 13 and CO RD 46	$	1,500,000
PHASE II		
Buses[2]		
61 Buses *(In additon to those added under Phase I)*	$	17,995,000
On-Line BRT Stations		
Lake Street BRT Station	$	5,000,000
I-494 Corridor BRT Station	$	5,000,000
LONG-TERM VISION		
Buses[2]		
61 Buses *(In addition to those added under Phases I & II)*	$	17,995,000
Potential Additional Costs		
Parking Structure at Lakeville North		
Interchange Improvements at CO RD 50 & I-35, *if Warranted*		
Pedestrian Connection & On-Line Station at Lakeville North		
Improvements for Buses at CO RD 70 & I-35 Park & Pool Lot		
Additional Park and Ride Sites		
Additional On-Line Transit Stations (38th, 66th & 98th Streets)		
Improved Transit Facilities in Downtown Minneapolis		

[1]*Costs of HOV lane construction are included in highway projects programmed in the Metropolitan Council's 20-Year Transportation Plan and Mn/DOT's 20-Year Transportation System Plan.*

[2] *Bus Numbers Reflect Express and Station-to-Station Buses*

APPENDIX A

LEGISLATION

APPENDIX A – LEGISLATION

Legislation for the I-35W BRT Study

Sec. 71. [BUS RAPID TRANSIT STUDY.]

Subdivision 1. [STUDY REQUIRED.] The department of transportation shall conduct a study on the feasibility of implementing a bus rapid transit (BRT) system in the I-35W corridor from downtown Minneapolis through south Minneapolis and the cities of Richfield, Bloomington, Burnsville, and Lakeville. Bus rapid transit systems are those systems that provide for significantly faster operating bus speeds, integrated service, greater service reliability, and increased convenience through investments in bus infrastructure, equipment, technology, and operational improvements.

Subivision 2. [STUDY REQUIREMENTS.] The study must, at a minimum, include an analysis of the benefits and costs of implementing a bus rapid transit system that includes the following:

1) frequent operation of buses on exclusive or near-exclusive right-of-way on marked interstate highway 35W;
2) changes in bus or platform design and fare collection that provide for faster convenient boarding;
3) station locations that are adjacent to, or easily accessible from, the exclusive right-of-way;
4) traffic management improvements and traffic signal preemption on local streets within the I-35W corridor; and
5) changes to existing transit services to provide for timely connections and transfers.

Subdivision. 3. [STUDY RECOMMENDATIONS.] The study must recommend:

1) options for implementing bus rapid transit in the I-35W corridor;
2) the associated cost of each option; and
3) the anticipated benefits in terms of reduced travel times, increased ridership, increased mobility, and impacts on congestion levels within the corridor.

The study must be submitted by December 10, 2004, to the house of representatives and senate committees with jurisdiction over transportation policy and finance.

The session law can be found at Section 71 of this web page:

http://www.revisor.leg.state.mn.us/slaws/2003/ss1.19.html

APPENDIX B

BRT SIMULATION AT 46TH STREET

(Submitted as a Compact Disc)

APPENDIX C

PUBLIC OPEN HOUSES

APPENDIX C – PUBLIC OPEN HOUSES

Summary of Comments from Public Open Houses

As part of the 35W BRT study, public open houses were held to share information on the study and to solicit comments and feedback from the public. The open houses were held on September 28th at the Burnsville Transit Station and on September 29th at Martin Luther King Park in Minneapolis.

Following is a summary of the common themes that emerged from the open houses:

- Need Service to Lakeville.
- Concern with Buses Ability to Operate at Posted Speeds
  - HOV Enforcement
  - Too Many Vehicles Allowed in Shared Lane
- Need Additional Service Now (to alleviate overcrowding)
- Prefer Light Rail Transit in the Corridor
- Frequency of Service is Important
- Consider Advance Payment of Fares
- Connections with Other Routes Important
- Avoid Parking Problems Associated with LRT
- Coordination in Planning is Important

Comments from the specific open houses are listed below and on the following pages:

<u>Burnsville Transit Center (September 28, 2004)</u>

- More busses more often
- I always have to stand – I'm too old for that. Lakeville is growing, the highways are just getting too congested. We need the bus to relieve the roads.
- I'd like to have a seat. I always have to stand. Sometimes buses pass me because they are so full.
- Lakeville should have their own station. People from Lakeville drive up to Burnsville station.
- Need service to the Lakeville/Elko/New Market area. If someone has to drive to the Burnsville station from Lakeville, they may as well just stay in their vehicle and skip the bus to get downtown.
- I hate standing on the bus. I'd rather drive than stand.
- Need a station in Lakeville.
- Need direct route from Lakeville to Downtown Minneapolis with no stops. This would alleviate major congestion on I-35.
- Third lane is already in place for part of the trip. Minor expansion needed.
- Could try combining the 490 bus from Prior Lake through 185th/60 (after interchange is completed.)
- A new lane should be restricted to buses only. I think it's ridiculous to "sell" entry to single car drivers.
- How would the bus lane be enforced? Hopefully better than the HOV lane. (Most vehicles in the HOV lane have 1 person per car) They should install cameras and issue tickets to offenders.
- After looking at the charts perhaps the number of buses during the rush hour in southern suburbs doesn't support a dedicated bus lane. In that case multi-passenger cars should be included but NEVER, NEVER should single drivers be allowed usage.

- Express service to downtown is most important (on either 35W or Cedar). I live in Lakeville and currently drive to the Apple Valley transit station.
- Should have a station in Lakeville (near Cedar and Dodd?)
- Frequency of service and time of commute are most important.
- I'd prefer LRT line on 35W corridor. Success of new line on Hiawatha should give some idea on how LRT would do in this corridor.
- There is too much pressure to open HOV lane to more traffic. This will cause so-called "Rapid Transit" to be not so rapid. A dedicated lane to busses would work better.
- A bicycle crossing needs to be built on 35W.
- NO crossing between Bloomington Ferry & 494

Martin Luther King Park (September 29, 2004)

- I'm very pleased that Minneapolis is making positive steps towards transit solutions.
- In Calgary they did a study entitled "a review of Bus Rapid Transit" the key findings:
  - Capital costs are much lower than LRT initially
  - Lower passenger capacity and shorter life expectancy of buses total vehicle costs would be similar to LRT
  - However, per passenger costs are much higher than LRT per passenger.
- Over all BRT applications can be more economical in the interim or where LRT's capacity will not be utilized.
- My main points
  - 35W is a heavily traveled corridor.
  - Please plan for the long run.
  - Go for the cost effective solution for the long run.
- Please don't exclude LRT as a possibility. In other words design a BRT solution to allow a "smooth" transition to LRT
- Frequency is important (more buses).
- Encourage people to ride their bike to the bus station.
- Financing by increasing the parking in downtown .
- What about all those buses trying to go downtown?
- Most important that is actually is RAPID.
- It appears that this is a marginal improvement over standard bus service (i.e. a dedicated lane for buses and HOV most likely.
- Unless pre-board fare collection is part of the system-this will not result in true rapid transit benefits. Further, if the present fleet of buses is used then the advantages of level boarding and the resulting improvement in times are lost.
- Unless a dedicated lane with a physical barrier is created the benefits of this system will be lost IN TOTAL with rush hour accidents potential blocking BRT lane.
- While political expediency may dictate that BRT share a lane with HOV, it will again diminish the benefit of BRT.
- Oil just passed $50/barrel and as driving becomes more prohibitive as oil goes to $60, $70, $80 a barrel will we regret the 1/2 measure currently proposed? Yes, I think. Either a true BRT system, or perhaps better yet, a plan for LRT is in order.
- Need connection with Highway 62 Crosstown buses.
- Need station at 50th Street on 35W and relocate the No. 46 crosstown bus line to 50th and Minnehaha Pkwy all the way across the city. Perhaps a straight route, faster and easier to find, will attract more riders than the new 46 has attracted so far.
- Need more access to destinations using more transit and fewer autos.

- Must have economic incentives for commuters to take transit instead of drive.
  - Employee earned vacation days for taking transit
  - Employer tax credits for transit matching parking costs.
- EIS regarding hydrology, air quality – changes due to project.
- Please think through the inner city parking along the freeway stations. Don't leave it as an after thought as LRT did..
- Why is station at 46th and not 54th? That's the commercial corridor that's where the traffic should be and is.
- Hurry up and get it going.
- All things work together along the freeway. A lot of planning has been for the Access project. We fear Mn/DOT will take over and slam in what is cheap and not follow any mitigation planning. A little sugar with the salt makes things go down easier. We don't have to battle over everything. People will work together for the greater good of the whole if everyone is respected.

APPENDIX D

TASK 1 REPORT:
RECOMMENDED BRT CONFIGURATION
FOR THE 35W/HIGHWAY 62 INTERCHANGE

(Submitted as a Compact Disc)