2.0 ALTERNATIVES CONSIDERED

This chapter describes the alternatives evaluated in this Draft Environmental Impact Statement (EIS) and how they were selected. It is divided into five major sections. Section 2.1 describes the process by which alternatives were developed. Section 2.2 summarizes the alternatives refined during the EIS Scoping Process. Section 2.3 defines the Baseline, Light Rail Transit (LRT) and Busway/Bus Rapid Transit (BRT) Alternatives to be evaluated in the Draft EIS. Finally, Sections 2.4 and 2.5 describe the capital and operating and maintenance (O&M) costs of the alternatives under evaluation.

Graphics for Chapter 2.0 are included at the end of the chapter.

2.1 ALTERNATIVES CONSIDERED IN THE TRANSIT STUDY

The results of the Central Corridor Transit Study form the basis for the alternatives under evaluation in this EIS.

2.1.1 Transit Study Process

The Central Corridor Transit Study was initiated in March 1999. The study identified a multi-modal package of transportation improvements. These improvements would address future travel demand and meet the goals of the community, i.e., economic opportunity, communities and environment, and transportation and mobility.

A review of existing and projected future conditions resulted in the development and adoption of a purpose statement by the Central Corridor Coordinating Committee (CCCC). Goals and objectives were established in response to the identified problems and needs. They were based on adopted long range plans, federal major investment planning criteria, public outreach efforts and agency coordination. They are defined in Section 1.3: Goals and Objectives of the Central Corridor Transit Study.

The goals and objectives were used to develop criteria and measures of effectiveness. These criteria were then used to evaluate the various alternatives used in the Transit Study. The Transit Study employed a three-tiered evaluation process. More general measures were applied to the earlier evaluations while more detailed measures were reserved for the final evaluation.

2.1.2 Transit Study Locally Preferred Investment Strategy

The development of alternatives in the Transit Study began with a Universe of Alternatives. It included all of the potential transit technologies in each of the six corridors identified within the Study Area, e.g.: bus, personal rapid transit (PRT), diesel multiple unit (DMU), heavy rail, monorail, magnetic levitation, Busway/BRT, LRT and commuter rail.

In the first level of evaluation, the universe of alternatives was reduced to 19 options. These options were then evaluated in Screen I (see *Technical Memorandum 2: Screen I Evaluation*, August 4, 2000). Screen I yielded nine options for further evaluation in Screen II.

On February 15, 2001, the CCCC determined that as a result of the Screen II evaluation, three build options would be retained for advancement to Scoping Process. These options are LRT on University Avenue, Busway/BRT on University Avenue and LRT on Interstate 94 (I-94). (See

Technical Memorandum 3: Screen II Evaluation, January 2002.) Based on analysis and comments received during Scoping, the CCCC decided on October 11, 2001 to eliminate LRT on I-94 as an alternative for consideration in the Draft EIS.

By letter dated February 14, 2002 (Appendix 9.12), the CCCC requested from the Federal Transit Administration (FTA) to combine the No-Build and Transportation Systems Management (TSM) alternatives into one alternative. Thus, the two build alternatives would be evaluated against a single Baseline Alternative. FTA response is pending.

Early in the screening process, two commuter rail options were considered. Upon analysis of several factors including ridership, the CCCC voted to separate these commuter rail alternatives from this process at their meeting on April 12, 2001.

On June 13, 2002, the Central Corridor Coordinating Committee voted to select light rail transit on University Avenue as the preliminary locally favored alternative for the corridor. This decision was based on study results that the other alternatives did not meet the goals of the study or the travel demand on the corridor. It is consistent with three prior planning efforts done on this corridor in prior years.

2.1.3 2020 Long Range Transportation Plan (LRTP)

The Twin Cities Metropolitan Council adopted the *Twin Cities Metropolitan Long Range Transportation Plan* (the 2020 Transportation Policy Plan) in December 1996. It identified the location, function and size of new and existing transportation corridors to be improved through 2020. The Policy Plan considered transitways as a high priority, including a combination of Busway/BRT and rail transit improvements. These planned transit improvements included LRT on the Hiawatha Corridor (under construction) and commuter rail on the Northstar and Red Rock Corridors. The Transportation Policy Plan, January 2001, indicates that by 2010 LRT will be constructed in the Central Corridor.

2.2 ALTERNATIVES REFINED DURING THE SCOPING PROCESS

The initiation of the Draft EIS for the Central Corridor began with a formal Scoping Process. The purpose of the Scoping Process was to publicly announce the alternatives to be considered for the Draft EIS. It also seeks out additional options for possible analysis and to assist in focusing the Draft EIS on significant issues. The process was also an opportunity to apprise the public, government agencies, elected officials, organizations and businesses to solicit comments and recommendations on the scope of the proposed project. See Chapter 8.0: Public and Agency Involvement Program, for details on the Scoping Process.

2.2.1 Alternatives and Design Options Presented During Scoping

The initial set of project alternatives included in the Scoping Process were based on the results of Screen II evaluation and were as follows:

- No Build
- Transportation Systems Management (TSM)
- University Avenue LRT Alternative

- University Avenue Busway/BRT Alternative
- I-94 LRT Alternative

Alternative alignments for LRT and Busway/BRT through the University of Minnesota, State Capitol and downtown St. Paul were also presented during Scoping. They are illustrated on Figure 2.2-1: Downtown Minneapolis/U of M LRT Alternative Alignments; Figure 2.2-2: Downtown Minneapolis/U of M BRT Alternative Alignments Figure 2.2-3: Capitol Area LRT Alternative Alignments; Figure 2.2-4: Downtown St. Paul LRT Alternative Alignments Presented During Scoping.

2.2.2 Alternatives and Design Options Suggested During Scoping

The following technologies and alignments were suggested during Scoping:

- Trolley/streetcar
- Personal Rapid Transit (PRT)
- Commuter Rail
- Pierce Butler Route
- Burlington Northern Santa Fe Railroad (BNSF)

Alternative alignments through the State Capitol and downtown St. Paul were also suggested during Scoping and are illustrated on Figure 2.2-5: Capitol Area and Downtown St. Paul Alternatives Suggested During Scoping.

Following the close of the public comment period, additional analysis of new downtown St. Paul LRT Alternatives was undertaken to satisfy concerns and to respond to comment received from the City of St. Paul and the Capitol Area Architectural Planning Board (CAAPB). This resulted in the development of a hybrid LRT Alternative for downtown St. Paul which incorporated segments of LRT Alternatives previously analyzed and presented to the public during the formal Scoping Process. This hybrid alternative was found to be acceptable by all parties and was ultimately adopted by the CCCC as an alternative to be advanced in the DEIS.

2.3 ENVIRONMENTAL IMPACT STATEMENT (EIS) ALTERNATIVES DEFINITION

This section reviews the development of alternatives for inclusion in the Draft EIS. These alternatives are:

- Baseline Alternative - As stated previously, the CCCC requested from the FTA permission to combine the No-Build and TSM alternatives into the Baseline Alternative. Thus, the two build alternatives would be evaluated against the single Baseline Alternative.
- University Avenue LRT Alternative – This alternative has the following characteristics:
  - Tunnel under Washington Avenue through the University of Minnesota
  - Tracks on Robert Street to Columbus Street to Cedar Street and 4th Street through the State Capitol and downtown St. Paul
- University Avenue Busway/BRT Alternative – This alternative has the following characteristics:
  - Operate in mixed traffic on Washington Avenue through the University of Minnesota

- Follows the existing Route 16 through the State Capitol and downtown St. Paul across the Robert Street Bridge.

Each of these alternatives is described in detail in the following sections.

2.3.1 Baseline Alternative

The Central Corridor is one of the busiest transit corridors in the Twin Cities. Many improvements have been made to the corridor over the years in an effort to effectively serve that demand. High frequency local, express, and limited stop services are already in operation. Articulated buses are used on the local service. Diamond lanes and reverse flow bus lanes are in place in both downtowns. Freeway ramp meter bypasses and shoulder lanes have been implemented on I-94. Several transit hubs have been built on the corridor. Bus congestion is already creating reliability and efficiency problems in the downtown areas and at the University of Minnesota. Future service changes will be aimed at increasing the numbers of buses in operation to compensate for increasing delays due to traffic congestion and to respond to population and employment growth in the corridor.

The service aspects of the Baseline Alternative are more fully described in Section 6.2.1 to 6.2.3. The Baseline Alternative includes all aspects of existing transit service in the Study Area. Baseline Alternative improvements include the creation of a new route, extension of others, and frequency improvements on many of the remaining routes.

The Baseline alternative under consideration has the following characteristics and is defined as follows:

- Employs a combination of relatively low cost capital improvements to increase capacity and improve operations of the existing transportation facilities.
- Includes all programmed improvements to roadway and transit.
- Considers reasonable enhancements to the existing transportation system included in the *Twin Cities Metropolitan Long Range Transportation Plan.*
- Differs only slightly from the National Environmental Policy Acts (NEPAs) definition of a No Build Alternative because of the various levels and types of transit services that exist in the Central Corridor. The total improvements over no-build conditions are expected to be fewer than five percent of existing services.

PROGRAMMED IMPROVEMENTS IN THE CENTRAL CORRIDOR

The transportation projects within the Central Corridor are identified in the Twin Cities and State 2001-2004 Transportation Improvement Program (TIP). Many of these improvements are minor, i.e. do not involve expansion of existing facilities to increase capacity extensively. Examples include adjustments to signal timing and/or phasing and addition of turn lanes at intersections. The funded projects still to be completed within the Central Corridor are identified on Figure 2.3-1: Programmed and Planned Improvements within the Central Corridor, and listed as follows:

- I-94 at TH 280 – Develop high occupancy vehicle (HOV) bypass ramp
- Snelling Avenue south of University Avenue – Develop new bus garage for Metro Transit.

The following projects in the TIP and located within the Central Corridor have been completed:

- I-94 between Snelling Avenue and Cedar Street – Resurface pavement
- I-94 between downtown St. Paul and Minneapolis – Widen shoulders for bus use during peak hours
- I-94 at Snelling Avenue – Improve bus stop.

Additionally, the Hiawatha LRT system is part of the TIP and currently under construction. The system will connect downtown Minneapolis to the Minneapolis-St. Paul International Airport and Mall of America in Bloomington. The segment from Minneapolis to Fort Snelling is scheduled to begin operation in fall 2003 and the segment from Fort Snelling to the Mall of America in fall 2004.

PLANNED IMPROVEMENTS IN THE CENTRAL CORRIDOR

The following improvements are planned for the Central Corridor:

A. To close existing gaps in north-south transit service the following improvements are proposed:
   - Run a new Route 60 along Victoria Street and Hamline Avenue south of University Avenue (30-minute frequency).
   - To eliminate service gap in the area, extend existing Route 63 from current terminus at Grand Avenue/Cretin Avenue to University Avenue near TH 280 via Pelham Boulevard (frequency: 20 minutes peak and 30 minutes off-peak).
   - As part of transit improvements to the Riverview Corridor, extend Route 83 to the south along Lexington Parkway to West Seventh Street.

B. Adjust services in the southern portion of the Central Corridor (south of St. Clair Avenue) to intersect with the Hiawatha LRT at the station on 46th Street South.

C. Replace I-94 segment of Route 191 express service with limited stop service along Marshall and Selby Avenues.

D. Other general improvements applicable to both the Central Corridor and other corridors in the Twin Cities that are documented in *Transit 2020 Master Plan* include:
   - Increase use of diamond lanes and provide priority signal timing at select intersections for buses to provide high-speed service.
   - Intensify regional coverage of bus-only shoulder use on I-94 and expand number of ramp meter bypass lanes.
   - Encourage better integration with University of Minnesota shuttle services and use of the Transitway.
   - Upgrade high-volume stations to "transit center" style to foster ticket sales areas, sheltered areas and increased marketing of the transit system.
   - Enhance local neighborhood services to directly link into the greater transit network.
   - Develop pricing strategies and customer incentives that encourage use of transit.

- Implement policies and strategies that encourage efficient use of land along transit corridors and provide pedestrian-oriented development.
- Enrich Travel Demand Management (TDM) and parking management strategies in the Central Business Districts (CBDs) to decrease the number of single occupant vehicles.

Operating statistics for the Baseline Alternative are illustrated in Table 2.3-1: Baseline Alternative Bus Transit Operating Plan.

2.3.2 University Avenue Light Rail Transit (LRT) Alternative

The characteristics of the University Avenue LRT Alternative are described as follows:

EIS ALIGNMENT

Figure 2.3-2: University Avenue LRT Alternative, presents the LRT Alternative. The alignment between downtown Minneapolis, through the University of Minnesota, on University Avenue to downtown St. Paul has the following characteristics:

Downtown Minneapolis

The LRT would connect with the Hiawatha LRT at-grade just east of the Downtown East/Metrodome Station.

Table 2.3-1: Baseline Alternative Bus Transit Operating Plan

Route	Description	Type of Service	Service Frequencies (in minutes)				
			Peak	Midday	Evening	Saturday	Sunday
3	St Paul CBD-Front-Como-Minneapolis CBD	Local	10	15	30	30	30
16	St Paul CBD-University-Minneapolis CBD	Local	10	10	10	10	10
21	Lake-Selby-St Paul CBD	Local	7.5	15	15	10	10
50	St Paul CBD-University-Minneapolis CBD	Limited Stop	**15**	**30**	0	0	0
62	Rice-St Paul CBD	Local	30	30	30	30	60
63	Grand-St Paul CBD	Local	10	15	15	20	20
65	Rosedale-Dale-St Paul CBD	Local	30	30	30	60	60
67	Cleveland-Minnehaha-Minneapolis CBD	Local	30	30	30	60	60
68	Jackson-St Paul CBD	Local	30	30	30	30	30
76	Midway-St Paul CBD	Local	0	60	0	0	0
83	Rosedale-Lexington	Local/Limited Stop	30	30	0	60	0
84	Rosedale-Snelling-Airport-Mall of America	Local	15	15	15	20	20
87	Rosedale-Cleveland	Local	30	30	0	60	0
94B	St Paul CBD- I-94 -Minneapolis CBD	Express	30	30	0	20	30
94C	St Paul CBD- I-94 -Minneapolis CBD	Express	30	30	30	0	0
94D	St Paul CBD- I-94 -Minneapolis CBD	Express	**20**	30	0	0	0
134	Ford-Cretin- I-94 -Minneapolis CBD	Limited Stop	12	0	0	0	0
191	Lake-Marshall-St Paul CBD	Express	20	0	0	0	0
194	Snelling-I-94-Minneapolis CBD	Express	30	0	0	0	0
52F	Cretin-Snelling-University of Minnesota	Local	60	0	0	0	0
60	**Hamline-Victoria Loop**		**30**	**30**	**30**	**30**	**30**

Source: Metro Transit and BRW 2001.
BOLD indicates change in service.

University of Minnesota and Prospect Park

The LRT would run in the median of Third Street and Fourth Street. It would connect to Washington Avenue and run in a tunnel under Washington Avenue through the East Bank campus. It would then connect with University of Minnesota Transitway at-grade and proceed to University Avenue through 29th Avenue SE in Prospect Park.

University Avenue

The LRT would run at-grade in the median between 29th Avenue SE and Robert Street near the State Capitol.

State Capitol Area and Downtown St. Paul

The alternative would run at-grade on Robert Street, Columbus Street, Cedar Street and 4th Street and terminate in front of the Union Depot.

TRACKWAY

Light rail vehicles (LRVs) would operate on standard gauge railroad track. The proposed system would be double-tracked throughout, providing a separate track for eastbound and westbound train movements. Generally, a cross-section of at-grade double track LRT alignment requires a 28-feet right-of-way. The minimum vertical clearance is approximately 14-feet from top of rail. The maximum recommended gradient along a vertical alignment is 6 percent; shorter segments may have steeper grades. The radius of track curvature plays a significant role in LRT operating speed. The absolute minimum turning radius for a typical modern articulated LRV is 82-feet. Crossovers to allow trains to cross from the eastbound to the westbound tracks would be provided at regular intervals for special operations. Because of the overall urban characteristic of the alignment, the tracks would be embedded for most of its length.

VEHICLES

LRVs would be double-ended, articulated cars capable of bi-directional operation as a single-unit or multi-unit train. A pantograph located on the roof of each vehicle would provide for power collection from the overhead power distribution system to the traction motors. Each car would be 95-feet long, with 66 seats and a capacity of approximately 160 passengers (including standees). Passengers would board the trains through four low-level double doors located on each side of the vehicle. The system would be designed for two-car trains with consideration for future expansion to accommodate three-car trains. The vehicles may be operated at up to 55 MPH.

TRAIN CONTROL

An operator would control each light rail train. The operator would have control over the acceleration and braking of the train and passenger door operations. Passenger announcements may be made by the operator or automatically by the rail control center. The operator would be in radio contact with the rail control center that would oversee and direct all rail operations. Automated train signal and communication systems would transmit various operations data to the rail control center. These systems would also provide for priority consideration at traffic signals, activation of crossing gates, collision and overspeed protection and track switch operations.

STATIONS

Passenger boarding would occur at designated station sites. LRT stations may vary in spacing and configuration, depending on their location and function. Boarding platforms would be approximately 200-feet long to accommodate two-car trains. They would be 14-inches above top of rails to allow for level boarding with a low-floor vehicle. Each station would consist of either one center loading platform approximately 18 to 30-feet wide located between the tracks, or two side-loading platforms each approximately 12-feet wide located on the side of the tracks. Generally,

each platform would be furnished with a canopy and windscreen for weather protection, signage, seating, track receptacles and self-service fare equipment. Station platforms have an expansion capacity of 300-feet to accommodate three-car trains when future ridership warrants.

Location of stations are illustrated on Figure 2.3-2 and listed as follows, along with the type of platform:

Downtown Minneapolis

The proposed Central Corridor LRT would share stations with the Hiawatha LRT in downtown Minneapolis. The Hiawatha LRT would run on Fifth Street South with stations at the following locations (several station locations may need refinement during preliminary engineering):

- Minneapolis Multimodal Station (Fifth Street South/Fifth Avenue North)
- Warehouse District Station (Hennepin Avenue at First Avenue North)
- Nicollet Mall Station
- Government Center Station (between Third and Fourth Avenue South)
- Downtown East/Metrodome Station

University of Minnesota and Prospect Park

- West Bank Station – Depressed center platform near existing bus stop on Washington Avenue
- East Bank Station – Depressed center platform in front of Coffman Union on Washington Avenue
- Stadium Village Station – Depressed center platform
- 29th Avenue SE Station – Two side platforms on northwest quadrant of 29th Avenue SE and University Avenue

University Avenue

- Westgate Station – Split side platforms
- Raymond Avenue Station – Center platform between Carleton and Lasalle Streets
- Fairview Avenue Station – Two side platforms on west side of intersection
- Snelling Avenue Station – Split side platforms
- Lexington Parkway Station – Split side platforms
- Dale Street Station – Split side platforms
- Rice Street Station – Center platform on west side of intersection

Capitol Area and Downtown St. Paul

- Capitol East Station – Two side platforms on Columbus Street west of Robert Street
- 10th Street Station – Two side platforms in median between 11th and 10th Streets at Cedar Street
- 6th Street Station – Two side platforms between 7th and 6th Streets at Cedar Street
- 4th Street Station – Two side platforms on 4th Street between Robert and Minnesota Streets
- Union Depot Station – Center platform with potential expansion at 4th Street in front of the Union Depot

FARE COLLECTION

A self-service, proof-of-payment fare collection system is planned. Passengers would purchase individual or multiple tickets or passes from fare vending machines located at each station. Passengers would validate tickets prior to boarding the train. Ticket inspectors would ride trains randomly and check passengers for proof of payment. The absence of positive fare control (i.e. turnstiles or fareboxes) and use of cars with multiple, wide boarding doors provides for rapid passenger boarding/alighting and minimal delays at stations.

POWER SYSTEM

Traction power substations would be located at regular intervals along the proposed LRT line. Most substations would be located near LRT stations. The substations would generally be single-story buildings approximately 40-feet by 20-feet on about a 4,000-square-foot limited access site. They would transform and rectify the utility three-phase alternating current to the direct current LRT electrification voltage. The power would then be distributed to the trains through an overhead contact system (OCS).

TRAFFIC CONTROL

At locations where the proposed LRT crosses public streets, active devices including traffic signals, railroad-type flashers, bells and gates would control traffic. In low-speed areas, including downtowns, intersection type traffic signals would be used. Traffic and pedestrian signals, signs and markings would generally be in accordance with the current *Manual on Uniform Traffic Control Devices* (MUTCD).

YARD AND SHOP

The Hiawatha LRT yard and shop would be expanded to accommodate additional trains from the Central Corridor LRT. The facility would be used as storage and for servicing and maintaining the LRVs. It would also be where LRT administrative staff would report for work and trains would enter and leave revenue service. Vehicles would be cleaned and repaired inside and outside daily. They also be inspected and serviced according to a fixed inspection and maintenance schedule to ensure operational safety and reliability.

An additional maintenance/storage facility near the eastern terminus of the proposed LRT line is also proposed. The facility would include storage for 10 to12 cars and vehicle washing and cleaning capability.

The Reevaluation for Hiawatha Avenue (TH55) Light Rail Transit Final Environmental Impact Statement, August 12, 1999, defined and evaluated the impacts of the proposed Hiawatha LRT Yard and Shop Facility in Minneapolis. Additionally, the Record of Decision (ROD) for the Hiawatha LRT (April 26, 2000) included the yard and shop facility in the definition of the federal action, and specified mitigation measures for the facility. The findings and commitments identified in the Hiawatha LRT ROD are therefore incorporated by reference into the Central Corridor DEIS. The implementation of LRT in the Central Corridor would not require physical expansion (e.g. no additional right-of-way would be required at the existing maintenance facility) of the existing yard and shop property. Only covered storage tracks added to the current building are required.

Based on the items presented above, there would not be additional impacts to surrounding resources associated with additional Central Corridor LRT vehicles at the Hiawatha maintenance facility. Hence no issue specific mitigation measures are proposed for this site. As this statement applies throughout the issue impact areas, it is being presented in summary form in Section 2.3.2 of the DEIS.

ACCESSIBILITY

The LRT system would be designed to be fully compatible with the Americans with Disabilities Act (ADA). The LRVs would be fully accessible with level boarding from accessible platforms (e.g. ramps and elevators) and provisions for wheelchair space on all cars.

OPERATING HOURS AND FREQUENCY

The LRT is proposed to operate from 5:00 AM to 12:30 AM seven days a week. Frequency would vary between 7.5 minutes during peak hours to 10 minutes during off-peak hours and weekends. The standard operating plan would be modified to accommodate special events (e.g. evening or weekend cultural or sporting events). A detailed operating plan is included in Chapter 6.0: Transportation Impact Analysis.

The University Avenue LRT Alternative includes the components of the Baseline Alternative and the bus system associated with the Baseline Alternative would be restructured to coordinate and interface with the proposed LRT service.

Figure 2.3-3: LRT Typical Sections, illustrates typical cross sections of the LRT alignment when operating in an exclusive guideway in median operation on University Avenue.

Inasmuch as the LRT Alternative will have sufficient capacity to accommodate forecasted passenger volumes through 2020, the amount and level of bus service in the study area will be significantly reduced particularly on Routes 16 and 94D. Additionally, the LRT Alternative would permit the elimination of Routes 50, 94B, 94C and 194. Figure 2.3-4: Proposed Central Corridor Bus Network, illustrates the proposed bus network.

The revised level of service (LOS) for the bus operating plan associated with the LRT Alternative is depicted in Table 2.3-2: LRT Alternative Bus Transit Operating Plan.

2.3.3 University Avenue Busway/Bus Rapid Transit (BRT) Alternative

The characteristics of the Busway/BRT Alternative are described as follows:

EIS ALIGNMENT

Figure 2.3-5: University Avenue Busway/BRT Alternative, presents the Busway/BRT Alternative. The alignment between downtown Minneapolis, through the University of Minnesota, on University Avenue to downtown St. Paul has the following characteristics:

Downtown Minneapolis

This alternative would follow the existing Routes 16 and 50 on Fourth Street South, with a western terminus at Metro Transit's Fifth Street Garage. Eastbound Busway/BRT vehicles would operate in mixed traffic. Westbound vehicles would operate on an existing contraflow bus lane on the north side of Fourth Street South.

Table 2.3-2: LRT Alternative Bus Transit Operating Plan

Route	Description	Type of Service	Service Frequencies (in minutes)				
			Peak	Midday	Evening	Saturday	Sunday
3	St Paul CBD-Front-Como-Minneapolis CBD	Local	10	15	30	30	30
16	St Paul CBD-University-Minneapolis CBD	Local	**20**	**30**	**30**	**30**	**30**
21	Lake-Selby-St Paul CBD	Local	7.5	15	15	10	10
50	St Paul CBD-University-Minneapolis CBD	Limited Stop	**0**	**0**	**0**	**0**	**0**
62	Rice-St Paul CBD	Local	30	30	30	30	60
63	Grand-St Paul CBD	Local	10	15	15	20	20
65	Rosedale-Dale-St Paul CBD	Local	30	30	30	60	60
67	Cleveland-Minnehaha-Minneapolis CBD	Local	30	30	30	60	60
68	Jackson-St Paul CBD	Local	30	30	30	30	30
76	Midway-St Paul CBD	Local	0	60	0	0	0
83	Rosedale-Lexington	Local/Limited Stop	30	30	0	60	0
84	Rosedale-Snelling-Airport-Mall of America	Local	15	15	15	20	20
87	Rosedale-Cleveland	Local	30	30	0	60	0
94B	St Paul CBD- I-94 -Minneapolis CBD	Express	**0**	**0**	**0**	**0**	**0**
94C	St Paul CBD- I-94 -Minneapolis CBD	Express	**0**	**0**	**0**	0	0
94D	St Paul CBD- I-94 -Minneapolis CBD	Express	20	0	0	0	0
134	Ford-Cretin- I-94 -Minneapolis CBD	Limited Stop	12	0	0	0	0
191	Lake-Marshall-St Paul CBD	Express	20	0	0	0	0
194	Snelling-I-94-Minneapolis CBD	Express	**0**	**0**	**0**	**0**	**0**
52F	Cretin-Snelling-University of Minnesota	Local	60	0	0	0	0
60	Hamline-Victoria Loop	Local	30	30	30	30	30
LRT	**Light Rail Transit Service**	LRT	**8**	**10**	**10**	**10**	**10**

Source: Metro Transit and BRW 2002.
BOLD indicates change in service.

University of Minnesota and Prospect Park

The alternative would run on Washington Avenue in mixed traffic through Prospect Park on University Avenue.

University Avenue

East of Bedford Avenue, the exclusive guideway for the Busway/BRT would begin. It would run in the median of University Avenue through Rice Street near the State Capitol.

Capitol Area and Downtown St. Paul

Similar to downtown Minneapolis, the Busway/BRT Alternative would operate following the existing Route 16. Buses would run on Constitution Avenue, Cedar Street, Minnesota Street, and Kellogg Boulevard. This alternative would also cross to River Park Plaza south of the Mississippi River using the Robert Street Bridge to serve a large office development.

GUIDEWAY

The Busway/BRT Alternative would operate in both mixed traffic and an exclusive guideway.

Within the downtown areas and University of Minnesota and on University Avenue between Washington Avenue and Bedford Street, the Busway/BRT Alternative would operate in mixed traffic.

The exclusive guideway would be located in the median of University Avenue between Bedford Avenue and Rice Street. Buses would operate on a 28-foot pavement that includes a separate bus lane for eastbound and westbound bus movements. Mountable curbs would separate the guideway from vehicular traffic while allowing emergency vehicles to access the guideway. The minimum turning radius for the BRT vehicle (articulated bus) is 38-feet.

VEHICLES

Articulated buses would be used. Each bus would be 60-feet long, with 60 seats and a capacity of over 75 passengers (including standees). Passengers would board the buses through three low-level double doors located on the right side of the vehicle. The system is being designed to accommodate simultaneously two articulated buses at each boarding platform. The vehicles may be operated at up to 55 MPH.

VEHICLE CONTROL

An operator would control each bus. The operator would have control over the acceleration and braking of the bus and passenger door operations. Passenger announcements may be made by the operator or automatically through the communications system. Vehicles would be equipped with global positioning system (GPS) and automatic vehicle locator (AVL) to facilitate priority consideration at traffic signals and safety and security of the operator and passengers.

STATIONS

Passenger boarding would occur at designated station sites. BRT stations may vary in spacing and configuration, depending on their location and function. Boarding platforms would be approximately 120-feet long to accommodate two articulated buses. They would be 14-inches above pavement to allow for level boarding with the low-floor bus. Each station would consist of

two side-loading platforms each approximately 12-feet wide located on the side of guideway. Generally, each platform would be furnished with a canopy and windscreen for weather protection, signage, seating, track receptacles and self-service fare equipment.

Locations of stations are illustrated on Figure 2.3-5 and listed as follows:

Downtown Minneapolis

In downtown Minneapolis, the proposed Central Corridor Busway/BRT would operate within mixed traffic with stops at the following locations:

- Fifth Street Garage – Metro Transit Garage on Fifth Street South
- Warehouse District – Fourth Street South/First Avenue North
- Nicollet Mall – at Fourth Street South
- Downtown East/Metrodome – Fourth Street South/Chicago Avenue

In general, buses would stop in the near side of the intersection. Existing sidewalks at station locations would be modified to accommodate and differentiate the new BRT vehicles from regular bus routes. Modifications would include signage, shelters and fare vending equipment. Bus pads would also be installed at station locations. Each bus pad would be 120-feet long to accommodate two articulated buses simultaneously.

University of Minnesota and Prospect Park

- Cedar Avenue – Buses would exit the roadway and stop at the top of the off-ramps at Cedar Avenue (near side).
- West Bank – Buses would stop at the existing major bus station in the area of the West Bank Skyway. The skyway connects Willey Hall to the north to Blegen Hall to the south.
- East Bank – Buses would not stop in front of Coffman Union on Washington Avenue.
- Stadium Village – Buses would stop at the east side of the intersection of Washington Avenue and Oak Street.
- 27th Avenue SE – Washington Avenue and 27th Avenue SE

University Avenue

All stations along the Busway/BRT guideway would be designed as split side platforms with a far side stop.

- Westgate
- Raymond Avenue
- Fairview Avenue
- Snelling Avenue
- Lexington Parkway
- Dale Street
- Rice Street

State Capitol Area and Downtown St. Paul

At the State Capitol area and downtown St. Paul, the proposed Central Corridor Busway/BRT would follow the existing bus Route 16. Stations would be sited at the following locations, with

northbound buses operating on Minnesota Street and southbound buses operating on Cedar Street. To facilitate transfers and minimize confusion for passengers, this analysis assumes that Busway/BRT stations would be sited at existing locations of the Route 16 and 50.

- Constitution Avenue – at the State Capitol
- 10th Street (Cedar/Minnesota Streets)
- 7th Street (Cedar/Minnesota Streets)
- 6th Street (Cedar/Minnesota Streets)
- 5th Street (Cedar/Minnesota Streets)
- River Park Plaza

FARE COLLECTION

A self-service, proof-of-payment fare collection system is planned. Passengers would purchase individual or multiple tickets or passes from fare vending machines located at each station. Passengers would validate tickets prior to boarding the rain. Ticket inspectors would randomly ride trains and check passengers for proof of payment. The absence of positive fare control (i.e. turnstiles or fareboxes) and use of buses with multiple, wide boarding doors provides for rapid passenger boarding/alighting and minimal delays at stations.

POWER SYSTEM

Hybrid vehicles using both electric and diesel fuel are proposed for this alternative.

TRAFFIC CONTROL

At locations where the Busway/BRT crosses public streets, traffic signals would control traffic and provide prioritization for the BRT vehicles. Pedestrian signals, signs and markings would generally be in accordance with the current MUTCD.

YARD AND SHOP

Vehicles would be serviced and maintained at existing Metro Transit garages.

ACCESSIBILITY

The Busway/BRT system would be designed to be fully compatible with the ADA. Vehicles would be fully accessible with level boarding from accessible platforms (e.g. ramps) and provisions for wheelchair space and securement on all buses.

OPERATING HOURS AND FREQUENCY

The Busway/BRT would operate from 5:00 AM to 12:30 AM seven days a week. Frequency would vary between 6 minutes during peak and midday hours to 10 minutes during evenings and weekends. The standard operating plan would be modified to accommodate special events (e.g. evening or weekend cultural or sporting events). A detailed operating plan is included in Chapter 6.0: Transportation Impact Analysis.

The University Avenue Busway/BRT Alternative includes the components of the Baseline Alternative and the bus system associated with the Baseline Alternative would be restructured to coordinate and interface with the proposed Busway/BRT service.

Figure 2.3-6: BRT Typical Sections, illustrates typical cross sections of the BRT alignment when operating in an exclusive guidway in median operation on University Avenue. Unlike the LRT Alternative, the BRT Alternative is severely constrained in meeting forecasted levels of passenger demand. In fact, it is believed that the capacity of the BRT Alternative will be exceeded before the forecast year of 2020. Consequently, significantly more bus service needs to be retained in the Central Corridor to insure that there is sufficient capacity to meet projected passenger volumes.

The only bus service that may be eliminated in the BRT Alternative is that operated on Route 50. Moreover, a higher LOS needs to be provided on the 94 routes to insure sufficient capacity to accommodate passenger loads.

The LOS to be operated for the bus operating plan to support the BRT Alternative is shown in Table 2.3-3: Busway/BRT Alternative Bus Transit Operating Plan.

Table 2.3-3: Busway/BRT Alternative Bus Transit Operating Plan

Route	Description	Type of Service	Service Frequencies (in minutes)				
			Peak	Midday	Evening	Saturday	Sunday
3	St Paul CBD-Front-Como-Minneapolis CBD	Local	10	15	30	30	30
16	St Paul CBD-University-Minneapolis CBD	Local	**30**	**30**	**30**	**30**	**30**
21	Lake-Selby-St Paul CBD	Local	7.5	15	15	10	10
50	St Paul CBD-University-Minneapolis CBD	Limited Stop	**0**	**0**	**0**	**0**	**0**
62	Rice-St Paul CBD	Local	30	30	30	30	60
63	Grand-St Paul CBD	Local	10	15	15	20	20
65	Rosedale-Dale-St Paul CBD	Local	30	30	30	60	60
67	Cleveland-Minnehaha-Minneapolis CBD	Local	30	30	30	60	60
68	Jackson-St Paul CBD	Local	30	30	30	30	30
76	Midway-St Paul CBD	Local	0	60	0	0	0
83	Rosedale-Lexington	Local/Limited Stop	30	30	0	60	0
84	Rosedale-Snelling-Airport-Mall of America	Local	15	15	15	20	20
87	Rosedale-Cleveland	Local	30	30	0	60	0
94B	St Paul CBD- I-94 -Minneapolis CBD	Express	30	**0**	**0**	**0**	**0**
94C	St Paul CBD- I-94 -Minneapolis CBD	Express	30	**0**	**0**	0	0
94D	St Paul CBD- I-94 -Minneapolis CBD	Express	20	30	0	0	0
134	Ford-Cretin- I-94 -Minneapolis CBD	Limited Stop	12	0	0	0	0
191	Lake-Marshall-St Paul CBD	Express	20	0	0	0	0
194	Snelling-I-94-Minneapolis CBD	Express	30	0	0	0	0
52F	Cretin-Snelling-University of Minnesota	Local	60	0	0	0	0
60	Hamline-Victoria Loop	Local	30	30	30	30	30
BRT	**Bus Rapid Transit Service**	BRT	**6**	**6**	**10**	**10**	**10**

Source: Metro Transit and BRW 2002.
BOLD indicates change in service

2.4 CAPITAL COSTS

This section presents the capital cost estimates for the Baseline, University Avenue LRT and University Avenue Busway/BRT Alternatives.

2.4.1 Methodology

The approach to estimate capital costs for the University Avenue LRT and Busway/BRT Alternatives involves categorizing and quantifying various construction elements, then developing and applying appropriate unit costs. For cost estimating purposes, the current level of design of both build alternatives is assumed to be consistent with prior system definitions and corresponding costs applicable in 2002. The costs have been adjusted to 2007, mid-point of construction, with escalation at 2.7 percent per year based on guidance received from the Minnesota Department of Transportation (Mn/DOT). Year 2008 is the anticipated completion of construction. The detailed methodology is included in Chapter 7.0: Evaluation of Alternatives. It should be noted that BRT and LRT are not designed to a comparable standard. It should be noted that LRT and BRT are not designed to a comparable standard.

MAJOR CATEGORIES

Costs were calculated for the capital cost estimate based on the following categories:

Guideway

The guideway is defined to encompass all of the civil elements directly associated with the construction of the proposed alignment. Examples of guideway elements include retaining walls, tunnels, structures, grading, drainage, subgrade, ballast (LRT), trackwork (LRT) pavement, curb and gutter, traffic barriers, fences, lighting and landscaping. Guideway costs are estimated by developing various typical cross-section designs and unit costs, and applying to the alignment as appropriate.

Utilities

The utility relocation item includes the cost to the proposed project for the relocation or adjustment of public utilities that may become the responsibility of the project during construction. The project may impact public utilities that are located in or near the right-of-way and utilities located in private easements. The costs for public utilities identified during this study which will need to be added, moved or adjusted are estimated. The utility costs are to be kept separate from the basic civil costs so that an advanced utility contract may be considered to facilitate an early start of the work. In general, the estimate uses a route-foot allowance of high (urban allowance), medium (suburban allowance) and low (rural allowance) to price the utility work. The allowance does not cover extraordinary utilities such as large water or sewer lines, heating ducts, undergrounding of electrical utilities and the like. These elements would be estimated as special line items as they are identified. A contingency of 100 percent for utility work was applied to accommodate the expected unknowns.

With respect to District Energy, the estimate includes the provision of a structural slab over shallow utilities to protect such utilities from the weight of the LRT trains. No provisions have been made for the relocation of private utilities in either build alternative.

Stations

Station costs are estimated using typical LRT and Busway/BRT design and unit costs. For each proposed station location, an appropriate typical station design is selected and the corresponding

unit cost is applied. The typical station costs include platforms, shelters, mezzanines, stairways, elevators and other furnishings. Additional station costs are estimated for each proposed station individually including site preparation, driveways, bus loading areas, and stormwater retention.

Systems

Systems costs include fare collection, communications, train control signaling and traction electrification, GPS and AVL.

Special Conditions

This cost element includes construction activity that is not accounted for in the LRT and Busway/BRT guideway component. Examples of special conditions include roadway restoration, non-guideway structures, traffic signals, grade crossings and traffic control. With respect to the LRT Alternative, total reconstruction of the public right-of-way will occur over the length of the guideway. Under the BRT Alternative however, improvements will be limited to the immediate area of the BRT stop when operating in mixed traffic, to the roadway when operating in exclusive guideway, and to the entire public right-of-way at intersections where stations occur.

Right-of-Way

This component includes an allowance for the costs associated with right-of-way acquisition and relocation of existing residential and commercial structures.

Yards and Shops

This component includes all of the costs associated with any necessary operating and maintenance facilities.

Vehicles

Vehicle costs are estimated using the LRT, BRT and bus fleet sizes indicated in the proposed operating plan plus a spare ratio. Unit costs are based on recent experience in other systems with similar characteristics.

Soft Costs

Soft costs are non-construction costs that can be anticipated during design and construction. They include engineering, construction management, project management, project administration, insurance and start-up. In addition to the preceding categories, capital costs developed for this analysis incorporate contingencies for specific items not included in the estimate. Together, these soft costs are listed as follows:

Engineering and Administration

- Infrastructure improvements: 30 percent
- Vehicles: 5 percent

Contingencies

- Utilities: 100 percent
- Infrastructure improvements: 20 percent
- Vehicles: 5 percent

UNIT COSTS

The unit costs used in these cost estimates were developed using a combination of data from similar projects in other locations and information on local construction cost trends.

REFINEMENTS

Cost refinements will be introduced during later stages of engineering project development. They will include assumptions related to the construction schedule and time of expenditure. The contingencies will be reduced as the current assumptions are refined.

BUS IMPROVEMENTS

Cost of bus improvements include both the cost of fixed facilities (e.g. transit centers) and new and replacement buses.

2.4.2 Capital Cost Estimates

Table 2.4-1: Preliminary Project Cost Estimate of Build Alternatives, presents the total estimated capital costs for the transit element (bus and LRT) for each build alternative in this Draft EIS. As indicated in the table, the University Avenue LRT Alternative would be $840 in year 2008 dollars and the University Avenue Busway/BRT Alternative as currently configured would cost approximately $241 million to construct. For each of the alternatives, a contingency of 100 percent for utilities, 20 percent for infrastructure improvements, and 5 percent for vehicles was used.

Table 2.4-1: Preliminary Project Cost Estimate of Build Alternatives[1/]

Description	Cost ($ million)			
	LRT		Busway/BRT	
	2002	2008	2002	2008
Civil construction	$ 155	$ 177	$ 38	$ 44
Utility allowance	$ 27	$ 31	$ 7	$ 8
Structures	$ 41	$ 47	$ 0	$ 0
Stations	$ 100	$ 114	$ 44	$ 50
Maintenance facility allowance	$ 20	$ 23	$ 9	$ 10
Traction power system	$ 15	$ 18	$ 0	$ 0
Signal system	$ 16	$ 18	$ 0	$ 0
Communications/GPS	$ 7	$ 8	$ 20	$ 23
Fare collection	$ 2	$ 2	$ 4	$ 4
Infrastructure Subtotal	**$ 383**	**$ 438**	**$ 122**	**$ 139**
Right-of-way allowance	$ 30	$ 34	$ 1	$ 1
Vehicle allowance	$ 99	$ 113	$ 20	$ 23
Miscellaneous Subtotal	**$ 129**	**$ 147**	**$ 21**	**$ 24**
Engineering and Administration[2/]	$ 120	$ 137	$ 37	$ 43
Contingencies[3/]	$ 103	$ 118	$ 31	$ 35
Soft Costs Subtotal	**$ 223**	**$ 255**	**$ 68**	**$ 78**
Preliminary Estimated Project Cost	**$ 735**	**$ 840**	**$ 211**	**$ 241**

[1/] 2008 cost based on 2.7 percent annual rate applied to 2002 cost.
[2/] Includes 30 percent for infrastructure improvements and 5 percent for vehicles (LRT only).
[3/] Includes 100 percent for utilities, 20 percent for infrastructure improvements and 5 percent for vehicles.

The Baseline Alternative would entail 23 additional buses and sufficient space at a maintenance facility. While these buses would be comparable to 60-foot articulated buses proposed in the Busway/BRT Alternative, a slightly lower unit cost would be used to calculate the cost of these vehicles. This is because the Busway/BRT Alternative calls for hybrid vehicles that have higher costs than regular diesel buses. However, these estimates include a similar cost for maintenance facility improvements required by both types of vehicles.

Using the same assumptions on contingencies, engineering and administrative expenses, Table 2.4-2: Preliminary Project Cost Estimate of Baseline Alternative, presents the current and start-up year cost of the Baseline Alternative.

As presented in Table 2.4-2, the Baseline alternative would require capital investment of $27 million in the existing bus system. This investment would accommodate additional ridership in the Central Corridor. It would also offset additional equipment required to maintain a comparable LOS due to increased roadway congestion.

Table 2.4-2: Preliminary Project Cost Estimate of Baseline Alternative

Description	Cost ($ million)	
	2002	2008[1/]
Maintenance facility allowance	$ 7.9	$ 9.0
Vehicles	$ 10.6	$ 12.0
Engineering and administration[2/]	$ 2.9	$ 3.0
Contingencies[3/]	$ 2.6	$ 3.0
Preliminary Estimated Project Cost	**$ 24.0**	**$ 27.0**

[1/] 2008 cost based on 2.7 percent annual rate applied to 2002 cost.
[2/] Includes 30 percent for infrastructure improvements and 5 percent for vehicles.
[3/] Includes 20 percent for infrastructure improvements and 5 percent for vehicles.

For a more direct comparison of capital costs between the three alternatives, consideration should also be given to the costs avoided by implementing the build alternatives. That is, if the Busway/BRT were constructed, service in the Central Corridor could be operated with 3 fewer vehicles (2 plus 1 spares) than the Baseline Alternative. Similarly, the LRT Alternative would result in operation of 49 fewer buses (including 10 spares). Table 2.4-3: Net Project Costs, presents the reduction in cost of the build alternatives. The table also indicates avoided costs associated with both build alternatives ranges from moderate to substantial.

Table 2.4-3: Net Project Costs[1/]

	Cost ($ million)					
	Baseline		LRT		Busway/BRT	
	2002	2008	2002	2008	2002	2008
Gross project cost	$ 24.0	$ 27.4	$ 735.1	$ 839.8	$ 211.0	$ 241.2
Less avoided costs	$ 0.0	$ 0.0	$ 48.9	$ 55.9	$ 3.1	$ 3.5
Estimated Net Project Cost	**$ 24.0**	**$ 27.4**	**$ 686.2**	**$ 783.9**	**$ 207.9**	**$ 237.7**

[1/] 2008 cost based on 2.7 percent annual rate applied to 2002 cost.

2.5 OPERATING AND MAINTENANCE (O&M) COSTS

This section presents preliminary O&M cost estimates for each alternative. These costs are based on operating year service plans and ridership forecasts. They do not include the annual cost of operating TDM and Intelligent Transportation Systems (ITS) programs in the region.

2.5.1 Methodology

These costs were developed in conjunction with Metro Transit. They were developed based on assumed levels of service associated with operating plans for the Baseline, LRT and Busway/BRT Alternatives under consideration for Central Corridor. The following paragraphs summarize the operations under each alternative. A detailed description is included in Section 7.5.1. O&M costs are presented for year 2002, 2008 and 2020. Year 2008 is the anticipated first year of operation. Costs in future years are based on 2002 cost inflated 4 percent annually, as calculated by Metro Transit.

BASELINE ALTERNATIVE

This alternative includes relatively low-cost improvements to the existing transit system. The incremental change in service is relatively small because of the relatively high level of transit service that currently exists within the corridor.

Improvements under this alternative fall under two general categories:

- Modest improvements to north-south services that connect to east-west routes in the corridor
- Additional service on existing routes to offset anticipated increases in ridership and roadway congestion.

UNIVERSITY AVENUE LRT ALTERNATIVE

Unlike the Busway/BRT Alternative, the LRT Alternative would operate in an exclusive right-of-way for the vast majority of its length between the two downtowns. An exclusive guideway would allow the LRT to operate at higher speeds and reduce running time between downtown Minneapolis and downtown St. Paul when compared with Busway/BRT. Service would be operated at a 7.5-minute frequency during peak periods and 10-minute frequency during non-rush hour periods utilizing two-car trains. On Saturdays, Sundays and holidays, LRT service would be provided every 10 minutes using single car trains.

Similar to the Busway/BRT operating plan, service would be maintained on Route 16 at 20-minute intervals to provide service to the intermediate stops along University Avenue between LRT stations. Service would also continue on I-94, although at a much lower level than Busway/BRT because the LRT does not have the same capacity and service reliability issues as Busway/BRT, at 20-minute intervals during rush hour periods only.

UNIVERSITY AVENUE BUSWAY/BRT ALTERNATIVE

The Busway/BRT Alternative would operate in mixed traffic in downtown Minneapolis, through the University of Minnesota on Washington Avenue and Prospect Park and in downtown St. Paul. An exclusive guideway is proposed in the median of University Avenue between Bedford Avenue and Rice Street in St. Paul. Service would operate every 6 minutes during the day and every 10 minutes in the evenings and on Saturdays, Sundays and holidays.

Metro Transit staff advised that the maximum frequency that could be provided consistently is every 6 minutes or 10 buses per hour in each direction. This would be accounted for in the following factors:

- Busway/BRT would operate in mixed traffic for approximately 50 percent of the route length
- Getting around illegally parked or stopped vehicles
- Boarding and alighting of disabled passengers
- Unusually large passenger queues

To ensure that passenger loads would not exceed capacity at a 6-minute headway, alternate service between downtown Minneapolis and downtown St. Paul on I-94 would have to be maintained at a frequency of 8.5 minutes. Otherwise, passenger loads would be higher than capacity and LOS would be degraded.

This bus operating plan would permit the elimination of the Route 50 bus, which currently serves the corridor. The Route 16 bus would be maintained with moderate service (15-minute frequency), stopping at locations sited between Busway/BRT stations.

2.5.2 Operating and Maintenance (O&M) Costs Estimate Results

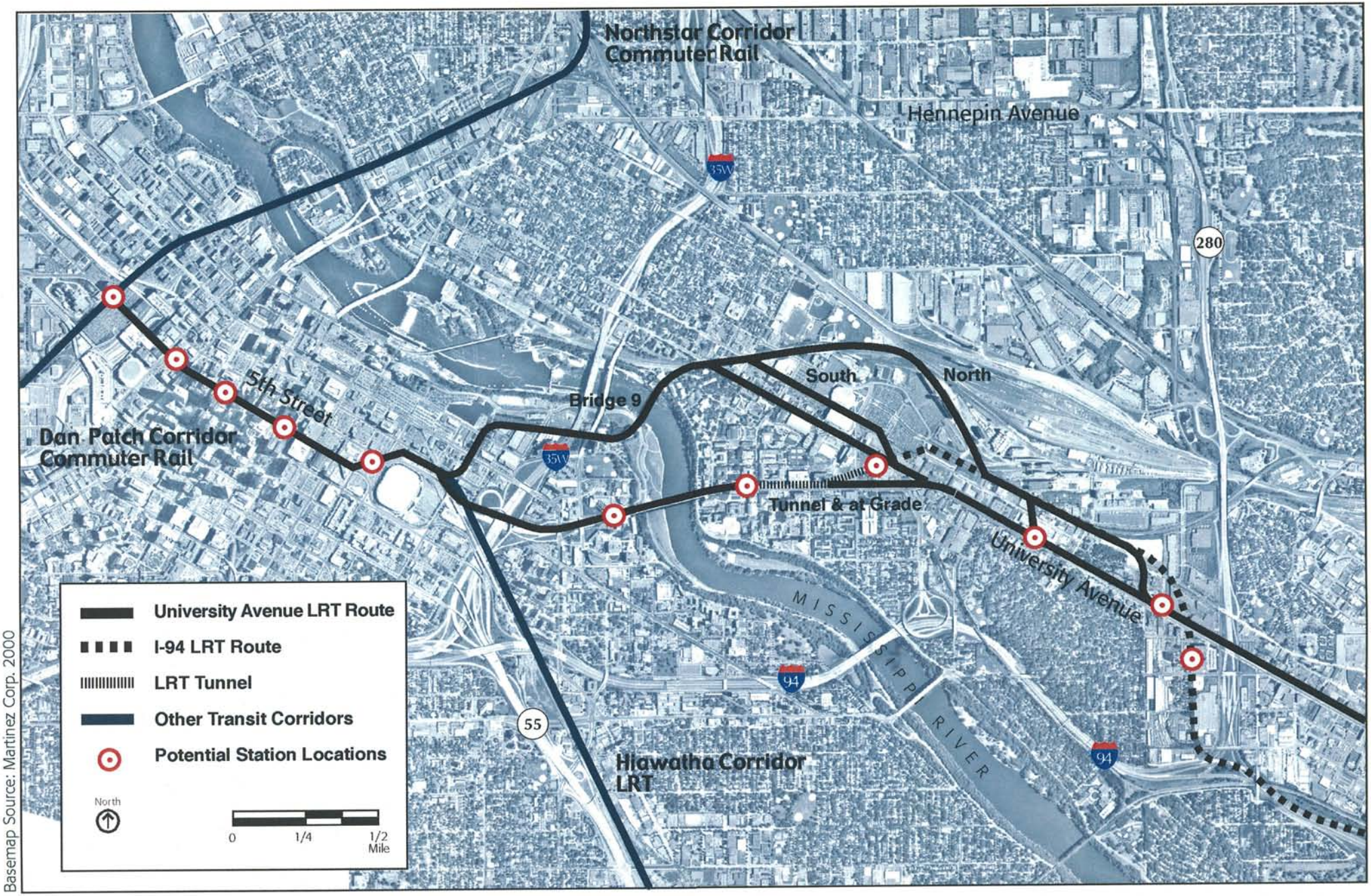
Table 2.5-1: Central Corridor Annual O&M Costs, presents the estimated annual O&M cost for the existing conditions and for each alternative considered for the Central Corridor.

Table 2.5-1: Central Corridor Annual O&M Costs[1/]

	2002	2008	2020
Existing	$40,500,000	–	–
Baseline	44,800,000	$56,700,000	$90,800,000
LRT	48,000,000	60,700,000	97,200,000
BRT	46,500,000	58,700,000	94,000,000

[1/] Year 2002 costs are inflated at 4 percent per year to derive 2008 and 2020 costs.

Table 2.5-1 shows that the annual O&M costs associated with each of the alternatives are comparable. However, the quality of service, level of ridership and ability to accommodate further growth are vastly different among the three alternatives. For example, the Baseline Alternative would continue to add vehicles to a severely congested roadway network, further deteriorating running times and diversion of trips to alternate modes. The Busway/BRT Alternative is severely constrained because of the inability to expand service beyond a 6-minute frequency and still provide reliable service. The LRT Alternative is the only one that meets future ridership demands. A detailed analysis of O&M costs are included in Chapter 6.0: Transportation Impact Analysis.



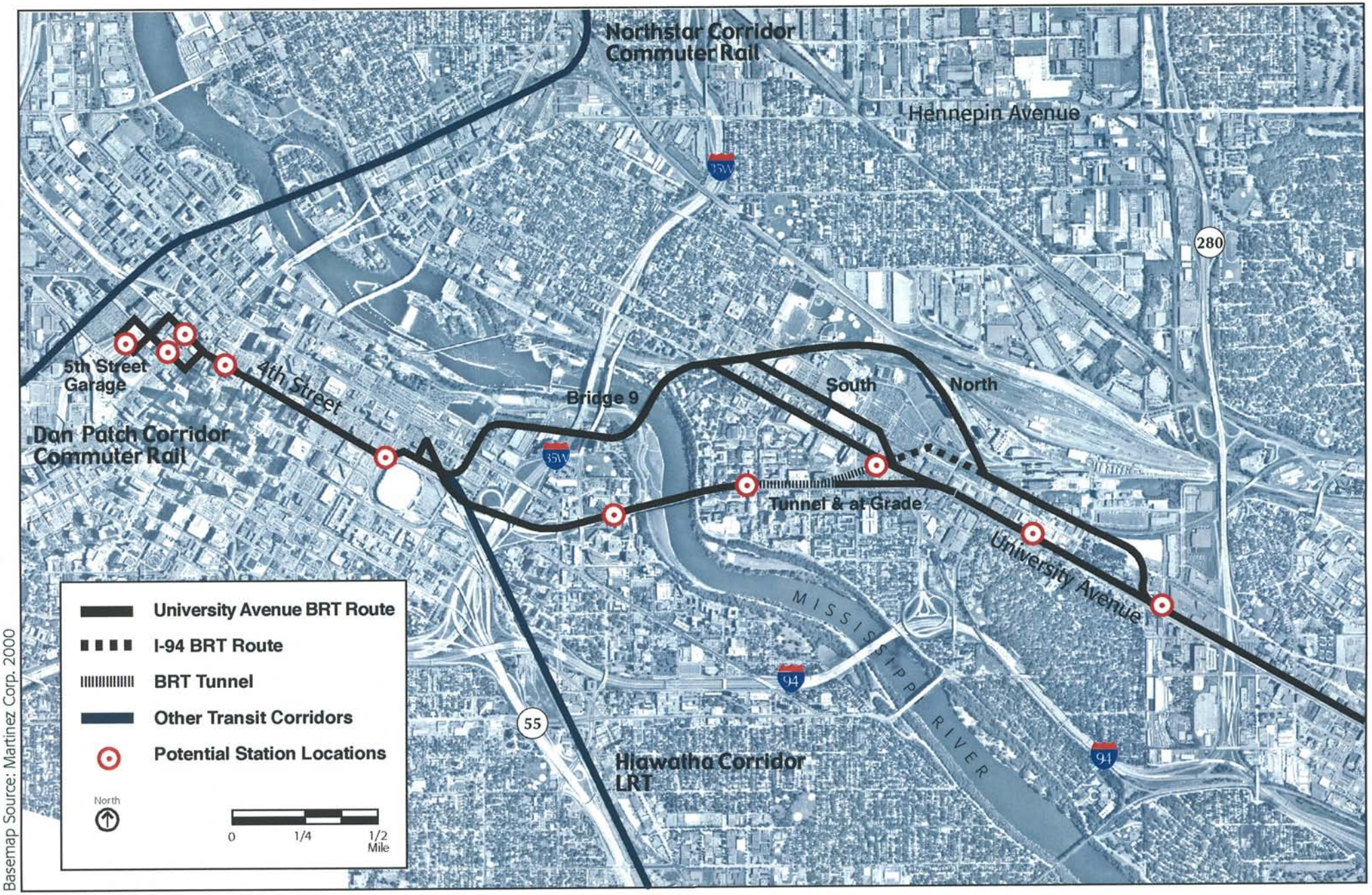
Basemap Source: Martinez Corp. 2000

THE CENTRAL CORRIDOR

Downtown Minneapolis / U of M LRT Alternative Alignments

April 2002

Figure 2.2-1



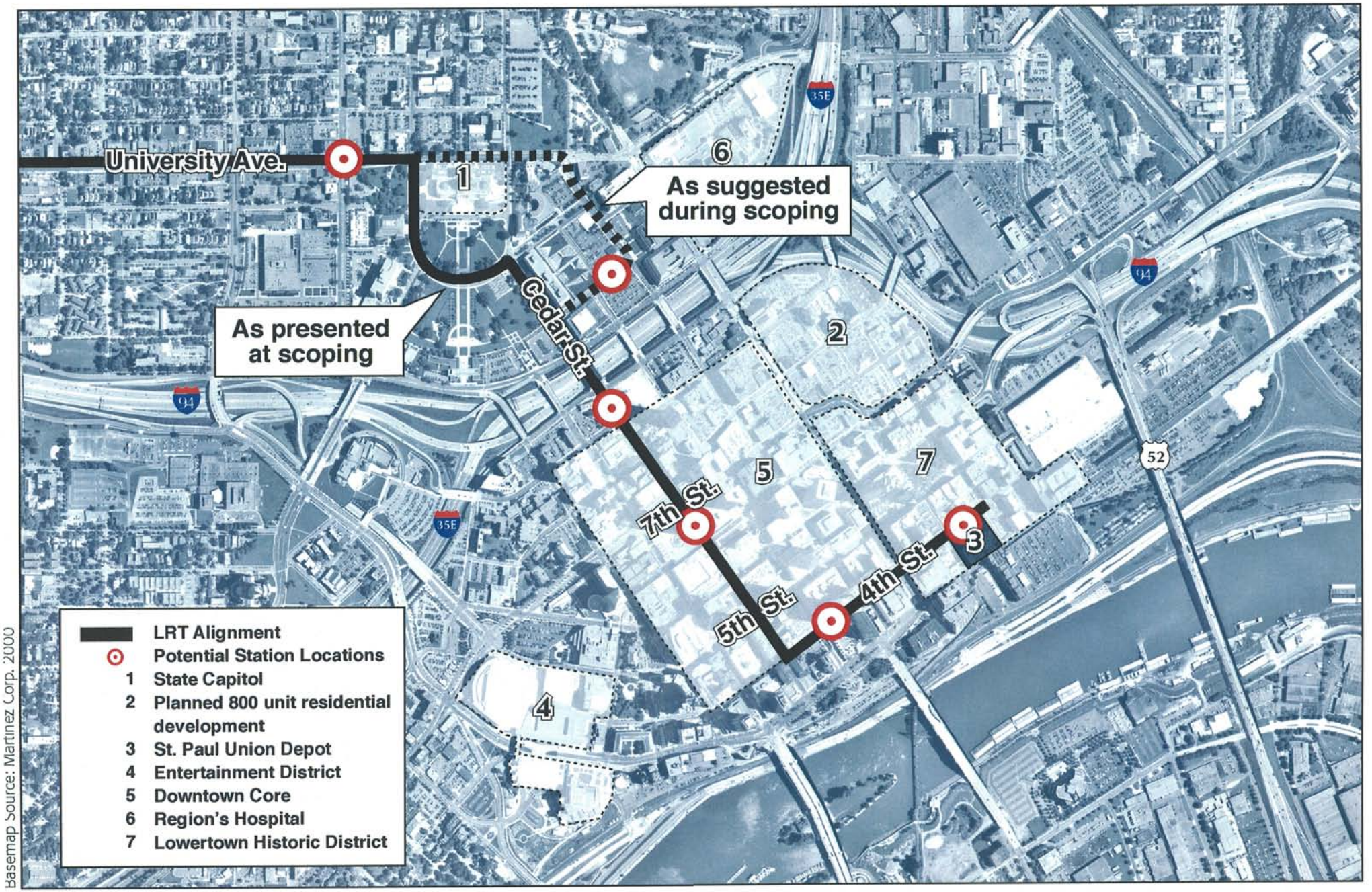
Basemap Source: Martinez Corp. 2000

THE CENTRAL CORRIDOR

Downtown Minneapolis / U of M BRT Alternative Alignments

April 2002

Figure 2.2-2



Basemap Source: Martinez Corp. 2000

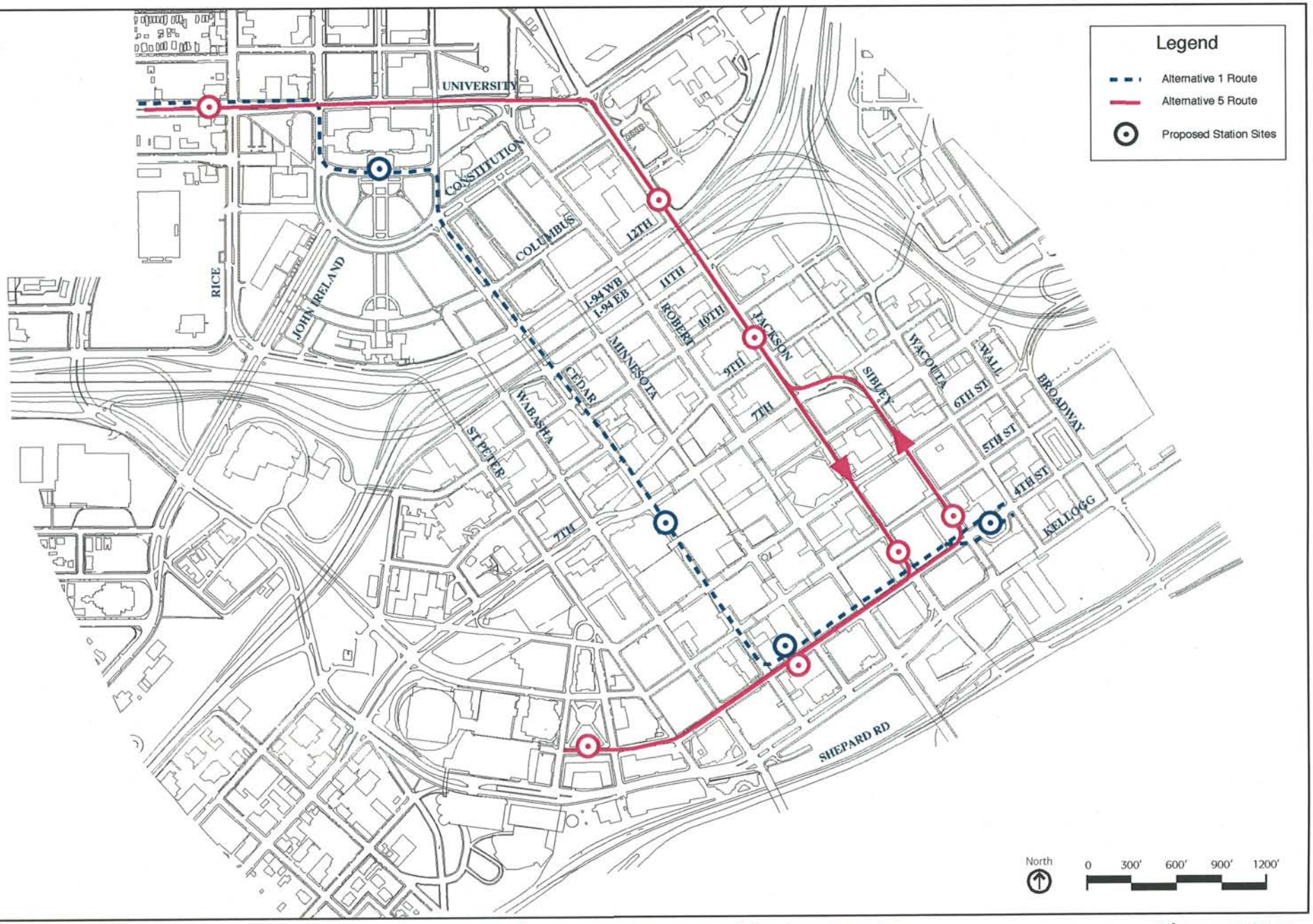
THE CENTRAL CORRIDOR

Capitol Area LRT Alternative Alignments

April 2002

Figure 2.2-3

NOTE: Potential connection to I-94 will be developed separately as part of the Capitol Area analysis.



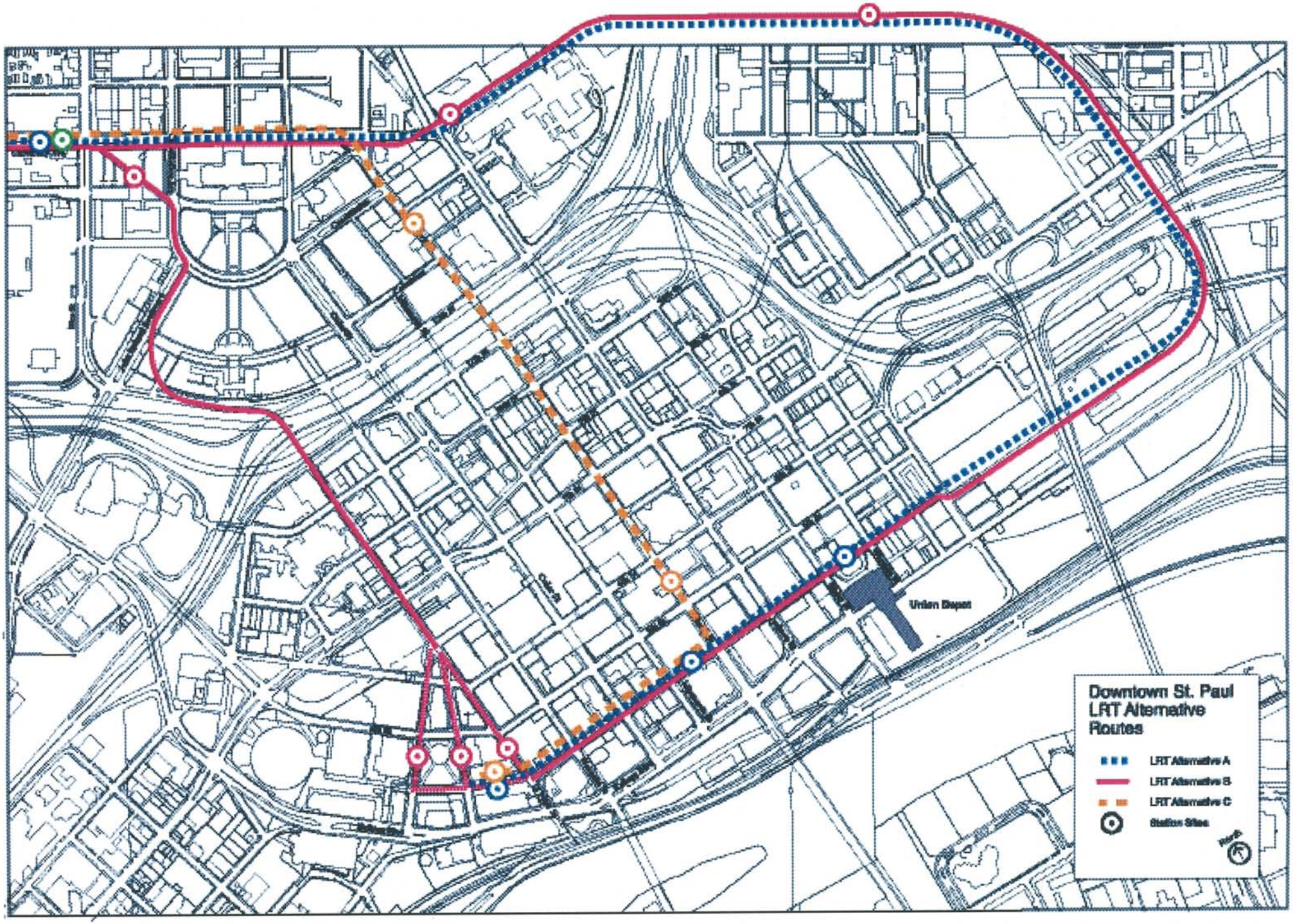
Basemap Source: Martinez Corp., 2001

THE CENTRAL CORRIDOR

Downtown St. Paul LRT Alternative Alignments Presented During Scoping

April 2002

Figure 2.2-4



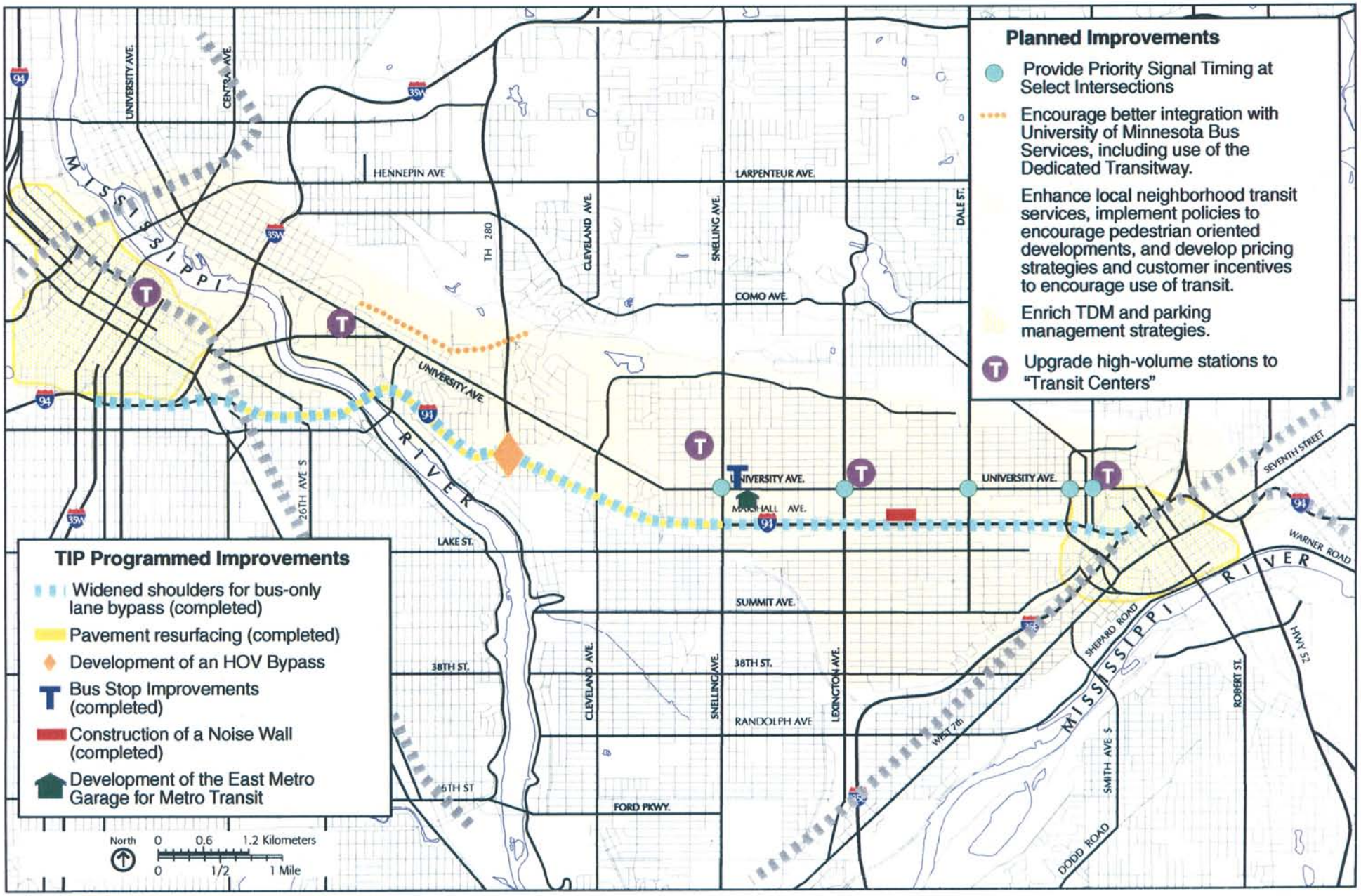
THE CENTRAL corridor

Capitol Area and Downtown St. Paul Alternatives Suggested During Scoping *

Figure 2.2-5

April 2002

*Developed by City of St. Paul Department of Planning and Economic Development

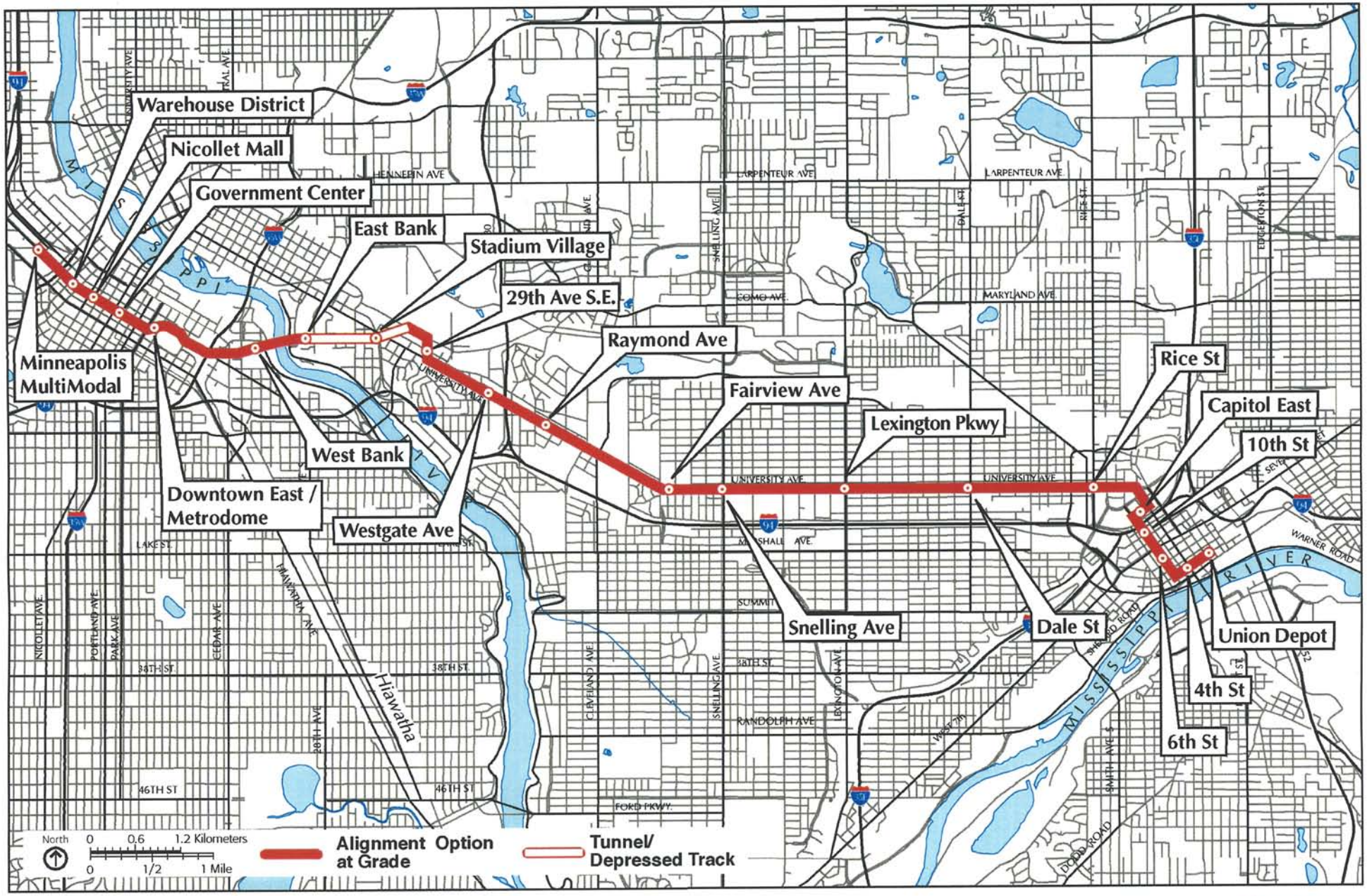


THE CENTRAL CORRIDOR

Programmed and Planned Improvements within the Central Corridor

April 2002

Figure 2.3-1

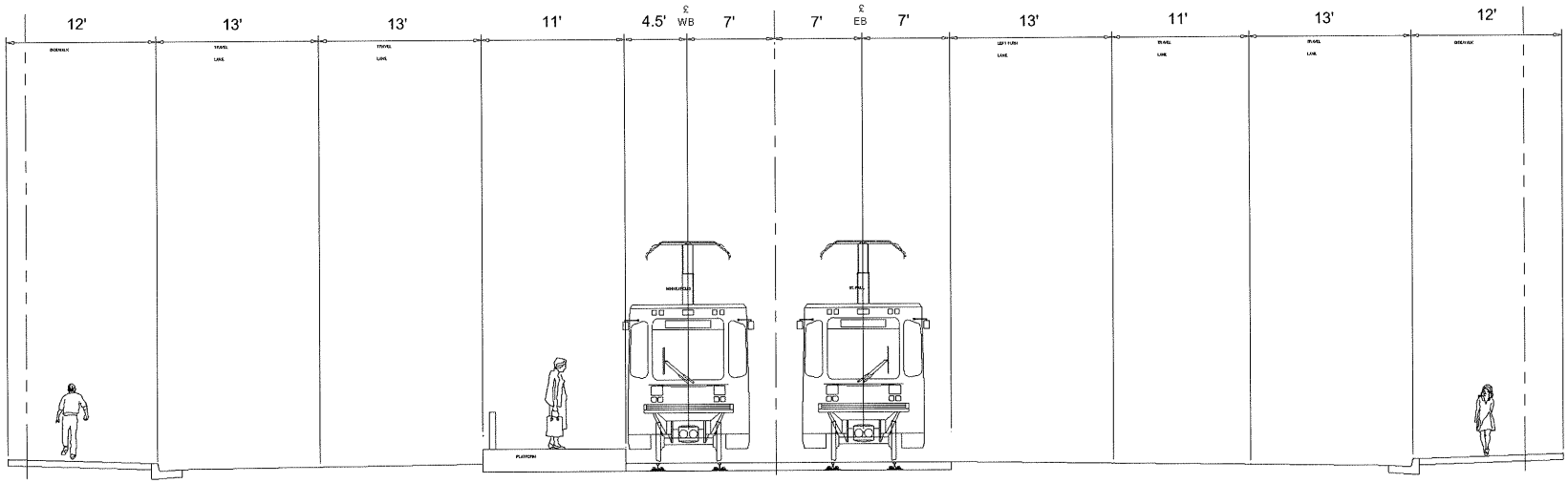


THE CENTRAL CORRIDOR

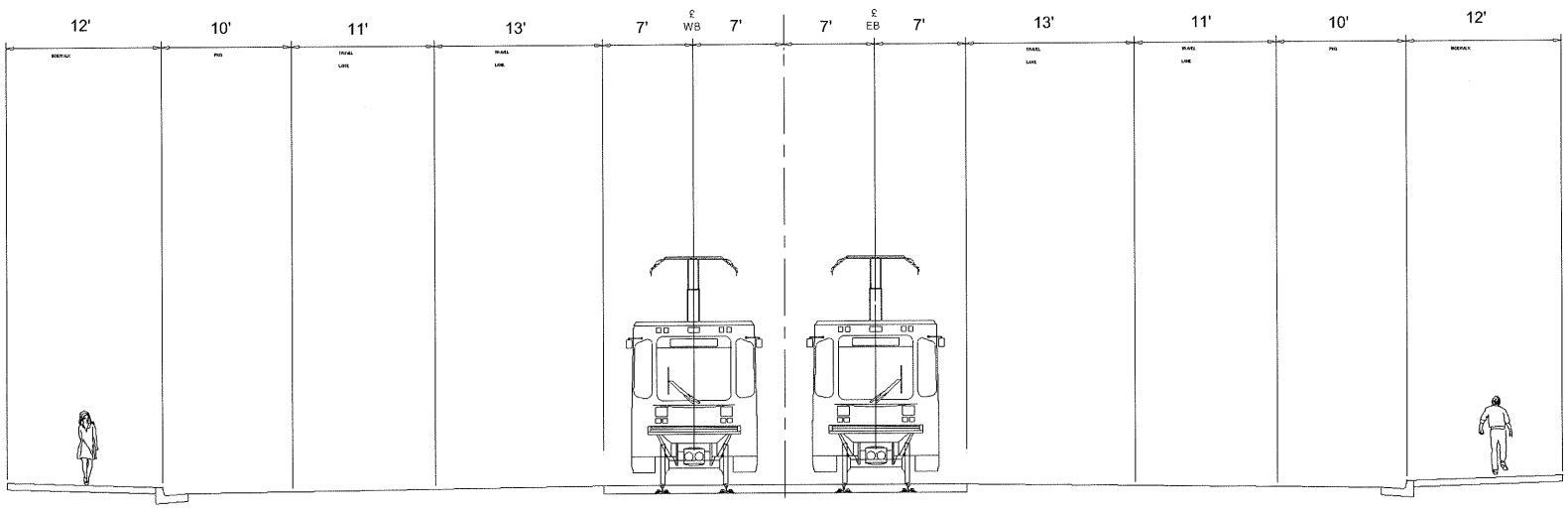
University Avenue LRT Alternative

April 2002

Figure 2.3-2



Typical Section at Station



Typical Section Midblock

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LRT Typical Sections

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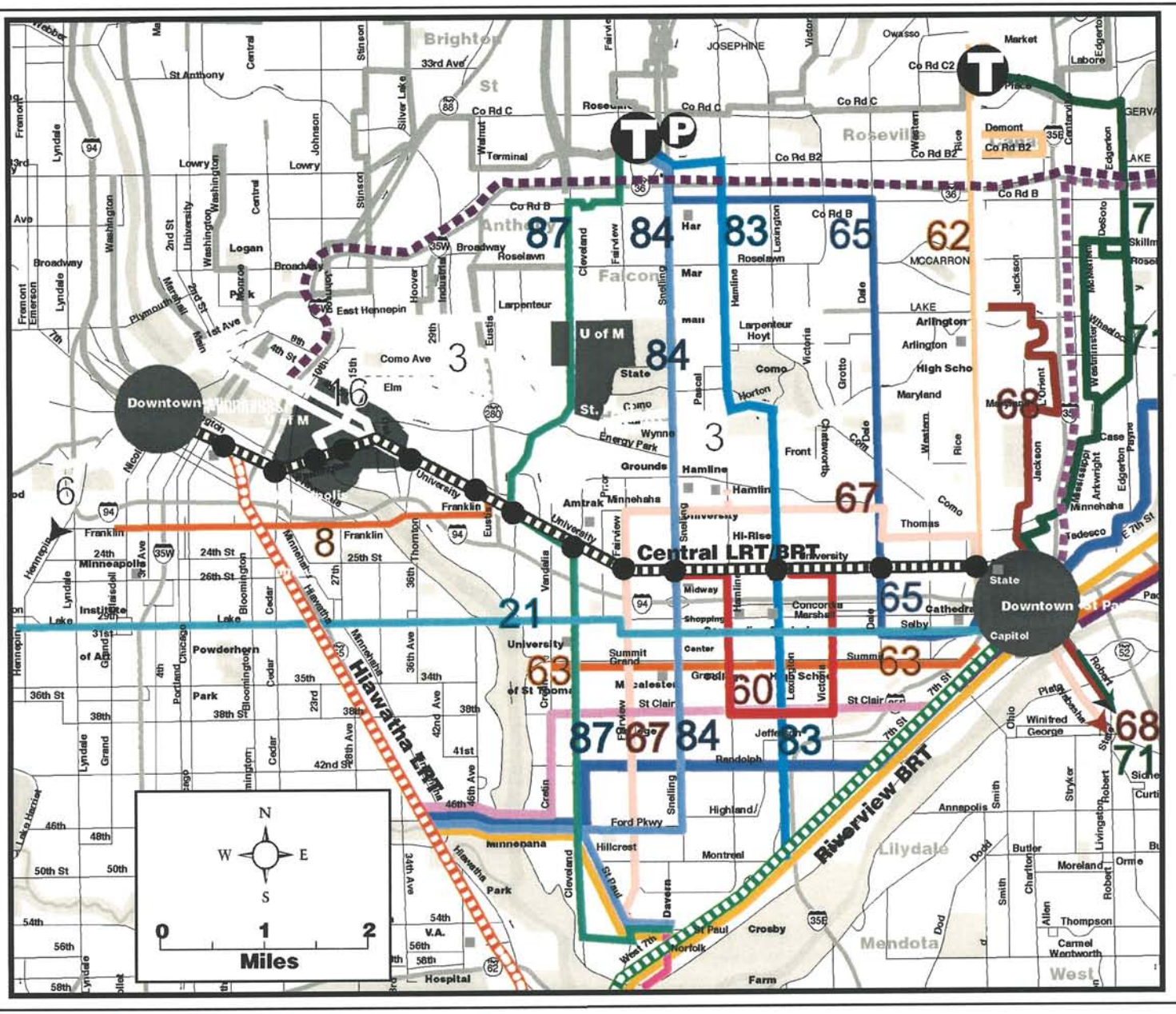
Figure 2.3-3



THE CENTRAL CORRIDOR

Proposed Central Corridor Bus Network

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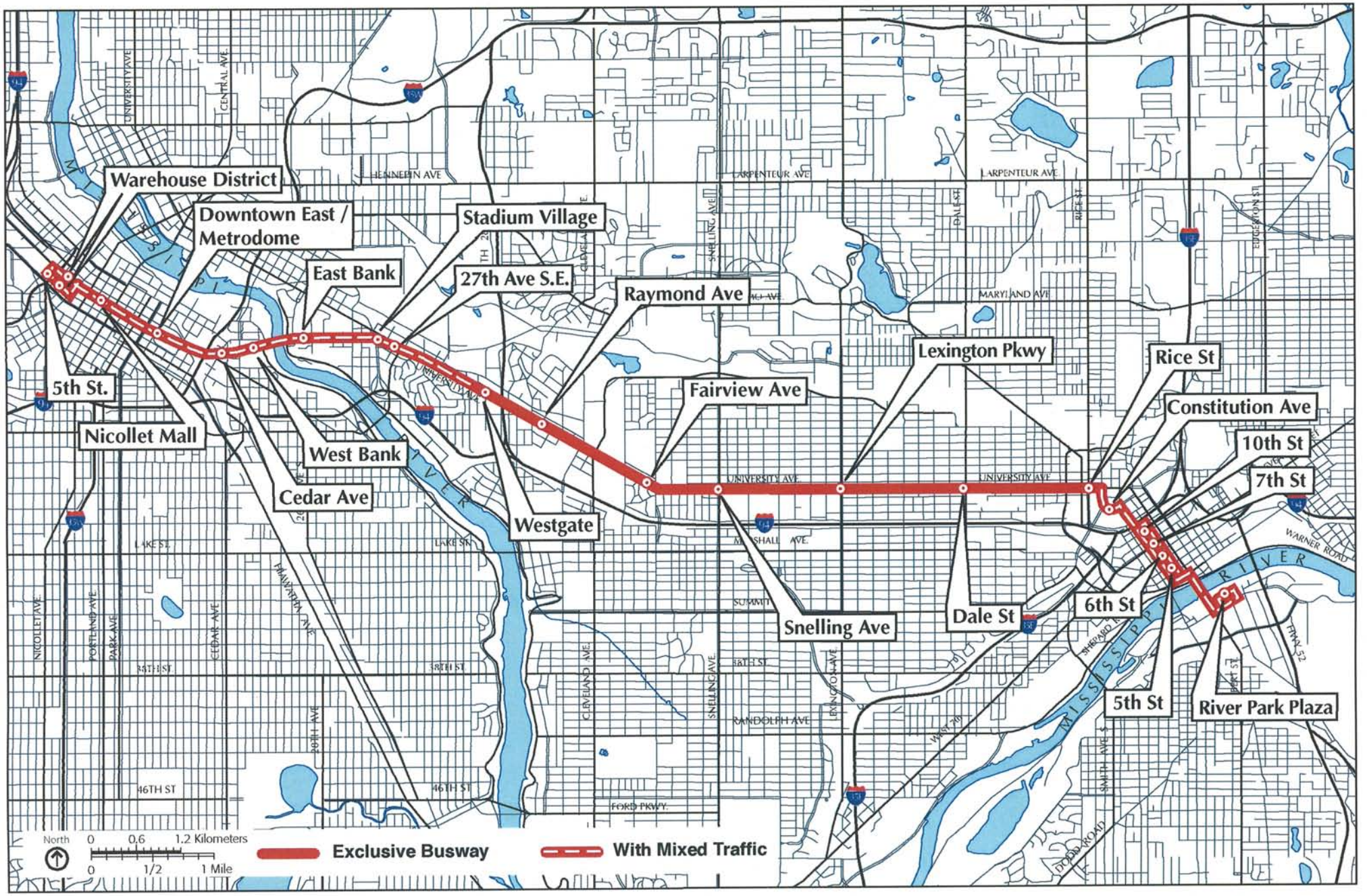
Figure 2.3-4

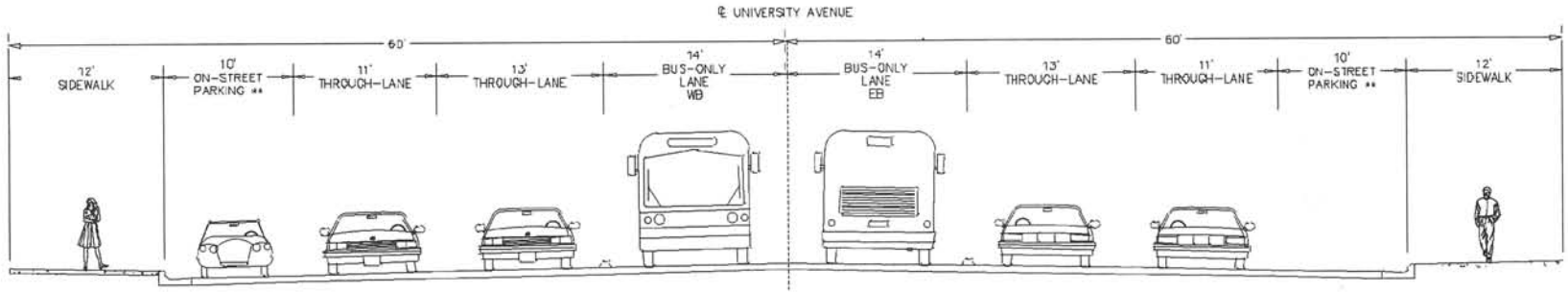


THE CENTRAL CORRIDOR

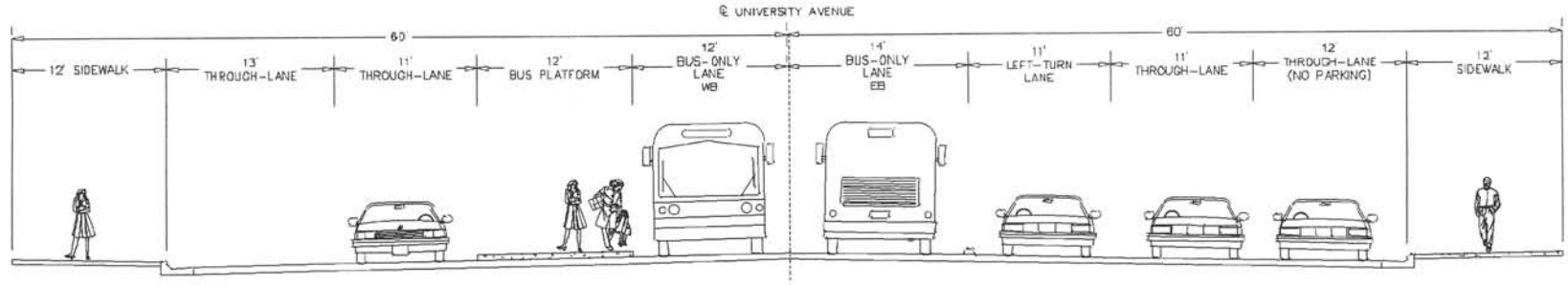
University Avenue Busway/BRT Alternative

April 2002

Figure 2.3-5



Typical Section Midblock



Typical Section at Station

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BRT Typical Sections

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Figure 2.3-6