5.0 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

5.1 INTRODUCTION

This chapter discusses potential environmental impacts which are anticipated to result from the construction and/or the operation of the proposed Hennepin County LRT system and the no-build alternative. The no-build alternative serves as the basis of comparison for the build alternative and illustrates the consequences, for each environmental issue area, of the LRT system. Means of mitigating impacts of the proposed LRT system are also identified.

5.2 LRT SYSTEM-WIDE ISSUES

Based on the level of analysis required to accurately determine the LRT impact on energy and employment; these issue areas were addressed on a system-wide level.

5.2.1 Energy

The Hennepin County LRT system will be powered by electrical power generated by Northern States Power Company (NSP). NSP has indicated that they are willing and able to accept the LRT system as a customer (Section 8.3).

Detailed electrical power requirements and specific distribution system characteristics will be further refined in the engineering phase of the LRT system process. Following is a preliminary estimate of annual LRT energy consumption. This estimate assumes LRT energy consumption of 7.5 kilowatt hours (kwh) per car mile. A study[1/] of the Portland LRT System found the average energy consumption to be 7 kwh per car mile. Thus, this is a conservative estimate of the power consumption of the proposed Hennepin County LRT System.

1/ "Assessing the Performance of Portland's New LRV's," Porter, 1988.

TABLE 5.1
LRT SYSTEM ENERGY CONSUMPTION AND REQUIREMENTS

Total Annual Rail VMT (Car Miles)	4,151,000
Electrical Consumption, LRV Propulsion plus Auxiliaries (Air Conditioning, etc.) at 7.5 kwh/car mile (kwh)	31,132,500
Allowance for Passenger Station Lighting and Auxiliaries[2/]:	
Surface Stations (35 at 150,000 kwh/ year each)	5,250,000
Subway Stations[1/] (6 at 1.5 million kwh/ year each)	9,000,000
TOTAL SYSTEM ENERGY CONSUMPTION (kwh/year)	45,382,500

1/ Subway estimates correspond to the north-south tunnel option and include ventilation fans, escalators, elevators, and lights.

2/ Number and type of stations is a worst-case condition for energy consumption.

In 1988, NSP generated a total of 31,304.6 million kwh with total energy sales of 34,796 million kwh. The estimated LRT system energy consumption of 45.4 million kwh is just over one-tenth of one percent of NSP's 1988 energy sales.

NSP has indicated that there would be no problem accommodating the LRT system power needs with their existing electrical generating facilities and agreements with other power companies. The LRT system will generate a relatively constant electrical power demand during the day and will contribute very little to peak electrical demands. This relatively constant demand improves power generating efficiency by raising power demand during off-peak periods.

5.2.2 Employment Impacts

Implementing LRT service in Hennepin County will have a positive impact on employment in the region. An analysis was conducted to quantify net employment benefits. The analysis considered both temporary and permanent jobs: jobs created during the construction period, jobs remaining after the completion of construction activities, and jobs created through secondary economic (multiplier) effect.

Inputs to the analysis were provided by MTC, Mn/DOT, Transportation Alliance, and light rail transit operating properties in Santa Clara County and Vancouver. Table 5.2 presents results of the analysis.

TABLE 5.2
HENNEPIN COUNTY LRT EMPLOYEE FORECAST ESTIMATES

EMPLOYMENT CLASSIFICATION	TUNNEL OPTION	AT-GRADE OPTION A	AT-GRADE OPTION B
o Temporary Jobs (During Construction)			
- Construction	1,890	1,455	1,400
- Real Estate	10	10	10
- Consultants	295	295	285
- Vehicle Assembly	85	100	80
- Total Temporary Jobs	2,280	1,860	1,775
- Economic Secondary Effect	1,140	930	890
- Total Temporary Jobs During Construction	3,420	2,790	2,665
o Permanent Jobs			
- Operations	25	30	25
- Maintenance	95	95	95
- Bus Operations (Reduction)	(80)	(80)	(75)
- Net New Permanent Jobs	40	45	45
- Economic Secondary Effect	20	20	20
- Net New Jobs	60	65	65

Construction Period and First Year of Operation

The tunnel option will generate more temporary jobs during implementation than the other two options due to the complexity of its design and construction.

Permanent jobs during the first year of operation vary little from option to option. A greater number of operators will be required for At-grade Option A because of the number of LRT vehicles required to provide the service. The number of maintenance employees, however, is not anticipated to be affected by the changes in the number of vehicles. The table quantifies the projected reduction in required bus operator positions during the first year of LRT operations. These are subtracted from the total number of jobs that will be generated through the operation of LRT.

As shown in the table, the tunnel option and at-grade option A will result in the highest number of lost bus operator jobs, resulting in 40 and 45 total permanent jobs, respectively.

5.3 IMPACT ISSUE AREAS

This section introduces the environmental impact issue areas which will be analyzed for both the no-build and build alternatives. It describes where appropriate: scope of analysis (including assumptions), methodology, a summary of build and/or no-build impacts for a particular issue area if they can be addressed on an overall system basis, and general mitigation measures.

5.3.1 Community and Neighborhood Character

Background

Community cohesion is a concern when assessing the social impact of a transit project which is as large and comprehensive as the proposed LRT system. Because of its scale, the Hennepin County LRT system has the potential to affect many individuals' ability to participate in community and neigborhood-based activities. Additionally, the LRT system has the potential to increase the accessibility and travel potential of work-trip oriented riders and certain transit dependent individuals.

Scope of Analysis

This analysis will focus on the impact that the LRT system could have on: community/neighborhood boundaries; emergency vehicle route accessibility; accessibility to community/educational facilities; and the transit dependent population. Information previously presented in the Demographics, Community Facilities and Services, and Community and Neighborhood Boundaries sections in Chapter 4 was used to estimate the impact of both alternatives on Community and Neighborhood Character in each corridor and the Central area.

Methodology

As a part of the community/neighborhood impact analysis, City Planners in the cities directly affected by the LRT system were consulted. These interviews provided a valuable assessment of anticipated community impacts associated with the LRT system. Additionally, base level data provided by regional, county and city staff formed the foundation for demographic analysis.

5.3.2 Potential Relocation/Displacement

Scope of Analysis

Based on preliminary alignment and station design, potential right-of-way acquisition required for the LRT is identified for each corridor and the Central Area. Right-of-way requirements for LRT operations and construction activities will be refined in the preliminary and final design stages of the project.

The Hennepin County Regional Railroad Authority is proposing to construct several segments of the LRT system on rights-of-way owned by and/or presently used by freight railroad companies. Impacts to specific rail lines and the businesses serviced by the railroad lines are identified on a corridor specific level.

General Mitigation Measures

The Hennepin County property acquisition and relocation program will follow the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended.

Relocation resources will be available--regardless of race, color, region, sex or national origin--to all persons and businesses displaced by the proposed project.

Consistent and ongoing coordination between the HCRRA and the potentially affected railroads is underway to ensure that the needs of both the LRT system and freight shippers are accommodated satisfactorily.

System-Wide Findings

No-Build Alternative

No properties would need to be acquired/relocated under the no-build alternative.

5.3.3 Economic Development

Background

Although past experiences indicate a strong transportation/land use relationship, an accurate projection of economic development linked directly to a light rail transit system is difficult. In other systems in North America, LRT has contributed to economic growth, but not without the cooperation of other factors. Specifically, development is dependent on regional or market demand for new development, land availability, the nature of adjacent land use, types of local land use plans and zoning ordinances, and taxation policies. Data presented in Chapter 4 regarding corridor Land Use and Zoning contributed to the development potential analysis for each corridor and the Central Area.

Scope of Analysis

Based on the experience of other communities, it has been assumed that development potential within each corridor exists primarily around proposed station sites. Because LRT stops have the potential to concentrate large volumes of transit users and consumers in a particular area, they can function as strong attractors to adjacent real estate development. Stations with development/redevelopment potential are identified on a corridor-by-corridor basis. Specific impacts on downtown Minneapolis are addressed in the Central Area section.

System-Wide Findings

No-Build Alternative

Under the no-build alternative development/redevelopment would take place as dictated by market forces, and in conformance with local zoning ordinances and land use plans.

5.3.4 Traffic

Scope of Analysis

The traffic analysis will identify, measure, and evaluate the traffic impacts of the build and no-build alternatives. The build alternative is composed of the future baseline transportation system overlaid with the proposed light rail transit system.

Methodology

The traffic impact analysis includes three steps:

- o Impact Identification: Identify direct and indirect traffic impact issues, geographic areas and potential group interests affected by traffic impacts. Direct traffic impacts result from the physical characteristics of the LRT system that alter the future baseline transportation system. Indirect traffic impacts are secondary effects of changing the transportation system.

- o Impact Measurement: Quantify traffic impact issues. The impact of the build alternative is measured by comparing the future baseline traffic conditions with LRT to future baseline traffic conditions without LRT.

- o Impact Mitigation: Where appropriate, identify impact prevention or impact management measures.

LRT Station Traffic Impacts

LRT stations will attract auto, bus and pedestrian traffic in varying proportions depending on the location and design of the station. Although there will be traffic in and out of the stations throughout the day, most of the trips will occur during the morning and afternoon peak periods. Potential direct impacts of station generated traffic include changes in area access and local street and intersection operation.

Estimates of traffic volumes were made for each station in the system. These forecasts were then reduced to peak hour forecasts. The peak hour forecasts were further reduced to reflect modal split.

As described in the November 8, 1988, Scoping Decision Document, a scoping analysis categorized stations into three traffic impact level groups:

- o No Significant Traffic Impact: The traffic impacts of the station are considered insignificant with no further analysis required.

- o Minor Traffic Impacts: A traffic analysis was conducted to determine station vehicular and pedestrian access, and adjacent street impacts. The traffic impacts of the station are considered minor.

- o Potentially Significant Off-Site Traffic Impacts: A traffic impact analysis was conducted to determine potentially significant traffic impacts on the local street system and station access.

Stations are grouped into these categories in accordance with recommended thresholds for study established in "Traffic Access and Impact Studies for Site Development," a summary of proposed recommended practice by the Transportation Planners Council of the Institute of Transportation Engineers. ITE states that a complete traffic access/impact study should be conducted whenever a proposed development will generate 100 or more additional (new) peak direction (inbound or outbound) trips to or from the site during the adjacent roadway's peak hour or the development's peak hour. This guideline was established to recognize:

- o One hundred vehicles per hour represents approximately fifteen percent of the capacity of a curb travel lane under signalized control.

- o One hundred additional vehicles per hour can change the level of service of an intersection approach.

- o Left or right turn lanes may be needed to satisfactorily accommodate site traffic without adversely affecting through traffic.

Stations generating greater than 250 (new) peak hour peak direction trips are considered to have higher traffic impact potential. This level of traffic has the potential to affect multiple intersections near the station. When 250 new trips are distributed throughout the local street network, it is likely that at least one intersection will see a volume increase of 100 new trips. As a result, a wider area is studied as compared to the minor impact category.

The impact analysis makes the following assumptions:

- o Roadway improvement needs are based on PM peak hour conditions. This time period is normally considered the critical time period for traffic operations on local streets in the metropolitan area.

- o Trip generation is based on LRT patronage forecasts and the experiences of other LRT systems.

- o Directional distribution of traffic is based on estimated traffic patterns of LRT station patrons.

- All project-generated trips are new trips; no trips are diverted from automobiles.

The traffic impact analysis considers the following issues:

- Affect on vehicular access
- Affect on street circulation and local travel patterns
- Change in street operations surrounding stations
- Change in street and intersection levels of service

Mitigation Measures

Traffic impact mitigation measures are addressed for each corridor and the Central Area.

System-Wide Findings

Regional Transportation System Impacts

Because the proposed light rail transit system has potential to attract current auto users, the number of vehicle trips made on the street system would be reduced. The indicator used to describe the change in regional auto travel is vehicle miles traveled (VMT). The estimated future baseline VMT without LRT ranges from 47.5 to 51.5 million vehicle miles traveled. This range was extracted from the regional travel model for the Year 1995. The estimated range of VMT in the Metropolitan area with the LRT system is 47.41 million to 51.38 million, representing a 0.2 percent decrease in regional auto travel. The portion of the regional system which would experience the greatest change would be roadways used by Downtown Minneapolis-destined trip makers.

At-Grade Light Rail Crossings

A direct traffic impact associated with building the LRT system is the interaction of street traffic and light rail vehicles at at-grade crossings. Street operations and safety issues are indirect traffic impacts.

The typical crossing protection strategies use four general approaches:

- Unprotected; warning signs only
- Flashing light signals only
- Flashing light signals and gates
- Traffic control signals

Of these strategies, only the latter two are expected to be utilized in the proposed LRT system.

Functionally, an at-grade street crossing protected by traffic control devices is no different from an intersection controlled by a two-phase traffic signal. LRT traffic will be interrupting the flow of traffic approximately seven percent of the time, and LRT trains will interrupt crossing traffic approximately twice every fifteen minutes during the peak periods. According to a recent study of existing LRT systems in North America[1/] no significant traffic impacts are associated with at-grade crossings. The following observations were made regarding field studies conducted in seven North American metropolitan areas in the fall of 1988:

- Traffic volumes over the crossings studied tended to be moderate. Levels of service, using the Highway Capacity Manual criteria for interrupted flow facilities, are all level of service "A" or "B." This is despite saturation flow rates which are lower than is typical for signalized intersections.

- Crossing blockage times increase as the degree of crossing protection is increased and with increasing proximity to stations.

- Lost times, defined as the elapsed time between the time after which the first driver may proceed across a crossing, and the time that the first driver begins to move forward, vary widely depending on the crossing protection used. Traffic signal operation generally generates long lost times, in part because of motorists' limited ability to anticipate the green light.

- The arrival of trains at each crossing was, in most cases, a predictable event. Therefore, signal operations can be programmed to account for LRT crossings.

The situation where an at-grade crossing is within the approach length of a signalized intersection could create a hazardous condition and affect the operation of the adjacent signal. It is recommended that the street area between at-grade crossings within the approach length of signalized intersections be clear of street traffic when the LRT is crossing. This distance may vary depending on the nearby signal approach volumes. There are many ways that this recommendation can be accomplished safely and with minimal affect on the nearby intersection. Each at-grade crossing location will be evaluated in the design phase.

1/ Berry, Richard A. and William, John C., Traffic Characteristics of At-Grade Light Rail Crossings, ITE 1989, Compendium of Technical Papers, September 17-21, 1989.

No-Build Alternative

The no-build alternative represents the existing transportation system conditions projected to the forecast year (1995)--the future baseline transportation system.

Existing intersection turning movement traffic volumes were counted in May 1989, at intersections expected to experience additional traffic generated by LRT stations. Traffic is expected to grow between one and three percent annually between 1989 and 1995. Traffic is expected to grow faster in the outer ring suburbs. The existing intersection volumes were projected out to 1995 using the appropriate growth factor. The result describes the baseline conditions of the no-build alternative.

5.3.5 Transit Service

Scope of Analysis/Methodology

Transit service level is measured in terms of travel time, service frequency, reliability, ride quality, access between corridors, and access within corridors.

Travel time estimates were developed for trips between Downtown Minneapolis and three different locations in each of the LRT corridors. The three points generally reflect the following locations: a point near the end of the specific LRT line, a mid-corridor point close to the LRT line, and a mid-corridor point which would require a bus transfer to the LRT.

The LRT trip time for each of the above-mentioned points was estimated based on the following information: bus travel time to the nearest LRT station based on current bus speeds; three minute bus-train transfers at stations (as necessary); LRT travel times based on station spacing and observed LRT vehicle performance characteristics in other systems.

Because of the varying bus frequencies in each of the LRT corridors, the impact that the LRT system would have on transit service frequencies will be addressed on a corridor by corridor basis.

Impacts to specific bus routes, and the neighborhood areas which they serve will be addressed for each corridor.

Conclusions regarding overall ride quality are based on system design characteristics, and experiences of operating LRT systems.

System-Wide Findings

With the implementation of the proposed Hennepin County LRT System, each LRT line would provide much of the radial service in the Corridor. Existing radial bus routes would be reconstructed to provide feeder bus service.

The adjustment of local bus lines to feed the LRT station would enhance transit movement within individual corridors. The feeder bus system would substantially improve cross-corridor transit movements as bus service shifts from its radial nature. Several LRT stations in each corridor would become transit centers serving both bus/rail transfer and bus/bus transfer for intra-corridor trips.

Implementation of the LRT system would result in a reduction in the number of buses in service during the peak periods, while improving the overall quality of transit service. The smaller bus fleet size would also reduce the competition for limited street capacity in downtown Minneapolis.

Service Reliability:

The LRT system would provide a significant service reliability advantage over the no-build alternative. The use of an exclusive right-of-way protects the LRT vehicles from interference caused by traffic accidents or congestion. Failure of LRT electric propulsion systems is typically less frequent than diesel buses and can be compensated by the electric motors in other cars of an LRT train.

Ride Quality:

The ride quality characteristic of LRT vehicles also improves service quality over conventional bus operation. The steady acceleration and deceleration provided by electric propulsion offers a more stable ride than bus technology. Abrupt stops are also less frequent since the LRT operates in an exclusive right-of-way. Finally, the LRT vehicle sway is less severe than buses because of the vehicle suspension and the rail guideway.

Transit Access:

Transit access between the corridors is generally enhanced by the LRT service. For those LRT routes that are linked, a single-seat ride carries the passenger from an origination point through downtown and into the destination corridor.

For those corridors which do not have "through routed" LRT service, the transfer between vehicles is greatly simplified since both vehicles would stop at the same or parallel platforms. These service impacts occur in all LRT corridors.

In the Central Area, under both the at-grade options, the one-way pair configuration on 2nd Avenue and Marquette Avenue would increase the required walking distance between platforms to one block. The travel time savings between corridors is greatest for the Central Area tunnel alternative, which would avoid the surface level vehicular conflicts in downtown.

No-Build Alternative

The No-Build alternative is outlined in the "Year 2010 Transit System Principles and Philosophy in Service." This service scenario, developed by the Regional Transit Board and Metropolitan Transit Commission, represents anticipated transit service levels of an all-bus system approximately twenty years into the future.

The 2010 bus plan includes route modifications, and new route and headway changes within the proposed LRT corridors. Most of the route changes are small extensions to existing routes. The new routes include several crosstown lines serving Hiawatha and the Southwest Corridor. The headway changes generally reflect increased service frequency in the off-peak periods. Although these modifications offer improved service coverage and frequency in certain areas, they do not represent a significant expansion of service over the current bus system.

5.3.6 Air Quality

Background

The Hennepin County LRT system has the potential to impact air quality in the following ways:

- The LRT system could reduce the amount of air pollution emitted by motor vehicles by providing an alternative mode of transportation and eliminating the need for some motor vehicle travel.

- The LRT system has the potential to increase motor vehicle emissions by reducing available roadway capacity. Roadway capacity may be reduced where LRT operates at-grade on existing roadways or where there are at-grade rail crossings. Motor vehicle emissions may increase if traffic is diverted to alternative routes or is subject to additional delays.

- The LRT system may add to existing traffic volumes in the vicinity of stations which will add to the air pollution generated at the station areas.

- The LRT system will be electrically powered. The need to generate additional electrical power for LRT may result in additional air pollutant emissions from power plants.

Scope of Analysis/System-Wide Findings

Mesoscale Analysis

The purpose of the mesoscale analysis is to estimate the change in regional pollutant emissions which will result from implementation of the LRT system. The mesoscale analysis considers two aspects of LRT operations:

- The change in regional travel caused by the LRT system is estimated. This analysis estimates the change in vehicle miles of travel in the metropolitan area caused by the LRT system and the resulting change in mobile source air pollutant emissions.

- The amount of electrical power needed to operate the LRT system is estimated. The pollutant emissions which may result from this additional electrical power generation are estimated.

Regional Transportation Emissions

The mesoscale transportation analysis estimates the change in regional travel associated with implementation of the LRT system and the resulting change in vehicular emissions of hydrocarbons (HC), carbon monoxide (CO), and nitrogen oxides (NOX). Implementation of the LRT system is expected to change the amount of regional travel by offering an alternative transportation mode and by altering the regional road system.

The following changes in regional travel have been considered.

- LRT Ridership - A portion of the people who elect to ride the LRT system would otherwise drive a private vehicle. It is estimated that after two years of LRT operation, approximately 12,500 to 16,400 trips per day will be made on LRT which would otherwise occur by private vehicle. Assuming an average work trip length is 8.11 miles (1982 Travel Behavior Inventory, Metropolitan Council), yields a decrease in regional vehicle miles of travel (VMT) of 101,000 to 133,000 miles per day.

- Downtown Operations - If the proposed LRT system operates at-grade in the downtown area, it will use existing street capacity. As described in the traffic analysis, at-grade LRT operation on Marquette and Second Avenue will require changes in downtown transit operations to maintain traffic flow. With these changes in transit operations, there will be no significant change in the capacity of the street system to carry private vehicles. For this reason, downtown LRT operation is not expected to change regional travel.

- Washington Avenue Bridge - The University Connector will displace traffic from Washington Avenue between Cedar Avenue and Church Street. Traffic which would otherwise use the Washington Avenue bridge will be diverted to alternative routes including I-94, I-35W, University Avenue, and Fourth Street. The change in VMT resulting from this traffic diversion has been estimated by assigning the Washington Avenue trips to alternative routes and calculating the change in trip length. This analysis indicated that construction of LRT on Washington Avenue would result in a net increase in regional travel of approximately 15,000 vehicle miles per day.

The overall change in travel attributable to the LRT system is small (Table 5.3). LRT will reduce travel in the metropolitan area by approximately 0.2 percent. In Hennepin County, travel will be reduced by 0.4 percent to 0.5 percent.

The reduction in travel associated with the LRT system will result in a corresponding reduction in vehicle generated pollutants (Table 5.4). The change in pollutant emissions would be small.

Emissions From Electrical Power Generation

The amount of air pollutants emitted by electrical generating facilities to produce the energy needed to power the LRT system has been estimated. This estimate is based on the LRT system energy requirements and the average pollutant emission rates from NSP power generating facilities in 1986. Table 5.5 shows the power plant emissions associated with generating the electrical power for LRT operations.

TABLE 5.3
CHANGE IN REGIONAL TRAVEL

1995 Vehicle Miles of Travel (VMT) in Millions	Metropolitan Area	Hennepin County
Vehicles Miles of Travel per Day (No-Build)	47.50 to 51.50	21.26 to 23.05
Change in VMT from LRT Ridership	-0.101 to -0.133	-0.101 to -0.133
Change in VMT from Downtown Operations	None	None
Change in VMT from Washington Avenue Bridge	0.015 to 0.015	0.015 to 0.015
Vehicles Miles of Travel per Day (With LRT)	47.41 to 51.38	21.17 to 22.93
Percent Change	-0.2% to -0.2%	-0.4% to -0.5%

NOTES:

1. Regional VMT without LRT for 1995 was estimated by the Metropolitan Council.

2. Hennepin County 1995 VMT was estimated based on the Year 2010 Regional Travel Model.

3. The change in VMT from LRT ridership was estimated by BRW, Inc. and represents LRT trips which would otherwise occur by private vehicle.

4. The change in VMT from downtown operations was estimated by BRW, Inc. and represents downtown traffic diversions associated with at-grade LRT operations.

5. The change in VMT from Washington Avenue Bridge was estimated by BRW, Inc. and represents traffic diverted from the Washington Avenue Bridge by LRT operations on the bridge.

TABLE 5.4
CHANGE IN REGIONAL TRANSPORTATION EMISSIONS

Change in VMT from LRT (Millions of miles per day)	-0.09	to	-0.12
Hydrocarbon Emission Rate (Grams per Vehicle Mile)			1.68
Carbon Monoxide Emission Rate (Grams per Vehicle Mile)			21.72
Nitrogen Oxide Emission Rate (Grams per Vehicle Mile)			1.74
Change in HC Emissions (Kilograms per Day)	-144	to	-198
Change in CO Emissions (Kilograms per Day)	-1864	to	-2559
Change in NOX Emissions (Kilograms per Day)	-149	to	-205

NOTES:

1. Emisison rates are taken from the US EPA MOBILE4 emissions Model. Emission rates assume an average speed of 20 MPH and an ambient temperature of 50 degrees fahrenheit.

2. No change in average operating speed is expected as a result of LRT implementation.

TABLE 5.5
AIR POLLUTANT EMISSIONS FROM LRT POWER GENERATION

	Pollutant		
	SOX	NOX	Particulate
1986 Average Emission Rate (Tons per million kwh)	2.68	3.71	0.12
LRT System Energy Consumption (million kwh per year)	45.4	45.4	45.4
Emissions Due to LRT Operation (Tons per Year)	122	168	5

Microscale Air Quality Impacts

While the mesoscale analysis indicates that the LRT system will result in a net reduction in traffic-generated emissions, there will be areas where vehicle activity and resulting vehicle emissions will increase following system implementation. Areas where vehicle emissions will increase include the following:

- o LRT Stations - LRT stations will attract traffic to the streets in the vicinity of the station. The number of trips generated will depend on the station LRT ridership, travel modes of LRT riders, and the number of parking spaces provided. The trip generation of each of the LRT stations is presented in the traffic impact analysis.

- o LRT Grade Crossings - Where the LRT line crosses streets at grade, train movements will cause additional vehicle delays. The traffic impact analysis concludes that at-grade LRT street crossings do not create significant traffic impacts and therefore are not expected to cause air quality impacts.

- o At-Grade LRT Operations - Where the LRT system operates at-grade on existing street right-of-way, it will reduce the capacity of the street. This can lead to increased vehicle delays and/or the diversion of traffic to alternative routes. Discussion regarding this impact is limited to the University and Central areas since these are the only areas where LRT operations will reduce existing roadway capacity.

To address the potential microscale air quality impacts of LRT stations, an analysis of future CO concentrations in the vicinity of a representative station site has been completed. The station site selected for analysis is the Bass Lake Road station. This station is forecast to have the greatest trip generation of any station and thus has the potential to cause the greatest impact on CO concentrations.

The Bass Lake Road station is forecast to generate 494 PM peak hour trips with 300 outbound and 194 inbound. The station will provide approximately 300 park-and-ride parking spaces north of Bass Lake Road between CSAH 81 and Elmhurst Avenue. Vehicle access to the station area will be from Elmhurst Avenue. It is assumed that there will a signalized intersection at Elmhurst Avenue and Bass Lake Road. The majority (65%) of the station-generated traffic will be oriented to and from CSAH 81.

The analysis considered three receiver sites in the vicinity of the park-and-ride lot as described below:

- Receiver R1 - Residence north of the park-and-ride lot east of Elmhurst Avenue.
- Receiver R2 - Residence west of the park-and-ride lot in the southwest corner of Brunswick Avenue North and Elmhurst Avenue North.
- Receiver R3 - Commercial use west of the park-and-ride lot in the northwest corner of the intersection of Bass Lake Road and Elmhurst Avenue.

The analysis methodology used forecast traffic volumes and street system characteristics to predict future traffic flow characteristics with and without the proposed LRT station. The future traffic flow conditions were used to estimate vehicle CO emission rates by roadway segment. Resulting CO concentrations at the receiver sites were predicted by modeling the dispersion of the roadway generated pollutants. The following series of air quality prediction models were used:

- Guidelines for Air Quality Maintenance Planning and Analysis, Volume 9 (Revised): Evaluating Indirect Sources (EPA-405/4-78-001) was used to determine traffic flow characteristics and baseline CO emission rates.
- The procedures for estimating intersection delays were based on the 1985 Highway Capacity Manual (Transportation Research Board Special Report 209). A computerized version of the signalized intersection operations analysis procedures was used.

- o The U.S. EPA MOBILE4 Mobile Source Emissions Model was used to adjust the baseline emission rates to the project year, temperature, vehicle mix, and percentage of cold starts.

- o The CALINE3 model (A Versatile Dispersion Model for Predicting Air Pollutant Levels Near Highways and Arterial Streets, FHWA/CA/TL-79/23) was used to disperse the roadway CO emissions to the selected receiver sites.

The air quality analysis requires a number of assumptions regarding regarding meteorology and vehicle characteristics. The following assumptions have been used in this analysis:

- o Analysis of Year 1995.

- o Peak one-hour CO concentrations are predicted based on forecast PM peak hour weekday traffic volumes.

- o The analysis considers emissions produced at the intersections of Bass Lake Road and Elmhurst Avenue and Bass Lake Road and CSAH 81. The analysis also includes emissions produced in the park-and-ride lot.

- o The one-hour CO concentrations are predicted assuming worst-case meteorology including a one meter per second wind speed, atmospheric stability class "D," an ambient temperature of 20 degrees Fahrenheit, atmospheric mixing height of 1,000 meters, and variable wind directions selected to maximize the roadway CO concentrations at the receivers.

- o Eight-hour average CO concentrations are predicted based on the one-hour concentrations adjusted by a persistence factor of 0.7. The persistence factor accounts for the lack of persistence of the worst-case meteorology assumed for the peak one-hour.

- o The analysis does not include the effects of the metropolitan area vehicle inspection and maintenance program scheduled to be implemented in 1991. This program is expected to decrease average CO emission rates by 25 percent.

Background CO concentrations were estimated based on monitoring conducted for the Bass Creek Business Park EIS. This monitoring was conducted in June and July of 1989, and is fully documented in Interpoll Laboratories, Inc., Report Number E9-3027, July 27, 1989. The monitoring site was located approximately 2.5 miles west of the Bass Lake Road LRT station site. Table 5.6 shows the estimated worst-case background CO concentrations used in this analysis.

TABLE 5.6
BACKGROUND CO CONCENTRATIONS NEAR BASS LAKE ROAD STATION

	Correction Factor	
	1-Hour	8-Hour
Maximum Monitored Concentration (PPM)	1.5	0.7
Holzworth Correction (To Worst-Case Winter Conditions)	1.2	1.2
Temperature Adjustment (To 20 Degrees Fahrenheit)	1.8	1.8
1989 Worst-Case Background CO (PPM)	3.4	1.6
1995 VMT Adjustment (1.00% per year)	1.062	1.062
1995 Emission Adjustment	0.662	0.662
1995 Worst-Case Background (PPM)	2.4	1.1

NOTE: Monitoring data for background concentrations were obtained by Interpoll Inc. at a site near the intersection of Bass Lake Road and Nathan Lake in Plymouth, Minnesota.

The analysis was done both with and without the proposed LRT station. The analysis results are shown in Tables 5.7 and 5.8. The maximum predicted CO concentrations are 8.9 PPM one-hour average and 5.6 PPM eight-hour average with the proposed LRT station. These values are well below the state air quality standards of 30 PPM one-hour average and 9 PPM eight-hour average. The LRT station results in an increase of 0.6 PPM in the one-hour CO concentration expected without the LRT station. The eight-hour average CO concentration is forecast to increase by 0.4 PPM over no-build levels as a result the LRT station.

The change in CO concentrations in the vicinity of other LRT stations is expected to be less than that forecast for the Bass Lake Road station since all other stations will generate less traffic. The increase in CO concentrations caused by the LRT stations is estimated to be approximately 0.5 PPM or less.

TABLE 5.7
PREDICTED CO CONCENTRATIONS WITH LRT STATION

Bass Lake Road Park-and-Ride

Background CO Concentrations
1-hour 2.4 PPM
8-hour 1.1 PPM

	WIND DIRECTION											
Receptor	60		80		90		130		140		160	
Site	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
R1	2.4	1.1	2.4	1.1	2.4	1.1	3.5	1.9	4.5	2.6	5.5	3.3
R2	2.8	1.4	3.2	1.7	3.4	1.8	5.9	3.6	7.1	4.4	5.6	3.3
R3	3.7	2.0	4.3	2.4	4.4	2.5	8.9	5.7	7.1	4.4	4.6	2.6
Maximum	3.7	2.0	4.3	2.4	4.4	2.5	8.9	5.7	7.1	4.4	5.6	3.3

	WIND DIRECTION											
Receptor	170		180		200		230		270		Maximum	
Site	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
R1	5.0	2.9	4.2	2.4	3.3	1.7	2.7	1.3	2.4	1.1	5.5	3.3
R2	4.6	2.6	4.0	2.2	3.3	1.7	3.2	1.7	2.5	1.2	7.1	4.4
R3	4.4	2.5	4.4	2.5	4.4	2.5	4.5	2.6	4.6	2.6	8.9	5.7
Maximum	5.0	2.9	4.4	2.5	4.4	2.5	4.5	2.6	4.6	2.6	8.9	5.7

TABLE 5.8
PREDICTED CO CONCENTRATIONS WITHOUT LRT STATION

Bass Lake Road Without Park-and-Ride

Background CO Concentrations
1-hour 2.4 PPM
8-hour 1.1 PPM

Receptor	WIND DIRECTION											
	60		80		90		130		140		160	
Site	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
R1	2.4	1.1	2.4	1.1	2.4	1.1	3.2	1.7	4.1	2.3	4.7	2.7
R2	2.4	1.1	2.8	1.4	3.0	1.5	5.4	3.2	6.5	4.0	5.0	2.9
R3	2.9	1.5	3.5	1.9	3.5	1.9	8.3	5.2	6.5	4.0	4.5	2.6
Maximum	2.9	1.5	3.5	1.9	3.5	1.9	8.3	5.2	6.5	4.0	5.0	2.9

Receptor	WIND DIRECTION											
	170		180		200		230		270		Maximum	
Site	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
R1	4.2	2.4	3.6	1.9	3.0	1.5	2.7	1.3	2.4	1.1	4.7	2.7
R2	4.0	2.2	3.6	1.9	3.2	1.7	3.2	1.7	2.5	1.2	6.5	4.0
R3	4.3	2.4	4.4	2.5	4.4	2.5	4.5	2.6	4.6	2.6	8.3	5.2
Maximum	4.3	2.4	4.4	2.5	4.4	2.5	4.5	2.6	4.6	2.6	8.3	5.2

The Minnesota Pollution Control Agency regulates CO emissions from parking lots through the Indirect Source Permit (ISP) requirements. The largest park-and-ride lot proposed for the LRT system will contain approximately 600 spaces. The minimum number of spaces in a new parking area requiring an ISP is 1,000 new spaces. Thus, none of the parking areas proposed as part of the LRT system will require an ISP.

5.3.7 Noise

Background

The proposed light rail transit (LRT) system has the potential to impact existing noise levels in each of the proposed corridors by:

- Increasing traffic in existing freight rail corridors: Along most segments of existing freight rail corridors which will be used as a LRT corridor, nearby noise sensitive receivers are currently exposed to two to three train passbys per day. With the implementation of the LRT system, the number of daily LRV passbys will range from 75 to 85 per day. While the frequency of LRT passbys is greater than the existing train frequency, the maximum single passby noise emission level from the LRT vehicle compared to a freight train is significantly lower and of shorter duration.

- Attracting vehicles to LRT station sites: Vehicles attracted to the sites will include park-and-ride or drop-off automobiles and feeder buses.

- Reducing the number of transit buses required to serve the metropolitan area: Implementation of an LRT system would reduce transit bus requirements in each of the LRT corridors. With a reduction in the number of buses, the total noise from buses would also decrease.

- Generating noise during the construction phases of the proposed LRT rail line and station sites.

Scope of Analysis/Methodology

LRT Vehicle Noise Emission Levels

For this analysis, an inventory of LRT system noise emission levels from existing LRT systems was completed to determine a best and worst-case maximum passby noise level for the proposed LRT system. Emission level data from the following LRT systems were used: Portland, Oregon; Sacramento, California; San Diego, California; and Baltimore, Maryland.

The maximum passby noise levels for each of the systems reflect readings at fifty feet from the centerline of the rail track. Data was collected for various operating speeds and rail bed characteristics (Table 5.9).

There is significant variation in the maximum noise levels of each system. The variation among systems can be attributed to the evolution of system design specifications and to differences in the maintenance procedures and capabilities of each of the systems.

For example, the Lmax levels reported for the Sacramento LRT system tend to be significantly higher than any of the other systems. Further investigation of the Sacramento system revealed the following factors which contribute to the higher Lmax noise levels:

- o The suspension system for the vehicles is a rigid system, rather than the quieter air suspension system.
- o LRT vehicle wheels are non-resilient, rather than the quieter resilient wheel used for other systems.
- o Shifting of the chasis on the rails, "truck hunting," has been a problem condition. This continual shifting creates an additional amount of wheel/rail noise.
- o The wheel grinding capabilities of the maintenance shop are limited.

Because the Sacramento operating conditions vary substantially from the proposed standards for the Hennepin County LRT System, the Sacramento data will not be used in the noise analysis.

Table 5.10 documents the Lmax noise emission rates used in defining the best and worst-case noise impact analysis area for the Hennepin County LRT system.

TABLE 5.9
COMPARISON OF LIGHT RAIL TRANSIT NOISE EMISSION LEVELS

Light Transit Line	Type of vehicle and wheel	Track Description	Operating Speed	Distance	Monitored Level	Comments
Sacramento1/	U2-Non-resilient wheel	Welded	30	50 Ft.	83 dBA	
	Rigid Suspension		35	50 Ft.	85 dBA	Downtown track embedded in asphalt
	Self-Vented Traction		40	50 Ft.	87 dBA	Vehicle is air conditioned
	Motor		45	50 Ft.	88 dBA	Rails were not ground after welding
			50	50 Ft.	90 dBA	
Portland2/	Resilient Wheel	Welded	5	50 Ft.	52 dBA	Downtown area track embedded in noise absorptive material
	Air Suspension		15	50 Ft.	68 dBA	
	Self-Vented Traction		25	50 Ft.	73 dBA	
	Motor		35	50 Ft.	77 dBA	
			45	50 Ft.	81 dBA	
			55	50 Ft.	83 dBA	
Baltimore3/	Resilient Wheel	Welded	10	50 Ft.	69 dBA	10-25 MPH on embedded track section
	Air Suspension		20	50 Ft.	73 dBA	
	Forced Air Traction		25	50 Ft.	75 dBA	
	Motor Ventilation		25	50 Ft.	72 dBA	
			30	50 Ft.	74 dBA	
			40	50 Ft.	76 dBA	
			50	50 Ft.	78 dBA	
San Diego-4/ Bayside Corridor	Resilient Wheel	Welded	10	50 Ft.	74 dBA	10-25 MPH on embedded track section
	Air Suspension		15	50 Ft.	76 dBA	
	Self-Vented Traction		25	50 Ft.	80 dBA	
	Motor		25	50 Ft.	78 dBA	
			35	50 Ft.	80 dBA	
			45	50 Ft.	82 dBA	
San Diego - East5/ Urban Corridor	Resilient Wheel	Welded	20	50 Ft.	74 dBA	
	Air Suspension		25	50 Ft.	75 dBA	
	Self-Vented Traction		30	50 Ft.	77 dBA	
	Motor		35	50 Ft.	79 dBA	
			40	50 Ft.	80 dBA	
			45	50 Ft.	81 dBA	
			50	50 Ft.	83 dBA	
			55	50 Ft.	84 dBA	
			60	50 Ft.	85 dBA	

1/ Evaluation of Existing Airborne Sound and Groundborne Vibration in the Folsom Line and Highway 50 Corridor of Sacramento, California. Earth Metric Incorporated, May 3, 1988.

2/ Banfield Transitway Project. Light Rail Transit Line and Banfield Freeway Improvements. Final Environmental Impact Statement. US DOT, FHWA & UMTA. August, 1989

3/ Baltimore Central Light Rail Transit Environmental Effects Report. Maryland DOT. December 1988. - Not an operating system.

4/ Noise and Vibration Study for the San Diego Bayside LRT Extension Project. Wilson, Ihrig and Associates, Inc. August 1987.

5/ East Urban Corridor Alternatives Analysis/Environmental Impact Statement Technical Report: Noise and Vibration. WESTEC Services. April 1984.

TABLE 5.10
DISTANCE TO APTA LMAX GUIDELINES FOR RESIDENTIAL USES

Operating Speed	Lmax Noise Level (dBA) at 50 Feet		Distance (Ft.) to Lmax 70 dBA*		Distance (Ft.) to Lmax 75 dBA*		Distance (Ft.) to Lmax 80 dBA*		Distance (Ft.) to Lmax 85 dBA*	
	Best	Worst	Best	Worst	Best	Worst	Best	Worst	Best	Worst
Embedded										
10	67	74	--	90	--	--	--	--	--	--
15	69	76	--	125	--	60	--	--	--	--
20	71	78	60	170	--	80	--	--	--	--
25	73	80	80	230	--	110	--	--	--	--
Tie and Ballast										
25	73	78	80	170	--	80	--	--	--	--
30	74	79	90	200	--	90			--	--
35	75	80	105	230	--	110	--	--	--	--
40	76	81	125	270	60	125	--	60	--	--
45	77	82	145	315	70	150	--	70	--	--
50	78	83	170	370	80	170	--	80	--	--
55	79	84	200	430	90	200	--	90	--	--

Note: Noise levels for 10, 15, 20 and 25 MPH are on an embedded segment of rail. Lmax 70 dBA guideline is for Low-Density Residential which includes areas with no nearby highways or boulevards. Lmax 75 dBA guideline is for Average Residential which includes areas near busy streets. Lmax 80 dBA guideline is for multi-family units in a commercial area, high-density multi-family developments and single-family units in an industrial or highway zone. Lmax 85 dBA guideline applies to industrial and commercial buildings and multi-family units in an industrial or highway zone.

The rates listed represent noise levels at 50 feet from the center line of of the LRT track and were developed from the data collected from presently operating systems.

* Distance attenuation is 4.5 dBA per doubling of distance between source and receiver. This is representative of a soft or acoustically absorptive surface.

Sources: Evaluation of Existing Airborne Sound & Groundborne Vibration in the Fulsom Line and Highway 50 Corridor of Sacramento, California. Earth Metrics Incorporated, May 3, 1988: Actual Measurements.

Banfield Transitway Project. Light Rail Transit Line and Banfield Freeway Improvements. Final Environmental Impact Statement. US DOT, FHWA and UMTA. August 1989.

Baltimore Central Light Rail Transit Environmental Effects Report. Maryland DOT. December 1988. - Not an operating system.

Noise and Vibration Study for the San Diego Bayside LRT Extension Project. Wilson, Ihrig and Associates, Inc. August 1987.

East Urban Corridor Alternatives Analysis/Environmental Impact Statement Technical Report: Noise and Vibration. WESTEC Services. April 1984.

LRT Vehicle Noise Impact Area

The noise impact of the LRT is primarily dependent on the vehicle operating speed and the adjacent land use. The higher the operating speed and the less intense the use of the adjacent land (residential as compared to industrial or commercial), the more extensive and significant the impact would be. Projected station-to-station operating speeds for LRT trains have been determined for each corridor and are displayed in Table 5.11.

The predicted noise impact areas for specific segments of each of the proposed LRT corridors have been determined using the best and worst-case LRV noise emission levels documented in Table 5.10. An attenuation rate of 4.5 dBA (based on FHWA Highway Traffic Noise Prediction Model, 1978), per doubling of the distance between the rail source and the receiver site was used in the analysis. This attenuation rate reflects accoustically soft ground cover (alpha=0.5) between the source and the receiver. For the noise analysis, each of the LRT corridors were divided into specific segments. The beginning and ending points of each segment were based on the location of significant changes in the general land use along a corridor and significant changes in the assumed maximum operating speeds.

The analysis reflects impacts of local topography which would provide additional attenuation of the noise levels (such as changes in elevation which would create a barrier between the source and the receiver).

Tables documenting the adjacent land use, operating speed and predicted noise level at the nearest receiver site for specific segments of each of the corridors are included in the noise section for each corridor. The corridor analysis also includes a table documenting the number of residential, commercial and industrial units and the acres of parkland potentially impacted by the proposed LRT project.

The American Public Transit Association (APTA) noise guidelines will be used to determine if there is a significant noise impact associated with the LRT train passby. As identified in Section 4.3.8, guidelines are set at levels acceptable to communities potentially affected by transient noise. The noise impact is considered potentially significant if predicted LRV noise levels at the receiver sites exceed the guidelines established by the APTA.

TABLE 5.11
ASSUMED MAXIMUM LRT OPERATING SPEEDS BY CORRIDOR SEGMENT

CORRIDOR	SEGMENT DESCRIPTION FROM	TO	MAXIMUM OPERATING SPEED (MPH)
Hiawatha	End of Line	70th	35 MPH
	70th	GSA	55 MPH
	GSA	Central Area	35 MPH
Northwest	End of Line	TH 55	55 MPH
	TH 55	Central Area	35 MPH
Southwest	End of Line	Central Area	55 MPH
University	End of Line	U of M Campus	30 MPH
	West of Campus	Metrodome	55 MPH
	Metrodome	Mills District	30 MPH
Central			
At-Grade Option A	Northwest Corridor	Royalston	35 MPH
	Royalston	Downtown	30 MPH
	Southwest Corridor	Nicollet Avenue	55 MPH
	29th Street	Downtown	35 MPH
	Downtown		30 MPH
	Hiawatha Corridor	Nicollet	55 MPH
At-Grade Option B	Northwest Corridor	Royalston	35 MPH
	Royalston	Downtown	30 MPH
	Southwest Corridor	Downtown	55 MPH
	Downtown		30 MPH
	Hiawatha Corridor	Downtown	35 MPH
Tunnel Option	Northwest Corridor	Royalston	35 MPH
	Royalston	Downtown	30 MPH
	Southwest Corridor	Portland	55 MPH
	Hiawatha Corridor	Portland	55 MPH
	Downtown		30 MPH

Feeder Bus Operations Noise Impacts

Where feeder bus service is routed along roadways which presently do not carry bus traffic, noise levels at adjacent sensitive receiver sites could increase. Conversely, noise levels would be reduced on roadways where bus service is eliminated.

The level of transit bus service provided by feeder buses would vary by route and by hour of the day (Table 5.12).

Vehicle noise generated by feeder bus operations was quantified using methodologies documented in the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model, Federal Highway Administration, FHWA-RD-77-108, Washington, DC, 1978. The model estimates traffic noise levels based on:

- Peak hour traffic levels
- Mixture of heavy trucks, medium trucks and cars in the vehicle stream
- National average vehicle noise emission levels
- Vehicle operating speeds
- The distance from the roadway source to the receiver site
- Acoustically soft ground cover between the noise source and the receiver site (alpha=0.5)

The noise model defines heavy trucks as those with three or more axles. Medium trucks are defined as having two axles and six wheels. Transit buses are included in the medium truck category. All other vehicle types are considered cars.

Roadway Traffic Noise

The proposed LRT system may increase ambient noise levels adjacent to station sites by increasing vehicular traffic volumes. Vehicle traffic generated by the proposed system includes:

- Traffic generated by the park-and-ride lots associated with LRT stations

- Traffic volumes generated by kiss-and-ride lots associated with LRT stations

- Additional feeder buses traveling to and from LRT stations

A significant traffic noise impact would occur when traffic volumes from the three sources listed above cause ambient noise levels to increase by three decibels or more, or creates the potential for traffic noise levels which are in

TABLE 5.12
PEAK HOUR HEADWAYS ON SELECTED FEEDER BUS ROUTES

LRT CORRIDOR	TRANSIT ROUTE	PEAK HOUR HEADWAY	PASSBYS IN PEAK HOUR
Hiawatha	19	15 Minutes	8
	107	15 Minutes	8
Southwest	267	15 Minutes	8
	285	30 Minutes	4
	280	15 Minutes	8
	281	15 Minutes	8
	286	30 Minutes	4
	288	30 Minutes	4
	261	15 Minutes	8
	287	15 Minutes	8
	290	30 Minutes	4
Northwest	452	15 Minutes	8
	453	120 Minutes	1
	5	15 Minutes	8
University	13 *	7.5 Minutes	16

* Non-MTC Service

excess of the State Noise Standards. The threshold of three decibels is used because it is the minimum noticeable change in noise level from a time-varying source such as traffic. To achieve a three decibel increase in noise levels, peak hour traffic generated by the proposed LRT system, including stations, must cause a doubling of traffic volumes on roadways affected by LRT traffic. No significant traffic noise impacts would be associated with the proposed LRT system if the forecast build-condition peak hour traffic volumes do not result in at least a doubling of forecast volumes.

System-Wide Findings

Feeder Bus Noise Impacts

Using the FHWA model, traffic noise levels were predicted at various distances from the roadway based on a range of operating speeds, varying levels of background traffic, and differing numbers of buses in the vehicles stream. The results of the modeling analysis are documented in Tables 5.13 through 5.15. The tables document a range of potential noise impacts based on the rerouting of existing bus routes to new roadways.

When compared to the no-build scenario, the additional buses would only slightly increase existing peak hour traffic noise levels at nearby receiver sites. The maximum increase documented in the table is approximately three decibels. The smallest noticeable change in a time-varying source, such as traffic, is three decibels. Thus, based on predicted L10 noise levels identified in Tables 5.10-5.12, no significant change in future noise levels due to feeder bus operations is expected along most segments of the proposed feeder bus routes.

Roadway Traffic Noise

Documented in the Traffic Impacts section for each corridor are the forecast build and no-build peak hour traffic volumes at intersections which would be significantly impacted by LRT traffic. As the volumes show, peak hour LRT traffic volumes would not cause volumes to more than double at any of the intersections impacted by LRT traffic. As was stated previously, a doubling of forecast peak hour no-build traffic is required to create the potential for a significant traffic noise impact. Because forecast peak hour traffic volumes would not double with the additional LRT-generated traffic volumes, significant traffic noise impacts are not expected.

TABLE 5.13
PREDICTED L10 NOISE LEVELS - 30 MPH

Range of Predicted Impacts from Additional Feeder Bus Routes

Travel Speed = 30 MPH

25 Feet

Feeder Buses Per Hour	Hourly Background Traffic Volume							
	100	200	400	800	1600	2400	3200	5000
0	57	61	64	67	70	72	73	75
4	57	61	64	67	70	72	73	75
8	58	61	64	67	70	72	73	75
12	58	61	65	67	70	72	73	75
16	59	62	65	68	70	72	73	76

50 Feet

Feeder Buses Per Hour	Hourly Background Traffic Volume							
	100	200	400	800	1600	2400	3200	5000
0	53	57	59	62	66	68	69	71
4	54	57	60	63	66	68	69	71
8	54	57	60	63	66	68	69	71
12	55	58	60	63	66	68	69	71
16	56	59	61	63	66	68	69	71

75 Feet

Feeder Buses Per Hour	Hourly Background Traffic Volume							
	100	200	400	800	1600	2400	3200	5000
0	51	54	57	60	63	65	67	69
4	51	54	57	60	63	65	67	69
8	52	55	58	60	64	65	67	69
12	53	56	58	61	64	66	67	69
16	55	56	59	61	64	66	67	69

100 Feet

Feeder Buses Per Hour	Hourly Background Traffic Volume							
	100	200	400	800	1600	2400	3200	5000
0	49	52	55	58	62	64	65	67
4	50	52	55	59	62	64	65	67
8	50	53	56	59	62	64	65	67
12	51	53	56	59	62	64	65	67
16	51	53	56	59	62	64	65	67

Notes:

1. Background traffic volumes are assumed to have a vehicle mix of 97 percent Auto, 2 percent medium trucks, and 1 percent heavy trucks.
2. The State Standards for the L10 descriptor in residential areas is 65 dBA for the daytime hours and 55 dBA for the nighttime hours.
3. Noise predictions assume a "soft" site between the roadway and the receiver.
4. Zero feeder buses per hour refers to the no-build alternative.

TABLE 5.14
PREDICTED L10 NOISE LEVELS - 35 MPH

Range of Predicted Impacts from Additional Feeder Bus Routes

Travel Speed = 35 MPH

25 Feet

FEEDER BUSES PER HOUR	HOURLY BACKGROUND TRAFFIC VOLUME 100	200	400	800	1600	2400	3200	5000
0	59	63	66	69	72	74	75	77
4	59	63	66	69	72	74	75	77
8	60	63	67	69	72	74	75	77
12	60	63	67	69	72	74	75	77
16	60	64	67	69	72	74	75	77

50 Feet

FEEDER BUSES PER HOUR	HOURLY BACKGROUND TRAFFIC VOLUME 100	200	400	800	1600	2400	3200	5000
0	55	59	62	64	67	69	71	73
4	56	59	62	65	68	70	71	73
8	56	59	62	65	68	70	71	73
12	57	60	62	65	68	70	71	73
16	57	60	63	65	68	70	71	73

75 Feet

FEEDER BUSES PER HOUR	HOURLY BACKGROUND TRAFFIC VOLUME 100	200	400	800	1600	2400	3200	5000
0	53	56	59	62	65	67	68	71
4	53	56	59	62	65	67	68	71
8	54	57	60	62	65	67	69	71
12	55	58	60	63	65	67	69	71
16	56	58	60	63	66	67	69	71

100 Feet

FEEDER BUSES PER HOUR	HOURLY BACKGROUND TRAFFIC VOLUME 100	200	400	800	1600	2400	3200	5000
0	51	54	57	60	63	65	67	69
4	52	54	57	60	63	65	67	69
8	52	55	58	61	64	66	67	69
12	53	55	58	61	64	66	67	69
16	53	55	58	61	64	66	67	69

NOTES:

1. Background traffic volumes are assumed to have a vehicle mix of 97 percent Auto, 2 percent medium trucks, and 1 percent heavy trucks.
2. The State Standards for the L10 descriptor in residential areas is 65 dBA for the daytime hours and 55 dBA for the nighttime hours.
3. Noise predictions assume a "soft" site between the roadway and the receiver.
4. Zero feeder buses per hour refers to the no-build alternative.

TABLE 5.15
PREDICTED L10 NOISE LEVELS - 40 MPH

Range of Predicted Impacts from Additional Feeder Bus Routes

Travel Speed = 40 MPH

25 Feet

Feeder Buses Per Hour	Hourly Background Traffic Volume							
	100	200	400	800	1600	2400	3200	5000
0	60	64	68	71	74	75	77	79
4	61	65	68	71	74	76	77	79
8	61	65	68	71	74	76	77	79
12	62	65	68	71	74	76	77	79
16	62	65	69	71	74	76	77	79

50 Feet

Feeder Buses Per Hour	Hourly Background Traffic Volume							
	100	200	400	800	1600	2400	3200	5000
0	57	61	64	66	69	71	72	74
4	57	61	64	66	69	71	73	75
8	58	61	64	67	70	71	73	75
12	58	61	64	67	70	71	73	75
16	59	62	64	67	70	71	73	75

75 Feet

Feeder Buses Per Hour	Hourly Background Traffic Volume							
	100	200	400	800	1600	2400	3200	5000
0	55	58	61	64	67	69	70	72
4	55	58	61	64	67	69	70	72
8	55	59	61	64	67	69	70	72
12	56	59	62	64	67	69	70	72
16	58	60	62	65	67	69	70	72

100 Feet

Feeder Buses Per Hour	Hourly Background Traffic Volume							
	100	200	400	800	1600	2400	3200	5000
0	53	56	59	62	65	67	68	70
4	53	56	59	62	65	67	68	70
8	54	56	59	62	65	67	68	70
12	54	57	59	63	65	67	69	71
16	55	57	60	63	66	67	69	71

NOTES:

1. Background traffic volumes are assumed to have a vehicle mix of 97 percent Auto, 2 percent medium trucks, and 1 percent heavy trucks.
2. The State Standards for the L10 descriptor in residential areas is 65 dBA for the daytime hours and 55 dBA for the nighttime hours.
3. Noise predictions assume a "soft" site between the roadway and the receiver.
4. Zero feeder buses per hour refers to the no-build alternative.

Construction Noise Impacts

Noise will be generated by equipment used to construct the LRT system. Noise impacts caused by construction activities will vary depending on the type of equipment in use, the location of the equipment on the construction site, and the operating mode. During a typical work cycle, construction equipment may be idling, preparing to perform a task, or operating under a full load. It may be congregated in a specific area or spread out over a larger area. Thus, the total noise impact on a single receiver point resulting from construction of the LRT station sites, park-and-ride lots and the rail line will vary significantly both day-to-day and hour-to-hour. Because the construction noise impacts would vary significantly over time, the potential for a significant impact at nearby receiver sites is difficult to quantify.

The range of and average noise levels monitored at fifty feet from various types of construction equipment are shown in Table 5.16. These pieces of equipment are generally associated with site grading and site preparation, which are usually considered the noisiest phases of construction.

The actual noise levels which may be experienced near a construction zone will depend on:

- o The distance between the construction equipment and the receiver
- o The type of equipment in use
- o The percent of the time the equipment attains the peak level
- o Noise control features incorporated into the equipment

TABLE 5.16
TYPICAL CONSTRUCTION EQUIPMENT NOISE LEVELS AT 50 FEET

Equipment Type	Peak Noise Level (dBA) Range	Average
Backhoes	74-92	83
Front End Loaders	75-96	85
Dozers	65-95	85
Graders	72-92	84
Scrapers	76-98	87

Source: Reagan, Jerry A. and Charles A. Grant. Highway Construction Noise: Measurement, Prediction and Mitigation, Special Report HEV-21, U.S. Department of Transportation, FHWA, Office of Environmental Policy, Washington, D.C., 1977.

No-Build Alternative

Noise impacts under the no-build alternative are addressed for each corridor and the Central Area.

General Mitigation Measures

Based on the results of the noise analyses for LRT vehicles, feeder buses and vehicle traffic generated by the proposed project; identification and evaluation of potential noise mitigation alternatives is warranted. Potential noise mitigation alternatives includes: reducing the noise emission levels from the sources; creating a noise buffer between the noise source and the receiver; and changing the land use adjacent to the source to a less sensitive use. Each of these alternatives is discussed below.

Reduce Source Noise Emission Levels:

A survey of operating LRT systems was conducted to collect LRV noise emission level data. Using the inventoried noise data, the impacts that different system component technologies have on noise emission levels were evaluated and a number of measures to reducing noise emissions are identified. Included in the alternatives are:

- o Specify a resilient wheel as opposed to a non-resilient, or all-steel construction wheel.
- o Weld and grind track joints. Welded track construction provides a smoother and quieter ride than non-welded track.
- o Specify an LRT vehicle which uses an air-suspension as opposed to a rigid-frame suspension.
- o Provide maintenance facilities which allow for adequate wheel trueing.
- o Reduce the operating speed of the system along segments of the proposed LRT lines adjacent to sensitive uses.

Create a Noise Barrier Between the Rail Source and Receiver:

In areas which are expected to experience maximum LRV passby noise levels in excess of the APTA guidelines, the feasibility and desirability of constructing a noise barrier between the LRT source and the receiver sites should be investigated. A noise barrier of a height which blocks the direct line of sight between the source and the receiver has the potential to reduce noise levels at the source by eight to ten decibels. A reduction of this magnitude would likely result in maximum passby noise levels of less than the APTA guidelines at most receiver sites more than 50 feet from the center line of the rail track.

Identification of the location and determination of the desired height of noise barriers should be completed as part of the preliminary and final engineering processes for each of the corridors.

Change Adjacent Land Use:

Changing the land use adjacent to the proposed LRT lines from a more sensitive residential land use to a commercial or industrial use would likely reduce the noise impacts of the LRT system. APTA guidelines for determining a significant noise impact are more stringent for residential property than for commercial or industrial property. By changing the land use in areas directly adjacent to the routes, the potential for a significant impact could be reduced.

Changing the land use, however, is not an overnight process. Most of the residential areas adjacent to the LRT routes are stable or growing neighborhoods. Modification of the land use from residential to commercial or industrial would be a difficult and costly process. Areas presently in a transitional or declining state which would benefit from development or redevelopment, such as commercial or industrial uses, would be best suited for this noise mitigation alternative. This newly created area of higher intensity, less sensitive uses would form a buffer between the proposed LRT system and the stable or growing residential areas which it would serve.

5.3.8 Vibration

Background

The proposed LRT system has the potential to create vibration impacts by:

- Increasing the number of passbys on the existing dedicated rail segments
- Creating an additional vibration source in the shared roadway right-of-way segments of the system

Vibration will be generated from the LRV wheels rolling along the track. Because the surface of the wheel is made up of numerous flat spots, contact between the wheel surface and the rail creates a small shock wave which is transmitted through the ground to nearby sensitive receivers. The APTA rapid transit design guidelines state that modern vehicle and track designs combine to effectively lower vibration, at receivers 100 to 200 feet from the source, to levels which are well within the threshold of tolerance to most people.

Scope of Analysis/Methodology

At this time the design specifications for the system, including the wheel type and wheel and rail maintenance procedures, have not been determined. Similarly, an in-depth geological investigation of the strata adjacent to the proposed rail lines has not been completed. Therefore, a detailed analysis of the potential vibration impacts of the proposed system cannot be completed at this time. However, research into predicted vibration levels for a number of other LRT systems has been completed and the results documented. From the information acquired from other systems, which are using a technology similar to that which is likely to be implemented in Hennepin County, an approximation of the potential system impacts can be formulated.

Detailed ground-borne vibration studies were completed as part of the environmental review process for the San Diego LRT system. The potential for significant impacts was evaluated by monitoring ground surface vertical vibration levels at various sites and at a number of setback distances along an operating line in the San Diego system. The monitoring results for the four sites selected are documented in Figure 5.1. The levels shown were recorded at fifty feet from the centerline of the track during an LRT passby. The distance of fifty feet was the closest setback distance monitored. Thus, monitored results at these locations would result in the highest vibration levels. Decibel levels were recorded over the zero to 1000 Hz octave band frequencies. The LRT passby travel speeds for each of the monitoring sites are documented in Table 5.17.

TABLE 5.17
LRT PASSBY TRAVEL SPEEDS AND WEIGHTED VERTICAL VIBRATION LEVELS AT MONITORING SITES

SITE	TRAIN PASSBY SPEED	WEIGHTED LEVEL (dB)
Location 1	20-25 MPH	68 dB
Location 2	50 MPH	65 dB
Location 3	50 MPH	60 dB
Location 4	40-50 MPH	61 dB

Source: East Urban Corridor Alternatives Analysis/ Environmental Impact Statement Technical Report: Noise and Vibration, San Diego Metropolitan Transit Development Board, April 6, 1984.

As the information presented in the figure shows, at fifty feet from the centerline of a LRT track, ground-borne vertical vibration levels fall within the detection area of "usually imperceptible" for all octave bands.

Weighted overall vibration velocity levels were also calculated as part of the San Diego East Urban LRT Corridor analysis. Generally, a weighted vibration velocity level of less than 69 dB would fall within the categories of "usually imperceptible" or "barely perceptible." As Table 5.9 documents, vibration velocity levels at all of the monitored sites in the San Diego LRT vibration study are below the 69 dB level.

System-Wide Findings

The assessment of the vibration impacts related to the LRT system is constrained because of the limited data regarding the geological strata adjacent to the LRT line, along with the fact that design specifications for the system have not been finalized.

Based on the information presented in the San Diego LRT environmental report, it could be concluded that the proposed LRT system in Hennepin County would not create a significant vibration impact on adjacent receiver sites. However, this statement is dependent on several assumptions of the proposed system, including:

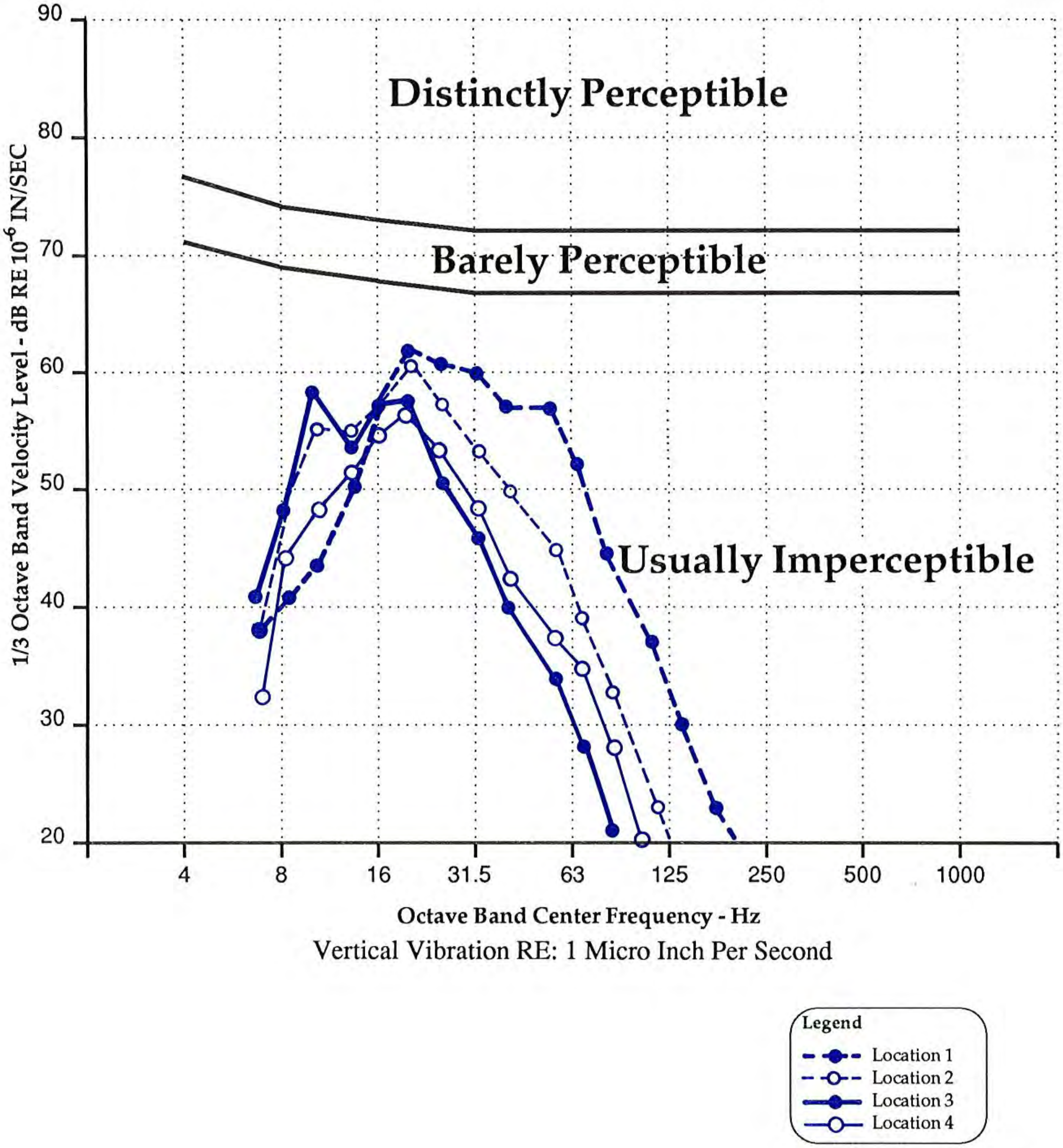
- The technology proposed for the Hennepin County system would be similar to that used in San Diego

- Vibration sensitive receiver sites are located at least fifty feet from the centerline of the nearside LRT track

- Passby travel speeds for the Hennepin County LRT system would be similar to San Diego LRT travel speeds

- The general geological strata in the Hennepin County LRT system study area is similar to that along the San Diego LRT line.

Additional vibration impact studies may need to be completed when the contributing vibration level features of the system have been determined (e.g., wheel type, wheel and rail maintenance procedures) and more detailed geological studies along the corridors are completed.



Source: San Diego East Urban Corridor Alternatives Analysis EIS Technical Report: Noise & Vibration, 1984.

HCRRA Hennepin County Regional Railroad Authority

LRT System

Environmental Impact Statement

Figure 5.1

BRW

Normalized Ground Surface Vibration at 50 Feet From LRT Track

Mitigation Measures:

If additional analysis reveals that there would be a significant vibration impact analysis associated with LRT, the impacts would be mitigated through the design components of the system.

No-Build Alternative:

There would be no change to the existing vibration levels (identified in Chapter 4) with the no-build alternative.

5.3.9 Wetlands, Vegetation and Wildlife

Scope of Analysis

The previous chapter identified the existing vegetation in each corridor and the Central Area, highlighting areas where native vegetation and wetland communities occur. Because there is no wetland or prairie vegetation in the University Corridor and Central Area, a detailed wetland and prairie vegetation impact analysis will be limited to the Hiawatha, Southwest and Northwest Corridors. The analysis in these corridors quantifies the impacts of LRT on native prairie and wetland areas, and the wildlife associated with each of these communities.

General Mitigation Measures

General mitigation measures for the impacts to wetlands and prairies are described to give an estimate regarding the cost and effort necessary to accomplish the appropriate mitigation for the impacted areas.

Wetlands:

Wetland vegetation is very dependent on soil types and the presence of water. The impacted wetland areas would be permanently filled, except where bridges are constructed. Because of this, the original vegetation cannot simply be replaced. An off-site mitigation area would need to be created to replace the eliminated wetlands. When an appropriate area is selected, the following list of general mitigation measures would apply to the creation of the new wetland.

1. Bottom contours would be varied to promote the growth of emergent vegetation on sixty to seventy percent of the wetland. Emergents are expected to grow where water depths are less than three feet. A 2:1 ratio of emergent vegetation to open water is the most desirable for wildlife habitat.

2. Depths between three and five feet would be included to provide growing conditions for submergent and floating aquatic plants and open water for wildlife.

3. The wetland edge would be meandered to provide the maximum amount of upland/lowland edge possible.

4. Upland side slopes would range from 3:1 to 10:1. Side slopes in the wetland would range from 5:1 to 50:1, to provide shallow fringe areas for aquatic vegetation growth.

5. Purple loosestrife would be controlled as necessary in accordance with currently accepted control procedures.

Prairie Vegetation:

General mitigation for lost prairie vegetation along corridors could be done two ways. First, the new railroad grade could be revegetated with a prairie seed mixture. The mixture would contain Big Bluestem (7 lbs/ac), Indian Grass (7 lbs/ac), and Switchgrass (4 lbs/ac). A nurse crop of oats (60 lbs/ac) would also be planted to stabilize the soil and reduce the weed competition with the prairie grasses. The second option is to remove the intact prairie sod prior to construction and transplant it to a protected area or use it in a prairie restoration project. This would ensure that none of the original prairie species would be lost.

To determine which method of mitigation to use, the quality of each section of prairie must be determined. Prairie quality is measured by the diversity of plant species present. The transplanting method would be preferred for the more diverse and unique sections of prairie in order to preserve the original prairie components. In areas where Big Bluestem represents most of the prairie remnant, revegetation with the above-mentioned mixture would be adequate.

System-Wide Findings

No-Build Alternative

Under the no-build alternative there would be no impacts to existing wetlands, vegetation and wildlife.

5.3.10 Water Resources

Runoff and Receiving Bodies of Water

Background:

In general, runoff from a natural watershed is relatively clean, with low concentrations of suspended solids and nutrients. In a natural watershed, runoff percolates into the ground, evaporates, or flows overland to streams, channels, lakes, and ponds. As a watershed is developed, impervious surface area is increased by pavement and buildings. This reduces vegetation and permeable soil area, which reduces percolation and evaporation. Runoff rate and volume are increased and runoff quality is reduced.

Pollutants resulting from human activity accumulate in the watershed and are carried to receiving waters by storm runoff. These pollutants commonly include phosphorous and nitrogen from lawn fertilizers, heavy metals, oil and grease from automobiles, solids such as dirt, silt and sand from road and parking surfaces, and chlorides from deicing chemicals.

One method of reducing storm water pollutants is to route storm water through a retention basin designed to settle out coarse sand and grit, heavy metals and some silts. Additional benefits also include reduction in phosphorous and nitrogen contents if retention times are of a sufficient duration.

It is anticipated that additional surface storm water runoff will be generated by the increase in impervious surfaces such as railroad ballast, roofs, and bituminous and concrete paving at LRT stations. Net increases in storm water volumes and rates should be minimal.

Scope of Analysis/Methodology:

Each of the Watershed Management Districts affected by the LRT system was asked to provide a preliminary assessment regarding LRT's consistency with the policies of their District and its potential impact in their specific area of jurisdiction. Copies of the response letters can be found in Section 8.3.

General Mitigation Measures:

It is not anticipated that the MPCA will require an NPDES Permit for storm water discharges. Park-and-ride facilities are generally planned to accommodate fewer than 600 vehicles. Storm water quality and quantity considerations will be included in the design for each station, in cooperation with state and local governing agencies, and the affected watershed districts.

During construction, storm runoff will be routed through sediment barriers (silt fences) to prevent sediment from reaching any existing wetlands or storm sewer systems. After construction, disturbed areas will be fine graded and revegetated.

System-Wide Findings:

No-Build

On a system-wide level of analysis, the no-build alternative would not impact the receiving bodies of water in the LRT System Study Area.

Floodplains

Background:

The proposed Light Rail Transit system would pass through several identified floodplains. Widening and/or regrading of existing railroad tracks and highway rights-of-way may involve work in floodplains.

Scope of Analysis/Methodology:

Watershed districts were asked to review and comment on the impacts the LRT system would have on floodplains in their jurisdiction.

It is the responsibility of the watershed districts to regulate the amount and type of construction and/or fill that is placed within the 100-year floodplain elevation. Land uses and structures that would be damaged by flood waters or structures that would restrict flood waters would not be permitted within the floodplain because of the possible flood hazards they would create. The placing of fill in any floodplain requires the approval of the appropriate watershed district and that compensation be provided for the loss of flood water capacity within the same watershed or floodplain.

General Mitigation Measures:

In areas where the LRT system crosses or encroaches on a floodplain, the amount of fill would be minimized by keeping sideslopes as steep as possible without creating a safety hazard or an erosion problem. Erosion control measures will also be implemented to maintain the water quality of the floodplain. All mitigation will be completed in compliance with the management plans of each of the watershed districts.

System-Wide Findings:

No-Build

On a system-wide level of analysis, there would be no impacts to the floodplains in the LRT system study area under the no-build alternative.

Shoreland Zoning

Background:

The Shoreland Zoning District is that area within 1,000 feet of the ordinary high water mark of a lake or within 300 feet of the ordinary high water mark of a stream or river or the landward extent of a floodplain on such rivers or streams, whichever is greater. The Cities of Robbinsdale and Saint Louis Park have not adopted a Shoreland Zoning Overlay District.

General Mitigation:

A permit from appropriate cities (Golden Valley or Minneapolis) would be required where construction of the LRT system would involve grading or filling within a Shoreland Zoning District, where the slope of the land is toward a protected water or a water course leading to a protected water.

System-Wide Findings:

No-Build

Under the no-build alternative there would be no impacts to the Shoreland Zoning district's in the System Study Area.

Mississippi River Critical Area

Scope of Analysis:

The Hiawatha and University Corridors and the Central Area include parts of the Mississippi River Critical Area. The impact analysis will address the proposed LRT alignments' consistency with both the City of Minneapolis Critical Area Plan and the University of Minnesota's Critical Area Plan.

General Mitigation Measures:

Although there are no permits specific to the Critical Area Plan, any LRT-related construction within the Critical Area would require a City Building Permit; review by the St. Anthony Falls Heritage Preservation District; and a Minneapolis Conditional Use Permit if the construction is within the floodplain. A Capital Improvement Project Review by the City Planning Commission may also be necessary.

System-Wide Findings:

No-Build

Under the no-build alternative there would be no impacts to the Mississippi River Critical Area included in the System Study Area.

Groundwater

Scope of Analysis:

The groundwater impacts in the Central Area and Airport (Hiawatha line) tunnel will be discussed in detail. Because the remaining portion of the LRT system would run at-grade and would be primarily on existing right-of-way, no long-term significant impacts to groundwater are anticipated.

Construction-related dewatering activities will be addressed where appropriate for each of the proposed corridors.

System-Wide Findings:

No-Build

Under the no-build alternative there would be no impacts to the groundwater in the System Study Area.

5.3.11 Soil Contamination

Background

The potential soil contamination sites in the LRT study area were identified through the Minnesota Pollution Control Agency (MPCA) records and available engineering boring records.

Scope of Analysis

Based on the data collected thus far, discussion regarding soil contamination impacts and potential mitigation measures will be addressed on a system-wide basis. Further investigation and more detailed testing will be necessary within each corridor, to confirm the presence of contaminants, their specific location, and to determine the type and extent of these contaminants. Some of this information may be acquired through MPCA's individual site files. Soil testing may be necessary if MPCA's files are incomplete or inaccessible.

Because light rail transit is electrically powered, and engineered to avoid hazardous material through the use of inert materials and air cooling of electrical equipment, it does not generate significant hazardous wastes. The area of concern for this impact analysis relates to existing soil contamination sites which would be directly affected by the proposed LRT alignments and station areas, and therefore, require mitigation prior to construction. In addition, physical disturbances to presently clean soils could change existing drainage patterns, allowing contaminants in close proximity to migrate into presently uncontaminated areas.

General Mitigation Measures

Soil contaminated areas directly affected by the LRT alignment and station areas will be mitigated in accordance with state and federal (MPCA and Environmental Protection Agency) regulations for the substances involved. Because of the limited data available regarding each of the known sites, general mitigation measures are discussed. Areas adjacent to the LRT system may also require mitigation due to the possibility of contaminant migration. Mitigation techniques could include:

Landfarming

Landfarming consists of spreading the contaminated soil in a thin layer over an area and tilling the soil periodically during the warm season. The Minnesota Pollution Control Agency (MPCA) has developed application requirements, criteria for site and soil characteristics, acceptable procedures and monitoring requirements (Appendix).

The advantage of landfarming is that it is a relatively cost-effective method. Disadvantages include spacial and time resources, seasonal applicability and visibility.

Thermal Treatment

Thermal treatment means heating the soil in a rotary kiln in order to volatize the petroleum product. This is regularly done by asphalt batch plants, though the regulatory and political atmosphere of this approach is changing rapidly. Currently, one plant is accepting soil for thermal treatment. Portable treatment plants specifically designed for this process will likely replace asphalt plants as an acceptable way for thermal treatment.

The advantage of thermal treatment is that it quickly remedies the contamination. Disadvantages are higher cost, seasonal applicability and a rapidly changing regulatory environment.

Encapsulation

Encapsulation refers to methods which isolate the contaminated soil from pollutant migration. Commonly a depression is lined, then filled with the contaminated soil and sealed with an impermeable cap. Small volumes of contaminated material have been incorporated into parking lots when it is demonstrated that groundwater and/or soil conditions preclude migration of the contaminant.

Advantages of encapsulation include costs and a relatively stable regulatory environment. This method is especially effective for smaller volumes of contaminated material.

Incorporation Into Class 5 Aggregate

This approach is similar to thermal treatment, except that the treated material is incorporated into asphalt. The contaminated soil must conform to standard specifications which govern the size distribution of particles comprising the aggregate. Generally, the soil should be free of fines like clay, silt, or organic matter.

Similar to thermal treatment, incorporation into Class 5 aggregate has the advantage of presenting a quick, permanent solution. However, the soil cannot contain fine material. Additional disadvantages include cost for excavation and hauling and seasonal applicability.

Toxic Contamination

Toxic contamination includes chemical and insecticide spills, polynuclear aromatic hydrocarbons (e.g., creosote) and some metals. If any of these occur in unsafe levels, the contaminated soil must be safely removed from the site and disposed of in an approved toxic waste landfill.

System-Wide Findings

No-Build Alternative

Under the no-build alternative there would be no impact to the existing soil contamination sites in the LRT System Study area.

5.3.12 Geological Conditions

Scope of Analysis

Geological conditions which would potentially be impacted by the Airport and Central Area tunnel will be addressed in the Hiawatha Corridor and Central Area sections, respectively.

System-Wide Findings

No-Build Alternative

Under the no-build alternative there would be no impacts to the existing geologic conditions.

5.3.13 Utilities

Scope of Analysis/Methodology

Utility structures which could be impacted by the proposed Hennepin County LRT system will be addressed.

Each utility owner has been contacted to determine the scope of their facilities, and potential impacts and treatments required to accommodate the proposed LRT system components. During the design and construction phases, the same procedure will be employed, but with added detail to determine more specifically any impact and proposed remedial measures.

System-Wide Findings

No-Build Alternative

Under the no-build alternative there would be no impacts to utilities in the System Study Area.

5.3.14 Steep Slopes

Scope of Analysis/Methodology

Each corridor was analyzed for areas where slope requirements would warrant retaining walls. Potential sites warranting such structures are identified in the corridor sections.

In cut sections, steep slope conditions will be encountered in two conditions. First, at all tunnel portals, the sides of the tunnel would act as retaining walls. The second condition is where construction of a track bed or station facility encroaches on an existing slope too steep to increase. This slope was generally greater than approximately two horizontal to one vertical (2:1), although in most of the affected areas, existing slopes were approximately 1:1, and likely approaching the natural soil angle of repose.

In fill conditions, a minimum slope approximating the existing fill section was assumed to be maintained in proposed fill areas. In general, a minimum fill slope of 2 to 3:1 would be produced by construction activities.

System-Wide Findings

No-Build Alternative

Under the no-build alternative there would be no impact to existing steep slopes in the System Study Area.

5.3.15 Parklands

Scope of Analysis

The parklands section for each corridor will address potential impacts of the LRT system on public park and recreation areas and the Minneapolis Lakes District. Areas of concern include: access, user safety and projected proximate development.

System-Wide Findings

No-Build Alternative

Under the no-build alternative there would be no impact to the parklands in the System Study Area.

Potential Mitigation Measures

System-Wide Measures:

Anticipated impacts on parks could be mitigated by the following general means:

1. Avoid encroachment on parks.

2. Plant additional trees and shrubs along the LRT line and the station sites which abut or can be seen from the parks.

3. Carefully design the station platforms and parking areas.

Corridor Specific Measures:

Potential mitigation measures for several parks impacted by the Northwest and Hiawatha LRT lines are addressed in Sections 5.4.12 and 5.6.11, respectively.

5.3.16 Visual and Aesthetics

Scope of Analysis

The visual and aesthetic analysis of each corridor will address the potential changes in the existing visual environment which would result from the implementation of the Hennepin County LRT system, as well as the no-build alternative.

System-Wide Findings

No-Build Alternative

There would be no impact to the visual and aesthetic character in the Hennepin County LRT System study area under the no-build alternative.

Potential Mitigation Measures

The primary technique employed to mitigate visual impacts related to the build alternative would be the construction of a landscape buffer between the light rail system and sensitive visual receptors. The buffer could consist of landscaping berms and walls as necessary.

5.3.17 Historic and Cultural Resources

Scope of Analysis/Methodology

The Hennepin County LRT System was reviewed by the State Historic Preservation Office (SHPO) pursuant to the responsibilities given by the National Historic Preservation Advisory Act of 1966 and the Procedure of the National Advisory Council of Historic Preservation (36 CFR 800). The SHPO response is documented in Chapter 8 (Section 8.3). SHPO reserves the right to re-review the project upon completion of a final design.

System-Wide Findings

No-Build Alternative

Under the no-build alternative, there would be no impacts to the existing historic and cultural resources in the System Study Area.

5.4 HIAWATHA CORRIDOR

5.4.1 Community and Neighborhood Character

Little or no impact is anticipated along the segments of the alignment in Minneapolis. Because the alignment would be located along Hiawatha Avenue, which currently serves as a major boundary between the corridor's communities and neighborhoods, implementation of the project will not divide continuous, cohesive communities/neighborhoods. With residential property on the west side of Hiawatha Avenue already acquired and cleared, impacts to these communities and neighborhoods would be minimal. A railroad right-of-way lies to the east of the proposed alignment as do commercial/industrial land uses and unplatted vacant land. These would serve as buffers between the proposed project and residential uses that parallel Hiawatha Avenue, approximately 300 to 450 feet to the east.

The alignment is oriented to the northwest as it approaches Minneapolis from the Fort Snelling Military Reservation. The east-west cross streets within Minneapolis would cross the alignment, but the north-south streets are not continuous across the proposed alignment. This configuration also maintains acceptable east-west access across the alignment for neighborhood residents.

No school attendance boundaries would be crossed by the alignment, and no school, church, or community facilities would be relocated because of this project's implementation.

No-Build

Under the no-build alternative there would be no impacts to the Hiawatha communities and neighborhoods.

5.4.2 Potential Relocation/Displacement

Potential property acquisitions and relocation impacts in the Hiawatha Corridor were identified in the Draft and Final EIS for TH 55 (Hiawatha Avenue) 1982 (page 5.30) and 1985 (page 4.7), respectively.

Additional preliminary impacts are identified for the following stations based on revisions to the LRT alignment and station areas south of the 50th Street station.

Control Data Corporation Station: Based on preliminary right-of-way calculations, approximately 95 parking spaces would be eliminated at Control Data.

Hubert H. Humphrey Terminal Station: Based on preliminary station configurations, the existing bus and taxi area would need to be relocated. Parking stalls at the adjacent lots could also be impacted. The level of impact to the parking facility would need to be determined following further station site planning.

VA Hospital Station: The major park-and-ride facility on the Hiawatha line is proposed for the 58th Street (VA station) site. The proposed site would encompass approximately seven acres. Currently, there are no buildings or parking facilities on this property.

No-Build

There would be no property acquisition/relocation impacts under the no-build alternative.

5.4.3 Economic Development

Stations With Development Potential:

Several of the LRT station locations on the Hiawatha line could play an important role in assisting in the development of a favorable environment for business enterprises. Of the thirteen station sites identified in the Hiawatha Corridor, four of these may create new development opportunities: 34th Avenue/80th Street; 46th Street; 42nd Street; Lake Street.

The station located at 34th Avenue and 80th Street in Bloomington may generate interest in commercial development in close proximity to the station. To the northeast is the Hyatt Hotel, to the northwest is a vacant hotel property and further northwest is an office complex. Appletree Square is located to the southeast and Control Data is located to the southwest. The vacant hotel property presents significant development potential that could complement existing uses.

The 46th Street station may generate interest in somewhat denser residential uses to complement flanking neighborhoods and Minnehaha Park. A sensitively designed development scheme could provide for an infusion of new units east of Hiawatha attracting additional neighborhood-serving retail and a few low-rise offices.

The 42nd Street station offers somewhat limited development opportunities. The community fabric might be somewhat more fragile with the spot commercial uses five and eight blocks west. It would be important to limit new development to medium-density residential infill on excess right-of-way on the west side of Hiawatha Avenue.

The area near the Lake Street station has been the focus of a number of projects aimed at tapping both the market support in adjacent neighborhoods and the general commercial character of the area. It is projected that development spurred by LRT at the Lake Street station would be similar to existing commercial and retail development.

Stations With No Anticipated Change In Development:

Based on the economic development analysis which considered land use in the area surrounding the station sites, vacant land availability, potential redevelopment sites and currently planned development; it was determined that no significant incremental development opportunities would occur at the following LRT stations:

- o Mall of America
- o Control Data Corporation
- o Northwest Airlines Office
- o Humphrey Terminal
- o Lindbergh Terminal
- o GSA
- o VA Hospital
- o 50th Street

No-Build

Under the no-build alternative, development opportunities in the Hiawatha Corridor would take place in accordance with the zoning ordinances and land use plans of the appropriate governing municipality.

5.4.4 Traffic

The results of the scoping analysis on stations within the Hiawatha Corridor are outlined in Table 5.18.

TABLE 5.18
HIAWATHA CORRIDOR STATION SCOPING ANALYSIS

Station	Potential Traffic Impact Level	PM Peak Hour Peak Direction Trips
Mall of America	Minor	Greater than 100
34th Avenue/80th Street	Not Significant	Less than 100
Control Data Corporation	Not Significant	Less than 100
Northwest Airlines	Not Significant	Less than 100
Humphrey Terminal	Not Significant	Less than 100
Lindbergh Terminal	Not Significant	Less than 100
GSA 8uilding	Not Significant	Less than 100
VA Hospital	Minor	Greater than 100
50th Street	Not Significant	Less than 100
46th Street	Not Significant	Less than 100
42nd Street	Not Significant	Less than 100
38th Street	Minor	Greater than 100
Lake Street	Minor	Greater than 100

Lake Street Station

The Lake Street station would be located on the south side of Lake Street west of Hiawatha Avenue. The site is currently vacant.

Hiawatha Avenue is now being upgraded in a multi-year project which will last several more years. When completed, Hiawatha Avenue will have at least two through-lanes in each direction with turn lanes at the intersections. The project extends from I-94 to just south of the Crosstown Highway at about 58th Street.

Auto access to the site would be provided from Lake Street, with trips to and from the station using 22nd Avenue and 31st Street. Buses serving this station would stop on Lake Street.

Trip generation at the site will be about 456 vehicle trips per hour during the PM peak hour under the build alternative (Table 5.19).

TABLE 5.19
HIAWATHA CORRIDOR STATION SITE TRIP GENERATION

	No-Build		Build		
Station	Daily	PM Peak Hour	Daily	PM Peak Hour In	PM Peak Hour Out
Lake Street	0	0	1,541	210	246
38th Street	0	0	589	86	117
VA Hospital	0	0	2,240	71	178
Mall of America	0	0	1,820	151	151

Most auto trips to and from the station which do not originate in the nearby neighborhood will pass through the intersection of Lake Street and 22nd Avenue. The intersection is currently signalized and operates within capacity. Under the no-build alternative, the intersection would operate within its capacity. With the additional traffic generated by the LRT station, the intersection of Lake Street and 22nd Avenue would continue to operate within capacity.

Trips from the east may also pass through the intersection of Lake Street and Hiawatha Avenue. This intersection will be reconstructed as a part of the overall upgrading of Hiawatha Avenue. With the upgrading, the intersection has been forecast to operate within its capacity through the Year 2000. Analysis indicates that the intersection will continue to operate within capacity with the additional traffic generated by the LRT station.

East 38th Street Station

The 38th Street station would be located in the northwest quadrant of the intersection of Hiawatha Avenue and 38th Street. The site is vacant. Access to the site will be from 38th Street at 30th Avenue South.

Trip generation at the site will be about 203 vehicle trips per hour during the PM peak hour under the build alternative (Table 5.19).

The intersection of Hiawatha Avenue and 38th Street, which is now being reconstructed, is forecast to operate within capacity through the Year 2010. Although the LRT station will generate some additional traffic through the intersection, expected increases in traffic demand will not result in a perceptible change in operating conditions.

Veterans Administration Hospital Station

The VA Hospital station would be located in the northeast quadrant of the intersection of Hiawatha Avenue and the Crosstown Highway. Vehicles will be able to access the site from Minnehaha Avenue and from relocated TH 55 via 57th Street. The site is vacant.

Trip generation at the site will be about 249 vehicle trips per hour during the PM peak hour under the build alternative (Table 5.19).

Trips to this station will come from a wider area than most stations because a large park-and-ride lot would be located here. Most trips will use TH 55 if they approach from the south or east, and the Crosstown Highway if they approach from the west. Both TH 55 and the Crosstown Highway will be reconstructed as part of the Hiawatha upgrading project.

The preliminary designs prepared for the Hiawatha Avenue reconstruction were prepared to accommodate Year 2010 traffic with an LRT system inplace. Analysis confirms that the intersections of TH 55/57th Street and Minnehaha Avenue/57th Street will operate within capacity for both the no-build and build alternative.

Mall of America Station

The Mall of America station would be located west of 24th Avenue just south of 81st Street. The Mall of America area will experience significant growth in the near future. Traffic analyses prepared for the Airport South District and the Mall of America have indicated that traffic operations will be very congested when the development occurs.

Vehicles will access the site using 24th Avenue, 34th Avenue and Old Shakopee Road.

Trip generation at the site will be about 302 vehicle trips per hour during the PM peak hour under the build alternative (Table 5.19).

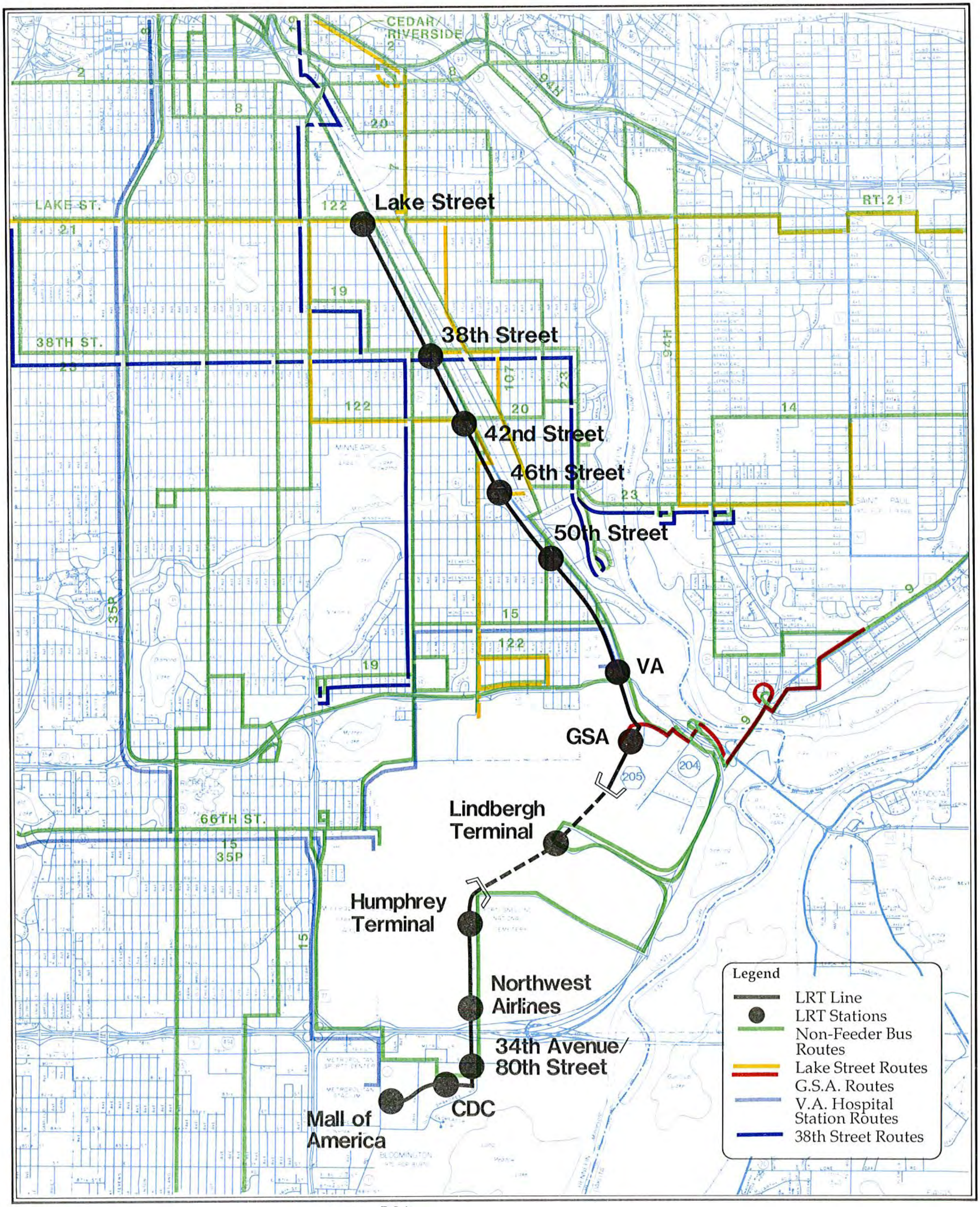
The improvements planned for the road system in the area are very extensive due to the level of traffic expected. Analysis has shown that the additional traffic generated by the LRT station will not affect the level of service on area streets.

5.4.5 Transit Service

The proposed feeder bus system which would service the Hiawatha line is illustrated in Figures 5.2A-B. Implementation of the tunnel alternative would reduce the daily bus miles by 25 percent and the fleet requirement by 27 percent (Table 5.20). Peak hour buses entering downtown would decrease by 49 percent. The large decrease in CBD bus volume results from the shift from radial bus service to crosstown bus service feeding the rail system. The Nicollet at-grade alignment option would follow a route similar to the tunnel. Therefore, it would have the same bus service characteristics.

Three Hiawatha Corridor bus routes would be eliminated and one would have reduced service if LRT is implemented. The routes to be eliminated include: Route 20 which serves southeast Minneapolis between Hiawatha Avenue and the Mississippi River; Route 22 which runs along Cedar and 34th Avenues; and Route 94H, an express which serves the Highland Park area in St. Paul. In addition, Route 7, which runs along Minnehaha and Hiawatha Avenues between downtown Minneapolis and the Lindbergh Terminal, will have a reduction in service frequency. Each one of the affected route areas will be replaced with feeder bus access to respective stations along the Hiawatha LRT line.

The impacts of the Kenwood at-grade LRT alternative are slightly different than the tunnel alternative. This at-grade option includes a Hiawatha LRT line connection with the University Connector LRT line near the Metrodome. This option would permit additional bus route modifications which would reduce bus miles traveled by 30 percent. In contrast,



HCRRA Hennepin County Regional Railroad Authority

LRT System

Environmental Impact Statement

Figure 5.2A

Hiawatha Corridor

BRW

0 1/2 Mile North

Transit Service Routes

Source: Metropolitan Transit Commission

the Nicollet at-grade and at-grade connection to the tunnel route divert from Hiawatha Avenue at Lake Street; therefore, a modification to the bus routes further north on Hiawatha Avenue would not occur.

TABLE 5.20
BUS SERVICE
HIAWATHA CORRIDOR

	EXISTING	LRT TUNNEL	NICOLLET AT GRADE	KENWOOD AT-GRADE
Daily bus miles	8,163	6,156	6,156	5,792
Peak fleet requirement	74	54	54	54
Peak hour buses entering downtown	43	22	22	22

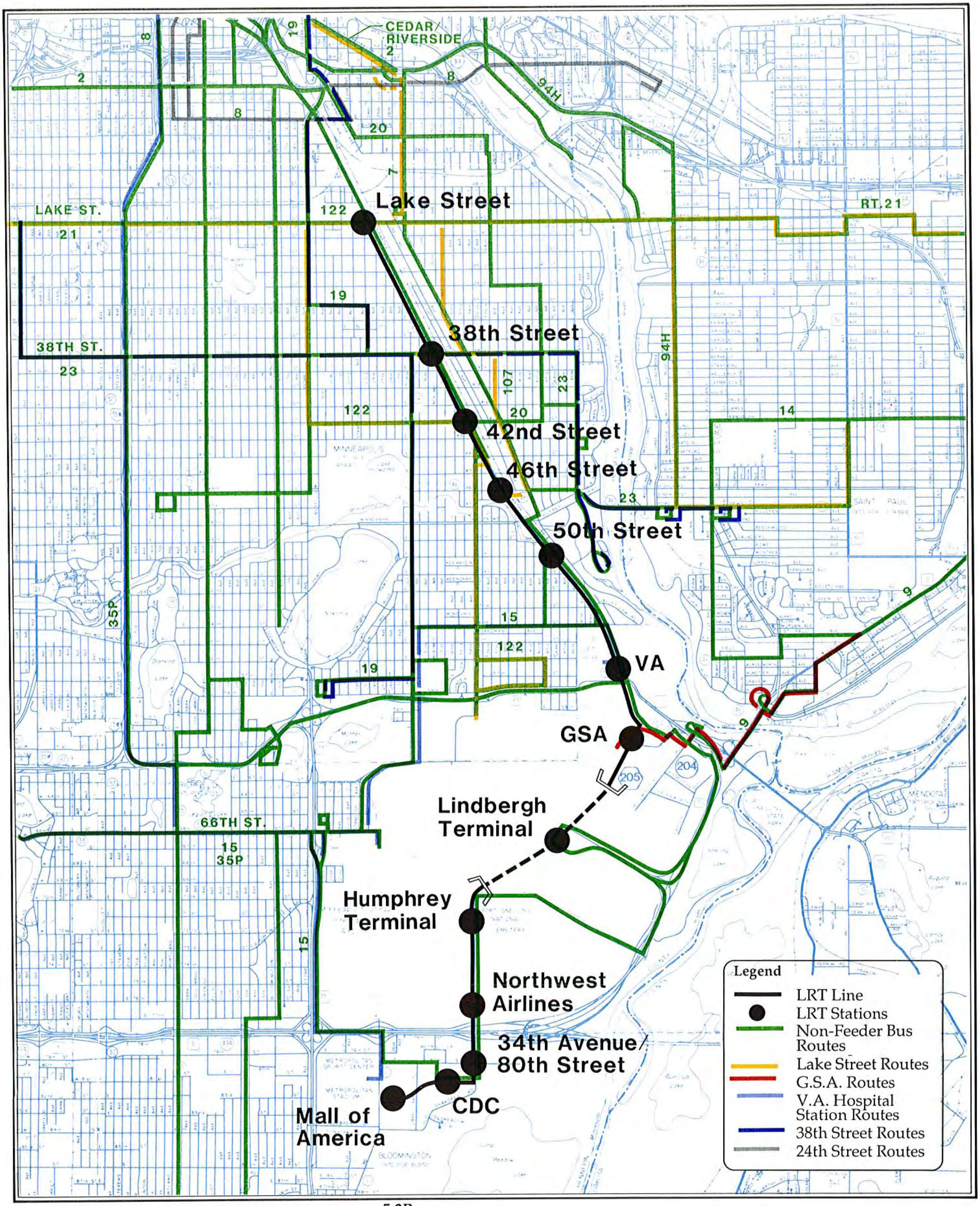
Most of the existing bus service in the Hiawatha Corridor operates at about twelve-minute intervals during the peak travel periods. The LRT operating scenario includes fifteen-minute train service with fifteen-minute feeder bus access to the stations. This service frequency is similar to existing conditions. Only MTC Route 22 following Cedar Avenue and 34th Avenue currently offers a significantly higher service frequency.

The LRT and existing bus travel times to downtown are shown in Table 5.21. The travel time comparisons for each of the corridors represent a "best-case" condition for the bus travel time since future increases in traffic volumes would reduce bus speeds while having little impact on LRT. In addition, current travel times from the Mall of America and Cretin/Ford originating points reflect express bus travel times.

5.4.6 Noise

Operating characteristics, the setback distance to the nearest receiver site and the predicted maximum passby noise levels at the nearest sensitive receiver site for specific segments along the corridor are documented in Table 5.22. Predicted noise levels at the nearest receiver site have been determined based on both the best- and worst-case noise emission rates. As the table indicates, APTA guidelines are exceeded by five dBA (worst-case only) from 54th to 46th Street.

Table 5.23 documents the number of impacted residential, commercial and industrial uses, and the acres of parkland that are forecast to experience maximum passby noise levels



HCRRA
Hennepin County Regional Railroad Authority

LRT
System

Environmental Impact Statement

Figure 5.2B

Hiawatha Corridor

BRW

0 1/2 Mile North

Transit Service Routes

Source: Metropolitan Transit Commission

TABLE 5.21
TRANSIT TRAVEL TIME COMPARISON FROM
HIAWATHA CORRIDOR TO DOWNTOWN MINNEAPOLIS

ORIGIN	PEAK HOUR TRAVEL TIME (MINUTES)				LRT TRAVEL TIME IMPACT (MINUTES)		
	CURRENT[1/]	LRT TUNNEL[2/]	LRT AT-GRADE[2/] (Nicollet Avenue Option)	LRT AT-GRADE[2/] (Kenwood Option)	LRT TUNNEL	LRT AT-GRADE (Nicollet Avenue Option)	LRT AT-GRADE (Kenwood Option)
28th Avenue/56th Street	35	26	27	27	-9	-8	-8
Mall of America	30	35	36	36	+5	+6	+6
Cretin/Ford	27	32	33	33	+5	+6	+6

1/ Current bus travel times are used rather than 2010 no-build conditions because of future congestion impacts on street travel speeds will decrease as traffic congestion continues to increase in the future.

2/ Transfer from feeder bus includes three-minute wait for LRT.

TABLE 5.22
PREDICTED LRT VEHICLE NOISE IMPACTS

Hiawatha Corridor

Line Segment Start	Line Segment End	Adjacent Land Use	Minimum Setback	APTA Guideline	Segment Speed	Predicted LMAX At Minimum Setback		Guideline Exceeded?		Distance To Applicable LMAX Guideline	
						Best	Worst	Best	Worst	Best	Worst
End of Line	I-494	Commercial	60'	85 dBA	35 MPH	73 dBA	78 dBA	N	N	*	*
I-494	Airport Tunnel	Airport/National Cemetary	140'	75 dBA	55 MPH	67 dBA	72 dBA	N	N	*	110'
Airport Tunnel	CSAH 62	Commercial	60'	85 dBA	35 MPH	73 dBA	78 dBA	N	N	*	*
CSAH 62	54th Street	Veteran's MC	120'	75 dBA	35 MPH	69 dBA	74 dBA	N	N	*	110'
54th Street	46th Street	Average Residential	50'	75 dBA	35 MPH	75 dBA	80 dBA	N	Y	50'	110'
46th Street	44th Street	WS-Average Residential	145'	75 dBA	35 MPH	64 dBA	69 dBA	N	N	50'	110'
		ES-Industrial	150'	85 dBA	35 MPH	68 dBA	73 dBA	N	N	*	*
44th Street	36th Street	WS-Average Residential	170'	75 dBA	35 MPH	64 dBA	69 dBA	N	N	50'	110'
		ES-Industrial	150'	85 dBA	35 MPH	68 dBA	73 dBA	N	N	*	*
36th Street	Lake Street	WS-Average Residental	140'	75 dBA	35 MPH	65 dBA	69 dBA	N	N	50'	110'
		ES-Industrial	150'	85 dBA	35 MPH	68 dBA	73 dBA	N	N	*	*

NOTE: * - Distance to applicable APTA guideline noise level is less than 50 feet from the centerline of the LRT line.
WS - West Side
ES - East Side
Y - Yes, predicted noise levels exceeds guideline
N - No, predicted noise levels do not exceed guideline

TABLE 5.23
PROPOSED LRT LINE NOISE IMPACTS

Hiawatha Corridor

Line Segment Start	Line Segment End	Dwellings Impacted	Institutional Uses Impacted	Comm/Indust Uses Impacted	Park Acres Impacted
End of Line	I-494	0 / 0	0 / 0	0 / 0	0.00 /0.00
I-494	Airport Tunnel	0 / 0	0 / 0	0 / 0	0.00 /0.00
Airport Tunnel	CSAH 62	0 / 0	0 / 0	0 / 0	0.00 /0.00
CSAH 62	54th Street	0 / 0	0 / 0	0 / 0	0.00 /0.00
54th Street	52nd Street	0 /34	0 / 0	0 / 0	0.00 /0.00
52nd Street	46th Street	0 / 0	0 / 0	0 / 0	0.00 /0.00
46th Street	44th Street	0 / 0	0 / 0	0 / 0	0.00 /0.00
44th Street	36th Street	0 / 0	0 / 0	0 / 0	0.00 /0.00
36th Street	Lake Street	0 / 0	0 / 0	0 / 0	0.00 /0.00
Lake Street	I-94	0 / 0	0 / 0	0 / 0	0.00 /0.00
I-94	I-35W	0 / 0	0 / 0	0 / 0	0.00 /0.00
I-35W	Central Area	0 / 0	0 / 0	0 / 0	0.00 /0.00
	Subtotal:	0 /34	0 / 0	0 / 0	0.00 /0.00

NOTE: 0 / 0 = Best-Case/Worst-Case

Impact area for proposed LRT line reflects construction of a noise barrier as is included in the Hiawatha Avenue Improvement Project.

Noise mitigation effects of intervening buildings were accounted for in the impact area evaluation.

Dwelling units include individual apartment units.

which exceed the APTA guidelines. Specifically, thirty-four dwelling units, under worst-case conditions, could experience noise levels which exceed APTA guidelines.

As a part of the TH 55 reconstruction project, noise barriers would be constructed along the west side of the LRT corridor. In the LRV noise impact analysis, the mitigative impacts of the noise barriers were taken into account. Mitigation impacts of the TH 55 noise barriers range from a one to ten decibel reduction in roadway noise at adjacent receivers.

No-Build

The no-build alternative is described by the noise levels identified in the Affected Environment section (4.4.9).

5.4.7 Wetlands, Vegetation and Wildlife

As stated in Section 4.4.11, there are small patches of prairie grasses in the vicinity of Crosstown (62) and Minnehaha Avenue. The prairie survey conducted in the spring of 1989 found the areas disturbed and degraded.

Impacts to the prairie areas are identified in the TH 55 (Hiawatha Avenue) Draft EIS, 1982, (pages 5.83 - 5.84).

No-Build

There would be no impacts to the prairie species under the no-build alternative.

5.4.8 Water Resources

Runoff and Receiving Waters

The Hiawatha LRT line is not expected to impact any storm water management systems. Local site-related storm water handling would be accomplished as approved by the Richfield-Bloomington Water Management organization, the Minnehaha Creek Watershed District, Middle Mississippi Watershed Management organization, and governing municipalities. A copy of the response letters from each of the above-mentioned watershed organizations is included in Section 8.3.

No-Build:

There would be no impacts to the receiving bodies of water under the no-build alternative.

Floodplains

This corridor crosses the Minnehaha Creek floodplain just south of the Hiawatha Avenue/Minnehaha Boulevard intersection. According to the Hiawatha Avenue FEIS, 1985, (pages 3.33 - 3.34), the replacement of the existing roadway bridge with the new roadway/LRT bridge will allow the creek to flow through this area with less restriction, decreasing the flooding problems at Longfellow Park.

No-Build:

There would be no impacts to the Hiawatha Corridor floodplains under the no-build alternative.

Shoreland Zoning Districts

The Hiawatha LRT track would run within a portion of the Minnehaha Creek Shoreland Zoning District. A permit from the City of Minneapolis Zoning Administrator would be required where construction of the LRT system within the District would involve grading or filling of earth and where the slope of the land is toward Minnehaha Creek. It is anticipated that no vegetative cutting would occur within the district boundaries. Mitigation measures for grading and filling would include standard erosion control measures.

No-Build:

There would be no impacts to the Minnehaha Creek Shoreland Zoning District under the no-build alternative.

Groundwater

At-Grade Segments:

During construction, local conditions may require site specific temporary (five to ten days) lowering of the water table. The groundwater affected would be confined to the area of construction. Impacts would occur for a brief (five- to ten-day) time period.

Groundwater appropriation would not be required for the at-grade segments of the Hiawatha Corridor.

Airport Tunnel:

The impact of the airport tunnel on the existing groundwater conditions would be minimal. Penetrations such as shafts and portals could affect perched groundwater in the limestone. Measures would be taken during construction to drain, divert or seal the rock to prevent water leaking into the excavation.

The tunnel would be excavated in the St. Peter sandstone around 770 MSL; the groundwater in the sandstone is expected to be well below the tunnel. Tunnel construction might require removing the shale layer below the limestone. When perched water occurs in the limestone, water could seep through vertical fractures into the tunnel. As with the shafts and portals, measures would be taken to prevent water from entering the tunnel.

<u>No-Build</u>

There would be no impacts to the groundwater under the no-build alternative.

5.4.9 Geological Conditions

Airport Tunnel:

The airport tunnel is proposed to be excavated in St. Peter sandstone using the Platteville limestone for a roof. The tunnel grade will be determined by the bottom surface of the limestone.

<u>No-Build</u>

There would be no significant impacts to the geological conditions under the no-build alternative.

5.4.10 Utilities

At-Grade:

Substantial utility impacts are not anticipated along the at-grade segments in the Hiawatha Corridor. Impacts are most likely to occur where cross-streets are encountered. Most of the existing utilities are being adjusted during roadway reconstruction in anticipation of LRT construction.

Airport Tunnel:

Surface utilities in the airport tunnel area consist of shallow drainage structures and water, electricity and natural gas utilities. Utilities do not pose a significant problem or expense for construction of portal structures. There are no known deep utilities in the limestone or sandstone along the proposed alignment.

<u>No-Build</u>

Existing utilities would not be impacted if the no-build alternative was selected.

5.4.11 Steep Slopes

Steep slopes are not a factor in the Hiawatha Corridor except at the two tunnel portals on the airport property and at the Lake Street underpass, where tunnel construction will accommodate the change in grade as the LRT tracks proceed underground.

5.4.12 Parklands

The parklands impact analysis identified Minnehaha Park, Minnehaha Parkway, Longfellow Gardens, and the Wenonah Triangle as parks which would be impacted by the Hiawatha LRT line.

The LRT would be developed in conjunction with the upgrading of TH 55 and would run alongside that arterial highway. The two facilities would pass through Minnehaha Park within a covered roadway, then over Minnehaha Creek on an open bridge. TH 55 and the LRT would be slightly depressed as it passes through the park, and Minnehaha Parkway would be slightly elevated as it crosses the highway and the LRT.

Construction of the two facilities would result in a net increase of 1.55 acres of usable parkland for Minnehaha Park and environs and would physically unite Minnehaha Park and Longfellow Gardens, making the two parks more usable.

Access to Minnehaha Park via Minnehaha Parkway would be improved because the roadway would be vertically separated. However, access to this park via TH 55 would be made more circuitous than it is presently for some trips.

Impacts to the Minnehaha Park complex as a result of the LRT and TH 55 project are identified in the TH 55 (Hiawatha Avenue) Draft and Final Environmental Impact Statement/ (4f) Evaluation and Alternatives Analysis, 1982 and 1985 (pages 6.1-6.37 and 6.1-6.31, respectively). Mitigation measures are also identified in the above-referenced documents.

Other Parks:

No noticeable impacts are expected on the following parks in the Hiawatha Corridor: Minnesota Valley National Wildlife Refuge and Recreation Area and Fort Snelling State Park. The Wildlife Refuge and Fort Snelling State Park would not be affected because of their distance from the LRT line and because of the intervening buildings, vegetation, and hills.

No-Build

There would be no impacts to the parks in the Hiawatha Corridor study area under the no-build alternative.

5.4.13 Visual and Aesthetics

The visual impact that the LRT alignment would have is related to the surrounding land use, visibility of the LRT track, overhead catenary wire and vehicle (Figures 5.3A-B).

South of CSAH 62, existing overhead wires would partially mask the LRT catenary wires. The visual impacts related to the airport tunnel would occur at the portals.

North of CSAH 62 the proposed LRT line, including the covered roadway and noise walls along Minnehaha Park, would impact the park environment. The combination of the LRT line and the roadway improvements would enhance the park atmosphere because of the decrease in vehicle encroachment.

As noted in the Hiawatha Avenue DEIS, 1982, from 46th to Lake Street, the corridor image would be enhanced with the widening of Hiawatha Avenue and the plans for landscape berms and noise walls predominantly on the west. Again, the existing overhead wires would help mask the LRT catenary wires.

No-Build

There would be no impact to the Hiawatha Corridor visual environment under the no-build alternative.

5.4.14 Historic and Cultural Resources

Impacts associated with building an LRT line in the Hiawatha Corridor were previously identified in the TH 55 (Hiawatha Avenue) Draft Environmental Impact Statement/4(f) Evaluation and Alternatives Analysis (1982) (pages 7.1-7.19) by the City of Minneapolis and Minnesota Department of Transportation. Adverse effects on historic properties within the Minnehaha Falls Historic District were documented at that time. These issues were addressed in the March 1984 Memorandum of Agreement (Appendix) reached between the Federal Highway Administration (FHWA), the Minnesota State Preservation Officer (SHPO), and the Advisory Council on Historic Preservation (ACHP). Stipulations for mitigation measures were outlined for the Minnehaha Depot, R.F. Jones (Longfellow House), Minnehaha Falls District, and the open field near the junction of TH 55 and CSAH 62.

Effects on the U.S. Army Department of the Dakota buildings remain undetermined until completion of the final LRT design. The critical issue is the location of the northern portal for the tunnel under the airport. This portal could impact the archaeological remains of the U.S. Department of the Dakota buildings that were located along the south end of Taylor Avenue and demolished for the present airport runway. The tunnel should not affect the integrity of the archaeological remains, as it will be bored below a strata of limestone, beyond the limits of the archaeological sites. The SHPO will need to re-review this section upon completion of a final LRT alignment/design.

No-Build

There would be no impacts to the historic and cultural resources under the no-build alternative.

5.5 SOUTHWEST CORRIDOR

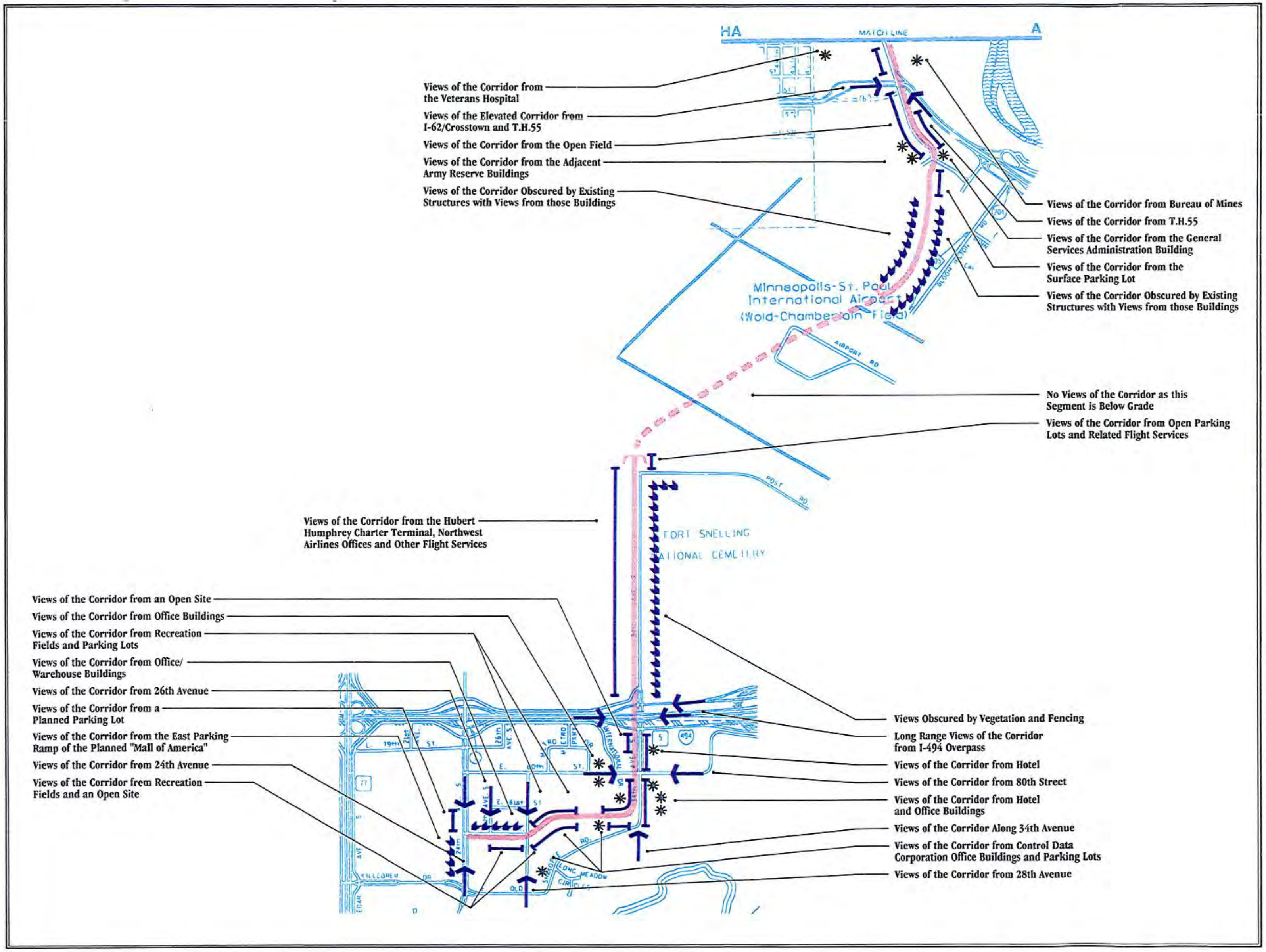
5.5.1 Community and Neighborhood Character

LRT services in the Southwest Corridor could play an important role in meeting the work trip demands of the corridor's residents. Additionally, LRT services would provide area residents, particularly transit dependent individuals, with increased access opportunities to community facilities and activities.

Many industrial uses are located in the Southwest Corridor. Station stops on the Southwest line have been planned to facilitate employee usage and access to nearby employment sites.

Because the alignment would be located within an established railroad right-of-way, impacts on abutting communities, neighborhoods, and related facilities are expected to be minimal. The existing railroad right-of-way is recognized as a boundary between the northern and southern communities and neighborhoods. Therefore, the proposed project would not divide communities or neighborhood units.

Excelsior Boulevard crosses the LRT alignment within the City of Hopkins. Fire Department vehicles from Hopkins must be able to cross the LRT alignment on Excelsior Boulevard in order to service southeast areas of the City. Emergency vehicles in route to the Methodist Hospital in St. Louis Park from the western areas of Hopkins must also be able to cross at-grade on Excelsior Boulevard. It is anticipated that fire department vehicle access and access to the Methodist Hospital will not be impacted by the LRT alignment.



Visual Aesthetics

Figure 5.3A

Hiawatha Corridor

BRW

0' 1,000' 2,000' North

Legend

- LRT Alignment
- Open View
- Elevated View
- Obscured View
- Vegetative Block
- ✱ View from Building

HCRRA

LRT System

Environmental Impact Statement

No-Build

There would be no impacts to the communities and neighborhoods in the Southwest Corridor study area under the no-build alternative.

5.5.2 Potential Relocation and Displacement

Station Locations

Table 5.24 identifies the preliminary estimates regarding station-related property acquisitions. These estimates may be refined/revised following additional engineering analysis.

Railroad Right-of-Way

As indicated in Section 3.2.2.2, the alignment in the Southwest Corridor would be in right-of-way previously owned by the Soo Line railroad. In 1981, the HCRRA purchased the old Chicago Northwestern railroad tracks that ran between Minneapolis and Victoria. It is proposed that the HCRRA acquire the Soo Line right-of-way which runs immediately to the south of the HCRRA right-of-way. Soo Line freight operations would switch to the northern HCRRA tracks.

No-Build

There would be no relocation/property acquisition required with this alternative.

5.5.3 Railroad Operations Impacts

Present railroad freight operations in the Southwest Corridor service three active freight customers on the north (HCRRA) side of the railway corridor, with four local customers serviced by the Soo Line on the south side of the Soo Line right-of-way between Minneapolis and Hopkins City Limits.

As noted previously, the HCRRA is currently negotiating with the Soo Line Railroad regarding LRT alignment on Soo Line right-of-way. Access to these businesses are included in these negotiations.

No-Build

There would be no impacts to the industries serviced by the Soo Line under the no-build alternative.

TABLE 5.24
STATION-RELATED PROPERTY ACQUISITIONS
SOUTHWEST CORRIDOR

STATION LOCATION	NO. OF STRUCTURES	SIZE OF STRUCTURES*	USE	APPROXIMATE SIZE OF PARCEL
Excelsior Boulevard Station	4	79,500	Industrial	6 acres
Blake/Tyler Avenue Station	0	0	Parking/ Industrial	3.17 acres
Louisiana Avenue Station	0	0	Industrial	3.54 acres
Wooddale Avenue Station	2	40,250	Industrial/ Commercial	3.86 acres
Beltline Boulevard Station	0	0	Vacant	2.18 acres

* Approximate ground floor square footage

5.5.4 Economic Development

The provision of LRT could enhance employment growth within the corridor without the impacts normally associated with development. Specifically, provision of LRT service would enable development to occur in the corridor, while potentially reducing the need for large employee parking areas.

The Excelsior Boulevard station could have some development impact on several parcels of land which are currently used for industrial purposes. The revised City of Hopkins Comprehensive Plan references the development potential that LRT may enhance, particularly at the site currently owned by Hennepin County. This station could also have a positive impact on downtown Hopkins development potential.

The area served by the Tyler station is very similar to that of the Excelsior Boulevard station. A mix of industrial and commercial land uses surround the site and good quality single-family and multi-family residential neighborhoods are located beyond the business properties. The City of Hopkins is currently considering establishing a T.I.F. redevelopment to the area south of the railroad right-of-way and west of the commercial shops. The potential extension of Tyler Street through to Excelsior Boulevard could enhance the redevelopment potential in this area.

The City of Saint Louis Park land use plan suggests a gradual intensification of the existing land use pattern around all three station sites located in Saint Louis Park. Industrial land uses and multi-family housing will be encouraged in these areas.

The Beltline station, in the City of St. Louis Park, is located in existing railroad right-of-way. This station would serve a well developed industrial park to the southwest; multi-family housing and small-scale industrial and commercial buildings to the north. There are several undeveloped sites in this area and some redevelopment may also be possible.

The Wooddale site is also located in the City of St. Louis Park. This station would serve both a mature neighborhood with some industrial size buildings to the south and a residential neighborhood with supporting commercial and public services located to the north. Although land in this area is fully developed, some parcels are underutilized and could become redevelopment opportunities at a future time. The City Council recently rezoned the nearby open elevator site for 156 residential units and received proposals for redevelopment of the industrial site northwest of the station. In addition, private developers are in the process of expanding the site currently occupied by the Burlington Coat Outlet to the southwest.

The station at Louisiana, which would be located in the City of St. Louis Park, would serve a mature industrial area. Methodist Hospital and a large multi-family residential community are located at the southern fringe of the station's primary service area. An older single-family neighborhood and a recently built multi-family complex are located to the northeast of the primary service area.

Major land use changes have occurred near the proposed Louisiana station site over the past few years. The extension of Louisiana Avenue across Highway 7 would create some redevelopment opportunities over the next few years.

No-Build

Under the no-build alternative, development within the Southwest Corridor would be in accordance with the zoning ordinances and land use plans of the governing municipalities.

5.5.5 Traffic Impacts

The results of the scoping analysis for the Southwest Corridor stations are outlined in Table 5.25.

TABLE 5.25
SOUTHWEST CORRIDOR STATION SCOPING ANALYSIS

Station Site	Potential Traffic Impact Level	PM Peak Hour Peak Direction Trips
Excelsior Boulevard Station	Significant	Greater than 250
Blake Road Station	Minor	Greater than 100
Louisiana Station	Not Significant	Less than 100
Wooddale Avenue	Not Significant	Less than 100
Beltline Boulevard	Not Significant	Less than 100

Excelsior Boulevard Station

This station would be located on the south side of County Road 3 and the Soo Line Railroad tracks to the west of TH 169 in Hopkins. The site currently contains three industrial or manufacturing facilities.

Access to the site will be provided from Washington Avenue, and from County Road 3 via a new road which would be an extension of the ramps from and to southbound TH 169. In addition, the City of Hopkins plans to construct a new road which would be an extension of the ramps from and to northbound TH 169. Trips to and from the station will be able to use this connection and Milwaukee Street, which passes under TH 169, to reach the station.

Trip generation at the site will be about 311 vehicle trips per hour during the PM peak hour under the build alternative (Table 5.23).

The intersections of County Road 3 with 5th Avenue, the northbound TH 169 ramps and the southbound TH 169 ramps could be affected by traffic generated by the LRT station. Capacity analysis of these three intersections found that all would operate within their capacity.

Blake Road Station

The Blake Road station would be located west of Blake Road and east of Tyler Avenue along the south side of the railroad tracks. Access to the station would be from both Blake Road and Tyler Avenue via 2nd Street Northeast. The site is currently used by an auto towing company for storage of impounded vehicles.

Trip generation at the site will be about 264 vehicle trips per hour during the PM peak hour under the build alternative (Table 5.26).

TABLE 5.26
SOUTHWEST CORRIDOR STATION SITE TRIP GENERATION

	No-Build		Build		
		PM Peak		PM Peak Hour	
Station	Daily	Hour	Daily	In	Out
Excelsior Boulevard (Hopkins)			1,628	82	229
Blake Road			1,432	59	205

Traffic generated by the station will approach from the east, via Blake Road and 2nd Street, or from the west via Tyler Avenue and 2nd Street. The intersection most likely to be affected is Blake Road and 2nd Street. The intersection is unsignalized and currently operates under capacity. The capacity analysis indicates that in the build condition, the intersection would continue to operate under capacity.

5.5.6 Transit Service

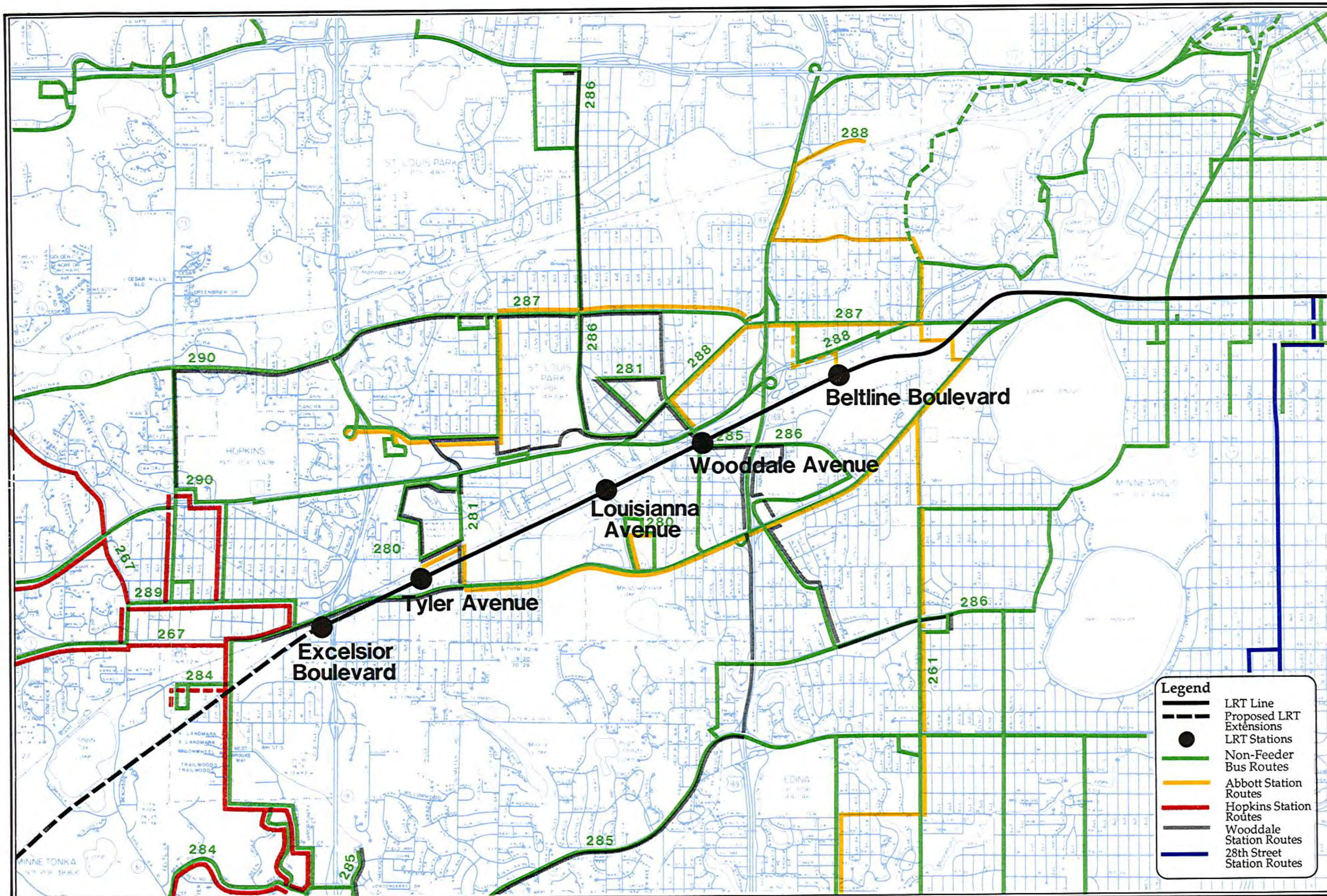
The transit service analysis compares the impacts that the Central Area alignment options would have on bus routes serving the Southwest Corridor area (Table 5.27). Figure 5.4 identifies the proposed feeder bus routes, and the non-feeder bus routes which would continue to service the Southwest area. The tunnel and Nicollet Avenue at-grade alternatives would result in an eighteen percent reduction in bus miles and 28 percent reduction in peak hour fleet requirements. Peak hour buses entering downtown from the Southwest Corridor area would drop by 61 percent.

In the Southwest Corridor five routes would be eliminated and two would have reduced service with LRT. The routes to be eliminated include: Route 6B South which runs along Hennepin and France Avenues in Minneapolis and Edina; Route 12 which serves Southwest Minneapolis, St. Louis Park, Hopkins and Minnetonka; Route 17 H and J, an express that runs along Highways 12 and 100 into St. Louis Park and Hopkins; Route 35B, an express that runs along West 50th Street and Vernon into Edina; and Route 67, an express that runs along Minnetonka Boulevard and Highway 7 between Tonka Bay and Minneapolis. In addition, Route 9 which runs along Glenwood Avenue, France Avenue and Cedar Lake Road, and the remaining portions of Route 17, will have a reduction in service frequency. Each one of these affected route areas will be replaced with feeder bus access to respective stations along the Southwest LRT line.

The Kenwood at-grade alignment into downtown would have a lesser impact on buses serving the Southwest Corridor area, as the route shifts from the 29th Street Corridor to the HCRRA right-of-way, which is located to the northwest through the Kenwood Area. Specifically, several bus routes intercepted by the LRT line along 29th Street would proceed into downtown. The net impact of the at-grade alternative is an eleven percent decrease in bus miles, 23 percent decrease in fleet requirements, and a 48 percent drop in downtown buses from the corridor.

TABLE 5.27
BUS SERVICE IN SOUTHWEST CORRIDOR

	EXISTING	LRT TUNNEL	LRT AT-GRADE (Nicollet Option)	LRT AT-GRADE (Kenwood Option)
Daily bus miles	7,018	5,736	5,736	6,236
Peak fleet requirement	78	56	56	60
Peak hour buses entering downtown	71	28	28	37



HCRRA Hennepin County Regional Railroad Authority

LRT System

Environmental Impact Statement

Figure 5.4

Southwest Corridor

BRW

Transit Service Routes

Source: Metropolitan Transit Commission

All the LRT options result in a significant decrease in transit travel time to downtown for each of the sample trip origins. As Table 5.28 indicates, the time savings ranges from seven to sixteen minutes, depending upon the trip origin and downtown alignment. The exclusive LRT right-of-way provides a considerable speed advantage over buses operating in mixed traffic.

Existing peak hour bus service in the Southwest Corridor generally operates at ten to twenty-minute intervals west of the City lakes. This service level would be maintained under both LRT options, using fifteen-minute feeder buses and fifteen-minute LRT service. Local routes east of the lakes would continue to operate at or near their current short headways, typically approaching five minutes. As shown in Figure 5.4 (dashed line), a limited service line will be provided from Route 288. Service frequency would drop significantly only along Vernon Avenue and 50th Street where the seven-minute local bus is replaced by a fifteen-minute feeder route.

Transit service within and between the LRT corridors would be enhanced by the increased crosstown service and connecting service through downtown. Crosstown service improvements would include improved corridor access to downtown Hopkins and the Knollwood Mall.

5.5.7 Noise

Operating characteristics, the setback distance to the nearest receiver site and the predicted maximum passby noise levels at the nearest sensitive receiver site for specific segments along the corridor are documented in Table 5.29. Predicted noise levels at the nearest receiver site have been determined based on both the best- and worst-case noise emission rates.

Table 5.30 documents the number of impacted residential, commercial and industrial uses and the acres of park that are forecast to experience maximum passby noise levels which exceed APTA guidelines.

As the tables indicate, the area which could incur the greatest noise impact would be between the Hopkins/Saint Louis Park city limits and Louisiana Avenue. In this section of the line, the APTA guidelines are exceeded under both the best- and worst-case.

No-Build

The no-build alternative is described by the noise levels identified in the Affected Environment Section (4.5.8).

TABLE 5.28
TRANSIT TRAVEL TIME COMPARISON FROM THE SOUTHWEST CORRIDOR TO DOWNTOWN MINNEAPOLIS

		PEAK HOUR TRAVEL TIME (MINUTES)				LRT TRAVEL TIME IMPACT (MINUTES)		
CORRIDOR	ORIGIN	CURRENT 1/	LRT TUNNEL 2/	LRT AT-GRADE 2/ (Nicollet Option)	LRT AT-GRADE 2/ (Kenwood Option)	LRT TUNNEL	LRT AT-GRADE (Nicollet Option)	LRT AT-GRADE (Kenwood Option)
Southwest	Lake/France	26	11	10	10	-15	-16	-16
	Main/17th Hopkins	39	32	31	31	-7	-8	-8
	Louisiana/Minnetonka	38	26	25	25	-12	-13	-13

1/ Current bus travel times are used rather than 2010 no-build conditions because future congestion impacts on street travel speeds are not quanitified. This represents a best case comparison, since bus travel speeds will decrease as traffic congestion continues to increase in the future.

2/ Transfer from feeder bus includes three minute wait for LRT.

TABLE 5.29
PREDICTED LRT MAXIMUM PASSBY NOISE LEVELS

Southwest Corridor

Line Segment Start	Line Segment End	Adjacent Land Use	Minimum Setback	APTA Guideline	Segment Speed	Predicted LMAX At Minimum Setback		Guideline Exceeded?		Distance To Applicable LMAX Standard	
						Best	Worst	Best	Worst	Best	Worst
Hopkins Station	US 169	NS-Av. Residential	230'	75 dBA	55 MPH	69 dBA	74 dBA	N	N	90'	200'
		SS-Commercial/ Industrial	70'	85 dBA	55 MPH	77 dBA	82 dBA	N	N	*	*
Monroe Ave	Van Buren Ave	SS-Residential	260'	75 dBA	55 MPH	68 dBA	73 dBA	N	N	90'	200'
US 169	East of Blake Road	Commercial/ Industrial	70'	85 dBA	55 MPH	77 dBA	82 dBA	N	N	*	*
East of Blake Road	Hopkins City Limits	NS-Industrial/ Commercial	70'	85 dBA	55 MPH	77 dBA	82 dBA	N	N	*	*
		SS-Av. Residential/ Industrial Commercial	180'	75 dBA	55 MPH	71 dBA	76 dBA	N	Y	90'	200'
Hopkins City Limits/Saint Louis Park	Louisiana	NS-Park/Av. Residential	50'	75 dBA	55 MPH	79 dBA	84 dBA	Y	Y	90'	200'
		SS-Industrial	100'	85 dBA	55 MPH	74 dBA	79 dBA	N	N	*	*
Louisiana Avenue	Soo Line Railroad	Industrial/ Commercial	70'	85 dBA	55 MPH	77 dBA	82 dBA	N	N	*	*
Soo Line Railroad	Wooddale Boulevard	NS-Industrial	50'	85 dBA	55 MPH	79 dBA	84 dBA	N	N	*	*
		SS-Av. Residential/ Park (to Brunswick)	100'	75 dBA	55 MPH	74 dBA	79 dBA	N	Y	90'	200'
Wooddale Boulevard	Beltline Boulevard	Industrial	65'	85 dBA	55 MPH	77 dBA	82 dBA	N	N	*	*
Beltline Boulevard	Central Area	NS-Av. Residential	190'	75 dBA	55 MPH	71 dBA	76 dBA	N	Y	90'	200'
		SS-Av. Residential	400'	75 dBA	55 MPH	65 dBA	70 dBA	N	N	90'	200'

NOTE: * - Distance to applicable APTA maximum guideline noise level is less than 50 feet from the centerline of the LRT line.
NS - North Side
SS - South Side
Y - Yes, predicted noise levels exceed guideline
N - No, predicted noise levels do not exceed guideline

TABLE 5.30
LEVEL OF LRT VEHICLE NOISE IMPACTS

Southwest Corridor

Line Segment Start	Line Segment End	Best- and Worst-Case Scenarios: Dwellings Impacted	Institutional Uses Impacted	Comm/Indust Uses Impacted	Park Acres Impacted
Excelsior Boulevard Station	US Highway 169	0 / 0	0 / 0	0 / 0	0.00 / 0.00
Monroe Avenue	Van Buren Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
East of Blake Road	US Highway 169	0 / 0	0 / 0	0 / 0	0.00 / 0.00
East of Blake Road	Hopkins/St.Louis Park City Limits	0 / 9	0 / 0	0 / 0	0.00 / 0.00
Hopkins/St. Louis Park City Limits	Louisiana Avenue	0 / 33	0 / 0	0 / 0	1.06 / 2.72
Louisiana Avenue	Soo Line Railroad	0 / 0	0 / 0	0 / 0	0.00 / 0.00
Soo Line Railroad	Wooddale Boulevard	0 / 4	0 / 0	0 / 0	0.00 / 0.49
Wooddale Boulevard	Beltline Boulevard	0 / 0	0 / 0	0 / 0	0.00 / 0.00
Beltline Boulevard	Central Area	0 / 2	0 / 0	0 / 0	0.00 / 0.00
	Subtotal:	0 / 48	0 / 0	D / 0	1.06 / 3.21

Note: - 0 / 0 - Best-Case Impacts/Worst-Case Impacts

- Noise mitigation effects of intervening buildings were accounted for in the impact area evaluation.

- Dwellings include apartment units.

5.5.8 Wetlands, Vegetation and Wildlife

Table 5.31 quantifies the impacts of the proposed Southwest LRT line on identified wetland and prairie communities (Figure 4.23).

Construction of LRT tracks would eliminate all the prairie vegetation in areas A, B, C, E, G and H, since much of it is presently growing on the top and slopes of the existing grade. The best means of mitigating this loss would be to revegetate the areas with a prairie seed mixture that includes some prairie forbs.

The DNR protected wetland (661W) would not be impacted by the LRT system. The riparian community between Minnehaha Creek and the existing tracks may be disturbed by LRT construction, in addition to the possible rechannelization of the creek itself if the tracks are expanded.

No-Build

The no-build alternative would have no direct impacts on wetland or prairie communities in the Southwest Corridor area.

TABLE 5.31
SOUTHWEST CORRIDOR-WETLAND AND PRAIRIE INVENTORY

Area	Prairie Impact Area (feet) (North)	Prairie Impact Area (feet) (South)	Wetland Impact Area (acres) (North)	Wetland Impact Area (acres) (South)
A	600 x 20	600 x 5	--	--
B	600 x 20	600 x 5	--	--
C	200 x 10	200 x 5	--	--
D	--	--	0.65	0.03
E	1,800 x 25	1,800 x 5	--	--
F	--	--	--	--
G	700 x 5	700 x 5	--	--
H	300 x 3	300 x 2	--	--

Note: Area F is a Protected Wetland (661W). The LRT would not impact this wetland.

Impacted prairies are quantified in linear feet to clearly identify areas which are located adjacent to the existing railroad right-of-way.

5.5.9 Water Resources

Runoff and Receiving Waters

Build Alternative:

The proposed Southwest LRT line would have no affect on storm water management facilities in the Minnehaha Creek Watershed District.

Localized handling of storm water and any mitigation required because of increased impervious area at station locations will be in accordance with the rules identified by the Minnehaha Creek Watershed District. (Response letter in Chapter 8.3.)

No-Build Alternative:

Under the no-build alternative, there would be no impacts to the runoff and receiving bodies of water.

Floodplains

Build Alternative:

There are two floodplains along this corridor that could be impacted by the LRT system. One of the floodplains is associated with a small area of Minnehaha Creek where it crosses under the existing tracks. The other area is located around DNR protected wetland 661W. It is anticipated that impacts imposed by the LRT on these floodplains would be insignificant.

No-Build Alternative:

There would be no impacts to the floodplains in the Southwest Corridor under the no-build alternative.

Groundwater

Build Alternative:

It is not expected that groundwater apppropriation for the build alternative would be required for any portion of the Southwest LRT line. It is possible, however, that local conditions may require site specific temporary lowering of the water table for construction. The groundwater affected would be confined to the area of construction. Impacts would occur for a brief (five- to ten-day) time period.

No-Build Alternative:

There would be no impacts to groundwater in the Southwest Corridor area under the no-build alternative.

5.5.10 Utilities

Significant utility impacts are not expected along the Southwest LRT line. Impacts are most likely to occur where cross-streets are encountered.

No-Build

There would be no impacts to utilities with the no-build alternative.

5.5.11 Parklands

- o Edgebrook Park (St. Louis Park):

  The LRT would result in visual and noise impacts on Edgebrook Park along the parks 2,000-foot southern edge. Existing trees and shrubs would serve to lessen the visual impacts on the park.

- o Jorvig Park (St. Louis Park):

  The LRT would result in noise and visual impacts along its 400-foot northern edge. The edge of the park would be located approximately 100 feet from the LRT line and elevated slightly above the rail lines. This change in elevation and a row of existing trees and shrubs along the northern edge of the park would help to lessen the visual impacts.

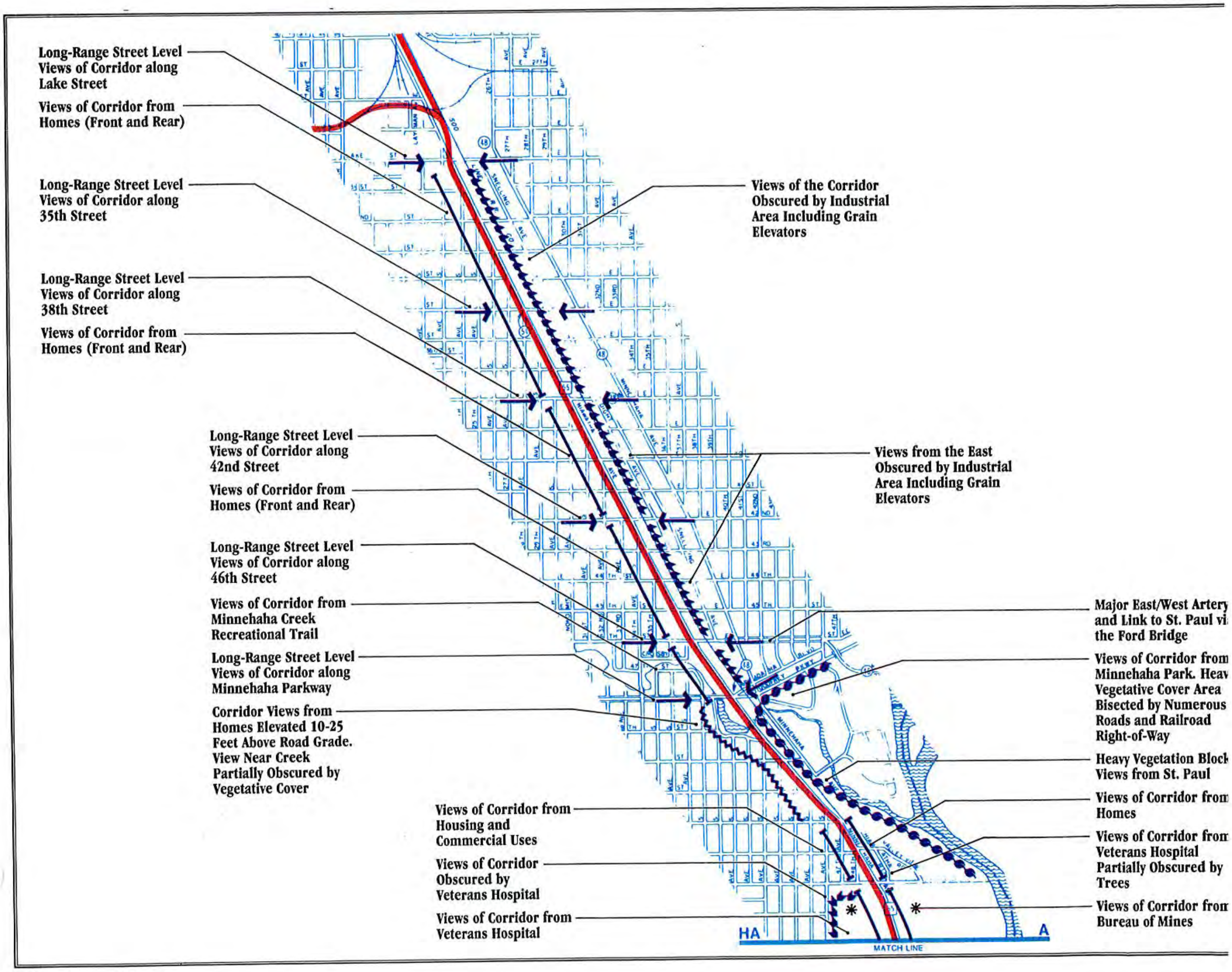
No-Build

There would be no significant impacts to the parks in the Southwest Corridor area with the no-build alternative.

5.5.12 Visual and Aesthetics

Figure 5.5 illustrates the specific areas along the southwest line which would be visually affected by the proposed LRT alignment. It also identifies areas where the view of the LRT corridor would be obstructed because of existing land use types and structures.

From the corridor's western limits at 5th Avenue in Hopkins to Blake Road, the LRT line would be visually compatible with the existing industrial/rail corridor. Proceeding east from Blake Road to TH 100 the LRT line would be visually compatible with the existing manufacturing and commercial



Long-Range Street Level Views of Corridor along Lake Street
Views of Corridor from Homes (Front and Rear)
Long-Range Street Level Views of Corridor along 35th Street
Long-Range Street Level Views of Corridor along 38th Street
Views of Corridor from Homes (Front and Rear)
Long-Range Street Level Views of Corridor along 42nd Street
Views of Corridor from Homes (Front and Rear)
Long-Range Street Level Views of Corridor along 46th Street
Views of Corridor from Minnehaha Creek Recreational Trail
Long-Range Street Level Views of Corridor along Minnehaha Parkway
Corridor Views from Homes Elevated 10-25 Feet Above Road Grade. View Near Creek Partially Obscured by Vegetative Cover
Views of Corridor from Housing and Commercial Uses
Views of Corridor Obscured by Veterans Hospital
Views of Corridor from Veterans Hospital
Views of the Corridor Obscured by Industrial Area Including Grain Elevators
Views from the East Obscured by Industrial Area Including Grain Elevators
Major East/West Artery and Link to St. Paul vi the Ford Bridge
Views of Corridor from Minnehaha Park. Heav Vegetative Cover Area Bisected by Numerous Roads and Railroad Right-of-Way
Heavy Vegetation Block Views from St. Paul
Views of Corridor from Homes
Views of Corridor from Veterans Hospital Partially Obscured by Trees
Views of Corridor from Bureau of Mines
HA
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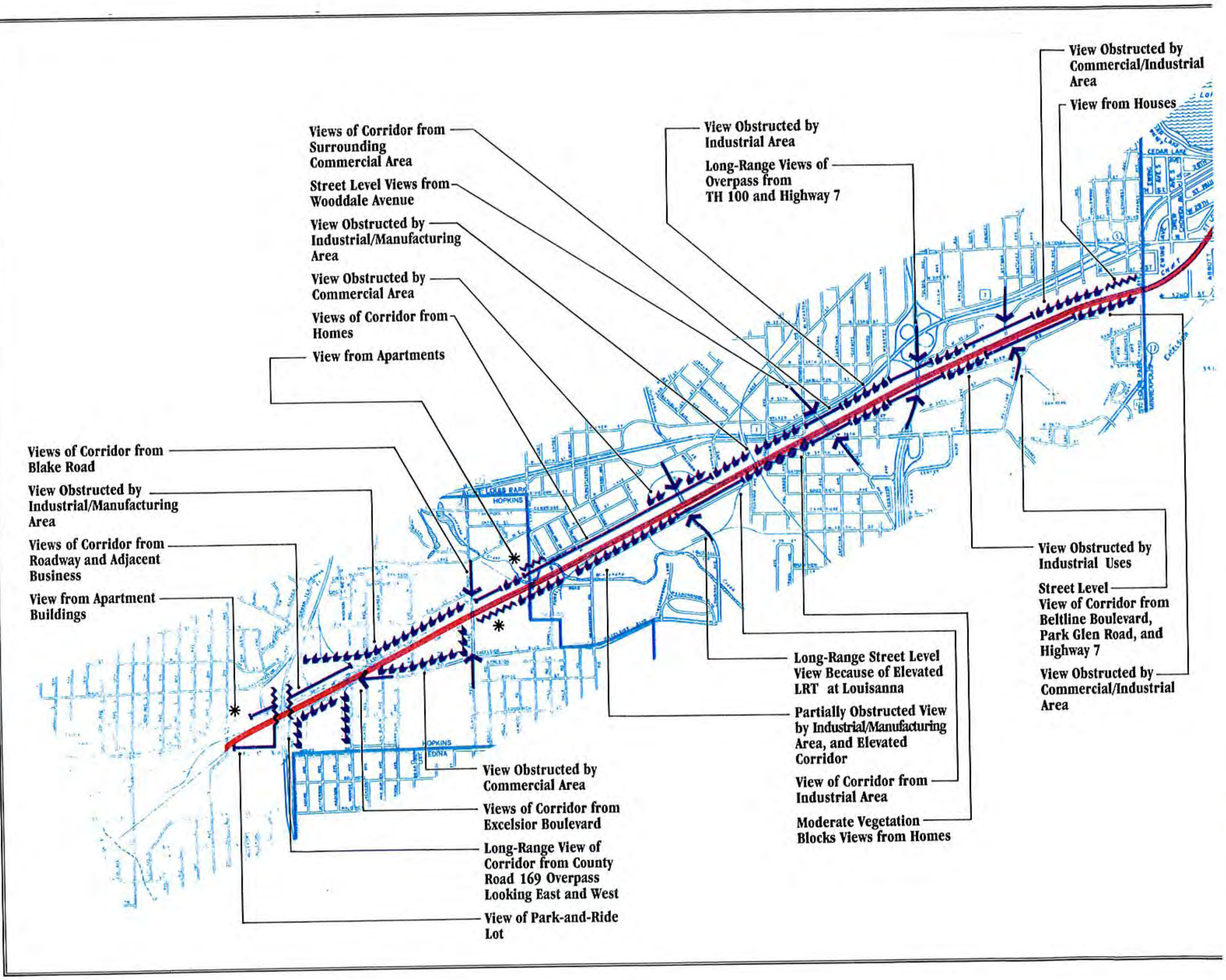
MATCH LINE


View Obstructed by Commercial/Industrial Area
View from Houses
Views of Corridor from Surrounding Commercial Area
Street Level Views from Wooddale Avenue
View Obstructed by Industrial/Manufacturing Area
View Obstructed by Commercial Area
Views of Corridor from Homes
View from Apartments
View Obstructed by Industrial Area
Long-Range Views of Overpass from TH 100 and Highway 7
Views of Corridor from Blake Road
View Obstructed by Industrial/Manufacturing Area
Views of Corridor from Roadway and Adjacent Business
View from Apartment Buildings
View Obstructed by Industrial Uses
Street Level View of Corridor from Beltline Boulevard, Park Glen Road, and Highway 7
View Obstructed by Commercial/Industrial Area
Long-Range Street Level View Because of Elevated LRT at Louisanna
Partially Obstructed View by Industrial/Manufacturing Area, and Elevated Corridor
View of Corridor from Industrial Area
Moderate Vegetation Blocks Views from Homes
View Obstructed by Commercial Area
Views of Corridor from Excelsior Boulevard
Long-Range View of Corridor from County Road 169 Overpass Looking East and West
View of Park-and-Ride Lot
HOPKINS
EDINA

uses. The eastern segment of the line from TH 100 to the Saint Louis Park City limits would continue and potentially enhance the character of the rail corridor.

Throughout the corridor, the existing overhead wires would help mask the LRT catenary wires.

No-Build

There would be no impact to the visual environment under the no-build alternative.

5.5.13 Historic and Cultural Resources

Because the Southwest Corridor does not contain any recorded historic properties, or prehistoric sites, there would be no impacts associated with this particular environmental issue for both either the build or the no-build alternatives.

5.6 NORTHWEST CORRIDOR

5.6.1 Community and Neighborhood Character

Benefits of implementing LRT facilities and services in the Northwest Corridor are directly related to the corridor's growth potential between 1980 and 2010. As outlined in Section 4.6.1, data indicates the Northwest Corridor study area has emerged as one of the growth areas within Hennepin County. Population is projected to increase by almost ten percent between 1980 and 2010, and household incomes are projected to increase by 34 percent during the same period. The forecast also indicates that employment opportunities within the corridor will increase by 27 percent. With an abundance of undeveloped vacant land, the cities within the northern section of the Northwest Corridor are likely locations for future growth in the County.

The transportation needs of Northwest Corridor residents and/or workers traveling to the downtown or within the area's employment centers could be better met through the provision of LRT service.

LRT service in the Northwest Corridor would assist the area's transit dependent individuals. The provision of LRT services for these people would assist them in traveling to employment sites and accessing support facilities and services.

Access to a number of community centers, schools, and health care facilities in the Northwest Corridor area would be enhanced through the provision of LRT service. Among these are:

- o Churches throughout the corridor
- o Hennepin County Vocational-Technical Institute
- o Early Childhood Center in Crystal
- o Crystal Airport
- o Robbinsdale Community Center
- o Robbinsdale Post Office
- o Wirth Park in Golden Valley
- o Harrison Special Education and School Rehabilitation Center in Minneapolis
- o School District Transportation Center in Minneapolis
- o Harrison Neighborhood Center in Minneapolis
- o Phyllis Wheatley Center in Minneapolis
- o Glenwood-Lyndale Community Center in Minneapolis
- o Sumner Library in Minneapolis

Traffic congestion presents obstacles to the efficient operation of emergency vehicles. Within the Northwest Corridor, future traffic congestion (Year 2010) would be lessened through the provision of LRT services, enabling emergency vehicles to more easily access the Golden Valley Health Center (via Golden Valley Road) and the fire stations on 77th Avenue and 40th Avenue.

Because the railroad right-of-way is generally recognized as a boundary between communities and neighborhoods, the proposed alignment would not divide community or neighborhood units in Brooklyn Park, Crystal, Robbinsdale, or Golden Valley. In Minneapolis, TH 55 is the boundary that separates the Willard-Hay and Near-North Neighborhoods (to the north) from the Harrison Neighborhood (to the south). Between Girard Terrace and Bryant Avenue North where the Sumner-Glenwood Neighborhood is divided by TH 55, the LRT line would reinforce this division.

No-Build

Under the no-build alternative there would be no impacts to the Northwest Corridor's community and neighborhood character.

5.6.2 Potential Property Acquisition or Relocation

Individual station sites proposed for the Northwest alignment are estimated to range in size from one to eight acres.

Property acquisitions would be necessary to locate stations along the alignment. Table 5.32 identifies potential displacement impacts.

TABLE 5.32
PROPERTY ACQUISITIONS (DISPLACEMENTS)
NORTHWEST CORRIDOR

STATION LOCATION	NO. OF STRUCTURES	SIZE OF STRUCTURES*	USE	APPROXIMATE SIZE OF PARCEL
85th Avenue Station	0	0	Vacant	8.0 acres
77th Avenue Station	3	29,000 SF	Industrial/ Commercial	6.0 acres
63rd Avenue Station	2	33,350 SF	Industrial/ Commercial	6.2 acres
Bass Lake Road Station	2	21,975 SF	Commercial	2.58 acres
42nd Avenue Station	3	38,625 SF	Commercial/ Industrial	2.5 acres
36th Avenue Station	4	6,600 SF	Residential	1 acre
Penn Avenue Station	0	0	Vacant	1.79 acres
Emerson Avenue Station	0	0	Vacant	1.89 acres

* Approximate Ground Floor Square Footage.

A large portion of the Northwest line is proposed to be located in existing railroad right-of-way. Specifically, the segment from TH 55/Olson Highway to 85th Avenue North would require the purchase of a portion of Burlington Northern's Osseo line right-of-way.

No-Build

There would be no property acquisition or relocation required with the no-build alternative.

5.6.3 Economic Development

Stations With Development Potential:

The station location at 77th Avenue is located in an area where there is opportunity for growth and large scale development, complemented by an increasing population and employment base. Commercial uses are located to the east. Directly to the southeast is an area of approximately three acres of open land that may be attractive to development because of its proximity to existing commercial uses. The City of Brooklyn Park projects that significant economic impact could be realized at this station.

The City of Crystal has tentative plans to increase the existing tax increment district southward to Corvallis Avenue. The City projects that with the developmeht of the Bass Lake Road station, implementation of this tax district could be accelerated. They visualize a mix of development in the expanded district to include more multi-family housing, commercial and some light industrial. Establishment of an LRT station near Bass Lake Road would greatly benefit this redevelopment.

The 42nd Avenue station would be located in the Robbinsdale central business district (CBD). The Robbinsdale CBD, which is a tax increment finance district, has undergone a great deal of redevelopment in the past few years. Although local officials believe that development would occur without the LRT station, they project that the LRT station at 42nd Avenue would be an impetus for redevelopment within the next five to ten years. The City projects that additional commercial space in the four- to five-story building range would be feasible. In addition, some multi-family housing could be worked into this scenario.

Land east of the 36th Avenue station site between the Burlington Northern line and Highway 81 is part of the City of Robbinsdale tax increment finance district which has not yet undergone redevelopment. Thus, there exists the potential for a mixed-use development in the vicinity of the 36th Street station. Development potential for the area could include high-density multi-family residential uses. There could also be a small amount of commercial development fronting West Broadway or Highway 81. The City of Robbinsdale anticipates that development would likely be in the ten- to twenty-year range. It is anticipated that redevelopment in the area of 36th Avenue would not occur without the LRT station.

Stations With No Anticipated Development Potential

The City of Brooklyn Park is currently involved in a redevelopment project near the intersection of 63rd and Douglas. Because this project has been planned for since 1970, it is independent of the LRT project. Other than the above-mentioned redevelopment plan, there are no new projects planned for in the 63rd Avenue station area. Redevelopment of any of the sites in the station's vicinity would require costly acquisition and relocation of existing businesses. Therefore, the City of Brooklyn Park anticipates minimal economic development impacts at the 63rd Avenue station.

Two northwest line stations are planned for within the City of Minneapolis: the Emerson Avenue and Penn Avenue stations.

The City's land use plan suggests the same mix and intensity of uses in the future as the present pattern of land uses. The City projects that little change is likely to be stimulated at the Emerson station unless, in the very distant future, the public housing or parcels north of Highway 55 could be assembled and recycled.

At the Penn Avenue station, residential uses comprise virtually the entire impact area. Little change is anticipated at this station. Rather, the station should be visualized as a stabilizing influence, enhancing the accessibility of neighborhood residents.

No-Build

Under the no-build alternative, development opportunities would take place, as dictated by market forces, in accordance with zoning ordinances and land use plans of the appropriate governing municipalities.

5.6.4 Traffic

The results of the scoping analysis on stations within the Hiawatha Corridor are outlined in Table 5.33.

TABLE 5.33
NORTHWEST CORRIDOR STATION SCOPING ANALYSIS

Station	Potential Traffic Impact Level	PM Peak Hour Peak Direction Trips
85th Avenue	Not Significant	Less than 100
77th Avenue	Minor	Greater than 100
63rd Avenue	Potentially Significant	Greater than 250
Bass Lake Road	Potentially Significant	Greater than 250
42nd Avenue	Minor	Greater than 100
36th Avenue	Minor	Greater than 100
Penn Avenue	Not Significant	Less than 100
Emerson Avenue	Not Significant	Less than 100

77th Avenue North Station

The 77th Avenue station would be located in the northwest quandrant of the intersection of the LRT track and 77th Avenue. The station site is immediately west of County Road 81. The site currently contains three industrial/commercial buildings.

Trip generation at the site will be about 256 vehicle trips per hour during the PM peak hour under the build alternative (Table 5.34).

TABLE 5.34
NORTHWEST CORRIDOR STATION SITE TRIP GENERATION

	No-Build		Build		
Station	Daily	PM Peak Hour	Daily	PM Peak Hour In	PM Peak Hour Out
36th Avenue	40	4	976	97	186
42nd Avenue			1,024	143	188
77th Avenue			2,000	70	186
Bass Lake Road	5,000	333	2,112	194	300
63rd Avenue			1,648	131	273

The intersection of County Road 81 and 77th Avenue North, which is signalized, currently operates near capacity. A queue currently forms on the west approach to the intersection. With expected increases in traffic, demand at the intersection will exceed capacity under the no-build condition.

Access to the station would be from 77th Avenue at a point about 600 feet west of County Road 81. This is an existing intersection which would be rebuilt to accommodate traffic generated at the LRT station. Analysis indicates that signalization of the intersection would be warranted under the build alternative. With signalization, the intersection would operate well under capacity.

63rd Avenue North Station

The 63rd Avenue station would be located in the west quadrant of the intersection of the LRT track and 63rd Avenue. Traffic to the station would enter at two points; bus traffic would enter at a point about 100 feet west of County Road 81, and other traffic would enter at Louisiana Avenue.

The intersection of County Road 81 and 63rd Avenue North currently operates near capacity. With the expected increase in traffic volumes, the demand will exceed the capacity of the intersection within the next three years.

Trip generation at the site will be about 405 vehicle trips per hour under the build alternative (Table 5.34). Capacity analysis shows that trips generated by the light rail station will add less than three percent to the levels of critical volumes at the intersection. The intersection would operate over-capacity under the build alternative, with a very small change in operating conditions from the no-build alternative.

Bass Lake Road Station

The Bass Lake Road station would be located in the northwest quadrant of the intersection of the LRT track and Bass Lake Road. Access to the station would be from Bass Lake Road via Elmhurst Avenue North.

A restaurant currently occupies the site of the proposed station. Although daily trip generation at the site would decrease by about 60 percent under the build alternative, PM peak hour traffic will increase from about 333 vehicle trips per hour to about 494 vehicle trips per hour (Table 5.34).

Most station traffic would pass through the intersection of Elmhurst Avenue and Bass Lake Road. Signalization is not expected to be needed because the signals at the nearby intersection of Bass Lake Road and County Road 81 should create sufficient gaps at Elmhurst Avenue. All intersection movements would operate well under capacity throughout the day.

42nd Avenue North Station

The 42nd Avenue station would be located in the southeast quandrant of the intersection of the LRT track and 42nd Avenue. Traffic to the station would enter from 42nd Avenue and exit to 41st Avenue. Station traffic would flow along what is now an alley providing access and parking to businesses along Hubbard Avenue and the Burlington Northern railroad traffic.

Trip generation at the site will be about 331 vehicle trips per hour under the build alternative (Table 5.34). Because circulation at the station site is one-way, all inbound traffic will use 42nd Avenue and all outbound traffic will use 41st Avenue.

Currently, eastbound traffic on 42nd Avenue queues at the signalized intersections to the east of the station site. This condition is likely to continue to occur in both the no-build and the build alternatives. The queues may block the entrance to the station for short times during the peak period. The queues are not expected to interfere with the operation of the intersection of 42nd Avenue and Hubbard Avenue.

Exiting traffic will use 41st Avenue and will be dispersed very quickly. The analysis indicates that site generated traffic will not cause a change in level of service.

36th Avenue North Station

The 36th Avenue station would be located in the northwest quadrant of the intersection of the LRT track and 36th Avenue. Access to the station would be from 36th Avenue at the intersection of June Avenue. North of 36th Avenue, June Avenue is a dead-end street serving four single-family homes.

Trip generation at the site will increase from about four vehicle trips per hour during the PM peak hour under the no-build alternative to about 283 vehicle trips per hour under the build alternative (Table 5.34).

Traffic volumes expected under the build alternative are likely to warrant signalization of the intersection of 36th Avenue and June Avenue. Without signalization, vehicles turning left from the station to 36th Avenue would experience delays. With signalization, all intersection movements would operate well under capacity throughout the day. Signalization would also mitigate an existing sight-distance deficiency to the east on June Avenue.

5.6.5 Transit Service

Figure 5.6 illustrates the feeder bus routes which are proposed to service the Northwest line. The impact that the Northwest LRT line would have on the existing bus route characteristics would be the same for all the Central Area alignment options. As shown in Table 5.35, implementation of the LRT line would reduce existing daily bus miles traveled by eighteen percent, peak fleet requirements by fifteen percent, and peak hour downtown buses by sixty-three percent. The substantial drop in downtown buses is indicative of the major shift from radial to crosstown bus service in the corridor.

In the Northwest Corridor four routes will be eliminated and one will have reduced service if LRT is implemented. The routes eliminated include: Route 19 North which serves portions of north Minneapolis, Golden Valley and Crystal; Route 45, an express that serves Osseo and portions of Brooklyn Park and Maple Grove; Route 81 which runs through north Minneapolis, Brooklyn Center and Brooklyn Park; and a Medicine Lake line route that runs through New Hope and Golden Valley. In addition, Route 14 North which serves portions of north Minneapolis, Brooklyn Center, Brooklyn Park, Crystal and New Hope will have a reduction in service frequency. Each one of the affected route areas will be replaced with feeder bus access to respective stations along the Northwest LRT line.

TABLE 5.35
NORTHWEST CORRIDOR BUS SERVICE

	Existing	LRT Tunnel	LRT At-Grade (At-Grade Option A and B)
Daily bus miles	5,066	4,165	4,165
Peak fleet requirement	52	44	44
Peak hour buses entering downtown	41	15	15

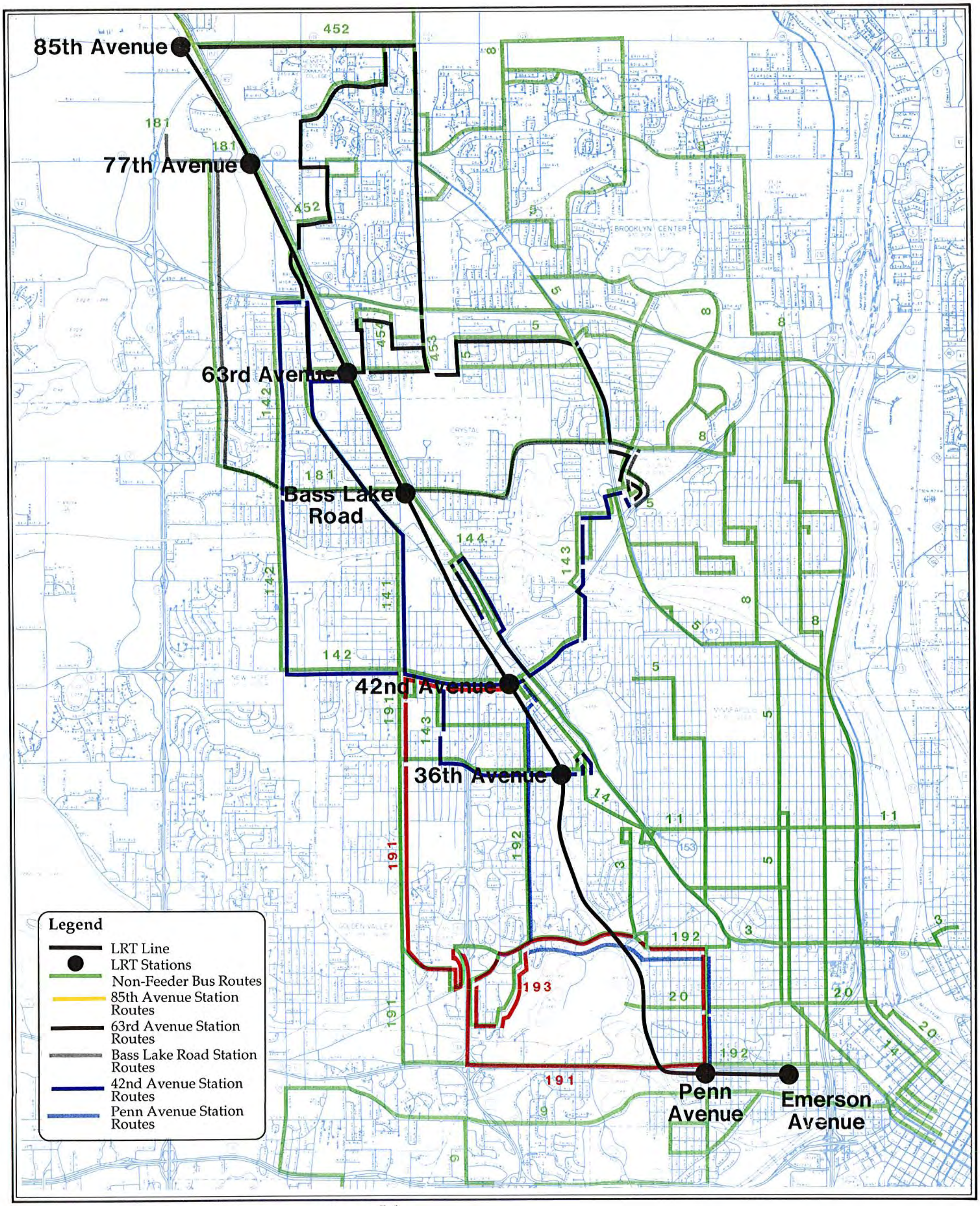
The travel time impacts of the LRT alternatives are shown in Table 5.36. Both the LRT alternatives would provide significant travel time savings compared to existing local bus trips. LRT also offers a three minute time savings compared to an express bus operating from the end of the route. This travel time advantage would increase as congestion grows along the express bus route. Travel time for the LRT would remain constant since it operates in an exclusive right-of-way.

TABLE 5.36
TRANSIT TRAVEL TIME COMPARISON FROM THE NORTHWEST CORRIDOR TO DOWNTOWN MINNEAPOLIS

		PEAK HOUR TRAVEL TIME (MINUTES)				LRT TRAVEL TIME IMPACT (MINUTES)		
CORRIDOR	ORIGIN	CURRENT[1/]	LRT TUNNEL[2/]	LRT AT-GRADE[2/] (Nicollet Option)	LRT AT-GRADE[2/] (Kenwood Option)	LRT TUNNEL	LRT AT-GRADE (Nicollet Option)	LRT AT-GRADE (Kenwood Option)
Northwest	42nd/Douglas	27	21	22	21	-6	-5	-6
	Brooklyn Boulevard/ Hampshire	52	39	40	39	-13	-12	-13
	85th Avenue Park-and-Ride	31	27	28	27	-4	-3	-4

1/ Current bus travel times are used rather than 2010 no-build conditions because future congestion impacts on street travel speeds are not quantified. This represents a best case comparison, since bus travel speeds will decrease as traffic congestion continues to increase in the future.

2/ Transfer from feeder bus includes three minute wait for LRT



HCRRA Hennepin County Regional Railroad Authority

LRT System

Environmental Impact Statement

Figure 5.6

Northwest Corridor

BRW

Transit Service Routes

Source: Metropolitan Transit Commission

The current peak hour bus headway in the corridor generally ranges from ten to thirty minutes. This level of service would be maintained by the feeder bus headway of fifteen minutes and an LRT frequency of fifteen minutes.

The general LRT service advantages offered in the other corridors would also apply to the Northwest. Service reliability and ride quality would be enhanced and service within and between the LRT corridors would improve. Improved corridor access to Brookdale would be the major travel benefit within the corridor.

5.6.6 Noise

Operating characteristics, the setback distance to the nearest receiver site and the predicted maximum passby noise levels at the nearest sensitive receiver site for specific segments along the corridor are documented in Table 5.37. Predicted noise levels at the nearest receiver site have been determined based on both the best- and worst-case noise emission rates.

Table 5.38 documents the number of impacted residential, commercial and industrial uses, and the acres of park land that are forecast to experience maximum passby noise levels which exceed the APTA guidelines.

As the table indicates, up to 645 dwelling units, two institutional uses, thirteen commercial/industrial uses and 58.41 acres of parkland could experience passby noise levels which exceed APTA guidelines.

No-Build

The no-build alternative is described by the noise levels identified in the Affected Environment Section (4.6.8).

5.6.7 Wetlands, Vegetation and Wildlife

The impacts of a LRT system on the identified wetland and prairie areas along the Northwest line are quantified in Table 5.39. (Figure 4.32A-B.) Areas labeled east and west refer to the direction from the proposed LRT track.

Four large, DNR protected wetlands occur within this corridor (644W, 639W, 563W, 560W). Each of these wetlands provides important habitat for wildlife. Only one (644W) would be impacted by the LRT tracks on the east side. As indicated in Table 5.39, alignment of the LRT tracks could adversely impact DNR Protected Wetland 644W. Under worst-case conditions, approximately .2 acres of wetland would be permanently filled to accommodate the LRT alignment.

TABLE 5.37
PREDICTED LRT MAXIMUM PASSBY NOISE LEVELS

Northwest Corridor

Line Segment Start	Line Segment End	Adjacent Land Use	Minimum Setback	APTA Guideline	Segment Speed	Predicted LMAX At Minimum Setback Best	Predicted LMAX At Minimum Setback Worst	Guideline Exceeded? Best	Guideline Exceeded? Worst	Distance To Applicable LMAX Standard Best	Distance To Applicable LMAX Standard Worst
End of Line	US 169	Commercial/ Industrial	60'	85 dBA	55 MPH	78 dBA	83 dBA	N	N	*	*
US 169	Brooklyn Boulevard	ES-Commercial WS-SF Residential	230' 90'	85 dBA 70 dBA	55 MPH 55 MPH	69 dBA 75 dBA	74 dBA 80 dBA	N Y	N Y	* 90'	* 200'
Brooklyn Boulevard	I-694	Commercial/ Industrial	70'	85 dBA	55 MPH	77 dBA	82 dBA	N	N	*	*
I-694	63rd Avenue	ES-Average Residential WS-Industrial/ Average Residential	220' 40'/130'	75 dBA 85/75 dBA	55 MPH 55 MPH	69 dBA 80 dBA	74 dBA 85/73 dBA	N N/N	N N/Y	90' */90'	200' */200'
63rd Avenue	62nd Avenue	MF-Residential	210'	80 dBA	55 MPH	70 dBA	75 dBA	N	N	*	90'
62nd Avenue	Bass Lake Road	Average Residential	100'	75 dBA	55 MPH	74 dBA	79 dBA	N	Y	90'	200'
Bass Lake Road	South of Becker Park	Park	100'	75 dBA	55 MPH	75 dBA	79 dBA	N	Y	90'	200'
South of Becker Park	Corvalis Avenue	Commercial/Industrial	30'	85 dBA	55 MPH	82 dBA	87 dBA	N	Y	*	*
Corvalis Avenue	42nd Avenue	Average Residential	50'	75 dBA	55 MPH	79 dBA	84 dBA	Y	Y	90'	200'
42nd Avenue	41st Avenue	ES-Commercial WS-Average Residential	30' 110'	85 dBA 75 dBA	55 MPH 55 MPH	79 dBA 74 dBA	84 dBA 79 dBA	N N	Y Y	* 90'	* 200'
41st Avenue	38th Avenue	SF-Residential	70'	70 dBA	55 MPH	77 dBA	82 dBA	Y	Y	200'	430'
38th Avenue	36th Avenue	Average Residential	50'	75 dBA	55 MPH	79 dBA	84 dBA	Y	Y	90'	200'
36th Avenue	TH 55	SF-Residential	30'	70 dBA	55 MPH	82 dBA	87 dBA	Y	Y	200'	430'
TH 55	Central Area	Average Residential/ MF-Residential	50'	75 dBA	35 MPH	76 dBA	81 dBA	N	Y	50'	110'
		Commercial/Industrial	70'	85 dBA	35 MPH	73 dBA	78 dBA	N	N	*	*

NOTE: * - Distance to applicable APTA maximum guideline noise level is less than 50 feet from the centerline of the LRT line.
ES - East Side
WS - West Side
Y - Yes, predicted noise levels exceed guideline.
N - No, predicted noise levels do not exceed guideline.

TABLE 5.38
LEVEL OF LRT VEHICLE NOISE IMPACTS

Northwest Corridor

Line Segment Start	Line Segment End	Dwellings Impacted	Institutional Uses Impacted	Comm/Indust Uses Impacted	Park Acres Impacted
End of Line	US Highway 169	0 / 0	0 / 0	0 / 0	0.00 / 0.00
US Highway 169	Brooklyn Boulevard	11 / 25	0 / 0	0 / 0	0.00 / 0.00
Brooklyn Boulevard	I-694	0 / 0	0 / 0	0 / 0	0.00 / 0.00
I-694	63rd Avenue	0 / 3	0 / 0	0 / 0	0.00 / 0.00
63rd Avenue	62nd Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
62nd Avenue	Bass Lake Road	0 / 52	0 / 0	0 / 0	0.00 / 0.00
Bass Lake Road	South of Becker Park	0 / 0	0 / 0	0 / 7	0.00 / 0.70
South of Becker Park	Corvalis Avenue	0 / 0	0 / 0	0 / 5	0.00 / 0.00
Corvalis Avenue	42nd Avenue	18 /109	0 / 0	0 / 0	0.31 / 2.33
42nd Avenue	41st Avenue	0 / 12	0 / 0	0 / 1	0.00 / 0.00
41st Avenue	38th Avenue	55 /117	0 / 1	0 / 0	0.06 / 1.03
38th Avenue	36th Avenue	26 / 58	0 / 0	0 / 0	0.15 / 1.85
36th Avenue	TH 55	90 /260	1 / 1	0 / 0	9.72 /49.07
TH 55	Central Corridor	0 / 9	0 / 0	0 / 0	1.18 / 3.43
	Subtotal:	200 /645	1 / 2	0 / 13	11.42/58.41

NOTE: 0 / 0 - Best-Case Impacts / Worst-Case Impacts

Noise mitigation effects of intervening buildings were accounted for in the impact area evaluation.

Dwelling unit total includes individual apartment units.

Areas A, C, F and H would probably be eliminated by the LRT system due to the disturbance by the construction of the two LRT tracks. Even though some native prairie vegetation exists within these areas, the prairie is confined to small narrow strips along the tracks which have very little species diversity. However, native prairies of any type are rare in the state and mitigation for the loss of these areas should be provided. Section 5.3.9 identifies mitigation measures for impacted prairie areas.

TABLE 5.39
NORTHWEST CORRIDOR-WETLAND AND PRAIRIE INVENTORY

Area	Wetland Impact Area (acres) (East)	(West)	Prairie Impact Area (feet) (East)	(West)
A	--	--	400 x 1	400 x 1
B	--	1.0 (560W)	--	--
C	--	--	800 x 1	800 x 1
D	--	1.0 (563W)	--	--
E	--	0.5 (639W)	--	--
F	--	--	500 x 1	500 x 1
G	--	--	--	--
H	--	--	1,000 x 1	1,000 x 1
I	0.2	0.6 (644W)	--	--
J	0.5	--	--	--
K	0.1	0.6	--	--
L	--	0.1	--	--
M	0.1	0.2	--	--
N	0.6	--	--	--

Note: A DNR Wetland Permit is required for any work done within these wetlands.

Impact area for Area I (Grimes Pond) reflects a worst-case condition.

No-Build

There would be no impacts to the wetland and prairie areas under the no-build alternative.

5.6.8 Water Resources

Runoff and Receiving Waters

Build Alternative:

The Northwest Corridor occurs within the Bassett Creek and Shingle Creek Watershed Districts. In each watershed, storm water ponding areas would be affected by the proposed LRT system. The impact to each of the site specific areas is described for each watershed management district in this corridor. Response letters from both watershed districts can be found in Section 8.3.

Bassett Creek Watershed District:

- The pond in the southeast quadrant of the Burlington Northern Railroad (BNRR) and TH 55, at the Highway 55 underpass: The construction of the rail bed would encroach on the small pond southeast of the BNRR and the highway if the existing BNRR underpass bridge is utilized by the LRT. If a separate LRT tunnel is constructed to cross under TH 55, encroachment on the pond would only occur during construction.

- Grimes Avenue Pond: The Grimes Avenue pond area covers approximately eleven hundred feet along either side of the existing BNRR track. The proposed LRT tracks would be installed on a bridge structure, or on an existing railroad embankment which would be widened. If the bridge is constructed, the impact on the storm water detention volume would be minimal. If the embankment is constructed, the detention volume lost would be mitigated. Any mitigation would occur as approved by the Watershed District, the Department of Natural Resources, and the City of Golden Valley.

Shingle Creek Watershed District:

Within the Shingle Creek Watershed District, additional railroad track bed construction would occur within the 100-year floodplain where Shingle Creek crosses the LRT track, and just south of the LRT intersection with Brooklyn Boulevard/77th Avenue. Lost storage volume within these two areas would be mitigated in a manner approved by the watershed.

Local handling of storm water from station sites and mitigations required because of an increase in impervious areas would be done on a site-by-site basis and in accordance with the Shingle Creek Watershed District and the governing municipality.

No-Build Alternative:

There would be no impacts to the Northwest Corridor runoff and receiving waters under the no-build alternative.

Floodplains

Build Alternative:

Five floodplains exist along the Burlington Northern Railroad tracks in the Northwest Corridor: four in the Shingle Creek Watershed District and one in the Bassett Creek Watershed District. The northernmost floodplain area is located just south of 85th Avenue near the tracks. The area currently serves as a drainage channel. Another floodplain is associated with Shingle Creek and three adjacent DNR protected Wetlands (560W, 562W, 563W). A third floodplain is associated with DNR protected wetland 639W, located just north of 62nd Avenue. The fourth area is located around the storm water pond in the southeast quadrant of the Soo Line Railroad and Burlington Northern Railroad intersection. The impact of the LRT system through these floodplains is expected to be minimal because the railroad grade already exists in these areas. Therefore, the amount of fill needed should be small.

The LRT line would parallel Bassett Creek and its' floodplain in the southern portion of the corridor, intersecting it in a few areas. The impacts to this floodplain are also expected to be minimal.

In areas where fill is required, the floodplain regulations of the Bassett Creek or Shingle Creek Watershed Commissions will be followed.

No-Build:

There would be no impacts to the floodplains in the Northwest Corridor under the no-build alternative.

Shoreland Zoning

Build Alternative:

A permit from the City of Golden Valley Zoning Administrator would be required in any instance where construction of the northwest line would involve grading or filling of earth within the Shoreland Zoning District where the slope of the land is toward Bassett Creek. No vegetative cutting is anticipated within this Shoreland Zoning District.

Mitigation measures for grading and filling would include standard erosion control measures.

No-Build Alternative:

There would be no impact to the Bassett Creek Shoreland Zoning District under the no-build alternative.

Groundwater Appropriation

Build Alternative:

It is anticipated that groundwater appropriation would be required in the form of dewatering activities to permit construction adjacent to Bassett Creek and the associated storm water ponding areas in the Cities of Minneapolis and Golden Valley. The construction activity areas are the Highway 55 underpass, and station locations at Plymouth Avenue, and Golden Valley Road. At these locations, dewatering is anticipated for installation of water service to station sites only, and is expected to occur for a brief (five to ten day) time period. The groundwater affected would be confined to the area of construction.

No-Build Alternative:

Under the no-build alternative, groundwater appropriations would not be required.

5.6.9 Utilities

The construction of the LRT system in this corridor will require relocation of NSP power poles for a segment north of Highway 55 to the NSP substation at 34th Avenue. Other utilities are potentially impacted along the Highway 55 segment, mainly where street crossings occur, and at the crossing under Highway 55 where relocation of an existing sanitary sewer forcemain is required.

The issue of relocating power lines has been coordinated with NSP engineering staff. NSP has concluded that the relocation of several electrical power lines would be feasible.

No-Build Alternative

There would be no impacts to existing utilities in the Northwest Corridor under the no-build alternative.

5.6.10 Steep Slopes

Approximately seven hundred and seventy five feet of retaining wall would be required to accommodate the LRT track construction north of the Grimes Pond. The retaining wall would be on the east side of the proposed tracks. Where the LRT tracks would pass under 36th Avenue, Golden Valley Road, Wirth Parkway and Plymouth Road bridges, retaining walls would be required adjacent to the east abutments.

No-Build Alternative

There would be no impacts to steep slopes in the Northwest Corridor under the no-build alternative.

5.6.11 Parklands

Anticipated impacts on parks in the Northwest Corridor would include:

- Greenhaven Park (Brooklyn Park):

  The LRT line may cause minor visual and noise impacts. The park area where the play equipment and skating area is located would be shielded from the LRT line by dense woods. Approximately 800 feet of park edge would abut the railroad right-of-way and any trails or other facilities which would be developed in the wooded area in the future may be subject to noise and visual impacts.

- Shingle Creek Park (Brooklyn Park):

  The LRT line may cause minor noise and visual impacts in a portion of this park. The park is 1,000 feet from the LRT line, and would be separated by a wetland.

- Lakeland Park (Brooklyn Park):

  The LRT line may cause minor noise and visual impacts. These effects would be minimized by the intervening CSAH 81 and surrounding buildings.

- North Lions Club Park (Crystal):

  The LRT line may cause minor noise and visual impacts. The park would be separated from the railroad right-of-way by approximately 400 feet, most of which is buffered by housing. However, there would still be a visual and auditory corridor from the northeast corner of the park to the LRT line which is only partially buffered by trees. The most actively used portion of the park is in the southwest corner, furthest removed from the LRT line.

- Becker Park (Crystal):

  The LRT line would cause noise and visual impacts to the portion of Becker Park containing children's play equipment, a skating area, and the community center building. A chain link fence with slats would act as a barrier between the park and the LRT line. Approximately 400 feet of park edge would abut the railroad line. The baseball and softball fields would also be affected, but to a lesser degree.

- Welcome Park (Crystal):

  Because Welcome Park is within eighty feet of the centerline of the LRT track, it would incur both visual and noise impacts from the system. Currently there is no significant intervening buffer.

- Grazier Park (Robbinsdale):

  Although the LRT line would be elevated above the park level, it would cause direct visual and noise impacts to Grazier Park. Approximately 400 feet of park edge would abut West Broadway Avenue and approximately 300 feet would abut the railroad right-of-way.

- Triangle Park (Robbinsdale):

  The LRT line would cause direct visual and noise impacts to the 300-foot eastern edge of Triangle Park, which is approximately sixty feet from the centerline of the LRT track and at the same elevation with little or no intervening buffering. Because of the existing fence along the edge of Triangle Park, the LRT is not expected to be a significant hazard to park users.

- Lee Park (Robbinsdale):

  The LRT would result in visual and noise impacts to the 500-foot eastern edge of Lee Park which abuts the railroad right-of-way. This portion of the park is at a lower level than the LRT, and currently has no intervening buffering.

- Sochacki Park (Robbinsdale):

  The LRT line would result in visual and noise impacts to the 5,000-foot eastern edge of Sochacki Park because it would be approximately thirty to eighty feet from the centerline of the LRT track, at a significantly lower elevation than the LRT, with no intervening buffering along most of its length. Some of the trails in the southern end of the park would be buffered from the LRT line by a wooded area. The secluded and natural character of this park, along with the elevation of the rail line would make these impacts especially noticeable.

  Potential impacts to Grimes Avenue Pond are addressed in the Water Resources section (5.6.8). Construction activities may temporarily affect up to 3,000 square feet of parkland.

- South Halifax Park (Robbinsdale):

  The LRT would result in direct visual and noise impacts to the 700-foot western edge of this park which is immediately adjacent to the LRT line, at a significantly lower elevation than the LRT, and without intervening buffering. Potential impacts to Grimes Avenue Pond are addressed in the Water Resources section (5.6.8). Because this park is intended for passive recreation and observation of the pond, LRT impacts could be significant.

- Mary Hills Park (Golden Valley):

  The LRT would result in direct visual and noise impacts to the 2,000-foot eastern edge of Mary Hills Park which is immediately adjacent to the railroad right-of-way and at a lower elevation than the LRT. Although most of this park is wooded, the park is narrow and its trails close to the rail line that the effect of auditory buffering would be minimal. Natural visual buffering would be generally effective but only when the leaves are on the trees. The secluded and natural character of this park would make these impacts noticeable.

- Valley View Park (Minneapolis Park Board):

  Although there are no formal trails in this park, there would be visual and auditory impacts on the heavily wooded and steeply inclined portion of Valley View Park. Approximately 700 linear feet of park edge would abut the LRT line.

- Theodore Wirth Regional Park (Minneapolis Park Board):

  The LRT would result in some direct and limited visual and noise impacts as approximately 4,000 feet of the edge of Wirth Park, including segments of the 18-hole golf course, Bassett Creek and its associated wetlands and pond, the archery range, the sliding hill, and the parkway, would be immediately adjacent or quite close to the LRT line and at a lower elevation. These impacts would be reduced by the fact that the LRT would be separated from the active portions of the park by Bassett Creek and its associated wetlands, ponds, trees and shrubs.

  Noise and visual impacts to Wirth Park would be reduced or removed entirely along the northern 2,000 feet of the park, as the LRT line would run through a sharp, heavily wooded depression in that area.

- Bassett Creek Park (Minneapolis Park Board):

  The LRT line would result in direct visual and noise impacts to Bassett Creek Park. The park would be approximately thirty feet from the centerline of the LRT track.

- Barnes Place (Minneapolis Park Board):

  The LRT line would result in visual and noise impacts to this park.

- Harrison Park:

  The LRT line would result in direct visual and noise impacts to Harrison Park because the 500-foot northern edge of this park would be approximately sixty feet from the centerline of the LRT track. The part of the park most directly affected would be the ball fields.

No noticeable negative impacts are expected for the following parks in the Northwest Corridor: Skyline (Crystal), Glenview Terrace (Golden Valley), Bethune and Sumner (Minneapolis Park Board).

Mitigation Measures

Anticipated impacts on individual parks could be mitigated by the following specific means.

- Theodore Wirth Park:

  a. Consider additional plantings along the entire length of the LRT line that would visually affect the park.

- o Glenview Terrace Park:

  a. Introduce additional landscaping along the LRT line.

  b. Minimize fill in the east side of the pond.

  c. Limit erosion into Bassett Creek during construction.

- o South Halifax Park:

  a. Minimize fill in the east half of Grimes Pond.

  b. Limit erosion into Grimes Pond during construction.

No-Build

There would be no significant impacts to the parklands in the Northwest Corridor with the no-build alternative.

5.6.12 Visual and Aesthetic

Figures 5.7A-B illustrate the specific areas along the Northwest line which would be visually affected, at varying levels, by the proposed LRT alignment. It also identifies areas where the view of the LRT corridor would be obstructed because of existing land use types and structures.

From 85th Avenue North to Corvallis Avenue, the LRT line would be compatible with the commercial/industrial uses in the area. The portion of the Northwest line which is located in Robbinsdale would be consistent with the downtown area's development. From 36th Avenue North to TH 55, the major visual impact would occur in the parkland areas along the line.

Throughout the Northwest Corridor, residential properties which are adjacent to the LRT line may require screening. The existing overhead wires in the railroad right-of-way portion of the corridor would help mask the LRT catenary wires.

No-Build

With the no-build alternative, the visual character of the Northwest Corridor would essentially remain unchanged.

5.6.13 Historic and Cultural Resources

The Sumner Library, and Sumner Field project, located at 611 Emerson Avenue North, although not directly affected by the LRT line, may be subject to secondary impacts (e.g., visual and noise).

The Floyd B. Olson statue located in the southeast side of the Penn Avenue, TH 55 intersection could be impacted by the LRT line. If the final LRT track alignment and station configuration warrants the relocation of the statue, review by the State Historic Preservation Office will be necessary. Since the statue's dedication in 1940, it has been relocated twice.

No-Build

There would be no impacts to the historic and cultural resources with the no-build alternative.

5.7 UNIVERSITY CORRIDOR

5.7.1 Community and Neighborhood Character

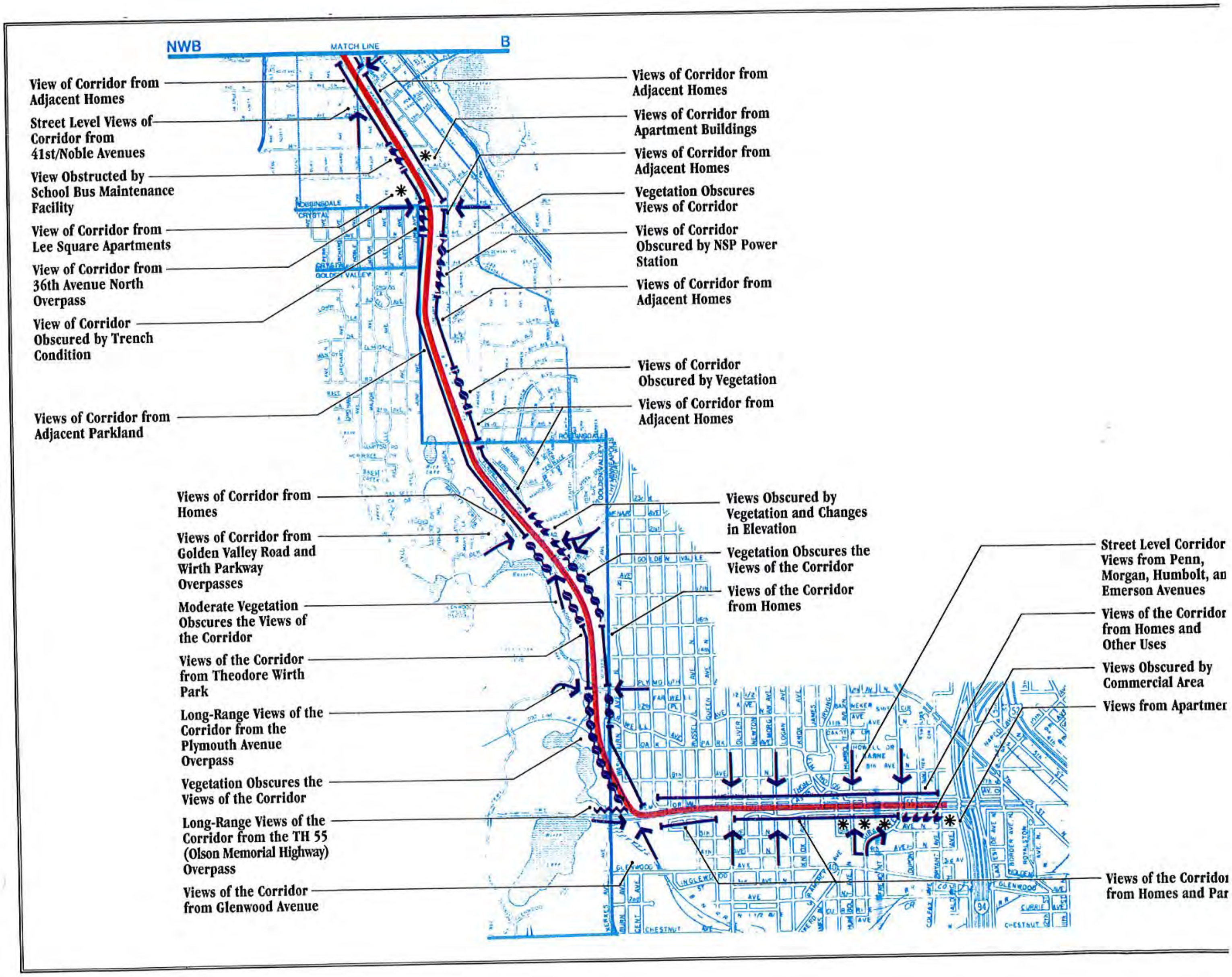
Because the University Corridor area contains a large transit dependent population, the provision of LRT services for this group of people would greatly enhance their mobility, enabling them to participate in the job market, gain access to community facilities and services, and attend educational programs that are provided in the community.

Much of the anticipated travel demand in the area would be generated by activity centers within the corridor, including the University of Minnesota (campus and hospital facilities), HHH Metrodome, Riverside Medical Center, Southeast Library, and other educational, employment, hospitality/retail/entertainment, and community service oriented facilities. Work, school, shopping, and event oriented trips could be accommodated on LRT and, as needed, on feeder buses.

Impacts of the LRT line on the cohesiveness of the University Corridor communities and neighborhoods are expected to be minimal. The elimination of auto traffic on Washington Avenue from Church Street to Cedar Avenue could minimize the divisive effect that Washington Avenue currently has because of the high traffic volumes it carries.

Traffic impacts in the University Corridor neighborhoods, associated with the diversion of auto trips from Washington Avenue are addressed in Section 5.7.4.

Fire Station 19, located at the Ontario and Beacon Street intersection, is east of the proposed terminus at Oak Street. LRT would not have any impact on the access to this fire station.



NWB
MATCH LINE
B
View of Corridor from Adjacent Homes
Street Level Views of Corridor from 41st/Noble Avenues
View Obstructed by School Bus Maintenance Facility
View of Corridor from Lee Square Apartments
View of Corridor from 36th Avenue North Overpass
View of Corridor Obscured by Trench Condition
Views of Corridor from Adjacent Parkland
Views of Corridor from Adjacent Homes
Views of Corridor from Apartment Buildings
Views of Corridor from Adjacent Homes
Vegetation Obscures Views of Corridor
Views of Corridor Obscured by NSP Power Station
Views of Corridor from Adjacent Homes
Views of Corridor Obscured by Vegetation
Views of Corridor from Adjacent Homes
Views of Corridor from Homes
Views of Corridor from Golden Valley Road and Wirth Parkway Overpasses
Moderate Vegetation Obscures the Views of the Corridor
Views of the Corridor from Theodore Wirth Park
Long-Range Views of the Corridor from the Plymouth Avenue Overpass
Vegetation Obscures the Views of the Corridor
Long-Range Views of the Corridor from the TH 55 (Olson Memorial Highway) Overpass
Views of the Corridor from Glenwood Avenue
Views Obscured by Vegetation and Changes in Elevation
Vegetation Obscures the Views of the Corridor
Views of the Corridor from Homes
Street Level Corridor Views from Penn, Morgan, Humbolt, an Emerson Avenues
Views of the Corridor from Homes and Other Uses
Views Obscured by Commercial Area
Views from Apartmer
Views of the Corridoı from Homes and Par

Emergency vehicle access on Washington Avenue from Church Street to Cedar Avenue will continue with the Washington Avenue transit mall. Emergency vehicle travel speeds could increase, with the elimination of traffic on this segment.

Because the station sites in the University Corridor would not provide park-and-ride and drop-off services, the station area impacts to community facilities would be minimal.

No-Build

Under the no-build alternative, many of the students who will commute to/from the campus will do so in private autos. Many of the University's administrative and health care facility staffs will also drive, adding further traffic volumes to the roadways that serve the area, including the future Dinkytown and Motley Bypasses. Parking availability is already a problem in the University Corridor. This problem will be exacerbated by the many off-campus commuters (students and employees).

The University of Minnesota is the location of many special events that attract patrons from the entire region. Athletic events on the East Bank campus are just one example. Under the no-build alternative, accessibility to/from these events will be accomplished in private autos, leading to traffic congestion, an increased number of accidents, and parking shortages.

5.7.2 Potential Displacement and Relocation

No property relocation/displacement would be required at the stations on the University line because they are proposed to be located in existing street right-of-way.

No-Build

There would be no property relocation/displacement required under the no-build alternative.

5.7.3 Economic Development

At the Oak Street station, non-University development potential in the immediate vicinity of the LRT station would be minimal because most of the present uses are stable and no vacant land is available. To the east and south of the station, the enhanced accessibility could stimulate high density residential uses and some office uses.

Because both the East and West Bank stations are proposed to be located within the boundaries of the University of Minnesota Campus, they are anticipated to have no direct effect upon privately owned or developed real estate.

No-Build

Under the no-build alternative, additional development proposals in the University area may experience difficulties in the development review process because of the increased traffic and demand for parking which they could generate.

5.7.4 Traffic

The alignment alternative selected for the University Connector requires the closure of Washington Avenue (from Church Street to Cedar Avenue) to general traffic. Buses, light rail vehicles (LRVs), and emergency vehicles would have exclusive access to this segment of Washington Avenue. Pedestrian access to Washington Avenue in the East Bank campus area would not be affected.

Included in the closure of Washington Avenue would be the Washington Avenue Bridge, one of five bridges within the study area available to general traffic. Pedestrian access to the Washington Avenue Bridge would not be affected by the proposed closure of Washington Avenue. Automobile traffic that would use the bridge, however, would be diverted to the four remaining study area bridges that cross the Mississippi River. An analysis of diverting auto traffic from the Washington Avenue Bridge was conducted to identify Year 1995 impacts on the remaining bridges, highway segments, and surface streets. The alternative bridge routes are listed below.

- I-35W Bridge
- 10th Avenue Bridge
- I-94 Bridge
- Franklin Avenue Bridge

Roadway network assumptions used in the analysis follow:

- Implementation of improvements to I-94 between the east end of the Dartmouth interchange and Riverside Avenue, resulting in four lanes between Riverside Avenue and the west end of the interchange and three lanes through the interchange.

- Addition of one lane in each direction on I-94 between the east end of the I-35W/I-94 common section and Riverside Avenue.

- Implementation of ramp metering on I-94.

- Implementation of the Dinkytown Bypass as a four-lane facility within a depressed railroad right-of-way, between the 10th Avenue Bridge and University Avenue.

- o Implementation of the Motley Bypass as a four-lane facility between the Dartmouth interchange and University/4th Street Southeast.

- o Implementation of geometric improvements to intersections in order to accommodate increased turning movement volumes under the assumption that Washington Avenue is closed.

Data from several sources was complied to provide base level inputs and assumptions. Resources used in the analysis are listed:

- o Mn/DOT 1986 Traffic Flow Map
- o Mn/DOT 2010 Forecasts from Bridge Crossings Study
- o Regional Model 2000 PM Peak Hour Forecasts
- o Vehicle Occupancy and Traffic Counts Conducted in April 1989; BRW, Inc.
- o Origin-Destination Study Conducted in May 1989; BRW, Inc.
- o Comprehensive LRT System Plan for Hennepin County; BRW, Inc.

Tables 5.40 and 5.41 outline the volume of general traffic that would be diverted from the Washington Avenue Bridge in 1995 and resultant diversion patterns, respectively.

TABLE 5.40
TRAFFIC DIVERTED FROM WASHINGTON AVENUE BRIDGE

		PM Peak		Total PM
	Daily	East-bound	West-bound	
1995 Washington Bridge Traffic Forecast	31,100	1,089	2,114	3,203
Vehicle Trips Not Diverted				
(4% Buses)	1,244	65	65	130
(3% LRT)	953	33	64	97
Vehicle Trips Diverted	28,923	991	1,985	2,976

TABLE 5.41
ESTIMATED PM PEAK HOUR TRAFFIC DIVERSION

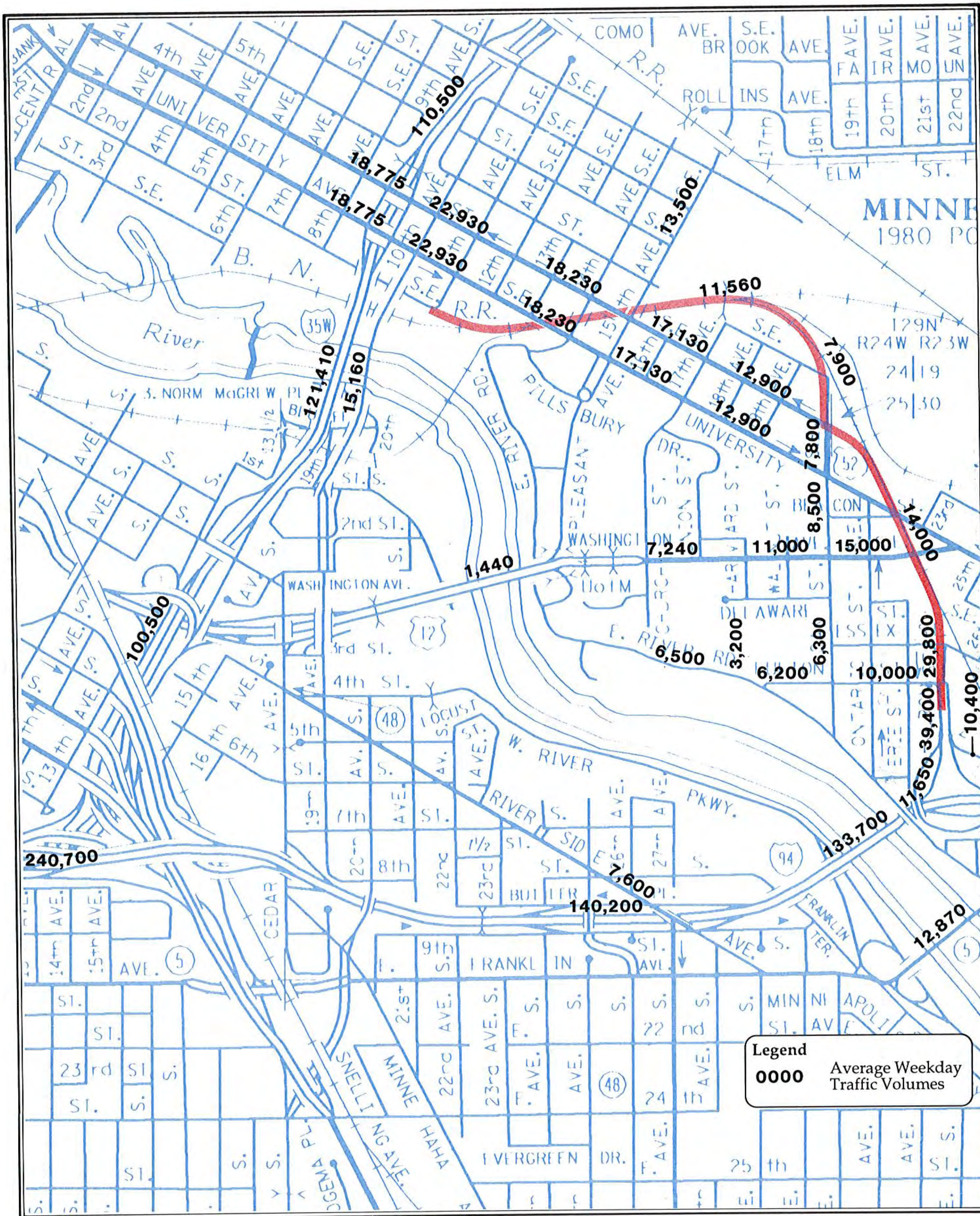
	PM Peak Hour			
	Total	Percent	Volume	
Route Diverted To		Eastbound/ Westbound	Eastbound/ Northbound	Westbound/ Southbound
I-94 Bridge	1,449	35.2/55.4	349	1,100
I-35W Bridge	371	23.6/ 6.9	234	137
10th Avenue Bridge	325	16.5/ 8.1	164	161
Franklin Avenue Bridge	176	10.7/ 3.6	105	71
Broadway Avenue	368	3.7/16.7	37	331
Other	287	10.3/ 9.3	102	185
Total	2,976	100/100	991	1,985

Figures 5.8, 5.9, and 5.10 illustrate the results of the traffic analysis. Figure 5.8 presents the 1995 build condition, where average daily diverted and background traffic are combined. Figure 5.9 shows 1995 average daily traffic volumes on the bridges, highway segments and surface streets under the no-build condition, where Washington Avenue and the Washington Avenue Bridge remain open to general traffic. Figure 5.10 illustrates 1995 average daily diverted traffic volumes within the study area. Figure 5.11 illustrates the study area.

A review of Figures 5.8, 5.9, and 5.10 shows traffic volumes will increase on some roadway segments and will decrease on others, as a result of diverting traffic from Washington Avenue and the Washington Avenue Bridge. Reductions in volume are forecast to occur along the following segments:

- I-35W, immediately north of the I-35W/I-94 common section
- Washington Avenue to Oak Street to Cedar Avenue
- University Avenue between 25th and 29th Streets

No changes in volumes are forecast to occur along Washington Avenue from University Avenue to Oak Street. Forecast increases in volumes, along the remaining roadways in the study area, range between 1 and 417 percent.



HCRRA Hennepin County Regional Railroad Authority

LRT System

Environmental Impact Statement

Figure 5.8

University Corridor

BRW

0 1/8 Mile North

1995 Total Daily Traffic : Build

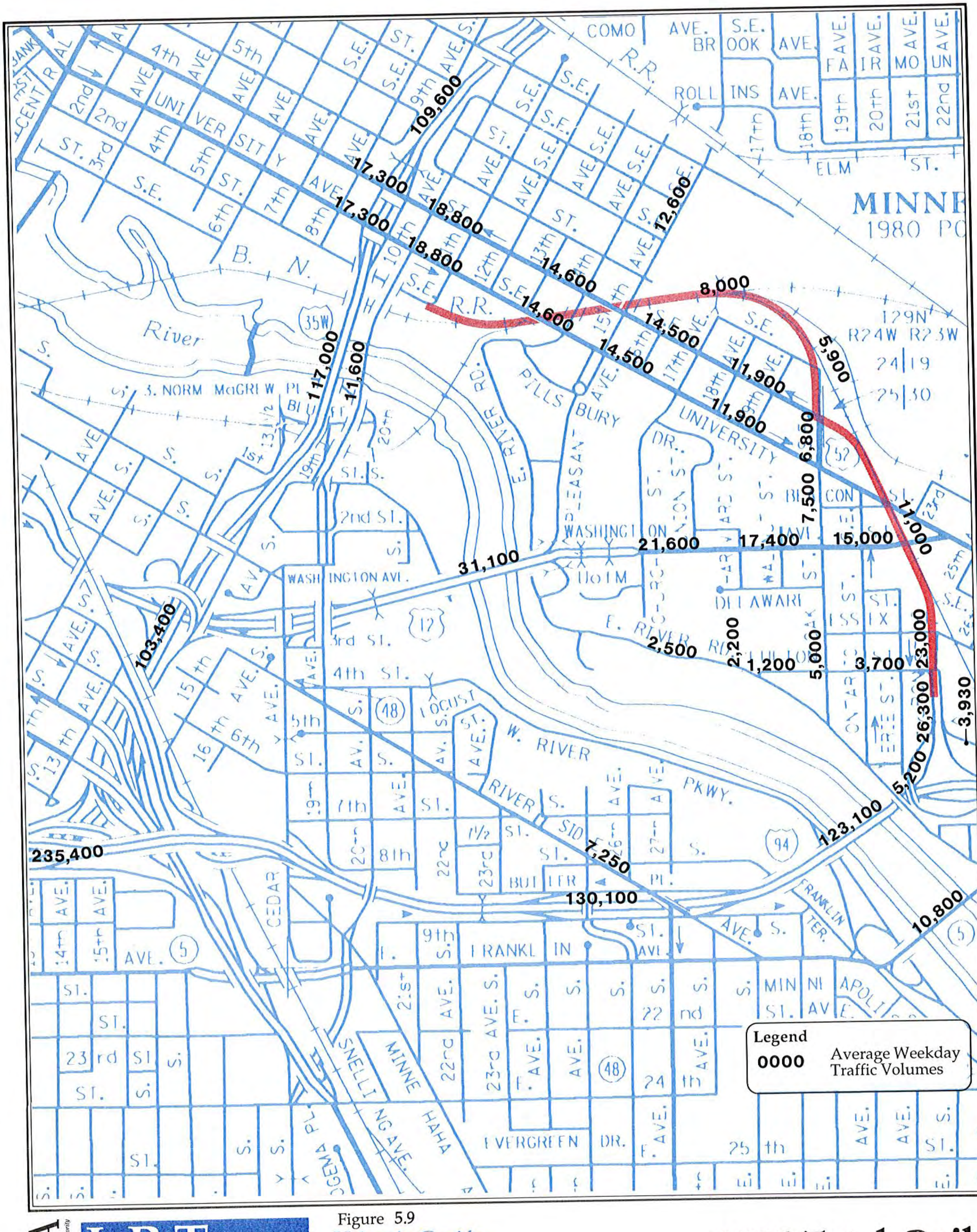


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Figure 5.9
University Corridor

BRW

0 1/8 Mile North

1995 Total Daily Traffic: No-Build

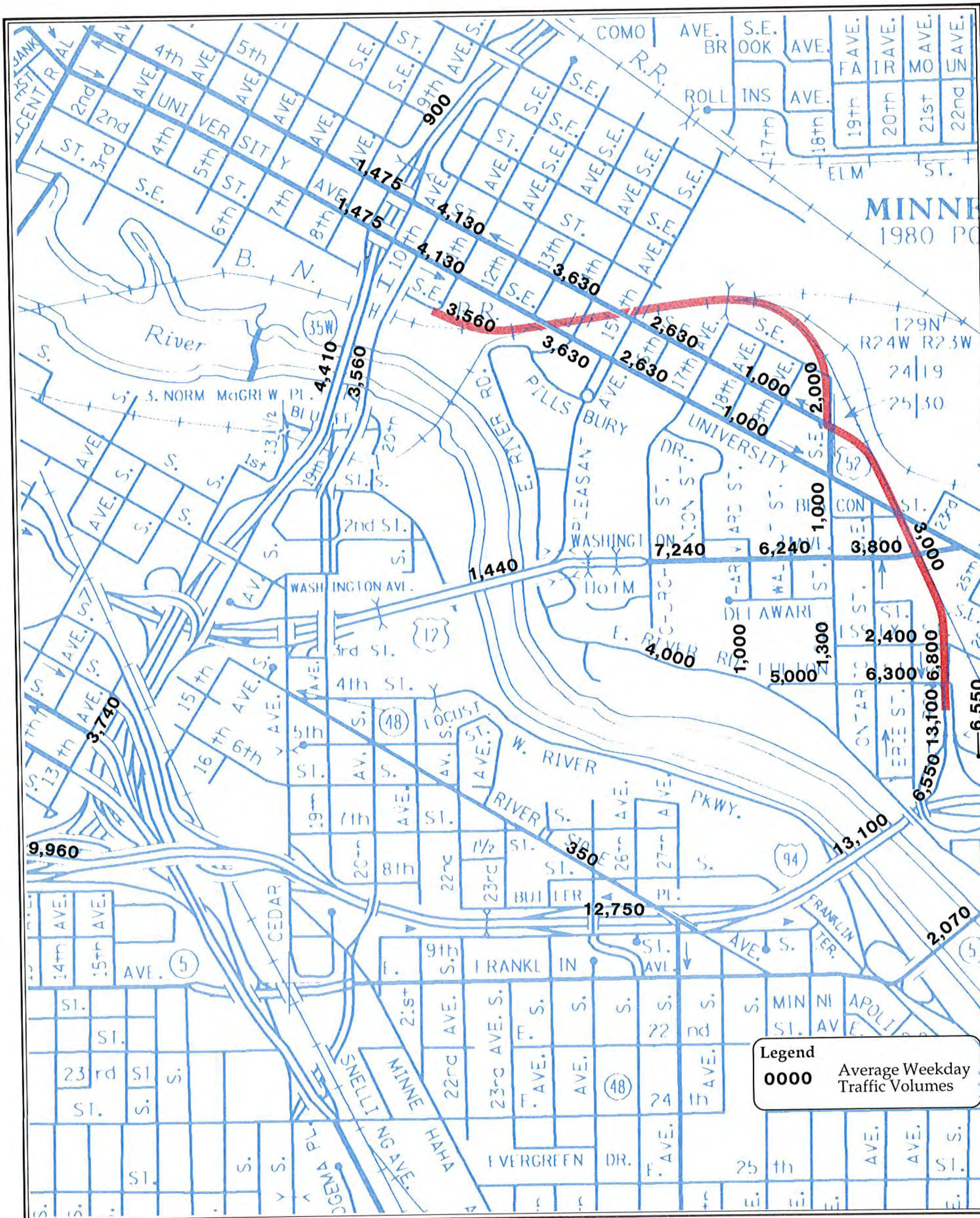

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Figure 5.10

University Corridor

BRW

1995 Daily Diverted Traffic

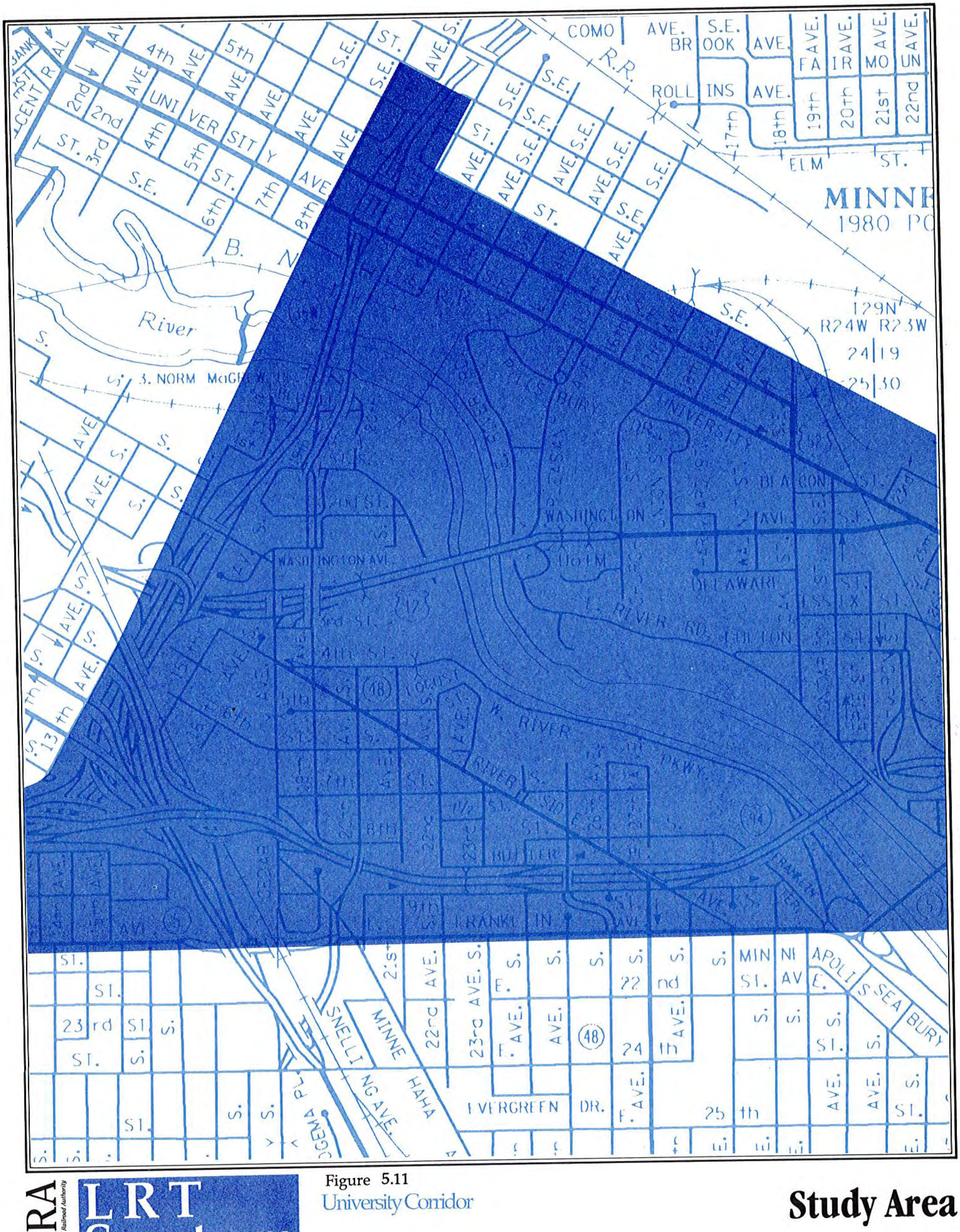

Figure 5.11
University Corridor

Study Area

HCRRA
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LRT System
Environmental Impact Statement

BRW

0 1/8 Mile North

Impacts of traffic volume increases at intersections in the study area were also addressed. Analysis showed that the following seven intersections in the East Bank campus area could be affected by the increased volumes:

- o 4th Street/10th Avenue
- o University Avenue/10th Avenue
- o 4th Street/15th Avenue
- o University Avenue/15th Avenue
- o 4th Street/17th Avenue
- o Motley Bypass/Washington Avenue
- o Motley Bypass/Fulton Street

The analysis of intersection operations considered both the no-build and build conditions in order to determine the extent to which the closure of Washington Avenue would impact intersection levels of service (LOS). The following table summarizes the results of the analysis.

TABLE 5.42
LEVEL OF SERVICE

Intersection	Level of Service	
	Build	No-Build
4th Street/10th Avenue	D	C
University Avenue/10th Avenue	C	B
4th Street/15th Avenue	E	C
University Avenue/15th Avenue	A	A
4th Street/17th Avenue	D	C
Motley Bypass/Washington Avenue	F	D
Motley Bypass/Fulton Street	E	B

Source: 1985 Highway Capacity Manual, Planning Methodology.

As indicated in Table 5.43, under the build condition the Motley Bypass/Washington Avenue and Motley Bypass/Fulton Street intersections would operate at unacceptable levels. Analyses were conducted to determine intersection approach configurations that would adequately accommodate forecast traffic volumes at these intersections. Results of the analysis are shown on the following page.

TABLE 5.43
BUILD APPROACH CONFIGURATION

Intersection	North T-R-L	East T-R-L	South T-R-L	West T-R-L	LOS
Motley Bypass/ Washington Avenue	2-0-0	2-0-1	2-0-2	2-1-1	C (over)
Motley Bypass/ Fulton Street	3-0-0	0-0-0	3-0-1	1-2-1	B (near)

Source: 1985 Highway Capacity Manual, Planning Methodology.

Further analysis showed that under the no-build condition, daily vehicle miles of travel (VMT) totaled 545,200. Under the build condition, daily VMT increased by two percent to 558,600. The average speed in the study area under the no-build condition was calculated to be 20.4 mph during the PM peak period and 43.7 mph during the off-peak. Under the build condition, average speeds were found to be 20.3 mph and 44.1 mph, for the PM peak and off-peak periods, respectively.

5.7.5 Transit Service

The characteristics shown in Table 5.44 reflect regular MTC routes and the University circulator statistics. The direct University bus services (Route 52) are not included in the table. The impact of the LRT system on the direct University routes would be influenced by the alignment of LRT lines through downtown into the University. As the LRT operating plan is refined, the impacts on Route 52 service can be quantified.

TABLE 5.44
BUS SERVICE BY CORRIDOR

	EXISTING	LRT SUBWAY	LRT AT-GRADE (Nicollet Option)	LRT AT-GRADE (Kenwood Option)
Daily bus miles	3,361	2,644	2,644	2,644
Peak fleet requirement	24	21	21	21
Peak hour buses entering downtown	21	18	18	18

LRT would reduce bus miles by 21 percent, fleet requirements by 13 percent, and peak hour CBD bus volumes by 14 percent. Figure 5.12 illustrates the University Corridor feeder bus routes.

The LRT impact on travel times to downtown is shown in Table 5.45. The travel time would decrease from the current fifteen-minute trip to eleven to twelve minutes, depending upon the downtown alignment. Although downtown is not a major destination from the University, it is the primary transfer location for regional transit trips to the University. An improvement in travel time to downtown, therefore, improves the regional accessibility of the University.

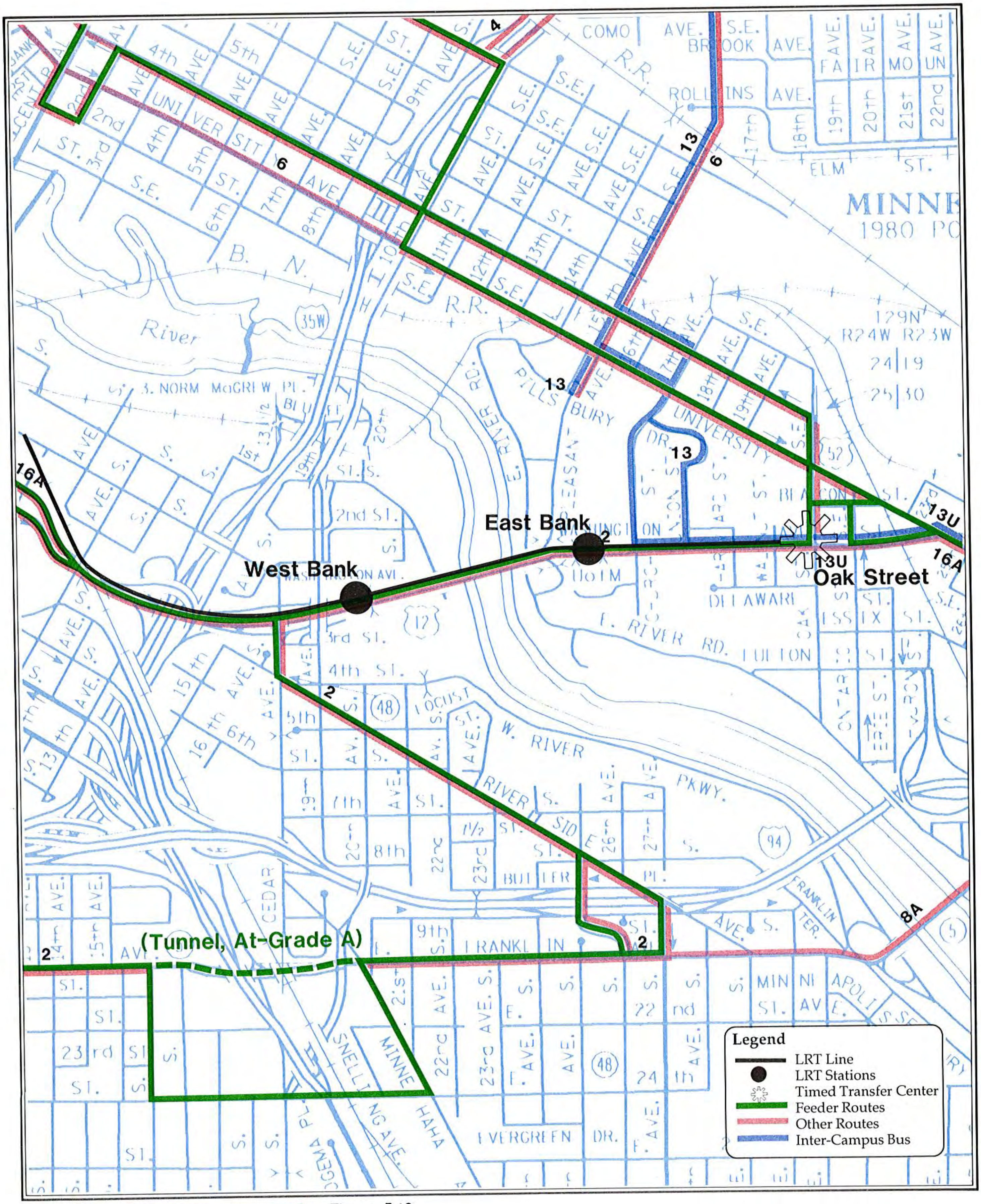
Currently, seventeen transit trips per hour connect the University and downtown during the peak period. As rail trips replace buses in the LRT alternatives, the service frequency would drop from seventeen to sixteen trips. Service capacity would increase significantly, however, since six of the hourly transit trips in the preliminary LRT Operating Plan are two- to three-car trains.

The introduction of LRT technology would enhance service reliability and ride quality to the University. The major advantage to the corridor would be the direct service from one of the other rail corridors, and simplified rail-to-rail transfer. Although the MTC Route 52 already provides direct service to the University, its service frequency is extremely limited, particularly in comparison to the proposed LRT frequency.

The short length of the University corridor significantly reduces the impact of the LRT feeder routes on cross-town excessibility within the corridor.

5.7.6 Air Quality

In the University Corridor, the proposed LRT system will displace private vehicle traffic from Washington Avenue. This traffic will be forced to use alternative routes including I-94, the Motley Bypass, I-35W, University Avenue, and Fourth Street. The traffic analysis of the University area indicated the greatest impact on traffic operations at the intersections of Washington Avenue and Fulton Avenue with the proposed Motley Bypass. For this reason, these two intersections were selected for detailed microscale air quality analysis.



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Environmental Impact Statement

Figure 5.12
University Corridor

BRW

0 1/8 Mile North

Transit Service Routes

Source: Metropolitan Transit Commission

TABLE 5.45
TRANSIT TRAVEL TIME COMPARISON FROM THE UNIVERSITY CORRIDOR TO DOWNTOWN MINNEAPOLIS

CORRIDOR	ORIGIN	PEAK HOUR TRAVEL TIME (MINUTES)				LRT TRAVEL TIME IMPACT (MINUTES)		
		CURRENT1/	LRT TUNNEL2/	LRT AT-GRADE2/ (Nicollet Option)	LRT AT-GRADE (Kenwood Option)	LRT TUNNEL	LRT AT-GRADE (Nicollet Option)	LRT AT-GRADE (Kenwood Option)
University	Oak/Washington	15	12	11	11	-3	-4	-4

1/ Current bus travel times are used rather than 2010 no-build conditions because future congestion impacts on street travel speeds are not quantified. This represents a best case comparison, since bus travel speeds will decrease as traffic congestion continues to increase in the future.

2/ Transfer from feeder bus includes 3 minute wait for LRT.

The analysis considered five receiver sites located in the vicinity of the two critical intersections. The receivers analyzed are described below:

- o Receiver R1 - Daycare center located east of the Motley Bypass (existing Huron Street) at Fulton Avenue.
- o Receiver R2 - Apartment building located in the northwest corner of the intersection of the Motley Bypass and Fulton Avenue.
- o Receiver R3 - Residence located in the southwest corner of the intersection of the Motley Bypass and Essex Street.
- o Receiver R4 - Restaurant located in the southeast corner of the intersection of the Motley Bypass and Washington Avenue.
- o Receiver R5 - Restaurant located in the northeast corner of the intersection of the Motley Bypass and Washington Avenue.

The analysis methodology and assumptions used to model the Motley Bypass intersections with Washington and Fulton are virtually identical to those used to model the Bass Lake Road station (Section 5.3.6). Background CO concentrations were estimated based on monitoring conducted in July 1989, on the University campus as part of an Indirect Source Permit application. The monitoring was conducted at a site near Cooke Hall and is fully documented in Interpoll Laboratories, Inc. Report Number E9-3030 dated August 10, 1989. Table 5.46 shows the estimated worst-case background CO concentrations used in this analysis.

Analyses have been done both with and without the proposed LRT system. The no-build analysis assumes that the Motley bypass is generally constructed as a four-lane facility as currently proposed. The build analysis assumes that the Motley bypass is expanded to provide the additional lanes determined to be necessary to provide an acceptable level of service. This analysis is contained in the traffic impact section.

The analysis results are shown in Tables 5.47 and 5.48. The maximum predicted CO concentrations are 8.4 PPM one-hour average and 6.2 PPM eight-hour average with the proposed LRT on Washington Avenue. These values are well below the state air quality standards of 30 PPM one-hour average and 9 PPM eight-hour average. The results indicate that the diversion of traffic caused by LRT on Washington Avenue will increase CO concentrations along the Motley Bypass. However, improvements to the Motley Bypass can be constructed to assure that CO concentrations will not exceed state air quality standards.

TABLE 5.46
BACKGROUND CO CONCENTRATIONS - UNIVERSITY OF MINNESOTA

	Correction Factor 1-Hour	Correction Factor 8-Hour
Maximum Monitored Concentration (PPM)	1.0	0.9
Holzworth Correction (To Worst-Case Winter Conditions)	1.2	1.2
Temperature Adjustment To 20 Degrees Fahrenheit)	1.7	1.7
1989 Worst-Case Background CO (PPM)	2.1	1.9
1995 VMT Adjustment (1.00% per year)	1.062	1.062
1995 Emission Adjustment	0.676	0.676
1995 Worst-Case Background (PPM)	1.5	1.4

NOTE: Monitoring data for background concentrations were obtained by Interpoll Inc. at a site on the University of Minnesota Campus.

TABLE 5.47
PREDICTED CO CONCENTRATIONS - MOTLEY BYPASS WITH LRT

BUILD LRT

Background CO Concentrations
1-hour 1.5 PPM
8-hour 1.4 PPM

Receptor Site	WIND DIRECTION 20		40		80		110		160	
	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
R1 NW Learning Center	1.5	1.4	1.5	1.4	1.5	1.4	1.5	1.4	1.5	1.4
R2 SE Face House	7.9	5.9	6.8	5.1	5.8	4.4	5.5	4.2	5.9	4.5
R3 NW Face House	7.2	5.4	7.2	5.4	6.1	4.6	6.1	4.6	8.4	6.2
R4 NW Face Arby's	2.8	2.3	2.8	2.3	2.2	1.9	1.5	1.4	2.5	2.1
R5 W Face Peking	1.5	1.4	1.5	1.4	1.5	1.4	2.4	2.0	3.4	2.7
Maximum	7.9	5.9	7.2	5.4	6.1	4.6	6.1	4.6	8.4	6.2

Receptor Site	WIND DIRECTION 220		250		280		310		Maximum	
	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
R1 NW Learning Center	2.6	2.2	3.3	2.7	3.8	3.0	3.6	2.9	3.8	3.0
R2 SE Face House	4.1	3.2	3.6	2.9	1.6	1.5	1.5	1.4	7.9	5.1
R3 NW Face House	1.7	1.5	1.5	1.4	1.5	1.4	1.6	1.5	8.4	6.2
R4 NW Face Arby's	3.0	2.5	3.1	2.5	5.2	4.0	4.6	3.6	5.2	4.0
R5 W Face Peking	3.4	2.7	4.4	3.4	3.1	2.5	2.7	2.2	4.4	3.4
Maximum	4.1	3.2	4.4	3.4	5.2	4.0	4.6	3.6	8.4	6.2

TABLE 5.48
PREDICTED CO CONCENTRATIONS - MOTLEY BYPASS WITHOUT LRT

NO BUILD

Background CO Concentrations

1-hour	1.5 PPM
8-hour	1.4 PPM

Receptor Site	WIND DIRECTION 20 1-Hour	20 8-Hour	40 1-Hour	40 8-Hour	80 1-Hour	80 8-Hour	110 1-Hour	110 8-Hour	160 1-Hour	160 8-Hour
R1 NW Learning Center	1.5	1.4	1.5	1.4	1.5	1.4	1.5	1.4	1.5	1.4
R2 SE Face House	5.5	4.2	4.9	3.8	4.3	3.4	4.1	3.2	3.6	2.9
R3 NW Face House	5.1	3.9	5.1	3.9	4.5	3.5	4.5	3.5	6.0	4.6
R4 NW Face Arby's	2.7	2.2	2.8	2.3	2.2	1.9	1.5	1.4	2.3	2.0
R5 W Face Peking	1.5	1.4	1.5	1.4	1.5	1.4	2.3	2.0	3.3	2.7
Maximum	5.5	4.2	5.1	3.9	4.5	3.5	4.5	3.5	6.0	4.6

Receptor Site	WIND DIRECTION 220 1-Hour	220 8-Hour	250 1-Hour	250 8-Hour	280 1-Hour	280 8-Hour	310 1-Hour	310 8-Hour	Maximum 1-Hour	Maximum 8-Hour
R1 NW Learning Center	2.6	2.2	2.5	2.1	2.7	2.2	2.9	2.4	2.9	2.4
R2 SE Face House	2.1	1.8	2.0	1.8	1.5	1.4	1.5	1.4	5.5	3.8
R3 NW Face House	1.6	1.5	1.5	1.4	1.5	1.4	1.5	1.4	6	4.6
R4 NW Face Arby's	2.8	2.3	2.9	2.4	4.8	3.7	3.8	3.0	4.8	3.7
R5 W Face Peking	3.1	2.5	3.7	2.9	2.3	2.0	2.1	1.8	3.7	2.9
Maximum	3.1	2.5	3.7	2.9	4.8	3.7	3.8	3.0	6.0	4.6

5.7.7 Noise

Operating characteristics, the setback distance to the nearest receiver site and the predicted maximum passby noise levels at the nearest sensitive receiver site for specific segments along the corridor are documented in Table 5.49. Prediced noise levels at the nearest receiver site have been determined based on both the best- and worst-case noise emission rates. As indicated in the table, from Oak Street to 19th Avenue South, under worst-case conditions, the predicted noise levels would exceed APTA guidelines.

Table 5.50 documents the number of impacted residential, commercial and industrial uses, and the acres of parkland that are forecast to experience maximum passby noise levels which exceed the APTA guidelines. As the table indicates, impacts would be limited institutional uses in the University area.

No-Build

The existing noise environment, described in Section 4.7.8, outlines the impact to the University Corridor area under the no-build alternative.

5.7.8 Water Resources

Runoff and Receiving Waters

Build Alternative:

The proposed LRT system facilities would not affect any storm water management facilities. Methods to handle the local storm water generated by individual station locations will be addressed in a manner approved by the City of Minneapolis.

No-Build Alternative:

There would be no impacts to the runoff and receiving waters under the no-build alternative.

Floodplains

Build Alternative:

The University line would cross the Mississippi River floodplain. The LRT alignment on Washington Avenue would have no impact on the floodplain.

TABLE 5.49
PREDICTED LRT MAXIMUM PASSBY NOISE LEVELS

University Corridor

From	To	Adjacent Land Use	Minimum Setback	APTA Guidelines	Speed (MPH)	LMAX Best	LMAX Worst	Guideline Exceeded ? Best	Guideline Exceeded ? Worst	Distance To LMAX Guide Line Best	Distance To LMAX Guide Line Worst
Oak Street	Church Street	University of Minnesota	40'	75 dBA	30 MPH	75 dBA	80 dBA	N	Y	*	90'
Church Street	Pleasant Street	University of Minnesota	55'	75 dBA	30 MPH	73 dBA	78 dBA	N	Y	*	90'
Church Street	Pleasant Street	University of Minnesota	70'	75 dBA	30 MPH	72 dBA	77 dBA	N	Y	*	90'
Pleasant Street	West River Parkway	University of Minnesota	100'	75 dBA	55 MPH	80 dBA	85 dBA	N	Y	90'	200'
West River Parkway	19th Avenue South	University of Minnesota	100'	75 dBA	55 MPH	74 dBA	79 dBA	N	Y	90'	200'
19th Avenue South	11th Avenue South	Right-of-Way Commercial	NS-200' SS-300'	85 dBA 85 dBA	55 MPH 55 MPH	70 dBA 67 dBA	75 dBA 72 dBA	N N	N N	* *	* *
11th Avenue South	Central	Commercial	20'	85 dBA	10 MPH	72 dBA	79 dBA	N	N	*	*

NOTE: * - Distance to applicable APTA Guideline noise level is less than 50 feet from the centerline of the LRT line.
Y - Yes, predicted noise levels exceed guideline.
N - No, predicted noise levels do not exceed guudeline.

TABLE 5.50
LEVEL OF LRT VEHICLE NOISE IMPACTS

University Corridor

Line Segment Start	Line Segment End	Dwellings Impacted	Institutional Uses Impacted	Comm/Indust Uses Impacted	Park Acres Impacted
End of Line	Church Street	0 / 0	0 / 4	0 / 0	0.00 / 0.00
Church Street	Pleasant Street	0 / 0	0 / 1	0 / 0	0.00 / 0.00
Pleasant Street	W. River Parkway	0 / 0	0 / 1	0 / 0	0.00 / 0.00
W. River Parkway	19th Avenue South	0 / 0	0 / 4	0 / 0	0.00 / 0.00
19th Avenue South	11th Avenue South	0 / 0	0 / 0	0 / 0	0.00 / 0.00
11th Avenue South	Central Area	0 / 0	0 / 0	0 / 0	0.00 / 0.00
		0 / 0	0 / 10	0 / 0	0.00 / 0.00

NOTE: - 0 / 0 - Best-Case Impacts/Worst-Case Impacts.

- Noise mitigation effects of intervening buildings were accounted for in the impact area evaluation.

No-Build Alternative:

There would be no impact to the Mississippi River floodplain under the no-build alternative.

Shoreland Zoning

Build Alternative:

As noted in Section 4.7.11, Shoreland Zoning, the proposed University line would run within a portion of the Mississippi River Shoreland Zoning District. Therefore, a permit from the City of Minneapolis Zoning Administrator would be required where construction of the LRT system would involve grading or filling of earth within the Shoreland Zoning District, and where the slope of the land is toward the Mississippi River. It is anticipated that no vegetative cutting would occur within the district boundaries.

Mitigation measures for grading and filling would include standard erosion control measures.

No-Build Alternative:

There would be no impact to the Mississippi River Shoreland Zoning District under the no-build alternative.

Mississippi River Critical Area

Build Alternative:

The University line would be within the Mississippi River Critical Area from Oak Street to its connection with the Central Area. The proposed alignment would be consistent with the University of Minnesota's Critical Area Plan.

No-Build Alternative:

The no-build alternative would also be consistent with the University of Minnesota's Critical Area Plan.

Groundwater

Build Alternative:

It is not expected that groundwater appropriation would be required for any portion of the University LRT line.

No-Build Alternative:

There would be no impact to the groundwater in the University area under the no-build alternative.

5.7.9 Utilities

Utility impacts are expected as the LRT system proceeds out of Minneapolis Central Business Oistrict (CBD) to the University of Minnesota campus. Impacts are expected to be similar to the CBD, but to a lesser extent. Pressure conduits running parallel within the dynamic envelope would be relocated to provide safe operation of the LRT. Other utilities may require relocation to provide access for future service ability.

No-Build Alternative

There would be no impacts to utilities in the University Corridor under the no-build alternative.

5.7.10 Steep Slopes

Steep slopes are encountered on both banks of the Mississippi River. The river would be crossed using the existing Washington Avenue bridge. Therefore, no impact on steep slopes is anticipated.

No-Build

There would be no impacts to steep slopes under the no-build alternative.

5.7.11 Parklands

Both the build and no-build alternatives would have no impact on parklands in the University Corridor.

5.7.12 Visual and Aesthetics

Figure 5.13 illustrates the specific areas along the University line which would be visually affected by the proposed LRT alignment. It also identifies areas where the view of the LRT corridor would be obstructed because of existing land use types and structures.

Rather than duplicate information presented in Figure 5.8, this section will address the LRT's compatibility with the existing character of the area, including the effects of the catenary wire.

From Oak Street to the Washington Avenue bridge the existing overhead wires and commercial signs will help mask the LRT catenary wire. It is anticipated, however, that the new visual element created by the LRT vehicles could be a significant visual impact to the area.

From the Washington Avenue bridge to the Central Area connection, the LRT's visual impact to the surrounding area would be minimal. This can be explained by the fact that

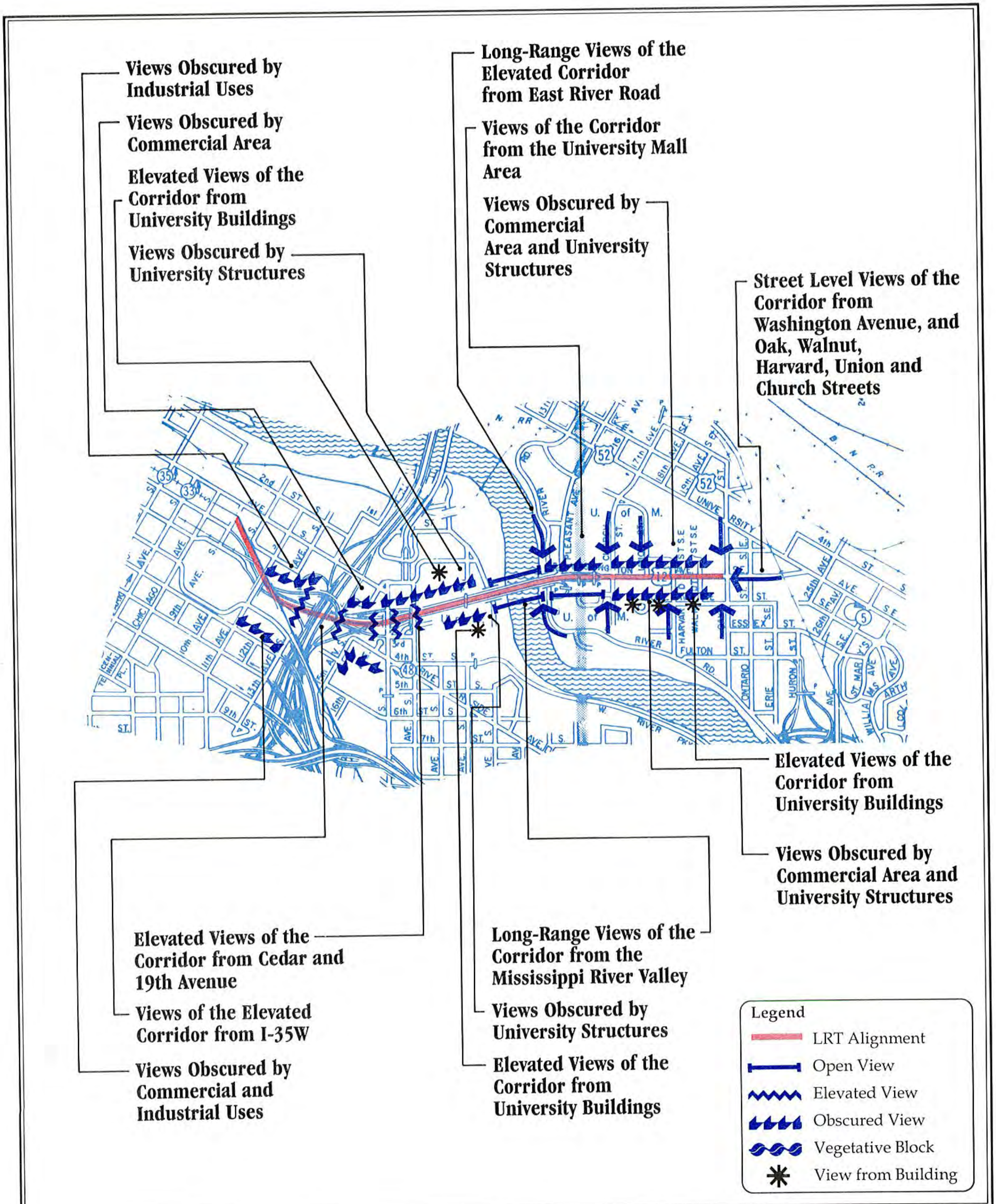


Figure 5.13

University Corridor

Visual Aesthetics

the proposed alignment would be located in a roadway that carries high bus volumes and is at a lower grade than the surrounding land uses.

No-Build

The implementation of the no-build alternative would reduce the incentive to solve existing image issues that involve traffic and campus planning.

5.7.13 Historic and Cultural Resources

The State Historic Preservation Office (SHPO) was unable to make a determination of effect for both the build and no-build alternatives, pending completion of the cultural resource survey currently being conducted along the West River Parkway. Upon completion of the above-mentioned survey, SHPO will need to re-review the LRT alignment which is proposed to cross the Mississippi River.

5.8 CENTRAL AREA

The format for the Central Area impact analysis is different from the previous corridor sections. Specifically, because there are three distinct LRT system options in the Central Area--two at-grade, and the tunnel--and the no-build alternative, comparisons of each of the options and the no-build alternative will be presented.

5.8.1 Community and Neighborhood Character

Tunnel Option

Because most of the tunnel alignment would be located within grade separated rights-of-way, LRT related impacts to the surrounding communities and neighborhoods would be minimal.

The segment of Olson Memorial Highway (TH 55) included in the Central Area, which serves as the at-grade connection for the Northwest Corridor to the tunnel alignment is a high volume roadway. In its existing condition, TH 55 forms a barrier to north-south vehicular and pedestrian access within the Sumner-Glenwood Neighborhood (Girard Terrace to I-94). If the proposed alignment were constructed at-grade along TH 55, it would further divide the neighborhood units.

Safety is a potential issue along the alignment at any location where vehicles or pedestrians would be able to access the alignment. For the most part, the at-grade connections to the tunnel are grade separated from vehicular traffic. Areas near residential units, however, are the locations where safety hazards will have the highest probability of occurring.

The LRT line located in the 29th Street Corridor (Hiawatha and Southwest Corridor Connections) would run within (from west to east) the Cedar-Isles-Dean, East Isles, Lowry Hill East, Wittier and Phillips neighborhoods. Because the alignment would be in a depressed railroad corridor as it passes through the Lowry Hill East, Wittier and Phillips neighborhoods, its impact would be minimal. Impacts to the Cedar-Isles-Dean and East Isles neighborhoods would be primarily noise and visual impacts (Sections 5.8.6 and 5.8.12, respectively).

A non-revenue segment of single track, which would provide access to the Coach Yard site, would be located in railroad right-of-way immediately adjacent to Hiawatha Avenue. Because Hiawatha Avenue serves as the border between the communities and neighborhoods, the LRT alignment would not divide continuous community or neigborhood units.

Twelve station locations are proposed for the Central Area under the tunnel option. Five of the stations are within the tunnel. The remaining seven stations would be located either in street or railroad right-of-way. It is anticipated that access to the Central Area stations will primarily be walk-ons. The stations would be located so as to improve accessibility to/from major activity nodes, including:

- o Retail District and commercial/office uses in the historic Mills District
- o Retail and residential uses in the Hennepin Avenue/Lake Street area
- o The Honeywell complex, and Abbott-Northwestern Hospital
- o Athletic and regionally oriented events and trade shows at the Metrodome
- o Convention Center uses and regionally oriented events and trade shows at the Convention Center
- o Established residential neighborhoods and community facilities that are east and west of Nicollet Avenue between 12th Street and 29th Street

Based on 1980 census tract data, approximately 48,750 transit dependent individuals in the Central Area would be serviced by the tunnel option.

At-Grade System Option A: Nicollet At-Grade

The neighborhoods affected by the Southwest and Hiawatha Line connections along the 29th Street Corridor are identified in the tunnel option discussion. Similar to the tunnel option, approximately 48,750 potentially transit dependent individuals would be serviced by this option.

The Nicollet Avenue segment from 29th Street to Grant Street would run through the Whittier, Stevens South Loring Heights, and Loring Park neighborhoods.

This at-grade alignment would present access and traffic flow impacts within the Central Area Corridor communities and neighborhoods. Traffic impacts are discussed in greater detail in Section 5.8.4.

The LRT alignment on 2nd and Marquette Avenues is within the North Loop, Downtown West, Loring Park, Stevens Square-Loring Heights, and Whittier Neighborhoods. The 2nd/Marquette alignment would divide these neighborhoods. However, the impacts of these divisions would not be significant because of the highly developed nature of the area and the existing barriers created by the high volume roadways.

Direct emergency vehicle access onto roadways where LRT is proposed to be aligned would be limited to police precinct #5 on Nicollet Avenue and 25th Street. Based on experiences in other cities with at-grade LRT systems, emergency vehicle access (fire, police, ambulance) would not be impaired by the at-grade alignments in the Central Area.

Access to the following medical complexes would be improved by LRT service:

- Hennepin County Medical Center, 7th Street South/Park Avenue South
- Metropolitan Mount Sinai Medical Center (Downtown Campus), 8th Street South/9th Avenue South
- Metropolitan Mount Sinai Medical Center (Phillips Campus), Chicago Avenue South/East 22nd Street
- Abbott-Northwestern Hospital, Chicago Avenue South East 28th Street

At-Grade System Option B (HCRRA right-of-way option)

Southwest Connection - This at-grade option would pass through the Cedar-Isles-Dean and Kenwood Neighborhoods. Because the alignment would be located in an existing depressed railroad right-of-way as it proceeds through these neighborhoods, access across the alignment would be no worse following implementation than it is now. As the LRT track proceeds to the northeast from the Kenwood neighborhood, it would follow the border between the Bryn-Mawr and Lowry Hill Neighborhoods. Therefore, it would not further divide these neighborhood units.

Hiawatha Connection - A Native American community is located in the area between Franklin Avenue and 25th Street on the West side of TH 55. The proposed action will not result in displacement of any part of this community, nor will there be any significant adverse impacts to this group (TH 55 (Hiawatha Avenue) Draft EIS, 1982).

Safety and security impacts would occur where the alignment is adjacent to residential uses. The increase in LRT train passby frequency compared to the existing freight train frequency could create additional safety concerns, and potential disruption to adjacent residential units. The addition of fencing along right-of-way to mitigate safety concerns will be considered as the design and final location of the system and stations are determined.

This option would not impact emergency vehicle access because of its alignment in existing railroad right-of-way (existing access across the railroad corridor would be retained).

Stations - Thirteen stations are proposed for this at-grade system option. Because the stations are projected to be used primarily by walk-on patrons, the traffic related impacts to the surrounding neighborhoods would be minimal. The exception to this would be at the Abbott Avenue Station, which would operate as a bus timed-transfer station.

The Kenwood area stations are proposed to be located on discontinuous collector roadways that serve the Cedar-Isles-Dean and Kenwood Neighborhoods.

Transit Dependents - Because this alignment option would not service the residential and business communities in close proximity to the 29th Street Corridor, a large transit dependent population and work-trip oriented riders would not be serviced. Based on 1980 census track data, it is estimated that approximately 11,000 transit dependent individuals would be serviced by this at-grade option.

No-Build

There would be no impacts to the community facilities and neighborhood boundaries under the no-build alternative.

5.8.2 Potential Relocation and Displacement

Tunnel Option

Two residential properties would be acquired at the south portal of the tunnel.

The alignment of the Southwest and Hiawatha lines on the 29th Street Corridor would require the acquisition of railroad right-of-way from the Soo line.

North Portal

The north portal of the tunnel could require the acquisition of two warehouse properties. A final determination will be made after preliminary engineering.

At-Grade Option A: Nicollet Avenue

The Northwest Corridor Connection to 2nd/Marquette Avenue would require the acquisition of the Colonial Warehouse building as the line turns from the Burlington Northern right-of-way onto 2nd Street North.

The Southwest and Hiawatha Connection (from the 29th Street Corridor) to Nicollet Avenue could impact two commercial properties to the east and west of Nicollet Avenue at 29th Street. Additionally, the acquisition of the 29th Street Corridor Soo Line right-of-way (identified in the tunnel option) would be required.

At-Grade Option B: HCRRA Alignment

Hiawatha access to Central Area surface routes will entail use of Soo Line yard trackage from the vicinity of Hiawatha Avenue and 24th Street past the Coach Yard area to the Metrodome, a distance of 1.1 miles.

Soo Line presently serves two customers from 24th Street to the Metrodome: Valspar and the Minneapolis Star and Tribune. Operations are limited to occasional switching locomotive moves to and from these sidings to spot or pick up cars.

Negotiations between the Soo Line and the HCRRA regarding the acquisition of railroad right-of-way would be required.

Yards and Shop Site

Each of the Central Area build alternatives would include the development of the Yards and Shops site at the Coach Yard. Potential impacts to the Soo Line right-of-way north of Lake Street are addressed in the At-Grade Option B discussion.

Development on the proposed coach yard site would require acquisition of four multi-family homes and two businesses to the west of the site.

No-Build Alternative

There would be no relocation required under the no-build alternative.

5.8.3 Economic Development

For the economic development impact analysis, the central business district (CBD) was defined as the area within the following boundaries: Interstate Highway 35W, I-394 and 94 Southwest of the Mississippi River. The impact of the Hennepin County LRT system on the Minneapolis CBD will be presented first, the discussion regarding the economic development potential at station sites along the at-grade connection alignments (outside the CBD) will follow.

Central Business District

The impact of the light rail transit system on downtown development can be most readily measured by illustrating its impact on the general-occupancy office market. The following table illustrates the demand for downtown general-occupancy office space utilizing the Metro Council forecast of employment in 2010, and the employment range developed by Hammer, Siler, George Associates without the light rail transit system. These calculations indicate that the incremental demand generated by the system would amount to between 900,000 and 1.2 million net rentable square feet.

TABLE 5.51
GENERAL-OCCUPANCY OFFICE SPACE DEMAND, WITH AND WITHOUT LRT, DOWNTOWN MINNEAPOLIS, 2010

	WITH LRT	WITHOUT LRT LOW	WITHOUT LRT HIGH
Total Employment	171,500	163,500	165,500
Space Per Employee (sq. ft.)	134.0	134.0	134.0
Occupied Space (million sq. ft.)	23.0	21.9	22.2
Vacant (million sq. ft.)	2.0	1.9	1.9
Total Space (million sq. ft.)	25.0	23.8	24.1
1995 Inventory (million sq. ft.)	19.4	19.4	19.4
Net New Space, 1995-2010 (million sq. ft.)	5.6	4.4	4.7
LRT Impact (million sq. ft.)	0.9 to 1.2		

Source: Metropolitan Council of the Twin Cities; BRW, Inc.; and Hammer, Siler, George Associates.

Overall, analysis indicates that LRT would cause between twenty and twenty-five percent additional net gain in general-occupancy office space between 1995 and 2010.

Central Area Outside CBD

Tunnel

LRT service to the area immediately south of the Minneapolis CBD could reinforce the continuation and limited expansion of redevelopment efforts in the Lake Street/29th Street Corridor. The area is currently experiencing a significant amount of redevelopment momentum to the west, in the vicinity of St. Louis Park and Lake Calhoun. LRT service is one factor that could stimulate the development and rehabilitation of housing in the vicinity of several of the proposed station sites, as well as the development of a limited amount of office and retail space. A brief overview of each of the stations follows.

Hennepin Avenue Station: The area in the vicinity of the Hennepin Avenue station is the focus of redevelopment activity. Commercial activity is taking place in rehabilitated older structures. There are numerous restaurants, shops and service establishments in this area. Office space is scattered and generally located above retail establishments. Plans for an eight-screen cinema seating 2,000 has been approved by the City of Minneapolis on Fremont Avenue between 29th and Lagoon Avenue. The area of positive impact around this commercial node extends from Lake Calhoun/Lake of the Isles on the west, to Emerson Avenue on the east. The station at Hennepin Avenue could add an addition mode of accessibility to the existing and planned area establishments.

Lyndale Avenue Station: Commercial redevelopment opportunities are not as great at this station as at Hennepin Avenue. Little renovation has taken place as yet; however, the residential base is strong. Impact from the station located at Lyndale Avenue would most likely come in the form of convenience retailing and a moderate number of housing units. The station would produce a stabilizing effect on the area rather than create a substantial base of new development opportunity.

Nicollet Avenue Station: Development in the vicinity of the Nicollet Avenue station would probably be modest and limited to convenience-oriented commercial shopping space and residential units. The City of Minneapolis projects that a station at this location could provide the necessary incentive for developers to rework the Kmart parcel. A neighborhood-serving retail complex has been suggested. This transition could be considered a long-term impact.

Chicago Avenue: A major redevelopment project is planned for the old Sears retail/distribution complex. The developer looks upon the LRT system as a desirable asset but not a necessary element in the redevelopment of the old center. Additional development is anticipated to be on a relatively small scale and would consist of office and retail space.

At-Grade Option A (Nicollet Avenue)

Four stations are proposed to be located in the 29th Street Corridor under At-Grade Option A. The stations at Hennepin Avenue, Lyndale Avenue and Chicago Avenue are discussed in the previous tunnel option section. The station located between 4th and 5th Avenue would serve the Honeywell headquarters located to the north of the site. The ridership is expected to be relatively high at this station because of the presence of a major employer. Therefore, retail and services business potential should be higher here than any station, except Hennepin Avenue. The City of Minneapolis envisions light industrial usage between Honeywell and I-35W, but realizes that industrial development would be difficult to accomplish, as the area has already been disrupted by interstate highway construction. A moderate amount of housing redevelopment is more likely.

Development potential at Nicollet Avenue and 28th Street is anticipated to be minimal because of its close proximity to the Honeywell station and the fragmented nature of commercial development in the immediate station area.

Franklin Avenue Station: Development in the vicinity of the proposed Franklin Avenue station is generally mixed commercial uses of medium to low quality. Development potential in the area is considered moderate and limited to convenience retailing and a small number of multi-family housing units.

At-Grade Option B (HCRRA Alignment With Hiawatha Connection Near the Metrodome)

Kenwood Segment:

No significant change in development is anticipated at either the Cedar Lake or the 21st Street stations because of the mature residential character and limited availability of undeveloped land in their vicinity.

At the time this document was prepared, the HCRRA had made no plans to develop the excess railroad right-of-way purchased from the Chicago and Northwestern Railroad.

Hiawatha Connection Segment:

At 24th Street, the proposed station would be east of Hiawatha Avenue in the midst of an industrial area. The City of Minneapolis has purchased Soo Line railroad property in the area and is currently in the process of exploring redevelopment opportunities. To the extent that any development potential exists near the station, it would be industrial in character.

Development opportunities are limited at the 15th Avenue station. There is no significant vacant land accessible to the station. Even though the University of Minnesota-West Bank campus is within the impact area, it is better served by the University Connector and stations. If development does take place near the 15th Avenue station, it will most likely be neighborhood-serving commercial or additional high-density housing.

5.8.4 Traffic Impacts

Methodology

The traffic impact analysis for the Central Area included the following components:

- Impacts of LRT Operations in Street Right-of-Way: Areas outside the Central Business District
- Impacts of LRT Operations in Street Right-of-Way: Central Business District
- At-Grade LRT Crossing of surface streets
- Traffic and pedestrian impacts of LRT stations
- Construction-related traffic impacts for both at-grade alignments and the tunnel

LRT operations within street right-of-ways were considered separately depending on whether the street in question was located in the CBD or outside the CBD. For the traffic analysis, the CBD was defined as the proposed LRT operations on Marquette Avenue and Second Avenue from 2nd Street to 15th Street.

In areas outside the CBD, the traffic analysis was based on the carrying capacity of streets on an average daily traffic (ADT) basis. Table 5.52 shows the estimated daily carrying capacity of various types of streets used in this analysis.

TABLE 5.52
ESTIMATED DAILY CAPACITY FOR VARIOUS ROADWAY CONFIGURATIONS

Roadway Configuration	Estimated Daily Traffic Capacity Which Will Provide Level of Service "D" Operations During Peak Hours 1/
One-Lane, One-Way	8,000
Two-Lane, Two-Way, No Left Turn Lanes	9,000
Two-Lane, Two-Way, With Left Turn Lanes	13,500
Two-Lane, One-Way	16,000
Three-Lane, One-Way	24,000
Four-Lane, Undivided, No Left Turn Lanes	18,000
Four-Lane, Divided, With Left Turn Lanes	27,000

1/ Based on the 1985 Highway Capacity Manual.

Street capacities were estimated by BRW based on information contained in the 1985 Highway Capacity Manual.[1] Each street segment which was identified as an alternative LRT line was analyzed to determine existing roadway capacity, existing traffic based on the City of Minneapolis 1988 Average Daily Traffic Flow Map, and roadway capacity with the LRT line.

All street capacities were expressed in terms of the maximum amount of traffic which could be carried on a daily basis in order to provide level of service "D" traffic conditions in the peak hours. In traffic engineering methodology, traffic operations are described in levels of service ranging from "A" (light traffic) to "F" (traffic demand above and beyond roadway capacity). Level of service "D" is the standard which is normally used for design purposes in urban and suburban areas.

In the CBD area, the traffic operations analysis was conducted by the City of Minneapolis. The analysis included peak hour intersection capacity analysis for intersections in the CBD area which would be affected by LRT lines. Intersection capacity calculations were conducted using the operations and design method of signalized intersection analysis from the 1985 Highway Capacity Manual using level of service "D" as the design standard. The Year 1995 was selected as the horizon year for this analysis.

At-grade LRT crossings of surface streets in the Central Area were also considered. In the CBD area, LRT movements were an integral part of the intersection capacity analysis conducted by the City of Minneapolis. Outside the CBO, all LRT crossings of surface streets in the Central Area would occur with the LRT vehicles operating concurrent with other street traffic. The at-grade street crossing analysis documented in the Traffic Characteristics of At-Grade Light Rail Crossings[2], concluded that in general, at-grade LRT street crossings do not create significant traffic impacts. Therefore, a separate analysis of individual street crossings was not considered necessary.

1/ Highway Capacity Manual, Special Report 209, Transportation Research Board, 1985.

2/ Berry, Richard A. and Williams, James C., Traffic Characteristics of At-Grade Light Rail Crossings, ITE 1989 Compendium of Technical Papers, September 17-21, 1989.

In terms of delay to street traffic, an at-grade LRT crossing can be analyzed as a signalized intersection, with the LRT line as the cross-street. According to the 1985 Highway Capacity Manual operations and design procedure for signalized intersection analysis, the level of service for street traffic at a signalized intersection is defined by the average vehicular delay. The results of the data shown in Traffic Characteristics of At-Grade Light Rail Crossings includes measurements of vehicular delay at typical LRT at-grade crossings along six LRT systems located throughout the United States. The average stopped delay ranged from 0.3 seconds per vehicle to 24.1 seconds per vehicle. Since the 1985 Highway Capacity Manual defines approaches with average delays of less than 40.0 seconds per vehicle as operating at level of service D or better, it can be concluded that typical LRT at-grade crossings do not create unacceptable traffic conditions.

Traffic and pedestrian impacts at LRT stations in the Central Area were analyzed using the same methodology as used for stations in other corridors.

Summary of Traffic Analysis

The traffic impacts of the LRT system in the Central Area are summarized in Table 5.53. All LRT stations in the Central Area were evaluated to determine the appropriate level of traffic impact analysis. Since none of the stations are projected to have park-and-ride lots, additional trip generation would be minimal. The traffic impacts will be due to the reductions in signal green time to accommodate LRT vehicle movements. Since this is a small percent of total green time, most stations in the Central Area are categorized as having no significant impact.

Six LRT stations in the CBD area were considered to have minor traffic and pedestrian impacts. They include:

- Marquette Avenue between 3rd and 4th Street
- Marquette Avenue between 6th and 7th Street
- Marquette Avenue between 11th and 12th Street
- Second Avenue between Washington Avenue and 3rd Street
- Second Avenue between 6th and 7th Street
- Second Avenue between 11th and 12th Street

With the exception of the LRT lines along 2nd Avenue and Marquette Avenue, the construction of the LRT at-grade system is expected to have traffic impacts very similar to the operation of LRT. The construction of the LRT system would typically require no more right-of-way than operation of the LRT system.

TABLE 5.53
SUMMARY OF CENTRAL AREA TRAFFIC IMPACTS

LRT Option	Roadway	Location	Existing (1988) Daily Traffic1/	Estimated Existing Daily Roadway Capacity2/	Estimated Daily Roadway Capacity With LRT2/	Loss In Daily Roadway Capacity Related to LRT
At-Grade Option A and B	2nd Street	Portland Avenue to 2nd/Marquette	2,195	9,000	9,0003/	0
At-Grade Option A and B	Marquette Avenue	1st Street to Grant Street	14,980	-- 4/	-- 4/	-- 4/
	2nd Avenue	1st Street to Grant Street	12,495	-- 4/	-- 4/	-- 4/
At-Grade Option A and B, Tunnel	TH 55	Bryant Avenue to Royalston Avenue	-- 6/	-- 6/	-- 6/	-- 6/
	Royalston Avenue	TH 55 to Burlington Northern Right-of-Way	3,380	27,000	13,5005/	13,5005/
At-Grade Option B	11th Street	2nd/Marquette to Linden Avenue	8,415	24,000	24,0003/	0
		Linden Avenue to Currie Avenue	2,960	16,000	8,000	8,000
At-Grade Option B	12th Street	Currie Avenue to Burlington Northern Right-of-Way	5,105	18,000	9,000	9,000
		Currie Avenue to Chestnut Avenue	3,710	16,000	16,0003	0

TABLE 5.53
SUMMARY OF CENTRAL AREA TRAFFIC IMPACTS (CONTINUED)

LRT Option	Roadway	Location	Existing (1988) Daily Traffic1/	Estimated Existing Daily Roadway Capacity2/	Estimated Daily Roadway Capacity With LRT2/	Loss In Daily Roadway Capacity Related to LRT
		Chestnut Avenue to Linden Avenue	3,710	16,000	8,000	8,000
		Linden Avenue to Marquette/2nd	10,275	18,000	18,0003/	0
At-Grade Option A	Nicollet Avenue	15th Street to 29th Street/Soo Line Rail Corridor	9,180	9,000	9,0003/	0
At-Grade Option A	2nd Street	2nd/Marquette to Burlington Northern Right-of-Way	6,940	9,000	9,0003/	0

1/ Source: 1988 City of Minneapolis Traffic Flow Map. In some cases, the ADT varies along the length of each street. The number shown is the highest ADT along each segment.

2/ Estimated maximum daily roadway traffic which will provide level of service "D" operations during peak hours. See Table 5.52.

3/ Parking will have to be removed to provide for LRT line.

4/ See text for more detailed discussion of this roadway segment.

5/ Assumes removal of traffic lanes to provide for LRT as a worst case. LRT could also be implemented through removal of parking with no loss in street capacity.

6/ This segment of the LRT line presents a special case. See text for discussion.

Along 2nd Avenue and Marquette Avenue, the construction of the LRT lines is likely to involve construction work along the current bus-only lanes and closure of the adjacent traffic lane. On a temporary basis, this is likely to create intersection operating conditions worse than level of service D along 2nd Avenue and Marquette Avenue and diversions of traffic to parallel streets.

Additional traffic impacts would, however, occur along streets which cross LRT lines at grade. Along such streets, full or partial closures of the streets would be required to construct LRT lines. These closures would be expected to last up to a maximum of a few days.

Tunnel Option

At-Grade Connections to the Tunnel:

Royalston Avenue, TH 55 to Burlington Northern Right-of-Way

Royalston Avenue in this area has two lanes of traffic in each direction plus a median, but no left turn lanes. Parking is provided along both sides of the street. Implementation of the LRT line could occur through removal of parking or removal of two of the four through traffic lanes.

The Royalston Avenue bridge over the Burlington Northern right-of-way near Holden Street is a two-lane bridge. A separate bridge should be provided for LRT traffic if a grade-separated LRT crossing of the Burlington Northern right-of-way is required.

TH 55, Bryant Avenue to Royalston Avenue

Along this segment, the LRT line will be located just south of the travelled lanes of TH 55. The generalized capacity of TH 55 will, therefore, be unaffected by the implementation of the LRT line.

The operation of the LRT line at the interchange of TH 55 and I-94 presents a special case because of the close spacing of the two traffic signals which provide access from TH 55 to I-94, Lyndale Avenue East, and Lyndale Avenue West. In this area the traffic impacts of the LRT line could vary widely depending on the type of signal timing plan which is used to operate these two traffic signals and the LRT line. Key issues include the need for coordination between the two signals and the level of LRT signal priority which is provided. Potentially significant traffic impacts could occur if an at-grade LRT line is built in this area, without the implementation of a signal timing plan which provides the necessary capacity for vehicle movements.

The alignment to the east of the tunnel portal which is located in the 2nd Street area (near 5th Avenue South) would require the removal of parking on both sides of the street, but would allow one traffic lane in each direction to continue.

At-Grade Construction Impacts:

In the segment of TH 55 between Bryant Avenue and Royalston Avenue (near the interchange of TH 55 with I-94), construction of the LRT line would require full or partial closure of East Lyndale Avenue, West Lyndale Avenue, and the TH 55 on-ramp to eastbound I-94. These closures would be expected to last up to several days while construction of the LRT line occurred.

Along Royalston Avenue, the impact of construction of the LRT line would be very similar to the impact of the LRT line after construction. No additional roadway right-of-way would be expected to be required for construction.

The impact of LRT construction along 2nd Street near 5th Avenue South is expected to be minimal. The construction of the LRT line could be accomplished through closure of the street or by maintaining two-way traffic through the construction area.

Tunnel Construction Traffic Impacts:

Tunnel Stations:

Portland and 27th Street

Portland Avenue would need to be closed to vehicular traffic during excavation of the open cut, construction of structural concrete, backfilling and restoration. Alternatively, the station could be constructed in stages, leaving two lanes of traffic open (at greater cost). It may be necessary to block 27th Street across Portland Avenue. Mitigation could include decking the excavation to minimize cross-street disruption.

3rd and Franklin

The surface work site would consist of two center lanes in 3rd Avenue between Franklin and 22nd, portions of Franklin Avenue at 3rd and part of the lot occupied by a gasoline station on the southwest corner of the intersection. Street disruption would partially close 3rd Avenue between 22nd and Franklin. Franklin Avenue could be excavated and decked over during mezzanine construction.

Convention Center

Construction of the shafts and mezzanines would require areas between 3rd Avenue and 2nd Avenue and 12th Street and 10th Street for surface work sites. In addition, the southeast corner of the block west of 2nd Avenue and north of 11st Street would be affected by mezzanine construction.

Street disruption which would result from shaft and mezzanine construction involves excavating portions of 12th and 11th Streets and 2nd Avenue. The streets would be decked over to allow traffic flow.

Marquette and 7th

Surface work sites for construction of the mezzanines and shafts would consist of open cut excavations and areas for equipment operation and truck loading/unloading. This space would impact nearly all of Marquette Avenue from south of 6th Street to 7th Street. Hence, street disruption would involve Marquette Avenue and temporary disruption of 6th and 7th Streets.

3rd and Hennepin

Street disruption would temporarily block 3rd Street and Hennepin Avenue while they are excavated and then decked over to allow traffic flow.

Tunnel Portals:

South Portal

Street disruptions would occur on Portland Avenue and 28th Street. 28th Street could be decked across the open cut on Portland to allow normal traffic flow. Traffic on Portland would be restricted to two lanes; decking the excavation area would allow Portland to remain partially open.

North Portal

Street disruptions consist of crossings at Washington Avenue, 2nd and 1st Streets and all of 1st Avenue north of 2nd Street. The street crossings could be decked over to allow normal traffic flow. Since the portal runs under 1st Avenue north of 2nd Street it would be necessary to close off the entire street. This is not deemed a significant impact since 1st Avenue is not a through street. However, the closure could temporarily interfere with conversion of 1st Avenue to a major southbound street south of the new Hennepin Avenue bridge.

The duration of construction activities identified in Table 5.54 outlines estimated time periods that tunnel construction activities would affect traffic operations.

At-Grade Alignments Outside the CBD

At-Grade Option A (Nicollet Avenue):

LRT construction and operation traffic impacts for the Northwest Corridor connection from TH 55/Bryant Avenue to the Burlington Northern right-of-way is addressed in the Tunnel Option discussion.

TABLE 5.54
DURATION OF CONSTRUCTION ACTIVITIES
FOR TUNNEL OPTION

ACTIVITY	DURATION (Years)	COMMENTS
Tunnel excavation and spoil haulage	2-3	Subject to number of headings and mining rate.
Mined station shafts and mezzanines	1.5-2	Potentially shorter without mezzanines or if construction is accelerated.
Cut-and-cover stations	2	Surface restoration possible after backfilling after 1 year.
Cut-and-cover portals	1	Cross-streets excavated and decked over weekends.
Soft ground tunnel or open cut portal on Portland Avenue	2	Construction portal for mined tunnel would last 3 to 4 years.

Note: Headings refers to the point(s) at which the tunnel is excavated.

The total construction time will depend on owner requirements and the resulting staging. Three to five years would be possible ranges.

2nd Street, Portland Avenue to 2nd/Marquette

The segment of 2nd Street in this area does not currently provide a continuous street connection between Portland Avenue and 2nd Avenue/Marquette Avenue. Where 2nd Street currently exists, one lane of traffic is provided in each direction, with parking along both sides of the street. The implementation of an LRT line in 2nd Street would require the removal of parking on both sides of the street, but would allow one traffic lane in each direction to continue.

Nicollet Avenue, 15th Street to 29th Street/Soo Line Rail Corridor

Figure 5.14 illustrates the proposed right-of-way allocation to LRT, vehicular traffic and sidewalks. In order to provide for the LRT line, parking along Nicollet Avenue would have to be removed. 270 on-street spaces would be lost along Nicollet Avenue. This represents fifteen percent of the total on-street and off-street spaces now available on Nicollet Avenue and the east-west cross-streets (one-half block on each side of Nicollet Avenue) from 29th to 15th Street (Table 5.55).

On the basis of number of traffic lanes provided, the capacity of this street would not be affected by the implementation of the LRT line. However, the signal priorities given to LRT vehicles is expected to result in a slight decrease in traffic capacity.

Additionally, traffic currently traveling on Nicollet Avenue could divert to 1st Avenue and/or Blaisdell Avenue.

2nd Street, 2nd/Marquette to Burlington Northern Right-of-Way

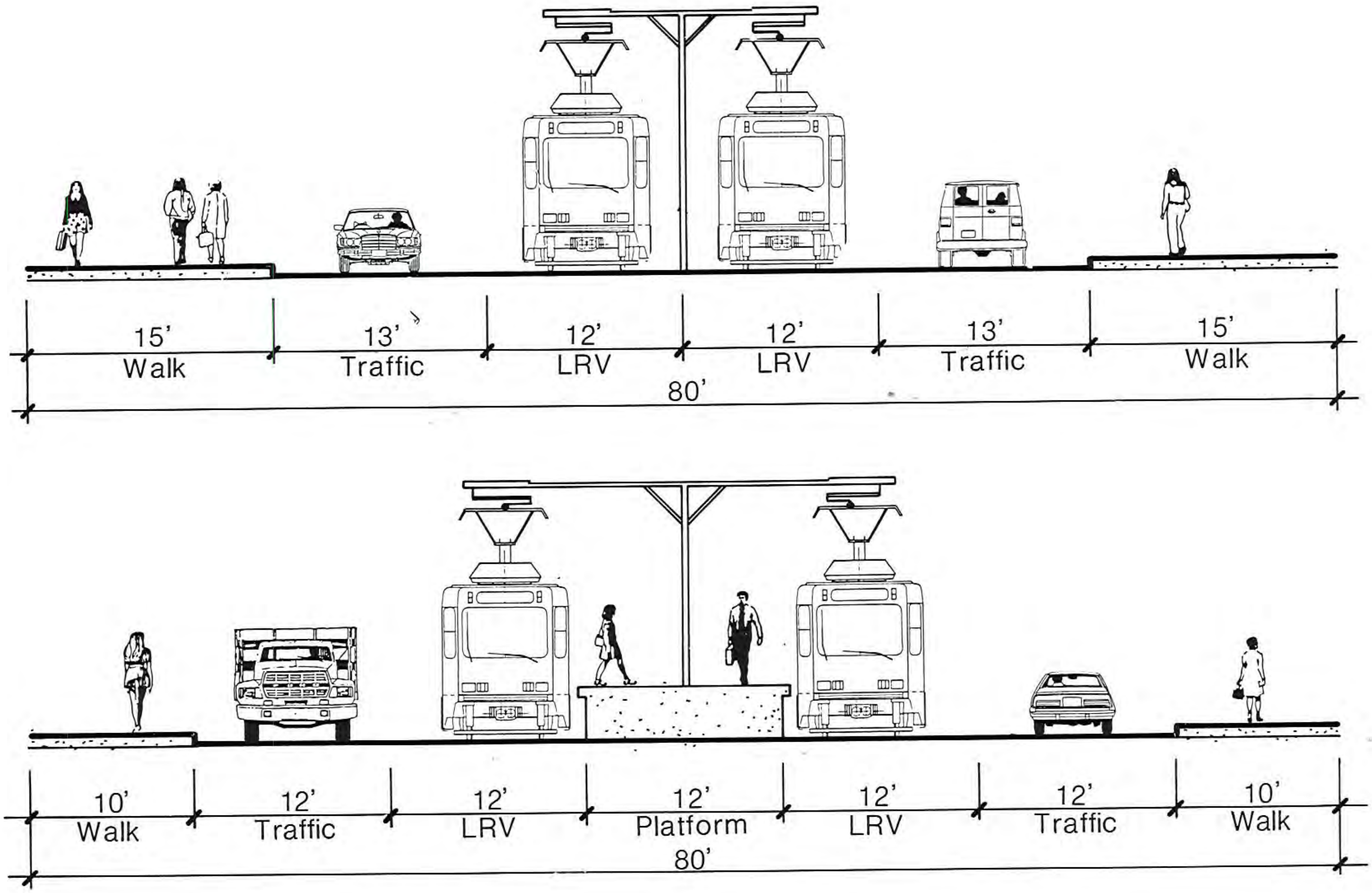
In the areas of 2nd Street where traffic movements are currently allowed, the implementation of the LRT line would require the removal of parking on both sides of the street. Roadway capacity would not significantly change with the implementation of the LRT line.

At-Grade Option B (HCRRA Alignment):

Royalston Avenue, TH 55 to Burlington Northern Right-of-Way: The impacts of this alignment are as previously described in the At-Grade Option A section.

11th/12th Street, 2nd/Marquette to Burlington Northern Right-of-Way:

Between 2nd Avenue/Marquette Avenue and Hennepin Avenue, 11th Street currently is a three-lane one-way street with parking along both sides of the street. Between Hennepin Avenue and Linden Avenue, parking is only provided on one side of the street. Implementation of an LRT line in this area would require removal of parking on one side of 11th Street.



HCRRA Hennepin County Regional Railroad Authority

LRT System Environmental Impact Statement

Figure 5.14

BRW

Nicollet Avenue Center Configuration

TABLE 5.55
NICOLLET AVENUE PARKING INVENTORY

SEGMENT	# ON-STREET STALLS	# OFF-STREET STALLS	COMMENTS/DESCRIPTION
Nicollet 15th-18th	30	245 private	On-street: 2 hour metered
Cross Streets 15th-18th	21	--	2 hour metered
Nicollet 18th-Franklin Avenue	22	179 private	2 hour metered
Cross Streets 19th, Groveland Franklin	12	--	2 hour metered except Franklin which is unmetered and has No Parking during rush hours
Nicollet Franklin-24th	59	262 private	Unmetered: 3 stalls - 5-minute limit remainder - 2 hour limit
Cross Streets 22nd, 24th	29	--	Unlimited, unmetered
Nicollet 24th-27th	108	438 private 22 public	All unmetered: 2 hour limit 24th-25th No limit 25th-27th
Cross Streets 25th, 26th, 27th	65	--	Unmetered, unlimited
Nicollet 27th-29th	48	205 private	All unmetered 5 stalls: 15 minutes 12 stalls: 1 hour
Cross Streets 27th-29th	25	--	27th: unlimited 28th: no parking during rush hours 29th: no parking Cecil Newman Lane: no parking

Between Linden Avenue and Currie Avenue, 11th Street narrows to two lanes with no parking. Implementation of the LRT line in this area would require elimination of one traffic lane. Because of the excess capacity on 11th Street, no significant impacts are expected to result from this decrease in capacity.

West of Currie Avenue, 11th Street and 12th Street join to form a four-lane undivided street. Implementation of the LRT line in the street right-of-way would require the use of two of the four lanes. This reduction in capacity is not expected to result in significant traffic impacts, because of the excess capacity along this segment.

Along 12th Street between Currie Avenue and Chestnut Avenue, 12th Street is a two-lane one way street with parking on one side of the street. In order to implement the LRT line in this area, parking would have to be removed. Between Chestnut Avenue and Hennepin Avenue, parking is not allowed and the LRT line would require elimination of a traffic lane. The resulting reduction in capacity would not be expected to cause significant traffic impacts.

East of Hennepin Avenue to Marquette Avenue/2nd Avenue, 12th Street is a four-lane undivided roadway with parking along both sides of the street. Parking along one side would have to be removed to provide for the LRT lane.

The impacts of the University line connection, on 2nd Street South from Portland Avenue to 2nd Avenue/Marquette Avenue, would be the same as described under At-Grade Option A.

At-Grade Options A and B: Central Business District Alignment on 2nd Avenue/Marquette Avenue

The operations of LRT lines in this area was the subject of a detailed analysis conducted by the City of Minneapolis. As outlined in Section 3.2.2.5.2, there were initially four at-grade alternatives under consideration in the CBD. Following the analysis conducted for each alternative, which included traffic studies by the City of Minneapolis, the 2nd and Marquette Avenue alternative was determined to be the most feasible.

The goals of the analysis conducted by the City of Minneapolis were to determine whether it was feasible to implement surface LRT lines in this area and still provide adequate traffic operations (i.e., level of service "D" in the peak hours) and to determine what actions would need to be taken to achieve adequate future traffic operations assuming implementation of the at-grade LRT lines.

The analysis of the Marquette Avenue/2nd Avenue alternative indicated that all intersections along these two streets in the study area could operate at level of service "D" in the Year 1995, if certain actions were taken to provide for both LRT and vehicular traffic along these streets. Following is a summary of the proposed operation and list of actions which would need to be taken in order to provide level of service "D" traffic conditions:

- The LRT lines would operate on 2nd Avenue and Marquette Avenue in a contra-flow manner, similar to the operation of the express buses along these streets today. Figure 5.15 shows a sketch of the proposed right-of-way allocation to LRT, vehicular traffic, and side-walks. It should be noted that Figure 5.15 shows the right-of-way designation in blocks with LRT stations. In other blocks, additional sidewalk right-of-way would be available.

- Express buses would no longer run on Marquette Avenue and 2nd Avenue. The riders who are currently served by these buses would be served by a shuttle service provided along the Nicollet Mall. At each end of the Mall, transit riders would transfer to express buses. The improvements necessary to provide the Nicollet Mall shuttle operation are currently in the initial stages of implementation by the City of Minneapolis.

- Local bus service which is currently provided on the Nicollet Mall would be transferred to 2nd Avenue and Marquette Avenue. Buses would operate in the same direction as automobile traffic. Bus stops would be located every other block so as not to interfere with right-turning traffic.

- Vehicles making left turns from Marquette Avenue and 2nd Avenue would operate in the same phase as LRT vehicles and would yield to LRT vehicles prior to turning.

- The downtown signal system would be operated to give priority to LRT vehicles and shuttle buses on the Nicollet Mall. The analysis conducted by the City of Minneapolis indicates that acceptable traffic operations could still be provided for other vehicles in the area.

Given the operating plan described above, one potential impact of the LRT line should be noted. Under the designation of street right-of-way shown in Figure 5.16, the sidewalks on the sides of Marquette Avenue and 2nd Avenue closest to the LRT line would be eight feet wide. This could be considered a less than the desirable sidewalk width

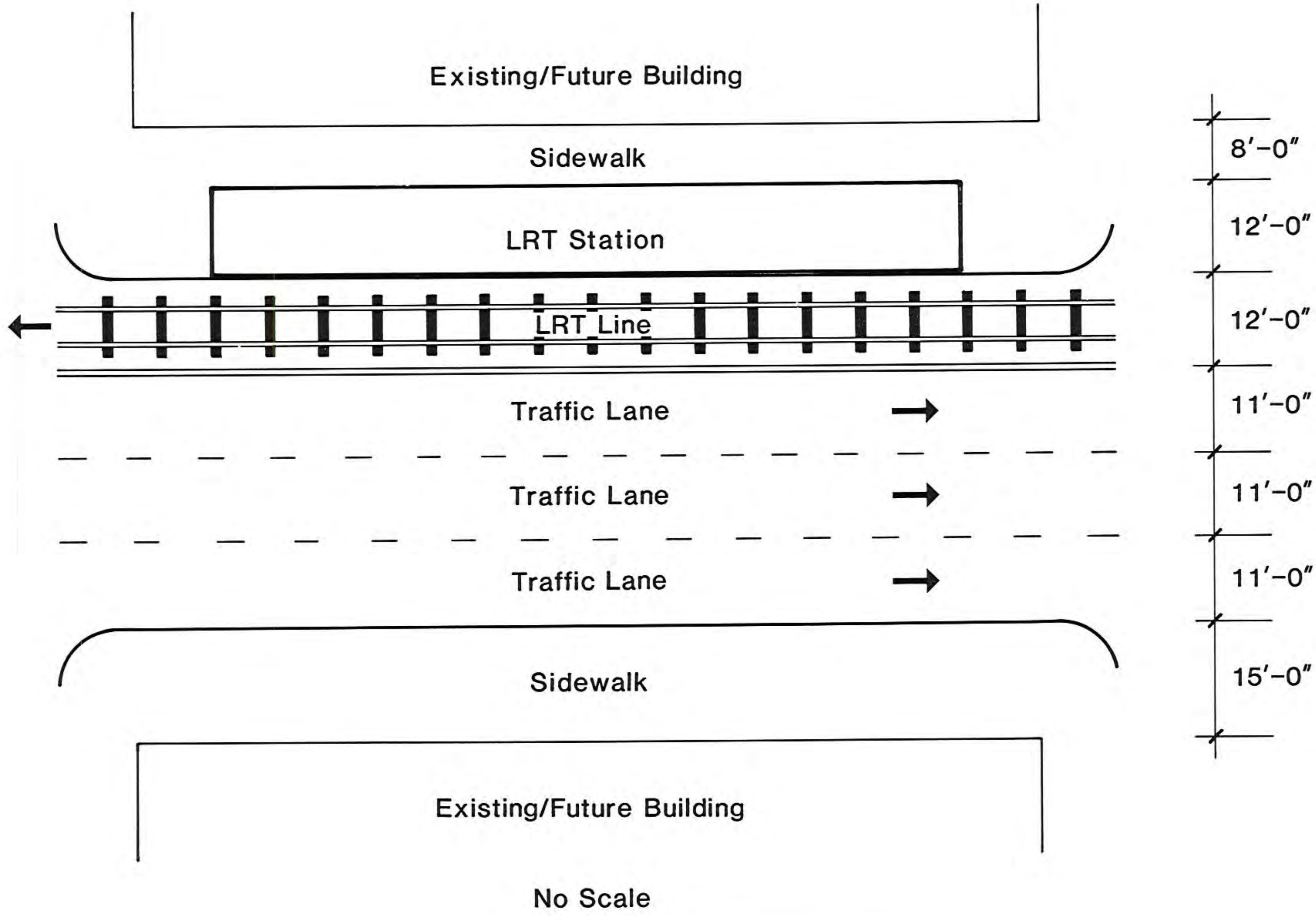


Figure 5.15

Proposed At-Grade LRT Operation Along Marquette Avenue/2nd Avenue

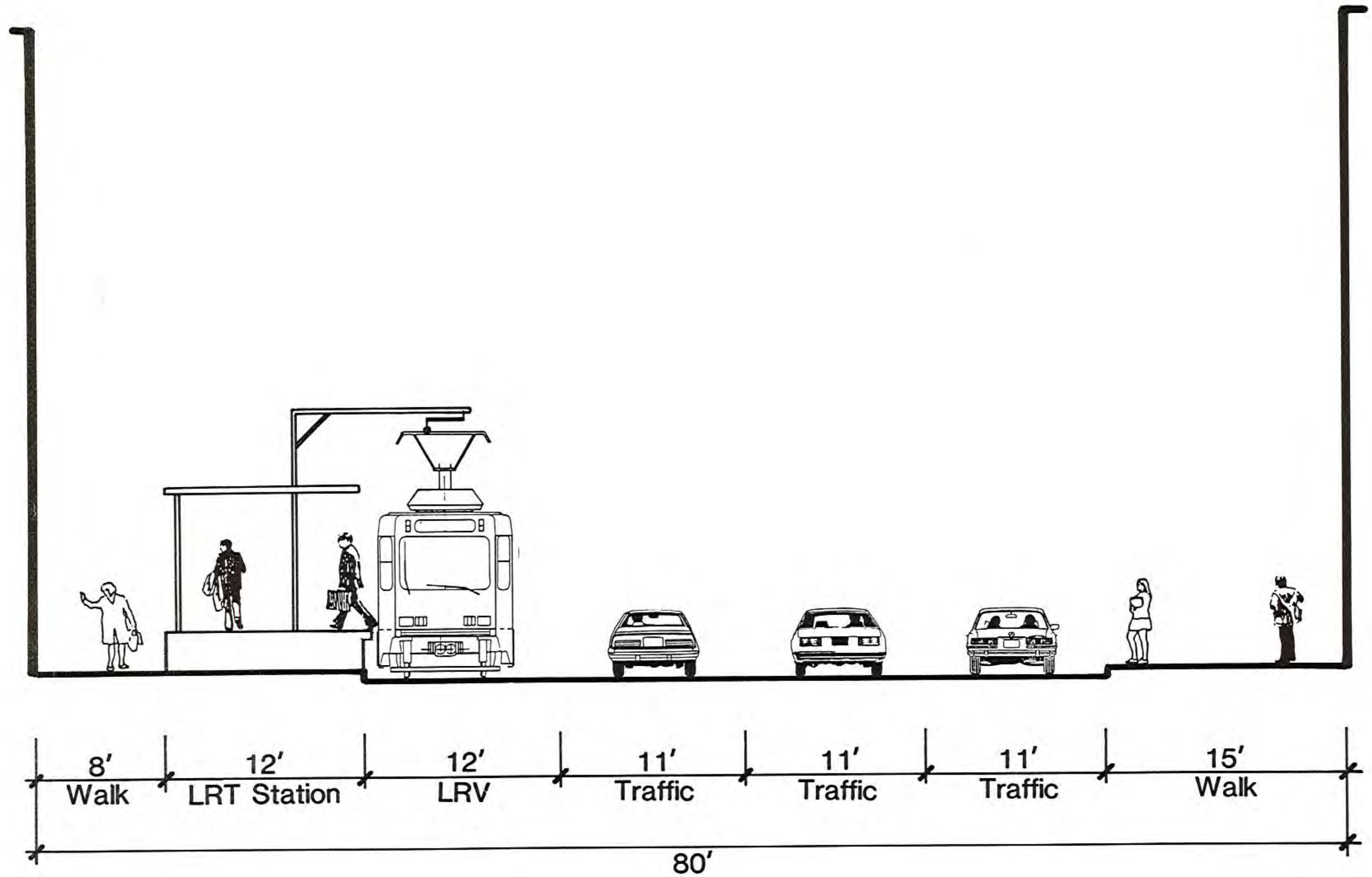


Figure 5.16

BRW

Proposed At-Grade LRT Operation Along Marquette Avenue/2nd Avenue

in the CBD area. A sidewalk width of at least twelve feet would be more appropriate in this area of downtown. Furthermore, the loading and unloading of LRT passengers would generate additional pedestrian traffic. Therefore, LRT generated pedestrians could adversely impact non-LRT related pedestrians.

In evaluating the impact of the proposed LRT system and Nicollet Mall Shuttle, it is important to note the net change in bus traffic along Nicollet Avenue, 2nd Avenue, and Marquette Avenue. Table 5.56 summarizes the results of the analysis regarding bus traffic along these streets, conducted by the City of Minneapolis.

Central Area Stations Traffic Impact Analysis

All stations in the Central Area were evaluated to determine what level of traffic impact analysis was appropriate. Since none of these stations are proposed to have park-and-ride lots, additional traffic analysis was limited to the following stations:

- Marquette Avenue between 3rd and 4th Street
- Marquette Avenue between 6th and 7th Street
- Marquette Avenue between 11th and 12th Street
- Second Avenue between Washington Avenue and 3rd Street
- Second Avenue between 6th and 7th Street
- Second Avenue between 11th and 12th Street

At the stations listed above, the implementation of the LRT system is expected to cause some congestion of pedestrian traffic on one side of the street blocks, where LRT stations are proposed to be located. The congestion is expected to occur because less than desirable sidewalk width would be provided in order to accommodate the LRT system and automobile traffic lanes.

Mitigation Measures

Because of the nature of the proposed project it is difficult in many cases to determine whether certain traffic improvements which will be implemented with the LRT system are mitigation measures or integral parts of the project. Rather than separating traffic improvements to be built as part of the project from traffic mitigation measures, the actions listed below are recommended in order to provide adequate traffic operations along affected streets upon implementation of the LRT system:

- Removal of express buses from Marquette Avenue/2nd Avenue and replacement of this service with a shuttle service on the Nicollet Mall, with express bus terminals on each end of the Mall, if an at-grade LRT line is built along Marquette Avenue/2nd Avenue.

TABLE 5.56
IMPACT OF NICOLLET MALL SHUTTLE
AND LRT SYSTEM ON DOWNTOWN BUS TRAFFIC[1/]

Street	Time Period	Number of Buses (Existing)	Net Change in Local Bus Traffic With Nicollet Mall Shuttle and At-Grade LRT on 2nd/Marquette[2/]	Net Change in Express Bus Traffic With Nicollet Mall Shuttle and At-Grade LRT on 2nd/Marquette[2/]	Number of Buses with Shuttle and LRT
Nicollet Avenue	Daily	727	-727	0	0[3/]
	PM Peak	81	-81	0	0[3/]
Marquette Avenue	Daily	345	+240	-345	240
	PM Peak	106	+20	-106	20
2nd Avenue	Daily	340	+240	-340	240
	PM Peak	58	+25	-58	25

1/ Source: April 6, 1988 memorandum from Ferrol Robinson, Strgar-Roscoe-Fausch to Mike Monahan, City Traffic Engineering, City of Minneapolis.

2/ Assumes Year 2000 conditions with six LRT routes operating at-grade along Marquette Avenue and 2nd Avenue.

3/ Buses will be replaced by the Nicollet Mall Shuttle.

- Operation of LRT lines on 2nd Avenue and Marquette Avenue in a contra-flow lane and provision of three through lanes of traffic on these streets, if an at-grade LRT line is built along Marquette Avenue/2nd Avenue.

- Construction of a grade separated LRT crossing of the Burlington Northern right-of-way at Royalston Avenue, if the Northwest Corridor Connection from Marquette/2nd to TH 55 is built.

- Preparation of a signal timing plan for the TH 55/I-94 interchange area which provides adequate capacity for vehicle movements, if an at-grade LRT line is built adjacent to TH 55 through this area.

5.8.5 Transit Service

Most of the transit impact in the Central Area results from improved access to downtown under the LRT alternatives. Within the Central Area, transit impacts focus upon the ability of the service to distribute riders to destinations throughout the downtown, and circulate riders between destinations. The primary measures of service are coverage, frequency, and travel time.

The no-build alternative continues to depend upon bus service to complete the downtown delivery of transit trips, while the LRT options use both LRT and buses. The reduction in downtown bus volumes, associated with the LRT options is shown in Table 5.57. The LRT tunnel option further reduces transit volumes on surface streets as the LRT vehicles are relocated below grade.

TABLE 5.57
PEAK HOUR BUSES ENTERING DOWNTOWN

Corridor	Existing	LRT Tunnel	LRT At-Grade (Nicollet Option)	LRT At-Grade (Kenwood Option)
Hiawatha	43	22	22	22
Southwest	71	28	28	37
Northwest	41	7	7	7
University Connector	21	18	18	18
TOTAL	176	75	75	84

Despite the reduced bus volumes in downtown, both the build and no-build alternatives offer a similar level of service coverage within downtown area. This coverage is critical to the distribution of transit trips from the primary transit routes throughout the downtown area. A comparison of the service coverage indicates that virtually all of the block faces that currently have transit service would continue to have transit access under the LRT options.

Frequency of service is equally important as service coverage in distribution of downtown transit trips. The lower bus volumes associated with LRT will increase the wait time for any riders transfering to buses to complete their trip. The average time between buses on major streets is shown in Table 5.58. The average wait time for a bus transfer would be half of the time interval between buses.

TABLE 5.58
PEAK HOUR BUS SERVICE
FREQUENCY ON EAST/WEST STREETS

	BUS FREQUENCY (MINUTES)	
STREETS	NO-BUILD	LRT
Washington Avenue	3	4
3rd/4th Street	6	8
5th/6th Street	2	3
7th/8th Street	1	2

As the table indicates, the time interval between buses increases about 1-2 minutes, resulting in an increase of 1 minute or less for bus/rail transfers for destinations in the downtown fringe area. This transfer delay is insignificant, particularly compared to the total trip length.

The last downtown service consideration is transit travel time for trips originating and ending in downtown. The surface LRT generally travels at speeds approximately fifty percent faster than its bus counterpart in downtown areas. This speed advantage results from fewer stops and selected transit pre-emption of traffic lights. This speed advantage is partially offset by the longer walking distances to stations. Typically, travel time within downtown will be comparable between the no-build and surface LRT, except for long trips along the LRT route where Light Rail offers a small time savings.

The tunnel option would offer a higher average speed than the surface LRT since it does not encounter vehicular conflicts. This travel speed advantage is constrained by the proximity of stations in the downtown area and speed restrictions dictated by track geometry. In comparison with the surface LRT, the speed advantage is largely offset by access time traveling from the street to the platform level.

The tunnel option would offer more reliable service and better schedule adherence since there are no auto/LRT conflicts. It is likely that transit/auto conflicts will increase at the surface level as traffic volumes continue to grow.

Like the surface options, the tunnel will only offer a travel time advantage to longer downtown trips beginning and originating near the guideway. All "through" LRT trips will benefit from improved travel speeds, particularly in the tunnel option.

Both the surface and tunnel alternatives would offer an "intangible" advantage over bus circulation within the downtown. The guideway route is self-marketing in its visibility and simplicity. The single alignment would not require research by the user to determine which route to use. Improved rider amenities provided at LRT stations are also attractive to potential riders. The tunnel stations are particularly attractive, protecting riders from extreme weather conditions in both summer and winter.

5.8.6 Air Quality

If the proposed LRT system operates at-grade in the downtown area, it would use existing street capacity. As described in the traffic analysis, at-grade LRT operation on Marquette and Second Avenue will require changes in downtown transit operations to maintain traffic flow. With these changes in transit operations, there will be no significant change in the capacity of the street system to carry private vehicles. For this reason, at-grade LRT operations in the downtown area will have no significant impact on downtown traffic flow or on downtown microscale air quality.

5.8.7 Noise

Operating characteristics, the setback distance to the nearest receiver site and the predicted maximum passby noise levels at the nearest sensitive receiver site for segments of each of the Central Area alignments options are documented in Table 5.59. Predicted noise levels at the nearest receiver site have been determined based on both the best- and worst-case noise emission rates. Prediction of maximum

TABLE 5.59
PREDICTED LRT MAXIMUM PASSBY NOISE LEVELS

Central Area

From	To	Adjacent Land Use	Minimum Setback	APTA Guidelines	Speed	LMAX Best	LMAX Worst	Guideline Exceeded Best	Guideline Exceeded Worst	Distance To LMAX Guide Best	Distance To LMAX Guide Worst
At-Grade Option A: (Nicollet Avenue)											
o Southwest Connection											
Minneapolis City Limits	West Lake	MF-Residential	40'	80 dBA	55 MPH	80 dBA	85 dBA	N	Y	*	90'
West Lake	West of Dean	NS-MF Residential	50'	80 dBA	55 MPH	79 dBA	84 dBA	N	Y	*	90'
		SS-Industrial	50'	85 dBA	55 MPH	79 dBA	84 dBA	N	N	*	*
West of Dean Ave	Dean Ave	MF-Residential	50'	80 dBA	55 MPH	79 dBA	84 dBA	N	Y	*	90'
Dean Ave	Isles Parkway	NS-Residential/Park	85'	75 dBA	55 MPH	76 dBA	B1 dBA	Y	Y	90'	200'
		SS-Commercial	50'	85 dBA	55 MPH	79 dBA	84 dBA	N	N	*	*
Isles Parkway	Hennepin Ave	NS-SF Residential	75'	75 dBA	55 MPH	76 dBA	81 dBA	Y	Y	90'	200'
		SS-MF Residential	150'	80 dBA	55 MPH	72 dBA	77 dBA	N	N	*	90'
Hennepin Ave	Fremont Ave	NS-Industrial	150'	85 dBA	55 MPH	65 dBA	68 dBA	N	N	*	*
		SS-Commercial	95'	85 dBA	55 MPH	67 dBA	72 dBA	N	N	*	*
Fremont Ave	Emerson Ave	NS-Industrial	75'	85 dBA	55 MPH	76 dBA	81 dBA	N	N	*	*
		SS-Commercial	90'	85 dBA	55 MPH	64 dBA	71 dBA	N	N	*	*
Emerson Ave	Dupont Ave	NS-Industrial	100'	85 dBA	55 MPH	74 dBA	79 dBA	N	N	*	*
		SS-Commercial	95'	85 dBA	55 MPH	75 dBA	80 dBA	N	N	*	*
Dupont Ave	Colfax Ave	NS-Industrial	55'	85 dBA	55 MPH	79 dBA	84 dBA	N	N	*	*
		SS-Commercial	115'	85 dBA	55 MPH	74 dBA	79 dBA	N	N	*	*
Colfax Ave	Bryant Ave	NS-Industrial	105'	85 dBA	55 MPH	74 dBA	79 dBA	N	N	*	*
		SS-MF Residential	100'	80 dBA	55 MPH	66 dBA	71 dBA	N	N	*	*
Bryant Ave	Aldrich Ave	NS-Industrial	125'	85 dBA	55 MPH	73 dBA	78 dBA	N	N	*	*
		SS-Commercial	95'	85 dBA	55 MPH	70 dBA	75 dBA	N	N	*	*
Aldrich Ave	Lyndale Ave	Commercial	55'	85 dBA	55 MPH	79 dBA	84 dBA	N	N	*	*
Lyndale Ave	Garfield Ave	Commercial	90'	85 dBA	55 MPH	75 dBA	B0 dBA	N	N	*	*
Garfield Ave	Harriet Ave	Commercial	85'	85 dBA	55 MPH	71 dBA	76 dBA	N	N	*	*

TABLE 5.59
PREDICTED LRT MAXIMUM PASSBY NOISE LEVELS
(CONTINUED)

Central Area

From	To	Adjacent Land Use	Minimum Setback	APTA Guidelines	Speed	LMAX Best	LMAX Worst	Guideline Exceeded Best	Guideline Exceeded Worst	Distance To LMAX Guide Best	Distance To LMAX Guide Worst
Harriet Ave	Grand Ave	NS-Industrial	65'	85 dBA	55 MPH	77 dBA	82 dBA	N	N	*	*
		SS-Average Residential	90'	75 dBA	55 MPH	74 dBA	79 dBA	N	N	65'	85'
Grand Ave	Pleasant Ave	NS-Industrial	65'	85 dBA	55 MPH	77 dBA	82 dBA	N	N	*	*
		SS-Average Residential	180'	75 dBA	55 MPH	76 dBA	81 dBA	N	N	90'	120
Pleasant Ave	Pillsbury Ave	NS-Average Residential	50'	75 dBA	55 MPH	79 dBA	84 dBA	Y	Y	90'	200'
		SS-Industrial	80'	85 dBA	55 MPH	73 dBA	78 dBA	N	N	*	*
Pillsbury Ave	Blaisdale Ave	Average Residential	60'	75 dBA	55 MPH	78 dBA	83 dBA	Y	Y	90'	200'
Blaisdale Ave	Nicollet Ave	NS-Industrial	50'	85 dBA	55 MPH	79 dBA	84 dBA	N	N	*	*
		SS-Commercial	70'	85 dBA	55 MPH	77 dBA	82 dBA	N	N	*	*
29th Street	24th Street	Commercial	40'	85 dBA	35 MPH	76 dBA	81 dBA	N	N	*	*
24th Street	22nd Street	Commercial	50'	85 dBA	35 MPH	75 dBA	80 dBA	N	N	*	*
22nd Street	I-94	MF-Residential	35'	80 dBA	35 MPH	76 dBA	81 dBA	N	Y	*	*
o Hiawatha Connection											
Hiawatha Ave	Cemetary East Limit	Industrial	100'	85 dBA	55 MPH	74 dBA	80 dBA	N	N	*	*
Cemetary East Limit	Cedar Ave	NS-Industrial	100'	85 dBA	55 MPH	67 dBA	72 dBA	N	N	*	*
		SS-Cemetary	60'	75 dBA	55 MPH	78 dBA	83 dBA	Y	Y	75'	90'
Cedar Ave	18th Ave S.	Average Residential	130'	75 dBA	55 MPH	68 dBA	73 dBA	N	N	70'	130'
18th Ave S.	15th Ave S.	Average Residential	60'	75 dBA	55 MPH	75 dBA	80 dBA	N	Y	60'	80'
15th Ave S	14th Ave S.	Average Residential	70'	75 dBA	55 MPH	77 dBA	82 dBA	Y	Y	90'	100'
14th Ave S.	11th Ave S.	NS-Industrial	60'	85 dBA	55 MPH	78 dBA	83 dBA	N	N	*	*
		SS-Average Residential	125'	75 dBA	55 MPH	67 dBA	72 dBA	N	N	90'	100'
11th Ave S.	Elliot Ave	NS-Industrial	50'	85 dBA	55 MPH	79 dBA	84 dBA	N	N	*	*
		SS-Commercial	85'	85 dBA	55 MPH	65 dBA	70 dBA	N	N	*	*
Elliot Ave	Columbus Ave	Commercial	80'	85 dBA	55 MPH	76 dBA	81 dBA	N	N	*	*

TABLE 5.59
PREDICTED LRT MAXIMUM PASSBY NOISE LEVELS
(CONTINUED)

Central Area

From	To	Adjacent Land Use	Minimum Setback	APTA Guidelines	Speed	LMAX Best	LMAX Worst	Guideline Exceeded Best	Guideline Exceeded Worst	Distance To LMAX Guide Best	Distance To LMAX Guide Worst
Columbus Ave	Oakland Ave	NS-MF Residential	120'	80 dBA	55 MPH	67 dBA	72 dBA	N	N	*	90'
		SS-Industrial	80'	85 dBA	55 MPH	72 dBA	77 dBA	N	N	*	*
Oakland Ave	Portland Ave	NS-Average Residential	170'	75 dBA	55 MPH	69 dBA	73 dBA	N	N	70'	130'
		SS-Industrial	80'	85 dBA	55 MPH	76 dBA	81 dBA	N	N	*	*
Portland Ave	4th Ave	NS-MF Residential	100'	80 dBA	55 MPH	71 dBA	76 dBA	N	N	*	75'
		SS-Average Residential	100'	75 dBA	55 MPH	74 dBA	79 dBA	N	Y	90'	140'
4th Ave	3rd Ave	NS-Commercial	115'	85 dBA	55 MPH	74 dBA	79 dBA	N	N	*	*
		SS-Industrial	115'	85 dBA	55 MPH	74 dBA	79 dBA	N	N	*	*
3rd Ave	I-35W	Average Residential	120'	75 dBA	55 MPH	69 dBA	73 dBA	N	N	50'	90'
I-35W	Nicollet Ave	NS-Industrial	60'	85 dBA	55 MPH	78 dBA	83 dBA	N	N	*	*
At-Grade Option B: (HCRRA Alignment With a Hiawatha Connection Near the Metrodome)											
o Southwest Connection											
City Limits	West Lake St.	MF-Residential	40'	80 dBA	55 MPH	80 dBA	85 dBA	N	Y	*	90'
West Lake St.	Cedar Lake Boulevard	NS-Average Residential	35'	75 dBA	55 MPH	81 dBA	86 dBA	Y	Y	90'	200'
		SS-MF Residential	45'	80 dBA	55 MPH	80 dBA	85 dBA	N	Y	*	90'
Cedar Lake Boulevard	West 26th St.	NS-SF Residential	120'	70 dBA	55 MPH	77 dBA	82 dBA	Y	Y	200'	430'
		SS-SF Residential	50'	70 dBA	55 MPH	79 dBA	84 dBA	Y	Y	100'	175'
West 26th St.	Burnham Ave	SF-Residential	NS-80'	70 dBA	55 MPH	76 dBA	81 dBA	Y	Y	200'	310'
			SS-70'	70 dBA	55 MPH	77 dBA	82 dBA	Y	Y	200'	430'
Burnham	West 24th St.	NS-Park	80'	75 dBA	55 MPH	76 dBA	81 dBA	Y	Y	90'	200'
		SS-Average Residential	110'	75 dBA	55 MPH	74 dBA	79 dBA	N	N	90'	110'
West 24th St.	21st St.	NS-Park	50'	75 dBA	55 MPH	79 dBA	84 dBA	Y	Y	90'	200'
		SS-SF Residential	175'	70 dBA	55 MPH	71 dBA	76 dBA	Y	Y	200'	230'
21st St.	Franklin Ave	NS-SF/Park	160'	70 dBA	55 MPH	71 dBA	76 dBA	Y	Y	210'	280'
		SS-SF Residential	80'	70 dBA	55 MPH	76 dBA	81 dBA	Y	Y	170'	300'

TABLE 5.59
PREDICTED LRT MAXIMUM PASSBY NOISE LEVELS
(CONTINUED)

From	To	Adjacent Land Use	Minimum Setback	APTA Guidelines	Speed	LMAX Best	LMAX Worst	Guideline Exceeded Best	Guideline Exceeded Worst	Distance To LMAX Guide Best	Distance To LMAX Guide Worst
Central Area											
Franklin Ave	I-394	NS-Park/Right-of-Way	50'	75 dBA	55 MPH	79 dBA	84 dBA	Y	Y	90'	200'
		SS-SF/Right-of-Way	140'	70 dBA	55 MPH	72 dBA	69 dBA	N	N	120'	120'
I-394	ES Bryn Mawr	NS-Park	150'	75 dBA	55 MPH	72 dBA	77 dBA	N	Y	90'	200'
		Railroad Right-of-Way	50'	85 dBA	55 MPH	79 dBA	84 dBA	N	N	*	*
ES Bryn Mawr	NW Corridor	Industrial	50'	85 dBA	55 MPH	79 dBA	84 dBA	N	N	*	*
o Hiawatha Connection											
Lake Street	I-94	Industrial/Commercial	50'	85 dBA	35 MPH	74 dBA	79 dBA	N	N	*	*
I-94	I-35W	Commercial/ MF Residential	50'	80 dBA	35 MPH	74 dBA	79 dBA	N	N	*	*
I-35W	Central Area	Commercial	60'	85 dBA	35 MPH	73 dBA	78 dBA	N	N	*	*
Tunnel Option											
o Southwest Connection											
Mpls. City Limits	West Lake St.	MF-Residential	40'	80 dBA	55 MPH	80 dBA	85 dBA	N	Y	*	90'
West Lake St.	West of Dean	NS-MF Residential	50'	80 dBA	55 MPH	79 dBA	84 dBA	N	Y	*	90'
		SS-Industrial	50'	85 dBA	55 MPH	79 dBA	84 dBA	N	N	*	*
West of Dean Ave	Dean Ave	MF-Residential	50'	80 dBA	55 MPH	79 dBA	84 dBA	N	Y	*	90'
Dean Ave	Isles Parkway	NS-Residential/Park	85'	75 dBA	55 MPH	76 dBA	81 dBA	Y	Y	90'	200'
		BS-Commercial	50'	85 dBA	55 MPH	79 dBA	84 dBA	N	N	*	*
Isles Parkway	Hennepin Ave	NS-SF Residential	75'	75 dBA	55 MPH	76 dBA	81 dBA	Y	Y	90'	200'
		SS-MF Residential	150'	80 dBA	55 MPH	72 dBA	77 dBA	N	N	*	90'
Hennepin Ave	Fremont Ave	NS-Industrial	150'	85 dBA	55 MPH	65 dBA	68 dBA	N	N	*	*
		SS-Commercial	95'	85 dBA	55 MPH	67 dBA	72 dBA	N	N	*	*

TABLE 5.59
PREDICTED LRT MAXIMUM PASSBY NOISE LEVELS
(CONTINUED)

Central Area

From	To	Adjacent Land Use	Minimum Setback	APTA Guidelines	Speed	LMAX Best	LMAX Worst	Guideline Exceeded Best	Guideline Exceeded Worst	Distance To LMAX Guide Best	Distance To LMAX Guide Worst
Fremont Ave	Emerson Ave	NS-Industrial	75'	85 dBA	55 MPH	76 dBA	81 dBA	N	N	*	*
		SS-Commercial	90'	85 dBA	55 MPH	64 dBA	71 dBA	N	N	*	*
Emerson Ave	Dupont Ave	NS-Industrial	100'	85 dBA	55 MPH	74 dBA	79 dBA	N	N	*	*
		SS-Commercial	95'	85 dBA	55 MPH	75 dBA	80 dBA	N	N	*	*
Dupont Ave	Colfax Ave	NS-Industrial	55'	85 dBA	55 MPH	79 dBA	84 dBA	N	N	*	*
		SS-Commercial	115'	85 dBA	55 MPH	74 dBA	79 dBA	N	N	*	*
Colfax Ave	Bryant Ave	NS-Industrial	105'	85 dBA	55 MPH	74 dBA	79 dBA	N	N	*	*
		SS-MF Residential	100'	80 dBA	55 MPH	66 dBA	71 dBA	N	N	*	*
Bryant Ave	Aldrich Ave	NS-Industrial	125'	85 dBA	55 MPH	73 dBA	78 dBA	N	N	*	*
		SS-Commercial	95'	85 dBA	55 MPH	70 dBA	75 dBA	N	N	*	*
Aldrich Ave	Lyndale Ave	Commercial	55'	85 dBA	55 MPH	79 dBA	84 dBA	N	N	*	*
Lyndale Ave	Garfield Ave	Commercial	90'	85 dBA	55 MPH	75 dBA	80 dBA	N	N	*	*
Garfield Ave	Harriet Ave	Commercial	85'	85 dBA	55 MPH	71 dBA	76 dBA	N	N	*	*
Harriet Ave	Grand Ave	NS-Industrial	65'	85 dBA	55 MPH	77 dBA	82 dBA	N	N	*	*
		SS-Average Residential	90'	75 dBA	55 MPH	74 dBA	79 dBA	N	N	65'	85'
Grand Ave	Pleasant Ave	NS-Industrial	65'	85 dBA	55 MPH	77 dBA	82 dBA	N	N	*	*
		SS-Average Residential	180'	75 dBA	55 MPH	76 dBA	81 dBA	N	N	90'	120
Pleasant Ave	Pillsbury Ave	NS-Average Residential	50'	75 dBA	55 MPH	79 dBA	84 dBA	Y	Y	90'	200'
		SS-Industrial	80'	85 dBA	55 MPH	73 dBA	78 dBA	N	N	*	*
Pillsbury Ave	Blaisdale Ave	Average Residential	60'	75 dBA	55 MPH	78 dBA	83 dBA	Y	Y	90'	200'
Blaisdale Ave	Nicollet Ave	NS-Industrial	50'	85 dBA	55 MPH	79 dBA	84 dBA	N	N	*	*
		SS-Commercial	70'	85 dBA	55 MPH	77 dBA	82 dBA	N	N	*	*
Nicollet Ave	I-35W	NS-Industrial	60'	85 dBA	55 MPH	78 dBA	83 dBA	N	N	*	*
I-35W	3rd Avenue	Average Residential	120'	75 dBA	55 MPH	69 dBA	73 dBA	N	N	50'	90'

TABLE 5.59
PREDICTED LRT MAXIMUM PASSBY NOISE LEVELS
(CONTINUED)

Central Area

From	To	Adjacent Land Use	Minimum Setback	APTA Guidelines	Speed	LMAX Best	LMAX Worst	Guideline Exceeded Best	Guideline Exceeded Worst	Distance To LMAX Guide Best	Distance To LMAX Guide Worst
3rd Ave	4th Ave	NS-Commercial	115'	85 dBA	55 MPH	74 dBA	79 dBA	N	N	*	*
		SS-Industrial	115'	85 dBA	55 MPH	74 dBA	79 dBA	N	N	*	*
4th Ave	Portal	NS-MF Residential	100'	80	55	71	76	N	N	*	75'
		SS-Average Residential	100'	75	55	74	79	N	Y	90'	140'
o Hiawatha Connection											
Hiawatha Ave	Cemetary East Limit	Industrial	100'	85 dBA	55 MPH	74 dBA	80 dBA	N	N	*	*
Cemetary East Limit	Cedar Ave	NS-Industrial	100'	85 dBA	55 MPH	67 dBA	72 dBA	N	N	*	*
		SS-Cemetary	60'	75 dBA	55 MPH	78 dBA	83 dBA	Y	Y	75'	90'
Cedar Ave	18th Ave S.	Average Residential	130'	75 dBA	55 MPH	68 dBA	73 dBA	N	N	70'	130'
18th Ave S.	15th Ave S.	Average Residential	60'	75 dBA	55 MPH	75 dBA	80 dBA	N	Y	60'	80'
15th Ave S	14th Ave S.	Average Residential	70'	75 dBA	55 MPH	77 dBA	82 dBA	Y	Y	90'	100'
14th Ave S.	11th Ave S.	NS-Industrial	60'	85 dBA	55 MPH	78 dBA	83 dBA	N	N	*	*
		SS-Average Residential	125'	75 dBA	55 MPH	67 dBA	72 dBA	N	N	90'	100'
11th Ave S.	Elliot Ave	NS-Industrial	50'	85 dBA	55 MPH	79 dBA	84 dBA	N	N	*	*
		SS-Commercial	85'	85 dBA	55 MPH	65 dBA	70 dBA	N	N	*	*
Elliot Ave	Columbus Ave	Commercial	80'	85 dBA	55 MPH	76 dBA	81 dBA	N	N	*	*
Columbus Ave	Oakland Ave	NS-MF Residential	120'	80 dBA	55 MPH	67 dBA	72 dBA	N	N	*	90'
		SS-Industrial	80'	85 dBA	55 MPH	72 dBA	77 dBA	N	N	*	*
Oakland Ave	Portal	NS-Average Residential	170'	75 dBA	55 MPH	69 dBA	73 dBA	N	N	70'	130'
		SS-Industrial	80'	85 dBA	55 MPH	76 dBA	81 dBA	N	N	*	*

NOTE: * - Distance to applicable APTA maximum guideline noise level is less than 50 feet from the centerline of the LRT line.

NS - North Side
SS - South Side
Y - Yes, predicted noise levels exceed guideline
N - No, predicted noise levels do not exceed guideline

passby noise levels for segments in the Central Area were limited to segments outside the area bounded on the west and south by I-94 and on the east by I-35W.

Table 5.60 documents the number of impacted residential, commercial and industrial uses, and the acres of parkland forecast to experience maximum passby noise levels which exceed the APTA guidelines.

In the area within the above-mentioned boundaries--referred to as the CBD for noise impact analysis only--detailed segment specific analyses were not completed. In the CBD, existing noise levels are significantly higher than along any other corridors in the proposed system. Monitored noise levels in the CBD and monitored noise levels in other corridors are documented in the noise sections (per corridor) of the Affected Environment chapter. The higher background noise levels would mask a portion of the passby noise from the LRV, reducing the degree of impact from the LRT system.

Land uses within this area consist mainly of high intensity residential and commercial uses, which have lower levels of outdoor activity. Thus, the noise impacts of the proposed LRT system would not be as significant as in other corridor areas which include lower intensity residential uses with more outdoor activity area. In addition to these land use differences, the operating speed of the LRT trains in the CBD would be significantly lower than in other corridor areas. In the CBD, stations are located closer together and the LRT vehicles conflict with auto traffic more frequently than in other corridors. Both of these factors combined, result in lower operating speed and therefore, lower noise emission levels.

Based on the combined effects of the CBD land use and LRT operations, no significant noise impacts in the CBD are predicted to occur in most areas of the CBD.

One area of exception occurs along the West River Parkway in the tunnel alternative. In this alternative LRT is proposed to operate at-grade directly adjacent to the Parkway from approximately Third Avenue to east of the tunnel portal. In this area, the park would likely be impacted by LRT maximum passby noise emissions. Based on the proximity of the park and the rail line and the assumed operating speed, approximately 1.5 acres of park area would experience noise levels in excess of the APTA maximum passby noise level guidelines. Thus, there is the potential for a noise impact in the park area.

TABLE 5.60
LEVEL OF LRT VEHICLE NOISE IMPACTS

Central Area

Line Segment Start	Line Segment End	Dwellings Impacted	Institutional Uses Impacted	Comm/Indust Uses Impacted	Park Acres Impacted
At-Grade Option A					
o Southwest Connection					
Minneapolis City Limits	West of Dean Avenue	0 / 37	0 / 0	0 / 0	0.00 / 0.00
West of Dean Avenue	Dean Avenue	0 / 21	0 / 0	0 / 0	0.00 / 0.00
Dean Avenue	Isles Parkway	2 / 6	0 / 0	0 / 0	2.25 / 6.25
Isles Parkway	Hennepin Avenue	20 / 40	0 / 0	0 / 0	0.00 / 1.00
Hennepin Avenue	Pleasant Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
Pleasant Avenue	Pillsbury Avenue	2 / 3	0 / 0	0 / 0	0.00 / 0.00
Pillsbury Avenue	Blaisdale Avenue	11 / 12	0 / 0	0 / 0	0.00 / 0.00
Blaisdale Avenue	Nicollet Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
29th Street	24th Street	0 / 0	0 / 0	0 / 0	0.00 / 0.00
24th Street	22nd Street	0 / 0	0 / 0	0 / 0	0.00 / 0.00
22nd Street	I-94	0 / 15	0 / 0	0 / 0	0.00 / 0.00
		35 /134	0 / 0	0 / 0	2.25 / 7.25
o Hiawatha Connection					
Lake Street	Park East Limit	0 / 0	0 / 0	0 / 0	0.00 / 0.00
Park East Limit	Cedar Avenue	0 / 0	0 / 0	0 / 0	0.30 / 0.50
Cedar Avenue	18th Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
18th Avenue	15th Avenue	0 / 4	0 / 0	0 / 0	0.00 / 0.00
15th Avenue	14th Avenue	1 / 2	0 / 0	0 / 0	0.00 / 0.00
14th Avenue	11th Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
11th Avenue	Elliot Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
Elliot Street	Columbus Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
Columbus Avenue	Oakland Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
Oakland Avenue	Portland Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
Portland Avenue	4th Avenue	0 / 2	0 / 0	0 / 0	0.00 / 0.00
4th Avenue	I-35W	0 / 0	0 / 0	0 / 0	0.00 / 0.00
I-35W	Nicollet Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
29th Street	24th Street	0 / 0	0 / 0	0 / 0	0.00 / 0.00
24th Street	22nd Street	0 / 0	0 / 0	0 / 0	0.00 / 0.00
22nd Street	I-94	0 / 15	0 / 0	0 / 0	0.00 / 0.00
		1 / 23	0 / 0	0 / 0	0.30 / 0.50
At-Grade Option B					
o Southwest Connection					
Minneapolis City Limits	West Lake Street	0 / 2	0 / 0	0 / 0	0.00 / 0.00
West Lake Street	Cedar Lake Blvd.	58 /163	0 / 0	0 / 0	0.00 / 0.50
Cedar Lake Blvd.	West 26th Street	9 / 28	0 / 0	0 / 0	0.00 / 0.00
West 26th Street	Burham Road	19 / 36	0 / 0	0 / 0	0.00 / 0.00
Burnham Road	West 24th Street	0 / 0	0 / 0	0 / 0	0.15 / 2.50
West 24th Street	21th Street	3 / 11	0 / 0	0 / 0	0.60 / 1.50
21st Street	W. Franklin Ave.	3 / 19	0 / 0	0 / 0	0.75 / 1.00
W. Franklin Ave.	I-394	0 / 0	0 / 0	0 / 0	0.41 / 3.50
I-394	East Side of Bryn Mawr Park	0 / 0	0 / 0	0 / 0	0.00 / 0.40
East Side of Bryn Mawr Park	Northwest Corridor	0 / 0	0 / 0	0 / 0	0.00 / 0.00
		92 /259	0 / 0	0 / 0	1.91 / 9.40
o Hiawatha Connection					
Lake Street	I-94	0 / 0	0 / 0	0 / 0	0.00 / 0.00
I-94	I-35W	0 / 0	0 / 0	0 / 0	0.00 / 0.00
I-35W	Central Area	0 / 0	0 / 0	0 / 0	0.00 / 0.00
		0 / 0	0 / 0	0 / 0	0.00 / 0.00

TABLE 5.60
LEVEL OF LRT VEHICLE NOISE IMPACTS
(CONTINUED)

Central Area

Line Segment Start	Line Segment End	Dwellings Impacted	Institutional Uses Impacted	Comm-Indust Uses Impacted	Park Acres Impacted
Tunnel Option					
o Southwest Connection					
Minneapolis City Limits	West of Dean Avenue	0 / 37	0 / 0	0 / 0	0.00 / 0.00
West of Dean Avenue	Dean Avenue	0 / 21	0 / 0	0 / 0	0.00 / 0.00
Dean Avenue	Isles Parkway	2 / 6	0 / 0	0 / 0	2.25 / 6.25
Isles Parkway	Hennepin Avenue	20 / 40	0 / 0	0 / 0	0.00 / 1.00
Hennepin Avenue	Pleasant Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
Pleasant Avenue	Pillsbury Avenue	2 / 3	0 / 0	0 / 0	0.00 / 0.00
Pillsbury Avenue	Blaisdale Avenue	11 / 12	0 / 0	0 / 0	0.00 / 0.00
Blaisdale Avenue	Nicollet Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
Nicollet Avenue	Portal	0 / 2	0 / 0	0 / 0	0.00 / 0.00
		35 /121	0 / 0	0 / 0	2.25 / 7.25
o Hiawatha Connection					
Lake Street	Park East Limit	0 / 0	0 / 0	0 / 0	0.00 / 0.00
Park East Limit	Cedar Avenue	0 / 0	0 / 0	0 / 0	0.30 / 0.50
Cedar Avenue	18th Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
18th Avenue	15th Avenue	0 / 4	0 / 0	0 / 0	0.00 / 0.00
15th Avenue	14th Avenue	1 / 2	0 / 0	0 / 0	0.00 / 0.00
14th Avenue	11th Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
11th Avenue	Elliot Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
Elliot Street	Columbus Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
Columbus Avenue	Oakland Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
Oakland Avenue	Portland Avenue	0 / 0	0 / 0	0 / 0	0.00 / 0.00
Portland Avenue	4th Avenue	0 / 2	0 / 0	0 / 0	0.00 / 0.00
4th Avenue	Portal	0 / 0	0 / 0	0 / 0	0.00 / 0.00
		1 / 8	0 / 0	0 / 0	0.30 / 0.50

Note: - 0 / 0 - Best-Case Impacts/Worst-Case Impacts

- Noise mitigation effects of intervening buildings were accounted for in the impact area evaluation.
- Dwelling unit total includes individual apartment units.

5.8.8 Water Resources

Tunnel Option

Runoff and Receiving Waters:

The proposed at-grade segments of the tunnel option would not have any affect on the storm water management facilities in the Central area. Local storm water facilities will be in accordance with the criteria of the Mississippi River and Minnehaha Creek Watershed Districts and the City of Minneapolis.

Sanitary sewer flow from the office/administrative portions of the Coach Yard site should be normal domestic sewage. Volumes would be consistent with Metropolitan Waste Control Commission (MWCC) data.

Floodplains:

The Southwest Corridor at-grade connection on the 29th Street Corridor may have an impact on the Lake Calhoun and Lake of the Isles floodplains. The proposed LRT alignments would cross the lagoon areas of these lakes over upgraded railroad bridges. The impact of the floodplain would be minimal during construction of the replacement bridges. LRT system operations impacts are not anticipated.

Shoreland Zoning:

The Southwest Corridor connection to the tunnel could impact the Shoreland Zoning boundaries for Lake of the Isles and Lake Calhoun. The University connection to the north portal could impact the Mississippi River District boundary.

A permit from the City of Minneapolis Zoning Administrator would be required for LRT construction within the above-mentioned Shoreland Zoning District boundaries. No vegetative cutting is anticipated within the districts. Mitigation measures for grading and filling would include standard erosion control measures.

Mississippi River Critical Area:

The University Connection to the north tunnel portal line would enter the Mississippi River Critical Area as it crosses Second Avenue South.

The City of Minneapolis Critical Area Plan does not specifically mention LRT, but it does contain policies which indicate that construction of an LRT line below the river bluff (approximately on the riverside of First Street) would not be consistent with elements of the Critical Area Plan. An alignment above First Avenue would be consistent with the Critical Area Plan.

Construction below First Avenue would not be consistent with the City of Minneapolis Critical Area Plan in that it would be contrary to the intentions of the Central Mississippi Riverfront Regional Park (passive recreation and enjoyment of the river), and the Federal Great River Road program. Further, it would be inconsistent with other Visual Quality policies of the Critical Area Plan (minimize visual clutter at bridgeheads) and with Transportation policies of the Plan which discourage transportation facilities not essential for river transportation, and recreation, or access to riverfront housing.

Groundwater:

Tunnel Segment

The static water level in the sandstone is higher than the top of sandstone south of I-94. Because the overlying shale is impermeable this means the sandstone acts as a confined aquifer in this region. North of I-94 along the tunnel route, the water table is relatively flat and about 760 feet MSL. The water table begins to rise near Nicollet as the tunnel approaches the Mississippi River at an elevation of 800 feet MSL. Construction dewatering for the tunnel would take place from about 25th Street in the south to about 5th Street in the north. Dewatering the sandstone for tunnel projects in this area has typically used an average well spacing of 500 feet which would require about 20 wells. The surface requirements for a dewatering well consist of power drop for the pump and a buried pipe to carry the water to a nearby storm sewer.

Station Sites

Of the five tunnel stations proposed, two would be cut and cover, and three would be mined stations, 95 to 120 feet below the surface.

The Portland and 27th and the 3rd and Hennepin stations would be cut and cover stations. It is anticipated that there would be minimal construction dewatering required at these two sites.

The mined stations include: 3rd and Franklin, the Convention Center and Marquette and 7th. A brief description of the groundwater impacts at these stations follows.

3rd and Franklin:

Construction dewatering would be required for construction in the sandstone with localized dewatering of the soils where perched water conditions occur. This would require a pump and power connection on the surface and a buried pipe from the pump to a storm sewer. Permanent station drainage would locally lower the water table in the sandstone.

Convention Center:

Wells and buried pipes for construction dewatering of the sandstone are anticipated. Additional wells may be required where water exists. Station drainage would locally lower the sandstone water table.

Marquette and 7th:

Construction dewatering in the soils and sandstone is probably less extensive than at the other two mined stations because the soils are generally dry and the water table is lower in the sandstone.

At-Grade Connections to the Tunnel

It is not expected that groundwater appropriation will be required for any portion of the at-grade alignments. It is possible, however, that local conditions may require site specific temporary lowering of the water table (five- to ten-day period) for construction.

At-Grade Option A

Runoff and Receiving Waters:

The proposed at-grade segments would not have any affect on the storm water management facilities along the Central Corridor routes. Local storm water facilities will be in accordance with the criteria of the Mississippi River and Minneahaha Creek Watershed Districts, and the City of Minneapolis.

Sanitary sewer flow impacts associated with the Coach Yard are addressed in the tunnel option discussion.

Floodplains:

Impacts to the floodplains in the Central area with At-Grade Option A would be the same as with the tunnel option.

Shoreland Zoning:

The Southwest Corridor connection to Nicollet Avenue, on the 29th Street Corridor, could impact the Shoreland Zoning Boundaries for Lake of the Isles and Lake Calhoun.

Mitigative measures for LRT construction within the Shoreland Zoning District boundaries are identified in the tunnel option.

Groundwater:

It is not expected that groundwater appropriation will be required for any portion of the at-grade alignments. It is possible, however, that local conditions may require site specific temporary lowering of the water table (five to ten day period) for construction.

<u>At-Grade Option B: HCRRA Alignment</u>

Runoff and Receiving Waters:

The proposed at-grade segments would not have any affect on the storm water management facilities along the Central Corridor routes. Local storm water facilities will be in accordance with the criteria of the Mississippi River and Minnehaha Creek Watershed Districts and the City of Minneapolis.

Sanitary sewer flow impacts at the Coach Yard are identified in the tunnel option discussion.

Floodplains:

The Southwest Corridor connection, on HCRRA right-of-way, would impact the Kenilworth lagoon floodplain. The proposed alignment would cross the lagoon area over an upgraded railroad bridge. The impact to the floodplain would be minimal during construction of the replacement bridge. LRT system operation impacts are not anticipated.

Shoreland Zoning:

The Southwest Corridor connection would impact the Cedar Lake and Kenilworth Lagoon Shoreland Zoning District boundaries.

A permit from the City of Minneapolis Zoning Administrator would be required for LRT construction within the above-mentioned Shoreland Zoning District boundaries. No vegetative cutting is anticipated within the above-mentioned Shoreland Zoning Districts. Mitigation measures for grading and filling would include standard erosion control measures.

Groundwater:

It is not expected that groundwater appropriation will be required for any portion of the at-grade alignments. It is possible, however, that local conditions may require site specific temporary lowering of the water table (five- to ten-day period) for construction.

No-Build

There would be no impacts to the water resources in the Central Area under the no-build alternative.

5.8.9 Steep Slopes

Tunnel Option

Steep slopes at the north and south portals for the tunnel option will be accommodated by the tunnel construction. Along the 29th Street/Soo Line corridor, existing bridge abutments would function as retaining walls where necessary.

At-Grade Option A: (Nicollet Avenue)

Steep slope impacts along the 29th Street Corridor are identified in the tunnel option.

At-Grade Option B: (HCRRA Alignment)

Steep slopes are not a factor for the At-Grade Option B alignments.

No-Build

There would be no impacts to steep slopes in the Central Area under the no-build alternative.

5.8.10 Geological Conditions

Tunnel Option

The proposed tunnel is 2.8 miles long north-south, with two portals and five stations. The tunnel would be constructed in a sandstone layer just below a hard limestone shelf.

The tunnel would be excavated by mechanical excavators such as front end loaders, continuous miners or tunnel boring machines. Spoil would be transported to the surface in dump trucks or rail cars and hauled away by conventional dump trucks. The present design includes a soft ground and mixed face tunnel under Portland Avenue: The soft ground and mixed face tunnel and sandstone tunnel are treated separately below.

Soft Ground and Mixed Face Tunnel:

The soft ground tunnel begins north of the station at 27th Street and extends to about I-35W where the sandstone tunnel starts. This type of tunnel is constructed by excavating the soil and installing a support system on the roof and walls. Mixed face tunnelling occurs when the tunnel encounters limestone bedrock requiring drilling and blasting. As the tunnel descends deeper into the limestone there is progressively less soil excavation and more rock excavation.

The surface work site would consist of an area within Portland Avenue for a construction portal. An adjacent area would be needed for stockpiling spoil for loading and hauling by dump trucks. The work site could be located in a parking lot west of Portland and south of 26th Street. The portal and work site would be connected by ramp.

Soft ground tunnels usually experience soil movements adjacent to construction. This takes the form of surface subsidence over the tunnel. The zone of influence extends up to one tunnel depth away from the alignment with the amount of subsidence decreasing as the tunnel becomes deeper.

This subsidence could impact surface structures in the block west of Portland Avenue between 26th and 25th Streets where the tunnel passes underneath. Potential effects include cracks in sidewalks, street pavement, basements and foundations.

Subsidence can be partially controlled by compaction grouting ahead of the tunnel. This involves drilling holes from the surface ahead of the tunnel and injecting a grout mixture under pressure to harden and consolidate the soil. Temporary impacts occur during drilling and grouting operations. It is expected that this would reduce but not totally eliminate subsidence.

Sandstone Tunnel:

The sandstone tunnel would be constructed just below the limestone layer approximately 60 to 90 feet below the surface. Portions of the tunnel would be wide enough to accommodate both tracks with a center dividing wall. Other sections would be separate tunnels with only one track per tunnel. While the exact methods and sequence of tunneling would be determined later, the following description represents a probable approach.

The tunnel would be mined from both the south and the north, requiring surface work sites at both ends. At the south end this would likely be the same as that used for the soft ground tunnel or open cut. On the north end this would probably be the location of the 3rd and Hennepin station.

Each work site would be used for stockpiling and hauling the mined sandstone. Materials used for initial support and final lining would be unloaded from trucks, stored and transported to the tunnel. Workmen and equipment would also enter the tunnel from this point.

5.8.11 Utilities

Tunnel Option

Existing deep structures will be influenced by LRT tunnel construction.

The proposed LRT tunnel would intersect a storm drain under I-35W. This twelve-foot diameter circular tunnel would need to be widened at the crossing to maintain its current flow capacity. The same is true further north where the LRT tunnel would intersect a nine-foot diameter storm drain serving I-94.

Several existing deep tunnels would be impacted by the LRT tunnel. Two of these are associated with I-35W and I-94 storm drain system. At both crossings the LRT tunnel would pass about mid-height through the existing storm drain tunnel. The storm tunnels would be widened and the crown dropped to accommodate their design flow.

A combined storm and sanitary sewer under Marquette Avenue would be impacted by the proposed tunnel. The LRT tunnel would parallel this tunnel from 7th Street to 5th Street. This utility tunnel would be replaced by a drain system incorporated into the new construction or a new parallel tunnel. The exact approach would be determined during final design.

North of 5th Street the LRT tunnel would leave Marquette Avenue and rise in elevation as it follows the limestone. In so doing it would miss sanitary and storm tunnels located under 4th Street, Nicollet Avenue, Hennepin Avenue and 2nd Street.

At-Grade Options

The highest concentration and greatest variety of private and public utility impacts occur in the districts downtown area of the Central Area. The utilities potentially impacted are as follows:

- o Minneapolis Sanitary Sewer
- o Minneapolis Storm Sewer
- o Minneapolis Water Main
- o Minnegasco (Natural Gas)
- o U.S. West (Telephone)
- o MCI (Communications)
- o Northern States Power (Electricity)
- o Minneapolis Energy Center (Steam)
- o Western Union
- o U.S. Link (Communications)

All utility companies and departments have been contacted to conceptually determine impacts from the LRT system. Of these utilities, only the Minneapolis Energy Center facilities are unaffected. The extent of potential impact of the LRT system on the various utilities will depend on the final location of the LRT track structure. The basic criteria for relocations required by the LRT at-grade system is no gas or water main will be allowed to parallel the system beneath the tracks. Other utilities could remain beneath the tracks; however, future accesses to these lines could not interrupt LRT service. Sanitary sewer and storm sewer lines located in the impact zone may need to be lined or replaced, but would remain in their existing location.

As the LRT system extends outside of the CBD, the density of utilities, and the potential impacts and costs of utility impacts would decrease.

No-Build

There would be no impacts to the utilities in the Central Area under the no-build alternative.

5.8.12 Parklands

Tunnel Option

- o Chain of Lakes Regional Park (Minneapolis Park Board):

  The LRT line would result in visual impacts to the park. The line would pass over Dean Parkway on the elevated railroad bridge. It would continue along the elevated freight line between Lake of the Isles and Lake Calhoun, then over the connecting channel between the two lakes. On the north side of the LRT line, most of the land is wooded but includes a soccer field and Park Board maintenance site and buildings. To the south is open space, Lake Street, and the landscaped northern edge of Lake Calhoun with its bicycle and pedestrian paths. The LRT line, which would run within 150 feet of the edge of the Lake Calhoun open space and within 350 feet of the edge of the lake itself, would be visible from both locations. Estimated acres of parkland which could incur a noise impact are addressed in the Noise section (5.8.7).

The LRT line would run parallel to and within fifty feet of The Mall.

- West River Parkway (Minneapolis Park Board):

  The LRT line would result in visual impacts to the park and the loss of approximately 0.72 acres of parkland between Central and Hennepin Avenues. The automobile parkway would be moved approximately thirty feet closer to the river, displacing landscaped open space and setting the road closer to the bicycle and pedestrian paths.

  LRT's consistency with the Mississippi River Critical Area Plan and the Saint Anthony Falls Historic District are addressed in Sections 5.8.8 and 5.8.14, respectively.

<u>At-Grade Option A (Nicollet Avenue)</u>

This at-grade LRT option in the Central area would impact the Chain of Lakes Regional Park (Minneapolis Park Board). Specific impacts to this park are identified in the discussion regarding the Tunnel Option.

<u>At-Grade Option B (HCRRA alignment with a Hiawatha Connection at the Metrodome)</u>

- Chain of Lakes Regional Park (Minneapolis Park Board)

  The LRT line would result in visual impacts to the park. The line would be within 150 feet of park land as it crosses Cedar Lake Parkway and would temporarily disrupt automobile, pedestrian and bicycle traffic each time it crosses that road. The LRT line would also run above park property on the railroad bridge over Kenilworth Lagoon, the channel which connects Cedar Lake and Lake of the Isles.

  The line would be within 20 to 150 feet of wooded, undeveloped public open space on the eastern shore of Cedar Lake between Burnham Road and Upton Avenue. In this location, the LRT would be approximately 10 to 20 feet lower in elevation than the open space.

Potential noise impacts to the park are discussed in the Noise section (5.8.7).

- o Park Siding Park (Minneapolis Park Board):

  The LRT line would result in noise and visual impacts to this park along its 150-foot western edge adjacent to the LRT right-of-way. Noise impacts would be lessened by the existing three-foot tall berm along the railroad line.

- o Bryn Mawr Meadows (Minneapolis Park Board):

  The LRT line would result in limited visual and noise impacts to the park. However, Bryn Mawr Meadows would be no closer than 150 feet to the LRT line with the majority of the park being further away. Significant noise levels would also be generated by the elevated I-394 roadway, reducing the relative noise impact of the LRT to the park.

- o Cedar Avenue Field (Minneapolis Park Board):

  Impacts to Cedar Avenue Field would be primarily visual. It is anticipated that LRT generated noise would be insignificant because of the existing noise generated by TH 55.

- o Other Parks:

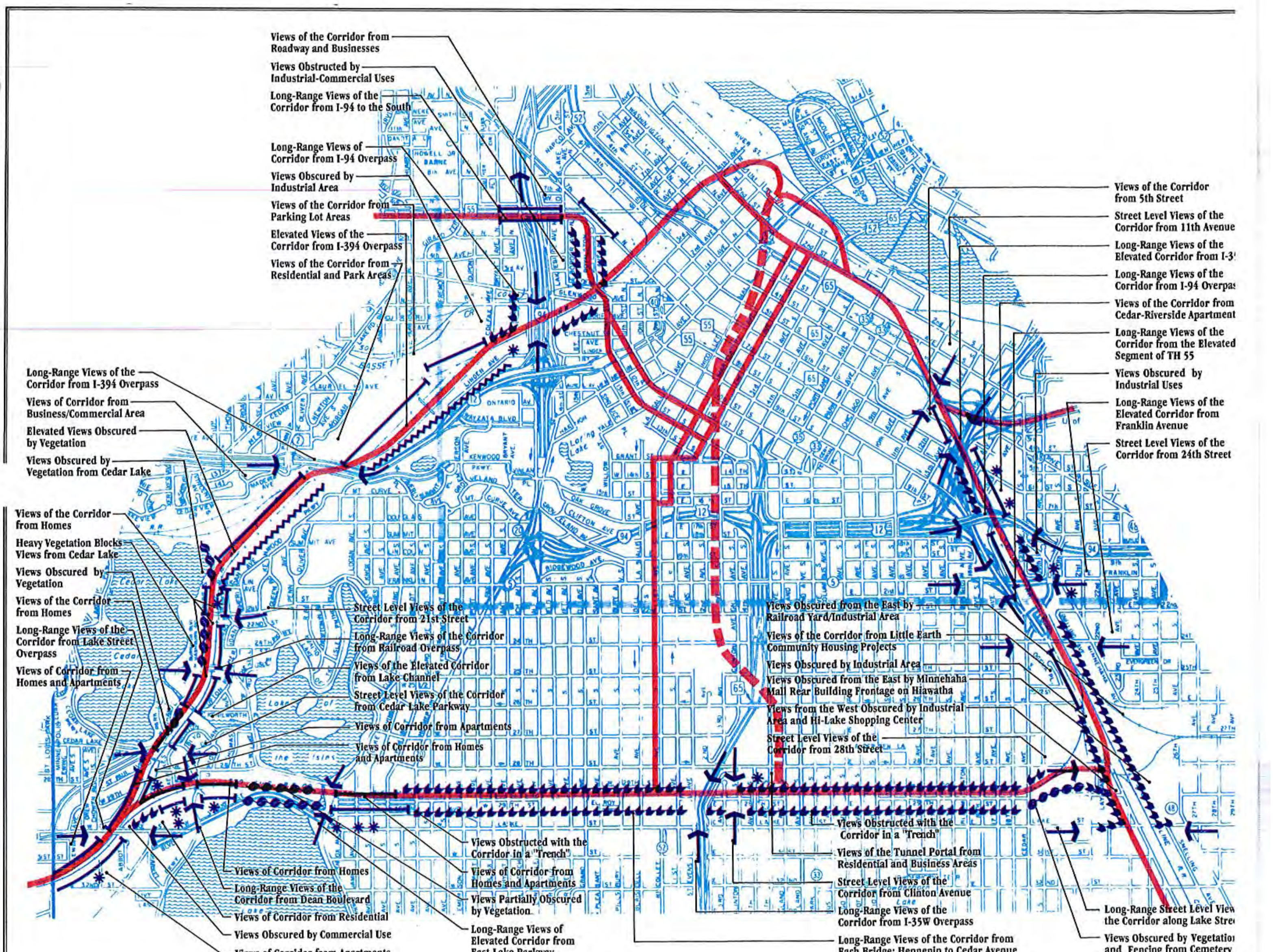
  No noticeable impacts to the East Phillips and Native American Park are expected because they would be separated from the LRT by the elevated TH 55.

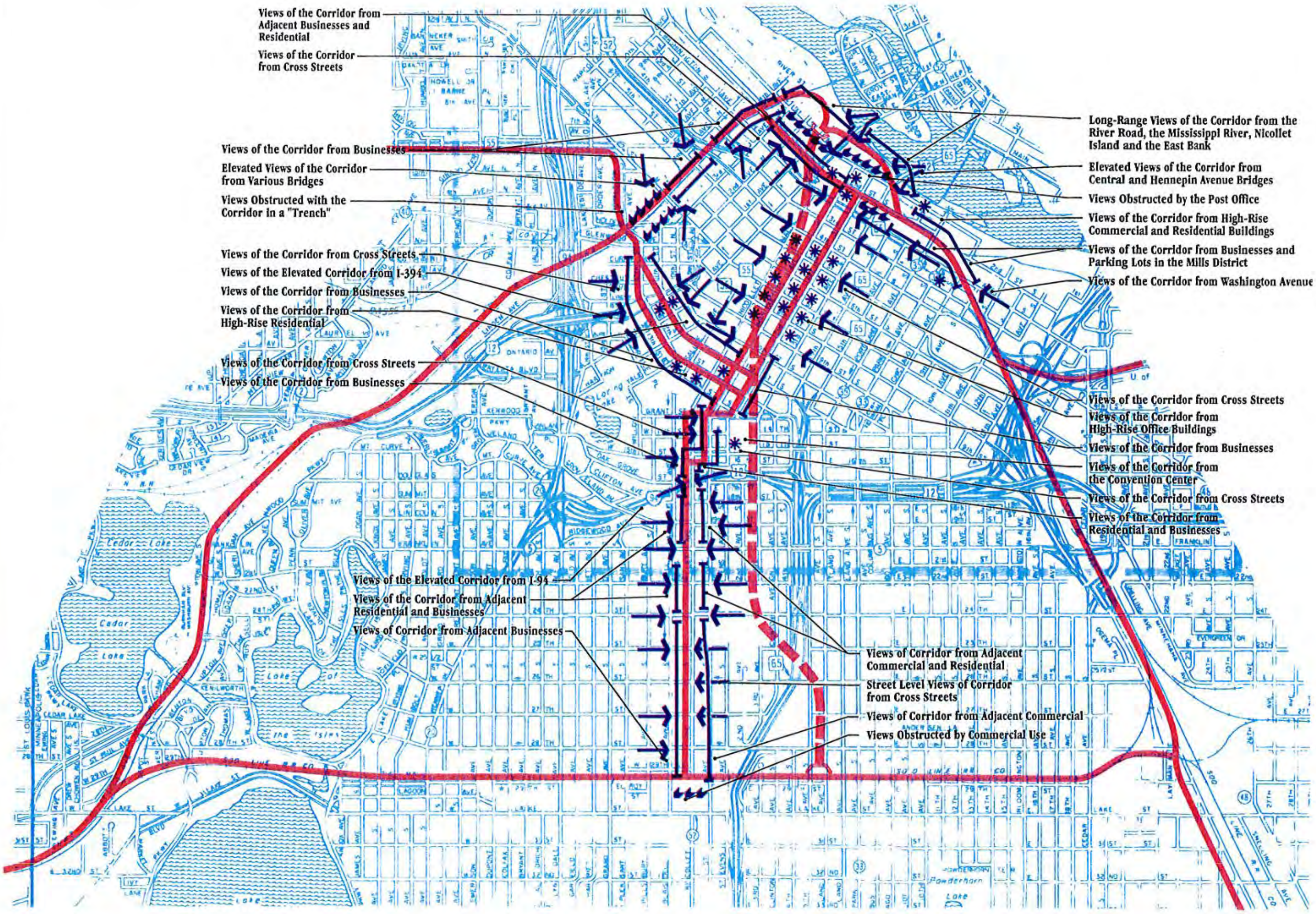
No-Build

There would be no impacts to the parks in the Central area under the no-build alternative.

5.8.13 Visual and Aesthetics

Figures 5.17A-B illustrate the specific areas in the Central Area which would be visually affected, at varying levels, by the proposed LRT Central Area alignment options. It also identifies areas where the view of the appropriate LRT corridor would be obstructed because of existing land use types and structures.


Views of the Corridor from Roadway and Businesses
Views Obstructed by Industrial-Commercial Uses
Long-Range Views of the Corridor from I-94 to the South
Long-Range Views of Corridor from I-94 Overpass
Views Obscured by Industrial Area
Views of the Corridor from Parking Lot Areas
Elevated Views of the Corridor from I-394 Overpass
Views of the Corridor from Residential and Park Areas
Long-Range Views of the Corridor from I-394 Overpass
Views of Corridor from Business/Commercial Area
Elevated Views Obscured by Vegetation
Views Obscured by Vegetation from Cedar Lake
Views of the Corridor from Homes
Heavy Vegetation Blocks Views from Cedar Lake
Views Obscured by Vegetation
Views of the Corridor from Homes
Long-Range Views of the Corridor from Lake Street Overpass
Views of Corridor from Homes and Apartments
Street Level Views of the Corridor from 21st Street
Long-Range Views of the Corridor from Railroad Overpass
Views of the Elevated Corridor from Lake Channel
Street Level Views of the Corridor from Cedar Lake Parkway
Views of Corridor from Apartments
Views of Corridor from Homes and Apartments
Views of Corridor from Homes
Long-Range Views of the Corridor from Dean Boulevard
Views of Corridor from Residential
Views Obscured by Commercial Use
Views of Corridor from Apartments
Views Obstructed with the Corridor in a "Trench"
Views of Corridor from Homes and Apartments
Views Partially Obscured by Vegetation
Long-Range Views of Elevated Corridor from East Lake Parkway
Views of the Corridor from 5th Street
Street Level Views of the Corridor from 11th Avenue
Long-Range Views of the Elevated Corridor from I-3
Long-Range Views of the Corridor from I-94 Overpa
Views of the Corridor from Cedar-Riverside Apartment
Long-Range Views of the Corridor from the Elevated Segment of TH 55
Views Obscured by Industrial Uses
Long-Range Views of the Elevated Corridor from Franklin Avenue
Street Level Views of the Corridor from 24th Street
Views Obscured from the East by Railroad Yard/Industrial Area
Views of the Corridor from Little Earth Community Housing Projects
Views Obscured by Industrial Area
Views Obscured from the East by Minnehaha Mall Rear Building Frontage on Hiawatha
Views from the West Obscured by Industrial Area and Hi-Lake Shopping Center
Street Level Views of the Corridor from 28th Street
Views Obstructed with the Corridor in a "Trench"
Views of the Tunnel Portal from Residential and Business Areas
Street Level Views of the Corridor from Clinton Avenue
Long-Range Views of the Corridor from I-35W Overpass
Long-Range Views of the Corridor from Each Bridge; Hennepin to Cedar Avenue
Long-Range Street Level View the Corridor along Lake Stre
Views Obscured by Vegetatio and Fencing from Cemetery


Views of the Corridor from Adjacent Businesses and Residential
Views of the Corridor from Cross Streets
Views of the Corridor from Businesses
Elevated Views of the Corridor from Various Bridges
Views Obstructed with the Corridor in a "Trench"
Views of the Corridor from Cross Streets
Views of the Elevated Corridor from I-394
Views of the Corridor from Businesses
Views of the Corridor from High-Rise Residential
Views of the Corridor from Cross Streets
Views of the Corridor from Businesses
Long-Range Views of the Corridor from the River Road, the Mississippi River, Nicollet Island and the East Bank
Elevated Views of the Corridor from Central and Hennepin Avenue Bridges
Views Obstructed by the Post Office
Views of the Corridor from High-Rise Commercial and Residential Buildings
Views of the Corridor from Businesses and Parking Lots in the Mills District
Views of the Corridor from Washington Avenue
Views of the Corridor from Cross Streets
Views of the Corridor from High-Rise Office Buildings
Views of the Corridor from Businesses
Views of the Corridor from the Convention Center
Views of the Corridor from Cross Streets
Views of the Corridor from Residential and Businesses
Views of the Elevated Corridor from I-94
Views of the Corridor from Adjacent Residential and Businesses
Views of Corridor from Adjacent Businesses
Views of Corridor from Adjacent Commercial and Residential
Street Level Views of Corridor from Cross Streets
Views of Corridor from Adjacent Commercial
Views Obstructed by Commercial Use

Tunnel Option

29th Street Corridor (Southwest and Hiawatha Connections):

In the segment from the East Saint Louis Park City Limits to Hennepin Avenue, a substantial visual impact to the residential areas in close proximity to the LRT line would occur. At both Dean Boulevard and East Lake Parkway, the LRT line would be in an elevated position, which would increase its visibility.

The visual impact associated with the LRT system would be minimized in the segment from Hennepin to Hiawatha Avenue because the alignment would be located in a depressed railroad corridor. The exceptions to this would be at Clinton Avenue, an at-grade crossing, and at each bridge overpass. At these locations the view of the corridor would open up. At each of the stations in the corridor the bridge head, which provides access from the bridge to the platform would create an additional architectural element.

Holden Street to 1st Street/1st Avenue:

The visual impact associated with LRT would be minimized in this segment because the alignment would be located in a depressed railroad corridor. Views of the corridor would be limited to bridge overpasses, adjacent industrial buildings and surface parking lots, and select views from the I-394 highway.

East Connection to the Tunnel Portal (University Line):

Visual impacts would be most prevalent in the West River Parkway area. Impacts would be primarily scale related (i.e., vehicle/train presence as perceived both by speed and size). Additional vehicle traffic caused by the connection of the University and Northwest lines at the north portal could also have an affect on the area.

At-Grade Option A

The Southwest and Hiawatha Connection impacts on the 29th Street Corridor alignment are identified in the tunnel option discussion.

Nicollet Avenue from 29th to 12th Street:

The visual impacts of the LRT line along this segment would be mixed. Because the existing visual environment contains substantial visual clutter, impacts would be limited to the following:

- o Vehicle presence, primarily interpreted as a clash between the physical scale of the surrounding streetscape and the size of the LRT vehicles.
- o Apparent reduction of space at station locations attributed to the presence of the platform/station mass. This reduction would be primarily perceived from the sidewalk.
- o Addition of overhead catenary wires could lower the overhead plane of the street. This coupled, with the existing presence of commercial signs and other vertical elements, would have an enclosing effect on the streetscape.
- o The LRT tracks would add another element to the ground plane for visual interpretation.

Individually, each element would not produce a significant negative visual impact. However, at station sites, a combination of the above-noted elements could affect the surrounding scale.

Mitigation, particularly at the station sites, could consist of the following:

- o Change street paving surface texture in a manner that would disguise the presence of tracks.
- o Design station enclosures to be as visually transparent as possible.

Second Street South (University Connection):

This segment extends from the Hubert H. Humphrey Metrodome to the northern terminus of Marquette and Second Avenues. Because the land uses along this segment are a mix of densities and uses--with varying visual quality--the significance of visual impacts will vary.

Along the eastern portion between the HHH metrodome and the Mills District, the existing visual quality is poor. Light rail associated visual impacts would consequently contrast far less with their surrounding environment. LRT could potentially serve as a means to improve this area's visual quality. Visual impacts to the Mills District would be predominantly scale related (i.e., vehicle/train presence as perceived both by speed and size). While the district is predominantly industrial and contains a great deal of open space, its location between the Mississippi River and Washington Avenue presents an image of self-contained compactness. This compactness encourages a slower moving pace. Therefore, penetration of a faster moving larger scale element could visually disturb this compact image. Visual impacts associated with station development will depend on scale. Insertion of high platforms and shelters will be perceived less as an insertion of a foreign element if designed with pedestrian scale in mind. Vehicle related scale issues may be mitigated by reinforcing the industrial/railroad nature of the district, thereby decreasing the contrast between the two.

The potential for visual conflict decreases between the Mills District and Marquette and Second Avenues, primarily because of the increase in density.

2nd Street North:

This segment, from the Burlington Northern rail corridor to Marquette Avenue, could have a significant impact to the area's visual environment. Specific visual impacts would include:

- o Change in character of 3rd Avenue North if the Colonial Warehouse is removed.
- o Elimination of the pedestrian and park-like setting between the Towers and the Northwestern National Life building.
- o Visual addition of the catenary system.

<u>At-Grade Option B</u>

Northwest Connection:

Visual impacts associated with the LRT would be minimal because of the LRT's adjacency to TH 55, and the existing land use and scale of businesses on Royalston Avenue.

Southwest Connection:

West City Limits to 21st Street:

The adjacent residential properties in this segment of the line would incur the greatest visual impact. Figure 5.17A identifies additional sites which would view the LRT corridor.

21st Street to Glenwood Avenue:

Because the majority of this segment is either vertically separated or at a horizontal distance, the visual impacts are limited to surrounding residential uses.

11th/12th Street:

The LRT alignment on 11th/12th Street would service both the Northwest and Southwest lines. Adjacent street level businesses would incur the greatest visual impact from LRT passbys.

Hiawatha Connection:

Because the segment from Lake to 26th Street is located in a commercial/industrial use area and adjacent to an existing transit corridor, it is anticipated that there would be a minimal visual impact associated with the LRT line.

On the west side of the segment from 26th to 24th Street, views from the Little Earth Community Housing Projects and other residential uses may require screening. To the east of the proposed LRT track, a minimal negative visual impact would occur because of the industrial/railroad uses. Existing overhead wires will reduce the impact of the catenary wires.

From 24th Street to Hubert H. Humphrey Metrodome there would generally be a low visual impact associated with the LRT line in this area because it is in an existing railroad right-of-way.

University Connection:

Visual impacts in the vicinity of 2nd Street South are identified in the At-Grade Option A discussion.

Central Business District: At-Grade Options A and B

Marquette and Second Avenue:

Because of the building density and scale within this segment, the visual impacts associated with LRT will be significant only at station sites. The presence of overhead wires would slightly increase visual annoyance and would all but disappear with use of trolley wire. Vehicle presence would not have a significant impact to the area because of the existing bus traffic.

The visual intrusion of station mass would be felt most where the building scale and density is lowest. The degree to which the visual intrusion is perceived throughout this segment is also dependent on the station architecture.

Visual conflicts occurring within this section may be mitigated through use of design elements which would soften the intrusion of LRT elements. Such design elements include: open/transparent shelter design, street surface textures that disguise track presence, use of trolley wire, and platform design which would reduce the apparent mass of the platform.

No-Build

There would be no impact to the visual environment in the Central area under the no-build alternative.

5.8.14 Historic and Cultural Resources

Tunnel Option:

The north tunnel portal would be located within the St. Anthony Falls Historic District and could significantly impact two contributing historic properties, depending upon the final portal configuration. The buildings include the Central Freight Station (10 North Hennepin) and the Foster House (100 1st Street North). Both properties are in the National Register of Historic Places and are contributing buildings. The SHPO will need to re-review the potential impacts of the tunnel option once the north portal location and configuration is better delineated.

The Northwest Corridor at-grade connection to the tunnel could also impact the Washington Avenue bridge (#6992). This bridge has been determined to be eligible for listing in the National Register. The Minnesota Department of Transportation is currently evaluating the feasibility of rehabilitating the bridge structure as part of the reconstruction of Washington Avenue.

The at-grade connection to the north tunnel portal from the east would pass through the Historic Mills District. As stated in the SHPO letter (Section 8.3), if the LRT alignment is located within existing street or railroad right-of-way, the construction of the LRT would not constitute an adverse affect on the historic buildings in the district.

At-Grade Option A:

Four historic properties (Chapter 4.8.18) may be potentially affected with the at-grade system option that includes the at-grade alignment on Nicollet Avenue between 29th Street and 12th Street. The State Historic Preservation Office (SHPO) is concerned about the effects of relocating traffic lanes for automobiles and the LRT line. The SHPO will be in a better position to comment on the potential affects of the LRT system once final design plans are completed.

The Northwest Corridor at-grade connection would require the removal of the Colonial Warehouse. As stated in the SHPO letter (Section 8.3) the Colonial Warehouse is listed in the city-designated Warehouse District and the proposed National Register Minneapolis Warehouse District.

The Northwest Corridor connection to 2nd Avenue/Marquette Avenue could also impact the Washington Avenue bridge (6992). The current status of the bridge is identified in the tunnel option discussion.

Four historic buildings would be in close proximity to the at-grade alignment on 2nd Street. They include: the Northwestern Consolidated Elevator "A" (Ceresota), Washburn Crosby Company, "A" Mill and the North Star Woolen Mill. The Chicago, Milwaukee, Saint Paul and Pacific Railroad Company Freight House has recently been approved for demolition by the Heritage Preservation Commission because it has been determined that the property cannot economically be rehabilitated. As stated in the SHPO letter, the construction of the LRT line would not constitute an adverse impact on the above-mentioned historic buildings. Because of the historic paving on Second Street North, the LRT has the potential to impact the visual setting of the area if removal of the paving is required.

At-Grade Option B:

No known historic properties would be impacted by the Kenwood at-grade system option.

No-Build

There are no anticipated impacts to the historic and cultural resources in the Central Area with the no-build alternative.