resultant loss of wetlands and natural areas has allowed untreated stormwater to discharge directly into the Mississippi River. While the ability of the corridor to support RTE species is minimal, this area provides habitat for species adapted to an urban environment.

4.5.1 Vegetation and Wildlife

Vegetation cover types correspond to plant associations and structural habitat components that provide essential life requisites such as food, shelter, and nesting sites for wildlife. The quality of the vegetative cover determines the inhabiting wildlife. Wetlands are discussed in Section 4.5.3 and RTE Flora and Fauna species are discussed in Section 4.5.4.

REGULATIONS

In general, there are no regulations that protect common vegetation and wildlife.

EXISTING CONDITIONS

Public Land Survey Records from 1853-1856, interpreted by Frances Marschner, show that the original vegetation in the Study Area consisted primarily of scattered trees and groves of scrubby oaks with some brush and thickets (*Minnesota County Biological Survey Map Series No. 7*, 1994). This cover type no longer exists within the Study Area.

Today the Study Area is mostly urbanized, primarily occupied by man-made impervious surfaces, such as high-density residential areas, streets, highways, and parking lots. Potential wildlife habitat includes the wooded banks of the Mississippi River and the maintained parklands & lawns along the corridor. These areas have limited wildlife habitat potential based on their location within a metropolitan area. Additionally, habitat within parks and lawns is further minimized by their regular maintenance (i.e., mowing). However, they do provide habitat to wildlife, such as small mammals and songbirds, which have adapted to an urban/suburban environment. Below, is a description of these areas.

The Mississippi River flows through the Study Area near the western terminus in Minneapolis. The west bank of the river has been altered for the development of West River Parkway, Washington Avenue Bridge and the University of Minnesota Elmer L. Anderson Library. Vegetative communities between the shoreline and the West River Parkway consist of a 50-foot wide strip of mowed bluegrass and a 100-foot wide strip of unmaintained grasses and forbs dominated by barnyard grass, foxtail, common ragweed, and bird's foot trefoil. A chain-link fence separates these areas. Just west of the West River Parkway, the elevation quickly increases to an approximate 2:1 slope. Due to the concrete rubble beneath the Washington Avenue Bridge, there is minimal vegetation directly under the bridge. Ash and boxelder with climbing cucumber and grapevine dominate the canopy of the surrounding vegetation. The understory has less than 50 percent cover and is dominated by white snakeroot. Just north of the Washington Avenue Bridge on the west bank, where the underground library entrance is located, disturb tolerant foxtail, smooth brome and Canada goldenrod dominate the vegetation.

The east bank of the river is bound by a steep bluff, and has not been altered to the extent of the west bank. The wooded cliffs are comprised of limestone and sandstone. Vegetation cover is dominated by deciduous species such as cottonwood, hackberry, buckthorn, and grapevine. The understory is dominated by white snakeroot. The river corridor and associated natural areas provide habitat to urban wildlife such as songbirds, hawks, owls, deer, raccoon, and small mammals.

Potential habitat provided by urban parkland and lawns generally includes maintained bluegrass with planted flowers, trees and/or shrubs associated with parks, the State Capitol, and residential, commercial or industrial lots. Urban parklands within the Study Area include West River Parkway, East River Parkway, Northrop Mall, Tower Hill, Iris Park, Dickerman Park, Leif Erickson Park, Cass Gilbert Park, Capitol Mall, Museum Park, and Kellogg Park. These areas provide low quality habitat for small mammals and song birds.

IMPACTS AND MITIGATION

Baseline Alternative

No impacts to vegetation and wildlife are associated with the Baseline Alternative. No mitigation is proposed or required.

University Avenue LRT Alternative

Minimal impacts to vegetation adjacent to the corridor may be associated with the LRT Alternative, as the existing right-of-way may need to be expanded in some areas to accommodate transit stations. Impacts would involve clearing and grading, however this would only affect the edge of a vegetated area. This type of impact would be negligible to urban wildlife since the vegetation that may be impacted is common within the Study Area and surrounding area (i.e., maintained bluegrass). No mitigation is proposed or required for impacts to vegetation or wildlife.

University Avenue Busway/BRT Alternative

Minimal impacts to vegetation adjacent to the corridor may be associated with the BRT Alternative, as the existing right-of-way may need to be expanded in some areas to accommodate bus pullouts. Impacts would involve clearing and grading, however this would only affect the edge of a vegetated area. This type of impact would be negligible to urban wildlife since the vegetation that may be impacted is common within the Study Area and surrounding area (i.e., maintained bluegrass). No mitigation is proposed or required for impacts to vegetation or wildlife.

4.5.2 Aquatic Habitat

The structure of a water body (i.e., sandy vs. rocky, stagnant vs. dynamic, shady vs. sunny) and quality of water determines the aquatic habitat and inhabiting species. This section discusses the existing general aquatic habitat. Wetlands are discussed in Section 4.5.3 and water quality is discussed in Section 4.6

REGULATIONS

In general, a permit from the Minnesota Department of Natural Resources (DNR) is required for the crossing of public waters. The DNR is to ensure that any bridge construction or reconstruction is not detrimental to significant fish and wildlife habitat (including but not limited to obstructing the movement of game fish or disruption during fish spawning) or protected vegetation. Any anticipated adverse effects require implementation of feasible and practical measures to mitigate effects.

EXISTING CONDITIONS

The proposed alignment crosses the Mississippi River. Aquatic habitat within the Mississippi River has degradation impacts due to the surrounding urban setting. Habitat for aquatic threatened and endangered species is not present within the Study Area. No aquatic species data

were available for the Study Area. However, about 8-miles upstream from the Washington Avenue Bridge, data indicates that walleye, catfish, crappie, sunfish, small mouth bass, drum and carp can be found. Data indicate that similar species can be found about 5-miles downstream from the Washington Avenue Bridge. Most of these species are expected to inhabit or travel through the Study Area.

IMPACTS AND MITIGATION

Baseline Alternative

There will be no bridge construction, and therefore no impacts to aquatic habitat are associated with the Baseline Alternative. No mitigation is proposed or required.

University Avenue LRT Alternative

There will be minor bridge construction associated with the LRT Alternative including bridge surfacing to accommodate tracks and overhead power. No impacts to aquatic habitat are expected to be associated with this type of activity. Best Management Practices (BMPs) would be installed and maintained under grading permits required by the Mississippi and the Capitol Region Watershed Management Organizations. An NPDES permit will be required for this project.

University Avenue Busway/BRT Alternative

There will be no bridge construction, and therefore no impacts to aquatic habitat are associated with the BRT Alternative. No mitigation is proposed or required.

4.5.3 Wetlands

REGULATIONS

Impacts to wetlands are regulated by several different agencies under the *Clean Water Act* (CWA) provided they are connected or adjacent to "navigable waters" of the United States (U.S.). Section 404 of the CWA requires a permit to be issued by the United States Army Corps of Engineers (COE) (or a delegated state) prior to the placement of any dredged or fill material into any waters of the U.S., including wetlands. Section 401 of the CWA requires the affected state to issue a water quality certification, or a waiver, for each Section 404 permit.

Wetlands are regulated by the DNR provided they have been identified as a protected "water" or "water wetland". Proposed impacts to these types of wetlands would require a permit from the DNR.

The MPCA reviews COE permits and is responsible for issuing water quality certification.

Under the Minnesota Wetland Conservation Act (WCA), the local government unit (LGU) regulates activity within all wetlands. The proposed alignment passes through the cities of Minneapolis and St. Paul and the Middle Mississippi and Capitol Region Watersheds. The respective LGUs responsible for the regulation of wetlands in the Study Area are the Middle Mississippi Watershed Management Organization and the City of St. Paul.

EXISTING CONDITIONS

National Wetland Inventory (NWI) maps were reviewed to identify potential wetland areas present within 200-feet on either side of the proposed alignments for all alternatives (Figure 4.6-1: National Wetlands Inventory and Protected Waters). An on-site field review was

conducted in September 2001 to verify this recorded information and to identify any other existing wetlands not shown on the NWI maps. Based on this analysis, it has been determined that no wetlands are located within the Study Area.

IMPACTS AND MITIGATION

Field review indicates that there are no wetlands located in the Study Area that would be impacted or require mitigation for the Baseline Alternative, University Avenue LRT Alternative, or University Avenue Busway/BRT Alternative. No mitigation is proposed or required for any of the three alternatives.

4.5.4 Rare, Threatened and Endangered (RTE) Flora and Fauna Species

REGULATIONS

Section 7 of the Endangered Species act (ESA) requires all federal agencies to consider and avoid, if possible, adverse impacts to federally listed threatened or endangered species or their critical habitats which may result from their direct, regulatory, or funding actions. The United States Fish and Wildlife Service (USFWS) is responsible for compiling and maintaining the federal list of threatened and endangered species. Section 9 of the ESA also prohibits the "taking" of any federally listed species by any person without prior authorization. The term "taking" is broadly defined at the federal level and explicitly extends to any habitat modifications that may significantly impair the ability of that species to feed, reproduce, or otherwise survive.

The DNR regulates the state listed threatened and endangered species. General requirements to protect state threatened and endangered species are to minimize impacts to the species and their habitat.

EXISTING CONDITIONS

Available information regarding reported occurrences of RTE species or critical habitats in proximity to the proposed project was obtained from the USFWS and the DNR National Heritage Program. Copies of the agency responses are included in Appendix 9.7. The database search by these agencies covered a corridor half- to one-mile wide along the proposed alignment.

Correspondence from the USFWS indicated that no known occurrences of any federally (proposed) listed threatened and/or endangered species are within the Study Area. Correspondence from the DNR states that there are 11 known occurrences of state listed rare species or natural communities in the area searched. These are listed below along with their status and habitat in Table 4.5-1: State Reported RTE Species.

Most reports of these species are associated with the Mississippi River and/or its immediate surroundings. Records of the jumping spider and the fox snake date back 23 and 62 years respectively. Species with records dating back over 20-years are not expected to be in the Study Area today. More recent reports exist for the state-threatened peregrine falcon (2000, 1997, and 1992), the eastern pipistrelle (2000 and 1988) and the bat concentrations (2000 and 1988). DNR records indicate that all known falcon nests are on tall buildings, which are outside the project's construction limits. DNR records indicate that all known bat concentrations (including the eastern pipistrelle) are in caves at least 1,000-feet from the Washington Avenue Bridge, which is outside

the project's construction limits. However, the wooded community on the banks of the Mississippi River may be utilized by bats and/or falcon for roosting or foraging. These activities may be within 500-feet of the Washington Avenue Bridge.

Table: 4.5-1: State Reported RTE Species

Scientific Name	Common Name	Observation Date	Agency	Status	Habitat
Birds					
Falcon peregrinus	Peregrine falcon	2000, 1997, 1992	DNR	State threatened	Open country near cliffs, along rivers, urban areas
Arachnids					
Marpissa grata	Jumping spider	1978	DNR	State special concern	Unknown
Reptiles					
Elaphe vulpina	Fox snake	1939	DNR	No legal status	Woodland and woodland edges, prairies, lowland meadows, and rocky outcroppings near rivers
Mammals					
Pipistrellus subflavus	Eastern pipistrelle (bat)	2000, 1988	DNR	Special concern	Summer roosts are usually caves or mines or hollow trees
-----	Bat concentration	2000, 1988	DNR	Unknown	Caves

IMPACTS AND MITIGATION

As indicated above, no threatened or endangered species have been documented within 500-feet of the bridge.

Baseline Alternative

There will be no bridge construction associated with this alternative, and therefore no impacts to documented RTE species. No mitigation is proposed or required.

University Avenue LRT Alternative

Although there may be potential for bats and/or falcon to utilize land within 500-feet of the bridge, the proposed minor construction activities would have no impact on either species. No mitigation is proposed or required.

University Avenue Busway/BRT Alternative

There will be no bridge construction associated with this alternative, and therefore no impacts to documented RTE species. No mitigation is proposed or required.

4.6 WATER QUALITY AND FLOODPLAINS

This section addresses surface and ground water resources within the Study Area. For purposes of this study, an area 500-feet on either side of the proposed transit alignments was used to determine potential impacts. Due to the developed nature of the Study Area, there are limited surface water resources. Water bodies influencing drainage in the proposed transit alignments and vicinity were identified primarily from USGS quadrangles, the NWI and the *Protected Waters Inventory* (PWI), followed by field verification. The Mississippi River is the only body of water within the Study Area and other tributaries and wetlands associated with the river are located outside the Study Area.

4.6.1 General Description of the Mississippi River Basin

Natural water bodies within this Study Area are non-existent with the exception of the Mississippi River. The Study Area is located within two watersheds of the Mississippi River, the Middle Mississippi Watershed and the Capitol Region Watershed. Both watersheds are direct tributaries to the Mississippi River.

The Mississippi River segment included in this studied area extends between the Upper and Lower St. Anthony Lock and Dams in downtown Minneapolis to the riverfront in the City of St. Paul. A narrow channel surrounded by steep limestone bluffs typically characterizes the river segment in this area. This segment of the Mississippi has been used for commercial and industrial purposes since the late 1820's and the river has be altered drastically to facilitate barge traffic and extensive milling operations from the late 1820's to around the 1930's in the St. Anthony Falls area. Excel Energy still maintains a hydroelectric generating facility in the St. Anthony Fall's area. There are three lock and dams within this segment of the river; Lock and Dam Number One and the Upper and Lower St. Anthony Lock and Dams, all operated by the COE. Currently this segment of the river is still in use for commercial barges and recreational use. Commercial shipping activities tend to be barges hauling coal, aggregates, steel and road salt with barges numbering in excess of 2,500 per year.

4.6.2 Surface Water Quality in Study Area

Construction activities within floodplain may add impervious surface area thereby increasing stormwater runoff, and may potentially increase sediment load thereby affecting water quality in the receiving waters. The primary receiving water in the Study Area is the Mississippi River. The are no other receiving waters within the Study Area.

REGULATIONS

As previously indicated, the Study Area is mostly urbanized. The land has been completely altered from the original condition and is now primarily characterized by commercial or industrial developed areas. The Study Area falls within the boundaries of two watershed management organizations, the Middle Mississippi River Watershed Management Organization and the Capitol Region Watershed Management Organization. The proposed project alternatives are located within existing roadway or transitway right-of-way, which are primarily impervious surfaces. All storm drainage systems located within the Study Area are designed to accommodate runoff from the existing fully developed conditions. Proposed construction activities are not expected to alter the current drainage patterns of the watersheds due to the existing conditions. All stormwater runoff within the Study Area has been piped and flows directly into the Mississippi River in both watersheds.

The following agencies regulate water resources within the Study Area:

- Middle Mississippi Watershed Management Organization
- Capitol Region Watershed Management Organization
- Minnesota Pollution Control Agency (MPCA)
- United States Army Corps of Engineers (COE)
- Minnesota Department of Natural Resources (DNR)

The above agencies would be responsible for review and permitting of surface water related issues resulting from construction of the proposed project.

The COE classifies the Mississippi River as navigable water. Navigable waters of the U.S. have historically been regulated under the Rivers and Harbors Act of 1899 (RHA). Sections 9 and 10 of the RHA establish the Corps' basic authority to regulate construction, filling, dumping, channelization and other activities in the navigable waters.

Principally, the MPCA, the DNR and the City of Minneapolis regulate water quality in the Mississippi River. The MPCA establishes water quality standards for the river and conducts periodic water quality and biological monitoring. Water quality standards are implemented primarily through National Pollution Discharge Elimination System (NPDES) permits issued to dischargers by the member states. The MPCA and City of Minneapolis review draft NPDES permits and receive periodic permit monitoring and compliance reports from the member states.

The proposed alignments for both the LRT and Busway/BRT Alternatives include a river crossing that is within the federal Mississippi National River and Recreation Area (MNRRA) and within the state Mississippi River Critical Area (MRCA). The MNRRA and MRCA both have the same boundaries as illustrated in Figure 4.6-2: Mississippi National River and Recreation Area Boundaries Map. The MNRRA/MRCA corridor extends landward approximately 300-feet beyond the ordinary high water of the river. The federal MNRRA Program works in partnership with the state MRCA Program. In 1976, the State of Minnesota declared the Mississippi River corridor through the Twin Cities Metropolitan Area to be a "critical area", requiring each municipality to develop plans and regulations for it's protection. The critical area is to be managed as a multi-purpose public resource by continuing use of the river channel for transportation by conserving the scenic, environmental, recreational, mineral, economic, cultural and historic resources and functions of the river corridor. This area will also be managed by providing for the continuation of development in a variety of urban uses. The DNR oversees this state program.

In 1988, the U.S. Congress designated 72-miles of the Mississippi River and 4-miles of the Minnesota River as the MNRRA. A *Comprehensive Management Plan* developed for the MNRRA adopts and incorporates the MRCA Program, Shoreland Management Program, and other applicable state and regional land use management programs. The MNRRA plan addresses preservation, recreation, conservation and development. The plan provides regulations on activities within the area to protect important historic, cultural, or aesthetic values or natural systems. The National Park Service oversees this federal program.

The Study Area for the proposed Central Corridor project is included in two watershed districts. The Middle Mississippi Watershed District extends from downtown Minneapolis to Highway 280 along the corridor and the Capitol Region Watershed District extends from Highway 280 to downtown St. Paul. Both the Middle Mississippi Watershed and the Capitol Region Watershed are directly tributary to the Mississippi River.

The Middle Mississippi Watershed Management Organization and Capitol Region Watershed Management Organization are responsible for construction permitting as it pertains to storm water runoff and to ensure that new construction projects meet the goals and requirements established by the watersheds. These two agencies will ensure that BMPs, as outlined in the NPDES permit, are used to limit sediment and particulate runoff during construction activities.

The DNR also requires that cities adopt zoning regulations to protect the environmental quality of surface waters and the natural and economic value of shoreline areas and to provide for wise

utilization of such waters. Both Minneapolis and St. Paul have designated the Shoreline Zoning district boundary, which includes the area within 300-feet from the ordinarily high water of the Mississippi River.

EXISTING CONDITIONS

The PWI and the NWI maps, respectively, produced by the DNR and USGS were reviewed to identify potential wetlands and/or public waters within the Study Area. The Mississippi River is identified on the PWI as a public water (Figure 4.6-1). The proposed river crossing for the LRT and BRT Alternatives would occur at the Washington Avenue Bridge, in the Middle Mississippi River Watershed District. There are no other defined public waters or potential wetlands within the Study Area.

LAKES

There are no lakes within the proposed project Study Area.

IMPACTS AND MITIGATION

No substantial impacts to the surface water quality are anticipated as the construction activities for the proposed transit are within commercial or industrial developed areas.

The City of Minneapolis will require the reconstruction of existing storm sewer structures as necessary to allow for proposed project construction and will not require additional stormwater runoff treatment. The City of St. Paul may require upgrades to the existing storm sewer system to provide additional treatment for stormwater runoff within the proposed construction limits. It is anticipated that the upgrades would be primarily in the form of sump manholes and possibly grit chambers.

No mitigation is anticipated for the Mississippi River Critical Area, as the proposed transit alternatives would utilize the existing Washington Avenue Bridge. No structural changes to the bridge are anticipated. Only the proposed LRT Alternative would require minor changes to the bridge surface to accommodate tracks and overhead power.

BMPs shall be used and monitored under grading permits issued by the Middle Mississippi Watershed Management organizations and the Capitol Region Watershed Management Organization. An NPDES permit will be required for this project.

4.6.3 Floodplains and Floodways

The addition of impervious surface within floodplain increases the runoff and potentially alters the drainage pattern of stormwater. This section discusses existing floodplains and floodways located within the Study Area.

FLOODPLAINS

Figure 4.6-3: 100-Year Flood Plain; illustrates the 100-year floodplain of the Mississippi River. The boundary of this floodplain is defined by the flood elevation that has a one-percent chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time. The 100-year flood, which is the regulatory standard used by most

federal and state agencies in natural resource and development planning, is used by the National Flood Insurance Program (NFIP) as the standard for floodplain management and to determine the need for flood insurance.

FLOODWAYS

Rivers and streams where the Federal Emergency Management Agency (FEMA) has prepared detailed engineering studies may have designated floodways. For most waterways, the floodway is defined as the area where floodwaters are likely to run deepest and fastest. It is the area of the floodplain that should be reserved (kept free of obstructions) to allow floodwaters to move downstream. Placing fill or buildings in a floodway may block the flow of water and increase flood heights. Such activities in the floodway are generally restricted and require mitigation in the form of compensatory volume to offset lost floodway storage.

REGULATIONS

Executive Order (E.O.) 11988, signed on May 24, 1977 by President Jimmy Carter, requires all federal agencies to evaluate and, to the extent possible, avoid adverse impacts to floodplain areas which may result from actions they administer, regulate, or fund. E.O. 11988 specifically requires floodplain impacts to be considered in the preparation of EIS for "major" federal actions.

EXISTING CONDITIONS

The most widely available source of information on the location and characteristics of floodplains and regulated floodways in the U.S. are the FEMA's *Flood Insurance Rate Maps* (FIRM) system. FIRM maps are produced for communities participating in the NFIP. Flood risk information presented on FIRMs is based on historic, meteorologic, hydrologic, and hydraulic data, as well as open-space conditions, flood control works, and development.

Floodway and 100-year floodplain boundaries for the Study Area are shown on the map provided in Figure 4.6-3. The only 100-year floodplain associated with the proposed project is along the Mississippi River at the existing Washington Avenue Bridge crossing.

IMPACTS AND MITIGATION

Baseline Alternative

The Baseline Alternative has no impacts on floodplains within the proposed project Study Area.

University Avenue LRT Alternative

No impacts to the floodplains or floodways are anticipated as the proposed University Avenue LRT construction activities would be outside the 100-year floodplains or on the existing Washington Avenue Bridge and would not impact the floodplain.

University Avenue Busway/BRT Alternative

No impacts to the floodplains or floodways are anticipated as the proposed University Avenue Busway/BRT construction activities are outside the 100-year floodplains or on the existing Washington Avenue Bridge and would not impact the floodplain.

4.6.4 Groundwater Resources

INTRODUCTION

In Hennepin and Ramsey Counties, most groundwater originates as precipitation that soaks into the ground and eventually reaches the water table and groundwater aquifers. Some of the precipitation drains across the surface or through underground storm sewers. The surface water eventually reaches the rivers, lakes and streams that interact or are connected to the groundwater table system. The groundwater in the water table and aquifer system typically discharges to the Mississippi River. The Mississippi River is the major surface water body near the Study Area. Water surface elevation of lakes in the Study Area generally decrease toward the river, reflecting groundwater movement from higher to lower elevations. The Study Area is contained within the Upper Mississippi River drainage basin.

HYDROGEOLOGY

The water table is the boundary between geologic materials completely saturated with water and the unsaturated zone above. The thickness of the unsaturated zone depends on the hydraulic gradient and surface topography. The water table exists in various types of geologic materials. Some such as sand and gravel yield water, however some such as clay and silt do not. Groundwater is stored in both glacial deposits and bedrock. The water table may also occur in bedrock near the Mississippi River. The water table aquifer is not uniform in thickness and its connection to bedrock aquifers is not clearly defined in all locations. The water-table aquifer is not used as a major source of potable groundwater within the Study Area and is mainly used by low capacity domestic wells.

The water table flow in the Study Area varies with location. In the western portion of the Study Area the water table generally flows east toward the Mississippi River. The water table in the center portion of the Study Area generally flows east and west from a groundwater divide approximately located at Snelling Avenue. West of Snelling Avenue, the water table generally flows west then southwest as it approaches the Mississippi River. East of Snelling Avenue, the water table generally flows east until near the intersection of Rice Street. Near the proposed Rice Street Station site and throughout the eastern portion of the Study Area, the water table generally flows southeast toward the Mississippi River. The depth of the water table can vary across the Study Area from less than 20-feet to greater than 100-feet below-grade.

Unconsolidated sediments in which the water table can be found along the Study Area include the following. The western portion of the Study Area predominantly contains sediments including sand, gravelly sand and loamy sand Terrace deposits of post-glacial rivers. The center portion of the Study Area predominantly contains sandy outwash known as the St. Paul Sand Flats. The sand consists of medium to coarse sand with pebbles. The majority of the eastern portion of the Study Area predominantly contains sand and gravel stream sediment deposited by post-glacial rivers.

Groundwater resources in bedrock aquifers beneath the unconsolidated sediments are the major resource for potable water in the Study Area. These aquifers include:

- St. Peter aquifer,
- Prairie Du Chien-Jordan aquifer,
- Franconia-Ironton-Galesville aquifer, and
- Mt. Simon-Hinckley aquifer.

These four aquifers describe the bedrock aquifers beneath the Study Area and are described above from upper to lower aquifer (shallower to deeper).

The St. Peter aquifer is not a major source of groundwater in the Study Area. It is used for domestic and low capacity wells. The St. Peter is primarily composed of fine to medium grained sandstone. Potential yields in gallons per minute (gpm) range from less than 250-gpm when the aquifer is not confined as near the Mississippi River in the eastern portion of the Study Area, to greater than 250-gpm where the aquifer is confined.

The Prairie Du Chien-Jordan aquifer is the most heavily used aquifer in the Study Area. This aquifer consists of approximately 120-feet of Prairie Du Chien dolostone and 100-feet of Jordan sandstone. No regional confining unit separates the two geologic units; therefore they are considered a single aquifer. Potential yield of the aquifer is generally greater than 2000-gpm. Seasonal fluctuations of the potentiometric surface can occur based on pumping in the areas of the western and eastern portions of the Study Area. Water level declines can be as much as 30-feet during heavy pumping periods.

The Franconia-Ironton-Galesville aquifer contains three geologic units. The upper part is Franconia Formation sandstone of approximately 140-feet thick. The middle part consists of Ironton sandstone approximately 20-feet thick. The bottom part consists of Galesville sandstone approximately 40-feet thick. This aquifer is not highly used in the Study Area. Potential yields are generally less than 1000-gpm.

The Mt. Simon-Hinckley aquifer is only surpassed in usage by the Prairie Du Chien-Jordan aquifer in the Study Area. The aquifer is comprised of Mt. Simon and Hinckley sandstone. These units total approximately 125 to 250-feet thick. Potential yields are generally between 1000 and 2000-gpm.

POTABLE WATER SUPPLY

Municipal potable water is supplied to the entire Study Area, although many low capacity residential and industrial groundwater wells are located within the Study Area. Suppliers of potable water are the City of Minneapolis Water Works and St. Paul Regional Water Services.

IMPACTS AND MITIGATION

Project construction activities for the proposed transit alternatives could affect the groundwater by:

- Contamination from accidental spills of petroleum products or hazardous substances which migrate from the ground surface or other point of release to the water table
- Any dewatering needed for foundation or tunnel construction.

Although shallow groundwater is not anticipated to serve as a resource for potable water supply (based on the availability of municipal water supply) in the Study Area, the potential for groundwater impacts will need to be mitigated during project construction.

4.7 ENERGY

The change in regional energy consumption in the forecast year (2020), measured in British Thermal Units (BTUs) per mile, is used as a means of comparing the Baseline and build alternatives. For this analysis, the Study Area consists of the regional transportation network modeled for travel demand and air quality forecasting purposes.

4.7.1 Operating Energy Consumption

Energy consumption factors used for this analysis are based on estimates of average energy consumption, as listed in the *Oak Ridge National Laboratory, Transportation Energy Book: Edition 16, 1996,* and as used for federal Section 5309 New Starts Criteria.

Transit operating energy consumption is defined as the energy used for vehicle propulsion, operation of stations and ancillary facilities and the maintenance of transit vehicles and track systems. The energy impacts of the proposed rail transit system are determined by comparing total energy consumption of each build alternative with the Baseline Alternative.

4.7.2 Methodology

Automobile and commercial vehicle miles traveled (VMT) were developed for each alternative from data reports generated by the *Twin Cities Regional Travel Demand Model.* Annual VMT for BRT and for rail transit was calculated using the P*reliminary Operations Plan,* February 13, 2002. Total annual VMT for each alternative is shown in Table 4.7-1: Vehicle Miles of Travel by Alternative (Millions). Energy consumption factors derived for each technology was applied to the estimated VMT and are summarized in Table 4.7-2: Energy Consumption by Alternative (Millions of BTUs/Year). The benefits associated with the two build alternatives were determined by comparing energy consumption by mode with the Baseline Alternative. The energy benefits demonstrated by this comparison are also shown in Table 4.7-2.

Table 4.7-1: Vehicle Miles of Travel by Alternative (Millions)

Modal Technology	BTUs/VMT	VMT/Year (millions)		
			Build Alternatives	
		Baseline	LRT	BRT
Passenger Vehicles *Auto, van, truck*	6,233	23,769.8	23,767.4	23,768.2
LRT	77,739	0.0	0.8	0.0
Bus Transit, all vehicle types	41,655	46.0	45.4	46.3
Totals		23,815.8	23,813.6	23,814.6

Source: BRW, and SRF Consulting Group, Inc., 2002.

Table 4.7-2: Energy Consumption by Alternative (Millions of BTUs/Year)

Modal Technology	BTUs/Year (millions)		
		Build Alternatives	
	Baseline	LRT	BRT
Passenger Vehicles *Auto, van, truck*	148,157,348	148,142,155	148,147,337
LRT	0	64,135	0
Bus Transit, all vehicle types	1,915,584	1,890,995	1,930,164
Totals	150,072,932	150,097,285	150,077,501

Source: BRW, and SRF Consulting Group, Inc., 2002.

4.7.3 Energy Impacts

The following paragraphs describe energy impacts estimated for each alternative.

BASELINE ALTERNATIVE

The Baseline Alternative is estimated to generate 23,769.8 million annual VMT and would consume 148,157,348 million BTUs of energy annually.

BUILD ALTERNATIVES

The results of the change in energy consumption for each of the build alternatives compared to the Baseline Alternative are summarized in Table 4.7-3: Change in Regional Energy Consumption (Millions of BTUs/Year).

Table 4.7-3: Change in Regional Energy Consumption (Millions of BTUs/Year)

Modal Technology	Build Alternatives VS. Baseline	
	LRT	BRT
Passenger Vehicles *Auto, van, truck*	-15,193	-10,012
LRT	64,135	0
Bus Transit, all vehicle types	-24,589	14,581
Total Change	24,353	4,569

Source: BRW, and SRF Consulting Group, Inc., 2002.

UNIVERSITY AVENUE LRT ALTERNATIVE

The LRT Alternative would result in the consumption of 150,097,285 million BTUs of energy annually. Operation and maintenance activities of the LRT transit system would be responsible for consuming 64,135 million BTUs of the total amount. The increase in energy consumption associated with this alternative would amount to 24,353 million BTUs when compared to the Baseline Alternative. This increase is attributed to an increase in service within the corridor.

UNIVERSITY AVENUE BUSWAY/BRT ALTERNATIVE

The BRT Alternative would result in the total consumption of 150,077,501 million BTUs of energy annually. Operation and maintenance activities of the BRT transit system would be responsible for increased consumption of 4,569 million BTUs annually. This increase is attributed to an increase in service within the corridor.

4.8 ENVIRONMENTAL JUSTICE

This section explains how Environmental Justice concerns have been addressed in the evaluation of alternatives for the Central Corridor Draft EIS. This section also identifies how areas protected under the Environmental Justice Executive Order 12898 were defined and the extent to which areas of minority and low-income populations would be affected by the alternatives under evaluation in this Draft EIS. The issues discussed in this section pertain to the environmental factors analyzed in Section 4.0: Environmental Impact Analysis. These include effects related to hazardous materials contamination, air quality, noise and vibration, ecology and habitat, water quality and flood plains, and energy. Additional analysis regarding social, economic and transportation issues can found in Chapters 3.0, 5.0 and 6.0.

The details regarding the legal and regulatory requirements of Environmental Justice and the definitions of minority and low-income populations were provided in Section 3.9 and are summarized below.

4.8.1 Legal and Regulatory Requirements

Presidential Executive Order 12898 *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (February 11, 1994) requires that federal agencies consider and address disproportionate adverse environmental effects of proposed federal projects on minority and low-income communities.

The intent of the DOT Final Order on Environmental Justice [DOT Order 5610.2, "Environmental Justice" (April 15, 1997)] is to integrate the goals of Executive Order 12898 into DOT operations.

Between June 1997 and March 1998, the Mn/DOT's Committee on Environmental Justice met and was charged with developing guidance to implement Executive Order 12898. The Committee on Environmental Justice produced *Mn/DOT's Environmental Justice Draft Guidance*, dated August 5, 1998. Methodology outlined in the guidance document was used to evaluate the proposed corridor for environmental justice.

To meet both the requirements of NEPA and Executive Order 12898, this section addresses the characteristics of the affected communities, potential effects on minority and low-income communities and potential mitigation measures.

4.8.2 Community Characteristics

Race and Ethnic composition and income characteristics within the impact assessment area have been identified in accordance with definitions established by the United States Department of Transportation (USDOT) and the United States Environmental Protection Agency (EPA) guidance on Environmental Justice.

MINORITY POPULATIONS

As shown in Figure 3.9-1: Minority Population, census blocks that exceed the thresholds defined in Section 3.9 is shaded light and dark purple. Census blocks within a half-mile radius of the alignments will be evaluated in the environment section for disproportionately high and adverse effects. The largest concentration of minorities, adjacent to the corridor alignment, is located north and south of University Avenue between Lexington Parkway and Interstate 35E (I-35E) in the Thomas-Dale and Summit-University neighborhoods in St. Paul. Neighborhood boundaries are shown in Figure 3.1-1: Designated Neighborhoods.

LOW-INCOME POPULATIONS

As shown in Figure 3.9-1, census block groups that exceed the thresholds defined in Section 3.9 are shaded light and dark purple. Census block groups within a half-mile radius of the alignments will be evaluated in the environment section for disproportionately high and adverse effects. Populations below the poverty level are adjacent to the corridor alignments for the entire length of the corridor with the exception of the University of Minnesota East Bank campus area.

4.8.3 Environmental Justice Analysis for Environmental Factors

The analysis for environmental factors includes an examination of the effect of the alternatives on minority and low-income populations with regard to hazardous materials contamination, air quality, noise and vibration, ecology and habitat, water quality and floodplains, and energy.

HAZARDOUS MATERIAL CONTAMINATION

A total of 325 sites were identified during the database search as having the potential to impact the right-of-way under consideration for the proposed transit alignment alternatives. Of the sites ranked "High" or "Medium" potential for contamination, 15 sites have the potential to be impacted by the proposed LRT Alternative and nine sites have the potential to be impacted by the proposed BRT Alternative. These sites and their location within minority or low-income population areas are discussed below by alternative.

Baseline Alternative

No significant impacts to identified hazardous material contamination sites are anticipated in association with the Baseline Alternative. Since the alternatives would have no impact to hazardous material contamination sites, adverse effects would not be borne disproportionately to minority or low-income populations.

University Avenue LRT Alternative

There are 10 sites that have the potential to be impacted by the proposed LRT Alternative. Six of these sites are ranked "medium" and four sites are ranked "high" as having potential for contamination. Of the 10 sites along the proposed alternative, eight sites are located within minority population areas and 10 sites are located within low-income population areas, as shown in Table 4.8-1: Hazardous Materials Contamination Sites by Minority and Low-Income Population Areas for LRT Alternative.

Table 4.8-1: Hazardous Materials Contamination Sites by Minority and Low-Income Population Areas for LRT Alternative

Name/Location	Potential for Contamination	Located in Minority Population Area?	Located in Low-Income Population Area?
Archer Daniels Midland	Medium	No	Yes
Reichhold Chemical	Medium	No	Yes
Mel Schroeder, Inc.	Medium	Yes	Yes
Olson Graphic Products	Medium	Yes	Yes
1919 University Avenue	Medium	Yes	Yes
Harcross Chemical Company	High	Yes	Yes
Mowrey Company Surface Impoundment	High	Yes	Yes
Auto-zone University	High	Yes	Yes
Fourth Street and Cedar Avenue	Medium	Yes	Yes
Buckbee-Mears	High	Yes	Yes
Total of 10 Sites		**Total of 8 Sites**	**Total of 10 Sites**

Although the majority of the sites are located within minority or low-income population areas, High and adverse impacts on those populations cannot be determined until the LPA is selected and sampling and testing can be conducted. Benefits could be incurred with the potential for site

clean-up. Avoidance of the site could be an option and possible alternatives would be considered or the sites could be remediated resulting in a benefit to the immediate and surrounding area.

University Avenue Busway/BRT Alternative

There are seven sites that have the potential to be impacted by the proposed BRT Alternative. Four of these sites are ranked "medium" and three sites are ranked "high" as having potential for contamination. Of the seven sites along the proposed alternative, five sites are located within minority population areas and seven sites are located within low-income population areas, as shown in Table 4.8-2: Hazardous Material Contamination Sites by Minority and Low-Income Population Areas for BRT Alternative.

Table 4.8-2: Hazardous Material Contamination Sites by Minority and Low-Income Population Areas for BRT Alternative

Name/Location	Potential for Contamination	Located in Minority Population Area?	Located in Low-Income Population Area?
Archer Daniels Midland	Medium	No	Yes
Olson Graphic Products	Medium	Yes	Yes
1919 University Avenue	Medium	Yes	Yes
Harcross Chemical Company	High	Yes	Yes
Mowrey Company Surface Impoundment	High	Yes	Yes
Auto-zone University	High	Yes	Yes
Riverview Area	Medium	No	Yes
Total of 7 Sites		**Total of 5 Sites**	**Total of 7 Sites**

Although the majority of the sites are located within minority or low-income population areas, impacts on those populations cannot be determined until the LPA is selected and sampling and testing can be conducted. Benefits could be incurred with the potential for site clean-up. Avoidance of the site could be an option and possible alternatives would be considered or the sites could be remediated resulting in a benefit to the immediate and surrounding area.

AIR QUALITY

The impacts of either the LRT Alternative or the BRT Alternative on regional emissions will be slight. The project would reduce CO and VOC emissions slightly with either the LRT Alternative or the BRT Alternative compared to the Baseline Alternative, in both 2008 and 2020. Emissions of NO_x would increase slightly due to the build alternatives; however, the increases are negligible and there is no regulatory requirement that the project reduce NO_x emissions.
Because the project-level emissions inventory has shown that the LRT Alternative and the BRT Alternative would reduce CO emissions, and the hot-spot analysis has shown that there would be no violations of the NAAQS or the MAAQS, the project conforms to the requirements of the transportation conformity rules. All estimated CO concentrations are less than the NAAQS and the MAAQS requirements. Therefore, no mitigation measures are necessary, and minority or low-income populations would not be adversely affected.

Construction activities have the potential to produce short-term, localized air quality impacts. These potential impacts can be minimized with appropriate mitigation measures as discussed in Section 4.3: Air Quality.

NOISE AND VIBRATION

The FTA noise criteria are delineated into two categories: *impact* and *severe impact*. The impact threshold defines areas where the change in noise is noticeable but may not be sufficient to cause a strong, adverse community reaction. The *severe impact* threshold defines the noise limits above which a significant percentage of the population would be highly annoyed by new noise. The environmental justice analysis considered *severe impacts* and their locations with regard to minority and low-income populations.

For the vibration analysis, FTA criteria was used to assess vibration and ground-borne noise from discrete receptors and corridor-wide impacts.

Discrete receptor locations are shown in Figure 4.4-3 (the same discrete receptors were used for both noise and vibrations) and corridor-wide noise and vibration impact locations are shown in Figures A-1 through A-6 in Appendix 9.9.

Baseline Alternative

In accordance with FTA guidelines, noise impacts from the proposed build alternatives are not compared to the Baseline Alternative to determine impact. Instead, the FTA analysis methodology establishes project criteria noise limits based on existing measured noise levels along the proposed project corridor. Exceedances of the FTA noise criteria limits under the build alternatives are considered impacts of the project. Therefore, FTA guidelines do not require a noise assessment for the Baseline Alternative.

In accordance with FTA guidelines, vibration impacts are only assessed from new proposed vibration sources such as LRT passbys. Under the Baseline Alternative, neither the proposed LRT nor the BRT Alternatives would be in service along the Central Corridor. Therefore, because no new sources of vibration are expected under the Baseline Alternative, a vibration impact assessment is not required.

University Avenue LRT Alternative

Noise Impacts

Receptors predicted to exceed the FTA Impact and Severe Impact Criteria

As shown in Tables 4.4-9 and 4.4-10, peak hour L_{eq} (h) and L_{dn} at discrete receptors and corridor-wide project noise levels (Appendix 9.9 Figure A-3) are not predicted to exceed the severe impact criteria anywhere along the project corridor; therefore, under FTA noise criteria, minority or low-income populations would not be adversely affected.

Vibration Impacts

Vibration impacts from LRT vehicles were evaluated at discrete receptors using the FTA criteria based on maximum single-event passbys. Unlike the cumulative noise criteria, vibration criteria are based on single-event passbys. No exceedances of FTA Land Use Category 1, 2 and 3 vibration and ground-borne noise impact criteria are predicted at any of the discrete receptor locations. Therefore, minority or low-income populations would not be adversely affected. Corridor-wide, exceedances of the FTA vibration impact criteria are predicted to occur at one FTA Category 2 receptor and ten Category 3 receptors. Similarly, exceedances of the FTA ground-borne noise impact criteria are predicted to occur at two FTA Category 2 receptors and ten Category 3 receptors. As shown in Table 4.8-4: FTA Vibrations and Ground-Borne Noise Impact Counts by Minority and Low-income Population Areas, with the exception of the Category 3 receptors near 29th Avenue and University Avenue, all other Category 2 and Category

3 exceedances would occur in minority population areas. Under the low-income population areas, all Category 2 and Category 3 exceedances would occur in low-income population areas.

University Avenue Busway/BRT Alternative

Noise Impacts

Receptors predicted to exceed the FTA severe impact criteria

Corridor-wide project noise levels are predicted to exceed the FTA Category 2 Land Use *severe impact* criteria at 11 locations (Appendix 9.9 Figure A-1). No exceedances of the FTA Category 3 Land Use *severe impact* criteria are predicted under the BRT Alternative. As shown in Table 4.8-5: FTA Noise Impact Counts by Minority and Low-Income Population Areas, all 11 Category 2 exceedances would occur in low-income population areas. Ten exceedances under Category 2 would occur in a minority population area near University Avenue between 30th Avenue to Bedford Street and between Wheeler and Aldine Streets.

Table 4.8-4: FTA Vibrations and Ground-Borne Noise Impact Counts by Minority and Low-income Population Areas

Corridor Section/Location	University Avenue LRT Alternative							
	Minority Population Area				Low-income Population Area			
	Category 2[1]		Category 3[2]		Category 2		Category 3	
	VIB[3]	GB-NZ[4]	VIB	GB-NZ	VIB	GB-NZ	VIB	GB-NZ
Downtown Minneapolis								
- Near Fourth and Hennepin	0	0	1	1	0	0	1	1
Campus								
- Near Oak Street/Washington	0	0	2	2	0	0	2	2
- Near 29th/University Avenues.	0	0	2	2	0	0	2	2
University Avenue								
- Near Lexington/University and Dale/University	1	2	5	5	1	2	5	5
Downtown St. Paul	0	0	0	0	0	0	0	0
Corridor-wide Totals	**1**	**2**	**10**	**10**	**1**	**2**	**10**	**10**
Minority and Low-Income Totals	**1**	**2**	**8**	**8**	**1**	**2**	**10**	**10**

[1/] Category 2 = Category 2, Residential
[2/] Category 3 = Category 3, Institutional
[3/] VIB = Vibration
[4/] GB-NZ = Ground-borne noise
Note: Shaded box indicates residential or institutional receptor is located within a minority or low-income population area.

Table 4.8-5 FTA Noise Impact Counts by Minority and Low-income Population Areas

Corridor Section/Location	University Avenue BRT Alternative			
	Minority Population Area		Low-income Population Area	
	Category 2[1]	Category 3[2]	Category 2	Category 3
Downtown Minneapolis	0	0	0	0
Campus				
- Near 26th Avenue	1	0	1	0
University Avenue				
- Near 30th Avenue to Bedford Street	4 to 8	0	4 to 8	0
- Between Wheeler and Aldine Streets	2 to 6	0	2 to 6	0
Downtown St. Paul	0	0	0	0
Corridor-wide Totals	**11**	**0**	**11**	**0**
Minority and Low-Income Totals	**10**	**0**	**11**	**0**

[1/] Category 2 = Category 2, Residential
[2/] Category 3 = Category 3, Institutional
Note: Shaded box indicates residential or institutional receptor is located within a minority or low-income population area.

Vibration Impacts

Vibration or ground-borne noise impacts would not occur with the BRT Alternative; therefore, minority or low-income populations would not be adversely affected.

ECOLOGY AND HABITAT

Vegetation and Wildlife

No impacts to vegetation and wildlife are associated with the Baseline Alternative. The build alternatives would have minimal impacts to vegetation and this would cause a negligible impact to urban wildlife. Since the alternatives would have no impact to minimal impact on vegetation and wildlife, adverse effects would not be borne disproportionately to minority or low-income populations.

Aquatic Habitat

No impacts to aquatic habitat are associated with the Baseline Alternative and BRT Alternative. Although minor bridge construction would be associated with the LRT Alternative, no impacts to aquatic habitat are expected. Since the alternatives would have no impact on aquatic habitat, adverse effects would not be borne disproportionately to minority or low-income populations.

Wetlands

Field review indicates that there are no wetlands in the Study Area that would be impacted or require mitigation for the Baseline Alternative, University Avenue LRT Alternative, or University BRT Alternative. Since the alternatives would have no impact on wetlands, adverse effects would not be borne disproportionately to minority or low-income populations.

RTE Flora and Fauna Species

No impacts to documented RTE species are associated with the Baseline Alternative, LRT Alternative and the BRT Alternative. Although there may be potential for bats and/or falcon to utilize land with 500-feet of the Washington Avenue Bridge, proposed minor bridge construction activities associated with the LRT Alternative would have no impact on either species. Since the alternatives would have no impact on RTE species, adverse effects would not be borne disproportionately to minority or low-income populations.

WATER QUALITY AND FLOODPLAINS

No substantial impacts to the surface water quality or impacts on floodplains are anticipated with any of the alternatives. Since the alternatives would have no impact on surface water quality or floodplains, adverse effects would not be borne disproportionately to minority or low-income populations.

Project construction activities for the proposed build alternatives could affect the groundwater. Although shallow groundwater is not anticipated to serve as a resource for potable water supply in the Study Area, the potential for groundwater impacts will need to be mitigated during project construction.

ENERGY

The impacts associated with the increase in energy consumption with the build alternatives would be dispersed region-wide and would not be borne disproportionately to minority or low-income populations within the Central Corridor.

4.8.4 Summary and Potential Mitigation

Although the majority of the hazard materials contamination sites ranked "high" or "medium" are located within minority or low-income population areas, impacts on those populations cannot determined until the LPA is selected and sampling and testing can be conducted. Benefits could be incurred with the potential for site clean-up. Avoidance of the site could be an option and possible alternatives would be considered or the sites could be remediated resulting in a benefit to the immediate and surrounding area.

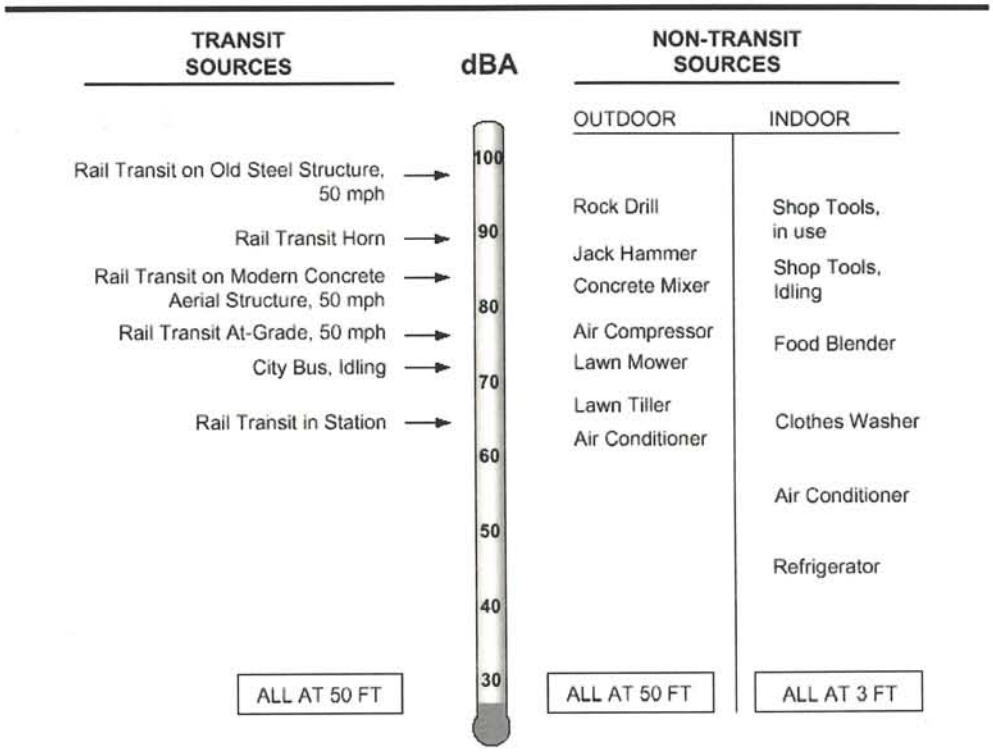
Predicted noise impacts associated with the BRT alternative and predicted vibration impacts associated with the LRT alternative would occur more frequently in minority and low-income population areas than in non-minority or non-low-income population areas. Disproportionate impacts borne to minority and low-income populations could be offset by applying recommended mitigation measures to minimize or eliminate noise and vibration impacts predicted along the proposed project corridor.

Impacts to the ecology and habitat in the Central Corridor are considered to be none or minor with no mitigation proposed or required. With the University Avenue LRT Alternative minor bridge construction activities, BMPs would be installed and maintained under grading permits required by the Mississippi and the Capitol Region Watershed Management Organizations. Since the alternatives would have no impact or minimal impact on ecology or habitat, adverse effects would not be borne disproportionately to minority or low-income populations.

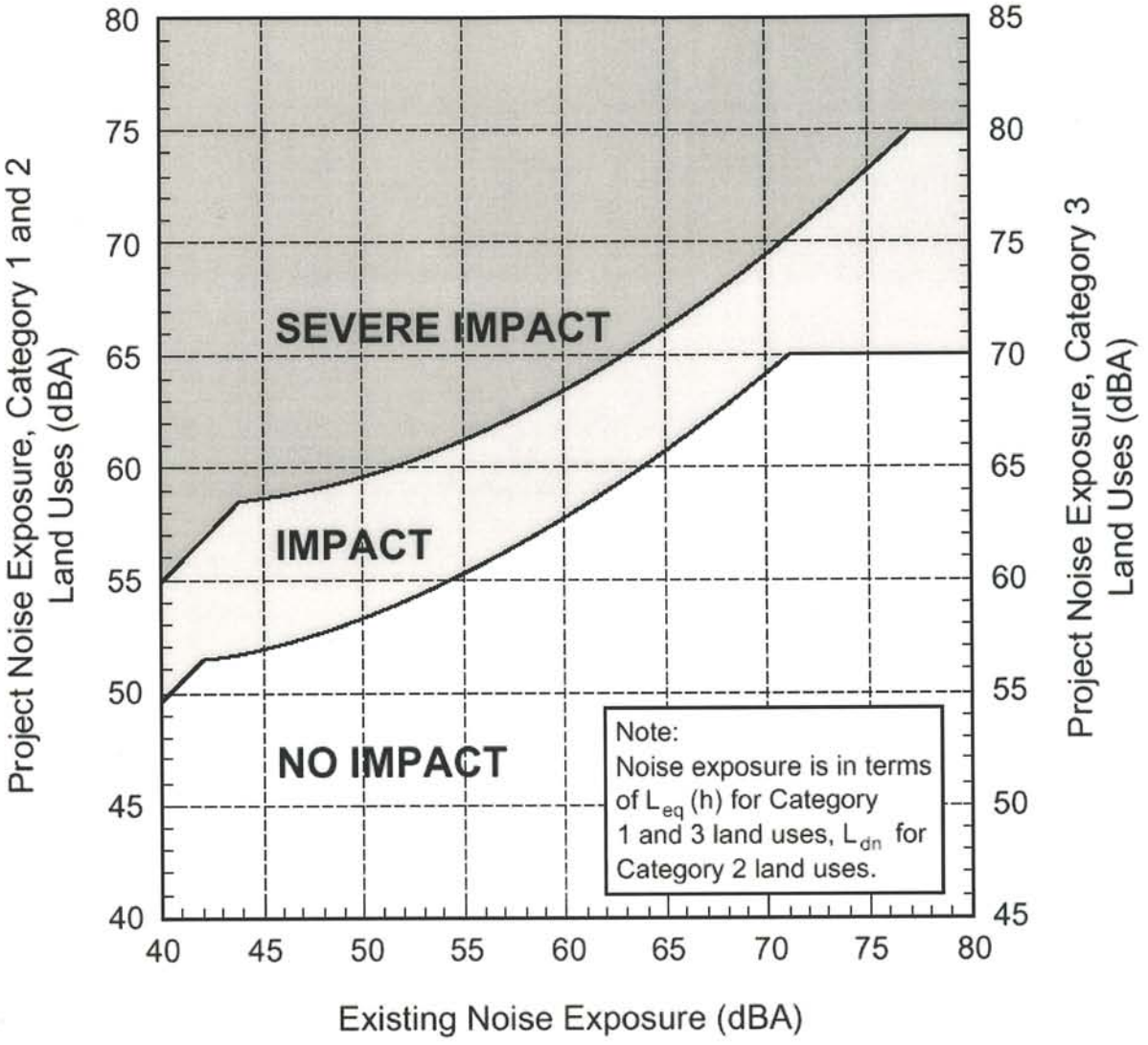
No substantial impacts to the surface water quality or impacts on floodplains are anticipated with any of the alternatives. Project construction activities for the proposed build alternatives could affect the groundwater. Although shallow groundwater is not anticipated to serve as a resource for potable water supply in the Study Area, the potential for groundwater impacts will need to be mitigated during project construction. Since the alternatives would have no substantial impact on water quality or floodplains, adverse effects would not be borne disproportionately to minority or low-income populations.

The impacts associated with the increase in energy consumption with the build alternatives would be dispersed region-wide and would not be borne disproportionately to minority or low-income populations within the Central Corridor.

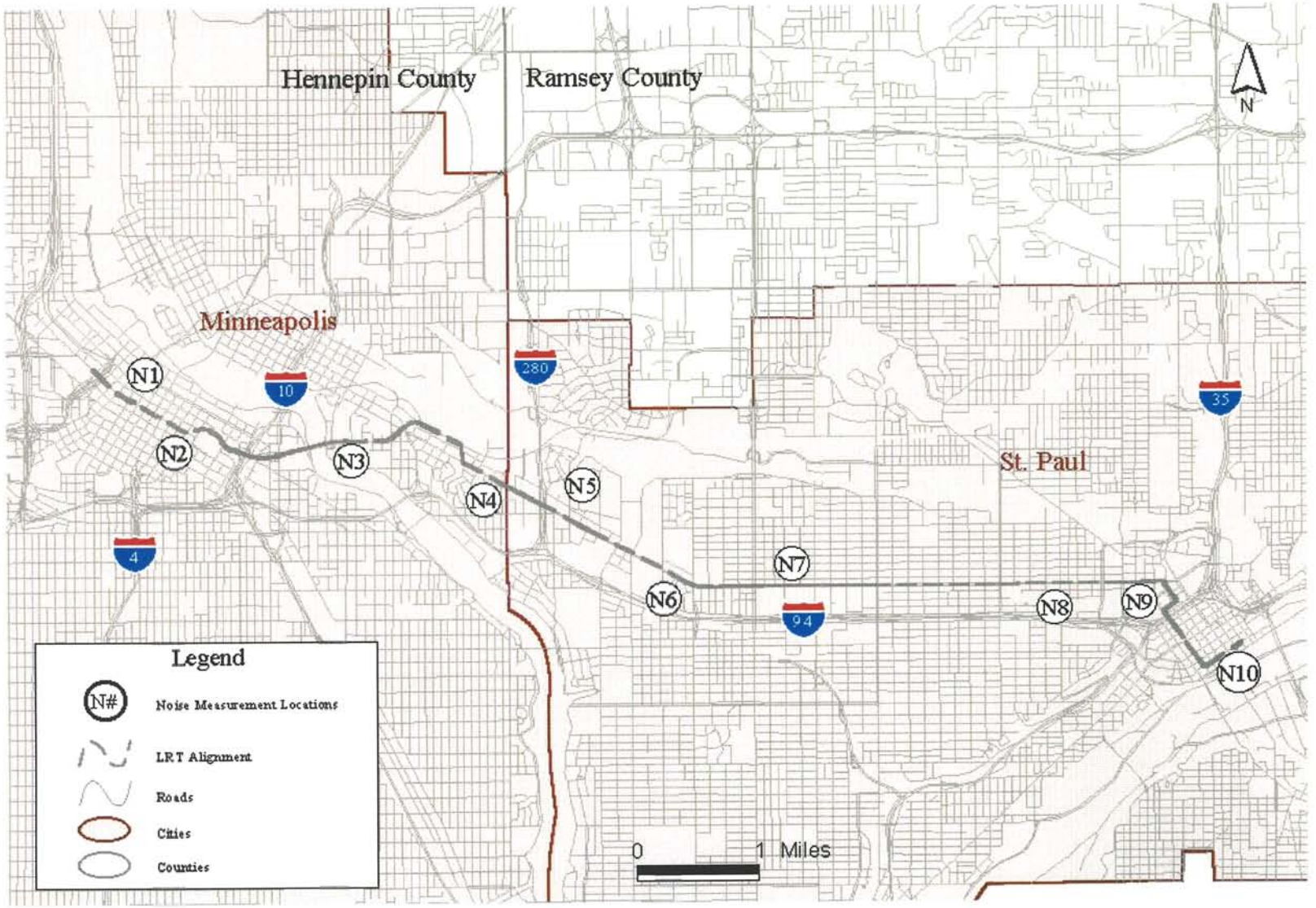
All impacts identified in this document would be mitigated, if possible, to avoid adverse impacts to all neighborhoods, with special concern and emphasis with regard to minority and low-income populations. The active involvement of all neighborhoods in the corridor would continue to be a goal through design and implementation. Public engagement for all communities along the corridor is explained in detail in Chapter 8.0: Public and Agency Involvement Program.



Source: *Transit Noise and Vibration Impact Assessment - Final Report*, FTA, Washington, D.C., April 1995.

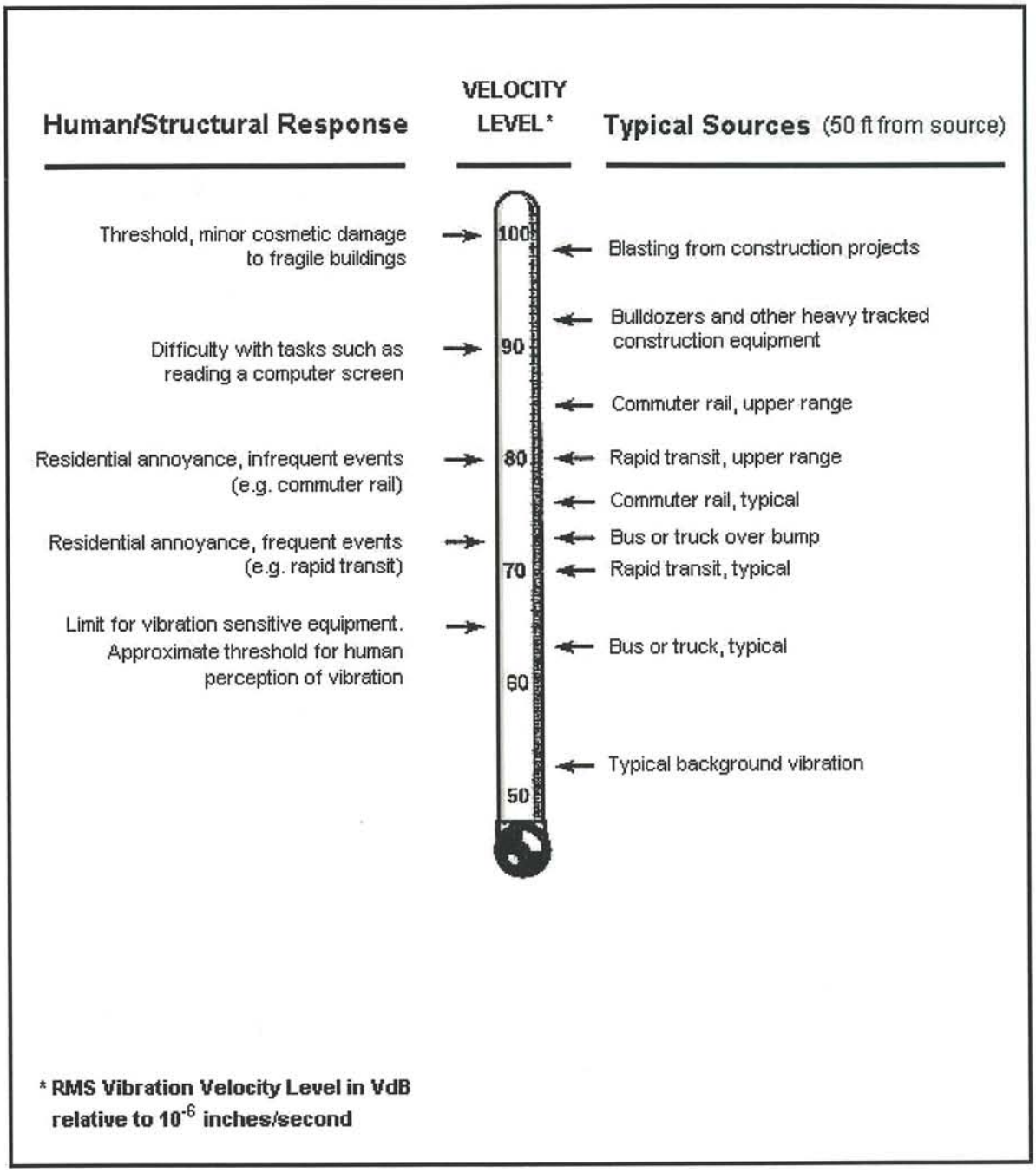


Source: *Transit Noise and Vibration Impact Assessment - Final Report*, FTA, Washington, D.C., April 1995.



Community Noise Monitoring Locations along the Central Corridor

Figure 4.4-3



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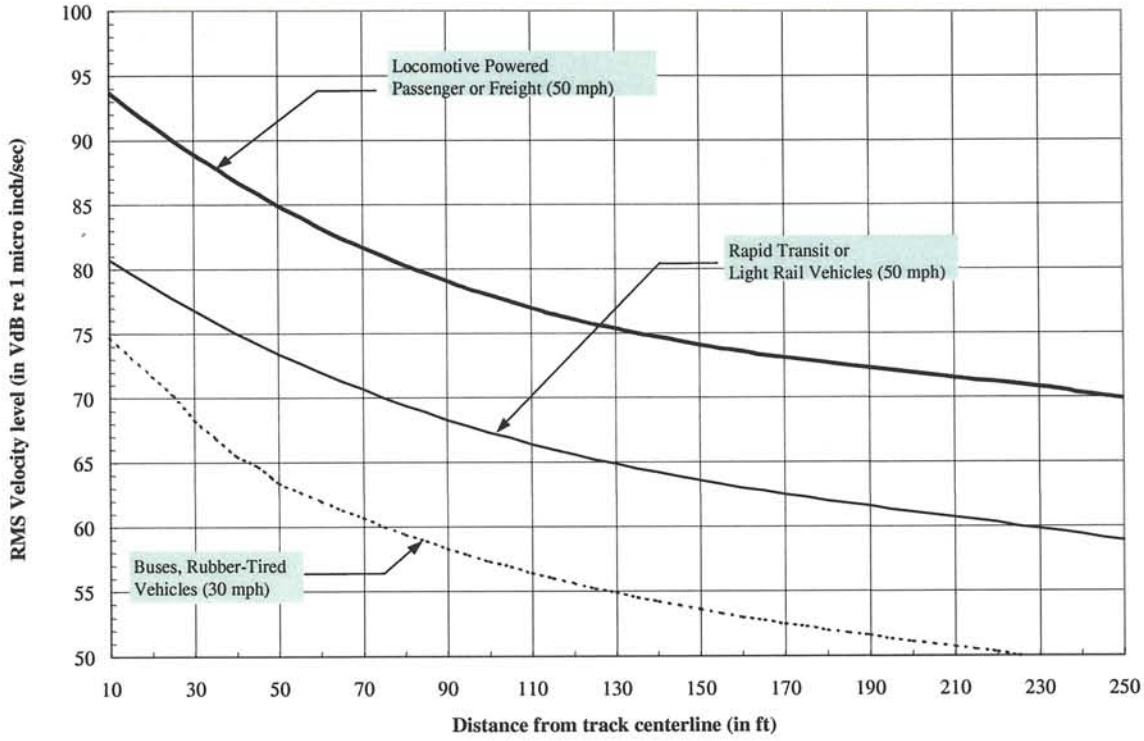
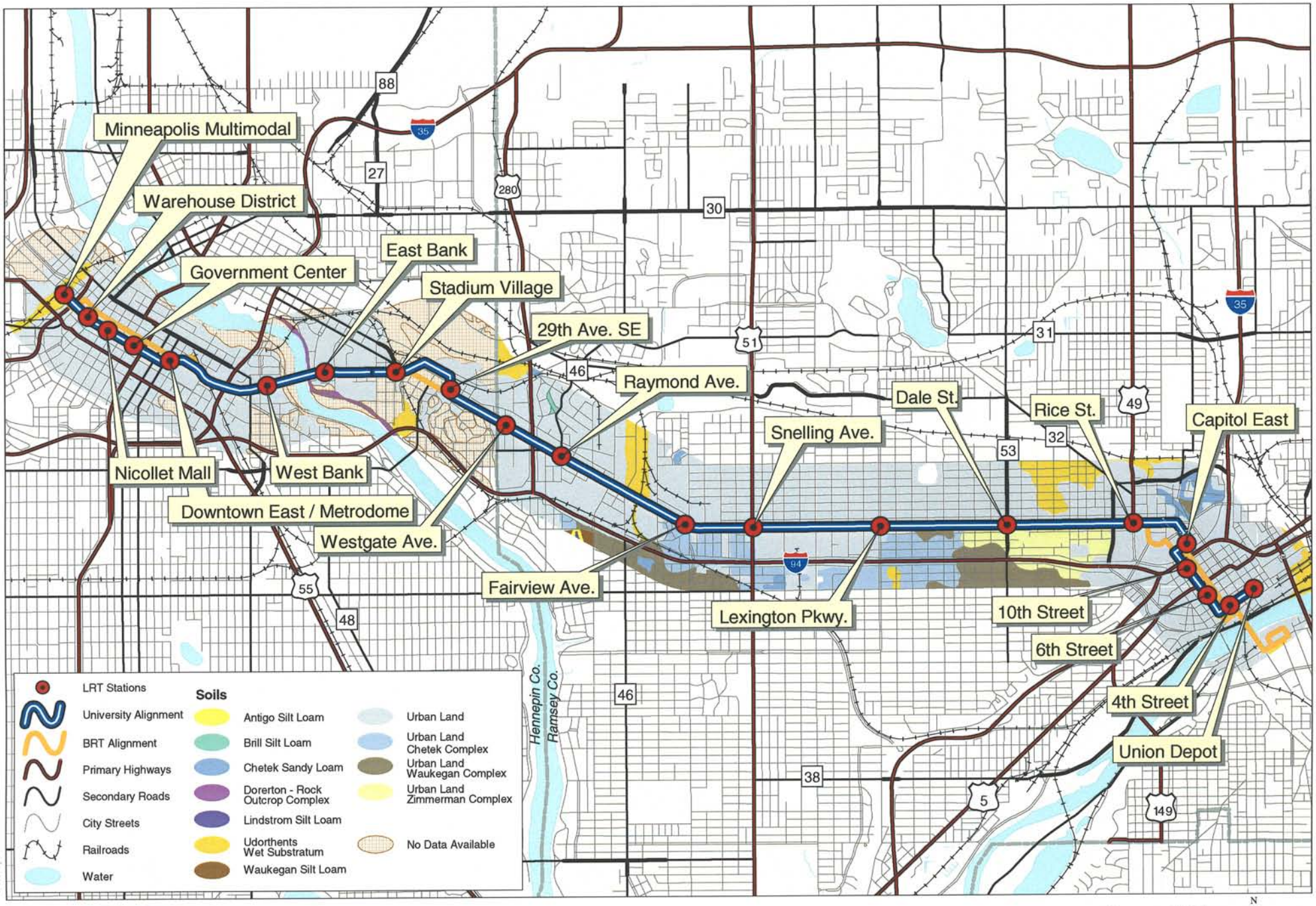


Source: *Transit Noise and Vibration Impact Assessment - Final Report*, FTA, Washington, D.C., April 1995.

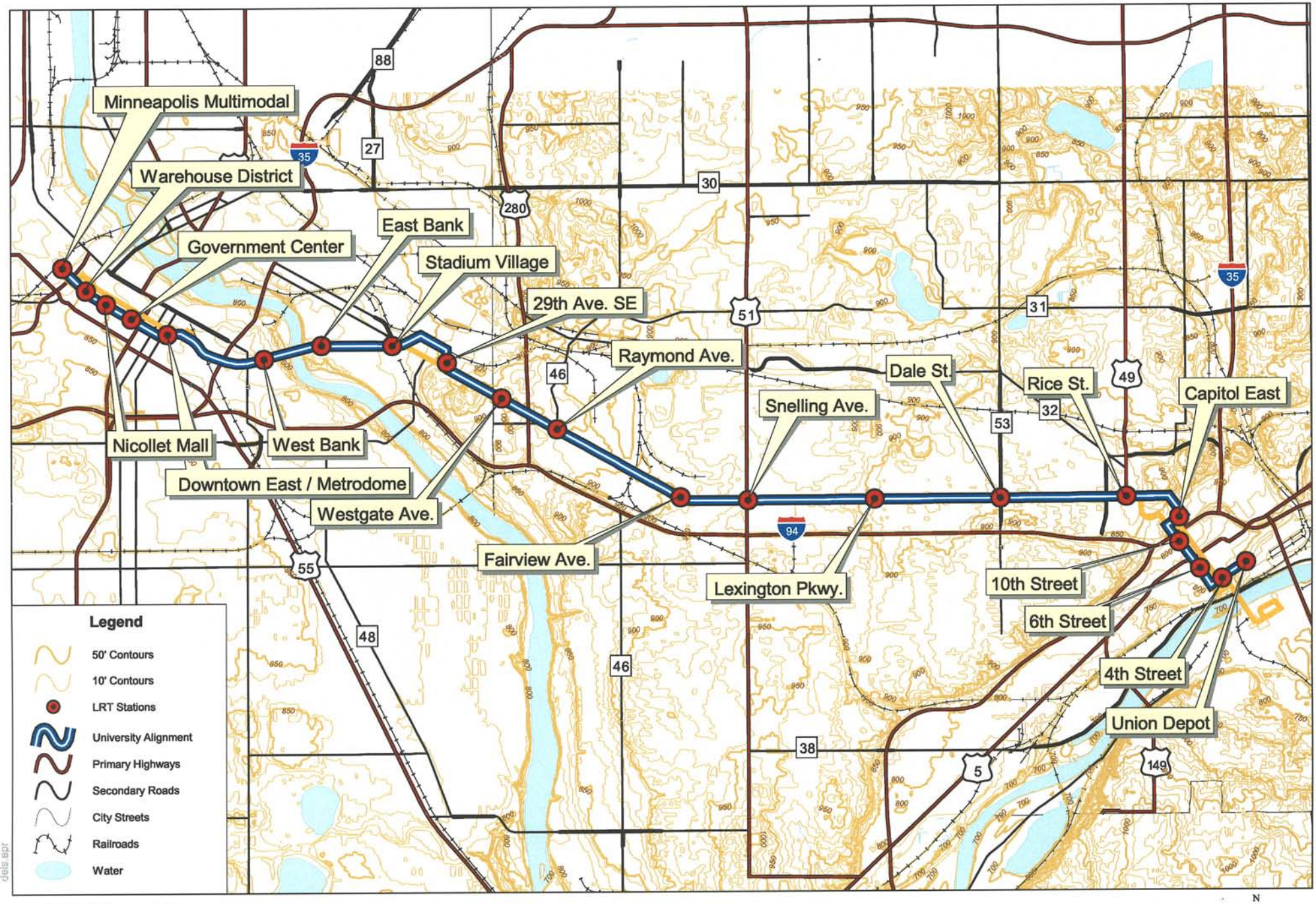


THE CENTRAL CORRIDOR

General Soil Classification

April, 2002

Figure 4.1-1



THE CENTRAL CORRIDOR

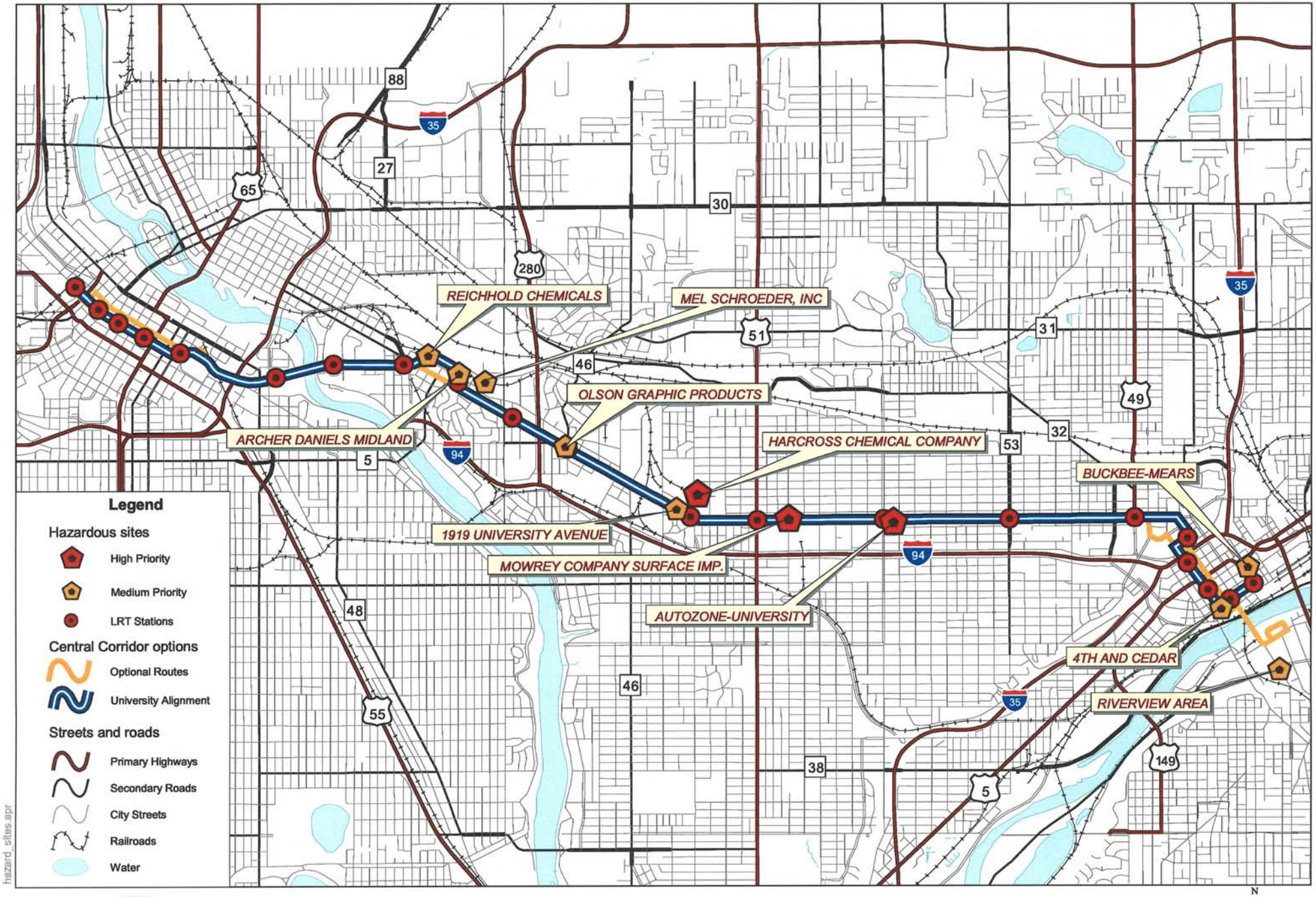
USGS Elevation Contours

April, 2002

0 0.5 Miles

N

Figure 4.1-2



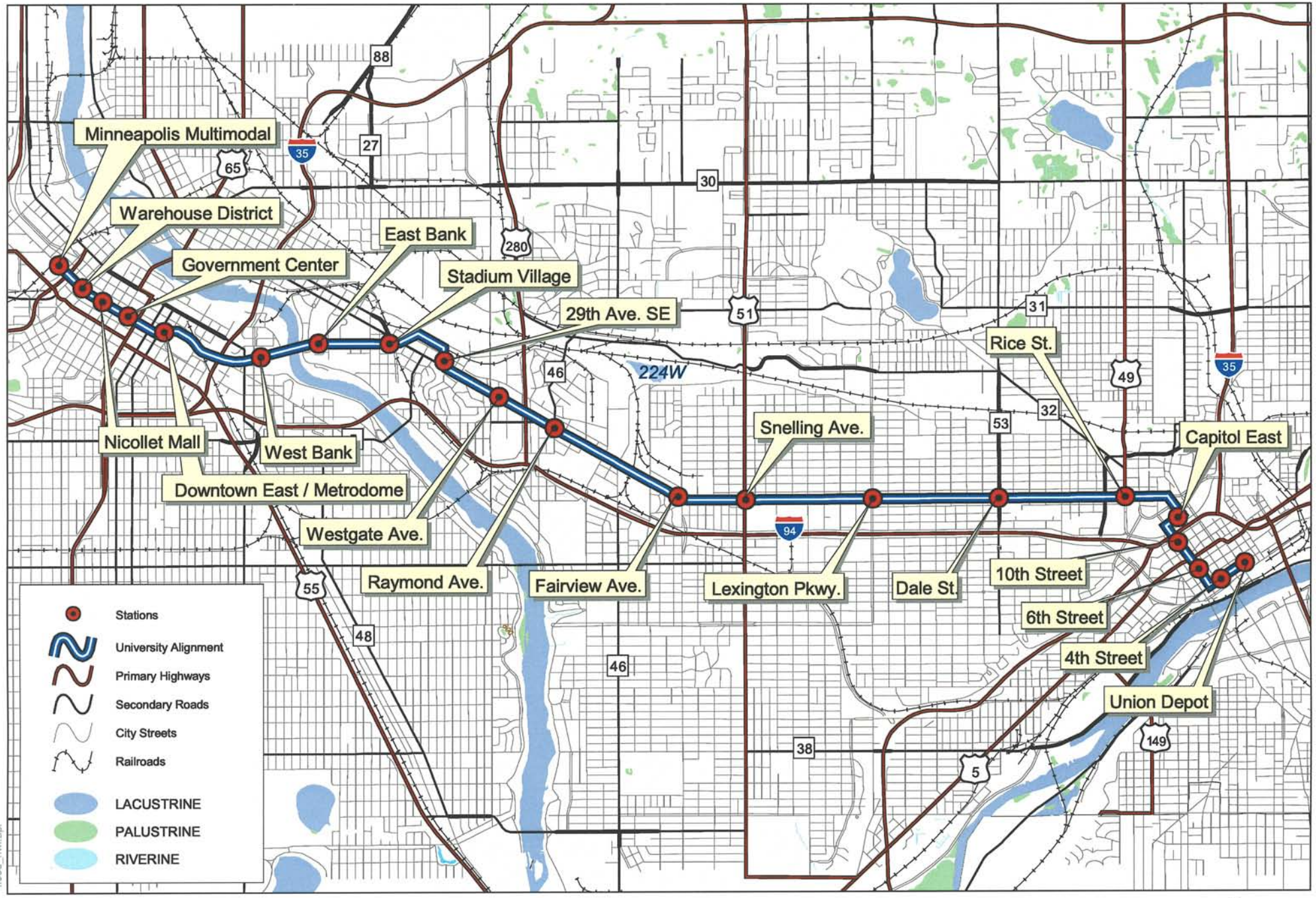
hazard_sites.apr

THE CENTRAL CORRIDOR

Hazardous Sites

April, 2002

Figure 4.2-1



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THE CENTRAL CORRIDOR

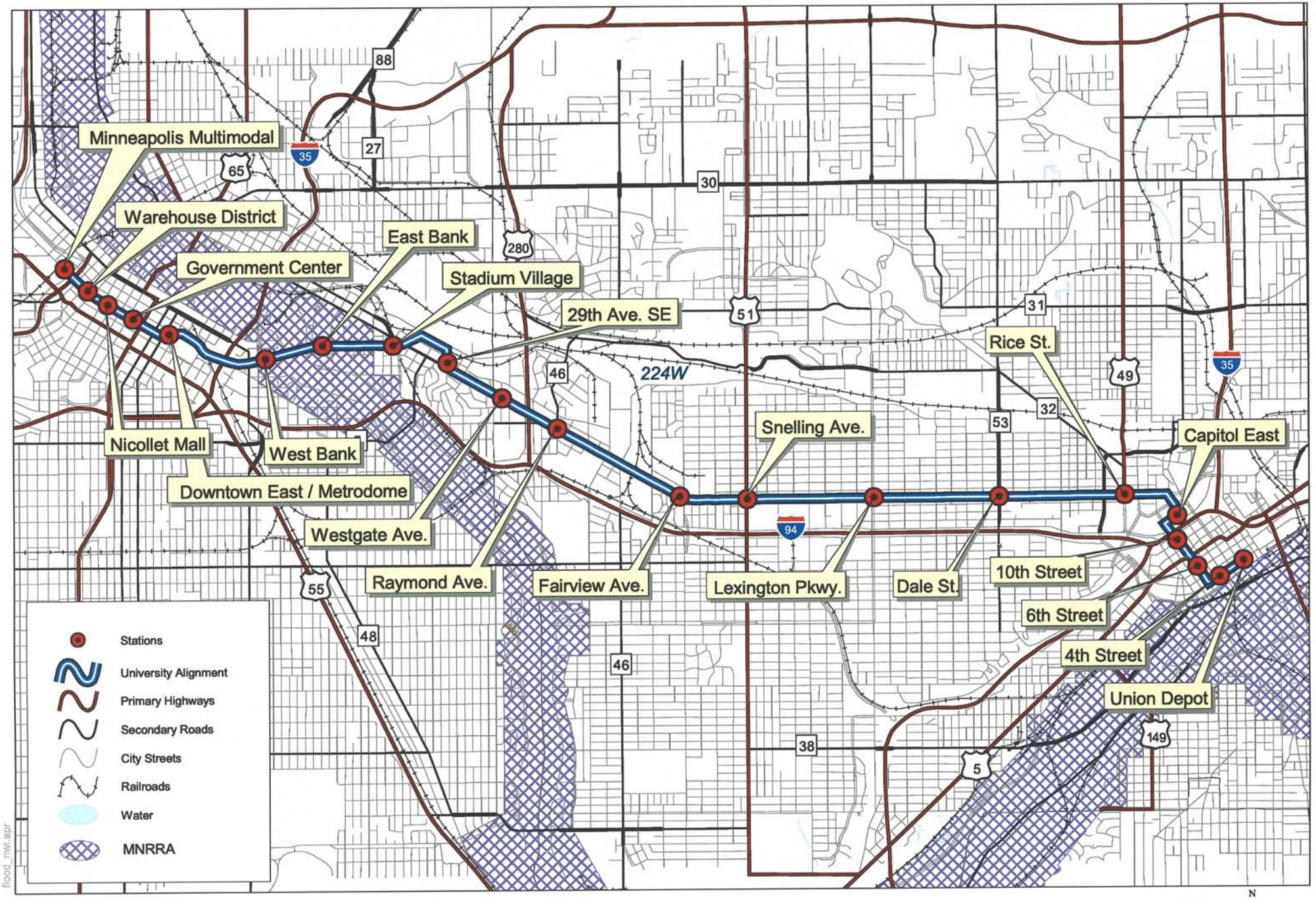
National Wetlands Inventory and Protected Waters

April, 2002

0 0.5 Miles

N

Figure 4.6-1



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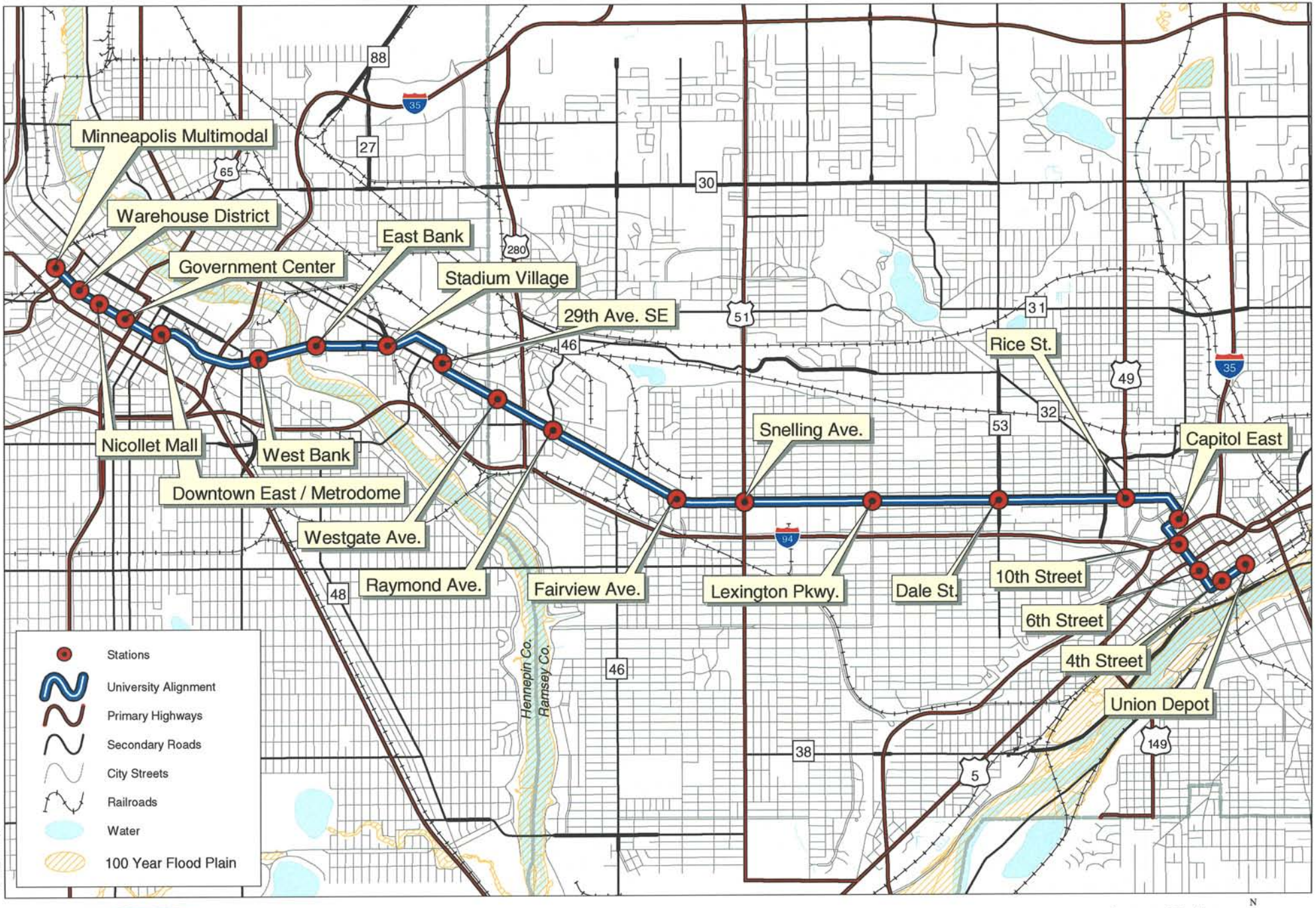
THE CENTRAL CORRIDOR

Mississippi National River and Recreation Area Boundaries Map

April, 2002

Figure 4.6-2



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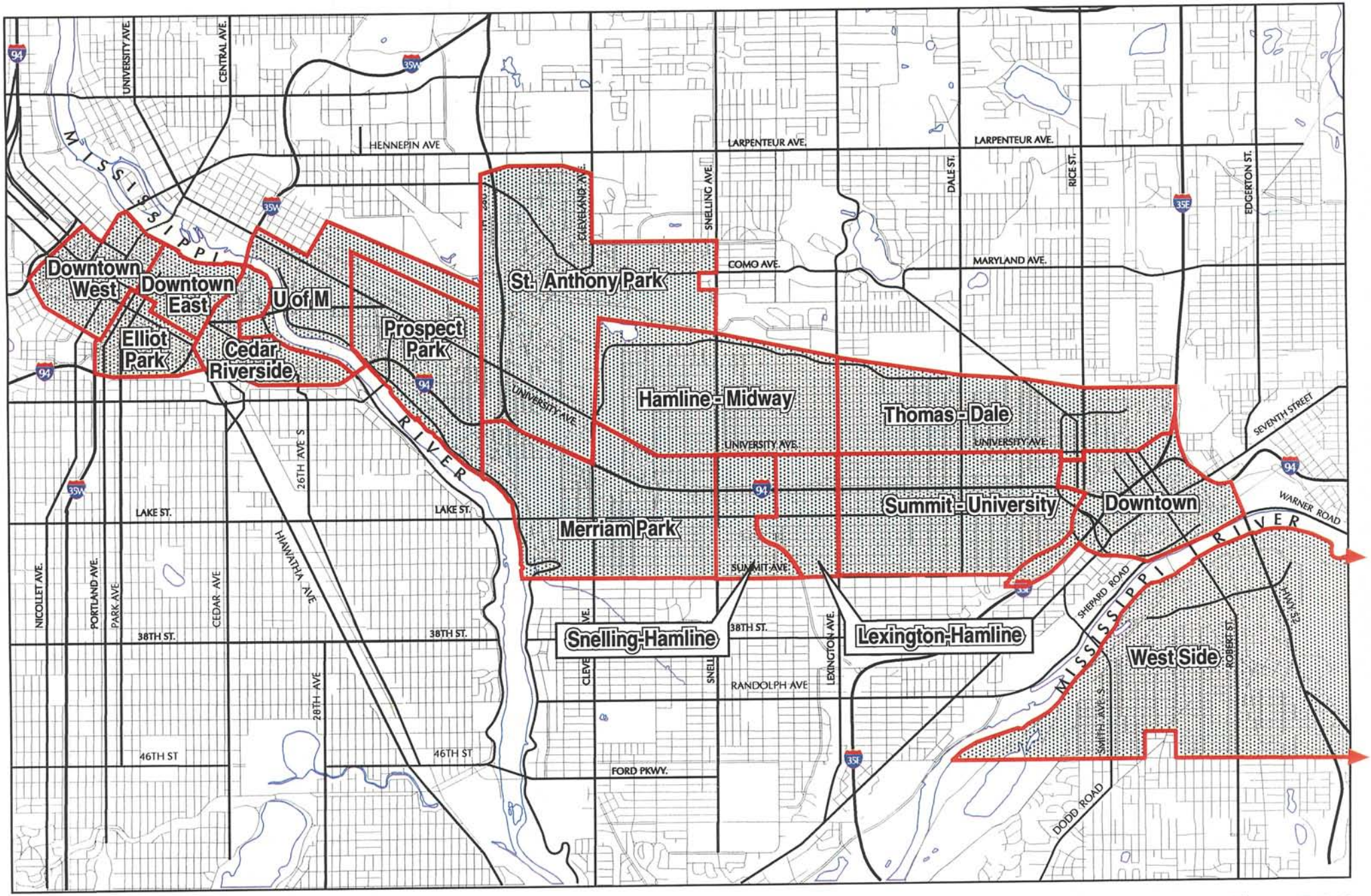
THE CENTRAL CORRIDOR

100-Year Flood Plain

April, 2002

Figure 4.6-3

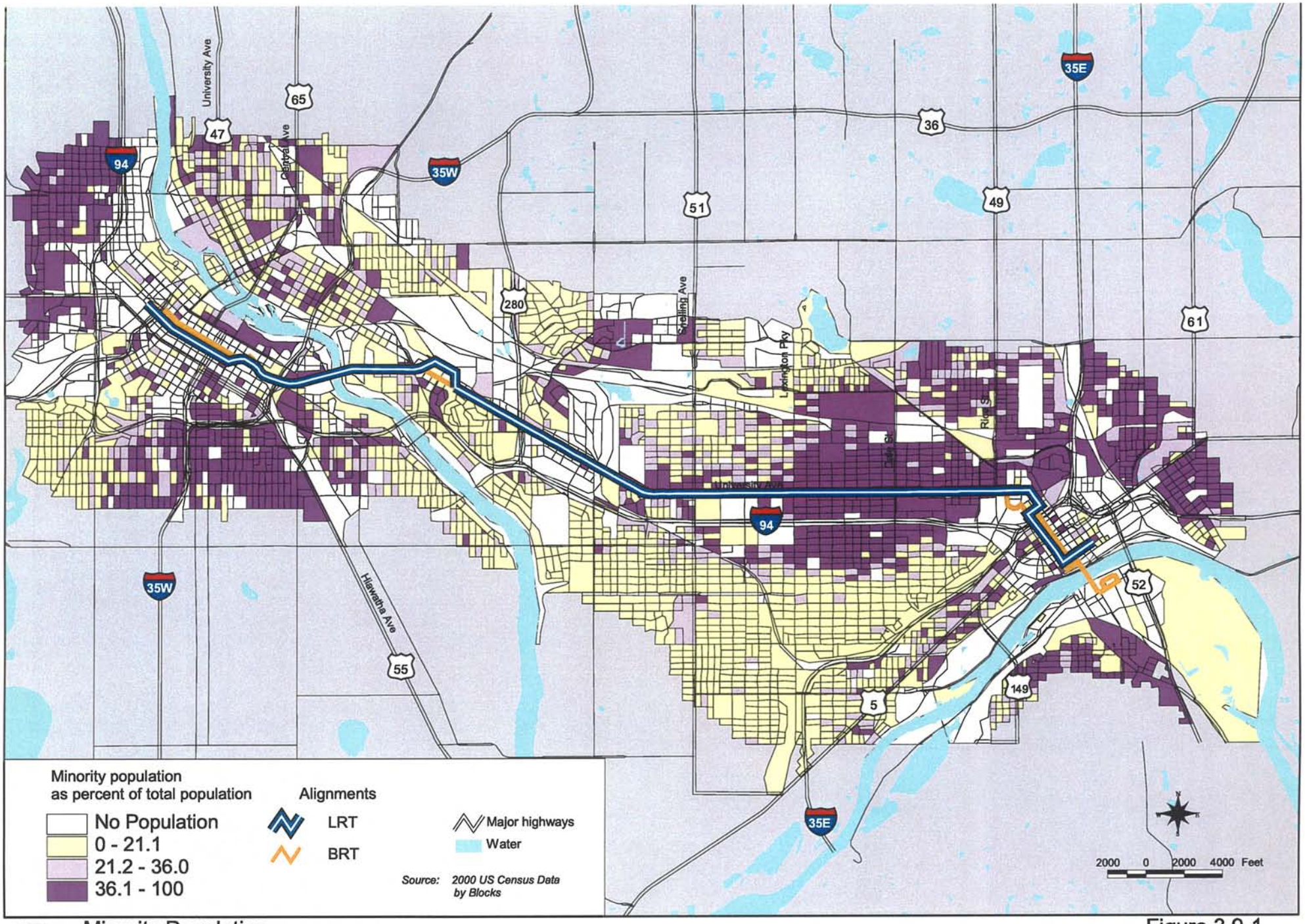


THE CENTRAL CORRIDOR

Designated Neighborhoods

April 2002

Figure 3.1-1



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CENTRAL CORRIDOR

Minority Population

April 2002

Figure 3.9-1