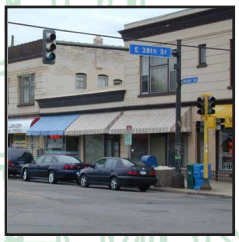
Nicollet Avenue Urban Design and Transportation Plan


Citizens for a Sensible Nicollet Avenue Plan

prepared by Design Center for American Urban Landscape
University of Minnesota

June 2002

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Nicollet Avenue Urban Design and Transportation Plan

prepared for
Citizens for a Sensible
Nicollet Avenue Plan (CSNAP)

prepared by
The Design Center for American Urban Landscape
College of Architecture and Landscape Architecture
University of Minnesota

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Citizens for a Sensible Nicollet Avenue Plan

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Study Contributors

A number of people participated in the study process by participating in meetings, reviewing draft plans, providing input, or offering technical assistance. Several of these contributors are listed below.

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Lyndale Neighborhood: Linda Alton, Ann Arthur, Jerry Finnerty, Jeannie Ha, Robert Ha, Jeanne Hiller, Tom Kilton, Lucille McQuitter, Carol Mork, Norma Pietz, Rita Rocheford and Myrtle Vikia.

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Whittier Neighborhood: Joanne Christ, Fred Glazer, Darcy Knight, Bruce Rasmussen, and David Sabaka

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Lyndale/Kingfield Joint I-35W/38th Street Mitigation Committee
Metro Transit—Aaron Isaacs and Tracy Jackson
I-35W Access—Craig Churchward, SEH; Tom Johnson, Smith-Parker
MnDOT—Len Sandstrom
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Table of Contents

Executive Summary

Nicollet Avenue, south of Lake Street, is a Minneapolis Community Corridor. In the *Minneapolis Plan*, community corridors are described as streets that "link people to each other, to local institutions and to daily destinations... [and] connect neighborhoods, serve as a principal travel route for many residents and visitors, and are almost always characterized by their limited mixed use" (p. 1.4.30). In other words, community corridors lend identity to individual neighborhoods, they provide public space, and they accommodate many transportation modes.

Citizens for a Sensible Nicollet Avenue Plan (CSNAP) concurs and maintains that to achieve this vision, community corridors must be planned as a contiguous street; cross-sections must be designed to balance activity and movement; and revitalization activities will be most effective if coordinated among neighborhoods and the city.

To that end, CSNAP initiated a neighborhood-based process to propose a design plan for Nicollet Avenue from Lake Street to the City's southern border. The plan builds on the recommendations of the Nicollet Avenue Task Force, which completed its work in May 2000. Five overarching principles guided development of the plan:

- balance traffic volumes with quality of life along the avenue.
- balance the needs of residents and business enterprises.
- enhance the urban forest by greening the avenue.
- ensure a high quality pedestrian experience.
- provide continuity for the driver, but respect the individual character of neighborhoods and places.

In general the design plan calls for:

- narrowing the road to provide for wider boulevards, generous sidewalks and traffic calming;
- widening key intersections to accommodate left-turn lanes;
- widening boulevards in residential areas to accommodate the needs of large street trees; and
- using small trees, planters, and public art to create a sense of place at activity nodes.

CSNAP makes four recommendations for moving the plan forward:

1) Neighborhood organizations and City Hall should adopt the CSNAP plan as the blueprint for reconstruction of the avenue.
2) Neighborhood organizations and City Hall should develop and adopt a reconstruction timetable for the avenue that is coordinated with other projects and plans.
3) Stakeholder groups should maintain the integrity of the CSNAP plan by continuing to involve neighborhoods and citizens in decisions impacting the avenue.
4) Neighborhood organizations and City Hall should take this plan to its next level of implementation by selecting design elements. These include, but are not limited to: street trees, lighting, street furniture, paving materials, and human-scale public art.

Nicollet Avenue Urban Design and Transportation Proposal

Nicollet Avenue, south of Lake Street, is a Minneapolis Community Corridor. Its particular blend of residential land uses with areas of commercial development, and its importance in the city's transportation network qualify it for this designation.

Nicollet Avenue is also a signature street for the Lyndale, Kingfield, Tangletown, and Windom neighborhoods. It has pockets of community and neighborhood commercial activity among blocks of single and multi-family residences, parks, and schools. These pockets, which are remnants of streetcar development patterns, are neighborhood landmarks that create identity and generate activity. The single-family housing and numerous apartment buildings that line the avenue give it a residential flavor that is attractive to many types of households. However, preservation and enhancement of the quality of life found in this neighborhood-scale mix of land uses is challenging as the avenue faces increasing traffic demands and redevelopment pressures.

Even though there are myriad redevelopment proposals and there is active planning to reconstruct portions of the avenue, there is no plan ensuring that the community corridor envisioned by the neighborhoods emerges out of future projects.

Aware of this gap and concerned that neighborhood residents and business owners have sufficient time and information to respond to redesign proposals, the Lyndale Neighborhood Revitalization Corporation (LNDC) invited representatives from the Neighborhood Revitalization Program (NRP) and the Kingfield, Tangletown, Windom, and Whittier neighborhoods to discuss these concerns. From this meeting, Citizens for a Sensible Nicollet Avenue Plan (CSNAP) was formed and began meeting to advocate for comprehensive and coordinated revitalization of the avenue. CSNAP's March 2001 mission statement declares its intention to *"help ensure development and implementation of a comprehensive plan for Nicollet Avenue that meets the needs of the residents and businesses from 28th Street South to 62nd Street South."*

CSNAP builds on efforts of the Nicollet Avenue Task Force. Comprised of public and private stakeholders, the task force produced *Nicollet Avenue: The Revitalization of Minneapolis' Main Street* in May 2000. The report recommended four key strategies:

1) Invest in well-defined commercial nodes and corridors.
2) Redevelop under-utilized commercial areas.
3) Encourage quality urban design and pedestrian-friendly environments.
4) Manage traffic flow and reduce speed.

Despite the report's detailed recommendations about land use changes and redevelopment opportunities, it stops short of making recommendations for street design. CSNAP chose to begin its work where the task force report ended. It would propose a comprehensive plan for reconstructing the street and advocate for its implementation.

The proposal for a comprehensive street design is timely. Nicollet Avenue, from Lake street to the city's southern border is facing many changes. Redevelopment of the K-Mart site will include reconnecting Nicollet Avenue, thus, reestablishing a continuous roadway to downtown Minneapolis. Also, proposals to change the location of access ramps to I-35W will alter travel patterns along the avenue.

Absent a comprehensive strategy, Nicollet Avenue will experience piecemeal improvements that do not add up to a well-designed community corridor that serves the neighborhoods and those who travel through them. In addition, while a number of funding sources are part of any reconstruction project, with a comprehensive corridor vision and plan in place, future Nicollet Avenue projects will be better positioned to secure funding from a broader range of sources, including but not limited to: City of Minneapolis Capital Improvement monies, Municipal State Aid funds, NRP and NRP Commercial Corridor funds, special assessments, and other regional, state and federal funding sources.

In May 2001, the Design Center for American Urban Landscape, University of Minnesota began working with CSNAP to develop such a comprehensive design for Nicollet Avenue. The Design Center provided technical assistance on urban design, transportation planning, and traffic engineering issues and also developed a street design proposal. CSNAP provided neighborhood vision, local knowledge, and unyielding commitment.

This report translates a neighborhood-based design process into a comprehensive design proposal. Additionally, this report outlines an urban design and transportation framework that can be used for other of the City's community corridors to balance the needs of neighborhood activity and citywide transportation.

Study Process

The study process was dynamic, driven as much by the insights of CSNAP members as professional expertise. By the time the Design Center became involved, CSNAP had held a series of meetings with staff from the Minneapolis Park and Recreation Board, Minneapolis Public Works Department, Metro Transit, and the Minnesota Department of Transportation, gathering considerable information about design standards, the physical characteristics of the avenue, transit considerations, and boulevard tree choices. They had also generated ideas for improvements in the Lyndale and Windom neighborhoods.

The Design Center used these ideas and the gathered information as a starting point for drafting a second iteration of designs. A variety of stakeholders were consulted in the development of these designs, including, but not limited to: Nicollet Avenue residents, businesses and neighborhood groups, Minneapolis City Council members, City of Minneapolis staff, consulting transportation planners and traffic engineers, and Metro Transit staff.

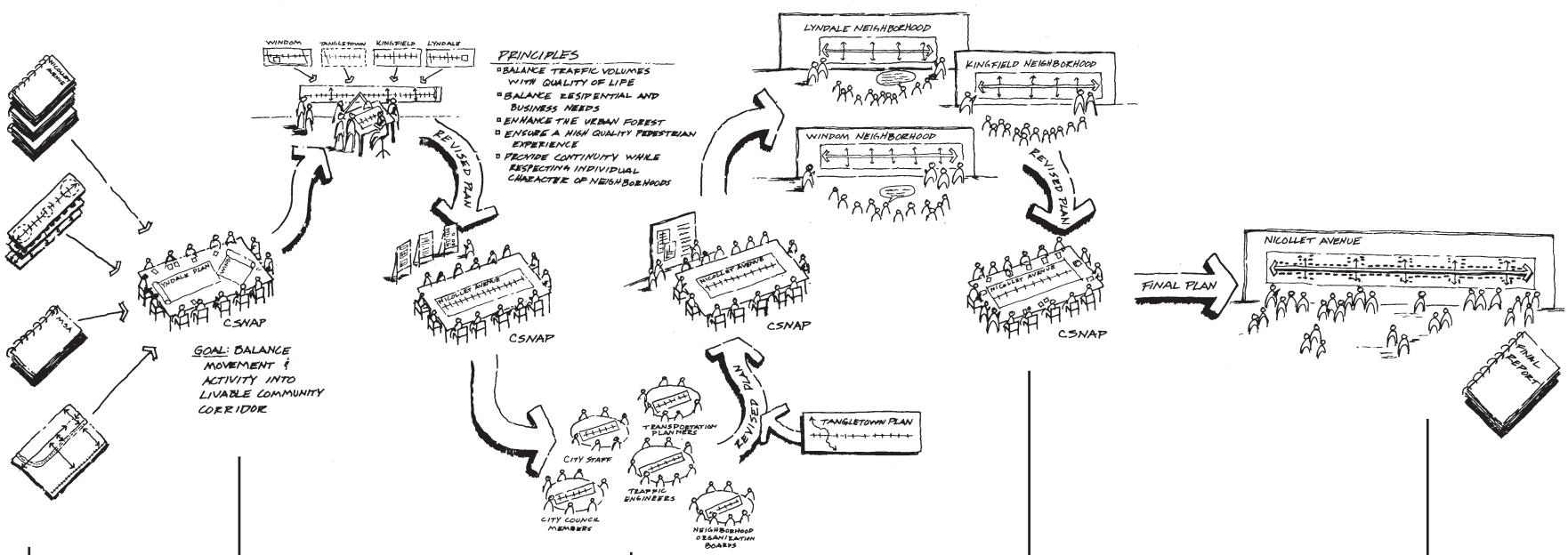
The second design iteration was shared with each neighborhood board. Comments were solicited and used to revise designs. At this point, other groups involved in detailed planning for portions of the avenue began discussing the benefits of working together. CSNAP and the Design Center offered to share information and to address their concerns in the CSNAP draft plan.

A third design iteration was drafted and shared with residents and businesses in meetings held in each neighborhood. A comment sheet was used to supplement discussion with written input. Comments from these meetings, along with input from CSNAP, served as the basis for the final design presented in this report.

Special Note:
Kingfield Neighborhood had six of their 10 blocks of Nicollet Avenue reconstructed by 2001. Ideas for the four remaining blocks were gathered in a special field session involving residents and businesses.

By the time the study was underway the Tangletown Neighborhood was engaged in a planning process for Nicollet from 46th to the Minnehaha Bridge and pedestrian enhancements to the bridge. Consequently, the Design Center did not draft a design for this section of the avenue.

Nicollet Avenue Urban Design and Transportation Plan Process Diagram



Gather existing reports, plans, and information

Bring together neighborhood plans into one plan

Solicit additional input from City staff, transportation planners, Council members, traffic engineers, and neighborhood organization boards

Collect comments at neighborhood meetings

Present plan and final report at Nicollet Avenue all-neighborhoods open house

This diagram summarizes the study process, illustrating the number of resources that shaped the draft street design, the groups involved, the types of meetings held, the sequence of events, and the final product. An enlargement of the diagram is included in Appendix A.

Context

Several initiatives–some completed, some still active–directly impact design considerations for Nicollet Avenue. These initiatives were woven into our process and are described briefly below.

Completed Initiatives

Nicollet Avenue: The Revitalization of Minneapolis' Main Street

The revitalization plan is the product of the Nicollet Avenue Task Force. Established in the summer of 1998, its charge was to develop "recommendations regarding redevelopment opportunities, areas for improved streetscapes, and, to a lesser extent, transportation and roadway improvements" (*Nicollet Avenue*, pp. 7-8). The task force included representatives of neighborhood organizations, residents, businesses, Minneapolis City Council members, and City of Minneapolis staff. The task force completed its work in May 2000 with the publication of its report. In the report's conclusion, the task force notes that their work is a "starting point" for revitalizing the avenue as a "continuous corridor."

Nicollet Avenue Reconstruction: 40th to 46th *

In 2000, the Minneapolis Public Works Department completed reconstruction of Nicollet Avenue from 40th to 46th Streets South. The new street section is 48'- 50' wide with 3-4' boulevards and 6' sidewalks. The Kingfield Neighborhood participated in selection of street lighting, design details, and street trees.

Active Initiatives

I-35W Access Project

This project seeks to improve access between I-35W and Lake Street. Hennepin County, the City of Minneapolis, and MnDOT are all participating in the project. A community Project Advisory Committee (PAC) and a Technical Advisory Committee (TAC) provide input to their planning process. The project is still in the planning phase, and funding has not been secured. The final ramp design and resulting change in transportation patterns is anticipated to have a significant impact on Nicollet Avenue. When these impacts are determined, they will trigger a review of the proposed design.

Kingfield-Lyndale Ad-Hoc Mitigation and Design Committee

In response to the I-35W Access Project proposal to move the 35th and 36th Street ramps to 38th Street, a citizens' group formed to provide input on traffic mitigation strategies for Nicollet from 35th to 38th Streets. This committee is working to develop alternative design strategies.

Nicollet and Lake Redevelopment

The Minneapolis Public Works Department, in conjunction with the Whittier Alliance, Stevens Square Community Organization, and Citizens for a Loring Park Community, has commissioned a traffic and parking management study for Nicollet , Blaisdell and 1st Avenues from 13th to 40th Streets South. Several components of this study will provide information of direct use to designing Nicollet Avenue: 1) traffic forecasts; 2) potential impacts of reconnecting Nicollet at the K-Mart site; 3) analysis of signalization at key intersections; 4) one-way versus two-way operational analysis for Blaisdell and 1st Avenues and impacts on Nicollet Avenue. When the results of this study are released, implications for the CSNAP design will need to be discussed.

** From the late 1880's to the 1950's Nicollet Avenue served as on of several major street car lines. With the disassembly of that system, the streetcar tracks and cobblestone paving on Nicollet Avenue were covered with asphalt in 1954. Since then, portions of the avenue have been reconstructed while others have received only maintenance. Nicollet Avenue from Franklin Avenue to 29th Street was reconstructed in 1988 and again in 1997 due to declining road surface conditions and a desire for streetscaping. Most of the avenue from Lake Street to 61st Street received a mill and overlay in 1977 and a seal coat in 1978. Other small-scale repairs and projects have occurred as well.*

Recommendations from *Nicollet Avenue: The Revitalization of Minneapolis' Main Street*

General Strategies

⬡ **Investment Area**
Enhance current land use and activities

* **Redevelopment**
Change land use patterns

Green Infrastructure
Widen boulevards and reestablish tree canopy

Public Art
Pursue "human scale" public art

Targeted Recommendations

Create pedestrian overlay zones at 31st, 38th, and 42nd to 43rd

Rebuild retaining walls on SW 41st

Pursue opportunities to add residential land uses

Reconfigure access to shopping center at 46th

Provide school bus pull-out lane at Ramsey School

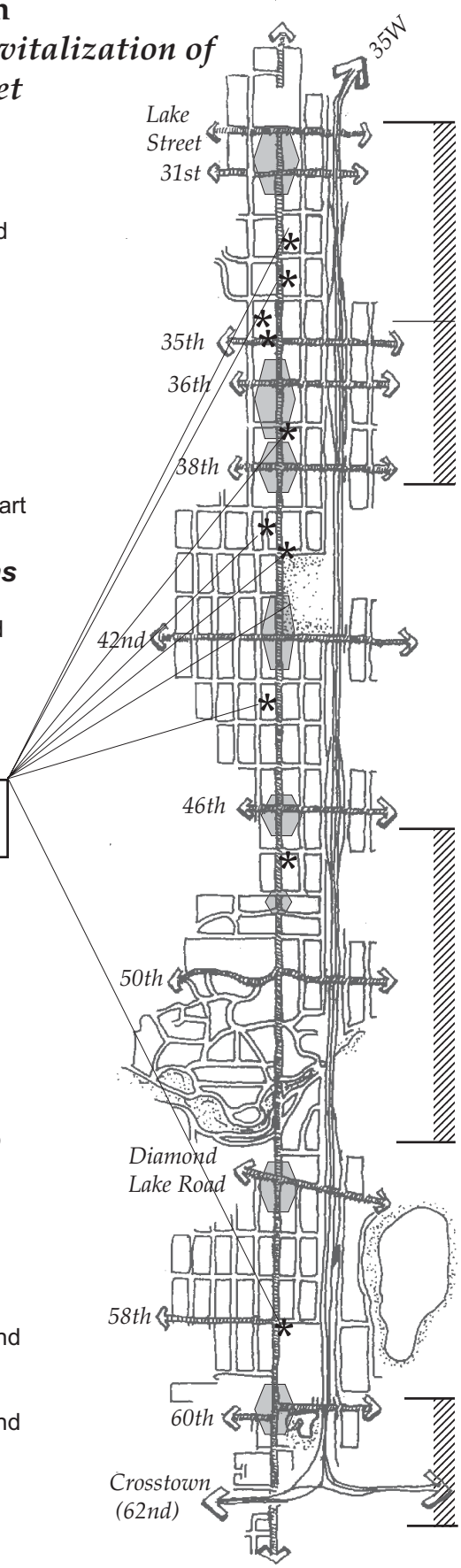
Redesign Minnehaha Creek bridge to be an amenity

Improve pedestrian access to and from Minnehaha Creek

Encourage creation of a business association at Diamond Lake

Create Special Use District and Pedestrian Crossing at 60th

Establish City Gateway at 62nd



Active Initiatives

35W Access Project
• Establish direct ramp access between Lake Street and I-35W
• Relocate access at 35th and 36th to 38th

Kingfield-Lyndale Ad Hoc Mitigation Group
• Develop mitigation strategies that respond to impacts of I-35W access at 38th

Kingfield Neighborhood Redevelopment Project
• Develop strategies to revitalize 38th and Nicollet as a neighborhood destination

Tangletown Neighborhood Street & Bridge Planning
• Redesign proposal prepared with technical support from Public Works Dept.
• Draft design proposals completed in 2002
• Work scheduled for 2003

Mn/DOT
• Redesign of Crosstown Commons
• Add HOV lane to I-35W

Primary Design and Planning Considerations

Under the Minneapolis Plan section heading "Marketplaces: Neighborhoods," streets with linear, mixed-use development are identified as corridors. Two corridor types are specified: commercial and community. Nicollet, from Lake Street south to the city boundary is designated a ***Community Corridor***. Also, the City has designated Nicollet Avenue a *Municipal State Aid* (MSA) road. Each designation has ramifications for designing the street. They are reviewed here to provide context for strategies proposed in the plan.

What does it mean to be a Minneapolis Community Corridor?

According to the Minneapolis Plan, community corridors are the "physical and cultural pathways that link people to each other, to local institutions, and to daily destinations such as work, shopping, school or home…the important streets [that] connect neighborhoods, serve as a principal travel route for many residents and visitors, and are almost always characterized by their limited mixed use" (*Minneapolis Plan*, p. 1.4.30). In addition, they lend identity to individual neighborhoods, they provide public space, and they accommodate many transportation modes.

Neighborhood and Transportation Design and Planning Implications

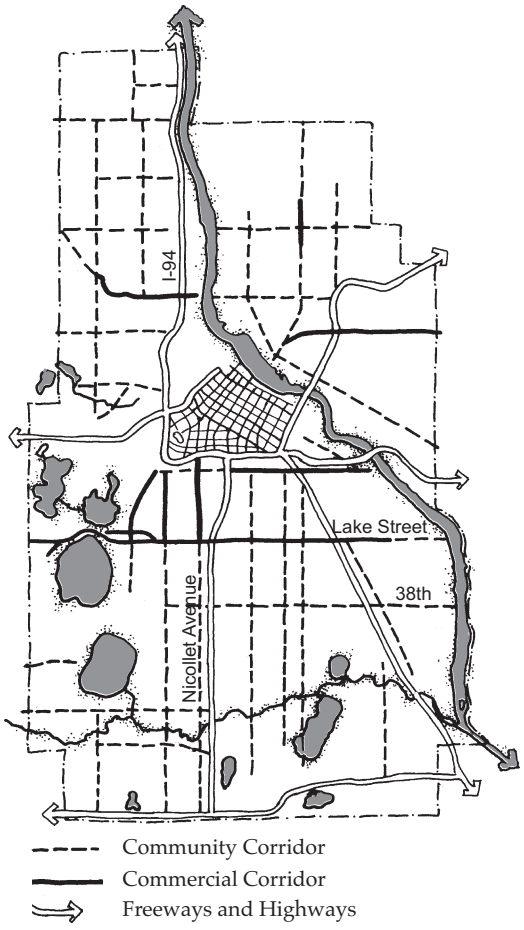
The long-range vision for community corridors is to keep them vital streets that have a limited number of neighborhood-scale nodes of commercial activity, substantial residential development, and fairly high volumes of traffic. The Minneapolis Plan calls for balancing "vehicular travel against residential quality of life" and to "prioritize transit advantages to Community Corridor streets" (*Minneapolis Plan*, p. 1.4.30). It further urges the city to "require that street design for these corridors preserves and enhances the strong residential character and pedestrian orientation of these streets while maintaining the street's capacity to carry current volumes of traffic" (*Minneapolis Plan*, p. 1.4.3).

For design and planning purposes, the strong policy emphasis placed on residential and pedestrian quality of life suggests developing street design strategies that maximize opportunities to "green" the street, ensure pedestrian safety, clarify driving cues for motorists, encourage residents to walk or bike, encourage use of transit and shared parking.

Community Transit Hub

Lake and Nicollet is a community transit hub candidate. Hubs are located "at the intersection of two or more major transit routes where people can get transit information or wait for transit service in a safe and comfortable location." (*Minneapolis Plan* Vol. II, Technical Appendix for Transportation Draft, p.9) Lake and Nicollet already has a high number of transit riders stopping to shop, work, or eat. Designation of a hub would suggest that even higher priority will need to be placed on the pedestrian environment at this intersection.

Minneapolis Plan Corridor Designations



What are functional classifications of roads and how do they impact planning?

The roadway network is organized as a tiered or hierarchical system based on different levels of vehicle service (mobility) and land access. There are three functional classes used nationally: arterial, collector, and local. Arterials provide the greatest mobility and the least land access, while locals provide the opposite.

There are sub-classifications of arterials to distinguish the freeway from the through street. In Minnesota, there are principal and "A" and "B" minor arterials. Nicollet Avenue is a B minor arterial.

Services associated with classes

Mobility, in conventional transportation planning terms, refers to the highest level of service for vehicles—or how far a vehicle can travel at the highest speed for the longest uninterrupted distance. Land access refers to the ability of the driver to turn off the public roadway onto a private property. Access is critical to commercial and residential properties. It is a matter of convenience, economic vitality, and, consequently, property value.

The role of functional classification in transportation planning and design

Functional classification determines ranges for several design parameters, such as design speed and roadway cross section, which includes such elements as lane width and type and width of median area. However, guidelines associated with each class do overlap, which permits a certain amount of flexibility for existing conditions. In most design decisions, professional judgement plays a critical role.

Assigning functional classification to a road

Assignment of functional class to a particular roadway segment is a complex decision which is subject to change. Classification is made in relation to the larger transportation system with immediate or future land uses in mind. Typically, roadways intended to serve long trips are classed arterials, while local roads are intended to serve short trips. Because both travel patterns and land use conditions are subject to change, the Federal Highway Administration recommends periodic reevaluation of roadway classifications.

Functional Road Classification

Nicollet Avenue is a "B" Minor Arterial.

Definition: A hierarchical classification of roadways. Classification involves determining what function each roadway should perform before determining street widths, speed limits and other design features as well as operational characteristics of a street.

Minor Arterials: Minor arterial streets connect major generators within central business districts and regional business concentrations. The emphasis of minor arterials is on mobility as opposed to access in the urban area. The minor arterial should connect to principal arterials, other minor arterials and collectors. Connection to some local streets is acceptable. Minor arterials should service medium to short trips.

Source: Minneapolis Plan, p.1.8.61, Metropolitan Council.

How does Minneapolis propose to balance functional needs with existing conditions?

The *Minneapolis Plan*'s chapter on "Movement" provides some insight (see pp. 1.8.59—68). From a policy perspective, the city states that the character and function of city streets should be designated not only according to their transportation function...or their economic function...but also by their neighborhood and community function" (p. 1.8.60). The plan acknowledges that most streets have been designated "in terms of their importance for general traffic movement..., that discussions about balancing the impacts of traffic on residential streets" are in order, and that "decisions about priorities will be guided by the need to protect and nurture livable neighborhood environments" (p. 1.8.60).

What does it mean to be a MSA road?

Municipal State Aid (MSA) streets are locally selected using criteria stipulated in state law (Minnesota Rules, Chapter 8820). Generally, such streets must carry heavier traffic volumes, connect major traffic destinations, e.g. parks or recreational areas, and serve as a link in an integrated street system. Municipalities can apply to the state-aid account for funding to aid in the maintenance or reconstruction of MSA streets. From the city's perspective, this amounts to substantial financial assistance for reconstruction.

Laws governing MSA design options?

Projects submitted for state-aid support must either meet minimum standards or receive a variance, both of which are set forth in the Minnesota State statutes. Design standards govern a wide variety of details, such as the number of travel lanes and their widths, curb reaction distances and parking lane width.

MSA standards are applied when a roadway is ready for improvement and submitted for funding assistance. MSA standards and criteria (including volumes) may change in the future. The plan in this report applies current MSA standards to stated assumptions.

Are there exceptions to the standards?

Variances may be requested. State law outlines the circumstances under which variances may be considered. Applications for variances are reviewed by an advisory committee, which is appointed by the commissioner of transportation according to legal requirements. Receiving a variance is feasible, but it is not frequently requested.

When is a variance justifiable?

If standards will have a notable negative impact on economic, social, safety, or environmental conditions or place undue burden on the local jurisdiction, then a variance may be appropriate. Decisions to grant a variance are based on professional judgement, which is based on a variety of engineering, financial, and political factors.

How is a variance initiated?

Variances are initiated typically by the public works departments and presented to the governing body for approval to submit to the State. A governing body, or one of its members, may also direct public works to prepare a variance request. (If initiated by an elected official, final submission to the State would require action by the whole body.)

Level of Service

Level of Service is a frequently used measure for determining appropriate traffic management and street design strategies. It applies to all types of roads, but is interpreted on a case-by-case basis. Here is basic information.

Level of service (LOS) refers to the "operational conditions within a traffic stream, and their perception by motorists…" (Transportation Research Board (TRB), Highway Capacity Manual, Special Report 209, Washington, D.C., 1994, p. 1-3) Measurement of LOS is affected by numerous variables, such as speed, traffic interruptions, convenience, and safety as well as the measurement point location relative to the urban setting and the transportation system. In other words, the same traffic variables may have two very different ratings depending upon the type of road and intersection, its location–downtown, urban, suburban or rural–etc.

According to transportation and urban planning expert Reid Ewing, however, LOS is a "simple function of travel speed" on urban and suburban roadways. (*Transportation and Land Use Innovations, 1997, p.72).*

Caveats and Assumptions

Caveats and assumptions influence the proposed redesign of Nicollet Avenue. This section highlights those that are most influential because they have the greatest potential to influence the final design of the roadway.

Caveats

- Traffic projection numbers were not available for design purposes. When these projections are available a final design can be prepared.
- Nicollet Avenue and the transportation network surrounding it are in a state of flux. Current proposals to open the avenue at Lake Street, add new ramps at Lake and 38th, remove ramps at 35th and 36th, and reconstruct the Crosstown Commons will have significant impacts on Nicollet. The specific impacts could not be fully anticipated in this design proposal, although possible outcomes were taken into consideration as part of the design assumptions.
- Because of the many proposed changes to Nicollet Avenue and its connecting infrastructure, a number of groups are involved in planning the future of the avenue. Concerns and suggestions of these groups to date have been considered as part of this design project and will continue to have an impact on the final redesign of the avenue.

Assumptions

- The 2020 average daily traffic projections were estimated using the city's rule-of-thumb of 20 percent increase over 20 years. Projections were based on 1999 Average Daily Traffic volumes, which were provided by the City of Minneapolis.
- Blaisdell and First Avenues are designated bicycle routes, Nicollet Avenue is not. This plan assumes that bicyclists will use designated routes and does not attempt to fit bicycle lanes into the cross section.
- The following development and infrastructure changes were assumed:

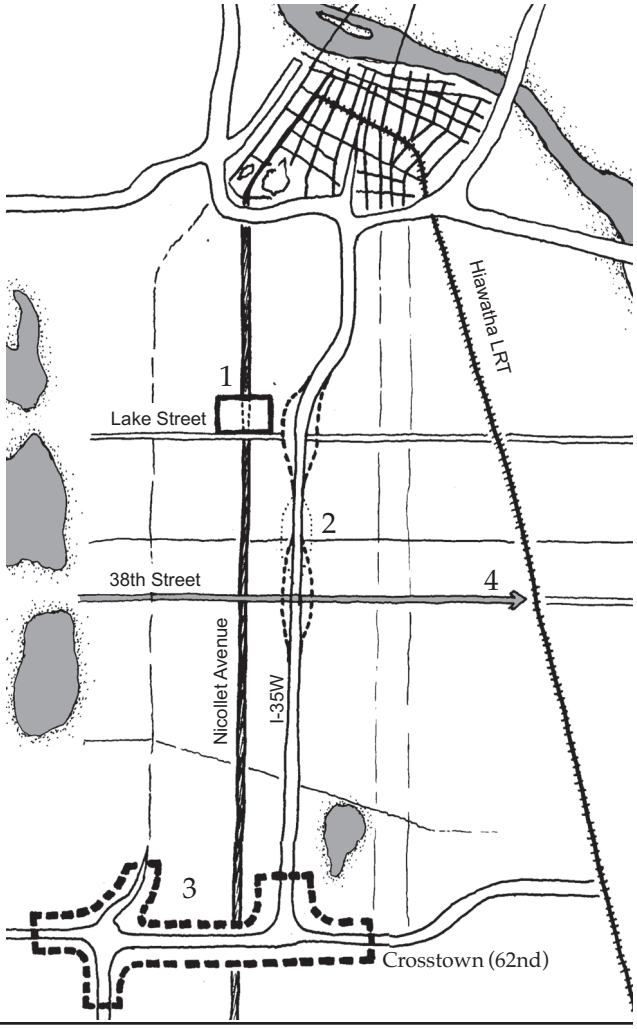
  1) Nicollet Avenue at Lake Street will be reconnected as part of redevelopment of the K-Mart site. (Traffic projections associated with the reconnection were not available for this study. The city is conducting a separate study.)

  2) There will be ramps at Lake and at 38th, while the ramps at 35th and 36th would be closed. (To approximate traffic volume impacts at this intersection, current ramp counts for 35th and 36th were added to current counts for 38th and extrapolated to 2020 using standard methods for estimating projections. The city is conducting a separate traffic study.)

  3) The Crosstown Commons will be reconstructed, but with unknown direct impacts on the function of Nicollet Avenue in the Windom Neighborhood.

  4) East-west bus service on Lake and 38th will increase significantly to provide better access to the Hiawatha LRT.

Locations of Design Plan Assumptions



Nicollet Avenue Proposed Redesign

Designing Livable Streets

The current era of transportation planning is shifting its emphasis from moving cars to moving people (Walter Kulash). Within the rubric of "livable streets," such concerns as managing traffic, improving the quality of travel, reducing auto dependency, enhancing conditions along the street, and attending to pedestrian crossings are integrated into the planning process. Design options must balance activity and movement.

Understanding and achieving that "balance" is not an easy matter. This study explores synthesizing urban design and transportation planning methods to produce a road design that supports the concept and intent behind "Community Corridor." The design approach was pragmatic.

1) Analyze the street
2) Gather and Assess potential solutions
3) Develop guiding principles
4) Prepare design drafts

Each of these steps is described briefly as background to the Nicollet Avenue Design Plan.

1. Street Analysis

Recent transportation research and local corridor studies suggest that movement and activity at key intersections offer a means to organize and design the corridor. Analysis of Nicollet Avenue reveals three types of organizing intersections:

1) Neighborhood Amenities— intersections that blend into the surrounding residential blocks.
2) Neighborhood Destinations—intersections that have lively businesses and are transition points in transportation networks.
3) Community Destinations—intersections that are major economic nodes and attract heavy auto, transit, and pedestrian activity.

Intersection types have common physical and movement characteristics that can be categorized by building/block scale and type, activity patterns, and movement patterns. These commonalities establish a rhythm along the avenue which is accented by the individual identities of these key intersections.

Each intersection type also has a distinctive set of urban design and transportation strategies for balancing movement and activity. Consistent application of these strategies sends behavioral messages to drivers, pedestrians, developers, and transportation planners.

The street analysis concluded with information gathering about the three street planning areas: roadway, sidewalk, and buildings. These three areas create the "experience" of the street for the driver, pedestrian, or bicyclist.

Roadway and sidewalk are delineated within the legal right-of-way (ROW). These areas are part of the public realm and lie within the jurisdiction of a governmental unit. Specific data collected included, 1999 Average Daily Traffic volumes; roadway, boulevard, and sidewalk measurements; signal timing and turning movement counts for signalized intersections; and transit routes and service frequencies.

On occasion, the actual ROW is wider than what is needed for streets, boulevards, and sidewalks. Private property owners wishing to use this area for trees, plantings, fences, walls, etc. must obtain an encroachment permit from the appropriate jurisdiction. If no encroachment permit is obtained, the property owner accepts all liability for uses in the public ROW.

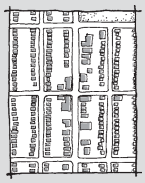
Buildings, on the other hand, lie within the private realm and, although subject to public regulation, are controlled by the property owner(s). This study supplemented building and lot information in the Nicollet Avenue Plan with field surveys, photographic documentation, and anecdotal information gathered at work sessions and meetings in the neighborhoods.

Nicollet Avenue's Organizing Intersections

Neighborhood Destinations
35th and 36th
38th
46th
Diamond Lake Road

Activity – Lively business life, especially in early evening and on weekends

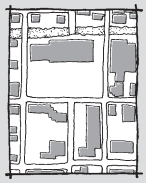
Key Design Strategies
- Facilitate traffic flow to accommodate turning
- Create safe pedestrian crossings
- Maximize sidewalk width
- Organize parking, control access points
- Create a common identity with streetscaping



Neighborhood Amenities
43rd
48th
58th

Activity – Places that blend into the residential fabric yet have a few notable neighborhood institutions

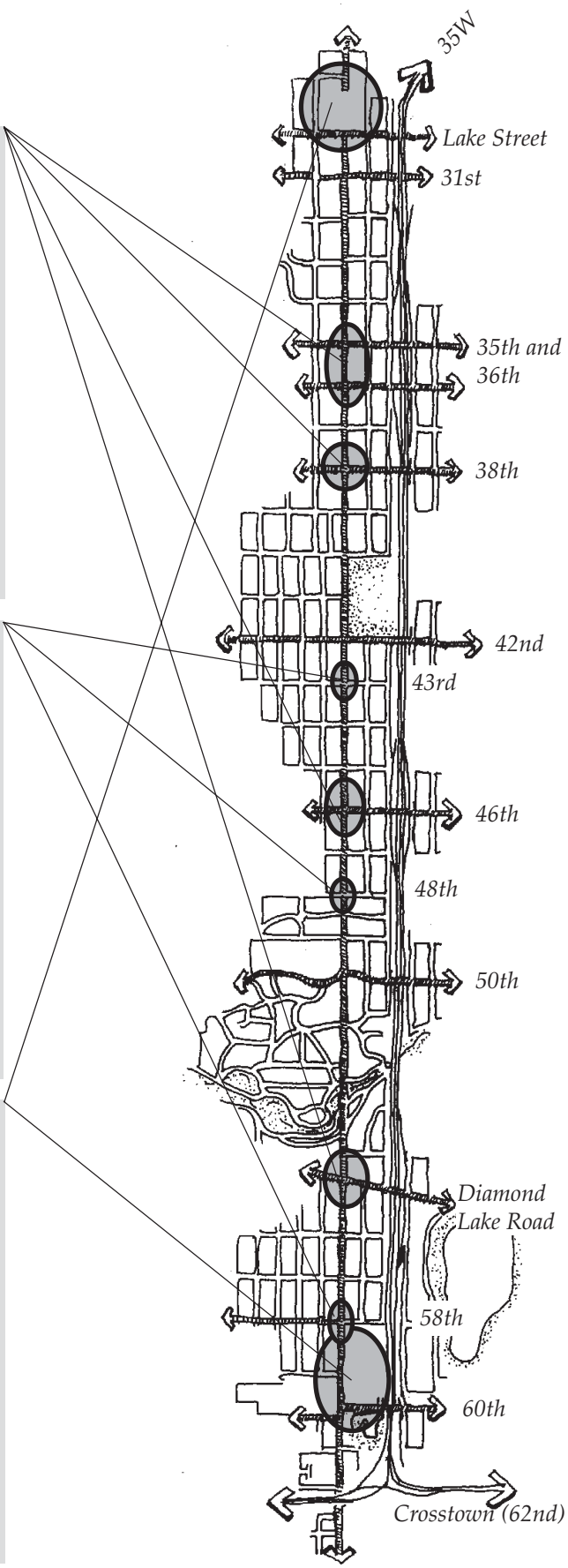
Key Design Strategies
- Calm traffic
- Enhance pedestrian crossings
- Create small areas for conversations and outdoor eating



Community Destinations
Lake Street
60th

Activity – Large scale job and shopping hubs that generate high activity levels all week and into the evening

Key Design Strategies
- Create clear internal circulation networks for pedestrians, bicyclists, and vehicles
- Maximize transit amenities
- Limit access to parking lots



2. Solutions Assessment

Current transportation literature contains a rich inventory of solutions to calm and manage traffic and to ensure safe pedestrian crossings. Not all solutions are physical or design-based, e.g. speed bumps or pedestrian refuge islands. Some are operational, such as channeling traffic, changing signalization, or influencing the driver's perception of the street.

Selecting an appropriate solution or group of solutions depends on candid assessment of street issues and concerns. To make this job easier, the City of Seattle in *Making Streets That Work: Neighborhood Planning Tool* (1996) includes a matrix of symptoms and solutions groups. For example, if the symptom is "too much traffic" the solutions may be found in managing traffic and reducing auto dependency, or if the symptom is "people drive too fast" the solutions may be found in managing traffic and changing conditions along the street. There were four solutions groups:

1) **Managing traffic** speed and volume by channeling or restricting movement.
2) **Changing conditions along street** to improve pedestrian travel, comfort, orientation, and safety, and also improve aesthetic qualities.
3) **Improving pedestrian crossing conditions** to enhance pedestrian safety.
4) **Reducing auto dependence** by encouraging use of alternate transportation.

Although that methodology was not applied directly to Nicollet Avenue, the concepts of addressing the causes, and underlying symptoms and grouping solutions into a set were used. In this way, the design plan represents an integrated street design approach that proposes physical and operational solutions.

The choice of solutions is also influenced by several factors: the functional class of the road, the average and peak traffic volumes, the conditions of the sidewalk and buildings, and the activity/land use on the corridor and in adjacent blocks. These factors, which are place-based, help to identify the best combination of solutions for a particular street segment or intersection.

3. Develop Guiding Principles

The overarching goals of the Nicollet Avenue street design are to balance movement and activity and to create a livable community corridor. Principles used to achieve these goals and guide design decisions follow:

- ***Balance traffic volumes with quality of life along the avenue***
- ***Balance the needs of residents and business enterprises***
- ***Enhance the urban forest by greening the avenue***
- ***Ensure a high quality pedestrian experience***
- ***Provide continuity for the driver, but respect the individual character of neighborhoods and places***

4. Prepare Design Drafts

Since neighborhood boundaries are important political and implementation delineations, the Nicollet Avenue plan proposal is presented by neighborhood.

This plan is intended to serve as a design framework. Streetscaping details such as choice of paving materials, street furniture, lighting, and tree species have been left for the next implementation phase.

However, the plan does make specific recommendations for:

- street width
- lane widths and configurations
- sidewalk widths
- pedestrian crossings
- boulevard widths
- median location and design
- bus stop and shelter locations
- signals and signalization

Comprehensive Design Plan Features

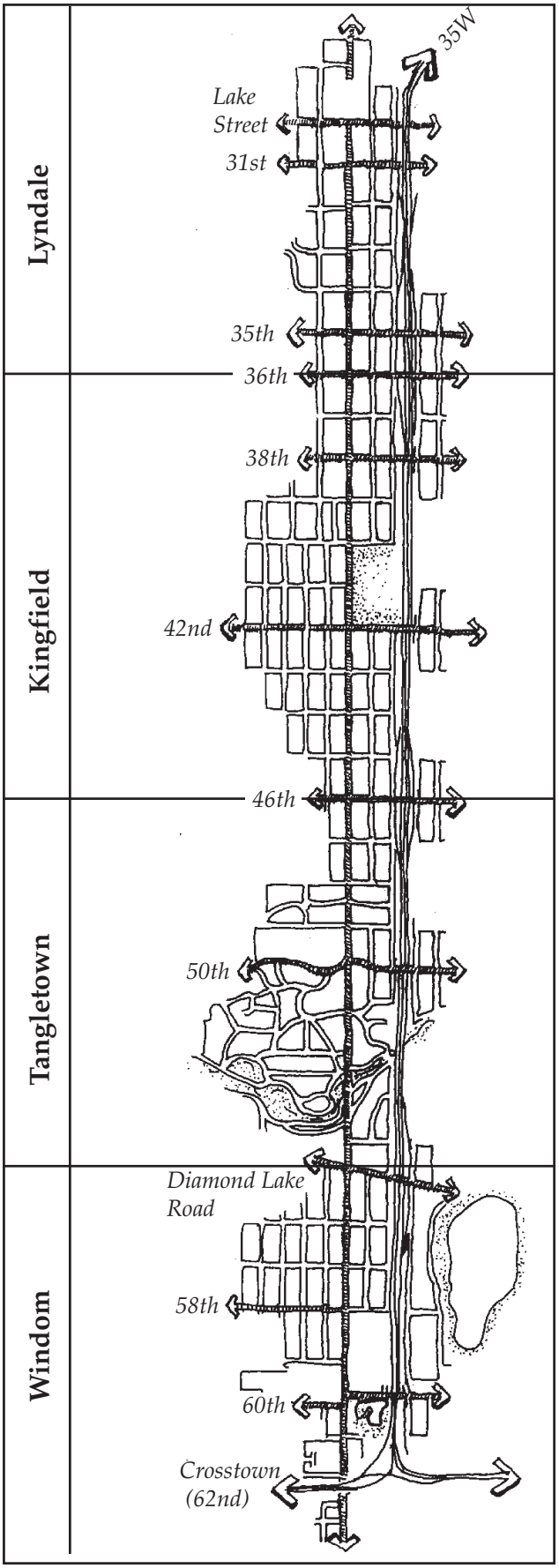
As a community corridor, Nicollet Avenue is home to a variety of users—those who utilize the roadway and sidewalks as well as those who have businesses or residences fronting the avenue. The design plan works to strike a balance among the needs of these users.

Widening the road or increasing the number of travel lanes as the sole means to accommodate future traffic needs was seen as inadequate in light of commercial and residential uses. Likewise, the sole use of strategies to reduce or inhibit traffic flow was not considered a desirable option. Instead, a multi-faceted approach was adopted as the best way to accommodate the variety of needs.

The design plan takes cues from best practices for successful commercial corridors and residential streets. In commercial areas, adequate parking, wide sidewalks, and easy turning movements are emphasized while residential areas have generous boulevards, large and numerous street trees and comfortably-sized sidewalks. In general, the design calls for:

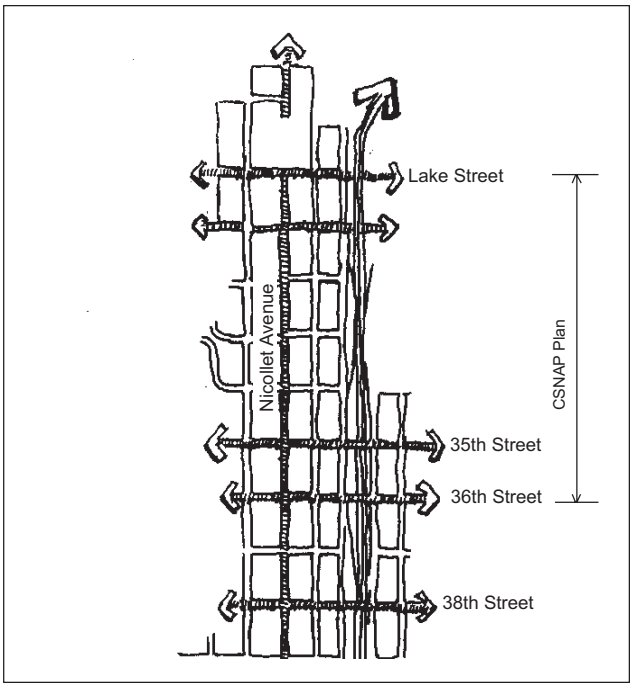
- narrowing the road to provide for wider boulevards, generous sidewalks and traffic calming.
- widening key intersections to accommodate left–turn lanes at key intersections.
- timing signals and adding left-turn signals to maximize the capacity of the road and level of service.
- widening boulevards in residential areas to accommodate the needs of large street trees.
- using small trees, planters, and public art to create a sense of place at activity nodes.

The detailed design plan is available as a separate document. Patterned after the Minneapolis Public Works' Tangletown Neighborhood plan, this document overlays a scaled, colored diagram of the proposed cross-section on an aerial photograph of Nicollet Avenue. Thus, the plan shows the buildings and lots in relation to proposed design changes. Specifics of that plan are summarized and organized by neighborhood in this report.



Lyndale Neighborhood

Lake Street to 36th Street



The Lyndale neighborhood portion of this plan reflects the desire for a safer, greener, and more attractive street. Accordingly, the design calls for narrowing the roadway to calm traffic, provide additional boulevard space for tree planting, and create a more attractive pedestrian environment. The design widens from the street's current condition at key intersections to provide dedicated left-turn lanes where necessary. The plan does not allow for four travel lanes.

Currently, the road is 50′ wide throughout most of the neighborhood with 2-3′ boulevards and 6′ sidewalks. The right-of-way is 80′ wide. Impacts on property owners have been minimized by limiting encroachment into the "next to lot" portion of the right-of-way. Design highlights include:

- 42′ street width in residential areas—two 11′ travel lanes and two 10′ parking lanes/bus pullovers*.

- 53′ street width at intersections with left-turn lanes—Lake Street, 31st Street and 36th Street—two 11′ travel lanes, one 11′ left-turn lane and two 10′ bus pullovers.

- a raised median integrated into the northbound left-turn lane at 31st Street. The median is an "extension" of the left-turn lane and signifies the transition between commercial activity near Lake Street and residential blocks south of the police station. Included in the median might be plantings, art or other appropriately-scaled elements.

- 7′ boulevards along residential blocks. Sidewalks remain at their present 6′ width, although they could be narrowed to 5′ in residential areas to provide wider boulevards. In residential areas, new street trees would be spaced at 25′ on center (40′ on center is the current standard for large boulevard trees). Closer spacing will enhance the street tree presence on this heavily-traveled community corridor.

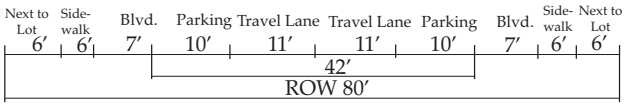
- City or neighborhood-sponsored planting of trees within the "next to lot" portion of the right-of-way.

- a pedestrian-activated caution signal and demarcated crosswalk at 33rd Street. While conducting traffic counts, neighborhood residents noticed a large number of children crossing at this intersection while traveling to and from community resources such as the YMCA and Lyndale Elementary School.

- demarcate pedestrian crosswalks at all intersections, including non-signalized intersections, that warrant them.

** While Metro Transit buses are typically 10.5 wide mirror-to-mirror, the passenger-side mirror overhangs the sidewalk when the buses are pulled over. In phone conversations, Metro Transit staff indicated that 10′ pullover lanes are sufficient.*

West



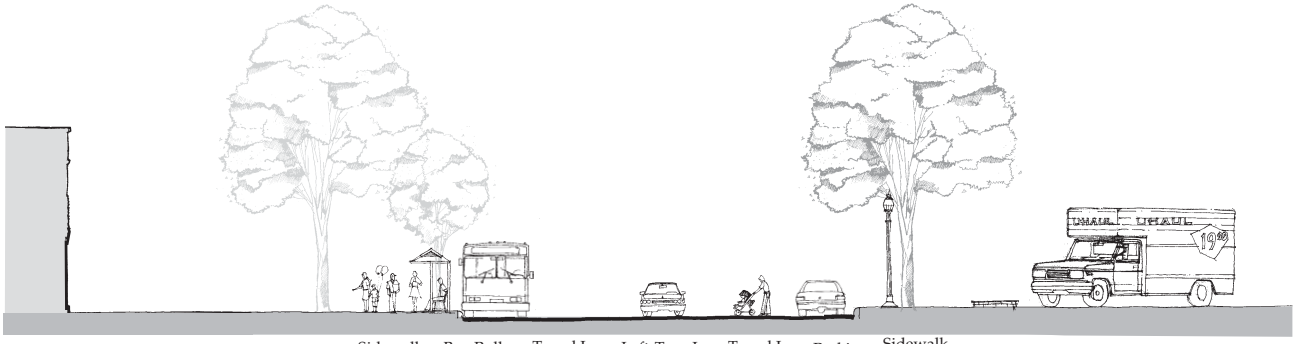
East

* Existing sidewalks are approximately 6′ wide.
** Existing boulevards are approximately 3′ wide.

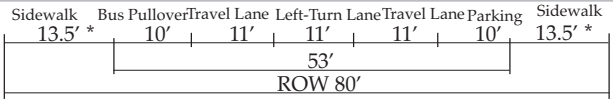
Nicollet Avenue Section

View looking north from between 32nd and 33rd Streets illustrating the proposed design for Nicollet Avenue

- *Current configuration of two travel lanes with on-street parking on both sides of the street is maintained*
- *Roadway is narrowed to 42′ from the current 50′ width*
- *Boulevards widened from 3′ to 7′ and planted with large boulevard trees*
- *Trees planted in "next to lot" portion of right-of-way help frame public walkway*



West



East

* Existing sidewalks are approximately 15′ wide.

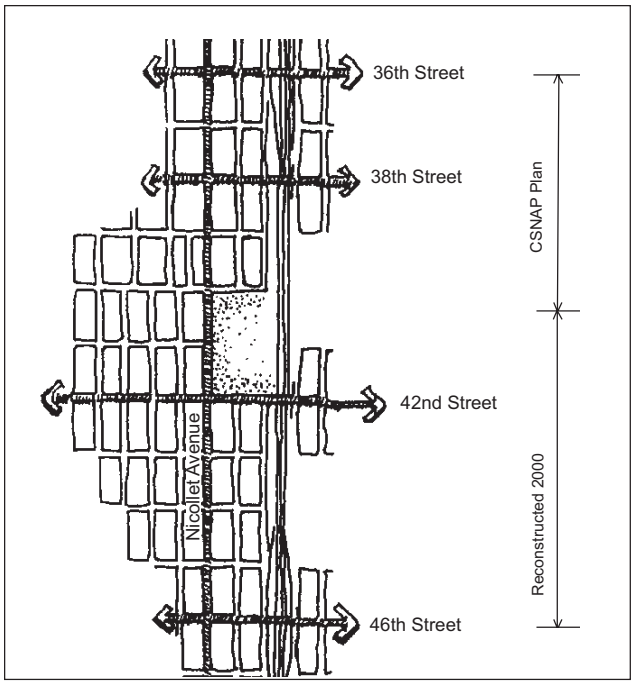
Nicollet Avenue Section

View standing at the intersection of 36th Street and Nicollet Avenue looking north

- *Road is widened to 53′ to provide a left-turn lane*
- *Wide sidewalks at corner complement commercial and transit activity*

Kingfield Neighborhood

36th to 40th Street (40th to 46th completed in 2000)



The design for the Kingfield Neighborhood from 36th to 40th Street continues the cross section proposed for the Lyndale Neighborhood; a narrowed street with two travel lanes and dedicated left-turn lanes at key intersections. Within the 80′ right-of-way, the roadway is currently 50′ wide, boulevards are 3′ wide and the sidewalks are 6′ wide. Design highlights include:

• 42′ street width along the residential blocks—two 11′ travel lanes and two 10′ parking lanes/bus pullovers.

•a street widened from its current width of 50′ to 53′ at 38th Street to accommodate a dedicated left-turn lane—two 11′ travel lanes, one 11′ left-turn lane and two 10′ bus pullovers.

• 38th Street east of Nicollet is 46′ wide—two 11′ travel lanes and two 12′ restricted parking/peak period travel lanes. This design reflects the assumption that the 35th and 36th Street ramps will be relocated to 38th Street and increased traffic will create the need for additional travel lanes during peak hours. (Please note: In order to minimize loss of sidewalk width, the roadway width necessary to handle four travel lanes was kept to a minimum and as designed does not meet current MSA standards. Reconstruction as proposed would require a variance.)

• 38th Street west of Nicollet Avenue is narrowed from its current width of 52′ to 42′—two 11′ travel lanes and two 10′ parking lanes/bus pullovers—by eliminating an east-bound bus pullover. Narrowing the roadway allows the sidewalks north and south of 38th Street to increase from 17′ to 18.5′ wide and 11′ to 19.5′ respectively, providing additional room for bus shelters and other street furnishings. Narrowing the street also helps calm additional through-traffic that might result from relocating the ramps.

• 7′ boulevards along residential blocks. Sidewalks remain at their present 6′ width, although they could be narrowed to 5′ in residential areas to provide wider boulevards. In residential areas, new street trees would be spaced at 25′ on center (40′ on center is the current standard for large boulevard trees). Closer spacing will enhance the street tree presence on this heavily-traveled community corridor.

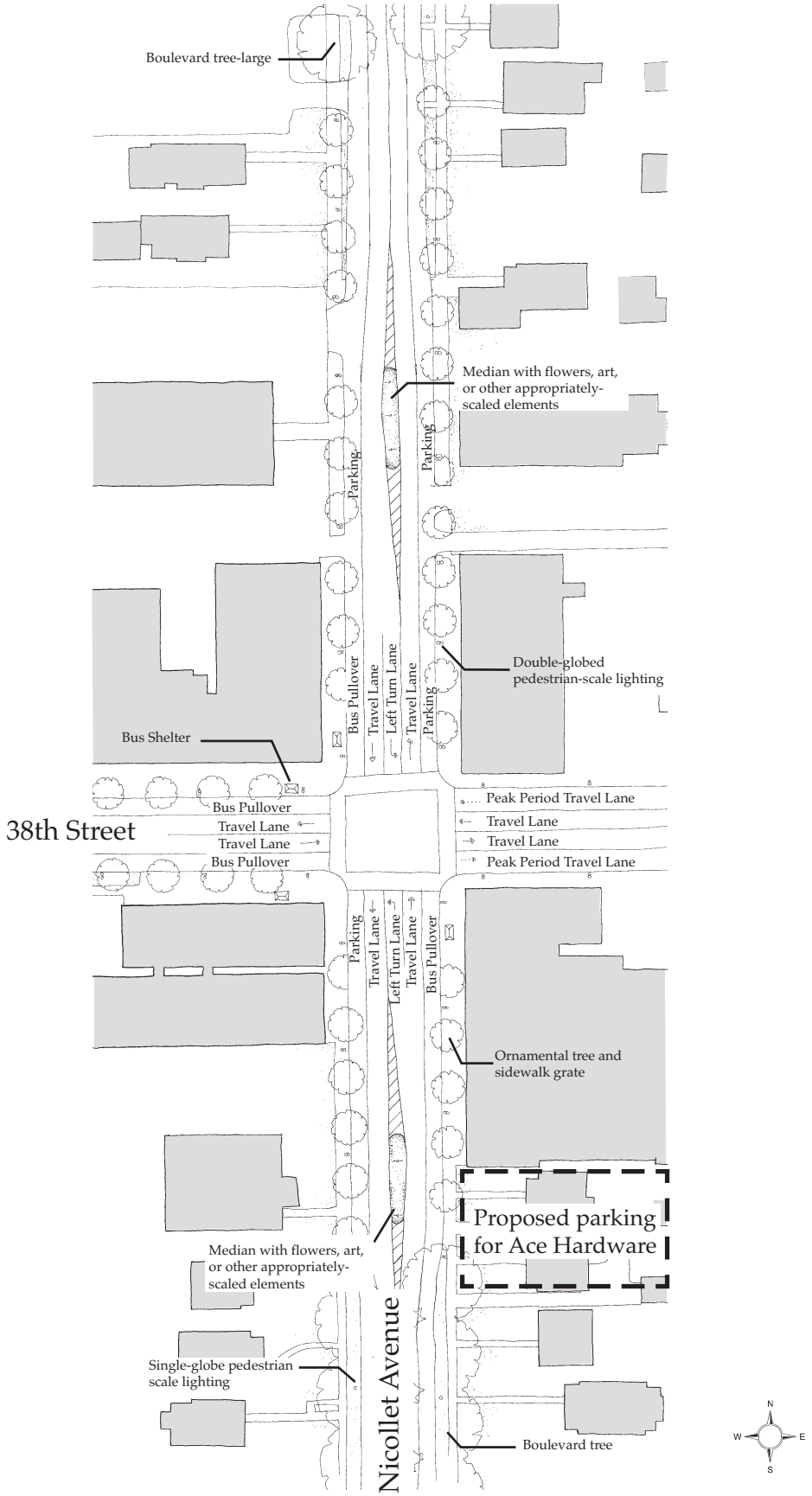
• raised medians integrated into the north and south-bound left-turn lanes at 38th Street. The medians are an "extension" of the turn lanes and call attention to this intersection as an important commercial and transit node with increased pedestrian activity. Plantings, public art or other appropriately-scaled elements could be included in the medians.

• demarcate pedestrian crosswalk at all intersections, including non-signalized intersections, that warrant them.

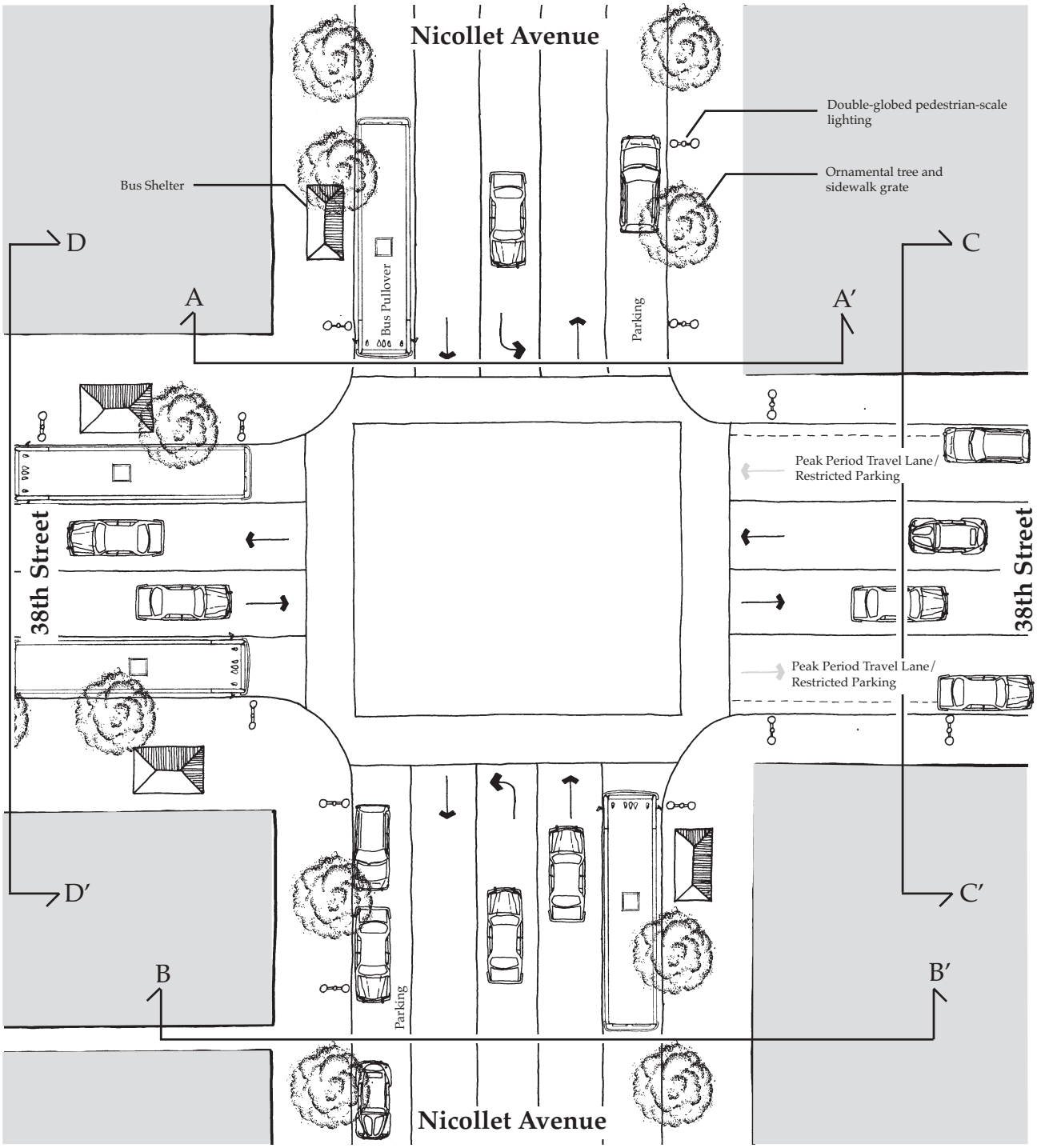
• City or neighborhood-sponsored planting of trees within the "next to lot" portion of the right-of-way.

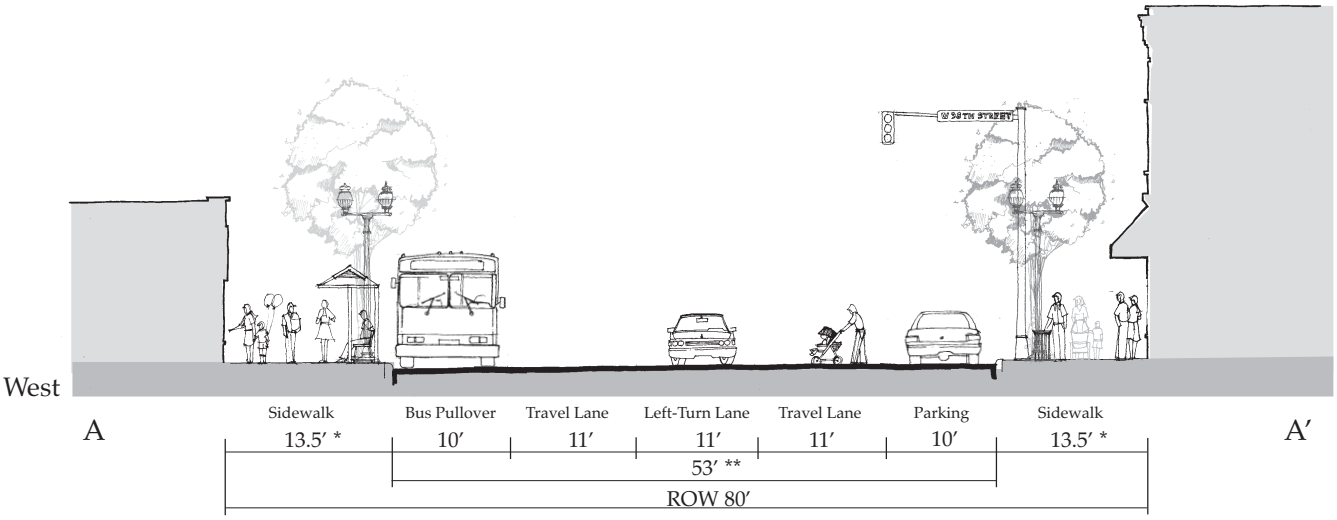
(Note: Nicollet Avenue from 40th Street to 46th Street was reconstructed in 2000. This portion of the avenue varies in width from 48′ where it adjoins Martin Luther King Park to 50′ from 42nd Street to 46th Street. Boulevards vary from 3′–4′.)

Nicollet Avenue and 38th Street Plan



Nicollet Avenue and 38th Street Plan



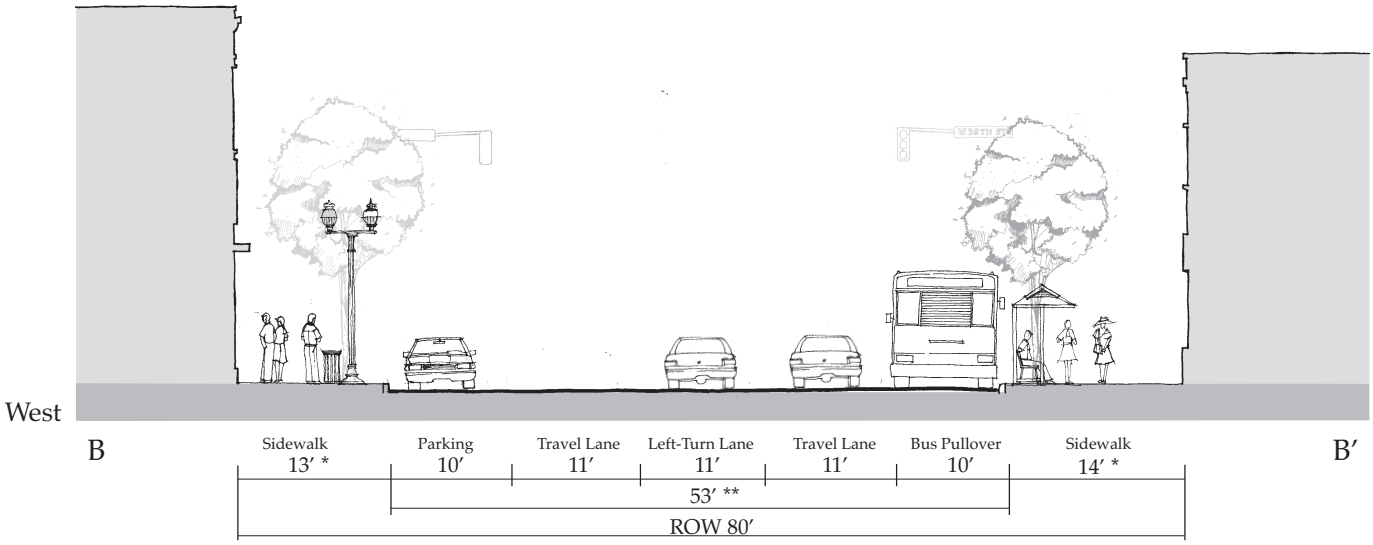


* Existing sidewalks are approximately 15′ wide.
** Existing street is approximately 50′ wide.

Nicollet Avenue South Section

View standing north of 38th Street looking north

- *Road is widened to provide a left-turn lane*
- *Small trees and other street furnishings enhance commercial streetscape*

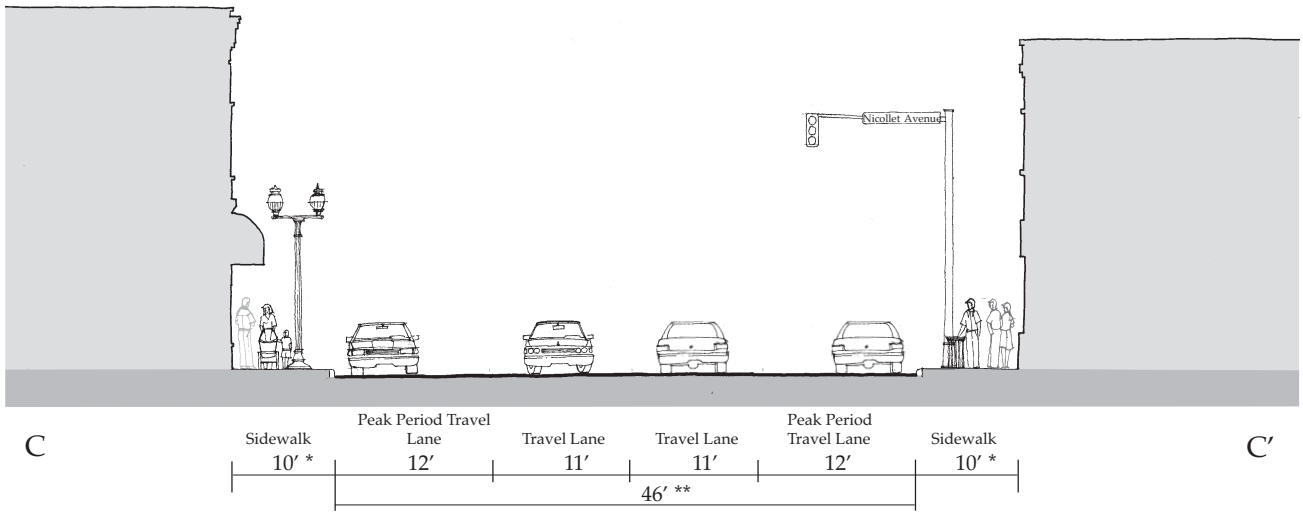


* Existing sidewalks are approximately 13′ wide.
** Existing street is approximately 54′ wide.

Nicollet Avenue South Section

View standing south of 38th Street looking north

- *Road is 1′ narrower than current condition*
- *Sidewalk on east side of street is widened*
- *Small trees and other street furnishings enhance commercial streetscape*

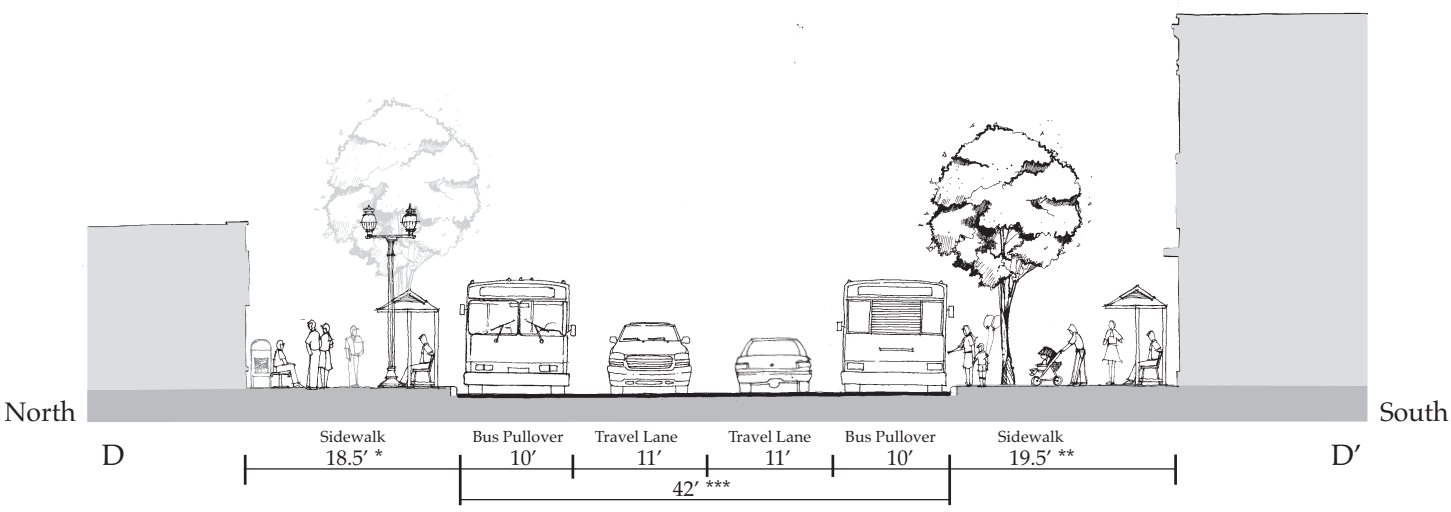


* Existing sidewalks are approximately 10′ wide.
** Existing street is approximately 45′ wide.

38th Street Section

View standing east of Nicollet Avenue looking east

- *Peak-period restricted parking lanes provide additional travel lanes when needed*
- *Due to narrow sidewalk, street trees are not provided*
- *Street furnishings complement commercial and transit uses*



* Existing sidewalk is approximately 17′ wide.
** Existing sidewalk is approximately 11′ wide.
*** Existing street is approximately 52′ wide.

38th Street Section

View standing west of Nicollet Avenue looking east

- *Road is narrowed from current condition*
- *Wide sidewalks provide room for street furnishings (possible seating for cafe or coffee shop)*
- *Small street trees (or large planters) provide greenery*

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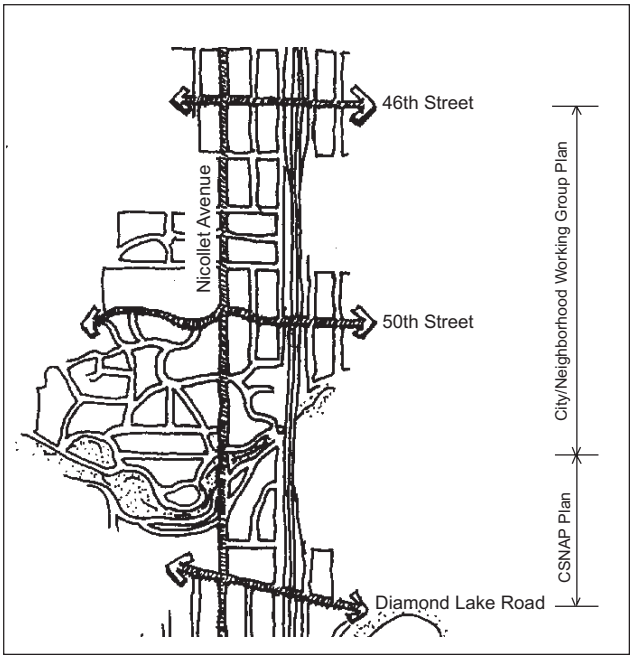
Tangletown Neighborhood

46th Street to Minnehaha Bridge and bridge design prepared by Minneapolis Public Works and neighborhood
52nd to Diamond Lake Road prepared by Design Center and CSNAP



Concurrent to the work of this study, City of Minneapolis staff and the Nicollet Avenue Working Group of the Tangletown Neighborhood Association developed a preliminary design for Nicollet Avenue from 46th Street to Minnehaha Creek. The plan and section on the following page are products of that process. The plan generally narrows the road from its current width of 50′ to 46′, providing two 11′ travel lanes, parking on both sides of the street, sidewalks that are 5′ wide, and boulevards that are 6′ wide. Curb extensions, which narrow the roadway to 38′, provide traffic calming at Rustic Lodge Avenue, 49th Street and Elmwood Place. Dedicated left-turn lanes are provided for northbound and southbound traffic at 50th Street.

From the Minnehaha Creek bridge to Diamond Lake Road, the Design Center/CSNAP design provides a widened street with the necessary room for left-turn movements and emergency vehicle access for the fire station at 54th Street. The right-of-way from 54th Street to Diamond Lake Road is 66′ wide. Design highlights include:

- 53′ street width from the Minnehaha Creek bridge to Diamond Lake Road—two 11′ travel lanes, one 11′ left-turn lane and two 10′ parking lanes/bus pullovers.

- 7-8′ sidewalks from Minnehaha Parkway to mid-block between 54th Street and Diamond Lake Road. Sidewalks widen up to 16′ at the intersection of Diamond Lake Road and Nicollet Avenue, reflecting the lively business activity at this neighborhood destination.

- boulevards provided in front of residential properties near the creek.

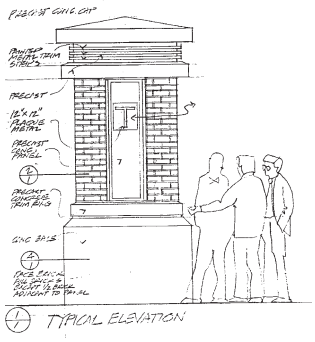
- demarcate pedestrian crosswalks at all intersections, including non-signalized intersections, that warrant them.

City of Minneapolis

A portion of the plan developed by the City of Minneapolis and Nicollet Avenue Working Group of the Tangletown Neighborhood Association is highlighted above. Curb extensions ("bump outs") narrow the street to 38' at 49th Street, Rustic Lodge Avenue and Elmwood Place (not shown).

City of Minneapolis

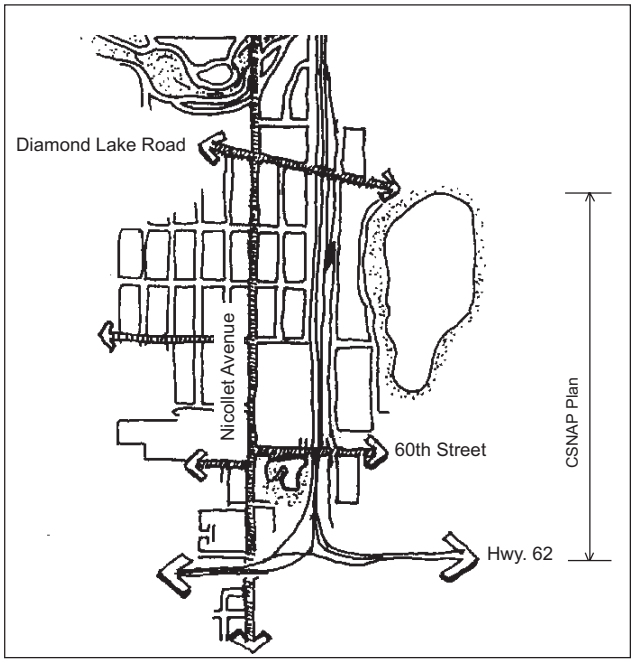
Drawings provided by the City of Minneapolis highlight the proposed road cross section from 47th to 49th Street (above) and the design for gateway pylons to be located on the Minnehaha Creek bridge (right).



City of Minneapolis

Windom Neighborhood

Diamond Lake Road to 62nd Street



This portion of Nicollet Avenue has current average daily traffic (ADT) counts that are near or at the 15,000 threshold at which MSA standards call for "at least four through-traffic lanes." However, the standards allow for less than four lanes if a roadway capacity analysis demonstrates a level of service "D" or better can be achieved. A cursory analysis conducted by transportation engineers suggests that LOS "D" can be achieved with two travel lanes and left-turn lanes at key intersections (see Appendix C). The Design Center and CSNAP pursued such a design cross section as it best balances commercial needs with residential quality of life.

Currently, within the 66′ right-of-way the roadway is 50′ wide with 2′ boulevards and 6′ sidewalks throughout most of the neighborhood. Boulevards 2′ in width are inadequate for boulevard trees. Design highlights include:

- 42′ street width along the residential blocks—two 11′ travel lanes and two 10′ parking lanes/bus pullovers.

- boulevards are widened from the present 2′ to 6′ wide. In residential areas, new street trees would be spaced at 25′ on center.

- sidewalks remain at their present 6′ width, although they could be narrowed to 5′ in residential areas to provide wider boulevards.

- demarcated pedestrian crosswalks at all intersections, including non-signalized intersections, that warrant them.

- a street widened from its current width of 50′ to 53′ at 58th and 60th Streets to accommodate a dedicated left-turn lane—two 11′ travel lanes, one 11′ left-turn lane and two 10′ bus pullovers.

- wider curb radii and set back stop lines at Diamond Lake Road and 60th Street to better accommodate the turning movements of large vehicles.

- PM peak period restricted parking on southwest corner of Nicollet/Diamond Lake Road intersection to better accommodate turning movement of buses and other large vehicles.

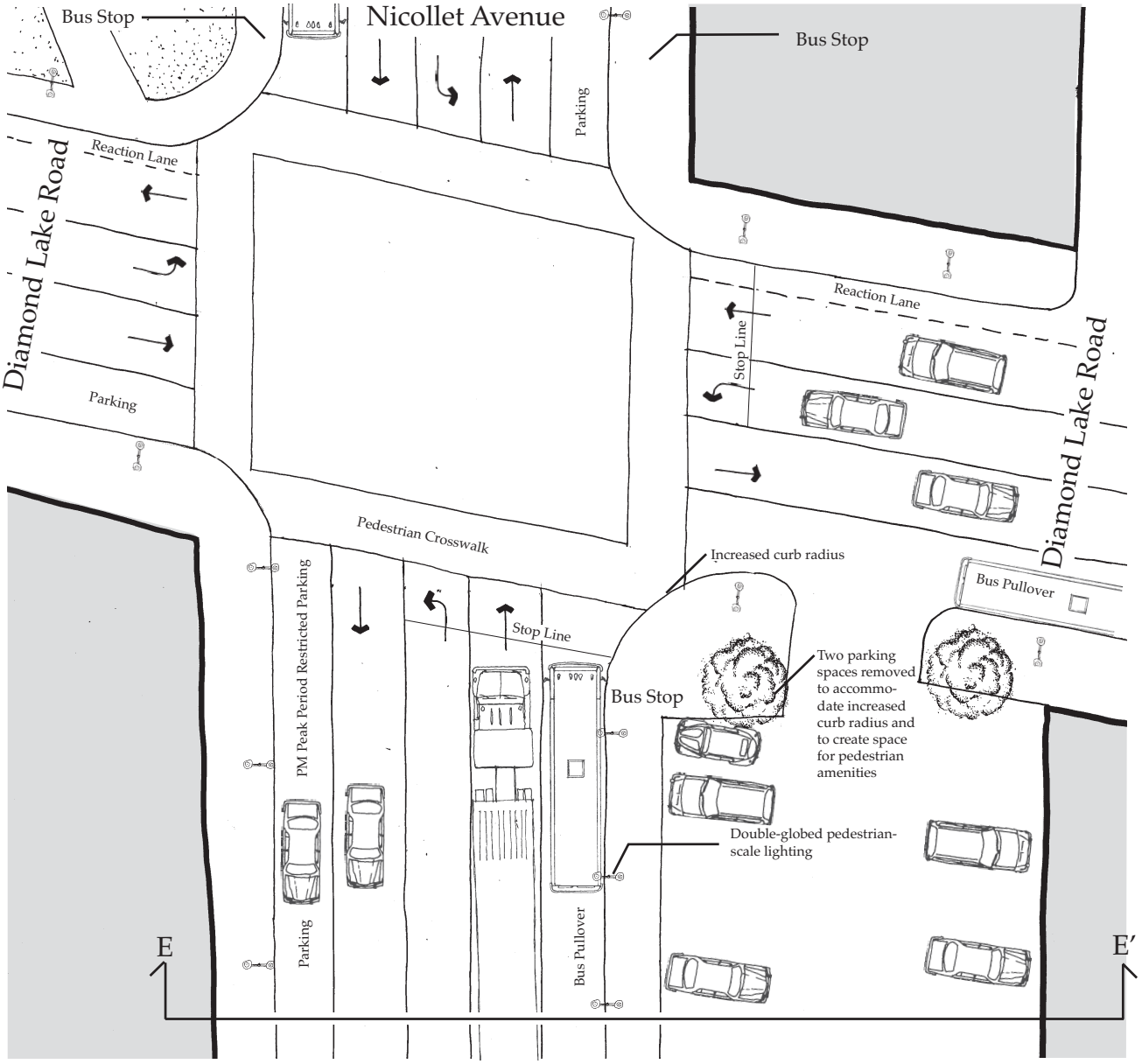
- 46′ road width in front of Klier's Nursery to accommodate delivery vehicles.

- throating at E/W 56th Street, E/W 57th Street, W 59th Street, and W 60th Street to dissuade truck use and to calm automobile traffic entering residential areas.

- traffic signals at E 59th Street to assist vehicle movement from the large multi-family housing. Studies to determine the feasibility of operating these signals at peak periods only are recommended.

- stop sign and lane transition at 62nd Street where Nicollet Avenue changes from a two lane configuration north of 62nd Street to the existing four-lane cross section south of 62nd Street.

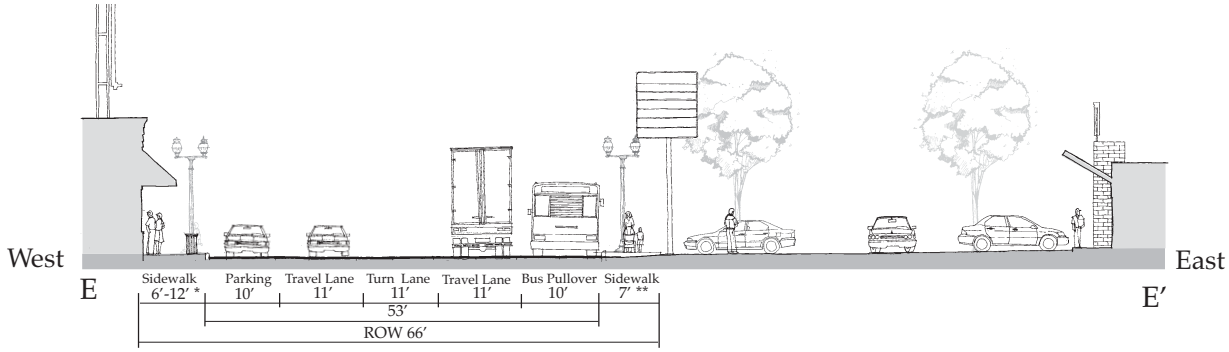
Note: MSA standards also allow for four travel lanes, with two lanes used for peak traffic hours if capacity analysis demonstrates that additional travel lanes are only required during peak periods. A design scenario was prepared for these conditions. Final dimensions are: 48′ street width—two 11′ travel lanes and two 11′ parking lanes/peak period travel lanes with two 2′ reaction lanes— with 4′ boulevards and 5′ sidewalks. After considerable neighborhood discussion, it was decided that this is not the preferred solution. The preferred scenario is described above and shown to the right.



Diamond Lake Road and Nicollet Avenue Plan

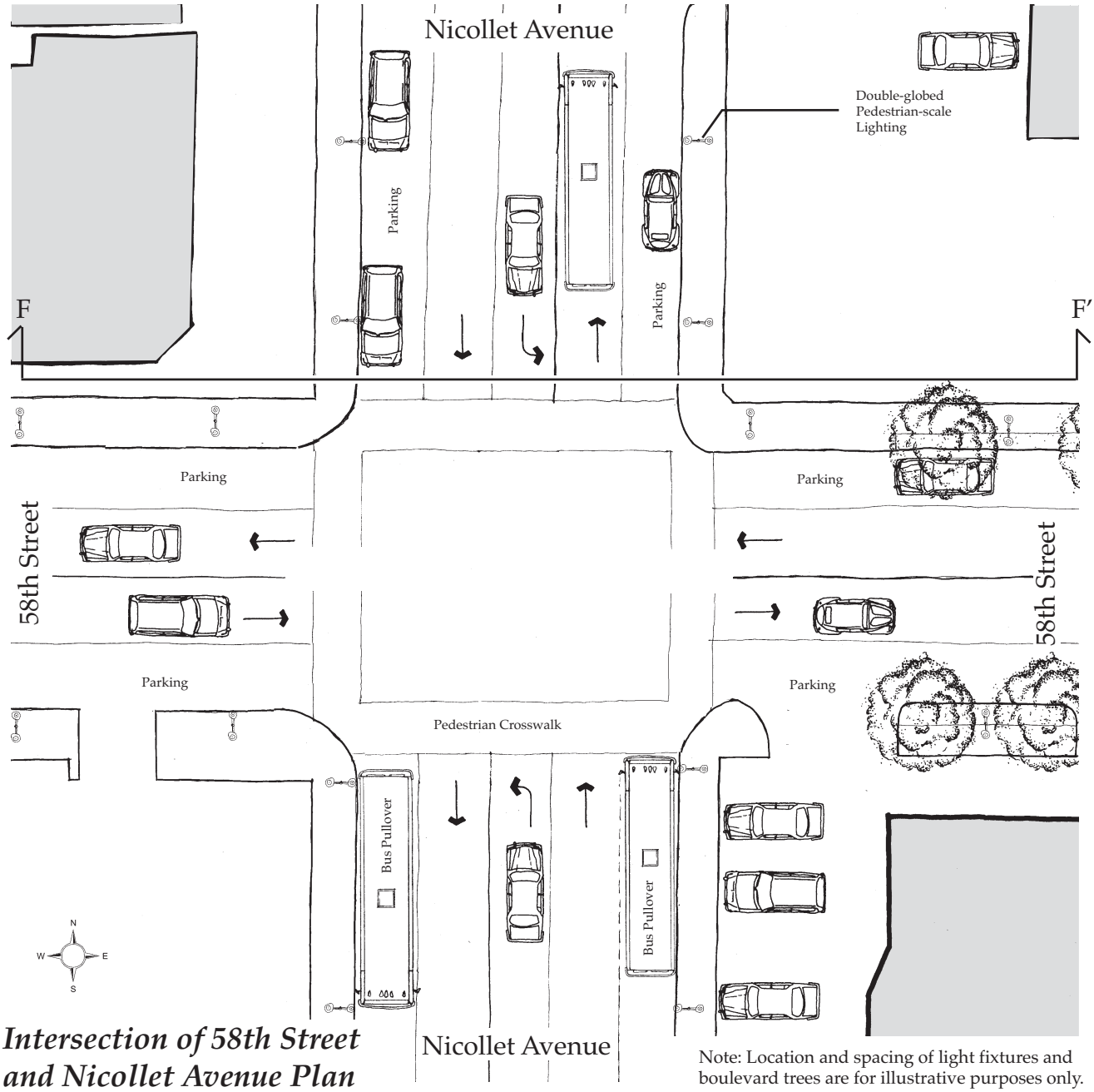
N
W E
S

Note: Location and spacing of light fixtures and boulevard trees are for illustrative purposes only.



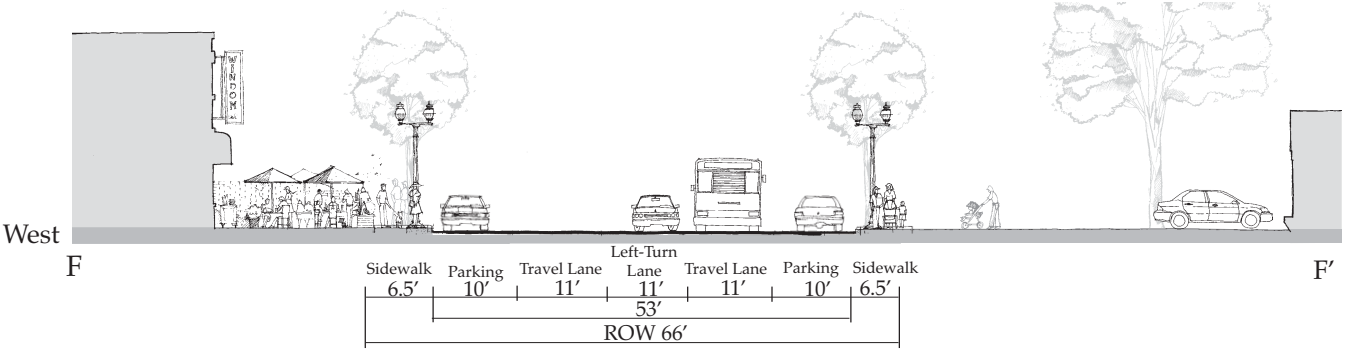
* Existing sidewalk is between 7.5 to 10.5′ wide.
** Existing sidewalk is approximately 7.5′ wide.

Nicollet Avenue Section looking north at Diamond Lake Road



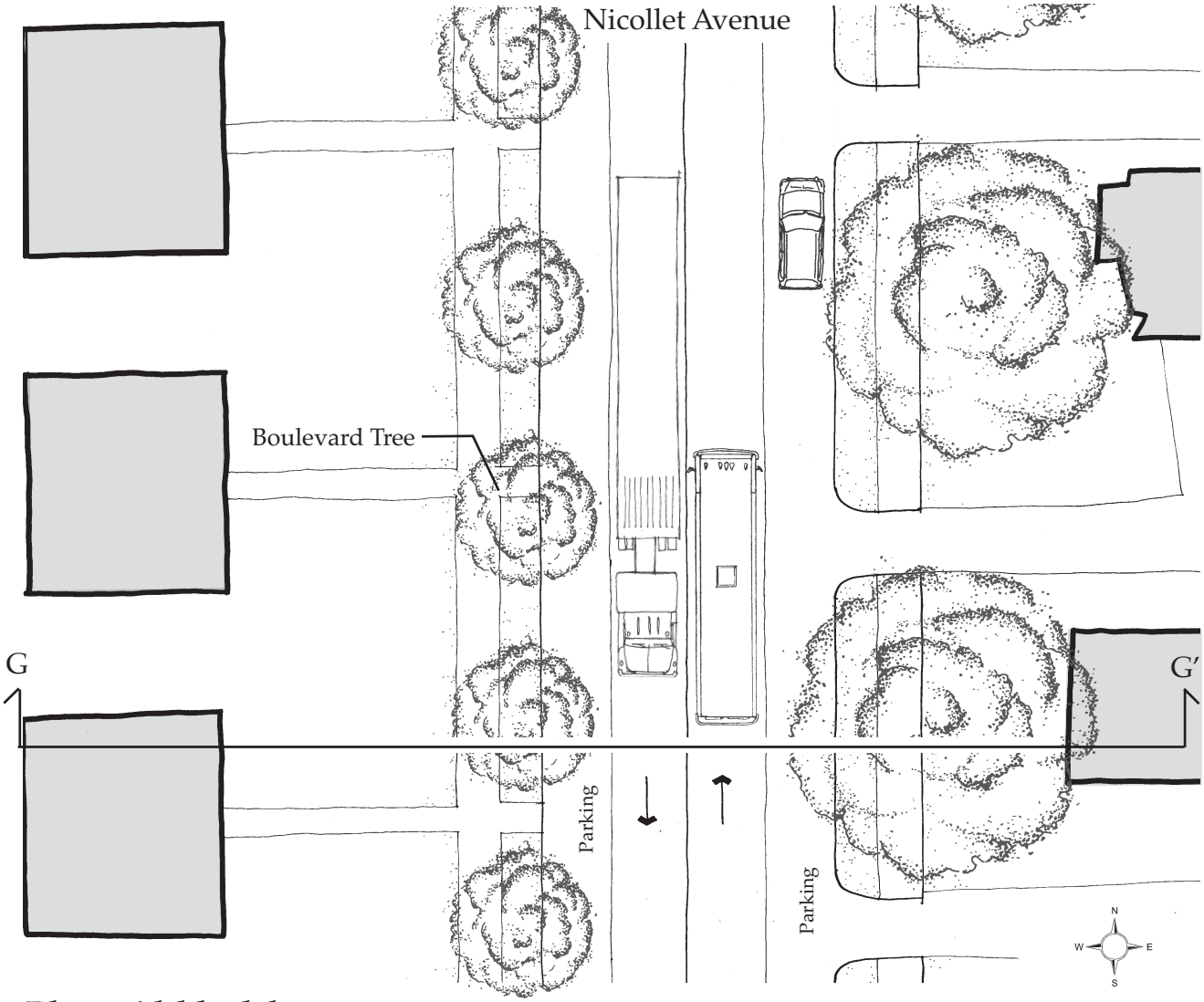
Intersection of 58th Street and Nicollet Avenue Plan

Note: Location and spacing of light fixtures and boulevard trees are for illustrative purposes only.

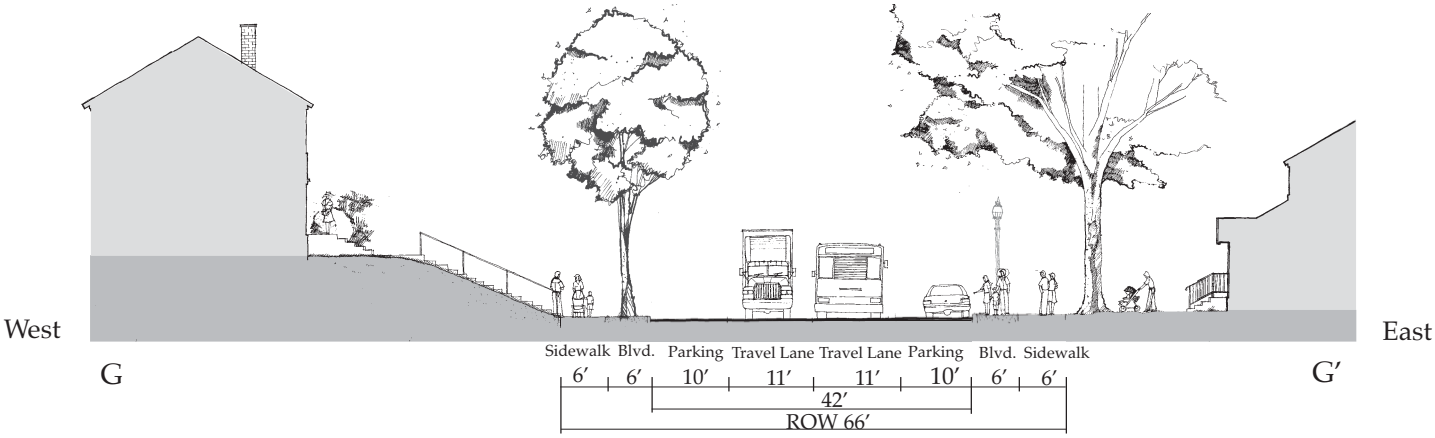


* Existing sidewalks are approximately 5′ wide (east side) and 8′ wide (west side).
** Existing boulevards are approximately 2′ wide (east side) and 0′ wide (west side).

Nicollet Avneue Section Looking North



Plan mid-block between 58th and 59th Streets



* Existing sidewalks are approximately 6′ wide.
** Existing boulevards are approximately 2′ wide.

Nicollet Avenue Section Looking North

Comprehensive Plan Summary

Boulevards

A healthy urban forest is fundamental to a livable community corridor. In addition to improving the environment and encouraging pedestrian activity, it conveys the strongest message to drivers that the street is shared by many. The plan provides 6' boulevards along residential stretches of the avenue wherever possible. This offers enough growing space for medium to large trees as specified by the Forestry Division of the Minneapolis Parks and Recreation Board. At activity nodes, the boulevards are reduced or eliminated to create opportunities for potted plants, banners, and street furniture. Trees would be smaller at these locations, which is a better balance for the type of activity and scale of the buildings.

Sidewalks

Sidewalk width indicates priority level for pedestrians and transit. It contributes to the perceptions of security and comfort and directly impacts use of the sidewalk for bus shelters, street furniture, and planters. The plan maximizes sidewalk width at community and neighborhood nodes where pedestrian and transit activity is greatest. Careful attention was given to those areas identified in the Nicollet Avenue Plan for pedestrian overlay zones.

Sidewalks along residential stretches are slightly smaller to provide for a larger boulevard with shade trees. Pedestrian crossings are given special consideration at non-signalized intersections and where children frequently cross to use community facilities on the opposite side of the street.

Roadway

The roadway must accommodate several types of movement: linear through trips, turning vehicles, acceleration and deceleration, buses and cars pulling out of traffic, pedestrians crossing, parked vehicles, and truck traffic. Traffic flow, not speed, is critical to reducing congestion and serving the local and citywide transportation needs. Also, lower speed allows for greater safety with smaller lane widths.

The number of lanes needed to accommodate use is determined by projected average daily traffic counts 20 years beyond the improvement start date.

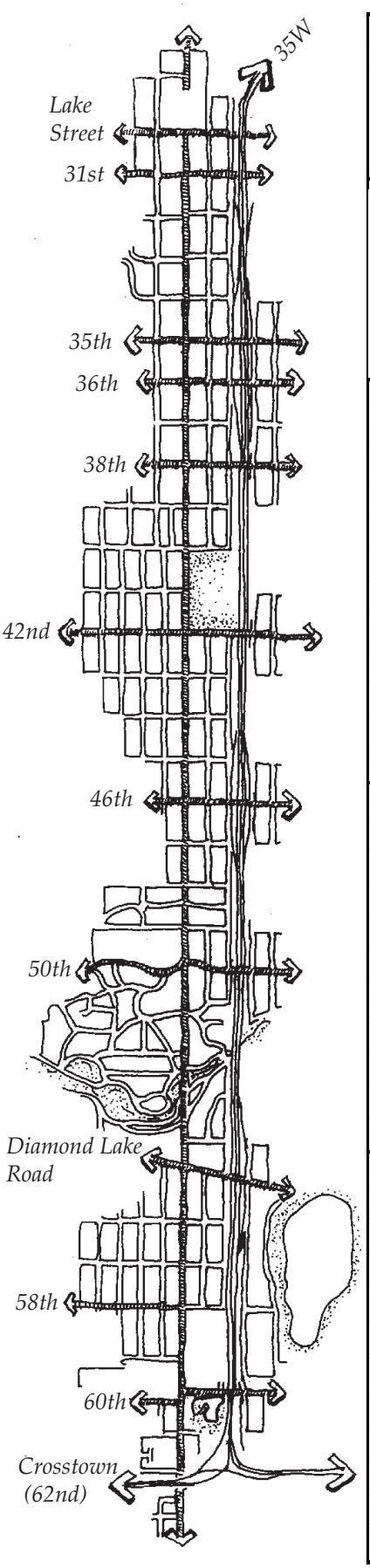
Key Intersections

Managing turning movements is critical to ensuring that maximum traffic volumes are accommodated and that adequate levels of service are maintained. By providing left-turn lanes at key intersections, turning movements are removed from the through travel lanes, thereby helping to ensure an orderly and efficient flow of traffic through the intersection.

Parking

Parking needs were a major consideration in developing the plan. Not only do commercial land uses rely on street parking for customers, but many residents, especially those in multi-family housing, depend on the availability of street parking. The plan responds to business needs at commercial intersections by leaving parking lanes and not proposing boulevards with large street trees. Also, there were several opportunities to throat side streets, but this was not proposed in favor of providing more parking spaces.

Solutions to parking problems do not always lie within the bounds of the right-of-way. Often times, reorganizing parking lots or rethinking off-street circulation plans off the street must be part of the overall strategy. Although outside the scope of this study, each of the community destination intersections, especially 38th and Diamond Lake Road, would benefit from an analysis of off-street parking options and internal connectivity for pedestrian and motorist.



		Existing								Proposed Road Design							
		West				East				West				East			
	Nicollet Avenue	Sidewalk to Lot	Sidewalk	Boulevard	Road width	Boulevard	Sidewalk	Sidewalk to Lot	ROW	Sidewalk to Lot	Sidewalk	Boulevard	Road width	Boulevard	Sidewalk	Sidewalk to Lot	ROW
Lyndale	Lake - 31st	0	15	0	50	0	15	0	80	0	18	0	45	0	17	0	80
	31st - 32nd	7	6	2	50	0	15	0	80	6	6	7	42	7	12	0	80
	32nd - 33rd	6	6	3	50	3	6	6	80	6	6	7	42	7	6	6	80
	33rd - 34th	6	6	3	50	3	6	6	80	6	6	7	42	7	6	6	80
	34th - 35th	6	6	3	50	3	6	6	80	6	6	7	42	7	6	6	80
	35th - 36th	6	6	3	50	3	6	6	80	6	6	7	42	7	6	6	80
Kingfield	36th - 37th	6	6	3	50	3	6	6	80	6	6	7	42	7	6	6	80
	37th - 38th	6	6	3	50	3	6	6	80	6	6	7	42	7	6	6	80
	38th Intersection N	0	15	0	50	0	15	0	80	0	14	0	53	0	14	0	81
	38th Intersection S	0	13	0	54	0	13	0	80	0	13	0	53	0	15	0	81
	38th - 39th	0	13	0	54	0	13	0	80	6	6	7	42	7	6	6	80
	39th - 40th	6	6	3	50	3	6	6	80	6	6	7	42	7	6	6	80
	40th - 41st	6	6	4	48	4	6	6	80								
	41st - 42nd	6	6	4	49	4	6	6	80								
	42nd - 43rd	6	6	3	50	3	6	6	80								
	43rd - 44th	6	6	3	50	3	6	6	80								
	44th - 45th	6	6	3	50	3	6	6	80								
	45th - 46th	6	6	3	50	3	6	6	80								
Tangletown	46th - 47th	6	9	0	50	3	6	6	80	6	9	0	50	4	5	6	80
	47th - 48th	6	6	3	50	0	9	6	80	6	5	6	46	6	5	6	80
	48th - Rustic Lodge	6	9	0	50	0	9	6	80	6	5	6	46	6	5	6	80
	Rustic Lodge - 49th	6	6	3	50	0	9	6	80	6	5	6	46	6	5	6	80
	49th - 50th	1	6	8	50	4	6	6	80	0	5	0	58	6	5	6	80
	50th - 51st	6	6	3	50	3	6	6	80	6	5	6	46	6	5	6	80
	51st - 52nd	8	5	2	50	2	5	8	80	8	5	4	46	4	5	8	80
	Minnehaha Parkway Bridge	-	7	-	50	-	7	-	-	-	14	-	36	-	14	-	-
	Minnehaha Parkway Bridge - 54th	6	8	0	52	0	9	7	80	6	7	0	53	0	7	8	81
	54th - Diamond Lake	0	8	0	50	0	8	0	66	0	7	0	53	0	8	0	68
	Diamond Lake Road Intersection N	0	8	0	50	0	8	0	66	0	7	0	52	0	8	0	67
Windom	Diamond Lake Road Intersection S	0	7	0	53	0	6	0	66	0	7	0	53	0	7	0	67
	Diamond Lake - 56th	0	5	3	50	3	5	0	66	0	6	6	42	6	6	0	66
	56th - 57th	0	8	0	50	3	5	0	66	0	6	6	42	6	6	0	66
	57th - 58th	0	8	0	47	2	5	4	66	0	6	6	42	6	6	0	66
	58th Intersection N	0	8	0	50	0	8	0	66	0	7	0	53	0	7	0	67
	58th Intersection S	0	8	0	50	0	8	0	66	0	7	0	53	0	7	0	67
	58th - 59th	0	6	2	50	2	6	0	66	0	6	6	42	6	6	0	66
	59th - 60th	0	6	2	50	2	6	0	66	0	6	6	42	6	6	0	66
	60th Intersection N	0	8	0	50	0	8	0	66	0	8	0	47	6	6	0	67
	60th Intersection S	0	8	0	50	0	8	0	66	0	5	3	53	0	6	0	67
	60th - 61st	0	6	2	50	0	8	0	66	0	6	6	42	6	6	0	66
	61st - 62nd	0	6	2	50	2	6	0	66	0	6	6	42	6	6	0	66

Road reconstructed in 2000

Moving Forward

Each month brings new activities to the avenue—a neighborhood organization establishes a facade improvement fund, a roadway improvement priority and funding is approved, or a property owner decides to redevelop a building. Little by little these activities begin to add up to comprehensive change. CSNAP maintains that it is urgent to get in front of these incremental changes with a commitment to a long-range plan. Significant community investment and citizen energy has gone into developing a design plan that lays a foundation for the future. The time is now to leverage these investments and this energy by taking the following actions:

1) Adopt the CSNAP plan as the blueprint for reconstruction of the avenue.

CSNAP urges adoption by neighborhood organizations, city hall, and the public works and planning departments.

2) Develop and adopt a reconstruction timetable for the avenue that is coordinated with other projects and plans.

CSNAP urges adoption by neighborhood organizations, city hall, and the public works and planning departments.

3) Maintain the integrity of the CSNAP plan by continuing to involve neighborhoods and citizens.

CSNAP envisions an ongoing dialogue between stakeholder groups to ensure coordination as respective projects move forward.

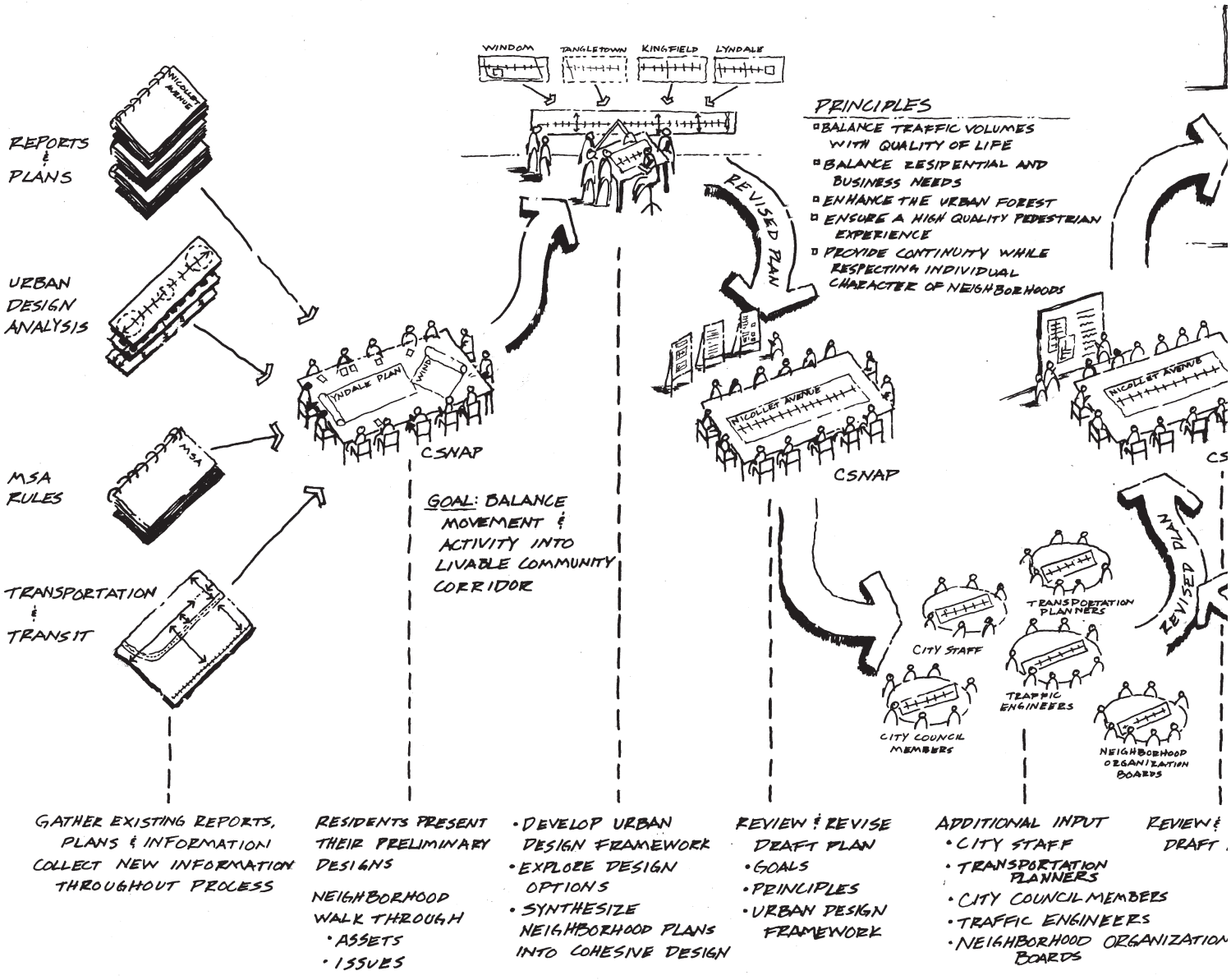
4) Select design elements that implement the plan. These include, but are not limited to: street trees, lighting, street furniture, paving materials, and human-scale public art.

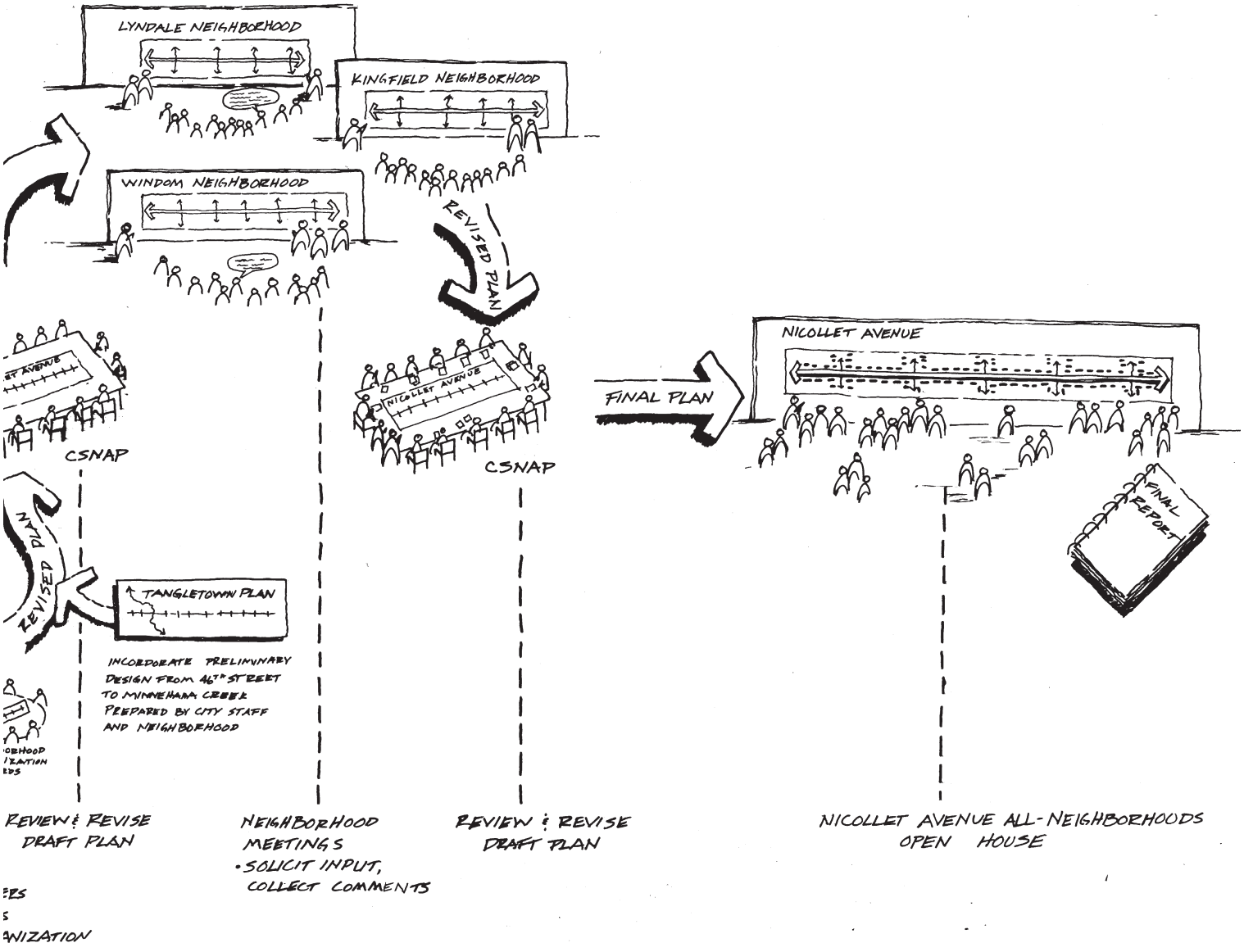
CSNAP envisions a second level of planning that will develop design details that flesh–out this plan. This planning could be initiated by any number of stakeholders, but designers should hold constant to the street, boulevard, and sidewalk dimensions of this plan.

Appendices

Appendix A: Process Diagram and Neighborhood Comment Forms

Appendix A includes an illustration of the process that CSNAP and the Design Center undertook. Also included are summaries of comment sheets completed by residents at design presentations in the Lyndale, Kingfield and Windom neighborhoods as well as the final "all-neighborhoods" presentation.


REPORTS & PLANS
URBAN DESIGN ANALYSIS
MSA RULES
TRANSPORTATION & TRANSIT
WINDOM
TANGLETOWN
KINGFIELD
LYNDALE
CSNAP
GOAL: BALANCE MOVEMENT & ACTIVITY INTO LIVABLE COMMUNITY CORRIDOR
REVISED PLAN
PRINCIPLES
BALANCE TRAFFIC VOLUMES WITH QUALITY OF LIFE
BALANCE RESIDENTIAL AND BUSINESS NEEDS
ENHANCE THE URBAN FOREST
ENSURE A HIGH QUALITY PEDESTRIAN EXPERIENCE
PROVIDE CONTINUITY WHILE RESPECTING INDIVIDUAL CHARACTER OF NEIGHBORHOODS
CSNAP
CITY STAFF
TRANSPORTATION PLANNERS
TRAFFIC ENGINEERS
CITY COUNCIL MEMBERS
NEIGHBORHOOD ORGANIZATION BOARDS
REVISED PLAN
GATHER EXISTING REPORTS, PLANS & INFORMATION
COLLECT NEW INFORMATION THROUGHOUT PROCESS
RESIDENTS PRESENT THEIR PRELIMINARY DESIGNS
NEIGHBORHOOD WALK THROUGH
• ASSETS
• ISSUES
• DEVELOP URBAN DESIGN FRAMEWORK
• EXPLORE DESIGN OPTIONS
• SYNTHESIZE NEIGHBORHOOD PLANS INTO COHESIVE DESIGN
REVIEW & REVISE DRAFT PLAN
• GOALS
• PRINCIPLES
• URBAN DESIGN FRAMEWORK
ADDITIONAL INPUT
• CITY STAFF
• TRANSPORTATION PLANNERS
• CITY COUNCIL MEMBERS
• TRAFFIC ENGINEERS
• NEIGHBORHOOD ORGANIZATION BOARDS
REVIEW & DRAFT


LYNDALE NEIGHBORHOOD
KINGFIELD NEIGHBORHOOD
WINDOM NEIGHBORHOOD
REVISED PLAN
CSNAP
NICOLLET AVENUE
CSNAP
FINAL PLAN
NICOLLET AVENUE
FINAL REPORT
REVISED PLAN
TANGLETOWN PLAN
INCORPORATE PRELIMINARY DESIGN FROM 46TH STREET TO MINNEHAHA CREEK PREPARED BY CITY STAFF AND NEIGHBORHOOD
REVIEW & REVISE DRAFT PLAN
NEIGHBORHOOD MEETINGS
• SOLICIT INPUT, COLLECT COMMENTS
REVIEW & REVISE DRAFT PLAN
NICOLLET AVENUE ALL-NEIGHBORHOODS OPEN HOUSE

COMMENT FORM SUMMARY

Lyndale Neighborhood

February 4, 2002

This plan was developed by members of Citizens for a Sensible Nicollet Avenue Plan (CSNAP) with assistance from the Design Center for American Urban Landscape, University of Minnesota. We would like to know your thoughts regarding the plan. What do you like? What do you dislike? How could the plan be improved?

Do you support narrowing the street to provide wider boulevards for street trees and to calm traffic?

15 responses
13 Yes's.

7 unqualified
2 emphatically in favor
4 emphasized the asset of green space
3 emphasized calmer, slower traffic
1 response opposed to bike lane, as it would diminish existing green verge

2 No's

Both do not support the narrowing of the street. One comment – 'wide boulevard ≠ green space'.
One comment; 'snow removal requires current street width and narrower streets will force faster traffic to secondary adjacent streets'.

Do you support widening the street at key intersections—31st Street and 36th Street—to provide left-turn lanes?

15 responses
8 Yes's

4 unqualified, 2 of which are emphatic
3 with comments that clearly defined lanes (through painting on street) is efficient, easy to maintain and flexible over time – and that while there may not be a pressing need for turn lanes now, the need seems probable in the near future.
1 with comment '31st St. needs turn lane; 36th St. would benefit from one'.

1 qualified Yes

"Only at key intersections."

1 "Yes and No"

"Yes" to 31st St. "No" to 36th St.

4 Undecided

2 comments: traffic study should be conducted to determine need.
1 comment: depends on where I-35W ramps are.
1 comment: " Maybe, if you don't funnel traffic to those intersections."

1 No

Citing need to know where I-35W ramps will be situated.

Would you support a median south of 31st Street that might include plantings, art, banners, lighting or other amenities

15 responses

10 Yes's

5 unqualified

5 qualified. Qualifications include 'with neighborhood involvement'; 'provided not too obstructive'; 'not a priority but will support it'; 'planting and lighting amenities improve safety and aesthetics'; respondent underlined "plantings"

2 Ambivalent:

'Depends on what it looks like – median must be attractive.'

'Not sure it's necessary.'

3 No's

2 Emphatic, citing that planted medians historically are not maintained and become litter collectors.

1 comment, concerned with maintenance responsibilities -also citing planting area on 35th St. as unsightly most of the time

Would you support closing either 32nd or 33rd Street for increased safety?

13 responses

5 Yes's, qualified.

1 comment: "Excellent idea."

3 comments: "Yes" to 33rd St only (1 specifically saying "No" to the closing of 32nd).

1 "Yes" – 'if attention is paid to maintain safety.'

4 Maybes and Mixed responses.

1 "Probably."

1 'With neighborhood approval.'

2 comments: 'Would have to see design first.'

4 No's

Comments:

'Closing off roads does not increase safety.'

'Closing off roads angers people.'

'Too many roads closed off presently. Forces traffic into alleys and residential streets.'

'Not if the road is closed to make parking; I'd rather have the road. (This comment aimed specifically at suggestion to close 32nd St.')

Additional comments

8 responses

1 comment – cannot determine relevance.

3 comments of 'Good job/nice work.' Appreciation of citizen involvement.

1 comment – strong comment that this work, though admirable is unfeasible, due to (1) lack of adequate information concerning I-35W ramp placement and (2) realities of ever increasing traffic volumes for Nicollet Ave.

1 comment – more thought needed concerning high traffic businesses east side 33rd.

1 comment – noting lack of provisions for bicycle traffic.

1 comment – expressing importance of providing on-street parking for businesses – where deciding factor should be length of time allowed to park - not peak-flow traffic times..

COMMENT FORM SUMMARY

Kingfield Neighborhood

February 18, 2002

This plan was developed by members of Citizens for a Sensible Nicollet Avenue Plan (CSNAP) with assistance from the Design Center for American Urban Landscape, University of Minnesota. We would like to know your thoughts regarding the plan. What do you like? What do you dislike? How could the plan be improved?

Do you support narrowing Nicollet Avenue to provide wider boulevards for street trees and to calm traffic? Do you support narrowing 38th Street west of Nicollet Avenue in order to widen the sidewalks?

6 responses.
5 Yes/Yes's
3 unqualified
2, qualified. One wanting more green on street; one cautioning against planting blocking sidewalk lighting.

1 No/No, unqualified

Do you support widening the street at key intersections—36th Street and 38th Street—to provide left-turn lanes?

6 responses.
5 Yes's.
3 unqualified.
2, qualified. One comment that this would improve traffic flow, by reducing speeding. One comment that traffic already behaves as though there are left turn lanes at these intersections.

1 comment, with no "yes/no" response
"Consider bus lane location. I like having a lane free for turns during peak traffic times and then available for parking on Sat/Sundays and non-peak times."

Would you support medians at the intersection of Nicollet Avenue and 38th Street that might include plantings, art, banners, lighting or other amenities?

6 responses.
3 Yes's
1 unqualified.
2, qualified. Concerns for maintenance and pedestrian safely.

3 dissenting comments.
1 ambivalent about median at this particular intersection for aesthetic reasons
1 concerned with traffic and maintenance issues of median.
1 comment: "Not really."

What do you see as the advantages and disadvantages of the two through lanes with a left turn lane configuration as shown in the CSNAP scenario?

5 responses
Comments:
Advantages: Faster travel; less congestion; safer turns better traffic flow.
Disadvantages seen as higher traffic volume, compromise of pedestrian experience.

What do you like/what do you dislike about the reconstructed portion of Nicollet Avenue (from 40th to 46th Street)? What positive or negative changes have you noticed following the reconstruction?

6 responses
Summary: *4 mentions of lights*
3 mentions of trees or green space
3 mentions of "street itself" - improved traffic and neighborhood feel
2 mentions of brickwork

"The street lights are a plus - much more inviting and providing a "neighborhood" feel. The trees and brickwork are also positives."
"I think it looks great. Even the not-so-pretty areas look better. Traffic moves more smoothly and the whole stretch is a much calmer drive.
"The lighting, the street itself."
[I like the] "trees, lights, brickwork."
"Continuity of lighting - better green space."
"A smooth road with uniformity."

Additional comments

2 additional comments

"The road between 30th and 39th is crappy."
"I think adding more green to the Lake to 40th street stretch would look wonderful. I fear that the designers are not familiar enough with the type of people in that stretch. There's not a lot of walkers, mainly bus takers and the businesses are not all that beautiful."

COMMENT FORM SUMMARY

Windom Neighborhood

March 11, 2002

This plan was developed by members of Citizens for a Sensible Nicollet Avenue Plan (CSNAP) with assistance from the Design Center for American Urban Landscape, University of Minnesota. We would like to know your thoughts regarding the plan. What do you like? What do you dislike? How could the plan be improved?

Do you support narrowing Nicollet Avenue to provide wider boulevards for street trees and to calm traffic? Please comment.

15 Respondents, 14 responses.

11 In support
- *4 unqualified "Yes"*
- *5 with comments:*
  - *2 comments it will improve traffic*
  - *2 comments it will improve the neighborhood (more green)*
- *1 qualifying comment: "As long as traffic can flow efficiently."*
- *1 response: "I support the entire plan."*

4 Opposed
- *2 unqualified "No"*
- *1 with comment that slowing traffic will only increase noise and congestion; and too much salt is used for boulevard plantings to flourish.*
- *1 "No" with reference to Additional Comments section.*

Do you support widening the street at Diamond Lake Road, 58th Street and 60th Street to provide left-turn lanes? Should left-turn lanes be provided at other intersections? Please comment.

15 Respondents, 14 responses.

8 In support
- *4 unqualified "Yes"*
- *4 with comments:*
  - *Should be left turn lane at 56th for high volume TCF traffic.*
  - *Especially 60th - with need to accommodate large semi's*
  - *" Left turn lanes good idea."*
  - *" Your plan is a good plan and in the best interests of the community."*

1 Yes and No
- *"Yes" to turn lanes at Diamond Lake Rd., 58th and 60th. "No" to turn lanes at other intersections.*

3 Ambiguous comments

"There are already Left turn lanes @ Diamond Lake Road, but there should also be left-turn signals and pedestrian walk signs for pedestrian safety."

"Limit parking in front of Barber Shop, Warners Stellion from 4-6pm. Have Post Office move drop box to side of building to prevent double parking that backs [up] traffic."

"Should have four lanes traffic between 58th and 62nd."

2 Opposed

"No, I don't think it is necessary at this point. No one can park in right lane because it's a bus stop, so travelers may go around left-turners."

"I don't think the street should be widened - unless it means smaller boulevards - keep existing left turn lanes."

Would you support moving the bus stop in front of Windom Gables to the corner of the block (the southwest corner of 61st Street and Nicollet Avenue)? Please comment.

15 Respondents, 9 responses.

7 In support

5 unqualified Yes's

2 with comments:

"I think all bus stops should be at the corners and parking should be in the middle of the block."

"Most residents do not want a bus stop in front of their houses."

1 "No opinion."

1 "?"

Would you support a traffic signal at the intersection of Nicollet Avenue and east 59th Street that operated during peak periods (approximately 6–9am and 4–6pm)? Should that light function as a pedestrian-activated caution signal during non-peak periods? Please comment.

15 Respondents, 14 responses.

9 In support

4 unqualified Yes's

5 with comments:

"Great idea."

" Good idea to stop traffic for semi-traffic and safety issues for City Limits."

" Yes and move the school bus stop into the apartment area"

" Yes - now, without a light people pull out onto Nicollet in front of oncoming traffic causing potentially dangerous conditions."

" Yes, I've seen cars wait for long periods of time trying to go left out of City Limits and they can't because of excessive traffic."

5 Opposed

1 unqualified No

1 emphatic No "No. No. No."

3 with comments:

"Time the lights at 59th and 58th to allow space (time) for left turn out of City Limits."

"No, that would be three lights in three blocks."

What do you see as the advantages and disadvantages of Stevens Avenue and 58th Street being converted into one-way streets from Diamond Lake Road to Nicollet Avenue?

15 Respondents, 12 responses.

3 Neutral responses: "None." "No opinion." One dash mark.

3 Ambiguous responses
"With stop signs on Stevens, so there is less speeding."
"Disadvantage - may affect ability to access 58th St. Auto. Advantage - keep traffic from speeding through neighborhood to avoid Diamond Lake intersection."
Question mark "?"

Remaining 6 responses express general disapproval of one-way option; criticism focusing on inconvenience to neighbors, shift of traffic into alleys, fear that one-way will encourage speeding.

"Don't change."
"Stevens would become a freeway."
"It will increase traffic bunching up."
"Leave two-way with speed bumps and stop signs on 1st Avenue and Stevens Avenue"
"Disadvantage: If Stevens is a one-way all the way, the traffic will shift to 1st Ave. and the alley."
"Most roads that parallel freeways are one-way. Residents along this road may find this a nuisance."

Additional comments

15 Respondents, 9 responses

No strong theme among "additional comments". Two respondents remarked that the local businesses ought to participate more as neighbors, if they expect the neighborhood to support them.

"(A) Are the trucks used for delivery within size limits for city? (B) Should the neighborhood be expected to accommodate truck traffic for the benefit of a few businesses that really don't give much back to the community? Community is a two way relationship."
"Close some of the exits on I 35 W. Open Nicollet from Downtown through Minneapolis should be our #1 concern."
"I'm one of the owners of Klier's Nursery - Don't change the width of the street, it's hard enough to get big trucks into our business now! If you make the street narrower it would be almost impossible for us to get trucks in. (Please call Howie at Klier's 612.866.8771 for any questions.)"
"With all respect to Klier's, let them become a good neighbor by contributing too. Make adjustments for public transportation, not semis (they will be fine)."
"How about using the median in front of the Fire Station as a shared turn lane!"
"Stop sign at Nicollet & 62nd - should stay, it helps SLOW traffic!"
"Keep the stop sign on 62nd and Nicollet to slow traffic down."
"Keep up the good work. "Measure twice—cut once.""
"Bring back the street cars"

COMMENT FORM SUMMARY

All Neighborhoods Meeting

April 13, 2002

This plan was developed by members of CSNAP with assistance from the Design Center for American Urban Landscape, University of Minnesota. We would like to know our thoughts regarding the plan. Please use this form for written comments.

Do you support a comprehensive approach for planning the street design of the avenue? Why?

13 responses

12 Yes's
- *1 unqualified*
- *11 with comments*
  - *3 positively remarked on inclusion of neighborhood input*
  - *3 positively remarked on balance, mix, attention to complexity demonstrated in plan*

1 response (no "yes/no" response)
- *"Hopefully it might cut down on 62/35W freeway drivers cutting through out neighborhood to avoid 62 Crosstown gridlock."*

Do you support moving ahead with the basic CSNAP plan and recommendations? Why?

12 responses

10 Yes's
- *2 unqualified*
- *8 with comments*
  - *3 positively remarked on inclusion of neighborhood input*
  - *1 "Yes with changes. Wider boulevards needed."*

1 "Hard to say."
1 "0"

What do you like best about the plan?

12 responses
- *4 cited the attention to pedestrian scale, needs and elements*
- *3 cited involvement and stimulation of neighborhood*
- *3 cited attention to greenspace and inclusion of trees*
- *3 cited traffic calming or improvement elements*

What do you like least about the plan?

11 Responses

1 "0" (naught sign)

2 comments on time-table; stress of not knowing when work will start; wanting work to begin sooner.

5 comments of additional/other traffic concerns;

"Narrowing of road is a problem…

"Little…consideration for traffic calming…between Diamond Lake Road and Minnehaha Creek."

Use of 1st Ave (residential street) by truck traffic

Bicycle safety

Maintenance of island greenspace

2 comments on civic process:

Need to include more property owners & provide information re: impacts on property and property value.

Comment that civic dialogue tends to polarize opinion; squeaky wheel gets the grease phenomenon.

1 comment 'Nothing wrong with plan'

"Nothing - I know these things take time and it is public dialogue, so I know I can't expect everyone to agree with me."

Additional Comments:

8 responses

3 comments concerning mass transit

Needs improvement

Need to minimize disruption of service through redevelopment

Need to accommodate turning transit traffic, specifically at DLR and Nicollet

2 comments on need to keep commercial traffic off residential streets

2 comments/concerns on potential real estate assessments

3 respondents included their name and phone number

Note:

Appendix B: Road Dimensions and Traffic Volumes

This appendix contains descriptions of the existing conditions along Nicollet Avenue from Lake Street to Highway 62. This information was provided to CSNAP by City of Minneapolis staff.

Lake St to E 31st St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 8,5000
Future ADT (2019) = 9,350 (10% increase)
Future ADT (2019) = 10,200 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	0.0 ft
Boulevard east side =	0.0 ft
Sidewalk west side =	15.0 ft
Sidewalk east side =	15.0 ft
Next to lot west side =	0.0 ft
Next to lot east side =	0.0 ft

E 31st St to E 32nd St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 11,300
Future ADT (2019) = 12,430 (10% increase)
Future ADT (2019) = 13,560 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	2.0 ft
Boulevard east side =	0.0 ft
Sidewalk west side =	6.0 ft
Sidewalk east side =	15.0 ft
Next to lot west side =	7.0 ft
Next to lot east side =	0.0 ft

E 32nd St to E 33rd St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 11,300
Future ADT (2019) = 12,430 (10% increase)
Future ADT (2019) = 13,560 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	3.0 ft
Boulevard east side =	3.0 ft
Sidewalk west side =	6.0 ft
Sidewalk east side =	6.0 ft
Next to lot west side =	6.0 ft
Next to lot east side =	6.0 ft

E 33rd St to E 34th St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 11,300
Future ADT (2019) = 12,430 (10% increase)
Future ADT (2019) = 13,560 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	3.0 ft
Boulevard east side =	3.0 ft
Sidewalk west side =	6.0 ft
Sidewalk east side =	6.0 ft
Next to lot west side =	6.0 ft
Next to lot east side =	6.0 ft

E 34th St to E 35th St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 11,300
Future ADT (2019) = 12,430 (10% increase)
Future ADT (2019) = 13,560 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	3.0 ft
Boulevard east side =	3.0 ft
Sidewalk west side =	6.0 ft
Sidewalk east side =	6.0 ft
Next to lot west side =	6.0 ft
Next to lot east side =	6.0 ft

E 35th St to E 36th St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 8,500
Future ADT (2019) = 9,350 (10% increase)
Future ADT (2019) = 10,200 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	3.0 ft
Boulevard east side =	3.0 ft
Sidewalk west side =	6.0 ft
Sidewalk east side =	6.0 ft
Next to lot west side =	6.0 ft
Next to lot east side =	6.0 ft

E 36th St to E 37th St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 8,500
Future ADT (2019) = 9,350 (10% increase)
Future ADT (2019) = 10,200 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	3.0 ft
Boulevard east side =	3.0 ft
Sidewalk west side =	6.0 ft
Sidewalk east side =	6.0 ft
Next to lot west side =	6.0 ft
Next to lot east side =	6.0 ft

E 37th St to E 38th St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 8,500
Future ADT (2019) = 9,350 (10% increase)
Future ADT (2019) = 10,200 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	3.0 ft
Boulevard east side =	3.0 ft
Sidewalk west side =	6.0 ft
Sidewalk east side =	6.0 ft
Next to lot west side =	6.0 ft
Next to lot east side =	6.0 ft

E 38th St to E 39th St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 12,500
Future ADT (2019) = 13,750 (10% increase)
Future ADT (2019) = 14,999 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	27.0 ft
Roadway east side =	27.0 ft
Boulevard west side =	0.0 ft
Boulevard east side =	0.0 ft
Sidewalk west side =	13.0 ft
Sidewalk east side =	13.0 ft
Next to lot west side =	0.0 ft
Next to lot east side =	0.0 ft

E 39th St to E 40th St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 12,500
Future ADT (2019) = 13,750 (10% increase)
Future ADT (2019) = 14,999 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	3.0 ft
Boulevard east side =	3.0 ft
Sidewalk west side =	6.0 ft
Sidewalk east side =	6.0 ft
Next to lot west side =	6.0 ft
Next to lot east side =	6.0 ft

E 46th St to E 47th St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 12,200
Future ADT (2019) = 13,420 (10% increase)
Future ADT (2019) = 14,640 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	0.0 ft
Boulevard east side =	3.0 ft
Sidewalk west side =	9.0 ft
Sidewalk east side =	6.0 ft
Next to lot west side =	6.0 ft
Next to lot east side =	6.0 ft

E 47th St to E 48th St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 12,200
Future ADT (2019) = 13,420 (10% increase)
Future ADT (2019) = 14,640 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	3.0 ft
Boulevard east side =	0.0 ft
Sidewalk west side =	6.0 ft
Sidewalk east side =	9.0 ft
Next to lot west side =	6.0 ft
Next to lot east side =	6.0 ft

Information from 40th to 46th Streets was not provided by City.

E 48th St to Rustic Lodge
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 12,200
Future ADT (2019) = 13,420 (10% increase)
Future ADT (2019) = 14,640 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	0.0 ft
Boulevard east side =	0.0 ft
Sidewalk west side =	9.0 ft
Sidewalk east side =	9.0 ft
Next to lot west side =	6.0 ft
Next to lot east side =	6.0 ft

E 49th St to E 50th St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 12,200
Future ADT (2019) = 13,420 (10% increase)
Future ADT (2019) = 14,640 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	8.0 ft
Boulevard east side =	3.5 ft
Sidewalk west side =	6.0 ft
Sidewalk east side =	6.0 ft
Next to lot west side =	1.0 ft
Next to lot east side =	5.5 ft

Rustic Lodge to E 49th St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 12,200
Future ADT (2019) = 13,420 (10% increase)
Future ADT (2019) = 14,640 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	3.0 ft
Boulevard east side =	0.0 ft
Sidewalk west side =	6.0 ft
Sidewalk east side =	9.0 ft
Next to lot west side =	6.0 ft
Next to lot east side =	6.0 ft

E 50th St to E 51st St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 12,200
Future ADT (2019) = 13,420 (10% increase)
Future ADT (2019) = 14,640 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	3.0 ft
Boulevard east side =	3.0 ft
Sidewalk west side =	6.0 ft
Sidewalk east side =	6.0 ft
Next to lot west side =	6.0 ft
Next to lot east side =	6.0 ft

E 51st St to E 52nd St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 12,200
Future ADT (2019) = 13,420 (10% increase)
Future ADT (2019) = 14,640 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	2.0 ft
Boulevard east side =	2.0 ft
Sidewalk west side =	5.0 ft
Sidewalk east side =	5.0 ft
Next to lot west side =	8.0 ft
Next to lot east side =	8.0 ft

Minnehaha Pkwy to E 54th St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 12,200
Future ADT (2019) = 13,420 (10% increase)
Future ADT (2019) = 14,640 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	26.0 ft
Roadway east side =	26.0 ft
Boulevard west side =	0.0 ft
Boulevard east side =	0.0 ft
Sidewalk west side =	8.5 ft
Sidewalk east side =	7.5 ft
Next to lot west side =	5.5 ft
Next to lot east side =	6.5 ft

E 52nd St to Minnehaha Parkway
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 12,200
Future ADT (2019) = 13,420 (10% increase)
Future ADT (2019) = 14,640 (20% increase)
Right of Way west side = 40.0 ft
Right of Way east side = 40.0 ft
Total = 80.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	0.0 ft
Boulevard east side =	0.0 ft
Sidewalk west side =	7.0 ft
Sidewalk east side =	7.0 ft
Next to lot west side =	8.0 ft
Next to lot east side =	8.0 ft

E 54th St to Diamond Lake Road
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 12,200
Future ADT (2019) = 13,420 (10% increase)
Future ADT (2019) = 14,640 (20% increase)
Right of Way west side = 33.0 ft
Right of Way east side = 33.0 ft
Total = 66.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	0.0 ft
Boulevard east side =	0.0 ft
Sidewalk west side =	8.0 ft
Sidewalk east side =	8.0 ft
Next to lot west side =	0.0 ft
Next to lot east side =	0.0 ft

Diamond Lake Road to E 56th St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 14,900
Future ADT (2019) = 16,390 (10% increase)
Future ADT (2019) = 17,880 (20% increase)
Right of Way west side = 33.0 ft
Right of Way east side = 33.0 ft
Total = 66.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	3.0 ft
Boulevard east side =	3.0 ft
Sidewalk west side =	5.0 ft
Sidewalk east side =	5.0 ft
Next to lot west side =	0.0 ft
Next to lot east side =	0.0 ft

E 56th St to E 57th St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 14,900
Future ADT (2019) = 16,390 (10% increase)
Future ADT (2019) = 17,880 (20% increase)
Right of Way west side = 33.0 ft
Right of Way east side = 33.0 ft
Total = 66.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	0.0 ft
Boulevard east side =	3.0 ft
Sidewalk west side =	8.0 ft
Sidewalk east side =	5.0 ft
Next to lot west side =	0.0 ft
Next to lot east side =	0.0 ft

E 57th St to E 58th St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 14,900
Future ADT (2019) = 16,390 (10% increase)
Future ADT (2019) = 17,880 (20% increase)
Right of Way west side = 33.0 ft
Right of Way east side = 33.0 ft
Total = 66.0 ft

Roadway west side =	25.0 ft
Roadway east side =	22.0 ft
Boulevard west side =	0.0 ft
Boulevard east side =	2.0 ft
Sidewalk west side =	8.0 ft
Sidewalk east side =	5.0 ft
Next to lot west side =	0.0 ft
Next to lot east side =	4.0 ft

E 58th St to E 59th St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 14,900
Future ADT (2019) = 16,390 (10% increase)
Future ADT (2019) = 17,880 (20% increase)
Right of Way west side = 33.0 ft
Right of Way east side = 33.0 ft
Total = 66.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	2.0 ft
Boulevard east side =	2.0 ft
Sidewalk west side =	6.0 ft
Sidewalk east side =	6.0 ft
Next to lot west side =	0.0 ft
Next to lot east side =	0.0 ft

E 59th St to E 60th St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 14,900
Future ADT (2019) = 16,390 (10% increase)
Future ADT (2019) = 17,880 (20% increase)
Right of Way west side = 33.0 ft
Right of Way east side = 33.0 ft
Total = 66.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	2.0 ft
Boulevard east side =	2.0 ft
Sidewalk west side =	6.0 ft
Sidewalk east side =	6.0 ft
Next to lot west side =	0.0 ft
Next to lot east side =	0.0 ft

E 60th St to E 61st St
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 14,900
Future ADT (2019) = 16,390 (10% increase)
Future ADT (2019) = 17,880 (20% increase)
Right of Way west side = 33.0 ft
Right of Way east side = 33.0 ft
Total = 66.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	2.0 ft
Boulevard east side =	0.0 ft
Sidewalk west side =	6.0 ft
Sidewalk east side =	8.0 ft
Next to lot west side =	0.0 ft
Next to lot east side =	0.0 ft

E 61st St to TH 62
2 traffic lanes, 2 parking lanes
Present ADT (1999) = 14,900
Future ADT (2019) = 16,390 (10% increase)
Future ADT (2019) = 17,880 (20% increase)
Right of Way west side = 33.0 ft
Right of Way east side = 33.0 ft
Total = 66.0 ft

Roadway west side =	25.0 ft
Roadway east side =	25.0 ft
Boulevard west side =	2.0 ft
Boulevard east side =	2.0 ft
Sidewalk west side =	6.0 ft
Sidewalk east side =	6.0 ft
Next to lot west side =	0.0 ft
Next to lot east side =	0.0 ft

Appendix C: Basic Corridor Sizing Requirements

This appendix presents the basic Nicollet Avenue sizing requirements research of Meyer, Mohaddes Associates, Inc.

Meyer, Mohaddes Associates, Inc.
An Iteris Company

MEMORANDUM TO: Ms. Carol Swenson
Senior Research Fellow
Design Center for American Urban Landscape
1313 5th Street S.E
Minneapolis, MN 55414

FROM: Fred Dock
Murthy Koti

DATE: April 11, 2002

SUBJECT: Nicollet Avenue Corridor Study
Basic Sizing Requirements 17-J01-0088

This memorandum presents the findings of a Nicollet Avenue corridor study, which identified the basic sizing requirements for the corridor. The study identified the lanes requirements along the Nicollet Avenue corridor broadly from Lake Street to 61st Street from a planning perspective. A detailed intersection level of analysis was also conducted at a few important intersections in the corridor to identify the turn lane requirements for satisfactory levels of operation. Planning level of analysis was also applied for a 20% volume growth rate scenario to interpret the needs for the corridor in the future.

Approach

The general sizing of the width of the corridor was conducted at a planning level of detail to provide an understanding of the characteristics of the corridor and to narrow the focus of the detailed operations analysis.

Lane capacity and Level of Service are the two primary determinants in sizing basic lane requirements on roadways. Level of Service D is used as the primary cutoff for operations in urban conditions. Lane capacity and traffic volumes are used to determine Level of Service. Lane capacity is determined through methods described in the Highway Capacity Manual (Transportation Research Board, 2000), primarily in Chapters 10, 20, and 21. Arterial capacity is a mixture of intersection and basic lane operating characteristics and can be quite complicated to calculate. The Florida Department of Transportation (FDOT) has developed a program that rigorously applies the arterial criteria of the HCM as a series of worksheets to calculate service volumes for a segment of roadway. The criteria are based on physical characteristics of the roadway that include signal spacing, directional distribution, percent left turns, and percent green time. By comparing traffic volumes to the calculated service volumes, the number of basic through lanes required can be determined.

Existing Traffic Counts

Turning movement traffic counts at intersections along the study corridor were obtained from the City of Minneapolis. **Figure 1** illustrates the existing P.M. peak hour turning movement counts and represents a composite existing peak hour. The composite peak represents the highest count hours within the evening commute period for each intersection. The obtained data was collected during various years and inconsistencies do exist in the traffic volumes. In other words, from a network perspective, the volumes are not balanced.

The average K factor (percentage of peak hour traffic with respect to daily traffic) for all data stations was 11%. Fast growing areas and rural areas may experience K factors as high as 13%-15%, whereas fully developed and or congested areas typically experience K factors in the range of 8%-9%. Nicollet Avenue is a unique arterial with multiple trip purposes of varying lengths. If the entire corridor were to fall into an average then the application of the Florida worksheets would be simple and the basic capacity of the average statistics would be applicable to the entire corridor. However, irregularities in the travel patterns and the effect of crossing arterials led to an analysis of patterns that would group together segments of Nicollet Avenue into logical pieces to more accurately reflect operating capacities on Nicollet Avenue.

Capacity-Based Lane Requirements

The following elements were reviewed to identify segmentation of the corridor to apply the ART TAB calculation sheets. Detailed calculations for each item are found in the appendix.

Signal Spacing

Signal spacing along the corridor is irregular and does not fall into a pattern that would significantly affect the operating performance of the corridor as a whole or in segments. Table A-1 shows signal spacing in the corridor

Percentage of Green Time

The second largest factor affecting the prevailing service volume calculations on Nicollet Avenue is the percentage of green signal time allocated to north-south movements. Table A-2 shows the variation in arterial green time

Directionality

Directionality refers to the prevailing direction of travel along the roadway and can be biased in one direction or the other, or can be balanced. Table A-3 shows an analysis of directionality in the corridor.

Existing Counts

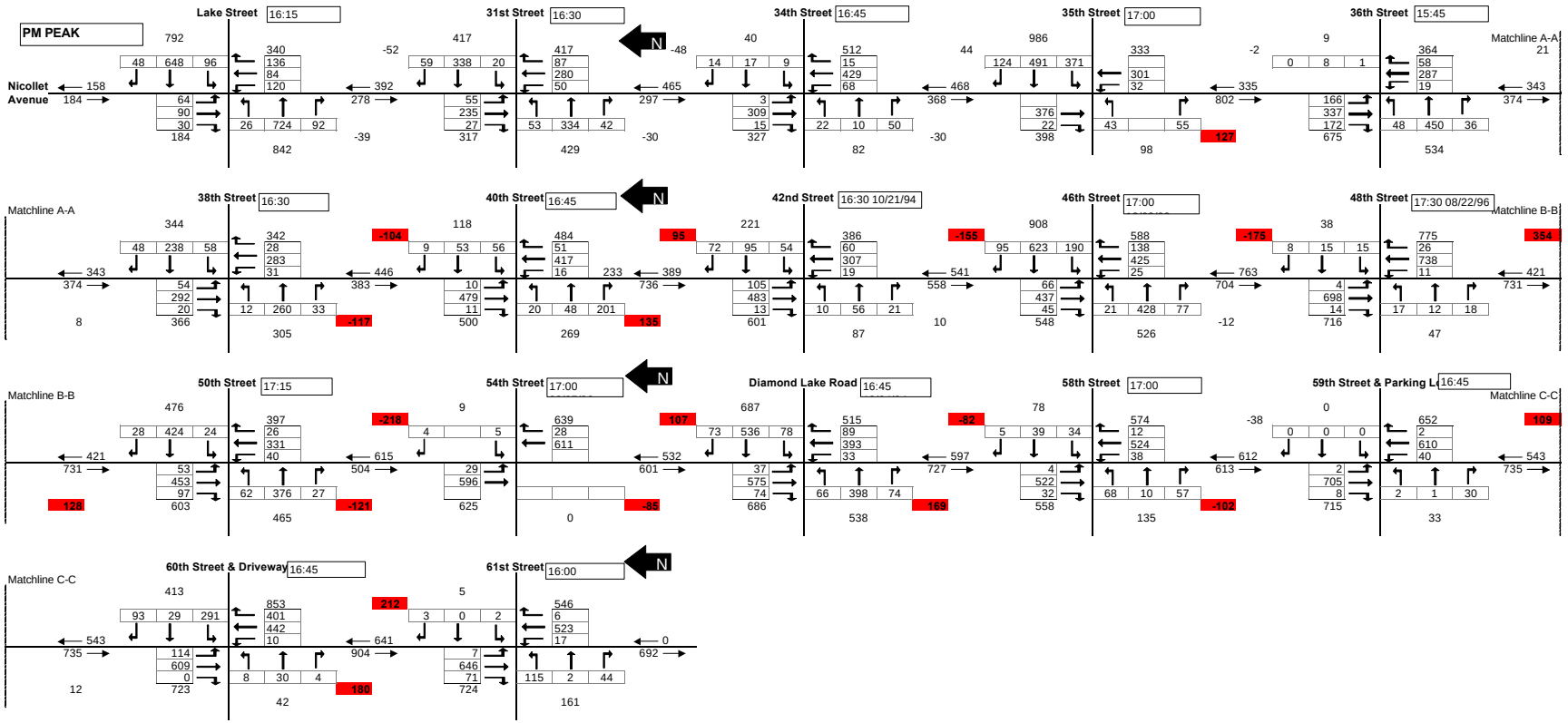


Figure 1 Existing PM Peak Hour Traffic Counts

Segment Characteristics

The existing and the 20% growth rate traffic volume scenarios were evaluated against the capacity thresholds to determine basic lane needs. Table 1 summarizes this evaluation. The conclusions that can be drawn include the following:

- The basic lane requirement on Nicollet Avenue between Lake Street and 61st Street is a single lane in each direction except at the intersection of 48th Street, where a minimum of two lanes in each direction is required. This conclusion is based on the results from the analysis at a planning level of detail.
- There is an inconsistency in the traffic volume data as mentioned earlier. The magnitude of through volume flowing on Nicollet Avenue at 48th Street is a factor that triggers the need for two lanes at this location. Volumes at adjacent intersections are lower and remain within the one lane per direction threshold.

Table 1 Basic Through Lane Requirements for Nicollet Avenue Corridor

Nicollet Avenue Intersection	Peak Hour	20% increase in Peak Vol	Two-way peak hour volume Thresholds
Lake Street	524	629	1010 1 lane (each direction)
31st Street	734	881	2140 2 lanes (each direction)
34th Street	839	1007	
35th Street	731	877	
36th Street	1039	1247	
38th Street	708	850	1460 1 lane (each direction)
40th Street	984	1181	2930 2 lanes (each direction)
42nd Street	987	1184	
46th Street	1136	1363	
48th Street	1491	1789	
50th Street	1000	1200	
54th Street	1264	1517	
Diamond Lake Road	1201	1441	2340 1 lane (each direction)
58th Street	1132	1358	4680 2 lanes (each direction)
59th Street & Parking Lot	1367	1640	
60th Street & Driveway	1576	1891	
61st Street	1270	1524	

Operational Analysis:

The corridor study was further developed with an operational analysis at three key intersections in the corridor for the 20% growth rate scenario. This operational analysis provides the details relating to turn lane requirements and other signal timing needs at these intersections in order for it to operate at an acceptable Level of Service 'D' or better.

The intersection of Nicollet at 38th Street, 46th Street and Diamond Lake road were analyzed for operational performance using the software 'Synchro'. The operational analysis was performed using a 20% volume growth rate. Consideration was given to the future changes in the corridor. Assumptions with regard to changes in the freeway access ramps at 35th and 36th Street were made. Volumes were adjusted accordingly to reflect these changes. Various scenarios with different intersection geometry were analyzed for Level of Service D or better, to arrive at geometry with lowest possible number of lanes at each intersection. This operational test analysis was conducted to provide a guide for designers to work with while designing the corridor. The results from the operational analysis are shown in the appendix.

Conclusions

The analysis indicates that Nicollet Avenue between Lake street and 61St Street should operate at acceptable levels of service with a single lane cross section in each direction except at 48th Street, which needs two lanes in each direction. The Florida DOT analysis methodology indicates the need for two lanes in each direction on Nicollet at 48th street due to the magnitude of through volume flowing on Nicollet at this intersection. Further evaluation of the traffic volumes on Nicollet Avenue near 48th street is necessary to understand why volumes appear higher at this location. The operational analysis for the 20% growth rate scenario indicates that Nicollet Avenue at 38th Street needs a Southbound left turn lane due to the magnitude of left turning traffic.

Appendix A

Nicollet Avenue Corridor
Operations Characteristics

Traffic Operations Characteristics

The information provided in the following tables were obtained from the City of Minneapolis Traffic Engineering Department and reflect current signal operations.

Signal Spacing

The number of signals and the spacing between them directly affects traffic operations along any corridor.

Table A-1 Existing Signalized Intersection Spacing

From	To	Distance Between Intersection Feet	Segment feet	Segment miles
Lake Street	31st Street	630		
31st Street	34th Street	1,930	2,560	0.5
34th Street	35th Street	660		
35th Street	36th Street	660		
36th Street	38th Street	1,320		
38th Street	40th Street	1,320		
40th Street	42nd Street	1,320		
42nd Street	46th Street	2,640		
46th Street	48th Street	1,320	9,240	1.8
48th Street	50th Street	1,180		
50th Street	54th Street	2,770		
54th Street	Diamond Lake Road	430		
Diamond Lake Road	58th Street	2,220		
58th Street	59th Street & Parking Lot	820		
59th Street & Parking Lot	60th Street & Driveway	490		
60th Street & Driveway	61st Street	680	8,590	1.6
	Total		20,390	3.9

Signal Operations

Table A-2 PM Peak Hour Green Time				
Segment	**Nicollet Avenue at:**	% of Cycle Length on Nicollet Movements: % of Cycle by Intersection	Average % by Segment	Existing Cycle Length (sec)
	Lake Street	**29%**		90
	31st Street	**49%**		90
	34th Street	77%	**52%**	90
	35th Street	50%		90
	36th Street	59%		90
	38th Street	59%		90
	40th Street	50%		90
	42nd Street	67%		90
	46th Street	**35%**		90
	48th Street	76%	**57%**	90
	50th Street	56%		90
	54th Street	70%		90
	Diamond Lake Road	51%		90
	58th Street	72%		90
	59th Street & Parking Lot	73%		90
	60th Street & Driveway	71%		90
	61st Street	74%	**67%**	90
	Corridor Average	**60%**		

0% priority of movement on cross-street

Traffic Volume Patterns

Table A-3 Peak Hour Traffic Volume Percentages									
		Directional Distribution				Left Turn Percentages			
		Intersection Percentages		Segment Average		Intersection Percentages		Segment Average	
Segment	**Nicollet Avenue at:**	SB %	NB %	SB	NB	SB Left Turn %	NB Left Turn %	SB	NB
	Lake Street	35%	65%						
	31st Street	43%	57%						
	34th Street	39%	61%	39%	61%				
	35th Street	54%	46%						
	36th Street	65%	35%						
	38th Street	52%	48%						
	40th Street	51%	49%						
	42nd Street	61%	39%						
	46th Street	48%	52%						
	48th Street	48%	52%	54%	46%				
	50th Street	60%	40%			9%	10%		
	54th Street	49%	51%			5%	0%		
	Diamond Lake Road	57%	43%			5%	6%		
	58th Street	49%	51%			1%	7%		
	59th Street & Parking Lot	52%	48%			0%	6%		
	60th Street & Driveway	46%	54%			16%	1%		
	61st Street	57%	43%	53%	47%	1%	3%	5%	5%
	Corridor Average	**51%**	**49%**			**5%**	**5%**		

Appendix B
ART TAB Calculations

ART-TAB 4.0

Arterial Level of Service Tables

Based on Chapter 11 of the 1997 Highway Capacity Manual

Florida Department of Transportation

Systems Planning Office - May 2000

Road Name: **Nicollet Avenue**

From/To: **Lake St. To 34th St.**

User Notes: **Default**

Study Period: **PM PEAK**

Traffic Characteristics

K Factor: **0.110**

D Factor: **0.610**

PHF: **1.000**

Adj. Sat. Flow Rate: **1,850**

% Turns from Exclusive Lanes: **0.0**

Roadway Characteristics

Posted Speed(mph): **35**

Area Type: **Urbanized**

Arterial Class: **3**

Medians: **No**

Left Turn Bays: **No**

Length of Arterial: **0.50** mi.

Control Characteristics

No. Signalized Intersections: **3**

Signal Type: **Pretimed**

Arrival Type: **3**

Cycle Length: **90** sec.

g/C: **0.52**

PEAK HOUR PEAK DIRECTION VOLUME

Level of Service

LANES	A	B	C	D	E
1	N/A	N/A	300	610	720
2	N/A	N/A	670	1,310	1,440
3	N/A	N/A	1,040	1,980	2,160
4	N/A	N/A	1,420	2,660	2,890

PEAK HOUR VOLUME (BOTH DIRECTIONS)

Level of Service

LANES	A	B	C	D	E
2	N/A	N/A	500	1,010	1,180
4	N/A	N/A	1,100	2,140	2,370
6	N/A	N/A	1,710	3,250	3,550
8	N/A	N/A	2,330	4,370	4,730

ANNUAL AVERAGE DAILY TRAFFIC (AADT)

Level of Service

LANES	A	B	C	D	E
2	N/A	N/A	4,500	9,100	10,800
4	N/A	N/A	10,000	19,500	21,500
6	N/A	N/A	15,500	29,600	32,300
8	N/A	N/A	21,200	39,700	43,000

PEAK HOUR PEAK DIRECTION Through/Right v/c Ratio

Level of Service

LANES	A	B	C	D	E
1	N/A	N/A	0.41	0.85	1.00
2	N/A	N/A	0.46	0.90	1.00
3	N/A	N/A	0.48	0.91	1.00
4	N/A	N/A	0.49	0.92	1.00

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ART-TAB 4.0

Arterial Level of Service Tables

Based on Chapter 11 of the 1997 Highway Capacity Manual

Florida Department of Transportation

Systems Planning Office - May 2000

Road Name: **Nicollet Ave**

From/To: **35th st. to 48th St.**

User Notes: **Default**

Study Period: **PM PEAK**

Traffic Characteristics

K Factor: **0.110**

D Factor: **0.540**

PHF: **1.000**

Adj. Sat. Flow Rate: **1,850**

% Turns from Exclusive Lanes: **0.0**

Roadway Characteristics

Posted Speed(mph): **35**

Area Type: **Urbanized**

Arterial Class: **3**

Medians: **No**

Left Turn Bays: **No**

Length of Arterial: **1.80** mi.

Control Characteristics

No. Signalized Intersections: **7**

Signal Type: **Pretimed**

Arrival Type: **3**

Cycle Length: **90** sec.

g/C: **0.57**

PEAK HOUR PEAK DIRECTION VOLUME

Level of Service

LANES	A	B	C	D	E
1	N/A	220	680	790	790
2	N/A	470	1,440	1,580	1,580
3	N/A	730	2,180	2,370	2,370
4	N/A	990	2,920	3,160	3,160

PEAK HOUR VOLUME (BOTH DIRECTIONS)

Level of Service

LANES	A	B	C	D	E
2	N/A	410	1,260	1,460	1,460
4	N/A	880	2,660	2,930	2,930
6	N/A	1,360	4,030	4,390	4,390
8	N/A	1,840	5,410	5,860	5,860

ANNUAL AVERAGE DAILY TRAFFIC (AADT)

Level of Service

LANES	A	B	C	D	E
2	N/A	3,700	11,500	13,300	13,300
4	N/A	8,000	24,200	26,600	26,600
6	N/A	12,300	36,700	39,900	39,900
8	N/A	16,700	49,200	53,300	53,300

PEAK HOUR PEAK DIRECTION Through/Right v/c Ratio

Level of Service

LANES	A	B	C	D	E
1	N/A	0.27	0.86	1.00	1.00
2	N/A	0.29	0.90	1.00	1.00
3	N/A	0.30	0.91	1.00	1.00
4	N/A	0.31	0.92	1.00	1.00

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ART-TAB 4.0

Arterial Level of Service Tables

Based on Chapter 11 of the 1997 Highway Capacity Manual

Florida Department of Transportation

Systems Planning Office - May 2000

Road Name: **Nicollet Avenue**

From/To: **50th st. to 61st**

User Notes: **Default**

Study Period: **PM PEAK**

Traffic Characteristics

K Factor: **0.110**

D Factor: **0.530**

PHF: **1.000**

Adj. Sat. Flow Rate: **1,850**

% Turns from Exclusive Lanes: **5.0**

Roadway Characteristics

Posted Speed(mph): **35**

Area Type: **Urbanized**

Arterial Class: **3**

Medians: **No**

Left Turn Bays: **Yes**

Length of Arterial: **1.60** mi.

Control Characteristics

No. Signalized Intersections: **7**

Signal Type: **Pretimed**

Arrival Type: **3**

Cycle Length: **90** sec.

g/C: **0.67**

PEAK HOUR PEAK DIRECTION VOLUME

Level of Service

LANES	A	B	C	D	E
1	N/A	560	1,130	1,240	1,240
2	N/A	1,220	2,320	2,480	2,480
3	N/A	1,890	3,530	3,720	3,720
4	N/A	2,550	4,750	4,960	4,960

PEAK HOUR VOLUME (BOTH DIRECTIONS)

Level of Service

LANES	A	B	C	D	E
2	N/A	1,060	2,140	2,340	2,340
4	N/A	2,300	4,390	4,680	4,680
6	N/A	3,560	6,660	7,020	7,020
8	N/A	4,810	8,960	9,350	9,350

ANNUAL AVERAGE DAILY TRAFFIC (AADT)

Level of Service

LANES	A	B	C	D	E
2	N/A	9,600	19,400	21,300	21,300
4	N/A	20,900	39,900	42,500	42,500
6	N/A	32,300	60,600	63,800	63,800
8	N/A	43,800	81,500	85,000	85,000

PEAK HOUR PEAK DIRECTION Through/Right v/c Ratio

Level of Service

LANES	A	B	C	D	E
1	N/A	0.45	0.91	1.00	1.00
2	N/A	0.49	0.93	1.00	1.00
3	N/A	0.50	0.94	1.00	1.00
4	N/A	0.51	0.95	1.00	1.00

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Operational Analyses
Calculations

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1861	1583	1770	1807	0	0	1814	0	1770	1844	0
Flt Permitted		0.977		0.950				0.843		0.307		
Satd. Flow (perm)	0	1820	1583	1770	1807	0	0	1536	0	572	1844	0
Satd. Flow (RTOR)			21		25			11			4	
Volume (vph)	12	450	33	370	490	125	31	283	60	160	292	20
Lane Group Flow (vph)	0	554	40	444	738	0	0	449	0	192	374	0
Turn Type	Perm		Perm	Prot			Perm			Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4				2			6		
Detector Phases	4	4	4	3	8		2	2		6	6	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0	20.0	8.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	31.0	31.0	31.0	26.0	57.0	0.0	33.0	33.0	0.0	33.0	33.0	0.0
Total Split (%)	34%	34%	34%	29%	63%	0%	37%	37%	0%	37%	37%	0%
Maximum Green (s)	27.0	27.0	27.0	22.0	53.0		29.0	29.0		29.0	29.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag	Lag	Lag	Lag	Lead								
Lead-Lag Optimize?	Yes	Yes	Yes	Yes								
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	Max	Max	Max	Max	Max		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0	11.0		11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0		0		0	0		0	0	
Act Effct Green (s)		27.0	27.0	22.0	53.0			29.0		29.0	29.0	
Actuated g/C Ratio		0.30	0.30	0.24	0.59			0.32		0.32	0.32	
v/c Ratio		1.01	0.08	1.03	0.69			0.89		1.04	0.63	
Uniform Delay, d1		31.5	10.6	34.0	12.2			28.3		30.5	25.6	
Delay		67.4	13.9	76.3	12.9			45.2		96.6	26.3	
LOS		E	B	E	B			D		F	C	
Approach Delay		63.8			36.7			45.2			50.1	
Approach LOS		E			D			D			D	
90th %ile Green (s)	27.0	27.0	27.0	22.0	53.0		29.0	29.0		29.0	29.0	
90th %ile Term Code	MaxR	MaxR	MaxR	MaxR	MaxR		Coord	Coord		Coord	Coord	
70th %ile Green (s)	27.0	27.0	27.0	22.0	53.0		29.0	29.0		29.0	29.0	
70th %ile Term Code	MaxR	MaxR	MaxR	MaxR	MaxR		Coord	Coord		Coord	Coord	
50th %ile Green (s)	27.0	27.0	27.0	22.0	53.0		29.0	29.0		29.0	29.0	
50th %ile Term Code	MaxR	MaxR	MaxR	MaxR	MaxR		Coord	Coord		Coord	Coord	
30th %ile Green (s)	27.0	27.0	27.0	22.0	53.0		29.0	29.0		29.0	29.0	
30th %ile Term Code	MaxR	MaxR	MaxR	MaxR	MaxR		Coord	Coord		Coord	Coord	
10th %ile Green (s)	27.0	27.0	27.0	22.0	53.0		29.0	29.0		29.0	29.0	
10th %ile Term Code	MaxR	MaxR	MaxR	MaxR	MaxR		Coord	Coord		Coord	Coord	
Queue Length 50th (ft)		~322	8	~272	258			268		~119	169	
Queue Length 95th (ft)		#533	31	#455	390			m244		#251	260	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1024			1568			5200			912	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (ft)			100	300								
50th Bay Block Time %		50%			1%							
95th Bay Block Time %		61%		39%	14%							
Queuing Penalty (veh)		22		144	32							

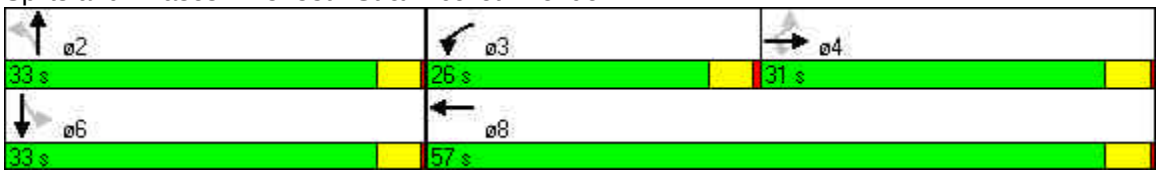
Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 65	
Control Type: Pretimed	
Maximum v/c Ratio: 1.04	
Intersection Signal Delay: 46.6	Intersection LOS: D
Intersection Capacity Utilization 126.8%	ICU Level of Service H

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: 38th St & Nicollet Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1859	1583	1770	1825	0	0	1800	0	0	1831	0
Flt Permitted		0.554		0.298				0.961			0.769	
Satd. Flow (perm)	0	1032	1583	555	1825	0	0	1733	0	0	1417	0
Satd. Flow (RTOR)			92		12			21			6	
Volume (vph)	21	428	77	190	623	95	25	425	138	66	437	45
Lane Group Flow (vph)	0	539	92	228	862	0	0	706	0	0	657	0
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phases	4	4	4	8	8		2	2		6	6	
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	48.0	48.0	48.0	48.0	48.0	0.0	42.0	42.0	0.0	42.0	42.0	0.0
Total Split (%)	53%	53%	53%	53%	53%	0%	47%	47%	0%	47%	47%	0%
Maximum Green (s)	44.0	44.0	44.0	44.0	44.0		38.0	38.0		38.0	38.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	Max	Max	Max	Max	Max		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)		44.0	44.0	44.0	44.0			38.0			38.0	
Actuated g/C Ratio		0.49	0.49	0.49	0.49			0.42			0.42	
v/c Ratio		1.07	0.11	0.84	0.96			0.95			1.09	
Uniform Delay, d1		23.0	0.0	19.9	21.8			24.3			25.7	
Delay		74.7	2.9	37.5	38.6			47.9			77.8	
LOS		E	A	D	D			D			E	
Approach Delay		64.2			38.4			47.9			77.8	
Approach LOS		E			D			D			E	
90th %ile Green (s)	44.0	44.0	44.0	44.0	44.0		38.0	38.0		38.0	38.0	
90th %ile Term Code	MaxR	MaxR	MaxR	MaxR	MaxR		Coord	Coord		Coord	Coord	
70th %ile Green (s)	44.0	44.0	44.0	44.0	44.0		38.0	38.0		38.0	38.0	
70th %ile Term Code	MaxR	MaxR	MaxR	MaxR	MaxR		Coord	Coord		Coord	Coord	
50th %ile Green (s)	44.0	44.0	44.0	44.0	44.0		38.0	38.0		38.0	38.0	
50th %ile Term Code	MaxR	MaxR	MaxR	MaxR	MaxR		Coord	Coord		Coord	Coord	
30th %ile Green (s)	44.0	44.0	44.0	44.0	44.0		38.0	38.0		38.0	38.0	
30th %ile Term Code	MaxR	MaxR	MaxR	MaxR	MaxR		Coord	Coord		Coord	Coord	
10th %ile Green (s)	44.0	44.0	44.0	44.0	44.0		38.0	38.0		38.0	38.0	
10th %ile Term Code	MaxR	MaxR	MaxR	MaxR	MaxR		Coord	Coord		Coord	Coord	
Queue Length 50th (ft)		~343	0	108	447			310			~354	
Queue Length 95th (ft)		#539	24	#253	#718			m#586			m#470	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		768			1408			5620			5200	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (ft)			200	200								
50th Bay Block Time %		26%			31%							
95th Bay Block Time %		47%		27%	47%							
Queuing Penalty (veh)		33		114	88							

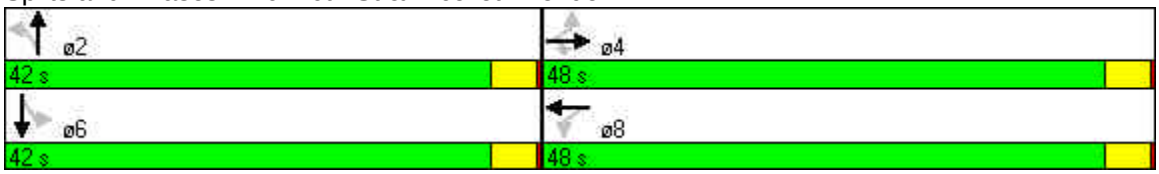
Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 65	
Control Type: Pretimed	
Maximum v/c Ratio: 1.09	
Intersection Signal Delay: 54.2	Intersection LOS: D
Intersection Capacity Utilization 161.9%	ICU Level of Service H

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: 46th St & Nicollet Avenue

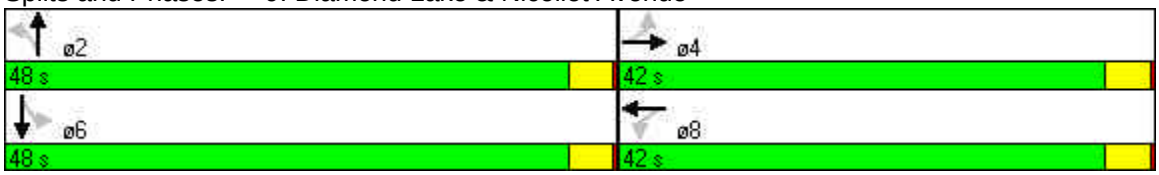


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	1770	1818	0	1770	1829	0	0	1814	0	0	1829	0
Flt Permitted	0.105			0.215				0.922			0.950	
Satd. Flow (perm)	196	1818	0	400	1829	0	0	1678	0	0	1743	0
Satd. Flow (RTOR)		13			9			16			9	
Volume (vph)	66	398	74	78	536	73	33	393	89	37	575	74
Lane Group Flow (vph)	79	567	0	94	731	0	0	619	0	0	823	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phases	4	4		8	8		2	2		6	6	
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	42.0	42.0	0.0	42.0	42.0	0.0	48.0	48.0	0.0	48.0	48.0	0.0
Total Split (%)	47%	47%	0%	47%	47%	0%	53%	53%	0%	53%	53%	0%
Maximum Green (s)	38.0	38.0		38.0	38.0		44.0	44.0		44.0	44.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	Max	Max		Max	Max		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	38.0	38.0		38.0	38.0			44.0			44.0	
Actuated g/C Ratio	0.42	0.42		0.42	0.42			0.49			0.49	
v/c Ratio	0.95	0.73		0.56	0.94			0.75			0.96	
Uniform Delay, d1	25.2	21.2		19.6	24.6			17.9			21.9	
Delay	101.5	21.9		23.5	39.5			18.8			32.0	
LOS	F	C		C	D			B			C	
Approach Delay		31.7			37.7			18.8			32.0	
Approach LOS		C			D			B			C	
90th %ile Green (s)	38.0	38.0		38.0	38.0		44.0	44.0		44.0	44.0	
90th %ile Term Code	MaxR	MaxR		MaxR	MaxR		Coord	Coord		Coord	Coord	
70th %ile Green (s)	38.0	38.0		38.0	38.0		44.0	44.0		44.0	44.0	
70th %ile Term Code	MaxR	MaxR		MaxR	MaxR		Coord	Coord		Coord	Coord	
50th %ile Green (s)	38.0	38.0		38.0	38.0		44.0	44.0		44.0	44.0	
50th %ile Term Code	MaxR	MaxR		MaxR	MaxR		Coord	Coord		Coord	Coord	
30th %ile Green (s)	38.0	38.0		38.0	38.0		44.0	44.0		44.0	44.0	
30th %ile Term Code	MaxR	MaxR		MaxR	MaxR		Coord	Coord		Coord	Coord	
10th %ile Green (s)	38.0	38.0		38.0	38.0		44.0	44.0		44.0	44.0	
10th %ile Term Code	MaxR	MaxR		MaxR	MaxR		Coord	Coord		Coord	Coord	
Queue Length 50th (ft)	42	257		39	383			248			405	
Queue Length 95th (ft)	#135	386		#109	#625			380			m402	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1008			1520			4496			5620	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (ft)	200			300								
50th Bay Block Time %		18%			18%							
95th Bay Block Time %		31%			41%							
Queuing Penalty (veh)		19			28							

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 65	
Control Type: Pretimed	
Maximum v/c Ratio: 0.96	
Intersection Signal Delay: 30.7	Intersection LOS: C
Intersection Capacity Utilization 134.5%	ICU Level of Service H
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 9: Diamond Lake & Nicollet Avenue



Appendix D: Neighborhood Traffic Surveys

As part of the study process, residents from the Lyndale and Windom neighborhoods conducted traffic surveys in order to better understand traffic issues in their neighborhoods. The results of these field surveys follow.

Lyndale Neighborhood

NICOLLET AVENUE CORRIDOR

LAKE & NICOLLET		
TRAFFIC	1/2 hour surveys	
	TUESDAY	
	8/28/01	
Start Times:	10:30am	6:50pm
Pedestrian	110	134
Automobile	928	1052
Bus	13	18
Comm. Truck	36	0
Bicycle	6	4
PARKING		
Business (K-Mart)	117	115
Residential	0	0
Bus Stops		
Bus Shelters	2	n/w & s/w corner
Bus Benches	2	
Traffic Lights	3	6 @ n/w corner
Stop Signs	4	
Crosswalks	0	
Trash Bins	3	
News Stands	5	
	Yes	

COMMENTS

During the am 2 cars went through the intersection after the light was red
During the pm 4 cars went through the intersection after the light was red
There are "no turn on red" signs but most of the cars turned anyway
Traffic backed up in the K-Mart lot when the busses going west were stopped on Lake Street
There are a lot of people just milling around, many of them sitting on the benches at the n/w corner
Many people getting on and off the buses
1 ambulance & 1 firetruck went past in the pm & traffic didn't move out of the way very well

31st & NICOLETT			
TRAFFIC	1/2 hour surveys		
	Friday	**Tuesday**	
	8/31/01	9/4/01	
Start Times:	7:55am	7:20am	8:55am
Pedestrian	12	23	30
Automobile	349	429	472
Bus	12	11	7
Comm. Truck		6	2
Bicycle	11	7	10
PARKING			
Business	0	0	1
Residential	0	0	0
Bus Stops	2	n/w & s/e corners	
Bus Shelters	2		
Bus Benches	2	1 inside shelter 1 outside	
Traffic Lights	Yes		
Stop Signs	No		
Crosswalks	4		
Trash Bins	5		
News Stands	Yes		

COMMENTS

During am 5 cars when through the intersection after the light was red
During pm 4 cars when through the intersection after the light was red
During pm 1 police car pulled out of parking lot on Nicollet, drove north and went through red light (no lights or siren)
There doesn't seem to be anyone parking on the west side of Nicollet at the meters
There is a left turn arrow for traffic going north to make a turn on 31st to go west
There is a right turn lane for traffic going north to make a turn on 31st to go west
Traffic going south, east or west does not have turn lanes or arrows

Lyndale Neighborhood

32nd & NICOLETT		
TRAFFIC	1/2 hour surveys	
	Monday	Wednesday
	8/27/01	8/29/01
Start Times:	3:30pm	11:50am
Pedestrian	49	23
Automobile	358	298
Bus	32	17
Comm. Truck	9	25
Bicycle	10	9
PARKING		
Business	lot/full	lot/full
Residential	0	0
Bus Stops	2	
Bus Shelters	1	
Bus Benches	0	
Traffic Lights	No	
Stop Signs	2	
Crosswalks	0	
Trash Bins	1	
News Stands	0	
COMMENTS		
The crosswalks need to be painted		

33rd & NICOLLET		
TRAFFIC		
	Friday	Monday
	8/24/01	8/27/01
Start Times:	10:00am	1:40pm
Pedestrian	17	25
Automobile	226	344
Bus	10	14
Comm. Truck	11	7
Bicycle	3	10
PARKING		
Business	1	0
Residential		
Bus Stops	2	
Bus Shelters	0	
Bus Benches	0	
Traffic Lights	0	
Stop Signs	2	
Crosswalks	0	
Trash Bins		
News Stands		
COMMENTS		
A lot of litter		

Lyndale Neighborhood

34th & NICOLLET

TRAFFIC

					Friday	Wednesday
	8/30/01	8/30/01	8/30/01	8/30/01	8/31/01	9/5/02
Start Times:	7:55am	9:25am	1:30pm	3:50pm	3:30pm	12:30pm
Pedestrian	9	20	31	22	45	13
Automobile	261	216	330	388	487	344
Bus	31	14	17	22	28	14
Comm. Truck		17		18		
Bicycle	12	11	2	8	3	11

PARKING

Business		3	4	5	4
Residential		8		12	

Bus Stops	2
Bus Shelters	1
Bus Benches	2
Traffic Lights	4
Stop Signs	0
Crosswalks	0
Trash Bins	4
News Stands	Yes

COMMENTS

35th & NICOLLET

TRAFFIC

	Monday	Wednesday	Thursday	Tuesday
	8/20/01	8/29/01	8/30/01	9/4/01
Start Times:	3:30pm	7:50am	9:00pm	12:37pm
Pedestrian	32	4	18	13
Automobile	800	510	685	546
Bus	29	36	6	16
Comm. Truck	4		0	
Bicycle	19	4	11	6

PARKING

Business	
Residential	

Bus Stops	2
Bus Shelters	2
Bus Benches	1
Traffic Lights	4
Stop Signs	0
Crosswalks	0
Trash Bins	
News Stands	

COMMENTS

A lot of traffic turns into Super America & there are kids playing in their lot
3 cars cut through the SA parking lot to avoid red light on 35th & Nicollet

Lyndale Neighborhood

36th & NICOLLET

TRAFFIC

	Saturday			Tuesday
	8/25/01			8/28/01
Start Times:	7:30am	7:20am	12:30pm	7:50am
Pedestrian	10	21	3	7
Automobile	299	724		815
Bus	7	9	3	14
Comm. Truck	2	6		
Bicycle	3	4	8	3

PARKING

Business	2 by U-Haul
Residential	Full / Not many
Bus Stops	2
Bus Shelters	2
Bus Benches	3
Traffic Lights	4
Stop Signs	0
Crosswalks	0
Trash Bins	2
News Stands	Yes

COMMENTS

NICOLLET AVENUE CORRIDOR

NICOLLET & DIAMOND LAKE ROAD

TRAFFIC	1/2 hour surveys			
	Friday	**Monday**	**Thursday**	**Saturday**
	9/14/01	**9/17/01**	**9/20/01**	**9/22/01**
Start Times:	7:30am	10:00am	7:30am	11:30am
Pedestrian	few	n/a		42
Auto				
eastbound	644 (e/w)	100	260	386 (e/w)
westbound	60/40%	56	164	
northbound	436 (n/s)	69	185	397 n/s)
southbound		100	182	
Truck n/s		10	not noted	4 *
Trucks e/w		13		
MTC Bus				
eastbound		0	-	-
westbound		2	-	-
northbound		2	2	3
southbound		2	2	2
School Bus				
eastbound		1	-	
westbound		2	-	
northbound		2	-	
southbound		2	-	
Bicycle		n/a	4	3

* Of 4 trucks: 1 semi; 2 delivery; 1 other

COMMENTS

9/14 Traffic moving too fast through the intersection
Eight cars went through already red light
Very pedestrian unriendly
Traffic going east blocked intersection for n/s traffic once
Few trucks
9/20 Unfriendly to pedestrians
4 cars entered intersection after light red
Left turn wait 1-3 minutes
Busses appear almost full

NICOLLET & 56th

TRAFFIC	1/2 hour surveys	
	Monday	**Saturday**
	9/17/01	**9/22/01**
Start Times:	1:00pm	5:00pm
Pedestrian	n/a	5
Auto		
eastbound	14	(e/w) 3
westbound	23	
northbound	167	(n/s) 319*
southbound	139	
Truck n/s	17 (9N/8S)	
Trucks e/w	1 W-bound	
MTC Bus		
eastbound	-	
westbound	-	
northbound	4	
southbound	1	
School Bus		
eastbound	-	
westbound	2	
northbound	5	
southbound	4	
Bicycle	n/a	2

* Of 319 n/s traffic: 7 turning East; 18 turning west

COMMENTS

9/17 Surveror has lived on Nicollet Ave for 30 yrs, and notes traffic has increased noticeably since CUB Foods was built.
9/22 Much of the westbound traffic goes to TCF.
Noticeable litter from mid-block all the way sount t0 62nd St.

NICOLLET & 58th St

TRAFFIC	1/2 hour surveys	
	Monday	**Tuesday**
	9/17/01	**[9/21/2001]**
Start Times:	5:00pm	9:00am
Pedestrian	15 *	2
Auto	838	
eastbound	15%	
westbound	20%	
northbound	65% (n/s)	205 (n/s)
southbound		50/50%
Trucks	1 (semi)	5^
Trucks Delivery	5	8
MTC Bus	9	3
eastbound		
westbound		
northbound		
southbound		
School Bus	16	17
eastbound		
westbound		
northbound		
southbound		
Greyhound		1
Bicycle	2	1

* Of 15, this corner a destination corner for 7.
^ Of 5 other trucks: 2 UPS, 2 tow, 1 cement

COMMENTS

Windom Neighborhood

NICOLLET & 60th St

TRAFFIC

	Friday 9/21/01	Friday 9/21/01
Start Times:	1:30pm	7:30am
Pedestrian		
Auto		
eastbound		15
westbound	131	104
northbound	481 (n/s)	307 (n/s)
southbound		
Trucks	28 *	
Trucks Delivery		40 (n/s)
MTC Bus		
eastbound		
westbound		
northbound		
southbound		
School Bus		
eastbound		
westbound		
northbound		
southbound		
Bicycle		

COMMENTS

NICOLLET & 61st St

TRAFFIC

	Tuesday 9/18/01
Start Times:	4:45pm
Pedestrian	12
Auto	
eastbound	60 (East on 61st)
westbound	
northbound	600 (n/s) More So. Bound
southbound	
Trucks	
Trucks Delivery	
MTC Bus	
eastbound	
westbound	
northbound	3
southbound	5
School Bus	
eastbound	
westbound	
northbound	
southbound	
Bicycle	

COMMENT:

COMMENTS

Three cars entered the 2-block residential area east of Nicollet and no cars left the area

Appendix E: Environmental Benefits Analysis

In order to better understand the ecological and economic benefits of boulevard trees along Nicollet Avenue the Design Center utilized CITYgreen software. Released by American Forests, CITYgreen software was used to analyze existing tree canopy benefits and model the impacts of planting additional trees in the right-of-way. This memo describes and summarizes this research.

Calculating the Benefits of Additional Tree Canopy on Nicollet Avenue

The Design Center for American Urban Landscape

College of Architecture and Landscape Architecture
University of Minnesota

June 27, 2002

In support of the *Nicollet Avenue Urban Design and Transportation Plan,* the Design Center for American Urban Landscape (DCAUL) sought to further describe the environmental and economic benefits associated with several report recommendations. Key to these recommendations is the desire to balance the needs of a variety of users and enhance the urban ecology of Nicollet Avenue.

CITYgreen, a software application developed by the oldest non-profit citizens' conservation organization in the United States, American Forests, was chosen to quantify the ecological and economic benefits attributed to urban forests. Armed with this type of data, communities are able to guide future public policy based not only upon aesthetic attributes of the urban forest, but also economic and quality of life considerations. In other words, *CITYgreen* provides the "tools to translate the benefits we grasp in an abstract way into a fiscal bottom line." The estimates found in this memorandum show the types and scales of benefits that can result from the urban design recommendations found in the Nicollet Avenue plan.

Utilizing *CITYgreen* software, DCAUL calculated the environmental and economic benefits of an enhanced urban tree canopy for a two-block study area between 33rd Street and 35th Street of Nicollet Avenue. Starting with the existing conditions and comparing them to two proposed scenarios, we were able to calculate benefits at the time of planting, and utilizing the software to model growth, we were also able to calculate future benefits. Benefits were calculated in the following areas:

Air Pollution Removal – *CITYgreen* software quantifies economic, ecological, and health benefits associated with the removal of ozone, sulfur dioxide, nitrogen dioxide, particulate matter, and carbon monoxide. While ozone in the upper atmosphere helps to protect the earth from ultraviolet radiation, ozone present at the ground level is a major component of smog and has been related to health concerns such as reduced lung function and increased sensitivity of the lungs to other irritants. Sulfur dioxide, nitrogen dioxide, and particulate matter also affect respiratory function. Carbon monoxide reduces the ability of the bloodstream to carry oxygen to the body's organs. Built upon scientific evidence that vegetation can remove harmful pollutants such as these, *CITYgreen* is able to quantify and assign a dollar value to the benefits associated with their reduction.

Carbon Storage and Sequestration—*CITYgreen* estimates the amount of carbon dioxide that is absorbed annually by trees (sequestration) and the amount of carbon that is stored in plant structures. It is believed that a continued increase in carbon dioxide may enhance the greenhouse effect of the atmosphere, with the potential to drastically change the Earth's climate.

Stormwater Control—Trees intercept precipitation and reduce the amount of stormwater that needs to be managed during a rainfall event. *CITYgreen* software calculates the impact tree canopy has on stormwater volumes, time of concentration and peak flow. Slowing stormwater runoff allows for greater infiltration and consequently less pollution of the streams and rivers that ultimately accept

collected runoff in the metropolitan area. Reducing stormwater runoff also acts as one safeguard against downstream flooding.

Residential Cooling Effects—Trees provide natural shade of windows, air-conditioners, and roofs. Cooling these elements avoids the production of unnecessary carbon via power plants, and reduces energy bills. *CITYgreen* is able to estimate the benefits of shade and the savings it provides to residential buildings.

Scenarios

Three scenarios were created in order to determine the benefits of (1) decreasing the amount of impervious surface by narrowing the road and (2) increasing the extent of the urban tree canopy through the addition of trees. Each scenario was modeled at the time of planting and at 10, 25, and 50 years into the future.

The study area covers two blocks, extending from the center of 33rd Street south to the center of 35th Street. Approximate east-west limits extend from the center of the alley west of Nicollet Avenue to the center of the alley east of the avenue. For a detailed view of the study area, consult the scenario plans attached to this memo.

Scenario 1 – *Existing conditions*

Scenario 1 is modeled using existing conditions that include, approximately, a 50 foot road width, 3 foot boulevard width, and 6 foot sidewalk width. Existing tree canopy was digitized from aerial photography (City of Minneapolis, April 1998) with field additions and deletions to reflect recent changes. Scenario 1 served as a baseline to which the following scenarios were compared.

Scenario 2 – *A narrowed street with trees planted in the boulevard*

Scenario 2 models the road based upon the design plan prepared by DCAUL for Citizens for a Sensible Nicollet Avenue Plan (CSNAP). This plan includes a roadway narrowed to 42 feet, 7 foot boulevards, 6 foot sidewalks, and boulevard trees spaced 25 feet on center. For this analysis, hackberry trees (Celtis occidentalis) were chosen as boulevard trees. For further information regarding the selection of hackberry trees, consult the Methodology section of this memo.

Scenario 3—*A narrowed street with trees planted in the boulevard and "next-to-lot" portion of the right-of-way*

Scenario 3 maintains the 42 foot road width, 7 foot boulevard, 6 foot sidewalk, and proposed boulevard plantings found in Scenario 2. However, this scenario includes additional hackberry trees spaced 25 feet on center in the "next-to-lot" portion of the right-of-way (as recommended by the DCAUL/CSNAP plan). Proposed tree placement was mindful of existing infrastructure such as driveways and parking lots.

Findings

Based on data produced by *CITYgreen* software, additional tree canopy along Nicollet Avenue provides measurable economic and environmental benefits. Compared to the relatively limited existing tree canopy, Scenarios 2 and 3 illustrate that additional tree plantings can reduce pollution, stormwater runoff, and cooling costs. The specific benefits calculated by *CITYgreen* for each scenario are found attached to this memo.

*Please note:

1) *CITYgreen* calculates dollar values as "1994 dollars." Accounting for inflation, present-day values would be greater.
2) Results presented in this memo reflect estimated benefits occurring within the 2-block study area (from 33rd Street to 35th Street). Actual benefits from implementing the plan (from Lake Street to 62nd Street) as proposed by DCAUL and CSNAP would be greater.

Tree Canopy

The tree configurations described in Scenarios 2 and 3 have the potential to substantially increase tree canopy (Figure 1). *CITYgreen* data indicates that, if growth of the scenarios were modeled 50 years into the future,

Scenario 1 would shade approximately 19% (1.87 acres) of the study area (9.77 acres); Scenario 2 would cover 31% (3.07 acres); and Scenario 3 would cover 35% (3.39 acres).

	Year 1	Year 10	Year 25	Year 50
Scenario 1 (acres)	1.60	1.75	1.79	1.87
Scenario 2 (acres)	1.67	2.18	2.52	3.07
Scenario 3 (acres)	1.72	2.43	2.82	3.39

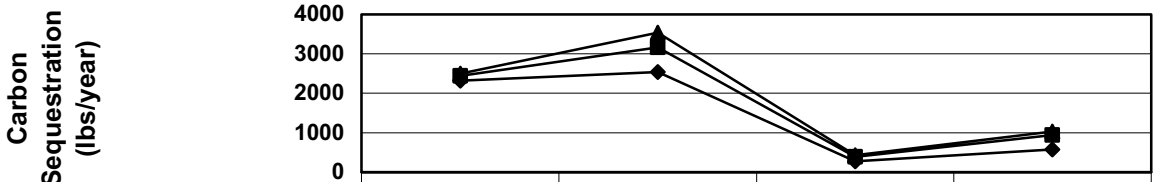
Figure 1: Potential tree canopy growth over time

The data produced by *CITYgreen* suggests that the greater the size of the study area that is covered by tree canopy, the greater the environmental and economic benefits that are produced. Trees have the natural ability to absorb and store carbon, reduce stormwater runoff, remove airborne pollutants, and reduce residential energy costs. As canopy size increases, so do the associated benefits.

Carbon Storage and Sequestration Benefits

CITYgreen software quantifies the role urban trees play in removing atmospheric carbon dioxide from the air (sequestration), and the storage of that carbon. Carbon dioxide (a gas) is utilized by plants during photosynthesis, with the resulting carbon (a solid) stored as biomass in the roots, stems, and leaves.

The results demonstrate the benefits of additional canopy in Scenarios 2 and 3, particularly in the first ten years of growth (Figure 2). During Year 10, the tree configuration described by Scenario 3 would absorb 39% more carbon than the existing conditions in the same year (3540 lbs compared to 2540 lbs).



	Year 1	Year 10	Year 25	Year 50
Scenario 1 (lbs/year)	2320	2540	275	574
Scenario 2 (lbs/year)	2440	3160	389	940
Scenario 3 (lbs/year)	2500	3540	434	1036

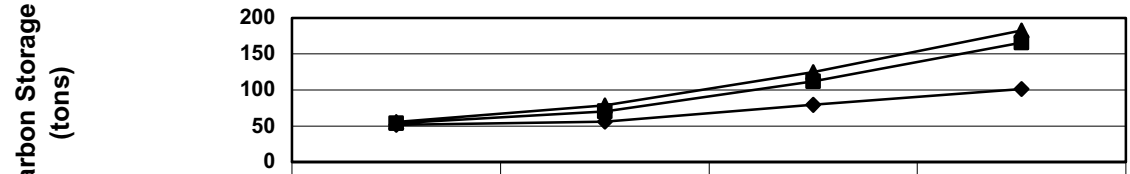
Figure 2: Potential carbon sequestration rate change over time

According to American Forests, urban forests will sequester carbon at differing rates depending on the age distribution of the trees within them. Rapidly growing, younger trees sequester carbon at a higher rate, reflecting the utilization of carbon for growth. Mature trees sequester carbon at a lower rate due to their slow rate of growth. This analysis produced rates of sequestration that initially increased, then dropped after Year 25, and finally rose again near Year 50.*

*Please note:

1) The rise in sequestration from Year 25 to Year 50 after a drop from Year 10 to Year 25 is unexpected. DCAUL staff is currently working with staff from American Forests to determine why this is so.

CITYgreen also calculates the total amount of carbon that is stored by trees (Figure 3). Approximately 50% of a tree's dry weight is comprised of carbon. After 50 years of growth, the trees in Scenario 3 will store 81% more carbon than the existing tree conditions in the same year (182.56 tons compared to 101.08 tons).



	Year 1	Year 10	Year 25	Year 50
Scenario 1 (tons)	51.65	56.29	79.09	101.08
Scenario 2 (tons)	54.03	70.23	111.67	165.63
Scenario 3 (tons)	55.53	78.52	124.60	182.56

Figure 3: Potential increase in amount of carbon stored

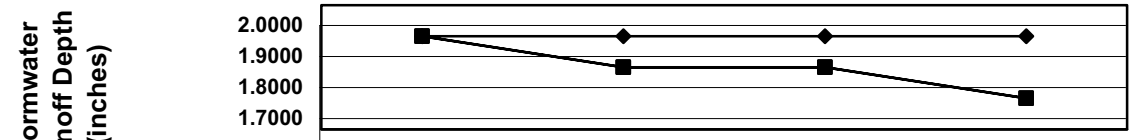
Stormwater Control Benefits

Based upon percentage of tree canopy and ground cover conditions within the study area, *CITYgreen* estimates the impact of varying environmental conditions on stormwater runoff. The program uses localized conditions such as tree canopy, rainfall patterns, soil type, and surface cover—among others—to approximate runoff depth (Figure 4), time of concentration, and peak flow volume.

The tree configurations of Scenarios 2 and 3 would reduce Runoff Depth (depth of water not absorbed into the soil during a rainfall event as if distributed evenly over the entire study area) by nearly a quarter of an inch in Year 50 as compared to the existing conditions (1.9 inches to 1.7 inches).*

*Please note:

1) Scenario 1 shows no change in runoff depth in years 1-50. This is partly due to the small size of the study area and the assignment of curve numbers (CN) by the software. CN's reflect site conditions such as soil type, plant cover, and amount of impervious area, among others, and are used in stormwater calculations, such as depth of runoff and time of concentration. When only small changes are made to site conditions, such as the limited change in canopy size in Scenario 1, the changes are insufficient to result in a change in the assigned CN, and consequently, the calculations remain the same. Similar results are seen in Scenarios 2 and 3 from year 10 to 25. Staff at American Forests emphasize that the <u>difference</u> in calculated results between scenarios is where the software is most accurate.



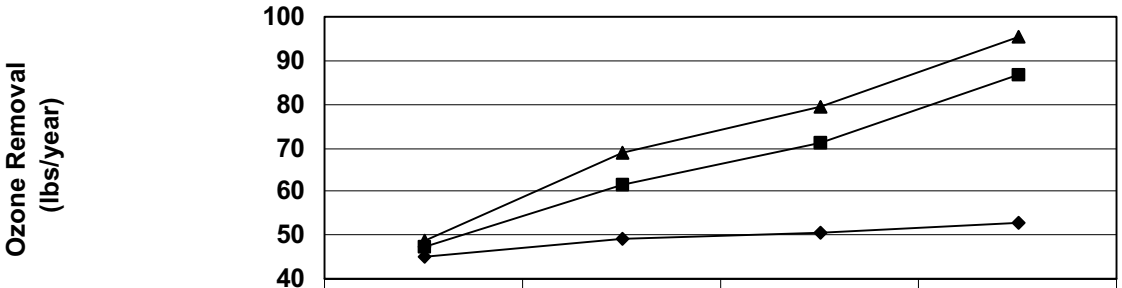
	Year 1	Year 10	Year 25	Year 50
Scenario 1 (inches)	1.9	1.9	1.9	1.9
Scenario 2 (inches)	1.9	1.8	1.8	1.7
Scenario 3 (inches)	1.9	1.8	1.8	1.7

Figure 4: Potential decrease in runoff depth

Air-Pollution Removal Benefits

The software calculates removal volumes for the following pollutants: ozone, sulfur dioxide, nitrogen dioxide, particulate matter, and carbon monoxide.* Highlighted below are the removal benefits for ozone (Figure 5). For analysis of the removal of the other pollutants listed, see the attached tables and analysis reports.

When Scenario 3 is modeled 50 years into the future, the trees remove 81% more ozone than existing conditions in the same year (95.63 lbs compared to 52.95 lbs).

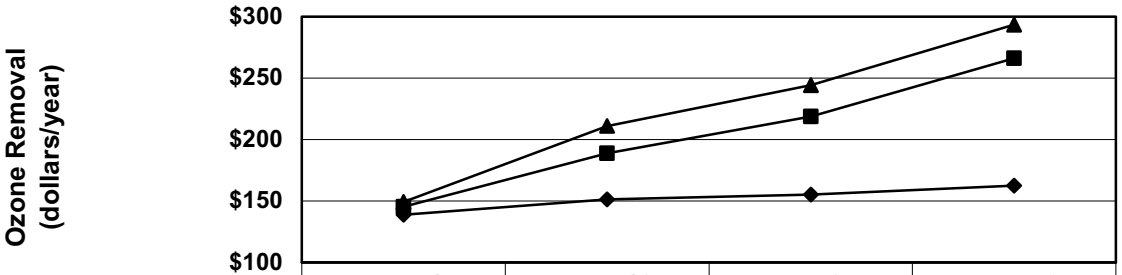


	Year 1	Year 10	Year 25	Year 50
Scenario 1 (lbs/year)	45.23	49.30	50.51	52.95
Scenario 2 (lbs/year)	47.32	61.50	71.33	86.76
Scenario 3 (lbs/year)	48.63	68.76	79.58	95.63

Figure 5: Potential increase in ozone removal volumes

CITYgreen also estimates the dollar benefit value associated with removing the preceding pollutants from the atmosphere in urban and suburban conditions (Figure 6). The benefits are based on "externality costs," expenses that society would have otherwise paid—in areas such as healthcare and reduced tourism revenue—because of polluted air.

If the scenarios are modeled after 50 years of growth, the ozone removal by Scenario 3 saves 81% more money than Scenario 1 ($293.45 compared to $162.51).



	Year 1	Year 10	Year 25	Year 50
Scenario 1 ($/year)	$138.82	$151.29	$155.03	$162.51
Scenario 2 ($/year)	$145.21	$188.76	$218.90	$266.27
Scenario 3 ($/year)	$149.25	$211.01	$244.24	$293.49

Figure 6: Potential increase in savings from ozone removal

*Please note:

1) Calculations for both annual pollutant removal rates and their corresponding dollar value are based on USDA Forest Service research conducted in Milwaukee, Wisconsin. Currently *CITYgreen* software does not include removal capacity rates for the Twin Cities region.
2) All monetary values are calculated in "1994 dollars."

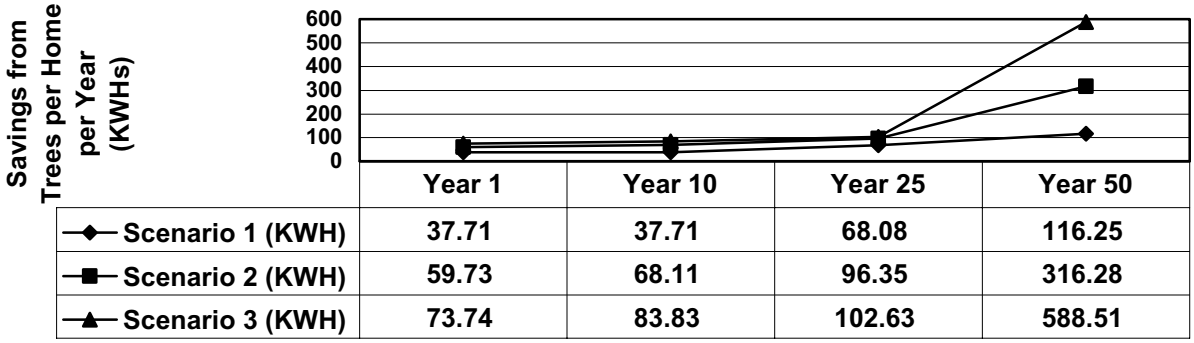
Residential Cooling Benefits

CITYgreen's analysis shows that increasing tree canopy has positive effects with regard to residential cooling. The shade of windows, air-conditioners, and roofs provided by trees avoids the production of unnecessary carbon via power plants, and reduces energy bills.

However, it is important to note that *CITYgreen* formulas only model energy saving benefits for residential structures (1-2 story, single-family detached homes with air conditioning). Therefore, the residential cooling benefits presented in this memo relate only to the estimated 21 1-2 story, single-family detached homes with air conditioning found within the study area. Actual savings would be greater if other of the estimated 40 cooled structures (taller residential structures, apartment buildings, businesses, etc.) were included in the calculations.

Initially, *CITYgreen* calculates the energy savings provided by tree canopy (Figure 7). Shading, such as this, has the potential to reduce the kilowatt-hours of energy required to cool a home. For example, if the scenarios are modeled after 50 years of growth, the tree configuration described by Scenario 3 saves 5 times more KWHs per home as compared to the existing conditions in the same year (588.51 KWHs compared to 116.25 KWHs).

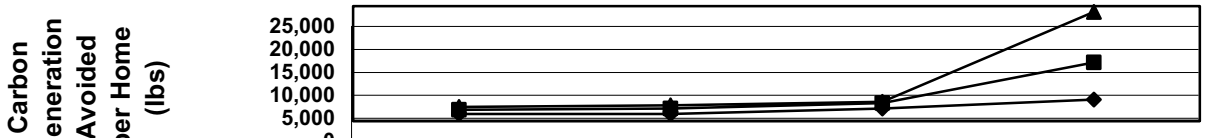
To further quantify the value of these trees, localized monetary savings can be calculated from the KWH data provided by *CITYgreen*. The cost per KWH of electricity for June-September months in Minnesota is $0.0735 (Xcel Energy, 2001). Therefore, Scenario 1 would save $8.54 per in Year 50 (2001 dollars); Scenario 2 would save $23.25 per home (2001 dollars); and Scenario 3 energy savings would total $43.25 per home (2001 dollars).



	Year 1	Year 10	Year 25	Year 50
Scenario 1 (KWH)	37.71	37.71	68.08	116.25
Scenario 2 (KWH)	59.73	68.11	96.35	316.28
Scenario 3 (KWH)	73.74	83.83	102.63	588.51

Figure 7: Potential increase in KwH saved per home

CITYgreen software also calculates the reduction of carbon generation by power plants that results from reduced residential energy use (Figure 8). For example, if the scenarios are modeled after 50 years of growth, the Carbon Generation Avoided per home (CGA) of Scenario 3 is 5 times greater than the CGA that results from the existing conditions in the same year (23,764.34 lbs avoided per home compared to 4,694.26 lbs avoided per home).



	Year 1	Year 10	Year 25	Year 50
Scenario 1 (lbs)	1,522.88	1,522.88	2,749.17	4,694.26
Scenario 2 (lbs)	2,411.98	2,750.33	3,890.78	12,771.48
Scenario 3 (lbs)	3,046.93	3,385.29	4,144.34	23,764.34

Figure 8: Potential increase in carbon generation avoided per home

Methodology

DCAUL staff used information obtained via site visits, digital orthographic photos (City of Minneapolis, April 1998), and planimetric drawings (City of Minneapolis, 1996-1997, revised 1998) to digitize data including existing tree canopies, building footprints, road widths, boulevard widths, and sidewalk widths. Additions and deletions of trees were made as of May 28th, 2002 in order to update the base information.

CITYgreen software requires data input in the following categories: Trees; Precipitation, Soil, and Site Attributes; and Residential Cooling and Energy Usage.

Tree Attributes

In order to correctly calculate the effect of trees, *CITYgreen* software requires the input of attributes in the following areas: Species; Diameter at Breast Height (DBH, diameter measured 4.5 feet above ground); Health; and Growing Conditions.

DCAUL staff recorded Species, Health, and Growing Conditions data during visits to the study area. DBH data was measured directly where possible, and estimated from public walks and alleys when trees were located on inaccessible private property.

All proposed plantings were assigned the following attributes:

Species: *Hackberry, Common* (Celtis occidentalis)

Rationale: Often used in urban situations, hackberries are tolerant of urban conditions such as salt accumulation in soils, soil compaction, and air pollution. In addition, their large canopies shade structures and road surfaces.

DBH: *3in.*

Rationale: While a 3 inch trunk diameter is larger than typical for a newly planted boulevard tree (1.75" is typical), the study assumes that high quality plants—establishing canopy as quickly as possible—would best achieve the goals of the corridor plan. City Forestry staff may recommend smaller DBH if their experience has shown that larger trees suffer excessive transplant shock.

Health: *Good*

Rationale: Freshly transplanted hackberry trees growing within a 7 foot boulevard with properly prepared soil should maintain an overall good health. Possible attributes include: Dead/Dying, Poor, Fair, Good, and Excellent.

Growing Conditions: *Fair*

Rationale: Urban boulevards, subject to salt accumulation in soil, soil compaction, and air pollution, are not ideal for tree growth. However, within an urban context, 7 foot boulevards would provide adequate growing conditions. Possible attribute choices include: Poor, Fair, and Good.

Precipitation, Soil, and Site Attributes

User-entered data in this category includes the following: Average 2-yr, 24hr Rainfall; Rainfall Distribution Classification Type; Hydrologic Soil Group; and Average Slope of Site.

Rainfall and soil information for the study area was obtained from **Protecting Water Quality in Urban Areas: Best Management Practices for Minnesota,** Minnesota Pollution Control Agency, Division of Water Quality, October 1989. Rainfall distribution type is Type II. Average 2-year, 24-hour rainfall is 2.75 inches. We assigned the soil type as "Type C – Somewhat Impervious" as soils in an urban context are often compacted.

Average Slope of Site data was obtained from planimetric drawings (City of Minneapolis, 1996-1997, revised 1998). Average slope was calculated to be 1%.

Residential Cooling and Energy Usage Attributes

CITYgreen requires that the following building attributes be assigned: Usage Type/Height; and Usage of Air Conditioning.

Usage Type/Height attributes were recorded by Design Center staff upon visits to the study area. Structures were assigned one of two possible Usage Type/Height values: 1) 1-2 story, single-family detached home with air conditioning; 2) All other buildings.

In order to calculate potential energy savings for these buildings, the user must also input the Average Yearly Cooling Cost per Home. According to the Home Energy Saver, an energy efficiency program sponsored by the U.S. Department of Energy (DOE), this cost for the study area in question is estimated to be $74/year. For more information regarding the Home Energy Saver and its calculations, please visit http://hes.lbl.gov/hes/about.html

*Please note:

1) The documentation of air conditioning units was conducted by DCAUL staff to the extent possible from public walks and alleys. Exact verification of unit type and usage was not available.
2) All documentation was completed as of May 28th, 2002. It is expected that a number of seasonal window-mounted units were not yet installed. Therefore actual savings data will be greater than is presented.

Summary

The DCAUL/CSNAP plan for Nicollet Avenue from Lake Street to 62nd Street calls for decreased road width, increased boulevard width, and additional trees within residential areas. Utilizing *CITYgreen* software, an analysis of a two-block portion of this proposal demonstrates that an enhanced urban tree canopy and an increase in percentage of pervious surfaces provide environmental and economic benefits. Benefits include decreased air pollution, a reduction of stormwater runoff, and decreased residential cooling costs. While the investigated included only a portion of the entire planning area, additional similar benefits would be expected if the design features included in the urban design proposal were executed for the entire length of Nicollet Avenue.

Resources

American Forests implements ecological models and research conducted by outside sources in the development of *CITYgreen* software. Below are listed some of these resources:

Cronshey, Roger G.; "Synthetic Regional Rainfall Time Distributions", Statistical Analysis of Rainfall and Runoff, Proceedings of the International Symposium on Rainfall-Runoff Modeling (1981), Water Resources Publications, Littleton CO, 1982.

Department of Energy, Energy Information Administration, "Electricity at a Glance: State Profiles, 1998." (http://www.eia.doe.gov/cneaf/electricity/st_profiles/toc.html).

Department of Energy, Energy Information Administration, "Carbon Dioxide Emissions from the Generation of Electric Power in the United States", October 15, 1999.

Engineering Field Handbook, Chapter 2, Soil Conservation Service, USDA, Washington DC, 1990.

Kibler, David F.; Small, Aaron B.; and Pasquel, R. Fernando, "Evaluating Hydrologic Models and Methods in Northern Virginia", Virginia Tech University Research Paper Evaluating Runoff Models, Virginia Tech University, Blacksburg, VA.

McPherson, E.; Nowak, David J.; Rowntree, Rowan A. eds. 1994. Chicago's Urban Forest Ecosystem: Results of the Chicago Urban Forest Climate Project. Gen. Tech. Rep. NE-186. Radnor, PA: USDA, Forest Service, Northeastern Forest Experiment Station: 201p.

McPherson, Greg; Sacamano, Paul; and Wensment, Steve. Modeling Benefits and Costs of Community Tree-Planting in 12 U.S. Cities, USDA Forest Service, 1993.

National Engineering Handbook, Chapter 15, Section 4, "Hydrology", Soil Conservation Service, USDA, Washington DC, 1985.

Nowak, David; Rowntree, Rowan A.; "Quantifying the Role of Urban Forests in Removing Atmospheric Carbon Dioxide", Journal of Arboriculture, 17 (10). October 1, 1991, p.269.

Rallison, Robert E. and Miller, Norman, "Past, Present, and Future SCS Runoff Procedure", Rainfall-Runoff Relationship, Proceedings of the International Symposium on Rainfall-Runoff Modeling (1981), Water Resources Publications, Littleton, CO, 1982.

Sanders, Ralph A., "Urban Vegetation Impacts on the Hydrology of Dayton, Ohio", Urban Ecology, vol. 9, Elsevier Science Publishers B.V., Amsterdam, 1986.

Technical Release 55, Urban Hydrology for Small Watersheds, Soil Conservation Service, USDA, Washington DC, June 1986.

Water Environment Federation-American Society of Civil Engineers, Design and Construction of Urban Stormwater Management Systems, American Society of Civil Engineers, New York, 1992.

Woodward, Donald M. and Moody, Helen Fox, "Evaluation of Stormwater Management Structures Proportioned by SCS TR-55", Engineering Hydrology: Proceedings of the Symposium, American Society of Civil Engineers, New York, 1987.

Comparisons of Environmental Benefits

Results from Existing Conditions and Proposed Scenarios

Landcover Distribution

	Scenario 1 - Existing		Scenario 2		Scenario 3	
	% of Site	Acres	% of Site	Acres	% of Site	Acres
Impervious Surface	53%	5.18	45%	4.44	45%	4.44
Urban Land Cover	47%	4.59	55%	5.34	55%	5.34

*Total Site = 9.77 acres

Tree Canopy Size

	Scenario 1 - Existing		Scenario 2		Scenario 3	
	% of Site	Canopy Acres	% of Site	Canopy Acres	% of Site	Canopy Acres
Year 1	16%	1.60	17%	1.67	18%	1.72
Year 10	18%	1.75	22%	2.18	25%	2.43
Year 25	18%	1.79	26%	2.52	29%	2.82
Year 50	19%	1.87	31%	3.07	35%	3.39

Carbon Storage (tons)

	Scenario 1 (Existing)	Scenario 2	Scenario 3
Year 1	51.65 tons	54.03	55.53
Year 10	56.29	70.23	78.52
Year 25	79.09	111.67	124.60
Year 50	101.08	165.63	182.56

Carbon Sequestration (lbs/year)

	Scenario 1 (Existing)	Scenario 2	Scenario 3
Year 1	2320 lbs/year	2440	2500
Year 10	2540	3160	3540
Year 25	275	389	434
Year 50	574	940	1036

Stormwater Runoff (inches)

	Scenario 1 (Existing)	Scenario 2	Scenario 3
Year 1	1.9 inches	1.9	1.9
Year 10	1.9	1.8	1.8
Year 25	1.9	1.8	1.8
Year 50	1.9	1.7	1.7

Stormwater Time of Concentration (hours)

	Scenario 1 (Existing)	Scenario 2	Scenario 3
Year 1	0.29 hours	0.29	0.29
Year 10	0.29	0.31	0.31
Year 25	0.29	0.31	0.31
Year 50	0.29	0.32	0.32

Stormwater Peak Flow (cu ft/sec.)

	Scenario 1 (Existing)	Scenario 2	Scenario 3
Year 1	20.12 cu ft/sec	20.12	20.12
Year 10	20.12	18.85	18.85
Year 25	20.12	18.85	18.85
Year 50	20.12	17.66	17.66

Ozone Removal

	Scenario 1 (Existing)		Scenario 2		Scenario 3	
	Amount-lbs	Dollar Value	Amount-lbs	Dollar Value	Amount-lbs	Dollar Value
Year 1	45.23	$138.82	47.32	$145.21	48.63	$149.25
Year 10	49.30	$151.29	61.50	$188.76	68.76	$211.01
Year 25	50.51	$155.03	71.33	$218.90	79.58	$244.24
Year 50	52.95	$162.51	86.76	$266.27	95.63	$293.49

Sulfur Dioxide Removal

	Scenario 1 (Existing)		Scenario 2		Scenario 3	
	Amount-lbs	Dollar Value	Amount-lbs	Dollar Value	Amount-lbs	Dollar Value
Year 1	6.31	$4.74	6.60	$4.96	6.78	$5.10
Year 10	6.88	$5.17	8.58	$6.44	9.59	$7.20
Year 25	7.05	$5.29	9.95	$7.47	11.10	$8.34
Year 50	7.39	$5.55	12.10	$9.09	13.34	$10.02

Nitrogen Dioxide Removal

	Scenario 1 (Existing)		Scenario 2		Scenario 3	
	Amount-lbs	Dollar Value	Amount-lbs	Dollar Value	Amount-lbs	Dollar Value
Year 1	17.63	$54.10	18.44	$56.59	18.95	$58.17
Year 10	19.21	$58.96	23.97	$73.56	26.80	$82.24
Year 25	19.69	$60.42	27.80	$85.31	31.02	$95.19
Year 50	20.64	$63.34	33.81	$103.77	37.27	$114.38

Particulate Matter Removal

	Scenario 1 (Existing)		Scenario 2		Scenario 3	
	Amount-lbs	Dollar Value	Amount-lbs	Dollar Value	Amount-lbs	Dollar Value
Year 1	28.98	$59.39	30.32	$62.12	31.16	$63.85
Year 10	31.59	$64.72	39.41	$80.75	44.05	$90.27
Year 25	32.37	$66.32	45.70	$93.65	50.99	$104.49
Year 50	33.93	$69.52	55.59	$113.91	61.27	$125.55

Carbon Monoxide Removal

	Scenario 1 (Existing)		Scenario 2		Scenario 3	
	Amount-lbs	Dollar Value	Amount-lbs	Dollar Value	Amount-lbs	Dollar Value
Year 1	2.83	$1.23	2.96	$1.29	3.05	$1.33
Year 10	3.09	$1.34	3.85	$1.68	4.31	$1.87
Year 25	3.16	$1.38	4.47	$1.94	4.99	$2.17
Year 50	3.32	$1.44	5.44	$2.36	5.99	$2.61

Energy Savings Year 1

	Scenario 1 (Existing)		Scenario 2		Scenario 3	
	Amount	Dollar Value	Amount	Dollar Value	Amount	Dollar Value
Savings from Trees	--	$96.62	--	$153.03	--	$193.32
Savings Per Home	--	$4.60	--	$7.29	--	$9.21
Kilowatt-hours Saved	791.98	--	1,254.36	--	1,548.57	--
KWHs Saved per Home	37.71	--	59.73	--	73.74	--
Carbon Generation Avoided (lbs)	31,980.55	--	50,651.59	--	63,985.59	--
CGA per Home (lbs)	1,522.88	--	2,411.98	--	3,046.93	--

Energy Savings Year 10

	Scenario 1 (Existing)		Scenario 2		Scenario 3	
	Amount	Dollar Value	Amount	Dollar Value	Amount	Dollar Value
Savings from Trees	--	$96.62	--	$174.50	--	$214.79
Savings Per Home	--	$4.60	--	$8.31	--	$10.23
Kilowatt-hours Saved	791.98	--	1,430.32	--	1,760.53	--
KWHs Saved per Home	37.71	--	68.11	--	83.83	--
Carbon Generation Avoided (lbs)	31,980.55	--	57,757.01	--	71,091.02	--
CGA per Home (lbs)	1,522.88	--	2,750.33	--	3,385.29	--

Energy Savings Year 25

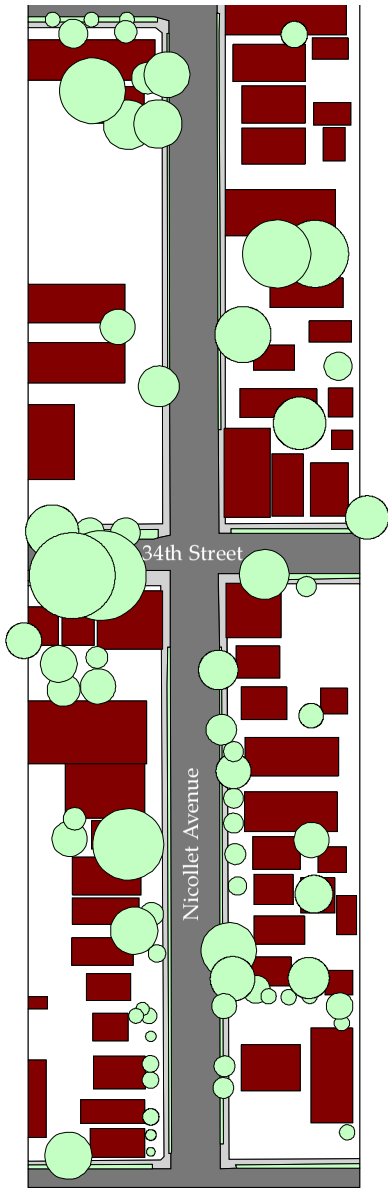
	Scenario 1 (Existing)		Scenario 2		Scenario 3	
	Amount	Dollar Value	Amount	Dollar Value	Amount	Dollar Value
Savings from Trees	--	$174.43	--	$246.86	--	$262.94
Savings Per Home	--	$8.31	--	$11.76	--	$12.52
Kilowatt-hours Saved	1,429.72	--	2,023.41	--	2,155.28	--
KWHs Saved per Home	68.08	--	96.35	--	102.63	--
Carbon Generation Avoided (lbs)	57,732.52	--	81,706.30	--	87,031.08	--
CGA per Home (lbs)	2,749.17	--	3,890.78	--	4,144.34	--

Energy Savings Year 50

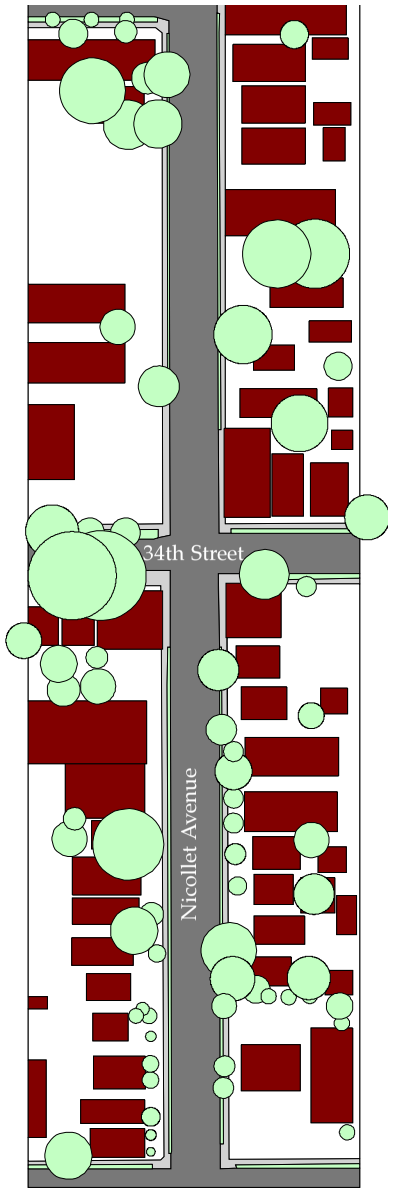
	Scenario 1 (Existing)		Scenario 2		Scenario 3	
	Amount	Dollar Value	Amount	Dollar Value	Amount	Dollar Value
Savings from Trees	--	$297.84	--	$810.31	--	$1,507.75
Savings Per Home	--	$14.18	--	$38.59	--	$71.80
Kilowatt-hours Saved	2,441.27	--	6,641.86	--	12,358.61	--
KWHs Saved per Home	116.25	--	316.28	--	588.51	--
Carbon Generation Avoided (lbs)	98,579.55	--	268,201.12	--	499,045.48	--
CGA per Home (lbs)	4,694.26	--	12,771.48	--	23,764.07	--

Year 1 - Existing

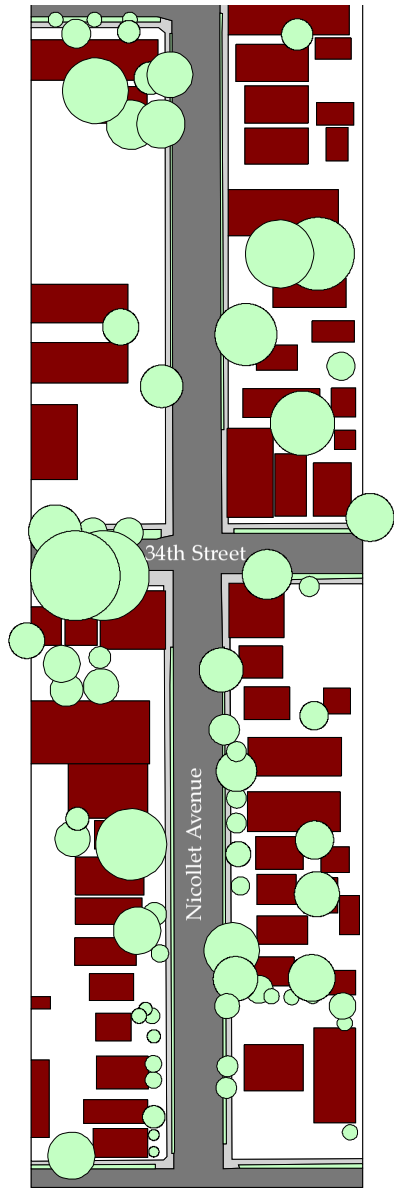
Year 10



Year 25



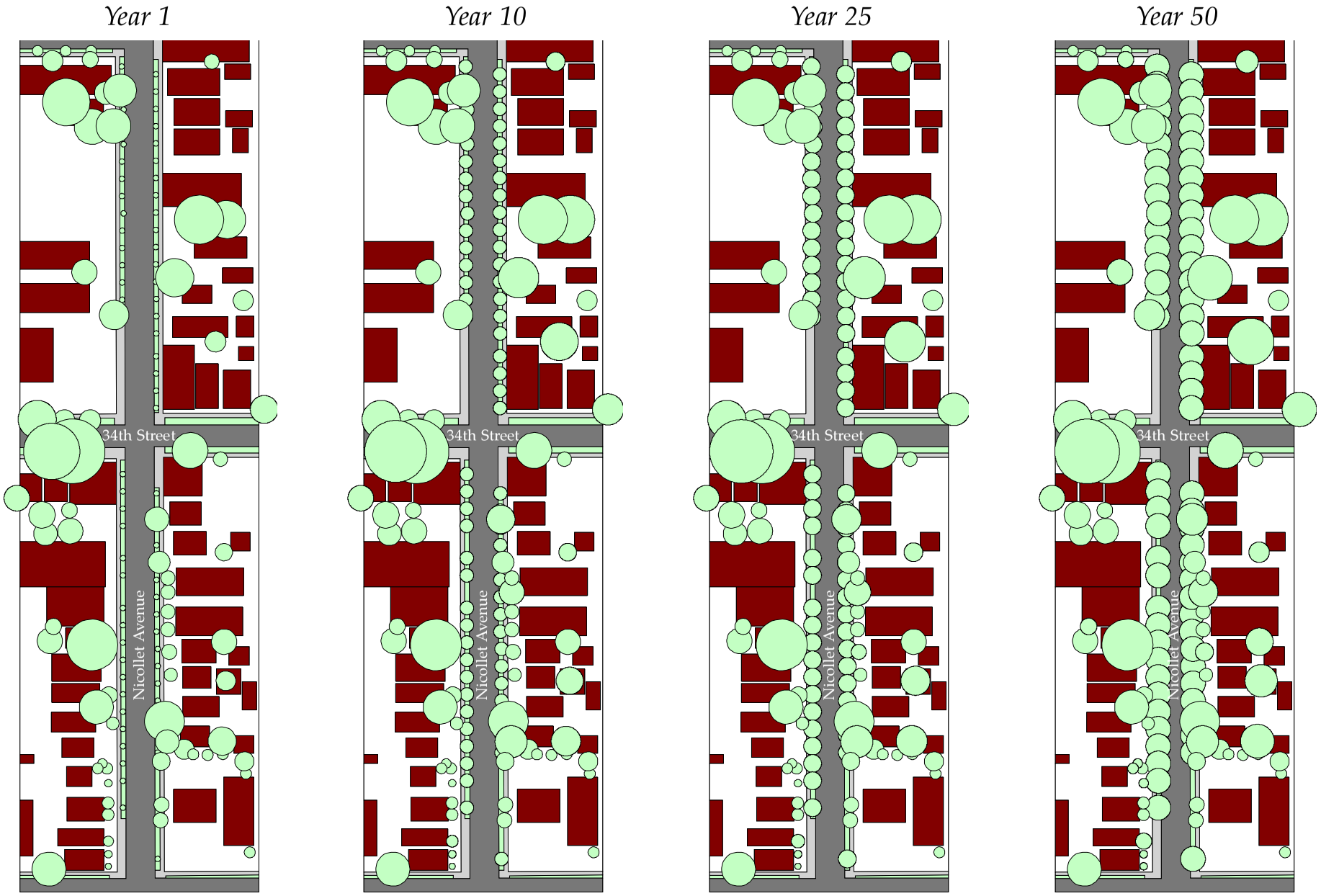
Year 50



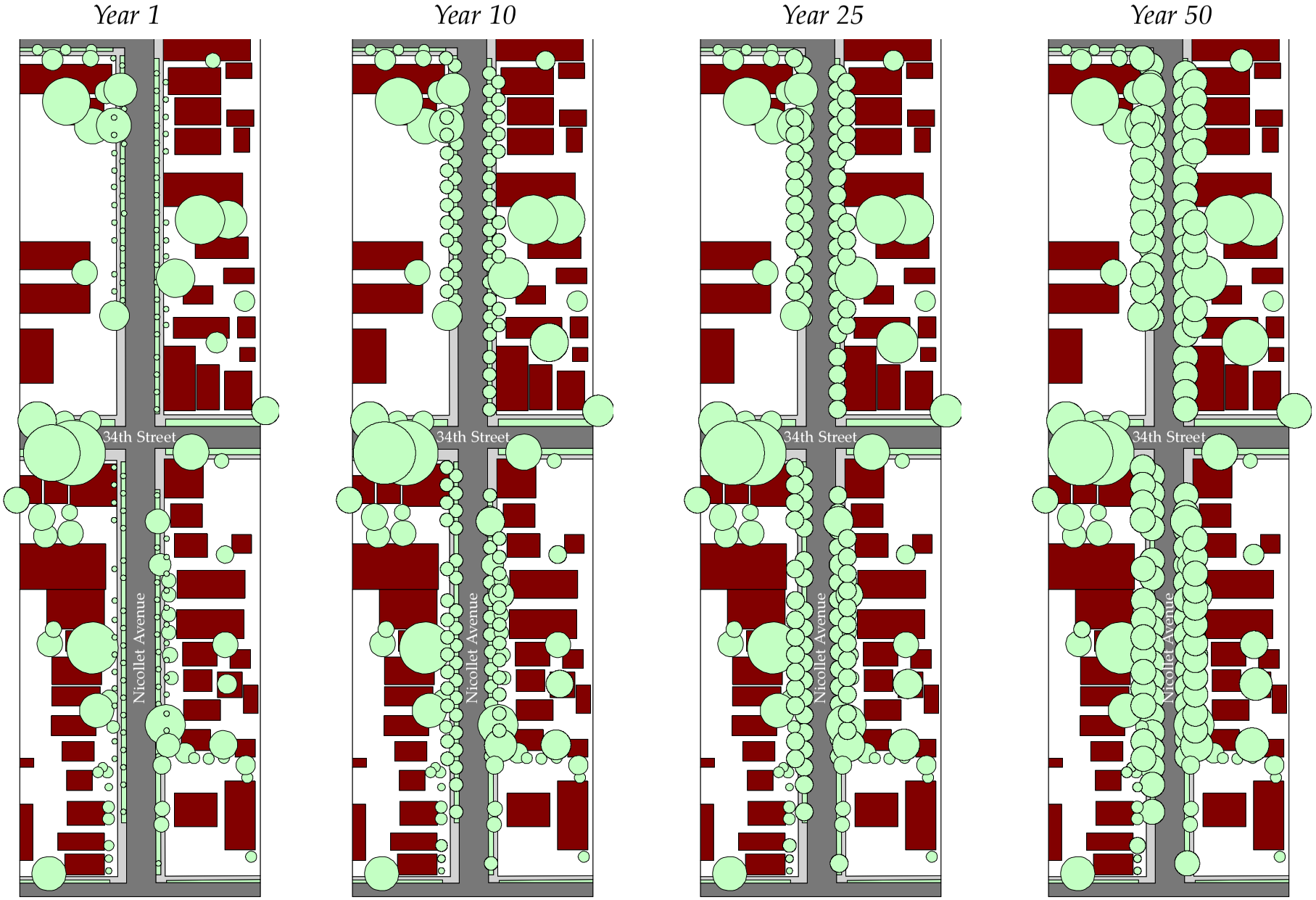
Scenario 1 - *Existing Conditions*

N

1"=200'



Scenario 2 - *Narrowed Road with Trees Planted in the Boulevard*



Scenario 3 - *Narrowed Road with Trees Planted in the Boulevard and in the "Next-to-Lot" Portion of the Right-of-way*

Analysis Report

Site Statistics

Analysis Area: Nicollet Avenue
33rd Street - 35th Street
Scenario 1 - Existing Conditions

Area:

0.02	sq. miles
9.77	acres
3.96	hectares

Landcover Distribution:		**Acres**
0%	Cropland	0.00
53%	Impervious	5.18
0%	Open Space/Pasture/Meadow	0.00
0%	Shrubs	0.00
16%	Tree Canopy	1.60
47%	Urban Land Use	4.59
0%	Water	0.00

*Dominant land use: Urban: Residential: 0.125ac Lots

Ecological Benefits

Air Pollution Removal (Annual)

Air Quality Reference City: Milwaukee

	lbs Removed	Dollar Value
Ozone:	45.23	$138.82
Sulfur Dioxide:	6.31	$4.74
Nitrogen Dioxide:	17.63	$54.10
Particulate Matter:	28.98	$59.39
Carbon Monoxide:	2.83	$1.23
Total:	**100.99**	**$258.28**

Residential Cooling Effects

Average Annual Cooling Cost per Home:		$74.00
Number of Homes:	21	
Savings from Trees:		$96.62
Total Savings:		**$96.62**
Savings per Home:		$4.60
Kilowatt-hours Saved:	791.98	
KWHs Saved per Home:	37.71	
Carbon Generation Avoided:	31,980.55 lbs.	
Carbon Generation Avoided per Home:	1,522.88 lbs.	

Carbon Storage and Sequestration

Age Distribution of Trees:		Young
Carbon Storage:	51.65	tons
Carbon Sequestration:	1.16	tons/year

Stormwater Control

Average 2-yr, 24-hour Rainfall:	2.75	in.
Rainfall Distribution Type:	II	
Hydrologic Soil Group:	C	
Average Slope:	1	%

	Conditions: Current	w/o trees*	
Curve Number:	92	94	
Runoff (in.):	1.93	2.11	
Time of Concentration (hrs.):	0.29	0.27	
Peak Flow (cu ft/s.):	20.12	22.93	
Storage volume needed to mitigate the change in peak flow:	10,984.00		cu. ft.

*Replaced by default landcover: Urban: Residential: 0.125ac Lots

Economic Benefit Summary

Annual Air Pollution Removal Savings:	**$258.28**
Annual Energy Savings:	**$96.62**
Total Annual Savings:	**$354.90**

*Please note: all monetary values are calculated as 1994 dollars.

Analysis Report

Site Statistics

Analysis Area: Nicollet Avenue
33rd Street - 35th Street
Scenario 1 - Year 10

Area:

0.02	sq. miles
9.77	acres
3.96	hectares

Landcover Distribution:

		Acres
0%	Cropland	0.00
53%	Impervious	5.18
0%	Open Space/Pasture/Meadow	0.00
0%	Shrubs	0.00
18%	Tree Canopy	1.75
47%	Urban Land Use	4.59
0%	Water	0.00

*Dominant land use: Urban: Residential: 0.125ac Lots

Ecological Benefits

Air Pollution Removal

Air Quality Reference City: Milwaukee

	lbs Removed	Dollar Value
Ozone:	49.30	$151.29
Sulfur Dioxide:	6.88	$5.17
Nitrogen Dioxide:	19.21	$58.96
Particulate Matter:	31.59	$64.72
Carbon Monoxide:	3.09	$1.34
Total:	**110.06**	**$281.49**

Residential Cooling Effects

Average Annual Cooling Cost per Home:		$74.00
Number of Homes:	21	
Savings from Trees:		$96.62
Total Savings:		**$96.62**
Savings per Home:		$4.60
Kilowatt-hours Saved:	791.98	
KWHs Saved per Home:	37.71	
Carbon Generation Avoided:	31,980.55 lbs.	
Carbon Generation Avoided per Home:	1,522.88 lbs.	

Carbon Storage and Sequestration

Age Distribution of Trees:		Young
Carbon Storage:	56.29	tons
Carbon Sequestration:	1.27	tons/year

Stormwater Control

Average 2-yr, 24-hour Rainfall:	2.75	in.
Rainfall Distribution Type:	II	
Hydrologic Soil Group:	C	
Average Slope:	1	%

	Conditions: Current	w/o trees*	
Curve Number:	92	94	
Runoff (in.):	1.93	2.11	
Time of Concentration (hrs.):	0.29	0.27	
Peak Flow (cu ft/s.):	20.12	22.93	
Storage volume needed to mitigate the change in peak flow:	10,984.00		cu. ft.

*Replaced by default landcover: Urban: Residential: 0.125ac Lots

Economic Benefit Summary

Annual Air Pollution Removal Savings:	**$281.49**
Annual Energy Savings:	**$96.62**
Total Annual Savings:	**$378.11**

*Please note: all monetary values are calculated as 1994 dollars.

Analysis Report

Site Statistics

Analysis Area: Nicollet Avenue
33rd Street - 35th Street
Scenario 1 - Year 25

Area:

0.02	sq. miles
9.77	acres
3.96	hectares

Landcover Distribution:

		Acres
0%	Cropland	0.00
53%	Impervious	5.18
0%	Open Space/Pasture/Meadow	0.00
0%	Shrubs	0.00
18%	Tree Canopy	1.79
47%	Urban Land Use	4.59
0%	Water	0.00

*Dominant land use: Urban: Residential: 0.125ac Lots

Ecological Benefits

Air Pollution Removal (Annual)

Air Quality Reference City: Milwaukee

	lbs Removed	Dollar Value
Ozone:	50.51	$155.03
Sulfur Dioxide:	7.05	$5.29
Nitrogen Dioxide:	19.69	$60.42
Particulate Matter:	32.37	$66.32
Carbon Monoxide:	3.16	$1.38
Total:	**112.78**	**$288.44**

Residential Cooling Effects

Average Annual Cooling Cost per Home:		$74.00
Number of Homes:	21	
Savings from Trees:		$174.43
Total Savings:		**$174.43**
Savings per Home:		$8.31
Kilowatt-hours Saved:	1,429.72	
KWHs Saved per Home:	68.08	
Carbon Generation Avoided:	57,732.52 lbs.	
Carbon Generation Avoided per Home:	2,749.17 lbs.	

Carbon Storage and Sequestration

Age Distribution of Trees:		Mature
Carbon Storage:	79.09	tons
Carbon Sequestration:	275	pounds/year

Stormwater Control

Average 2-yr, 24-hour Rainfall:	2.75	in.
Rainfall Distribution Type:	II	
Hydrologic Soil Group:	C	
Average Slope:	1	%

	Conditions: Current	w/o trees*	
Curve Number:	92	94	
Runoff (in.):	1.93	2.11	
Time of Concentration (hrs.):	0.29	0.27	
Peak Flow (cu ft/s.):	20.12	22.93	
Storage volume needed to mitigate the change in peak flow:	10,984.00		cu. ft.

*Replaced by default landcover: Urban: Residential: 0.125ac Lots

Economic Benefit Summary

Annual Air Pollution Removal Savings:	**$288.44**
Annual Energy Savings:	**$174.43**
Total Annual Savings:	**$462.87**

*Please note: all monetary values are calculated as 1994 dollars.

Analysis Report

Site Statistics

Analysis Area: Nicollet Avenue
33rd Street - 35th Street
Scenario 1 - Year 50

Area:

0.02	sq. miles
9.77	acres
3.96	hectares

Landcover Distribution:

		Acres
0%	Cropland	0.00
53%	Impervious	5.18
0%	Open Space/Pasture/Meadow	0.00
0%	Shrubs	0.00
19%	Tree Canopy	1.87
47%	Urban Land Use	4.59
0%	Water	0.00

*Dominant land use: Urban: Residential: 0.125ac Lots

Ecological Benefits

Air Pollution Removal (Annual)

Air Quality Reference City: Milwaukee

	lbs Removed	Dollar Value
Ozone:	52.95	$162.51
Sulfur Dioxide:	7.39	$5.55
Nitrogen Dioxide:	20.64	$63.34
Particulate Matter:	33.93	$69.52
Carbon Monoxide:	3.32	$1.44
Total:	**118.22**	**$302.36**

Residential Cooling Effects

Average Annual Cooling Cost per Home:		$74.00
Number of Homes:	21	
Savings from Trees:		$297.84
Total Savings:		**$297.84**
Savings per Home:		$14.18
Kilowatt-hours Saved:	2,441.27	
KWHs Saved per Home:	116.25	
Carbon Generation Avoided:	98,579.55 lbs.	
Carbon Generation Avoided per Home:	4,694.26 lbs.	

Carbon Storage and Sequestration

Age Distribution of Trees:		Even Mix
Carbon Storage:	101.08	tons
Carbon Sequestration:	574	pounds/year

Stormwater Control

Average 2-yr, 24-hour Rainfall:	2.75	in.
Rainfall Distribution Type:	II	
Hydrologic Soil Group:	C	
Average Slope:	1	%

	Conditions: Current	w/o trees*	
Curve Number:	92	94	
Runoff (in.):	1.93	2.11	
Time of Concentration (hrs.):	0.29	0.27	
Peak Flow (cu ft/s.):	20.12	22.93	
Storage volume needed to mitigate the change in peak flow:	10,984.00		cu. ft.

*Replaced by default landcover: Urban: Residential: 0.125ac Lots

Economic Benefit Summary

Annual Air Pollution Removal Savings:	**$302.36**
Annual Energy Savings:	**$297.84**
Total Annual Savings:	**$600.20**

*Please note: all monetary values are calculated as 1994 dollars.

Analysis Report

Site Statistics

Analysis Area: Nicollet Avenue
33rd Street - 35th Street
Scenario 2 - Year 1

Area:

0.02	sq. miles
9.77	acres
3.96	hectares

Landcover Distribution:

		Acres
0%	Cropland	0.00
45%	Impervious	4.44
0%	Open Space/Pasture/Meadow	0.00
0%	Shrubs	0.00
17%	Tree Canopy	1.67
55%	Urban Land Use	5.34
0%	Water	0.00

*Dominant land use: Urban: Residential: 0.125ac Lots

Ecological Benefits

Air Pollution Removal (Annual)

Air Quality Reference City: Milwaukee

	lbs Removed	Dollar Value
Ozone:	47.32	$145.21
Sulfur Dioxide:	6.60	$4.96
Nitrogen Dioxide:	18.44	$56.59
Particulate Matter:	30.32	$62.12
Carbon Monoxide:	2.96	$1.29
Total:	**105.63**	**$270.17**

Residential Cooling Effects

Average Annual Cooling Cost per Home:		$74.00
Number of Homes:	21	
Savings from Trees:		$153.03
Total Savings:		**$153.03**
Savings per Home:		$7.29
Kilowatt-hours Saved:	1,254.36	
KWHs Saved per Home:	59.73	
Carbon Generation Avoided:	50,651.59 lbs.	
Carbon Generation Avoided per Home:	2,411.98 lbs.	

Carbon Storage and Sequestration

Age Distribution of Trees:		Young
Carbon Storage:	54.03	tons
Carbon Sequestration:	1.22	tons/year

Stormwater Control

Average 2-yr, 24-hour Rainfall:	2.75	in.
Rainfall Distribution Type:	II	
Hydrologic Soil Group:	C	
Average Slope:	1	%

	Conditions: Current	w/o trees*	
Curve Number:	92	94	
Runoff (in.):	1.93	2.11	
Time of Concentration (hrs.):	0.29	0.27	
Peak Flow (cu ft/s.):	20.12	22.93	
Storage volume needed to mitigate the change in peak flow:	10,984.00		cu. ft.

*Replaced by default landcover: Urban: Residential: 0.125ac Lots

Economic Benefit Summary

Annual Air Pollution Removal Savings:	**$270.17**
Annual Energy Savings:	**$153.03**
Total Annual Savings:	**$423.20**

*Please note: all monetary values are calculated as 1994 dollars.

Analysis Report

Site Statistics

Analysis Area: Nicollet Avenue
33rd Street - 35th Street
Scenario 2 - Year 10

Area:

0.02	sq. miles
9.77	acres
3.96	hectares

Landcover Distribution:

		Acres
0%	Cropland	0.00
45%	Impervious	4.44
0%	Open Space/Pasture/Meadow	0.00
0%	Shrubs	0.00
22%	Tree Canopy	2.18
55%	Urban Land Use	5.34
0%	Water	0.00

*Dominant land use: Urban: Residential: 0.125ac Lots

Ecological Benefits

Air Pollution Removal (Annual)

Air Quality Reference City: Milwaukee

	lbs Removed	Dollar Value
Ozone:	61.50	$188.76
Sulfur Dioxide:	8.58	$6.44
Nitrogen Dioxide:	23.97	$73.56
Particulate Matter:	39.41	$80.75
Carbon Monoxide:	3.85	$1.68
Total:	**137.31**	**$351.19**

Residential Cooling Effects

Average Annual Cooling Cost per Home:		$74.00
Number of Homes:	21	
Savings from Trees:		$174.50
Total Savings:		**$174.50**
Savings per Home:		$8.31
Kilowatt-hours Saved:	1,430.32	
KWHs Saved per Home:	68.11	
Carbon Generation Avoided:	57,757.01 lbs.	
Carbon Generation Avoided per Home:	2,750.33 lbs.	

Carbon Storage and Sequestration

Age Distribution of Trees:		Young
Carbon Storage:	70.23	tons
Carbon Sequestration:	1.58	tons/year

Stormwater Control

Average 2-yr, 24-hour Rainfall:	2.75	in.
Rainfall Distribution Type:	II	
Hydrologic Soil Group:	C	
Average Slope:	1	%

	Conditions: Current	w/o trees*	
Curve Number:	91	94	
Runoff (in.):	1.84	2.11	
Time of Concentration (hrs.):	0.31	0.27	
Peak Flow (cu ft/s.):	18.85	22.93	
Storage volume needed to mitigate the change in peak flow:	12,580.00		cu. ft.

*Replaced by default landcover: Urban: Residential: 0.125ac Lots

Economic Benefit Summary

Annual Air Pollution Removal Savings:	**$351.19**
Annual Energy Savings:	**$174.50**
Total Annual Savings:	**$525.69**

*Please note: all monetary values are calculated as 1994 dollars.

Analysis Report

Site Statistics

Analysis Area: Nicollet Avenue
33rd Street - 35th Street
Scenario 2 - Year 25

Area:

0.02	sq. miles
9.77	acres
3.96	hectares

Landcover Distribution:

		Acres
0%	Cropland	0.00
45%	Impervious	4.44
0%	Open Space/Pasture/Meadow	0.00
0%	Shrubs	0.00
26%	Tree Canopy	2.52
55%	Urban Land Use	5.34
0%	Water	0.00

*Dominant land use: Urban: Residential: 0.125ac Lots

Ecological Benefits

Air Pollution Removal (Annual)

Air Quality Reference City: Milwaukee

	lbs Removed	Dollar Value
Ozone:	71.33	$218.90
Sulfur Dioxide:	9.95	$7.47
Nitrogen Dioxide:	27.80	$85.31
Particulate Matter:	45.70	$93.65
Carbon Monoxide:	4.47	$1.94
Total:	**159.24**	**$407.28**

Residential Cooling Effects

Average Annual Cooling Cost per Home:		$74.00
Number of Homes:	21	
Savings from Trees:		$246.86
Total Savings:		**$246.86**
Savings per Home:		$11.76
Kilowatt-hours Saved:	2,023.41	
KWHs Saved per Home:	96.35	
Carbon Generation Avoided:	81,706.30 lbs.	
Carbon Generation Avoided per Home:	3,890.78 lbs.	

Carbon Storage and Sequestration

Age Distribution of Trees:		Mature
Carbon Storage:	111.67	tons
Carbon Sequestration:	389	pounds/year

Stormwater Control

Average 2-yr, 24-hour Rainfall:	2.75	in.
Rainfall Distribution Type:	II	
Hydrologic Soil Group:	C	
Average Slope:	1	%

	Conditions: Current	w/o trees*	
Curve Number:	91	94	
Runoff (in.):	1.84	2.11	
Time of Concentration (hrs.):	0.31	0.27	
Peak Flow (cu ft/s.):	18.85	22.93	
Storage volume needed to mitigate the change in peak flow:	12,580.00		cu. ft.

*Replaced by default landcover: Urban: Residential: 0.125ac Lots

Economic Benefit Summary

Annual Air Pollution Removal Savings:	**$407.28**
Annual Energy Savings:	**$246.86**
Total Annual Savings:	**$654.14**

*Please note: all monetary values are calculated as 1994 dollars.

Analysis Report

Site Statistics

Analysis Area: Nicollet Avenue
33rd Street - 35th Street
Scenario 2 - Year 50

Area:

0.02	sq. miles
9.77	acres
3.96	hectares

Landcover Distribution:

		Acres
0%	Cropland	0.00
45%	Impervious	4.44
0%	Open Space/Pasture/Meadow	0.00
0%	Shrubs	0.00
31%	Tree Canopy	3.07
55%	Urban Land Use	5.34
0%	Water	0.00

*Dominant land use: Urban: Residential: 0.125ac Lots

Ecological Benefits

Air Pollution Removal (Annual)

Air Quality Reference City: Milwaukee

	lbs Removed	Dollar Value
Ozone:	86.76	$266.27
Sulfur Dioxide:	12.10	$9.09
Nitrogen Dioxide:	33.81	$103.77
Particulate Matter:	55.59	$113.91
Carbon Monoxide:	5.44	$2.36
Total:	**193.70**	**$495.40**

Residential Cooling Effects

Average Annual Cooling Cost per Home:		$74.00
Number of Homes:	21	
Savings from Trees:		$810.31
Total Savings:		**$810.31**
Savings per Home:		$38.59
Kilowatt-hours Saved:	6,641.86	
KWHs Saved per Home:	316.28	
Carbon Generation Avoided:	268,201.12 lbs.	
Carbon Generation Avoided per Home:	12,771.48 lbs.	

Carbon Storage and Sequestration

Age Distribution of Trees:		Even Mix
Carbon Storage:	165.63	tons
Carbon Sequestration:	940	pounds/year

Stormwater Control

Average 2-yr, 24-hour Rainfall:	2.75	in.
Rainfall Distribution Type:	II	
Hydrologic Soil Group:	C	
Average Slope:	1	%

	Conditions: Current	w/o trees*	
Curve Number:	90	94	
Runoff (in.):	1.76	2.11	
Time of Concentration (hrs.):	0.32	0.27	
Peak Flow (cu ft/s.):	17.66	22.93	
Storage volume needed to mitigate the change in peak flow:	13,930.00		cu. ft.

*Replaced by default landcover: Urban: Residential: 0.125ac Lots

Economic Benefit Summary

Annual Air Pollution Removal Savings:	**$495.40**
Annual Energy Savings:	**$810.31**
Total Annual Savings:	**$1,305.71**

*Please note: all monetary values are calculated as 1994 dollars.

Analysis Report

Site Statistics

Analysis Area: Nicollet Avenue
33rd Street - 35th Street
Scenario 3 - Year 1

Area:

0.02	sq. miles
9.77	acres
3.96	hectares

Landcover Distribution:

		Acres
0%	Cropland	0.00
45%	Impervious	4.44
0%	Open Space/Pasture/Meadow	0.00
0%	Shrubs	0.00
18%	Tree Canopy	1.72
55%	Urban Land Use	5.34
0%	Water	0.00

*Dominant land use: Urban: Residential: 0.125ac Lots

Ecological Benefits

Air Pollution Removal (Annual)

Air Quality Reference City: Milwaukee

	lbs Removed	Dollar Value
Ozone:	48.63	$149.25
Sulfur Dioxide:	6.78	$5.10
Nitrogen Dioxide:	18.95	$58.17
Particulate Matter:	31.16	$63.85
Carbon Monoxide:	3.05	$1.33
Total:	**108.57**	**$277.69**

Residential Cooling Effects

Average Annual Cooling Cost per Home:		$74.00
Number of Homes:	21	
Savings from Trees:		$193.32
Total Savings:		**$193.32**
Savings per Home:		$9.21
Kilowatt-hours Saved:	1,584.57	
KWHs Saved per Home:	75.46	
Carbon Generation Avoided:	63,985.59 lbs.	
Carbon Generation Avoided per Home:	3,046.93 lbs.	

Carbon Storage and Sequestration

Age Distribution of Trees:		Young
Carbon Storage:	55.53	tons
Carbon Sequestration:	1.25	tons/year

Stormwater Control

Average 2-yr, 24-hour Rainfall:	2.75	in.
Rainfall Distribution Type:	II	
Hydrologic Soil Group:	C	
Average Slope:	1	%

	Conditions: Current	w/o trees*	
Curve Number:	92	94	
Runoff (in.):	1.93	2.11	
Time of Concentration (hrs.):	0.29	0.27	
Peak Flow (cu ft/s.):	20.12	22.93	
Storage volume needed to mitigate the change in peak flow:	10,984.00		cu. ft.

*Replaced by default landcover: Urban: Residential: 0.125ac Lots

Economic Benefit Summary

Annual Air Pollution Removal Savings:	**$277.69**
Annual Energy Savings:	**$193.32**
Total Annual Savings:	**$471.01**

*Please note: all monetary values are calculated as 1994 dollars.

Analysis Report

Site Statistics

Analysis Area: Nicollet Avenue
33rd Street - 35th Street
Scenario 3 - Year 10

Area:

0.02	sq. miles
9.77	acres
3.96	hectares

Landcover Distribution:

		Acres
0%	Cropland	0.00
45%	Impervious	4.44
0%	Open Space/Pasture/Meadow	0.00
0%	Shrubs	0.00
25%	Tree Canopy	2.43
55%	Urban Land Use	5.34
0%	Water	0.00

*Dominant land use: Urban: Residential: 0.125ac Lots

Ecological Benefits

Air Pollution Removal (Annual)

Air Quality Reference City: Milwaukee

	lbs Removed	Dollar Value
Ozone:	68.76	$211.01
Sulfur Dioxide:	9.59	$7.20
Nitrogen Dioxide:	26.80	$82.24
Particulate Matter:	44.05	$90.27
Carbon Monoxide:	4.31	$1.87
Total:	**153.50**	**$392.60**

Residential Cooling Effects

Average Annual Cooling Cost per Home:		$74.00
Number of Homes:	21	
Savings from Trees:		$214.79
Total Savings:		**$214.79**
Savings per Home:		$10.23
Kilowatt-hours Saved:	1,760.53	
KWHs Saved per Home:	83.83	
Carbon Generation Avoided:	71,091.02 lbs.	
Carbon Generation Avoided per Home:	3,385.29 lbs.	

Carbon Storage and Sequestration

Age Distribution of Trees:		Young
Carbon Storage:	78.52	tons
Carbon Sequestration:	1.77	tons/year

Stormwater Control

Average 2-yr, 24-hour Rainfall:	2.75	in.
Rainfall Distribution Type:	II	
Hydrologic Soil Group:	C	
Average Slope:	1	%

	Conditions: Current	w/o trees*
Curve Number:	91	94
Runoff (in.):	1.84	2.11
Time of Concentration (hrs.):	0.31	0.27
Peak Flow (cu ft/s.):	18.85	22.93

Storage volume needed to mitigate the change in peak flow: 12,580.00 cu. ft.

*Replaced by default landcover: Urban: Residential: 0.125ac Lots

Economic Benefit Summary

Annual Air Pollution Removal Savings:	**$392.60**
Annual Energy Savings:	**$214.79**
Total Annual Savings:	**$607.39**

*Please note: all monetary values are calculated as 1994 dollars.

Analysis Report

Site Statistics

Analysis Area: Nicollet Avenue
33rd Street - 35th Street
Scenario 3 - Year 25

Area:

0.02	sq. miles
9.77	acres
3.96	hectares

Landcover Distribution:

		Acres
0%	Cropland	0.00
45%	Impervious	4.44
0%	Open Space/Pasture/Meadow	0.00
0%	Shrubs	0.00
29%	Tree Canopy	2.82
55%	Urban Land Use	5.34
0%	Water	0.00

*Dominant land use: Urban: Residential: 0.125ac Lots

Ecological Benefits

Air Pollution Removal (Annual)

Air Quality Reference City: Milwaukee

	lbs Removed	Dollar Value
Ozone:	79.58	$244.24
Sulfur Dioxide:	11.10	$8.34
Nitrogen Dioxide:	31.02	$95.19
Particulate Matter:	50.99	$104.49
Carbon Monoxide:	4.99	$2.17
Total:	**177.67**	**$454.42**

Residential Cooling Effects

Average Annual Cooling Cost per Home:		$74.00
Number of Homes:	21	
Savings from Trees:		$262.94
Total Savings:		**$262.94**
Savings per Home:		$12.52
Kilowatt-hours Saved:	2,155.28	
KWHs Saved per Home:	102.63	
Carbon Generation Avoided:	87,031.08 lbs.	
Carbon Generation Avoided per Home:	4,144.34 lbs.	

Carbon Storage and Sequestration

Age Distribution of Trees:		Mature
Carbon Storage:	124.60	tons
Carbon Sequestration:	434	pounds/year

Stormwater Control

Average 2-yr, 24-hour Rainfall:	2.75	in.
Rainfall Distribution Type:	II	
Hydrologic Soil Group:	C	
Average Slope:	1	%

	Conditions: Current	w/o trees*	
Curve Number:	91	94	
Runoff (in.):	1.84	2.11	
Time of Concentration (hrs.):	0.31	0.27	
Peak Flow (cu ft/s.):	18.85	22.93	
Storage volume needed to mitigate the change in peak flow:	12,580.00		cu. ft.

*Replaced by default landcover: Urban: Residential: 0.125ac Lots

Economic Benefit Summary

Annual Air Pollution Removal Savings:	**$454.42**
Annual Energy Savings:	**$262.94**
Total Annual Savings:	**$717.36**

*Please note: all monetary values are calculated as 1994 dollars.

Analysis Report

Site Statistics

Analysis Area: Nicollet Avenue
33rd Street - 35th Street
Scenario 3 - Year 50

Area:

0.02	sq. miles
9.77	acres
3.96	hectares

Landcover Distribution:

		Acres
0%	Cropland	0.00
45%	Impervious	4.44
0%	Open Space/Pasture/Meadow	0.00
0%	Shrubs	0.00
35%	Tree Canopy	3.39
55%	Urban Land Use	5.34
0%	Water	0.00

*Dominant land use: Urban: Residential: 0.125ac Lots

Ecological Benefits

Air Pollution Removal (Annual)

Air Quality Reference City: Milwaukee

	lbs Removed	Dollar Value
Ozone:	95.63	$293.49
Sulfur Dioxide:	13.34	$10.02
Nitrogen Dioxide:	37.27	$114.38
Particulate Matter:	61.27	$125.55
Carbon Monoxide:	5.99	$2.61
Total:	**213.50**	**$546.05**

Residential Cooling Effects

Average Annual Cooling Cost per Home:		$74.00
Number of Homes:	21	
Savings from Trees:		$1,507.75
Total Savings:		**$1,507.75**
Savings per Home:		$71.80
Kilowatt-hours Saved:	12,358.61	
KWHs Saved per Home:	588.51	
Carbon Generation Avoided:	499,045.48 lbs.	
Carbon Generation Avoided per Home:	23,764.07 lbs.	

Carbon Storage and Sequestration

Age Distribution of Trees:		Even Mix
Carbon Storage:	182.56	tons
Carbon Sequestration:	1,036	pounds/year

Stormwater Control

Average 2-yr, 24-hour Rainfall:	2.75	in.
Rainfall Distribution Type:	II	
Hydrologic Soil Group:	C	
Average Slope:	1	%

	Conditions: Current	w/o trees*	
Curve Number:	90	94	
Runoff (in.):	1.76	2.11	
Time of Concentration (hrs.):	0.32	0.27	
Peak Flow (cu ft/s.):	17.66	22.93	
Storage volume needed to mitigate the change in peak flow:	13,930.00		cu. ft.

*Replaced by default landcover: Urban: Residential: 0.125ac Lots

Economic Benefit Summary

Annual Air Pollution Removal Savings:	**$546.05**
Annual Energy Savings:	**$1,507.75**
Total Annual Savings:	**$2,053.80**

*Please note: all monetary values are calculated as 1994 dollars.

Appendix F:
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