Chapter 4 – Transportation

Introduction

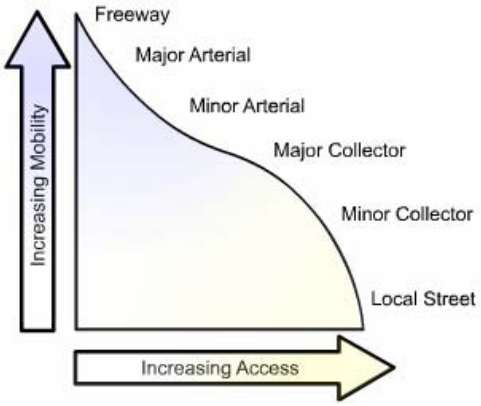
An efficient, safe, and connected transportation system is a key component to a vibrant, healthy city. Convenient access to jobs, schools, entertainment, recreation, and critical services such as banking, medical care, and shopping is vitally important to a city's quality of life. Achieving this mobility requires a diverse transportation system of roads, transit, bikeways, and sidewalks. It also requires appropriately designed systems for moving freight and meeting regional mobility needs.

Existing Roadway System

The major highways connecting Madison to the rest of South Dakota, and the nation, are U.S Routes 81 and South Dakota Highway 34. U.S. Route 81 is a north-south highway connecting to Yankton in the south and north into Interstate 29 near Watertown. South Dakota Highway 34 is an east-west highway running along the north side of Lake Madison and through the City of Madison. It runs from the Wyoming border near Belle Fourche to the Minnesota border east of Egan. The City does not have direct interstate access; the closest interstate roads are I-29 which is approximately 20 miles east of the city and accessed via South Dakota Highway 34, and I-90, which is approximately 25 miles south of the City and accessed via South Dakota Highways 34 and 19. Due to high truck traffic volumes and the continuing growth of population and traffic in the Madison area, the portion of Highway 34 between Madison and I-29 has been targeted for reconstruction as a four-lane divided roadway. This initiative is receiving widespread local, regional and state support.

Functionally Classified Roadways. Roads serve two primary purposes: mobility and access. Mobility is the efficient movement of people and goods. Access allows those people and goods to reach specific properties. A roadway designed to maximize mobility typically does so in part by limiting access to adjacent properties, for example an Interstate Highway. While a motorist could expect to travel quite efficiently over a long distance using an Interstate Highway, the number of access points is restricted to freeway interchanges every few miles. Roadways designed for high mobility are anticipated to accommodate higher speeds as well. At the other extreme, a local residential street would provide easy and plentiful access to all adjacent properties, but long distance travel on such a roadway would be impractical and speeds should be much slower (FDOT n.d.)

Figure 4.1. Inverse relationship between road access and mobility (FHWA 2006).



Functional classification is a hierarchical ranking based on the degree of mobility and access that a street provides (Figure 4.1). Streets are generally classified as arterials, collectors and local streets based on the character of the service they provide. This classification is used in transportation planning, roadway design, and for the allocation of federal roadway improvement funds. Figure 4.2 displays the distribution of roadways by functional classification for the City of Madison.

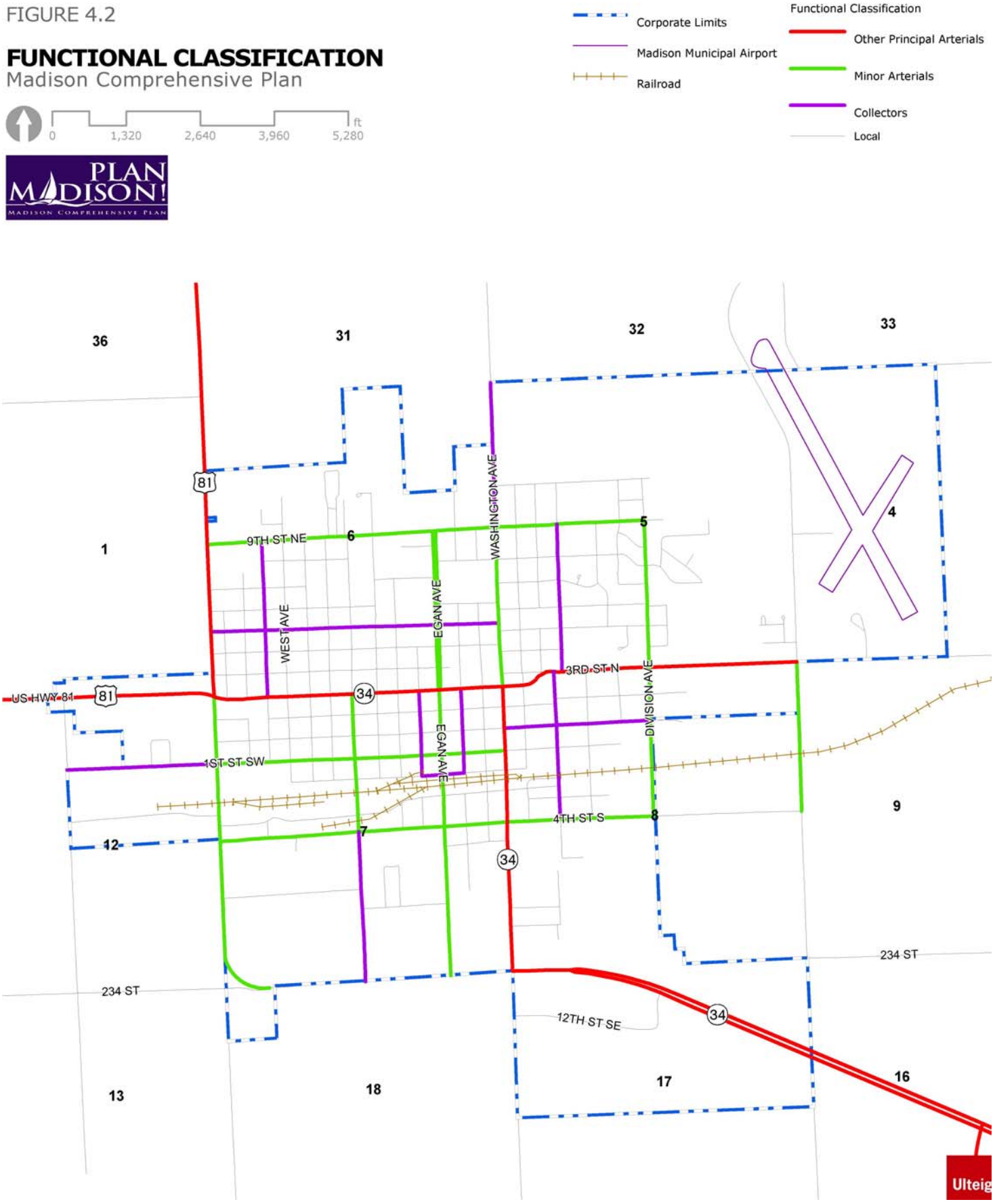
FIGURE 4.2

FUNCTIONAL CLASSIFICATION

Madison Comprehensive Plan

0 1,320 2,640 3,960 5,280 ft

PLAN MADISON! MADISON COMPREHENSIVE PLAN



In addition to the highways previously noted, other arterial roadways in the city include the main north-south roads of Division, Prairie, Washington, Egan, Union, Olive, and Highland Avenues and the main east-west roads of 4 St S, 1 St S, Center St, 1 St N, 2 St N, 5 St N, and 9 St N.

There are approximately 55 miles of total roads within the incorporated limits of Madison, 47 miles which are hard-surface roads. These include roads which are owned by the City and those which are owned and partially maintained by the County or the State. Approximately seven miles of the City's road network are currently gravel roads.

Traffic Volumes. Figure 4.3 illustrates the traffic volumes of the major roadways in the Madison area.

Commuting Patterns. The number of Madison residents who drive alone to work is nearly 78%, which is nearly identical to the state average. Figure 4.4 illustrates the number of residents car pooling, walking, or working from home. These rates are slightly higher than the state average. The average commute time is 11.8 minutes, which is approximately 4.8 minutes less than the state average. The greatest share of commute times require 5-9 minutes. Overall commute times have remained fairly consistent between the 1990 and 2000 census (Figure 4.5).

Figure 4.4. City of Madison commuting to work transportation mode, 2000 (US Census).

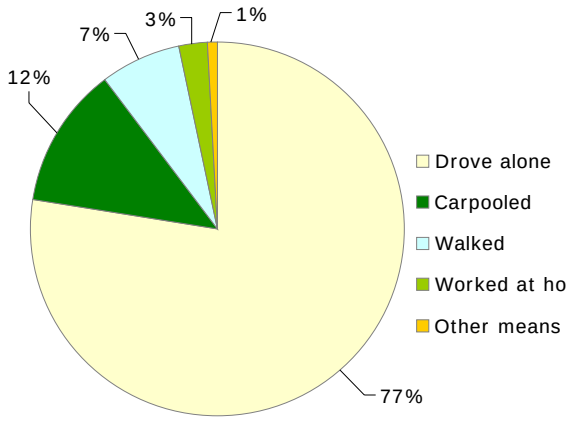


Figure 4.5. Commute times for 1990 and 2000 (US Census).

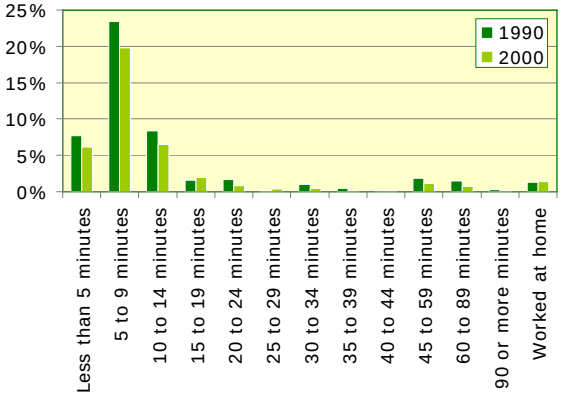


FIGURE 4.3

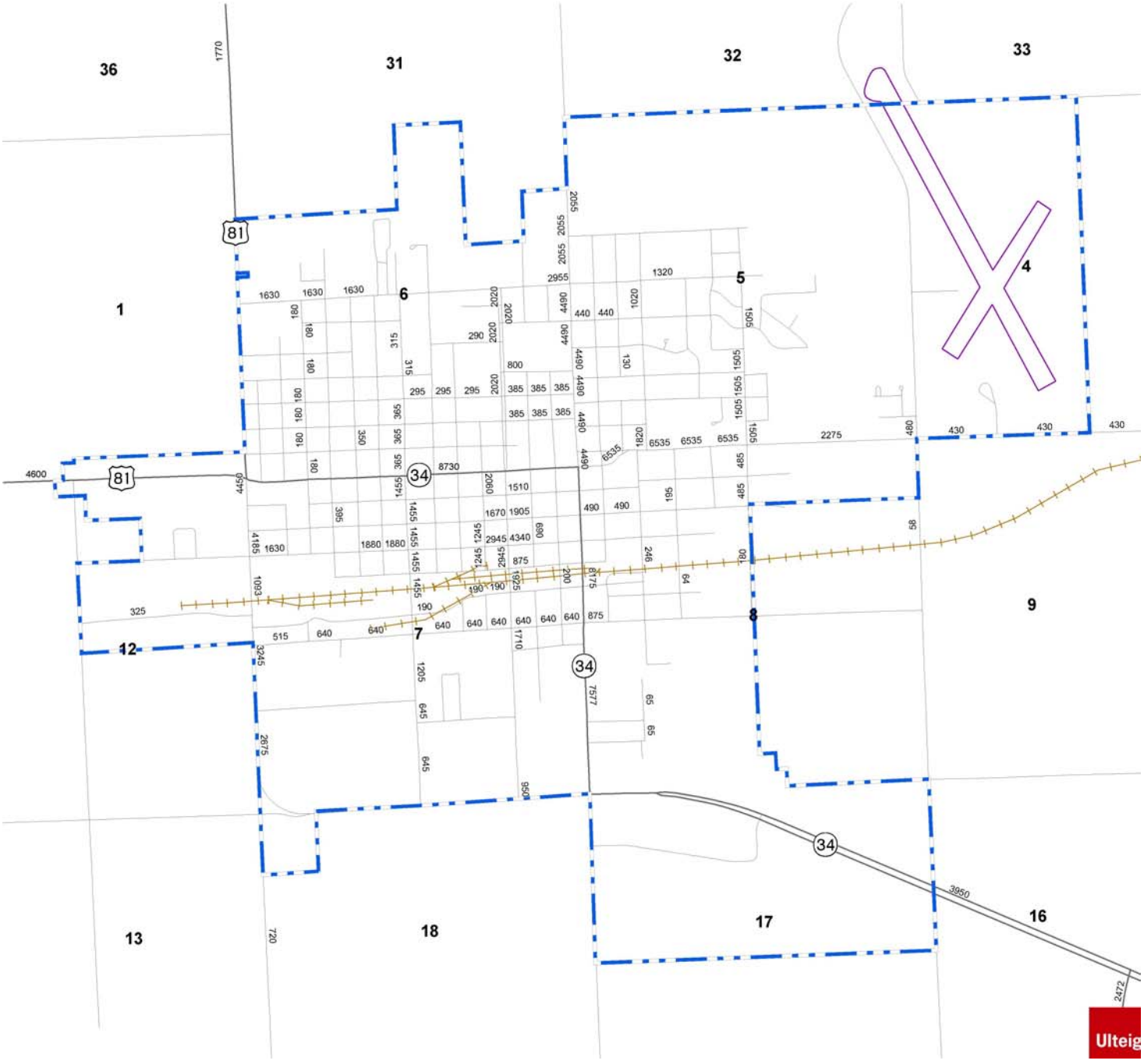
AVERAGE DAILY TRAFFIC (2004)

Madison Comprehensive Plan

0 1,320 2,640 3,960 5,280 ft

Corporate Limits
Madison Municipal Airport
Railroad
Roads

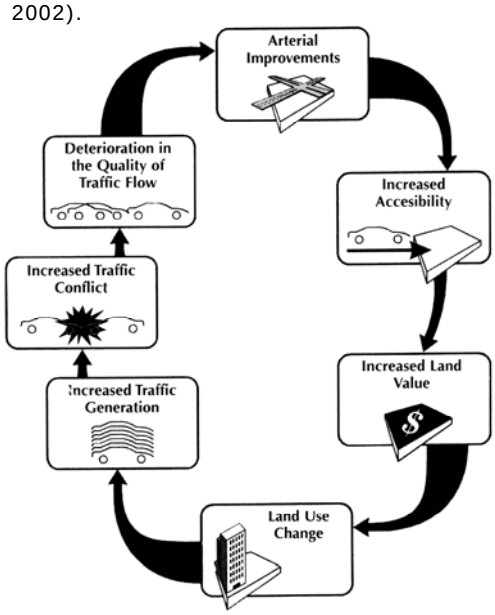
ADT Data for State Highways from 2007



Roadway System Analysis

Transportation and land use are inextricably linked in numerous ways and have strong influences, both positive and negative, on one another (Figure 4.6). For example, building a new roadway will improve access to an area. This improved access will spur new development and changes in the land use. The change in land use will typically increase traffic and demand for a larger transportation system. This will ultimately create pressures for additional road network capacity expansion.

Figure 4.6. Transportation and development relationship (Stover and Koepke 2002).



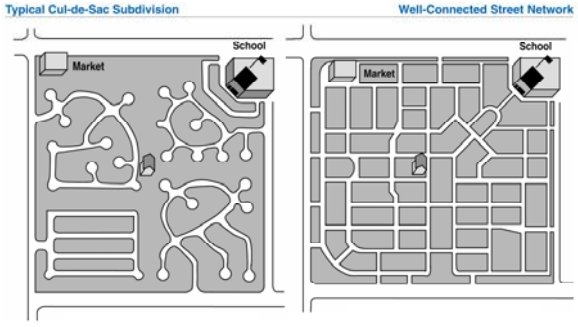
Decisions about land use and the transportation network can positively and negatively influence the following:

- Noise pollution
- Safety
- Value of the land
- Number of vehicle trips
- Traffic flow
- Traffic generation
- Demand for roads
- Change in land use
- Air pollution
- Neighborhood livability
- Drive times
- Dependence on the automobile
- Quality of life
- Public Health (Stover and Koepke 2002, Frank 2000).

Without carefully coordinating transportation infrastructure decisions and local land use planning, unintended and undesirable financial, mobility, safety and quality of life impacts may result.

Connectivity. Developing a sound transportation system relies heavily on street connectivity. Street connectivity – the number of connecting streets in a given area – helps reduce the volume of traffic and traffic delays on major streets (arterials and major collectors), and ultimately improves livability in communities (Figure 4.7). Higher densities of street connections or local street intersections in communities enhance the opportunities for bicycle and pedestrian travel since these modes of travel are local in nature and are more likely to occur when their trip distances can be shortened.

Figure 4.7. Well connected street network versus typical cul-de-sac development (Community Planning Workshop 2000).



Transportation and land use planning which emphasize street connectivity are beneficial for the following reasons:

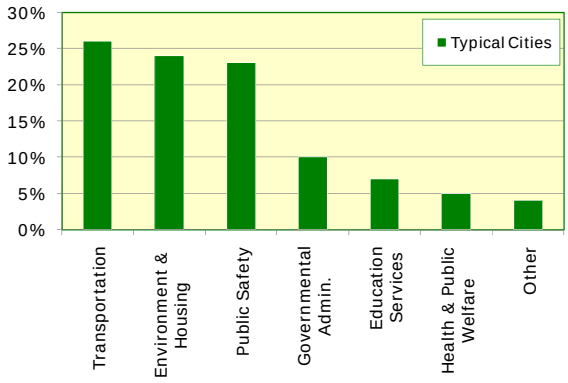
- Trip distances can be reduced.
- Traffic on arterial streets can be reduced by providing more transportation routes.
- Automobile dependency can be reduced because biking and walking opportunities are enhanced with multiple direct routes for traveling short distances.
- Local traffic stays local through an accommodating network of small roads.

- Reduced trip lengths ultimately reduce the road maintenance costs for a community.
- Lower speeds on local streets result in reduced accident severity.
- Short blocks with interconnected street patterns better accommodate the development of town or neighborhood centers.
- Emergency vehicles have better access and shorter drive times.

Madison's local street network has a high degree of connectivity. However, some recent plats at the edge of the City have less desirable connectivity. An example is the lack of a connection from 3rd Street NE into Windsor Estates. This is a critical aspect of plat review which must be incorporated into the City's planning review process.

Transportation Expenditures. Transportation is important because it plays a vital role in an area's long term land development and quality of life. It is also one of the largest expenditures for a municipality. Roads account for the single largest expense for cities with populations under 50,000 residents (Figure 4.8).

Figure 4.8. Expenditures for cities with populations under 50,000 (Census of Governments 1999).



Demand for this very large expenditure is directly related to the distribution and density of the population (Stopher and Meyberg 1975). Zoning, subdivision ordinances, and long-range plans play an integral role in determining where new growth will occur, the type and intensity of land use permitted, and the number of new businesses or residents allowed. Decisions that form a city's future land use patterns will ultimately determine the demand for new or expanded roads.

The funding to pay for small cities' largest expense (transportation) will likely become a larger burden on local revenue streams. Research conducted by the National League of Cities found revenue conditions are declining, state aid and support is decreasing, and the lone bright spot in the municipal finance picture is the continued resiliency of the property taxes (National League of Cities 2007). At the national level, the Highway Trust Fund is the key source of funding for the nation's highway system and analysis of recently available Treasury data shows this account could be in deficit starting in 2010 (National Chamber Foundation 2006). The implication of these financial trends is the likelihood that local transportation expenditures will be funded largely through local revenue streams. This trend emphasizes the need for cities to develop long range plans and development policies that compliment the existing transportation system and limit the need for expensive and likely locally-funded road improvements.

Roadway Spacing. While local roadways are typically closely spaced according to the size of the lots they serve, spacing of collector and arterial roadways often occurs by default if careful planning has not been completed in advance. Improper spacing of collector and arterial roads can put excessive congestion on these roads if they are too far apart, can reduce the efficiency of traffic operations, or can complicate land development if they are spaced too closely together.

The functionally classified collector and arterial roads in the Madison area are generally spaced in an appropriate manner. Designation on the State of South Dakota Functionally Classified System is partially a matter of jurisdictional quotas. Therefore not all roads which serve the function of arterials or collectors may receive the title under the state system. It should be noted that Average Annual Daily Traffic alone does not determine how a road is functionally classified.

Access Spacing. There are direct correlations between access spacing, roadway capacity and roadway safety. Simply stated, the closer the access spacing, the greater the reduction in roadway capacity and safety.

There are a significant number of roads functioning as collectors or arterials which have access spacing concerns. As traffic volumes increase roadway safety will become a greater concern.

On-Street Parking. Provision of on-street parking on collector and arterial roadways reduces roadway capacity and safety. Safety impacts are also evident in locations where there is pedestrian activity, as parked vehicles can obscure pedestrian crossings. These impacts become greater as the width of the on-street parking lane is reduced. It should be noted that on-street parking in the DSU area is a problem that should be addressed.

Future Traffic Growth. Decisions that locate future growth will result in an increase in traffic on the roadways that serve those areas. Transportation system needs should account for a minimum of 20 years of traffic growth, given that most roadways are designed to last for 20 years without significant maintenance. In the case of structural improvements, traffic projections with longer time periods should be used.

Barriers. Barriers, such as a river, railroad, or severe terrain can have a dramatic effect on the transportation system. The results of barriers include longer travel trips, misdirection, driver confusion, added traffic congestion, poorly spaced facilities, and high improvement costs.

Despite the presence of a railroad and waterways, no major barriers exist. However, when opportunities present, grade separated crossing location(s) should be identified and pursued. Upgrading waterway crossings to contain 100 year flood events may improve emergency access throughout the city and should also be pursued when there is opportunity.

Pavement Conditions. A strong pavement maintenance program is essential to protecting the investment of the City's roadway infrastructure. The cost of reconstruction has been proven to far outweigh the cost of timely roadway maintenance. No systemic roadway maintenance issues were identified.

Other Transportation Systems

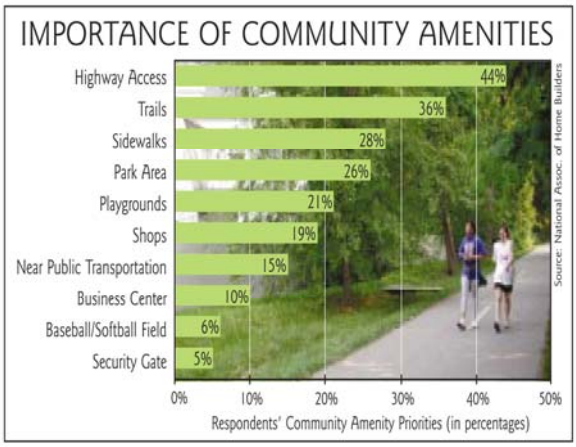
It is important to understand a healthy transportation network can not rely solely on the automobile. Multiple modes of transportation provide redundancy and reduce demand on any single mode. In some circumstances, increased use of alternative transportation – walking, biking, public transit – can also improve the environmental quality of an area by reducing air pollution and conserving open space. Further, the presence of multiple trans-

portation mode infrastructures, such as sidewalks, multi-use trails and public transit, can offer much-needed alternatives for children, the elderly, the disabled, and low income populations.

The presence of sidewalks and multi-use trails can even have a significant impact on where people choose to buy a house. The 2002 Consumer's Survey conducted by the National Association of Realtors and National Association of Home Builders (Figure 4.9), found that 36% of home buyers designated walking, jogging, or biking trails as either an "important" or "very important" community amenity. Trail availability outranked 16 other options and only highway access was found more important to home buyers (NAR and NAHB 2002).

Multi-Use Paths. Madison's multi-use paths are reviewed in the context of the Parks, Recreation and Public Facilities Chapter.

Figure 4.9. Important of community amenities (Rails to Trails Magazine 2002).



Transit. East Dakota Transit serves Madison and Lake County. Madison service is provided Monday through Friday. Service is provided as-needed in the country and small communities and is also provided on Sunday for church services.

Air traffic. The Madison Municipal Airport is a general aviation airport located in the northeast portion of the City. It has a 5000 foot concrete runway designed for Category A & BII (Small Jet) Aircraft. There are two GPS instrument approaches and 1NDB instrument approach. Fiftythree aircraft reside at the airport. The airport serves a critical role in the local economy by providing needed air access for several local industries, and also enhances residents' quality of life by providing access to charter, medical, private and commercial air services.

Railroad and Freight. Madison is served by a single railroad and is the last stop on the line. The railroad provides potential for significant additional long distance freighting by agricultural commodities brokers, industrial plants, and other users. There may be space for additional railroad spurs on the eastern side of the City.

Transportation System Plans and Recommendations

Sidewalk Implementation Program. The public transportation system is enhanced with a functional distribution of sidewalks. Sidewalks improve all-weather accessibility from and within residential areas to businesses, schools, and industrial sectors. Sidewalks provide a safe means for individuals to travel unencumbered by vehicular traffic. The placement of sidewalks is especially necessary to insure a safe transportation route for children walking to school. It is essential that sidewalk construction be uniform throughout the community. Random placement of sidewalks diminishes the effectiveness of the entire system. Inconsistent construction increases the potential for vehicle-pedestrian

hazards. Presently, the City has a sidewalk ordinance in place requiring the construction of sidewalks in new commercial and residential areas where curb and gutter are in place.

The City of Madison has established a sidewalk committee that annually evaluates and prioritizes locations where sidewalk installation assessments are necessary. The recommendations this committee makes to the City Commission are based upon a variety of factors, including but not limited to important facility connectivity, pedestrian safety, and street functional classifications. Specific sidewalk installation recommendations include:

- The City of Madison should require developers to install intersection ramps as part of infrastructure installed during initial development.
- The sidewalk committee should continue to utilize previous recommendations and/or other studies for additional guidance.
- Sidewalks should meet all American with Disabilities Act goals and objectives
- Sidewalks should be constructed according to the established priorities

This part of this comprehensive plan hereby constitutes a Transition Plan for the city public right-of-ways (ROW) only as required by American with Disabilities Act (ADA) 28 CFR 35.150(d)(2). The most significant obstacle to providing access to individuals with disabilities is the lack of sidewalks and/or sidewalk ramps at intersections. Upon installation of sidewalks as part of the SIDEWALK IMPLEMENTAITON PROGRAM, sidewalk ramps will be installed by City per ADA standards. In addition to the SIDEWALK IMPLEMENTAITON PROGRAM, all infrastructure improvement projects which are in the city Infrastructure Improvement Plan (IIP) will include sidewalk ramp installation/modification per ADA standards. Particular special projects may be implemented on a case by case basis to address separately identified areas of concern. These projects will continue on an annual basis at a pace determined by budgeting of the Madison City Commission. A self-evaluation or inventory of the ROW accessibility needs will be conducted separately from this document. The City Engineer is the official responsible for implementation of this plan. The Finance Officer is the City of Madison's ADA Coordinator.

Future Street Network Plan. As noted earlier in this chapter the relationship between roadway networks and land use is very close. In order to adequately provide access to future growth areas a future street network must be planned and protected from encroachment. If development is allowed to compromise this plan, appropriate emergency access, efficient property access, and efficient utility extensions may all also be compromised. Figure 4.10 illustrates this future street network which coordinates with the future land use plan of the following chapter. It is essential that any plat be reviewed in light of this future street network and the major road plan (Figure 4.11) to ensure conformity with these plans. Rights–of-way must be preserved during any platting which involves some segment of the future street network. It was noted earlier in this chapter that there are connectivity concerns in some of the newer development areas of the City. The future street network plan also illustrates recommended linkages to restore that loss of connectivity. One opportunity for improved connectivity is a potential extension of Egan Avenue to the north that would link into the existing mile line road east of Section 31. Potential routes for this extension are illustrated in Figure 4.12.

Transportation System Recommendations.

- Address connectivity in recent development areas by extending the local street network as indicated in Figure 4.10
- Address future functional class roadway needs by preserving right-of-way for future collectors and arterials consistent with the recommended network in Figure 4.10
- Adopt right-of-way and access spacing standards and implement them as a standard part of the plat review process
- Monitor crash frequency and locations, and review opportunities for increasing safety by appropriate traffic management tools
- Seek opportunities to create a single 4 way intersection in the vicinity of State Highways 34 and 19 which can serve future north– and southbound traffic at the eastern edge of the City
- Develop a highway noise compatibility plan consistent with SD DOT guidelines

FIGURE 4.10

RECOMMENDED FUTURE ROAD NETWORK

Madison Comprehensive Plan

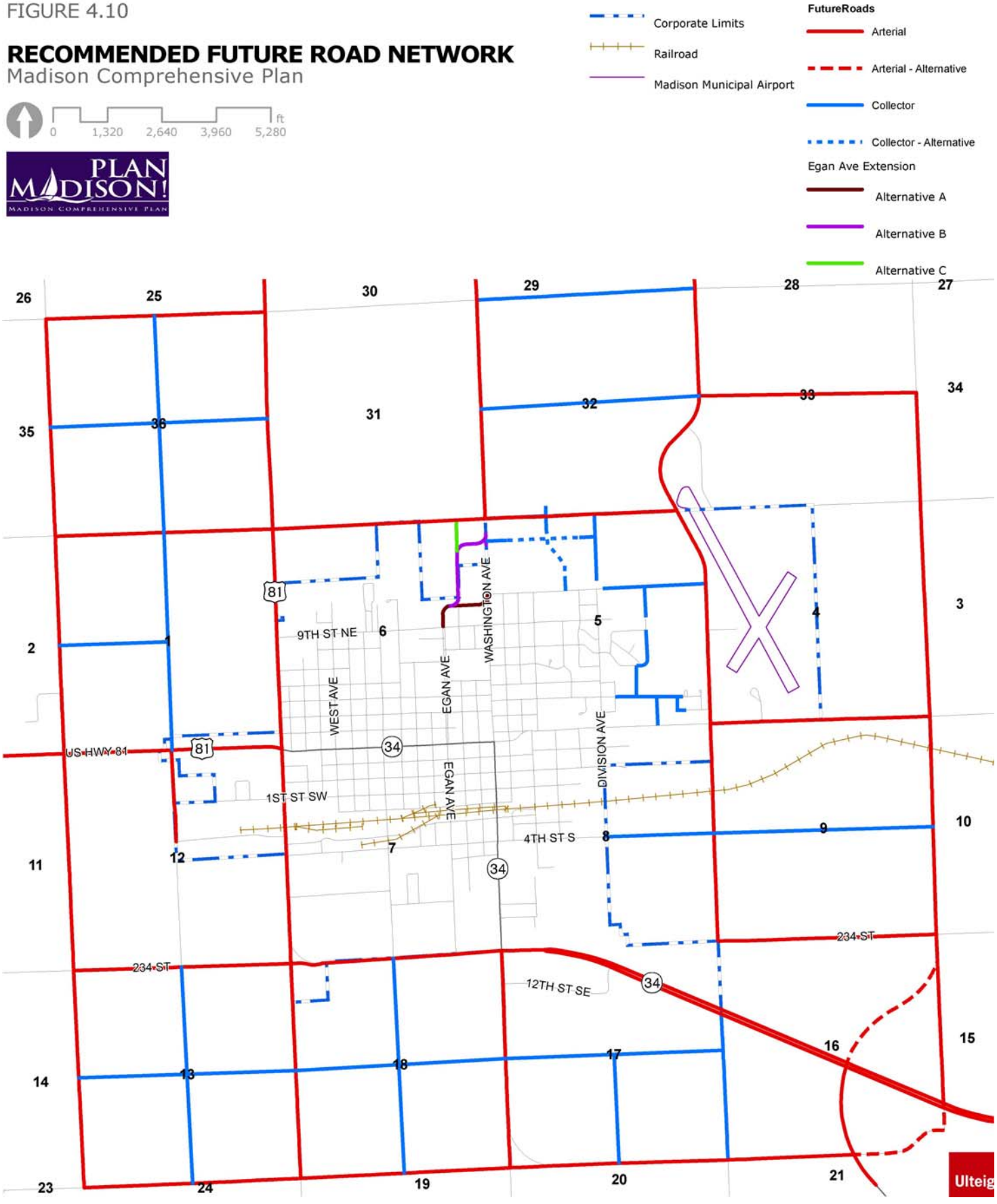


FIGURE 4.11

MAJOR STREET PLAN

Madison Comprehensive Plan

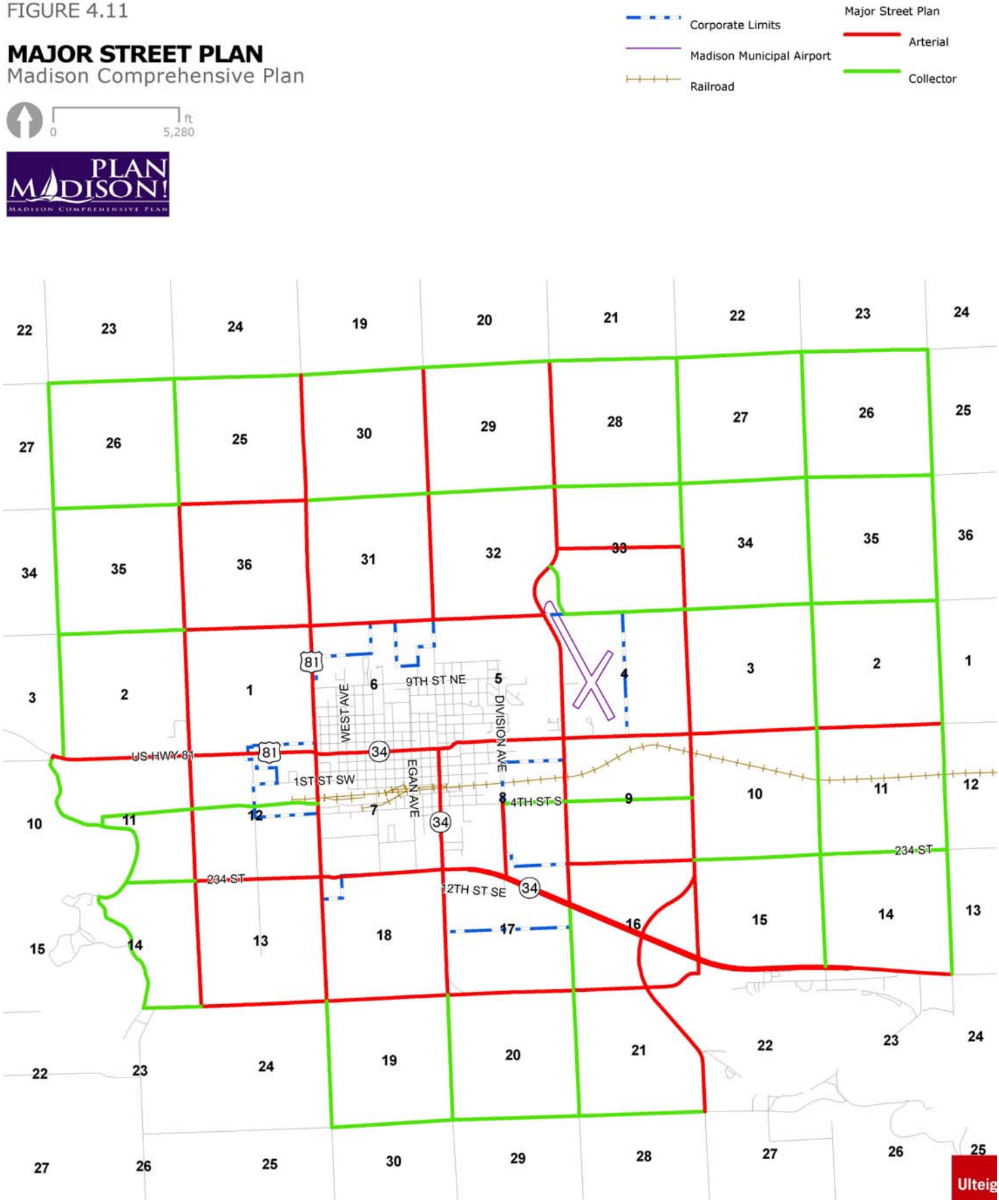


FIGURE 4.12

Egan Avenue Alternatives
Madison Comprehensive Plan

0 100 200 300 400 ft

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MADISON COMPREHENSIVE PLAN