Complete Streets **Ames**

COMPLETE STREETS PLAN

City of Ames

Adopted October 2018

TOOLE DESIGN

Contents

Disclaimer: Information contained in this document is for planning purposes and should not be used for final design of any project. All results, recommendations, concept drawings, and commentary contained herein are based on limited data and information, and on existing conditions that are subject to change. Further analysis and engineering design are necessary prior to implementing the recommendations contained herein.

Chapter 1: Overview & Policy

Ames has a well-established transportation system, made up of interconnected networks of streets, shared use paths, freeways, and railroads. This system accommodates—to varying degrees—people walking, biking, driving, and using transit for a variety of reasons. Whether commuting to work, running errands, or meeting friends at a sidewalk cafe, the transportation system is critical to most functions of life in Ames. In short, the transportation system moves people and fosters commerce while also enabling civic engagement and enhancing quality of life.

Over time, a complex system of travel patterns has emerged to connect people to destinations and to each other using these networks. These patterns continually evolve based on changes in seasons, whether school is in session, shifts in technology and preferences, changes in the economy, the opening of new businesses and employers, and development of new neighborhoods.

Until recently, the approach to addressing these complex and evolving travel patterns in Ames and most cities across the country has been to plan and design the transportation system first and foremost for motor vehicle travel. However, many cities (including Ames) have recently seen the strong need and public desire to balance transportation priorities so that convenience, safety, and access are improved for people walking, biking, and using transit. These needs are based on growing awareness of the role transportation plays in public health, quality of life, environmental, fiscal, and equity considerations.

Paradigm Shift in Planning and Design

The conventional approach to street design is based primarily on a roadway's functional classification (arterial, collector, local, etc.), which is a surrogate for motor vehicle traffic volume and speed. Higher classifications (e.g., arterial streets) tend to carry higher volumes of traffic at higher speeds, whereas lower classifications (e.g., local streets) tend to carry lower volumes of traffic at lower speeds. There are several limitations to this approach:

- **The conventional approach is not context sensitive** – The conventional approach lacks a consistent method for adjusting street designs to the surrounding context. South Duff Avenue and Lincoln Way at Campustown are both classified as arterial streets but exist in vastly different contexts and should thus be designed differently. Under the current approach, it can be challenging to design major streets that support walkable, vibrant places.
- **The conventional approach couples traffic volume with design speed** – The conventional approach assumes a constant relationship between the amount of car traffic and the function of the street. However, two streets can carry the same amount of traffic but serve different functions. An arterial street through downtown might emphasize access and lower speeds, while a suburban arterial might emphasize throughput (the quick and efficient movement of people) at somewhat higher speeds.
- **The conventional approach is not compatible with Ames' future** – As Ames continues to grow, it is important that streets are designed to be compatible with new development types, such as walkable mixed use, that are promoted by the Comprehensive Plan and other plans for corridors and districts across the city. The current street design approach is less conducive to designing streets that respond to and support such development patterns.

The New Complete Streets Approach

Moving forward, the City of Ames has adopted a context-sensitive Complete Streets approach to planning and designing the street network to be safer, more comfortable, and more useful for all modes. In the past, the City of Ames has informally incorporated aspects of the Complete Streets approach into transportation planning and design. This has included consistently providing sidewalks along streets and, more recently, including bike lanes when resurfacing or restriping streets.

This Complete Streets Plan and Policy formalizes the City's approach to Complete Streets; shifts priorities so that biking, walking, and transit use are safer and more attractive choices; guides street design decisions; and increases consistency in transportation design.

What are Complete Streets?

First and foremost, Complete Streets is a **process** that entails planning and designing streets that support the surrounding context—e.g., the destinations and character of development along the corridor—and adequately serve all anticipated users and uses. Complete Streets is not a prescribed one-size-fits-all solution. In fact, a variety of designs and treatments can and should be employed to serve all users and uses in a variety of land use and traffic contexts.

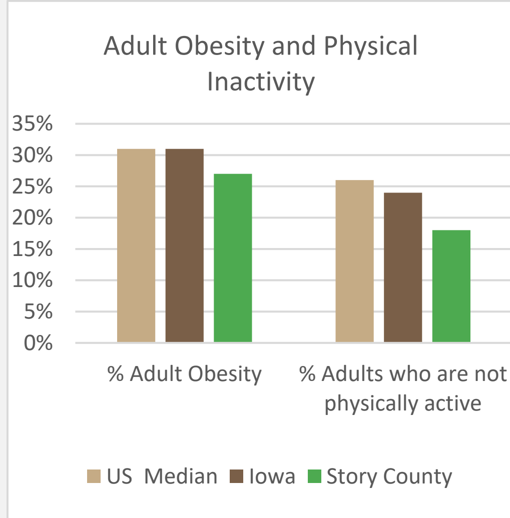
Complete streets typically have space for people driving, bicycling, and walking. Complete Streets in urban settings (left) look different than Complete Streets in suburban and rural settings (right).

There is no specific type of infrastructure—e.g., bike lanes, transit shelters, or street furnishings—that is prerequisite for Complete Streets. For example, many streets without bike lanes can be considered Complete Streets if they have low motor vehicle speeds and low traffic volumes. Similarly, neither streetscape nor aesthetic enhancements are required for Complete Streets, although they may add greatly to the character and experience of a street. On the other hand, the presence of neither bike lanes nor streetscaping automatically qualify a street as a Complete Street.

Context is important in Complete Streets design. Although an attempt at improving conditions for walking and biking have been made in example streets on the left (from another city), it is probable the street cannot be considered complete. Traffic volumes and speeds are too high for the unprotected bike lane to serve most people bicycling.

Transportation and Public Health

Public health is significantly affected by the transportation system and peoples' travel choices. Complete Streets can provide many public health benefits including:



- **Encouraging active lifestyles** – Complete Streets create opportunities for people to exercise for recreation, and to build physical activity into their daily routine. By providing and improving bicycle and pedestrian facilities on streets, more people might bike or walk to work, shops, and services. About 18% of adults in Story County report that they are physically inactive. Sedentary lifestyles contribute to obesity and other chronic diseases.[1]
- **Reducing crashes and crash severity –** Motor vehicle collisions are one of the leading causes of unintentional death in the United States (and Iowa and Story County)[2]. Transportation agencies can use Complete Streets policies to reduce injuries and deaths by designing safer streets that protect all users of the transportation system, particularly vulnerable users such as people walking and biking.
- **Providing cleaner air** – Motor vehicles are a leading source of air pollutants that affect human health. Diesel particulate matter (for which freight vehicles are a major source) is of particular concern. Scientific studies have shown a relationship between asthma, bronchitis, and heart attacks and traffic-related air pollution around major streets.[3] Complete Streets can help mitigate air pollution around streets by encouraging cleaner travel options like bicycling and walking.
- **Access to food, healthcare, jobs, and education** – Access to destinations is one of the key factors to improving health.[4,5] People need to access grocery stores for healthy food, health clinics for regular check-ups, and jobs or education that contribute to psychological and economic well-being. Complete Street design, the presence and quality of bicycle and pedestrian infrastructure, and the connectedness of the street grid influence how easy it is for people to access those destinations.[6]
- **Increased equity** – The most vulnerable members of the community often experience the most negative health effects related to the transportation system. Low income households typically have fewer vehicles, longer commutes, and higher transportation costs.[7] Many of the Complete Streets policies that improve safety, air quality, and connectivity can also improve equity if they are targeted in low-income and minority communities.

[1] CDC Diabetes Interactive Atlas. Retrieved November 27, 2017, from https://www.cdc.gov/diabetes/atlas/countydata/atlas.html
[2] Webb, C. Motor vehicle traffic crashes as a leading cause of death in the United States, 2012–2014. Traffic Safety Facts Crash•Stats. Report No. DOT HS 812 297. Washington, DC: National Highway Traffic Safety Administration. 2016
[3] HEI Panel on the Health Effects of Traffic-Related Air Pollution. 2010. Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects. HEI Special Report 17. Health Effects Institute, Boston, MA.
[4] Hoehner C, Barlow C, Allen P, Schooman M. Commuting distance, cardiorespiratory fitness, and metabolic risk. American Journal of Preventive Medicine 2012;42(6):571-578.
[5] Inagami S, Cohen DA, Finch BK, Asch SM. You are where you shop: grocery store locations, weight, and neighborhoods. American Journal of Preventive Medicine 2006;31(1):10-17.
[6] https://www.ncbi.nlm.nih.gov/pubmed/16777537
[7] Equity: Relationship to public health. Retrieved November 27, 2017, from https://www.transportation.gov/mission/health/equity

Complete Streets Policy

The Complete Streets Policy provides guiding principles, defines authority and applicability, identifies areas of flexibility, and commits the City of Ames to designing streets that serve all anticipated users and uses of a street.

Purpose & Vision

The City of Ames will design, build, maintain, reconstruct, and resurface public streets in order to provide for the safety and comfort of all users of a corridor. This includes pedestrians, bicyclists, users of mass transit, people with disabilities, motorists, freight providers, emergency responders, and adjacent land users; regardless of age, ability, income, or ethnicity.

The values promoted by the City of Ames Complete Streets Policy include safety, connectivity, access, fiscal responsibility, and quality of life. Complete Streets enhance the environment, economy, sense of place, preservation of historic resources, and aesthetics of the community, making Ames a healthier, more sustainable, and equitable place to live.

Complete Streets are not one-size-fits-all. They are designed through a flexible process that considers the surrounding character of the built environment, the street's role within the transportation network, and input from people that use the transportation system. The Complete Streets approach demands careful evaluation of the needs of all users for all transportation corridors and integration with actions and strategies for achieving the planned land use density, character, and development pattern for the city.

Complete Streets Principles

Complete Streets are based on four principles, which guide the City of Ames' planning, design, and budgeting for transportation projects.

- Complete Streets **serve all users and modes**, including pedestrians, bicyclists, users of mass transit, people with disabilities, motorists, freight providers, emergency responders, and adjacent land users; regardless of age, ability, income, or ethnicity.
- Complete Streets **emphasize safety for all users**, and do not trade the safety of one mode for the convenience of another.
- Complete Streets form **connected multimodal networks** that provide safe, convenient access to neighborhoods and destinations for all modes. This policy recognizes that all modes do not receive the same type of accommodation or amount of space on every street, but that the street network should allow everyone to safely and conveniently travel across the community.
- Complete Streets are **context-sensitive**, and are designed to support the current and future local land use and development context while considering impacts to surrounding streets and neighborhoods. Similarly, land use and development plans should support Complete Streets and interconnected multimodal networks.

Jurisdiction

The Complete Streets Policy applies to all transportation infrastructure projects carried out within the City of Ames, whether by the City of Ames, Story County, Boone County, CyRide, or Iowa DOT. Iowa State University is also encouraged to follow this policy, although the City of Ames does not have jurisdiction over Iowa State University Institutional Roads. This policy is meant to guide the decisions of the City of Ames and its partners.

Applicability

The Complete Streets Policy applies to:

- All streets, existing and future; and
- All transportation infrastructure projects, regardless of funding source, including these five phases of a project:
    - Project identification;
    - Scoping procedures and design approvals, including design manuals and performance measures;
    - Construction/reconstruction;
    - Repaving and rehabilitation; and
    - Operations and maintenance, including restriping and signal design.

The Complete Streets Policy does not apply to:

- Iowa State University Institutional Roads;
- Streets ultimately to be privately owned and maintained;
- Streets where specified users are prohibited by law;
- Emergency street reconstruction; or
- Maintenance activities such as mowing, cleaning, sweeping, crack sealing, and spot repair.

Exceptions to the application of this Complete Streets Policy include instances where the City identifies issues of safety that cannot be mitigated or absence of need. The Public Works Director shall document and explicitly explain why a transportation project is exempt from this policy.

Flexibility

This Complete Streets Policy allows flexibility to accommodate different types of streets and users, and to promote Complete Streets design solutions that fit within the context(s) of the community.

In some cases, the most appropriate design solutions may not be feasible due to right-of-way or budgetary constraints. In such cases, alternative design solutions will be considered. The Public Works Director shall document and explicitly explain how the alternative solutions adequately accommodate all anticipated users of the street.

Cost

Complete Streets are not necessarily more expensive—they often cost the same as or marginally more than a conventional street. However, there are occasionally projects in which the additional cost for adding bicycle, pedestrian, or transit accommodations is significant.

In order to minimize impacts on the City's budget, the Complete Streets Policy establishes the following annual program-level cost threshold for Complete Streets projects: the cumulative cost increase of incorporating bicycle, pedestrian, and transit accommodations as part of Complete Streets projects may not exceed 22 percent of the City of Ames' annual transportation capital improvement budget.

Existing Policies and Regulations

City staff will review existing policies, plans, and regulations when planning and designing streets, including:

- Land Use Policy Plan
- Ames Mobility 2040 Long Range Transportation Plan
- Small area and neighborhood plans
- Corridor plans
- Development/redevelopment plans
- Traffic studies

- Iowa State University master plans
- CyRide transit plans and studies
- Subdivision code
- Manuals of practice
- Impact assessments
- Departmental policies and procedures
- Any other applicable transportation, land use, or development plans
- Any other applicable procedures and standards

Latest Standards

In furthering Complete Streets principles, City staff will make use of the latest and best design standards, policies, and guidelines, including the latest edition of the Complete Streets Plan and the following:

- General Street Design
    - Designing Walkable Urban Thoroughfares: A Context Sensitive Approach: An ITE Recommended Practice (Institute of Transportation Engineers)
    - Urban Street Design Guide (National Association of City Transportation Officials; NACTO)
    - SUDAS Design Manual (Iowa Statewide Urban Design and Specifications)
    - A Policy on Geometric Design of Highways and Streets (American Association of State Highway and Transportation Officials; AASHTO)
    - Manual on Uniform Traffic Control Devices (Federal Highway Administration)
- Bicycle and Pedestrian Design
    - Guide for the Development of Bicycle Facilities (AASHTO)
    - Urban Bikeway Design Guide (NACTO)
    - Guide for the Planning, Design, and Operation of Pedestrian Facilities (AASHTO)
    - Public Rights-of-Way Accessibility Guidelines (United States Access Board)
    - SUDAS Design Manual

Performance Measures

The City of Ames will measure the effectiveness of the Complete Streets Policy and associated implementation steps using various performance measures that align with related transportation planning efforts, particularly the Ames Area MPO Long Range Transportation Plan. Performance measures should relate to the transportation objectives of connectivity, safety, access, efficiency, reliability, facilitation of economic exchange, and asset management.

Recommended performance measures can be found in Chapter 4.

Implementation

Implementation of this policy will be carried out cooperatively among all departments in the City of Ames with multi-jurisdictional cooperation, and to the greatest extent possible, among private developers and state, regional, and federal agencies.

The City will take specific steps to implement this policy, including:

1. Implement the Complete Streets Plan, which includes a process, procedures, classifications, and design guidance for Complete Streets.
2. Establish or designate a Complete Streets Advisory Committee or Subcommittee. City staff will be assigned to the committee and will report the committee's input to Council regularly. The Complete Streets Advisory Committee will:
    a. Meet at least annually and up to quarterly;

b. Review individual street projects pre- and post-construction (including projects excepted from this policy along with justifying documentation) for conformance with the Complete Streets Plan and other City plans and objectives;
c. Assist in completing the annual Complete Streets Program Review, including setting program performance goals;
d. Suggest program/policy revisions; and
e. Recommend projects for the next funding cycle.

3. Prepare an Annual Complete Streets Program Review to document compliance with the policy. The review will compile evaluation metrics for individual transportation projects as well as overall program assessment.
4. Update the Supplemental Specifications to the Iowa Statewide Urban Design and Specifications to reflect the current state of best practices in bicycle and pedestrian design.
5. Restructure or revise related procedures, plans, regulations, and other processes to conform to and support the Complete Streets Policy and guidance contained within the Complete Streets Plan.
6. Offer opportunities for City staff, community leaders, and the general public to participate in workshops and other training opportunities to increase understanding of the Complete Streets vision, process, and design approach.

How to Use the Complete Streets Plan

The Complete Streets Policy contained earlier in this chapter serves as the mandate for a new approach to street design and provides a framework by which to evaluate the success of implementation by the City of Ames. Also included in this chapter are discussions regarding the relationship between this Plan, previous City plans, and state and national standards and design guides. The remainder of this Plan includes tools designed to facilitate the implementation of Complete Streets in order to meet the policy's goals and objectives. The Plan is structured around the major steps in the Complete Streets design process:

Select a street type – Chapter 2 outlines the approach for selecting a street type based on context and transportation function. It also describes each street type in terms of character and typical configuration.

Determine design criteria – Chapter 3 includes parameters for various roadway and right-of-way design criteria (e.g., maximum lane width and minimum sidewalk width) as well as guidance on selecting criteria and prioritizing elements when tradeoffs must be made.

Incorporate these steps into the project development process – Chapter 4 provides an overview of the City of Ames' project development process and guidance on how to implement the Complete Streets Plan in individual projects.

Relationship to Other Plans and Policies

The Complete Streets Plan builds upon years of prior studies and policies that have shaped and will continue to guide decision-making, priorities, land use patterns, and transportation investments in Ames. Multiple plans, studies, and policies shaped the development of the Complete Streets Plan and will continue to be consulted as the Plan is implemented. They include:

Land Use and Development Plans

- **Land Use Policy Plan** (1997, revised 2011) – Ames' Comprehensive Plan, which guides land use decision-making and heavily shapes the City's zoning ordinance.
- **Lincoln Corridor Plan** (2017) – A plan for land use and redevelopment along Lincoln Way.
- **South Lincoln Way Mixed Use Plan** – A plan to guide future redevelopment in the area south of Lincoln Way, between South Grand Avenue and South Duff Avenue (also known as the South Lincoln Way Sub-Area Plan)

Transportation Plans

- **Ames Mobility 2040** (2015) – The long-range, multi-modal transportation plan for the Ames Area Metropolitan Planning Organization (AAMPO), which establishes a vision and goals for multimodal roadways that serve people walking, biking, driving, and using transit and prioritizes projects for receiving federal transportation funding.
- **Capital Improvements Plan** (CIP; updated annually) – The CIP is a five-year plan that identifies funding sources and amounts to be spent on infrastructure, facilities, and equipment throughout the city.
- **CyRide System Redesign** (2017) – A study that includes recommended modifications to selected bus routes in order to increase the efficiency and capacity of the transit system.

Engaging Ames in Complete Streets (2016)

The Iowa State University Community Design Lab, in conjunction with Healthiest Ames, undertook an initiative to develop a proposed Complete Streets policy and recommendations for implementing Complete Streets in Ames. This effort involved members of Healthiest Ames, the City of Ames, Ames Bicycle Coalition, and the Iowa State University Community Design Lab. The project team engaged with the broader community through four Open Streets events.

The report includes an analysis of existing conditions, including identification of which modes are served by which streets. A significant portion of the report is dedicated to analyzing connections and the quality of Ames' trail and sidepath network. One of the more valuable maps in the report identifies trails and routes that are most heavily utilized by people biking and identifies which routes are leisure-oriented and which are commuting-oriented. This map was considered with determining priorities for the new street types developed for the Complete Streets Plan.

Engaging Ames in Complete Streets presents a variety of best practices and a vision of how Complete Streets could be realized in Ames. However, for several reasons the City of Ames embarked on creating its own Complete Streets Plan to build upon the momentum created by the Engaging Ames in Complete Streets project:

- To develop a Complete Streets Policy that meets the needs of the City of Ames.
- To create street types that better account for the variation of constraints and contexts across the community.
- To develop a process for making design decisions, accepting public input on individual street projects, and provide for more flexibility.
- To provide a process for judging tradeoffs when constraints preclude the ability to incorporate all desired street elements.
- To create design guidelines that tie together and define the compatibility and appropriate use of various street design elements.

State and National Standards and Guidelines

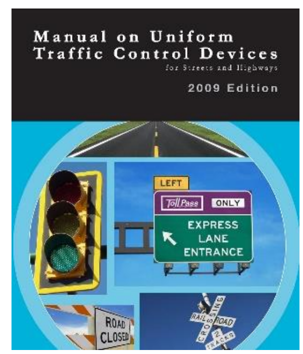
Street design is influenced by multiple standards and guidelines at the state and national levels. Some of these documents have a higher level of authority than others. SUDAS, the MUTCD, and the AASHTO Green Book include standards that engineers are required to follow (or otherwise document variations from the standard). On the other hand, numerous guidelines—such as the NACTO suite of design guides—are intended to help designers make decisions and implement innovative designs.

The most relevant standards and guidelines, from a Complete Streets perspective, are described below.

Statewide Urban Design and Specifications (SUDAS)

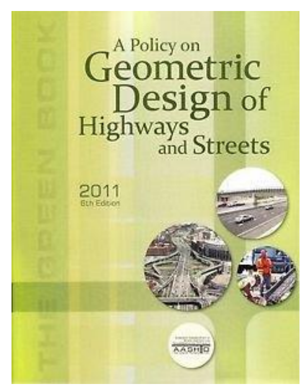
Unlike most other states, Iowa has an established statewide road design manual that was developed specifically for use by local jurisdictions. In many ways, SUDAS mirrors the Iowa DOT Office of Road Design's Design Manual—in fact, the sections relating to ADA compliance and shared-use path design are identical between the two manuals. This provides a major benefit to users and designers alike as it ensures consistency across the state and between jurisdictions. SUDAS also includes a section for the design of on-street bicycle facilities (Section 12B-3). This section is based on the 2012 edition of AASHTO's *Guide for the Development of Bicycle Facilities*.

Manual on Uniform Traffic Control Devices (MUTCD)



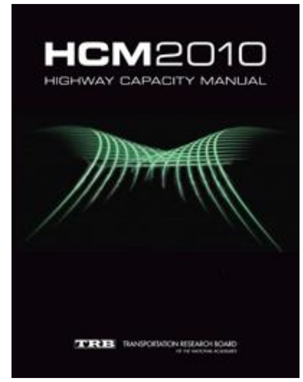
The MUTCD is issued by the Federal Highway Administration of the U.S. Department of Transportation to specify the standards by which traffic signs, road surface markings, and signals are designed, installed, and used. These specifications include the shapes, colors, fonts, sizes, etc., used in road markings and signs. In the United States, all traffic control devices must generally conform to these standards. The manual is used by state and local agencies and private design and construction firms to ensure that the traffic control devices they use conform to the national standard.

AASHTO Green Book



The American Association of State Highway and Transportation Officials' (AASHTO) Policy on Geometric Design of Highways and Streets, 6th Edition, 2011, commonly referred to as the "Green Book," contains the current design research and best practices for highway and street geometric design. The document provides guidance to engineers and designers who strive to make unique design solutions that meet the needs of roadway users while maintaining the integrity of the environment. Design guidelines are included for freeways, arterials, collectors, and local roads, in both urban and rural locations, paralleling the functional classification used in highway planning.

Highway Capacity Manual

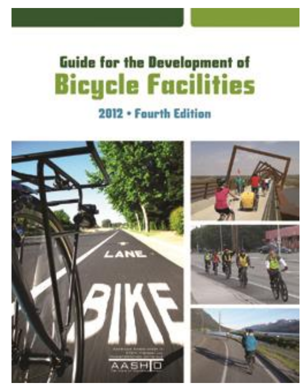


The Highway Capacity Manual contains concepts, guidelines, and computational procedures for computing the capacity and quality of service of various roadway facilities, including freeways, highways, arterial roads, roundabouts, signalized and unsignalized intersections, rural highways, and the effects of mass transit, pedestrians, and bicycles on the performance of these systems.

The latest edition of the Highway Capacity Manual (2010) significantly updates the methodologies that engineers and planners use to assess the traffic and environmental effects of highway projects. Most notably, the manual includes an integrated multi-modal approach to the analysis and evaluation of urban streets from the points of view of automobile drivers, transit passengers, bicyclists, and pedestrians. This multi-modal approach is known as Multi-modal Level of Service or Quality of Service.

Building on previous research (NCHRP Report 616, NCHRP 3-70) the 2010 Highway Capacity Manual enables agencies to balance the level of service needs of auto drivers, transit riders, bicycle riders, and pedestrians in their street designs by providing agencies with a tool for testing different allocations of scarce street right-of-way to the different modes using the street. It is anticipated that quality of service analysis will continue to improve as the understanding of various roadway user characteristics and perceptions improves and microsimulation analyses are calibrated accordingly.

AASHTO Guide for the Development of Bicycle Facilities

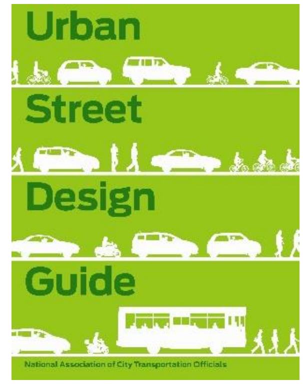


The AASHTO Guide for the Development of Bicycle Facilities is a resource for the design, development, and maintenance of safe on- and off-street bicycle facilities. The Guide presents a set of best practices for designing roadways that comfortably accommodate a variety of user types. The information in the Guide is not intended serve as design standards, nor is it all encompassing. Rather, it aims at providing guidance that should be used in conjunction with other regulations such as the Manual on Uniform Traffic Control Devices (MUTCD). The guide is undergoing a substantial revision and expansion, expected to be completed in 2018.

FHWA Separated Bike Lane Planning and Design Guide

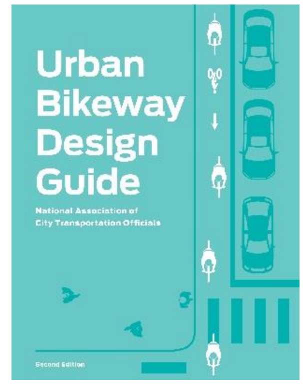
The Separated Bike Lane Planning and Design Guide is issued by the Federal Highway Administration (FHWA) and provides guidelines for one- and two-way separated bike lanes, including options for intersections, driveways, transit stops, accessible parking and loading zones. Recognizing this is a developing facility type, the guide provides case studies to aid in implementation. The guide also identifies data to collect before and after separated bike lane projects and potential future research to refine and improve the practice.

NACTO Urban Street Design Guide



The purpose of the NACTO Urban Street Design Guide is to provide cities with state-of-the-practice solutions that can help to design complete streets in urban settings. The NACTO Urban Street Design Guide recognizes the direct relationship between street design and economic development and emphasizes safety for all traffic modes. The NACTO Urban Street Design Guide is not intended to be a comprehensive guide for the geometric design of the street, rather it covers design principles to meet the complex needs of cities. It builds off the street design manuals adopted by several cities since 2009. The NACTO Urban Street Design Guide references the MUTCD.

NACTO Urban Bikeway Design Guide



The purpose of the NACTO Urban Bikeway Design Guide is to provide cities with state-of-the-practice solutions that can help create complete streets that are safe and enjoyable for bicyclists. Most treatments included in the NACTO Urban Bikeway Design Guide are not directly referenced in the current (2012) version of the AASHTO Guide for the Development of Bicycle Facilities, although they are virtually all (with two exceptions) permitted under the MUTCD. The NACTO Urban Bikeway Design Guide is not intended to be a comprehensive guide for the geometric design of bikeways, rather it covers certain types of on-road bikeway designs, specifically bike lanes and several new and innovative types of on-street bikeway design treatments, but does not cover shared use paths, signal design, and many other relevant topics. In most cases, the NACTO Urban Bikeway Design Guide should be used in tandem with the AASHTO Bike Guide.

NACTO Transit Street Design Guide

The purpose of the National Association of City Transportation Officials (NACTO) Transit Street Design Guide is to provide design guidance for the development of transit facilities, and for the design and engineering of city streets to prioritize transit, improve transit service quality, and support other goals related to transit. Included is guidance on integrating transit with other modes (most notably the integration of transit stops and bike lanes) and the design of specialized transit street elements.

Terminology and Acronyms

The following is a list of phrases and acronyms used throughout this document and commonly used by City of Ames planners, designers, and officials.

Terms

85th percentile speed – the speed at which 85 percent of motor vehicle traffic travels at or below. This is a common measurement used to determine whether people are driving at or near the intended speed of a street and to the set speed limit; see *target speed*

city (uncapitalized) – the geographic area known as Ames; this term is used when referring to Ames as a place

City (capitalized) – short for City of Ames; this term is used when referring to the City government, which is responsible for planning, designing, constructing, and maintaining Ames' transportation system

Guide – a non-binding document that provides best practices (or a summary of standards) for planning and design; see *standard*

Mode shift – a shifting of trips from one mode to another, typically from motor vehicle to transit, walking, or biking

Person miles traveled (PMT) – a measurement of how many cumulative miles individuals travel in a given period of time; one person driving one mile equates to one person mile traveled, while 25 people riding a bus one mile equates to 25 person miles traveled; see *vehicle miles traveled*

Right-of-way (ROW) – land owned or granted by easement to the City for transportation purposes; this term is often used to refer to the public land outside of the roadway in which sidewalks, landscaping, and set-backs are present

Roadway – the paved or unpaved area meant for conveying motor vehicles and bicycles, including all through lanes, turn lanes, bike lanes, paved shoulders, medians, curbs, and gutters

Standard – usually a non-binding parameter (or set of parameters) that specifies the typical treatment for a design feature (such as bike lane width); non-binding standards can be deviated from so long as adequate documentation and justification is provided

Street – the entirety of a transportation corridor, including the roadway, pedestrian spaces, landscaped areas, and even building facades; a holistic concept in which transportation, land use, character, economics, and quality of life should be considered equally

Street Type – a defined street type (whether existing or potential) in Ames used to describe the general design, function, and character of a street design; the Plan includes eight street types

Target Speed - the speed at which people are expected to drive; the target speed is intended to become the posted speed limit; see Chapter 3

Vehicle miles traveled (VMT) – a measurement of how many cumulative miles are traveled by motor vehicles; one person driving one mile and 25 people riding a bus one mile each equates to one vehicle mile traveled; see *person miles traveled*

Acronyms

AAMPO – Ames Area Metropolitan Planning Organization; the regional transportation planning body

AASHTO – American Association of State Highway and Transportation Officials; AASHTO has produced numerous design guides and standards

CSP – Complete Streets Policy

FHWA – Federal Highway Administration; a division of the US Department of Transportation

Iowa DOT – the Iowa Department of Transportation

ISU – Iowa State University

NACTO – National Association of City Transportation Officials; NACTO has produced multiple design guides that incorporate innovative and sometimes experimental approaches to street design

Chapter 2: Street Classification

During the transportation planning process and prior to the design of an individual project, streets are classified based on function and context. The classification of a street guides its design and which elements—and therefore uses and users—are prioritized when tradeoffs must be made. The City's Complete Streets approach requires the context of the surrounding area and the intended function of the street to be taken into account, resulting in streets designed to serve all anticipated users. Street classification follows a three-step approach:

1. **Identify place type** – Place types represent the context of the surrounding area and are simplified categories that combine land use, development patterns, and density. Although not tied to zoning, each place type encompasses several zoning and future land use categories. Place types influence transportation function. For example, in dense mixed-use areas, transportation function emphasizes access and circulation over throughput.
2. **Determine transportation function** – Transportation function exists on a spectrum with one end emphasizing throughput and the other end emphasizing local access and small-scale, localized circulation. Transportation function is determined first and foremost by place type and secondarily by conventional factors (e.g., traffic demand). Transportation function is a continuum but is divided into three categories for simplicity.
3. **Select street type** – Street types represent common combinations of place types and transportation functions in Ames. Street types serve as starting points for street design and include a range of design parameters and set of priorities for the inclusion of various street elements (e.g., bike lanes versus on-street parking).

The classification approach is shown in **Error! Reference source not found.**. Street types are selected by first identifying the relevant place type for the context, choosing the appropriate transportation function, and then selecting the resulting street type produced by the matrix. In some situations, multiple street type options are appropriate. Selecting between the multiple options requires considering the fine-grained context and constraints within the corridor.

Place types, transportation function categories, and street types are discussed in detail in this chapter.

Figure 1: Street Type Selection Matrix

	Transportation Function		
Place Type	**Emphasizes Access**	**Balances Access and Throughput**	**Emphasizes Throughput**
Activity Center	Shared Street, Mixed Use Street	Mixed Use Avenue	n/a*
Urban Mix	Shared Street, Mixed Use Street, Neighborhood Street	Mixed Use Avenue	n/a*
Residential	Shared Street, Neighborhood Street	Avenue	Thoroughfare, Boulevard
Large-Scale Commercial	Industrial Street	Avenue	Thoroughfare, Boulevard
Industrial	Industrial Street	Avenue	Boulevard

Street Types

*Throughput-oriented streets are incompatible with the Activity Center and Urban Mix place types.

Place Types

Place types represent the context of the surrounding area and are simplified categories that combine land use, development patterns, and density. Identifying the most appropriate place type—considering the existing and future context of an area—is the first step in selecting an appropriate street type. Individual projects may pass through multiple place types, which may require transitioning between multiple street types along the corridor.

Common development patterns, land uses, and character of the five place types in Ames are illustrated in the table below. These place types relate to, but do not replace, the City's zoning classification system.

Table 1: Place Type Overview

Place Type	Description	Development Density	Typical Land Uses	Building Distance from Street	Walking, Bicycling, and Transit Trip Generation	Examples
Activity Center A	Areas with high amounts of circulation across and along streets, with a high proportion of people accessing buildings by walking or on bike	Moderate to High	Housing Retail Education Office Parking	Close Buildings attached or detached and 1-10 stories	High	Downtown, Campustown, Somerset Village
Urban Mix U	Areas or corridors with a mix of uses, with people accessing buildings using multiple modes of transportation	Moderate	Housing Retail Education Office Parking	Close to Moderate Buildings attached or detached and 1-3 stories	Moderate to High	Lincoln Way Corridor, Hospital/Medical District, ISU Research Park
Residential R	Areas with single and multi-family homes, oftentimes with adjacent schools and parks	Low to Moderate	Housing Education Parks	Close to Moderate Setbacks between buildings	Moderate	Numerous neighborhoods throughout Ames
Large Scale Commercial C	Areas oriented toward automobile traffic, with parking lots placed between streets and buildings	Low to Moderate	Retail Office Parking	Moderate to Far Setbacks between buildings	Low to Moderate	North Grand Mall, South Duff Corridor
Industrial I	Areas with small to large, often sprawling buildings used for manufacturing and employment	Low	Industrial Retail Office Parking	Far Large setbacks between buildings	Low	East Side Employment District / Dayton Avenue Corridor

A Activity Center

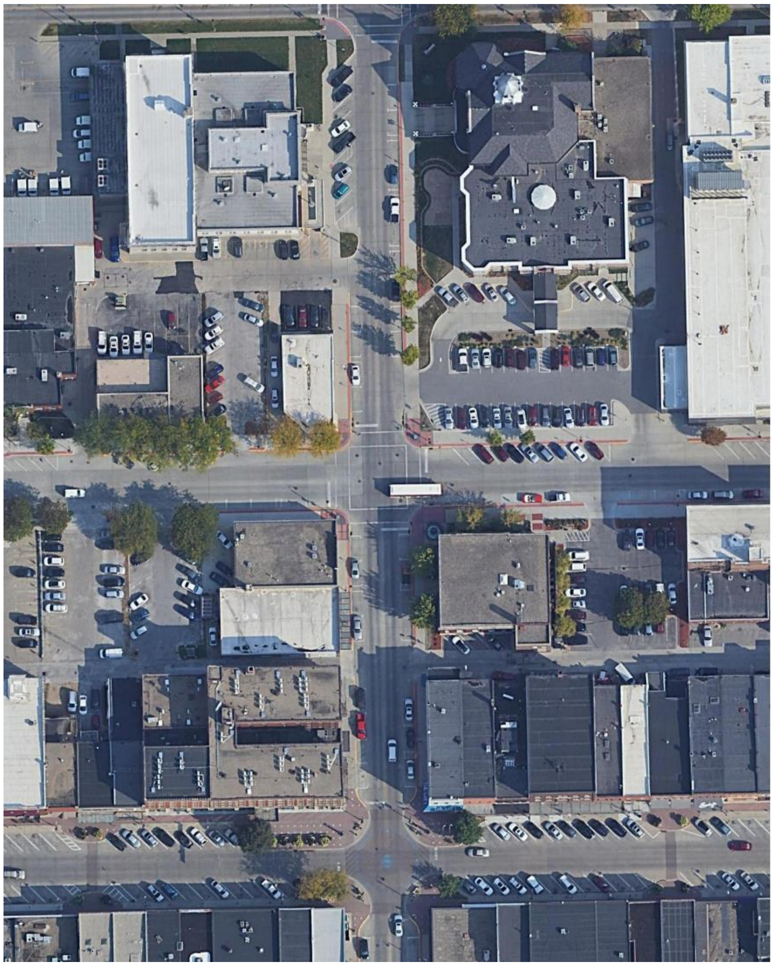
Activity centers are characterized by dense building placement, high amounts of circulation across and along streets, and a high proportion of people accessing buildings by walking or on bike.

Example Places
Downtown, Campustown, Somerset Village

Typical Land Uses
Housing, retail, education, office, parking

Development Density
Moderate to high

Building Distance from Street
Close; buildings attached or detached and 1-10 stories



Compatible Street Types

Shared Street (access-oriented)

Mixed Use Avenue (balances access and throughput)

Mixed Use Street (access-oriented)

U Urban Mix

Urban mix places are areas or corridors with a mix of uses, with people accessing buildings using multiple modes of transportation.

Example Places

Lincoln Way Corridor, Hospital/Medical District, ISU Research Park

Typical Land Uses

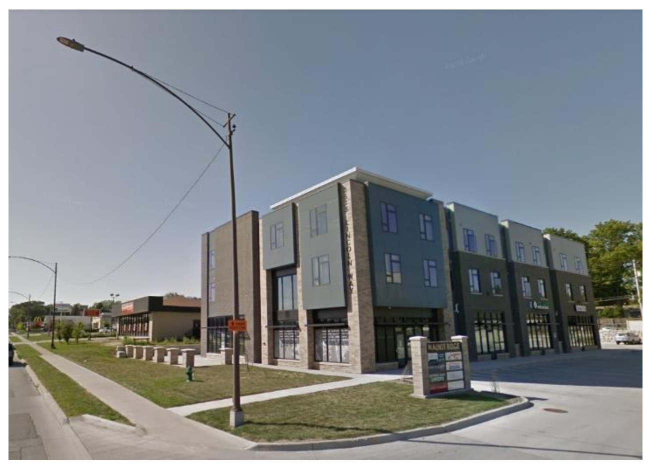
Housing, retail, education, office, parking

Development Density

Moderate

Building Distance from Street

Close to moderate; buildings attached or detached and 1-3 stories



Compatible Street Types

Shared Street (access-oriented)

Neighborhood Street (access-oriented)

Mixed Use Street (access-oriented)

Mixed Use Avenue (balances access and throughput)

R Residential

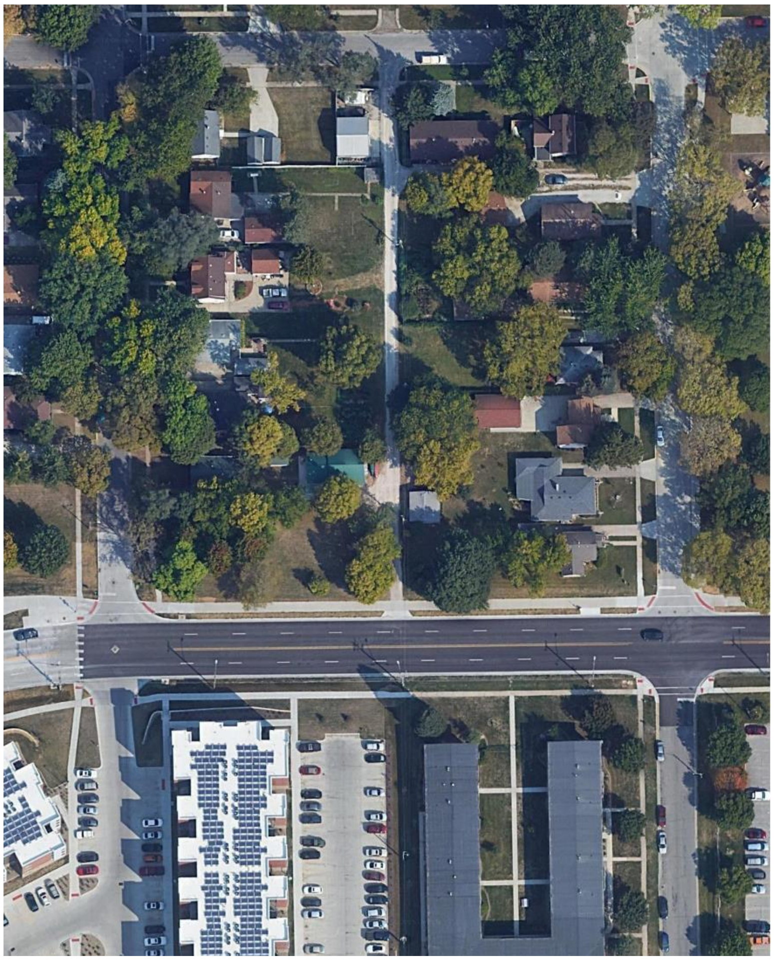
Residential places are areas with single and multi-family homes, often with adjacent schools and parks.

Example Places
Numerous neighborhoods throughout Ames

Typical Land Uses
Housing, education, parks

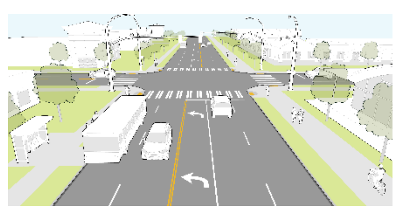
Development Density
Low to moderate

Building Distance from Street
Close to moderate; setbacks between buildings

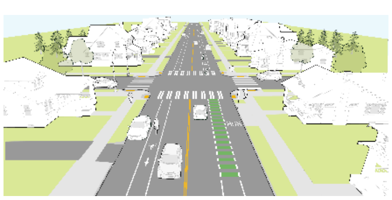


Compatible Street Types

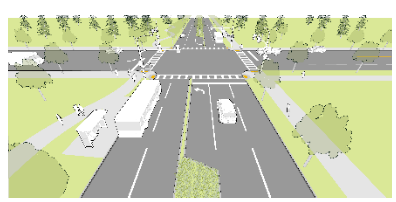
Neighborhood Street (access-oriented)



Thoroughfare (throughput-oriented)



Avenue (balances access and throughput)



Boulevard (throughput-oriented)

C Large Scale Commercial

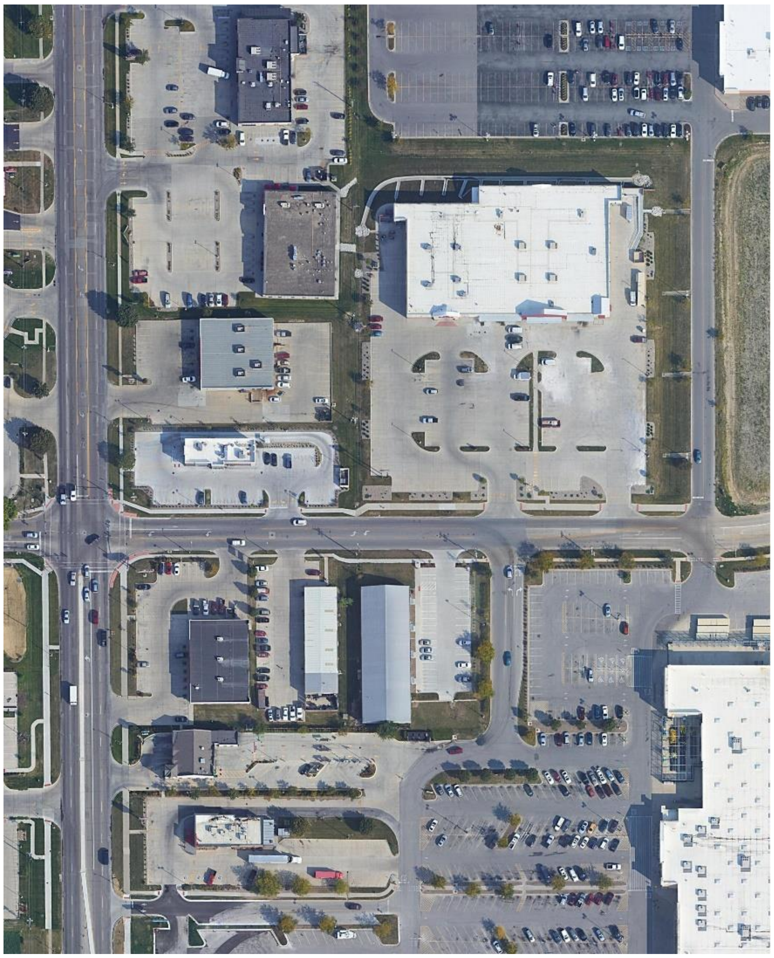
Large scale commercial areas are oriented toward automobile traffic, with parking lots placed between streets and buildings.

Example Places
North Grand Mall, South Duff Corridor

Typical Land Uses
Retail, office, parking

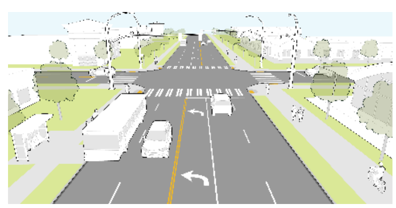
Development Density
Low to moderate

Building Distance from Street
Moderate to far; large setbacks between buildings

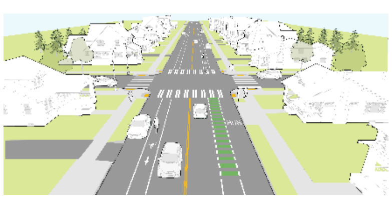


Compatible Street Types

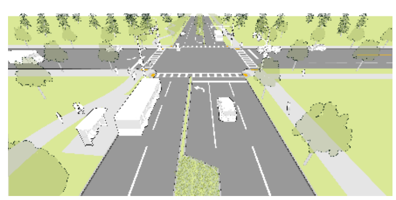
Industrial Street (access-oriented)



Thoroughfare (throughput-oriented)



Avenue (balances access and throughput)



Boulevard (throughput-oriented)

I Industrial

Industrial areas have small to large buildings used for manufacturing and employment.

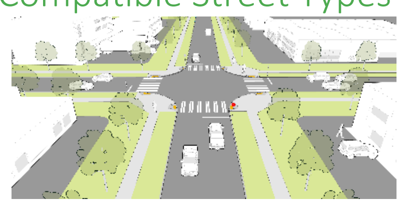
Example Places
East Side Employment District, East Lincoln Way

Typical Land Uses
Industrial, retail, office, parking

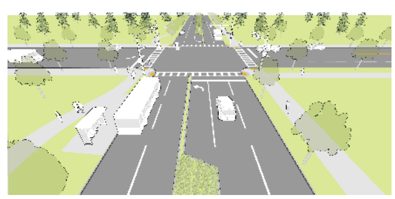
Development Density
Low

Building Distance from Street
Far; large setbacks between buildings

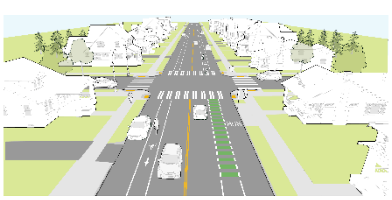
Compatible Street Types



Industrial Street (access-oriented)



Boulevard (throughput-oriented)



Avenue (balances access and throughput)

Transportation Function

All streets facilitate the movement of people, but different streets emphasize different aspects of transportation. Some streets are designed for very slow movement where people walking, biking, and even driving share the same space and intermingle. Other streets and roads—such as expressways—are intended to move people and goods quickly without providing access to adjacent properties.

For simplicity, the spectrum of transportation function is divided into three categories:

- **Access-oriented streets** focus on increasing peoples' ability to reach destinations and individual properties along a street by any mode. Access-oriented streets are typically lower-speed with higher levels of foot traffic.
- **Streets that balance access and throughput** provide moderate levels of access and throughput and therefore tend to have speeds that are lower than those on throughput-oriented streets but higher than those on access-oriented streets. They tend to have moderate to high traffic volumes.
- **Throughput-oriented streets** facilitate the efficient movement of people at greater distances, often at higher speeds. Safely maximizing throughput typically requires physically separating modes and limiting the number of intersections and driveways.

Dense, active places (e.g., downtown) should be primarily served by access-oriented streets while throughput-oriented streets are appropriate in lower-density places. Once place type is considered, additional factors should be considered in order to select the preferred street type:

- Are there many destinations along the street? A high density of destinations suggests an access-oriented street type.
- Is there much foot or bike traffic (currently or potentially)? High numbers of non-motorized trips within a corridor suggests an access-oriented or balanced street type.
- Is the street an important link for cross-town travel? Demand for longer-distance trips suggests a throughput-oriented street. While balanced street types can efficiently convey high volumes of motor vehicle traffic, throughput-oriented streets can do so more quickly.

It is important to realize that the characteristics of streets that facilitate access often conflict with the characteristics that facilitate throughput. **Street designs that attempt to simultaneously increase access and throughput often result in increased conflicts between modes, increased crash rates, and operational challenges that increase traffic congestion.**

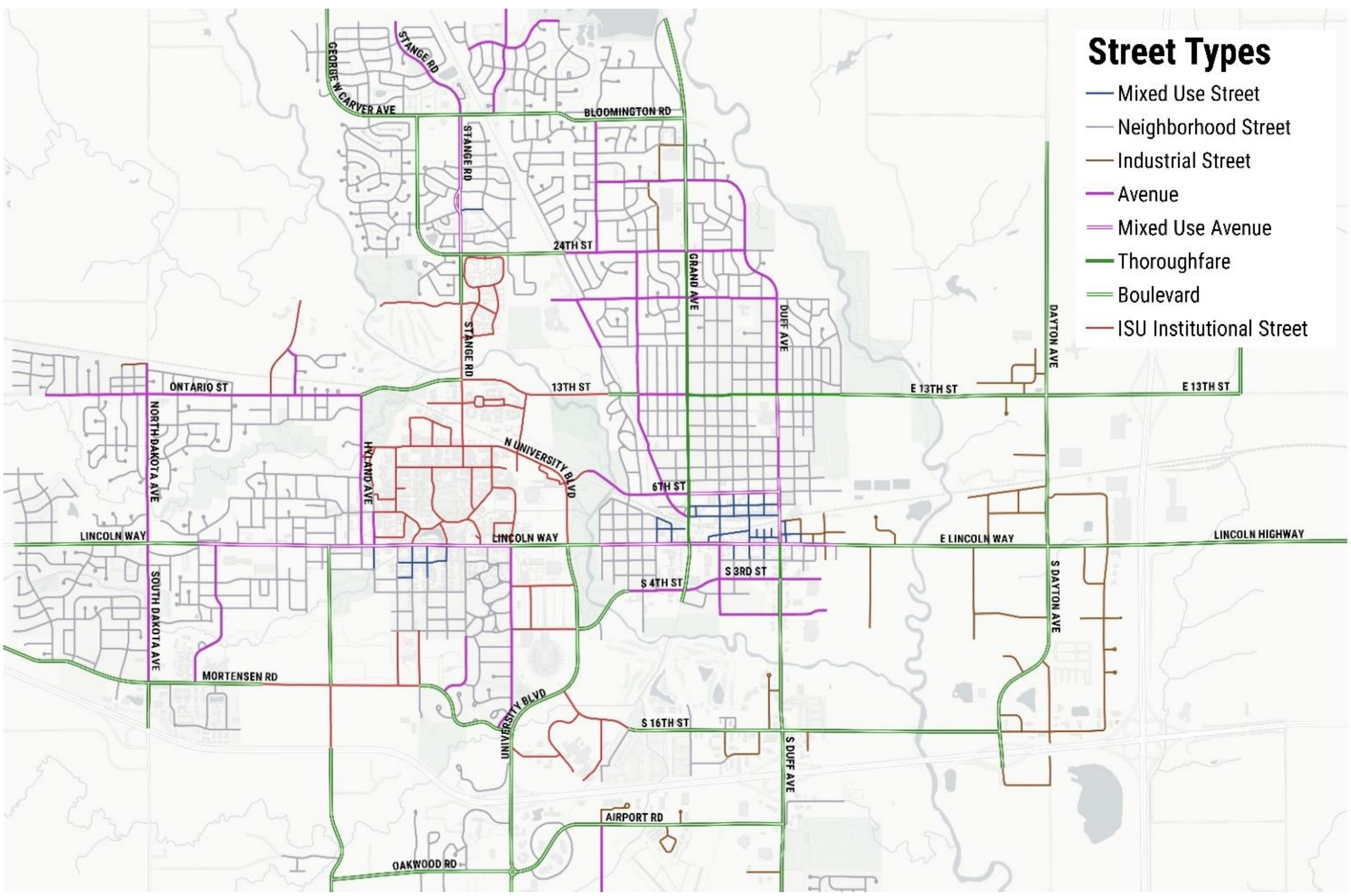
Street Types

Once the place type and transportation function of a street corridor are determined, a street type can be selected. Street types are unique to the conditions and contexts of Ames and provide a starting point for street designs that implement the objectives of the Long Range Plan, Comprehensive Plan, individual area or corridor plans, and urban design goals. The street types ensure that all modes of travel are safely accommodated, while some prioritize different modes. For example, Mixed Use Streets prioritize walking while Thoroughfares prioritize transit and driving.

Because land use contexts (and therefore place types) can change throughout the length of a corridor, multiple street types may be applied to different segments of a single roadway project. For example, a corridor may be categorized primarily as an Avenue, however a commercial node along it may result in a segment being classified as a Mixed Use Avenue. Street design elements will change accordingly, reflecting the designated street type and its economic and mobility objectives.

Conceptual Street Type Application

The map below was developed to illustrate how street types could be applied to existing public streets (excluding ISU's institutional streets). Street types were assigned to streets based on existing and planned development patterns, current traffic speeds and volumes, and estimated bicycle and pedestrian demand. This map is illustrative and not a regulatory document.



Overview of Street Types

There are eight street types used as starting points for street design projects as well as a companion supporting infrastructure type (Greenway). Each street type is flexible and provides guidance for the overall design of a street. The Greenway street type is included because—although it is not a type of street—greenways are important elements of Ames' multimodal transportation system.

Table 2: Street Type Overview

	Street Type	Description	Relevant Place Types
Access Emphasis	**Shared Street**	A street or alley with no curbs or separate areas for various types of transportation. Emphasizes nonmotorized movement and pedestrians have priority.	Activity Center, Urban Mix, Residential
Access Emphasis	**Mixed Use Street**	A street with high amounts of a diverse mix of retail, housing, office and/or education, with people using several types of transportation to circulate.	Activity Center, Urban Mix
Access Emphasis	**Neighborhood Street** (including Bicycle Boulevard variant)	A low traffic street with housing and separated walkways, sometimes with on-street parking. A variation called "Bicycle Boulevard" is available, which optimizes the street for bicycle traffic through traffic calming and diversion; also includes pedestrian enhancements	Urban Mix, Residential
Access Emphasis	**Industrial Street**	A low-traffic street, often with a high percentage of truck traffic, accessing centers of manufacturing and large-scale retail.	Industrial, Large Scale Commercial
Balance of Access and Throughput	**Mixed Use Avenue**	A street with high amounts of a diverse mix of retail, housing, office and/or education, with people using several types of transportation to circulate, but with increased transit and motor vehicle demand compared to that of a Mixed Use Street	Activity Center, Urban Mix
Balance of Access and Throughput	**Avenue**	A street with a moderate amount of traffic, wider than a Neighborhood Street. These may include on-street parking and bike lanes.	Residential, Large Scale Commercial
Throughput Emphasis	**Thoroughfare**	A street with moderate to high amounts of traffic, used most often used for longer distance travel and automobile oriented uses.	Residential, Large Scale Commercial
Throughput Emphasis	**Boulevard**	A street with moderate to high amounts of traffic, with a landscaped median used to separate lanes of traffic and provide refuge for crossing pedestrian and bicycle traffic.	Residential, Large Scale Commercial, Industrial
Supporting Infrastructure	Greenway	A shared use path in an independent alignment, exclusively for the use of bicyclists and pedestrians. Greenways provide connections that supplement the street network.	All

Streets that Emphasize Access

Access-oriented streets emphasize peoples' ability to reach destinations and individual properties along a street by any mode. Access-oriented streets are typically lower-speed with higher levels of foot traffic.

Shared Street

A street or alley with no curbs or separate areas for various types of transportation. Emphasizes nonmotorized access; pedestrians have priority.

Relevant Place Types

A U R

A Shared Street has a continuous surface that is shared by people using all modes of travel at slow speeds. Curbs are removed, and the sidewalk is blended with the roadway. Speeds are slow enough to allow for pedestrians to intermingle with bicycles, motor vehicles, and transit. Shared Streets can support a variety of land uses, including commercial and retail activity, entertainment venues, restaurants, offices, and residences. They are unique spaces where people can slow down to enjoy the public realm.

When designing Shared Streets, special consideration must be given to accommodating pedestrians with disabilities. To facilitate navigation for people with visual impairments, materials can vary and street furnishings such as bollards, planters, street lights, and benches can be strategically placed to define edges. These streets are often surfaced with pavers or other types of decorative surface treatments.

Overall, the primary design consideration for Shared Streets is maintaining slow motor vehicle speeds (no more than 15 mph) in order to minimize the potential for conflicts with pedestrians. Entrances to Shared Streets are often raised and narrowed to one lane to force drivers to slow before entering. Chicanes can be used to help regulate vehicular speeds along the length of the street, and can be formed using trees, benches, plantings, play areas, and parking areas that are laid out in an alternating pattern to deflect and slow traffic.

Mixed Use Street

A street with a diverse mix of retail, housing, office and/or educational uses, with people using several types of transportation to circulate.

Relevant Place Types

A U

Mixed Use Streets are typically found in areas with a high density of small commercial and retail businesses and have an emphasis on walkability. Mixed Use Streets are often concentrated in an area only a few blocks long, such as downtown. The curbside uses on Mixed Use Streets prioritize walking, bicycling, transit, and short-term parking for local shops and restaurants.

Because these streets are a meeting ground for residents, they should be designed to support gathering and community events such as farmers' markets and festivals. In addition, they are characterized by public facilities such as libraries, as well as community and health centers.

Mixed Use Streets have many similarities to Mixed Use Avenues. However, Mixed Use Streets have lower target speeds, somewhat higher volumes of people biking and walking, lower volumes of motor vehicle traffic, and more storefronts. Mixed Use Streets also more often have unique aesthetic branding and design elements that reflect the area's cultural or historic past.

Neighborhood Street

A low traffic street with housing and separated walkways, sometimes with on-street parking. A variation called “Bicycle Boulevard” is available, which optimizes the street for bicycle traffic through traffic calming and diversion; also includes pedestrian enhancements

Relevant Place Types

U R

Neighborhood Streets provide immediate access to Ames’ multifamily and single-family homes. They are used primarily for local trips and are characterized by lower motor vehicle traffic volumes and speeds. The emphasis is on pedestrian safety, space for children to play, ample street trees, and well-defined walking and bicycling connections to nearby parks, bus stops, transit stations, community centers, and libraries. The primary role of Neighborhood Streets is to contribute to a high quality of life for residents of the city.

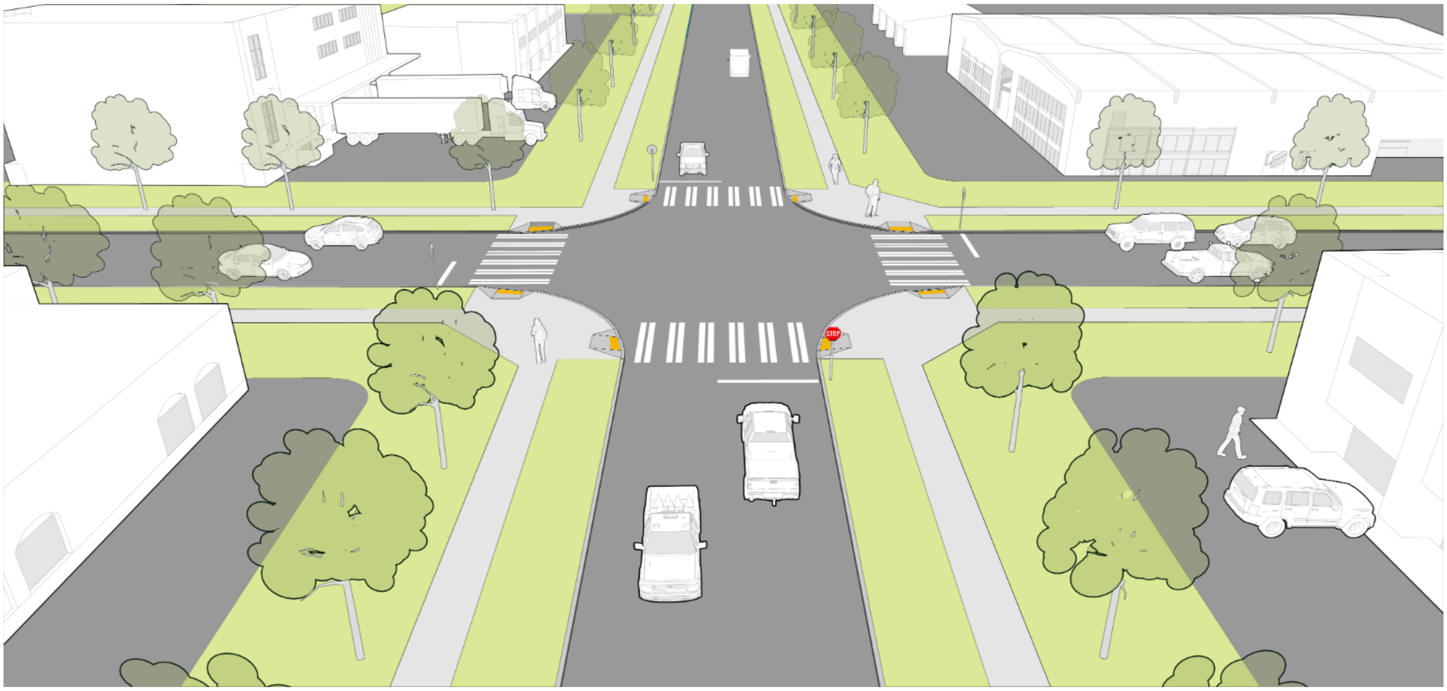
The design of Neighborhood Streets focuses on encouraging slow speeds. Typically, they do not have more than two travel lanes (one in each direction). They often have on-street parking and some existing Neighborhood Streets in Ames are so narrow that two-way traffic is limited when cars are parked on the street. This effectively slows and calms traffic in these neighborhoods.

Bicycle Boulevard Variant

While not intended for motor vehicle through-traffic, making longer connections for people biking via Neighborhood Streets is encouraged. A Bicycle Boulevard is a variant of the Neighborhood Street type intended to achieve this outcome. This variant can be implemented to enhance bike routes on low-speed, low-traffic streets—sometimes to provide parallel alternatives to providing bikeways on nearby high-traffic streets. Bicycle Boulevards are designated and designed to give bicycle travel priority and discourage through trips by motor vehicles and create safe, convenient bicycle crossings of busy arterial streets. Treatments vary depending on context, but often include traffic diverters, speed attenuators such as speed humps or chicanes, pavement markings, and signs.

Industrial Street

A low-traffic street, often with a high percentage of truck traffic, accessing centers of manufacturing and large-scale retail.



Relevant Place Types

C I

Industrial Streets support the manufacturing, research, and scientific facilities that form Ames' industrial base. These streets support truck traffic and accommodate the loading and distribution needs of wholesale, construction, commercial, service, and food-processing businesses. They typically connect directly to the regional highway system and distribution hubs. Industrial streets also serve large-scale and auto-oriented commercial areas, providing access for people driving personal vehicles and for deliveries via large trucks.

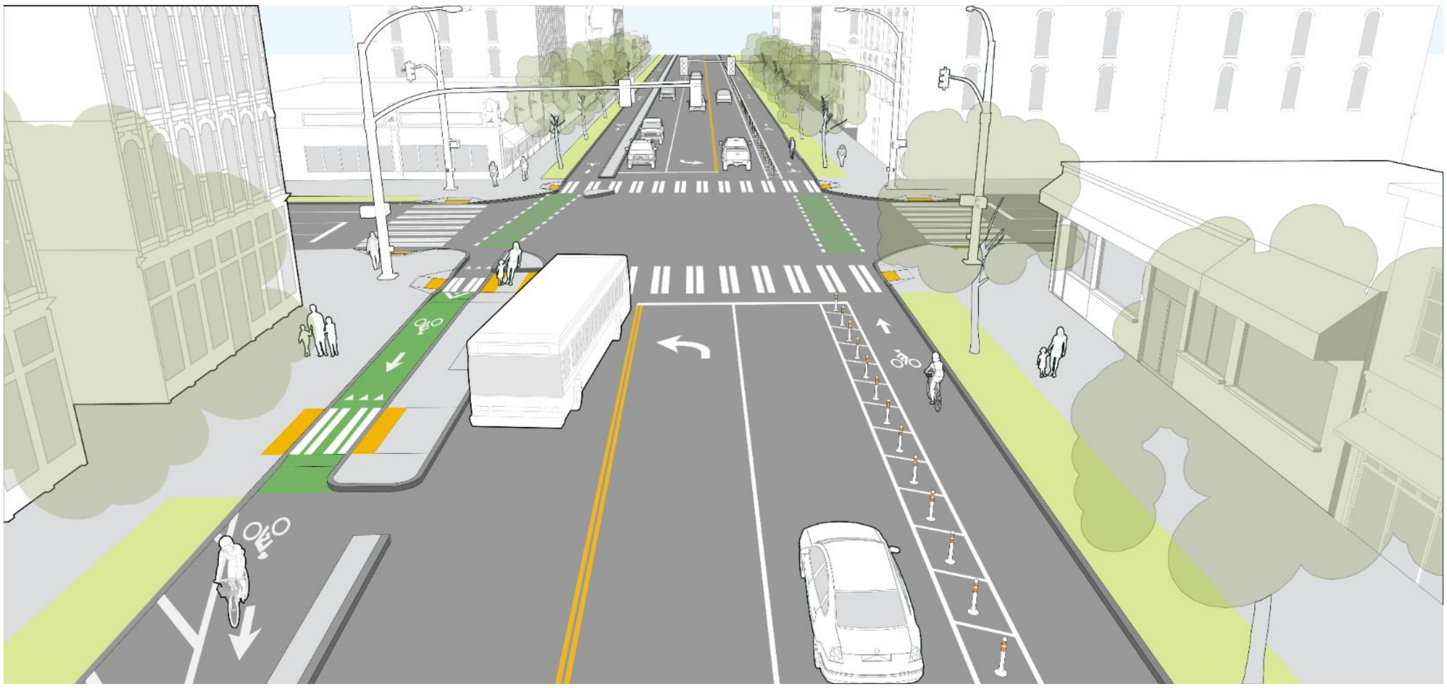
Accommodation of truck traffic, including providing adequate turning radii at intersections, is a primary design consideration for these streets. While pedestrian use may be relatively low, sidewalks and accessible accommodations are provided. When designing Industrial Streets as part of the interconnected street network, consideration should be given to designs that discourage truck traffic from using residential streets in the surrounding neighborhoods.

Streets that Balance Access and Throughput

Streets that balance access and throughput accommodate a reasonable level of motor vehicle throughput while maintaining a high level of comfort and convenience for people using transit, walking, and biking.

Mixed Use Avenue

A street with a diverse mix of retail, housing, office and/or educational uses, with people using several types of transportation, but with increased transit and motor vehicle demand compared to that of a Mixed Use Street.



Relevant Place Types

A U

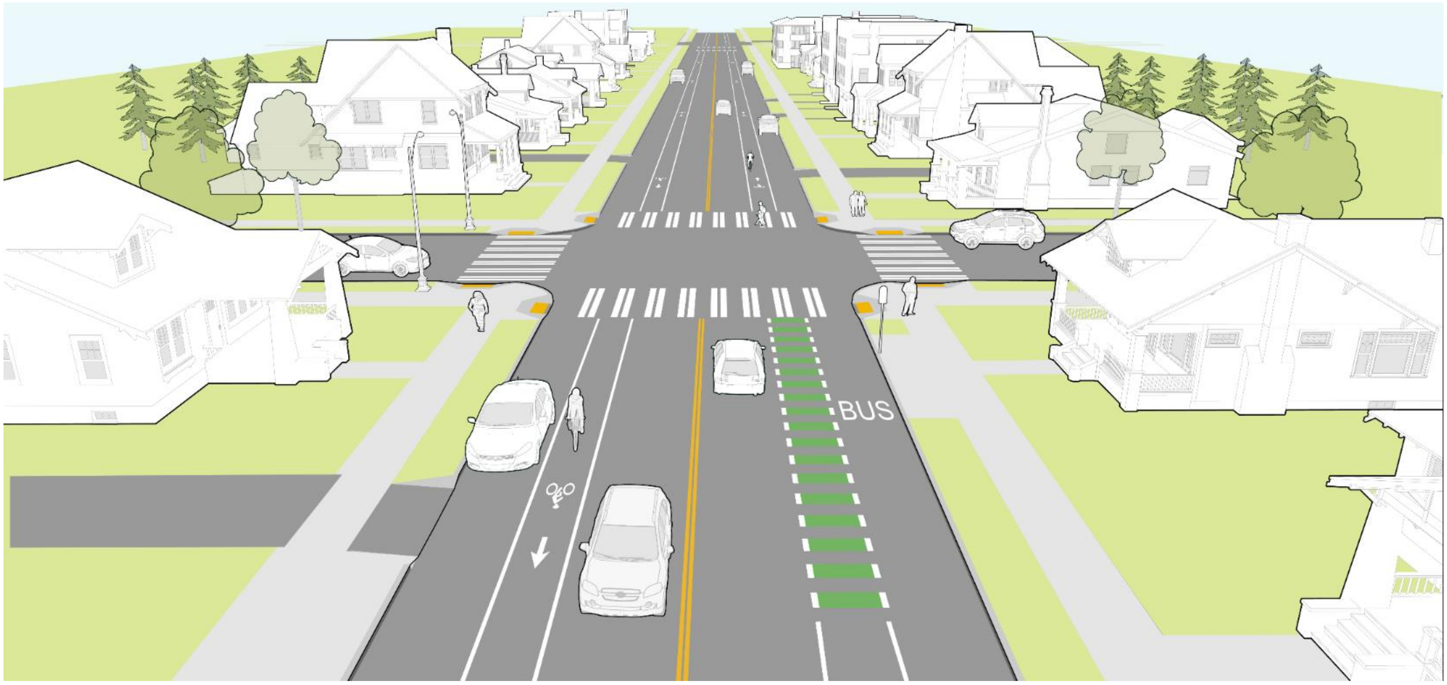
Mixed Use Avenues serve a diverse variety of land uses and high development densities. Appropriate in downtown, Campustown, and other existing and future higher-density urban areas, these streets support a lively mix of retail, residential, office, and entertainment uses. These streets serve residents, visitors, and workers by supporting high levels of walking, bicycling, and transit.

On Mixed Use Avenues, a lively and visually stimulating public realm should be supported by landscaping, street furniture (i.e., benches, information kiosks, trash and recycling receptacles, etc.), outdoor cafés, plazas, and public art. In short, these streets are where people work, play, shop, eat, and gather to enjoy city life.

Mixed Use Avenues have many similarities to Mixed Use Streets. However, Mixed Use Avenues have slightly higher target speeds, higher motor vehicle traffic volumes, and—most importantly—place greater emphasis on facilitating throughput while also supporting access. These streets typically serve transit and people bicycling, and therefore often include bus stops or shelters and higher-level bikeways (such as separated bike lanes). On-street parking is an optional addition to this type of street if space is available after transit, bicycling, and motor vehicle throughput needs are met.

Avenue

A street with a moderate amount of traffic, wider than a Neighborhood Street. These may include on-street parking and bike lanes.



Relevant Place Types

R C I

Avenues are streets that balance access and throughput and often traverse large-scale commercial areas and neighborhoods. They provide continuous walking and bicycling routes and often include bus routes. While they are essential to the flow of people across the city, the needs of people passing through must be balanced with the needs of those who live and work along the street.

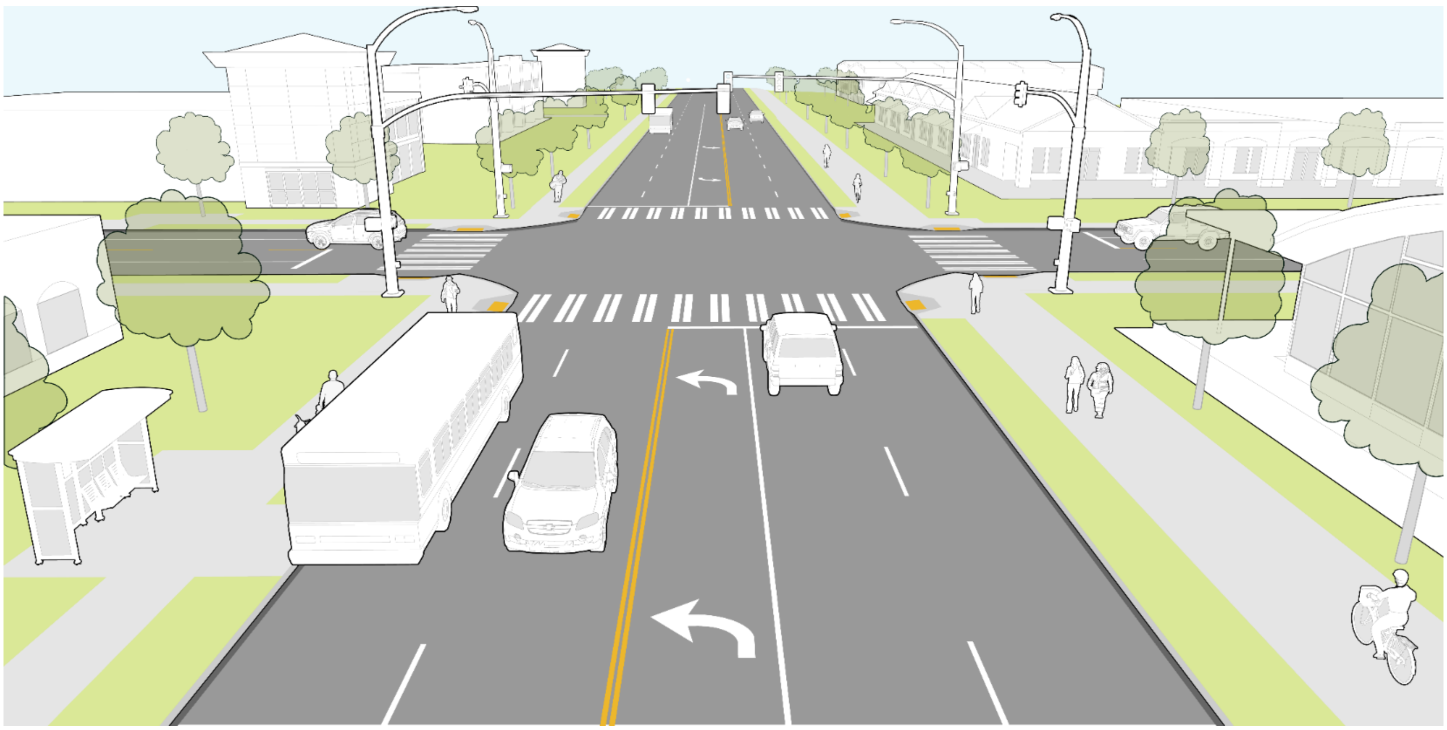
Land uses, right-of-way widths, and the presence of on-street parking can vary along Avenues. Design considerations include encouraging efficient movements of vehicle and transit traffic, continuous and comfortable bicycle facilities, wide sidewalks with sufficient buffers to motor vehicle traffic, and safe pedestrian crossings at intersections. Street lighting, tree plantings, street furniture, and other urban design elements should create a unifying identity for the entire street.

Streets that Emphasize Throughput

Throughput-oriented streets emphasize the efficient movement of people across greater distances, often at higher speeds. Safely maximizing throughput typically requires physically separating modes and limiting the number of intersections and driveways.

Thoroughfare

A street with moderate to high amounts of traffic, most often used for longer distance travel and automobile-oriented uses. Thoroughfares are often state highways.



Relevant Place Types

R C

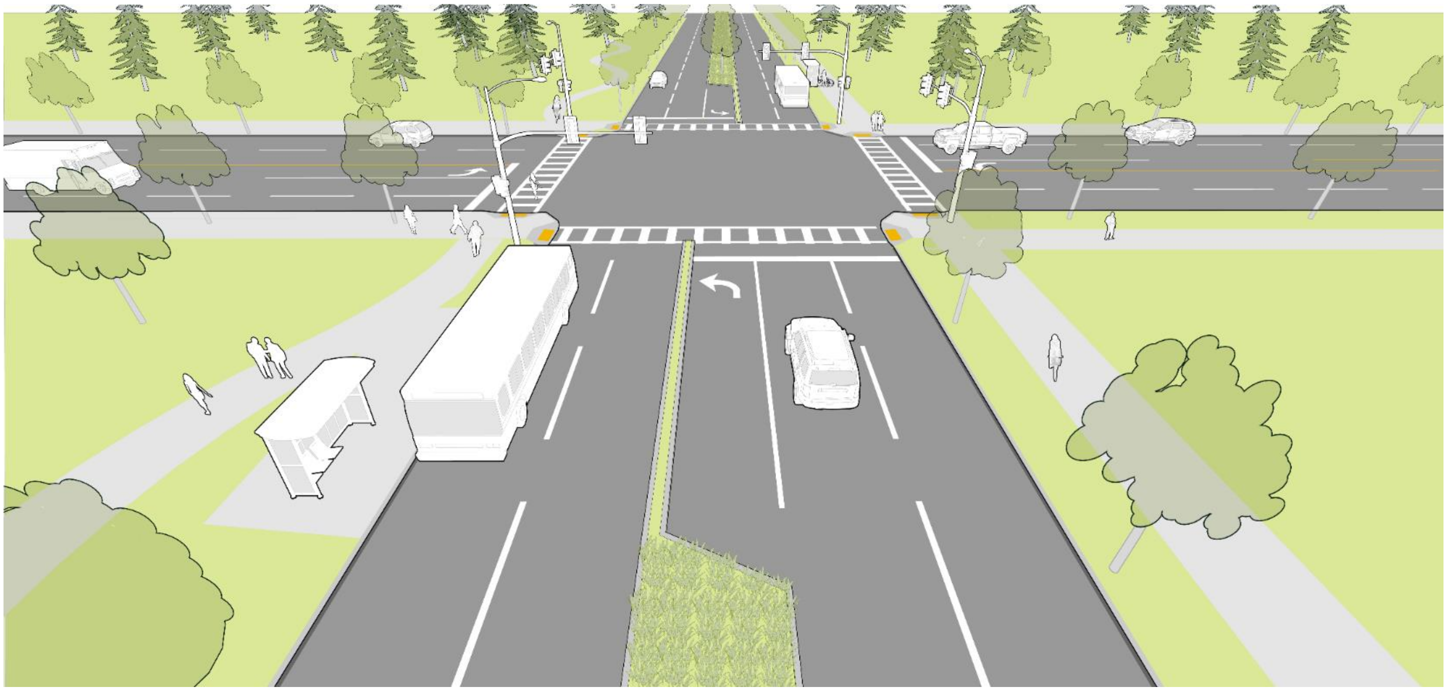
Thoroughfares are throughput-oriented streets that connect commercial areas, employment centers, civic and institutional areas, and neighborhoods. Along with Boulevards, they have the highest volumes of motor vehicles and transit service as well as moderate to high volumes of pedestrian activity. The demand for bicycling along Thoroughfares may be moderate to high, but because of the constrained environments in which this street type is found, bicycle traffic is often encouraged to use parallel low-traffic streets.

While target speeds are slightly higher on this street type than most other types, the design of Thoroughfares balances the needs of mobility and safety. Safety for pedestrians and bicyclists is emphasized by focusing on providing appropriate sidewalks and bikeways (sidepaths or separated bike lanes preferred), opportunities for pedestrians and bicyclists to safely cross the street, and separation from high volumes of traffic. Where bicyclists cannot be accommodated, facilities are provided on nearby parallel streets to create a "complete corridor."

Right-of-way is very constrained along Thoroughfare street corridors. As such, focus should be on providing separation between motor vehicle traffic and the sidewalk (this can be achieved with bike lanes, the amenity zone, or occasionally with on-street parking). In addition, clear sight lines at unsignalized intersections should be provided.

Boulevard

A street with moderate to high amounts of traffic, with a landscaped median used to separate lanes of traffic and provide refuge for crossing pedestrian and bicycle traffic.



Relevant Place Types

R C I

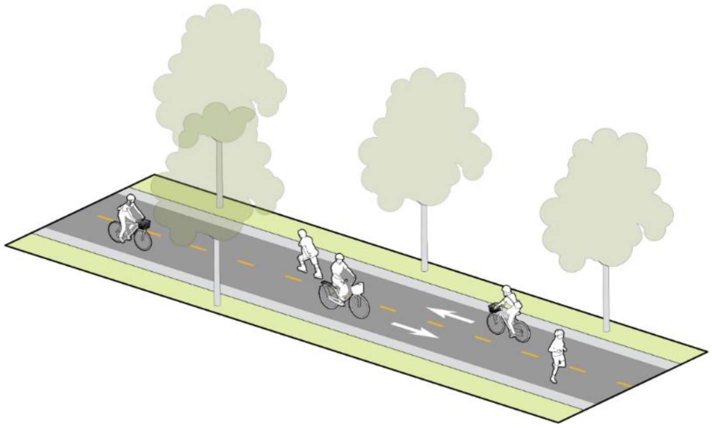
Boulevards are throughput-oriented streets that connect commercial areas, employment centers, civic and institutional areas, and neighborhoods. Along with Thoroughfares, they have the highest volumes of motor vehicles and transit service. Boulevards have low to moderate volumes of pedestrian activity, depending on the land use composition of nearby development. Bicycle activity is moderate to high along Boulevards with sidepaths, which provide longer-distance throughput for bicyclists.

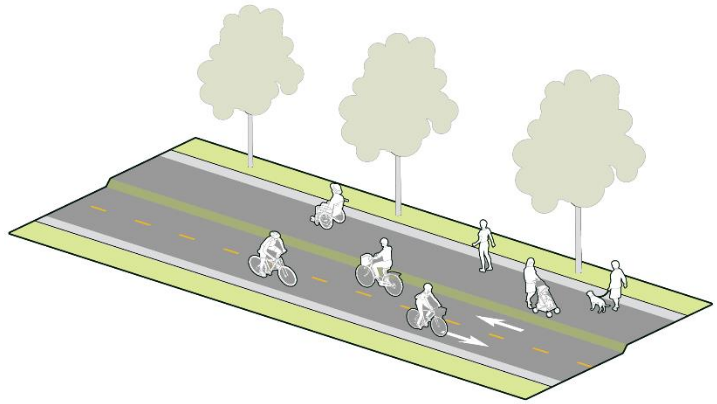
Boulevards can accommodate the highest target speeds of any Complete Street type and on-street parking and traffic calming are not typically compatible. Access to adjacent properties is managed by requiring greater distances between driveways and encouraging shared driveways.

Safety for pedestrians and bicyclists is emphasized by focusing on providing appropriate sidewalks or sidepaths, opportunities for pedestrians and bicyclists to safely cross the street, and separation from high volumes of traffic. Bicyclists are typically accommodated on a separated sidepath shared with pedestrians.

Greenways

Shared-use paths in independent alignments, such as through parks, along waterways, or rail trails.





Relevant Place Types

A U R C I

Greenways are important parts of the multimodal network. They provide non-motorized connections where streets do not or should not connect, such as through a park or conservation area. Numerous greenways exist in Ames today and the Ames Mobility 2040 plan includes additional Greenway corridors for future development. The volume and composition of non-motorized traffic should be analyzed when determining the width and configuration of shared use paths. The minimum width of shared use paths is 10 feet (8 feet is acceptable for short distances in constrained environments). Where a high level of pedestrian activity is likely, wider shared use paths (12 to 14 feet or wider) or separate paths for people walking and people biking should be considered.

Intersections and Street Types

The design of intersections should reflect the context of converging street types, surrounding land uses, and neighborhood identities. Key elements of an intersection, such as lane and curb alignments, crosswalk locations, and bicycle accommodations, vary in design and configuration depending on the function of the street and role of the intersection in the surrounding neighborhood.

Prioritizing Typologies at Intersections

Design elements of some street types should take precedence over design features on other street types. Intersections that transition from one street type to another should alert all users of the change in the character of the roadway through obvious and intuitive design features. Usually, the design of an intersection should default to the design criteria of the lower-speed street in order to calm traffic. For example, the curb radii at a Thoroughfare-Avenue intersection should default to the design criteria for the Avenue street type (see Chapter 3). Two types of intersections, described below, involve important types of transitions and design considerations.

Intersections with Neighborhood Streets and Shared Streets

When drivers turn off Avenues, Thoroughfares, and Boulevards onto these low-speed, low-traffic streets, the design should alert people of the change in context and use of the street and encourage drivers to slow down. Treatments such as pavement texture, tighter curb radii, curb extensions, narrower roadway throat widths, and even raised crosswalks can help facilitate slower speeds and visually demarcate the change in street type.

In addition, enhancements for pedestrians crossing the busier streets should be considered. This may include marked or raised crosswalks, curb extensions, median refuge islands, warning signs, or signalized traffic control. Depending on pedestrian volume, traffic signals and raised intersections should be considered where Shared Streets intersect Mixed Use Avenues, Avenues, Thoroughfares, and Boulevards.

Intersections with Mixed Use Streets and Mixed Use Avenues

Mixed Use Streets and Mixed Use Avenues typically have higher levels of pedestrian activity than other street types. This should be considered in the design of streets—especially Thoroughfares and Boulevards—as they approach and intersect these street types. Gateway treatments, traffic calming measures, and the creation of inviting spaces should characterize intersections between these divergent street types. These intersections should prioritize pedestrian crossings by featuring short crossing distances and enhanced pedestrian signals (e.g., countdown timers, leading pedestrian intervals, and signals that automatically include a WALK phase every cycle).

Chapter 3: Design Criteria Parameters & Guidelines

Street design decisions—such as how many travel lanes are needed, whether to include on-street parking, and what type of bikeway to provide—are made and documented initially during the project scoping phase of a street design project and may be revised during the conceptual design phase (see Chapter 4). These decisions are typically oriented around what are called design criteria.

Each street type described in Chapter 2 has a unique set of parameters for roadway and pedestrian zone design criteria that make the street type compatible with and supportive of the relevant place types. These criteria—and associated guidelines for making design decisions—are described in the following pages.

The combination of design criteria (e.g., number of travel lanes, bikeway and parking configuration, and sidewalks width and setback from the curb) determine the typical overall width and required right-of-way for each street type (see Table 3). The total required right-of-way may influence the selection of a street type for a roadway project. For example, a narrow available right-of-way may make the Thoroughfare type more compatible than the Boulevard type.

Following the sections on roadway and pedestrian zone design criteria, this chapter includes guidance on the prioritization of street design elements (consult when making tradeoffs).

TABLE 3: STREET TYPE SPACE REQUIREMENTS

Street Type	Total Pedestrian Zone Width (per side)		Total Roadway Width*			Total Right-of-Way Width		Typical ADT
	Pref.	Min.	Max.	Typ.	Min.	Typ.	Min.	
Shared Street	N/A	N/A	Varies	Varies	20’	Varies	20’	<500
Mixed Use Street	22’	8’	62’**	40’	20’	62’	36’	<3,000
Neighborhood Street (including Bicycle Boulevard variant)	15’	7’	35’	25’	20’	55’	34’	<3,000
Industrial Street	11’	7’	36’	25’	25’	47’	39’	<3,000
Mixed Use Avenue	22’	7’	94’†	58’	30’	80’	52’	3,000 to 25,000
Avenue	16’	7’	72’	48’	30’	80’	44’	1,000 to 15,000
Thoroughfare	14’	7’	78’	56’	32’	84’	60’	10,000 to 25,000
Boulevard	18’	9’	92’	60’	40’	96’	58’	>3,000

**Including all travel lanes, center turn lanes, medians, and on-street bikeways.*
***Assuming angled on-street parking on both sides. Maximum pavement width for a Mixed Use Street is 30 feet if no on-street parking is provided.*
†Assuming a pair of one-way separated bike lanes, on-street parking on both sides, and a median.

Roadway Design Criteria

Design criteria for roadways are determined using Table 4 and Table 5 and the accompanying footnotes and clarifications. Deviation from the ranges specified should be carefully considered and occur rarely. When deviations occur, they will be documented appropriately. The ranges of values conform to state and federal standards (AASHTO, MUTCD, and SUDAS). Many of the parameter ranges are informed by the NACTO *Urban Street Design Guide*, which is an acceptable alternative or supplement to AASHTO.

TABLE 4: ROADWAY SPACE ALLOCATION PARAMETERS

Street Type	# of Travel Lanes[1]	Traveled Way / Lane Width[2]			Center Turn Lane / Median[3]	Default Bikeway Type[4]	Default On-Street Parking[5]
		Min.	Pref.	Max.			
Shared Street	No centerline	20’ Total	Varies	N/A	Not compatible	N/A	None
Mixed Use Street	No centerline	20’ Total	25’ Total	30’ Total	Not preferred	Shared roadway	Parallel preferred, Reverse angled acceptable
Neighborhood Street (including Bicycle Boulevard variant)	No centerline	20’ Total	25’ Total	35’ Total	Not compatible	Shared roadway or bicycle boulevard	Non-delineated
Industrial Street	2	25’ Total	25’ Total	36’ Total	Optional	Shared roadway	None
Mixed Use Avenue	2-4	10’ Lanes	11’ Lanes	11’ Lanes*	Optional	Bike lanes or separated bike lanes	Optional, parallel preferred
Avenue	2	10’ Lanes	11’ Lanes	11’ Lanes*	Optional	Bike lanes or separated bike lanes	Optional
Thoroughfare	2-4	10’ Lanes	11’ Lanes	12’ Lanes	Standard	Separated bike lanes or shared use path	None
Boulevard	2-6	11’ Lanes	12’ Lanes	12’ Lanes	Median standard	Separated bike lanes or shared use path	None

**Except on bus routes, where the outside lane should be 12 feet wide.*

TABLE 5: ROADWAY OPERATIONAL PARAMETERS

Street Type	# of Travel Lanes[1]	Target Speed[6] (miles per hour)	Corner Radii[7]		Typical ADT[8]
			Pref.	Max.	
Shared Street	No centerline	10	0’	10’	<500
Mixed Use Street	No centerline	20	5’	15’	<3,000
Neighborhood Street (including Bicycle Boulevard variant)	No centerline	20	5’	15’	<3,000
Industrial Street	2	25	20’	35’	<3,000
Mixed Use Avenue	2-4	25	5’	20’	3,000 to 25,000
Avenue	2	25	10’	25’	1,000 to 15,000
Thoroughfare	2-4	35	15’	30’	10,000 to 25,000
Boulevard	2-6	35	15’	30’	>3,000

Roadway Design Criteria Footnotes and Clarifications

The following numbered sections provide additional guidance on roadway design criteria. The superscript numbers correlate with the superscript numbers in Table 4 and Table 5.

[1] Number of Travel Lanes:

- Specified number of travel lanes represents the default or typical configuration. Street designs can deviate (e.g., a four-lane Avenue) if warranted by unique context or constraints. Thorough documentation should be provided for any deviations.
- The minimum total width for Shared Streets is space shared by all modes. Motor vehicle traffic can be restricted to one-way movement, but pedestrian and bicycle traffic should be allowed to travel both directions.
- The minimum total width for Shared Streets and Mixed Use Streets assumes two-way motor vehicle travel. On one-way streets, the minimum traveled way width is 16 feet, which allows an 11-foot lane and a 5-foot counter-flow bike lane.

[2] Lane Width:

- For Mixed Use Street, Neighborhood Street, and Industrial Street, total width is for the traveled way exclusive of on-street parking.
- The bus route minimum width applies to designated bus lanes, the outside lane on bus routes, or the total traveled way width on bus routes along Mixed Use Streets and Industrial Streets.
- The maximum lane width may be used on truck routes. The following typologies are not compatible with truck routes: Shared Street, Neighborhood Street, Mixed Use Street, and Avenue. The Mixed Use Avenue street type may be applied to truck routes with careful consideration of impacts on bicycle and pedestrian modes.

[3] Center Turn Lane / Median:

- Center turn lanes and medians are not preferred for Mixed Use Streets because they increase crossing distances for pedestrians and consume right-of-way that could otherwise be used for sidewalk cafés, etc. To facilitate intersection operations, on-street parking can be removed to allow left turn lanes as needed in order to maintain LOS E or better during peak periods.

- Center turn lanes or medians are recommended for any roadway with two or more through lanes in each direction.
- For typologies in which a median is not preferred or optional, it may still be beneficial to provide crossing islands or non-continuous centerline traffic-calming islands in certain locations.

4 Default Bikeway Type:

- Motor vehicle traffic volume and speed are critical contextual considerations for bicyclist safety and comfort. Proximity to motor vehicle traffic is a significant source of stress, safety risks, and discomfort for bicyclists, and corresponds with sharp rises in crash severity and fatality risks for vulnerable users when motor vehicle speeds exceed 25 miles per hour. Furthermore, as motorized traffic volumes increase above 3,000 vehicles per day, it becomes increasingly difficult for motorists and bicyclists to share roadway space.
- From a bicycling perspective, people vary considerably in terms of traffic stress tolerance, which is defined as comfort, confidence, and willingness to interact with motor vehicle traffic. Research[1] indicates that people fall into one of the four categories shown below. The largest group (51 percent) has a low tolerance for interacting with motor vehicle traffic. As such, the type of bikeway facility and amount of separation from motor vehicle traffic will largely determine whether the bikeway will be used by the majority of the population or only by a smaller portion that is comfortable interacting with motor vehicle traffic.

FIGURE 2: BICYCLIST TYPES AND PREFERENCES

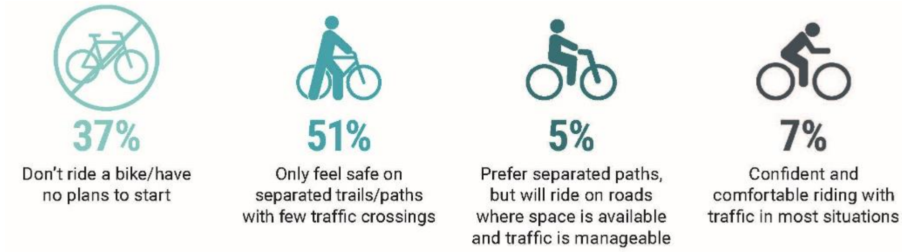
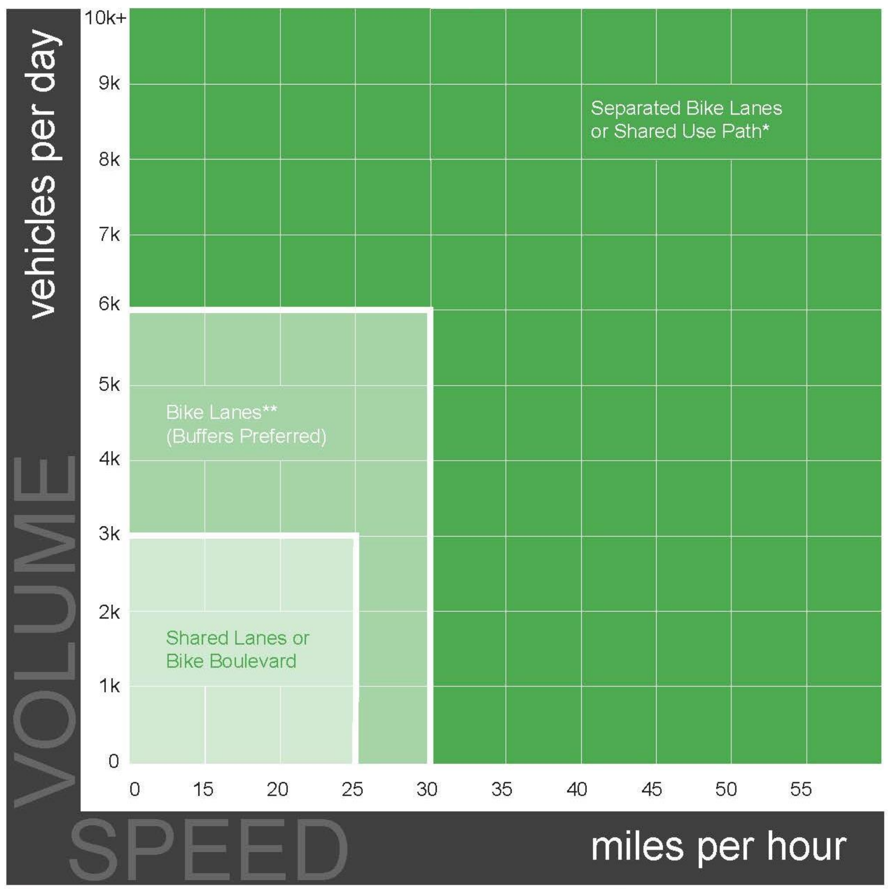


FIGURE 3: BICYCLE FACILITY SELECTION



*To determine whether to provide a shared-use path or separated bike lane, consider pedestrian and bicycle volumes or, in the absence of volume, consider land use.
**Advisory bike lanes may be an option where traffic volume < 4K ADT

[1] *Dill, J. and N. McNeil. (2013, January) "Four Types of Cyclists? Examining a Typology to Better Understand Bicycling Behavior and Potential." Paper presented at the Annual Meeting of the Transportation Research Board.*

- The default bikeway type indicates the type of bikeway that is typically appropriate for the street type. This does not indicate a minimum or maximum standard. Designers should consider traffic speeds and forecasted volumes of each individual project when selecting a bikeway. Figure 3 illustrates the **baseline** optimal bicyclist accommodations for the projected traffic context of the street. The speed and volume thresholds shown correlate with a Level of Traffic Stress rating of LTS2.
- Shared Streets do not separate modes; therefore, no dedicated bikeway type is needed.
- Shared lanes or bicycle boulevards are generally appropriate on streets with traffic volumes at or below 3,000 vehicles/day and posted speeds at or below 25 mph. These conditions are often comfortable for a wide range of bicyclists and thus they may be designated as bicycle routes to complement or comprise a large percentage of a bicycle network in a community. For the purposes of bikeway selection, it is assumed that posted speeds are approximately the same as operating speeds. If operating speeds differ from posted speeds, then operating speed should be used instead of posted speed. However, dedicated bikeways may be warranted in special circumstances, such as near elementary schools.
- Bike lanes are the preferred facility type when traffic volumes are between 3,000 to 6,000 vehicles/day and posted speeds are 25 to 30 mph. Within this range, buffered bike lanes are preferred in order to provide spatial separation between bicyclists and motorists, especially as volumes or speeds approach the limits. Bike lanes should be a minimum of 6 feet wide where adjacent to on-street parking. Bike lanes may be 5 feet wide where on-street parking does not exist or in constrained environments.
- Separated bike lanes and shared use paths are the preferred facility type as traffic volumes exceed 6,000 vehicles/day or vehicle speeds exceed 30 mph. However, because many higher-traffic streets (especially Thoroughfares) have very constrained rights-of-way, it may be infeasible to provide these facilities. In constrained corridors, the solution will often be to provide parallel routes or Bicycle Boulevards on lower-traffic streets.
- Sidepaths (shared use paths along roadways) may be acceptable design solutions in lieu of separated bike lanes in land use contexts where pedestrian volumes are relatively low and are expected to remain low. The sidepath may be located on one or both sides of the street, depending upon bicycle and pedestrian network connectivity needs. As volumes increase over time, the need for separation should be revisited. Where land use is anticipated to add density over time, right-of-way should be preserved to allow for future separation of bicyclists and pedestrians.
- There may be conditions under which it is infeasible to provide bicycle facilities that are sufficiently comfortable for the majority of people. These limiting conditions could include funding shortfalls associated with right-of-way acquisition or budget limitations. Under these conditions, it may be necessary to select the next-best facility type, which may have less separation between bicycle and motor vehicle traffic than the ideal facility. If this decision is made, the designer and project team must document the decision and the constraints that led to the facility type downgrade. If a downgraded facility is selected, it is important to be aware that it may accommodate more confident or experienced bicyclists but will likely be uncomfortable for the majority of the population.
- If the Ames Mobility 2040 Long Range Transportation Plan or any future bike plans specify a bikeway facility that differs from the default facility shown in the table, then the facility which provides the highest level of comfort (i.e., lowest level of traffic stress) for bicyclists should be provided.

[5] Default On-Street Parking:

- The table indicates the typical treatment of on-street parking for each street type. Other options for on-street parking can be explored for each street type so long as alternative configurations are compatible with the modal priority and goals for the project.
- The default width for parallel parking lanes is 7 feet. Wider (8-foot) lanes may be appropriate where adequate pavement is available. Decisions regarding parking lane width when adjacent to bike lanes should consider the

amount of parking, parking turnover rates, and vehicle types. When parallel parking and bike lanes are provided adjacent to each other, the minimum combined width of the two is 12 feet (minimum 5-foot wide bike lane), with 14 feet or more preferred.

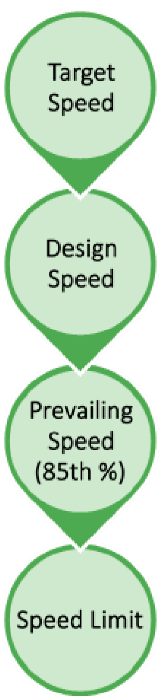
- Shared Streets may include on-street parking in randomly-spaced stalls. Street designs should avoid continuous rows of cars.
- Avenue streets may include on-street parking if sufficient space is available.
- Thoroughfares and Boulevards may include on-street parking in urban contexts (Activity Center, Urban Mix).

[6] Target Speed:

- Target speed is the speed at which people are expected to drive and is determined for each street based on context, the street type, and the street's role within the transportation network. The target speed is intended to become the posted speed limit. Per the Institute of Traffic Engineers (ITE; *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*, 2010), the target speed should be set at "the highest speed at which vehicles should operate on a thoroughfare in a specific context, consistent with the level of multimodal activity generated by adjacent land uses to provide both mobility for motor vehicles and a safe environment for pedestrians and bicyclists." In other words, target speeds—and by extension posted speed limits and design speeds—should balance the needs of all anticipated street users based on context.

FIGURE 4: SPEED AND PEDESTRIAN CRASH SEVERITY

FIGURE 5: FOUR TYPES OF SPEED



The speed that people should drive

Target speed is the ideal speed for a street and is determined for each project based on context and the role of the street in the multimodal transportation network. Target speed guides the selection of design speed.

Tool to determine the design of the roadway

Design speed is used to determine the design of geometric features of the roadway, which ultimately determines the speed at which people drive. **Design speed should generally be selected so that the resulting prevailing speed matches the target speed.**

The speed most people drive at or below

Prevailing speed is defined as the speed at which the majority of people (85 percent) are driving at or below. Prevailing speed is largely determined by the design of the roadway.

The legal maximum speed

The speed limit should match the target speed, but is also dependent on the prevailing speed. Lowering speed limits without also making changes to the roadway or traffic control (i.e., lowering the design speed) is often ineffective at slowing traffic. FHWA's *Methods and Practices for Setting Speed Limits: An Informational Report* describes methods for setting speed limits.

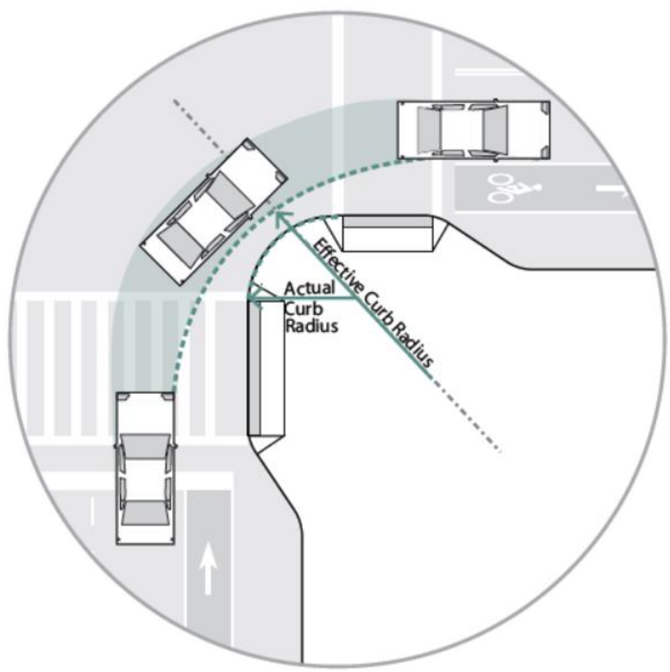
- Design speed is a tool used to determine the various geometric features of the roadway. When designing a roadway, it is preferable for the design speed to equal the target speed. However, in some cases a design speed higher than the target speed is necessary, whether due to existing roadway geometric features (in the case of reconstruction) or design vehicle requirements. For example, a residential street's design speed should typically not exceed its target speed, whereas in an industrial area some leeway should be possible to accommodate turning movements of heavy vehicles. Generally, people will naturally drive at approximately the design speed of the roadway, regardless of the posted speed limit. As is feasible, measures (examples of which are listed below) should be considered to reduce the design speed to match the target speed.

- Existing roadway geometric features, intersection spacing, or other factors may result in a design speed higher than the target speed. When projects occur on such roadways, measures should be considered to reduce the design speed to match the target speed. ITE outlines 10 measures that can be used to lower design speeds and thereby achieve appropriate target speeds:
    - Setting signal timing for moderate progressive speeds from intersection to intersection;
    - Using narrower travel lanes that cause motorists to naturally slow their speeds;
    - Using physical measures such as curb extensions and medians to narrow the traveled way;
    - Using design elements such as on-street parking to create side friction;
    - Minimal or no horizontal offset between the inside travel lane and median curbs;
    - Eliminating superelevation (banking of the roadway);
    - Eliminating shoulders in urban applications, except for bicycle lanes;
    - Smaller curb-return radii at intersections and elimination or reconfiguration of high-speed channelized right turns;
    - Paving materials with texture (e.g., crosswalks, intersection operating areas) detectable by drivers as a notification of the possible presence of pedestrians; and
    - Proper use of speed limit, warning, advisory signs and other appropriate devices to gradually transition speeds when approaching and traveling through a walkable area.

[7] Corner Radii:

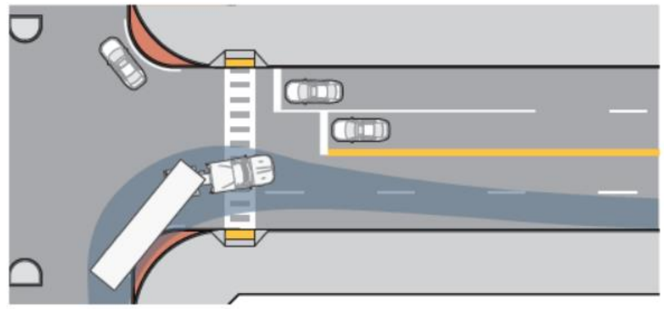
- Small corner radii are an effective way to make design speed match target speed. Large radii are associated with higher design speeds and small radii are associated with lower design speeds.
- The values in this column refer to the actual radii of curb returns. In many cases, the effective corner radii—the curve which motor vehicles follow when turning—will be significantly greater than these values. For example, a street with a 5-foot curb return and on street parking and bike lanes may have an effective corner radius in excess of 25 feet.
- Small curb radii benefit pedestrians by creating sharper turns that require motorists to slow down, increasing the size of waiting areas, allowing for greater flexibility in the placement of curb ramps, and reducing pedestrian crossing distances. Ideally, the curb radius should be as small as possible while accommodating the appropriate design vehicle for the intersection.

FIGURE 6: ACTUAL AND EFFECTIVE CURB RADII



- At locations where a significant number of trucks, buses, and other large vehicles make right-hand turns, consider solutions that allow the corner radii to remain small for traffic calming and pedestrian safety. Effective corner radii can be increased for large vehicles through the provision of truck aprons, which retain the traffic-calming effect of smaller corner radii for passenger vehicles. Planning for lane encroachment can also allow corner radii to remain small. Specific applications include:
    - At signalized intersections, corner design should assume that a large vehicle will use the entire width of the receiving lanes on the intersecting street. Where additional space is needed to accommodate large vehicles, consideration can be given to recessing the stop bar on the receiving street to enable the vehicle to use the entire width of the receiving roadway (encroaching on the opposing travel lane).
    - On low-volume (less than 4,000 vehicles per day), two-lane streets, corner design should assume that a large vehicle will use the entire width of the departing and receiving travel lanes, including the oncoming traffic lane.
    - In some cases, it may be possible to allow a large turning vehicle to encroach on the adjacent travel lane on the departure side (on multi-lane roads) to make the turn.

FIGURE 7: EXAMPLE APPLICATION OF TRUCK APRONS AND RECESSED STOP BAR TO ALLOW LANE ENCROACHMENT



- The values in this column assume that right-turn slip lanes are not present. If a radius over the maximum value for a street in the Thoroughfare, Boulevard, or Industrial Street type is deemed necessary, a right-turn slip lane should be provided and a refuge (or “pork chop” island) should be included. The design of right-turn slip lanes should create a 55 to 60 degree angle between motor vehicle flows and should either be stop-controlled or have a raised crossing.

[8] Typical ADT:

- The values in this column represent the typical average daily traffic volume (ADT) compatible with each type. Traffic volumes higher or lower than the typical value may be appropriate depending on context and ability to adequately control speeds and maintain operational efficiency. A traffic study should be performed for streets nearing the upper limits of these ranges.

Supporting Transit in Complete Streets

CyRide operates on all street types in Ames. Due to the size and operational characteristics of buses, it is often necessary to adjust the geometric design, pavement markings, or traffic control of a street to accommodate transit effectively. However, some of the design treatments to accommodate transit (e.g., wider lanes or larger corner radii at intersections) may have an "anti-traffic calming" effect of encouraging higher passenger vehicle speeds. As such, transit-accommodating design treatments should be applied only where transit operates or may operate in the future, and are not applied wholesale to the street typologies in the Complete Streets Plan.

Case-by-case design flexibility is incorporated into the Complete Streets design process and will apply to bus routes by shifting design parameters to accommodate transit. This may include wider lanes, larger corner radii, lane encroachment areas, alternative bikeway treatments, and more. The design parameters for each street type include ranges of values, which in most cases will provide satisfactory results for transit. In cases where values outside of the parameters are necessary or desirable to accommodate transit, the design engineer should consider and balance the needs of all modes while emphasizing the safety of all users, especially pedestrians and bicyclists.

Bus Stops and Bikeways

Transit stops should be safe and efficient for all users, with minimal negative impacts on transit operations. One area of particular interest is the design of bus stops located along bike lanes and separated bike lanes. The goal in these locations is to reduce conflicts and minimize delays. Bus stops should be provided curbside (against a curb) in most instances, as this is the most functional location for a bus stop. Designs that require passengers to cross bike lanes when boarding or alighting should be avoided. Designs that require buses to pull out of the flow of motorized traffic are also not desirable.

Based on common roadway and bikeway configurations, transit operations, and other considerations, two primary bus stop designs exist (with multiple variations possible):

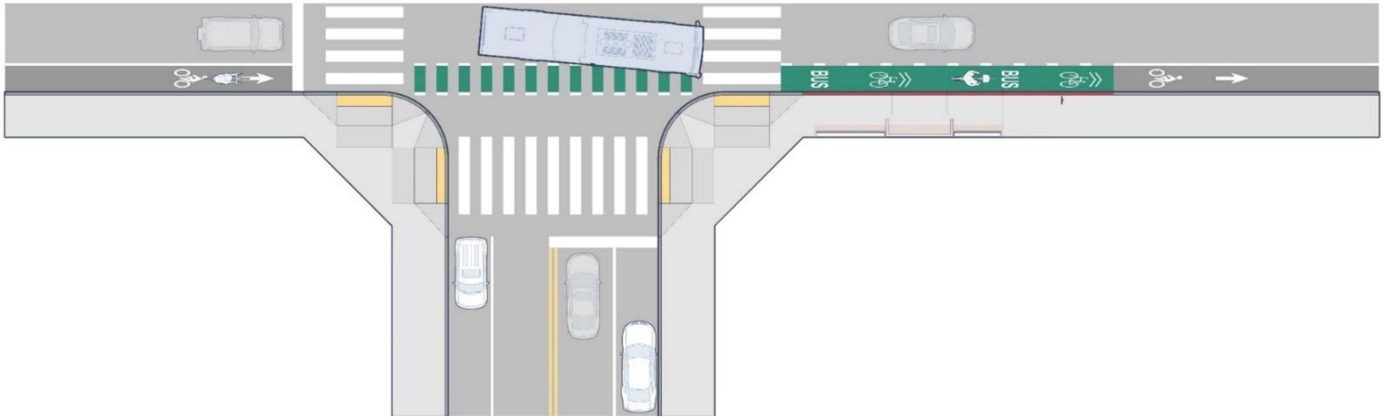
1. Conventional Bus Stop with Interrupted Bike Lane (bus enters/crosses bikeway)
2. Floating Bus Stop (bikeway is directed behind passenger waiting area)

Conventional Bus Stop with Interrupted Bike Lane

Conventional bus stops with interrupted bike lanes are traditional curbside bus stops adjacent to an on-street bikeway. At these stops, buses enter or cross the bike lane in order to pull to the curb. Bike lanes can have solid or dashed lines and green pavement can be used to increase awareness of potential conflicts. When a bus is blocking the bike lane, bicyclists stop and wait until the bus proceeds, or merge into the motor vehicle travel lane.

Conventional bus stops with interrupted bike lanes require less space than floating bus stops, but provide less separation between buses and bicyclists. This type of stop is best utilized at locations with lower boarding/alighting levels and/or on streets with lower speed and lower volume traffic.

FIGURE 8: EXAMPLE CONVENTIONAL BUS STOP WITH INTERRUPTED BIKE LANE

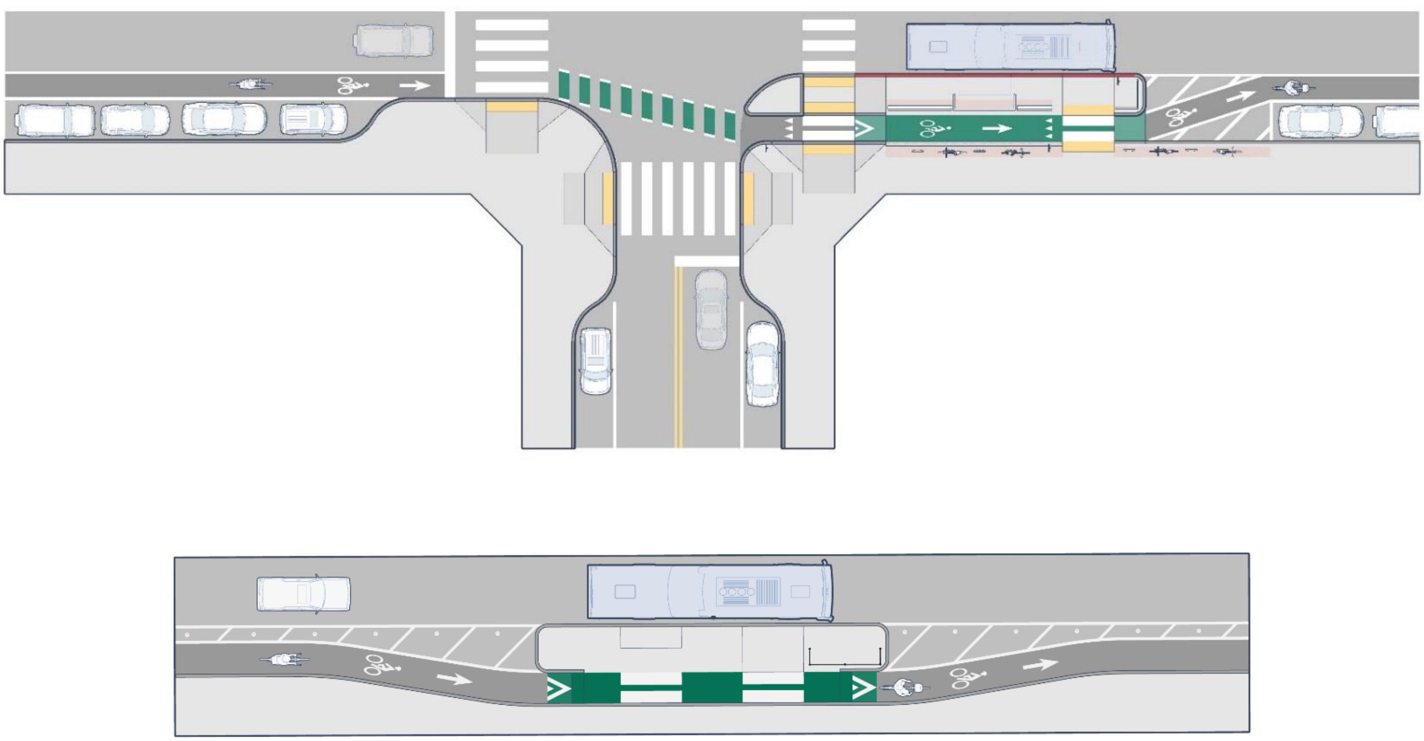


Floating Bus Stops

Floating bus stops are sidewalk-level platforms built between the bikeway and the roadway travel lane. Floating bus stops direct bicyclists behind the bus stop, reducing or eliminating most conflicts between buses and bicyclists, and expanding available sidewalk space. By eliminating bus and bicyclist interaction, floating bus stops have safety benefits for bicyclists. This design can also benefit pedestrians, as the floating bus stop doubles as a pedestrian refuge, which if designed efficiently, can shorten crossing distances and enable shorter signal cycles.

Floating bus stops are recommended for use with separated bike lanes and can also be used with standard and buffered bike lanes.

FIGURE 9: EXAMPLES OF FLOATING BUS STOPS AT INTERSECTIONS AND MIDBLOCK LOCATIONS



Pedestrian Zone Design Criteria

The function and design of the pedestrian realm significantly impacts the character of each street. Extending from curb to building face or property line, this area includes sidewalks, street trees, street furniture, signs, green stormwater infrastructure (GSI), street lights, bicycle racks, and transit stops. They are places of transition and economic exchange as restaurants engage the public space and retailers attract people to their windows and shops.

The pedestrian realm is not a singular space—rather it is composed of distinct usage zones (see Figure 10) performing unique functions in the overall operation of the street. Although boundaries between zones may blur and blend, the overall function of each zone generally remains consistent. These zones are further described in the following pages.

FIGURE 10: PEDESTRIAN ZONES

Frontage Zone   Clear Zone   Amenity Zone

The widths of the various zones are based on the street type, the available right-of-way, scale of the adjoining buildings and the intensity and type of uses expected along a particular street segment. A balanced approach for determining the width of zones should consider the character of the surrounding area and the anticipated pedestrian activities. Preferred pedestrian zone widths may not always be possible and design judgment must be used to achieve a safe, comfortable, and functional balance.

TABLE 6: PEDESTRIAN ZONE DESIGN CRITERIA

	Frontage Zone[9] Door swings, awnings, café seating, retail signage and displays, building projections, planters		**Clear Zone**[10] Clear space for pedestrian travel, should be clear of any and all fixed obstacles.		**Amenity Zone**[11] Street lights, utilities, trees, landscaping, bike racks, parking meters, transit stops, street furniture, signage		**Total Pedestrian Zone Width**[12] Excluding setback	
Street Type	Preferred	Minimum	Preferred	Minimum	Preferred	Minimum	Preferred	Minimum
Shared Street	Shared Streets do not have defined zones. Rather, amenities, greenscape, and clear zones suitable for pedestrian, bicycle, and very low-speed motor vehicle traffic are intermingled.						Varies	Varies
Mixed Use Street	4’	0’	10’	6’	8’	2’	22’	8’
Neighborhood Street	2’	0’	5’	5’	8’	2’	15’	7’
Industrial	2’	0’	5’	5’	4’	2’	11’	7’
Mixed Use Avenue	4’	0’	10’	5’	8’	2’	22’	7’
Avenue	2’	0’	6’	5’	8’	2’	16’	7’
Thoroughfare	2’	0’	6’	5’	8’	2’	14’	7’
Boulevard	2’	0’	6’	5’	8’+	4’	18’+	9’

Pedestrian Zone Design Criteria Footnotes and Clarifications

The following numbered sections provide additional guidance on roadway design criteria. The superscript numbers correlate with the superscript numbers in Table 6.

[9] Frontage Zone:

- The Frontage Zone is the area of the pedestrian realm (usually paved) that immediately abuts buildings along the street. In residential areas, the Frontage Zone may be occupied by front porches, stoops, lawns, or other landscape elements that extend from the front door to the sidewalk edge. The Frontage Zone of commercial properties may include architectural features or projections, outdoor retailing displays, café seating, awnings, signage, and other intrusions into or use of the public right-of-way. Frontage Zones may vary widely in width from just a few feet to several yards.
- The Frontage Zone is measured from edge of right-of-way to the edge of the Clear Zone.
- Where buildings are located against the back of the sidewalk and constrained situations do not provide width for the Frontage Zone, the effective width of the Clear Zone is reduced by 1 foot as pedestrians will shy away from the building edge.
- Wider frontage zones are acceptable where conditions allow. The preferred width of the Frontage Zone to accommodate sidewalk cafes is 6 to 8 feet.

[10] Clear Zone:

- Also known as the “walking zone,” the Clear Zone is the portion of the sidewalk space used for active travel. For it to function, it must be kept clear of any obstacles and be wide enough to comfortably accommodate expected pedestrian volumes including those using mobility assistance devices, pushing strollers, or pulling carts. To maintain the social quality of the street, the width should accommodate pedestrians passing singly, in pairs, or in small groups as anticipated by density and adjacent land use.
- The Clear Zone should have a smooth surface, be well lit, provide a continuous and direct path with minimal to no deviation, be adequately maintained, and meet all applicable accessibility requirements.
- In locations with severely constrained rights-of-way, it is possible to provide a narrower clear zone. The Americans with Disabilities Act (ADA) minimum 4-foot wide clear zone can be applied using engineering judgement and should account for a minimum 1-foot shy distance from any barriers. If a 4-foot wide clear zone is used, 5-foot wide passing zones are required every 200’. Driveways meet the criteria of ADA-compliant passing zones.
- For any sidewalk intended to also convey bicycle traffic (i.e. shared use path), the clear zone should be a minimum of 10 feet wide. For short segments through constrained environments, 8-foot wide shared use paths are acceptable.

[11] Amenity Zone:

- The Amenity Zone lies between the curb and the Clear Zone. This area is occupied by elements such as street lights, street trees, bicycle racks, parking meters, signposts, signal boxes, benches, trash and recycling receptacles, and other amenities. In commercial areas, it is typical for this zone to be hardscape pavement, pavers, or tree grates. In residential, or lower intensity areas, it is commonly a planted strip.
- The Amenity Zone can provide a temporary emergency repository for snow cleared from streets and sidewalks, although snow storage should not impede access to or use of important mobility fixtures such as parking meters, bus stops, and curb ramps.
- The minimum width necessary to support standard street tree installation is 7 feet.

- Green stormwater infrastructure (GSI) is commonly located in the Amenity Zone. GSI features typically require a minimum of 7 feet of width.
- Utilities, street trees, and other sidewalk furnishings should be set back from curb face a minimum of 18 inches.
- Where on-street parking is not present, a wider Amenity Zone should be prioritized over the width of the Frontage Zone.
- The preferred width of the Amenity Zone to accommodate sidewalk cafes is 6 to 8 feet.
- Shared Streets include lighting, landscaping, bike racks, furnishings, and other elements, but not in a defined zone.
- Curb extensions extend the Amenity Zone and curb into the roadway. The use or function of curb extensions typically mirrors or complements that of the Amenity Zone and may include stormwater management features, transit stops or passenger facilities, seating, dining, or additional pedestrian space.

[12] Total Width:

- The minimum total width of the pedestrian zone for any street with transit service is 8 feet (preferably 10 feet) in order to provide space for a minimum 5-foot wide by 8-foot deep landing zone.
- The total width for Shared Streets is from façade to façade and serves pedestrian, bicycle, and motor vehicle traffic.

Crosswalks

- By legal definition, there are crosswalks whether marked or unmarked at any intersection location where a sidewalk leads to and crosses the intersection, unless pedestrian crossing is explicitly prohibited. Marked crosswalks serve many purposes, including:
    - Acting as a warning device and reminder to motorists that pedestrian conflicts can be expected, especially where an unmarked crosswalk would not be clearly discernable due to peculiar geometrics or other physical characteristics.
    - Pointing out to the pedestrian the safest crossing path.
    - Encouraging pedestrian crossings at specific locations.
    - Aiding in enforcing crosswalk laws.
    - Discouraging drivers from blocking the pedestrian crossing at intersections.
- By default, marked crosswalks should be located at every signalized intersection (on all approaches); across cross-streets that intersect Boulevard, Thoroughfare, Avenue, and Mixed Use Avenue streets; and all intersections involving Mixed Use Streets. Consider providing raised crosswalks across Shared Street, Mixed Use Street, and Neighborhood Street cross-streets that intersect Boulevard, Thoroughfare, Avenue, and Mixed Use Avenue streets as traffic-calming devices to slow motor vehicle traffic as it enters neighborhoods and pedestrian-oriented districts.
- Crosswalk markings must comply with the MUTCD standards in Section 3B.18. Marked crosswalks should be at least 10 feet wide or the width of the approaching sidewalk if it is greater. In areas of heavy pedestrian volumes, crosswalks can be up to 25 feet wide. Crosswalks should be aligned with the approaching sidewalk and as close as possible to the parallel street to maximize the visibility of pedestrians while minimizing their exposure to conflicting traffic.
- Standard crosswalk markings, or simple transverse lines at least 6 inches in width, may be used at a minimum at stop-controlled and signalized intersections. High-visibility markings (continental or ladder crosswalks) may be used at any location, but are especially important at midblock crossings, designated school crossings, and near heavy pedestrian generators such as major destinations, transit stops, and parks.
- Decorative crosswalks (brick pavers, colored or textured concrete, or similar materials) are discouraged because they often create accessibility challenges. Decorative materials are more appropriately used in the center of

intersections. Locations where decorative crosswalks have been installed should be assessed for visibility, especially at night. Visibility of decorative crosswalks can be improved by adding transverse markings on either side of the decorative pavement, installing pedestrian signs at both curbs, or installing pedestrian lighting.
- Marked crosswalks are a useful traffic control device but they are not the only solution to improving pedestrian crossings. In some cases, a marked crosswalk might not be adequate on its own to increase the safety of pedestrians. Multi-lane intersections with high traffic volumes, longer crossing times, and higher speeds increase the exposure of pedestrians to potential crashes. At these intersections, crosswalk markings can provide increased awareness of the presence of pedestrians, but they may need to be supplemented with pedestrian refuge islands, curb extensions, increased signal cycle length, overhead illumination, warning signs, etc. to reduce pedestrian exposure.

Midblock Crossings

- At a mid-block location, a marked crosswalk is required to create a legal pedestrian crossing. High-visibility (continental or ladder markings) marked crosswalks are recommended at all midblock crossings, especially those without traffic control. They delineate the crossing location and can help alert roadway users to the potential conflict ahead.
- On roadways with low traffic volumes and speeds where sight distances are adequate, a marked crosswalk should be sufficient to accommodate pedestrians effectively. Additional crossing improvements such as warning signs, Rectangular Rapid Flash Beacons (RRFB), or Pedestrian Hybrid Signals (HAWK signals) are recommended at locations without traffic signals and where any of the following is true:
    - There is a history of pedestrian crashes near the location.
    - The area has high levels of pedestrian activity.
    - The speed limit or 85th percentile speed is greater than 35 miles per hour.
    - The roadway has four or more lanes of travel without a raised crossing island and an ADT of 9,000 vehicles/day or greater.
    - The roadway has four or more lanes of travel with a raised crossing island (either existing or planned) and an ADT of 12,000 vehicles/day or greater.
- See FHWA's *Safety Effects of Marked versus Unmarked Crosswalks at Uncontrolled Locations: Final Report and Recommended Guidelines* for additional information and guidance.

Street Element Priorities

Many street projects are subject to tradeoffs. Whether limited by budget, available right-of-way, or operational challenges, relatively few street projects in developed portions of the city can provide optimal operating spaces for all modes while also supporting urban design and placemaking goals. When tradeoffs are required, they are made based on priorities for each street type. The result is street designs that safely accommodate all users within the constraints of the specific project or location and achieve the multimodal goals of the project.

Feasibility is typically assessed during the conceptual design phase of the project development process, at which time tradeoffs are also made (see Chapter 4). Table 7 provides guidance for designers when weighing tradeoffs. Judgments regarding the inclusion of certain design elements (e.g., bike lanes) or where to allocate additional width where right-of-way allows should be based on the priorities outlined in this table depending on street type.

User safety is paramount and a minimum accommodation or reasonably-convenient alternative route for people biking and walking is required for every street project. Features that are indicated to be medium or lower priorities should not be dismissed from inclusion unless constraints make it infeasible to include all default elements for the street type.

TABLE 7: STREET ELEMENT PRIORITIES

	Pedestrian Realm & Crossings						Roadway				
Street Type	Frontage Zone	Pedestrian Clear Zone	Amenity Zone	Curb Extensions, Parklets,	Crossing / Refuge Islands	Marked Crosswalks*	Traveled Way / Lane Width	On-Street Parking	Dedicated Bikeway	Median / Center Turn Lane	Traffic Calming / Speed Management Features
Shared Street	M	H	M	NC	NC	L	L	L	NC	NC	H
Mixed Use Street	H	H	H	H	L	H	L	H	L	NC	H
Neighborhood Street	L	H	M	H	L	L	L	M	L	NC	H
Industrial Street	L	H	M	M	M	M	H	L	M	L	L
Mixed Use Avenue	H	H	M	H	M	H	L	M	H	M	M
Avenue	L	H	H	M	H	H	L	M	H	M	M
Thoroughfare	L	H	H	L	H	H	H	L	L	M	L
Boulevard	M	H	H	L	H	H	H	L	H	H	L

H Higher Priority | M Medium Priority | L Lower Priority | NC Not Compatible

*Marked Crosswalks are a high priority in school zones, regardless of street type.

Chapter 4: Implementation

The Complete Streets Plan and Policy applies to all public street design, construction, and retrofit projects managed and implemented by the City of Ames initiated after the Policy adoption (i.e., projects not yet in the CIP; see page 52). However, Complete Streets features should be integrated into projects already in the CIP at the time of Policy adoption, where feasible. The Plan and Policy also applies to all developer-led street projects initiated (i.e., the pre-application conference has not yet occurred) after the Policy adoption. It is important to note that the Plan and Policy do not state that the City will plan, design, or construct a street project solely to implement Complete Streets features. Instead, Complete Streets will be implemented through the inclusion of Complete Streets principles and design standards into new construction, major street and right-of-way renovation, and pavement improvement projects.

The Challenge of Making Streets Do More

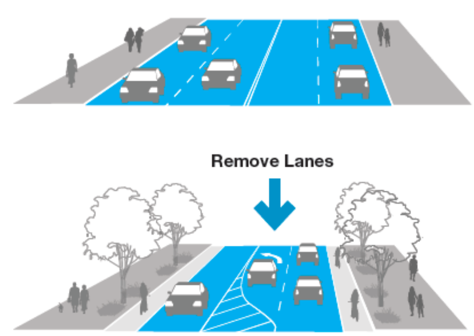
The configuration and width of various street elements—travel lanes, bike lanes, center turn lanes, parking lanes, sidewalks, etc.—has a great impact on the availability of space on Ames' streets. Especially in already developed areas of the city, every foot of roadway and right-of-way width is a precious commodity.

The construction of new streets (as well as the conversion of rural roads to urban cross section streets) in newly-developing areas presents relatively few obstacles. As such, streets can typically be designed to include all the desired street elements for the selected street type (see Chapter 4) and adhere to the principles of Complete Streets. However, the same is not typically true for road reconstruction and resurfacing projects—especially in already-developed portions of Ames. When designing streets in developed areas, reallocation of street space may be necessary to achieve the modal priorities of the selected street type.

Furthermore, design solutions during resurfacing projects are likely to be different than road reconstruction projects (e.g., projects in which curb location and subsurface elements are impacted). Road reconstruction projects are an opportunity to reconsider all aspects of the cross section and to achieve a balance between all users. This may include relocating the curb, widening or adding sidewalks, installing bicycle facilities, providing transit lanes, and incorporating green street elements. Resurfacing and restriping projects, on the other hand, are typically much lower in cost and are implemented more quickly. Since the curb location is typically fixed in these types of projects, opportunities for design solutions are limited to those that accommodate bicycle, pedestrian, and transit facilities without widening the roadway.

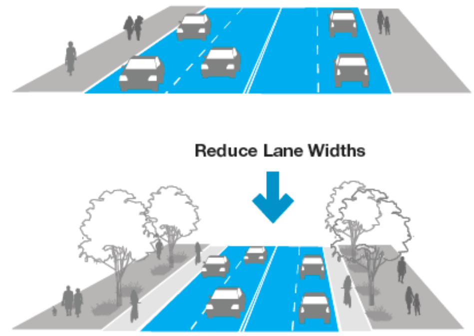
Optimizing Street Space

Whether the project is a simple resurfacing or a more complex reconstruction, two strategies will be central to Ames' ability to reconfigure streets to achieve Complete Streets objectives.



Road diets are sometimes possible on streets in which space can be reallocated by removing one or more parking or travel lanes. Example applications include converting four-lane undivided roadways to three-lane cross sections (one lane in each direction with a center turn lane or center median), removing one or more lanes from multi-lane streets with extra capacity. As a rule of thumb, converting a four-lane street to a two-lane street with a center turn lane is feasible for streets with traffic volumes up to 15,000 to 20,000 ADT. Such conversions typically improve traffic flow and reduce crashes for all modes.

Lane diets are possible on some streets with lanes wider than 10 or 11 feet. Reduced lane widths encourage slower motor vehicle speeds, can reduce crossing distances (improving conditions for pedestrians), and provide space for bike lanes. Wide parking lanes and wide center turn lanes can also be narrowed. On some streets, lanes narrower than 11 feet may not be appropriate. Consideration should be given to transit operations and truck routes when evaluating lane diet opportunities.



Road diets and lane diets both present opportunities to reallocate space to widen sidewalks, create curb extensions, plant street trees or other landscape elements, install street furniture, implement bicycle lanes or separated bike lanes, or provide on-street parking lanes. During resurfacing and restriping projects, removing travel or parking lanes can provide additional space to install bicycle lanes or separated bike lanes, even if the curbs are not modified.

While reconstruction projects often provide a greater opportunity than repaving and restriping projects to reallocate space, both types of projects present opportunities to reconfigure the street. Such strategies are key to achieving the principles of Complete Streets in Ames.

Steps to Implementation

The remainder of this chapter outlines several aspects of implementation of the Complete Streets Plan:

- Roles and responsibilities of City departments and external stakeholders
- Types of street projects subject to the Complete Streets Policy
- The project development process, which explains how and when Complete Streets principles are incorporated in the planning and design process
- Project evaluation and documentation of decisions
- Complete Streets Program performance measures

Roles and Responsibilities

Streets are planned, designed, funded, and constructed through a complex process that includes many stakeholders—both internal to the City and external, such as members of the public and staff from local, county, and state agencies. The City partners with the Iowa DOT, CyRide, Story County, developers, and business districts to develop facilities and accommodations that advance Complete Streets principles in Ames.

Internally, implementing Complete Streets is the work of all City departments, who jointly and collaboratively work to achieve the principles and vision of the Complete Streets Policy for the community's streets. The Public Works Department is primarily responsible for designing, constructing, and maintaining Complete Streets in Ames. However, the Planning Department is an especially important stakeholder in street projects, from early planning stages to scoping and concept development. Staff from both departments comprise project teams that oversee the development of individual street projects.

Some types of projects require a higher degree of interdepartmental and interagency coordination than others. Major capital projects, such as the reconstruction of a street, require the involvement of several City departments, external agencies, and stakeholder groups. This is especially true if the project passes through a redeveloping area where character and context are changing. Maintenance projects (such as resurfacing portions of the roadway), on the other hand, require less coordination since the general design of the street will not change substantially.

Table 8 lists the primary stakeholders and their responsibilities in Complete Streets projects.

TABLE 8: COMPLETE STREETS ROLES AND RESPONSIBILITIES

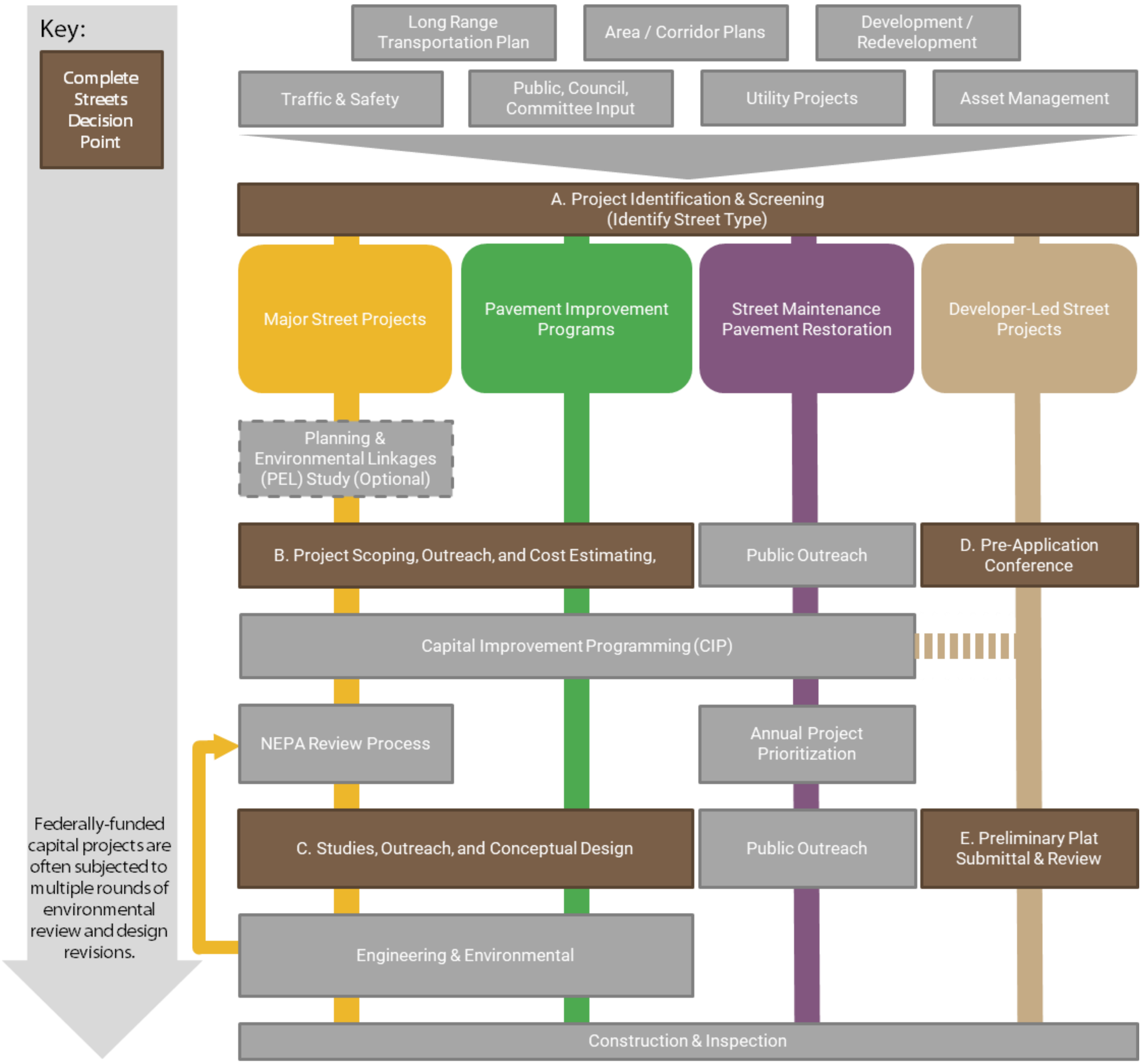
City of Ames	Responsibilities	Complete Streets Program Roles
Public Works Department	Traffic engineering, street construction, maintenance, street lighting, stormwater	Final authority for the construction of elements in the City right-of-way, as well as reporting responsibility for exceptions granted to this policy, resides with the Public Works Department.
Planning Department	Long-range land use and transportation planning, urban design, zoning	Engage in citywide, area, and corridor planning to provide context for street design and work closely with Public Works on individual street design projects.
Parks Department	Right-of-way maintenance, maintenance of park and greenbelt trails, forestry	Coordinate with Public Works and Planning on the design of right-of-way.
City Manager's Office	Oversee the Capital Improvement Program, establish annual budgets	High-level oversight of the Complete Streets Program and ensure implementation of the Plan.
City Council	Adopt, amend or repeal ordinances and budgets	Provide accountability and adequate funding for implementation of the Plan and amend or update the Complete Streets Policy as necessary.
Fire Department	Fire and EMS response and prevention, including responding to traffic crashes	Adjust operations to narrow and traffic-calmed streets, acknowledging that slow streets are safer and produce fewer injuries and property damage.
Police Department	Crime response and prevention, traffic enforcement	Help evaluate Complete Streets projects by providing reports on speeding and observed traffic safety issues.
External Agencies		
Ames Area Metropolitan Planning Organization	Long-rage regional transportation planning and allocating state and federal transportation funding	Consider the City's Complete Streets objectives and the multimodal and placemaking roles of streets when developing regional transportation plans.
Iowa DOT	Plan, design, construct, and maintain the statewide transportation system	Coordinate with the Public Works and Planning departments on state highway projects occurring within City limits, including conformance with the City's Complete Streets Policy.
FHWA	Provide standards and guidance for the design of streets	Provide review of environmental assessment documents for federally-funded projects.
CyRide	Fixed route and paratransit operations	Provide input on the location and design of transit stops, speed mitigation features, and other elements that may benefit or impact transit operations.
Community Groups		
Advocacy Groups	Assist the City in finding balanced solutions that meet the needs of all street users	Participate in stakeholder involvement efforts and provide input on plans and designs.
Business Improvement Districts	Provide maintenance, economic development programs, beautification, and advocacy for specific business areas	Participate in corridor/area planning, provide insight on future development and revitalization efforts, and give input on street design goals and priorities.
Neighborhood Associations	Serve as a forum to create a sense of community and a unified voice for residents	Participate in corridor/area planning and give input on street design goals and priorities.
General Public	Elect the City Council and fund projects via property taxes	Participate in corridor/area planning and give input on street design goals and priorities.

Project Development Process

The City of Ames has a defined process for planning, designing, funding, and constructing streets. Street projects fall into four broad categories and the process varies, both in terms of complexity and length, depending on the category. Major street projects, pavement improvement program projects, and developer-led street projects are the primary ways in which the Complete Streets Plan is implemented.

Figure 11 illustrates the process and how it differs for the four categories of street projects. It also highlights the key Complete Streets decision-making points, which are described in further detail on the following pages. For major construction and reconstruction projects, this process typically takes multiple years.

FIGURE 11: CITY OF AMES PROJECT DEVELOPMENT PROCESS



Complete Streets Decision Points

There are several decision points or phases in the project development process during which Complete Streets decisions are made and documented. The five key points are:

A. Project identification and screening
B. Project scoping, outreach, and cost estimating
C. Studies, outreach, and conceptual design
D. Pre-application conference (developer-led projects only)
E. Preliminary plat submittal and review (developer-led projects only)

These five points and relevant Complete Streets actions are described in detail on the following pages.

A. Project Identification & Screening Phase

How are projects identified?

The need for a street project arises through a variety of channels. Projects are typically identified through one or more of the following:

- **Long Range Transportation Plan** – This plan identifies changes in traffic volumes and travel patterns anticipated to occur due to land use and density changes, or due to changes in peoples' travel preferences. This may mean changing the capacity of a street or reconfiguring the street to better serve people biking, walking, or using transit. This plan greatly influences the design of streets, often years before any engineering occurs.
- **Comprehensive Plan –** This plan identifies changes to land use and density in the future, which in turn may trigger needs for increased roadway capacity or shifting priority between modes.
- **Area / Corridor Plans –** Redevelopment plans for corridors or areas may identify the need to expand or reconfigure a street to support the transportation needs of the desired future development patterns.
- **Development / Redevelopment –** Large-scale development typically necessitates building new streets (typically the responsibility of the developer). Smaller-scale development may not require building new streets, but may necessitate making changes to the right-of-way of existing streets, such as adding sidewalks or shared-use paths.
- **Traffic & Safety –** Intersections or street corridors with high crash rates, excessive traffic congestion, conflicts between modes, or other inefficiencies often trigger intersection projects, speed mitigation projects, and street reconfiguration.
- **Asset Management** – Streets or bridges with poor pavement are often prioritized for reconstruction or repair.
- **Utility Projects** – Water, sewer, and stormwater projects often require excavating a portion of streets. Sometimes utility projects can affect multiple blocks of a street and are therefore opportunities to combine the project with other street modification projects.
- **Public Input** – Public input regarding the function of a street, safety concerns, etc. can prompt street projects.
- **City Council/Committee Input** – Boards, committees, or commissions may identify the need for a project—or increase the priority of a project—based on strategic objectives, group priorities, constituent input, etc.

Complete Streets Action

Identify Street Type Prior to CIP Program Assignment – For every project, the street type should be identified during the project identification phase prior to assigning the project to a CIP program. For resurfacing projects, if the current configuration of the street differs significantly from the ideal configuration based on the selected street type per the guidance in the Complete Streets Plan, the project should be assigned to one of the Pavement Improvements Programs.

How are projects classified and assigned to CIP programs?

Once the need for a project is identified, it is classified and assigned to a specific Capital Improvements Plan (CIP) program. The level of complexity and scale of the project determines which program it is assigned to. The process from screening to construction differs between these categories:

- **Major Projects** (e.g., Grand Avenue Extension and W Lincoln Way Intersection Improvements) – Large-scale projects, typically originating from the MPO's Long Range Transportation Plan, that are incorporated into the CIP as standalone programs. They typically include major street expansion or widening and expanding or modifying intersection geometry.
- **Pavement Improvements Programs** – Annual programs for repairing or reconstructing streets to restore pavement and reduce maintenance costs. Projects are typically chosen based on pavement condition. The programs are categorized based on street type:
    - Arterial Streets
    - Collector Streets
    - Asphalt Streets (typically residential streets)
    - Concrete Streets (typically residential streets)
    - Downtown Streets
    - CyRide Routes
    - Seal Coat Streets (typically residential streets)
    - Multi-Modal Roadway Improvements (projects to create safer interaction between bicycle and automobile modes; typically include adding bike lanes, improving signal detection for bicycles, and intersection crossing visibility enhancements; these projects are typically identified based on traffic and safety considerations, rather than pavement condition)
- **Street Maintenance Pavement Restoration** – Annual program that includes a large variety of maintenance activities, including seal coats, patching, and full-depth paving. Projects are identified annually.

Developer-Led Street Projects may be partially funded with City funds through the CIP if the project includes elements that the Subdivision Ordinance does not require of developers.

Complete Streets Action

Begin Design Decision Documentation – When a project is identified, the project team should begin populating the project checklist including project extents and street type according to the Complete Streets Plan. If the project is assigned to the Street Maintenance Pavement Restoration program, the designer should document why implementing Complete Streets principles and features in the project is unnecessary or unfeasible. If it is determined that the street should have a street type other than that which is identified based on the guidance provided in the Complete Streets Plan, the change should be documented and explained.

B. Project Scoping, Outreach, and Cost Estimating Phase

(Applies to Major Street Projects and Pavement Improvement Programs and occurs before a project is added to the CIP)

Design Coordination

- Identify agency stakeholders
- Review Long Range Transportation Plan
- Review existing plans/vision for the corridor
- Identify land use, zoning, and redevelopment opportunities
- Review existing multimodal traffic counts
- Identify multimodal (walking, biking, transit, freight) needs
- Identify potential coordination with water, sanitary sewer, and stormwater projects

Public Involvement

- Meet with stakeholders to announce the project and identify issues

Complete Streets Actions

Confirm Selected Street Type with Stakeholders – Based on stakeholder input, confirm that the selected street type is appropriate. If a different street type is determined to be necessary, this decision should be documented and explained. Alternative street types should be compatible with the context and should be considered carefully. If an alternative street type is being considered, additional public outreach should occur.

Seek Stakeholder Input on Tradeoffs and Priorities – Consult the priority matrix to identify priorities for the selected street type. If it appears that tradeoffs may be necessary, identify this issue with the public and seek input on priorities, if warranted.

Scope, Cost Estimate & Funding Strategy

- Complete purpose and need statement
- Select design criteria
- Identify typical cross section
- Identify potential right-of-way needs
- Estimate engineering, construction, and right-of-way costs
- Identify funding source and CIP program

Complete Streets Action

Update Design Decision Documentation – Continue populating the project checklist to include existing conditions, design coordination activities, record of public input, purpose and need, typical cross section, etc. In addition, document any priorities identified, deviations from the original street type, and deviations from design parameters (e.g., if narrower than specified sidewalks are shown on the typical cross section). Any exceptions to the Complete Streets Policy will be recorded and justified.

Pre-CIP Conceptual Design (Major Street Projects Only)

For major projects, the City may perform some level of conceptual design prior to adding the project to the CIP, in order to increase the accuracy of the cost estimate.

C. Studies, Outreach, and Conceptual Design Phase

(Applies to Major Street Projects and Pavement Improvement Programs. This phase typically lasts one to three years before construction.)

Study

(Not all studies and reviews are needed for each project.)

- Review any new or updated plans/vision for the corridor
- Confirm land use, zoning, and redevelopment opportunities
- Perform traffic studies and update multimodal traffic counts (optional)
- Identify multimodal (walking, biking, transit, freight) needs
- Identify safety issues and accessibility deficiencies

Design Coordination

- Confirm agency stakeholders and expand as needed
- Identify and coordinate with non-agency stakeholders
- Identify existing and planned transit routes and stops
- Identify existing and planned bicycle and pedestrian infrastructure
- Identify potential coordination with water, sanitary sewer, and stormwater projects
- Utility coordination
- Perform drainage study
- Identify environmental and permit needs
- Conduct resource reviews and identify mitigation

Preliminary Concept

- Map existing right-of-way and develop preliminary alignment (and alternative alignments if necessary)
- Update preliminary cross section (and alternative cross sections if necessary)
- Quantify potential additional right-of-way needs
- Coordinate with potentially-affected stakeholders

Complete Streets Actions

Confirm Selected Street Type – Based on any potential changes to land use, development patterns, or goals for the corridor in the years since the project was added to the CIP, confirm that the selected street type is appropriate prior to developing the preliminary cross section and design criteria. If a different street type is determined to be necessary, this decision should be documented and explained. Alternative street types should be compatible with the context and should be considered carefully. If an alternative street type is being considered, input from the public should be sought on this decision.

Identify Potential Issues that Require Making Tradeoffs – Consult the priority matrix to identify priorities for the [selected street type] / [relevant place type]. If it appears that tradeoffs may be necessary, identify this issue with the public and seek input on priorities, if warranted.

Public Involvement

- Present the preliminary concept or alternatives for feedback (in-person or online)
- Seek input on issues (in-person or online)

Complete Streets Action

Seek Stakeholder Input on Tradeoffs and Priorities –If it appears that tradeoffs may be necessary, identify this issue with the public and seek input on priorities, if warranted.

Finalized Concept

- Revise typical cross section
- Present revised cross section for public and stakeholder feedback (in-person or online)
- Finalize design criteria

Complete Streets Action

Update Design Decision Documentation – Continue populating the project checklist to include existing conditions, design coordination activities, record of public input, typical cross section, etc. In addition, document any priorities identified, deviations from the original street type, and deviations from design parameters (e.g., if narrower than specified sidewalks are shown on the typical cross section). Any exceptions to the Complete Streets Policy will be recorded and justified.

D. Pre-Application Conference (Sketch Plan)

(Applies to Developer-Led Street Projects)

Developers are required to schedule a Pre-Application Conference prior to filing a preliminary plat. They are required to bring a Sketch Plan to the conference that contains locations and dimensions of lots and location, width, and dimensions of streets. In the lifespan of a street project, the Pre-Application Conference roughly parallels the initial project scoping phase that applies to City-led projects.

Complete Streets Action

Identify Street Type in Sketch Plan or During Pre-Application Conference – For every street on the Sketch Plan, the street type should be identified prior to preliminary plat development. If the developer wishes to propose a street type other than that which is identified in the Complete Streets Plan, they should describe how it is a reasonable and justifiable change. If a variance is granted, this decision should be documented and explained by the City.

E. Preliminary Plat Submittal & Review

(Applies to Developer-Led Street Projects)

Developers are required to submit a completed Application for Preliminary Plat to be reviewed by City staff, commissions, and City Council. The Preliminary Plat includes updated locations, widths, and dimensions of streets, sidewalks, and shared use paths to be built by the developer. In the lifespan of a street project, the Preliminary Plat roughly parallels the conceptual design phase that applies to City-led projects.

Complete Streets Action

Confirm that Street Designs Comply with Street Type Parameters – For every street, City staff should confirm that the design complies with the parameters of the selected street type before recommending for approval. If the developer wishes to deviate from the specified parameters, they should coordinate this intent with City staff prior to Preliminary Plat submittal and describe how such deviations are reasonable and justifiable changes. If a variance is granted, this decision should be documented and explained by the City.

Project Evaluation

Design decisions are documented throughout the project development process in order to ensure compliance with the Complete Streets Policy and to record and justify any deviations from the guidance provided in this Plan. After construction, street projects are evaluated in order to assess how successfully the project met the objectives of the Complete Streets Policy and Plan.

Checklist

Design decisions are documented at several stages during the project development process using the design decision documentation checklist. The checklist provides a consistent format for recording decisions and is also a tool that helps designers and the project team ensure that the design criteria are appropriate for the context, street type, and project goals.

The checklist helps the project team and the public easily determine whether the project:

- Is based on an appropriate street type for the context and functional classification;
- Is reasonably compatible with planning, urban design, and redevelopment initiatives in the surrounding area;
- Was developed with adequate stakeholder and public engagement, the amount of which varies based on the context and complexity of the project;
- Is based on an appropriate target speed for the context;
- Has adequate pedestrian zone width;
- Includes an appropriate bikeway type for the conditions;
- Adequately accommodates transit and freight vehicles, where needed; and
- Includes appropriate space for landscaping, placemaking, and Green Stormwater Infrastructure.

Exceptions and Mitigation

The checklist also provides space to document any exceptions to the Complete Streets Policy that result in the street design not adequately accommodating all modes and any mitigation efforts. If all the specified street elements and modal facilities cannot be incorporated into the street design, the designer and project team should seek solutions that at least partially achieve the goals of the project. One example of this approach is adding a sidewalk to only one side of the street where right-of-way is constrained. Another example is adding a bike lane only in the uphill direction (a climbing lane) and shared lane markings in the downhill direction when pavement width is limited.

Complete Streets Action

Revise the Project Development Checklist – City staff should revise the project development checklist to include sections where place type, transportation, and street type can be recorded; spaces to record selected values for each of the design criteria included in Tables 2, 3, and 4 in Chapter 4; and provide space for explaining and justifying any exceptions to the Complete Streets Policy and the design criteria parameters and describing the approach to mitigation.

Documentation Points for City-Led Projects

Design decisions should be explained and documented throughout the project development process. This is especially important for purposes of communication and transparency with the public. Specific documentation points include:

1. Project Identification & Screening – Basic context and project information is recorded for all projects, regardless of whether they are major projects or maintenance projects. This includes recording traffic volume, typical street section, speeds, existing bicycle and pedestrian infrastructure, functional classification, and appropriate street type. If the Comprehensive Plan, or a corridor or area plan identifies any planned redevelopment in the area, the designer will identify the probable future place type and potential street types. Any exceptions to the Complete Streets Policy will be recorded and justified.
2. Project Scoping – Update the information input during the project identification and screening phase based on results from new studies/analysis and stakeholder/public input. The project team will record any changes to street type selection, project goals, and design criteria resulting from additional study of the corridor while generally documenting the decisions made during the scoping phase. Any exceptions to the Complete Streets Policy will be recorded and justified.
3. Conceptual Design – Update the information input during the project scoping phase. The project team will record decisions made such as typical section, bikeway type, pedestrian zone widths, etc. Any exceptions to the Complete Streets Policy will be recorded and justified. Any mitigation efforts/measures will be identified and documented.

If significant changes are made to the street design at later phases of the project development process (for example, during detailed engineering design), the information in the design decision documentation checklist will be updated.

After each of the stages above, the design decision documentation should be publicized on the City's website.

Project Evaluation Metrics

Evaluating the outcomes of street projects allows the City to determine the effectiveness of the street design. This, in turn, helps to improve the City's street design process to better meet the goals of the Complete Streets Plan and the goals of individual street projects. Project evaluations are important for communicating with decision makers and community members and can also be helpful in prioritizing transportation projects or guiding resource allocation in the future.

There are many ways to evaluate a street project, some of which are more complex and data-intensive. Options for project-level metrics for evaluating the outcomes of projects are listed below, organized by subject.

- Safety and Comfort
  - Crash reduction along the corridor (total crash reduction, reduction in crash severity, and reduction by mode)
  - Observed motor vehicle speed (85^{th} percentile) compared to the project's target speed
  - Resulting perception of safety for people bicycling (measured using the Level of Traffic Stress model with a goal of LTS 1 or 2 for each project)
- Use and Mode Shift
  - Transit use (measured as boardings within the project area)
  - Number of biking and walking trips
  - Number of motor vehicle trips
  - Change in motor vehicle travel time

- Activity
  - Return on investment (retail sales, property values, and/or total amount of private investment in the corridor)
  - Occupancy rates (commercial by square footage, residential by unit)
  - Changes in activity and use of public space (communicated with descriptive text, user feedback, and before and after photos)

When possible, individual projects metrics should be measured prior to project construction and one, three, and five years following project completion to allow for a baseline comparison and long-term evaluation.

Complete Streets Program Performance Measures

Performance measures can be tracked and reported to determine the effectiveness of the Complete Streets Plan and its implementation. A variety of measures can be tracked, but the ones that are chosen should be relatively easy and inexpensive to collect and should relate to the vision and objectives of the plan. Prior to committing to specific metrics, the City should determine what data is readily available or can easily be collected. In addition to data the City already collects, the City will likely need to use data collected by other agencies, such as the Iowa DOT, U.S. Census, local school districts, or Story County Public Health Department.

Table 9 lists **recommended** performance measures for consideration by the City of Ames. It may not be feasible or necessary for the City to track each of these measures. Selecting measures for tracking necessitates identifying data availability for each measure. Over time, the City should provide targets for these outcome measures.

TABLE 9: RECOMMENDED COMPLETE STREETS PROGRAM PERFORMANCE MEASURES

Questions Being Addressed	Measures
Are people walking, biking, taking transit, and carpooling more than they used to? Are people driving less?	Mode shift
	Mode shift for trips under 1 miles, and between 1 and 3 miles
	Vehicle miles traveled (VMT) per capita
Are students walking and biking to school more than they used to?	Number of K-12 students who walk or bike to school
Are Complete Streets increasing safety?	Citywide crash reduction (total crash reduction, reduction by mode, and reduction by crash severity)
	85th percentile speed compared to target speed (aggregate of all streets/projects; measures whether people are speeding)
Have Complete Streets designs created delays for driving or transit?	Travel time along key corridors
Are Complete Streets benefiting everyone?	Crash reduction, mode shift, and person miles traveled for Environmental Justice* (EJ) populations versus non-EJ populations.
	Household and employment proximity to bicycle and pedestrian facilities
	EJ population proximity to bicycle and pedestrian facilities
Are Complete Streets effectively increasing opportunities for biking and walking?	Miles of on-street bicycle facilities, sidepaths, and sidewalks
	Bicycle Network Analysis (BNA) score
Are Complete Streets supporting economic activity?	Commercial vacancies along Complete Streets
Is investment in Complete Streets supporting the City's asset management objectives?	Pavement Condition Index (PCI)

Appendix A: Plans & Policies

The Complete Streets Plan builds upon years of prior studies and policies that have shaped and will continue to guide decision-making, priorities, land use patterns, and transportation investments in Ames. These studies and policies shaped the development of the Complete Streets Plan in numerous ways. The most relevant components of each—and ways in which they may influence the development of the Complete Streets Plan—are identified in the following pages.

Land Use and Development Plans

Land Use Policy Plan (1997, revised 2011)

The Land Use Policy Plan (LUPP) is Ames' Comprehensive Plan, which guides land use decision-making and heavily shapes the City's zoning ordinance. The plan analyzes factors that will influence new development and land use changes in Ames, such as population growth, changes in housing preference, and increased employment levels. The plan establishes a vision and ten defined goals for the future of the community.

The LUPP emphasizes the importance of growing in a smart, sustainable way by re-envisioning future development patterns, preserving neighborhoods, and identifying opportunities for increased development intensity in certain parts of the city. Namely, the LUPP includes policy options for the redevelopment of areas within the urban core, such as downtown, a small area south of Lincoln Way near downtown, and the medical center.

The LUPP envisions walkable, interconnected development patterns that mix densities and uses in ways that encourage people to engage with their community and travel on foot and by bike. The LUPP explicitly states an objective that is very much in keeping with the context-sensitive spirit of Complete Streets: "Ames seeks a transportation system that is linked with the desired development pattern of the overall community and areas therein."

However, in the LUPP's short section on mobility, the focus is primarily on large-scale connectivity needs (such as connecting streets to serve planned growth in the northwest growth priority area) and identifying solutions for meeting perceived increases in motor vehicle demand along corridors such as Grand Avenue, Duff Avenue, and Lincoln Way. No specifics are given for designing streets to support the new development patterns outlines by the LUPP.

The LUPP describes Ames' Capital Investment Strategy, which is intended to stimulate development in priority areas and disincentivize development in other areas. Outside of Incentivized Growth Areas, developers are responsible for all costs associated with development of the area, including street construction. As such, the Complete Streets Plan will affect how developers design and build streets.

"This plan for Ames is about connections—connections involving land use, environment, recreation, mobility and infrastructure. This plan is also about connections involving people with their neighborhood and community in creating a sense of place."

– from the foreword to the Land Use Policy Plan

Lincoln Corridor Plan (2017)

Lincoln Way is a primary east-west corridor in Ames. The Lincoln Corridor Plan (LCP) describes this corridor as the backbone of Ames that "ties together the historic Downtown, Iowa State University, several neighborhoods, and areas where people work and shop." While primarily a plan for land use and redevelopment, the LCP explains that this street functions both as a major thoroughfare for through traffic, as well as an important means of accessing the numerous destinations it connects. It identifies the numerous demands placed on Lincoln Way from motorists, transit users, and people walking and biking, as well as business and neighborhoods interested in enhanced placemaking.

A key part of the LCP's vision is that Lincoln Way should become a community-wide multi-modal corridor. It contains recommendations for new bicycle and pedestrian infrastructure to link together the many distinct zones (or districts) that comprise the Lincoln Way corridor. Notably, the LCP includes conceptual cross sections for many portions of Lincoln Way, each of which includes enhanced accommodations for people walking and biking—mostly in the form of wider sidewalks and shared-use sidepaths.

South Lincoln Way Mixed Use Plan

Also known as the South Lincoln Way Sub-Area Plan, the need for this plan was identified in the LUPP to plan for future redevelopment in the area south of Lincoln Way, between South Grand Avenue and South Duff Avenue. The plan includes recommendations for new multimodal street connections, streetscape treatments, site identity elements, and new sidewalks and bikeways on several existing streets, most notably South 5th Street and South Walnut Avenue.

An objective of the plan is to encourage pedestrian and bicycle use, which is seen as highly compatible with the future development patterns, and to discourage adjacent high-speed traffic where appropriate. In other words, the entire design of this area—from streets to buildings and public spaces—should encourage people to walk and bike, rather than drive.

Transportation Plans

Ames Mobility 2040 (2015)

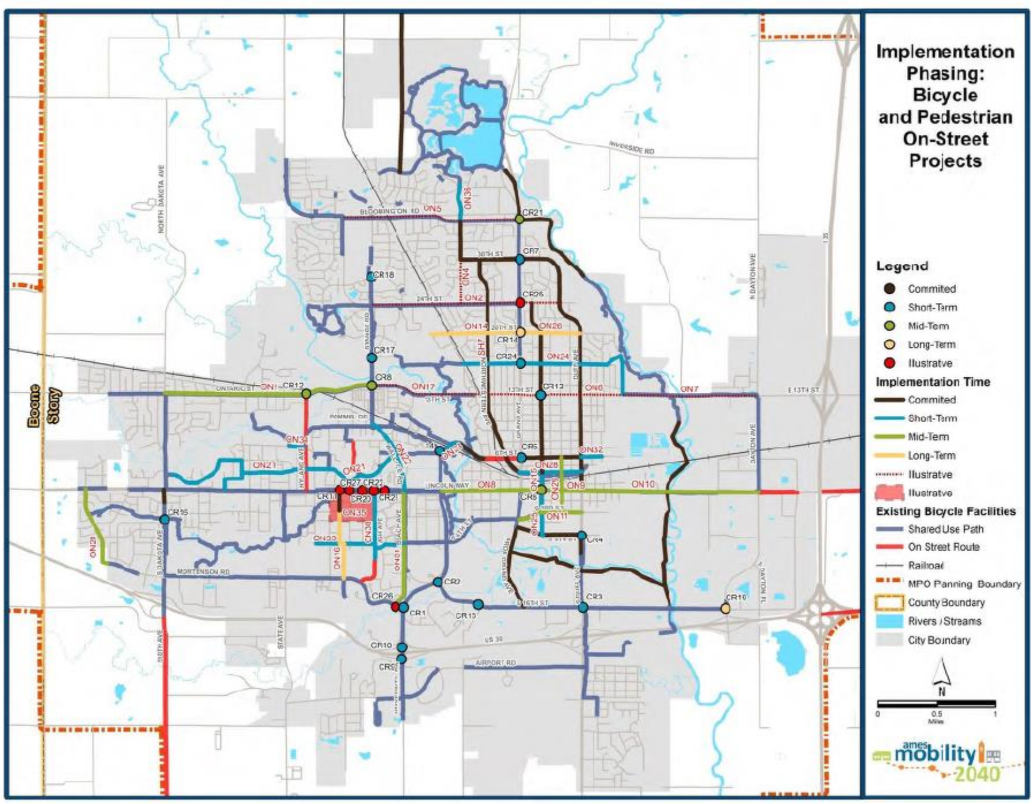
Ames Mobility 2040 is the long-range, multi-modal transportation plan for the Ames Area Metropolitan Planning Organization (AAMPO)—a multijurisdictional agency mandated by the federal government for urban areas with populations greater than 50,000. Although the City of Gilbert is included in AAMPO's planning area, the City of Ames constitutes most of the planning area in terms of population, land area, and density of the transportation network. As such, the Ames Mobility 2040 plan also serves as the City's *de facto* transportation plan.

Mobility 2040 establishes a vision and goals for multimodal roadways that serve people walking, biking, driving, and using transit and prioritizes projects for receiving federal transportation funding. The plan was developed through an extensive online and in-person public involvement process. The majority of public comments received during the public outreach efforts focused on enhancements for people walking and biking.

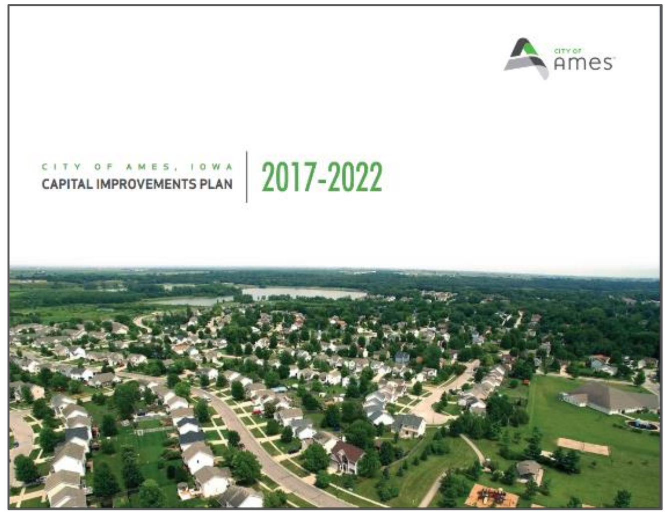
Complete Streets is identified as an important implementation method for the Mobility 2040 plan. The plan includes a Complete Streets policy for AAMPO, which was adopted along with the Mobility 2040 plan. The policy commits AAMPO to only funding projects that adhere to Complete Streets principles and values.

Included in the plan is a network of existing and future bikeways both on- and off-street (Figure 61. Planned On-Street Bicycle Route Projects and Figure 62. Planned Off-Street Bicycle and Pedestrian Projects). The plan classifies future projects as committed, short-term, mid-term, long-term, and illustrative (no identified time horizon). The routes identified by these maps influenced the Complete Streets Plan's network classifications and typologies, such as by influencing the priority given to accommodating bicycling in various contexts.

Figure 61. Planned On-Street Bicycle Route Projects



Capital Improvements Plan (Updated Annually)



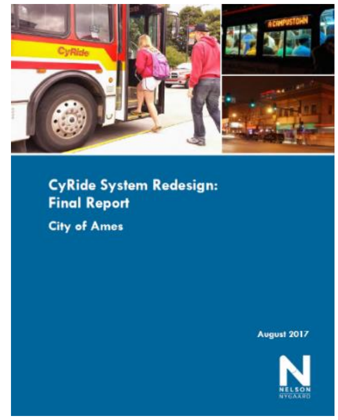
The Capital Improvements Plan (CIP) is an annually-updated five-year plan that identifies funding sources and amounts to be spent on infrastructure, facilities, and equipment throughout the city. In addition to utilities, public safety equipment, and parks and recreation facilities, the plan includes a section on transportation.

The five-year transportation budget in the 2017-2022 CIP totals over $85.9 million worth of projects, categorized as follows:

- **Street Engineering** ($61.6 million) – the largest portion of CIP transportation funding goes to this category, which includes major street projects such as the Grand Avenue Extension and South Duff Avenue Improvements. This category also includes several annual Pavement Improvement programs to repair, reconstruct, or otherwise improve surfaces of various streets in Ames throughout the year.
- **Shared Use Paths** ($7.4 million) – a dedicated line item for expanding and maintaining the shared use path system, as well as implementing on-street bikeways and improving intersections for bicycling.
- **Traffic** ($6.1 million) – includes traffic calming projects, implementation of features to improve accessibility (as defined by the ADA), replace outdated traffic signals, and upgrade signals to optimize traffic and pedestrian flow.
- **Transit** ($8.9 million) – much of this funding is for replacing CyRide buses and upgrading the bus storage facility. This line item also includes funding for installing new bus shelters and updating bus tracking and management technology.
- **Airport** ($0.7 million) – demolishing the old airport terminal building and studying a future runway expansion.

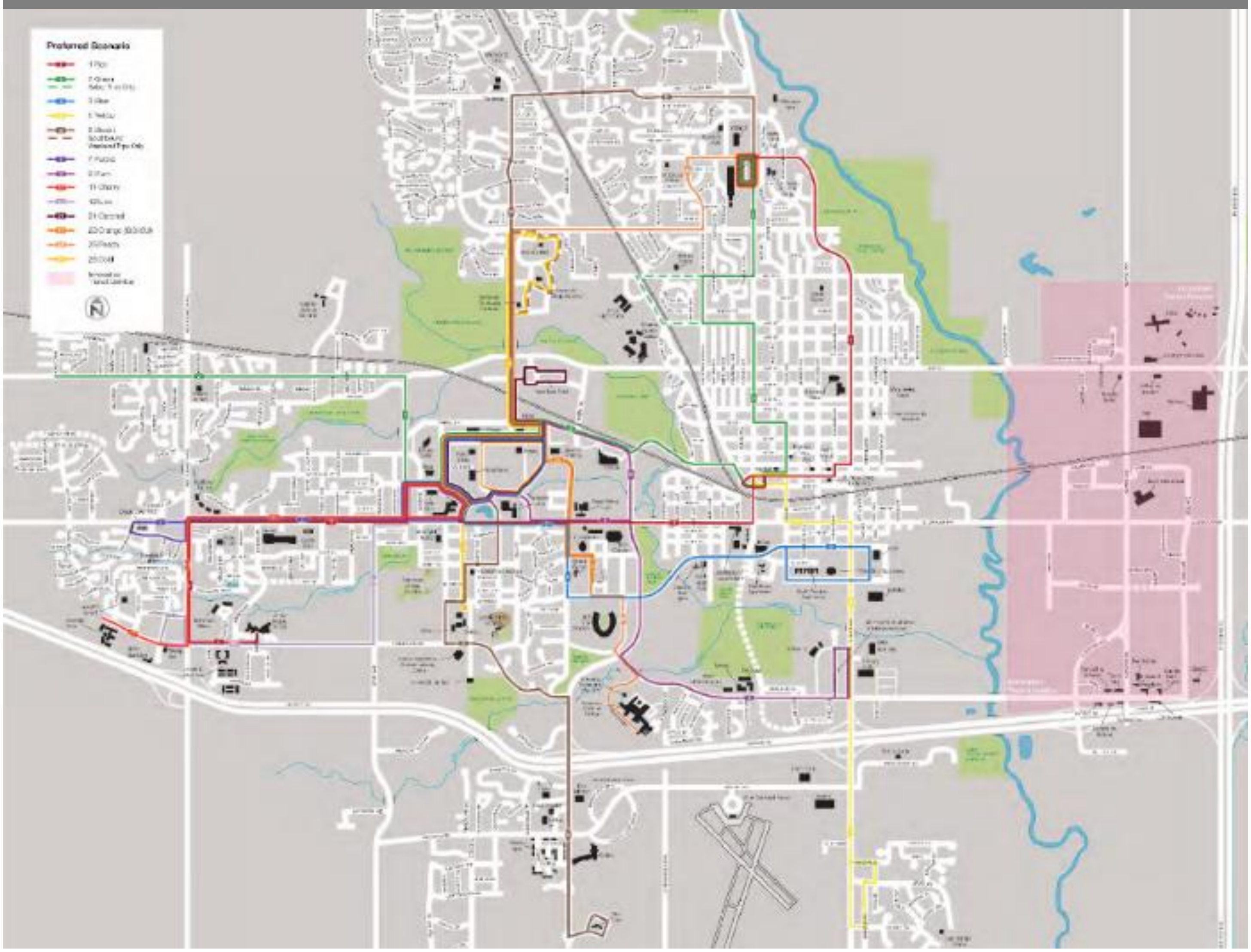
All street projects—regardless of scale or budget—funnel through the Capital Improvements Plan, whether as a dedicated project (in the case of the Grand Avenue Extension) or as part of one of the street Pavement Improvement programs. Typically, the projects already in the CIP are prioritized over new projects that are added.

CyRide System Redesign (2017)



CyRide completed a system redesign study in August 2017. The system redesign examined key issues relevant to the Complete Streets plan, including balancing coverage and productivity to better serve users in areas other than campus and downtown and managing demand for transit service. Recommendations include modifications to selected routes and the elimination/consolidation of two routes in order to increase the efficiency and capacity of the remaining routes while extending operating hours. One of the most significant changes is the elimination of routes in eastern Ames and the creation of an Innovative Transit Service zone (on-demand transit) in that area. While the report does not make specific recommendations for street design, it does highlight the importance of providing direct routes.

CyRide System Redesign Recommendations

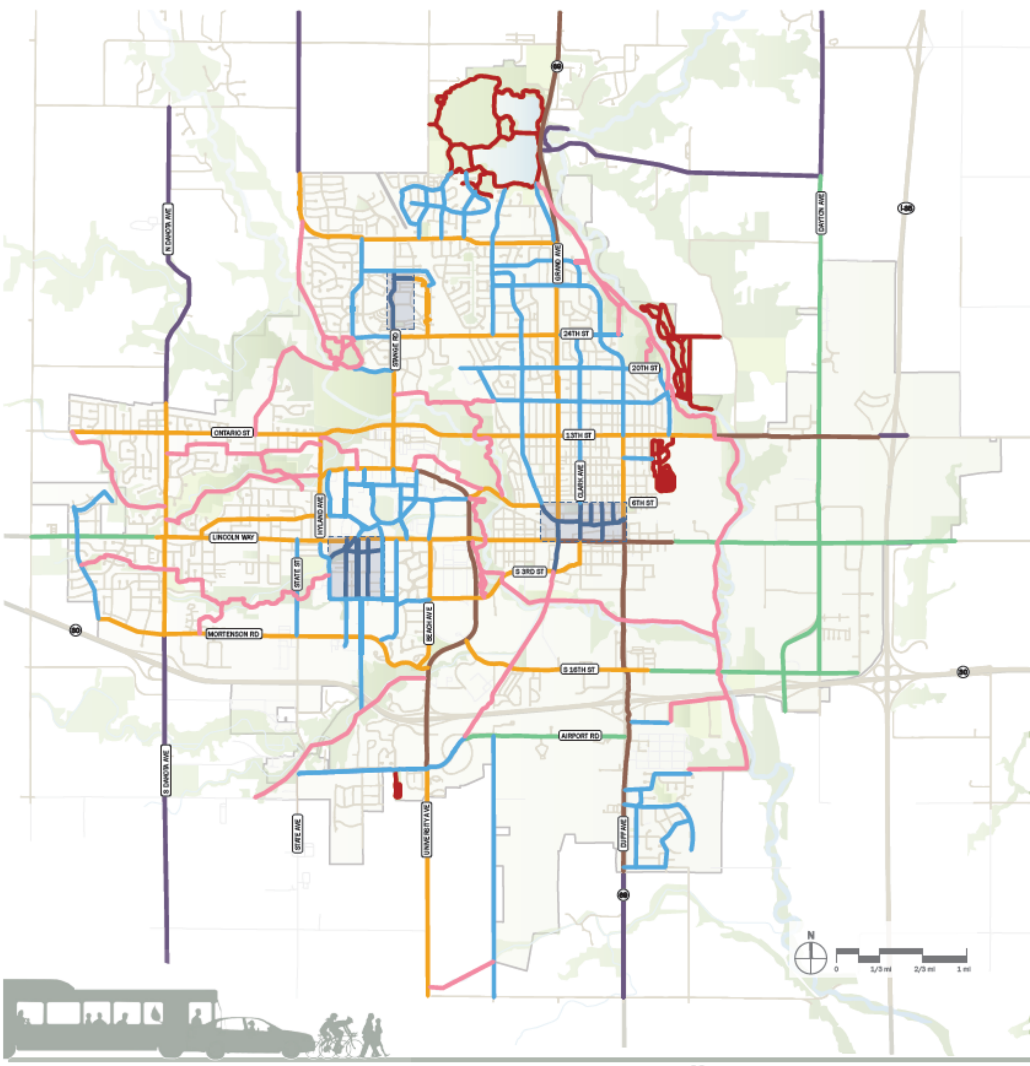


Engaging Ames in Complete Streets (2016)

The Iowa State University Community Design Lab, in conjunction with Healthiest Ames, undertook an initiative to develop a Complete Streets policy and make recommendations for implementing Complete Streets in Ames. This effort involved members of Healthiest Ames, the City of Ames, Ames Bicycle Coalition, and the Iowa State University Community Design Lab. The project team also engaged with the broader community through four Open Streets events.

The report includes an analysis of existing conditions, including identification of which modes are served by which streets. A significant portion of the report is dedicated to analyzing connections and the quality of Ames' trail and sidepath network. Factors analyzed included lighting, connectivity to surrounding areas, quality of surrounding landscape, safety features, surface condition, and signage.

From a Complete Streets perspective, the central recommendations of the report are contained within six route classifications for streets (supplemented by two greenway trail classifications). Each street classification includes a typical cross section and recommendations for street zone width parameters. The classifications were applied to specific streets in Ames. While some classifications—notably Neighborhood Main Street—are noticeably context-based, the classifications for the most part align with conventional functional classifications (the Community Connector, Gateway/Thoroughfare, Vehicle-Oriented & Industrial, and Rural classifications follow arterial streets; the Local Connector classification follows collector streets).



ROUTE CLASSIFICATIONS

Ames' routes were organized into eight route classifications stemming from the City's functional street classification, incorporating current and proposed pedestrian and bicycle networks and building on the potential of innovative complete streets precedents. The following design guidelines identify the street classification(s) utilized as precedent for each of Ames' route types. The goal of the classification is to supplement the current motor vehicle based, functional classification with additional guidance on streetscape features and designs related to context sensitivity, adjacent land use, green infrastructure and pedestrian, bicycle and public transit accommodations.

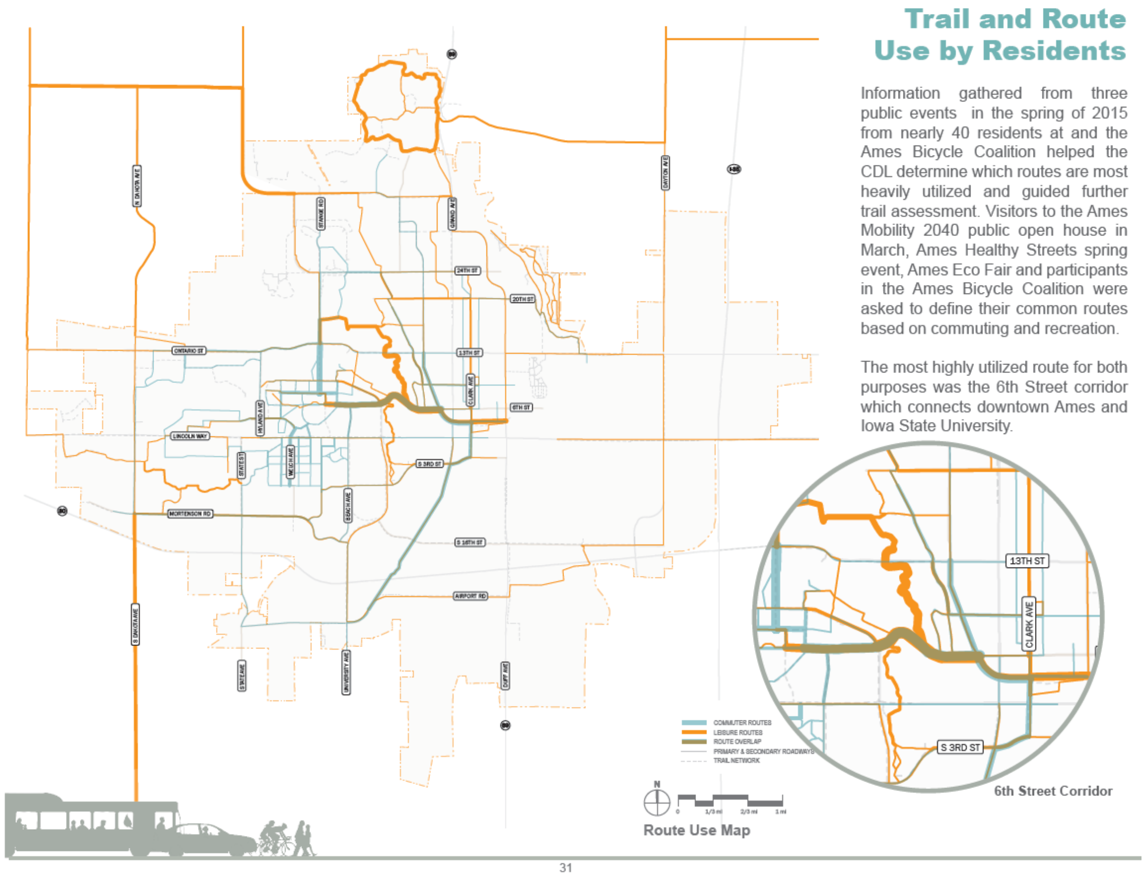
ROUTE CLASSIFICATIONS:

- Greenway Corridor
- Greenway Destination
- Gateway / Thoroughfare
- Community Connector
- Neighborhood Main Street
- Local Connector
- Vehicle-Oriented & Industrial
- Rural

89

Each classification makes some distinction in terms of sidewalk width and type of bike accommodation between commercial, residential, and campus areas. However, the approach to context-sensitivity and design flexibility does not account for the variation of constraints and changes in context that are present along the corridors. For example, the "commercial" context does not offer a distinction between auto-oriented big box shopping centers and downtown.

One of the more valuable maps in the report is one that identifies trails and routes that are most heavily utilized by people biking and identifies which routes are leisure-oriented and which are commuting-oriented. This map was considered with determining priorities for the new street types developed for the Complete Streets Plan.



Engaging Ames in Complete Streets presents a variety of best practices and a vision of how Complete Streets could be realized in Ames. However, for several reasons the City of Ames embarked on creating its own Complete Streets Plan to build upon the momentum created by the Engaging Ames in Complete Streets project:

- To develop a Complete Streets Policy that meets the needs of the City of Ames.
- To create street types that better account for the variation of constraints and contexts across the community.
- To develop a process for making design decisions, accepting public input on individual street projects, and provide for more flexibility.
- To provide a process for judging tradeoffs when constraints preclude the ability to incorporate all desired street elements.
- To create design guidelines that tie together and define the compatibility and appropriate use of various street design elements.

Appendix B: Transportation Profile

This transportation profile provides an assessment and summary of the existing conditions related to multimodal transportation in Ames. This document was prepared by reviewing and incorporating relevant elements from the Ames Mobility 2040 long-range transportation plan, Land Use Policy Plan, CyRide System Redesign Study, and various corridor and small area plans as well as performing new analyses of the transportation system to shed light on needs and opportunities. This transportation profile includes the following sections:

- Overview of the Existing Transportation System
- Mode Share and Travel Demand
- Bicycle and Pedestrian Network Analysis

Overview of the Existing Transportation System

The transportation system in Ames serves people biking, walking, driving, and using transit through an interconnected system of streets, shared-use paths, and freeways. A significant amount of freight is conveyed on railroads passing through Ames, as well as on freeways and some streets. For purposes of the Complete Streets plan, the focus is on the street network and to a lesser degree its connections to shared-use paths.

Street Network Form

There are approximately 245 miles of streets in Ames, not including US Highway 30 or Interstate 35. Almost all streets have sidewalks on both sides. In many parts of Ames, these streets form a gridded street network, which provides multiple route options, good connectivity, and a high level of access for people biking, walking, or driving. However, certain barriers and bottlenecks exist within the city. Most notable are the South Skunk River and its western tributaries, which divide the city into three parts, and the two railroads (which merge near downtown). To a lesser degree, Interstate 35 and US Highway 30 are barriers that limit crossing opportunities to every 1 to 1.5 miles.

Each of the barriers in Ames disrupts the street grid and forces traffic of all modes to a small set of crossings. As a result, multimodal traffic is funneled to streets such as 13th Street, Lincoln Way, 16th Street, Stange Road, and Duff Avenue. Large demands are subsequently placed on these streets in terms of traffic volume, which creates operational challenges, especially for people crossing these arterials by bike or on foot.

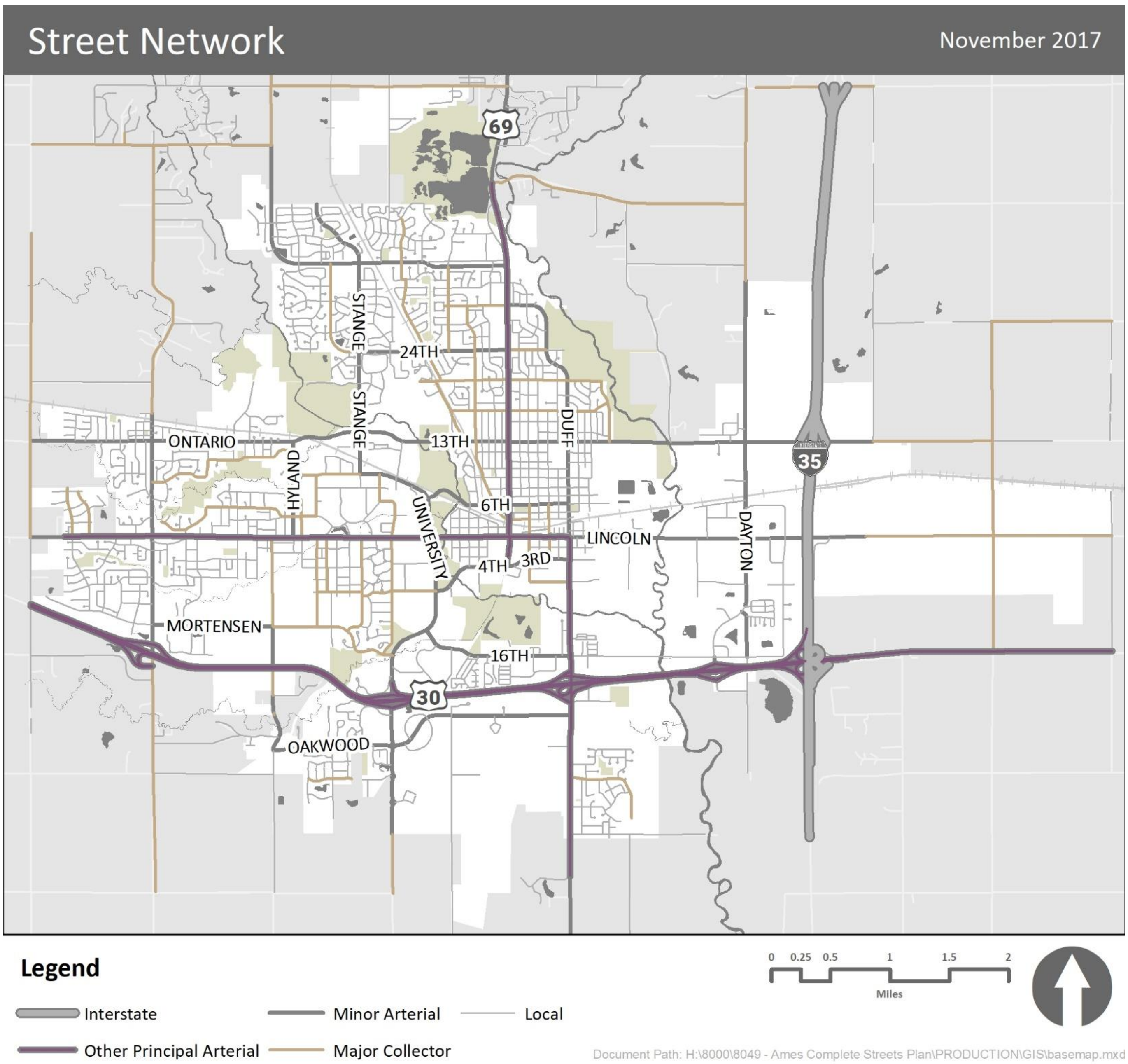
The street network in Ames includes many examples of Complete Streets. However, several barriers create challenges for interconnected multimodal networks, such as railroads, waterways, and freeways.

Functional Classification

All roads, streets and highways in Iowa are classified according to a federal functional classification system. Functional classification is the grouping of highways, roads and streets by the character of service they provide. Functional classification defines the part that any individual route should play in serving the flow of trips through a roadway network. Functional classifications in Ames include:

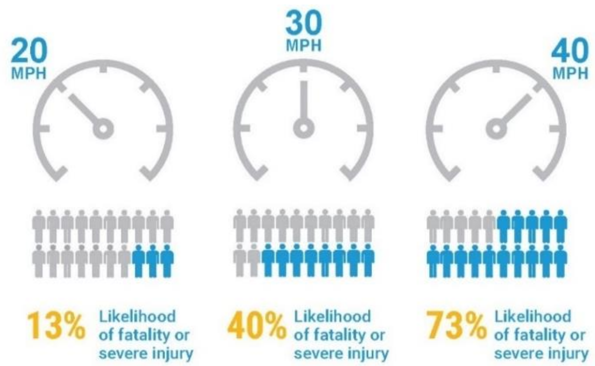
- Interstate
- Other Principal Arterial (e.g., US Highway 30, portions of Lincoln Way, North Grand Avenue, South Duff Avenue)
- Minor Arterial (e.g., 13th Street, University Boulevard, Stange Road, 16th Street)
- Major Collector (e.g., 20th Street, Northwestern Avenue, Mortensen Road)
- Local (neighborhood streets and many downtown streets)

Moving forward, functional classification will be augmented by street type (see Chapter 2) during the design process.



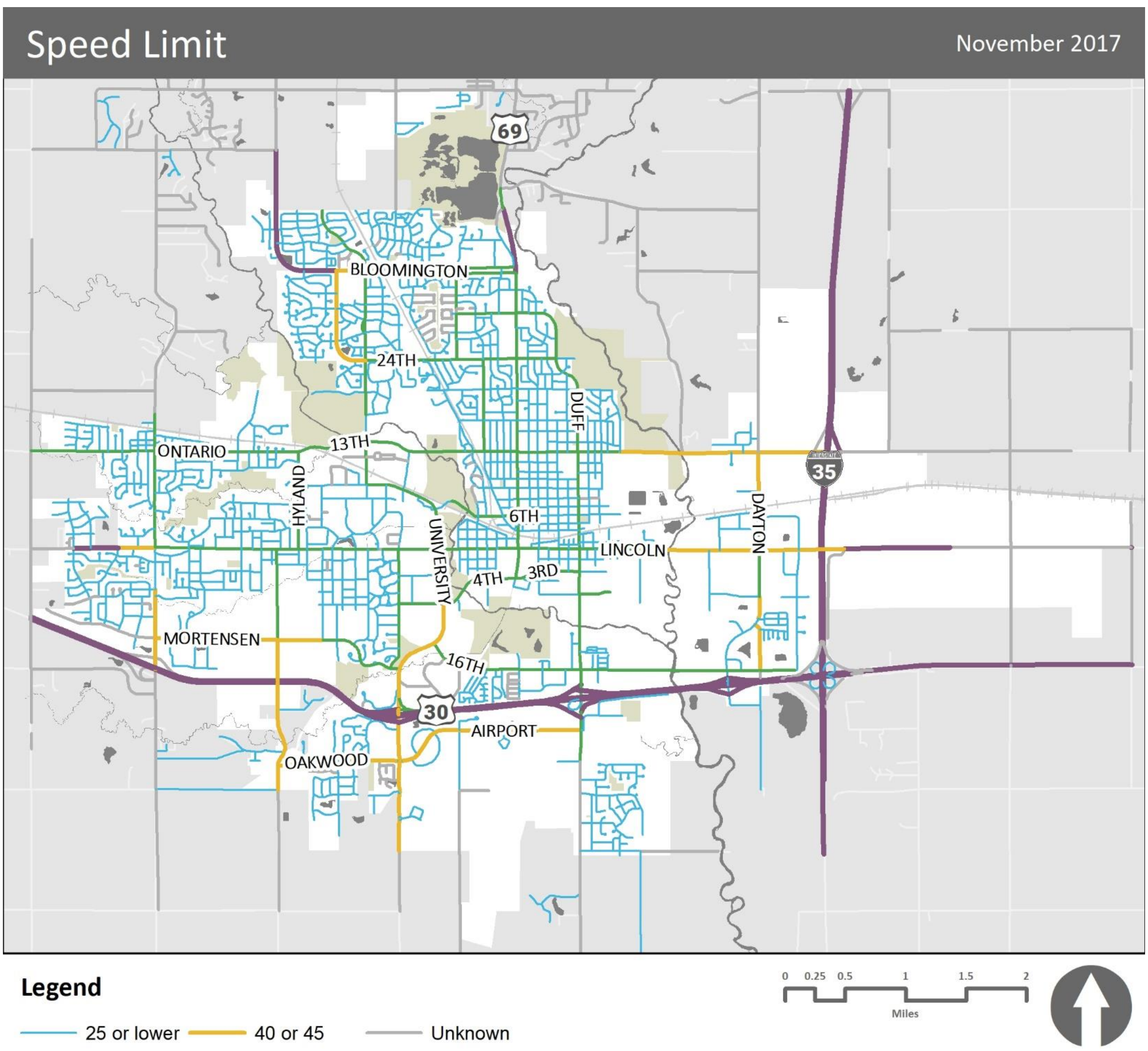
Speed Limit

Speed is the primary factor determining the severity of crashes, especially crashes involving vulnerable user groups, such as people walking or bicycling. Research shows significant increases in the likelihood of fatalities and severe injuries for pedestrians when speeds increase to 30 and 40 miles per hour.



Source: Tefft, Brian C. Impact speed and a pedestrian's risk of severe injury or death. Accident Analysis & Prevention. 50. 2013

In Ames, local streets and some major collector streets have 25 mile per hour speed limits. Some major collector streets and most minor and other principal arterial streets have speed limits between 30 and 45 miles per hour. Streets near Iowa State University and downtown typically have lower speed limits while streets in the suburban and rural periphery have higher speed limits.

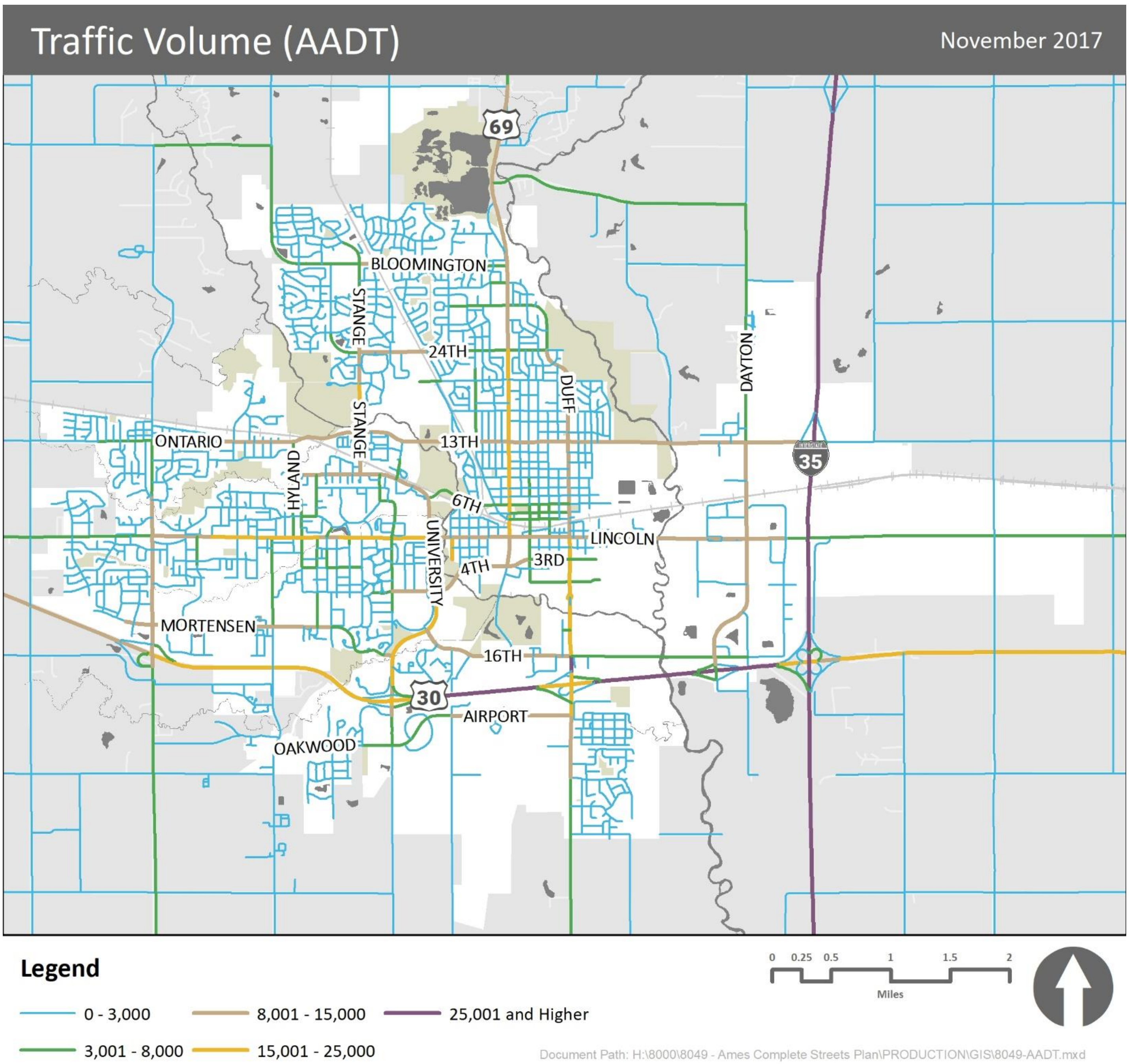


Document Path: H:\8000\8049 - Ames Complete Streets Plan\PRODUCTION\GIS\8049-SpeedLimit.mxd

Traffic Volume

Traffic volume is a measurement of the average number of motor vehicles using each street on a daily basis (calculated as annual average daily traffic or AADT). Most of the streets in Ames are local/neighborhood streets and therefore have low traffic volumes. Arterial and collector streets typically have higher traffic volumes. Streets that cross major barriers, such as South Duff Avenue, Stange Road, and Lincoln Way, carry high volumes of traffic. Grand Avenue also carries a high amount of traffic because it is part of the state highway system and is also the most convenient, direct, and continuous north-south arterial street in Ames.

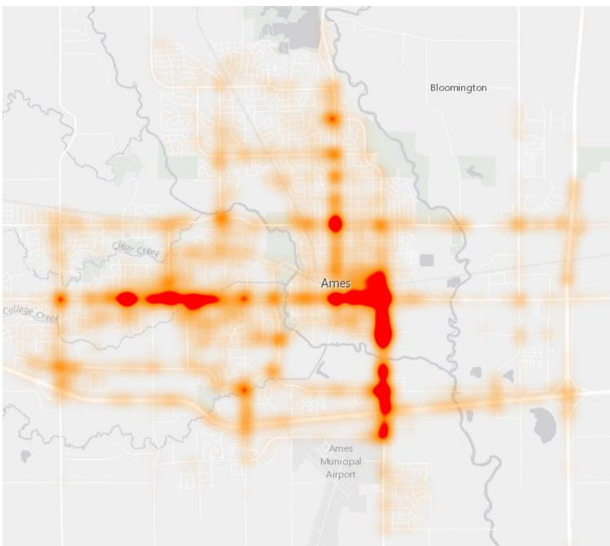
The Ames Mobility 2040 plan found that Ames' street network has minimal motor vehicle travel delay (meaning that the network adequately serves current motor vehicle traffic volumes). However, there are nine intersections in the city—all of which are located along Lincoln Way, Grand Avenue, or Duff Avenue—that are over capacity at peak travel times.



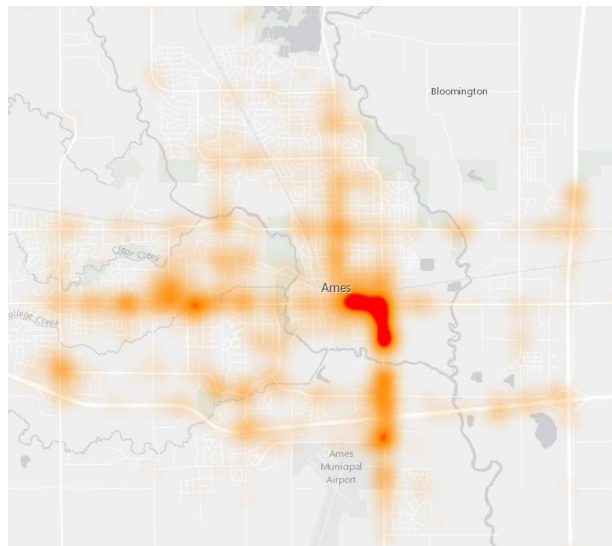
Crashes

The most visible transportation impact on public health is the effect of injury and fatality crashes. Reducing the risk and severity of crashes is a cornerstone of the Complete Streets approach. The heatmaps below indicate the locations where crashes are most common in Ames. Grand Avenue, South Duff Avenue, and Lincoln Way have the highest number of crashes for all modes and are hotspots for injury/fatality crashes. This is in part a result of the fact that these streets carry large amounts of traffic, but is also likely influenced by the design of the streets, intersections, and driveways, which make higher-speed crashes possible.

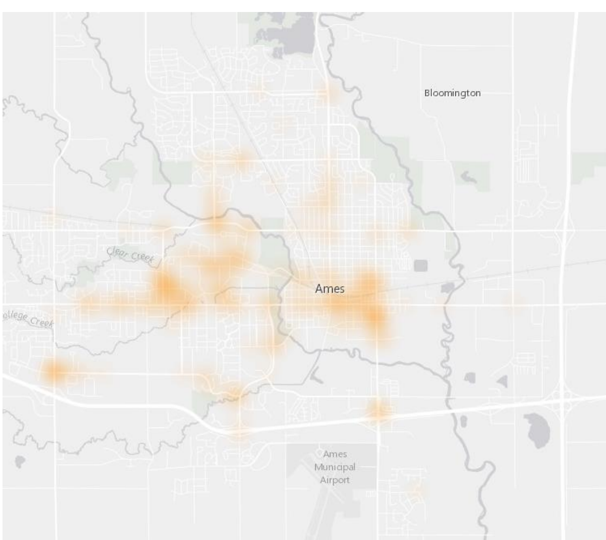
Lincoln Way near Iowa State University and through downtown has an especially high number of crashes involving people bicycling and walking. These locations have very high levels of bicycle and pedestrian activity as well as high volumes of motor vehicle traffic, resulting in greater potential for conflict between modes.



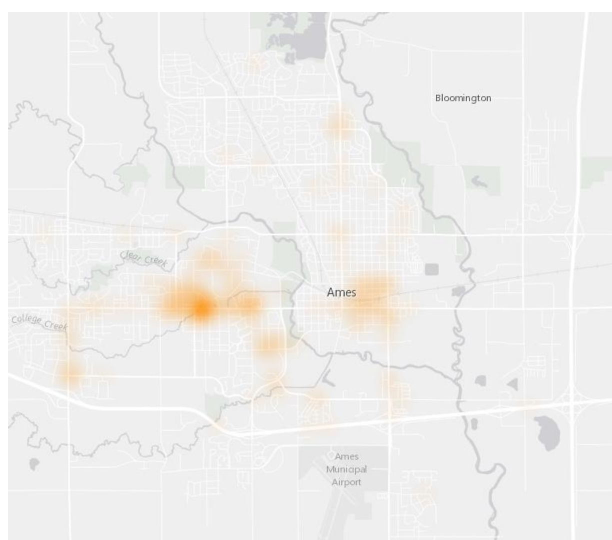
Heatmap of all crashes (all modes; 2007-2017)



Heatmap of injury/fatality crashes (all modes; 2007-2017)



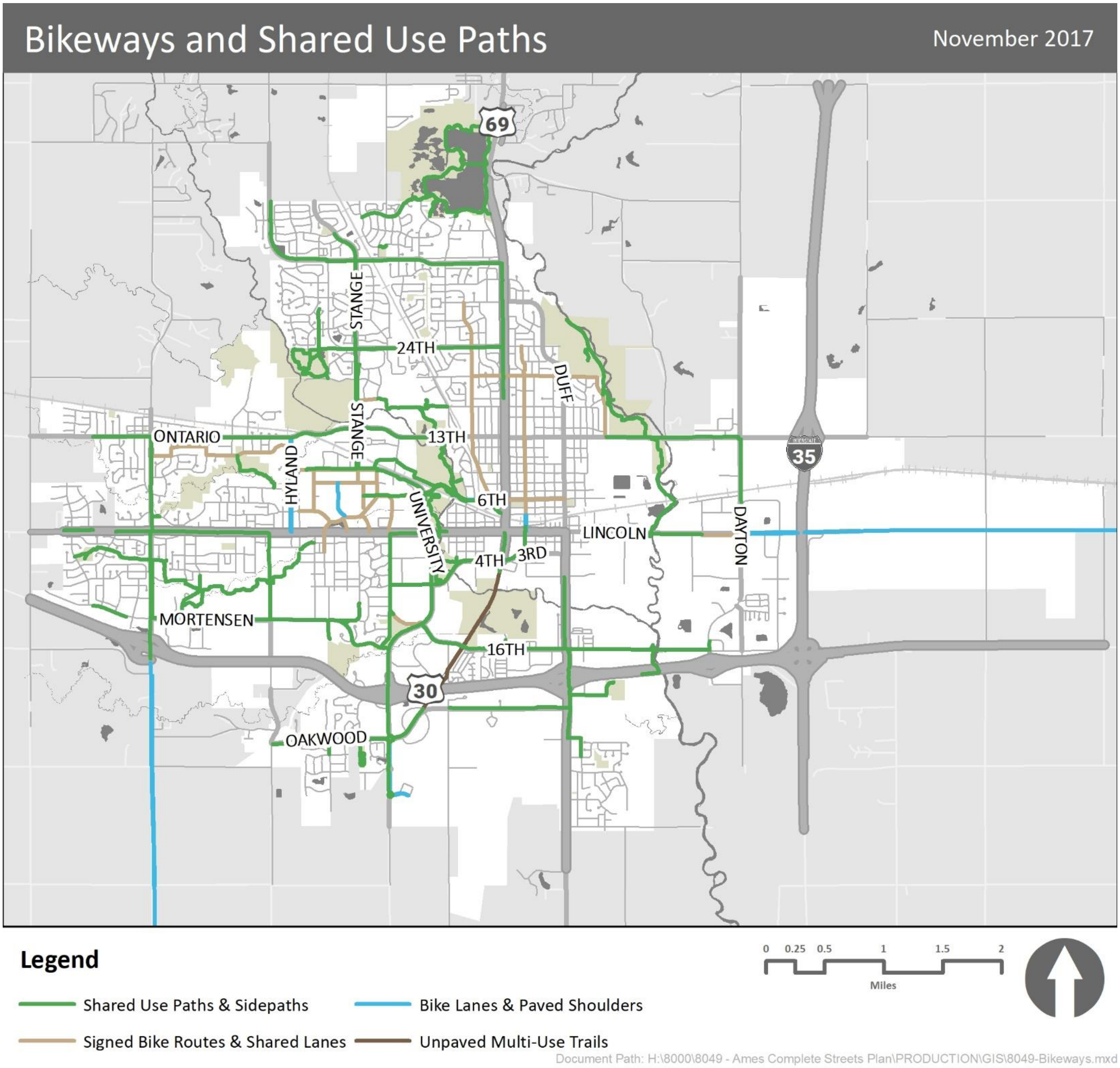
Heatmap of bicycle crashes (2007-2017)



Heatmap of pedestrian crashes (2007-2017)

Bikeways and Shared Use Paths

The on-street bikeway network in Ames is small but growing. There are approximately 5.5 miles of bike lanes, 2.5 miles of paved shoulder, and 12.7 miles of signed bike routes and shared lanes within the city limits. The on-street network is augmented by a 56-mile network of shared-use paths, a significant portion of which—68 percent or 38 miles—consists of sidepaths (paths along roadways).

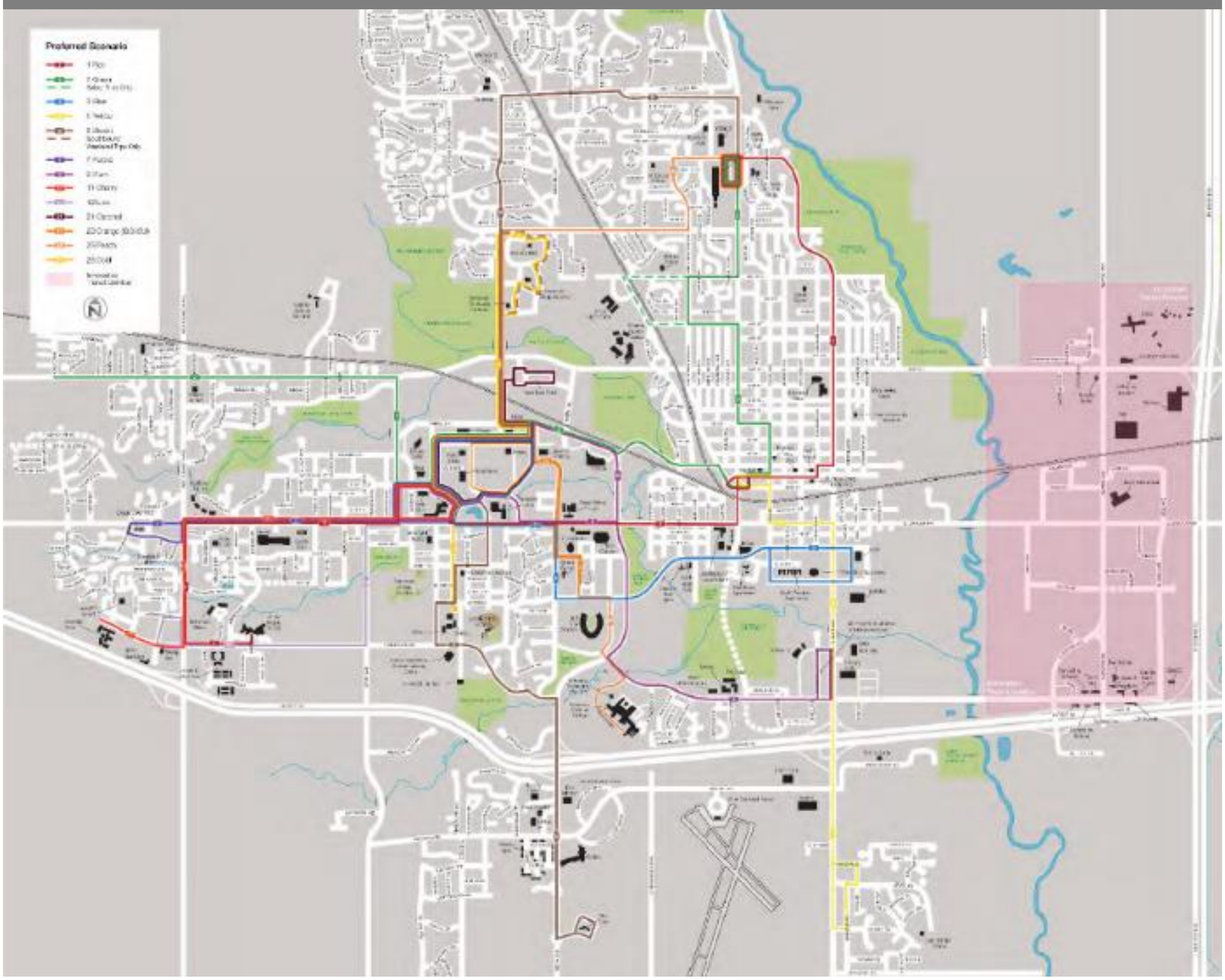


Transit Routes

Transit service in Ames is provided by CyRide, a collaboration between the city of Ames, Iowa State University, and the Student Government (StuGov) at Iowa State University. CyRide operates 13 fixed bus routes, a safe ride home service, and paratransit services throughout the City. Fixed bus routes, which primarily provide service to the Iowa State University campus and downtown Ames and make up a majority of CyRide's transit services.

CyRide completed a system redesign study in August 2017. The system redesign examined key issues relevant to the Complete Streets plan, including balancing coverage and productivity to better serve users in areas other than campus and downtown and managing demand for transit service. Recommendations include modifications to selected routes and the elimination/consolidation of two routes in order to increase the efficiency and capacity of the remaining routes while extending operating hours. One of the most significant changes is the elimination of routes in eastern Ames and the creation of an Innovative Transit Service zone (on-demand transit) in that area.

CyRide System Redesign Recommendations



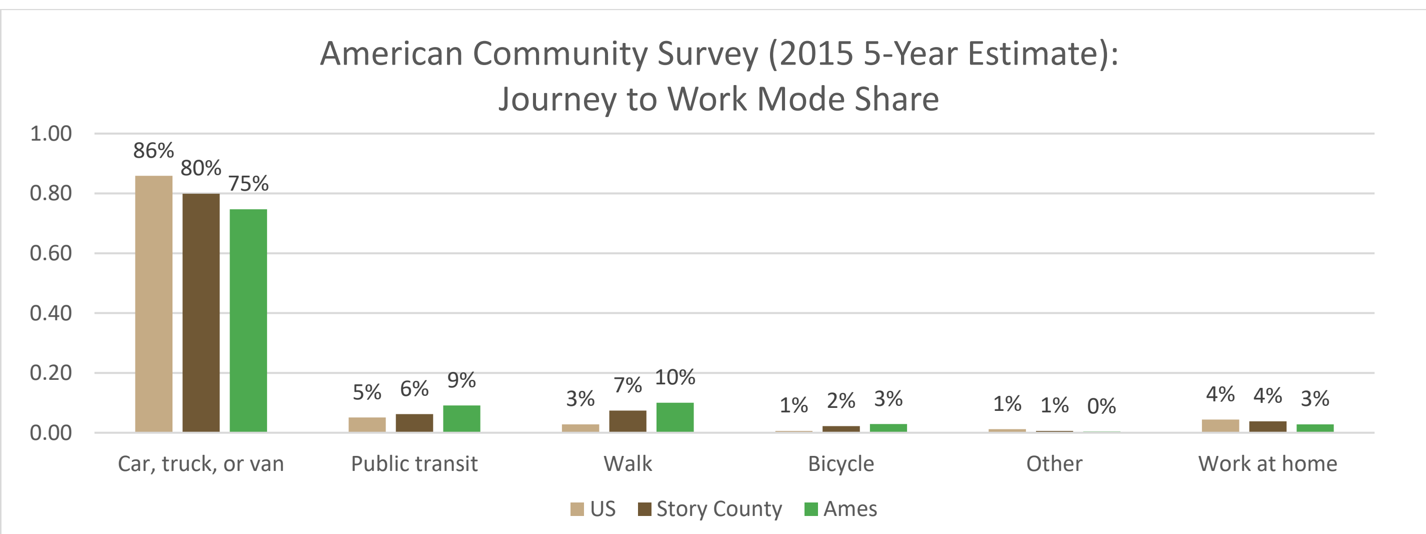
Mode Share and Travel Demand

Mode share is an estimation of the percentage of trips taken by various modes. Accurately estimating this information is challenging because consistent and comprehensive bicycle and pedestrian data collection is limited. There are two primary sources for this analysis—the Census Bureau's American Community Survey (ACS) and the National Household Travel Survey (NHTS), which is conducted as a joint effort by FHWA and other federal agencies. Each of these sources has limitations, however—the ACS only accounts for journey to work trips and the NHTS includes all trips, but is conducted on an irregular basis once every five to ten years. Furthermore, the NHTS data is only available at the state level.

American Community Survey

The ACS is performed annually and collects journey to work data by asking "How did this person usually get to work LAST WEEK?" Respondents can select multiple options. Limitations of this methodology include:

1. It asks people about their journey to work for only one week out of the year. If it happened to be a week with poor weather, a normal bicycle and pedestrian commuter might have chosen to drive or take transit.
2. The question asks what mode people usually used. Taken literally, if someone takes transit to work one day per week and drives on other days, they would likely not say that they usually use transit.
3. This survey only collects transportation to work data. However, the NHTS data shows that only 16 percent of trips made in America are to/from work. The remaining 84% of trips are for errands, shopping, visiting friends/family, school, or recreation. Many people are more likely to walk or bike to school, for errands, or for recreation than they are to get to work.



National Household Travel Survey

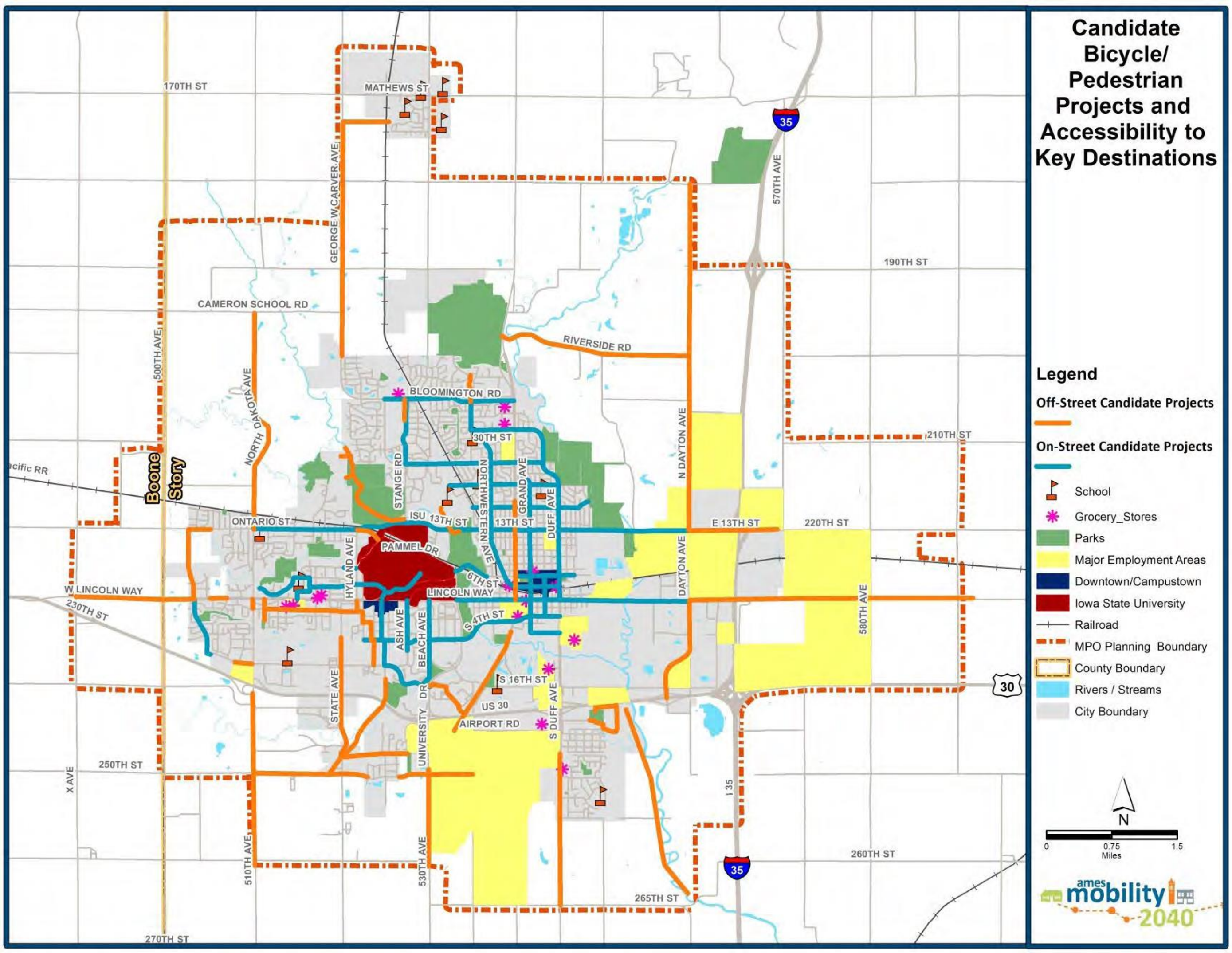
The National Household Travel Survey (NHTS) is performed irregularly (once every 5 to 10 years), but—unlike the ACS—it accounts for all types of trips, not just journey to work trips. The last NHTS was performed in 2017 and was funded by FHWA, the Federal Transit Administration, the American Automobile Association (AAA), and the American Association of Retired Persons (AARP) and some state DOTs. The previous NHTS was performed in 2009.

The results of the 2017 NHTS show greater mode shares for bicycling and walking statewide in Iowa than was recorded by the ACS—1.0% of all trips were bicycling trips and 8.6% were walking trips. For journey to work, the NHTS estimates

0.6% of people travel by bicycle (compared to the 2011-2015 ACS statewide estimate of 0.5%) and 5.3% of people walk to work (compared to the ACS statewide estimate of 3.5%). As such, it can be presumed that walking and bicycling mode shares in Ames are similarly underrepresented by the ACS.

Major Transportation Generators

Development patterns, density, and land use influence people's travel patterns and the mode they choose for each trip. Certain combinations of these factors—typically dense development patterns with diverse uses—result in major transportation generators and destinations. The most obvious examples include the Iowa State University/Campustown and downtown. Grocery stores, shopping centers, schools, and major employers are also major destinations and trip generators. The Ames Mobility 2040 plan includes a map of key generators and destinations (below).

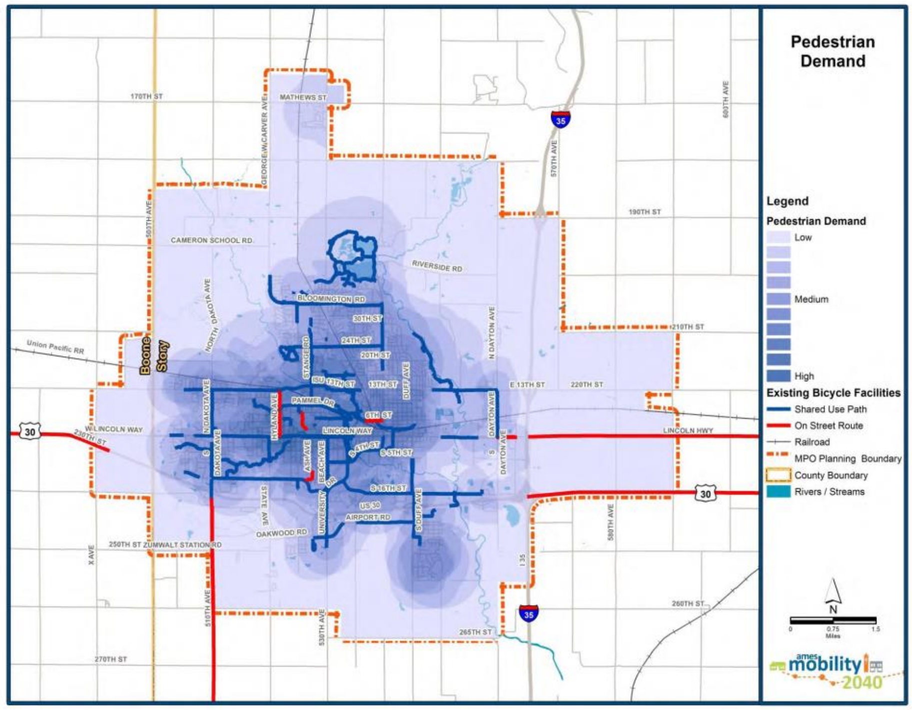


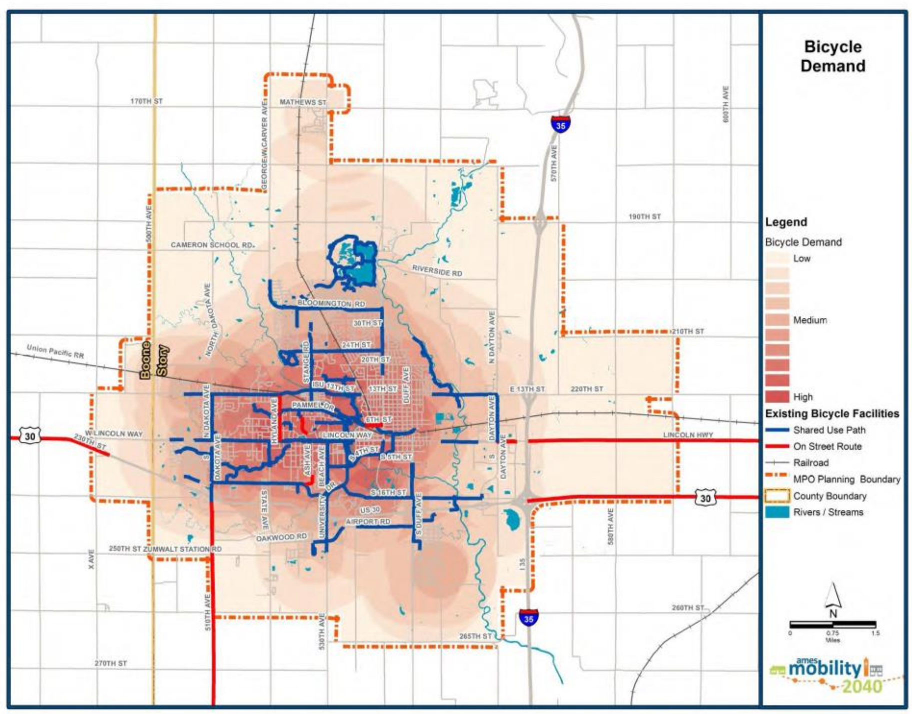
While Ames' largest employers (ISU, Iowa DOT, Mary Greeley Medical Center, and McFarland Clinic) are centrally-located, many of Ames' major employers are located on the outskirts of the city. In fact, six of the 15 largest employers are located along the Interstate 35 and US Highway 30 corridors. Many of the employment centers located on the periphery are not just generators of commuter traffic—they are also generators of truck traffic for shipping and receiving supplies and products.

Bicycle and Pedestrian Demand

An assessment of bicycle and pedestrian demand was performed as part of the Ames Mobility 2040 plan. The analysis was based on proximity to destinations, with areas closer to destinations receiving higher demand scores. The evaluation only considered transportation trips being made to destinations, and did not consider recreational trips such as recreational bike rides or jogs/walks that do not include a stop at an intermediate destination.

The findings of the analysis are that bicycle and pedestrian demand is generally highest in the areas encompassing and immediately surrounding the Iowa State University campus and downtown Ames; this is because these areas have a mix of complementary land uses in close proximity to each other where short trips can easily be made by bicycling or walking. The farther away from Iowa State University and downtown Ames, the less demand generally exists for bicycling and walking trips because these areas consist largely of a single land use, separated by longer distances.

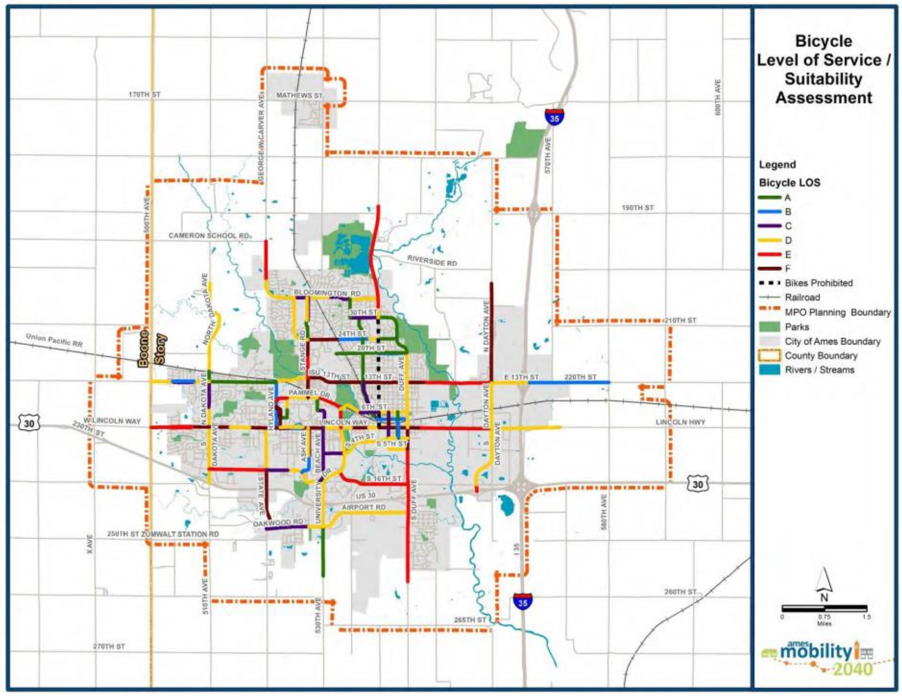




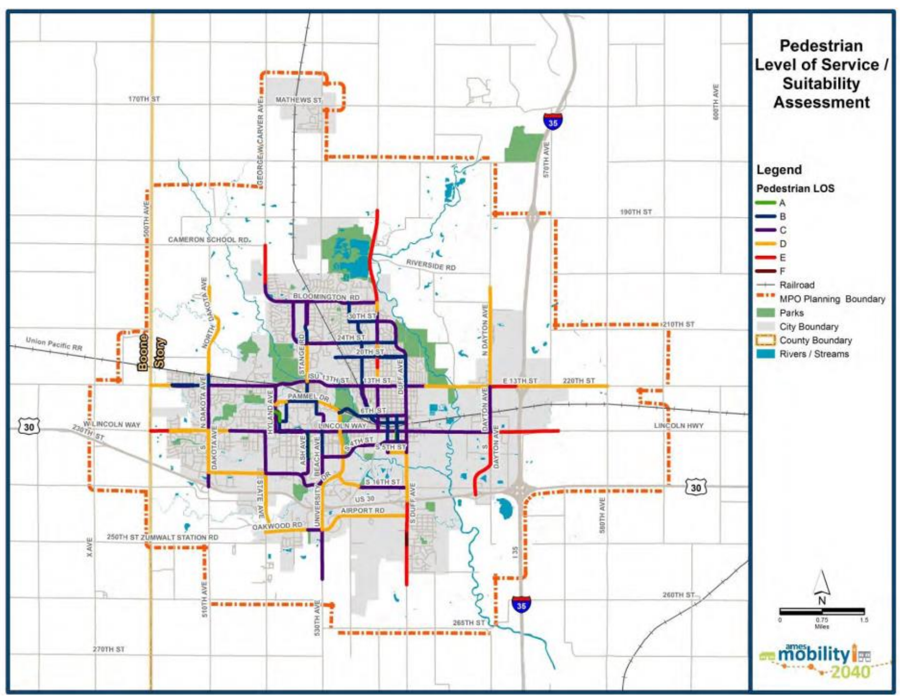
Bicycle and Pedestrian Network Analysis

Bicycle and Pedestrian Level of Service

The Ames Mobility 2040 plan includes an analysis of Bicycle and Pedestrian Level of Service (LOS). The Bicycle Level of Service and Pedestrian Level of Service models (version 2.0) do not measure travel flow or capacity, but are based on human responses to measurable roadway and traffic characteristics. The ratings (A through F, with A being the best rating) generated by the Bicycle LOS model are largely dependent on roadway width and the presence of bike lanes, with traffic volume, speed, and pavement condition having somewhat lesser influence.



The Bicycle and Pedestrian LOS calculated as part of the Ames Mobility 2040 plan rated approximately 65 miles of streets. The study found that only about 20 percent of streets have Bicycle and Pedestrian LOS B or better, although 63 percent of all street miles evaluated rate a Pedestrian LOS C or better. The percentage of roadways with very poor bicycling environments (Level of Service E or F) is 30 percent, although the percentage of very poor conditions for pedestrians is much lower at only 11 percent.



The LOS models—particularly the Bicycle LOS model—have limitations. Namely, a clear minimum LOS rating suitable for the general public has not been established. It is clear that LOS B is better than LOS C, but the model does not provide any guidance as to whether LOS B (or C, D, or E) is adequate for most users. In addition, the Bicycle LOS model does not factor the effects of sidepaths or intersection characteristics.

Level of Traffic Stress

In order to address some of the shortcomings of the Bicycle LOS analysis, a team of researchers sponsored by the California DOT and US DOT developed the Level of Traffic Stress (LTS) model. Compared to Bicycle LOS, the LTS method provides a greater weight to motor vehicle speeds and volumes. The classification uses characteristics of the roadway such as speed limits, the amount of motor vehicle traffic, and whether a separated bikeway is provided. Shared use paths are typically classified as low stress. This classification is important because people have different levels of comfort interacting with motor vehicle traffic when they are biking or considering biking. The model provides clear guidance on the suitability of bikeways for various users:

- LTS 1 is suitable for most people, including most children (low stress)
- LTS 2 is suitable for the mainstream adult population (low stress)
- LTS 3 is tolerated by confident bicyclists that still prefer dedicated bikeways (high stress)
- LTS 4 is tolerated by very confident bicyclists willing to interact with high levels of motor vehicle traffic (high stress)

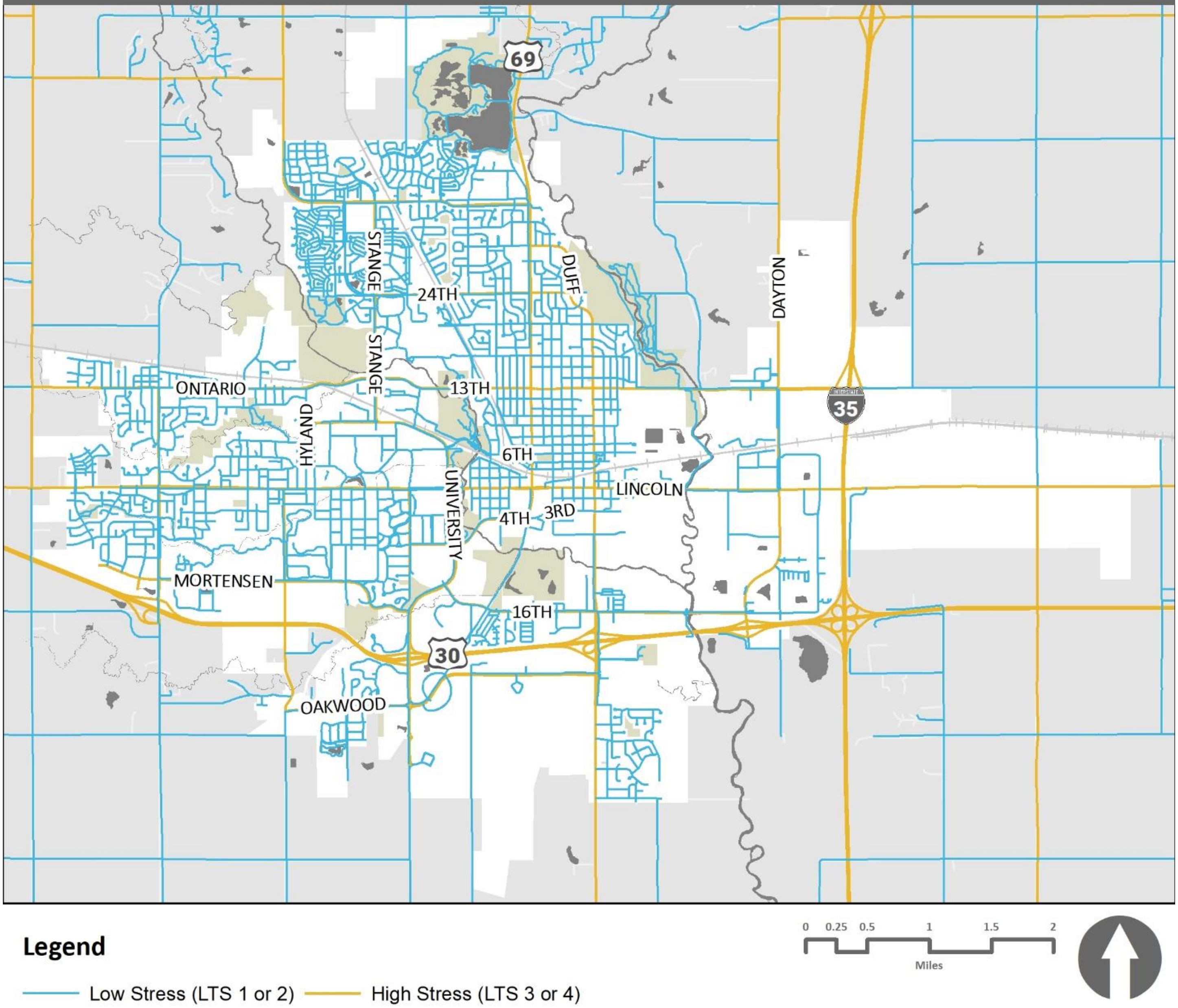
A simplified LTS analysis was performed for Ames, classifying each street and shared use path as either low stress (LTS 1 or LTS 2) or high stress (LTS 3 or LTS 4). Results from this analysis are shown on the map on the following page. The majority of streets (and all sidepaths and shared use paths) in Ames are classified as low stress. However, most arterial streets are classified as high stress, meaning they are uncomfortable for the average person to bike along or across. While some high stress arterials have low stress sidepaths, many do not. This creates gaps in connectivity across the city resulting in pockets or islands of low stress streets. For example, the neighborhoods surrounding North Duff Avenue have many low stress streets, but are disconnected from much of the City because North Duff Avenue is high stress for bicycling along and across.

Compared to the Bicycle LOS analysis, many LOS A/B streets, some LOS C, and even a couple of LOS D stress are classified as low stress. However, there are some streets (such as North Duff Avenue and 24th Street) that were classified as LOS A/B but were found during the LTS analysis to be high stress.

North Duff Avenue has a Bicycle Level of Service rating of A, because it is very wide. However, it is considered high stress by the LTS model because of its 30 mile per hour speed limit and lack of bike lanes.

Level of Traffic Stress

November 2017



Legend

Low Stress (LTS 1 or 2) High Stress (LTS 3 or 4)

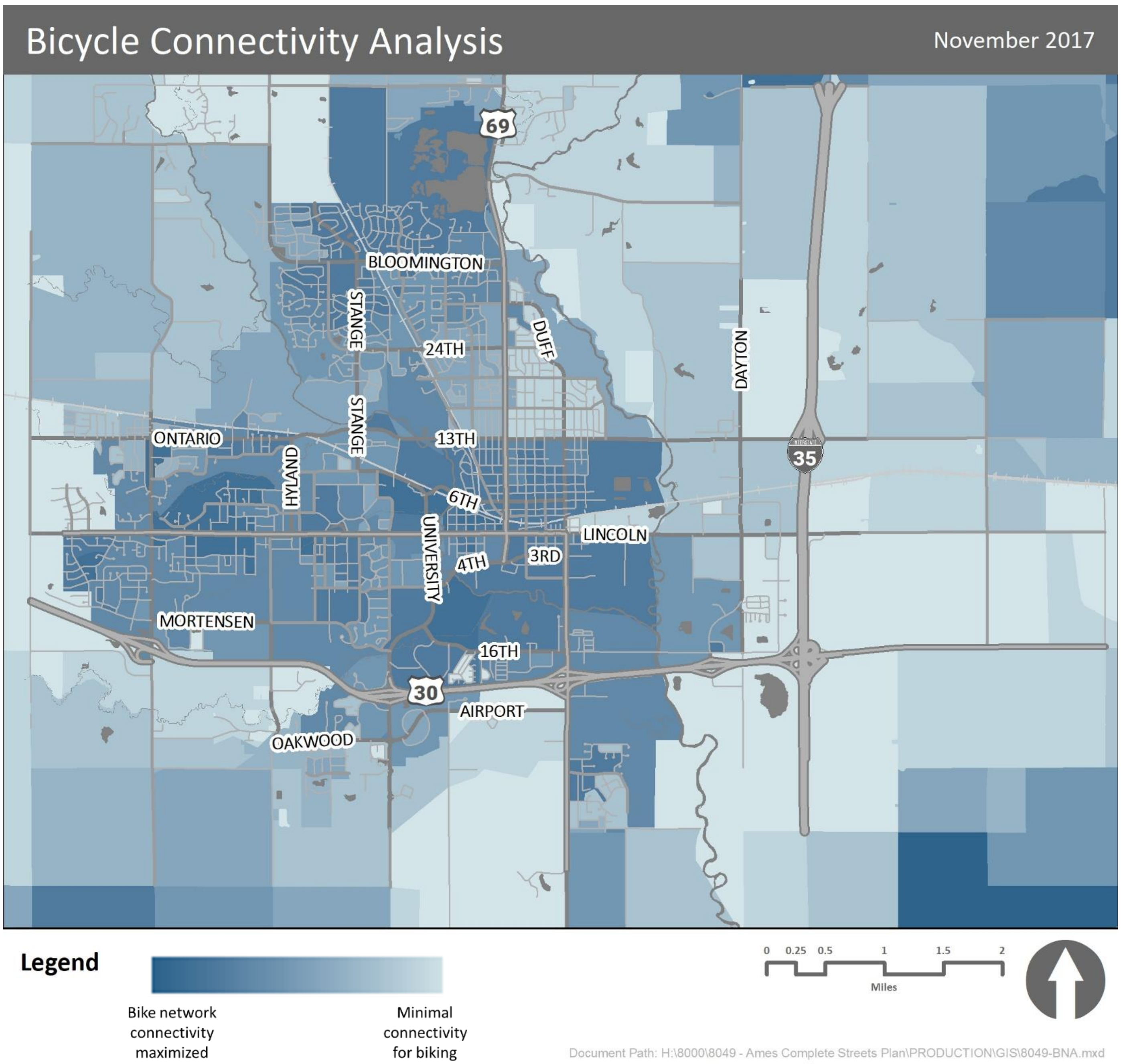
Document Path: H:\8000\8049 - Ames Complete Streets Plan\PRODUCTION\GIS\8049-Stress.mxd

Bikeway Connectivity

The Bicycle Network Analysis (BNA) score is a new tool for measuring how well bike networks connect people with the places they want to go. The BNA score builds upon the Level of Traffic Stress Analysis, to measure how well the low-stress bike network connects to destinations. The analysis highlights the importance of a continuous network, rather than a patchwork of bike lanes and paths that do not interconnect.

Areas with higher scores are places where the low-stress bicycle network is close to the maximal potential level of connectivity. Areas with sparse or disconnected street networks (such as the rural periphery) may have higher scores if the existing streets are generally suitable for biking or if there are few nearby destinations within biking distance.

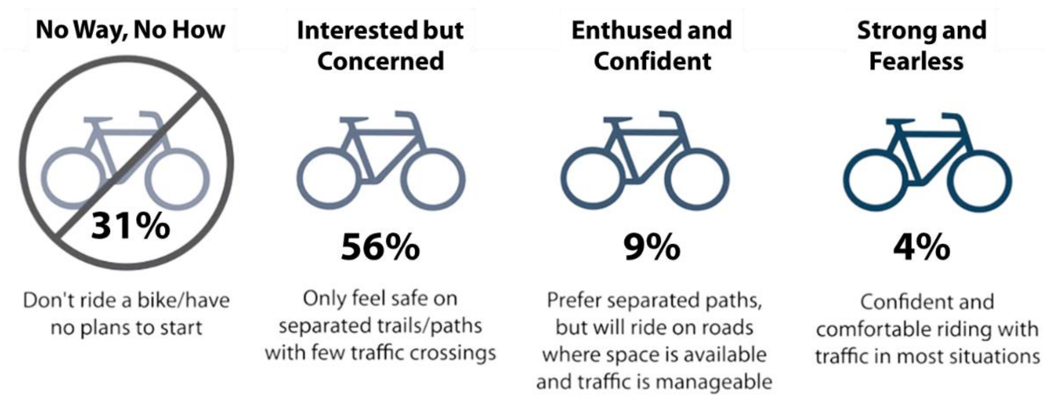
Areas with lower scores, such as along North Duff Avenue, are places where the low-stress bicycle network has a low level of overall connectivity, whether due to a lack of low-stress bikeways or the presence of high-stress intersections.



Appendix C: Analysis Methodologies

Level of Traffic Stress Methodology

Research indicates that while avid bicyclists are accustomed to interacting with motor vehicle traffic, most people have little tolerance for interacting with traffic while riding a bike and are very worried about being struck by a motor vehicle.[2,3] These concerns discourage many people from biking in the first place. The share of people that are interested in biking but concerned about traffic comprise 51 to 56 percent of the population (avid or confident bicyclists comprise 12 to 13 percent, and the remainder have no interest in riding a bike). This "interested but concerned" group prefers quiet streets, trails, and other "low stress" places to bike that have limited motor vehicle traffic or are separated from traffic.



Methodology

The Mineta Transportation Institute (a California-based research institution) developed the Level of Traffic Stress (LTS) model to classify streets as high-stress and low-stress. High-stress streets may be suitable for some bicyclists, including those that are confident or very confident. Low-stress streets are suitable for almost everyone and in some cases are also suitable for children.

While most people are comfortable bicycling on quiet streets, the LTS method requires physical separation between bicycles and cars when traffic levels and speeds exceed certain thresholds. This is important because separation from motor vehicle traffic may be the most important factor to consider to encourage more people to bicycle.

The method uses several base criteria for determining traffic stress (street width, posted speed limit, and presence of on-street parking) as well as additional criteria depending on facility type (bike lane width, traffic volume when streets do not have bike lanes, and number of driveway/street crossings for paths).

For this project, traffic stress was calculated using a simplified version of the LTS methodology, as described in the tables on the following pages.

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2 *Geller, R. "Four Types of Cyclists." Portland Office of Transportation. (https://www.portlandoregon.gov/transportation/article/264746)*

3 *Dill, J. and N. McNeil. (2013, January) "Four Types of Cyclists? Examining a Typology to Better Understand Bicycling Behavior and Potential." Paper presented at the Annual Meeting of the Transportation Research Board.*

Calculation Tables

Traffic Stress – Default segment assumptions

These assumptions are used when speed and street configuration data is not available or is missing.

Open Street Maps Functional class	Nearest comparable functional classification in Ames	Speed	Number of lanes	Parking	Parking lane width	Roadway width
Primary	Other Principal Arterial	40	2	Y	8 ft	N/A
Secondary	Minor Arterial	40	2	Y	8 ft	N/A
Tertiary	Major Collector	30	1	Y	8 ft	N/A
Unclassified	n/a	25	1	Y	N/A	27 ft
Residential	Local	25	1	Y	N/A	27 ft

Traffic Stress – Stress on segments (except local streets)

Facility type	Speed	Number of lanes (each direction)	Parking	Facility width	Stress
Cycle track or Shared use path					Low
Buffered bike lane	> 35				High
	35	> 1			High
	35	1	Yes		High
	35	1	No		Low
	30	> 1	Yes		High
	30	> 1	No		Low
	30	1			Low
	<= 25				Low
Bike lane without parking	>30				High
	25-30	> 1			High
	25-30	1			Low
	<= 20	> 2			High
	<= 20	<= 2			Low
Bike lane with parking				>= 15 ft	*Treat as buffered lane*
				13-14 ft	*Treat as bike lane without parking*
				< 13 ft	*Treat as shared lane*
Shared lane	> 20				High
	<= 20	1			Low
	<= 20	> 1			High

Traffic Stress – Stress on segments (local streets)

Facility type	Speed	Number of lanes	Parking	Road width	Stress
Shared lane	>=30				*Treat as tertiary – see previous table*
	25	>1			*Treat as tertiary – see previous table*
	25	1	One side or none	>= 19 ft	Low
	25	1	One side or none	18 ft	High
	25	1	One side or none	< 18 ft	High
	25	1	Both sides	>= 27 ft	Low
	25	1	Both sides	26 ft	High
	25	1	Both sides	< 26 ft	High
	<= 20	>1			*Treat as tertiary – see previous table*
	<= 20	1	One side or none	>= 19 ft	Low
	<= 20	1	One side or none	18 ft	Low
	<= 20	1	One side or none	< 18 ft	Low
	<= 20	1	Both sides	>= 27 ft	Low
	<= 20	1	Both sides	26 ft	Low
	<= 20	1	Both sides	< 26 ft	Low

Bicycle Network Analysis Methodology

The BNA evaluates every census block to determine how well connected it is to other census blocks via a low-stress biking network. Two census blocks are connected if and only if there is an unbroken low-stress connection between them that does not require more than a 25 percent longer distance than the shortest car trip. Even a short stretch of stressful biking negates a potential connection.

The BNA score also summarizes the number and types of destinations available in each census block, including people, opportunities (jobs and education), core services, recreation, retail, and transit. Using this information, paired with the knowledge of which census blocks are connected on the low-stress network, the BNA calculates a score for each census block by comparing the number and type of reachable destinations on the low stress network to the destinations reachable by car within the same distance.

In other words, the score measures disparity in connectivity between modes. Areas with high scores are where bike network connectivity is maximized relative to the street network's overall level of connectivity.

For more information, visit: https://bna.peopleforbikes.org/#/methodology