



Flagstaff Metropolitan Planning Organization  
Blueprint 2040 Regional Transportation Plan  
March 2017



COCONINO  
COUNTY ARIZONA  
ADOT  
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Dear Flagstaff Region Residents:

We, the members of the Flagstaff Metropolitan Planning Organization (FMPO), are pleased to present *Blueprint 2040: Flagstaff Regional Transportation Plan*. This important document provides strong recommendations on the transportation projects we need over the course of the next 20-25 years. The plan offers a balance of transportation projects that are in keeping with our adopted land use policies, economic aspirations and fiscal realities. It supports travel by all modes: walking, biking, automobile, bus and truck.

As the FMPO, we work to fulfill our mandate to guide and authorize the spending of federal transportation dollars and our mission of delivering the finest transportation system for a community our size. Ultimately, the transportation projects built depend on decisions made by FMPO member agencies: The City of Flagstaff, Arizona Department of Transportation, Coconino County and NAIPTA, our regional transit agency. It also depends on future decisions made by our voters regarding sales taxes and other revenues supporting transportation investment. We believe the information in *Blueprint 2040* is valuable in guiding those choices and fulfilling our purpose.

As your representatives to the FMPO, we commit to continue the dialogue with you about the projects under the control of our respective agencies. Some of the “lines on the map” represent transportation solutions that may impact some neighborhoods and businesses. As those decisions arise, we will engage with you in project level decisions to protect the integrity of our neighborhoods.

We are thankful for the involvement of our citizens and visitors in the planning process and encourage you to read *Blueprint 2040*. It holds out the prospect for exciting partnerships, new and safer ways to travel the region, and intriguing thoughts about our needs for the next 20-years and beyond.

Respectfully submitted,

Art Babbott, Chair  
District 1 Supervisor  
Coconino County

Jeff Meilbeck, Vice-Chair  
General Manager & CEO  
NAIPTA

Jerry Nabours  
City of Flagstaff  
Mayor

Arlando Teller  
Az. State Transportation Bd.  
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Coral Evans  
City of Flagstaff  
Councilmember

Matt Ryan  
District 3 Supervisor  
Coconino County

Jeff Oravits  
City of Flagstaff  
Councilmember



**COCONINO COUNTY ARIZONA ADOT DRAFT**





## "PARTNERS IN TRANSPORTATION ENHANCING OUR COMMUNITY"

Dear Residents and Visitors to the Flagstaff Region,

Welcome to *Blueprint 2040*, the update to the FMPO Regional Transportation Plan. Thank you for your participation and interest in the well-being of our region. Exciting opportunities emerged from the process and I am confident that the next 20-25 years will bring many positive developments for moving around the region.

That you expressed strong support for all modes of travel is no surprise, so in *Blueprint 2040* we work hard to advance all modes in an effective and responsible way. As a region, we value the environment, our active life-style and vibrant and comfortable places to live, work and play. The ability to walk and bike in safe, well-connected and attractive settings is key to achieving that quality of life. Closing gaps in the sidewalk and bike lane systems along and across major roadways is recommended. Transit extends those walking and biking trips, allows residents more discretion in their housing and transportation budgets, and shows effectiveness in addressing congestion in key corridors. High frequency transit between the Airport and the Mall is prominently featured and holds promise to re-organize the system to better meet the needs of today and the future. New and expanded roadways are planned and programmed, too. These will be complete streets – they will accommodate all modes – and so improve mobility for all. Improvements recommended for Lone Tree Road and J.W. Powell Boulevard offer much need alternative routes. Milton Road and W. Route 66 offer great opportunities for partnering with ADOT.

Planning and public discussion never end and a very important discussion will start soon. The City's transportation sales taxes will expire in 2020 – with the important exception of the transit tax which was renewed in 2016. I hope *Blueprint 2040* provides a firm foundation for the community to discuss the renewal of that vital funding source and what it is to be used for. *Blueprint 2040* recommends projects that assume tax levels stay the same. As they say, trend is not destiny, and as community we are free to consider alternatives.

Other conversations important to defining projects are underway and I encourage your participation. NAIPTA is updating its 5-Year Transit plan and will shortly start design of the cross-town, high frequency transit route. The FMPO is working closely with the City to produce an Active Transportation Master Plan (walking and biking). The City will soon launch a Roads & Streets Master Plan. ADOT will evaluate US 180 to identify more solutions to winter congestion. Collectively, these plans bring a higher level of definition and commitment to the systems and projects in *Blueprint 2040*.

Please feel free to contact me and my staff with any questions you have about current or future transportation concerns. I look forward to the conversation.

Sincerely,

David Wessel, Manager

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## FLAGSTAFF METROPOLITAN PLANNING ORGANIZATION

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## RTP STEERING COMMITTEE EXECUTIVE SUMMARY

**May 18, 2016**

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To our fellow community members, the FMPO Executive Board and David Wessel, FMPO Manager:

Transportation congestion is a problem. It clogs our streets, slows us down, detracts from our quality of life and pollutes our environment. In the *City of Flagstaff 2013 Citizen Survey* when asked to write *in their own words the one thing the City could do to improve their quality of life the most, one-quarter of residents mentioned better traffic flow, roads and mass transit.* This scored 27% and the next highest was 10%. Although busy streets, sidewalks, bikeways and buses are a result of a thriving community, there is a difference between gridlock and the “Great Streets” described in *Flagstaff Regional Plan 2030: Place Matters* (hereto referred to as *Regional Plan 2030*). As our community grows in population and popularity, so must our systems for moving people who reside and visit here. The document before you, *Blueprint 2040*, is a first step in addressing this critical community challenge and moves forward the vision crystalized in *Regional Plan 2030* that was adopted by residents.

As the Steering Committee for *Blueprint 2040: Regional Transportation Plan*, our mission has been “*To identify priority transportation projects, related costs and viable revenue sources for turning ideas into reality.*” We are a diverse group representing environmental, business, government, education, economic development and citizen interests. Our focus over seven months was to work together to meet our mission in a manner that each of us could agree upon.

In the words of management guru Peter Drucker, “*plans are only good intentions unless they immediately degenerate into hard work.*” This Steering Committee and the staff of the Flagstaff Metropolitan Planning Organization have done hard work and we hope that others will pick up where we left off. Our mission was identification. In many ways, that is the easy part. Our intent is to point the community in the right direction so that planning can be refined, funding can be secured and projects can be built. Keeping sustainability, fiscal viability, and this place we love in mind, we prioritized projects that have great impact on congestion mitigation and create resiliency through connectivity and mode choice. These projects also align with the vision and values of *Regional Plan 2030*.

Projects come down to money and money is expanded with partnerships. By working together we will leverage public and private funding sources. For example, dedicating public funds to the Lone Tree corridor and the Lone Tree railroad overpass may allow private sector landowners to develop property and support transportation infrastructure in a manner that is financially viable and consistent with *Regional Plan 2030*. Similarly, by dedicating local funds to transit construction projects, we may be able to leverage federal grants and build more than we could build on our own. Many of the projects recommended are on state facilities. Through these recommendations, the City will be an able partner with the State to improve these highways. As citizens of the region and state, we strongly urge the State and City to join together as financial and construction partners. The guiding philosophy is that working together on common projects toward a vision shared by all funding partners, the constituents and customers we serve will benefit.

Recognizing that much more work on revenue analysis is needed, the Steering Committee’s initial environmental scan identified several viable – and reasonable – potential funding sources. For example, the .00426 Transportation Sales Tax approved by voters in the City of Flagstaff expires on June 30, 2020. Extending that tax at existing rates without an increase would generate an estimated

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\$195 million over a 20 year period. Furthermore, the transit system has averaged \$3 million per year in competitive federal grant awards over the past 10 years and the Steering Committee's recommendations estimate \$2 million per year over the next 20 years.

Potential Funding Source	20 Year Total
Transportation Tax Renewal at Current .00426 Rate	\$195,000,000
Federal Transit Grants	\$40,000,000
ADOT Capital Projects (Federal and HURF)	\$16,000,000
Transit User Fees / Fares	\$8,500,000
Private Sector Investment	\$15,000,000
<b>(A) Total Revenues</b>	<b>\$274,500,000</b>

Recommended Projects	Cost
Lone Tree Railroad Overpass (Includes Debt Financing)	\$81,200,000
Lone Tree Widening – Pine Knoll North	\$11,500,000
Fourth Street Bridge (Over I-40)	\$13,000,000
Operations TDM Signal Sync (not on map)	\$8,000,000
West Route 66 (Complete Street and Widen)	\$12,000,000
Milton Road BNSF Underpass Widening	\$20,000,000
Milton Road BRT Capital and Right-of-Way	\$22,000,000
* NB BRT Lane University to BNSF Bridge	
Fourth Street Corridor (Complete Street)	\$15,000,000
Lone Tree I-40 Interchange (Design)	\$3,300,000
Bus Rapid Transit (20 Year Operating Costs)	\$25,000,000
Lone Tree (Existing) Widening – I-40 to J. W. Powell Boulevard	\$12,000,000
Bus Rapid Transit (Other Capital)	\$8,000,000
J.W. Powell Boulevard Extension (Airport Only – 2 Lanes)	10,000,000
Missing Sidewalks (Major Segments)	\$3,500,000
Pedestrian/Bicycle Grade Separation	\$10,000,000
Enhanced Pedestrian Crossings	\$2,600,000
Missing Bike Lanes (Major Corridors)	\$1,000,000
Future FUTS Trails (Major Projects)	\$3,000,000
2 <sup>nd</sup> Lake Mary to Lone Tree via Anita and Zuni Drives	8,000,000
<b>Total Estimated Expenses</b>	<b>\$269,100,000</b>
<b>Surplus / (Deficit)</b>	<b>\$5,400,000</b>

We anticipate that our project recommendations will be modified and we welcome a rigorous review and assessment of our findings. A number of references and appendices, including details on these project recommendations, are found elsewhere in this document. They document the process we have been through and the guiding principles our recommendations are based upon. We encourage the reader to view these documents. It is only through this ongoing evaluation that we will arrive at the best choice for our community.



## RTP STEERING COMMITTEE EXECUTIVE SUMMARY

As a Steering Committee, it is time for us to pass the baton. Our recommendations are a beginning, not an end. As an advisory group our influence is limited and work now needs to be taken by others who have the political and financial authority to affect change. We respectfully request that our work can be most useful if the following steps are taken:

What	Who	When
Form a Citizen Review Panel to review project and funding recommendations in preparation for a return to Flagstaff voters in November 2018.	City of Flagstaff	Winter 2017
Send <i>transit</i> tax question back to voters in November 2016 and request a flat tax renewal without an increase.	City of Flagstaff NAIPTA	November 2016
Continue discussions between ADOT and City of Flagstaff regarding possible route transfers.	ADOT City of Flagstaff	Winter 2017
Complete a statistically valid survey of Flagstaff residents' interests related to specific transportation projects.	City of Flagstaff	Spring 2018
Continue to pursue grant funding.	ALL	
Continue to work with statewide interests to restore and expand transportation funding at the state and federal level including but not limited to Highway User Revenue Funds.	City of Flagstaff Coconino County	Ongoing
Continue to review capacity of Transportation Decision 2000 (Sunsets 2020).	City of Flagstaff	Winter 2017
Research property for I-17 Lone Tree Connector via Anita Drive.	ALL	Winter 2017
Conduct discussions with BNSF on widening Milton underpass and Lone Tree overpass.	ALL	Fall 2016
Explore the implications of various levels of debt financing on project costs and timing.	City of Flagstaff	Winter 2017
Consider J. W. Powell / Lone Tree design and land use implications carefully to protect the arterial roadway function and balance development with potential future growth.	City of Flagstaff	
Consider providing flexibility in 2018 Transportation Renewal Ballot language.	City of Flagstaff	
Provide clear messaging of project benefits for the voters.	ALL	
Explore impact fees and other funding mechanisms for developers, especially those who benefit from public investments.	City of Flagstaff Coconino County	
Schedule a focused discussion between regional partners regarding commitment to projects that have shared costs.	ALL	

In closing, it has been an honor to serve on this Committee and we convey these suggestions and recommendations with the utmost respect. We do not claim to completely understand all of the political, financial and technical intricacies of these major capital projects. We do, however, trust the commitment and talent of the people and institutions of this community. We offer our suggestions with a healthy dose of humility and encourage others to refine our effort and take it further. The quality of our transportation system can improve if we continue to work together and take action.

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Respectfully submitted,

Blueprint 2040 Flagstaff Regional Transportation Plan Steering Committee

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City of Flagstaff

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## Blueprint 2040 Regional Transportation Plan

### Flagstaff Metropolitan Planning Organization

#### Acknowledgements

Funding for this FMPO Regional Transportation Plan update is provided by the Federal Highway Administration and the Federal Transit Administration through the Arizona Department of Transportation.

#### FMPO Executive Board

This FMPO Regional Transportation Plan Update was adopted by the FMPO Executive Board on **(Date Placeholder)**, 2017.

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Coconino County Board of Supervisors – District 1

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## FMPO Technical Advisory Committee

The FMPO Technical Advisory Committee recommended adoption of this plan on **(Date Placeholder)**, 2017.

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**FMPO wishes to thank the RTP Steering Committee, Consultants and others instrumental in producing Blueprint 2040**

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## Blueprint 2040 Regional Transportation Plan

### Flagstaff Metropolitan Planning Organization

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*Appendices are not intended as policy. They are supplemental material to describe analysis, facilities, processes or provide further planning guidance.*

*Note: Blueprint 2040 will be available on-line and in digital format. Printed copies will be available for viewing at the Flagstaff City Hall Community Development Office and City-County Public Libraries. Printed copies may be purchased for the cost of duplication.*

# Blueprint 2040: Regional Transportation Plan

Flagstaff Metropolitan Planning Organization

## Executive Summary

### Key Outcomes of Blueprint 2040

*Blueprint 2040* sets transportation direction and priorities. A build out transportation system plan provides vision. Planning guidance for each mode assures that new projects and new developments create the transportation system desired. The 20-year program, high performing projects within the region's financial means, sets priorities. The plan, guidance and program have all been filtered through performance measures based on the guiding principles and transportation policies in *Flagstaff Regional Plan 2030: Place Matters* and weighted according to public input. These measures are congestion, arterial density, multimodal service, safety and economic development.

*Blueprint 2040* meets the Flagstaff Metropolitan Planning Organization's (FMPO) federal mandate for regional transportation planning. It brings a sharper focus and renewed commitment to many long-standing ideas. These ideas define the vision of our region and guide the transportation system that will serve it best. Provided here is an overview of how *Blueprint 2040* address several of these key concepts followed by three figures illustrating the build out plan, system guidance, and the 20-year program.

#### Renewed commitment to Connectivity

All modes rely heavily on an efficient and interconnected network of roads and streets. *Blueprint 2040* quantifies the weaknesses in the current network, identifies major roads for the future (see figure 0.1), and sets guidance for development patterns to better support regional transportation. Guiding principles from the regional plan are clearly supported by connectivity:

- People Matter – an efficient system recognizes that time is valuable
- Smart and Connected Matters – connectivity provides choice, redundancy and shorter distances
- Environment Matters – a more efficient system for all modes is better for the planet

#### Renewed commitment to Multimodalism

The FMPO Region has invested in all modes for decades. Figure 0.2 illustrates expectations for the pedestrian system. Investing in walking, biking, transit and roads is motivated by these guiding principles:

- People Matter – health, safety and affordability benefits are gained from alternate modes
- Place Matters – human-scaled environments for walking and biking make places welcoming
- Prosperity Matters – walking, biking and transit allow for vibrant social engagement that energizes activity centers
- Environment Matters – non-motorized travel choices and efficient, well-designed motorized systems protect the natural beauty and health of the region

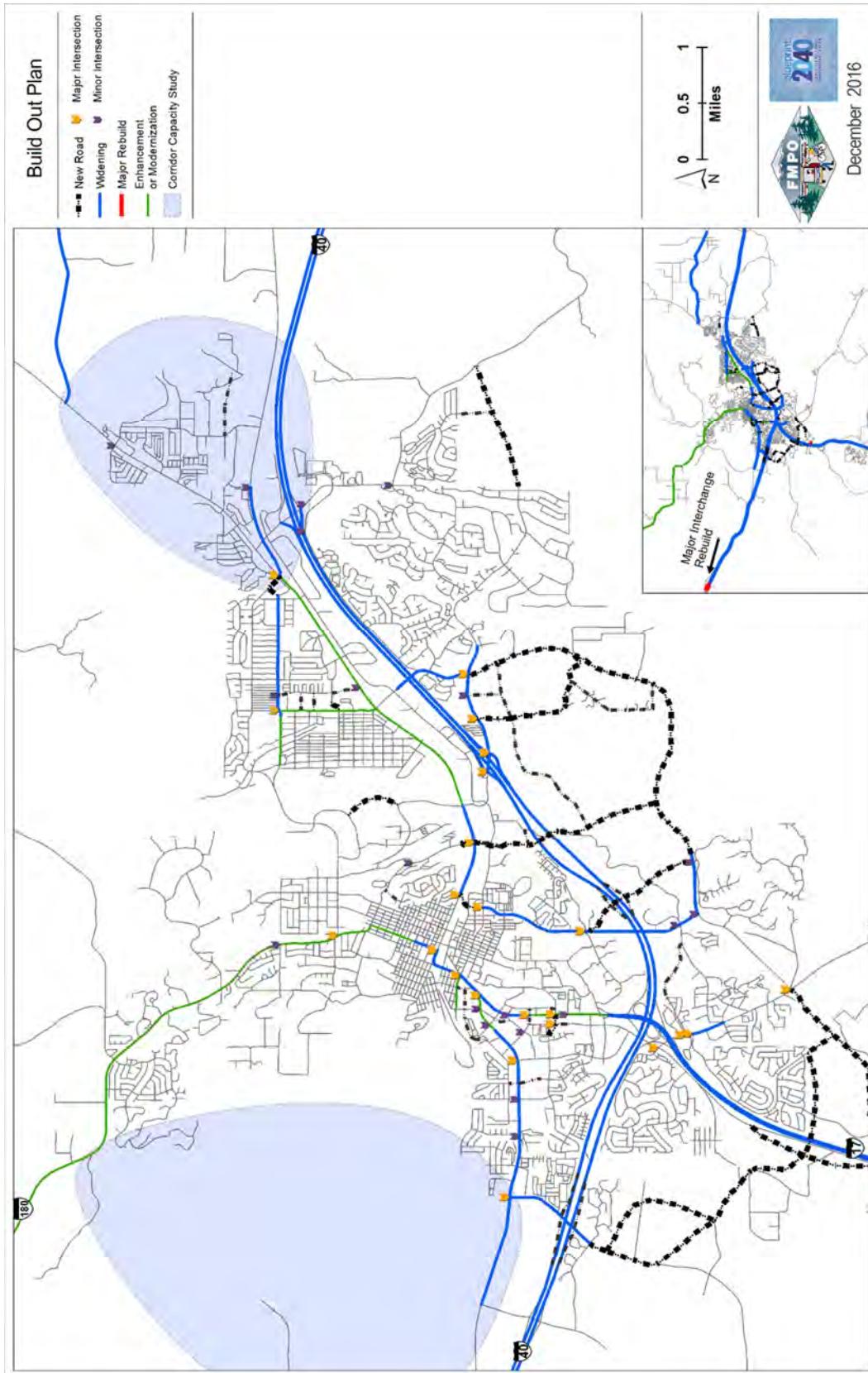
*Blueprint 2040* lays out projects and performance levels to assure that the components of the transportation system work to build the community desired.

### **Renewed commitment to Partnership**

The challenges and opportunities before this region are too great to be faced by any one agency alone. The members of FMPO are the City of Flagstaff, Coconino County, the Northern Arizona Intergovernmental Public Transportation Authority and the Arizona Department of Transportation. In *Blueprint 2040* these agencies identify projects and programs to pursue together in support of the regional vision. This collaboration embodies these principles:

- Cooperation Matters – government-to-government relations will be vital to achieve the system, project design and funding envisioned in *Blueprint 2040*
- Trust and Transparency Matter – *Transportation Decision 2000*, a series of dedicated sales tax propositions, started regional investments in transportation on an unprecedented scale. Dozens of projects have been promised and built, garnering public trust. *Blueprint 2040* is the next step in a trust-building dialogue between regional decision makers and the public.





FMPO Blueprint 2040  
Regional Transportation Plan

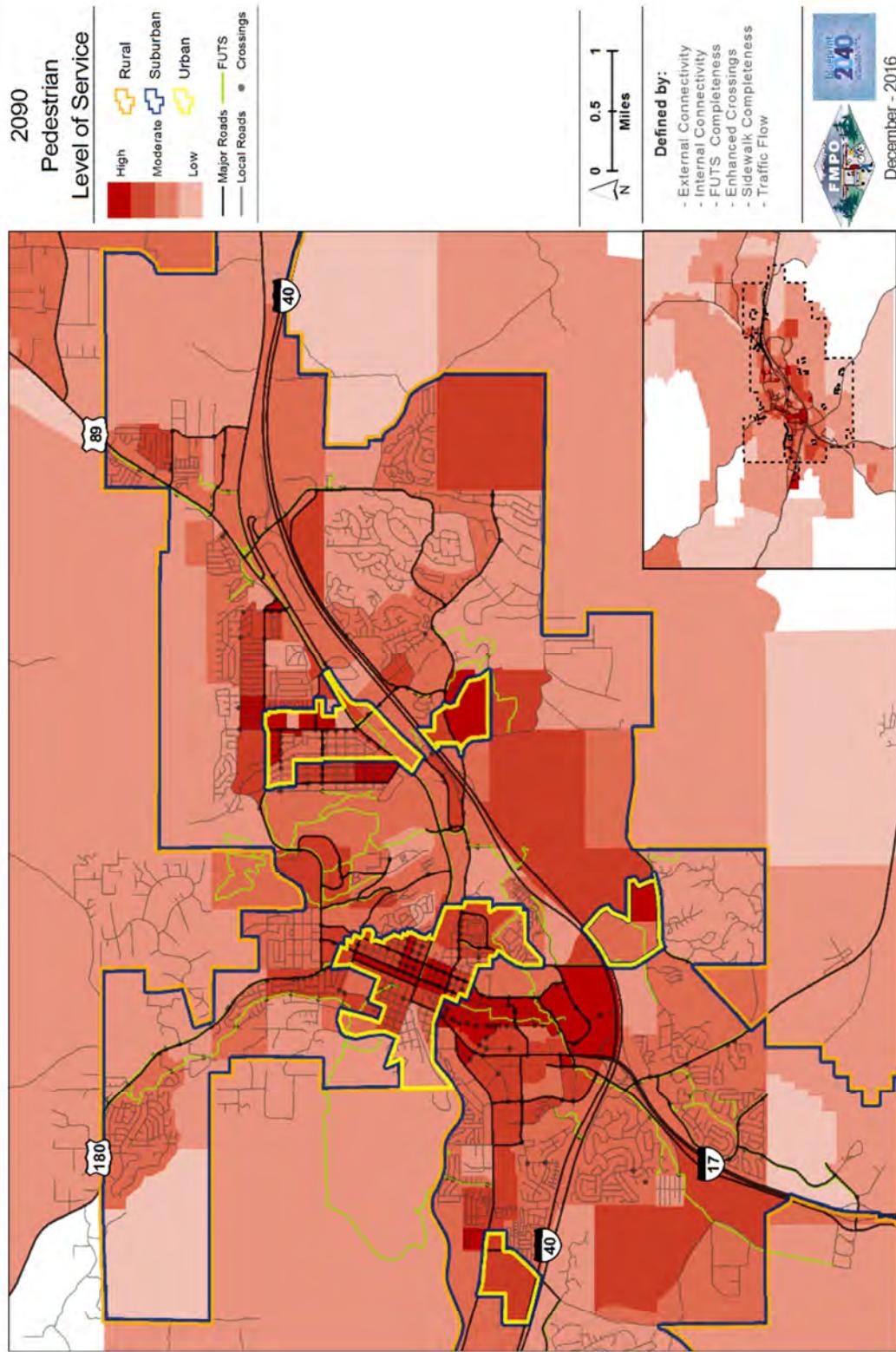


Figure 0.1 Blueprint 2040 has level of service Build Out Plans for pedestrians, bicycles and transit

## The 20-Year Program

Figure 0.3 depicts the road projects included in the multimodal program recommended to be delivered for the next 20-years. Nearly \$280,000,000 in sales tax funds, grants and other revenues are projected to be available. The program of public projects is listed here with their project identification numbers:

- Bus Rapid Transit (BRT) / High Frequency Transit (HFT)
  - Bus service from the Airport to the Mall
- Milton Road widening (MIL\_54)
- Fourth Street Bridge widening (FOU\_22)
- Fourth Street widening (FOU\_23)
  - Soliere to Butler
- J.W. Powell - Airport (JWP\_37)
- High Country Trail Extension (HCT\_27)
  - To J.W. Powell
- Lone Tree Road widening (LTR\_42, 43)
  - Butler to J.W. Powell
- Butler Avenue Widening (BUT\_6)
  - I-40 to Fourth Street
- Extensive sidewalk program
- Grade Separated and other pedestrian crossings
- Reserve Fund: partnering & contingencies
- Safety, Travel Demand Management & Technology Programs

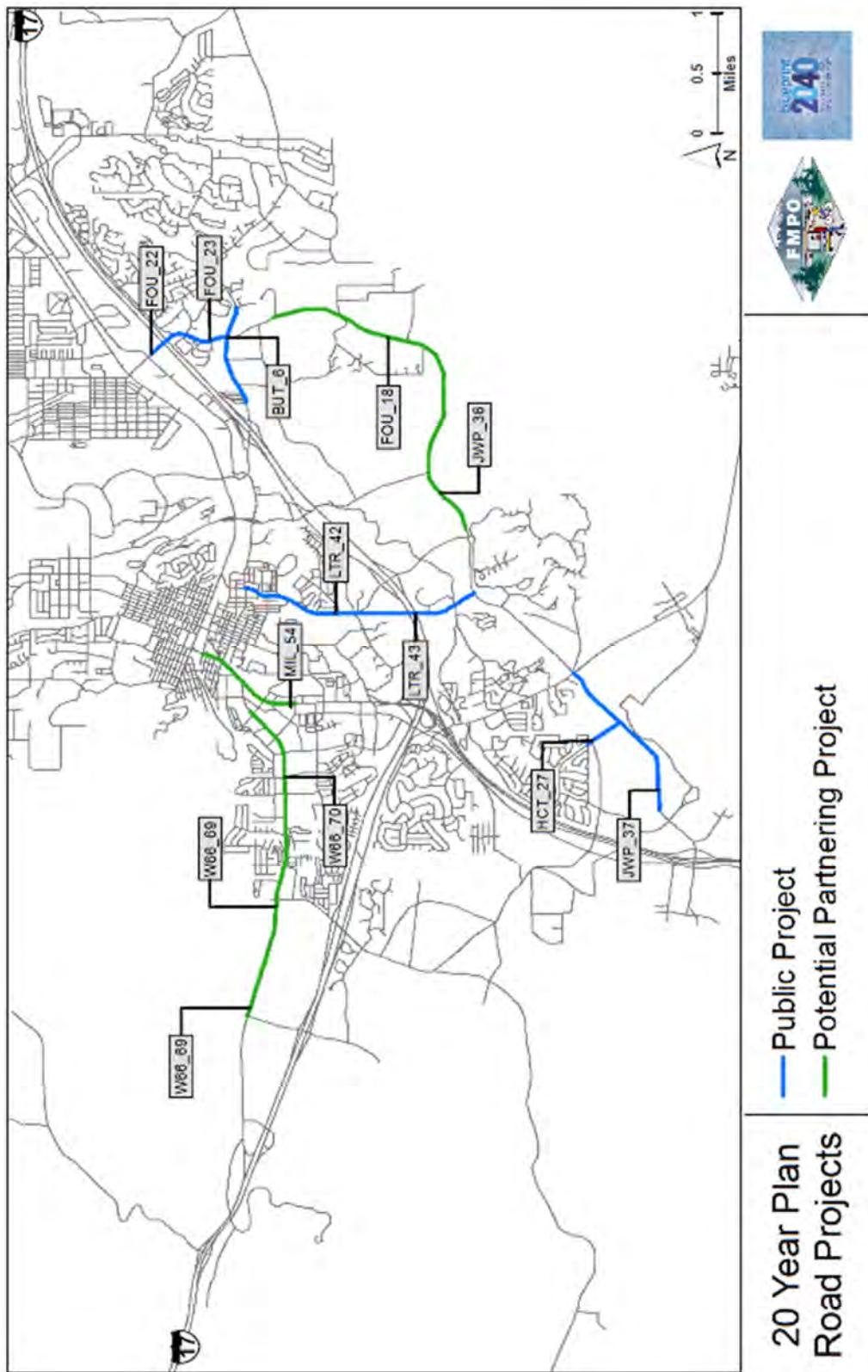
Partnering projects of a high priority are mapped, too. As the partnerships between agencies or public and private entities solidify, the partnering project may displace a public project listed above. Because partnering brings additional funds a surplus may exist and a new project could be added to the public list.

This combination of projects has been determined to best use reasonably expected funds to meet these regional needs and priorities:

- Strengthening and expanding the arterial road network to serve personal mobility for walkers, bicyclists, transit riders and drivers.
- Closing gaps within the sidewalk and bicycle networks – many along and across major roads - to make these mode choices viable, safe and attractive.
- Establishing a high frequency transit spine as a foundation to better serve existing and emerging growth centers and more easily expand to meet future needs.
- Creating an alternate route for peak event traffic to access I-17 via Lone Tree Road and J.W. Powell Boulevard.
- Identifying opportunities for leveraging funds through partnerships.

Local leaders will continue efforts through the FMPO and elsewhere to solidify partnerships, to bring additional Federal and State funds into the region, and to engage citizens and voters about transportation needs and opportunities.





## Blueprint 2040: Regional Transportation Plan

### Flagstaff Metropolitan Planning Organization

#### Chapter 1 – Foundation

### Introduction

#### The Flagstaff Metropolitan Planning Organization

The Flagstaff Metropolitan Planning Organization (FMPO) formed in September 1996 after the City of Flagstaff reached the requisite 50,000 population and related density. FMPO provides transportation planning and programming services for a planning area of 525 square-miles including the City of Flagstaff, Bellemont, Fort Valley, Kachina Village, Mountainaire, Doney Park and others (see figure 1.1).

Intergovernmental agreements established the members as the City of Flagstaff, Coconino County and State of Arizona represented by the Arizona Department of Transportation. NAIPA, the Northern Arizona Intergovernmental Public Transportation Authority, was added to the Board in January 2016. Representatives of these bodies serve on the seven-person Executive Board. The same organizations have representatives serving on the 8-member Technical Advisory Committee.

#### Blueprint 2040 and the Federal Mandate

This regional transportation plan (RTP) satisfies the requirements of 23 U.S. Code Section 134 which states that metropolitan planning organizations; "...in cooperation with the State and public transportation operators, shall develop long-range transportation plans and transportation improvements programs through a performance-driven, outcome-based approach to planning..." The 2040 Regional Transportation Plan, known as *Blueprint 2040*, is a major update of the existing RTP, *Flagstaff Pathways*, which was adopted in December 2009. It meets all federal planning requirements including:

- A minimum 20-year plan horizon;
- Reflects latest available land use, population and employment, travel and economic activity assumptions;
- Identifies long-range transportation goals and specific long- and short-range investment strategies across all modes of transportation to support meeting those goals;
- Supports regional land use and economic development policies and plans;

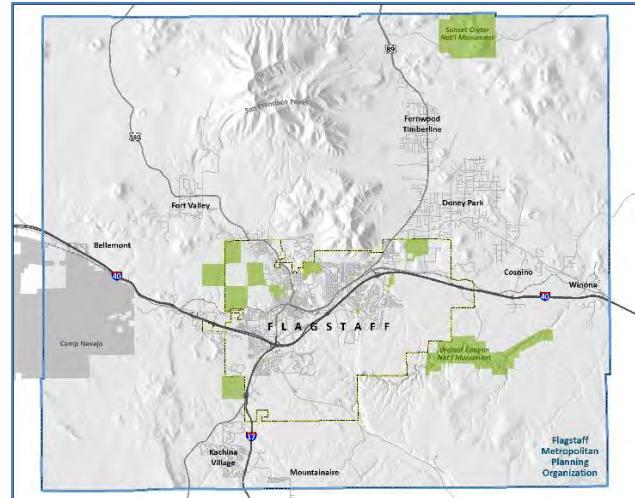


Figure 1.1 FMPO Planning Boundary

- Demonstrates fiscal constraint for all funded projects; and
- Reflects a broad set of public and stakeholder input.<sup>1</sup>

President Obama signed the *Fixing America's Surface Transportation Act*, also known as the FAST Act, on December 4, 2015. The FAST Act is a funding and authorization bill to govern United States federal surface transportation spending; it replaces *Moving Ahead for Progress in the 21<sup>st</sup> Century (MAP-21)*. The FAST Act continues many of the planning requirements of previous bills, the significant expectations for performance measurement and management from MAP-21, and adds important provisions and funding for freight.

#### Plan Overview

*Blueprint 2040* followed a standard process. Needs were identified, criteria developed for evaluating projects and systems, preferred systems selected and a list of high-performing projects developed that the region can afford. Figure 1.2 diagrams the process and will be used throughout the plan as a reference. The plan is structured around the principle of performance based planning and programming as directed in the FAST Act.

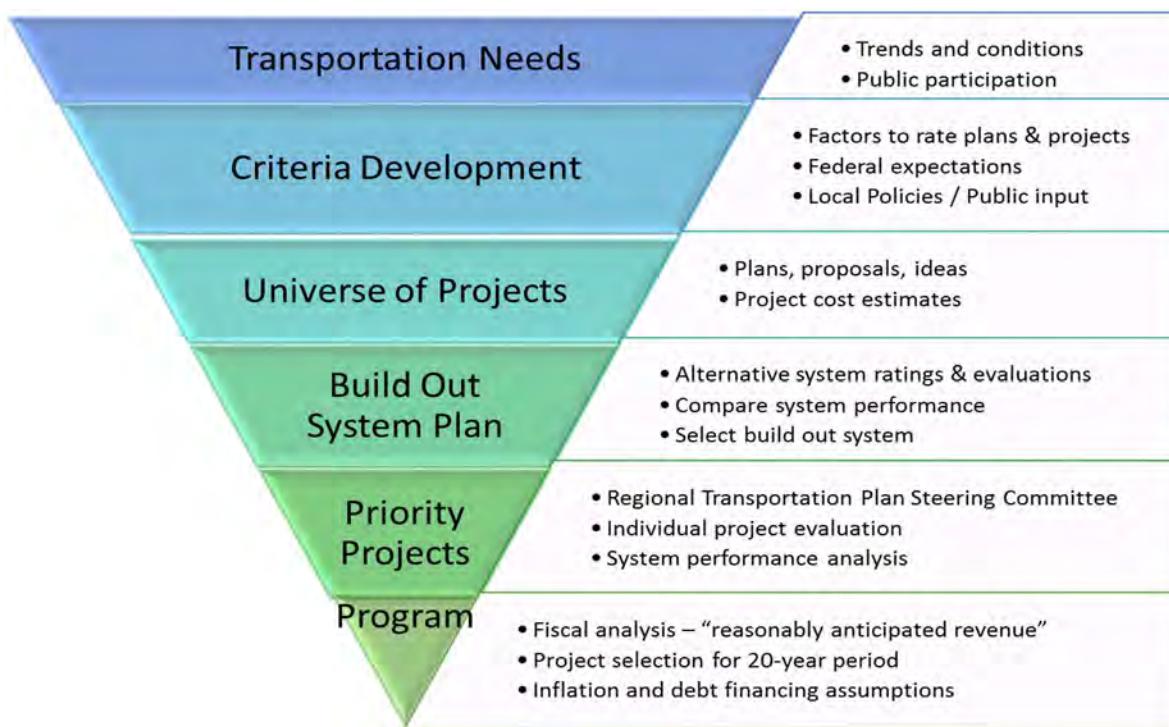


Figure 1.2 RTP Planning Process

Most chapters listed below reflect an aspect of transportation performance measurement associated with the values expressed by the region's residents:

#### *Blueprint 2040 Chapter Outline*

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>Executive Summary</li> <li>1. Introduction</li> <li>2. Trends and Conditions</li> <li>3. Public Involvement</li> <li>4. Performance Measurement</li> <li>5. Investment Needs / System Assessment</li> <li>6. System Plans and Performance</li> <li>7. Roads &amp; Streets Plan &amp; Guidance</li> <li>8. Transit Plan &amp; Guidance</li> <li>9. Pedestrian &amp; Bike Plan &amp; Guidance</li> </ul> | <ul style="list-style-type: none"> <li>10. Freight</li> <li>11. Fiscal Policy</li> <li>12. Project Priorities and Program Alternatives</li> <li>13. 20-Year Program</li> <li>14. Operations and Maintenance</li> <li>15. Safety</li> <li>16. Travel Demand Management</li> <li>17. Intelligent Transportation Systems</li> <li>18. System Preservation</li> <li>19. Environmental Justice</li> </ul> |
|---|--|

#### **Plan Context and Technical Advances**

##### *Plan Context*

*Blueprint 2040* follows on the heels of *Flagstaff Regional Plan 2030: Place Matters (FRP 2030)* which is a general plan adopted by the City of Flagstaff voters and Coconino County Board of Supervisors in May 2014. FRP2030 also serves as an area plan for outlying communities like Kachina Village and Doney Park within the FMPO Boundary. This state-mandated general plan departs from plans of the past in that it focuses much more on place type: urban, suburban and rural, identifies different categories of activity centers, and calls out "Great Streets." Important additions to the plan are elements on economic development and water. The 2040 RTP takes the transportation goals and policies in *FRP 2030* and sets more specific system plans, strategies and programs for their implementation.

*Blueprint 2040* comes in advance of a series of transportation sales taxes, voted on in 2000, that will sunset in the year 2020. These taxes implemented transportation improvements recommended in earlier general plans. Similarly, *Blueprint 2040* will frame the discussion for possible continuation of those taxes and the projects they support. It also follows recent passage of propositions 403 and 406 in Coconino County and the City of Flagstaff, respectively. These taxes largely support road

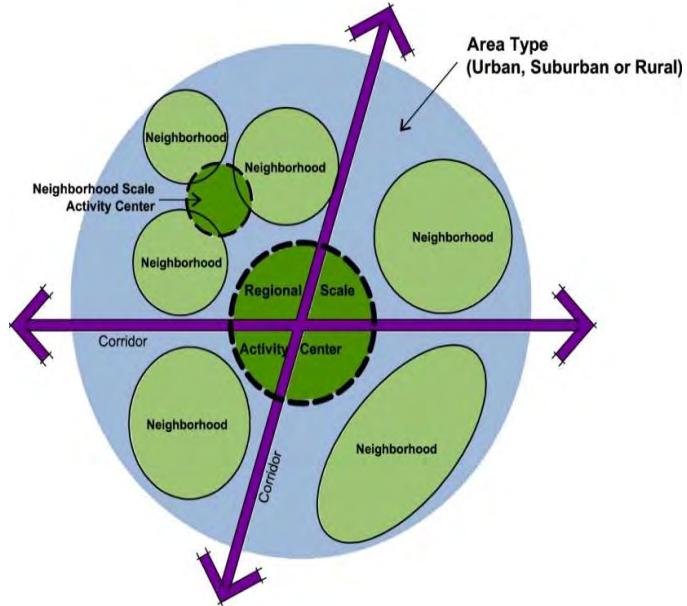


Figure 1.3 Area and Place Types, FRP2030

repair, maintenance and operations and will influence how much more citizens are willing to pay for transportation capital projects and transit operations.

### Vision & Goals

*Blueprint 2040* is dedicated to refining and implementing the visions, goals, and policies set forth in the *FRP 2030*. Transportation supports many aspirations embodied in *FRP 2030*. These are summarized here as context for the transportation policies presented in detail in later chapters.

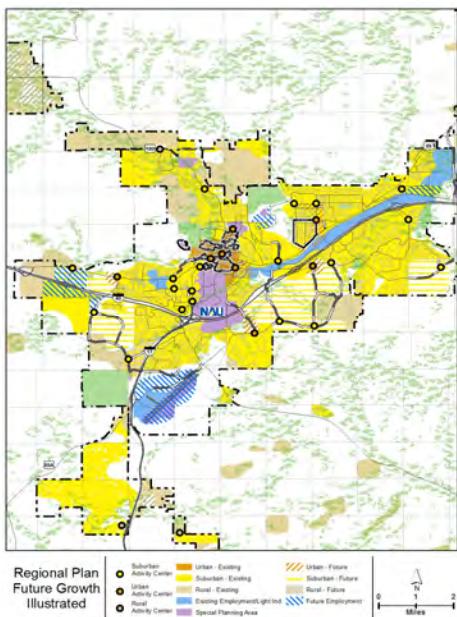


Figure 1.4 Future Growth Illustration, FRP 2030

#### FRP 2030 – Land Use and Economic Development

Development of private land in the region is intended to complement our natural and cultural environment and result in distinctive, context sensitive places for people to live, work, and play. Private lands are planned for three place types or contexts: corridors, neighborhoods, and activity centers; and five area types: Urban, Suburban, Rural, Employment Districts, and Special Districts. Readers should review the Future Growth Illustration and supporting text in *FRP 2030: Place Matters* for more information.

*FRP 2030* recognizes the strong economic role for government; education - including NAU; and tourism. It also looks to expand advanced manufacturing, biotechnology, astronomy and wood products building on the success of SCA Tissue, W.L. Gore, Lowell Observatory and others. Chapter 10 in *FRP 2030* set the transportation goals listed in Table 1.1.

These goals are in line with the federal and state transportation planning goals listed below with which *Blueprint 2040* should comply and coordinate

:

From 23 Code of the Federal Register (CFR) 450

- Support economic vitality
- Increase safety
- Increase security
- Increase accessibility and mobility
- Protect and enhance the environment
- Enhance integration and connectivity across modes
- Promote efficient operations and maintenance

**Table 1-1 Transportation Goals from the Flagstaff Regional Plan 2030: Place Matters**

Goal T.1	Improve mobility and access throughout the region.
Goal T.2	Improve transportation safety and efficiency for all modes.
Goal T.3	Provide transportation infrastructure that is conducive to conservation, preservation, and development goals to avoid, minimize, or mitigate impacts on the natural and built environment.
Goal T.4	Promote transportation infrastructure and services that enhance the quality of life of the communities within the region.
Goal T.5	Increase the availability and use of pedestrian infrastructure, including FUTS, as a critical element of a safe and livable community.
Goal T.6	Provide for bicycling as a safe and efficient means of transportation and recreation.
Goal T.7	Provide a high-quality, safe, convenient, accessible public transportation system, where feasible, to serve as an attractive alternative to single-occupant vehicles.
Goal T.8	Establish a functional, safe, and aesthetic hierarchy of roads and streets.
Goal T.9	Strengthen and support rail service opportunities for the region's businesses and travelers.
Goal T.10	Strengthen and expand the role of Flagstaff Pulliam Airport as the dominant hub for passenger, air freight, public safety flights, and other services in northern Arizona.
Goal T.11	Build and sustain public support for the implementation of transportation planning goals and policies, including the financial underpinnings of the Plan, by actively seeking meaningful community involvement.

From the Arizona Department of Transportation's Long Range Transportation Plan, *What Moves You Arizona, 2010-2035*:

- System Goals
  - Improve mobility and accessibility
  - Preserve and maintain the system
  - Support economic growth
  - Enhance safety and security
- Process Goals
  - Link transportation and land use
  - Consider natural, cultural and environmental resources
  - Strengthen partnerships
  - Promote fiscal stewardship

Table 1.2 identifies guiding principles used throughout *FRP 2030* and the *Blueprint 2040* performance measures that support them. Associated with the idea of performance based planning is the concept of planning design guidelines. For each of the modal system plans like roads and streets or bicycles, the plan sets out a series of guidelines. These are intended to assist professional staff in *system* design and bridge the gap between high-level policy and detailed engineering standards.

**Table 1-2 Blueprint 2040 Performance Measures**

FRP 2030				
<i>Guiding Principle</i>	<i>Objective</i>	<i>Measure 1</i>	<i>Measure 2</i>	<i>Measure 3</i>
People Matter	Congestion	Vehicle Delay	Vehicle Miles of Travel	Percent Lane Miles Congested
	Social Interaction	Mode Share	Pedestrian / Bike / Transit Level of Service	
	Safety	Total Crashes	Fatal Crashes	Injury Crashes
	Social Justice	Comparative Benefits by Title VI Populations		
Environment Matters	Health	Mode Share	Proximity to Walk / Bike Facilities	
	Air Quality	CO2 Estimate	Ozone Estimate	
	Habitat & Open Space	Acres impacted	Acres Developed	
Prosperity Matters	Cultural Resources	Acres impacted	Sites impacted	
	Market Access	Bottlenecks fixed	Freight System Gaps	Proximity to Transit
	Development Access	Project in or accesses future growth	Project in planned redevelopment area	Project cited by Employer
Smart & Connected Matters	Connectivity	System Gaps		
	Travel Choice	Mode share	Proximity to Pedestrian / Bike / Transit	
	Technology	Technology Budget		
Trust & Transparency Matters	Operations & Maintenance	Percent of Roads in Good Repair	Percent Buses in Good Repair	Frequency of Street Sweeping
	Social Justice	Comparative Benefits to Title VI Populations		
	Fiscal Responsibility	Benefit Cost Analysis		
Sustainability Matters		See measures on people, economy and environment		
Cooperation Matters	Partnering	Funding partners per project	Stakeholder consensus per project	

### Technical Advances

Several technical advances developed over the last several years are being employed for the first time together in support of *Blueprint 2040* including:

- Scenario Planning
- Performance Measurement
- Context Based Guidance
- Benefit Cost Analysis
- Transportation Modeling Advances

Scenario planning is strongly recommended by the Federal Highway Administration.<sup>ii</sup> It helps envision alternative futures and evaluate relative performance against desired outcomes and potential risks or influences. Scenarios are employed in two ways in this plan. The land use scenario served by *Blueprint 2040* stems from a public charrette exercise that evaluated several scenarios. *FRP 2030*'s future growth illustration is the preferred land use scenario. This plan evaluates alternative transportation system scenarios against the “future growth illustration” to arrive at an ultimate system plan. (See Chapter 6)

Performance measurement is applied much more assertively in this RTP and the programs it influences. Collaboration with stakeholders, the public and professionals yielded measures to evaluate alternatives, prioritize projects and monitor and manage the system. Aligned with broader community goals the process assures that transportation is a means to many desired ends.

Context sensitivity emerged as a practice to address the destructive application of suburban highway treatments to urban areas that depend on a walkable character to thrive. Generations of plans in the region have evolved to where we now identify urban, suburban and rural area types – different contexts - and their respective activity centers. Transportation systems adapt to serve their unique needs.

Benefit Cost Analysis is a technical advance adopted two years ago by the FMPO and applied for the first time to an RTP in *Blueprint 2040*. This tool allows for better side-by-side comparison of projects and, by evaluating the “payback” period, can help place them strategically in time.

The Regional Transportation Model is experienced two decades of continuous improvement. More quantitative analysis for pedestrian, bicycle and transit modes improves confidence and the ability to evaluate the effect of investments in these modes. New Geographic Information System (GIS)-based and off model analysis methods allow a closer look at environmental and social impacts of the transportation system.

## Chapter Conclusion

*Blueprint 2040* addresses regional, state and federal goals, expectations and mandates. It does this by establishing performance measures for the guiding principles in *FRP 2030* that extend well beyond transportation. Factors influencing how the region strives to improve transportation in the region are described in Chapter 2 – Trends & Conditions.

## Blueprint 2040: Regional Transportation Plan

### Flagstaff Metropolitan Planning Organization

## Chapter 2 – Trends & Conditions

### Chapter Overview

The chapter begins with a general policy response to the trends and conditions that affect us. It is followed by a description of the international, national and state trends that influence our region. A convergence of trends at all levels is observed. The chapter closes with an overview of regional development and investment trends and conditions that bear upon our transportation system.

Understanding these trends and conditions reveals opportunities and threats to the success of our transportation system. In turn, they influence transportation policy and investment decisions and may have effect on other policy areas.



### Policy Response to Trends & Conditions

#### **Improve and enhance the interstates and state highways serving our region**

Interstate 17 is an economic lifeline connecting Flagstaff to trading partners to the south while Interstate 40 connects Flagstaff to partners east and west. Congestion, safety, and maintenance are issues that need continual attention.

US Highway 180 and State Route 89 are also key corridors in the FMPO region with strong links to tourism and recreation. SR 89 plays an important role linking the Navajo and Hopi Reservations as well as Page to the Flagstaff region, thus facilitating trade throughout the region and beyond. Both of these highways need preservation and maintenance efforts and US 180 needs shoulder improvements to increase traveler safety and emergency service access.

#### **Pursue sustainable funding sources and partnerships**

The FMPO region should strive to strengthen the regional arterial network in order to keep pace with population growth and travel demand while collaborating with partners to advocate for increased funding. Existing arterials are predominantly owned by the State and some new arterials will be built by the private sector. Funding through local sales taxes has improved, while state and federal agency funding has remained stagnant or declined.

#### **Collaborate with the Private Sector on Supply and Demand**

Demand is influenced by the private sector in many ways. Development patterns influence the viability of mode choice. Work patterns influence peak demand. Given constraints by geography, topography, historic development patterns, and funding the FMPO region is challenged to develop an optimal road network. Therefore, strategic public and private investments are needed to optimize use of our transportation network. The region should invest in more formal and

coordinated travel demand management activities, or TDM. This will encourage employers to enact flexible hours, telework and other influential activities and encourage, incentivize employees to take advantage of them, and educate and encourage all travelers to use ride the bus, walk and bike.

#### **Invest in technology, data, and analysis**

Numerous technological advances in infrastructure, vehicles, data production, data collection and analysis are here. The region is largely unprepared to take advantage of them and should work to correct this starting with staffing resources and then infrastructure hardware and software. Public-private partnership opportunities may present themselves including areas like alternative fuel vehicle infrastructure.

#### **Build a resilient, multimodal system**

Trends in age distribution, wages, health, housing affordability, technology, increasing wildfires and regional transportation all recommend continued investment in connectivity and expansion across modes. Transit, pedestrian and bicycles systems support demographic issues and improved arterial networks assist with emergency evacuations.

International and national trends in trade and truck congestion at the ports of Los Angeles/Long Beach make it advisable to position the region for more efficient trucking and movement of goods by rail which are dependent on a robust arterial network.

#### **Coordinate and integrate across public service disciplines**

Housing, health, recreation, employment, education and transportation are basic human needs that receive considerable public resources. Coordination with transportation will deliver a win for people in need and tax payers alike.

---

## **International Trends**

### **Global Economy**

Global economic growth is slowing. Most of our regional trade is national, so import and export transportation may not be heavily impacted. However, to the degree wages, earnings and buying power are influenced it may dampen economic growth and transportation demand. This is offset by increasing production costs in emerging economies. Previous rapid growth in large economies like China put upward pressure on wages there, making investment in or nearer to the United States more attractive.

### **Lower Oil and Gas Prices**

Related to lower demand of a slower global economy, new extraction technology and Saudi Arabia's decision to maintain production, gas prices have been below \$3.00 per gallon for nearly three years after approaching \$4.00 in 2012. This is in stark contrast to projections made in 2009. Low prices tend to increase personal travel and decrease mass transit ridership.

## National Trends

The U.S. DOT produced *Beyond Traffic: Trends and Choices 2045* in 2015 as a catalyst for national dialogue on what transportation our country really needs and why. The report reveals that if we don't change, by 2045, the transportation system that powered our rise as a nation will instead slow us down<sup>iii</sup>. The content of this subsection is largely drawn from *Beyond Traffic*.

### Demographic Changes

- America's population will grow by 70 million by 2045.
- By 2050, emerging megaregions could absorb 75 percent of the U.S. population; rural populations are expected to continue declining.
- Population growth will be greatest in the South and West; existing infrastructure might not be able to accommodate it.
- It is possible that Americans, particularly millennials, will continue reducing trips by car in favor of more trips by transit and intercity passenger rail.
- In 2045 there will be nearly twice as many older Americans—thus, more people needing quality transit connections to medical and other services.<sup>iv</sup>



### Megaregions and Shifts in Population Centers

11 megaregions are linked by transportation, economics, and other factors.

They represent over 75% of our population and employment.

In 2014, 365,000 people moved to the South—up 25% from 2013—and moves to the West doubled.

Figure 2.1 Emerging Megaregions, Beyond Traffic, p. 25

### Freight and Goods Movements

- By 2045, freight volume will increase 45 percent.
- Online shopping is driving up demand for small package home delivery.
- Airline mergers and the consolidation of hubs may result in increased air traffic congestion.
- International trade balances, due in part to low U.S. energy costs, could shift from imports toward exports, but overall globalization will increase both, straining ports and border crossings.

### Freight Movement is Multimodal

Every mode of transportation moves freight, but trucking is the primary mode of freight travel.

	2012	(in tons)	2040
Truck	13.2 billion	+43%	18.8 billion
Rail	2.0 billion	+37%	2.8 billion
Waterborne	975 million	+10%	1.1 billion
Air	15 million	+250%	53 million

Figure 2.2 Freight by Mode. Beyond Traffic, p. 49

## Connected Vehicles

Vehicles that communicate are the latest innovation in a long line of **successful safety advances**.

The motor vehicle fatality rate has dropped by

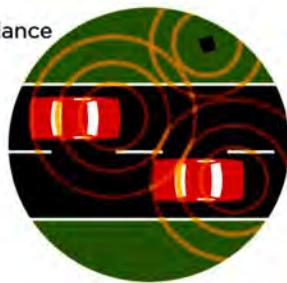
**80%**

over the past 50 years.

Connected vehicles and new crash avoidance technology could potentially address

**81%**

of crashes involving unimpaired drivers.



## Technology changes

- Technological changes and innovation may transform vehicles, infrastructure, logistics, and the delivery of transportation services to promote efficiency and safety.
- New sources of travel data have the potential to improve travelers' experience, support more efficient management of transportation systems, and enhance investment decisions.
- Data collection and analysis will become cheap and widespread. In a "big data" world, public agencies will need to develop their capacity to collect, store, analyze, and report data.<sup>v</sup>
- Automation and robotics will affect all modes of transportation, improving infrastructure maintenance and travel safety, and enabling the mainstream use of autonomous vehicles

Figure 2.3 Safety and Technology, *Beyond Traffic*, p. 100

## Climate change

- The effects of climate change will include global mean sea level rise, temperature increases, and more frequent and intense storm and wildfire events, all of which will impact highways, bridges, public transportation, coastal ports and waterways.<sup>vi</sup>

## Transportation funding stagnation

- Public revenues to support transportation are not keeping up with the rising costs of maintenance and capacity expansion.
- The federal gas tax is no longer enough to address our transportation needs.
- Overall financing uncertainty, shortfalls in the Highway Trust Fund, and the absence of reliable federal funding for rail, marine, highways, and ports have created a need for new financing mechanisms.<sup>vii</sup>

## A growing and changing economy

- The American economy has more than doubled over the past 30 years, growing at an average annual rate of approximately 2.6 percent.
- The economy is expected to double in size over the next 30 years and freight movement will increase as well, albeit at a slower rate.<sup>viii</sup>
- E-commerce accounted for 6.6% of all sales.

### A “focused” Federal role

- A consensus appears to be growing for the establishment of a more focused, goal-driven, mode-neutral, and performance-based federal transportation program. This would include development of measurable national transportation objectives that tie performance to incentives or consequences for recipients of federal funding.
- Incentivizing coordination across jurisdictions and the development of state and local revenues.
- Strengthening planning and project development at the regional level.<sup>ix</sup>

## Arizona Trends

The Arizona Town Hall (ATH) held a session on *Transportation and Arizona* from April 19-22, 2015 in Tucson, Arizona. About the same time, the Arizona Department of Transportation initiated an update to *What Moves You Arizona (WMYA)*, the statewide long range transportation plan. These are some key points from their background paper and Working Paper #1, respectively.

### Transportation trends

- The need to travel has grown exponentially as urban areas have spread
- 80% of workers commute daily by car
- Freight is moved primarily by truck
- Investments have not kept track with population growth<sup>x</sup>

### Mode share

- Cars and trucks dominate the system, but other modes are important
- Busses are the primary means of public transit with light rail and streetcars emerging in the major metro areas
- Walking and biking are up dramatically since 2000<sup>xi</sup>
- Growth provides an opportunity to potentially invest in intercity passenger rail service between Phoenix and Tucson. ADOT, working closely with federal and local agencies, will soon move forward various rail routes for further study<sup>xii</sup>

### Land use and transportation

- Land use and transportation are interdependent
- Population growth drives land development in Arizona<sup>xiii</sup>
- Home to 5.8 million residents in 2014, the Sun Corridor region’s population accounts for 87 percent of Arizona’s total population and is predicted to have a population ranging from 8.2 to 9.0 million after 2040. As the population continues to grow, development continues to spread to more rural areas and closer to public lands.
- Expected population increases not only will require housing and associated infrastructure to provide goods and services, but the continuing growth also will influence demand for recreational activities and increase the demands and challenges for public recreational lands.<sup>xiv</sup>

## Transportation and the economy

- Nationally, transportation accounts for 17% of jobs and 10% of household budgets
- Tourism and international trade depend heavily on good transportation systems<sup>xv</sup>
- Arizona is projected to outpace the U.S. in terms of job, population, and real income growth between 2015 and 2040<sup>xvi</sup>
- Diversifying Arizona's economy is a state priority and transportation plays a critical role in meeting this goal.<sup>xvii</sup>
- The largest industries in Arizona in 2014 were:
  - Finance, insurance, real estate, rental, and leasing. 21.9% of Arizona GDP and had 1.0 percent real growth.
  - Government. 13.8% of GDP and 0.6% real decline.
  - Professional and business services accounted for 0.45 percent of the total growth in real GDP. Retail trade provided for 0.44 percent of the total growth in real GDP.<sup>xviii</sup>
- In 2004, per capita personal income in Arizona was \$30,222 which ranked Arizona 37<sup>th</sup> in the U.S. Between 2004 and 2014, the Arizona per capita personal income compound annual growth rate was 2.3 percent compared to 3.0 percent nationally.
- Arizona is expected to have the nation's fastest high tech job growth at 3 percent annually from 2012- 2017. Each high-tech job creates an additional 5.8 jobs in the economy. The average high-tech wage is nearly 2.5 times greater than the average wage in Arizona.<sup>xix</sup>
- The following notes the importance manufacturing plays in the Arizona economy:
  - Over 80 percent of Arizona's \$18.4 billion in exports for 2012 were manufactured goods.
  - The largest sectors for manufactured goods were: electrical machinery, aircraft, spacecraft, machinery, and optics.
  - The average annual wage for a manufacturing position in 2012 was \$68,964. This is more than 50 percent higher than the average wage for all positions in Arizona.

## Transportation and society

- Arizona's roadways remain some of the most dangerous in the country.
- Rural households earn less, drive further and have fewer transportation choices.
- Arizona is not prepared for the coming wave of older drivers.<sup>xx</sup>
- The transportation landscape is changing – Emerging forces and trends associated with demographics, the political climate, culture and attitudes, technology, energy, the environment, and the workforce will change the way people and goods move, the challenges transportation agencies face, and the way programs and projects need to be delivered.<sup>xxi</sup>

## Transportation and energy

- Transportation in the U.S. relies on oil for 93% of its energy.
- Vehicles that run on alternative fuels are limited by the lack of refueling stations.<sup>xxii</sup>

## Paying for transportation

- State gas taxes have not been raised for decades.

- State funds for transportation are being used increasingly for Department of Public Safety purposes.
- Extended lack of funding is limiting funds for expansion of the system for future population growth.<sup>xxiii</sup>

### Critical corridors

- Arizona highways provide an important through connection from the ports in California to the rest of the U.S. Specifically, I-10 and I-40 provide an important connection from the Ports of Los Angeles and Long Beach to inland markets. Similarly, I-8 connects the Port of San Diego with I-10 in Arizona then onward to points east. The interstate highway connections in the State also provide direct access to national markets from the State's two largest metropolitan areas: Phoenix and Tucson.
- Several corridors recognized in federal legislation are of particular importance to the movement of goods within and through Arizona. (WMYA, WP1, 37-40):
  - Economic Lifeline Corridor along I-15 and I-40 in California, Arizona, and Nevada.
  - CANAMEX Corridor generally following I-19 from Nogales to Tucson, I-10 from Tucson to Phoenix, US 93 from near Phoenix to the Nevada border (future I-11)
  - Alameda Corridor (I-10 between California and Phoenix and between Tucson and New Mexico).<sup>xxiv</sup>
- It will be critical to preserve and maintain the transportation infrastructure along those corridors which are projected to experience high levels of growth. These corridors include I-40, I-19, I-17, I-10, I-8, SR 77, and SR89.
- In addition, features such as intelligent transportation systems (ITS), multi-modal options, and other congestion management measures should also be considered along these corridors to alleviate additional travel along these routes.<sup>xxv</sup>

### Asset management challenge

- From a national perspective, Arizona's transportation assets are generally in good condition, but due to both financial constraints and the age of the system, ADOT and its stakeholders will face increasing investment demands to maintain existing asset conditions.<sup>xxvi</sup>

### Arizona's transportation assets

- ADOT owns and maintains more than 10 percent (18,488 miles) of the state's total lane miles with the majority of those (11,117 miles) on the National Highway System (NHS) including more than 5,000 lane miles of Interstate.
- Another 1,627 NHS lane miles in Arizona are owned by jurisdictions other than ADOT.
- Approximately 2.23 miles of US 89 is owned by the City of Flagstaff and is part of the NHS.
- ADOT currently dedicates approximately \$220 million annually for preservation and reconstruction activities, an amount barely adequate to maintain current conditions.

- ADOT staff reports that the Department currently dedicates approximately \$40 million annually to inspection, preservation, and replacement of its nearly 5,000 ADOT-owned bridges and culverts, a funding level incapable of maintaining existing bridge conditions. Staff estimates that nearly \$60 million annually is required to maintain current conditions.<sup>xxvii</sup>
- As of 2015, there were 12 fixed route transit systems operating, which accounted for more than 25 million passenger trips in the first quarter of 2015.
- Demand response services support travel within 23 communities outside the major metropolitan areas of the State and provide critical connections to certain designated destinations, such as regional hospitals and colleges.<sup>xxviii</sup>
- The current freight infrastructure of the State is comprised of the State Highway System and urban arterials moving goods via truck throughout the State, two Class I railroads and a number of short lines, and 2 public airports providing the majority of air cargo service.<sup>xxix</sup>

Infrastructure Improvements	Capital Costs & 20-Year O&M (Billions)	Total Jobs for 20 Years
Arizona Corridors	\$ 18.8	21,700
I-19 Nogales to Tucson	\$ 2.4	2,700
I-10/I-8 Tucson to Phoenix	\$ 6.4	7,400
I-11 (US 93) Phoenix to Las Vegas	\$ 2.5	2,900
I-17 Phoenix to Flagstaff	\$ 3.0	3,500
I-10 California to Phoenix	\$ 2.3	2,600
I-10 Tucson to New Mexico	\$ 2.2	2,600
Arizona Borders	\$ 0.8	900
Arizona Bridges	\$ 0.4	400
<b>Total Improvements and Jobs</b>	<b>\$ 20.0</b>	<b>23,000</b>

Figure 2.4 Key Commerce Corridor Infrastructure Improvements Costs

Source: What Moves You Arizona

## Regional Trends & Conditions

Information for this subsection is drawn from a variety of sources. The results of these trends and transportation investments on system performance is described in later chapters. In short, connectivity and modal investments over the past 20-years have managed to keep per capita vehicle miles of travel, hours of travel and delay virtually flat. However, those trends seem on the verge of moving up in the wrong direction.

### Population growth & demographics

The FMPO region grew from a population in 2000 of approximately 69,200 to 90,300 in 2015. In 2015 the City of Flagstaff population was right at 70,000. Population in the Coconino County area of the FMPO region is expected to reach build out in 2040 at about 30,100 people. At this time the City and FMPO populations are projected to be 94,100 and 124,200 respectively.

The Arizona Department of Administration, from which these figures are derived, projects a slowing growth rate from 2% per year between 2000 and 2010 to 1.5% and 1% in the following two decades, respectively, and less than 1% annual growth rate beyond that. This places the build out population of 150,000 in year 2090. Per the American Community Survey or ACS, the Region is relatively young compared to the State due to the presence and share of population represented by NAU. In 2014 the median age for the City of Flagstaff was 27 versus 36.9 for the State. A large student population

may also effect the median wage for the Region which reported by ACS is less than that of the State, \$48,200 compared to \$50,100 in 2014. Importantly, the Region's wage actually dropped from \$49,500 in 2010 whereas the state has grown from \$46,800. NAU, however, positively affects regional educational attainment where 24.8% of the labor force had attained a bachelor's degree in 2014, up from 22.5% in 2010. The Statewide numbers for 2014 and 2010 are 17.3% and 16.7%, respectively.

#### *NAU enrollment growth*

In 2010, NAU enrollment stood at 16,000 students or 24% of the City population. By 2015, enrollment had grown to 21,100 and 30% of the City population. If the Arizona Board of Regents' goal of 25,000 students by 2020 is met, the NAU student body will represent 34% of all City residents. It is an open question of where ABOR policy for future enrollment stands, but if enrollment effectively freezes the region should see a climb in median age and wage.

#### **Regional economy**

The regional economy is dominated by small firms. According to American FactFinder there were 6,382 firms doing business in Flagstaff employing 35,676 people. According to the Economic Collaborative of Northern Arizona or ECoNA, the top 20 firms employ 14,348 people with the smallest of those firms at 133 employees. This means that the remaining 6,362 firms' average size is 3.4 employees.

**Table 2-1 City vs. State Employment Change by Industry 2010-2014**

Industry Sector	Employment					
	Flagstaff 2010	Flagstaff 2014	Percent Change	Arizona 2010	Arizona 2014	Percent Change
Agriculture	505	500	-1%	36,905	42,703	16%
Construction	2,392	1,588	-34%	244,026	180,682	-26%
Manufacturing	2,575	2,331	-9%	211,782	201,880	-5%
Wholesale	452	442	-2%	73,841	66,199	-10%
Retail	4,415	5,145	17%	334,791	338,202	1%
Transportation & Utilities	1,228	1,210	-1%	136,251	135,687	0%
Information	400	392	-2%	52,675	49,470	-6%
Finance, Insurance, Realty	1,571	1,409	-10%	225,051	219,465	-2%
Professional Services	2,313	2,347	1%	306,180	321,626	5%
Education & Social Assistance	9,955	10,368	4%	562,284	613,582	9%
Arts, Entertainment & Hospitality	5,557	6,698	21%	282,794	297,000	5%
Other Services	1,538	1,254	-18%	129,761	132,469	2%
Public Administration	1,849	1,952	6%	151,134	156,017	3%
<b>Total</b>	<b>34,750</b>	<b>35,676</b>	<b>3%</b>	<b>2,754,982</b>	<b>2,747,475</b>	<b>0%</b>

Source: American FactFinder

The industry sectors of Education & Social Sciences; Arts, Entertainment, & Hospitality; and retail have higher shares regionally compared to the state level. The state is nominally stronger in several sectors with an importantly larger share in the Finance sector.

As may be seen in the following table, the region is also dominated by these sectors:

**Table 2-2 City vs. State Employment Percentage by Industry 2010-2014**

Industry Sector	Percent of Employment			
	City 2010	City 2014	Arizona 2010	Arizona 2014
Agriculture	1%	1%	1%	2%
Construction	7%	4%	9%	7%
Manufacturing	7%	7%	8%	7%
Wholesale	1%	1%	3%	2%
Retail	13%	14%	12%	12%
Transportation & Utilities	4%	3%	5%	5%
Information	1%	1%	2%	2%
Finance, Insurance, Realty	5%	4%	8%	8%
Professional Services	7%	7%	11%	12%
Education & Social Assistance	29%	29%	20%	22%
Arts, Entertainment & Hospitality	16%	19%	10%	11%
Other Services	4%	4%	5%	5%
Public Administration	5%	5%	5%	6%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Source: American FactFinder

### Development Trends

The Region did not suffer the housing collapse as severely as the southern parts of the State and is seeing a rebound in construction and development proposals. The map below illustrates more than 5,000 housing units either under construction or in the review pipeline. Student housing proposals represent more than 2,000 of these units, more than enough to accommodate the additional 4,800 students to reach the 25,000 ABOR goal. Notably, the large subdivisions on the west and south of the City, if approved, could be the first residential subdivisions since Presidio in the Pines almost a decade ago.

The County areas of the region are seeing activity too, with a significant subdivision activity in Doney Park (62 lots), West of Flagstaff (56 lots), Bellemont (118 lots) and Kachina Village (130 lots). Additional development is in the planning process for Bellemont.

Commercial activity is rebounding, too, with new construction of a Sportsmen's Warehouse, several hotels under construction and construction of a new Harkin's Theater. The Southside has experienced a resurgence with many new restaurants and shops and is expanding into the Sawmill area east of Lone Tree.

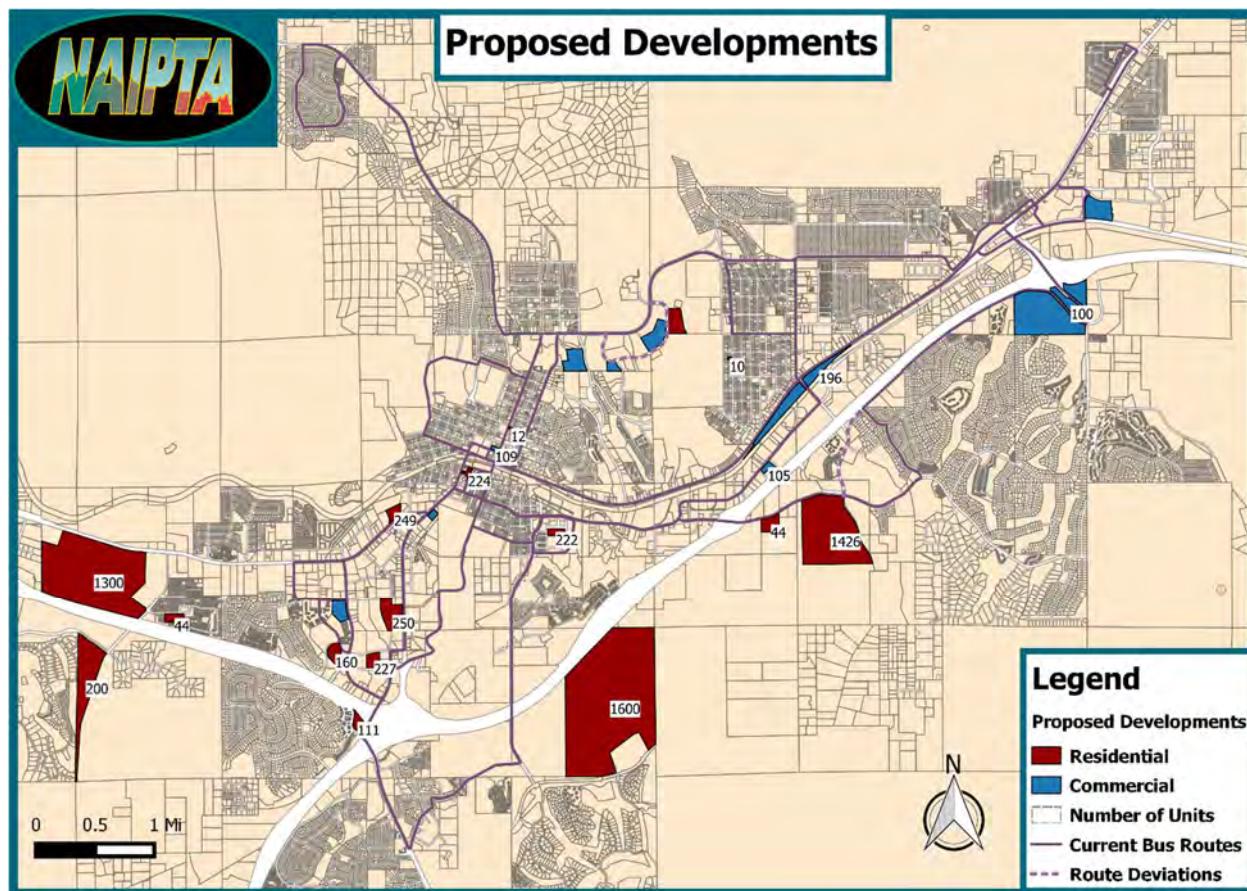


Figure 2.5 City of Flagstaff Proposed Developments.

Source: NAIPTA

### Transportation investments

Depending on the mode of transportation, investments have either kept pace with or lagged behind population growth (see Figure 2.6 – note that the first two data points span a full decade). As will be demonstrated in later performance discussions, investments made under *Transportation Decision 2000*, a package of sales tax initiatives approved by voters nearly two decades ago, have managed to mostly hold back worsening congestion, but the tide may be about to turn. Assigned to distinct modes or projects, these funds have resulted in the construction of the 4<sup>th</sup> Street

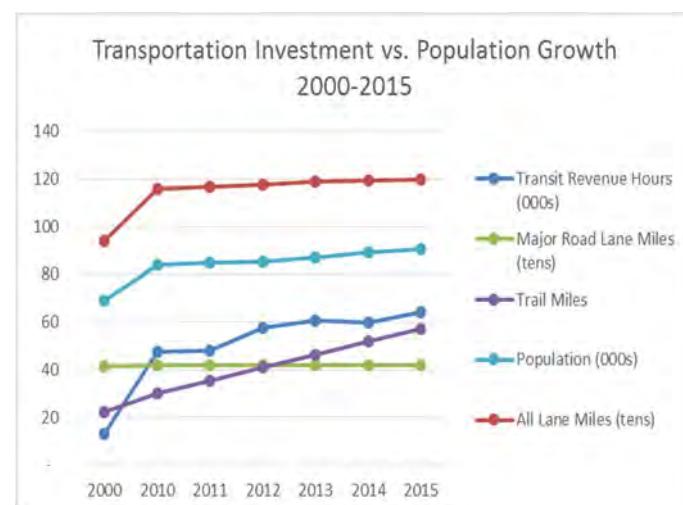


Figure 2.6 Transportation Investments vs. Population Growth.

Source FMPO

Railroad Bridge, significant expansion of transit service, and numerous road, pedestrian and bicycle improvements.

#### *Roadway investments*

Roadway investments made by the jurisdictions within the region consisted primarily of important new connections or operational improvements. Very little system capacity was added. Connectivity projects include the 4<sup>th</sup> Street Railroad Overpass, the Empire Avenue extension to US 89 and the Soliere Avenue extension to 4<sup>th</sup> Street. ADOT's East Flagstaff Traffic Interchange was largely an operational improvement replacing a functionally and structurally obsolete structure. It did add lanes to US 89 between Fanning Drive and Marketplace. Another valuable capacity project is the widening of Country Club between Soliere Avenue and I-40. One of the few new roads built in the past 20 years is the extension of Rio Rancho Road in Doney Park. This road connects Stardust Trail to Townsend-Winona Road. The County has effectively added capacity to many other roads by virtue of paving them. This includes Yancey Lane, Slayton Ranch Road and several others.

As Figure 2.6 demonstrates, the percentage of arterial lane miles added is considerably behind regional population growth and that's including residential lane miles and the paving of County roads. Of the 259 lane miles added since 2000, *only 4.3 miles have been added to major roads*. This represents only a 1% increase in major road lanes miles since 2000 in the face of a 31% increase in population.

#### *Roadway Maintenance*

In 2014, City and County voters passed propositions 406 and 403 respectively for the purposes of road and street maintenance and, for the County, road operations. Millions of dollars annually are being used to bring roads and streets into a state of good repair, replace equipment forced into extended service by the recession, and keep operations like snow-plowing from falling even further behind.

#### *Transit Investments*

Transit investments are illustrated in Figure 2.6 in thousands of revenue hours. After the initial 2000 tax campaign and renewal and expansion in 2008, it may be seen that NAIPTA is adding revenue hours faster than population growth. Given a near non-existent system before 2000, this investment was much needed. Ridership response has been even more impressive especially with the addition of the Mountain Link through NAU campus in 2011. Buses have been leaving passengers behind on that busy route due to lack of capacity.

Transit investment is not limited to service hours. NAIPTA has made important capital investments in stops, transit lanes on campus, administrative and bus storage and maintenance facilities.

#### *Pedestrian and Bicycle Investments*

*Transportation Decision 2000* included a sales tax dedicated to “safe routes to school and other pedestrian and bicycle improvements.” The Flagstaff Urban Trail System is a good example of investments made for non-motorized mobility. There were just 22 miles in the FUTS system in 2000. There are now 56 within the City and an additional 1.3 miles in the Doney Park area. Other important

investments since 2000 are the pedestrian tunnels at Route 66 and US 89, the bridge over Cedar Avenue, and sidewalks on the west side of Woodlands Village Boulevard. The West Street Corridor project added sidewalks and bike lanes to an important collector street in the Sunnyside neighborhood. In the County, new and newly paved or reconstructed streets are being built with shoulders wide enough to support pedestrians and bicyclists. Rio Rancho Road in Doney Park is an excellent example of this.

## Chapter Conclusion

The Trends & Conditions influencing the region support continued investment in multimodal improvements. This includes a more dense arterial network that supports trips by all modes and for all purposes. Development pressures and patterns will create transportation demands most likely solved through public and private partnerships, even more so than in the past. In Chapter 3 – Public Involvement, it can be seen how public sentiment aligns with these influences.

## Strategic Initiatives

Annual reporting on trends and conditions and performance measurements will help local decision makers and the public better understand the impact of their investments.

# Blueprint 2040: Regional Transportation Plan

## Flagstaff Metropolitan Planning Organization

### Chapter 3 – Public Involvement

#### Chapter Overview

The outreach effort for *Blueprint 2040* is briefly described here with a summary of the comments, concerns and ideas heard from the public. A variety of means were employed to communicate with the public and ensure broad community involvement.

Activities designed to solicit input included planning studios and focus groups, online surveys, and city/county boards and commissions meetings. A Steering Committee of 11 community leaders met over seven months to provide input on priorities. More than 600 people actively participated online and tens of thousands more were made aware through three *Cityscape* articles and numerous newspaper editorials and stories.



#### Policy Response to Public Participation

##### PUBLIC SUPPORT FOR TRANSPORTATION GOALS AND POLICIES

**Goal T.II. Build and sustain public support for the implementation of transportation planning goals and policies, including the financial underpinnings of the Plan, by actively seeking meaningful community involvement.**



Policy T.II.1. Maintain the credibility of the regional transportation planning process through the application of professional standards in the collection and analysis of data and in the dissemination of information to the public.

Policy T.II.2. Approach public involvement proactively throughout regional transportation planning, prioritization, and programming processes, including open access to communications, meetings, and documents related to the Plan.

Policy T.II.3. Include and involve all segments of the population, including those potentially underrepresented such as the elderly, low-income, and minorities (see Title VI of the Civil Rights Act of 1964 and Executive Order 12898 - Environmental Justice).

Policy T.II.4. Attempt to equitably distribute the burdens and benefits of transportation investments to all segments of the community.

Policy T.II.5. Promote effective intergovernmental relations through agreed-upon procedures to consult, cooperate, and coordinate transportation-related activities and decisions, including regional efforts to secure funding for the improvement of transportation services, infrastructure, and facilities.

Source: *FRP 2030*

DRAFT

The input received from public participation supports the following policies:

**Build a resilient, multimodal system**

Participants registered interest in improving all modes of transportation.

**Improve and enhance the interstates and state highways serving our region**

Milton Road and US 180 received considerable focus for improvement. Interstate 17 is recognized as an important connection to Phoenix.

**Pursue sustainable funding sources and partnerships**

Most people recognize funding as essential to future improvements and support partnerships among public agencies and the private sector.

**Focus on the Region's Core**

Milton, NAU, Downtown, Southside and Route 66 entering downtown received numerous comments.

**Creating new roadway connections is preferred to widening**

Generally, people are wary of widening roads as disruptive to businesses, homes and the pedestrian environment.

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## Public Participation Requirements

The citizens of the Flagstaff region expect to be engaged, want to be involved and gladly share their thoughts on how to make their home a better place. Public input is a critical and required element of any transportation plan and for *Blueprint 2040* an extensive effort was put in to place. Those involved in the process made significant contributions to identifying and placing a value on regional transportation performance measures. The measures greatly influenced system plan selection and project prioritization. Key stakeholders gave regular input to assure that plan recommendations fit within their strategic visions and fiscal realities. Other interest groups were engaged at key points in the process where their expertise, knowledge and passion allowed creative initiatives to emerge.

This section summarizes more specifically the efforts undertaken for *Blueprint 2040*. Full documentation and a listing of events can be found in Appendix A – Public Engagement.

### Participation Requirements

FMPO's *Public Participation Plan* sets out minimum public participation requirement of two public meetings and a 30-day comment period for conducting a regional transportation plan process. *Blueprint 2040* has far exceeded that by implementing a participation plan tailored to this update. In order to effectively address our Region's diversity of geography, culture, and interests; the plan utilized a variety of techniques to advertise events, inform and educate participants, and excite input.

In addition to meeting FMPO policy, the *Blueprint 2040* participation plan addresses Title VI of the Civil Rights Act which prohibits discrimination on the basis of race, color, or national origin. The Office of Management and Budget (OMB) issued Policy Directive 15, Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity, in 1997, establishing five minimum categories for data on race. Executive Order 12898 and the U.S. DOT and FHWA Order on environmental justice address persons belonging to any of the following groups: African American, Hispanic, Asian, American Indian and Alaskan Native, Native Hawaiian or Other Pacific Islander, and low-income individuals. FMPO used census data and GIS-analysis to identify where residents within these groups reside and placed ads in Hispanic media to enhance our outreach. On-line survey data tracking similar demographic features was used to compare input from these groups to the community as a whole.

## Participation Activities

*Blueprint 2040* outreach process provided for five types of public input opportunities as part of overall plan development: 1) RTP Steering Committee; 2) Public Meetings; 3) Online Public Surveys; 4) Planning Studios and Focus Groups; and 5) Targeted Employer Survey.

### RTP Steering Committee

The Steering Committee was comprised of members from the City of Flagstaff, Friends of Flagstaff's Future (F-cubed), Coconino County, Greater Flagstaff Chamber of Commerce, Arizona Department of Transportation (ADOT), Northern Arizona University (NAU), Economic Collaborative of Northern Arizona (ECoNA), Flagstaff Unified School District (FUSD), Northern Arizona Intergovernmental Public Transportation Authority (NAIPTA), and the La Plaza Vieja Neighborhood. The Steering Committee Chair was the General Manager and CEO of NAIPTA. All meetings were open to the public and meetings were attended by some citizens and media. The local media published several articles following some of the meetings.

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*"Keeping sustainability, fiscal viability, and this place we love in mind, we prioritized projects that have great impact on congestion mitigation and create resiliency through connectivity and mode choice" RTP Steering Committee Executive Summary*

---

For seven months, eleven people from these diverse organizations met monthly to *"identify priority transportation projects, related costs and viable revenue sources for turning ideas into reality."* They considered guiding principles from *FRP 2030*, revenue projections, potential partnerships, and project costs. The committee also considered public input received during the process and provided recommendations for increased engagement as necessary.

In the end, the Steering Committee recommended projects balanced across all modes and new roadway connections for Lone Tree Road at E. Route 66 and for J.W. Powell Boulevard to the airport to provide much needed alternate routes to Milton Road. The Committee recognizes that much more needs to be done and encouraged further action by all agencies. Of particular consideration is the involvement of the Arizona Department of Transportation (ADOT) and Northern Arizona University (NAU). Many state routes are identified in *Blueprint 2040* which are under ADOT jurisdiction and NAU continues to be the largest trip generator in the FMPO region. The RTP Steering Committee Executive Summary is available in Appendix A.

The map on the following page features the Steering Committee's recommended projects. State highways are prominently featured as are J.W. Powell Boulevard, Lone Tree Road, and multi-modal projects. The Committee's recommendations serve as a foundation for the final program of projects (Chapter 9). A more rigorous application of inflation and debt financing costs resulted in a smaller list of projects.



Figure 3.1 Steering Committee Members vote to prioritize projects

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*"Projects come down to money and money is expanded with partnerships. By working together, we will leverage public and private funding sources." RTP  
Steering Committee Executive Summary*

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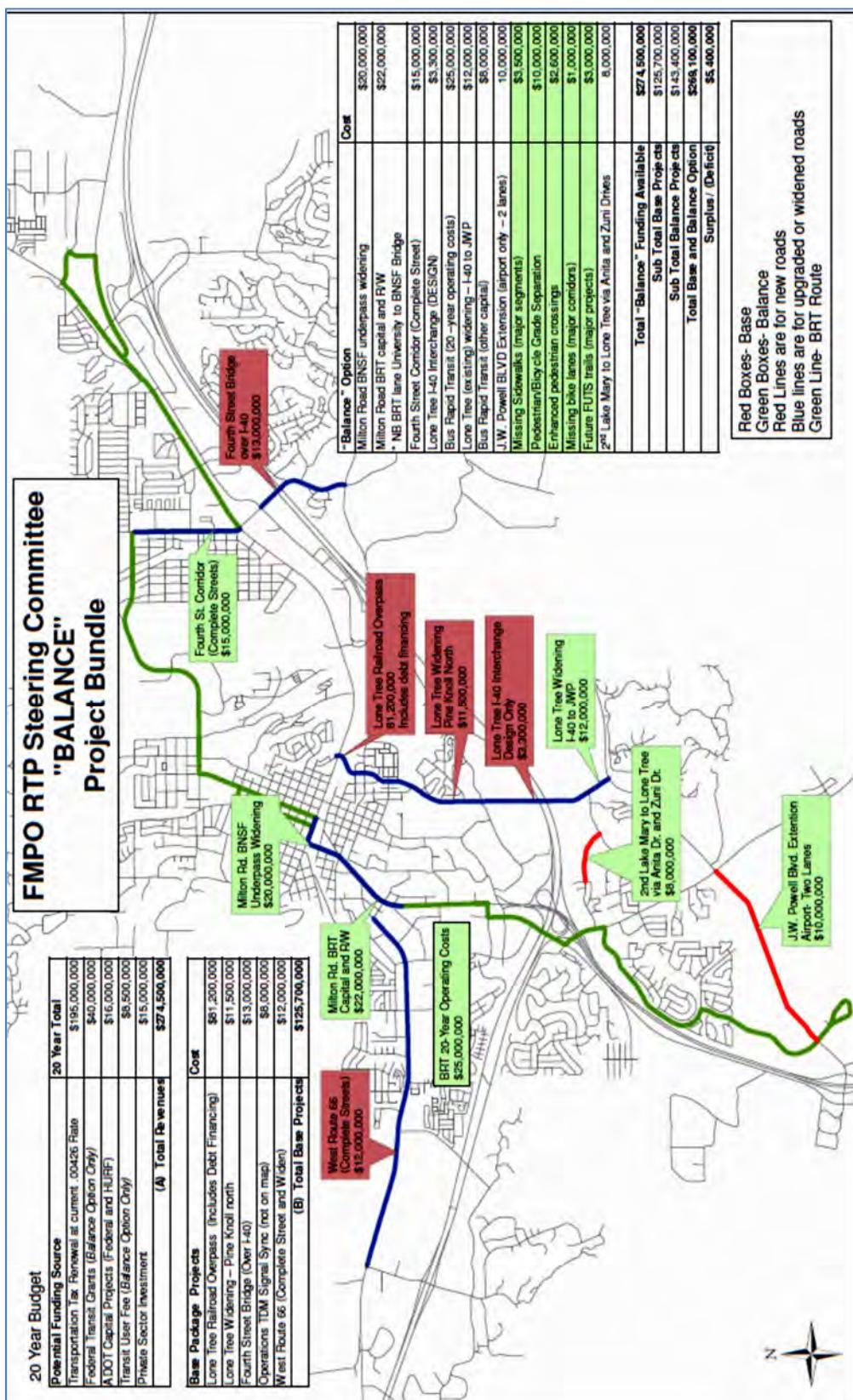


Figure 3.2 Final recommendation from the RTP Steering Committee

## Public Meetings

The many relevant boards and committees of the City of Flagstaff and Coconino County received updates on *Blueprint 2040*, provided input on interim products, and discussed recommendations. Engaging these legislative bodies early was critical to ensure their thorough understanding of the process and how recommendations were being developed. This was key as they are responsible for review and adoption of future transportation master plans to be based on *Blueprint 2040*.

The boards, commissions, and councils engaged during the process include:

- Flagstaff City Council
- City of Flagstaff Planning & Zoning Commission
- City of Flagstaff Transportation Commission
- City of Flagstaff Bicycle Advisory Committee
- City of Flagstaff Pedestrian Advisory Committee
- City of Flagstaff Disability Awareness Committee
- City of Flagstaff Tourism Commission
- City of Flagstaff Open Space Commission
- City of Flagstaff Sustainability Commission
- City of Flagstaff Historic Preservation Commission
- Coconino County Board of Supervisors
- Coconino County Planning & Zoning Commission

The Boards and Commissions generally agreed with the Steering Committee and public sentiment for focusing on the movement of people while protecting the environment and creating jobs. Likewise, whether it was the Sustainability Commission looking to save energy, the Planning & Zoning Commission wanting to support a higher density development pattern to address housing shortages, or the Open Space Commission looking to keep development contained to protect open space there was broad support for transit and multi-modal transportation investments. Commissioners from several bodies noted that investing in a multi-modal system should result in an overall transportation system that is safe, resilient, and both environmentally and economically friendly.

Regarding bypasses, a majority of commissioners, including those from the County Planning & Zoning Commission, were comfortable with the US-180 bypass. Many noted the impact of winter activity on the US-180 corridor. A desire that measures be taken to protect wildlife and prevent development from expanding in the corridor was broadly stated. A US-89 bypass is more problematic given the perceived impacts to Picture Canyon and received relatively little attention. County commissioners expressed an interest in a transit connection to Page.

On February 17, 2016 the FMPO, in conjunction with the Arizona Department of Transportation hosted 46 people to discuss long range planning. Attendees expressed support for increased focus on system preservation, creating redundancy and resiliency across all modes and particularly in rural areas, strong support for tourism and recreation and sensitivity to environmental concerns. Noise pollution, salt on roads, wildlife and dark skies lighting were all specifically mentioned. Funding needs at the local and state levels were cited frequently. The event focused on goal setting, but two

projects were mentioned: Support for a US 180 bypass and concerns about W. Route 66 becoming the “New Milton,” an unwelcome outcome.

### Online Surveys

An on-line tool, *Peak Democracy*, was used to engage a broad array of residents, businesses, and stakeholders through the Flagstaff Community Forum on the City of Flagstaff website. Four surveys were issued. The first was a Transportation Values Survey, the second was a Future Spending Survey, the third was a Walking and Biking Survey, and the fourth sought input on the 20-year program. An Employer Survey was also issued in partnership with ECoNA, the Economic Collaborative of Northern Arizona.

#### *Transportation Values Survey*

The Transportation Values Survey had a total of 676 visitors and 460 responses; representing 23 hours of public comment based on three minutes per response. This survey sought to understand priorities within and between moving people, creating jobs, strengthening neighborhoods and protecting the environment. The most important objectives within each category are:

- Moving people: well-maintained roads, sidewalks, and trails
- Creating jobs: access to current employment centers for employees
- Strengthening neighborhoods: complete streets that are comfortable for bicycles and pedestrians
- Protecting the environment: protecting water quality and resources

People were then asked to prioritize across the categories. Not surprisingly, “To move people” is the highest priority for a transportation plan. These are the results from the 460 responses:

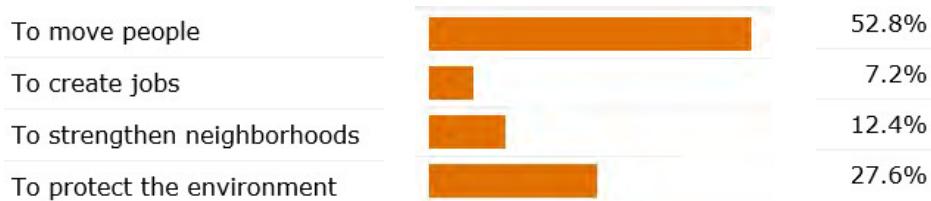


Figure 3.3 A result from the Transportation Values Survey

The results were used as input when creating criteria weights for project scoring which is presented in Chapter 9.

For more information on the Community Values Survey see Appendix A.

#### *Future Spending Survey*

The Future Spending Survey asked respondents to help guide the FMPO forward in how to prioritize spending for the future of regional transportation. This survey had a total of 559 visitors and 372

responses; representing 18.6 hours of public comment based on three minutes per response. The survey results identified average future spending priorities per mode as follows:

- Roadways: Preservation (40%); Modernization (31%); Expansion (26%)
- Bus/transit: Expansion (40%); Preservation (33%); Modernization (25%)
- Walk/Bike: Expansion (48%); Modernization (26%); Preservation (25%)

Respondents also emphasized spending funds on bypasses to relieve congestion and that they would rather invest more in bus/transit, pedestrian, and bicycle infrastructure to avoid the impact of widening roads.

#### *Walking and Biking Survey*

The Walking and Biking Survey asked citizens to help determine which potential pedestrian and bicycle infrastructure projects are most important or of greatest priority. Citizens were given a limited number of voting dots to assign to projects with the greatest priority. These are the projects receiving the most dots by category:

- Project type (e.g., bike lanes, missing sidewalks, etc.): filling in missing bike lanes
- Completing missing sidewalks: The Fourth Street corridor
- Completing missing bike lanes/creating a complete street: The Milton Road Corridor
- Location for an overpass/underpass: Downtown (underpass)
- Location for enhanced crossings: West Route 66

#### *Flagstaff Major Employer Survey*

FMPO worked closely with ECoNA to develop and execute a survey to businesses to identify transportation investments critical to regional business expansion. The input would assist in prioritizing transportation project investments. The survey results are as follows:

- 75% of employers have expansions plans in the next five years
- Over 50% of those with expansion plans expect a modest to significant expansion in market base
- Over 40% felt that transportation improvements were critical to the success of their expansion plan



Figure 3.4 Citizens participants at a RTP planning studio

#### **Planning Studios and Focus Groups**

In January and February 2016, the FMPO hosted three pairs of mode-based planning studios and focus groups around the following topics: roads & streets, transit, and pedestrians & bicycles. The two different focused events (Planning Studios and Focus Groups) were held on the same day to solicit input. The planning studios were open to the

public and involved area professionals. Images of the maps they produced are available in **Appendix A**. In spite of efforts to recruit the general public for the focus group meetings, they were attended by advocates for a particular mode.

Nine members of the public participated in the Pedestrian & Bicycle Planning Focus Group. Members identified where Flagstaff is succeeding with pedestrian and bicycle infrastructure. It was agreed there is a good mix of paved and unpaved trails, there are multiple routes connecting various places, and bike racks on NAIPTA buses help ease commutes. The public also identified where Flagstaff can do better which included better crosswalks, more grade separated crossings, more bike parking, and improved winter maintenance. Participants of the planning studio agreed that grade separated crossings were among the most important projects to consider to improve conditions for walking and biking.

Six members of the public attended the Roads & Streets Focus Group. They noted that capacity on roads like Milton was not keeping pace with growth. There was general support for expanding capacity with bypasses and new connections were favored over widening roads. Widening, when done, should accommodate all modes. The studio session for Roads & Streets added 10 staff people from various agencies. Participants concurred with the focus group on a preference for new connections over wider roads. They also noted that parking requirements may be too limited to support anticipated growth.

Seven members of the public attended the Transit Focus Group. Service to major destinations and special events, bike racks on buses, and providing an efficient system were recognized as what NAIPTA/Mountain Line is doing well. Individuals identified needs to serve neighborhoods and outlying areas and providing good connections to transit stops for the ‘first and last mile’. Road widening was only acceptable when it would accommodate other modes of transportation, not just vehicles.

FMPO also met with the Conservation Study Forum, an ad hoc group of professionals and citizens dedicated to preserving and improving the natural environment.

### **Information and Earned Media**

Information about *Blueprint 2040* was posted on the MoveMeFLG.com website. Articles were placed in the Cityscape in March and May that is circulated to 34,000 addresses. Since the launch of the effort, the Arizona Daily Sun published eight articles and editorials.

### **Social Media**

Social media was used to inform people about upcoming regional transportation plan events including on-line surveys and general happenings in transportation. It was not used as a direct means of collecting input.

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## FMPO Executive Board Adoption and Technical Advisory Committee Recommendation

The FMPO Executive Board adopted *Blueprint 2040: FMPO Regional Transportation Plan* on February XX, 2017. This followed the Technical Advisory Committee recommendation earlier that month. These open meetings were duly posted and advertised.

The TAC recommended the draft for release for public comment on December 1, 2016 and the Executive Board followed on February XX, 2017. Over the XX day comment period XX comments were received and addressed. Responses to the public comment may be found in Appendix A.

[NOTE: Highlighted text will be updated at adoption]

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### Chapter Conclusion

Residents and visitors of the Flagstaff region display a consistency of opinion over time: Reduce congestion, provide the ability to walk and bike safely, protect the environment and community character. This “political” reality lends guidance to transportation system performance measurement, the topic of Chapter 4, and eventually the projects to be selected.

## Blueprint 2040: Regional Transportation Plan

### Flagstaff Metropolitan Planning Organization

#### Chapter 4 – Performance Measures

### Chapter Overview

Performance based planning and programming is a federal requirement for regional transportation plans. This chapter describes the measures used by FMPO to meet these requirements and advance regional objectives. The results of these measurements are found in Chapter 5 – System Needs Assessment and Chapter 6 – System Plan and Performance.

Measures are applied for several purposes from system evaluation and monitoring to project selection. Depending on the purpose, the measures may be adapted, often in regard to precision. At the highest level, they are used to select one transportation scenario over another and fewer measures are applied for this purpose. At a medium level, measures are used to evaluate competing bundles of projects in a fiscally-constrained condition. In the case of *Blueprint 2040*, that condition is the revenues projected to be reasonably available between years 2020 and 2040. More measures are applied in this case to create a distinction between alternatives. At the deepest level, project selection, measures become more discreet and are used to rank projects for effectiveness. Finally, measures are used to monitor the effectiveness of both projects and systems over time.



### Policy Response to Performance Measures

#### FAST Act National Performance Goals

The FAST Act retained the MAP-21 emphasis on the use of performance-based planning. Although specific to the federal-aid highway program, many of these themes have a universal application over all travel modes. The planning factors listed below gave rise to the national goals and measures immediately following:

#### FAST Act Planning Factors

1. Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency;
2. Increase the safety of the transportation system for motorized and non-motorized users;
3. Increase the security of the transportation system for motorized and non-motorized users;
4. Increase the accessibility and mobility of people and for freight;

5. Protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns;
6. Enhance the integration and connectivity of the transportation system across and between modes for people and freight;
7. Promote efficient system management and operations; and
8. Emphasize the preservation of the existing transportation system.

*FAST Act National Goals and Measures*

- *Safety:* To achieve a significant reduction in traffic fatalities and serious injuries on all public roads
  - 5-year rolling average of fatalities and serious injuries (and rate per 100 million vehicle miles traveled).
  - Non-motorized fatalities and serious injuries
- *Infrastructure condition:* To maintain the highway infrastructure asset system in a state of good repair
  - Percent of interstate highway in good condition and percent in poor condition (ADOT provided)
  - Percent of non-interstate national highway system in good and poor condition (ADOT provided)
  - Percent of national highway system bridges in good and poor condition (ADOT provided)
  - Transit Asset Management Plan (Tier II) including inventory, condition assessment, decision support tools and investment prioritization (NAIPTA provided)
- *Congestion reduction:* To achieve a significant reduction in congestion on the National Highway System
  - Peak hour travel time on the interstate and non-interstate national highway system (Not applicable to small MPOs)
- *System reliability:* To improve the efficiency of the surface transportation system
  - Percent of interstate and non-interstate national highway system with travel time reliability within 1.5 times threshold of free flow condition (ADOT supplied)
- *Freight movement and economic vitality:* To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development
  - Percent of interstate with reliable truck times (ADOT provided)
  - Percent of interstate with uncongested average truck speed (ADOT provided)
- *Environmental sustainability:* To enhance the performance of the transportation system while protecting and enhancing the natural environment
  - Congestion Mitigation/Air Quality – traffic congestion and on road mobile emissions (Not applicable to small MPOs)
- *Reduced project delivery delays:* To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices

States are expected to develop their own metrics in pursuit of these goals and MPO's are to follow suit in aligning with their respective states. Federal guidance has been greatly delayed and ADOT is

still refining its measures. So, the challenge within the *Blueprint 2040* process is to do our best to both anticipate Arizona's response to these national goals and align our measurement regime with it and the advancement of regional policy objectives. To meet this aim, the regional plan transportation goals were aligned first with federal planning factors to assure all were addressed. There are regional goals from the *Flagstaff Regional Plan 2030 (FRP 2030)* associated with each of the eight planning factors previously mentioned in Table 4.1 on the following page.

These *FRP 2030* transportation goals were also aligned with their appropriate guiding principle from the plan and measures established for each. This assures the higher principles are being well-served by the transportation system plans and recommended investments. The measures were reviewed and approved by the RTP Steering Committee and the FMPO governing structure. Table 4.2 shows this relationship between principles, goals and measures.

The measures presented for consideration took into account the data available and the ability of staff to maintain them. Please see **Appendix B** for a full description of the measures and the methodology used to develop and apply them.

**Table 4-1 Flagstaff Regional Plan 2030 Goals and FAST Act Planning Factors**

Themes	Regional Plan Goals	FAST Act Planning Factor
Mobility and Access	T.1. Improve mobility and access throughout the region.	4, 5, 6, 7, 8
Safe and Efficient Multimodal Transportation	T.2. Improve transportation safety and efficiency for all modes.	1, 2, 3, 7
Environmental Considerations	T.3. Provide transportation infrastructure that is conducive to conservation, preservation, and development goals to avoid, minimize, or mitigate impacts on the natural and built context.	5, 6
Quality Design	T.4. Promote transportation infrastructure and services that enhance the quality of life of the communities within the region.	1, 5, 6
Pedestrian Infrastructure	T.5. Increase the availability and use of pedestrian infrastructure, including FUTS, as a critical element of a safe and livable community.	1, 2, 6, 8
Bicycle Infrastructure	T.6. Provide for bicycling as a safe and efficient means of transportation and recreation.	2, 6, 8
Transit	T.7. Provide a high-quality, safe, convenient, accessible public transportation system, where feasible, to serve as an attractive alternative to single-occupant vehicles.	2, 6, 8
Automobiles	T.8. Establish a functional, safe, and aesthetic hierarchy of roads and streets.	1, 4, 6, 8
Passenger Rail and Rail Freight	T.9. Strengthen and support rail service opportunities for the region's businesses and travelers.	1, 4, 6, 8
Air Travel	T.10. Strengthen and expand the role of Flagstaff Pulliam Airport as the dominant hub for passenger, air freight, public safety flights, and other services in northern Arizona.	1, 4, 6
Public Support for Transportation	T.11. Build and sustain public support for the implementation of transportation planning goals and policies, including the financial underpinnings of the plan, by actively seeking meaningful community involvement.	--

**Table 4-2 Blueprint 2040 Performance Measures**

<i>FRP 2030 Guiding Principle / Goals</i>	<i>Objective</i>	<i>Measure 1</i>	<i>Measure 2</i>	<i>Measure 3</i>	<i>Targets or Trends</i>	
Congestion	Vehicle Delay	Vehicle Miles of Travel	Percent Lane Miles Congested	Maintain current levels per capita		
Social Interaction	Mode Share	Pedestrian / Bike / Transit Level of Service	--	<ul style="list-style-type: none"> <li>▪ Increase combined mode share to 30%</li> <li>▪ Increasing context sensitive LOS</li> </ul>		
<b>People Matter</b>						
T.1 Mobility, Access	Safety	Total Crashes	Fatal Crashes	<ul style="list-style-type: none"> <li>▪ Decreasing crashes</li> <li>▪ Zero Fatalities</li> <li>▪ Decreasing injuries</li> </ul>		
T.2 Safety, Efficiency						
T.11 Public support	Social Justice	Comparative Benefits by Title VI Populations	--	<ul style="list-style-type: none"> <li>▪ Equality of service</li> </ul>		
	Health	Mode Share	Proximity to Walk / Bike Facilities		<ul style="list-style-type: none"> <li>▪ Increase combined mode share to 30%</li> <li>▪ Increasing percent of homes within ¼ mile of a primary network</li> </ul>	
	Air Quality	CO2 Estimate	Ozone Estimate	--	<ul style="list-style-type: none"> <li>▪ Decreasing CO2 and Ozone levels</li> </ul>	
<b>Environment Matters</b>						
T.3 Conservation	Habitat & Open Space	Acres Impacted	Acres Taken	--	<ul style="list-style-type: none"> <li>▪ Best practices employed</li> </ul>	
T.4 Design	Cultural Resources	Acres impacted	Sites impacted	--	<ul style="list-style-type: none"> <li>▪ Best practices employed</li> </ul>	

Table 4-2 Blueprint 2040 Performance Measures (continued)						
FRP 2030 Guiding Principle / Goals	Objective	Measure 1	Measure 2	Measure 3	Targets or Trends	
<b>Prosperity Matters</b> T.1 Access T.9 Freight T.10 Air Travel	Market Access	Bottlenecks fixed	Freight System Gaps	Proximity to Transit	▪ Bottlenecks removed ▪ Identified gaps closed ▪ Increasing % of households within $\frac{1}{4}$ mile of transit	
	Development Access	Project in or accesses future growth	Project in planned redevelopment area	Project cited by Employer	▪ Identified gaps closed	
	Connectivity	System Gaps	--	--	▪ See earlier measures	
<b>Smart &amp; Connected Matters</b> T.2, T.5 – T.9 Pedestrians, Bicycles, Transit, Autos, Freight	Travel Choice	Mode share	Proximity to Pedestrian / Bike / Transit	--	▪ Projects using technology	
	Technology	Technology Budget	--	--	▪ 70% of roads with OCI of X or better X% of buses in good condition Increasing frequency of sweeping	
	Operations & Maintenance	Percent of Roads in Good Repair	Percent Buses in Good Repair	Frequency of Street Sweeping	▪ See above	
<b>Trust &amp; Transparency Matters</b> T.2, T.5 – T.9, T.11 Safety, Pedestrians, Bicycles, Transit, Autos, Public Support	Social Justice	Comparative Benefits to Title VI Populations	--	--	▪ Projects with BCR of less than 1.5 justified on other grounds	
	Fiscal Responsibility	Benefit Cost Analysis	--	--	▪ Leverage 5-year program by 15-20%	
	See measures on people, economy and environment			Stakeholder consensus per project	--	
<b>Cooperation Matters</b> T.11 Public support	Partnering	Funding partners per project				

### *Target Setting*

Target setting is very useful in the monitoring and achievement of goals. Many states and communities are opting to set trend directions instead of hard and fast targets. Another approach is the benchmarking against peer communities, which is employed here. Targets may be ultimate, such as zero traffic deaths, with incremental targets along the way. The FAST Act does not establish penalties for failing to reach targets.

### *Peer Cities – What will our story be?*



Figure 4.1 Flagstaff's Peer Cities

Flagstaff compares itself to eleven cities. These cities are chosen as peers based on their proximity west of the Mississippi River, population size, and presence of a university in the town.

For the purpose of this plan Flagstaff is compared most closely with Bellingham, Washington; Boulder, Colorado; Bozeman, Montana; Missoula, Montana; and Santa Cruz, California. These cities are doing well with strong Walk Friendly and Bike Friendly designations, they are recognized among the best places to live in America, and enjoy high percentages of mode share.

### **Mode Share: What's the Story?**

There is room to improve. Flagstaff enjoys a good reputation for alternate mode use. Compared to its western peers, however,

Flagstaff is about average (see Table 4-5). A closer look at communities where the university population percentage is similar to our 29% (Boulder-31%, Santa Cruz 28%, Bozeman 37%) shows Flagstaff still lagging in most categories. Importantly, two of the three have similar climates. Flagstaff would nearly double its combined non-automotive mode share from 15.6% to 29.5% if it were to match the highest of these three peer cities in each category.

**Table 4-3 Peer City Mode Share**

Transit Mode Share			Walking Mode Share			Biking Mode Share		
City	Percent	Rank	City	Percent	Rank	City	Percent	Rank
Boulder	9.0%	1	Corvallis	12.2%	1	Davis	70.7%	1
Davis	6.5%	2	Santa Cruz	9.9%	2	Corvallis	12.5%	2
Bellingham	5.8%	3	Boulder	9.8%	3	Boulder	10.6%	3
Santa Cruz	5.4%	4	Bozeman	9.8%	4	Santa Cruz	9.5%	4
Corvallis	2.9%	5	<b>Flagstaff</b>	<b>9.4%</b>	<b>5</b>	Missoula	6.2%	5
<b>Flagstaff</b>	<b>2.7%</b>	<b>6</b>	Bellingham	8.3%	6	Bozeman	5.8%	6
Missoula	2.0%	7	Missoula	7.5%	7	Chico	5.5%	7
Pocatello	1.9%	8	Chico	5.4%	8	<b>Flagstaff</b>	<b>4.5%</b>	<b>8</b>
Chico	1.3%	9	Pocatello	4.2%	9	Bellingham	3.4%	9
Bozeman	1.3%	10	Bend	3.5%	10	Bend	2.2%	10
Bend	0.7%	11	Davis	3.4%	11	Pocatello	1.5%	11
Las Cruces	0.5%	12	Las Cruces	2.7%	12	Las Cruces	1.1%	12
Average	3.3%			7.2%			11.1%	

Source: ACS 5-Year Estimates (2009-2013)

### Road Network Density: What's the Story...

The communities in the next table range considerably in population, but have similar arterial densities. When evaluating key measures, Vehicle Miles of Travel (VMT) per capita and Vehicle Hours of Travel (VHT) per capita, one could draw these conclusions:

- Exceptional arterial density and good mode share is a winning combination. (WCOG)
- Good arterial density of the high capacity facilities can compensate for modest mode share. (RTC)
- Exceptional arterial density can partially compensate for poor mode share (5-County)
- Very good mode share can compensate for poor to modest arterial density. (FMPO)
- Poor arterial density and poor mode share is a losing combination. (KYOVA)

Given local challenges to increasing arterial density, overcompensating on mode-share is advised.

Table 4-4 Road Network Density

	Flagstaff MPO Urbanized Area (UA)	RTC Washoe (Reno, NV) Urbanized Area	5-County MPO (St. George, UT) Urbanized Area	WCOG (Bellingham, WA) Urbanized Area	KYVOVA (Huntington, WV) Urbanized Area
UA Population 2010	71,957	392,141	98,370	114,473	202,637
UA Land area (sq. miles) (FHWA, Highway Statistics Series)	34.83	164	44.89	48	130
Urbanized Area Density (population / sq. mile)	2,066	2,386	2,191	2,379	1,555
UA/MPO Land	7%	3%	10%	2%	8%
Model-generated VMT (per capita)	18	17	24	17	28
Model-generated VHT (per capita)	0.58	0.51	0.59	0.46	0.85
UA/MPO VMT	58%	89%	91%	55%	66%
Lane miles by functional classification					
Freeways & Expressways	81	205	169	136	149
Principal Arterial	41	74	315	146	142
Other Principal-Major Arterials	--	455	--	--	--
Minor Arterial	62	576	--	271	251
Arterial Lane miles / land area	5.3	8.0	10.8	11.5	4.2
Arterial lane miles per capita	2.56	3.34	4.92	4.83	2.67
Central City Mode Share (Journey to Work)					
Car	65%	77%	80%	69%	79%
Carpool	12%	10%	9%	7%	8%
Transit	3%	3%	0%	6%	2%
Walk	10%	2%	3%	5%	3%
Bike	5%	1%	2%	0%	0%

## Chapter Conclusion

The performance measures selected for *Blueprint 2040* are aligned with the guiding principles of *FRP 2030*. This will help transportation serve as a means to many ends within the region. They also match up well with State and Federal mandates, so that reaching compliance in the future will be easier. These measures are used to paint a picture of current system deficiencies in Chapter 5 – System Assessment and Investment Needs.

## Strategic Initiatives

### Peer Cities Protocol

Establishing routine exercises where peer city updates are made and regular communications with peer cities are established will provide sound basis for understanding local conditions.

### Target Setting

Federal mandates require FMPO to coordinate performance targets with ADOT. ADOT will likely pursue a minimum number of targets and may elect to target trends as opposed to hard goals. FMPO may wish to be more aspirational.

# Blueprint 2040: Regional Transportation Plan

## Flagstaff Metropolitan Planning Organization

### Chapter 5 –System Assessment and Investment Needs

#### Chapter Overview

This chapter employs several of the performance measures to assess current system need. It lays out broad areas for improvement to the existing system and looks forward to needs that will be generated by future growth.

#### Policy Implications of Investment Needs and System Assessment



##### **Increase mode share**

Public sentiment, crash rates, air quality trends and the challenges of providing new and wider roads all point to expanded reliance on alternate mode of transportation.

##### **Increase roadway connectivity and capacity in critical locations**

Fixing bottlenecks or providing alternate routes around them can address important elements of delay, shorten trips and serve new growth areas.

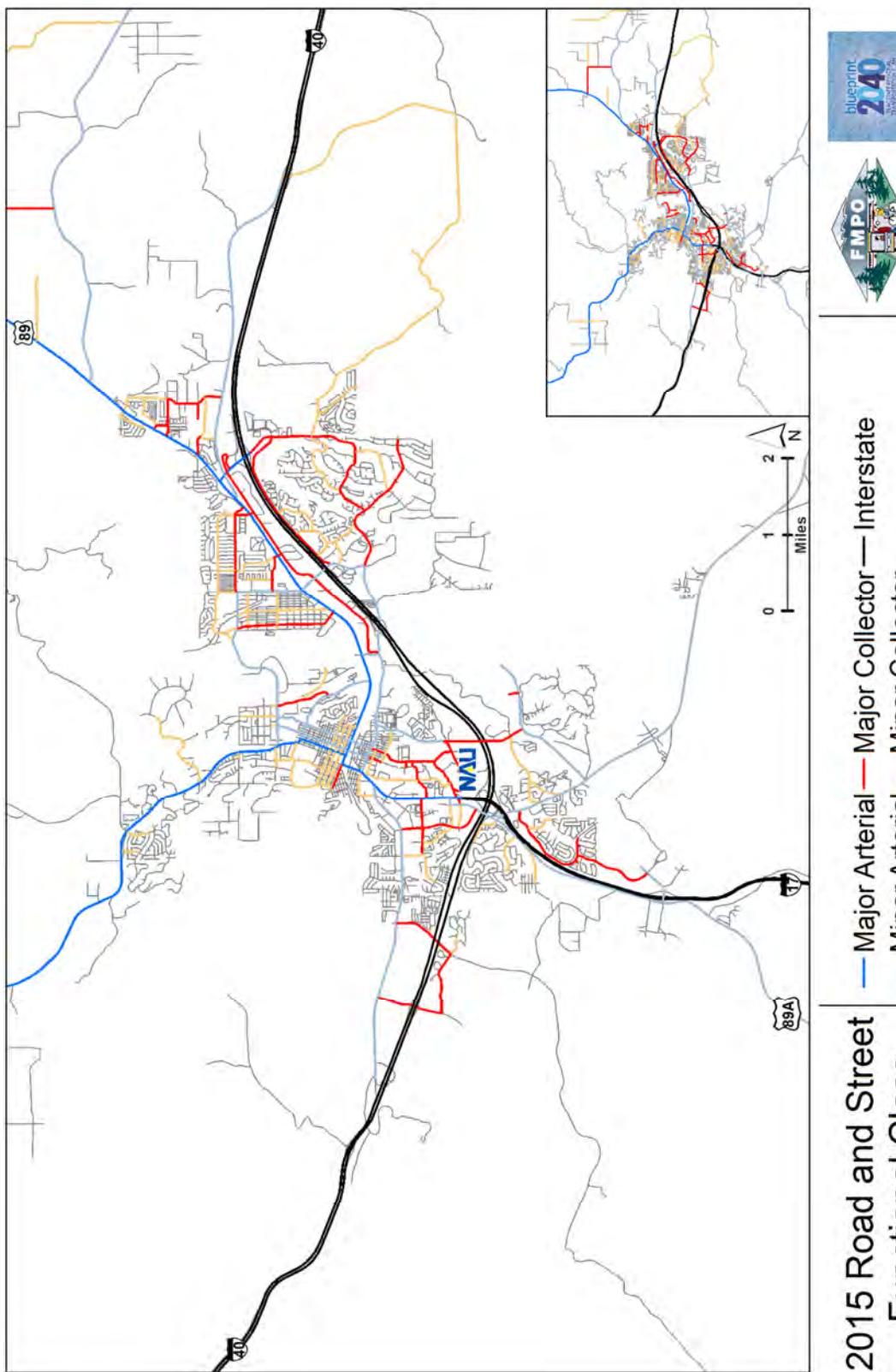
#### Roadway System Assessment

##### **Arterial Network Density**

A grid system distributes traffic, provides redundancy and increases capacity by providing parallel routes. Grids are often developed in a hierarchy of functional classifications with interstates or freeways being the largest facilities serving long-distance trips and local streets serving access needs to adjacent properties. A mile grid of 4-lane arterials is appropriate for a region of Flagstaff's existing and planned density. This equates to about 8 lanes miles per square mile of area.

In the functional classification of roads illustrated in figure 5.1 a relatively weak grid is revealed. There is no east-west arterial south of Interstate 40. North of I-40 Butler Avenue and E. Route 66 are close together and do not serve in a continuous manner west of Milton Road. Lone Tree Road as a companion to Milton is disconnected from both I-40 and E. Route 66. From Lone Tree Road, it is nearly 2.5 miles to Fourth Street, the next north-south roadway.

The arterial network density as reported in Table 4-4 is a meager 5.3 lanes miles per square mile and that is including minor arterials.



December 2016



### Miles of congested roadway

Roadway congestion is described in level of service “A” through “F.” At FMPO, “G” is used to illustrate areas of severe congestion. These ratings might be understood as:

- A – free flow conditions, interacting with few cars
- B – near free flow, pay attention to the cars around you
- C – experiencing some stops on the trip
- D – experiencing regular stops on the trip
- E – experiencing frequent stops, occasionally sitting through 2 or more traffic signal cycles
- F – experiencing regular standstill
- G – gridlock

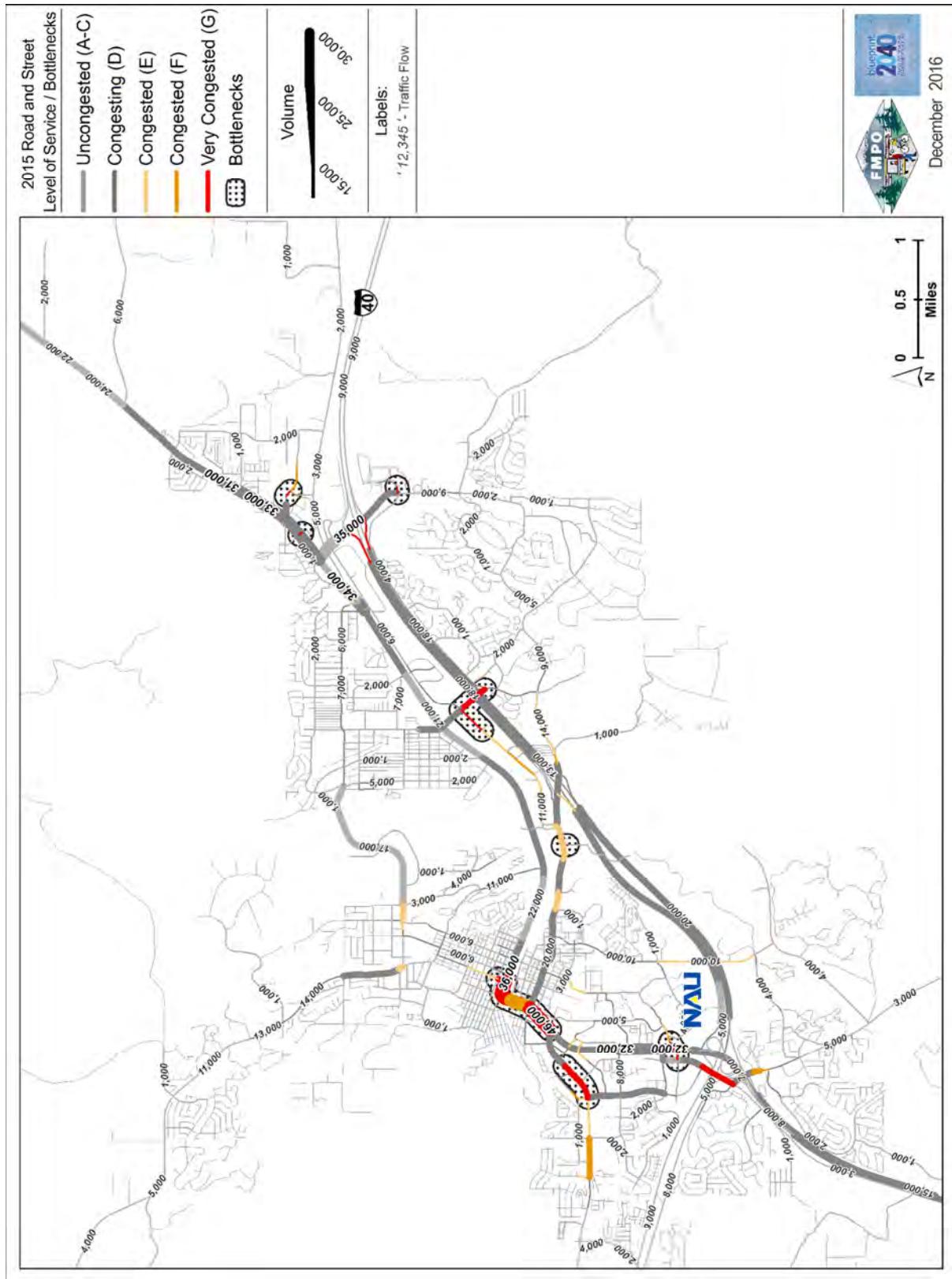
“Congestion” in *Blueprint 2040* begins with LOS “D.” It is measured with the FMPO Regional Transportation Model. Land use is added to the model over time as are improvements to transit, pedestrian and bicycle facilities, and the road network. The following table 5.1 indicates a slow trend increasing the miles congested at levels E through G. Figure 5.2 – FMPO Region Congestion Levels 2015, on the following page illustrates where congestion occurs with the most intense areas highlighted as bottlenecks. ADOT is near completion of corridor profiles for Interstate 40 and 17 that show both facilities performing at an acceptable level of service.

Table 5-1 FMPO Roadway Level of Service Over Time

Condition	2007	2010	2013	2015
LOS A - free flow	274.5	292	302.1	301.4
LOS B - some cars	32.7	31.7	27	30.6
LOS C - some stops	16.3	11.2	14.1	13.1
LOS D - regular stops	6.3	4.5	6.2	4.9
LOS E - frequent stops	1.6	1.8	1.8	1.3
LOS F - regular standstill	1.5	1.6	2.2	2.2
LOS G - gridlock	1.6	0.8	0.5	0.4

Note: LOS miles do not add up equally year to year

Source: FMPO 2007-2015 base year models, based on link segments, not intersections



Map 5.2 FMPO Region Congestion Levels 2015

### Vehicle Miles of Travel (VMT) and Vehicle Hours of Travel (VHT)

VMT and VMT *per capita* are good indicators of how well land use patterns, mode shift, and new connections that shorten trips are working. VHT and VHT per capita are indicative of the “time cost” of travel. When VMT and VHT are compared with each other they indicate the travel conditions for vehicles. For example, high VMT with low VHT can indicate that many miles are traveled in a short

Measures	2007	2010	2013	2015
Population	79,383	84,071	86,914	90,301
Model Roadway Miles	760	760	775	775
Vehicle Trips	422,000	386,053	398,036	407,763
Full VMT	2,276,000	2,155,631	1,986,380	2,065,609
Full VMT Per Capita	29	26	23	23
Daily Internal VMT	1,697,923	1,627,289	1,474,767	1,524,069
VMT Per Capita	21	19	17	17
VHT	62,583	60,518	48,268	50,411
VHT Per Capita	0.79	0.72	0.56	0.56

amount of time, therefore traffic is free-flowing.

Table 5.2 shows the Region holding the line on VMT and VHT. Considering the amount of recent mid-to-high density development, enhanced connections like the 4<sup>th</sup> Street Railroad Overpass, and significant increases in transit service, these numbers reveal the Region’s success addressing mobility. These measures are likewise derived from the regional model. The measure “Daily Internal VMT” removes the estimated through trips from the model, so it is possible to examine those trips over which local jurisdictions and individuals can exercise some control.

#### Bottlenecks

Bottlenecks like those on W. Route 66 and Fourth Street may be addressed directly with capital projects. This is the same situation for congesting roadways such as Butler Avenue west of Fourth Street and Lone Tree south of Pine Knoll. The Milton bottleneck results from several factors including concentrated land uses and no, or poor, alternate routes and supporting network

## Mode Share Assessment

### Mode Share by Sub-region

Mode share is greatly driven by context. Urban areas with their short block lengths, highly connected environment and mixed uses separated by shorter distances tend to have higher bicycle, pedestrian and transit participation rates. Universities with younger and less affluent populations

and a unique mixed-use environment have higher rates, still. This is clear from the most recent trip diary survey from 2012 (Table 5.3) and output from the regional transportation model (Table 5.4).

**Table 5-3 Trip Diary Mode Share by Sub-region\***

Travel Mode	Core of Flagstaff		Rest of Flagstaff		Flagstaff		Rest of FMPO	
	2006	2012	2006	2012	2006	2012	2006	2012
SOV	50.50%	26.00%	56.30%	60.80%	54.40%	48.70%	67.70%	57.40%
MOV	18.70%	16.10%	20.40%	28.60%	19.80%	24.30%	26.60%	38.00%
Transit**	1.40%	11.30%	3.40%	0.40%	2.80%	4.30%	0.00%	0.50%
Bicycle**	10.00%	14.00%	8.10%	4.20%	8.70%	7.60%	0.60%	1.00%
Walk**	19.40%	32.50%	11.80%	5.90%	14.20%	15.10%	5.00%	3.10%
TOTAL	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

**Table 5-4 FMPO Regional Travel Model 2015 Mode Share**

	Core		Rest of Flagstaff		Rest of FMPO	
	Total Trips	Percent	Total Trips	Percent	Total Trips	Percent
Person Trips	208,747	100	292,435	100	103,237	100
Walk Trips & Share:	28,448	13.6	17,259	5.9	1,182	1.1
Bike Trips & Share:	14,366	6.9	8,187	2.8	1,000	1
Transit Trips & Share:	7,771	3.7	2,892	1	0	0
Auto Trips & Share:	158,161	75.8	264,096	90.3	101,055	97.9

\*Differences in sub-regional mode share between Table 5.3 trip diary and Table 5.4 model results are due to different methodologies. Relative proportions between sub-regions and between modes is consistent. \*\* Large percentage changes from 2006 to 2012 may be due to small sample sizes. More recent ridership from NAIPA indicates growing transit ridership in the “Rest of Flagstaff.”

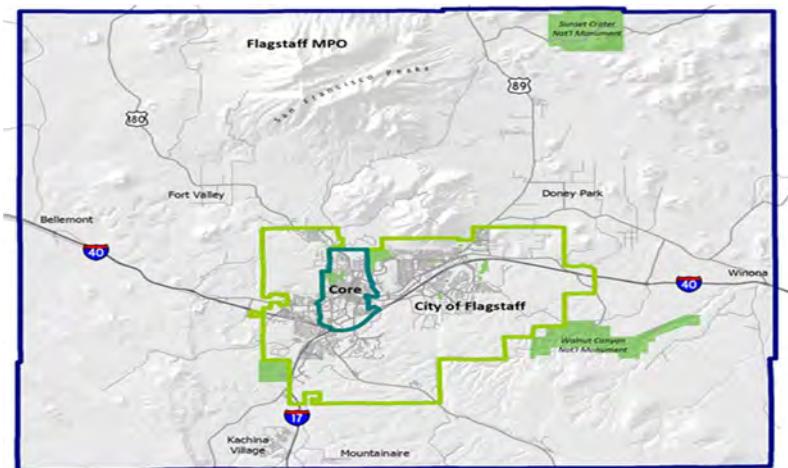


Figure 5.1 Sub-regions of the FMPO

### Alternate Mode Level of Service

A series of factors were employed to rate the facility level of service for pedestrians and bicycles and the facility and route frequency service for transit. Transportation Analysis Zones (TAZ) from the regional model are the areas evaluated.

#### *Transportation Analysis Zones*

The maps utilize transportation analysis zones (TAZ) to loosely represent areas such as the urban, suburban and rural area types identified in the *FRP 2030* as well as neighborhoods. The TAZs work well for their primary purpose of transportation modeling and describing conditions for a general area. However, some TAZs are awkwardly shaped and some are quite large. They all get “painted” with the general characteristics found inside them, so these unusual TAZ’s may give a false impression of exactly how well or how broadly served an area is.

#### *Context*

Expectations for service change with context. A rural area where the streets are relatively frequent, paved and have shoulders will show up with a high level of service. An urban area or future urban area may show a poor level of service even though a system of sidewalks might be present. This could be due to higher expectations for more frequent intersections and enhanced crossings in urban areas.

---

### *A HOW TO GUIDE TO READING PEDESTRIAN, BICYCLE AND TRANSIT LEVEL OF SERVICE (LOS) MAPS*

*First, determine if the area under consideration is Urban, Suburban or Rural in area type context.  
Second, check the shade on the map for level of service from low to high.  
Third, find the corresponding area type table and shade to find the expectations for service levels (see Chapters 6A – Pedestrians & Bicycles and 6B – Transit for the tables).  
Fourth, consider the factors that make up level of service. These are described below and mapped as thumbnails to provide a general sense of existing conditions. For existing conditions one area may have a high LOS for excelling in one factor where another area may have a high LOS by virtue of good conditions on several factors. For future conditions, jurisdictions and developers can work together to find the right mix of factors to achieve the recommended LOS.*

*REMEMBER: The LOS shade is applied to an entire TAZ which may create confusion about LOS especially where a TAZ is large. The shade implies a uniform level of service across the area which is not always the case.*

---

## Level of Service Maps and Factors for Alternate Modes

The maps on the following six pages illustrate levels of service for the pedestrian, bicycle and transit modes and the understanding of them will benefit from some explanation.

### *Pedestrian and Bicycle Systems*

There are four factors in common for the pedestrian and bicycle evaluation where connectivity is critical:

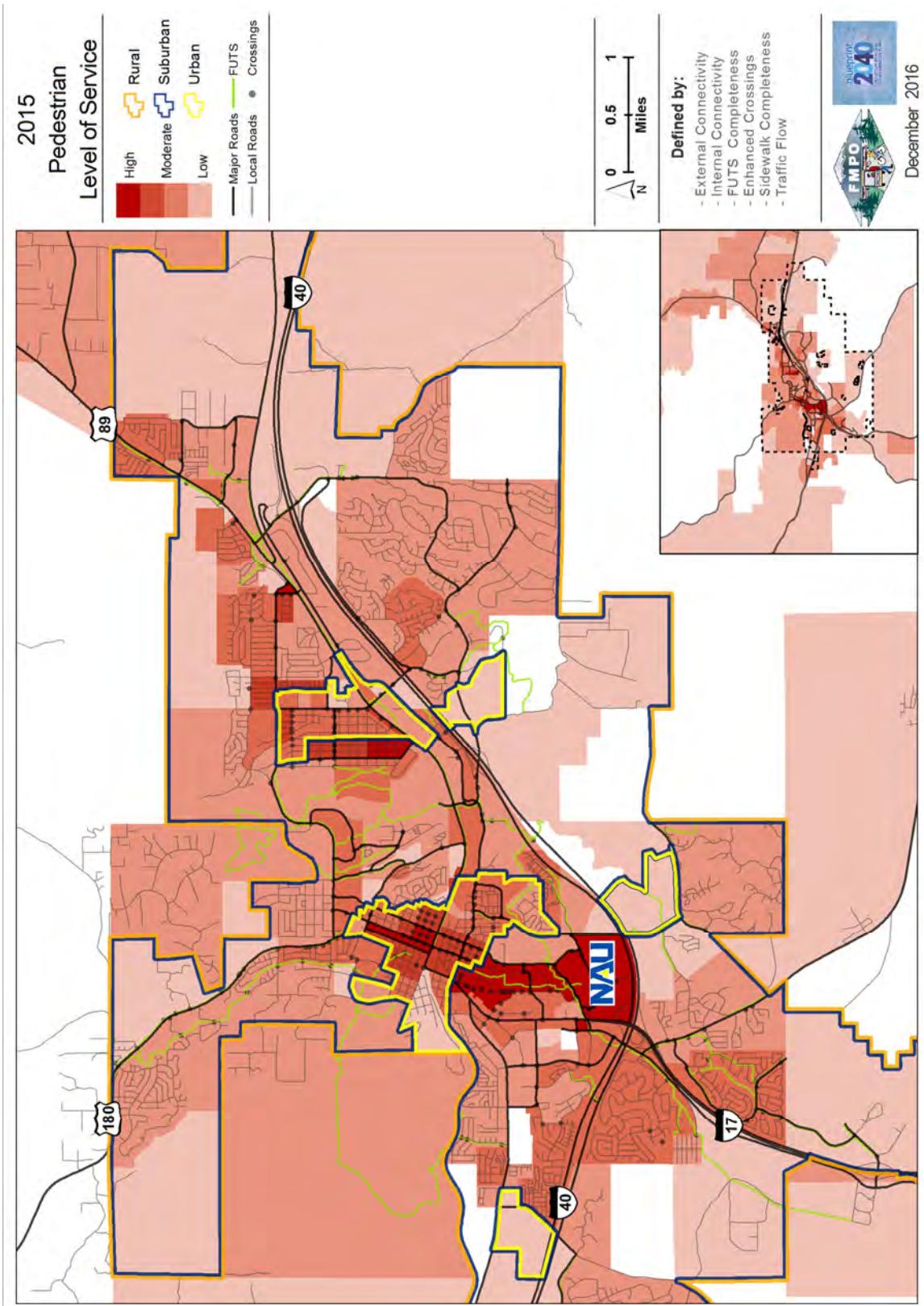
- Internal connectivity – The ability to move within the TAZ. The measure is intersections per square mile.
- External connectivity – The ability to leave a TAZ. The measure is intersections of the TAZ boundary per linear mile of boundary.
- Enhanced crossings – The number of improved crossings in a TAZ. These are weighted based on level of added safety. At the low end are continental-striped crosswalks where visibility is improved. At the high end are grade separated crossings which physically separate users from traffic.
- Completeness of the trail system – This measure compares the amount of existing or completed trail to the amount of the entire trail system planned for the TAZ.

Additional measures for the pedestrian system includes: the completeness of the sidewalk system and the total traffic flow within the TAZ. The latter measure is a “negative” factor that the other factors work to offset. For the bicycle system, sidewalk completeness is replaced by the completeness of the planned bike lanes. A special emphasis is given to completeness over a larger area than the immediate TAZ as bicyclists take longer trips, but won’t if they know even a short section is missing or dangerous.

### *Transit System*

For the transit system the level of service for a TAZ is comprised of the following factors:

- Access to transit stops – The ability to reach a bus stop via sidewalk or trail within 1 to 10 minutes, or approximately  $\frac{1}{4}$  of a mile. Research indicates that there is a strong positive response in ridership relative to distance.
- Frequency of service – High frequency routes within walking distance are rated higher than low frequency routes. Research indicates that there is a strong positive response to ridership relative to frequency.
- Number of routes within walking distance – The more routes accessible to a TAZ makes more areas of the region accessible by transit to that TAZ



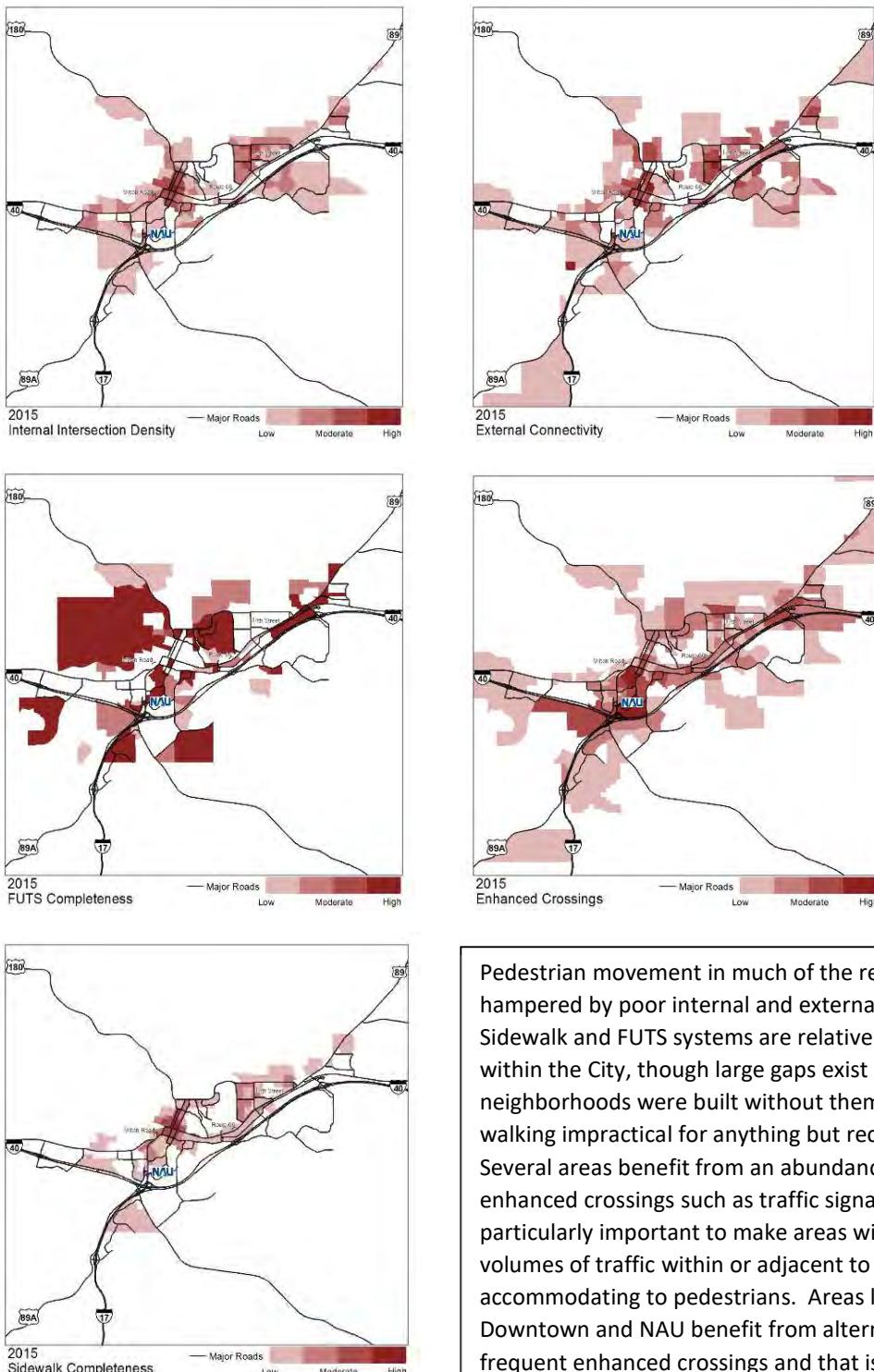
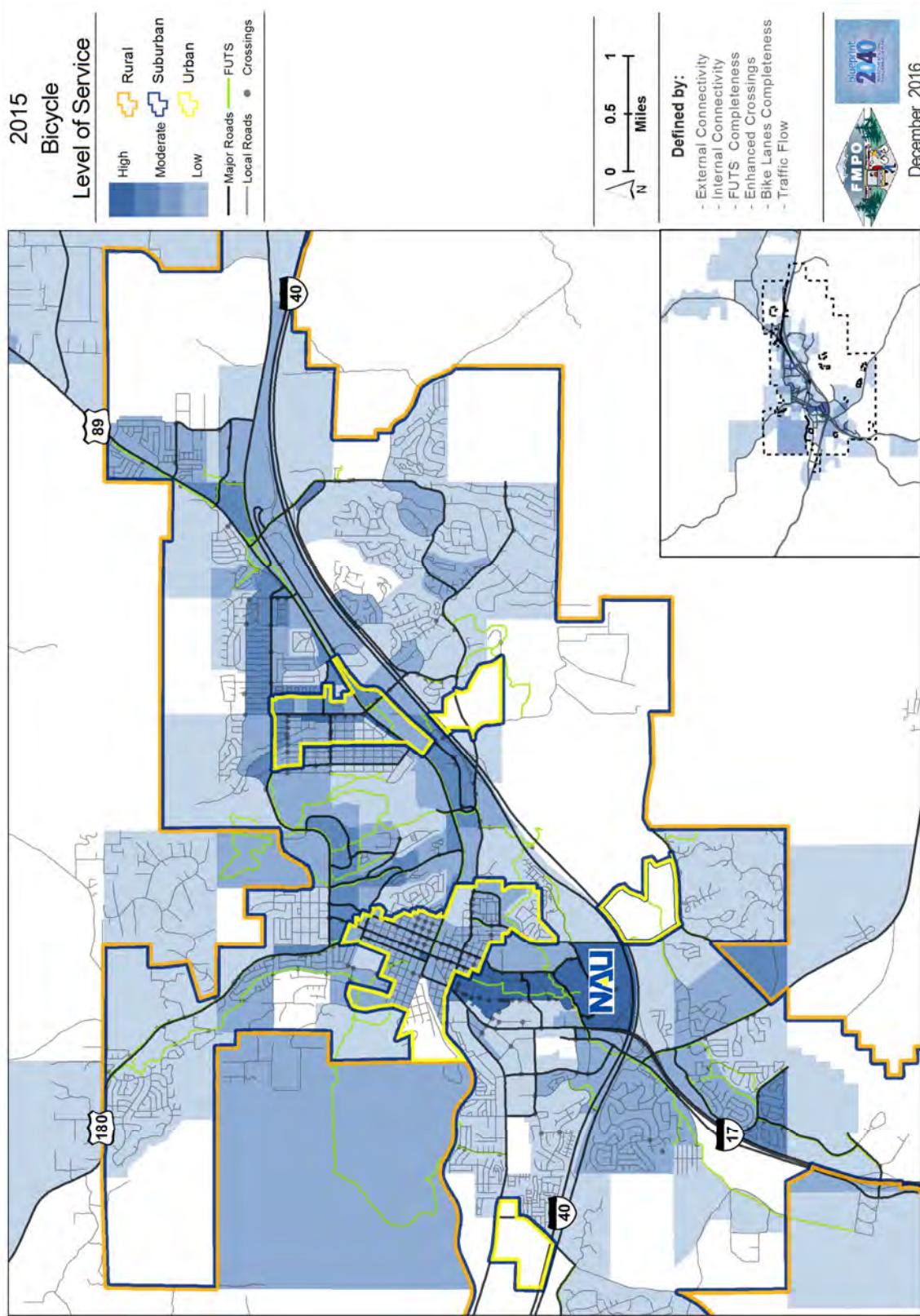
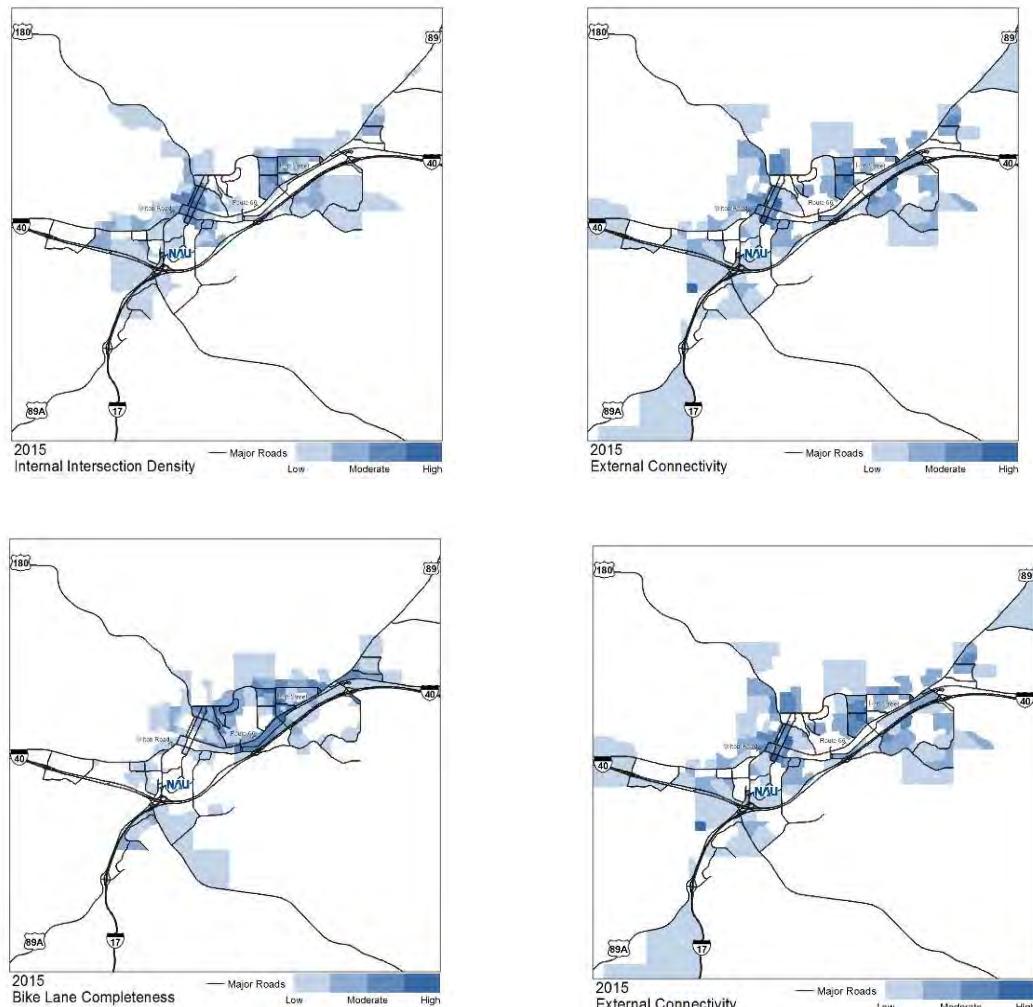


Figure 5.2 Pedestrian Level of Service Factors

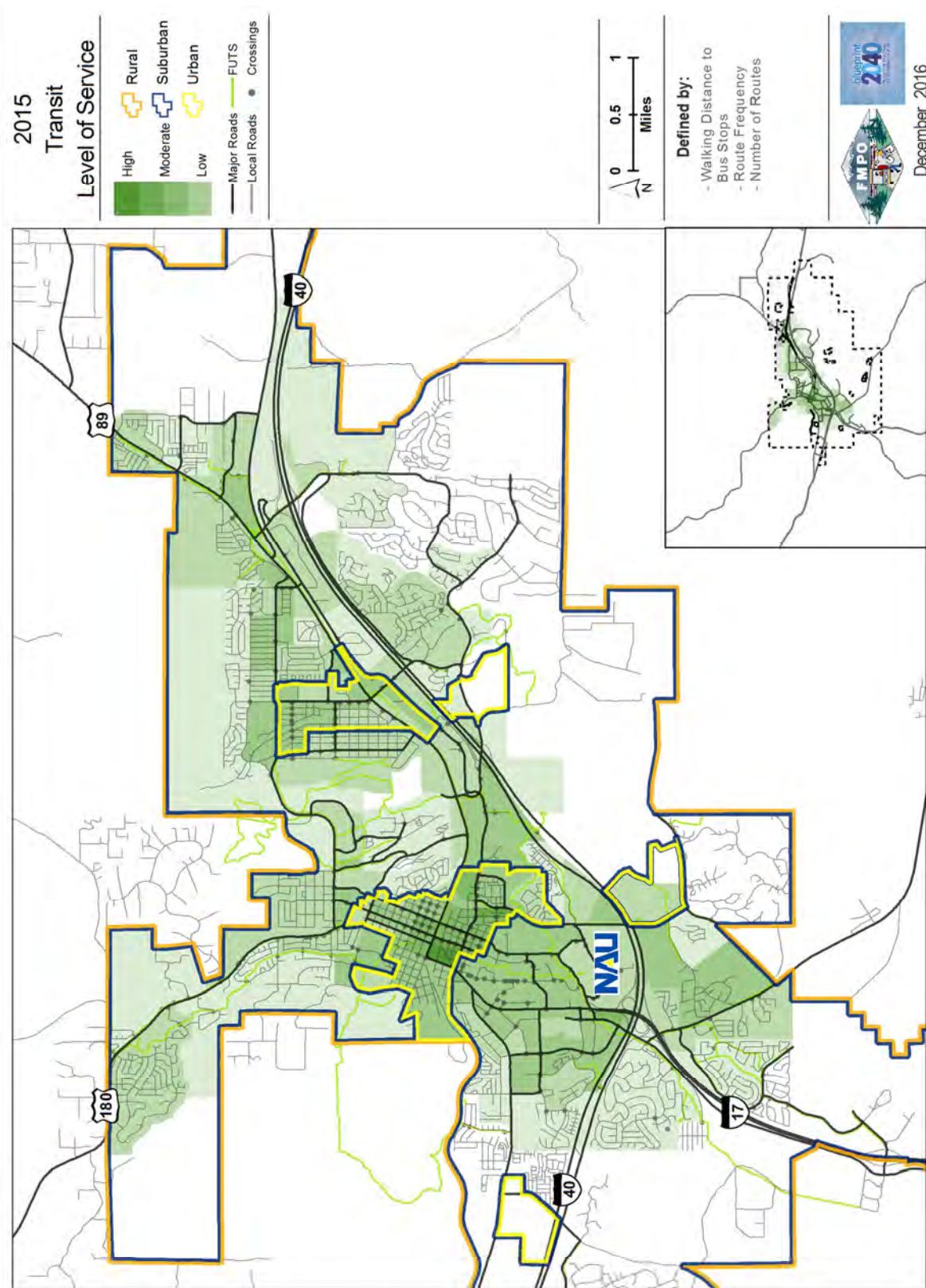
Pedestrian movement in much of the region is hampered by poor internal and external connectivity. Sidewalk and FUTS systems are relatively complete within the City, though large gaps exist and some neighborhoods were built without them making walking impractical for anything but recreation. Several areas benefit from an abundance of enhanced crossings such as traffic signals. These are particularly important to make areas with high volumes of traffic within or adjacent to them more accommodating to pedestrians. Areas like Downtown and NAU benefit from alternate routes, frequent enhanced crossings and that is dispersed across several roads. Areas like Fourth Street where an urban environment is desired, suffer from missing sidewalks, high traffic, and poor connectivity to the east of Fourth Street. Criteria for rural areas is lower due to longer distances and large lots, so wide, paved shoulders serve pedestrian needs.





Generally, there is a disconnect between residential areas with good bicycle level of service and activity centers where service tends to be poor. The bicycle system experiences the same general connectivity benefit and issues as the pedestrian system. However, the Completeness map indicates significant gaps that influence the Bicycle Comfort Index. W. Route 66 and E. Route 66 have sections with missing bike lanes and high traffic levels moving at high speeds. FUTS trails compensate in some, but not all, areas. The more comfortable places for bicycles are on the periphery of the urbanized area and in rural areas where wide shoulders are available. The areas with the poorest overall service tend to be the region's commercial and employment centers.

Figure 5.3 Bicycle Level of Service Factors



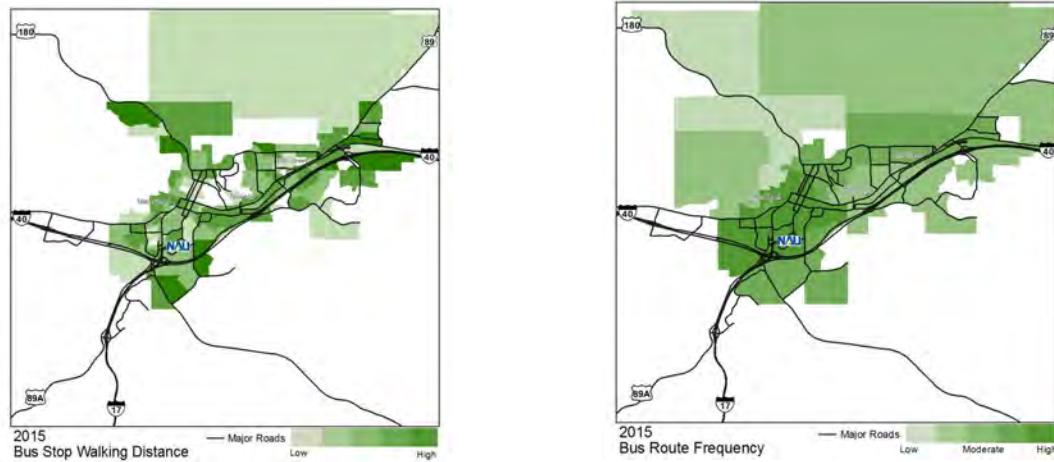


Figure 5.4 Transit Level of Service Factors

**PENDING FINAL IMAGES** Transit services are concentrated in Downtown, NAU, the Mall, and the Fourth Street Corridor. Areas of high residential density such as Woodlands Village and Bow & Arrow also receive better service. Service to the more suburban, residential areas is often complicated by poor walking connectivity, and poor roadway connectivity. These areas are also lower density where achieving adequate ridership per cost of service is more difficult.

## Safety Assessment

### Crash Trends

#### Injury Crashes

Overall crash rates and injuries per 100,000 people steadily fell from 2005 to 2010, but have since leveled off at about 2,000 crashes per 100,000 population. The graph in figure 5.10 shows a remarkable 50% higher crash rate for the region than in the state which is likely due to winter weather. Injury rates track very closely to both the State rate and parallel the overall crash rate.

Overall pedestrian and bicycle crashes in the FMPO region have remained relatively flat with a noticeable increase from 2013 to 2014.

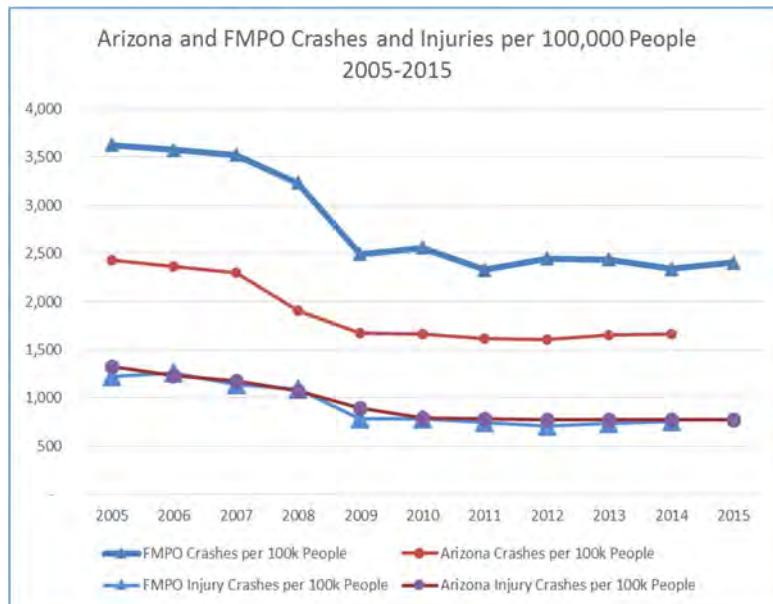


Figure 5.5 Arizona and FMPO Crashes and Injuries 2005-2015

Source: Arizona Departments of Transportation and Administration

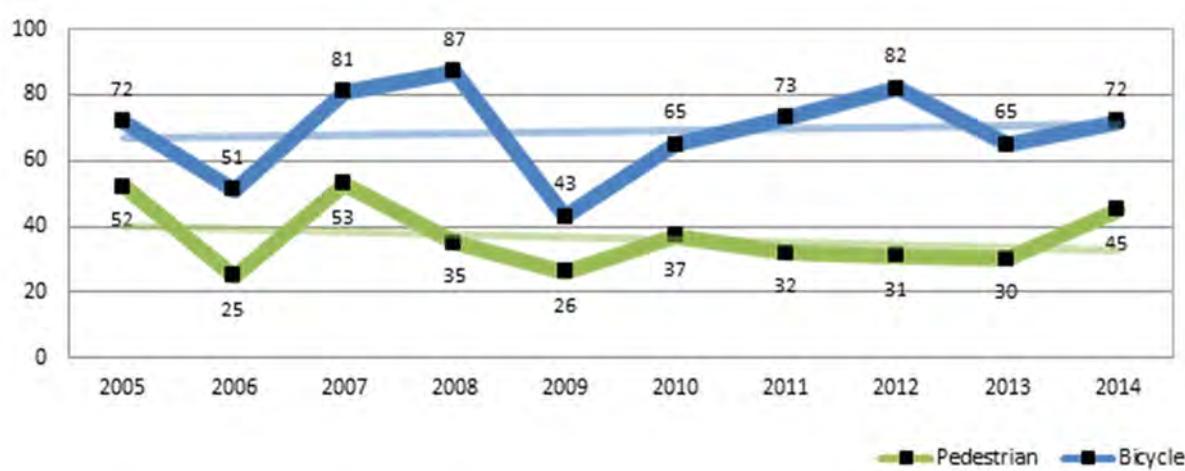


Figure 5.6 Pedestrian and bicycle crashes by year

## Fatal Crashes

Fatalities are more difficult to determine a trend because of the relatively small numbers in the Region. As the graph below shows, fatality rates swing wildly, with a spike in 2015 after years of low or flat fatality rates.



Figure 5.7 Arizona and FMPO Fatal Crashes 2005-2015

Of more concern is the high percentage of overall fatalities represented by pedestrians. Making all areas safe to travel for pedestrians and bicyclists is vital to improving mode share. More information on crashes is provided in the Chapter 10A Operations – Safety.

Table 5-5 Fatalities by type – 2006 - 2014

Crash Type	FMPO		City of Flagstaff	
	Crashes	Percent	Crashes	Percent
Single vehicle	36	37.9%	16	29.1%
Multiple Vehicle	19	20.0%	7	12.7%
Pedestrian	35	36.8%	27	49.1%
Bicycle	5	5.3%	5	9.1%
<b>Total</b>	<b>95</b>	<b>100%</b>	<b>55</b>	<b>100%</b>

## Investment Needs

A quick read of the following investment needs shows great promise for “complete street” type investments along several key corridors like Milton Road, Fourth Street, Fort Valley Road, and W. Route 66. Complete street investments will vary by context and may include protected bike lanes, widened sidewalks, enhanced crosswalks, center medians, and transit facilities such as bus stops and transit lanes.

## Roads & Streets Investments

The regional interstate system is performing well and not in need of immediate or near-term expansion as supported by ADOT's Corridor Profile Studies (<http://azdot.gov/planning/CurrentStudies/corridor-profile-studies>). A minor exception to this are the westbound on ramp and east bound off ramp at the Country Club exit of I-40 which are nearing capacity. Traffic flow during routine maintenance is becoming difficult to maintain, so widening may be called for sooner.

The major arterial system has an important capacity issue on Milton Road between Butler Avenue and W. Route 66. A series of intersection improvements including ITS as well as assertively applied access management can improve performance and widening may be considered. Access management will be more successful with the development of a supporting access network. Investments in alternate arterial routes will also provide relief to this corridor. A capacity issue is emerging at the south end of Humphreys Street along with an associated capacity need at its intersection with E. Route 66. US 89, part of the national highway system and operated by the City of Flagstaff and ADOT, is performing well with occasional peak hour concerns at the southwest to southeast left turn movement onto Country Club Drive.

The minor arterial system needs several spot roadway widening improvements to address bottlenecks in places like W. Route 66 at Woodlands Village Boulevard, Butler Avenue west of Fourth Street, and the Fourth Street bridges over I-40. Several minor arterial segments are congesting and will face considerable pressure from future growth. This includes parts of Lone Tree Road and W. Route 66, another ADOT facility. Minor arterials such as Cedar Avenue between West Street and Fourth Street face severe right-of-way constraints and improvement or management may only come through access management and travel demand management (see Chapter 10).

The major and minor collector systems are operating well for vehicles with some intersection related exceptions such as Woodlands Village Boulevard and W. Route 66.

## Pedestrian and Bicycle Investments

Much can be achieved by constructing missing sidewalks, FUTS trails, and bicycle lanes to improve connectivity. Enhanced crossings in key locations will greatly supplement this effort. As noted in the analysis, investments in activity centers for these modes is of particular importance. Destinations for work, school, shopping and more are simply inaccessible due to a lack of infrastructure.

Examples of key sidewalks that are missing includes sections on N. Fourth Street, Lone Tree Road, San Francisco Street and W. Route 66. For missing bike lanes, Milton Road, Butler Avenue, Lone Tree Road, and W. Route 66 are prominent. The public and other analyses identified the desire for under or overpasses in the Downtown at E. Route 66 and across Milton Road. W. Route 66 would benefit from additional enhanced crossings as there is significant distance between traffic signals on that road.

## Transit Investments

Frequency of service will be driven by residential and employment densities and the willingness and ability of the user and general public to pay for it. Density is occurring near NAU and planned for some

areas like Fourth Street and could occur in smaller activity center pockets permitting higher frequency service with fewer stops.

Transit has lower performance in areas where there is a lack of pedestrian connectivity and bus frequency is low. A possible remedy to pedestrian connectivity is the example of the Ponderosa Trails subdivision where mid-block and cul-de-sac pedestrian and bicycle connections are made out to the arterial and collector system. This allows people who are commuting on foot or by bike to take a more direct route rather than the circuitous path that vehicles take on the road. Overtime, retro-fitting existing neighborhoods with direct pedestrian and bicycle connections will make transit available to many more residents. Where lots are larger, easements might be purchased from adjoining properties.

If patrons cannot access multiple routes on foot, they can transfer to other routes to access more of the community. The “pulse” design of the current transit network makes transfers in the core urban area effective while service to outlying connections may not be as seamless. NAIPTA is seeking to implement a bus rapid transit route that will intersect with several other routes in a more desirable grid system. A more robust arterial and collector street network will enhance their ability to implement the best system possible.

### **Freight Investments**

No explicit freight analysis was conducted for *Blueprint 2040*. Instead, an effort was made to contact several local trucking firms and ask their opinion on which locations pose problems for truck circulation. None responded. Information from the ongoing ADOT Freight Study was included. The locations listed below lend additional support to the concept of complete street investments:

- I-17 Climbing Lanes south of the region
- I-40 / I-17 System Interchange – WB to NB movement
- US 89 southbound by the Flagstaff Mall
- Switzer Canyon Drive from E. Route 66

### **Safety Investments**

Pedestrians represent a disproportionate share of fatalities. Focusing safety investments on reducing these crashes is a definite need. Many access management techniques will reduce conflict points and provide areas of refuge. Enhanced crossings and grade separations will increase safety. This topic is covered more completely in the Operations – Safety chapter.

### **Other Investments**

The Operations chapter discusses maintenance, technology and travel demand management (TDM) practices as strategies that will require increased levels of investment. All of the FMPO member agencies have focused on system preservation strategies. Most recently, City and County residents approved road maintenance and operations sales tax measures in 2014. Though not organized formally under a TDM program, FMPO members and partners are engaged in several traditional TDM activities including deep discounted employer bus passes, parking fees at NAU, the City of Flagstaff Downtown Parking Plan,

compact and mixed-use development policies at the City, bike-to-work week promotions, and more. Investments in carshare, bikeshare, vanpool, and other ridesharing technologies can aid in reducing congestion and supporting public transportation. Technology investments are lagging the most, but the City will soon launch a traffic responsive signal control system on Butler Avenue and NAIPTA employs numerous technological advances such as automatic passenger counters, automatic vehicle locators, smart card fare box technologies, and real time arrival to display bus locations in real time to customers.

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## Chapter Conclusion

The system has some trouble spots – bottlenecks and concentrations of crashes for example – but is performing relatively well. Investments are clearly needed in every mode and across the urban and suburban parts of the region. In Chapter 6 – System Plans & Performance, these needs are amplified as the build out system for *FRP 2030 Future Growth Illustration* is considered

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## Strategic Initiatives

### Annual Trends & Conditions Report

An annual report coordinated with EcoNA, the Greater Flagstaff Chamber of Commerce, the Arizona Commerce Authority, and others will provide context for overall system performance.

## Blueprint 2040 Regional Transportation Plan

### Flagstaff Metropolitan Planning Organization

## Chapter 6 – System Plans & Performance

### Chapter Overview

This chapter ties together elements from the previous chapters and industry best practices to establish transportation system planning design guidance and criteria for each mode. Facility spacing and sizing receive particular attention. This introductory section provides a brief explanation of many of the design principles employed. The design guidance and performance measures are applied in this chapter to evaluate alternative build out system plans: “Wide Roads” and “Many Roads.” A recommended plan for build out land use conditions emerges as a hybrid reflecting context, public input and physical constraints.

Roads & Streets, Transit, Pedestrians & Bicycles, and Freight then receive their own subsections where the respective system or network plan is presented.



### Policy Response to System Criteria

**MOBILITY AND ACCESS GOALS AND POLICIES**

**Goal T.1. Improve mobility and access throughout the region.**

Policy T.1.1. Integrate a balanced, multimodal, regional transportation system.

Policy T.1.2. Apply Complete Street Guidelines to accommodate all appropriate modes of travel in transportation improvement projects.

Policy T.1.3. Transportation systems are consistent with the place type and needs of people.

Policy T.1.4. Provide a continuous transportation system with convenient transfer from one mode to another.

Policy T.1.5. Manage the operation and interaction of all modal systems for efficiency, effectiveness, safety, and to best mitigate traffic congestion.

Policy T.1.6. Provide and promote strategies that increase alternate modes of travel and demand for vehicular travel to reduce peak period traffic.

Policy T.1.7. Coordinate transportation and other public infrastructure investments efficiently to achieve land use and economic goals.

Policy T.1.8. Plan for development to provide on-site, publicly-owned transportation improvements and provide adequate parking.

Source: Flagstaff Regional Plan 2030: Place Matters

*Flagstaff Regional Plan 2030: Place Matters (FRP 2030)* espouses several principles about things that “matter:” people, place, environment, prosperity, sustainability, cooperation, a smart and connected community, and trust and transparency. The region must rely on all modes of travel to hold true to these principles. Our transportation system works best when it provides a range of legitimate transportation options, holistically planned to build on the interdependence between modes.

As industry best practices and analysis of alternative build out systems are applied, the previous policy responses may be reiterated, emphasized and added to.

### **Develop an arterial and collector network capable of supporting a robust, multimodal system**

This is an “all hands on deck” and “everything and the kitchen sink” approach to meeting regional transportation needs. Bikes and transit will need to work effectively down to the collector level. More arterials and strategic widening projects are needed to distribute traffic. Mass transit may be the best means of adding capacity in the future.

### **Set the stage for a greatly expanded High Frequency and Bus Rapid Transit in the long-term**

The public is generally opposed to widening arterial roads. Assuming this sentiment holds in the long-term, converting lanes to a grid BRT system may be necessary to provide person trip capacity. This may also require shifts of density within greenfield and redevelopment sites closer to the arterial network.

## **Smart Transportation**

Evidence and public sentiment have supported multimodal transportation planning and design concepts expressed in such movements as *Context Sensitive Solutions, New Urbanism, and Smart Growth*.

Working with several industry standard publications, *Blueprint 2040* takes these concepts and tailors them to the Flagstaff region. *Blueprint 2040* promotes these basic principles from the *Smart Transportation Guidebook*, developed by the states of New Jersey and Pennsylvania in 2008:



Figure 6.1 Bus Rapid Transit, Bogota, Columbia

### *Principles of Smart Transportation<sup>xxx</sup>*

1. Tailor solutions to the context.
2. Tailor the approach.
3. Plan all projects in collaboration with the community.

NOTE: Future corridor plan processes will emphasize participation

4. Plan for alternative transportation modes.
5. Use sound professional judgment.
6. Scale the solution to the size of the problem.

## Context Sensitive Solutions

**QUALITY DESIGN GOALS AND POLICIES**

**Goal T.4. Promote transportation infrastructure and services that enhance the quality of life of the communities within the region.**

Policy T.4.1. Promote context sensitive solutions (CSS) supportive of planned land uses, integration of related infrastructure needs, and desired community character elements in all transportation investments.

Policy T.4.2. Design all gateway corridors, streets, roads, and highways to safely and attractively accommodate all transportation users with contextual landscaping and appropriate architectural features.

Policy T.4.3. Design transportation facilities and infrastructure with sensitivity to historic and prehistoric sites and buildings, and incorporate elements that complement our landscapes and views.

Source: Flagstaff Regional Plan 2030

Land use and transportation best work together when we treat roadways as public spaces that influence urban environments<sup>xxxii</sup> and recognize the value roads and other modes add by providing access to all environments. Recognizing that intentions for land use and economics change across the region assures that transportation solutions will change, too. For the Flagstaff region, land use and economic expectations are defined in *FRP 2030*. For general purposes, land use may be understood by residential density, employment density and proximity to activity centers. These land uses define economic relationships that occur at several scales from the international to the personal. Consequently, the transportation system needs to be appropriately diverse in choice and scale to serve that range of land uses and transactions.

As context changes from an urban activity center to a rural neighborhood, the community's performance expectations for transportation changes with it. Different modes receive higher priority in different locations. Pedestrians receive higher priority in urban activity centers. Streets are designed to slow traffic down. More space is dedicated to sidewalks and pedestrian amenities. The following table from *FRP 2030* sets these expectations in a broad manner and in chapters 7 through 9, *Blueprint 2040* expands on this concept with level of service tables for each mode for the urban, suburban and rural contexts.

URBAN	Level of Service									
	Automobiles		Transit		Bicycle		Pedestrian		Truck	
	Activity Center	General	Activity Center	General	Activity Center	General	Activity Center	General	Activity Center	General
Freeways	n/a	M	n/a	n/a	n/a	n/a	n/a	n/a	n/a	M
Arterials	L	H	H	M	M	H	H	M	L	M
Collectors	M	M	M	M	H	M	H	H	L	M
Thoroughfares	L	M	H	M	M	H	H	H	L	M

H = High Priority

M = Medium Priority

L = Low Priority

SUBURBAN	Level of Service									
	Automobiles		Transit		Bicycle		Pedestrian		Truck	
	Activity Center	General	Activity Center	General	Activity Center	General	Activity Center	General	Activity Center	General
Freeways	n/a	M	n/a	n/a	n/a	n/a	n/a	n/a	n/a	M
Arterials	M	M	H	M	H	H	M	M	M	M
Collectors	M	M	M	L	H	H	H	H	L	M
Thoroughfares	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

H = High Priority

M = Medium Priority

L = Low Priority

RURAL	Level of Service									
	Automobiles		Transit		Bicycle		Pedestrian		Truck	
	Activity Center	General	Activity Center	General	Activity Center	General	Activity Center	General	Activity Center	General
Freeways	n/a	H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	H
Arterials	H	H	L	L	H	M	L	L	H	H
Collectors	H	H	n/a	n/a	H	M	M	M	M	M
Thoroughfares	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

H = High Priority

M = Medium Priority

L = Low Priority

Source: Flagstaff Regional Plan 2030

## Complete Streets and Layered Networks

The transportation context needs to consider many factors for all modes: continuity, connectivity, function or functional classification, and speed.<sup>xxxii</sup> Each of these system characteristics are described below. Detailed guidance is then provided in the sub-chapter related to each mode. When considering

continuity, connectivity and functionality for different modes, the concept of “complete streets” should be applied. Complete streets are roadways designed and operated to enable safe, attractive, and comfortable access and travel by all users. The concept of complete streets is especially applicable in the urbanized environment, where land use activity patterns result in movement by a variety of user groups and in a mix of modes. Pedestrians, bicyclists, and buses can be expected along and in major urban streets, sometimes in considerable volume. Incorporating these users in the design and operation for a major urban or suburban street is essential for the convenient and efficient movement of all users, including motor vehicle users.<sup>xxxiii</sup>



Figure 6.2 City of Portland pedestrian cut-through.

Source (copyright): <https://rayatkinsonplans.wordpress.com/2014/08/03/signs-for-bikes-and-peds/>

The design of complete streets will vary with their context and the modes expected on a corridor. Arterial street cross sections should fit within the available right-of-way and be “complete” in that they consider the needs of motorists, pedestrians, and cyclists.<sup>xxxiv</sup> A contrast between an arterial and local street illustrates the concept. The high speeds encountered on arterials suggest that pedestrians and bicyclists be accommodated on separate facilities or a shared path that is physically separated from vehicular traffic lanes by a landscaped buffer. Whereas, the local street is integral to the design of the residential neighborhood. To enhance neighborhood livability, speeds and vehicular volume should be low, 25 mph and less than 1000 vehicles per day, respectively. Further, neighborhood travel is incidental to reaching a collector street.<sup>xxxv</sup>

### Layered Networks

It is often a challenge for a single roadway to be “complete” and meet all the demands and expectations of the different, diverse roles of roadways. In a system of layered networks, the freight mobility routes, pedestrian network, and bicycle network may be assigned to different segments of the overall network, in order to reduce the potential conflict inherent in trying to design all roadways for all uses. Layered networks are appropriate in situations where providing priority to a particular mode can improve the efficiency or safety on a roadway. There are many situations where the needs of one mode can negatively affect another mode. One obvious example: Increased automobile speeds reduce pedestrian safety.<sup>xxxvi</sup>

When the network consists of a series of discontinuous roadways, like Milton Road to US 180 or Butler Avenue to W. Route 66, it is more likely that a single roadway will struggle to accommodate all modes. This sometimes results in conditions that do not serve any mode particularly well. Improving

connectivity is important for each mode traveling within the roadway system. A layered network concept can allow for certain roadways to be continuous for a particular mode, while discouraging use by other modes. For example, a collector street may be planned to provide continuity for pedestrians, bicyclists or transit vehicles, while discouraging its use by ‘cut-through’ traffic.<sup>xxxvii</sup>

### System Characteristics

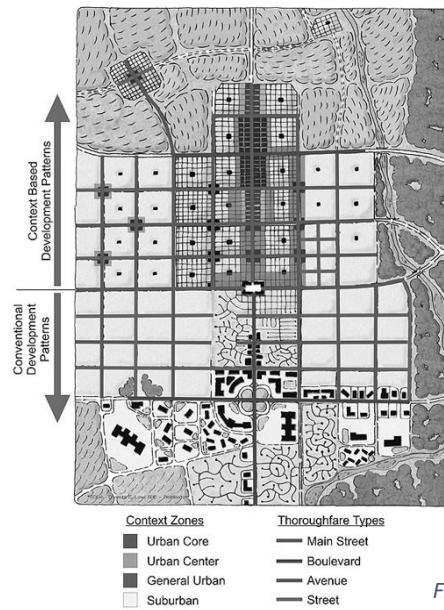
#### *Continuity*

Continuity is the ability to travel a long distance on the same roadway. An urbanized principal arterial should have continuity from the urbanizing area on one side of the developed area to the urbanizing area on the other side. In a large metropolitan region, most, if not all, principal arterials should have continuity across the entire metropolitan area. Local residential roads, which lie at the other end of the roadway classification system, need to be developed with limited continuity for automobile movement. This helps prevent unwanted high volumes in neighborhoods, higher speeds and high crash rates. It should be noted that continuity can be provided for pedestrians and bicycles without providing continuity for automobiles.

#### *Connectivity*

Connectivity refers to the number of alternative travel paths that are available for direct movement between the same origins and destinations. As connectivity increases, the number of alternative routes increases, travel distance

between an origin and destinations typically decreases, and so do traffic volumes and related intersection sizes on any given facility. Greater connectivity within and between neighborhoods increases the efficiency of automobile trips and facilitates the use of public transit, walking and cycling.<sup>xxxviii</sup> Residential areas can be designed on a grid or modified grid with through movement being limited by the use of strategies such as narrow travel lanes, on-street parking, T-intersections, and other traffic calming techniques to limit continuity, particularly between major streets.<sup>xxxix</sup>



Context based development patterns are formed around a highly connected network of walkable thoroughfares. Note the higher level of connectivity *and* continuity in the context based development patterns. Source: Thomas Low (DPZ) and Digital Media Productions.

<http://www.ite.org/css/online/DWUT03.html>

Figure 6.3 Continuity and Connectivity

### *Functional Circulation Systems and Access Management*

In a revenue-constrained environment, effective management of the transportation system is more than an option – it is essential (1,5) and begins with the recognition of a roadway system's two primary functions: (a) provide efficient, safe and reliable movement; and (b) provide access to abutting property. Through movement and access are often in conflict with each other and may be considered mutually incompatible functions. This dilemma can be resolved by designating a few roadways for efficient movement (principal arterials) and others for the provision of direct access (local roadways) and designing each accordingly. This system must supply both functions for transit, bicycles, and pedestrians as well as vehicles. Furthermore, motor vehicle travel needs involve three groups: automobiles, large trucks, and delivery and service vehicles.<sup>xl</sup>

In the absence of a sufficient supporting network of local and collector streets, arterial roadways are used for direct site access. Closely spaced access forces more local trips onto the arterial, traffic conflicts multiply, and crashes increase. Milton Road is a prime example of this. Gradually congestion and delay diminish the market reach of local business and investments shift to newer, better-managed corridors.<sup>xli</sup> This strip development also leads to greater distances between land uses and thereby increases dependence on driving.<sup>xlii</sup> The following figures illustrate the balance between through movement and land access as it changes with changes in functional classification. The figure on the left illustrates preferred practice and the clear distinction between arterial functions and local roads. Only the major collector provides balanced service to both. The middle illustrations show earlier thinking and communicates a mistaken application of smooth transition from one purpose to the next. The many compromises of actual practice are illustrated in the far right figure with only freeways serving the through movement.



Figure 6.4 Access Management and Functional Classification

### *Access Management*

Access management is the coordinated planning, regulation, and design of access between roadways and land development. It encompasses a range of methods that promote the efficient and safe movement

*An effective access management program can reduce crashes by 50%, increase roadway capacity by 23% to 45%, and reduce travel time and delay by 40% to 60%.  
TRB, p. 5*

of people and goods by reducing conflicts on the roadway system and at its interface with all modes of travel. These methods will change with the functional classification of the road and include improvements to benefit transit, pedestrians, and bicyclists, as well as different treatments for urban, suburban and rural settings. The following are examples of access management techniques:

- Traffic signal spacing
- Median treatments
- Designated access points to minimize conflicts
- Deceleration and storage lanes
- Limited and separated driveway access to major roadways
- Restricted driveways near intersections
- Providing an adequate network
- Bicycle and pedestrian network with direct connections to transit including at mid-block crossings<sup>xliii</sup>

Access management is used to reduce or separate conflict points, support safe passage along a corridor and should help manage speeds in a manner sensitive to context and function. The approaches to access design on major corridors classified and intended for longer-distance, higher-speed travel will be different from those where local circulation is a priority.<sup>xliv</sup> From the technique examples above it is clear that access management is compatible with concepts of complete streets and planning for alternate modes.

#### *Speed*

Speed is a critical factor in designing to context and is influenced by continuity and connectivity. Directness of travel and speed of travel influence travel time and are importantly different for each travel mode. The resulting speed differential between modes should be considered when designing for speed and safety. Given that, slowing traffic on *all* highways is not appropriate, but slowing traffic on *parts of some* highways is not detrimental to regional trip travel time.

Speed expectations should use the context of “target speed” not “design speed.” Speed, due to congestion, changes by time-of-day. This variability should be factored into design controls and control systems addressing progression speeds and mix of travel modes among others.

- **Target Speed** is the 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. The target speed is usually the posted speed. Target speeds should be lower in walkable areas.
- **Design Speed** is the speed that governs certain geometric features of the thoroughfare, primarily safety-related criteria like horizontal curvature, superelevation and sight distance. Design speed is typically higher than the posted speed limit to result in conservative values for these criteria. The CNU-ITE manual recommends the design speed be 5 mph over the target speed.<sup>xlv</sup>

### Intermodalism: A closing thought

The following chapters segregate the different modes. Ideas about functional classification, modal priorities and layered networks may even push practitioners toward thoughts of segregating or even excluding modes. This would be wrong.

The system needs to be considered as whole; integrated and connected to the greatest extent possible. Regardless of mode, many travelers share the same destinations. So, even though priorities among modes may shift with context, provision of safe, practical and generally attractive passage and access for all modes should be provided.

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## Build Out Alternatives Analysis

Several alternative transportation systems were analyzed to determine the best fit for the land use build out depicted in *FRP 2030 Future Growth Illustration*. Build out population is estimated to be 150,000 people more or less. Growth rates from the Arizona Department of Administration place build out in approximately 2090. Obviously, much can change in the next 70 years to affect outcomes. This includes demographic shifts, technology changes, climate and the economy, to name a few.

These are the alternatives evaluated:

**Many Roads:** This alternative attempts to maximize the number of new roads and connections to meet future needs. Included in this scenario are the US 180 bypass on the west side and the US 89 bypass on the east. A connection of Switzer Canyon Drive south under E. Route 66, the BNSF railroad and Butler Avenue is another dramatic connection tested here. Some limited widening is anticipated in places. Transit, bike and pedestrian levels of service are anticipated at levels somewhat higher than most 2040 alternative levels of improvement.

**Wide Roads:** Widening the Interstate 40 to 4 lanes and Milton and E. and W. Route 66 to six lanes are major features of this plan. The bypasses and Switzer Canyon Drive connections are not considered. The same levels of service are assumed for alternate modes as in “Many Roads.”

**Pedestrian, Bike and Transit Improvements/Hyper Improvements:** A reasonably large increase to alternate mode levels of service are tested in isolation to determine their effect. These are similar to the 2040 Walk & Bike Focus alternative level of improvements. An unreasonably large increase in transit is also tested in the “Hyper” version, mostly as a thought exercise, but it does suggest a possible path forward.

**Recommended or Hybrid Plan:** System performance, environmental and cultural resource impacts and public input rule out parts of all the alternative above. As in previous plan updates, the preferred solution combines aspects of all alternatives.

Table 6.1 provides comparative performance statistics for the various build out system plan alternatives. This is followed by a series of maps illustrating the roadway level of service for each.

Table 6-1 Build Out Transportation Alternative Systems Performance

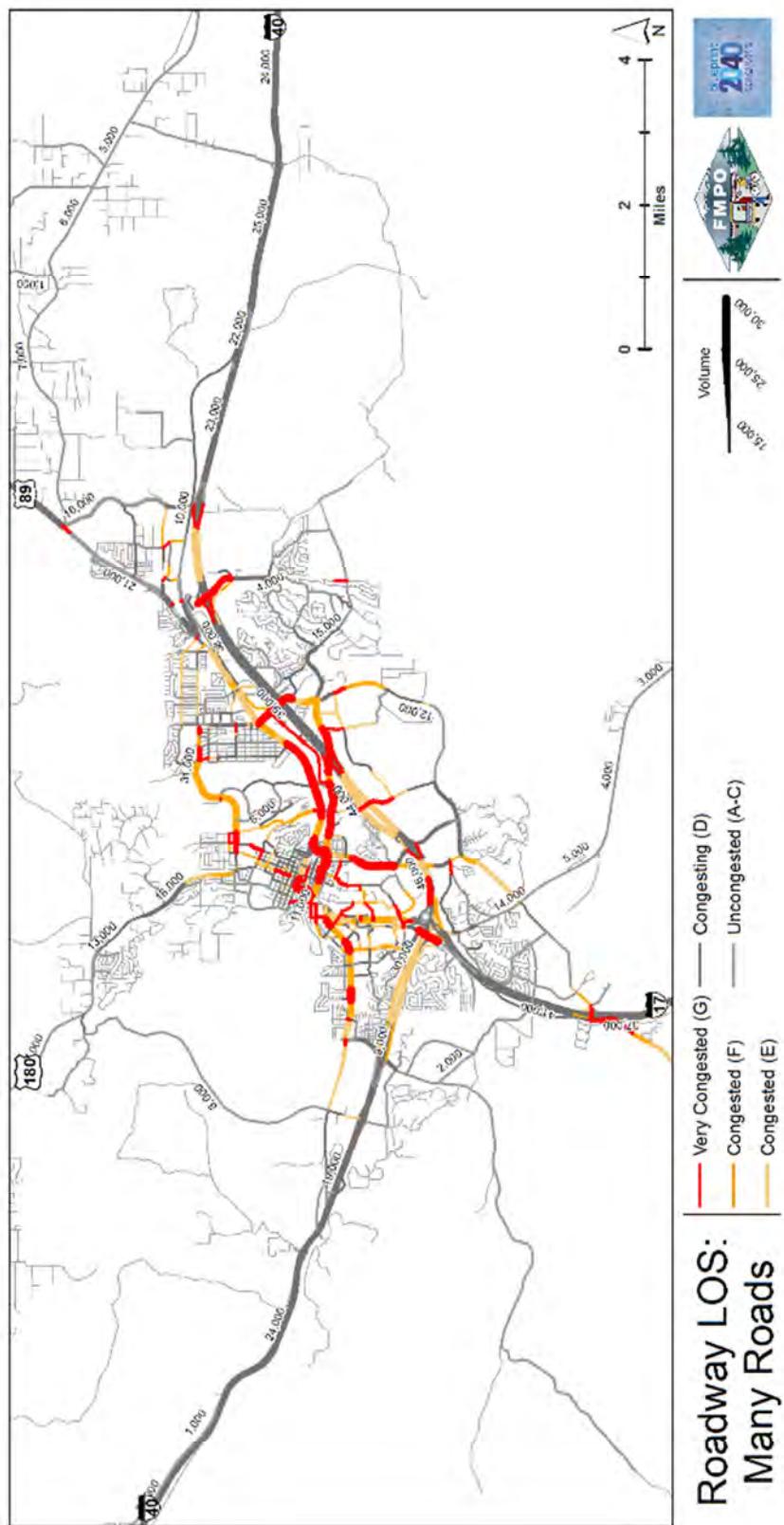
Measures / Model Output	2015 Base	2090 Many Roads	2090 Wide Roads	2090 Ped-Bike-Transit	2090 Hybrid / Recommended	2090 Hyper-Transit
VMT (miles):	2,054,585	4,873,389	4,768,367	4,952,735	4,610,806	4,132,315
VHT (hours):	49,974	218,737	202,018	497,495	193,809	162,349
Avg Delay (Hours):	5,241	113,485	100,154	390,868	95,609	78,402
Avg Speed:	41.1	22.3	23.6	10.0	23.8	25.5
Person Trips:	597,530	1,124,645	1,124,659	1,107,243	1,107,244	1,016,727
Walk Trips & Share:	73,562	130,351	130,572	132,781	144,397	144,990
Transit Trips & Share:	10,135	15,975	15,963	36,073	35,574	130,929
Auto Trips & Share:	513,833	978,319	978,124	938,389	927,272	740,807
Walk/Bike Mode Share	12.3	11.6	11.6	12.0	13.0	14.3
Transit Mode Share	1.7	1.4	1.4	3.3	3.2	12.9
Auto Mode Share	86.0	87.0	87.0	84.8	83.7	72.9
Vehicle Trips:	404,814	775,156	775,015	745,355	737,220	598,575
Avg Trip Length:	5.1	6.3	6.2	6.6	6.3	6.9
Avg Trip Time (Min):	7.4	16.9	15.6	40.0	15.8	16.3
VMT/Capita	22.75	31.81	31.13	32.33	30.10	26.97
VHT/Capita	0.55	1.43	1.32	3.25	1.27	1.06
Delay/Capita	0.06	0.74	0.65	2.55	0.62	0.51
Non-auto trips/capita	0.93	0.96	0.96	1.10	1.17	1.80
Arterial Network Density / Sq.Mile	5.4	6.2	6.6	5.4	6.1	6.1

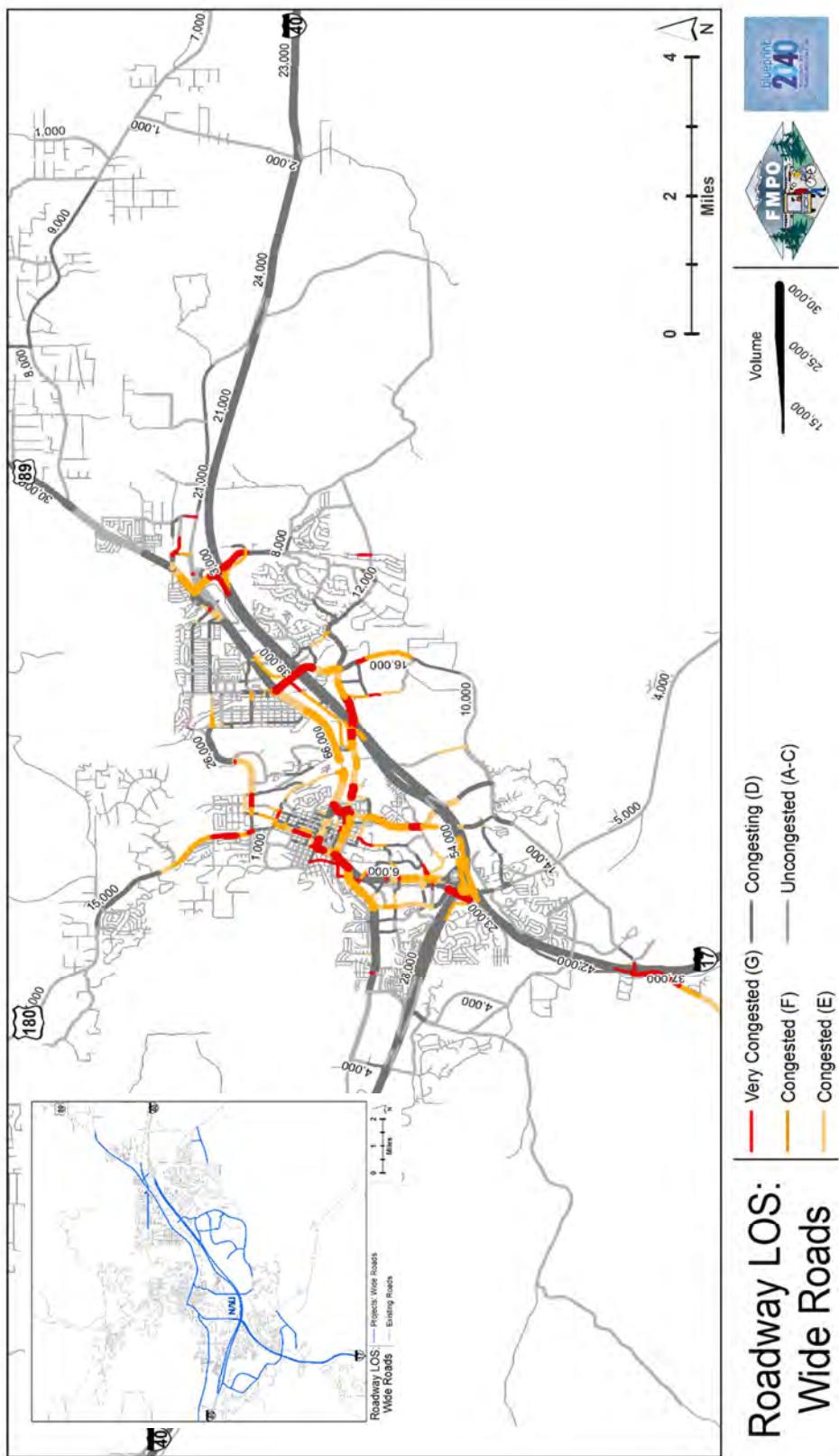
Some important observations can be made from this table.

- Congestion as measured by vehicle hours of travel (VHT) and delay are going to increase substantially under all scenarios
- Considering the data on a per capita basis, it is not as dramatic: VHT per capita will more than double and delay per capita will go up six-fold
- Wider roads generally do a better job at addressing congestion than Many Roads
- Arterial network density improves under all but the Ped-Bike-Transit alternative, but is still short of the 8 lanes per square mile of urbanized area.
- Retaining only the existing system, the Ped-Bike-Transit alternative, creates more vehicle miles of travel as travelers migrate to the interstate to make faster trips
- Many Roads creates slightly more VMT as travelers use bypasses to make faster trips
- A combination of new and wider roads and alternate modes is nearly as effective as Wider Roads
- Mode share will drop without adequate investment as future development tends to be lower density, single use, and on the periphery of existing development, so not as conducive to walking, biking and transit
- Dramatic gains in mode share can be made with dramatic improvements to service

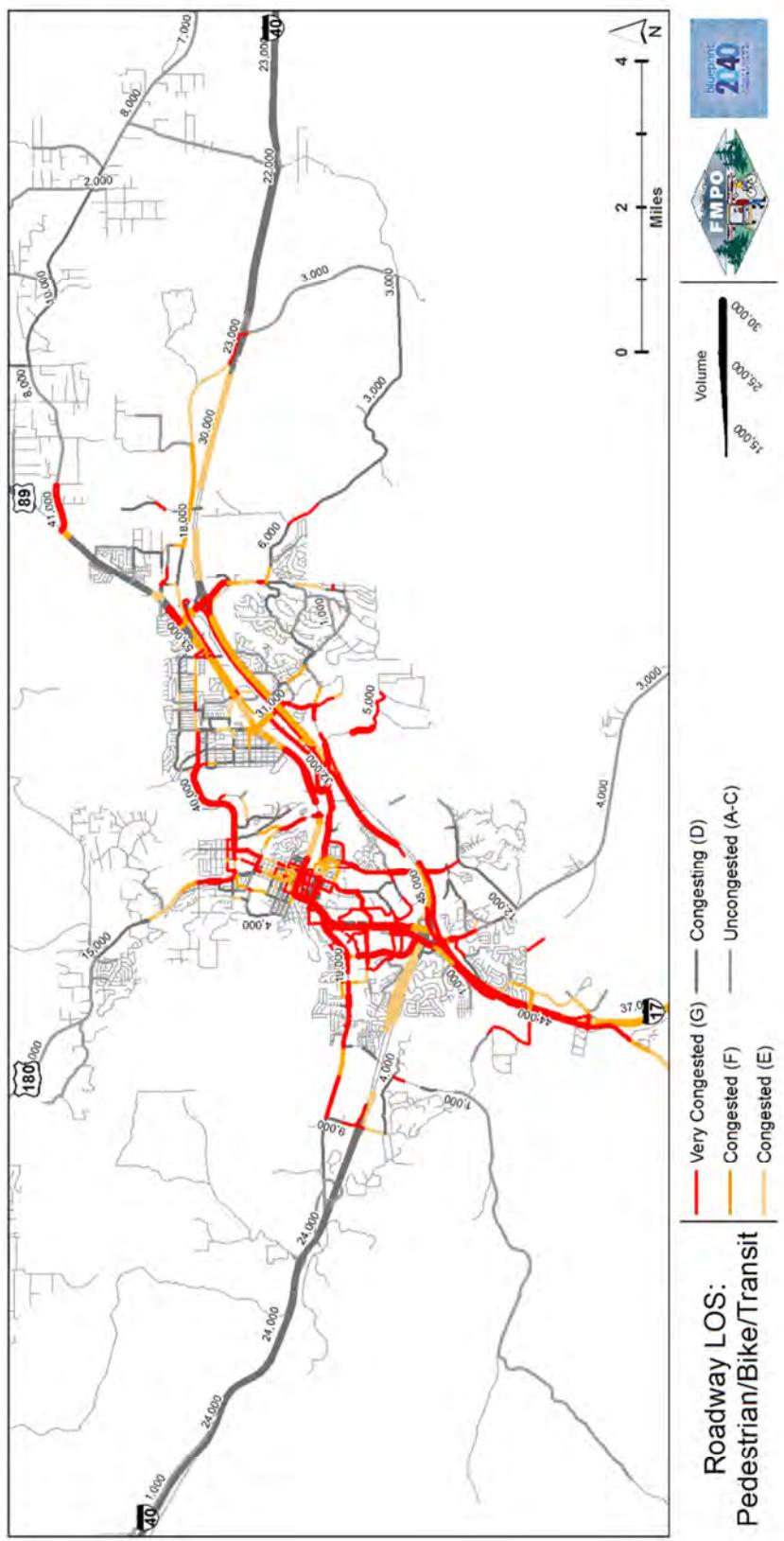
A comparison of level of service maps offers valuable insights, too.

- Several areas are persistently congested or very congested regardless of the solution:
  - Milton Road
  - Butler east of I-40
  - Fourth Street at I-40
  - Lone Tree RR Bridge
  - Forest Avenue at Beaver Street
  - Country Club/I-40 interchange
- Widening E. and W. Route 66 to 6 lanes improves LOS from “E” and “F” to “C” and “D” and increases traffic volumes by 20%
- Widening the interstate to 4 lanes keeps the LOS at “C”
- The bypasses reduce system delay by 6%, a figure that will be more pronounced in the parallel corridors

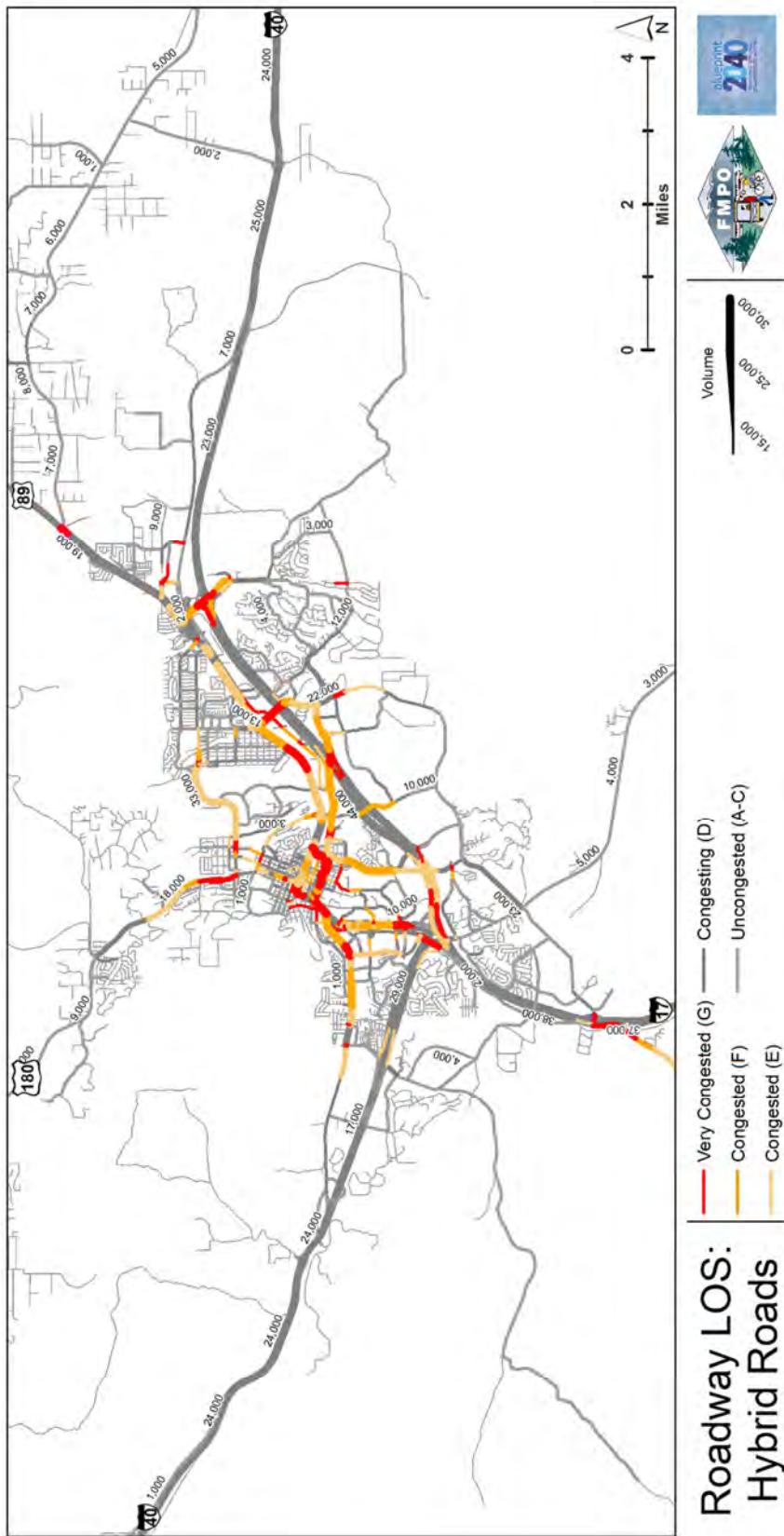




Map 6.2 "Wide" Roads Build Out Alternative Projects & Performance



Map 6.3 Pedestrian, Bike & Transit Only Build Out Alternatives



Map 6.4 "Hybrid" Roads Build Out Alternative Projects & Performance

## Chapter Conclusion

The hybrid build out plan is the recommended build out plan. It is a combination of new roads, widened roads and increasing levels of service for pedestrian, bicycles and transit. These strategies complement each other in that new roads are needed for the circulation of all modes and that a shift to alternate modes will decrease the demand on the road network. By avoiding or deferring new roads like the bypasses and the widening of roads like E. Route 66 for their full length, some negative consequences are avoided. These include historical, cultural and environmental resources and the creation of wider streets that inhibit pedestrian and bicycling activity.

The following chapters layout system guidance and plans in more detail for Roads & Streets, Transit, Pedestrian & Bicycles, and Freight

## Strategic Initiatives

### **City and County Master Plans**

Recognizing that *Blueprint 2040* is largely an advisory document for member agencies, it is recommended that FMPO work with member agencies to establish master plans for the various modes based on *Blueprint 2040*. This will establish much as local policy to influence capital programs and development standards. It also permits the FMPO independence to explore new policies and projects.

### **Transportation Improvement Analysis (TIA) Process**

Opportunities remain to better integrate all modes into the TIA process. This would include negotiations with developers..

## Blueprint 2040: Regional Transportation Plan

### Flagstaff Metropolitan Planning Organization

## Chapter 7 – Roads & Streets System Plan & Performance

### Roads & Streets Network Principles

AUTOMOBILE GOALS AND POLICIES

**Goal T.8. Establish a functional, safe, and aesthetic hierarchy of roads and streets.**

Policy T.8.1. Promote efficient transportation connectivity to major trade corridors, employment centers, and special districts that enhances the region's standing as a major economic hub.

Policy T.8.2. Maintain the road and street classification system that is based on context, function, type, use, and visual quality.

Policy T.8.3. Design neighborhood streets using appropriate traffic calming techniques and street widths to sustain quality of life while maintaining traffic safety.

Policy T.8.4. Protect rights-of-way for future transportation corridors.

Policy T.8.5. Support the area's economic vitality by improving intersection design for freight movements.

Policy T.8.6. Maintain the City's street infrastructure in a cost effective manner to ensure the safety and convenience of all users.



Source: Flagstaff Regional Plan 2030

### Network Density and Patterns

The density of the network – or frequency of spacing for minor and major arterials – should correlate to the density of the population. The distance between arterials in an urban area compared to a rural area can range between 1 and 8 miles. Population densities of 4,500 to 5,000 persons per square mile can be served by a network of four-lane principal arterials on a 1-mile grid with a supporting system of minor arterials and major collectors.<sup>xvi</sup> This equates to roughly 8 principal arterial lane miles per square mile.

To keep non-arterial traffic off of arterials and protect residential neighborhood integrity, these matters should also be accounted for in network planning:

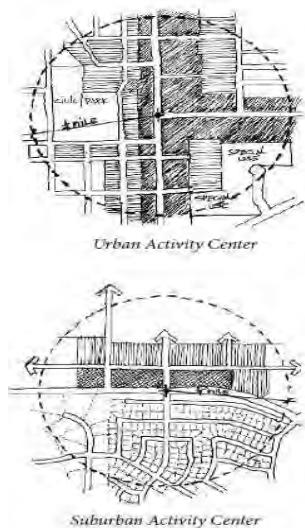
- A supporting system of collector streets should be required for all development abutting an arterial
- Connectivity should be provided between residential neighborhoods and adjacent commercial development and employment centers.
- Connections should be provided between the on-site circulation systems of adjacent commercial developments.<sup>xvii</sup>

The Flagstaff region has a population density of 2,200 persons per square mile in the census-defined, urbanized area. However, including minor arterials, the arterial network density is only 5.3 lane miles

per square mile. Additionally, many subdivisions are not interconnected and many commercial lots are physically separated from each other with no cross-connection opportunities off of the arterial network.

#### *Network Form*

The density of a network will also be influenced by the form it takes. The traditional urban grid has short blocks, straight streets, and a crosshatched pattern (Figure 6A.1). The typical contemporary or conventional suburban street network has large blocks, curving streets, and a branching pattern (Figure 6a.1). The two networks differ in three respects: (1) block size, (2) degree of curvature, and (3) degree of interconnectivity.



Contemporary networks do have some advantages, such as the ability to lessen traffic on local residential streets. With their curves and dead ends, contemporary networks can go around or stop short of valuable natural areas.<sup>xlviii</sup> Developers also like them because they typically use 25% of the developer's property versus over 35% for a traditional square grid.<sup>xlix</sup> The unintended consequence of this benefit to suburban-style developers is the eventual need to widen existing main roads at the public's expense and at great impact to individual property owners. Therefore, traditional urban grids best fulfill *FRP 2030* goals because they shorten distances for non-motorized modes and reduce intersection size by distributing traffic across several facilities. Traditional urban grids are recommended for application in all urban areas and some suburban activity centers.

Figure 7.1. Network Forms  
Source: *FRP 2030*

The Flagstaff region possesses both types of networks. The Central Business District has a block size of 330' is a traditional grid. This extends to the neighboring residential areas. Woodlands Village is laid out as a conventional suburban development with greatly curving streets and large blocks with relatively poor connectivity. Again, the surrounding residential areas mimic this pattern. These latter areas should be examined for the potential to improve pedestrian and bicycle connectivity and new conventional suburban areas should be designed with these goals in mind.

#### **Strategies for Improving Existing and Built-out Areas**

In a built-out area, can the network be improved such that local traffic can use local streets to a greater degree? It should be determined how much *local* traffic can be removed from arterial networks if the local and collector system is made to work more effectively. The network should be evaluated using measures of internal connectivity, external connectivity, and pedestrian route directness.

If improving the network will not address the problem or is not an option, the two primary choices are to widen the arterial or to build a parallel roadway.<sup>l</sup> *Blueprint 2040* utilizes all of these tools in restoring and providing efficiency to the current and future road network.

### Roadway Widening

Access management and intersection changes are first recommended to address the problem and are sometimes applied in addition to mainline widening. Widening should be done only if the resulting roadway is compatible with the land use context. In most cases, widening roads for general traffic is viewed by the community as the least favored approach to providing throughput capacity. The *Blueprint 2040* survey results support this. Ensuring other modes are accommodated and contributing to throughput capacity has been considered when widening is recommended. Planners should identify the existing roadway role, its consistency with the community vision, and whether an alternative roadway type would better support the community.<sup>li</sup>

### Parallel Roadway

If a parallel roadway is necessary, the addition of a major or minor arterial is considered first. They should be consistent with the area network plan and be tied in to the existing road system at the most practical location. This improves the effectiveness of these road links.<sup>lii</sup> Bypasses are supported by some segments of the Flagstaff community. However, they are expensive and have negative consequences that are difficult to mitigate. As such, they are generally held for future application, if needed, and on the condition that adequate mitigation measures can be implemented.

## Creating a Road Framework for New Development

A newly developing area offers the opportunity to implement a highly connected street system with less reliance on multi-lane arterials. Following are guidelines to be used in laying out a context sensitive roadway network capable of providing safe, multimodal choices for all trips. *Blueprint 2040* provides the initial planning for higher order roads needed for ultimate build-out. Local roads and neighborhood collectors should then be included, depending upon specific developments proposed and follow the spacing guidelines later in this chapter.<sup>liii</sup>

### Network Configuration – Area-wide

The regional travel demand model has been used to estimate the density, spacing and capacity needs for major roadways in the region. The minimum spacing described below are not always met, due to historic development patterns and terrain.

- Arterial roadways should be continuous and networked in generally rectilinear form with spacing of  $\frac{1}{2}$  to 1 mile in suburban contexts and  $\frac{1}{4}$  to  $\frac{1}{2}$  mile in urban contexts. Closer spacing may be needed depending on activity levels and through movements.
- Collectors may be spaced at 1/8 mile intervals, if needed. Local or neighborhood transit service via the collector network is an important consideration in determining need.
- Activity centers should be connected by minor arterials and major collectors. These roadways should have the area's highest level transit service.
- Collectors should link neighborhood centers with adjacent neighborhood centers and regional centers. All such connectors should be able to accommodate transit service.

Major roadways that are to serve as truck routes or primary through traffic routes should avoid the centers of urban areas or neighborhoods wherever possible. Minor arterials and major collectors may be designated local truck routes to reach clusters of commercial uses in centers or cores.<sup>liv</sup>

**Table 7-1 Roads & Streets Facility Spacing Policy Guidance**

Facility Type	Connectivity		Connectivity Standards	
	Measures	Rural	Suburban (1)	Urban
Access (local streets)	Facility Spacing (feet)		660 ft. preferred	330 to 660 ft.
	Block Size (acres)		7 to 15	2 to 3.5
	Intersection Density (per sq. mile)	930 to 1320 ft.	130 preferred	200 preferred
	Street Density (per sq. mile)	not applicable	75 minimum	130 minimum
			25 preferred	27 preferred
			17 minimum	23 minimum
Circulation (collectors)	Facility Spacing (miles)	1/2 mile	1/4 to 1/2 mile	1/8 to 1/2 mile
Regional Travel (Minor arterials)	Facility Spacing (miles)	As needed	1/2 mile	1/2 mile
Regional Travel (Thoroughfares)	Facility Spacing (miles)	not applicable	not applicable	1/8 to 1/4 mile
Regional Travel (Major arterials /Freeways)	Facility Spacing (miles)	As needed	1 mile	1 mile

(1) When setting suburban block sizes, pedestrian connections may be considered

### Facility Spacing for Transit, Pedestrian and Bicycle Networks

Irrespective of major roadway or thoroughfare spacing, pedestrian facilities should be well networked. In suburban contexts, block sizes of no more than 600 feet on a side with a maximum area of 7 acres will provide a reasonable level of connectivity. In urban contexts, block sizes of 300 to 400 feet with a maximum area of 3-4 acres are ideal. Where streets cannot be connected, provision of bike and pedestrian connections at cul-de-sac heads or midblock locations should be provided as a second best solution to accessibility needs. For reference, blocks in the downtown area are 2 acres; in Sunnyside, 3.5 acres; Foxglen and Continental, 5-40 acres. In Ponderosa Trails one block of 27 acres is effectively reduced to three smaller blocks by pedestrian connections. This treatment is supportive of pedestrian usage and its design and application can be improved upon.

Multilane arterials should have a nontraversable median wide enough to accommodate a left turn at signalized intersections. This calms traffic, reduces conflict points, and provides pedestrians with safe refuge. Pedestrian crossings on major collectors should be provided at intervals of not more than  $\frac{1}{4}$  mile.<sup>lv</sup> Where at-grade crossings cannot be provided as a result of signal spacing or otherwise, the creation of grade separations for pedestrians and bicyclists is advisable at strategic locations.

Bicycle-compatible roadways should comprise a bicycle network of parallel routes with effective spacing of  $\frac{1}{4}$  mile. Connections providing access of 600' – 900' should be provided. Bicycle lanes should be

provided on both sides of arterial and collector roadways in addition to a shared or multiuse path on one side.

Bus pullouts may be provided for bus stops on major arterials under certain conditions where safety is compromised. Where the bus stop is not adjacent to an intersection, a pedestrian crossing with refuge in the median should be provided adjacent to the bus stop. Minor Arterials may be served by curb lane bus stops.<sup>lv</sup>

### **Signal spacing and Level of Service**

#### *Traffic Signal Spacing*

The spacing of traffic signals has a major influence on roadway operating speeds and capacity. Studies have found that a four lane divided arterial roadway with signal spacing of  $\frac{1}{2}$  mile carries the same amount of traffic as a six lane arterial with signals spaced at  $\frac{1}{4}$  mile. Neither situation is optimal for pedestrians nor is there much support for roads wider than the region's typical 4-lane section with turn lanes. On the one hand, narrower roadways are more amenable to pedestrian crossings. On the other, many four-lane arterial sections in the region are projected to exceed capacity. Where long and uniform arterial spacing cannot be achieved, then special intersections (i.e., Michigan lefts, roundabouts) or lower development densities should be considered.<sup>lvii</sup>

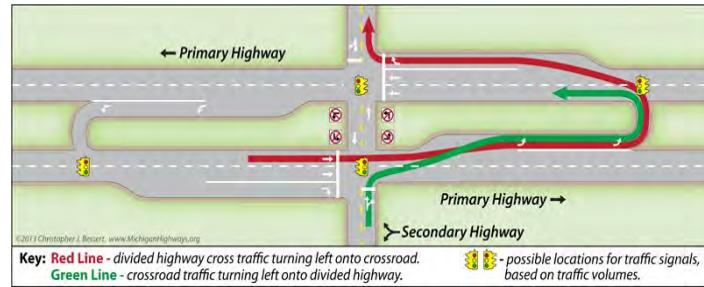


Figure 7.2 Michigan Left Turn

Source: [http://www.michiganhighways.org/indepth/michigan\\_left.html](http://www.michiganhighways.org/indepth/michigan_left.html)

In the Flagstaff region, signal spacing appropriately varies by context. In the downtown, spacing is as close as 330' to 660'. This signal spacing on arterials and collectors can be an important strategy in complementing traditional grid networks where low traffic speeds and high pedestrian activity are desired.<sup>lviii</sup> On Milton Road, a more suburban context, the signals are spaced from 450' to 2200' with an opportunity to achieve a more uniform spacing of approximately  $\frac{1}{4}$  mile. The spacing on E. Route 66 east of downtown stretches to more than  $\frac{1}{2}$  mile between signals and shortens to  $\frac{1}{4}$  mile on both sides of 4<sup>th</sup> Street. Signal spacing of  $\frac{1}{4}$  mile begins to permit the speed progressions where traffic flow is a priority as recommended by some state departments of transportation. On lower order suburban roadways,

spacing of 660 ft. (1/8 mile) permits safe pedestrian crossings at the upper boundary of desirable block lengths. This corresponds to long-block orientation and is similar to blocks sizes in Sunnyside.

***"If you plan cities for cars and traffic, you get cars and traffic. If you plan for people and places, you get people and places."*** -Fred Kent, Project for Public Spaces

Tables 7.2 and 7.3 identify ideal signal spacing and desired intersection level of service in different settings. Spacing seems frequent, but it should be considered that signals are only to be placed when they meet traffic signal warrants.

Table 7-2 Traffic Signal Spacing in Different Contexts

Facility Type	Urban Activity	Suburban Activity	Rural
	Centers	Centers	Contexts
Major Arterial	660 to 1320 feet	1320 to 1540 feet	1980 feet
Minor Arterial	300 to 1100 feet	1320 feet	1540 feet
Major Collector	300 to 660 feet	660 to 1320 feet	1540 feet

Table 7-3 Intersection Peak Hour Level of Service(LOS) Policy Guidance (1) (2) (3)

Facility Type	Rural	Suburban	Urban
Access (local streets)	LOS C	LOS C	LOS C
Circulation (collectors)	LOS C	LOS D	LOS D
Regional Travel (arterials, freeways)	LOS D	LOS D	LOS E

#### Application

Intersection LOS is often worse than link or segment LOS, so comparing these guidance LOS to link LOS on the system maps is not appropriate

LOS as prescribed applies to the ultimate facility cross section, not necessarily the number of lanes in the current condition. Geometric changes in keeping with the context of the area, multi-modal system improvements and network enhancements are appropriate mitigations to maintain or achieve LOS. In some cases, the prescribed LOS will be exceeded and further geometric changes deemed unsuitable for the area. At such times, additional emphasis on multi-modal improvements and street network enhancements should be made or reductions in the development intensity considered.

- (1) Applied to development-impacted controlled intersections (PM peak hour) during entitlement TIA process.
- (2) Applied to volume/capacity traffic model analysis for ongoing system performance monitoring.
- (3) Intersection Level of Service, including critical movements, is a valued resource paid for and enjoyed by existing system users. Growth is responsible for addressing proportional impacts to service levels through improvements that address capacity or vehicular demand for the intersection(s) impacted. Responsibility may be accepted directly through the development agreement or indirectly through payment of a mobility fee.

Additional work is recommended in relating intersection this LOS guidance to the link LOS from forecast model runs from the regional transportation model. This will assist in estimating when an intersection may meet signal warrants and placing the signal within a development schedule or capital program.

## Functional Classification

The successful design and implementation of automobile and truck networks builds on the concepts in the introduction starting with functional classification followed by access management. Classification systems should increase in sophistication with increases in factors like geographic area, range of road types within the region, population and employment, and range of development goals. On all of these points, with development goals being most relevant, a review of the region suggests a more robust set of functional classification categories. *FRP 2030* provides the number, type, purpose and function of the roadway categories for use in *Blueprint 2040*.

**Freeways (Interstates)** - serve regional travel as a high-capacity carrier for automobiles and trucks and provide space and shelter via rest areas and truck stops. They accommodate high-speed, long trips that connect the region to the state and nation. Freeways build regional economies, but can destroy landscapes, cities and neighborhoods if improperly planned. Freeways require large rights-of-way (up to 300 ft. or more), are designed with full access control and are intended to carry a large percentage of trucks. Adjacent land uses may include commercial areas, open space, public lands, industrial sites, and certain institutional sites. Residential property will not abut freeways unless separated by adequate buffering.

**Major Arterials** - serve regional travel on relatively high-capacity roadways as a carrier for predominantly cars, transit, trucks, and bicycles. Pedestrians will find passage along these arterials and special attention is given to pedestrian crossings. Space and shelter is found at bus stops, pedestrian waiting areas at intersections, and mid-block crossings. Key connections are to major regional centers of activity and to extra regional destinations like other cities. As in the case of Route 66 which is symbolic of “the mother road” – major arterials can embody regional identity and pride. Throughput capacity provided by strong access management will be emphasized over direct property access. Adjacent land uses include highway and regional commercial areas, open space, public lands, industrial sites, and institutional sites. Residential property should not abut major arterials unless separated by adequate buffering.

**Minor Arterials** - serve circulation and some travel functions within and between different areas of the region. Activity centers will often be located along a minor arterial or at the intersection with another minor arterial or a major collector. All modes are carried on minor arterials with increasing emphasis on the bicycle and pedestrian modes. Space and shelter become more pedestrian in scale, more frequent, and generous. A minor arterial like Lake Mary Road might symbolize the “Great Outdoors.” Connections between residential and commercial areas, regional parks, and major institutions are often made by minor arterials. Adjacent land uses include residential and commercial areas, open space, public lands, industrial sites, and institutional sites.

**Thoroughfares** - are unique components of the urban network. They synthesize circulation, access, and to a lesser extent, travel functions on frequently spaced facilities with fewer lanes. The roles they serve are more balanced and at a uniformly high level. All modes are carried with special emphasis on the pedestrian, transit, and bicycle

**Major Collectors** - serve circulation by collecting traffic from minor collectors and local streets in an area and delivering it to major or minor arterials. All modes of transit are carried. These roadways are generally contained entirely within a recognizable area and connect adjoining neighborhoods with each other. Adjacent land uses include residential areas, commercial areas, open space, public lands, industrial sites, and institutional sites. Moderate access management is expected with limited direct access being acceptable.

**Minor Collectors** - collect traffic from local streets and deliver it to major collectors or minor arterials. They serve as carriers for pedestrians, bicycles, and cars with lesser roles for transit and trucks. Connections are made between smaller neighborhoods and parks and occasional convenience centers. Through trips are discouraged as space and shelter activities have increased including promenading, recreational walking, and exercise. Adjacent land uses include residential and commercial areas, open space, public lands, industrial sites, and institutional sites.

**Connectors/ Commercial Local/ Residential Local (Neighborhood Streets)/ Alleys** - are all minor roads that provide direct vehicle, bicycle, and pedestrian access to individual commercial and residential properties, providing no route continuity beyond the areas they serve. Alleys provide secondary access to the rear of residential or commercial properties and may also be used to provide access to parking garages and surface parking lots. They carry pedestrians, bicycles, and cars and in commercial areas some streets will provide access to trucks. In residential areas the street surface may be used for impromptu recreational activities, visiting, and car-washing. As place builders, these streets are vital in creating an attractive setting, efficient access, safe operations, and strong internal circulation.<sup>lx</sup>

Several characteristics of these different functionally classified roads are identified in Table 7-4. Districts are referenced in the arterial functions. These are sub-areas of the larger region like Woodlands Village or the East Side. They are comprised of numerous residential neighborhoods and can contain more than one activity center of various scales.

**Table 7-4 Characteristics of Functional Classified Roads**

Roadway Classification	Route Function	Terminate At	Access Control	Maximum Vehicle Lanes	On-Street Parking	Bicycle Provision
Freeway	Interstate & inter-regional travel	Freeways or Major Arterials	Full Control	6 thru lanes, ramps as needed	No	Allowed on shoulder of some routes
Major Arterial	Inter-regional and inter-district travel	Freeway, Major Arterial, Minor Arterial	Extensive Control	2 (rural) to 6 (urban) thru lanes, turn lanes as needed	Only in downtown Flagstaff	On-street shoulders, bike lanes or parallel, close-by facility
Minor Arterial	Local travel between districts	Freeway, Major Arterial, Minor Arterial	Extensive Control	2 - 4 thru lanes, 4 lane max.	Yes, in commercial areas only	On-street bicycle lanes
Major Collector	Collect local traffic and deliver to arterials	Major Arterial, Minor Arterial, Major Collector	Partial Control	2 - 4 thru lanes, 2-way left turn only with 3-lane total	Yes, in commercial areas only	On-street bicycle lanes
Minor Collector	Collect local traffic and deliver to collectors and arterials	Arterials and Collectors	Partial Control	2 thru lanes, turn lanes as needed, 2-way left turn only with 3-lane total	Yes, if width is available	On-street bicycle lanes
Commercial Local	Access to commercial land uses	Arterials and Collectors	Partial Control	2 thru lanes, left turn lane if needed	Yes, if width is available	Bikes in vehicle or bike lanes
Residential Local	Access to residential land uses	Major Collector, Minor Collector, Local	Partial Control	2 thru lanes, no turn lanes	Yes, if width is available	Bikes in vehicle lanes
Alley	Access to adjacent land uses	Major Collector, Minor Collector, Local	Partial Control	Lanes not delineated	No	Bikes in vehicle lanes

### Access Management

Access management can improve operations and, by extension, regional or corridor economics. It does this by increasing capacity and speed allowing access to markets further away. Properly implemented, it can adapt environments to be more conducive to desired land use.

Access management strives to: (a) limit the number of traffic conflicts that occur at any given location and separate the locations at which conflicts can occur; and (b) minimize speed changes and limit the

speed differential between turning vehicles and through traffic to an acceptable level.<sup>lx</sup> Key elements include:

- Classifying roadways into a logical hierarchy according to function;<sup>lxii</sup>
- Planning, designing, and maintaining roadway systems on the basis of functional classification and road geometry;
- Defining acceptable levels of access for each class of roadway to preserve its function, including criteria for the spacing of signalized and unsignalized access points;
- Applying appropriate geometric design criteria and traffic engineering analysis to each allowable access point; and
- Establishing policies, regulations, and permitting procedures to carry out and support the program.<sup>lxiii</sup>

Several access management strategies may be employed to ensure complete streets and layered network objectives are achieved. Table 7-5 provides some examples.

Table 7-5 Modal Considerations in Access Management<sup>lxvii</sup>

Mode	Relationship to Access Management
Pedestrians and bicyclists	<p>Nontraversable median or median design</p> <p>Spacing and design of median openings</p> <p>Spacing of vehicular access connections</p> <p>Location of bicycle and pedestrian-only connections</p> <p>Limitation of driveway volume and reduction of vehicular conflicts with pedestrians and bicyclists</p> <p>Facilitation of internal site circulation for bicycle and pedestrian access and minimization of conflicts with motor vehicle parking</p>
Pedestrians	<p>Spacing, frequency, and design of driveways</p> <p>Intersection of driveway and sidewalk</p> <p>Continuity of pedestrian (sidewalk) circulation</p> <p>Pedestrian crossings and, where possible, reduction of pedestrian midblock crossing distances (with particular attention to primary egress locations and transit stops)</p>
Bicyclists	<p>Bicycle lane crossings</p> <p>Reduction of roadway lane width to provide greater separation between bicyclists and vehicles</p>
Bus Transit	<p>Location and design of bus stops and pullouts</p> <p>Interface with pedestrian/bicycle circulation systems</p>

*Locate Signals to Favor Through Movements*

Long, uniform spacing of intersections and signals on major roadways enhances the ability to coordinate signals and to ensure continuous movement of traffic at the desired or target speed. Flexibility in varying cycle lengths for efficient traffic progression over a range of traffic volumes and speeds generally increases as traffic signal spacing increases. On major arterials  $\frac{1}{2}$  mile is a standard interval for allowing full median openings and other locations that might be considered for signalization. Excessive cycle length of more than two minutes usually indicates the need for special intersection design like grade separation.<sup>lxiv</sup>

#### *Preserve the Functional Area of Intersections and interchanges*

The area that is critical to the intersection function, where motorists decelerate and maneuver to the appropriate lane should be protected from driveways and other access that may create conflicts.<sup>lxv</sup>

#### *Limit the Number of Conflict Points*

There is a potential for collision at every conflict point. Conversely, simplifying the driving task by reducing conflict points contributes to improved traffic operations and fewer collisions.<sup>lxvi</sup> Recall that the region suffers from a crash rate nearly 50% higher than that of the State. Strategies to reduce conflict points include:

- Separate conflict areas
- Remove turning vehicles from through traffic lanes
- Use nontraversable medians on Major roadways
- Provide unified access and circulation systems

Medians eliminate many left turns which are the cause of most access-related collisions. They improve safety by limiting the exposure of through traffic and pedestrians or bicyclists to left-turning vehicles and by providing a refuge for midblock pedestrian crossings. Full median openings, which allow left turns from either direction, are best provided at signalized intersections and unsignalized junctions of arterial and collector streets.

#### *Safety Effects of Access Management*

The greatest benefit of access management is to improve safety in a region. Table 7-6 summarizes the safety effects of several access management techniques.

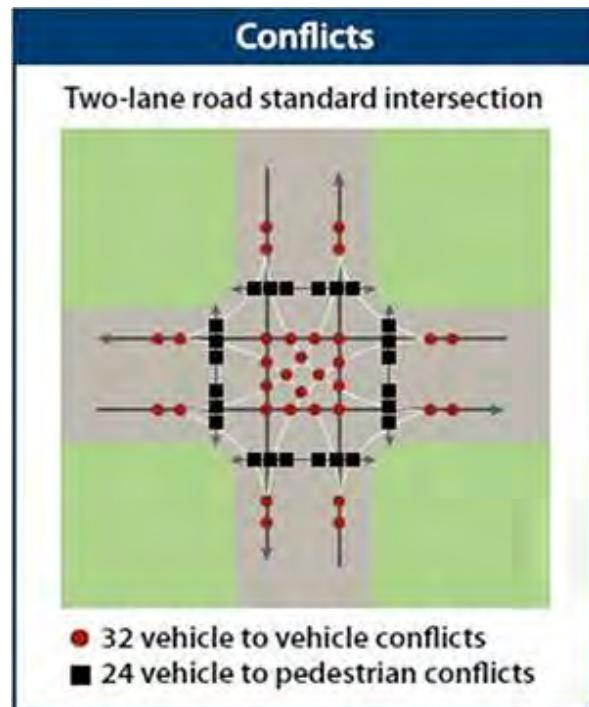


Figure 7.3 Conflict points at a 4-legged intersection

Source: FHWA

Table 7-6 Effects of Access Management Techniques, Summary of Research on Effects

Treatment	Effect
Add continuous	35% decrease in total crashes
Two Way Left Turn Lane [TWLTL]	30% decrease in delay 30% increase in capacity
Add nontraversable median	>= 55% in total crashes 30% decrease in delay 30% increase in capacity
Replace TWLTL with nontraversable median	15% to 57% reduction in crashes on four-lane roads 25% to 50% reduction in crashes on six-lane roads
Add left-turn bay	25% to 50% reduction in crashes on four-lane roads Up to 75% reduction in total crashes at unsignalized access 25% increase in capacity
Left-turn improvements:	
Painted	32% reduction in total crashes
Separator or raised divider	67% reduction in total crashes
Add right-turn bay	20% reduction in total crashes Limit right-turn interference with platooned flow, increased capacity
Increase driveway speed from 5 to 10 mph	50% reduction in delay per maneuver; less exposure time to following vehicles
Visual cue at driveways, driveway illumination	42% reduction in crashes
Prohibition of on-street parking	30% increase in traffic flow; 20% to 40% reduction in crashes
Long signal spacing with limited access	42% reduction in total vehicle hours of travel 59% reduction in delay

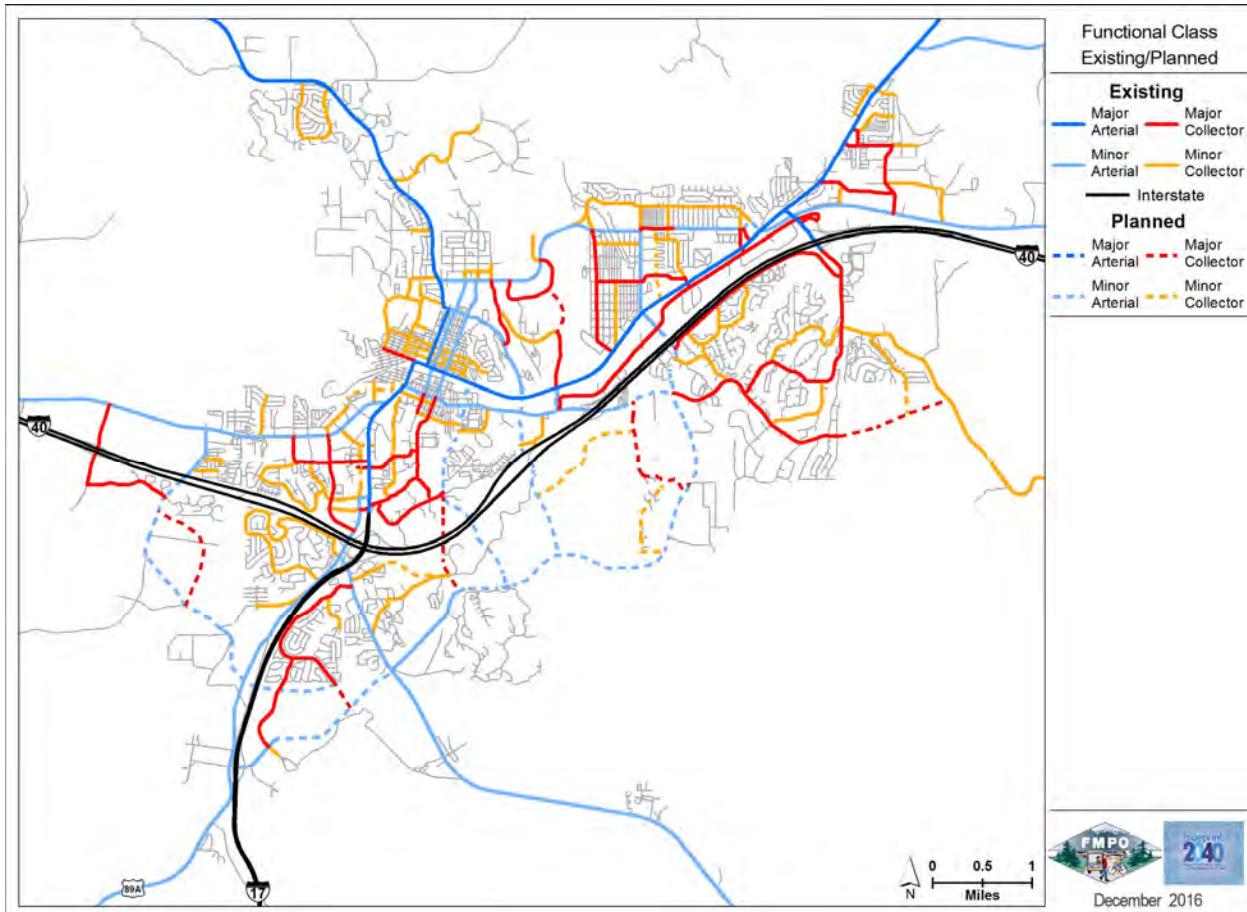
Source: Access Management Manual, 2<sup>nd</sup> Edition, ITE

## Roads & Streets System Plan

### System Description

### *Functional Classification*

As new streets are added a final alignments determined official City and County maps should be reviewed for potential changes in designation to existing roads and streets.



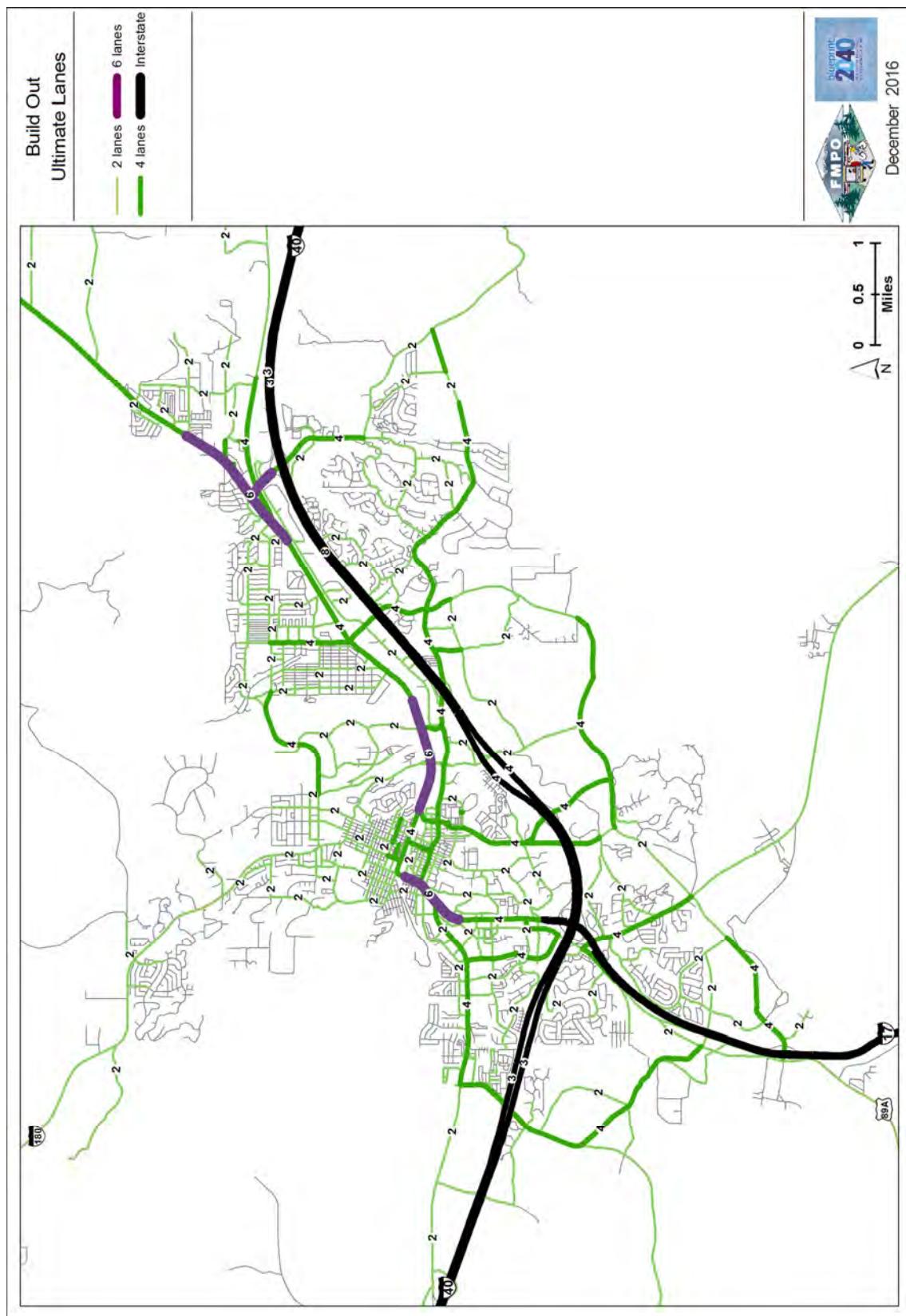
Map 7.1 FMPO Future Functional Classification

### *Ultimate Lanes*

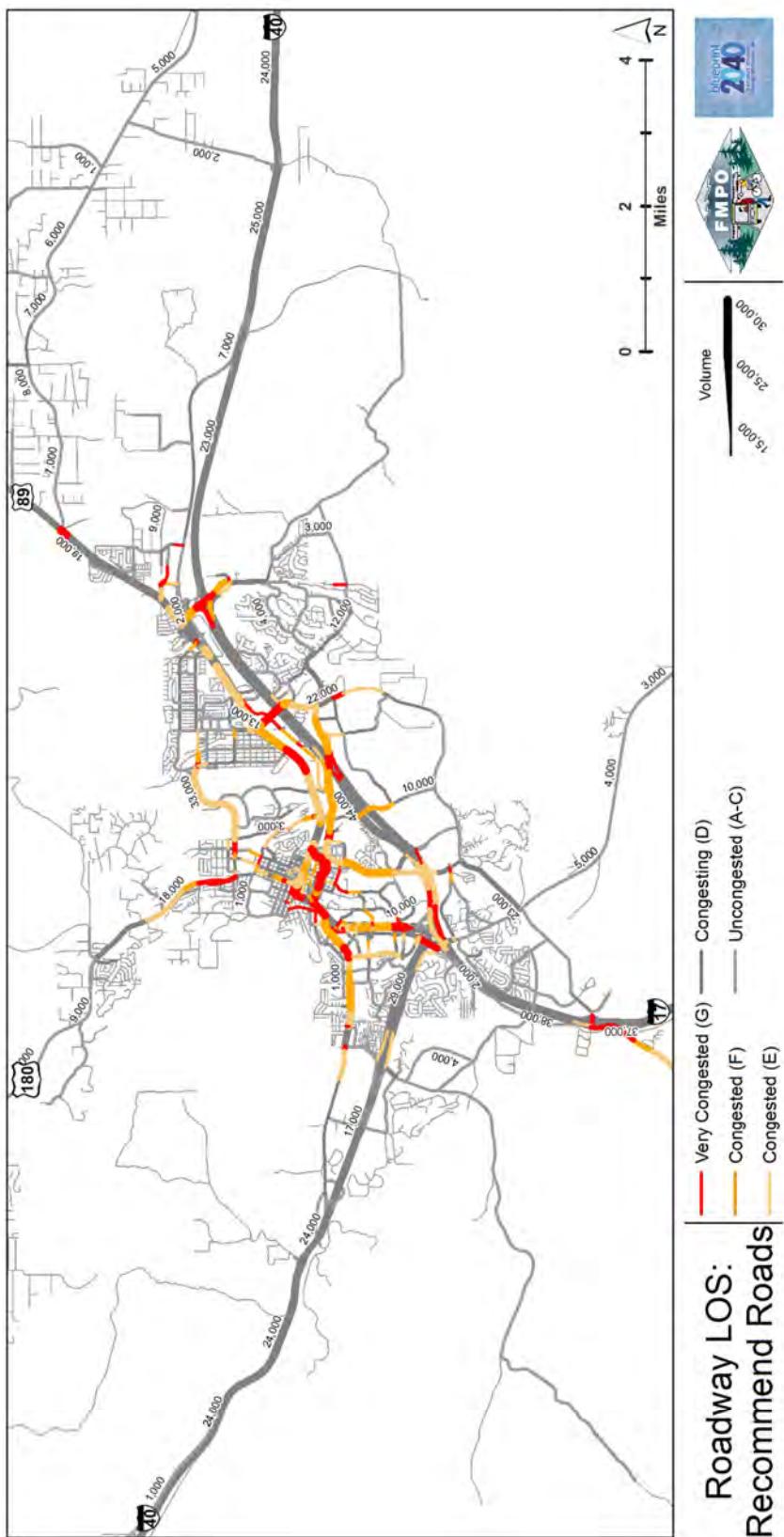
The ultimate roadway cross-section will generally be determined by a transportation impact analysis. Roads in forecast years may be nearing capacity and require additional right-of-way be provided to accommodate future widening. Figure 6a.5 on the next page illustrates proposed number of lanes.

## System Performance

Table 7-7 Recommended Road & Street Plan Performance	
Measures / Model Output	2090
	Hybrid / Recommended
VMT (miles):	4,610,806
VHT (hours):	193,809
Avg Delay (Hours):	95,609
Avg Speed:	23.8
Person Trips:	1,107,244
Walk Trips & Share:	144,397
Transit Trips & Share:	35,574
Auto Trips & Share:	927,272
Walk/Bike Mode Share	13.0
Transit Mode Share	3.2
Auto Mode Share	83.7
Vehicle Trips:	737,220
Avg Trip Length:	6.3
Avg Trip Time (Min):	15.8
VMT/Capita	30.10
VHT/Capita	1.27
Delay/Capita	0.62
Non-auto trips/capita	1.17
Arterial Network Density / Sq.Mile	6.1



Map 7.2 Ultimate Travel Lanes



Map 7.3 Recommended Roads & Streets Network Performance

## Strategic Initiatives

### Develop access management plan

More specific access management plans, perhaps associated or modified for specific corridors, will provide more clear direction for site plans and capital projects. The Transportation Research Board, *Access Management Manual, 2<sup>nd</sup> Edition*, provides a good reference.

### Develop strategic corridor plans

Corridor plans will help with project phasing and refine complete street and layered network approaches

### Develop leveraging strategies with funding partners

Agreed to priorities, frameworks, memorandums of understanding, and letters of intent could be employed to make funding commitments more predictable. “Codifying” these commitments into years 6-10 of the FMPO Transportation Improvement Program and ADOT 5-Year Construction program will reinforce these further.

# Blueprint 2040: Regional Transportation Plan

Flagstaff Metropolitan Planning Organization

## Chapter 8 – Transit System Plan and Performance

### Transit Network Principles

**TRANSIT GOALS AND POLICIES**



**Goal T.7. Provide a high-quality, safe, convenient, accessible public transportation system, where feasible, to serve as an attractive alternative to single-occupant vehicles.**

Policy T.7.1. Cooperate with NAIPTA in developing and implementing the five-year transit master planning goals and objectives to continuously improve service, awareness, and ridership.

Policy T.7.2. Provide public transit centers and options that are effectively distributed throughout the region to increase access to public transit.

Policy T.7.3. Support a public transit system design that encourages frequent and convenient access points, for various transportation modes and providers, such as private bus and shuttle systems, park-and-ride lots for cars and bicycles, and well-placed access to bus, railroad, and airline terminal facilities.

Policy T.7.4. Support mobility services for seniors and persons with mobility needs.

Policy T.7.5. Incorporate adopted plans and policies for non-motorized and public transportation in the permitting process for all development or land use proposals, including provisions for efficient access and mobility, and convenient links between pedestrian, bicycle, and transit facilities.

Policy T.7.6. Coordinate with NAIPTA to establish rural transit service within the region that is consistent with County land use plans, based on funding availability, cost effectiveness, location of major trip generators, distance between generators, and the needs of transit-dependent individuals.

*Note: Transit dependent individuals are those who can only get around via public transit, and who do not own a car or cannot drive.*

Source: Flagstaff Regional Plan 2030

The role of public transportation has evolved and grown with the Region. It started as Pine Country Transit more than 30-years ago serving the transit dependent with 4, hour-long routes. Today, under the management of the Northern Arizona Intergovernmental Public Transportation Authority (NAIPTA), the original mission is expanded to include commuters, students, and more. Nearly 2,000,000 riders were served by NAIPTA in 2015.

This level of success is supported by several studies showing substantial transit benefits in rural and small urban areas. In small urban areas benefit-cost ratios average around 2.5:1. In rural areas, the ratio is lower, but generally positive reaching almost 2:1 at its highest.<sup>lxvii</sup> The benefits to small urban and rural are diverse and include:

- *Jobs and economic stimulus* - While these benefits tend to be larger in urbanized areas compared with small urban and rural areas, smaller population areas gain substantially from transit services, with between 40%-46% of total transit benefits attributable to jobs and the economy.

- *Health care access and outcomes* – Transit access to medical services decreases the tendency of low-income people to forgo treatments, thereby improving public health and reducing societal costs.
- *Transit saves people money* - Overall, this is an important benefit category for transit services.
- *Transit is safe* – Traveling by transit is shown to be safer than driving a personal automobile.
- *Greenhouse gas emissions, air quality, and other important benefits* - Transit reduces greenhouse gas emissions and dependence on foreign oil, increases property values, encourages more compact development patterns, and improves emergency response services<sup>lxviii</sup>

Congestion relief benefits for small urban areas are generally restricted to corridors in which transit operates. For example, FMPO's evaluation of the Mountain Link project showed a benefit cost ratio of greater than 9 with much of the benefit derived from traffic reduction on Milton Road.

## Transit Networks

### *Relationship to functionally classified roadways*

Existing transit networks largely follow automobile networks and will benefit from network components such as runningways dedicated solely to transit. Ideally, central business districts and other urban activity centers should be highly accessible, both regionally and locally, via a variety of transportation modes and multiple paths.<sup>lxix</sup> They should be connected by arterials and collectors and these roadways should have the area's highest level transit service. Collectors should link neighborhood centers with adjacent activity centers. All such connectors should be able to accommodate transit service.<sup>lxx</sup>

These connections could include:

- Freeways, expressways, or other access-controlled major arterial highways along with regional transit service (e.g., commuter rail, rail rapid transit, light rail, or bus rapid transit) to support regional mobility between major activity centers and key points in the community;
- Regularly spaced arterial and major collector roadways, complemented by local transit service, to support mobility within and across urbanized areas; and
- A dense, connected network of minor collector and local streets, alleys, multiuse paths, sidewalks, and user facilities (e.g., bicycle racks benches, water fountains) to support neighborhood mobility within and between local activity centers and surrounding residential areas.<sup>lxxi</sup> These connections are critical for the first and last mile of transit trips. Greater connectivity within and between neighborhoods increases the efficiency of automobile trips and facilitates the use of public transit, walking and cycling (1,61).<sup>lxxii</sup>

NOTE: The Flagstaff regional transit system does not use the interstate system. Some potential route transfers are limited because of the lack of arterial and network connectivity.

Transit service should be designed to provide a higher degree of service to areas of high density, medium density, and commercial and employment centers than to areas of low density development or areas protected from development.<sup>lxxiii</sup> Typically service can be identified with a purpose of productivity or coverage. Coverage of service may be a priority in areas with lower densities to provide service to specific locations or populations regardless of their productivity. Added service may be provided along corridors with high demand or productivity to provide a more efficient service.

The following elements are important for an effective transit network:

- Connectivity and continuity of principal arterials, minor arterials and major collectors with appropriate access control;<sup>lxiv</sup>
- Route spacing that generally avoids parallel routes closer than  $\frac{1}{2}$  mile that split demand to avoid duplication of service except at major transfer points or activity centers;<sup>lxv</sup>
- Marked pedestrian crossings with raised median for pedestrian refuge near a bus stop, with signalization if necessary;
- First and last-mile infrastructure – sidewalks, trails, etc.:
  - Separate off-street multiuse paths for pedestrians and bicyclists where the local and minor collector streets do not provide a direct connection between houses and bus stops;
  - Connectivity of employment centers and commercial development where development does not directly adjoin the sidewalk;
  - Connectivity between residential areas and bus stops;
- Bus pullouts may be necessary on major arterials where the posted speed is greater than 40 mph and/or when a large number of passengers are boarding or disembarking



Figure 8.1 Bus-bike lane in Mexico City

Source:  
<http://mundourbanismo.blogspot.com/2013/03/busbike-lane-sharing-in-mexico-city.html>

#### Route Design

The most common classifications for route design are radial or trunk, cross-town, circulator, feeder/shuttles, and regional routes.

- **Radial routes** (or trunk routes) are the backbone of a transit system and operate mainly along arterial streets. Radial routes typically serve the Central Business District (CBD) or urban core and are considered the nucleus of the transit network. These routes are characterized by frequent stops, short passenger trips, and relatively slow average bus speeds.
- **Cross-town routes**, on the other hand, are non-radial in nature. Cross-town routes are used to link major activity centers with direct routing or serve high density corridors sometimes including the CBD. They generally intersect radial lines, and schedules should be coordinated to provide optimal transfer connections.
- **Circulator routes** provide service that is confined to a specific location, typically downtown or residential areas. Circulators connect to major activity centers and allow passengers to transfer to other routes to gain access to the rest of the network. They typically operate in a loop fashion, sometimes with only one-way directional service.
- **Feeders or shuttle service** provide service in higher density or higher demand areas that feed to other routes in the system, an activity center, or another mode of transportation (air, rail, etc.). Routing is generally short and as direct as possible to maximize customer convenience. Special event service can be classified as feeder service.

- **Regional service** provides transportation that is regional in nature, connecting one major urban area with another major urban area. Regional routes are typically long with few stops and act as a limited stop or express type of service.<sup>lxxvi</sup>

### Service types

Service can be understood by frequency of stops and bus arrival and by the type population served.

- **Local service** is service that ensures a basic level of access throughout the service area, connecting major trip origins and destinations.
- **Limited stop service**. This type of service varies from regular route service by having fewer stops and operating at higher speeds. Limited stop services tend to operate in outlying areas with direct service along a freeway or arterial to increase operating speed and help to reduce loads at high activity/transfer stops.
- **Rapid service or BRT (Bus Rapid Transit)** is a form of limited stop service that combines a much higher service frequency. At the low end, BRT service is also known for the use of technologies such as transit signal priority, off-board payment, and queue-jump lanes to increase the speed of the service. At the high-end, dedicated runningway options, including contraflow lanes, can be used to increase efficiency. BRT is often overlaid on local service corridors.

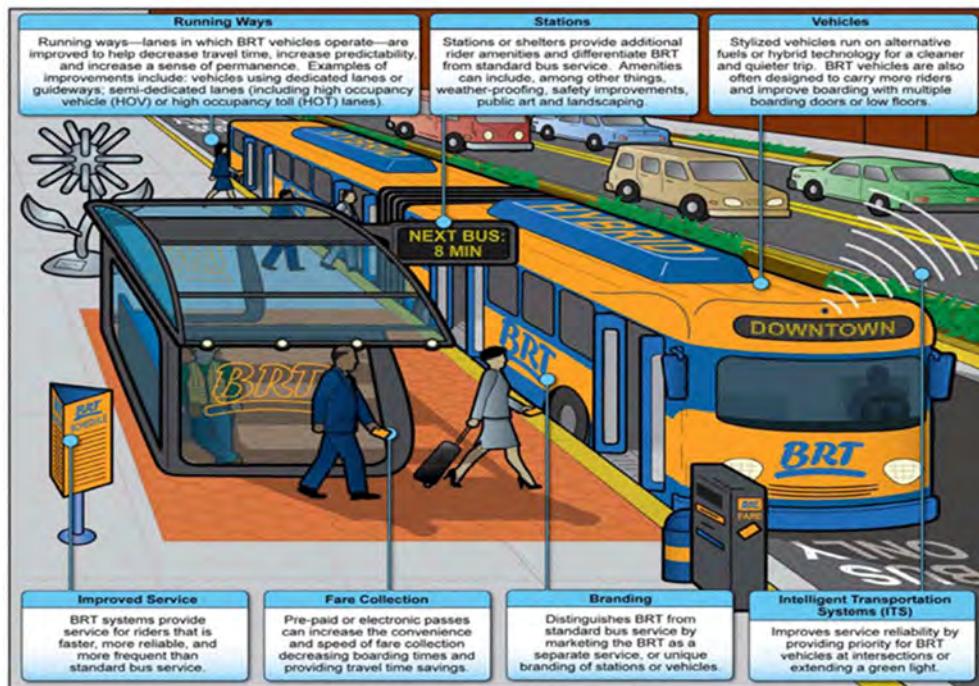


Figure 8.2 BRT Features

Source: Smart Growth America

- **Express service** takes limited stops to the extreme by serving two distinct points with no or few stops in between, is sometimes placed on freeways for speed advantages, serves significant number of passengers from a major origination point (possibly a park-n-ride lot) to a major destination point (typically, a high density working environment).

- **Flexible service or route deviation** allows for deviations from the general route path to provide direct transportation access to passengers who live in the vicinity of the basic route path. On request the vehicle will deviate from the route to pick up or deliver a passenger. This service is most often provided with smaller vehicles and provides service in a designated area (typically lower density).
- **Extremely low density service** also referred to as **safety-net or peripheral service** provides some level of minimal service or coverage in areas with low population density or low transit use. This type of service typically operates on secondary streets with typical one-hour headways or higher and may not operate a full day or every day.
- **Paratransit** includes mandated American with Disabilities Act (ADA) service within  $\frac{1}{4}$  miles of a fixed-route and ADA Plus service which extends beyond the that limit. Provision of taxi vouchers is a complementary program. These services are operated primarily to provide accessibility to transit-dependent populations that have no other alternative.
- **Vanpools** are operated by private individuals, but may be made available through public programs. High vanpool participation from a particular area may indicate potential for safety-net or low frequency local service.

The *Blueprint 2040* position on rail transit is to follow the long-term state level investments in high-speed rail transit as they emerge out of the Phoenix and Tucson metropolitan areas. Likewise, technology developments such as the personal rapid transit "hyper loop," will also be followed for long-term viability. When these show prospects for regional application, development patterns and investments should prepare for their implementation.

In addition to service type, another classification is based on the **function of the population served**. This includes groups such as:

- **Commuter/work-based service** – clearly focused on commuters with high peak hour frequency.
- **Student-based transportation** – may entail express service for universities and higher frequency on routes serving public and charter schools.
- **Special event / Seasonal service** – close coordination with event sponsors is helpful and can address parking and peak hour traffic demand.
- **Regional service** – services designed to reach beyond central city focused service. May include intercity private bus, regional vanpool and other strategies.<sup>lxxvii</sup>
- **Human Services Populations** – special needs addressed by dial-a-ride, paratransit, flex route and taxi voucher services and supplemented by appropriately equipped vehicles and trained personnel.

#### *Bus stop guidance*

The following considerations are among those related to bus stops and will be augmented by guidelines being developed by NAIPTA:

- Location of bus stops should consider the future placement of passenger shelters and amenities and compliance with the Americans with Disabilities Act,<sup>lxxviii</sup>
- Adequate lighting for security and other purposes should apply to virtually all stop;
- Proximity to major activity centers and passenger generators;

- Curb space to accommodate the number of buses demanded by service type;
- Whether to install a bus stop pullout or stop in the traffic lanes;
- Consistent pattern of stop location in relation to intersection (e.g., all nearside, farside, or midblock);
- When possible, stops should be located close to a signalized intersection for the advantages of safe pedestrian crossings.
- Where the bus stop is not adjacent to an intersection, a pedestrian crossing with refuge in the median should be provided adjacent to the bus stop.<sup>lxxix</sup>
- Preference for a far-side bus stop at a complex intersection with auxiliary turn lanes;
- Preference for a near-side bus stop when associated with a queue-jump lane (where transit signal priority (TSP) is not present).
- Where the route requires a left turn, whether to locate the bus stop on the far side after the left turn is completed or to locate the stop midblock;
- Where the route requires a right turn or if there is a high volume of right turns, location of the bus stop on the far side (i.e., after the right turn has been completed);
- Passenger shelters should be provided at all bus stops where warranted by existing conditions, including boarding passenger counts, passenger wait time, bus stop situation, exposure to weather conditions, and the facility or land use being served.<sup>lxxx</sup>
- Bus stop spacing involves a trade-off between frequency of stops (service coverage) and trip travel time. The following table provides suggested and typical bus stop spacing for different contexts.<sup>lxxxi</sup>



Figure 8.3 NAIPTA Bus Shelter

Photo credit: Ken Starr

Table 8-1 Urban Transit Service - Use Guidelines

Urban		Level of Service	High			Low
<b>Transit Service Investments – Service Levels are color-coded to Figure 8.4</b>						
Non-fixed Route		(These services may feed urban areas but will not usually be based there. Includes transportation demand management, paratransit, park-and-ride, express bus, commuter route etc.)				
		Number of routes within walking distance	1	2	3+	
Local Bus (Fixed Route) Major Roads	Local fixed route (basic)	Urban areas should not have densities this low				
	Local fixed route (intermediate)	<ul style="list-style-type: none"> <li>• 20-60 peak &amp; off peak</li> <li>• min residential density (du/acre) - 7</li> <li>• Hours daily: 12 minimum</li> </ul>				
	Local fixed route (High Frequency)	<ul style="list-style-type: none"> <li>• peak - 20 minutes or less</li> <li>• off peak - 60 minutes or less</li> <li>• min residential density (du/acre) - 12</li> <li>• Hours daily: 12 minimum</li> </ul>				
B.R.T.	Bus rapid transit (Dedicated runningway options, including contra-flow lanes when necessary)	<ul style="list-style-type: none"> <li>• peak - 15 minutes or shorter</li> <li>• off peak - 30 minutes or less</li> <li>• min residential density (du/acre) – 12+</li> <li>• Hours daily: 16 minimum</li> </ul>				
<b>Curb-side Factors – Increase amenities with level of demand</b>						

ADA sidewalks/pathways provided – higher levels of connectivity yield a higher Transit Level of Service

Shelter and seating

Bicycle Storage

Trash Receptacles

Route or Patron Information

<b>Street-side Factors</b>	
Stop Spacing	<ul style="list-style-type: none"> <li>• Urban centers: 8-10 / mile; typical spacing 660 feet</li> <li>• Urban neighborhood: 4-8 / mile; typical spacing 1,500 feet</li> </ul>
Bus Pullouts	<ul style="list-style-type: none"> <li>• generally not desired in urban areas and activity centers</li> </ul>
Bus Stops - Far side	<ul style="list-style-type: none"> <li>• far-side intersection placement is best</li> <li>• Locate at signalized intersections so that gaps in traffic are created</li> </ul>
Bus Stops - Near side	<ul style="list-style-type: none"> <li>• Not preferred because of right turn conflicts and bus delay</li> </ul>
Bus Stops - Mid-block	<ul style="list-style-type: none"> <li>• generally not desired or needed</li> </ul>
Nubs (Bulb-outs, curb extensions)	<ul style="list-style-type: none"> <li>• reduce pedestrian crossing distance</li> <li>• best used with lower traffic speeds/volumes and significant pedestrian activity</li> </ul>

**Table 8-2 Suburban Transit Service - Use Guidelines**

<b>Suburban</b>		Level of Service	High				Low	
<b><i>Transit Service Investments – Service Levels are color-coded to Figure 8.4</i></b>								
Non-fixed Route	(Includes transportation demand management, paratransit, park-and-ride, express bus, commuter route, vanpools etc.)							
	Number of routes within walking distance		1		2		3+	
Local Bus (Fixed Route) Major Roads	Local fixed route (basic)	<ul style="list-style-type: none"> <li>• 60 or longer, no peak service</li> <li>• min residential density (du/acre) - 4</li> <li>• Hours daily: 10 minimum</li> </ul>						
	Local fixed route (intermediate)	<ul style="list-style-type: none"> <li>• 20-60 peak &amp; off peak</li> <li>• min residential density (du/acre) - 7</li> <li>• Hours daily: 12 minimum</li> </ul>						
	Local fixed route (High Frequency)	<ul style="list-style-type: none"> <li>• peak - 20 minutes or less</li> <li>• off peak - 60 minutes or less</li> <li>• min residential density (du/acre) - 12</li> <li>• Hours daily: 12 minimum</li> </ul>						
B.R.T.	Bus rapid transit (Dedicated runningway options, including contra-flow lanes when necessary)	<ul style="list-style-type: none"> <li>• peak - 15 minutes or shorter</li> <li>• off peak - 30 minutes or less</li> <li>• min residential density (du/acre) - 12+</li> <li>• Hours daily: 16 minimum</li> </ul>						
<b><i>Curb-side Factors – Increase amenities with level of demand</i></b>								

ADA sidewalks/pathways provided – higher levels of connectivity yield a higher Transit Level of Service

Shelter and seating

Bicycle Storage

Trash Receptacles

Route or Patron Information

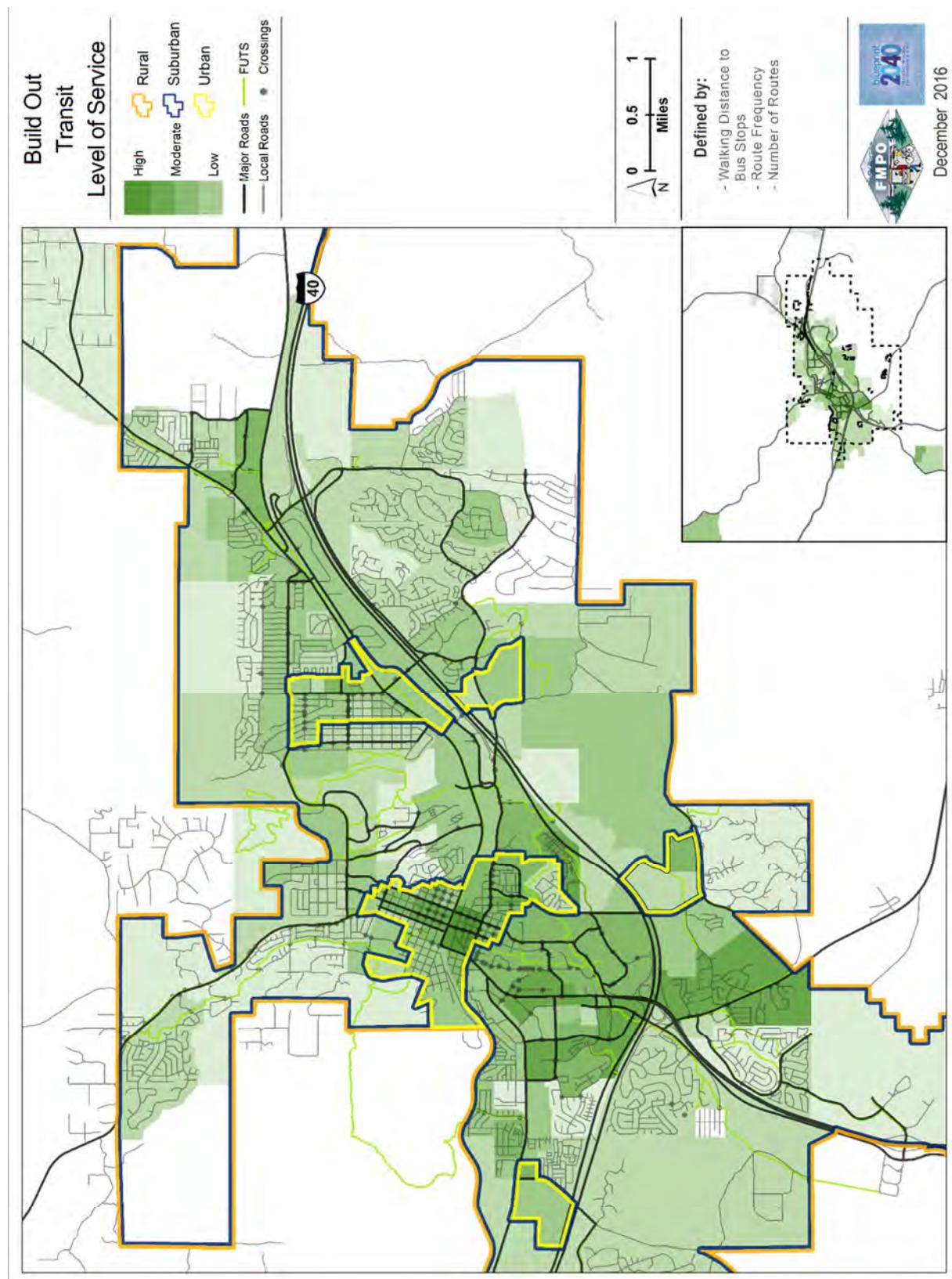
<b>Street-side Factors</b>	
Stop Spacing	<ul style="list-style-type: none"> <li>• Suburban centers: 4-8 / mile; typical spacing 990 feet</li> <li>• Suburban neighborhood: 2-5/mile; typical spacing 2,000 feet</li> </ul>
Bus Pullouts	<ul style="list-style-type: none"> <li>• traffic speed is greater than 40 mph</li> <li>• traffic in the curb lane exceeds 250 vehicles during the peak hour</li> <li>• bus volumes are 10 or more per peak hour on the roadway</li> <li>• passenger volumes exceed 20 to 40 boardings an hour</li> </ul>
Bus Stops - Far side	<ul style="list-style-type: none"> <li>• far-side intersection placement is best</li> <li>• Locate at signalized intersections to use gaps in traffic</li> </ul>
Bus Stops - Near side	<ul style="list-style-type: none"> <li>• Not preferred due to right turn conflicts, except in queue jump situations</li> </ul>
Bus Stops - Mid-block	<ul style="list-style-type: none"> <li>• Only when associated with major activity center and safe crossing</li> </ul>
Nubs	<ul style="list-style-type: none"> <li>• reduce pedestrian crossing distance</li> <li>• best used with lower traffic speeds/volumes and significant pedestrian activity</li> </ul>

Table 8-3 Rural Transit Service - Use Guidelines

<b>Rural</b>		Level of Service	High		Low
<b><i>Transit Service Investments – Service Levels are color-coded to Figure 8.4</i></b>					
Non-fixed Route	(Includes transportation demand management, paratransit, park-and-ride, express bus, commuter route, vanpools etc.)				
Local Bus (Fixed Route) Major Roads	Local fixed route (basic)			If demand warrants, and funding is available	
	Local fixed route (intermediate)				
	Local fixed route (High Frequency)			not applicable	
B.R.T.	Bus rapid transit				
<b><i>Curb-side Factors – Increase amenities with level of demand</i></b>					

Generally apply to Park-n-Ride locations in rural areas  
 ADA sidewalks/pathways provided  
 Shelter and seating  
 Bicycle Storage  
 Trash Receptacles  
 Route or Patron Information

<b>Street-side Factors</b>	
Stop Spacing	
Bus Bays	
Bus Stops - Far side	
Bus Stops - Near side	As needed
Bus Stops - Mid-block	
Nubs	



Map 8.1 Build Out Transit Level of Service

*Transit Level of Service (TLOS)*

TLOS is defined for a given traffic analysis zone (TAZ) by the combination of walking distance to transit stops, frequency of the service at those stops, and the number of routes accessible to the area. Criteria weighting for walk distance and frequency is based on transit industry research showing much increasingly higher ridership response to shorter distances and higher frequencies, respectively. Walk distances are set at 1, 5 and 10 minute walks and use the street network within the developed area of a TAZ to capture employment and residential access. Frequencies are based on 60, 30, 20, 15 and 10 minute frequencies. The number of routes available are a proxy for the areas of the region accessible to the TAZ.

# Blueprint 2040 Regional Transportation Plan

## Flagstaff Metropolitan Planning Organization

### Chapter 9 – Pedestrian & Bicycle System Plans & Performance

#### Non-motorized Network Principles

Walking and biking need to be supported and encouraged in order to thrive. An effective plan will be comprehensive in scope and address multiple aspects of walking and biking, as five E's typically associated with pedestrian and bicycle planning – engineering, evaluation, encouragement, enforcement, and education. The latter aspects are addressed in the chapter on travel demand management. More people will choose to walk and bike when it serves their interest in health, the environment or convenience and they know it is safe, comfortable, convenient, and appealing.

**PEDESTRIAN INFRASTRUCTURE GOALS AND POLICIES**

**Goal T.5. Increase the availability and use of pedestrian infrastructure, including FUTS, as a critical element of a safe and livable community.**

Policy T.5.1. Provide accessible pedestrian infrastructure with all public and private street construction and reconstruction projects.

Policy T.5.2. Improve pedestrian visibility and safety and raise awareness of the benefits of walking.

Policy T.5.3. Identify specific pedestrian mobility and accessibility challenges and develop a program to build and maintain necessary improvements.

Policy T.5.4. Design streets with continuous pedestrian infrastructure of sufficient width to provide safe, accessible use and opportunities for shelter.



**BICYCLE INFRASTRUCTURE GOALS AND POLICIES**

**Goal T.6. Provide for bicycling as a safe and efficient means of transportation and recreation.**

Policy T.6.1. Expand recognition of bicycling as a legitimate and beneficial form of transportation.

Policy T.6.2. Establish and maintain a comprehensive, consistent, and highly connected system of bikeways and FUTS trails.

Policy T.6.3. Educate bicyclists and motorists about bicyclist safety through education programs, enforcement, and detailed crash analyses.

Policy T.6.4. Encourage bikeways and bicycle infrastructure to serve the needs of a full range of bicyclist experience levels.

Policy T.6.5. Provide short- and long-term bicycle parking where bicyclists want to travel.

Policy T.6.6. Integrate policies to increase bicycling and meet the needs of bicyclists into all relevant plans, policies, studies, strategies, and regulations.



Source: Flagstaff Regional Plan 2030

Non-motorized networks provide circulation for bicyclists and pedestrians. These users may be separated in the same right-of-way on bike lanes and sidewalks or share the same space on a multi-use path. Not surprisingly, these users share many of the same needs. One common need is year-round maintenance:

#### Take care of what we have

- Keep streets in a state of good repair
- Keep sidewalks clear of snow, debris, and obstructions
- Keep bike lanes clear of snow, debris, and obstructions
- Enforce no parking in bike lanes
- Set signals to detect bicycles

As vulnerable travelers, attention to their safety is critical. Safety treatments may come in the form of horizontal separation and vertical buffers from vehicular traffic and from each other. Both pedestrians and bicyclists will benefit from a system that is comfortable, appealing, convenient, and useful. Comfort is not found in temperature control and heated seats, but in a smooth surface and freedom from stress and threats. Non-motorized travelers move at slower speeds and have time to pay attention to detail – appealing features like street trees and shop windows matter. Convenience and usefulness will be present if facilities are accessible and direct. Directness of travel through greater connectivity needs to be planned for and provided. This means paying attention to “last mile” details for walking and biking – e.g., getting from the street to the front of a building or providing pedestrian connections between neighborhoods and commercial areas.

It is critical that we complete the essential networks for walking and bicycling. This includes sidewalks, bike lanes, FUTS trails, crossings and underpasses and overpasses. It means parking for bicyclists and shelter and seating for pedestrians. Our performance measures indicate a need for increased mode share for walking and biking to achieve regional mobility and performance goals.



Figure 9.1 Buffered Bike Lane

Source: National Association of City Transportation Officials

The design and character of pedestrian and bicycle facilities should reflect the context in which they are located. As directed in the table from *FRP 2030* (repeated Chapter 6), it is expected that urban activity centers will have the highest bike and pedestrian levels of service and remote rural areas the lowest.

## Bicycle Networks

The majority of the bicycle network will utilize the road network including right-of-way for shared-use paths. Therefore, a successful bicycle network will show the same characteristics as the larger network

regarding connectivity, continuity and other factors and, in recognition that bicycles are self-powered and bicyclists vulnerable, provide for the following:

- Directness – routes are preferred that are direct rather than including jogs from street to street
  - Network density notwithstanding, no more than 25% longer than the most direct road network
- Physical separation from vehicular traffic that increases as traffic speed and volume increase;
  - Use innovative facilities to address specific problems in specific locations
- Comfortable routes that in addition to physical separation consider
  - Grade
  - Surface type and condition
  - Crossing length and level of traffic control or management
- Varying skill level
  - Bicycles provide mobility for the very young. A network, especially within neighborhoods, supportive of their needs and acceptable comfort levels should be provided.

### Bicycle Network and Arterials

A network of bicycle facilities will include bicycle routes, bicycle lanes, and off-street bikeways or shared use bicycle–pedestrian paths that provide both connectivity and continuity. Bicycle-compatible roadways should comprise a primary bicycle network of parallel routes with effective spacing of  $\frac{1}{4}$  mile.<sup>lxxxii</sup> Where streets cannot be or are not connected, bike and pedestrian connections should be provided at cul-de-sac heads or midblock locations as a second best solution to accessibility needs and the completion of the  $\frac{1}{4}$  mile (minimum) bicycle network. Minor connections to this network are recommended at a maximum spacing of 660 ft.<sup>lxxxiii</sup>



Figure 9.2 Bicycle Boulevard, Berkley, CA

**Arterials** should provide continuity for bicycles as they do for automobiles. On major arterials, ideally spaced at 1 mile intervals, bike lanes should be available on both sides of the arterial and multi-use path on at least one side. In rural areas a high-quality paved shoulder of 8-10' wide should be provide on all arterial roadways.<sup>lxxxiv</sup> A layered network approach may reveal that an acceptable level of comfort cannot be achieved on an arterial, so a parallel route that minimizes out-of-direction travel is recommended.

**Minor arterials** should have protected crossings provided at intervals of  $\frac{1}{4}$  mile but not more than  $\frac{1}{2}$  mile. In some case, an overpass will be necessary to provide needed continuity for important intersecting bikeways. Bicycle lanes should be provided on both sides of the roadway and a shared or multiuse path is desired along or in proximity to the corridor. A layered network approach may reveal that an acceptable level of comfort cannot be achieved on an arterial and a parallel route that minimizes out-of-direction travel is recommended.<sup>lxxxv</sup>

Access management principles should be applied along arterials to enhance bicyclist safety. For instance, within suburban activity centers and suburban corridors driveways should be designed for pedestrian, bicycle and automobile travel across (or past) them to provide continuity and along them to provide access.

### Bicycle Facility Spacing for New Development

#### *Performance Measures and Bicycle Level of Service (BLOS)*

BLOS measures the utility of the bicycle facilities serving an area. It is comprised of six components:

- Internal connectivity: This is measured by intersections / square mile and reflects how well bicycles can circulate within an area. Higher density is better.
- External connectivity: This is measured in external intersections / linear mile of perimeter. It reflects how easily bicycles can leave or exit an area.
- Bike lane completeness: This measure assumes that most major city streets and county roads will have bike lanes and wide shoulders, respectively, on two sides and measures how much of that system has been completed.
- FUTS completeness: Trails are often used to provide bicycle connectivity for those less comfortable on the street be they novice riders, youth or the elderly or for those moving more slowly.
- Enhanced Crossings: This is an absolute count of the number of enhanced crossings serving the area. Crossings are weighted with a grade-separated crossing being the highest and a continental-striped crossing being the lowest. Enhanced crossings at the highest end of the scale provide the highest level of safety and induce participation. At the lowest end of the scale, they raise driver awareness and create a better environment.

BLOS identifies areas that are poorly served and enables investments for improving level of service to be quickly pin-pointed.

#### *BLOS Expectations by Context*

Earlier in the main chapter the idea that public expectations for transportation change with context was presented. That idea is operationalized here. In short, as activity levels and interactions between people and modes of travel increase, so generally do expectations for better bicycle and pedestrian facilities. This is true as one transitions from a rural neighborhood to a rural activity center and increases more moving into suburban and urban areas. A rural activity center with wide shoulders,  $\frac{1}{4}$  mile spacing and a traffic signal is considered to have a high level of service. These same facilities are entirely unacceptable for an urban activity center.

**Table 9-1 Bicycle Facilities Urban Level of Service Guidelines**

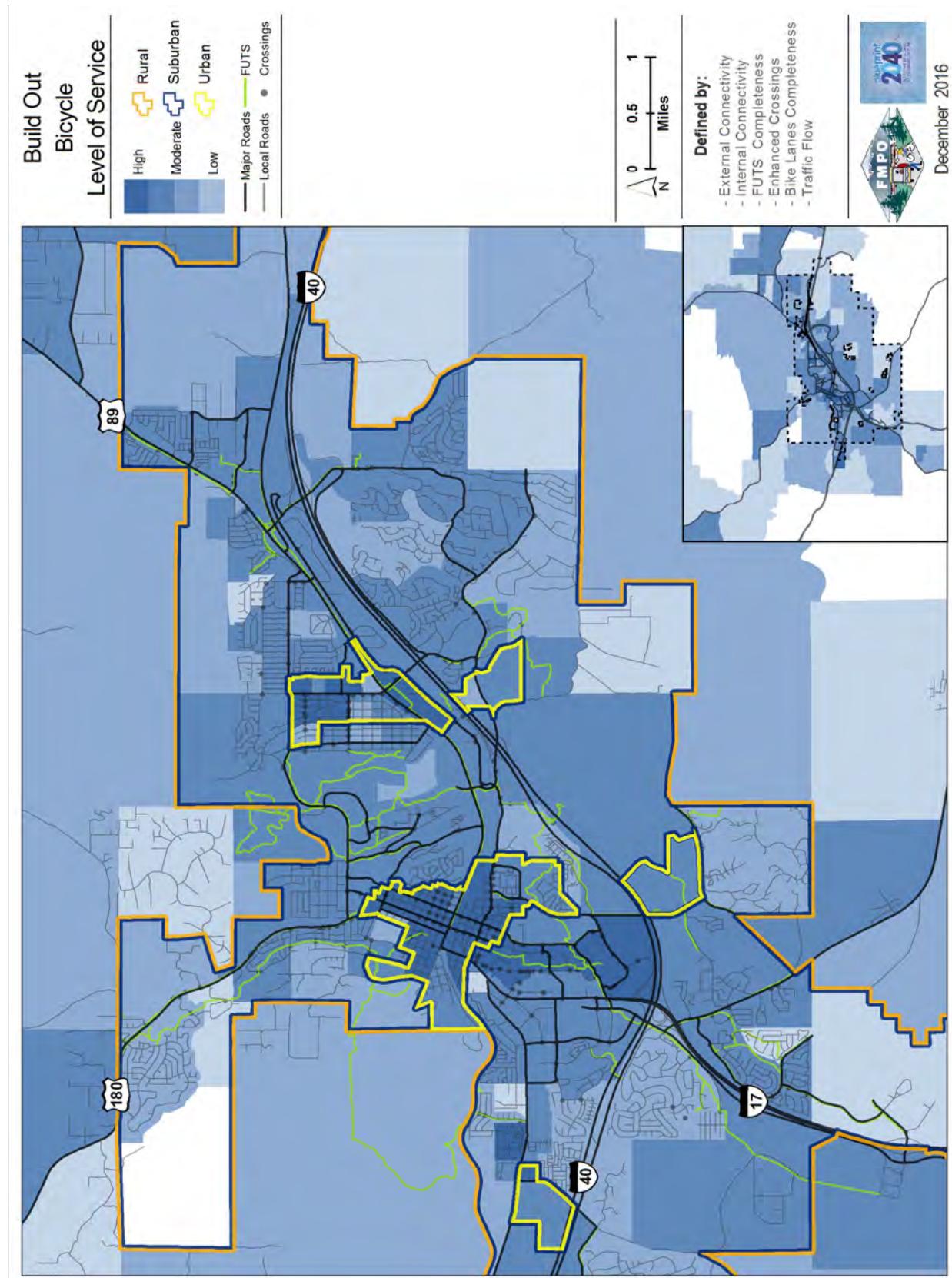
<b>Urban</b>	Level of Service	High			Low					
<b>Color coded to Figure 9.3</b>										
<b>None</b>					Unacceptable					
All urban areas should be served by bicycle facilities										
<b>Low</b>										
Path*										
Multi-use trail	Less than 8' or none									
Bike lane	none									
Shared roadway	Typical signing									
Paved shoulder										
Special facilities	Rarely Used									
Parking	Infrequent									
Vehicle speeds	<30 mph									
Spacing	> 1/4 mile									
<b>Moderate</b>										
Path*										
Multi-use trail	Paved, 10-12 feet									
Bike lane	Standard width									
Shared roadway	Regular signing									
Paved shoulder										
Special facilities	Regularly used									
Parking	Racks, locker, shelters, sharing									
Vehicle speeds	<25 mph									
Spacing	1/4 mile									
<b>High</b>										
Path*										
Multi-use trail	Paved, 12-14 feet									
Bike lane	Standard width									
Shared roadway	Universal signing, pavement markings									
Paved shoulder										
Special facilities	Frequently used									
Parking	Racks, shelters, lockers, sharing, station									
Vehicle speeds	<20 mph									
Spacing	1/8 mile									

Table 9-2 Bicycle Facilities Suburban Level of Service Guidelines

<b>Suburban</b>	Level of Service	High	Medium	Low
<b>Color coded to figure 9.3</b>				
<b>None</b> Unacceptable				
All suburban area types should be accessible by bicycle facilities				
<b>Low</b>				
Path*				
Multi-use trail	Aggregate, 8-10 feet			
Bike lane	Standard width			
Shared roadway	Unsigned			
Paved shoulder				
Special facilities	Rarely used			
Parking	Racks			
Vehicle speeds	<35 mph			
Spacing	1/2 mile			
<b>Moderate</b>				
Path*				
Multi-use trail	Aggregate, 8-10 feet or paved, 10 feet			
	Paved, 10 feet			
Bike lane	Standard and extra width			
Shared roadway	Signing on major routes			
Paved shoulder				
Special facilities	Sometimes used			
Parking	Racks, locker, shelters			
Vehicle speeds	<30 mph			
Spacing	1/4 mile			
<b>High</b>				
Path*				
Multi-use trail	Aggregate, 8-10 feet or paved, 10 feet			
Bike lane	Standard and extra width			
Shared roadway	Regular signing			
Paved shoulder				
Special facilities	Regularly used			
Parking	Racks, locker, shelters, sharing			
Vehicle speeds	<25 mph			
Spacing	1/4 mile			

**Table 9-3 Bicycle Facilities Rural Level of Service Guidelines**

Rural	Level of Service	High	Medium	Low
<b>Color coded to figure 9.3</b>				
<b>None (clear)</b>				
Path*	2-4 feet			
Multi-use trail	Aggregate, 6-8 feet			
There will be large areas of rural lands in public holdings or, if private, where no public right-of-way exists. In these locations, more formal facilities like bike lanes and paved shoulders will not be called for.				
Spacing	>1 mile			
<b>Low (Arterials &amp; Collectors Only)</b>				
Path*	2-4 feet			
Multi-use trail	Aggregate, 8 feet			
Bike lane				
Shared roadway				
Paved shoulder	4-5 feet			
Special facilities				
Parking	Racks			
Vehicle speeds	<45 mph			
Spacing	1 mile			
<b>Moderate (Arterials &amp; Collectors Only)</b>				
Path*	4-6 feet			
Multi-use trail	Aggregate, 8-10 feet			
Bike lane	Some roads			
Shared roadway				
Paved shoulder	4-5 feet			
Special facilities				
Parking	Racks			
Vehicle speeds	<40 mph			
Spacing	1/2 mile			
<b>High (Arterials &amp; Collectors Only)</b>				
Path*				
Multi-use trail	Paved 8-10 feet			
Bike lane				
Shared roadway				
Paved shoulder	6-8 feet			
Special facilities				
Parking	Racks			
Vehicle speeds				
Spacing				



Map 9.1 Build Out Bicycle Level of Service

## Pedestrian Networks

Virtually every trip by any mode begins and ends with a pedestrian movement. Assuring that we have a quality pedestrian network is a critical success factor for the overall network. A consulting firm that has done considerable work for the Flagstaff region, sets broad goals for pedestrian friendliness:

- No place should be **pedestrian intolerant**
- Every place should be at least **pedestrian tolerant**
- Most places should be **pedestrian supportive**
- A few select locations should be **pedestrian places**

This perspective aligns well with the *FRP30* level of service tables found in the Chapter 6 introduction. These call out the priority levels for each mode in various place types and road classifications. In no place are pedestrians a low priority with the exception of freeways and rural arterials.



Figure 9.3 HAWK pedestrian Signal

A hierarchical network of sidewalks and pedestrian paths has been planned and is being developed. This network is overlaid on the motor vehicle network to:

1. Identify elements of the pedestrian network that need to be provided separately from the automobile network (e.g., pedestrian paths or separate rights-of way);
2. Identify locations where sidewalks will be located within the same right-of-way as the travel lanes for motor vehicle including:
  - a. Sidewalk width and alignment
  - b. Buffer strip width and landscaping
  - c. Pedestrians crossing locations
3. Identify locations where pedestrians will have priority over motor vehicles; and
4. Identify locations that are to be free of automobiles.<sup>lxxxvi</sup>

The following are among the best practices to achieve these objectives:

- Provide physical separation of sidewalks on a major street from vehicular movement by a landscaped strip. Increasing separation distance as vehicular traffic speed and volume increase.
  - Parking lanes may be used in limited activity center circumstances
- Where the street pattern would cause circuitous movement for pedestrians, provide an off-street connection (e.g., between a cul-de-sac and the sidewalk paralleling the adjacent street).
- Provide a raised median or an isolated raised median section for protection of pedestrians crossing a major street to shorten crossing distances.
  - This includes innovative intersection designs to cross in multiple stages
- On arterials and major collectors minimize access connections to reduce the number of locations where vehicle-pedestrian conflicts occur.
- Install a nontraversable median to limit the number of locations where pedestrians and bicyclists are exposed to left-turning vehicles.
- Provide wide, lighted, and well-maintained facilities.

- A grade separation for pedestrians is desirable where large numbers of pedestrians cross a high-speed, high-volume urban arterial.<sup>lxxxvii</sup> These may also contribute to maintain vehicular progression speed.
- The slow speed of pedestrian travel makes pedestrian demand particularly impacted by out of direction travel and other delays.
- Site design of private facilities, especially in the commercial contexts of Suburban Activity Centers and Corridors, should establish as direct a connection as possible to current and future sources of pedestrian demand surrounding the site.
- A seamless pedestrian system should be designed to connect to and across state highways. Pedestrian facility spacing, especially crossings, should not exceed 660'.

*Pedestrian Level of Service (PLOS)*

PLOS measures the utility of the pedestrian facilities serving an area. It is very similar to the BLOS reported earlier. It is comprised of six components. Those identical to PLOS:

- Internal connectivity
- External connectivity
- FUTS completeness
- Enhanced Crossings – see Figure 9.6 for guidance on placing crossings

Other factors considered in the PLOS:

- Sidewalk completeness: This measure assumes that every city street will have a sidewalk and county road will have a wide shoulder on two sides and measures how much has been completed. For areas like Continental and for rural areas where sidewalks are not planned it should be recognized that PLOS is poorer for it. It should also be recognized that current policy is to not build sidewalks
- Total Traffic Flow: This is the only negative measure. It is the sum of all traffic within or adjacent to the area. It is effectively the barrier the other measures are looking to overcome.

Roadway Type (# of Travel Lanes and Median Type)	ADT < 9,000			ADT 9,000 - 12,000			ADT 12,000 - 15,000			ADT > 15,000		
	Speed Limit											
	≤ 30 mph	35 mph	40 mph	≤ 30 mph	35 mph	40 mph	≤ 30 mph	35 mph	40 mph	≤ 30 mph	35 mph	40 mph
2 Lanes	Yellow	Yellow	Green	Yellow	Yellow	Green	Yellow	Yellow	Green	Yellow	Green	Green
3 Lanes	Yellow	Yellow	Green	Yellow	Green	Green	Yellow	Green	Green	Yellow	Green	Green
4+ Lanes w/ Raised Median	Yellow	Yellow	Green	Yellow	Green	Green	Green	Green	Green	Green	Green	Green
4+ Lanes w/ out Raised Median	Yellow	Green	Dark Green	Yellow	Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green

Level 1 or 2	Yellow
Level 3 or 4	Green
Level 5 or multiple 2/3/4 treatments	Dark Green

Level 1 - standard crosswalk  
 Level 2 - high visibility crosswalk (e.g. colored or textured pavement)  
 Level 3 - pedestrian refuge island, bulbout, pork chop treatment  
 Level 4 - flashing beacons, pedestrian actuated signals  
 Level 5 - grade separation

<sup>1</sup> Modified from Zegeer et al: Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations : Executive Summary and Recommended

<sup>2</sup> These guidelines apply across all area types.

Figure 9.5 Crossing Location Guidance by speed, volume and number of lanes

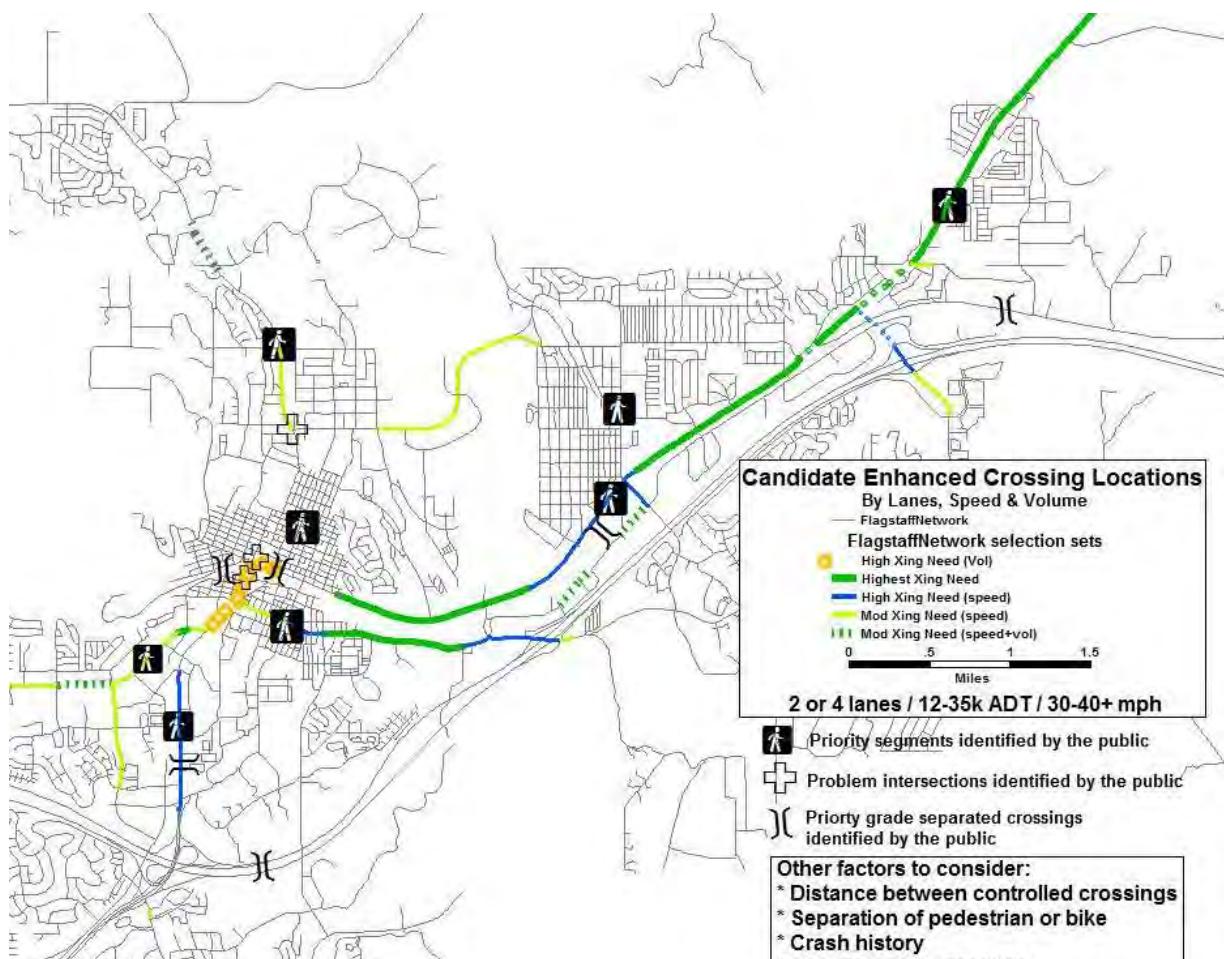


Figure 9.4 Candidate crossing locations

### PLOS Expectations by Context

As stated earlier, no place should be pedestrian intolerant. It is the goal of the region that more places be pedestrian supportive and pedestrian places. The standards set in *Blueprint 2040* set expectations for pedestrian supportiveness. The means by which locations such as activity centers become pedestrian places is left to *FRP30* and supporting specific plans and area plans.

The following tables set level of service expectations for the different area types for pedestrian facilities.

### Facility Standards Are Not the End of the Story

Pedestrians in particular are also influenced by the aesthetics and interest of the journey. Landscaping, quality of building materials, windows and doors that invoke possibilities can take the experience beyond the practical and utilitarian to enjoyable. These factors are not represented here

Table 9-4 Pedestrian Facilities - Urban Level of Service Guidelines

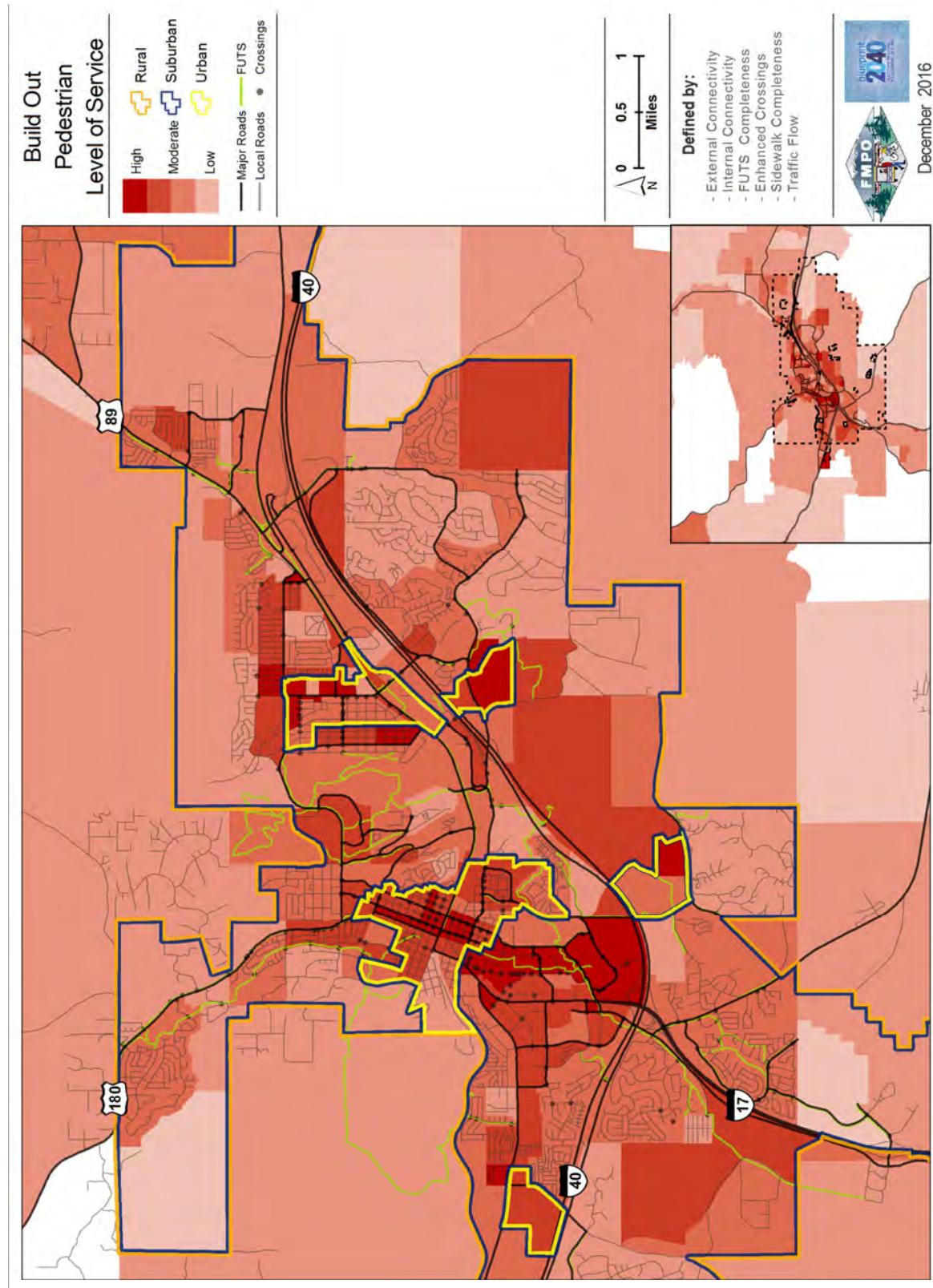
Urban	Level of Service	High	Moderate	Low
<b>Color coded to figure 9.7</b>				
<b>None</b>				
Sidewalk et al				
Vehicle speed	Unacceptable			
Traffic volume				
<b>Low</b>				
Sidewalk	< 6 feet			
Parkway	none			
Amenities	Sometimes used			
Crossing frequency	< 660 feet			
Crosswalks - Marked	Standard or none			
Extensions/islands	none			
Target vehicle speed	30			
Traffic volume	< 20,000 ADT			
<b>Moderate</b>				
Sidewalk	6-8 feet			
Parkway	5 feet – furnishing zone			
Amenities	Regularly used			
Crossing frequency	<330 feet			
Crosswalks - Marked	High visibility, pattern, color			
Extensions/islands	Crossing islands, curb extensions			
Target vehicle speed	25 mph			
Traffic volume	<10,000 ADT			
<b>High</b>				
Sidewalk	8-10 feet			
Parkway	5-15 feet – furnishing zone			
Amenities	Frequently used			
Crossing frequency	<330 feet			
Crosswalks - Marked	High visibility, texture, pattern, color			
Extensions/islands	Crossing islands, curb extensions, raised intersection			
Target vehicle speed	20 mph			
Traffic volume	<5,000 ADT			

Table 9-5 Pedestrian Facilities - Suburban Level of Service Guidelines

Suburban	Level of Service	High	Moderate	Low
<b>Color coded to figure 9.7</b>				
<b>None</b>				
Sidewalk et al				
Vehicle speed	Unacceptable			
Traffic volume				
<b>Low</b>				
Sidewalk	5 feet			
Parkway	5 feet - landscaped			
Amenities	Rarely used			
Crossing frequency	>660 feet			
Crosswalks - Marked	Standard			
Extensions/islands				
Target vehicle speed	35 mph			
Traffic volume	<25,000 ADT			
<b>Moderate</b>				
Sidewalk	6 feet			
Parkway	5 feet - landscaped			
Amenities	Sometimes used			
Crossing frequency	<660 feet			
Crosswalks - Marked	High visibility markings			
Extensions/islands	Crossing islands			
Target vehicle speed	30 mph			
Traffic volume	<20,000 ADT			
<b>High</b>				
Sidewalk	6-8 feet			
Parkway	5 feet - landscaped			
Amenities	Regularly used			
Crossing frequency	<330 feet			
Crosswalks - Marked	High visibility, pattern, color			
Extensions/islands	Crossing islands, curb extensions			
Target vehicle speed	25 mph			
Traffic volume	<15,000 ADT			

Table 9-6 Pedestrian Facilities - Rural Level of Service Guidelines

Rural	Level of Service	High	Medium	Low
<b>Color coded to figure 9.7</b>				
<b>None</b>	<b>(Rural Arterials &amp; Collectors only)</b>			
Sidewalk et al				
Vehicle speed	<55 mph			
Traffic volume	>8,000 ADT			
<b>Low</b>	<b>(Rural Arterials &amp; Collectors only)</b>			
Sidewalk / Shoulder	4 feet to 5 feet shoulder			
Parkway	none			
Amenities	none			
Crossing frequency				
Crosswalks - Marked				
Extensions/islands				
Target vehicle speed	45 mph			
Traffic volume	<30,000 ADT			
<b>Moderate</b>	<b>(Rural Arterials &amp; Collectors only)</b>			
Sidewalk	5 feet			
Parkway	5 feet			
Amenities	none			
Crossing frequency	990 feet to 1320 feet			
Crosswalks - Marked	Parallel			
Extensions/islands				
Target vehicle speed	40 mph			
Traffic volume	<25,000 ADT			
<b>High</b>	<b>(Rural Activity Centers only)</b>			
Sidewalk				
Parkway	The County may wish to require			
Amenities	pedestrian amenities in these areas			
Crossing frequency	to achieve higher safety, social or			
Crosswalks - Marked	aesthetic objectives			
Extensions/islands				
Target vehicle speed				
Traffic volume				



# Blueprint 2040 Regional Transportation Plan

## Flagstaff Metropolitan Planning Organization

### Chapter 10 - Freight

#### Chapter Overview

Virtually everything outside the natural environment in this region arrived here by truck. From the smallest vegetable seed planted to big screen televisions, it all came from somewhere else. In this chapter, the freight system from truck, to rail, and to air is examined. Key issues and opportunities are identified and broad goals established. Much of the work is based on past freight studies conducted by the FMPO.

#### Policy Implications of Freight Transportation

PASSENGER RAIL AND RAIL FREIGHT GOALS AND POLICIES

**Goal T.9. Strengthen and support rail service opportunities for the region's businesses and travelers.**

Policy T.9.1. Seamlessly integrate passenger rail with other travel modes including connectivity and operational improvements to the downtown passenger rail station and surroundings.

Policy T.9.2. Promote Amtrak service and support opportunities for interregional passenger rail service.

Policy T.9.3. Promote development of rail spurs and an intermodal freight facility or facilities as needed to support viable economic growth.

Policy T.9.4. Increase the number of grade-separated railroad crossings.



Source: Flagstaff Regional Plan 2030

#### **Freight routes and facilities are critical to the long-term economic health of the region.**

Every sector of the regional economy is dependent on the ability of goods and materials to arrive here affordably. Even the digital sector depends on computers and communications infrastructure delivered by truck.

#### **Diversity of freight options will support a diverse and resilient economy.**

Diversity in terms of mode will support a wider variety of industry. Diversity of modes and choice within modes creates competition that can lower cost. As rates, regulations or calamity disrupt one mode, a diversity of modes provides resiliency.

#### **Freight needs should be considered in the context of the area, the design of roads and the selection of industrial development site locations.**

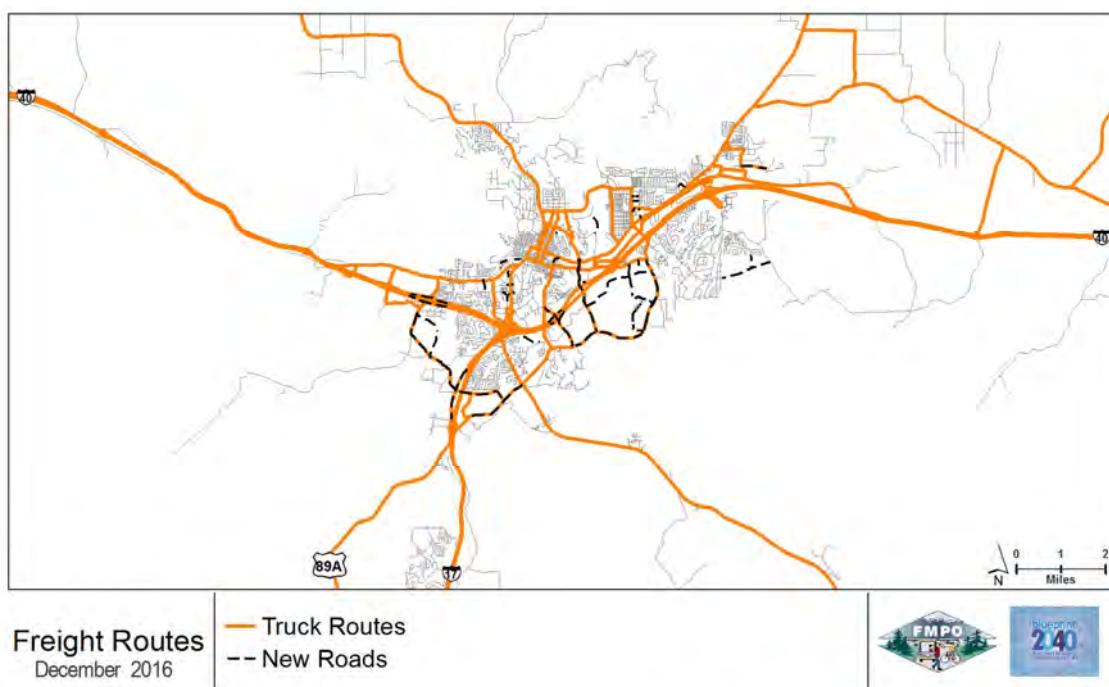
Inadvertently failing to consider freight in the design of a commercial corridor will limit the range of activity supported there. Conversely, creating large intersections for trucks that discourages pedestrian activity will diminish the vibrancy of an area.

## The FMPO Regional Freight System

### Truck Routes

Truck routes in the region are comprised of the interstates, major and minor arterials and some major collectors. Between 8,000 to 10,000 trucks per day travel I-40 through Flagstaff. Interstate 17 carries almost 4,000 trucks per day and another 1,000 can be found traveling US 89. A relative small percentage of those move on Flagstaff's surface streets.

There are warehouses and distribution centers dedicated to individual businesses such as SCA Tissue in Bellemont and Nestle Purina at the Country Club exit. *There are no regionally based centers for general distribution.*



### Issues

ADOT recently completed corridor profiles for I-17 and I-40 and is organizing a freight plan. For trucking they examined frequency of road closures, “hot spots” for clearance and road restrictions, and recurring and non-recurring delay. No issues were found in the immediate region. Outside the region the following issues were identified:

- I-40 West of Flagstaff:
  - Eastbound delay issues on the grades climbing out of Kingman and Ashfork.
  - Occasional weather-related road closures
  - Clearance related hot spots associated with two interchanges.
- I-40 East of Flagstaff: No issues
- I-17 South of Flagstaff:
  - Clearance related hot spot at Table Mesa and McGuireville traffic interchanges
  - Grade and safety related delays north of Black Canyon City

For non-interstate locations, several local trucking firms were contacted and asked to identify problem areas or locations. Tight turning radii is the largest recurring problem and these intersections were identified:

- E. Route 66 at Switzer Canyon Drive: westbound to northbound right turn
  - Low clearance at the Milton Road/BNSF RR bridge
- US 89: Lockett to Townsend Winona

### Opportunities

ADOT identified potential solutions that will be considered for long-term programming.

- Restructuring substandard interchanges to replace low-clearance bridges or provide drive-around solutions will open the region to a wider variety of freight.
- Adding climbing lanes to crucial locations will decrease delays for cars and faster-moving trucks.

Within the more urbanized areas of the region, there are spot improvements that should be considered as part of larger corridor projects or as standalone projects to meet the need. Projects include:

- E. Route 66 at Switzer Canyon Drive: channelized west to north right turn

Recent regulations limiting daily driving hours for trucks puts Flagstaff at a competitive turn around location for transferring loads. A modest 5% market share of truck traffic could provide a revenue stream for a regional warehouse and cross-dock operation. In addition, as noted in Chapter 2, Flagstaff's community is comprised of hundreds of small businesses. It is assumed that many of them are shipping and receiving at the higher less-than-truckload rates. Consolidating local freight into full truck loads and successfully capturing interstate truck freight could make a regional freight facility profitable. The differential between less than trailer load (LTL) rates and trailer load (TL) rates can range from 20-30% providing the LTL shipper with substantial savings and the ability to create more profits and to grow their businesses.

## Planning & Design Solutions

As intersections grow larger to meet capacity needs or radius for trucks, they increase crossings distances and exposure to crashes for pedestrians and bicyclists. This also increases delay for the motoring public. Several communities such as Boulder, CO; Davis, CA; Portland, OR and many in Florida are using a multimodal intersection design that utilizes raised cross-walks, pedestrian refuges and truck aprons to add vehicular capacity, slow speeds, improve sight angles, shorten crossing distances and provide operating space for trucks. These are illustrated in figure 10D-X. In some designs, the truck apron is on a side slope that meets ADA requirements but discourages automobiles from driving on it.

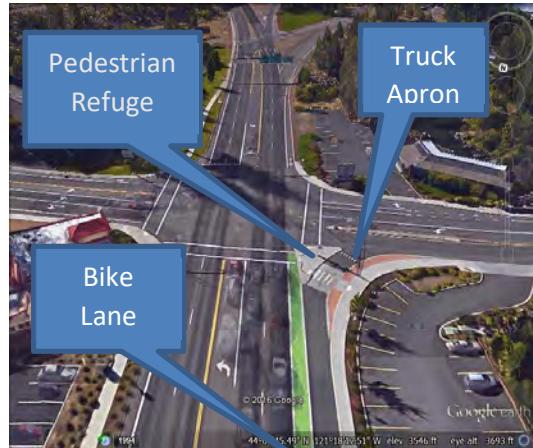


Figure 10.1 Freight compatible multimodal intersection

Source: Google Earth

The identification of freight districts helps guide the application of different design features and set the behavior expectation for truck drivers, motorists and pedestrians. Portland, OR and the Florida DOT have excellent programs that might be applied regionally.

### Rail

The BNSF transcontinental Class I railroad runs east-west across the region. Between 100 and 120 trains per day travel the rails depending on the season. The “Great Recession” hit the rail industry like everyone else as has the general recovery. Anecdotal figures illustrated in Figure 10.3 suggests rail traffic is approaching pre-recession levels.

### Safety

Safety is always a concern because of the devastation a train can cause. According to the Federal Railroad Administration Office of Safety Analysis there have been 29 safety incidents at the six public, at-grade crossings in the region over the last twenty years. Crossing incidents are occurring at about 1.5 per year over that time span. Seven incidents occurred in the last five years, a slightly slower rate of 1.4 per year. All but one of the seven fatalities involved pedestrians with five of those

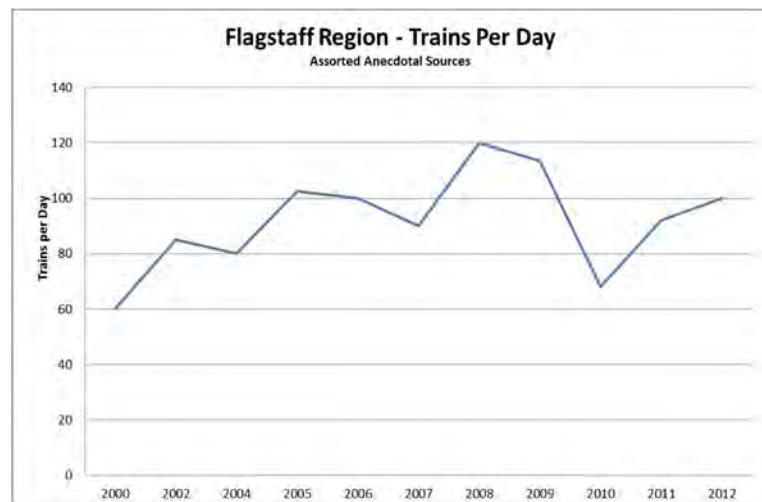


Figure 10.2 Regional rail traffic

occurring at the two Downtown crossings.

Ponderosa Parkway has the greatest number incidents. Of those ten, five involved tractor-trailers.

**Table 10-1 Railroad Crossing Incidents, 20-Year History**

Crossing	Total Incidents	Vehicles	Pedestrians	Killed	Injured
Beaver Street	3	1	2	2	0
San Francisco Street	8	2	5	3	6
Ponderosa Parkway	10	10	0	0	2
Steves Boulevard	0	0	0	0	0
Fanning Drive	5	3	2	2	1
Cosnino Road	3	3	0	0	1
<b>TOTALS</b>	<b>29</b>	<b>19</b>	<b>9</b>	<b>7</b>	<b>10</b>

Source: Federal Railroad Administration (<http://safetydata.fra.dot.gov/OfficeofSafety/publicsite/crossing/crossing.aspx>)

The City of Flagstaff installed quiet zones in 2010. None of the five crossings have arms that prevent pedestrians from crossing the tracks. Very few sections of the track are fenced to prevent pedestrian access and those fences are routinely cut.

#### *Vehicle Delay*

E. Route 66 closely parallels the railroad tracks, so the traffic signals at these locations are pre-empted by the railroad. There is a phase that permits traffic on the cross streets to clear before the gate arms come down. Trains are becoming longer and more frequent, creating greater delay for automobiles.

#### *Capacity*

120 trains per day put the transcontinental line over 90% capacity during the peak period of 2006-2008. This was inferred from conversations over time with BNSF employees and freight consultants. Rumors of triple-tracking the line to address long-term capacity needs have persisted for years and escalate during good economic times. The region has cooperatively built new street facilities such as the E. Flagstaff Traffic Interchange and Fourth Street Railroad Crossing to accommodate triple tracks.

#### *Opportunities*

Additional street grade separation over or under the railroad will reduce the number of vehicles and pedestrians crossing the road and reduce delay for those modes. A railroad overpass at Lone Tree Road from E. Route 66 to Butler Avenue is proposed and would significantly decrease automobile traffic at the Beaver Street and San Francisco Street crossings. Pedestrian under crossings are also proposed at Florence-Walnut west of downtown and in the Rio de Flag flood control channel just west of City Hall. Other pedestrian undercrossings are being contemplated in the vicinity of

Arrowhead Avenue and the Rio de Flag drainage crossing east of Country Club. No at-grade crossing closures are anticipated at this time.

Several businesses in the region make use of rail spurs: SCA Tissue, Nestle Purina, and Joy Cone. A newer business, IML Plastics in Bellemont, is actively building a spur. All of these industries use the

spurs for receiving raw materials in bulk. Virtually all outgoing freight is by truck. As dependence on rail Regional freight facilities increase and costs of truck shipping increases, there may be an opportunity to consolidate freight in quantities sufficiently attractive for rail. This may involve development of a small intermodal railyard that could start with a cross dock operation like that pictured to the left. The *Northern Arizona Regional Freight Facility Study* completed in 2004 identified Bellemont and Winslow as prospective locations.



Figure 10.3 Cross-dock facility

Source: <https://www.linkedin.com/topic/cross-dock>

## Air Cargo

Air cargo tends to deal in high value, low-weight freight. It is either shipped out of Flagstaff Pulliam Airport or, more likely, trucked to Phoenix Sky Harbor and then air freighted to its final destination. The RTP deals with surface transportation. Issues related to Air Cargo are tied almost exclusively to the traffic interchange serving the airport, J.W. Powell Boulevard, and multimodal access.

## A Regional Freight Strategy

FMPO worked with the Economic Collaborative of Northern Arizona (ECoNA) in 2014 to produce a Regional Freight Strategy. The strategy recommends a multi-faceted, regional approach that addresses five high-level improvement strategies indicated below for a future regional freight system that is both fiscally and environmentally sustainable:

- Applying new technologies and system operations practices to improve the performance of all aspects of the freight system;
- Strategically adding new capacity;
- Addressing the positive and negative impacts of freight movement through programs and projects;
- Maintaining and enhancing existing assets; and
- Providing background and specific training in logistics to local, regional, and state organizations.

To be successful, the strategy must take an approach to overcome these obstacles to good freight policy identified by the FHWA:

- Lack of regional cohesiveness;
- Incomplete understanding of the role of freight facilities in the economy;
- Misunderstanding of the community's role in the global/regional/local transportation network;
- Lack of coordination among planning, economic development, and transportation agencies;
- Lack of public/private coordination.

The primary strategies recommended in the Regional Freight Strategy include:

### **Regional Freight Advisory Board (RFAB) & Regional Freight Roundtable**

The RFAB has been established through a memorandum of understanding with the Greater Flagstaff Chamber of Commerce and its Northern Arizona Manufacturers Partnership (NAMP). NAMP represents major shippers in the region and will serve as the RFAB. The RFAB can provide an excellent source of data, information, input and advice for the FMPO while ensuring that Regional freight transportation planning, especially with regard to infrastructure, is satisfying the needs of the shippers.

A Regional Freight Advisory Roundtable or Freight Mobility Roundtable might also be convened that will, prior to the adoption of road and street projects review, analyze, and then make recommendations regarding the RTP and FMPO projects. The Roundtable meetings can be public meetings that have been well posted so the community has an opportunity to voice its opinion regarding proposed projects to the members of the committee and the FMPO and to have their questions answered or at least addressed.

### **Regional Shipper Association**

The Regional Freight Strategy recommends the formation of a Shipper Association. Shipper Associations are anti-trust protected, nonprofit, cooperatives that negotiate and manage transportation services on behalf of its members with motor carriers, railroads, ocean carriers, and air carriers. The Shipper Association is made up of shippers committed to providing a portion of their traffic to the Association enabling the collective to negotiate, through its manager, for improved transportation services and rates in select transportation corridors. It is anticipated that the collective negotiating power of the Association will be reflected in lower rates for freight transportation for the member companies. This is largely a private effort that will hopefully be initiated through dialogue at the RFAB and Roundtable events.

### **Regional Freight Facility**

The strategies above are precursors to the eventual development of a Regional Freight Facility and a marketing effort focused on the diversion of freight from the I-40 and a consolidation of freight from the Region at this facility. This is a strategy that would provide the Region with some measure of

influence over through-traffic (truck traffic) and by intercepting these trucks presenting an opportunity for the Region to develop rail service for current and future businesses in the Region.

# Blueprint 2040: Regional Transportation Plan

## Flagstaff Metropolitan Planning Organization

### Chapter 11 – Funding Analysis

#### Chapter Overview

*Blueprint 2040* is required to be fiscally constrained meaning the projects in the 20-year program can be delivered with “reasonably anticipated revenues.” This chapter identifies major funding sources and projects funds available to the FMPO region through 2040. Key funding agencies include the City of Flagstaff, Coconino County, Northern Arizona Intergovernmental Public Transportation Authority (NAIPTA), and the Arizona Department of Transportation (ADOT). This includes money that may be available through grant programs.

Approximately \$1.3 Billion in transportation revenues is projected for the period between 2020-2040. \$925 Million of that is estimated for roads and streets operations and maintenance. Assuming the City sales taxes in support of transportation are extended by voters, about \$280 Million is reasonably anticipated for system expansion and modernization. These are summarized in table 11-6 at the end of the chapter. This is compared to more than \$1.4 Billion in transportation needs for the build out system plan. For more detailed information about how funding sources were forecast, please see Appendix C.



#### Policy Response to Funding Analysis

##### Establish a long term funding strategy through interagency partnerships

Given the uncertainty of state and federal funds the FMPO should strive for financial resiliency through interagency partnerships and creative funding mechanisms.

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*“As a steering committee, it is time for us to pass the baton. Our recommendations are a beginning, not an end. As an advisory group our influence is limited and work now needs to be taken by others who have the political and financial authority to affect change.” RTP Steering Committee Executive Summary*

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##### Balance investments between modes and project type

Investments should be balanced between mode type (i.e.; transit, roads, pedestrian improvements) and by project type (i.e.; expansion, modernization, preservation), in order to ensure a resilient regional transportation network.

## Funding Sources and Revenue Forecasting by Member Agency

### City of Flagstaff

The City of Flagstaff has several key revenue sources which include sales taxes, HURF funds, and general funds transfers. The Road Repair and Street Safety Sales Tax which is a one-third of one cent sales tax approved by city voters in November 2014 for a 20-year period, through the end of 2034. For budgeting purposes of *Blueprint 2040* this tax is assumed to be in effect through 2040. Additionally, the Transportation Sales Tax is a .721% sales tax that is allocated to certain transportation projects. The Transportation Sales Tax is in effect until 2020, for budgeting purposes of *Blueprint 2040* it is assumed that the tax will be extended to 2040.<sup>1</sup>

#### *Highway User Revenue Funds (HURF)*

A key source of revenues for transportation is the Highway User Revenue Funds (HURF) that are distributed to the cities, towns and counties and to the State Highway Fund on a formula basis. HURF funds are comprised of state of Arizona taxes on motor fuels and fees and charges relating to the registration and operation of motor vehicles on the public highways of the state. These collections include gasoline and use-fuel taxes, motor-carrier taxes, vehicle-license taxes, motor vehicle registration fees and other miscellaneous fees. 1

Table 11-1 below summarizes City of Flagstaff transportation revenues from Fiscal Year (FY) 2020 through FY 2040. This table does not reflect revenues from the transportation sales tax that are provided to NAIPTA, which is discussed in the section on NAIPTA revenues.

Table 11-1 City of Flagstaff Transportation Revenue Estimates, FY 2020-2040

Category	FY 2020 – FY 2024	FY 2025 – FY 2029	FY 2030 – FY 2034	FY 2035 – FY 2040	Total
Highway Use Revenue Fund revenues	\$44,249,000	\$47,279,000	\$47,279,000	\$56,735,000	\$195,542,000
Transportation Tax revenues (excluding allocation to NAIPTA)	\$39,729,000	\$43,436,000	\$47,489,000	\$62,870,000	\$193,525,000
Road Repair and Safety Tax revenues	\$30,563,000	\$33,743,000	\$37,2556,000	\$49,859,000	\$151,421,000
<b>Total Revenues</b>	<b>\$114,540,000</b>	<b>\$124,459,000</b>	<b>\$132,023,000</b>	<b>\$169,465,000</b>	<b>\$540,488,000</b>

Source: Kimley Horn and City of Flagstaff

### Coconino County

Coconino County has several key revenue sources which include sales tax, vehicle license tax, and HURF funds. The Coconino County Road Maintenance Sales Tax is a three-tenths of one percent

(.003) tax that is restricted to road maintenance costs. Similar to the City of Flagstaff's road repair tax this tax was approved by voters in November, 2014 and is in effect until 2034. For *Blueprint 2040* budgeting purposes it is assumed to be in effect through 2040. No published HURF projections are available after 2024 so for budgeting purposes the amount will remain constant through 2040.

Table 11-2 below summarizes Coconino County transportation revenues from Fiscal Year (FY) 2020 through FY 2040.

**Table 11-2 Coconino County Transportation Revenue Estimates, FY 2020-2040**

Category	FY 2020 – FY 2024	FY 2025 – FY 2029	FY 2030 – FY 2034	FY 2035 – FY 2040	Total
Highway Use Revenue					
Fund revenues	\$50,363,627	\$51,856,860	\$51,856,860	\$62,228,232	\$262,423,599
Road Maintenance					
Sales Tax Revenues	\$44,172,679	\$49,368,557	\$53,974,587	\$71,457,316	\$254,557,224
Vehicle License Tax revenues	\$10,448,415	\$11,428,191	\$12,494,429	\$11,223,159	\$55,002,590
<b>Total</b>	<b>\$104,984,721</b>	<b>\$112,653,608</b>	<b>\$118,325,876</b>	<b>\$150,227,005</b>	<b>\$577,301,711</b>

Source: Kimley Horn and Coconino County

### Northern Arizona Intergovernmental Public Transportation Authority (NAIPTA)

NAIPTA's revenue sources include contributions from each agency receiving transit service, the NAIPTA portion of the City of Flagstaff transportation sales tax, Arizona Department of Transportation and Federal Transit Administration grants, and fares and contract fees. The source of

- Passenger Fares (on-board)
- Passenger Fares (U-Pass, C-Pass and agency)
- FTA Sec 5307 Formula Program (up to 50% of net operating costs)
- FTA Sec 5307 Capital Program (up to 80% of costs)
- FTA Sec 5339 Capital Program (up to 80% of costs)
- Vehicle Replacement Fund
- Other-Existing Misc Sources
- Transit Tax needed to balance the budget

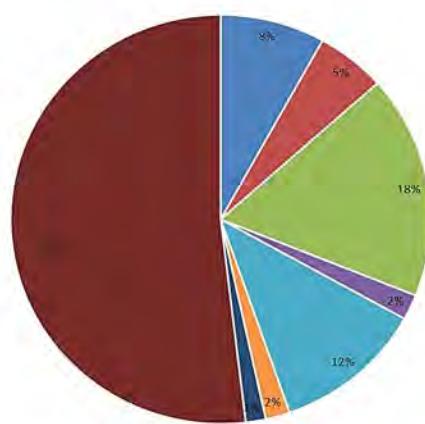


Figure 11.1 NAIPTA Revenue Resources

FTA grant funds are authorizations from the *Fixing America's Surface Transportation (FAST) Act*, signed into law in 2015. The revenues are paid directly to NAIPTA and tracked by service, which include the Mountain Line fixed route service and the Mountain Lift paratransit public transportation systems. NAIPTA revenue projections for fiscal years 2020 through 2040 and are summarized in Table 11-4 below.

**Table 11-3 NAIPTA Revenue Estimates, FY 2020-2040**

Category	FY 2020 – FY 2024	FY 2025 – FY 2029	FY 2030 – FY 2034	FY 2035 – FY 2040	Total
Passenger Fares (on board payments and pass sales)	\$7,036,903	\$7,193,946	\$7,589,766	\$10,157,542	\$31,978,157
FTA Formula Funds	\$11,349,445	\$11,349,445	\$11,349,445	\$13,619,334	\$47,667,669
Misc funding sources	\$1,005,270	\$1,005,270	\$1,005,270	\$1,206,324	\$4,222,134
Transit tax	\$24,256,223	\$33,504,791	\$51,130,562	\$72,280,278	\$181,171,855
<b>Total</b>	<b>\$43,647,841</b>	<b>\$53,053,452</b>	<b>\$71,075,044</b>	<b>\$97,263,478</b>	<b>\$265,039,815</b>

Assumptions:

Based on 2016 year end actual revenues and at FY2016 funding levels.

Does not include competitive federal funds for capital projects.

Does not include operation of the BRT.

Source: Kimley Horn and NAIPTA

### ADOT and FMPO: Federal Revenues

The Federal Aid Highway Program is currently the primary source of funding for Arizona highways, roads, and streets. ADOT revenue estimates are based on historical spending patterns on capital projects – not preservation projects - in the region. Revenues available in the Surface Transportation Program, Transportation Alternatives Program, and Highway Safety Improvement Program are outlined below. Note that Highway Safety Improvement Program and Transportation Alternatives Program are now competitive, so no reasonable estimate of funds may be made. Member organizations are encouraged to use *Blueprint 2040* as a basis for submitting competitive grants.

**Table 11-4 Federal revenue estimates, FY 2020-2040**

Category	FY 2020 – FY 2024	FY 2025 - FY 2029	FY 2030 - FY 2034	FY 2035 - FY 2040	Total
Surface Transportation Program (FMPO)	\$2,215,000	\$2,215,000	\$2,215,000	\$2,658,000	\$9,303,000
State Transportation Improvement Program (estimate for ADOT)	\$6,000,000	\$6,000,000	\$6,000,000	\$7,200,000	\$25,200,000
Highway Safety Improvement Funding		Competitive statewide funding			unknown
Transportation Alternatives Program		Competitive funding on project by project basis			unknown
<b>Total</b>	<b>\$8,215,000</b>	<b>\$8,215,000</b>	<b>\$8,215,000</b>	<b>\$9,858,000</b>	<b>\$34,503,000</b>

Source: Kimley Horn and FMPO Transportation Improvement Program

## Total Revenues

Table 11-5 summarizes all transportation revenues.

**Table 11-5 Total Agency Revenues, FY 2020-2040**

Agency	FY 2020 – FY 2024	FY 2025 – FY 2029	FY 2030 – FY 2034	FY 2035 – FY 2040	Total
City of Flagstaff	\$114,540,481	\$124,458,783	\$132,023,370	\$169,465,416	\$540,488,050
Coconino County	\$104,984,721	\$112,653,608	\$118,325,876	\$150,227,005	\$486,191,210
NAIPTA	\$43,647,841	\$53,053,452	\$71,075,044	\$97,263,478	\$265,039,815
Federal	\$8,215,000	\$8,215,000	\$8,215,000	\$9,858,000	\$34,503,000
<b>Total</b>	<b>\$271,788,043</b>	<b>\$308,380,843</b>	<b>\$329,639,290</b>	<b>\$426,814,999</b>	<b>\$1,326,274,375</b>

Source: Kimley Horn, FMPO Transportation Improvement Program, City of Flagstaff, Coconino County, NAIPTA

## Total spending by activity type

Spending is broken down by three types:

preservation, modernization, and expansion

Preservation: where roads and facilities are preserved in their existing states

Modernization: where roads and facilities are improved by installing enhanced crossings, wider shoulders, etc.

Expansion: where new roads and facilities are built

Of the \$1.3 Billion in projected revenues, it is estimated that only \$280 Million are reasonably anticipated for modernization and expansion. There are many ways to leverage these funds. This includes partnerships with federal and state agencies and private partners, sales of excess right-of-way and more.

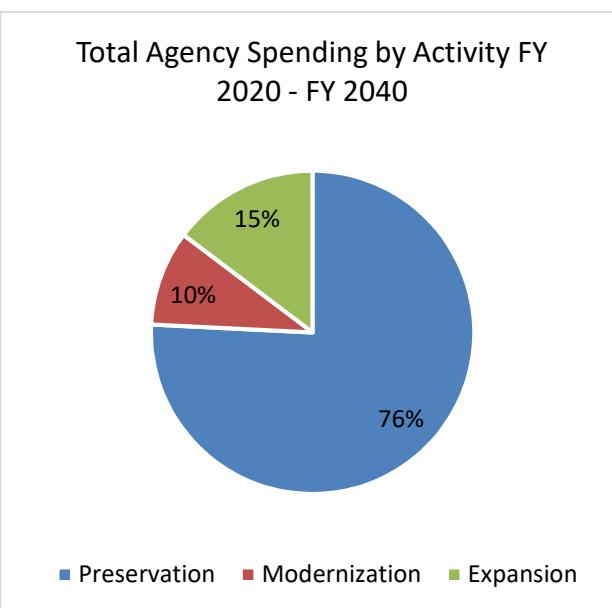


Figure 11.2 FMPO Regional revenue forecast by activity

Table 11-6 Reasonably Anticipated Revenues, FY 2020-2040

Revenue for Expansion/Modernization	Amount
City Transportation 2000 Renewal (20 Year)	\$ 195,000,000
County Capital Projects (HURF+Tax) (Assumes one capital project every 5 years)	\$12,000,000
ADOT Capital Projects (Federal + HURF) (Assumes one capital project every 5 years)	\$16,000,000
Private Sector Investment	\$ 15,000,000
Universal Pass or U-Pass (Transit)	\$ 2,000,000
Transit Grants - above annual 5307 (Assumes \$2 million / year vs. \$3 million historical average)	\$ . 40,000,000
<b>Total Revenue</b>	<b>\$ 280,000,000</b>

## Creative Financing Mechanisms

A financing mechanism is a tool that allows agencies to build needed projects today by borrowing against tomorrow's funding streams. Local governments often finance transportation projects by selling bonds in the open market at prevailing interest rates. See Table 11-7 below which summarizes municipal options for transportation financing available in Arizona.

**Table 11-7 Transportation Financing Mechanisms**

Finance Source Name	Jurisdictional Eligibility	Eligible Modes/Project Types					
		Roads	Bridges	Safety	Transit	Bike/Ped	Other
<b>FINANCING MECHANISMS - AUTHORIZED BY STATE LAW</b>							
Street and Highway Improvement Bonds	All counties	✓	✓	✓			
Community Facilities District	All counties	✓	✓	✓		✓	✓
Roads of Regional Significance Congestion Mitigation Account	All counties; project must be in TIP	✓	✓	✓			
Public/Private Partnerships in Transportation *	All counties; in partnership with ADOT	✓	✓	✓	✓	✓	✓
Grant Anticipation Notes	Unclear if counties are eligible	✓	✓	✓			
Highway Project Advancement Notes	All counties	✓	✓	✓			
Highway Extension and Expansion Loan Program	All counties	✓	✓	✓			
<b>FINANCING MECHANISMS - AUTHORIZED BY FEDERAL LAW</b>							
Transportation Infrastructure Finance and Innovation Act	All counties; project must be in STIP	✓	✓	✓	✓		
Grant Anticipation Revenue Vehicles	All counties; may need additional credit assistance or insurance	✓	✓	✓	✓	✓	
Transit Grant Anticipation Notes	Recipients of federal transit funding				✓	✓	

Source: Maricopa County Department of Transportation and AECOM, *Transportation Options for Arizona Counties* (June 2010), <http://www.azace.org/>, referenced 3/30/2015.

## In Pursuit of Other Funds

Reasonably anticipated funding will clearly fall short of projected needs. So, FMPO and its member agencies regularly pursue other funds. At the highest level, FMPO coordinates with like-minded agencies and organizations across the state and country to seek increases in state and federal funding. The gas taxes that fund these programs have not been raised in decades and inflation and increasing fuel efficiency and demand keep them from meeting today's needs.

There are strategic initiatives FMPO and its members could pursue on a programmatic or project level to garner additional funds from existing state and federal programs.

### Federal Funds

Federal funds are either sub-allocated or competitive. Sub-allocated funds are apportioned to the States based on formulas under a variety of programs. Federal funds spent in the region are identified in the ADOT 5-year construction program. Generally, the State must spend a certain percentage of funds in areas of greater than 200,000 population; 200,000 to 5,000 population; and less than 5,000 population. After meeting those requirements, the state has discretion on where to spend remaining funds. Both the population-based and discretionary funds are prioritized through the ADOT Planning-to-Programming (P2P) process and then subject to the final decision of the Arizona State Transportation Board (ASTB). Competitive funds are those for which the State, MPO, or other eligible parties may apply. Depending on the program, application may be made directly to the federal government or may be conducted by the State.

*Sub-allocated Funds: Increasing FMPO sub-allocated Surface Transportation Block Grant funds*  
In order to increase sub-allocated funds to the FMPO, either the “pie” must increase or FMPO’s share of the pie must increase. To “grow the pie,” the FMPO and other rural MPO’s and Councils of Government (COG’s) in the state must reach an agreement with Arizona to increase the sub-allocation which is presently \$9.2 Million. Arguments to do so might include: an overall increase in funding to the State through the FAST Act should warrant a commensurate increase in this base amount; large metropolitan areas have a larger share of the property and sales tax bases and so have a greater ability to pay. Sub-allocations to the regions are based on a per-capita distribution. To increase the FMPO share of the pie a new formula must be submitted and agreed to by the State and other MPOs and COGs. In addition to population, factors such as seasonal visitation rates, weather, lane miles per capita and others might be introduced.

*Sub-allocated funds: Increasing amount of National Highway Performance Program (NHPP) and Surface Transportation Block Grant funds spent in the region, especially on the State Highway System*

These are the two largest programs within ADOT. NHPP funds are restricted to use on the National Highway System which includes the interstates and most state highways. Some off-system bridges are also eligible to use NHPP funds. STBG funds are very flexible in their range of eligible uses. The P2P and ASTB processes represent the greatest opportunity to influence funding in the region.

The P2P process has three primary inputs: Technical, District Priority, and Policy that receive 25%, 25% and 50% of the total weighting criteria, respectively. Application of regional staff and fiscal resources to assure maximum scoring for each of these components for all eligible projects is a strategy that may yield benefits. Activities might include participation in state-wide and regional policy planning efforts and studies, strategic development use of regional and local planning documents, and improved coordination and support for the North Central District project scoping efforts.

The ASTB will give due consideration to P2P results and may consider other factors like partnering opportunities and regional distribution of funds. One or more of the City, County, NAIPTA, NAU or even private entities, may present funding partnerships that improve the value of a project to the State. Jurisdictions that succeed in this have a top-priority project, are generally persistent in telling their story to the ASTB and ADOT staff, and have compelling anecdotes to support or enhance P2P results.

*Competitive Programs: Transportation Alternatives Program (TAP)*

The TAP is the successor to the transportation enhancements program that builds trails, pedestrian and bicycle crossings, beautification of transportation facilities, and other enhancements. Funds are sub-allocated to ADOT, MAG and PAG. ADOT has exercised its authority to flex 50% of its funds to highway construction, operations and maintenance. TAP funds in FY16-18 are being used to fund a backlog of transportation enhancement projects. Starting in FY19, ADOT will make the remaining \$4.2 million available on an annual basis for competition among local jurisdictions. Eligible project types and application materials are under development by ADOT.

*Competitive Programs: Highway Safety Improvement program (HSIP)*

Starting in FY 2019 all HSIP funds will be competitive through an ADOT process. Approximately \$40 million per year will be awarded to projects and programs with the highest benefit to cost ratio with a heavy focus on reducing fatalities. Projects must be included in a regional transportation safety strategic plan, minimum project size is \$250,000 and the minimum benefit cost ratio is 1.5. Most competitive projects exceed a benefit cost ratio of 10. Examples of regional HSIP projects under the current sub-allocation program include safety sign replacements, rumble strips installation, and pedestrian count-down crossing signals.

*Competitive Programs: Transportation Investment Generating Economic Recovery (TIGER)*

The USDOT administers TIGER. The total program is about \$500 million annually. A wide range of projects are eligible with a current focus on freight and multimodal projects. Consideration is given to urban vs. rural and regional distributions. Minimum grant size is \$5 million. Competition is fierce. The City has applied for the Fourth Street Bridges at Interstate 40 for the past two years. It is not clear if there will be a FY 2017 program or what the eligibility or preferences will be.

*Competitive Programs: Federal Lands Access Program*

This USDOT administered program provides approximately \$15 million annually to the state for transportation improvements in, on or providing access to federal lands. Past awards in the region include the widening of Lake Mary Road within the City limits and pavement preservation efforts on Lake Mary Road within the County.

*Competitive Programs: Advanced Transportation and Congestion Mitigation Technologies Deployment*

This USDOT administered grant program will pay up to 50% of project costs for technology applications geared to reduce costs, improve return on investments, alleviate congestion, reduce crashes and better manage “big” data for decision-making. States, transit agencies, large MPO’s and local jurisdictions are eligible. Reporting requirements apply.

*Competitive Programs: Transit Section 5304 Planning and Research Grants*

Rural and small urban transit programs. This ADOT administered program provides up to \$600,000 more or less. Grant awards are for generally for research, planning and preliminary design efforts related to transit. ADOT advises a maximum grant amount of \$100,000. Match will be in-kind or cash. MPO's, COG's and rural transit agency recipients are eligible. Local governments may apply in partnership with the MPO. NAIPTA's Bus Rapid Transit study was funded using 5304 funds applied for by FMPO.

*Competitive Programs: Transit Section 5310 Elderly and Disabled Mobility and 5311 Rural Transit Programs*

The 5310 and 5311 programs are administered by ADOT. Local jurisdictions, transit agencies and non-profits organizations are eligible. Consideration is given to need and geographic distribution. ADA plus programs and taxi voucher programs are examples of recently received awards.

*Competitive Programs: Transit Section 5307 Urban Transit and 5339 Transit Capital Programs*

The 5307 program is a formula program with two competitive provisions. The Small Transit Intensive Cities program through FTA and the ADOT surplus 5307 program. NAIPTA has been very successful in both programs. The 5339 program is a capital grants program for projects of merit. A wide variety of ancillary project types supportive of a primary transit objective are eligible. Making these funds attractive for addressing multi-faceted and multimodal problems.

### **Local Funds**

The City and County exercise due diligence when asking citizens to approve taxes for improvements and services. *Blueprint 2040* assumes voters will approve the continuation of existing taxes, but does not assume any taxes above that in order to comply with federal fiscal constraint requirements. Increasing taxes above existing levels is a possible outcome of a future dialogue with voters as they are presented with the full range of transportation needs. What to present to voters in terms of the range of projects and related tax levels is ultimately the decision of the Flagstaff City Council and Coconino County Board of Supervisors.

If the City or County engage voters about expanding taxes, *Blueprint 2040* highly recommends the inclusion of the Lone Tree Rail Road Bridge and completion of pedestrian and bicycle systems in these discussions for the City. The rail road bridge enhances the Lone Tree corridor as an alternate route, improves emergency services access and reduces train delay. Walking and biking participation rates are greatly influenced by the completeness and connectivity of the systems. These trips also leverage the use of transit.

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## Chapter Conclusion

Transportation funding for the planning period will be heavily dependent on the renewal of the City of Flagstaff transportation taxes that expire in 2020. These are primary funds for many projects and are also matching funds to leverage grants or partnering funds to incentivize participation. There are many priority projects for which partnering with other public agencies or private developers is a real possibility. This allows for funds to be leveraged and more projects to be completed. In Chapter 12, the reasonably anticipated revenues identified in this chapter are applied to a series of program alternatives for evaluation.

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## Strategic Initiatives

### **Set funding priorities in annual work program**

Not all grant opportunities will fit within the FMPO strategic objectives for a given time period. Anticipating grant cycles and setting priorities for those to pursue and contingencies for program adjustments if they are awarded will accommodate these changes.

# Blueprint 2040 Regional Transportation Plan

## Flagstaff Metropolitan Planning Organization

### Chapter 12 - Project Priorities and Program Alternatives

#### Chapter Overview

*Blueprint 2040* is mandated to deliver a fiscally-constrained program of projects that takes into account reasonably expected revenues, project costs, and inflation. Details and expectations are highest in the first five-years and decrease in later years. Project placement in the program is a matter of priority or score, logical sequencing of projects and phases, coordination with public and private development, project cost relative to funding availability, and project readiness. Project readiness consists of planning, design and right-of-way phases. These may have significant costs individual costs and may take up to 36-months to complete.



#### Policy Implications for Project Programming

##### Increasing importance of right of way acquisition

Private development notwithstanding, the need for right-of-way in transportation projects will become more common and complicated. Widening roads, making room for sidewalks, bus shelters or bus lanes, or squeezing in a new alignment will impact many developed properties. Lead time for acquisition can be significant. A predictable process and a clear public need attached to priorities are essential elements of an acquisition program. Acquisition over time may create interim revenue opportunities.

##### Flexibility

Retaining some level of funds for contingencies and opportunities is advisable. Predicting growth patterns is difficult in Flagstaff. Anticipating grant awards or a partner's new funding opportunity is even harder. A surprise utility line or rock shelf will be expensive too expensive to overcome. Retaining some liquid funds improves the ability to cover costs and keeping a project and program on schedule.

##### Partnering

Partnerships may take years to develop. If they address a large, priority project and formed earlier than anticipated they may significantly disrupt a program by shifting funds to the large project or freeing up funds for several newer projects. Having a clear sense of priorities and projects ready for construction is important to take advantage of this.

## Project Scoring & Selection

Toward the end of the chapter is a table listing most of the projects evaluated for the RTP. The evaluation offers several perspectives: Score based on criteria, projects costs, and a benefit cost ratio.

### Criteria: Balancing values

The projects were evaluated against several broad criteria:

- Congestion: The degree to which a project improves vehicle miles of travel, vehicle hours of travel and delay, with an emphasis on improvements to today's condition.
- Arterial Density: Whether a project adds lanes to an existing arterial or represents a new arterial
- Multimodal Improvements: The degree to which the project will complete missing sidewalks, missing bike lanes, add a crossing, or contribute to bus service performance.
- Safety: The number of fatal and injury crashes, pedestrian and bicycle crashes, and total crashes within the project limits and the degree to which the project may address them.
- Economic Development: Whether a project serves a future growth area, redevelopment area, activity center, or is named by employers in the business survey as being helpful to expansion plans.

These criteria were given weights based on public survey results and a presentation of recommended weights to boards and commissions. The next two tables generalize the results from the transportation values survey where people were asked to prioritize the focus of the plan (Table 12-1) and to compare these focus areas against each other (Table 12-2).

**Table 12-1 Transportation Plan Priorities Survey Response Results**

Priorities for Transportation Plan	Percent	Normalized
Move	56	8
Environment	27	4
Neighborhoods	11	2
Jobs	7	1

**Table 12-2 Areas of Concern, Survey Response Results**

Areas of Concern	Percent	Normalized
Mode Choice	60	3
Moving Efficiently	60	3
Protecting the Environment	40	2
Improving Safety	40	2
Moving Freight	20	1

Table 12-3 Criteria Weighting Based on Survey Results

Criteria	Weight
Congestion Relief	30
Arterial Density	5
Mode Choice	25
Safety	30
Economic Development	10

#### *Environmental Factors as a Criteria*

Environmental impacts for natural and cultural resources were evaluated, but not included as part of the scoring system criteria. Some projects like the Pipeline Arterial at the base of Mount Elden were eliminated for environmental reasons. For most projects, these impacts were not of such magnitude to eliminate the project and were not reason to delay a project, so the cost to mitigate impacts was incorporated into the project through an increased contingency factor.

## Project Costs and Benefit-Cost Analysis

### Project costs

The cost estimates are at a detailed planning level. Inclusion of a range of factors increases the accuracy of the estimates and helps avoid wild swings in the program due to poor estimates. The factors considered in creating the cost estimates:

- Unit cost: Cost per lane mile for urban and rural roadways are based on recent projects.
- Project length: Projects were aligned based on contours and parcel data for accuracy.
- Terrain/slope: Costs increased for the length of a project exceeding 5% grade.
- Drainage structures: Centerline profiles and drainage maps were used to estimate the number of major and minor structures required.
- Intersections: Major intersection improvements within a project's limits added costs.
- Enhancements: Different levels of enhancement were assumed based on area type and activity center proximity and costs raised for those sections of the project.
- Right-of-way: Right-of-way width based on number of lanes and standards from member agencies were overlaid on parcel maps. Recent sales, assessor's data, and judgement those with right-of-way acquisition were used to set an assumed level of taking and price per square feet for properties in different area types and geographies.
- Soft costs: Design, construction management, and traffic control are added in as a percent of construction.
- Contingencies: A 12% contingency comprised of 3% each for environmental, soils, cut & fill, and utilities is added to all projects. Local engineering knowledge is used to raise those components as needed.

## Benefit Cost Analysis (BCA)

A BCA produces a benefit to cost ratio (BCR). It does this by comparing the effects of a transportation projects under two conditions: land use conditions today with and without the project and future land use conditions with and without the project. The BCR is used as a point of comparison and not as a scoring criteria. The primary reason for this is that many BCA factors like congestion and mode share are already considered. Poor BCA results will not disqualify a project, but may indicate a need to revisit cost and scope assumptions. Table 11-5 lists projects by BCR.

### *Important Exceptions*

Small projects and new roads in or near new developments tend to do very well. The former is due to relatively low cost, especially if it is solving an existing bottleneck projected to get much worse. The latter is because the methodology creates a false reality – a lot of development with effectively no roads to travel on. The new road creates a very large benefit for that new growth. Imagine J.W. Powell Boulevard doesn't exist but the state land develops. Suddenly, the road is built, but only one phase in one direction. It takes all the traffic.

### *Right-of-way Doesn't Count*

In the world of benefit cost analysis, when a city invests in right-of-way, it still enjoys the value of the purchase, so there is no "cost." In the everyday real world, that asset is not particularly liquid. In the following tables, projects with exceptionally large right-of-way costs are evaluated twice, once including right-of-way, for information purposes. Also, private development projects will generally have right-of-way dedicated to the city or county. For all of these projects, if right-of-way value were considered, note that the benefit cost ratio would be smaller.

### *Corridors: The whole is greater than the sum of the parts*

Conventional wisdom holds true: Things work better together. Corridors were broken into deliverable projects and those projects scored individually. *A separate BCA was not conducted for corridors.* In most cases, projects do well alone, but do far better with other links in the corridor. This is demonstrated in the following table where congestion effects measured in the regional model are compared between entire corridors and the sum of their parts or phases).

Table 12-4 Full Corridor vs. Project Phase, Comparison of Congestion Impacts

Corridor and Projects	Congestion Score	
	Whole Corridor	Sum of Parts
Lone Tree Corridor- complete (Widening, Traffic Interchange and Bridge)	28,627	22,688
Lone Tree Corridor without Interchange	25,459	17,895
Lone Tree Corridor without Bridge	21,128	19,286
J.W. Powell Boulevard (Connections to 4 <sup>th</sup> Street and Airport)	20,843	12,207
J.W. Powell Boulevard without Airport	19,269	9,970

*About the BCA Tool*

The BCA spreadsheet tool was developed for the FMPO by Parsons-Brinckerhoff in 2013. Relevant inputs like the consumer price index have been updated.

**Table 12-5 Projects Ranked by Benefit Cost Ratio**

Project ID	Project Name	Project Rank	Benefit-Cost Ratio	BCR w/ Right-of-Way \$
RRS_64	Riordan Ranch St Extension - S	17	458	
MWE_50	Metz Walk Extension	23	386	
WMR+4	Woody Mountain Road/W 66 intersection	3	370	
FOU_92	Fourth Street/Butler Intersection	20	275	
McD_47	McConnell Drive Extension - E (2)	29	257	
YAL_55	New Milton Access Road (Yale)	16	225	
E66_68	E. Rte 66 Widening (F40)	19	167	
W66_71	W. Rte 66 Widening (3)	13	156	
BRT	Bus Rapid Transit	26	142	113
WMR_89	Woody Mountain Collector SW (New)	27	141	
FOU_18	Fourth Street Extension - South (2)	24	131	
FOU_17	Fourth Street Extension - South (1)	31	131	
FOU_22	Fourth Street Bridge	15	126	
FOU_93	Fourth/6th/7th Intersection	2	121	
FOU_23	Fourth Street Widening	30	118	
HRR_25	Herold Ranch Road Widening (1)	28	98	
WMR_86	Woody Mountain Rd SW	7	95	
AnD_90	Anita Drive Extension	68	86	
JWP_35	J.W. Powell Blvd Extension (1)	34	81	
W66_70	W. Rte 66 Widening (2)	25	72	
BUT_6	Butler Avenue Widening	9	64	
MIL_54	Milton Widening	1	62	31
JWP_37	J.W. Powell Blvd Airport	12	57	
LAC_56	Little America Collector (New)	22	53	
LTR_45	New Lone Tree Road Alignment (5)	11	49	
WMR_85	Woody Mountain Rd Airpark	10	31	
LTR_43	Lone Tree Road Widening (3)	8	26	
SWI_73	Switzer Canyon Dr RR Underpass	32	24	
LTR_42	Lone Tree Road Widening (2)	6	23	
LTR_44	New Lone Tree Rd Realignment & TI (4)	4	19	
WMR_87	Woody Mountain Road TI @ I-40	18	16	
LTR_41	Lone Tree Road Railroad Overpass (1)	5	13	
SW_Sh_M1	Major sidewalks short and 1st half mid	86	11	

## Project Scoring

The following table provides an overview of the top 40 projects. Projects, including project phases indicated by a suffix number in parentheses, are evaluated separately. For each criterion, all projects were scored and the top project awarded 100 points with the remaining projects scored proportionately. This allowed for the weights to be applied against each criteria. The overall score is provided to allow for a sense of scale between the ranked projects. The Milton Road widening project is far and away the most impactful project. Appropriately implemented, it should have strong positive impacts on all measure. The cost in the table includes right-of-way (R/W), but the benefit cost ratio (BCR) does not.

More than 100 projects were evaluated and may be reviewed in Appendix D. For assistance in understanding this table the following guidance is provided:

- “Widening” in the name generally indicates that one lane will be added in each direction to the existing condition and will be used for general traffic.
- “(#)” at the end of the project description is the phase within the corridor. Generally, phases are numbered from north to south or from west to east. It does not indicate priority or preferred sequence of construction.
- “Upgrade” indicates the construction of a combination of complete street components like sidewalks, bike lanes, landscaping, and medians. Milton\_54 and Milton\_51 maybe contrasted in that Milton\_54 is a widening project that would include much of the complete street components where Milton\_51 excludes the widening effort. Costs are similar because right-of-way would be similar in both cases and is the largest cost component.
- “Extension S” indicates the extension of an existing road in a southerly direction
- “Intersection” indicates improvements a major reconstruction of an intersection including important lengths of the approaches.

Table 12-6 Project Criteria Scores, Total Scores, Environmental Score, Benefit Cost Ratio and Cost

PROJ_ID	Project	Criteria & Weights					Score 100	Rank	Other Factors	Cost w/ R/W \$ MIL.
		Con- gestion 30	Arterial 5	Multi- modal 25	Safety 30	ED 10				
MIL_54	Milton Widening	100	50	29	77	100	7,278	1	54	62
FOU_93	Fourth/6th/7th Intersection	59	-	91	5	87	5,061	2	65	121
WMR+4	Woody Mtn Rd/W 66 intersection	87	50	46	0	88	4,914	3	70	370
LTR_44	New Lone Tree Rd Realignment & TI (4)	96	100	46	0	34	4,883	4	16	19
LTR_41	Lone Tree Road Railroad Overpass (1)	71	100	57	1	64	4,719	5	22	13
LTR_42	Lone Tree Road Widening (2)	66	100	70	8	18	4,635	6	6	23
WMR_86	Woody Mountain Rd SW	96	100	36	-	36	4,627	7	42	95
LTR_43	Lone Tree Road Widening (3)	89	100	43	2	25	4,559	8	12	26
BUT_6	Butler Avenue Widening	69	50	54	8	57	4,464	9	30	64
WMR_85	Woody Mountain Rd Airpark	61	100	70	-	36	4,418	10	34	31
LTR_45	New Lone Tree Road Alignment (5)	56	100	64	-	61	4,379	11	46	49
JWP_37	J.W. Powell Blvd Airport	65	100	68	0	20	4,360	12	21	57
W66_71	W. Rte 66 Widening (3)	62	50	43	20	54	4,340	13	70	156
MIL_51	Milton Road Upgrade	-	-	21	100	78	4,312	15	62	no model
FOU_22	Fourth Street Bridge	70	100	63	1	-	4,166	15	62	126
YAL_55	New Milton Access Road (Yale)	67	-	50	1	88	4,163	16	70	225
RRS_64	Riordan Ranch St Extension - S	52	-	68	0	88	4,140	17	23	458
WMR_87	Woody Mountain Road TI @ I-40	68	100	48	0	36	4,100	18	70	16

Table 12-6 (continued) Project Criteria Scores, Total Scores, Environmental Score, Benefit Cost Ratio and Cost

PROJ_ID	Project	Criteria & Weights					Rank	Other Factors	Cost w/ R/W \$ Mill.
		Con- gestion 30	Arterial 5	Multi- modal 25	Safety 30	ED 10			
E66_68	E. Rte 66 Widening (F40)	56	50	57	0	74	4,100	19	69
FOU_92	Fourth Street/Butler Intersection	56	50	55	2	72	4,083	20	58
LAC_56	Little America Collector (New)	84	-	39	-	54	4,049	22	26
MWE_50	Metz Walk Extension	61	-	68	2	44	4,036	23	70
FOU_18	Fourth Street Extension - South (2)	84	100	34	-	3	3,888	24	24
W66_70	W. Rte 66 Widening (2)	72	50	36	11	27	3,874	25	38
BRT	Bus Rapid Transit	23	-	75	6	100	3,850	26	-
WMR_89	Woody Mountain Collector SW (New)	89	-	46	-	-	3,839	27	70
HRR_25	Herold Ranch Road Widening (1)	62	-	45	0	83	3,800	28	66
McD_47	McConnell Drive Extension - E (2)	67	-	71	-	-	3,792	29	70
FOU_23	Fourth Street Widening	57	50	63	2	15	3,733	30	50
FOU_17	Fourth Street Extension - South (1)	56	100	34	0	70	3,723	31	40
SWI_73	Switzer Canyon Dr RR Underpass	63	-	66	5	-	3,711	32	61
FOU_20	Fourth Street Upgrade (1)	-	-	96	13	88	3,685	33	52
JWP_35	J.W. Powell Blvd Extension (1)	56	100	43	-	44	3,680	34	41

## Alternative Programs Evaluation

Four prospective programs were evaluated and scored against the criteria in the table above. The programs were fiscally constrained and derived from the plan and project priorities established by the RTP Steering Committee, the individual project scores, and how well projects complement each other. The final program presented in the chapter 10, is a variation on the highest ranked program.

The four programs are made up of different combinations of a limited set of more than 100 projects evaluated. Higher ranked projects that were not selected are usually isolated, so don't complement a larger objective or are associated with potential development that may not be in the development pipeline. Other projects may be left out due to lower rankings or excessive costs.

The projects from which the four alternative programs are developed are listed below with a short description and indicators of which plan goals and performance measures they support. Those are summarized here as a reminder of the goals and measures described in Chapter 4:

### Plan Goals & Performance Measures

#### *Goals*

- T1 – Mobility & Access
- T2 – Safety & Efficiency
- T3 – Conservation
- T4 – Context sensitive design
- T5 – Pedestrian facility availability
- T6 – Safe & efficient bicycle system
- T7 – High quality transit
- T8 – Hierarchy of streets
- T9 – Rail service support

#### *T10 – Pulliam airport support*

- T11 – Public support

#### *Performance Measures*

- "C" - Congestion
- "A" - Arterial Density
- "M" - Multimodal support
- "S" - Safety
- "E" - Economic Development

*Butler Avenue Widening (BUT\_6)* – Minor arterial. Complete street. Project limits from Interstate 40 to Sinagua Heights. Existing 2-lanes, widened to 4 lanes. Roundabout proposed at Herold Ranch Road. Medians where appropriate. Supporting Study or Plan: *Butler Avenue Corridor Study, City of Flagstaff Economic Vitality Division, c. 2008*.

*Plan Support:* T1, T2, T4, T5, T6, T8 / C, A, M, S, E

*Bus Rapid Transit (BRT)* Construction and operating costs. A high frequency, cross-town bus route extending from Pulliam Airport, up Milton Road and US 180 to the hospital, across Cedar Avenue, down Fourth Street and then US 66 and US 89 to the Flagstaff Mall. Special technology applications and unique bus stops will be included. Supporting Study or Plan: *Transit Spine Route Study, NAIPTA & FMPO, 2016 / NAIPTA 5-Year and Long-Range Transit Plan, NAIPTA, 2013*

*Plan Support:* T1, T2, T3, T4, T7 / C, M, S, E

*Fourth Street Extension South (FOU\_18)* – Minor arterial. Complete street. Project limits from ½ miles south of Butler Avenue to the new alignment of J.W. Powell Boulevard. New road constructed with proposed Canyon del Rio project. 2 lanes with medians. Includes crossing of the Rio de Flag.

*Plan Support:* T1, T4, T5, T6, T7, T8 / C, A, M, E

Plan Goals & Performance Measures

*Goals*

- T1 – Mobility & Access
- T2 – Safety & Efficiency
- T3 – Conservation
- T4 – Context sensitive design
- T5 – Pedestrian facility availability
- T6 – Safe & efficient bicycle system
- T7 – High quality transit
- T8 – Hierarchy of streets
- T9 – Rail service support

- T10 – Pulliam airport support
- T11 – Public support

*Performance Measures*

- “C” - Congestion
- “A” - Arterial Density
- “M” - Multimodal support
- “S” - Safety
- “E” - Economic Development

*Fourth Street Bridge (FOU\_22)* – Minor arterial. Complete street with FUTS trail. Project limits from Huntington Drive to Soliere Avenue. Replacement or widening of existing bridge. 2 lanes to 4 lanes.

Supporting study: *Fourth Street South Corridor Study, South; City of Flagstaff, March 2010*

Plan Support: T1, T2, T4, T5, T6, T8 / C, A, M, S, E

*4th Street Widening (FOU\_23)* – Minor arterial. Complete street with FUTS trail. Project limits from Soliere Avenue to Butler Avenue. Existing 2 and 3 lane section to 4 lanes section with median.

Supporting study: *Fourth Street South Corridor Study, South. March 2010*

Plan Support: T1, T2, T4, T5, T6, T7, T8 / C, A, M, S, E

*J.W. Powell Boulevard (JWP\_37)* – Minor arterial. Complete street. Project limits from Pulliam Drive to Lake Mary Road. Construction of new 2-lane arterial with medians. Supporting Study or Plan:

*Flagstaff Pulliam Airport Master Plan, City of Flagstaff, 2009*

Plan Support: T1, T4, T5, T6, T7, T8, T10 / C, A, M, S, E

*J.W. Powell Boulevard (JWP\_36)* – Minor arterial. Complete street. Project limits from existing Lone Tree Road to New Lone Tree Road. Widening of existing 2-lane section to accommodate turn movements at existing and new intersections with J.W. Powell Boulevard. Supporting Study or Plan: none.

Plan Support: T1, T4, T5, T6, T7, T8, T10 / C, A, M, S, E

*J.W. Powell Boulevard (JWP\_35)* – Minor arterial. Complete street. Project limits from New Lone Tree Road to Fourth Street Extension-South. New road constructed with future development. 2 lanes with median. Supporting study or plan: none.

Plan Support: T1, T4, T5, T6, T7, T8, T10 / C, A, M, S, E

*Lone Tree Road widening South (LTR\_43)* – Minor arterial. Complete street. Project limits from Pine Knoll Road to J.W. Powell Boulevard. Widening of existing 2 lane section to 4 lane section with medians. May require replacement of I-40 bridges over Lone Tree Road. May include roundabout at Zuni Drive. Supporting Study or Plan: *Lone Tree Corridor Study, City of Flagstaff, 2008 / Interstate 40 Initial Design Concept Report, ADOT, 2011*

Plan Support: T1, T2, T4, T5, T6, T7, T8, T10 / C, A, M, S, E

Plan Goals & Performance Measures

*Goals*

- T1 – Mobility & Access
- T2 – Safety & Efficiency
- T3 – Conservation
- T4 – Context sensitive design
- T5 – Pedestrian facility availability
- T6 – Safe & efficient bicycle system
- T7 – High quality transit
- T8 – Hierarchy of streets
- T9 – Rail service support

T10 – Pulliam airport support

T11 – Public support

*Performance Measures*

- "C" - Congestion
- "A" - Arterial Density
- "M" - Multimodal support
- "S" - Safety
- "E" - Economic Development

*Lone Tree Rd Railroad Overpass (LTR\_41)* – Minor arterial. Complete street. Project limits from E. Route 66 to Butler Avenue (or Franklin Avenue). Construction of new bridge over the BNSF Railroad. Involves the raising of E. Route 66 and lowering of BNSF railroad. Supporting Study or Plan: *Lone Tree Corridor Study, City of Flagstaff, 2008 / Lone Tree Overpass Study Railroad Relocation Alternatives Report, City of Flagstaff, 2010*

*Plan Support:* T1, T2, T4, T5, T6, T7, T8, T9, T10 / C, A, M, S, E

*Lone Tree Road widening North (LTR\_42)* - Minor arterial. Complete street. Project limits from Butler Avenue to Pine Knoll Road. Widening of existing 2 lane section to 4 lane section with medians. Supporting Study or Plan: *Lone Tree Corridor Study, City of Flagstaff, 2008 / Lone Tree Overpass Study Railroad Relocation Alternatives Report, City of Flagstaff, 2010*

*Plan Support:* T1, T2, T4, T5, T6, T7, T8, T10 / C, A, M, S, E

*Milton Road Widening (MIL\_54)* – Major arterial. Complete street. Project limits from Phoenix Avenue to south of Plaza Way. May include widening of existing road from 4 lanes to 6 lanes. Alternatively, may include a series of extensive intersection improvements. Supporting Study or Plan: *Milton Road Alternatives Operations Analysis, FMPO, 2016*

*Plan Support:* T1, T2, T4, T5, T6, T7, T8, T10 / C, A, M, S, E

*W. Route 66 widening (W66\_69)* – Minor arterial. Complete street. Project limits from Flagstaff Ranch Road to Woody Mountain Road. Widening of existing 2 lane road to 4 lanes with center turn lane or medians. Supporting Study or Plan: *Flagstaff Urban Mobility Study, ADOT & FMPO, 2004*

*Plan Support:* T1, T2, T4, T5, T6, T7, T8, T10 / C, A, M, S, E

*W. Route 66 widening (W66\_70)* – Minor arterial. Complete street. Project limits from Woody Mountain Road to Woodlands Village Boulevard. Widening of existing 2 lane road to 4 lanes with center turn lane or medians. Supporting Study or Plan: *Flagstaff Urban Mobility Study, ADOT & FMPO, 2004.*

*Plan Support:* T1, T2, T4, T5, T6, T7, T8, T10 / C, A, M, S, E

*W. Route 66 widening (W66\_71)* – Minor arterial. Complete street. Project limits from Woodlands Village Boulevard to Milton Road. Widening of existing 2 lane road to 4 lanes with center turn lane or medians. Supporting Study or Plan: *Flagstaff Urban Mobility Study, ADOT & FMPO, 2004.*

*Plan Support:* T1, T2, T4, T5, T6, T7, T8, T10 / C, A, M, S, E

Plan Goals & Performance Measures

*Goals*

- T1 – Mobility & Access
- T2 – Safety & Efficiency
- T3 – Conservation
- T4 – Context sensitive design
- T5 – Pedestrian facility availability
- T6 – Safe & efficient bicycle system
- T7 – High quality transit
- T8 – Hierarchy of streets
- T9 – Rail service support

T10 – Pulliam airport support

T11 – Public support

*Performance Measures*

- “C” - Congestion
- “A” - Arterial Density
- “M” - Multimodal support
- “S” - Safety
- “E” - Economic Development

*Short term sidewalks (SW\_Short)* – Independent sidewalk projects on major roadways. 100% of recommended projects. Supporting Study or Plan: Draft *Active Transportation Master Plan, City of Flagstaff/FMPO, pending*

*Plan Support:* T1, T2, T3, T4, T5, T7, T8 / C, A, M, S, E

*Mid-term sidewalks (SW\_Mid\_1)* – Independent sidewalk projects on major roadways. 50% of recommended mid-term projects. *SW\_Mid\_2* and *SW\_Long\_1* indicate expanding the sidewalk program to cover additional mid-term and long-term projects. Supporting Study or Plan: Draft *Active Transportation Master Plan, City of Flagstaff/FMPO, pending*

*Plan Support:* T1, T2, T3, T4, T5, T7, T8 / C, A, M, S, E

*Crossings/Grade Separations (X\_Low)* – Enhanced pedestrian and bicycle crossings at various priority locations. Includes projected signalized intersections as part of private development. *X\_Med* and *X\_High* projects expand the budget under different program options. Supporting Study or Plan: Draft *Active Transportation Master Plan, City of Flagstaff/FMPO, pending*

*Plan Support:* T1, T2, T3, T4, T5, T6, T7, T8 / C, A, M, S, E

*Reserve Funds (Projects of Opportunity)* – Proposal for City of Flagstaff to reserve funds annually to be used for projects of opportunity. This may include partnering projects with another agency or private developer or projects of need such as an intersection meeting warrants for traffic signal. Supporting Study or Plan: none.

*Plan Support:* T1, T2, T11 / C, A, M, S, E

*Programs (TDM/ITS/etc.)* – Proposal for City of Flagstaff annual budget item to initiate ongoing programs such as travel demand management (TDM), intelligent transportation systems (ITS), and other needs.

*Plan Support:* T1, T2, T11 / C, A, M, S, E

*Coconino (Unspecified County Project(s))* – Historical patterns suggest Coconino County will spend approximately \$12 million on capital expansion projects over the 20-year planning period. No county-specific or county partnership project opportunities were identified as regional priorities to which these funds might apply. No recommendations are made for County expenditures.

Supporting Study or Plan: *Townsend-Winona Corridor Study, Coconino County & FMPO, 2006 / Draft Coconino County Engineering Design Standards (pending)*

## Program Alternatives

**Program Option 1.** Lone Tree Corridor Focus: Developing an alternative to Milton Road and strengthening the arterial network is a priority. The Lone Tree Railroad Bridge is expensive and leverages benefits on the corridor.

Table 12-7 Lone Tree Corridor Focus, Program Option 1 Summary

Project ID	Project Name	Rank	Years of Construction	Cost (2013 \$)	Finance
LTR_41	Lone Tree Rd Railroad Overpass	5	2021	\$65,385,136	Bond
BRT	Bus Rapid Transit	26	2022	\$46,870,000	Loan/Grants
	BRT (Operating)		Annual	\$1,250,000	\$25,000,000
	Short term sidewalks (100% draft ATMP** recommendation)				Cash/Grants
SW_Short	Mid-term sidewalks (50% draft ATMP** recommendation)	90	2022	2026	\$2,589,413
SW_Mid_1		91	2026	2031-2035	\$5,888,332
LTR_42	Lone Tree Road widening North	6	2027	\$9,164,054	Bond
LTR_43	Lone Tree Road widening South	8	2029	\$13,825,046	Bond
JWP_37	J.W. Powell (Airport)	12	2030	\$11,494,668	Bond
Programs	TDM/ITS/etc.**		Annual	\$400,000	\$8,000,000
Coconino	Unspecified County Project(s)		Varies		\$12,000,000
<b>Subtotal</b>				<b>\$200,216,649</b>	
	Inflation & Debt Financing***			\$79,783,351	
<b>Total</b>				<b>\$280,000,000</b>	

\*\* ATMP is Active Transportation Master Plan

\*\*\* Inflation and debt financing costs are presumed to be the balance of available funds

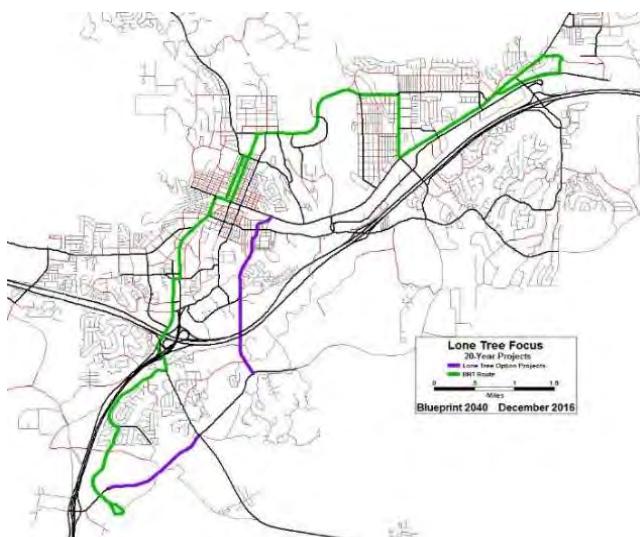
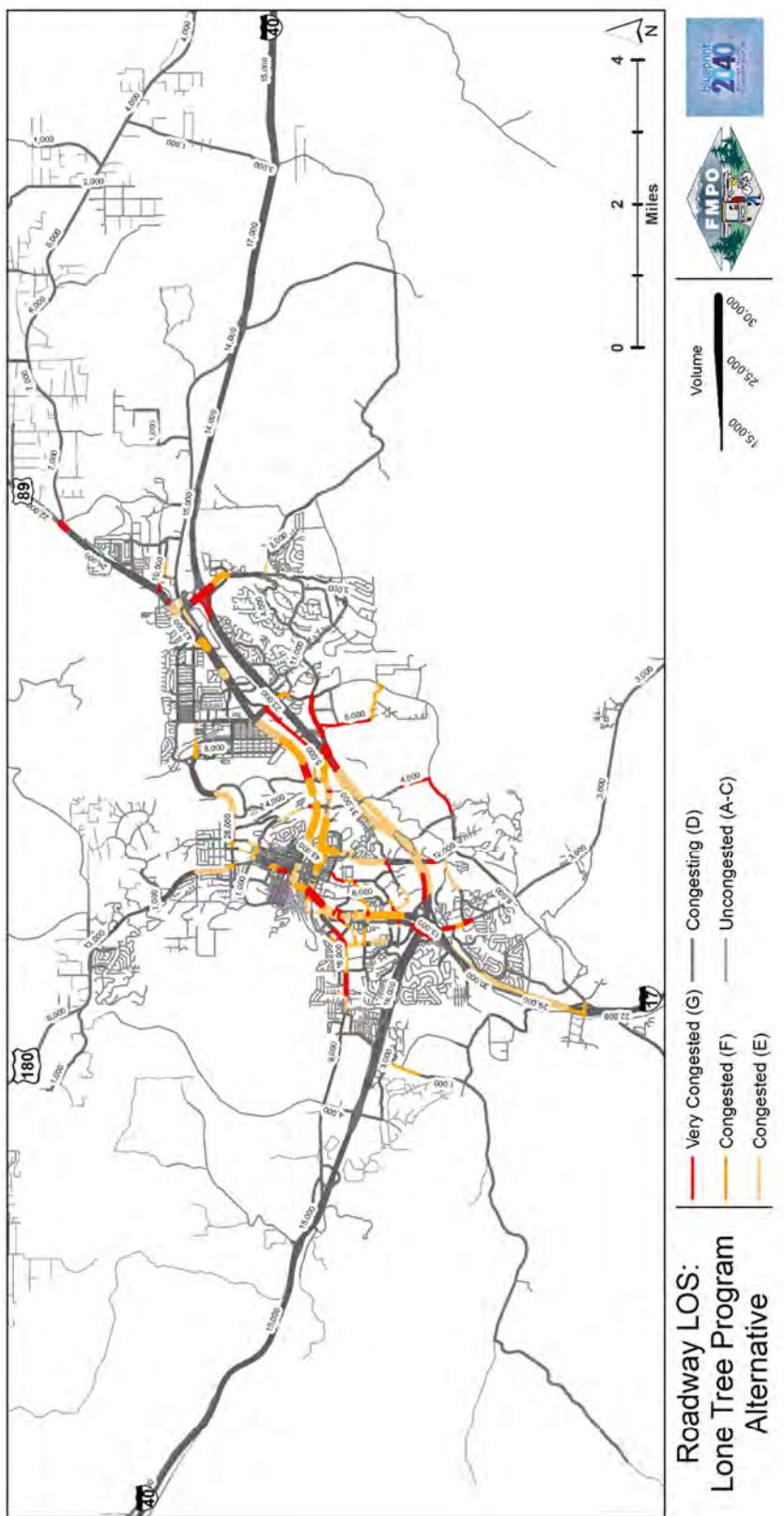


Figure 12.1 Lone Tree Corridor emphasis projects



**Program Option 2.** Partnership Focus: Identifying priority projects that have a potential for partnerships. This leverages funds and results in more projects.

Table 12-8 Partnership Focus, Program Option 2 Summary

Project ID	Project Name	Rank	Years of Construction	Cost (2013 \$)	Finance
MIL_54	Milton Road Widening	1	2026	\$36,559,211	Bond
BRT	Bus Rapid Transit	26	2023	\$21,450,000	Loan/Grants
	BRT (operating)		Annual	\$1,250,000	\$25,000,000
LTR_43	Lone Tree Road widening South	8	2025	\$13,825,046	Bond
JWP_36	J.W. Powell Boulevard	60	2021	\$7,697,600	Cash
	Existing Lone Tree to New Lone Tree				
FOU_22	Fourth Street Bridge	15	2023	\$9,724,816	Bond
JWP_37	J.W. Powell Boulevard	12	2027	\$10,457,958	Bond
	New Lone Tree to Fourth St. Ext.				
FOU_18	Fourth Street Extension South	24	2027	\$9,173,197	Bond
	J.W. Powell ext to Fourth Street Ext				
W66_70	W. Route 66	25	2031-2035	\$11,673,143	Bond
	Woody Mtn. to Woodlands Village				
LTR_42	Lone Tree Road widening North	6	2030	\$9,164,054	Bond
	Franklin to Pine Knoll				
FOU_23	4th Street Widening	30	2031-2035	\$6,004,460	Bond
	Soliere to Butler				
SW_Short	Short term sidewalks (100% draft ATMP** recommendation)	90	2021 2024	\$2,589,413	Cash
SW_Mid_1	Mid-term sidewalks (50% draft ATMP** recommendation)	91	2021 2026	\$5,888,332	Cash
X_Low	Crossings/Grade Separations	76	2023 2036-2040	\$9,900,000	Cash
Reserve	Projects of Opportunity/Partnering		No reserve in this option	\$0	
Programs	TDM/ITS/etc.**		No programs in this option	\$0	

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Coconino	Unspecified County Project(s)	Varies	\$12,000,000	Cash
<b>Subtotal</b>				<b>\$191,107,229</b>
Inflation & Debt Financing***				\$88,892,771
<b>Total</b>				<b>\$280,000,000</b>

\*\* ATMP is Active Transportation Master Plan, TDM is Travel Demand Management, ITS is Intelligent Transportation Systems

\*\*\* Inflation and debt financing costs are presumed to be the balance of available funds

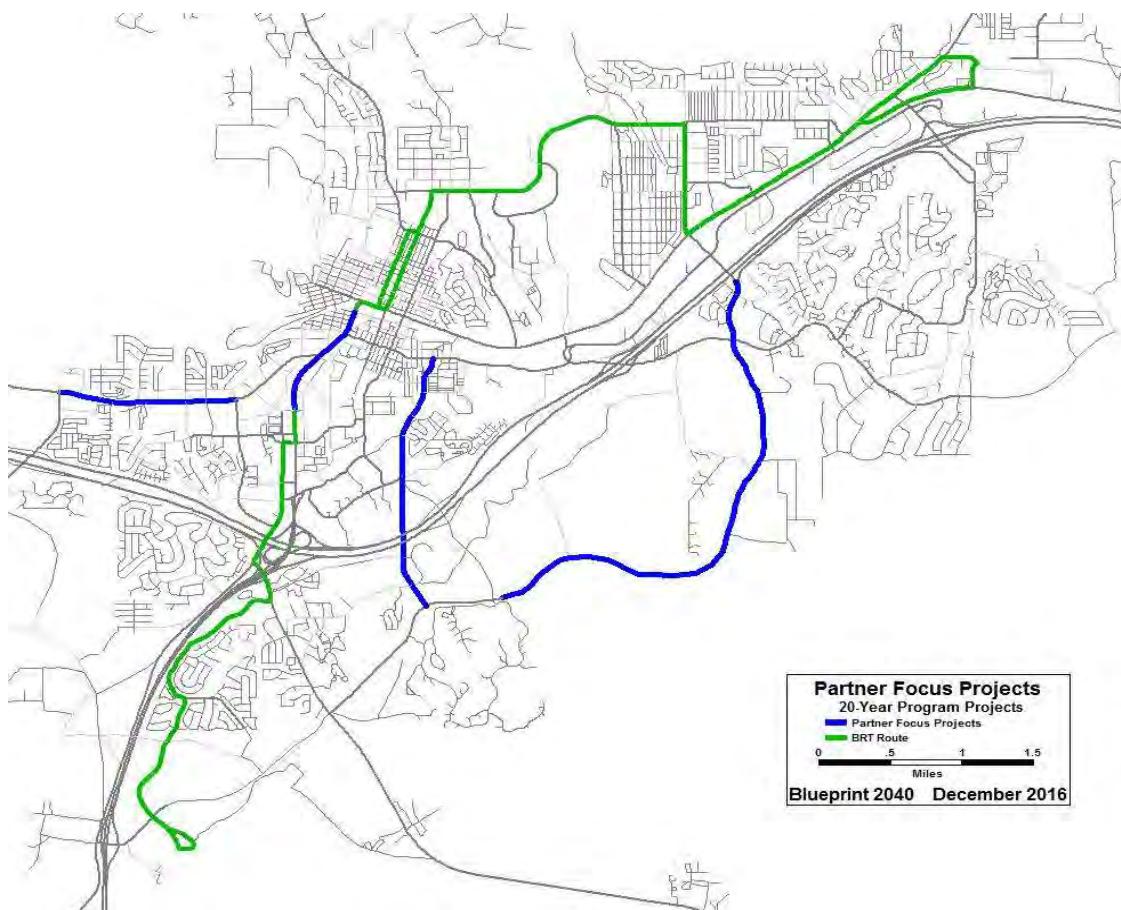
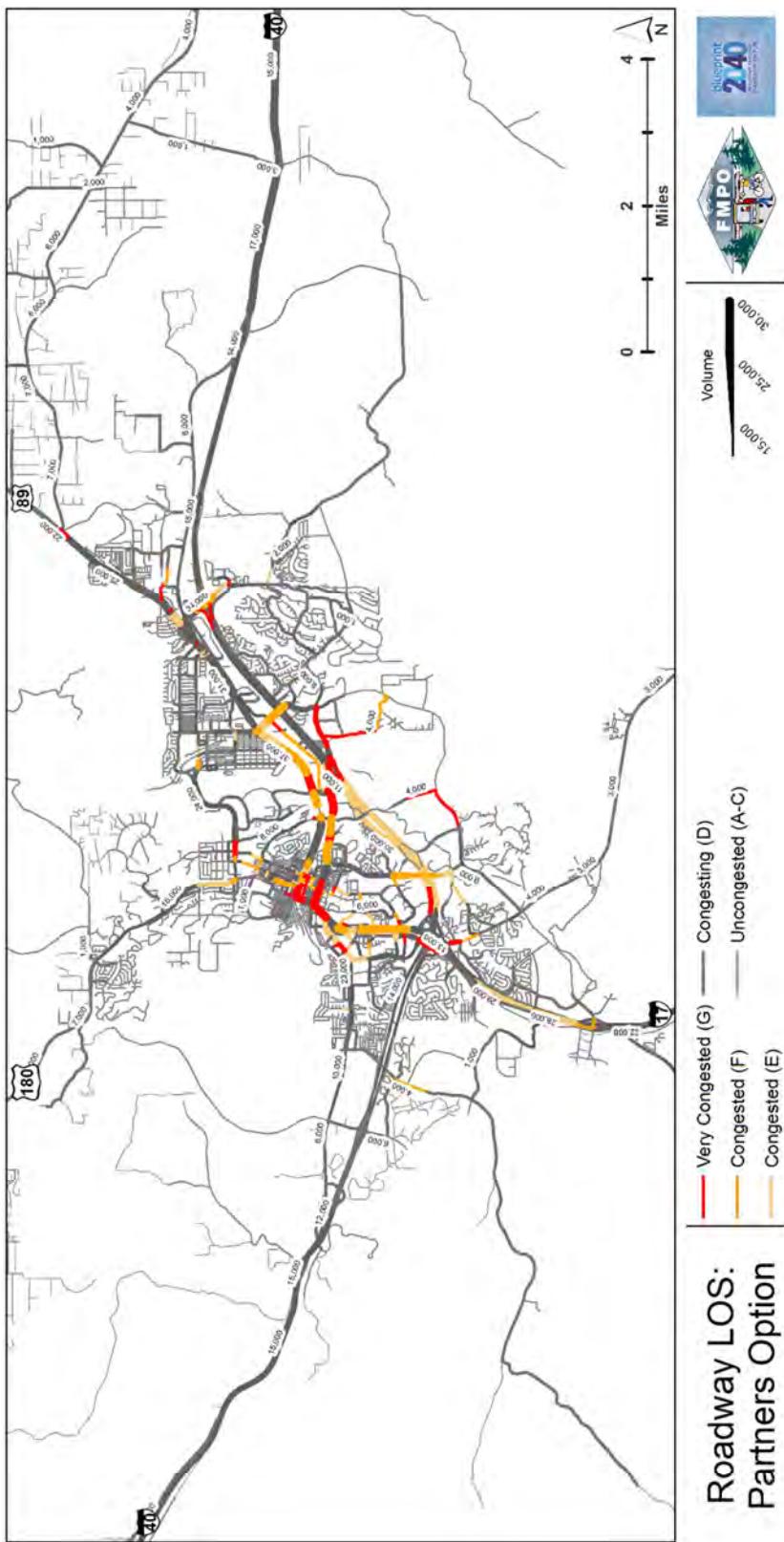


Figure 12.2 Partnership Focus projects



Map 12.2 Partner Focus System Performance

**Program Option 3.** City Project Focus: The vast majority of reasonably anticipated revenues come from the assumed extension of the City transportation tax. The priority projects in this program are those under greatest control of the City. This option also introduces annual City reserve funds for contingencies and opportunities and programming funds for travel demand management, intelligent transportation systems and other efforts.

Table 12-9 City Focus, Program Option 3 Program Summary

Project ID	Project Name	Rank	Years of Construction	Cost (2013 \$)	Finance
BRT	Bus Rapid Transit	26	2021	\$46,870,000	Loan/Grants
	Bus Rapid Transit - Operating		Annual	\$1,250,000	\$25,000,000 Cash/Grants
LTR_43	Lone Tree Road widening South	8	2025	\$13,825,046	Bond
FOU_22	Fourth Street Bridge	15	2023	\$7,296,878	Bond
HCT_27	High Country Trail Extension	99	2036-2040	\$2,708,541	Cash
FOU_23	Fourth Street Widening	30	2025	\$6,004,460	Bond
	Soliere to Butler				
JWP_37	J.W. Powell (Airport)	12	2031-2035	\$11,494,668	Bond
LTR_42	Lone Tree Road widening North	6	2030	\$9,164,054	Bond
BUT_6	Butler Avenue Widening	9	2028	\$13,322,891	Bond
SW_Short	Short term sidewalks (100% draft ATMP** recommendation)	90	2021	2022	\$2,589,413 Cash
SW_Mid_1	Mid-term sidewalks (50% draft ATMP** recommendation)	91	2022	2026	\$5,888,332 Cash
X_Med	Crossings/Grade Separations	74	2022	2036-2040	\$12,100,000 Cash
MIL_54	Milton Road Widening*	1	Phased	\$36,559,211	Cash
Reserve	Projects of Opportunity*/Partnering		Annual	\$1,250,000	\$4,000,000 Cash
				balance after Projects of Opportunity*	
Programs	TDM/ITS/etc.**		Annual	\$600,000	\$12,000,000 Cash
Coconino	Unspecified County Project(s)		Varies		\$12,000,000 Cash
<b>Subtotal</b>				<b>\$220,823,494</b>	
	Inflation & Debt Financing***			\$59,176,506	
<b>Total</b>				<b>\$280,000,000</b>	

\* Milton widening is assumed to be the project of opportunity for this program. Reserve funds would be applied to project costs. Project scope may be reduced or require more ADOT participation

\*\* ATMP is Active Transportation Master Plan, TDM is Travel Demand Management, ITS is Intelligent Transportation Systems

\*\*\* Inflation and debt financing costs are presumed to be the balance of available funds

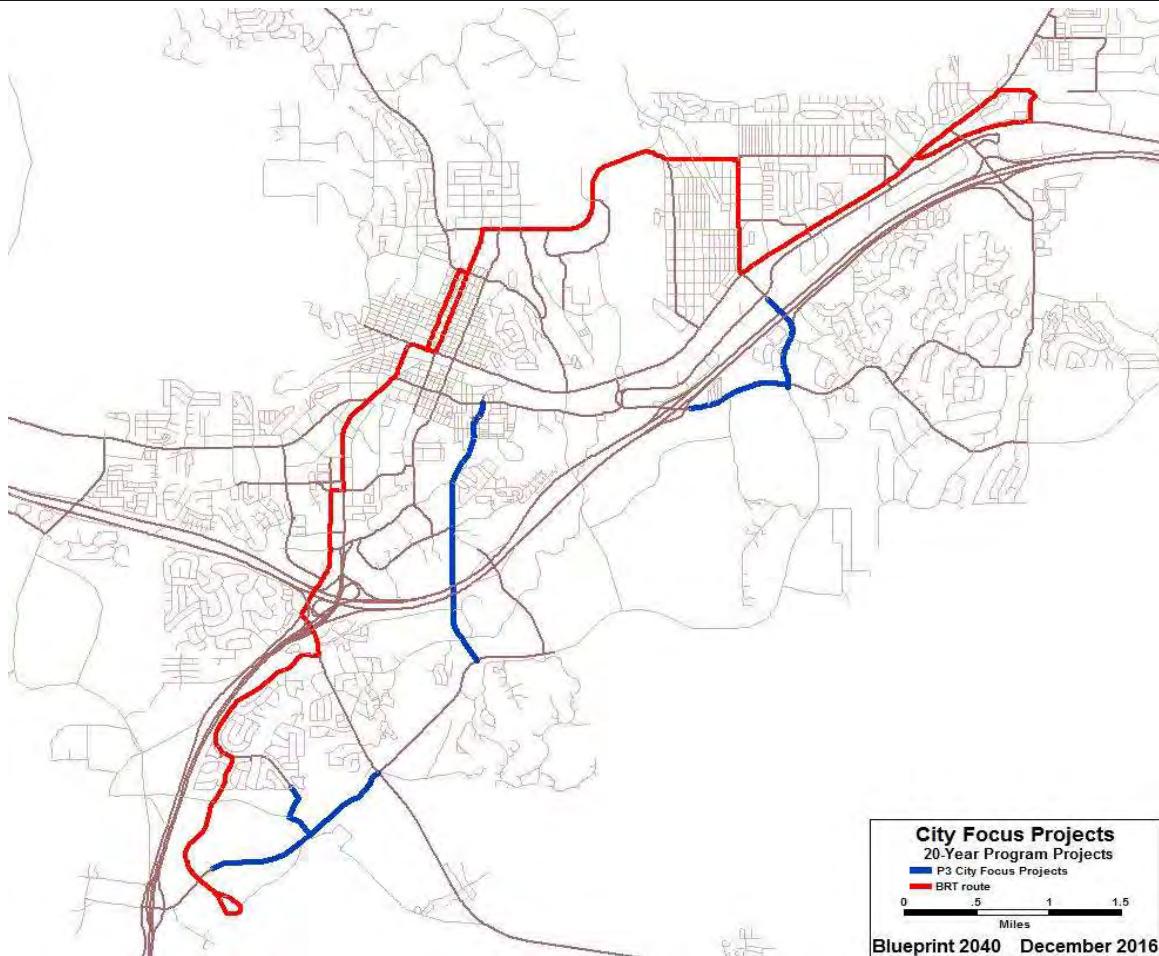
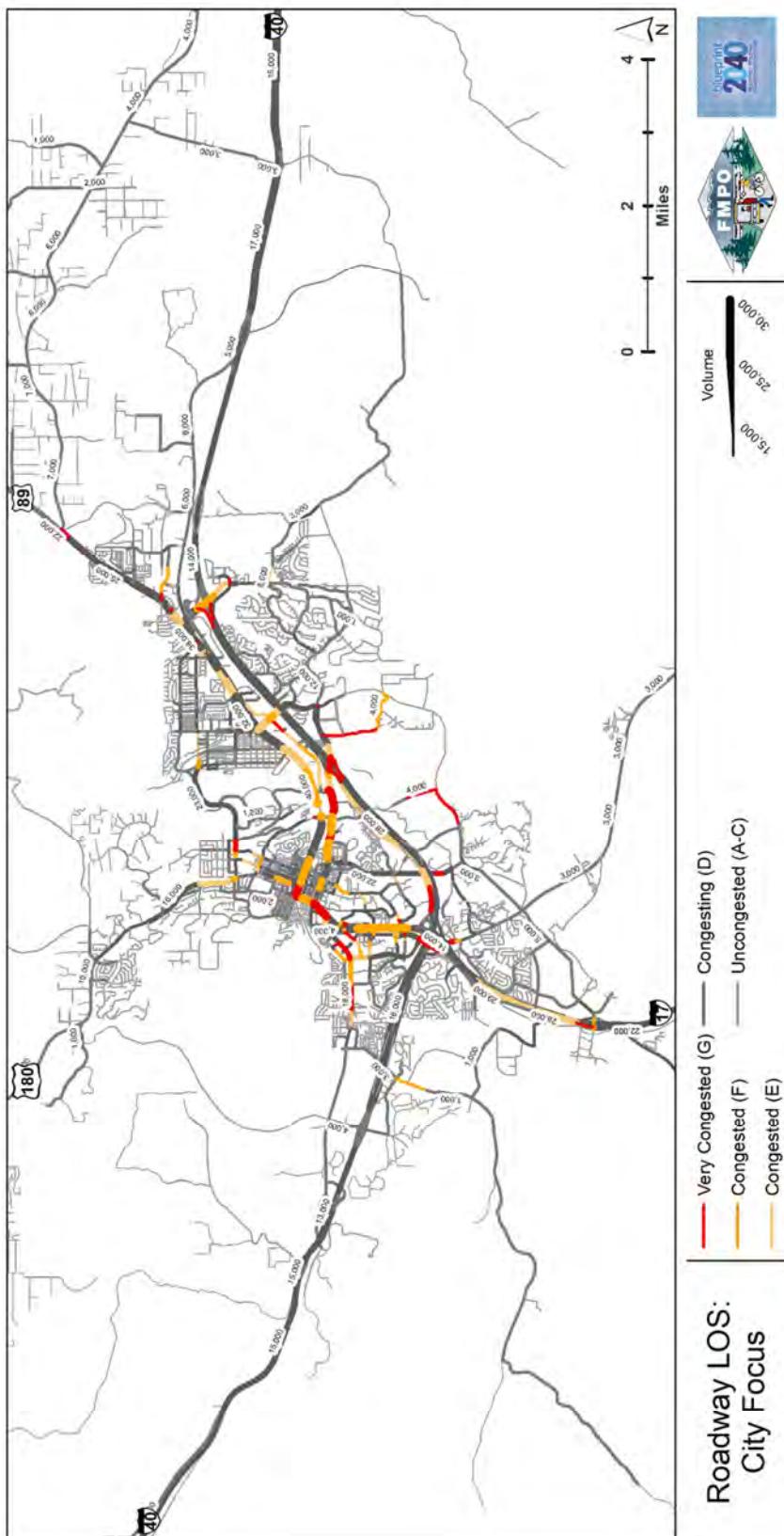


Figure 12.3 City funding emphasis projects

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Map 12.3 City Focus System Performance

**Program Option 4.** Walk & Bike Focus: The limited funds prevent substantial improvements to the road network. Shifting some funds to pedestrian and bicycle facilities allow for near completion of those networks. This has implications for immediate safety benefits and may create long-term travel behavior changes.

Table 12-10 Pedestrian & Bicycle Emphasis, Program Option 4 Program Summary

Project ID	Project Name	Rank	Years of Construction	Cost (2013 \$)	Finance
BRT	Bus Rapid Transit	26	2021	\$46,870,000	Loan/Grants
	BRT (operating)		Annual	\$1,250,000	\$25,000,000 Bond/Grant
					s
LTR_43	Lone Tree Road widening South	8	2023	\$13,825,046	Bond
FOU_22	Fourth Street Bridge	15	2022	\$7,296,878	Bond
FOU_23	Fourth Street Widening Soliere to Butler	30	2024	\$6,004,460	Bond
LTR_42	Lone Tree Road widening North	6	2031-2035	\$9,164,054	Bond
BUT_6	Butler Avenue Widening	9	2029	\$13,322,891	Bond
JWP_37	J.W. Powell (Airport)*	12	Variable	\$11,494,668	Cash/Bond
HCT_27	High Country Trail Extension*	99	Variable	\$2,708,541	Cash
SW_Short	Short term sidewalks (100% draft ATMP** recommendation)	90	2021	\$2,589,413	Cash
SW_Sh_M1&M2	Mid-term sidewalks (100% draft ATMP** recommendation)	87	2023	\$8,929,321	Cash
SW_Long_1	Long-term sidewalks (60% draft ATMP** recommendation)	94	2030	\$7,541,512	Cash
2036-2040					
X_High	Crossings/Grade Separations	69	2022	\$15,125,000	Cash
Bike_All	Bike Lanes	100	2031-2035	\$4,215,734	Cash
Reserve	Projects of Opportunity*/Partnering		Annual \$1,250,000, balance after Projects of Opportunity*	\$10,796,790.67	Cash

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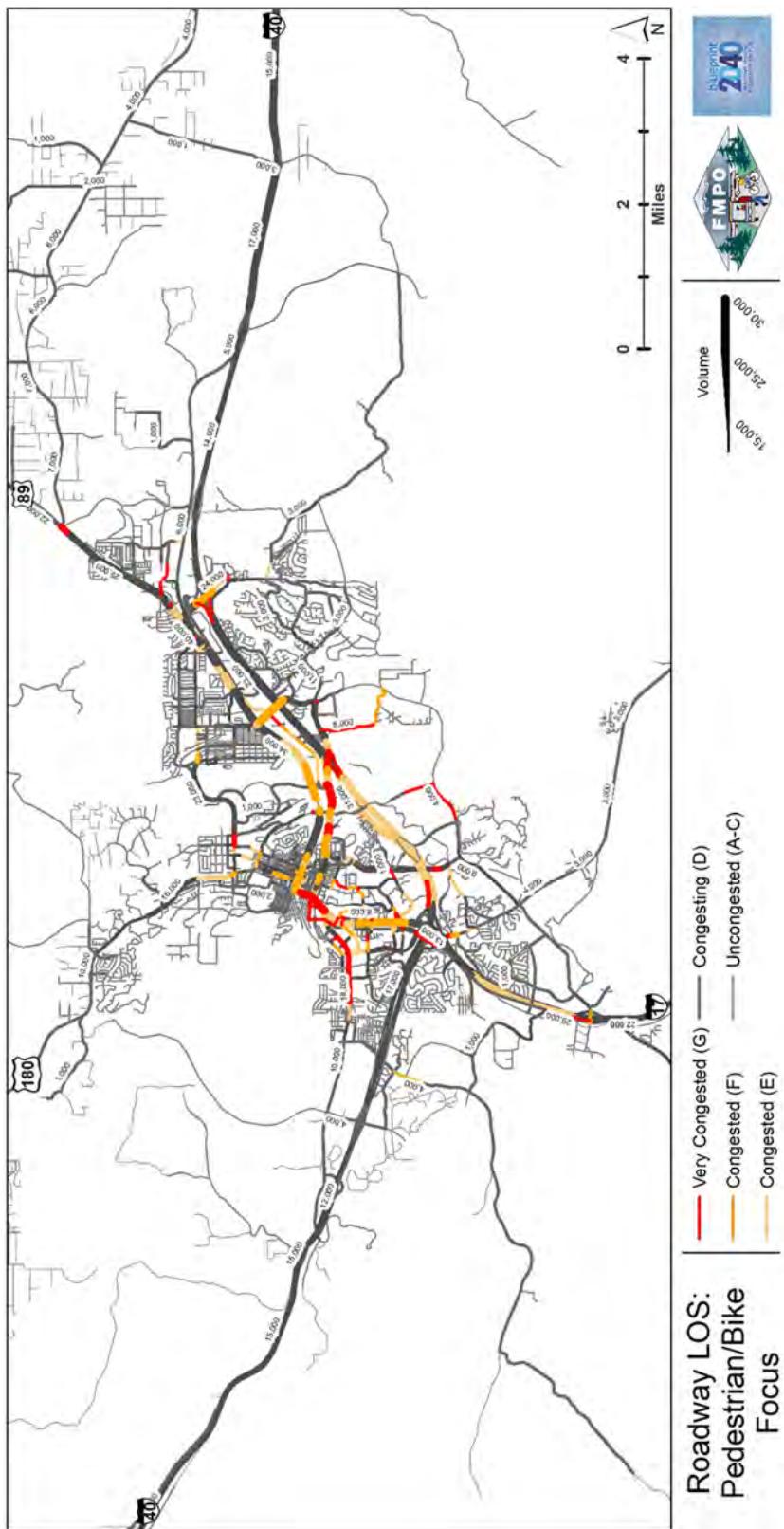
Programs	TDM/ITS/etc.**	Annual	\$600,000	\$12,000,000	Cash
Coconino	Unspecified County Project(s)	Variable		\$12,000,000	Cash
<b>Subtotal</b>					<b>\$208,884,309</b>
Inflation & Debt Financing***					\$71,115,691
<b>Total</b>					<b>\$280,000,000</b>

\* J.W. Powell (airport) and High Country Trail extensions are assumed to be the projects of opportunity for this program. Reserve funds would be applied to project costs.

\*\* ATMP is Active Transportation Master Plan, TDM is Travel Demand Management, ITS is Intelligent Transportation Systems

\*\*\* Inflation and debt financing costs are presumed to be the balance of available funds

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Map 12.4 Pedestrian-Bicycle Focus System Performance

### Program Alternative Performance

The Partner option produces more projects and better results across all measures. The Milton Road project is one of the more effective at reducing congestion and carries this option far. It should be noted that the BRT is modified in this option with the working assumption that widening Milton Road will improve conditions for all modes and more than offset the improvements that would have been gained by replacing the BNSF railroad overpass on Milton.

Possible performance exceptions may be related to the Walk/Bike option related to safety. The additional facility improvements including crossings will target pedestrian and bicycle fatalities and injuries that are a priority safety concern. Improved pedestrian facilities are known to positively influence property values and retail sales, but these are difficult to quantify.

Table 12-11 Performance Comparison of 20-Year Program Options

Measure	20-Year Program Options			
	P1-Lone Tree	P2-Partner	P3-City	P4-Walk/Bike
Congestion (delay)	22,097	20,300	18,583	22,403
Arterial Density	5.7	5.9	5.8	5.7
Mode Share (% auto)	86.5	86.4	86.4	86.0
Safety (score)	24	100	98	46
Econ. Develop. (score)	67	96	92	100

## Blueprint 2040 Regional Transportation Plan

### Flagstaff Metropolitan Planning Organization

#### Chapter 13 - FMPO 20-Year Plan & Program

### Chapter Overview

The *Blueprint 2040* fiscally constrained plan for years 2020-2040 delivers a balance of projects both geographically and by mode. It recognizes that a large majority of “reasonably anticipated” revenues will come from the City, so the plan and program are largely advisory in that regard. Partnerships are important and sought after by member agencies, but are difficult to predict both in terms of timing and magnitude. So, in addition to a recommended program, *Blueprint 2040* identifies priority partnership opportunities as potential substitute or add-on projects. A City fund for these opportunities and contingencies is recommended as are program funds for intelligent transportation systems, safety and travel demand management.

In 2000, 2008 and 2016 City voters elected to tax themselves for a range of transportation improvements. The combined transportation tax rate stands now at 0.72 with 0.295 committed to the extension of *existing* transit services provided by NAIPTA. This means that to leave transportation sales taxes at existing levels and expand *all* modes of transportation will require they be paid for out of the balance or remaining 0.426. Existing policy and public input support this as the direction for *Blueprint 2040*.



### Policy Implications of the 20-Year Plan

#### Transportation serves other policy priorities

The project scoring and plan evaluation criteria include elements beyond transportation mobility for mobility's sake: social interaction, health, economic development, and recreation, to name a few. Housing is also influenced by transportation, and because it is difficult to quantify and predict the effect of transportation investments on housing supply and cost it is addressed narratively here. City leaders may deem housing supply a priority and find the expense and complexity of delivering necessary transportation improvements too high for any one developer. In this case, the partnership aspect of the plan may be employed and projects addressing housing supply advanced. Instruments such as community facilities districts may be appropriate for J.W. Powell Boulevard, for example.

#### Projects in sensitive areas require additional study and public input

The FMPO Executive Board stated their commitment to continued public dialogue and design effort on projects that impact sensitive areas, particularly neighborhoods. Most projects in the 20-year plan are not controversial per se, but some will impact neighborhoods. The Lone Tree Road widening projects addressed in a 2008 corridor study, are two such projects. As project delivery

approaches, the community should be brought back together and the solutions revisited to assure these impacts are handled appropriately.

#### Land use and transportation are still connected

In order to deliver the performance anticipated, the prescribed levels of service in developing and redeveloping areas must be achieved for all modes. This includes levels of internal and external connectivity and investments in enhanced crossings for bikes and pedestrians.

### The 20-Year Plan

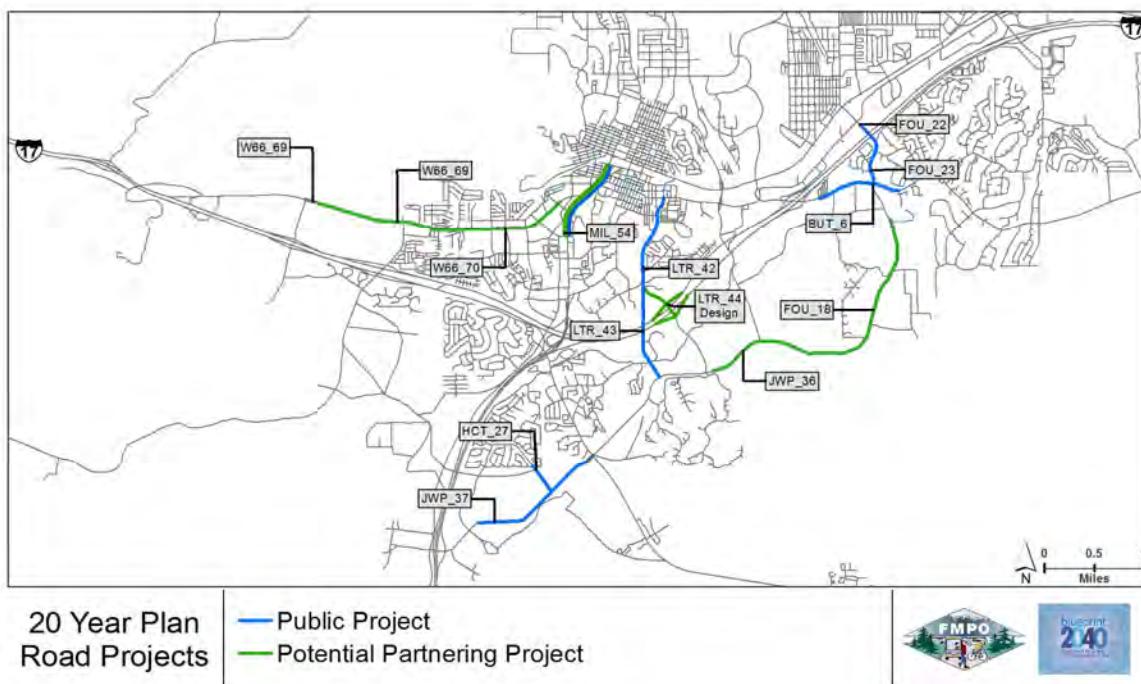


Figure 13.1 FMPO Blueprint 2040 20-Year Plan

Figure 13.1 above and Table 13-1 below provide an overview of the recommended projects to be delivered in a fiscally constrained program. Chapter 12 provides detail on assumptions about inflation, financing costs, and alternative programs that were considered. Chapter 12 also reports on projects program performance.



Figure 13.2 Children board the Mountain Line

**Table 13-1 FMPO Blueprint 2040 20-Year Program**

Project ID	Project Name	Years of Construction	Cost (2013 \$)	Finance
BRT	Bus Rapid Transit	2021	\$46,870,000	Bond/Grants
	Bus Rapid Transit - Operating	Annually with inflation	\$25,000,000	Cash/Grants
LTR_43	Lone Tree Road widening South	2025	\$13,825,046	Bond
FOU_22	Fourth Street Bridge	2023	\$7,296,878	Bond
HCT_27	High Country Trail Extension	2036-2040	\$2,708,541	Cash
FOU_23	Fourth Street Widening Soliere to Butler	2025	\$6,004,460	Bond
JWP_37	J.W. Powell (Airport)	2031-2035	\$11,494,668	Bond
LTR_42	Lone Tree Road widening North	2030	\$9,164,054	Bond
BUT_6	Butler Avenue Widening	2028	\$13,322,891	Bond
SW_Sh	Short term sidewalks	2021-2022	\$2,589,413	Cash
SW_M1	Mid-term sidewalks (50% of project list)	2022-2026	\$5,888,332	Cash
SW_X	Crossings/Grade Separations	2022, 2036-2040	\$12,100,000	Cash
MIL_54	Milton Road Widening*	Phased	\$36,559,211	Cash/Bond
Reserve	Projects of Opportunity*	Annually with inflation	\$25,000,000	Cash
Programs	Safety/Travel Demand Mgmt./ITS/etc.	Annually with inflation	\$12,000,000	Cash
<b>Subtotal</b>			<b>\$229,823,494</b>	
Offsets	ADOT Milton partnership (assumed)		-\$15,000,000	

FTA capital grants (estimated)	-\$32,809,000
FTA operating assistance (estimated)	-\$12,500,000
<b>Total**</b>	<b>\$169,514,494</b>

\* Milton widening is assumed to be the project of opportunity for this program. Reserve funds would be applied to project costs. Project scope may be reduced or require more ADOT participation

\*\* Total does not account for inflation or debt financing costs, so is less than projected revenues

### Pedestrian and Bicycle Projects

*Blueprint 2040* makes great strides in establishing the mobility benefits of these projects in addition to the general quality of life, health and equity issues historically associated with them. A program of \$21 million is recommended for the 20-year period. Bundles of specific sidewalk and street crossing projects prioritized by citizens' committees and staff were evaluated for their impacts. More work is needed to establish the final mix of sidewalks, bike lanes and FUTS trails. In addition to these funds, public road projects will be developed as complete streets, so these elements are included in their cost estimates. The development community are also expected to build to these standards.

The following figures are excerpts from the Missing Sidewalks working paper supporting the draft *Active Transportation Master Plan* and illustrate some of the priorities being established. Similar

Table 26 Recommended medium term sidewalk projects

ID	Project name	Category	Sub	Juris	Lin feet	Cost est	Score
69	Roadway - West Route 66 1	Roadway	Capital	ADOT	1651	217,605	229.4
70	Roadway - West Route 66 2	Roadway	Dev	ADOT	1899	250,114	216.6
166	Roadway - University Ave 2	Roadway	Dev	COF	262	21,933	209.8
2	FUTS - Cedar Trail	FUTS trail	Pave	COF	3528	718,920	208.3
164	Sidewalk - Yale St	Sidewalk	Minor	COF	843	70,368	203.5
33	Roadway - Fort Valley Rd 1	Roadway	Capital	ADOT	1041	99,708	201.3
130	Sidewalk - Navajo Rd	Sidewalk	Major	COF	2048	214,005	199.7
139	Sidewalk - Plaza Way 3	Sidewalk	Minor	COF	771	56,385	196.9
82	Sidewalk - Beulah Blvd	Sidewalk	Minor	COF	582	38,319	188.3
148	Sidewalk - Switzer Canyon Dr 1	Sidewalk	Major	COF	2122	162,708	187.5
34	Roadway - Fort Valley Rd 2a	Roadway	Dev	ADOT	1114	146,766	187.5
91	Sidewalk - Cherry Ave 2	Sidewalk	Major	COF	2344	224,577	184.0

Figure 13.3 Short term sidewalk projects, partial list

Source: Active Transportation Master Plan, Working Paper 7

tables for FUTS, bike lanes, and crossings are being established. All are supported by public input and technical analysis.

Table 13 Recommended short term sidewalk projects								
ID	Project name	Category	Sub	Juris	Lin feet	Cost est	Score	
135	Sidewalk - Phoenix Ave	Sidewalk	Minor	COF	109	13,851	255.4	
143	Sidewalk - San Francisco St 3	Sidewalk	Minor	COF	311	22,368	247.8	
106	Sidewalk - Fourth St 2	Sidewalk	Major	COF	1461	135,579	244.3	
107	Sidewalk - Fourth St 1	Sidewalk	Minor	COF	573	57,070	226.0	
76	Sidewalk - Aspen-Verde	Sidewalk	Minor	COF	552	52,920	219.9	
128	Sidewalk - Milton Rd	Sidewalk	Minor	ADOT	191	27,876	219.1	
92	Sidewalk - Columbus Ave	Sidewalk	Minor	COF	371	43,599	217.2	
104	Sidewalk - Elm St	Sidewalk	Minor	COF	120	10,326	214.6	
160	Sidewalk - Verde St	Sidewalk	Minor	COF	31	2,100	214.0	
142	Sidewalk - San Francisco St 2	Sidewalk	Major	COF	1094	144,726	211.2	
9	FUTS - Lone Tree Trail S	FUTS trail	Construct	COF	915	219,307	211.2	
138	Sidewalk - Plaza Way 1	Sidewalk	Minor	COF	46	2,748	204.0	
90	Sidewalk - Cherry Ave 1	Sidewalk	Minor	COF	587	54,807	200.9	

Figure 13.4 Mid-term sidewalk projects, partial list

Source: Active Transportation Master Plan, Working Paper 7

## Transit Projects

NAIPTA continues to progress in the delivery of its current 5-Year and Long Range Transit Plan. A key component is the implementation of the crosstown, bus rapid transit (BRT) route funded in this plan. Based on past experience and conversations with Federal Transit Administration personnel it is reasonably assumed that federal grants will cover approximately 50% of combined capital and operating expenses over the 20-year plan period.

The scope and cost of the BRT project included in *Blueprint 2040* is based on a recently completed feasibility study. It is possible and probable that the final scope and cost will change. NAIPTA recently received grants to conduct design and environmental review work for the BRT. Refined BRT alternatives will be evaluated and a 2017 update to their *5-Year Transit Plan* will address the reorganization of existing routes in relation to the BRT.

## Road Projects

### Public Road Projects

Six major projects are recommended for development:

- Fourth Street Bridge over I-40: widening to four lanes with pedestrian and bike facilities
- Fourth Street widening from Soliere Avenue to Butler Avenue
- Butler Avenue widening from I-40 to Sinagua Heights
- Lone Tree Road widening from Butler Avenue to J.W. Powell Boulevard
  - Likely developed in 2 phases
- J.W. Powell Boulevard construction from Lake Mary Road to the airport
  - Includes the extension of High Country Trail south to the new roadway

These projects address existing bottlenecks, add transit facilities, and establish a new route around Milton Road congestion. They may also prove useful in managing winter snow play traffic.

#### *Partnership Projects*

Projects in blue on the map are potential partnering projects. The City, ADOT and the development community may be partners on W. Route 66. The City and the development community might participate together in connecting J.W. Powell Boulevard from Lone Tree Road to Fourth Street. ADOT and the City may choose to address needed improvements to Milton Road. This latter project, being the highest ranked, is assumed for purposes of estimating system performance though other projects may ultimately be selected. Finally, new partnership opportunities for transit, pedestrian and bicycle facilities may emerge.

#### *Private Development Projects*

Part of planning involves making assumptions about future growth. Some roads will have to be built by developers for growth to occur. New road construction includes Fourth Street south of Butler Avenue, improvements to Herold Ranch Road, and internal collector streets supporting that development. Much or all of J.W. Powell Boulevard between Lone Tree Road and Fourth Street may be constructed, too.

#### *Program Projects between 2016 and 2020*

There are several projects and studies programmed for the next four-years that will fulfill commitments under *Transportation Decision 2000* and more recent sales tax initiatives. The extension of Beulah Boulevard from Forest Meadows to Yale Drive is funded by the City and tied to a private development project. That effort includes the realignment of University Avenue to meet University Drive at Milton Road. Other programmed City projects include improvements at the intersections of Country Club and Oakmont Drive, Switzer Canyon Drive and Turquoise Drive, and Butler Avenue and Fourth Street. The City has budgeted design funds for the Fourth Street bridge over I-40 in anticipation of a cooperative agreement with ADOT. Additional work will be done on Industrial Drive to improve drainage and finish the edge improvements like curb, gutter and sidewalk. Design and construction of new trails are anticipated along or near Lone Tree Road and also at Switzer Canyon Drive. NAIPTA received voter approval of Proposition 411 to extend its tax support and received grants for continued improvement to its facilities and operations. ADOT will install a southbound right turn lane on Milton Road at Plaza Way and will begin design of a second southbound right turn lane on Humphreys at E. Route 66. Coconino County is scheduled to widen

the shoulders on several roads within the FMPO as part of their pavement preservation program. These include all or parts of Burris Lane, Stardust Trail, Cosnino Road, and Kachina Trail. All agencies will continue their regularly scheduled maintenance and operations during this time period.

## In Pursuit of Other Funds

### Federal and State Funds

FMPO and its member agencies regularly pursue other funds. At the highest level, FMPO coordinates with like-minded agencies and organizations across the state and country to seek increases in state and federal funding. The gas taxes that fund these programs have not been raised in decades and inflation, increasing fuel efficiency and growth in demand keep reduce their ability to meet today's needs.

Grants are routinely applied for from state and federal programs. NAIPTA has been extremely effective in leveraging these funds.

The partnership road projects identified are a means of leveraging them as well. Partnering with ADOT on state highways in the region improves the chances of getting regionally important projects into ADOT's 5-Year Construction program. ADOT Project priorities from *Blueprint 2040* and the ADOT North Central District office are listed below in Table 13-2. Differences in priority are for two primary reasons. First, the RTP list includes other jurisdictions and calls out intersection projects that might be initiated by a local road project. Second, the ADOT list is derived from ADOT studies. No adopted ADOT studies exist defining improvements for Milton Road. Other studies address needs like weather stations, dynamic messaging and other specific modernization applications that *Blueprint 2040* does not address in detail. Getting projects onto ADOT's list or moving them up in priority may require requesting or funding project scoping studies, working with ADOT to assure that all scoring criteria are well addressed in their studies, and identifying local funding that could be applied to various projects. Educating the Arizona State Transportation Board about partnership benefits may also be helpful.

### Local Funds

The City and County exercise due diligence when asking citizens to approve taxes for improvements and services. *Blueprint 2040* assumes voters will approve the continuation of existing taxes, but to comply with federal fiscal constraint requirements may not assume anything above that. Increasing taxes above existing levels is a possible outcome of a future dialogue with voters as they are presented with the full range of needs. What to present to voters in terms of the range of projects and related tax levels is ultimately the decision of the Flagstaff City Council and Coconino County Board of Supervisors.

*Blueprint 2040* highly recommends the inclusion of the Lone Tree Rail Road Bridge and completion of pedestrian and bicycle systems in these discussions about increasing tax levels. The rail road bridge enhances the Lone Tree corridor as an alternate route, improves emergency services access and reduces train delay. Walking and biking participation rates are greatly influenced by the completeness and connectivity of the systems. These trips also leverage the use of transit.

**Table 13-2 ADOT District Priority Projects**

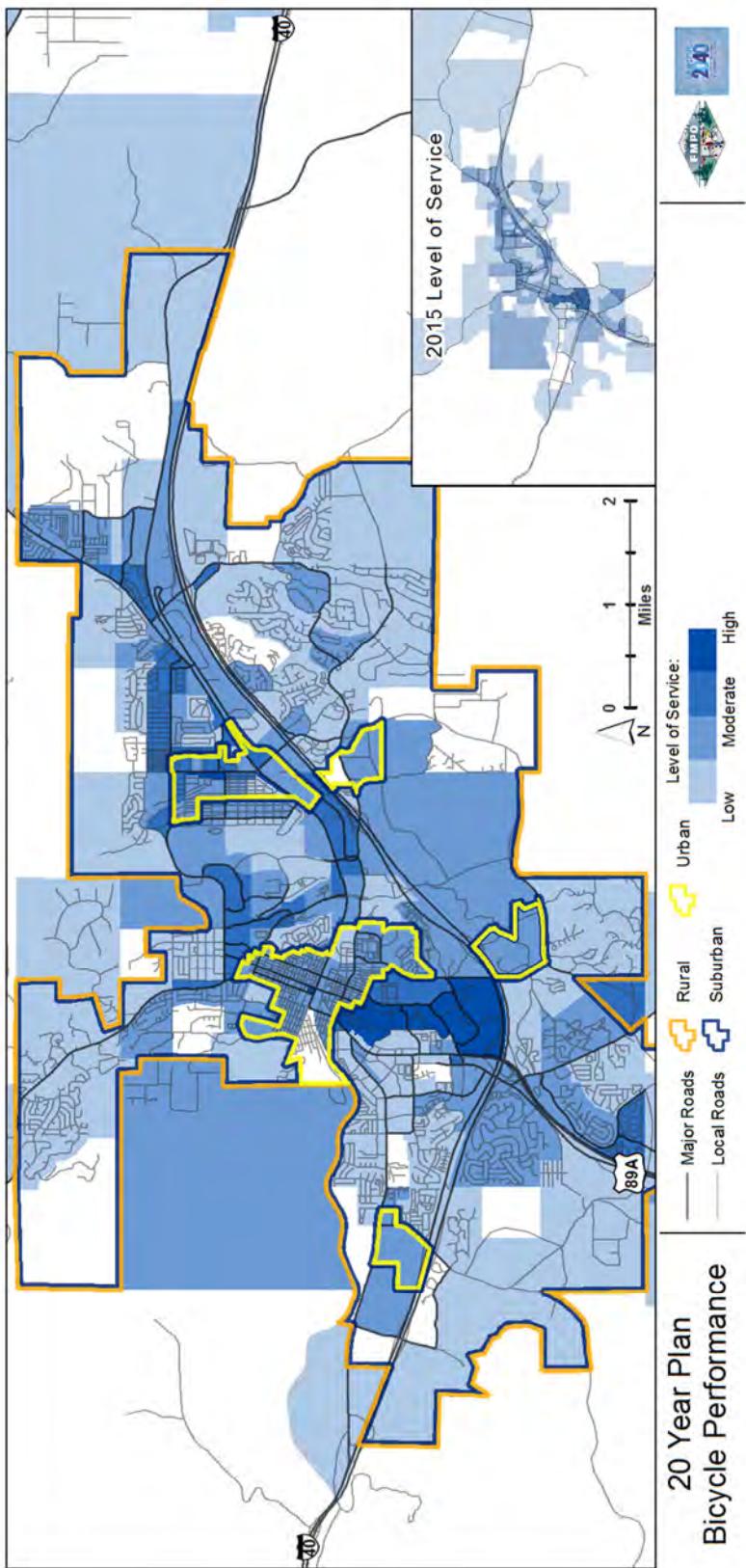
Key to District Rankings: NR = No Rating; E = Expansion; M = Modernization; S = Scoping; Other = project likely initiated by other; #/# = rank/total projects in category

PROJ_ID	Project	RTP Rank	District Rank	FMPO Cost Estimate
MIL_54	Milton Widening	1	NR	\$ 36,559,000
WMR+4	Woody Mountain Road/W 66 intersection	3	E 8/8	\$ 4,527,000
LTR_44	New Lone Tree Rd Realignment & Interchange	4	NR	\$ 63,723,000
LTR_41	Lone Tree Road Railroad Overpass (1)	5	Other	\$ 65,385,000
W66_71	W. Rte 66 Widening (3) Woodlands to Milton	13	E 8/8	\$ 7,915,000
MIL_51	Milton Road Upgrade	14	NR	\$ 36,928,000
FOU_22	Fourth Street Bridge	15	S 1/15	\$ 7,297,000
YAL_55	New Milton Access Road (Yale)	16	NR	\$ 4,203,000
WMR_87	Woody Mountain Road TI @ I-40	18	NR	\$ 51,763,000
W66_70	W. Rte 66 Widening (2) Woody Mtn. to Woodlands	25	E 8/8	\$ 11,673,000
BRT	Bus Rapid Transit	26	NR	limited ADOT \$\$
SWI_73	Switzer Canyon Dr RR Underpass	32	Other	\$ 38,664,000
SWI_72	Switzer Canyon Drive Extension South	40	Other	\$ 22,390,000
CCR+5	Country Club /I-40 Interchange	42	M 13/42	\$ 8,600,000
McD_48	McConnell Drive/Beulah	43	Other	\$ 13,591,000
PoP_12	Ponderosa Parkway RR Overpass	44	Other	\$ 44,365,000
BUT+3	Butler/I-40 Interchange	47	M 12/42	\$ 10,484,000
I17_28	I-17 Widening	48	NR	\$ 54,411,000
I40_34	I-40 Widening (6) Walnut Canyon to Winona	49	NR	\$ 52,230,000
U89_81	US 89 Bypass	50	NR	\$ 124,904,000
I40_32	I-40 Widening (4) Lone Tree to Country Club	54	E 2/8	\$ 32,322,000
E66_66	Route 66 Enrichment	55	NR	\$ 19,315,000
W66_69	W. Rte 66 Widening (1) Flag. Ranch to Woody Mtn.	58	E 8/8	\$ 8,964,000
U18_79	US 180 Bypass	59	NR	\$ 41,891,000
I40_31	I-40 Widening (3) Woody Mtn. to Lone Tree	61	NR	\$ 29,539,000
I40_30	I-40 Widening (2) A-1 Mtn. to Woody Mtn.	62	NR	\$ 21,009,000
I40_33	I-40 Widening (5) Country Club to Walnut Cnyn.	63	NR	\$ 8,975,000
I40_29	I-40 Widening (1) Bellemont to A-1 Mtn.	64	NR	\$ 26,531,000
JWP_38	J.W. Powell Blvd / I-17 Improvement	65	NR	\$ 1,517,000
MIL_53	Milton BNSF Bridge Replacement	79	NR	limited ADOT \$\$
FVR_94	Fort Valley Rd/Forest Intersection	95	NR	\$ 1,638,000
FVR_15	Fort Valley Road Cultural Corridor	97	Other	\$ 7,390,000
U18_80	US 180 Upgrade - Far North	105	NR	\$ 57,095,000

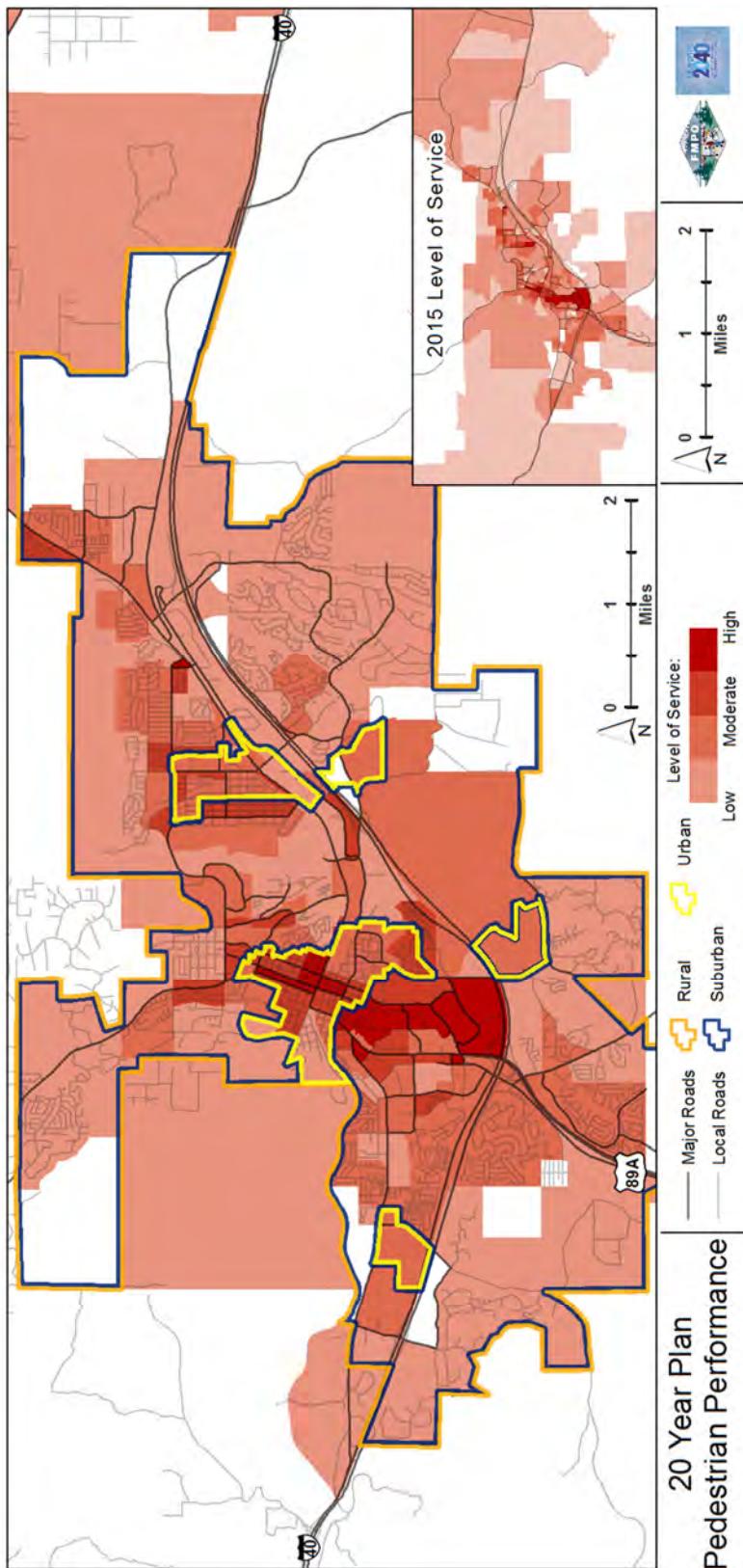
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## 20-Year Plan Performance

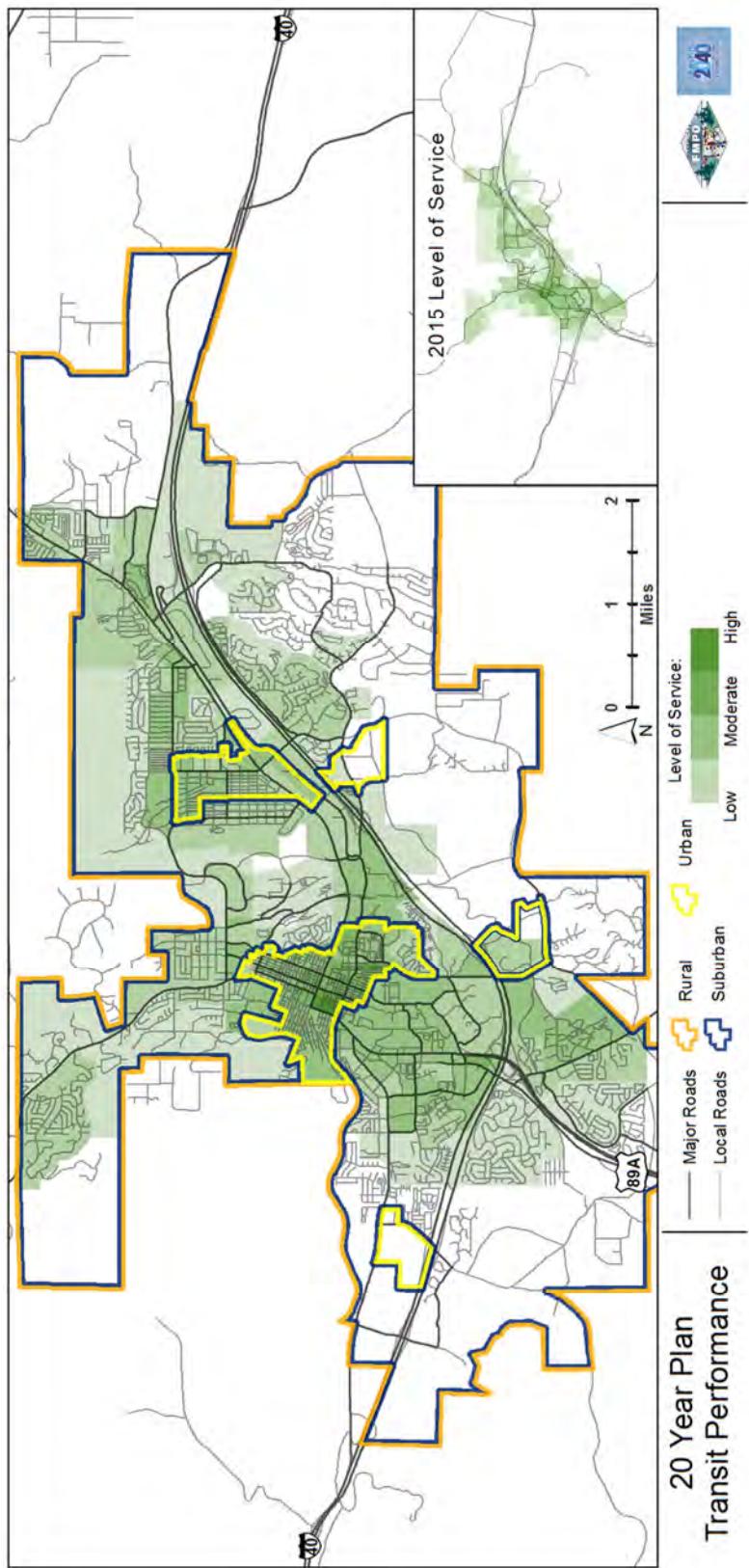
In keeping with future requirements of the *FAST* Act, *Blueprint 2040* reports on projected system performance. Minor decreases in system performance are anticipated including miles of congested roadway and VMT, VHT and delay per capita. Minor gains in mode share and arterial network density will be realized. The former is the result of new pedestrian and bicycle connections and expanded transit service. These impacts are illustrated in the respective level of service maps that follow. Transit mode share is expected to decrease while overall ridership continues to climb. Three factors contribute to this: First, future growth is primarily expected to occur in areas where transit service will not be extended based on funding expectations. Second, NAU enrollment is assumed to cap at 25,000 per the current Board of Regents goals. That is only 3-4,000 additional students some of whom will live on campus or within walking distance. Finally, the BRT route as planned largely serves existing areas. The impact due to reorganization of existing routes is only guessed at and is likely conservative in its estimates. Further, important factors that will drive up ridership are not accounted for at this time. These include a City parking management program and the prospects of a “U-pass” or universal pass that allows students access to the entire transit system upon payment of an annual fee.



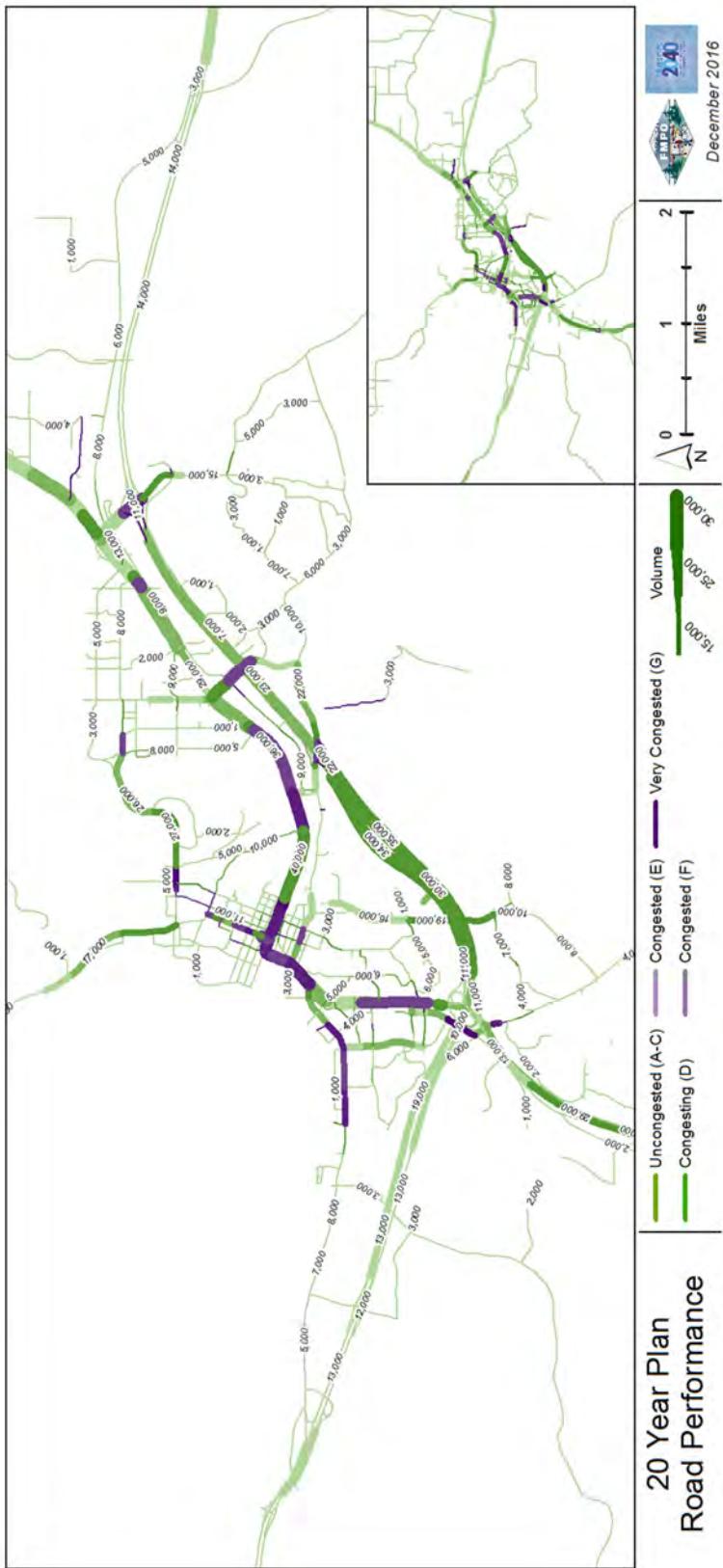
Map 13.1 Bicycle System Performance, 20-Year Plan



Map 13.2 Pedestrian System Performance, 20-Year Plan



Map 13.3 Transit System Performance, 20-Year Plan



Map 13.4 Roads & Streets Performance, 20-Year Plan

## Beyond 2040

Recommended investments in *Blueprint 2040* are predictable: roads, transit, pedestrian and bicycle facilities. The list of projects not funded is much longer and includes projects receiving strong support. An attempt is made to address some of those omissions.

### What? No US 180 Bypass?

A US 180 bypass is not in the plan for two primary reasons. First, it is not clear that a majority of the region supports the facility. Second, it is expensive and largely serves a need experienced 15-20 days of the year. Relief from the three and four-hour traffic backups experienced during holiday winter weekends is the motivation behind much of the concern. Other reasons include environmental impacts. *Blueprint 2040* policy is to preserve the opportunity for the facility while continuing to seek other solutions. The area of study is depicted as a “bubble” or “blob” on the map in Chapter 6. The same is true for the **US 89 bypass**.

### When will we see the Lone Tree Traffic Interchange?

The Lone Tree Traffic Interchange started as a \$26 million simple diamond interchange in the late 1980's. The cost now is over \$100 million. Some of that is due to inflation, but most of that is due to a new design. The close proximity to the I-17/I-40 system interchange prompted ADOT to conduct more preliminary design work in 2010. The weaving movements from a simple westbound diamond on-ramp to the north, south and westbound movements could not be safely accommodated and ADOT now recommends a braided or fly-over ramp configuration.

### Technology to the Rescue?

There are exciting things in our transportation future. Autonomous vehicles, vehicle-to-vehicle communication and more. Because the impacts of these things is still uncertain, they have only a small part in the plan. Autonomous vehicles, for instance, are projected to increase capacity by permitting cars to travel closer together. This is good. They are also projected to increase the number of trips as the personal costs of travel are reduced. This is bad. Provisions are made for investments in technology without dictating exactly what that is. Almost certainly bandwidth for communication will be needed to support much of what is coming.

# Blueprint 2040 Regional Transportation Plan

## Flagstaff Metropolitan Planning Organization

### Chapter 14 - Operations & Maintenance

#### Chapter Overview

Operations and maintenance covers many aspects of the transportation system. Several are covered in Chapters 15-18. System preservation including pavement, vehicles and other assets is vital to long-term success and fiscal sustainability. Safety is a community priority that is influenced by the design and availability of facilities and systems. Technology appropriately applied can improve efficiency of traffic flow, emergency services, and traveler decisions. Travel demand management (TDM) equips people with trip information on costs, time advantages, health benefits and incentives. Approaching “perfect information” in the transportation marketplace will help optimize use of the entire system.

#### Policy Implications for Operations & Maintenance

##### Preserving assets

Transportation is central to many aspects of society, one of the “golden geese” that enables prosperity. Investing in the upkeep of the system is fiscally prudent as preventive maintenance is far less expensive than major repairs or replacement.



Figure 14.1 City contractors pave a street in Woodlands Village

##### Optimize use of investments

Having capital sit idle is inefficient. Informing travelers of alternate choices, alternate routes or optimal times to travel will optimize the use of capital investments in transportation.

##### Ongoing support

Maintaining transportation related information and operations technology – both hardware and software, requires ongoing commitment to personnel and commodities.

#### Chapter Conclusion

A successful operation and maintenance program is vital to achieving the full range of transportation goals and sustaining that performance over time. FMPO member agencies are making important strides in maintaining assets. Coordinated and organized efforts in the areas of safety, TDM and intelligent transportation are only at the conceptual stage. *Blueprint 2040* identifies the need, opportunity and strategy for advancing these efforts.

# Blueprint 2040 Regional Transportation Plan

## Flagstaff Metropolitan Planning Organization

### Chapter 15 - Safety

## Chapter Overview

This safety chapter provides an overview of transportation safety concerns in the region. Based on a high level analysis of regional crash data, it then sets broad goals for improving safety and recommends a process for establishing a Strategic Transportation Safety Plan. Safety goals are focused on reducing – or more ambitiously, eliminating – fatal and serious injury crashes. This chapter draws heavily from the Arizona Strategic Highway Safety Plan and work done by other regional organizations across the State.

## Policy Implications of Regional Safety Issues

### **Increasing traveler safety requires investment in education and infrastructure**

The cause of most crashes is behavioral for which improving design will often be ineffective. Examples from around the country prove that well-targeted safety campaigns can save lives.

### **Improving safety for pedestrians and bicyclists may help achieve other regional goals**

Statistics underscore the vulnerability of these travelers. Surveys indicate real and perceived dangers inhibit participation in walking and biking. Creating a safer environment should contribute to mode shift, healthier people, cleaner air and more vibrant activity centers.

## Fatal and Serious Injury Crashes Over Time

The FMPO Region is experiencing a positive trend in serious crash reduction. Between 2006 and 2014 fatal and serious injury crashes declined from 75 to 43. This occurred during increases in population and vehicle miles of travel.

## Who, What, Where, When, Why and How of Regional Crashes

In order to recommend emphasis areas for addressing safety concerns, a basic understanding of crash history is needed. The cause of most accidents and related fatalities and injuries in Arizona is behavioral. Drivers are fatigued, distracted, impaired, drive too fast or fail to wear a seat belt. Knowing something about who these people are can help target messages and measures at changing behavior. Some crash patterns form around particular places and the nature



Figure 15.1 Serious crash trends, 2006-2014

or design of the transportation system there. Again, a high level of analysis can help focus our attention on distinct problems that warrant greater emphasis.

### Who is involved in Regional Crashes?

Men account for 57% of all crashes, 64% of all fatal and serious injury crashes, and more than 70% of serious bicycle and pedestrian crashes. Crashes by age are evenly distributed. In spite of a large student population, drivers younger than 24 comprise 28% of serious crashes compared to 35% statewide. However, they make up more than 60% of fatal or serious injuries experienced by bicyclists. Drivers 65 years and older in the region tend to be safer than their counterparts across the state. Motorcyclists are also disproportionately killed or injured in a crash. They constitute 1% of all crashes but almost 10% of serious crashes.

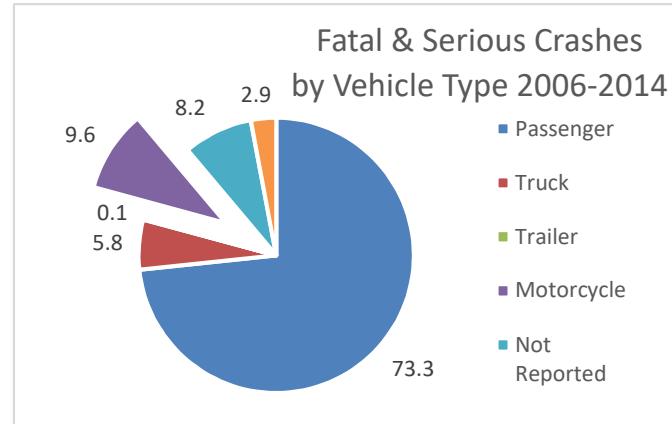


Figure 15.2 Crashes by vehicle type, 2006-2014

### What causes the harm in the accident?

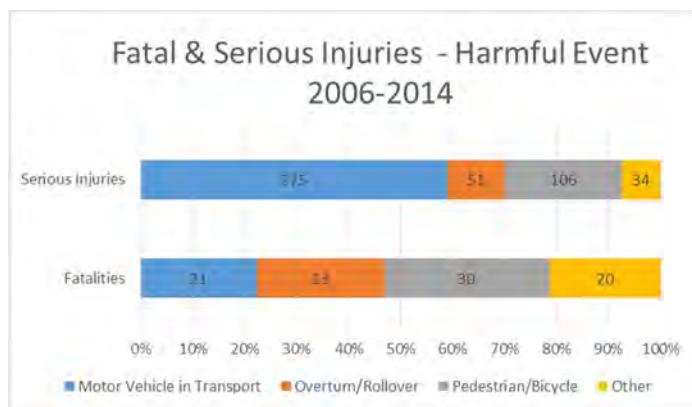


Figure 15.3 Crash cause-harmful event, 2006-2014

A crash, almost by definition, involves running into something. Harm is caused or received by the moving vehicle. Most often it is another “motor vehicle in transport.” Other times it is a stationary object. Tragically, in others, it is a pedestrian or bicyclist. Pedestrians and bicyclists comprise 4% of all accidents, but 32% of fatalities and 23% of serious injuries in the region. Rollovers are the second leading category of fatal crashes and are often associated with driver behavior such as fatigue.

### Where do most crashes occur in the Region?

The following heat maps show clear concentrations of crashes between 2006 and 2014 in the Downtown and Milton Road corridor, particularly at Milton’s north end. This is true for all crashes and for bikes and pedestrians when considered separately. Smaller concentrations are found at the intersections of E. Route 66 and Fourth Street, and Ponderosa Parkway at both Butler Avenue and Route 66. For bicycles and pedestrians, the entire Fourth Street Corridor is an area of concern.

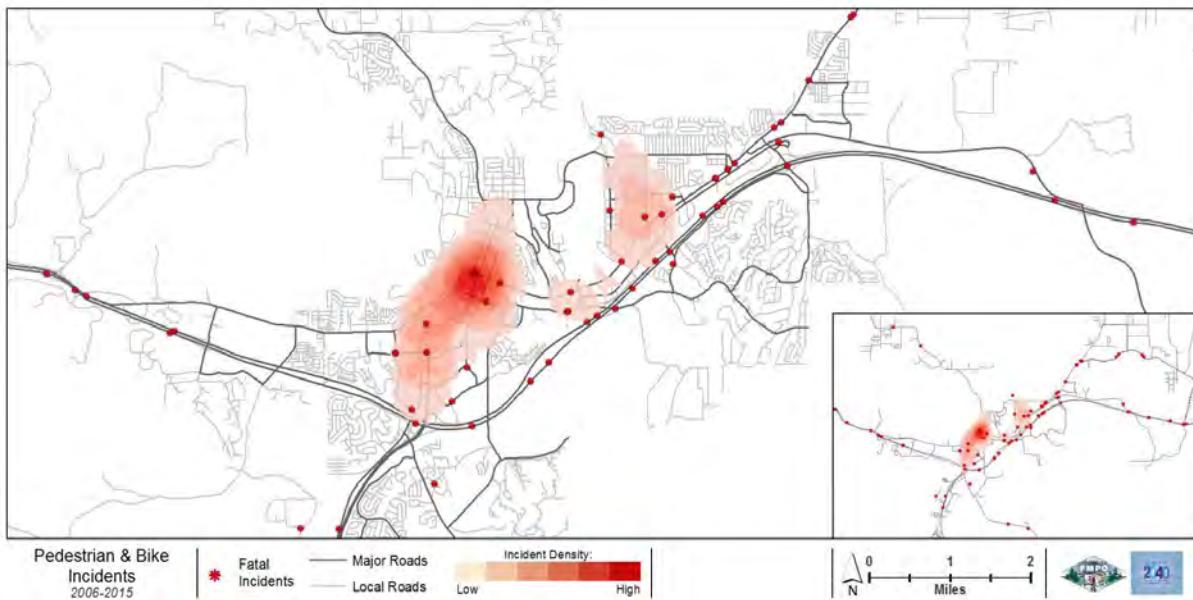


Figure 15.4 All crashes concentrations, 2006-2014

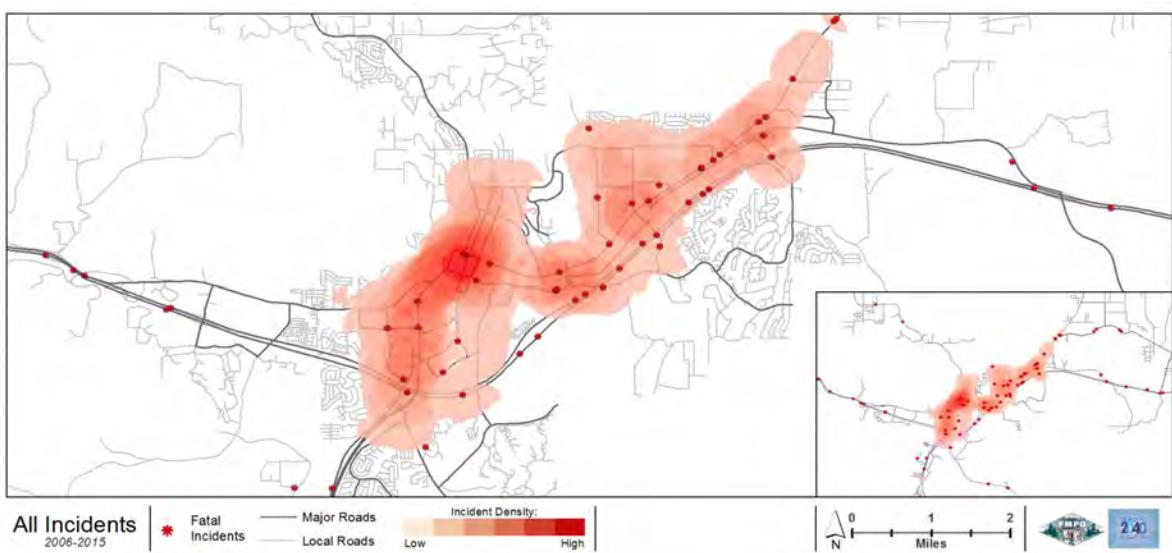


Figure 15.5 Pedestrian and Bicycle crash concentrations, 2006-2014

Observing just fatalities and serious injuries, marked by a star symbol on the maps, clusters of 3 or more appear in these areas:

#### Pedestrians and Bicycles

- Downtown
- Butler/Babbitt
- E. Route 66/1<sup>st</sup> and 2<sup>nd</sup> Streets
- Butler/San Francisco
- Milton/University
- Knoles/University

Concentrations of fatal vehicle crashes are found in these areas:

- Woodlands/W. Route 66
- Milton/Plaza Wy. to Riordan Rd.
- Milton/Butler Ave.
- Milton/Butler to W. Route 66
- Butler/O'Leary
- E. Route 66/Humphreys St.
- E. Route 66/San Francisco St.
- E. Route 66/Switzer Canyon Dr.
- E. Route 66/Ponderosa Parkway
- E. Route 66/Fanning to Lockett
- E. Route 66/First St. to Fourth St
- E. Route 66/ Arrowhead Ave.
- US 89/Country Club Dr.
- Woodlands Village Blvd./McConnell to Beulah Blvd.

#### *Urban versus Rural Crash Distribution*

The region is divided into place types, each with its own crash pattern. Rural crashes are more often serious crashes as indicated in figure 15.6.



Figure 15.6 All crashes and serious urban and rural crashes, 2006-2014

The ADOT North Central District analyzed 3-years of crash data at 68 signalized intersections across their region. By crash rate, eight of the top ten and thirteen of the top twenty worst intersections are within the FMPO Boundary. Crash rate is the annual number of crashes per million vehicles entering the intersection, so it permits a side-by-side comparison between locations. The data in table 15-1 puts some numbers behind the heat map. Together with the chart in chapter 5 showing that Flagstaff has a crash rate per capita nearly 50% higher than the State does give one pause to think.

Table 15-1 Intersections by Crash Rate, ADOT North Central District

Intersection	Major RD ADT	Minor RD ADT (veh)	Intersection ADT (veh)	No. of Collisions	Years of Data	Crash Rate	FMPO
B40 @ BEAVER	19,921	5,638	25,559	56	3	2.0	x
B40 @ SWITZER	24,184	4,977	29,161	60	3	1.9	x
SR89A @ UNIVERSITY	26,716	16,030	42,746	79	3	1.7	x
SR89A @ RIORDAN	37,348	7,186	44,534	78	3	1.6	x
B40 @ CLAY/BUTLER	36,815	15,781	52,596	86	3	1.5	x
B40 @ STEVES	23,676	14,206	37,882	53	3	1.3	x
B40 @ Ponderosa	26,259	10,546	36,805	51	3	1.3	x
SR98 @ COPPERMINE	4,179	2,507	6,686	9	3	1.2	
B40 @ 4TH ST	25,689	21,884	47,573	60	3	1.2	x
US 60 @ SR260 SPUR	5,389	3,233	8,622	10	3	1.1	
B40 @ SAN FRANCISCO	20,940	5,390	26,330	30	3	1.0	x
SR 77 @ HOPI HOLBROOK	11,470	4,339	15,809	18	3	1.0	
SR89A @ MTN SHADOWS	20,514	12,308	32,822	36	3	1.0	
US180 @ COLUMBUS	11,200	7,075	18,275	18	3	0.9	x
SR89A @ PLAZA	29,059	17,435	46,494	45	3	0.9	x
SR260 @ 89A	22,402	14,850	37,252	36	3	0.9	
B40 @ WOODLAND VILL.	18,049	15,940	33,989	31	3	0.8	x
SR260 @ SPUR EAGER	2,851	1,711	4,562	4	3	0.8	
SR89A @ FOREST MEADOWS	32,146	19,288	51,434	40	3	0.7	x
SR77 @ SR277 SNOWFLAKE	11,415	6,849	18,264	14	3	0.7	

## When do most crashes occur?

### *Time of Day*

Crashes correspond well with trip start time. Morning commute hours appear relatively safer and the late night and early morning hours have much higher fatal and serious injury crashed relative to the number of trips.

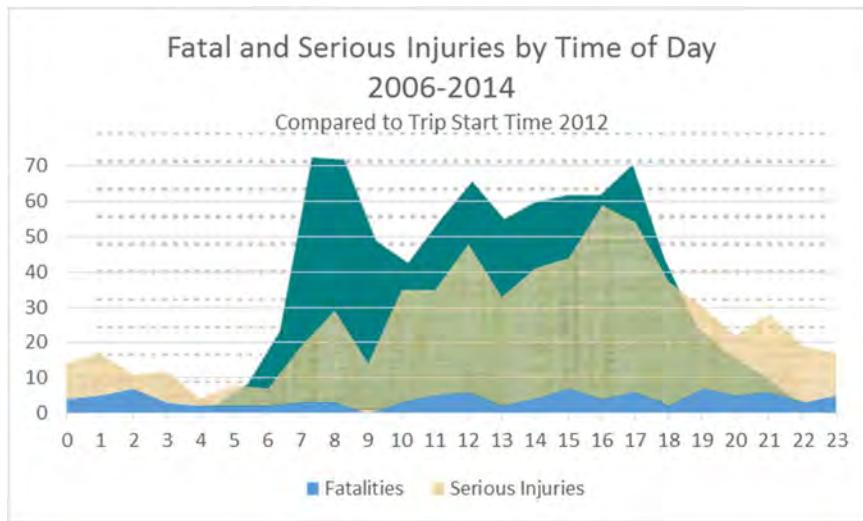


Figure 15.7 Serious crashes by time of day, 2006-2014

### *Time of the Year*

Fatal and serious injury crashes show a peak in June and July. February stands out for a relatively high number of fatal crashes, perhaps due to February being one of the snowiest and most consistent months to receive snow. On average, about 32 days or 9% of the year there is measurable fresh snow in Flagstaff. Only 4% of the fatal and serious injury crashes take place in snow or blowing snow conditions. It may be worth noting that 10% of all crashes occur under these conditions.



Figure 15.8 Serious crashes by month, 2006-2014

### How do most crashes occur?

The largest category of crashes is “Single vehicle” crashes suggesting driver behavior plays a significant role – or “why” as addressed in the next section. “Rear end” accidents, though rarely fatal, are often due to inattention and are the second leading cause of serious injuries. Many single vehicle crashes involve lane departure. According to independent analysis by County staff, excessive speed is involved in many of those crashes in rural areas.

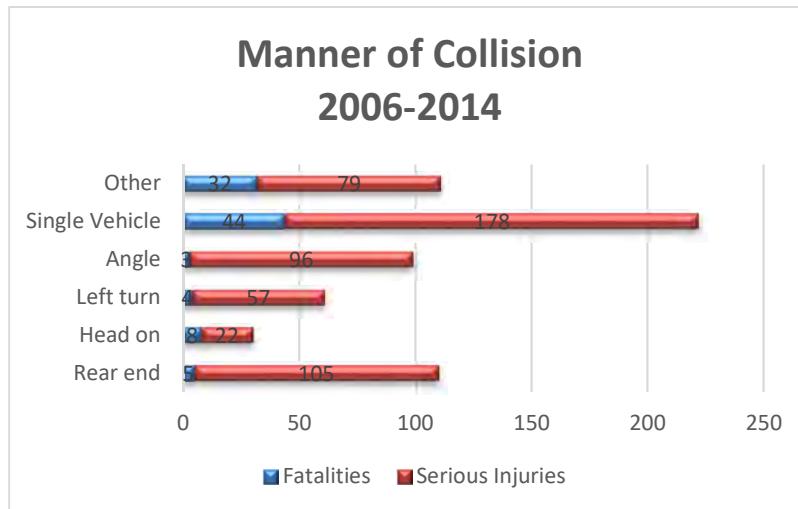


Figure 15.9 Serious crashes by manner of collision, 2006-2014

### Why do crashes occur?

Distracted driving contributed to at least 22% of serious crashes. 78% of all crashes report “No data” for distractions, so the figure could be much higher. The nature of the distraction is rarely reported. Meanwhile, drugs or alcohol played a part in 3% of all crashes, but 8% of fatal and serious injury crashes. Other factors such as vehicle defect, glare or even any particular road surface condition play only small roles in the number of serious crashes.

## Conclusions and Recommended Emphasis Area

Based on the data analysis with attention to: the contribution toward fatal and serious injury crashes; the difference between the role in total crashes and serious crashes; and a comparison to statewide factors, the following six emphasis areas are recommended:

### Pedestrian and Bicycle Safety

4% of all crashes. 30% of serious crashes, versus 16% for the state

### Distracted Driving

18% of all crashes. 21% of serious crashes, versus 21% for the state

### Impaired Driving

3% of all crashes. 8% of serious crashes, versus 21% for the state

### Motorcycle Safety

1.1% of all crashes. 11% of serious crashes, versus 17% for the state

### Rural Crashes

14% of all crashes. 24% of serious crashes, versus 26% for the state

### Lane Departure

33% of all crashes. 36% of serious crashes, versus 35% for the state

## Suggested Safety Vision, Goals and Performance Measures

Final determination of vision, goals and performance measures should be developed in a regional strategic transportation safety plan (STSP). This is funded in the FMPO TIP for fiscal year 2018 with the intent of moving those funds forward if possible.

Suggested language gleaned from the state and others include:

### Vision

- *Make the Flagstaff Region a safer place to live, work, and recreate by reducing transportation fatalities and serious injuries.*

### Goal

- *To achieve a targeted reduction in traffic fatalities and serious injuries on all public roads in the FMPO Region.*

### Performance Measures

In the safety arena the idea of “zero deaths” as a target is gaining national attention and has effectively been adopted by the State of Arizona. Accepting any deaths as a policy position is seen as indefensible and zero deaths as aspirational. The following examples come from the Central Arizona Governments’ STSP and are based on the analysis for their area.

#### *Fatality Target*

*Reduce the annual average number of fatalities from 23 over the 2010 to 2014 five-year period to 17 over the 2016 to 2020 five-year period, a 5 percent annual reduction.*

#### *Serious Injury Target*

*Reduce the annual average number of serious injuries from 77 over the 2010 to 2014 five-year period to 56 over the 2016 to 2020 five-year period, a 5 percent annual reduction.*

#### *Goal*

To achieve a targeted reduction in speed-related traffic fatalities and serious injuries on all public roads in the CAG Region.

#### *Performance Measures*

Number of speed-related fatalities, Number of speed-related serious injuries

*Strategies*

Strategy 2.1 - Increase highly visible and effective enforcement to reduce the frequency of crashes associated with speeding and aggressive driving.

## Strategy Initiatives

### Strategic Transportation Safety Plan (STSP)

The development of an FMPO STSP should have these objectives:

- Align with the Arizona Strategic Highway Safety Plan
- Involve agencies and organizations responsible for the 5 E's (Engineering, Education, Enforcement, Emergency Medical Services, Engagement) and seek their consensus and support on the following:
  - Establish Regional Vision and Goals for Transportation Safety
  - Emphasis Areas, Goals and Performance Measures
  - Identify Transportation Safety Strategies
  - Develop a Strategy to Improve Safety Project Development Process
  - Network Screening Methodologies for Prioritization of Transportation Safety Needs
  - Safety in the Regional Transportation Plan / Review and recommend needed amendments
  - Implementation Plan
- Identify priority projects, conduct Benefit/Cost Ratio tabulations, and submit letters of eligibility to ADOT.



Figure 15.10 Arizona Strategic Highway Safety Plan cover, 2014

### Continuous Safety Campaign

A continuous safety campaign will target most critical behaviors and audiences. It will coordinate with national, state and other regional organizations to leverage available resources. It will seek cooperation and support from local media, educational institutions and major employers.

### Crash Modification Factors & Road Safety Audits

For each emphasis area there will be treatments, that upon investigation, will prove most effective at addressing the safety problem. Conducting a road safety audit (RSA) is one means of identifying solutions. Coconino County worked with ADOT to conduct RSA's on several regional roads resulting in the identification and installation of rumble strips as an effective crash modifier. The following examples are from the FHWA Crash Modification Clearinghouse. They identify the crash modification factor and corresponding reduction rates. Only those factors rating 3 or 4 stars out of 4 for the quality of research were selected.

### *Pedestrian and Bike Safety*

- Bicyclists
  - Replacement of traditional intersection with roundabout with separated cycle path
    - CMF (%): 0.83 / CRF (%): 17 / Quality: 3 stars
  - Install cycle tracks, bike lanes, or on-street cycling
    - CMF: (0.41 to 0.26) / CRF (%): 59 to 74 / Quality: 3 stars
- Roadway
  - Install transverse rumble strips at pedestrian crosswalks on rural low-volume roads
    - CMF: 0.76 / CRF (%): 24 / Quality: 3 stars
- Pedestrians
  - Installation of High Intensity Activated Crosswalk (HAWK) pedestrian activated beacon at an intersection.
    - CMF: (0.85 to 0.31) / CRF (%): 15 to 69 / Quality: 3 and 4 stars
- Intersection Traffic Control
  - Modify Signal Phasing (implement a leading pedestrian interval)
    - CMF: (0.63 to 0.554) / CRF (%): 37 to 44.6 / Quality: 3 Stars

### *Distracted Driving*

- Enforcement
  - High visibility cell phone and text messaging enforcement
  - Spotter techniques and roving patrols radio ahead to another officer when driver using a cell phone is detected
  - Campaign through media about these High Visibility Cell Phone Enforcements (HVE)
    - Effectiveness: 4 stars (works in certain situations)
    - "A Highway Safety Countermeasure Guide for State Highway Safety Offices" 7<sup>th</sup> Edition, 2013
- Roadway
  - Install shoulder rumble strip
    - CMF: (0.84 to 0.58) / CRF (%): 16 to 42 / Quality: 5 stars
- Signs
  - Install drowsy driving signs
    - CMF: 0.37 / CRF (%): 62.9 / Quality: 3 stars

### *Impaired Driving*

- Enforcement
  - Publicized Sobriety Checkpoints
  - Intensive publicity increases the perceived risk of arrest
    - Effectiveness: 4 stars (works in certain situations)
    - "A Highway Safety Countermeasure Guide for State Highway Safety Offices" 7<sup>th</sup> Edition, 2013
- Median Barriers
  - Install cable median barrier
    - CMF: (0.79 to 0.59) / CRF (%): 21 to 41 / Quality: 3 stars
- Shoulder Treatments
  - Install shoulder rumble strips
    - CMF: (0.81 to 0.69) / CRF (%): 19 to 31 / Quality: 3 stars

### *Motorcycle Safety*

- Advanced Technology and ITS
  - Install red-light camera on minor/major road of a 4-leg intersection
    - CMF: 0.75 / CRF (%): 25 / Quality: 3 stars
- Motorcycle Helmets
  - Universal coverage state motorcycle helmet use laws
  - Research Indicates helmets reduce motorcycle rider fatalities by 22 to 42%
  - Most states only have laws covering riders under a specified age, typically 18 or 21
    - Effectiveness: 5 stars (demonstrated to be effective by several high-quality evaluations with consistent results)
    - "A Highway Safety Countermeasure Guide for State Highway Safety Offices" 7<sup>th</sup> Edition, 2013

### *Rural Crashes*

- Roadway
  - Install centerline and shoulder rumble strips
    - CMF: (0.8 to 0.63) / CRF (%): 20 to 36.8 / Quality: 5 stars
- Pavement Edges
  - Crashes involving pavement edge drop-offs greater than 2.5 inches are more likely to be severe or fatal compared to other roadway departure crashes
  - May contribute to roadway departure crashes on rural roads with narrow shoulders
    - FHWA "Safe Roads for a Safer Future"
- Highway Lighting
  - Install lighting
    - CMF: (0.68 to 0.51) / CRF (%): 32 to 49 / Quality: 4 stars
- Roadway Crosswalk
  - Install transverse rumble strips at pedestrian crosswalks on rural low-volume roads
    - CMF: 0.76 / CRF (%): 24 / Quality: 3 stars
- Roadside
  - Install Roadside Barrier
    - CMF: 0.49 / CRF (%): 51 / Quality: 3 stars

### *Lane Departure*

- Pavement Edges
  - Crashes involving pavement edge drop-offs greater than 2.5 inches are more likely to be severe or fatal compared to other roadway departure crashes
  - May contribute to roadway departure crashes on rural roads with narrow shoulders
    - FHWA "Safe Roads for a Safer Future"
- Roadway
  - Install centerline and shoulder rumble strips
    - CMF: (0.8 to 0.63) / CRF (%): 20 to 36.8 / Quality: 5 stars
- Roadside
  - New guardrail along embankment
    - CMF: (0.56 to 0.53) / CRF (%): 44 to 47 / Quality: 4 and 5 stars
- Shoulder Treatments
  - Increase shoulder width from 0 to 10 feet
    - CMF: (0.13 to 0.29) / CRF (%): 71 to 87 / Quality: 3 stars

# Blueprint 2040: Regional Transportation Plan

## Flagstaff Metropolitan Planning Organization

### Chapter 16 – Intelligent Transportation Systems

#### Chapter Overview

Intelligent Transportation Systems (ITS) apply technology and advanced analysis of data to gain system operating efficiency. Operating efficiency is realized through reduced congestion on roadways; proactively mitigating roadway traffic without adding roadway lanes is cost effective. ITS allows operators to virtually see travelers in all modes, adapt or adjust the system to meet their needs, and inform travelers of system changes they need to know. The potential for operations improvements through applied ITS is great with advances like traffic signal technology improvements, in-car safety and communications systems, and access to large data streams through personal mobile devices. This chapter lists prescribed actions under a statewide strategy known as the Arizona Statewide ITS Architecture, current activities in the region, and additional implementation proposals. It should be noted that a region-wide effort to identify the need for many prescribed actions or their priority has not taken place.

#### Policy Implications for ITS

The FMPO Region stands to gain considerably by embracing ITS, because member agencies have only just started pursuing these strategies. Potential for partnerships is strong and critical for long-term success. It is strongly recommended that the FMPO Region develop its own ITS Architecture that clearly identifies priorities and opportunities for cooperation.



Figure 16.1 Dynamic Message Boards are examples of ITS

**ITS requires investment in human capital for development and daily operations and maintenance**

ITS applications can be data intensive and need personnel to respond to respond when technology identifies an issue in the field. Some activities and responses may be automated, but human judgement and quick response is often the best path forward.

**ITS components can and should be integrated into most capital projects**

Current and future ITS applications require high speed communications to deliver large amounts of data, video being one of the largest. At a minimum, conduit and fiber optic runs should be installed with most roadway construction projects, perhaps even trail projects if the alignment is advantageous.

**ITS will be most effective in an atmosphere of interagency *and interdepartmental* coordination and cooperation defined in a Regional ITS Architecture**

An obvious example is the coordination and interconnection of City and ADOT signals. Less obvious are the relationships between traffic, police, fire and even public works for asset management.

**ITS requires robust and redundant communications capabilities**

Installation of redundant, high-speed, broadband loops can yield benefits beyond traffic management.

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## ITS: Prospects for the State and Region

ADOT's ITS Architecture covers the entire state outside of Maricopa and Pima Counties and many of the FMPO Region's agencies and departments were engaged in its development. This chapter covers current activities in the region, some of which are identified in the Statewide Architecture, and the strategic activities the region may take to advance its efforts. This architecture describes components and intended integration across agencies needed for:

- Archived Data Management Systems
- Commercial Vehicle Operations
- Emergency Management
- Maintenance and Construction Operations
- Surface Street Management
- Traffic Management
- Transit Services
- Traveler Information

This simple list illustrates the many needs and opportunities for managing data and systems. This is amplified when one considers that multiple jurisdictions may be involved in "managing" any single trip, cargo shipment, or even emergency situation. The full statewide architecture may be found at <https://apps.azdot.gov/files/ITS-Architecture/index.html>.

The FMPO 2003 signal synchronization study, an early regional foray into ITS, contains a statement that was reinforced in a meeting with regional professionals:

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*It is also essential that appropriate operations and maintenance staff be made available to reap the benefits of a new system.*

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With that foundational statement in mind, the following section lists prescribed actions under the Statewide Architecture, current activities in the region, and additional implementation proposals. It should be noted that a region-wide effort to identify the need for many prescribed actions or their priority has not taken place.

### **Archived Data Management Systems**

*Prescribed:* Perform traffic counts on roads to provide Highway Performance Monitoring System (HPMS) Data Collection for all functionally classified roads and provide current traffic count; Input year round HPMS data real-time into ADOT's database; Perform traffic counts on roads to provide HPMS data collection for all functionally classified roads and provide current traffic counts.

#### *Current*

- FMPO
  - Periodic traffic counts uploaded to ADOT's Traffic Data Management Software system (<http://adot.ms2soft.com/tcds/tsearch.asp?loc=Adot&mod=>) and HPMS system
- City
  - Improving communications through optical fiber network development and microwave integration
  - Initiating publicly available GIS products
  - Initiating asset inventory and management
- County
  - Initiating asset inventory and management
- ADOT
  - Installing permanent traffic counters and uploading data to the TDMS website.
  - Corridor profiles and asset management
- NAIPTA
  - Automatic fare collection (smart card) assists with passenger data collection
  - Automatic passenger counters employed for route and system based collection

#### *Proposed*

- FMPO
  - Establish more routine data collection periods and expand to include origin-destination studies. Make this data more generally available and accessible to practitioners, developers and the public.
  - Improve data collection for bicycle and pedestrian modes.
- City
  - Expand GIS and data management capacity to manage “big data;” take advantage of third party applications such as *Woosh* and *Strava*; expand publicly available GIS services; unify asset management systems and coordinate with the County.
  - Implement permanent count stations in key locations.
- Coconino County
  - Expand asset management and coordinate with the City.

- ADOT
  - Expand permanent count locations.
- NAIPTA
  - Install *Sportworks* or similar product that tracks bike rack utilization on buses
  - Transition to automated processes for data collection for non-bus programs such as vanpool, taxi vouchers and 5310 subrecipients.
  - Archive on-time performance to illustrate larger transportation system performance.

### **Commercial Vehicle Operations**

*Prescribed:* Arizona Commercial Vehicle Operations (CVO) statewide operate at one or more fixed locations within Arizona. The state CVO performs administrative functions supporting credentials, tax, and safety regulations. CVO also receives applications for, and issues special Oversize/Overweight and HAZMAT permits in coordination with other cognizant authorities. The subsystem coordinates with other Commercial Vehicle Administration Subsystems (in other states/regions) to support nationwide efforts.

#### *Current*

- Within the Region, ADOT has primary responsibility for commercial vehicle operations.

#### *Proposed*

- Investigate benefits of routine process and data information sharing to understand industry trends and appropriate responses.

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### **Emergency Management**

*Prescribed:* Dispatch local police, fire and ambulance vehicles; Maintain emergency service responses in an action log; Provide information to the media concerning the status of an emergency response; Dispatch emergency vehicles for various public safety agencies in the county that do not have local dedicated dispatch capabilities; Report City, County road closures to all agencies; Request Emergency Services actions taken or needed; Use real-time traffic information received from other agencies to aid the emergency dispatcher in selecting the emergency vehicle(s) and routes that will provide the timeliest response; Track and manage emergency vehicle fleets; Create, store, and utilize emergency response plans to facilitate coordinated response; Interface with other emergency and traffic agencies to support coordinated emergency response involving multiple agencies; Collect, analyze, store and process information regarding emergency notification findings; Receive 911 public safety calls and forward to appropriate dispatch center.

#### *Current*

- FMPO
  - FMPO is not currently engaged in emergency services planning
- City
  - The City has two fire stations with hard-wired connections to adjoining traffic signals.
  - The City and County cooperatively operate County-wide dispatch
- Coconino County
  - The County operates emergency operations centers (EOC) as needed and coordinates activities with regional agencies

- ADOT
  - ADOT participates in EOC efforts
- NAIPTA
  - NAIPTA participates in EOC training to meet mass transit needs in emergency evacuation scenarios.

*Proposed*

- FMPO
  - Participate regularly with area agencies on evaluating evacuation schemes
- City
  - Investigate the benefits of emergency vehicle pre-emption at key traffic signals.
- County
- ADOT
  - Investigate the benefits of emergency vehicle pre-emption at key traffic signals.
- NAIPTA
  - Implement live feed of on-bus security video to improve security response

### **Maintenance and Construction Operations**

*Prescribed:* Respond to agency requests regarding hazard removal, field equipment repair and other roadway maintenance; Maintain, install and replace field equipment (signals, DMS, CCTV, etc...); Coordinate planning and scheduling of winter maintenance activities; Provide information about anticipated closures to other management agencies; Manage traffic on arterials using traffic signals including preemption for emergency vehicles and at highway-rail intersections; Maintain police, sheriff and/or fire vehicles and monitor regular maintenance activity.

*Current:*

- All agencies
  - The City and County are presently studying their Roads & Streets Operations and Pavement Management Systems with the intent of implementing Maintenance and Pavement Management Systems.

*Proposed:*

- All agencies
  - Implement findings from the Roads & Street Management Efficiency Study
  - Share best practices for roads & streets maintenance

### **Surface Street Management**

*Prescribed:* Manage traffic on arterials using traffic signals including preemption for emergency vehicles and at highway-rail intersections; Collect and exchange traffic sensor and control data with other coordinating agencies; Receive and respond to transit signal priority requests and emergency pre-emption requests (where applicable); Report road and street closures to all agencies; Maintain field equipment; Operate traffic detectors, other surveillance equipment, the supporting field equipment, and fixed-point to fixed-point communications to transmit the collected data back to the Traffic Management Subsystem; Monitor traffic on arterials; Exchange road network conditions from traffic sensor and surveillance data collection to other systems for distribution; Rail Operators

Exchange information with Arizona Statewide stakeholders that would aid in coordinating highway rail interface, timing plans for crossing busy arterials and a consistent flow of rail and traffic. Participate in regional discussions of rail and traffic movement

*Current:*

- All agencies
  - Coordination of traffic control systems is largely a bilateral effort between ADOT and the City of Flagstaff.
  - Coordination efforts take place on a regular basis, occasionally within the context of studies like the *Milton Road Operational Alternatives Analysis*

*Proposed:*

- All agencies
  - Work toward fully integrated traffic control system with central monitoring facility

## Traffic Management

*Prescribed:* Use digital systems polling feature to provide process fault data for ITS field elements; Monitor and maintain ITS systems on road and streets; Coordinate and facilitate sharing of traffic, event, weather, incident and other information on corridors crossing boundaries; Report road closures to all agencies; Perform other “non-transportation related” public safety duties; Monitor traffic on arterials; Provide traffic and incident information to the public.

*Current:*

- FMPO
  - Work with member agencies to evaluate operational impacts of various technologies such as the *Milton Road Operational Alternatives Analysis*
- City
  - Butler Avenue Corridor traffic responsive signal control installed at the end of 2016
  - Most City traffic signals are older TS1 models only capable of pre-programmed plans
- County
  - Disseminates information on weather, incidents, etc. to relevant parties and the public.
- ADOT
  - Most ADOT traffic signals are older TS1 models only capable of pre-programmed plans
- NAIPTA
  - NAIPTA is currently responsive to traffic incidents and road closures; this information is typically relayed via radio communications

*Proposed:*

- FMPO
  - Support capital and planning efforts as needed
- City
  - Systematically upgrade traffic signal controllers, sensors and communications capability
  - Utilize *Innoprise* or other software to track permits including road closures and automatically message impacted agencies
  - Expand traffic responsive systems and upgrade systems like Butler Avenue when adaptive technology becomes more reliable

- Use current video cameras to collect traffic data.
- County
  - Disseminate information on weather, incidents, etc. to relevant parties
- ADOT
  - Systematically upgrade traffic signal controllers, sensors and communications capability;
  - Continue to investigate and implement vehicle to vehicle (V2V or connected vehicles) communications, automated vehicles, variable speed limits (VSL).
- NAIPTA
  - Work cooperatively with City and ADOT to identify operational impacts of Transit Signal Prioritization (TSP), queue-jumping, and adaptive and responsive technologies
  - Deploy *MobileEye* or similar technology to track bus near-misses and mark locations for engineering improvement.

### Transit Services

*Prescribed:* Collect and send passenger counts to transit center; Participate in regional transit and transportation planning issues; Maintain passenger counts; Schedule and dispatch fixed route and paratransit vehicles; Maintain Transit Center software and systems; Collect, process, store and disseminate transit routes and schedules and fares; Provide customized information on travel times, transit routes, weather conditions and road closures; Collect, process, store and disseminate transit routes and schedules and fares

*Current:*

- All agencies – integrate transit planning and priorities into routine procedures
- NAIPTA – NAIPTA is the agency primarily responsible for delivery and management of transit operations
  - Real time arrival technology is installed on buses and available on mobile devices
  - Transit trip planning is available on Google Transit.

*Proposed:*

- All agencies
  - Work cooperatively to review new technology and regulatory practices to improve transit operations.
- NAIPTA
  - Implement transit fare purchase on mobile devices to expedite passenger loading
  - Install visual and audio bus stop enunciators buses to better serve all passengers
  - Enhance MoveMeFLG to provide greater level of information regarding transit resources

### Traveler Information

*Prescribed:* Coordinate and facilitate sharing of traffic, event, weather, incident and other information on corridors crossing boundaries; Provide requested information to ISP service providers for dissemination to stakeholders; Update Information to ISP and Media Outlets (web sites, TV, etc.) and issue alerts.

*Current:*

- All agencies

- Include public information officers and media in preparing for emergency situations and planning for special events
- Employ social media to inform public of relevant travel information

*Proposed:*

- All agencies
  - Include public information officers and media in preparing for emergency situations and planning for special events

# Blueprint 2040 Regional Transportation Plan

## Flagstaff Metropolitan Planning Organization

### Chapter 17 - Transportation Demand Management (TDM)

## Chapter Overview

Transportation Demand Management (TDM) is briefly described and the balance of the chapter is devoted to strategies regional partners should employ to coordinate existing TDM efforts and advance new efforts in an integrated manner.

### What is TDM?

Transportation Demand Management (TDM) complements physical transportation infrastructure – it helps people use the infrastructure that is already in place with a focus on transit, walking, and biking. TDM enhances the utilization of roads by reducing overall demand through mode shift from single occupant vehicles to other means of transportation that can equally or better meet their needs. Successful TDM helps defer or avoid costly roadway capacity expansion projects. Throughout this section the terms alternate or alternative transportation, active transportation, and sustainable transportation will be used interchangeably.

With TDM serving as an organizing principle, physical transportation infrastructure and land use will be designed so that alternative transportation is naturally encouraged and the maximum efficiency of the transportation network is realized.

TDM focuses on moving *people* and functions on two levels: first as a Program of Information, and second as a Guiding Principle. As a Program of Information local and regional organizations inform



people of their transportation options and how to use them. Locally this is seen through websites like [www.MoveMeFLG.com](http://www.MoveMeFLG.com).

Figure 17.1 Move ME FLG webpage

## Policy Implications of TDM

### TDM supports market-driven economic principles.

TDM recognizes that the principles of supply and demand apply to transportation infrastructure, including parking supply. Even the concept of “perfect information” is advanced by TDM.

### TDM leads to optimal use of transportation resources

Trails, sidewalks, transit services and roads can be utilized more fully and effectively when demand is managed as well as supply.

### TDM pro-actively supports other regional goals

By promoting active transportation and reducing use of single-occupancy vehicles, TDM promotes regional goals for social interaction, health, and air quality.

## TDM Background

### History of TDM

Long-standing federal programs focus on reducing highway traffic congestion and improving air quality in areas that do not meet current federal air quality standards. Areas failing to meet standards *must* take actions in their transportation program priorities and project selection to rectify air quality deficiencies or face penalties. The current transportation bill, *Fixing America's Surface Transportation (FAST Act)*, continues to dedicate funds to addressing air quality.

Projects and programs eligible for these funds include:

- Fringe parking
- Traveler information services
- Shuttle services
- Guaranteed ride home programs
- Carpools, vanpools
- Traffic calming measures
- Parking pricing
- Telecommuting/Teleworking
- Employer-based commuter choice programs
- Bike lanes, trails, bike racks on buses, and bicycle storage facilities bike share
- Alternative transportation planning and staffing.

The Flagstaff region's air quality is currently in attainment, so the region is not eligible to receive special funding. However, ozone levels have exceeded federal limits to the extent that the Arizona Department of Environmental Quality briefly considered recommending to the EPA that Coconino County be designated as non-attainment for ozone. The Flagstaff region should be proactive in maintaining its air quality. Implementing low cost solutions now can mitigate future mandated processes and solutions that will be more expensive.

### Flagstaff's Peer Cities

The FMPO identified ten peer cities in the Western United States based on a population greater than 50,000 residents and the presence of a university. All of these peer cities are actively participating in some level of TDM. Median income, poverty and educational attainment are included as loose evidence that TDM related efforts do not negatively effect the regional economy and can enhance it. For example, achieving mode share goals identified in Chapter 4 can improve overall system effectiveness, which increases market reach and sales per square foot in pedestrian and bicycle friendly environments.

Table 17-1 Flagstaff's Peer Cities for Transportation Demand Management

<i>City, State</i>	<i>Population</i>	<i>Median Household Income</i>	<i>Education</i>	<i>Poverty</i>	<i>University Name</i>	<i>Student Body Population</i>	<i>Walk Friendly Community Designation</i>	<i>Bike Friendly Community Designation</i>	<i>Appearance on best places to live list</i>
Bellingham, WA	83,365	\$ 42,440	40.7%	23.2%	Western Washington University	15,060	--	Silver	Yes, 47
Bend, OR	84,040	\$ 53,027	39.0%	13.3%	Central Oregon Community College	16,901	Silver	Silver	Yes, 76
Boulder, CO	105,112	\$ 58,062	71.5%	23.2%	University of Colorado Boulder	32,080	Gold	Platinum	Yes, 4
Chico, CA	89,180	\$ 42,334	34.9%	24.5%	California State University Chico	17,220	--	Silver	--
Corvallis, OR	54,953	\$ 40,425	58.5%	29.5%	Oregon State University	30,058	Gold	Gold	Yes, 69
Davis, CA	66,742	\$ 57,454	71.0%	27.1%	University of California Davis	36,104	--	Platinum	--
<b>Flagstaff, AZ</b>	<b>68,785</b>	<b>\$ 48,120</b>	<b>42.8%</b>	<b>24.9%</b>	<b>Northern Arizona University</b>	<b>20,143</b>	<b>Bronze</b>	<b>Silver</b>	<b>--</b>
Las Cruces, NM	101,408	\$ 40,658	33.6%	23.9%	New Mexico State University	15,490	--	Bronze	--
Missoula, MT	66,877	\$ 41,968	45.7%	19.8%	University of Montana	13,358	--	Gold	Yes, 8
Pocatello, ID	54,230	\$ 40,792	29.9%	18.8%	Idaho State University	14,371	--	--	--
Santa Cruz, CA	63,364	\$ 61,533	49.4%	24.3%	University of California Santa Cruz	17,866	--	Gold	Yes, 56
Average	76,187	\$ 47,892	47%	23%	--	20,786	--	--	--

- Population based on 2014 population estimates from the US Census Bureau.
- Median household income is based on 2014 dollars and is averaged over the years 2010-2014.
- Education is measured by the percentage of residents, over age 25, who have a Bachelor's degree or higher.
- Poverty is a percentage of residents living in poverty.
- Student population is taken from respective university websites on enrollment.
- Walk Friendly and Bike Friendly Community designation is designated by walkfriendly.org and the League of American Bicyclists , respectively.
- Communities must apply to be recognized and are ranked, in ascending order, Bronze, Silver, Gold, Platinum, and Diamond depending on how walk friendly or bike friendly the city is. This is based on traffic, quality of infrastructure, and availability of options.
- Best places to live list is published annually by livability.com and results from 2015 are used.

For most measures, Flagstaff is on par with our peer cities. In terms of our Walk Friendly and Bike Friendly designations, Flagstaff could be more competitive in both managing and enhancing our transportation infrastructure in order to reach the next subsequent levels of designation. The following are model examples from peer cities that Flagstaff could draw on to improve TDM: Missoula, Montana; Boulder, Colorado; and Santa Cruz, California:

#### Missoula, MT

In Missoula the organization that sponsors the city's TDM program is called "Missoula in Motion." It's "Way To Go!" club is a rewards program where people log how many miles they commuted or ran errands using sustainable transportation options. Miles are then used as points to redeem prizes like water bottles, bike locks and pumps, backpacks, and more.



Figure 17.2 Missoula In Motion webpage

#### Boulder, CO

In Boulder, Colorado the TDM program is called "Go Boulder." Since 1989, *GO Boulder* has been working to create an innovative and balanced transportation system to sustain the quality of life valued by the Boulder community. *GO Boulder* promotes "Great Options" to increase available travel choices. The city has constructed an average of one mile of off-street paths, half a mile of on-street bicycle lanes, and two underpasses each year since its inception.

#### Santa Cruz, CA

In Santa Cruz, California the program of information is *cruz511*. The website provides traveler information on planning trips across all modes, regional traffic conditions, transit options, and education on where and how to walk and bike safely. [www.Cruz511.org](http://www.Cruz511.org) also provides information on workplace programs that promote sustainable forms of transportation including what options are available at workplaces, how to request a free emergency ride home, and how to utilize tax benefits.

## TDM Strategies

The following are examples of what a formal TDM program might develop, coordinate, promote and monitor.

### Intelligent Transportation Systems

Intelligent Transportation Systems (ITS) improve efficiency by reducing single occupant vehicle trip time. This is done by utilizing transportation system technology, like traffic signals, that can talk to each other and respond to the amount of traffic on the road at a given time. ITS infrastructure also improves the efficiency of public transit. For more on ITS see Chapter 10B.

### Parking Management

TDM programs are most successful when a comprehensive parking management program is in place. Such programs recognize that parking (e.g., land) is a scarce commodity, that some parking is more valuable than others, and balance supply and demand through effective pricing and enforcement. Construction costs range from \$5,000-\$10,000 for a surface parking space and upwards of \$20,000 for a parking space in a garage. Clearly, parking is a resource that deserves attention.

By managing parking, market-like forces influence individual choices on the use of cars, ridesharing and alternative transportation. A regional example is the success of NAIPA's Mountain Link transit service that is partly driven by NAU's parking permit system. Parking management yields other benefits by creating turn-over and allowing multiple people, usually customers, to utilize the same parking space throughout the day. Parking management tools include the use of meters to collect fees and/or time limit parking, permit systems to ensure spaces are available to residents or employees who subscribe to them, management of shared-parking between businesses and more.



Figure 17.3 Virtual meeting reduce travel demand

Source: <http://biz30.timedoctor.com/images/2012/09/10-tips-managing.png>

The City of Flagstaff initiated a parking management system in 2016 that should be operational in 2017.

### Off-Peak Travel

Shifting travel to off-peak times to improve peak-hour efficiency can be achieved by promoting alternate work schedules. Offsetting start and end times of the typical 8-5 work day

by one hour can reap many benefits: employers are able to reduce employee commuting time, remove employees from peak commuting stress and decrease the demand on the transportation infrastructure during peak commute hours. A TDM program actively educates employers about these benefits and helps promote them to employees. Alternative efforts may include compressed work weeks and telecommuting. Currently there are no off-peak requirements for new developments.

## Incentives

Providing incentives to use or develop alternative travel modes or work schedules help ensure the success of a TDM program. Individual incentives can include a rewards program, similar to the “Way To Go! Club” in Missoula, Montana. Removing perceived barriers to choosing alternate modes also helps through secure and covered bike parking for employees, comfortable and secure places to shower and change clothes, or preferred parking for carpools. Several employers such as NAIPTA have already implemented such strategies. Parking fees, a disincentive, can be avoided by carpooling to work, walking, biking, taking transit, and telecommuting.

Monetary incentives are available through the Commuter Choice Tax Credit program. This federal program permits individuals to set up a pre-tax account through their employer to pay for sustainable forms of commuting. Employers can also take advantage of this credit through savings on payroll taxes. In the FMPO, vanpool members and bike commuters are already taking advantage of this program.

Incentives for developers are provided in the form of parking reductions and reduced off-site improvement requirements. Under Flagstaff’s current zoning code, a developer may reduce parking requirements by providing bike parking and by being within ¼ mile of a bus stop. Compared with a single parking space, a bus stop serves significantly more people. Likewise, bike corrals fit inside one parking space and house 10-12 bikes. In future, a developer or expanding business may be able to demonstrate that their proposal shifts enough demand to alternative transportation modes so as to avoid the need or requirement for more expensive roadway improvements.

## Shared Mobility

Shared mobility is all the ways an individual can get around without reliance on a privately-owned, single occupant vehicle. TDM programs promote technologies and facilities that enable shared mobility. This includes carshare, bike share, all forms of transit, vanpools, private shuttles, taxicabs, and other forms of ride-hailing.

## TDM Recommendations

### Current Stakeholder Activities

There are many stakeholders within the FMPO that are, or may be, engaged in TDM. Included in these stakeholders are policy and law makers, service providers, business representatives, large employers, citizens and voters. Stakeholders include, but are not limited to:

- City of Flagstaff
- FMPO
- NAIPTA
- Coconino County
- Northern Arizona University (NAU)
- Coconino Community College (CCC)
- Flagstaff Unified School District
- Downtown Business Alliance
- Chamber of Commerce
- Friends of Flagstaff’s Future (F3)
- Large employers like
  - Flagstaff Medical Center
  - W.L. Gore
- Citizens/voters

Following are examples from three stakeholders of current TDM activities followed by an illustrative multi-year strategy:

#### *Northern Arizona University*

Northern Arizona University has its own form of a bike share program, known as the yellow bike program, where students may rent a bike free of charge for one week at a time. This program is constrained to campus, so barriers to off campus travel still exist. NAU also has a small fleet of carshare vehicles that students may check out and use for trips. Additionally, the University has a rideshare system where students can solicit passengers and/or drivers for trips down to Phoenix, California, the Grand Canyon, etc. Through this system, students coordinate amongst themselves the cost of the trip, departure dates, times, etc.



Figure 17.4 Share mobility in action, a bike rental program

#### *NAIPTA*

Mountain Line has a commuter vanpool program. Under this program, employees who live in a similar geographic region and have similar work schedules at the same place of employment or within close proximity, can be matched together and join a vanpool. Vanpool participants do not drive a personal vehicle and the operations cost of the vanpool are split among members. NAIPTA also operates the ecoPASS program used by several employers to provide discounted transit passes their employees.

#### *City of Flagstaff*

The Downtown Parking plan is showing significant efforts to effectively and efficiently manage the supply of parking in the downtown and surrounding neighborhoods. The Flagstaff zoning code allows for parking reductions given a development's proximity to transit and presence of bike racks on site.

#### *FMPO*

FMPO conducts a trip diary survey every five to six years to track travel behavior. This can measure the effects of TDM.



**Table 17-2 Illustrative TDM Strategy Plan**

	Short-term (1-5 years)	Mid-term (5-10 years)	Long-term (10-20+ years)
Downtown Parking Plan	Downtown Parking Plan is in effect	The Parking Program effectively expands to other areas of the city	The Parking Program is effectively managing parking and implementing a capital program
ecoPASS	Employers continue to increasingly buying into the NAIPTA ecoPASS program	Employers participation in the ecoPASS program expands and provide adequate facilities for bike storage, changing rooms, and showers	Continue to grow the program
Mountain Line	Mountain Line plans for a Bus Rapid Transit (BRT) route and expanded service coverage	Mountain Line implements crosstown BRT and expands service where feasible.	Mountain Line enhances and expands service where feasible, BRT routes will be fully operational
University Pass-UPASS	NAIPTA works with NAU and CCC on a Universal Access Pass (UPASS) allowing students full transit system access	NAU and CCC will have a functioning UPASS program	NAU and CCC will have a functioning UPASS program
Sidewalk and Bicycle Infrastructure	The City of Flagstaff will continue to update and enhance sidewalk and bicycle infrastructure	The City of Flagstaff will continue to update and enhance sidewalk and bicycle infrastructure	The city of Flagstaff will have expanded and enhanced bike lanes and FUTS trails and the sidewalk network may be completely connected.
Walk Friendly and Bike Friendly Designations	The City works toward next higher community designation levels. NAU and CCC work toward next higher university designation levels. Employers encouraged to apply for Bike Friendly Businesses.	All parties work toward higher Walk and Bike Friendly designations.	All parties work toward higher Walk and Bike Friendly designations.
Bikeshare and Carshare Intelligent Transportation Systems	A bikeshare and/or carshare system is programmed	Expand carshare and/or bikeshare systems	Expand carshare and/or bikeshare systems
MoveMeFLG	Flagstaff begins updating its transportation infrastructure to include greater applications of ITS	Flagstaff will continue to update its transportation infrastructure to include greater applications of ITS	An innovative and modern ITS system may be in place with the ability to accommodate autonomous vehicles
Carpool/ vanpool	Carpool and vanpool programs are established.	Residents regularly participate in carpooling and vanpooling.	MoveMeFLG will have a functioning incentive program that encourages citizens to commute via sustainable forms of transportation and rewards them to do so
			Carpooling and vanpooling are operated with vehicles which are utilized for a variety of transportation needs

# Blueprint 2040 Regional Transportation Plan

## Flagstaff Metropolitan Planning Organization

### Chapter 18 – System Preservation

## Chapter Overview

System preservation – or maintenance – is featured prominently in federal legislation, ADOT construction programs, and local budgets. This chapter examines how well agencies in the region are able to fulfill their responsibilities for our highway, roads, streets, buses, shelters, sidewalks and trails. With significant policy and related focus on preservation and important voter approved taxes in 2014 at the City, Proposition 406, and the County, Proposition 403, system preservation is performing well.

## Policy Implications of System Preservation

### Protecting assets is fiscally prudent

“Pay me now or pay me later,” is an old slogan that applies to many situations, not the least of which is road and street preservation.

### More critical to pedestrian and bicycle modes

Walking and bicycling are more easily disrupted by poor conditions.

### Public Trust

Well-maintained facilities engender public trust, knowing that the taxes and fees paid will be used to take care of their community.

## System Investments by Agency

System maintenance faces some extreme challenges here in Northern Arizona. Flagstaff registers one of the highest annual snowfall levels among US cities, with an extremely high amount of freeze thaw cycles. At 7000’, the ultra-violet light exposure is also extreme. These conditions work together to damage asphalt surfaces. Responding to those conditions has several public relations implications: Salt vs. Cinders; Frequency of street sweeping; Frequency of striping

### ADOT Highways

FMPO is located within the ADOT North Central District. Across ADOT, system preservation has become increasingly critical and an ever-increasing percentage of the overall budget. That is particularly true in “Greater Arizona” – those areas outside of Maricopa and Pima Counties, where funds available for expansion projects have averaged less than \$30,000,000 per year for several years.

This chart from the current 5-Year Construction Program shows that ADOT intends to commit 60-65% of funding to preservation for the years 2022 to 2026.

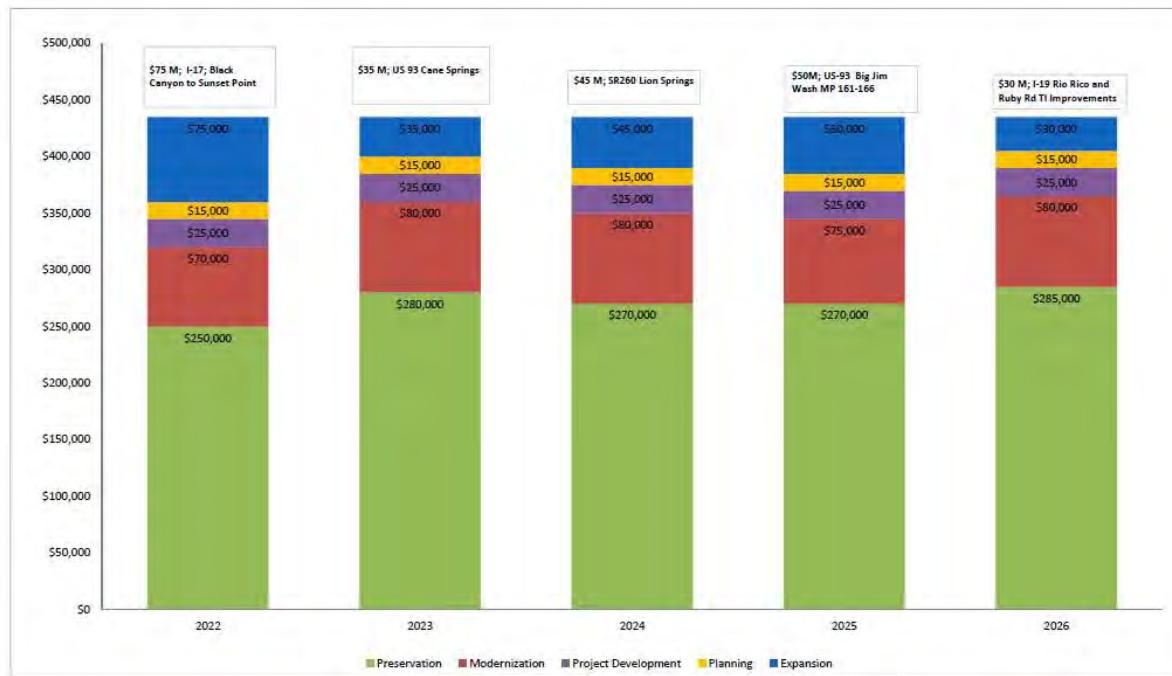


Figure 18.1 ADOT investment schedule 2022-2026

Source: ADOT 5-year construction program, 2017-2021

ADOT is prioritizing the maintenance of interstates which are generally in good to fair condition. The corridor profiles for I-17 and I-40 that are nearly complete show segments in the Flagstaff region as underperforming. ADOT projects a slow, statewide decline in the condition of state highways absent an increase in funding or the dedication of even higher percentages of the program to Preservation. A recent policy change increasing maintenance funds for districts in areas with higher snow fall may help address the problem.

### City of Flagstaff

Roads and streets maintenance is administered by the City Public Works Division. Support is received from City Engineering through the Capital and Transportation Sections. The City of Flagstaff is working with Coconino County on a Roads & Streets Operations and Maintenance Efficiency Study. The City is looking to improve its operations. Here are a few of the early findings:

- City employees are performing many good and innovative practices which demonstrates a philosophy of change and capability for continuous improvement.
- Policy for an OCI of 70 on every street segment within seven years is a high goal that most cities do not achieve. The average OCI in 2014 was 73.2 which is similar to the database average.
- Pavement condition values in the Northeast & Southeast areas have improved 10 points in the past 10 years.

- The City is unique with light pollution standards that affect both cost and maintenance. Seventy-six percent (76%) of the City's streetlights (LPS) have a short life (20%) as compared to current technology lighting. These features are near obsolescence and require additional maintenance due to weather and lack of availability.
- The City is moving their yard three miles west from its' current location which could impact travel time and response.
- Predefined snow operation routes exist in the City that are coordinated with the County and ADOT. Defined routes established for each grader, loader, and truck.
- Snow Control and Street Maintenance are the major portion of expenditures accounting for 50% of the total budget.

In 2014, City voters approved Proposition 406 Road Repair and Street Safety Funds. This funding stream is estimated to raise about \$6,000,000 annually. Together with Highway User Revenue Funds and a General Fund transfer, City maintenance funds are up significantly.

Table 18-1 City of Flagstaff Maintenance Funds, 2015

Funding Source	Annual Revenue
Highway User Revenue Funds	\$7,500,000
Proposition 406 Road Repair & Street Safety	\$6,000,000
General Fund Transfer	\$1,000,000
Total	\$14,500,000

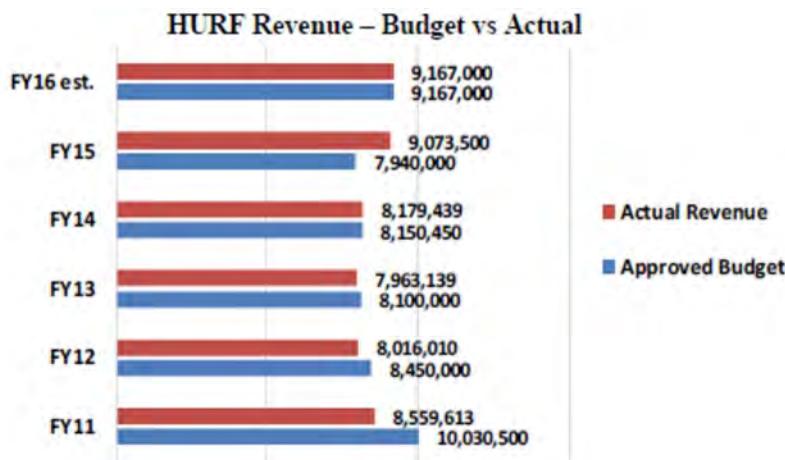
City staff estimate that this level of funding will enable them to maintain an average Overall Condition Index of 70, which is a state of good repair. The City spends about 65% of its Streets budget on preservation including sidewalks and FUTS trails. A frequent concern of pedestrians and cyclists is the clearing of ice, snow and cinders from sidewalks and bicycle lanes.

### County Roads

As with the City, road maintenance is handled out of the Coconino County Public Works Department. The Operations & Maintenance Efficiency Study findings for the County include:

- County employees are performing many good and innovative practices, which demonstrates a philosophy of change and capability for continuous improvement as demonstrated by being the first County in the US to obtain APWA accreditation.
- A considerable amount of County area is located in the Navajo Nation (27% of acreage) and other tribal areas (12%) which totals 39% of acreage in the County. Most assets that the County is required to maintain are located in the southern portion of the County.
- Multiple agencies (ADOT, USFS) require coordination with the County in various areas within those agencies.
- County Public Works has a mission, vision, and value statement that include both efficiency and effectiveness.

- A majority of County roads (>80%) are gravel and local roads, which impacts maintenance strategy.
- An important amount of the paved inventory is within the MPO area with 120 miles, or 37%, and only a small portion (41 miles, or 6.1%) of gravel roads.



*Figure 18.2 Coconino County HURF revenues, 2011-2016*

- Seasonal employees are utilized throughout the County for snow operations and are integrated with the other employees.
- County staffing is slightly lower than the benchmark database, without consideration for snow operations.
- Road grading, gravel road repair, drainage ditch and snow operations are the most commonly performed County activities.

activities. Twelve activities in Cartograph account for over 80% of the reported labor for maintenance.

In 2014, County voters approved Proposition 403 Road Operations. In the County's estimate, this effectively returned funding back from deterioration due to inflation, fleet efficiency and HURF diversions by the State. The County also performs contract work with the US Forest Service and the Bureau of Indian Affairs. The primary funding sources total about \$19,000,000 per year. The County believes greater efficiencies and additional funding may be necessary to keep roads from deteriorating faster than desired.

**Figure 3-20**  
**Budgeted Positions per 100 Road Miles**



*Figure 18.3 Coconino County public works employees per 100 miles*

Table 18-2 Coconino County Road Maintenance Funds

Funding Source	Annual Revenue
Highway User Revenue Funds	\$9,000,000
Proposition 406 Road Repair & Street Safety	\$8,000,000\$
Vehicle License Tax	\$2,000,000
Total	\$19,000,000

The County spends about 75% of its Roads budget on preservation.

#### **NAIPTA Buses, Shelters & Stops**

NAIPTA is in the process of producing a required Tier 2 Transit Asset Management Plan. That plan is not complete as of the writing of this report. Customer surveys show high levels of satisfaction with vehicles and stops. NAIPTA employs industry standards when setting operations and maintenance budgets.

# Blueprint 2040: Regional Transportation Plan

## Flagstaff Metropolitan Planning Organization

### Chapter 19 - Environmental & Social Justice

#### Chapter Overview

*Blueprint 2040* evaluates the impact of planned transportation investments on the region's Title VI communities, natural environment and cultural resources. This is a prelude to the more rigorous project evaluation needed to comply with the National Environmental Policy Act (NEPA) for federally-funded projects.

In respect to the groups protected under the Civil Rights Act, the plan exceeds the requirement to avoid disproportionate impact. In fact, the lower income groups gained more in transit, pedestrian and bicycle level of service than the region as whole.

#### Policy Response to Environmental & Social Justice

##### ENVIRONMENTAL CONSIDERATIONS GOALS AND POLICIES

###### **Goal T.3. Provide transportation infrastructure that is conducive to conservation, preservation, and development goals to avoid, minimize, or mitigate impacts on the natural and built environment.**



Policy T.3.1. Design and assess transportation improvement plans, projects, and strategies to minimize negative impacts on air quality and maintain the region's current air quality.

Policy T.3.2. Promote transportation systems that reduce the use of fossil fuels and eventually replace with carbon neutral alternatives.

Policy T.3.3. Couple transportation investments with desired land use patterns to enhance and protect the quality and livability of neighborhoods, activity centers, and community places.

Policy T.3.4. Actively manage parking, including cost and supply, to support land use, transportation, and economic development goals.

Policy T.3.5. Design transportation infrastructure that implements ecosystem-based design strategies to manage stormwater and minimize adverse environmental impacts.

Policy T.3.6. Seek to minimize the noise, vibration, dust, and light impacts of transportation projects on nearby land uses.

Policy T.3.7. Design transportation infrastructure to mitigate negative impacts on plants, animals, their habitats, and linkages between them.

Policy T.3.8. Promote transportation options such as increased public transit and more bike lanes to reduce congestion, fuel consumption, and overall carbon emissions and promote walkable community design.

#### PUBLIC SUPPORT FOR TRANSPORTATION GOALS AND POLICIES

**Goal T.11. Build and sustain public support for the implementation of transportation planning goals and policies, including the financial underpinnings of the Plan, by actively seeking meaningful community involvement.**



Policy T.11.1. Maintain the credibility of the regional transportation planning process through the application of professional standards in the collection and analysis of data and in the dissemination of information to the public.

Policy T.11.2. Approach public involvement proactively throughout regional transportation planning, prioritization, and programming processes, including open access to communications, meetings, and documents related to the Plan.

Policy T.11.3. Include and involve all segments of the population, including those potentially underrepresented such as the elderly, low-income, and minorities (see Title VI of the Civil Rights Act of 1964 and Executive Order 12898 - Environmental Justice).

Policy T.11.4. Attempt to equitably distribute the burdens and benefits of transportation investments to all segments of the community.

Policy T.11.5. Promote effective intergovernmental relations through agreed-upon procedures to consult, cooperate, and coordinate transportation-related activities and decisions, including regional efforts to secure funding for the improvement of transportation services, infrastructure, and facilities.

#### Keep lines of communication open

Language barriers, lack of access to technology, lack of access to transportation or social isolation can all contribute to the needs of Title VI communities being ignored or missed. Intentional, regular outreach is needed to overcome these barriers.

#### Avoid, minimize or mitigate impacts to the natural and cultural environment

This is very much in keeping with FRP 2030 Goal E&C.6: "Protect, restore and improve ecosystem health and maintain native plant and animal community diversity across all land ownerships in the Flagstaff region." It also reflects many of the comments received through the surveys.

#### Consider development of an Urban Wildlife Policy

There are several locations within existing and future developed areas where roadways and wildlife will come into contact, often with undesirable outcomes. A policy setting expectations for the treatment of urban wildlife can help guide safety efforts and wildlife habitat protection.

### Title VI Environmental & Social Justice Evaluation

Environmental justice means identifying and addressing disproportionately high and adverse effects of transportation programs, policies, and activities on minority and low-income populations to achieve an equitable distribution of benefits and burdens. Title VI communities were identified using data from the American Community Survey (ACS) and adjusted based on local knowledge. For instance, a TAZ that was identified as being part of a Title VI community in a larger block group, but in which no population is present, was removed from that categorization.

Maps from the FMPO Title VI Plan show where these Title VI populations generally reside. Shaded areas indicate concentrations increasingly above of the regional average. Non-white and Hispanic communities are more likely to be located along W. Route 66, E. Route 66 and US 89 with additional concentrations surrounding NAU. There is a strong relationship between these communities and low-income or poverty.

The proposed projects and service levels for current and 2040 conditions were compared to these locations. Proximity to traffic and level of transit, bicycle and pedestrian services in the current and 2040 condition were used to evaluate environmental justice.

### Proximity to Traffic

The amount of traffic in and around a TAZ will affect the quality of life of residents within it. Quality of life will be affected by noise, light, safety impacts of changes in traffic levels, and relative travel time. This is a proxy, albeit weak, for travel time impacts. Vehicles per square mile (VMT/SqM) is the measure used to approximate impacts on the area.

### Transit, Pedestrian and Bicycle Level of Service

Level of Service is a measure used to describe traffic service using factors like traffic flow and quality of infrastructure and amenities. In Table 19-1 below “T-LOS,” “B-LOS,” and “P-LOS” describe transit, bicycle and pedestrian levels of service, respectively, and are more fully defined in Chapters 6 and 8. Complete streets projects, spot improvements or transit service expansion can raise the level of traffic or transit, pedestrian or bicycle levels of service within a TAZ. The level of change for Title VI communities was compared to change for the entire region

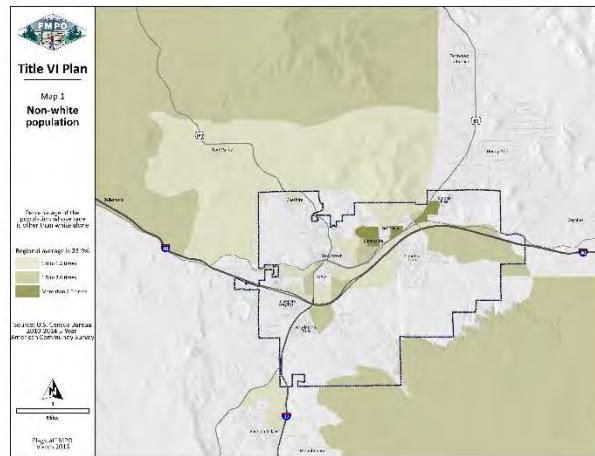


Figure 19.1 FMPO minority population distribution

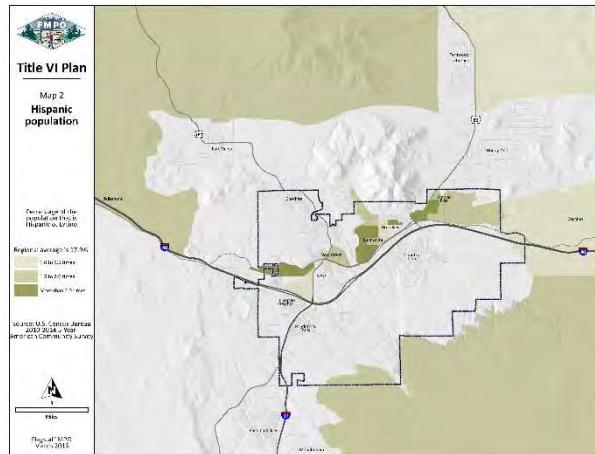


Figure 19.2 FMPO Hispanic population distribution

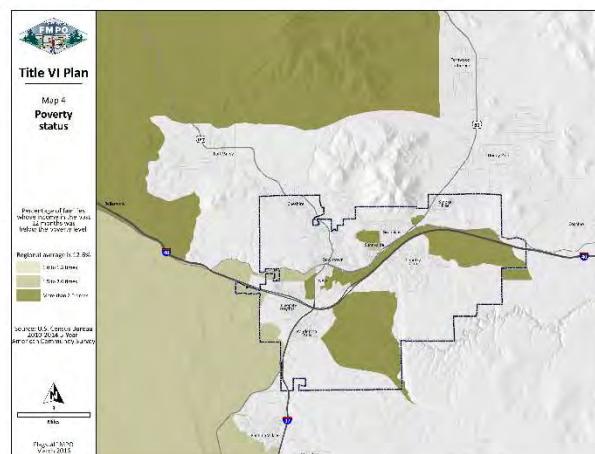


Figure 19.3 FMPO Household poverty distribution

and then again at an area type context level. For instance, Title VI urban communities compared to all urban communities.

Table 19-1 illustrates relative existing and planned future transportation services between Title VI communities and the region. Figures greater than 100% indicate that the population group enjoys better service than the entire region. For VMT/SqM a number less than 100% is better.

**Table 19-1 Title VI Population Analysis**

Area	Title VI Population	2015 Value				2015 Percent			
		T-LOS	B-LOS	P-LOS	VMT/SqM	T-LOS	B-LOS	P-LOS	VMT/SqM
Region	Black	2.05	1.03	1.78	242,014	150%	101%	111%	139%
	Native	1.79	0.93	1.54	146,752	131%	91%	96%	84%
	Asian	1.99	1.1	1.76	74,931	145%	108%	110%	43%
	Hispanic	1.96	1	1.86	191,465	143%	98%	116%	110%
	Hawaiian	1.63	1.2	2.6	86,898	119%	118%	163%	50%
	Low-income	1.96	0.9	1.67	155,191	143%	88%	104%	89%
	All	1.37	1.02	1.6	174,473	100%	100%	100%	100%
Urban	Black	3.23	1.07	2.4	397,149	108%	104%	104%	105%
	Native	2.7	0.75	1.37	316,693	90%	73%	60%	83%
	Asian	1.57	0.57	1.42	176,768	52%	55%	62%	47%
	Hispanic	3.28	1.02	2.4	424,849	109%	99%	104%	112%
	Hawaiian	4.12	1.6	3.125	329,799	137%	155%	136%	87%
	Low-income	3.15	1.2	2	310,756	105%	117%	87%	82%
	All	3	1.03	2.3	379,998	100%	100%	100%	100%
Suburban	Black	1.63	0.96	1.4	182,362	109%	96%	100%	100%
	Native	1.95	0.96	1.6	127,608	130%	96%	114%	70%
	Asian	2.02	1.14	1.7	67,427	135%	114%	121%	37%
	Hispanic	1.85	0.95	1.6	126,780	123%	95%	114%	69%
	Hawaiian	1.81	1.06	1.6	41,484	121%	106%	114%	23%
	Low-income	2.07	0.82	1.5	140,174	138%	82%	107%	77%
	All	1.5	1	1.4	182,837	100%	100%	100%	100%
Rural	Black	0.14	1.57	1.125	21,998	700%	131%	87%	105%
	Native	0	1.4	1.3	--	0%	117%	101%	0%
	Asian	0	0	0	--	0%	0%	0%	0%
	Hispanic	0	1.5	1	10,822	0%	125%	78%	52%
	Hawaiian	0	1	1.16		0%	83%	90%	0%
	Low-income	0.06	0.83	1.3	544	300%	69%	101%	3%
	All	0.02	1.2	1.29	20,952	100%	100%	100%	100%

In 2015, it appears that Title VI communities generally enjoy greater transit, bicycle and pedestrian services while being subject to greater levels of traffic. This is more pronounced in urban areas where traffic and transit services are concentrated. Hispanic and Black communities in particular are located near high concentrations of traffic. The trend breaks down for low-income populations

as they are distributed more evenly across the region. The pattern does not hold for bicycle level of service where it has been difficult to retrofit suitable facilities in areas of higher density and higher traffic. Comparing Title VI populations in suburban areas to all suburban populations reveals a more equitable distribution of impacts and benefits.

In 2040, should all of the planned projects be implemented and non-automotive policy levels of service be achieved, the distribution of impacts changes as shown in Table 19-2.

**INSERT 2040 TITLE VI IMPACT TABLE HERE**



*Photo credit: Arizona Game & Fish Department*

Figure 19.4 FMPO wildlife

## Natural Resource Impacts

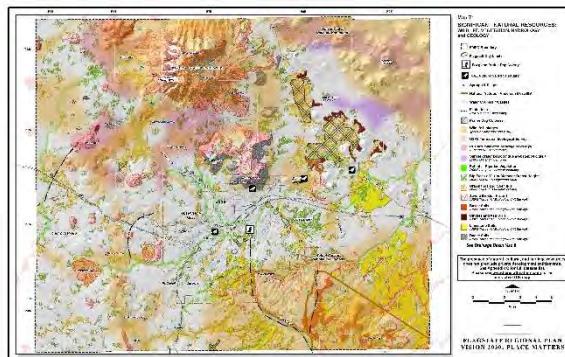
Flagstaff and the surrounding region are rich in natural resources; the lands that make up the region are owned and maintained by several jurisdictions including the City of Flagstaff, Coconino County, Arizona State Land Department, U.S. Forest Service, Department of Defense, National Park Service, and private land owners.

In the context of *Blueprint 2040* it is especially important to consider the impact that transportation has on significant resources such as wildlife, vegetation, hydrology, and geology. *FRP 2030* identifies a vision for the future where, “the long-term health and viability of our natural environment is maintained through strategic planning for resource conservation and protection.”

As part of the *Blueprint 2040* planning process a meeting was held between representatives of the FMPO, the Arizona Game and Fish Department, and SWCA Environmental Consultants to discuss potential impacts to natural resources from planned transportation improvements. Notes were circulated to regional professionals from other resource agencies and comments received from ADOT and the National Park Service.

Standard strategies to avoid, minimize, and mitigate impacts to natural resources will be applied with special attention to three resources: perennial water sources, waterways (drainages), and wildlife linkages. Given the difficulty of mitigating impacts of roadways on water sources, avoiding locating roads in close proximity or that drain into these resources is a highly preferred strategy. Applying low impact development (LID) stormwater management techniques will also assist in keeping harmful sediments and pollutants out of the natural water system. Wildlife is crucial to the environmental health and economy of our region; therefore, special consideration should be given to crossing structures, fencing, and wildlife detection systems. It is additionally important to avoid impacting sensitive soils as they are frequently associated with endangered plant species that wildlife can depend on in order to thrive in their environment.

See the map from *FRP 2030* on the following page that identifies cultural resources:



*Figure 19.5 FRP 2030 Natural Resources*

Table 19-2 Roadway Project Impacts to Natural Resources and Potential Mitigation Strategies	
Project or Resource	Description / Impact / Strategies
I-40 widening & Interchanges	Widening to 3 lanes into the median. Existing and increasing traffic volumes disrupt important wildlife linkages and cause significant mortality for deer, elk and other wildlife. Strategies: Barrier fencing; Crossing structures (see draft ADOT Design Concept Report Wildlife Accident Reduction Study for more information)
I-17 widening	Widening to 3 lanes to the outside. Existing and increasing traffic volumes disrupt important wildlife linkages and cause significant mortality for deer, elk and other wildlife. Strategies: Barrier fencing (much already in place); Crossing structures (see draft ADOT Design Concept Report for more information)
US 180	Edge, aesthetic, and access management improvements. Existing and increasing traffic volumes disrupt important deer wildlife linkage in the Museum of Northern Arizona vicinity. Strategies: Education; signing, barrier and detection system
US 89	Possible north-south bypass on east side. Existing and increasing traffic volumes disrupt important deer and elk wildlife linkage near Townsend Winona Road. Strategies: Education; signing, barrier and detection system, crossing structure with any major construction
J.W. Powell Boulevard	New east-west arterial. Road alignment splits a Gunnison Prairie Dog colony, a species of Greatest Conservation Need. Strategies: Minimize through design. Mitigate through relocation.
Switzer Canyon Drive Extension	Conditional roadway extending north-south arterial. Road alignment impacts I-40 wetlands and FUTS trail. Strategies: Avoid: Keep alignment east along escarpment. Minimize: Utilize appropriate structure design to avoid excessive fill sections and maintain flow of water, wildlife and trail.

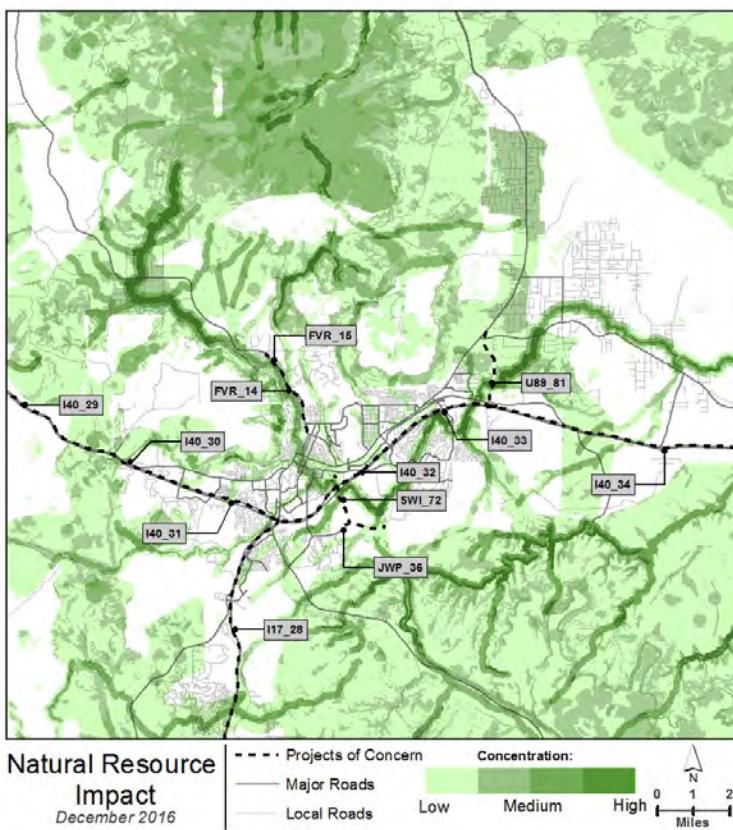


Figure 19.6 Road projects with natural resources impacts

native plant species a decrease the value of wildlife habitat. Sound construction practices and enforcement of rules to prevent the spread of noxious weeds are in place.

#### *Low Impact Development Stormwater Management*

Alluded to earlier, LID, if widely employed, will have a positive impact on water tables, water quality, and erosion control. The City of Flagstaff

#### *Wildlife Friendly Fencing*

Depending in the situation and purpose, inappropriate fencing can serve as a barrier to some species. This fragments habitat and could have long-term negative effects on species gene pools. Arizona Game & Fish Department offers design guidance on wildlife fencing.

#### *Wildlife Friendly Bridge & Culvert Design*

Grade-separated roadway crossings for almost any purpose and at almost any scale may be an opportunity for a wildlife crossing. Arizona Game & Fish Department offers design guidance for bridge and culvert design to meet these purposes.

### **Best practices in Support of Natural Resource Protection**

In addition to the broad and specific strategies applied to distinct projects, there are several practices that can be employed or improved that over time will have a positive impact on the environment:

#### *Road salt application*

Road salt is used for de-icing and snow melt to varying degrees by FMPO member agencies. Inappropriately applied it can have a negative effect on nearby vegetation and downstream water quality. Member agencies should strive to continuously improve their methods and materials to limit impacts.

#### **Noxious Weed Mitigation**

Noxious weeds outcompete

### Urban wildlife policy

Encounters between people and wildlife are occurring with increasing frequency in town. Most encounters are pleasurable, but many are annoying and others dangerous for the people and animals involved. Wildlife and wildlife habitat surround the City of Flagstaff and other communities within the FMPO region. Urban open space and drainages serve as corridors by which wildlife may enter urbanized areas where golf courses, lawns, flower beds, and gardens serve as attractive food sources. This is especially true during drought years.

The FMPO is not aware of any over-arching policy guidance to direct the management of urban wildlife. Regional resource agencies and FMPO member organizations have a collection of design guidance, nuisance laws, and other policies and standards that might be assembled, reviewed, and augmented to produce a holistic policy and practice.

### Cultural Resource Impacts

Cultural and heritage resources are also highly valued by the FMPO region as indicated by Goal CC.2. from *FRP 2030*, “Preserve, restore, and rehabilitate heritage resources to better appreciate our culture.” Transportation is part of that history and expansion of existing corridors began in earnest with the sawmill industry’s need to transport timber to the mills and products to market. The railroad, logging roads, and ranch-to-market roads grew. The early twentieth century brought growth beyond the limits of the historic downtown and subsequently major roadways passing through the region. Much of the original alignment of Route 66, the “Mother Road,” remains intact with numerous sites on the National Register of Historic Places. The 60’s brought the interstate – worlds apart from the game trails followed by early indigenous people and solitary mountain men.

Growth and supporting transportation continue to change the landscape. It requires vigilance to protect regional culture and history. Compliance with section 4(f) of the Federal-Aid Highway Program when federal funding is involved and coordination with the Arizona State Historic Preservation Office will help. The City of Flagstaff is a Certified Local Government which shows their commitment to historic preservation and comes with obligations and eligibility for financial and technical assistance in historic preservation efforts.

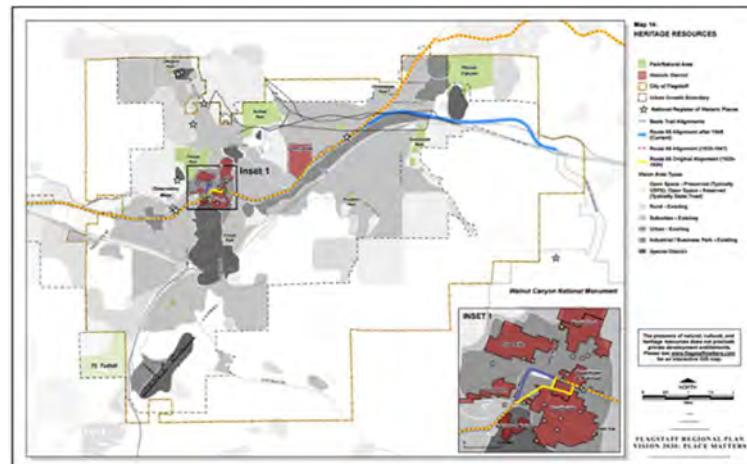


Figure 19.7 FRP 2030 Flagstaff Heritage Resources

Under Section 4(f) it must be demonstrated quantitatively that all feasible alternatives have been considered to avoid impacts. This includes impacts to any hotels that have significance under criteria for events, persons, or architecture. SHPO documents historic properties, reviews properties

nominated for the National Register of Historic Places, and prepares a statewide historic preservation plan.

SHPO is also works with tribes in Arizona on preservation of their cultural heritage. Consultation with tribes about “traditional cultural resources” like plants and springs historically used is recommended. Tribes to be consulted with include, but are not limited to, Hopi, Navajo, Havasupai, and Hualapai.

Table 19-3 identifies the *Blueprint 2040* roadway projects most likely to have cultural or heritage resource impacts and potential strategies to address them. A multi-agency meeting of preservation professionals reviewed these projects and they were presented to the City of Flagstaff Historic Preservation Commission on September 21, 2016. The figure on the previous page illustrates the heritage resources in the FMPO region.

The proposed road projects were evaluated against the Heritage Resources and Cultural Sensitivity maps from *FRP30*. The sensitivity map illustrates the probability of encountering an archaeological site from a comparison of elevation, slope, aspects, distance to water, soil, geology, and vegetation to known archaeological sites.

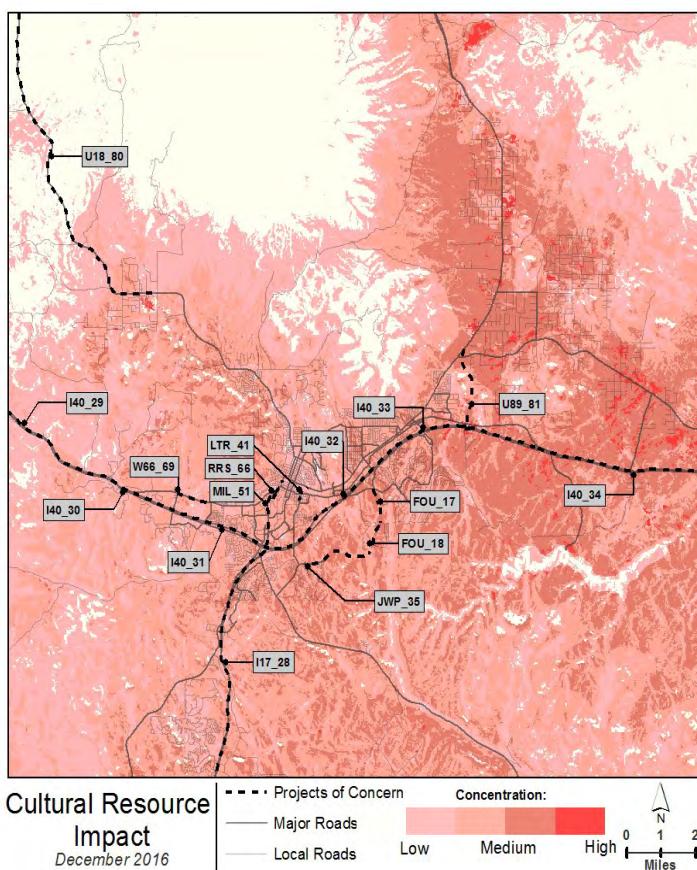


Figure 19.8 Road projects with cultural resource impacts

**Table 19-3 Roadway Projects Impacts to Cultural Resources and Potential Mitigation Strategies**

Project	Description / Impact / Strategies
I-40 widening & Interchanges	Widening to 3 lanes into the median. Low probability of cultural resources. Strategy: Mitigate – Data recovery
I-17 widening	Widening to 3 lanes to outside of current roadway. Design Concept Report complete. Strategy: Mitigate – Data recovery
Route 66 widening	Widening to 6 lanes. Route 66 is nationally designated an “All-American Road.” Impacts historic hotels and several restaurants and diners yet to be inventoried. Strategy: Avoid: Attempt to widen to the south side only. Minimize: Evaluate widening in limited locations at critical intersections. Mitigate: Complete Multi-property Assessment for Historic Hotels. Data recovery.
W Route 66 widening	Widening to 5 lanes. Impacts to setting of historic McAllister Ranch and other logging, ranching, and archaeological resources. Strategy: Mitigate – Data recovery
Highway 180 Bypass	Evaluated north-south bypass road west of town. 3.5 +/- miles long and carrying 3,000 vehicles per day. Few cultural or historical resources likely to be encountered. Strategy: Avoid through exploration of alternatives or minimize through design. Special note: impacts to open space on Observatory Mesa of special significance.
US89 Bypass and Interchange	Evaluated north-south bypass road east of town. Up to 20,000 vehicles a day. Probable impacts to archaeological sites. Probable impacts to recreational resources. Strategies: Avoid through alternative solution such as improve existing US 89 and Country Club interchange. Minimize through design and Mitigate - Locate near Sheep Hill and terrain compromised by extraction industry and outside of areas with high probability of cultural resources.
Milton Road / Backage Road System	Widen to 6 lanes – establish parallel routes and cross-streets. Possible impact to historical setting at north end. Impact to hotels with limited significance. Possible impact to Riordan Mansion State Historic Park entrance. Strategy: Mitigate – document hotel histories. Avoid – do not modify entrance to state park.
J.W. Powell / 4 <sup>th</sup> Street Corridor	New east-west arterial. Private and State land. Probable impact to heritage resources such as Herald Ranch and prehistoric habitation site. Cultural resources study complete. Strategy: Avoid - Use by use of zoning code prescriptions. Minimize and Mitigate through design.
Pipeline Arterial (Mount Elden Bypass)	Evaluated east-west bypass at base of Mount Elden and Dry Lake Hills. Possible impacts to cultural resources – particularly recreation resources. Strategy: Eliminate from consideration.
Lone Tree Railroad Bridge	New bridge between Route 66 and Butler Avenue. Potential visual impact to setting of historic district. Strategy: Minimize - Design structure to complement setting.

## Blueprint 2040 Appendices

### Appendix A Public Participation

### Appendix B Performance Measures

### Appendix C Funding Forecasts

### Appendix D Project Descriptions

## Blueprint 2040 Acronyms & Glossary

### Acronyms

Some companies are more well known for the acronym of their name, as is the case with The Flagstaff Metropolitan Planning Organization (FMPO).

Below is a convenient reference for other acronyms you may find herein as the FMPO does associate with them on a consistent basis.

**ADA** – Americans with Disabilities Act

**ADOT** – Arizona Department of Transportation

**BRT** – Bus Rapid Transit

**CSS** – Context Sensitive Solutions

**CMS** – Congestion Management System

**FHWA** – Federal Highway Administration

**FMPO** – Flagstaff Metropolitan Planning Organization

**FTA** – Federal Transit Administration

**FY** – Fiscal Year

**GHG** – Greenhouse Gas

**HURF** – Highway User Revenue Fund

**ITS** – Intelligent Transportation System

**LID** – Low Impact Development

**LOS** – Level of Service

**MPG** – Miles per Gallon

**MPO** – Metropolitan Planning Organization

**NACOG** – Northern Arizona Council of Governments

**NAIPTA** – Northern Arizona Intergovernmental Public Transportation Authority

**ROW** – Right of Way

**SAFETEA-LU** – Safe, Accountable, Flexible, Efficient, Transportation Equity Act – a Legacy for Users

**STIP** – State Transportation Improvement Program

**TAC** – Technical Advisory Committee  
**TAZ** – Traffic Analysis Zone  
**TI** – Traffic Interchange  
**TIP** – Transportation Improvement Program  
**TND** – Traditional Neighborhood Development  
**UPWP** – United Planning Work Program  
**VMT** – Vehicle Miles of Travel  
**VT** – Vehicle Trip

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## Glossary

Activity center – an area within a community characterized by mixed land uses, high density, and compact, traditional development patterns, typically resulting in a high level of activity.

Area type – the character of an area related to its pattern of development – urban, suburban or rural.

Arterial street – a larger road or highway purposed to carry longer trips across the region and to other regions.

Bicycle boulevard – a street where bicyclists share the roadway with motor-vehicle traffic, designed to provide bicycle travel greater continuity, safety and right-of-way advantages.

Bike box – a marked or painted rectangle located at signalized intersections between the motor-vehicle stop line and the crosswalk that allows bicyclists to pull in front of waiting traffic.

Bus rapid transit - is a bus-based mass transit system. A true BRT system generally has specialized design, services and infrastructure to improve system quality and remove the typical causes of delay.

Bypass – a roadway or other transportation facility purposed with directing travel around a target area generally to avoid congestion or avoid creating congestion.

Collector street – a street purposed with collecting traffic from surrounding local roads, often within a neighborhood or district, and delivering to an arterial street.

Commuter (bus) route – a fixed bus route running only during peak commute times, usually in the morning and evening.

Compact development – development that takes place within a defined, concentrated or central area, sometimes designated by an urban growth boundary.

Congestion – when the volume of cars on a given road is such that crowding, interaction between vehicles, and stop and delay increases.

Context – the nature of the surrounding environment including its development patterns, density, landscaping, history, residential, commercial or undeveloped character and other aspects to be respected.

Contra-flow bicycle lane – a signed and striped lane where bicycles travel in a direction opposite to vehicular traffic.

Conventional development – development characterized by separated land uses on large or disconnected blocks, lower densities and strip or shopping center commercial development.

Cycle-track – a bicycle lane separated from traffic by a wider buffer often with a physical element such as a curb

Density – the amount of development within a given area, usually expressed in dwelling units, population or employment per acre or square mile.

Express bus – a bus route that may follow a standard route but skips several intervening stops, making a quicker trip to the destination.

Furnishing zone – the space between the curb and sidewalk that in urban areas is paved and occupied by benches, signs, etc.

Greenhouse gas emissions – carbon dioxide and other gases that accumulate in the atmosphere and trap heat.

Hybrid development – a development pattern characterized by elements of conventional and traditional development.

Infill development – development that occurs on vacant parcels that are surrounding by existing development.

Intermodal (intermodal yard) – the interaction, sometimes transfer between means or modes of travel. An intermodal yard involves freight between rail to truck modes of transport.

Level of service – a qualitative assessment of the road's operation conditions.

Local street – local streets serve immediate access to property and are designed to discourage longer trips through a neighborhood.

Mixed use development – a diverse and complimentary set of uses within close proximity to each other through vertical integration and/or smaller lot sizes.

Mobility – the degree to which people and goods may move safely, efficiently, and effectively between origins and destinations.

Mode – a means of travel such as pedestrian, bicycle, transit, vehicle, etc.

Multimodal – travel or transportation systems characterized by more than one means or mode of transport.

Multimodal corridor – a road or highway designed and intended to carry more than one mode of travel with a high level of mobility.

Off-peak hour – those hours of the day – usually late evening into very early morning – outside of peak hour where travel is light.

Parkway – the unpaved area between the curb and sidewalk reserved for landscaping, contrast to furnishing zone.

Peak hour – that hour or hours of the day when travel demand is greatest, often the morning and evening commute periods.

Redevelopment – the removal of existing development and replacement with newer structures that may contribute to the transformation of the area type.

Stakeholder – an individual or organization that has any involvement with a project.

Traditional neighborhood development – development characterized by small blocks, small lots, and human-scaled buildings.

Traffic analysis zone – a unit of geography used to support traffic modeling. Zones are often defined by the road network and contain similar levels of activity, so rural zones are much larger than urban zones.

Transect – a sample strip of land, from the center of region to the edge, used to examine or define development patterns.

Urban growth boundary – a legislated boundary around a community within which all urban growth should occur.

## End Notes

- <sup>i</sup> 23 CFR 450.322 (c)
- <sup>ii</sup> FHWA scenario planning reference here
- <sup>iii</sup> *Beyond Traffic: Trends and Choices 2045*; 2015, p.3, USDOT
- <sup>iv</sup> Id; p.4
- <sup>v</sup> Id; p.87
- <sup>vi</sup> Id; p.5
- <sup>vii</sup> Id; p.6
- <sup>viii</sup> Id; p.50-51
- <sup>ix</sup> Id; p.165, 183
- <sup>x</sup> 106<sup>th</sup> Arizona Town Hall, April 19-22, 2015; highlights
- <sup>xi</sup> Id
- <sup>xii</sup> *What Moves You Arizona*, Arizona DOT, 2015, Working Paper #1, p. 27
- <sup>xiii</sup> Id, 106<sup>th</sup> Arizona Town Hall
- <sup>xiv</sup> Id, *What Moves You Arizona*, p. 15-16
- <sup>xv</sup> Id, 106<sup>th</sup> Arizona Town Hall
- <sup>xvi</sup> Id, *What Moves You Arizona*, P. 27
- <sup>xvii</sup> Ibid; p. 21
- <sup>xviii</sup> Ibid; p. 22
- <sup>xix</sup> Id; p. 25
- <sup>xx</sup> Id, 106<sup>th</sup> Arizona Town Hall
- <sup>xxi</sup> Id, *What Moves You Arizona*, p. 65
- <sup>xxii</sup> Id, 106<sup>th</sup> Arizona Town Hall
- <sup>xxiii</sup> Id, 106<sup>th</sup> Arizona Town Hall
- <sup>xxiv</sup> Id, *What Moves You Arizona*, p. 37-40
- <sup>xxv</sup> Id, p. 14
- <sup>xxvi</sup> Id, p. 65
- <sup>xxvii</sup> Id, p. 27-30
- <sup>xxviii</sup> Id, p. 30
- <sup>xxix</sup> Id, p. 37-40
- <sup>xxx</sup> *Smart Transportation Guidebook*, 2008, New Jersey DOT/Pennsylvania, p. 12
- <sup>xxxi</sup> Samdahl, Planning Urban Roadway Systems, ITE Proposed Recommended Practice, Western ITE Conference
- <sup>xxxi</sup> Transportation Research Board, 2014, *Access Management Manual, 2<sup>nd</sup> Edition*, p.69
- <sup>xxxiii</sup> Id, p.91
- <sup>xxxiv</sup> Id, p.6
- <sup>xxxv</sup> Id, p.91
- <sup>xxxvi</sup> Id, p.86
- <sup>xxxvii</sup> Ibid, Samdahl
- <sup>xxxviii</sup> Ibid, TRB, p.83
- <sup>xxxix</sup> Id, p.61
- <sup>xl</sup> Id, p.65
- <sup>xli</sup> Id, p.6
- <sup>xlii</sup> Id, p.15
- <sup>xliii</sup> Id, p.3-4
- <sup>xliv</sup> Id, p.6
- <sup>xlv</sup> Institute of Transportation Engineers, 2005, *Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities*
- <sup>xlivi</sup> Transportation Research Board, 2014, *Access Management Manual, 2<sup>nd</sup> Edition*, p.85

- xlvii Ibid, p.87
- xlviii *Smart Transportation Guidebook*, 2008, New Jersey DOT/Pennsylvania, p.32
- xlix Ibid, TRB, p.80
- <sup>l</sup> Ibid, NJDOT, p.32
- <sup>li</sup> Ibid
- <sup>lii</sup> Ibid
- <sup>liii</sup> Ibid
- <sup>liv</sup> Ibid, p.33
- <sup>lv</sup> Ibid, TRB, p.74
- <sup>lvi</sup> Ibid, p.72
- <sup>lvii</sup> Ibid, p.87
- <sup>lviii</sup> Ibid, NJDOT, p.34
- <sup>lx</sup> *Flagstaff Regional Plan 2030: Place Matters*, 2014, p.X19-20
- <sup>lx</sup> Ibid, TRB, p.11
- <sup>lxii</sup> Ibid
- <sup>lxii</sup> Ibid
- <sup>lxiii</sup> Ibid
- <sup>lxiv</sup> Ibid, p.13
- <sup>lxv</sup> Ibid
- <sup>lxvi</sup> Ibid, p.14
- <sup>lxvii</sup> Ferrell, Christopher E., 2015, *The Benefits of Transit in the United States: A Review and Analysis of Benefit-Cost Studies*, Mineta Institute, p.8
- <sup>lxviii</sup> Ibid, p.4-5
- <sup>lxix</sup> Transportation Research Board, 2014, *Access Management Manual, 2<sup>nd</sup> Edition*, p.61
- <sup>lx</sup> *Smart Transportation Guidebook*, 2008, New Jersey DOT/Pennsylvania, p.33
- <sup>lxxi</sup> Ibid, TRB, p.159
- <sup>lxii</sup> Ibid, p.61
- <sup>lxiii</sup> Mistretta, Mark – Center for Urban Transportation Research, University of South Florida, 2009, *Best Practices in Transit Service Planning*, Florida DOT, p.10
- <sup>lxiv</sup> Ibid, TRB, p.88
- <sup>lxv</sup> Ibid, Mistretta, p.13
- <sup>lxvi</sup> Ibid, p.8
- <sup>lxvii</sup> Ibid, p.6-7
- <sup>lxviii</sup> Ibid, Mistretta, p.15-16
- <sup>lxix</sup> Ibid, TRB, p.88
- <sup>lx</sup> Ibid, p.30
- <sup>lxxi</sup> Ibid, TRB, p.88
- <sup>lxii</sup> Transportation Research Board, 2014, *Access Management Manual, 2<sup>nd</sup> Edition*, p.81
- <sup>lxiii</sup> Ibid, p.81
- <sup>lxxiv</sup> Ibid, p.89
- <sup>lxv</sup> Ibid, p.73
- <sup>lxvi</sup> Ibid, p.89
- <sup>lxvii</sup> Ibid