



ACCESS MANAGEMENT COMMUNICATION TOOLKIT

NCHRP RESEARCH REPORT 1032

How to Measure and Communicate the Value of Access Management

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National Cooperative Highway Research Program
Transportation Research Board

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Transportation Research Board
NAS-NRC

LIMITED USE DOCUMENT

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Purpose: Our purpose with this project is to gather the research on access management that pertains to benefits and costs to society and distill it in a way that helps you, the user, clearly communicate those benefits and costs.

Key Message: Access to the transportation system takes the form of driveways, intersections, medians, signals and turn lanes. All of these have attributes that can be expressed in terms of benefits or costs (B/C). Some can be quantified, whereas others are more qualitative or cannot yet be quantified.

Outcomes: By the time you complete this presentation you will:

- 1) Understand the topics covered by the toolkit.
- 2) Be able to locate the tools you want to use.
- 3) Understand the basis, application and limitations of the tools.
- 4) Communicate the results of those tools in terms of B/C.

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 2

Purpose: The purpose of this slide is to introduce the contents of the toolkit.

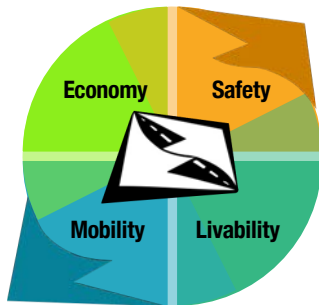
Key Message: The various tools have been developed separately through many research efforts. In this training you will learn how to tie them together into one compelling conversation.

Outcomes: Recognize that –

- 1) There are 8 sections in the Toolkit.
- 2) Section 1 covers the organization and use of the Toolkit.
- 3) Sections 2 – 7 cover the various components for which research exists and each component is explained as B/C and in terms of Safety, Economy, Mobility, and Livability.
- 4) Section 8 presents case studies that tie together the contents of Sections 2 – 7.

Suggestion: This would be a good place to point out that each of these sections include both quantitative and qualitative elements of B/C. Often it's the qualitative examples and messages that are most compelling to non-technical audiences and quantitative measures that are most compelling to technical audiences.

Introduction



MESSAGING

Today's busy world demands better ways to keep up with the latest research. Research reports often take too long to read between e-mails and meetings. So, we ignore them until our schedules allow a long block of time to consume dense information—if that time ever comes.

This Toolkit helps you quickly get the answers you need to communicate the value of access management to safety, mobility, the economy and livability.

Access management saves lives, improves the economy, moves people and goods more efficiently and increases the livability of our communities. Simply put, it is good planning and engineering.

Purpose: The purpose of this slide is to tie ALL of the various research papers and reports into one easy-to-use guide.

Key Message: The goal of this guide is to give the user tools that tie the four pillars of safety, economy, mobility, and livability together, and discuss both the qualitative and quantitative B/C with an audience.

Outcomes: Recognize that –

- 1) The goal of this Toolkit is to provide the user with graphical visualizations of complex concepts.
- 2) The goal of this slide-deck is to provide the user with targeted messages focused upon B/C.
- 3) No two situations or audiences will be the same, and no two audiences will respond to the same messaging.

Suggestion: It is suggested that you highlight the need for target audience analysis so that messaging will be meaningful to the audience you're addressing. Keep in mind that answering "what's in it for me" is on the mind of the target audience.

MESSAGING

About the Toolkit

The goal of the toolkit is to synthesize research findings and provide analysis methods that are simple and repeatable by the user. Consideration is given to providing analysis outputs and messages that are compelling, easy to understand, and useful to agency personnel in communicating the rationale for access-related decisions.

The tools are grounded in research, so engineers and planners can rely on their technical strength to address public concerns. The following pages explain how the toolkit is organized.

The benefits of effective access management include, but are not limited to, improved safety, reduced delay, better multimodal quality of service, and livability. These benefits translate into economic benefits to the agency and the public.

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 4

Purpose: The purpose of this slide is to explain the various resources within the toolkit available to the user.

Key Message: The various resources available to the user (shown on the left side of the screen). These tools and resources may be selected as appropriate to serve the target audience.

Outcomes: Recognize that –

- 1) Resources such as Infographics and Brochures may be more suitable to non-technical audiences.
- 2) Resources such as the report, fact sheets and spreadsheet tools are more suitable to technical audiences.
- 3) The spreadsheet tools are, by their very nature, keyed to the quantitative research.

Suggestion: An explanation that the resources are all intended to convey the B/C elements of access management and are intended to be adaptable to any audience or situation might be appropriate.

About the Toolkit

MESSAGING

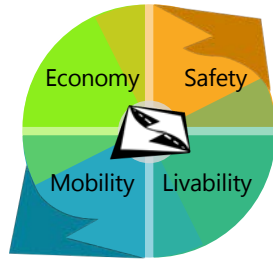
The Toolkit offers ideas on communicating the value of access management techniques. Every section focuses on a technique and its value. The Toolkit includes messages and links to communication tools that you can [download](#) and customize for your program or project.

The next page explains how to use the toolkit. You will select techniques you want to apply. Then click through the information on their value. Use the images and ideas to create customized communication tools with PowerPoint, video, handouts, and infographics to meet the needs of your project.

The spreadsheets provide simple planning level calculations to estimate the impact of specific techniques.

This Toolkit is a visual document that organizes ideas, images, and resources on the value of access management.

Communicate the value of these techniques



- Access Management Program
- Median Treatments
- Turn Lanes
- Signalized Access Spacing
- Driveways & Unsignalized Access Spacing
- Network Connectivity

No Trainer/Speaker Notes Required

HOW TO USE THE TOOLKIT
Safety | Economy | Mobility | Livability

This area above indicates the value being communicated.



Photo by J. Malone

The photo or graphic shown in this area can be used or modified to communicate about your project. Please credit photographer or source where indicated.

The technique is highlighted here with an icon so you know where you are in the Toolkit.

MESSAGING

This area shows messages you can share with stakeholders.

Access management preserves the safety, economy, mobility and livability of our community.

Communication tools can be created or adapted using these resources.

A Fact Sheet is available for every spreadsheet

Simple spreadsheet tools provide help in calculating the safety, mobility, and economic value of selected techniques.

TECHNICAL SUPPORT

This area provides technical support in the form of information, tools, and other resources.

- Infographics
- PowerPoint
- Brochures
- Fact Sheets
- Case Studies

Use the spreadsheets to generate project-specific data for your communication tools

- Spreadsheets

See the final report for more information on how to use the tools.

Program Medians Turn Lanes Signals Driveways Network Examples

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 6

Purpose: The purpose of this slide is to walk through how the document pages are organized.

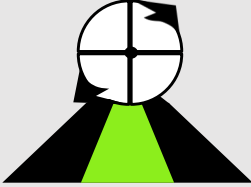
Key Message: There are links throughout the Toolkit that will allow you to access the platforms associated with that material.

Outcomes: Recognize that –

- 1) Where a technique is highlighted the value is shown in the middle.
- 2) A graphic is shown that supports the message you can share using the communication tools that are linked.
- 3) Where spreadsheets are available you can use them to customize the tools to your situation and the references are shown to supporting research.





Suggestion: It is advisable to play with the links and demonstrate the interoperability of the toolkit.


Access Management Programs



This section of the toolkit address the value of access management programs. It summarizes content that is detailed further in subsequent sections on specific techniques. It also links to tools that are useful for programs and plans.

MESSAGING

Safety	Economy	Mobility	Livability
 <p style="font-size: x-small;">Source: Citrus County Chronicle; B. Thompson</p>	 <p style="font-size: x-small;">Source: J. Malone</p>	 <p style="font-size: x-small;">Source: Utah DOT</p>	
<p>The primary benefit of access management is a reduction in crashes, including fatal and serious injury crashes. Access management has been shown to improve safety for all roadway users.</p>	<p>Access management helps the transportation system function safely and efficiently as development occurs, which is vital to the economy. It is a low-cost way to maintain the transportation system in an era of limited resources.</p>	<p>Improving mobility improves market area and shortens freight delivery times. It also reduces the need for costly road widening projects that displaces homes and businesses.</p>	<p>Making a corridor safer for non-motorized users supports priorities like Vision Zero, Safe Routes to School, curb management, and Complete Streets. Fewer driveways and landscaped medians enhance the aesthetics of major corridors.</p>

Program  Medians Turn Lanes Signals Driveways Network Examples

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 7

Purpose: The purpose of this slide is to introduce the four pillars of the Toolkit.

Key Message: There are elements of safety, economy, mobility, and livability that are a combination of qualitative and quantitative factors and are all applicable in most any scenario.

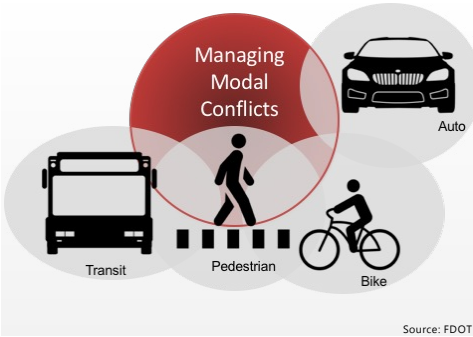
Outcomes: Recognize that –

- 1) Implementation of good access management produces benefits
- 2) Implementation of poor access management produces costs
- 3) This Toolkit gives the user a large number of alternatives to explore comparing relative benefits.

Suggestion: Explain that there are very few aspects of surface transportation or property development that do not incorporate access management in some way. Point to the section on Comprehensive Access Management Programs in the final report. Highlight the communication strategies mentioned for freight, retail businesses and other stakeholders.

Access Management is...

...the coordinated planning, regulation, and design of access between roadways and land development."



MESSAGING

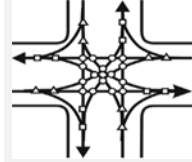
Techniques include:

- Locating traffic signals to support signal coordination and efficient traffic progression;
- Median treatments to limit the exposure of through traffic and pedestrians or bicyclists to left-turning vehicles and provide a refuge for midblock crossings;
- Providing right- and left-turn lanes so drivers can wait safely to complete a turn and do not delay through traffic;
- Limiting and separating driveways and median openings to reduce the number of potential conflicts;
- Restricting driveways near signalized intersections to reduce conflicts and crashes;
- Providing a local and collector street network and internal connections between land uses to support local circulation and reduce use of major roads for short local trips.

TECHNICAL SUPPORT

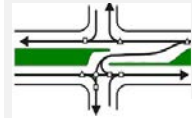
Full movement intersection

- 32 total conflict points
- 48 with bike/ped



Directional median opening

- 8 total conflict points
- 14 with bike/ped



Purpose: The purpose of this slide is to define access management and list some of the primary examples of access management that will result in benefits to the public.

Key Message: The three foundational purposes of access management are to: reduce conflict points, separate conflict areas, and manage speed differential.

Outcomes: Recognize that –

- 1) Reduction of conflict points is behind managing the number of intersections and driveways, but also the configuration of medians.
- 2) Separation of conflict areas is behind managing the location of intersections and driveways, but also applied to network and separation of motorized and non-motorized users.
- 3) Management of speed differential is behind turn lanes, but also applies to the breaking of medians, control of intersections, and provision of supporting network.

Suggestion: Ask participants for examples of access management and its value.

VALUE OF ACCESS MANAGEMENT PROGRAMS

Failure to manage access...



Photo by P. Demosthenes

...results in ugly, unsafe and less functional corridors."

This is NOT Sustainable
Capable of being continued with minimal long-term effect on the environment

Costs of failure to manage access include, but are not limited to:

- Increase in vehicular crashes and collisions involving pedestrians and cyclists
- Accelerated reduction in roadway efficiency
- Need for continuous road widening or bypasses
- Longer commute times
- Smaller market area for businesses and economic development
- Declining property values
- Increased fuel consumption and emissions

Only one road can be used to access these businesses.

Not managing access is costly to the public.

Public dollars are often needed to fix problems caused by poorly managed development access. This may include the need to:

- replace or widen a major roadway and install turn lanes;
- replace or reconstruct a highway interchange;
- reconstruct site access to improve vehicular, pedestrian and bicycle safety.

Poorly managed access can also result in potential liabilities to the permitting agency and the landowner, including the need to mitigate adverse safety and operational effects of poor access location and design.

MESSAGING

TECHNICAL SUPPORT

Program Medians Turn Lanes Signals Driveways Network Examples

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 9

Purpose: The purpose of this slide is to introduce the concept that failure to implement access management results in costs to the public.

Key Message: One of the most common sources of resistance to implementing access management is that it often shifts more costs to private developers by making access to a property less convenient or more expensive to construct.

Outcomes: Recognize that –

- 1) Opting for the least expensive/most convenient access will have costs to the public.
- 2) Research shows that the number of driveways has no measurable impact on sale price of property.
- 3) Balancing the private costs of development with the public costs of poor access management is situationally specific.

Suggestion: None.

VALUE OF ACCESS MANAGEMENT PROGRAMS

Comprehensive Programs

Policies → **Procedures** → **Standards**

The value of access management is best achieved when it is **systematically applied** to the transportation system through a comprehensive program of policies, procedures, and standards.

A majority of states and many local agencies practice some form of access management, but often these standards and criteria have not been updated in many years. **The resources provided or referenced in this section of the toolkit can help you update your program, using the latest guidance and best practices.**

MESSAGING

Contemporary access management programs include:

- An access classification system that builds upon functional classification and land use context
- Permitted levels of access for each access class
- Signalized and unsignalized access spacing
- Means of enforcing policies and standards
- Provisions for variances and waivers



Go to trb.org for the latest guidance on developing or updating your access management program.

TECHNICAL SUPPORT

Example State Highway System Access Classification Framework

Freeway (National)	
Principal Arterial (Statewide)	
R1 (rural principal)	U1 (urban principal)
Secondary Arterial (Regional)	
R2 (rural secondary)	U2 (urban mixed)
	U3 (urban secondary)
Collector (District)	

Download and adapt this brochure



[Access Management Brochure 2020.pdf](#)

Program | Medians | Turn Lanes | Signals | Driveways | Network | Examples | ACCESS MANAGEMENT COMMUNICATION TOOLKIT 10

Purpose: The purpose of this slide is to introduce the importance of a comprehensive approach to access management.

Key Message: There are few elements of surface transportation that do not touch upon access management. Full value of benefits to the public will not be realized without a comprehensive approach.

Outcomes: Recognize that –

- 1) Access management on the margin of the roadway depends in part upon completeness of network that provides multiple vectors of approach.
- 2) Access management in the median promotes safe and efficient flow of traffic, but it also provides refuge for non-motorized users and space to improve livability.
- 3) Management of not only the number of intersections, but also their design and control is vitally important.

Suggestion: Explain that the brochure can be downloaded and edited for use in explaining the rationale for access management programs to businesses.

Corridors and Bypasses

Corridor access management plans and projects address the unique needs of a roadway corridor or interchange area. Resources in this section of the toolkit can help communicate the value of access management on major corridors, including bypasses and connecting roadways.

Don't forget to "right-size" the bypassed road and transform it into a "complete street."



MESSAGING

Bypasses are a costly solution to congested highways. Access management and land use controls (zoning, subdivision regulations) are needed to preserve this investment.

A bypass may resolve congestion and improve travel speed, but there will be indirect impacts:

- Opens up new areas to development
- Redistributes economic activity
- Affects livability, community character, local mobility

Develop local mitigation plans and strategies:

- Right size and redesign the old bypassed roadway
- Access management along connecting roadways and around interchanges
- Land use and network plans in areas between the community and the bypass

TECHNICAL SUPPORT



Download a Bypass Basics brochure and presentation:

- [Bypass Basics brochure](#)
- [Considering a Bypass white paper](#)
- [Bypass webinar presentation](#)

Managing the Indirect Impacts of Bypasses on Small and Medium-Sized Communities in Florida

Karen Stappman and Kristen Williams
 This report provides a comprehensive overview of the indirect impacts of bypasses on small and medium-sized communities in Florida. It discusses the economic, social, and environmental impacts of bypasses and provides recommendations for managing these impacts.

Purpose: The purpose of this slide is to highlight the concept that major capacity improvements and construction of bypasses are very costly to the public.

Key Message: Projects to restore functional losses as a result of poor access management are akin to angioplasty or heart bypass operations: they are invasive, expensive, and painful and full function can never be completely restored.

Outcomes: Recognize that –

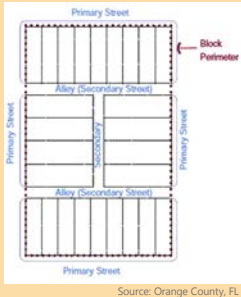
- 1) Loss of function due to poor access management is also bad for business.
- 2) Transportation function is difficult and expensive to install, yet can be destroyed very quickly.
- 3) Transportation and land use exist in a supply and demand relationship just like any economic system. Unless they are balanced together neither can succeed.

Suggestion None

VALUE OF ACCESS MANAGEMENT PROGRAMS

Local Plans and Ordinances

Manage access with:



- Street network plans and standards
- Form based codes
- Transit oriented development
- Mixed-use activity centers
- Overlay zoning
- Performance standards
- Parking lot cross access
- Complete streets projects
- Mid-block pedestrian crossings
- Driveway spacing standards
- Median policies
- ...And much more!

Source: Orange County, FL

MESSAGING

Studies show that most communities engage in access management for economic and livability reasons.

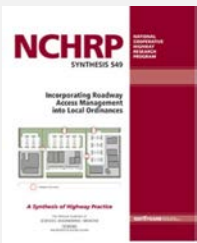
-NCHRP Synthesis 549

These reasons include attracting economic development, improving roadway and bicycle/pedestrian safety, increasing chances of receiving funding from the state or MPO for major roadway improvements, and enhancing community character.


Download and adapt this brochure

“We don’t want to be another ‘so and so’ “ is a common response, as more and more communities see the adverse impacts of poorly managed access down the road.

TECHNICAL SUPPORT



[NCHRP Synthesis 549](#)



[10 Ways To Manage Access.pptx](#)

Resources include model ordinances, PowerPoints, guidance documents, and brochures you can use to update and explain your program.

Program
Medians
Turn Lanes
Signals
Driveways
Network
Examples

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 12

Purpose: The purpose of this slide is to highlight the value of access management to local agencies that have implemented it.

Key Message: Adopting ordinances and developing access management plans and projects is a low-cost way to improve the transportation system, and protect the livability and economy of local communities.

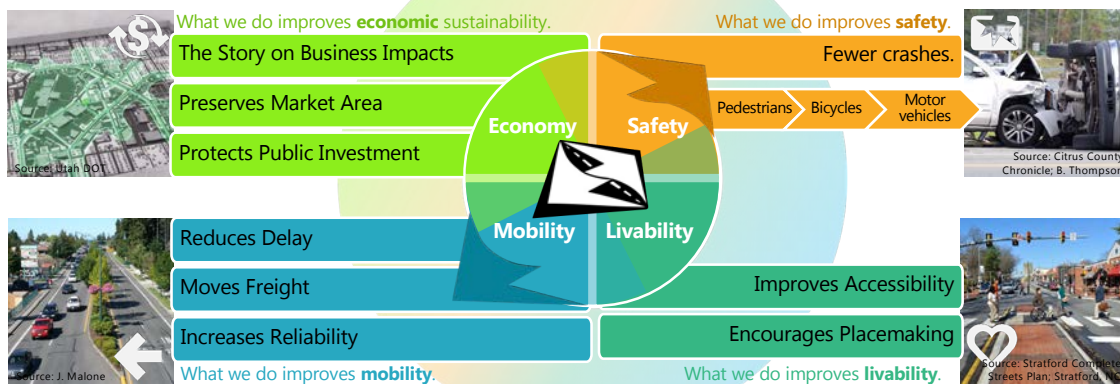
Outcomes: Recognize that –

- 1) Good planning and access management can attract investment, both public and private.
- 2) Driveway-ridden commercial strips are neither livable nor walkable.
- 3) Preventing these problems before they occur can save money.
- 4) Access management can support many different local planning objectives, including complete streets and placemaking.

Suggestion This would be a good time to explore some of the resources for local governments.

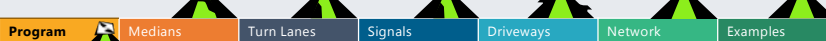
The Case for Access Management

Communicating the benefits is not easy. This toolkit can help you tell the story.



These are crosscutting issues. Fewer and less severe crashes improve the economy, decrease delay and make communities more livable. Network connectivity makes businesses more accessible, sustainable, and supports placemaking. Medians expand market area, improve aesthetics, and support pedestrian mobility.

Our Tools



ACCESS MANAGEMENT COMMUNICATION TOOLKIT 13

Purpose: The purpose of this slide is to introduce the idea that we should tie safety, mobility, livability, and economy and we should consider the quantitative and qualitative together in access management.

Key Message: The goal of this guide is to bring together the variety of research on access management and express the concept in terms of sustaining economic activity in a safe and efficient way that recognizes the public's investment in transportation infrastructure.


Outcomes: Recognize that –

- 1) While the costs of crashes and loss of mobility may be indirect, they are real.
- 2) While often difficult to monetize, costs in terms of livability are real.
- 3) Management of access connections does not have a measurable impact upon property value but failing to manage access does have a measurable and negative impact upon economic value.

Suggestion: It is suggested that you highlight the distinction between SPENDING money (often for immediate gratification) and INVESTING money (often sacrificing immediate gratification for longer term returns). Access management is an INVESTMENT.

VALUE OF ACCESS MANAGEMENT PROGRAMS

Safety



2 OUT OF 3 crashes involve left turns

1 out of 3 severe injury crashes involve left turns

10 times as many crossing-path crashes involve left turns versus right turns

22% involve a left turn at an intersection

Left turns are roughly **3 times** as likely as right turns to cause a fatal crash involving a pedestrian


for more information, visit www.accessmanagement.info/toolkit

MESSAGING


What we do improves safety.

- Each driveway introduces conflict points for drivers, pedestrians, and cyclists.
- Access spacing limits and separates conflict points. The more driveways along a corridor, the higher the likelihood of crashes.
- Medians improve safety by limiting left-turns to well-planned, designated locations.
- Turn lanes remove turning traffic from through lanes, reducing rear-end collisions.

A majority of driveway-related crashes involve left-turns.



Crossing/Angle

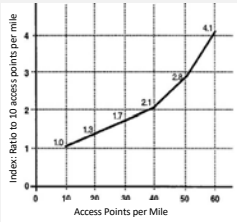


[T-bone Video](#)

Source: Insurance Institute for Highway Safety, Arlington, Virginia USA. www.iihs.org

TECHNICAL SUPPORT

The type and spacing of driveways and other intersections can significantly impact the number and severity of crashes. Research shows a clear correlation between crashes and access density.



Access Points per Mile	Ratio of 10 access points per mile
10	1.0
20	1.5
30	1.7
40	2.1
50	2.5
60	4.1

Source: NCHRP Report 420 (Indices estimated from various sources, see p. 42 for more details.)

See page 65 for links to safety tools

Program Medians Turn Lanes Signals Driveways Network Examples

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 14

Purpose: The purpose of this slide is to underscore the fact that the body of research on the link between access management and roadway safety is indisputable.

Key Message: There is no such thing as a “safe” access connection. Anywhere conflict points and speed differential are introduced there is risk introduced along with them.

Outcomes: Recognize that –

- 1) The link between safety and access management is undeniable.
- 2) The associated costs of access/intersection driven crashes are enormous.
- 3) The surface transportation system is one of the most dangerous public infrastructures in the country.

Suggestion: It is suggested that you explain that crashes arising from intersections and access connections are predictable and can be monetized. Methods for doing so are explained in the final report for the research.

NHTSA reports that an estimated 36,120 people lost their lives in motor vehicle crashes in the U.S. in 2019 – an average of 99 people per day. Millions more people were injured or had property damage only. Many of these crashes could have been prevented through access management.

VALUE OF ACCESS MANAGEMENT PROGRAMS

Economy

SAFE ACCESS IS GOOD FOR BUSINESS

U.S. Department of Transportation
Federal Highway Administration

You may be reading this primer because your state transportation agency or local government has told you about plans that will affect access to your business. They may be planning to install a raised median on your roadway, to close a median opening, or to reconfigure your driveway. Perhaps your request for a driveway is under review or the regulating agency has imposed conditions on its approval. Or, maybe the state or local agency is planning a new access policy and you have questions or concerns about the economic effects of these changes.

Whatever the reason, it is important for you to understand the basis for these changes and how they might affect your business. This primer will address questions you may have about access management and its effect on business activity and the local economy. It focuses on economic concerns that may arise in response to proposed access changes or policies, including potential impacts on business activity, freight and deliveries, parking for customers, and property or resale value of affected property.

TECHNICAL SUPPORT
Freight and Market Area Impacts

Delay can increase shipping and distribution costs proportionally; that is, a 10% increase in travel time along a corridor can increase shipping costs by up to 10% for that segment.

Reduction in Avg System Speed	Market Area Relative to Previous Size
0%	100%
10%	81%
20%	65%
30%	45%
40%	36%
50%	25%

What we do improves the economy.

Preserving Market Area

- Access management helps preserve the market area of retail businesses by preserving the efficient flow of traffic. Even only a 10% increase in travel time can decrease market area by about 19%.

Moving Freight

- Inefficient transportation in supply chain links results in increasing transportation costs, which affects product pricing, production cycles, competitive position in the marketplace, and can make a state or region a less economically efficient location for new business ventures.

Protecting Public Investment

- Managing access and providing a road network for local circulation helps transportation corridors operate safely and efficiently over a longer period, preventing or delaying the cost and major disruption of adding lanes.

Safe access is good for business.

The Story on Business Impacts

- Good access management improves the economic environment for a corridor and despite concerns, medians have not been shown to hurt businesses. Most business impacts happen during roadway reconstruction and can be mitigated by proactively maintaining vehicular, bicycle and pedestrian access during construction.

Economic Fact Sheet.pdf

Program Medians Turn Lanes Signals Driveways Network Examples ACCESS MANAGEMENT COMMUNICATION TOOLKIT 15

Purpose: The purpose of this slide is to introduce the fact that the costs of failing to manage access do not fall exclusively upon the public.

Key Message: In the immediate and short term the going-in costs of good access management can be much higher than direct, convenient access connection to an abutting highway. However, these benefits are ultimately outweighed by loss of mobility and market area.


Outcomes: Recognize that –

- 1) The goal of a property developer is sometimes to build the project as inexpensively as possible to realize the maximum profit when the property is “flipped”.
- 2) The going-in costs of developing a property with good access management can sometimes price smaller owners out of the market.
- 3) Unclear or inconsistently applied access management requirements introduce risk to the development process. Risk means higher costs.

Suggestion: None

VALUE OF ACCESS MANAGEMENT PROGRAMS

Mobility



Source: Utah DOT

Managing and retrofitting access reduces crashes and delay, making travel times more reliable. This short video demonstrates the how medians can preserve market area.

MESSAGING

What we do improves mobility.

Reduced Delay

- Right- and left-turn lanes increase intersection capacity and decrease delay. When drivers must turn left from a through lane, for example, those following in the lane can experience lengthy delays as they wait.
- By managing the spacing and location of traffic signals, we can move traffic more efficiently at appropriate speeds and with less delay.

Signals have a profound adverse impact on travel time throughout the network.

- Each individual driveway creates measurable delay.
- Managing and retrofitting driveway access reserves curb space for transit, pedestrians, and bicyclists.
- Decreasing the density of driveways improves conditions for pedestrians and bicyclists.

Improved Accessibility

- Connected street networks, pedestrian connections into developed sites, and midblock crossings support mobility for pedestrians, cyclists, and persons with disabilities. Local traffic can better circulate without using major roads.
- Moving driveways away from signalized intersections improves the ease of access to and from corner businesses by reducing the chances that the driveway will be blocked and improving on-site circulation.

TECHNICAL SUPPORT

Spreadsheet

[AM_Mobility_Tools_Final_Modules.xlsx](#)

Major roadways in urban areas require a coordinated signal system to maintain the efficient movement of traffic. Poorly located signals lead to delay that cannot be reduced by signal coordination. This type of delay is often caused by the installation of traffic signals for new developments at locations where progression may not be maintained.

Access points introduce conflicts and friction into the traffic stream as vehicles enter and leave the through traffic lanes. The typical reduction in free-flow speed (for one direction) is approximately 0.25 mph per access point and 0.005 mph per right-turning movement per hour per mile of road.

Measure the economic value of mobility

ECONOMIC FACTSHEET

[Economic Fact Sheet.pdf](#)

Program Medians Turn Lanes Signals Driveways Network Examples

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 16

Purpose: The purpose of this slide is to introduce the fact that inefficient traffic flow with many delays and disruptions can also be monetized as a cost.

Key Message: Our goal with this guide is to give the user tools that tie the four pillars of safety, economy, mobility, and livability together, and discuss both the qualitative and quantitative B/C with an audience.

Outcomes: Recognize that –

- 1) The goal is not always to drive faster, but rather to get to one's destination with less delay.
- 2) Often our goal, therefore, is to reduce delay and manage the introduction of speed differential.
- 3) Often even driving a few seconds slower can get you there faster and also have a positive effect upon market area AND safety for ALL users.

Suggestion: It is suggested that you highlight the need for recognizing the functional purpose of the roadway. It is possible to realize an ideal speed AND serve the purposes of mobility and safety through good access management.

VALUE OF ACCESS MANAGEMENT PROGRAMS






Photo by J. Malone

Managing and retrofitting access is a key part of revitalizing commercial corridors.

These photos show how Bridgeport Way, in University Place, Washington was transformed into a safer, more livable main street for the community.
http://medbikesafe.org/PEDSAFE/casestudies_detail.cfm?CM_NUM=22&CS_NUM=17

MESSAGING

What we do improves livability.

- Reducing delay and congestion reduces emissions and fuel consumption.
- Making a corridor safer for non-motorized users benefits the environment, and supports social priorities like Safe Routes to School, Vision Zero, and Complete Streets.
- A 4-lane road with good access management may delay or even prevent the need for a 6-lane road that decreases the livability of a community.

Here? **Where would you want to live or do business?**

Or here?




Photo by J. Malone

TECHNICAL SUPPORT

Access management aligns with the objectives for a sustainable transportation system:

- Allows the basic access needs of individuals, companies and societies to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between generations;
- Is affordable, operates fairly and efficiently, offers choice of transport mode, and supports a competitive economy, as well as balanced regional development; and
- Limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and uses non-renewable resources at or below the rates of development of renewable substitutes, while minimizing the impact on the use of land and the generation of noise.

European Ministers Council of Transport

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 17

Purpose: The purpose of this slide is to acknowledge the importance of livability to many stakeholder groups. Good access management supports livability goals.

Key Message: Though often very difficult to quantify or monetize, goals, such as accommodating non-motorized facilities, architectural features, and green space, can be advanced by access management. These benefits can be compelling for local stakeholder groups.

Outcomes: Recognize that –

- 1) Every place you have an access connection you have declared that space for motor vehicles.
- 2) Every place you have an access connection you have removed ALL separation between motorized and non-motorized users of the facility.
- 3) Raised medians may introduce U-turns and more indirect routes, but they also provide opportunity to accommodate bicycle/pedestrian refuge and landscaping.

Suggestion: Discuss the Bridgeport Way case study.

VALUE OF ACCESS MANAGEMENT PROGRAMS

Program Success Factors

MESSAGING

Legislation and Policy	Strong authority, derived from legislation and/or regulations, is the foundation for a successful access management program.
Access Classification System (ACS)	An ACS provides a framework for implementing access management on a systemwide basis.
Institutional Commitment	Access management is most successful when an agency has the institutional commitment to implement the program and integrate it into their daily business functions.
Staffing	Implementation works best when transportation agencies can dedicate staff to access management.
Access Champion	Programs are often not successful without a champion to advance the access management agenda.
Legal Case History	State DOTs with a strong case history of winning court cases are more empowered in making future access-related decisions.
Case Studies	Case studies that illustrate the benefits of access management are instrumental in convincing decision makers of its merits.
Education and Training	Ongoing access management training for agency staff is crucial.
Outreach Activities	Elected officials, the development community, and the general public need to be educated about the rationale and benefits of access management to understand its public value.
Stakeholder Cooperation	A defining characteristic of a successful access management plan or process is the level of cooperation and coordination achieved among affected property owners and the agencies involved.
Access Review Committee	Having a review committee and written variance review process provides flexibility, while helping maintain consistency of policy during implementation.
Monitoring and Evaluating	Any access management program will benefit greatly from continuous monitoring and evaluation to identify issues and resolve problems.

TECHNICAL SUPPORT

"Because it does not meet our standards" is **NOT a sufficient explanation for denying an access request.**

- If you cannot find agreement, be sure that your decision is based on solid traffic engineering, as well as safety principles.
- Allow more flexibility on roadways that are less critical and more strongly enforce standards on the higher priority network.

References:
 Gluck, J. (2010). NCHRP Synthesis 404: State of the Practice in Highway Access Management, Washington, D.C.: Transportation Research Board of the National Academies.

Program Medians Turn Lanes Signals Driveways Network Examples

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 18

Purpose: The purpose of this slide is to point out success factors for access management programs to be most effective in accomplishing benefits and reducing costs.

Key Message: Access management is a process, and benefits from well thought-out procedures. If access management is not properly implemented, it can lead to legal action or legislative changes that increase costs to the public.

Outcomes: Recognize that –

- 1) Regulatory standards, with written procedures for flexibility from those standards provide a strong foundation for success.
- 2) If access requests are denied or approved with changes, a clear rationale for that decision is important to acceptance. Not just because it doesn't meet standards.
- 3) Staff training is essential, as is ongoing monitoring for problem areas and a willingness to improve the process.

Suggestion: Discuss how to provide flexibility and consistency in application of standards. Consider why inconsistent application can create liability for the agency and/or undermine an entire program.

Medians and Median Openings



MESSAGING

Safety	Economy	Mobility	Livability
 <p style="font-size: x-small; text-align: center;">Source: J. Malone</p>	 <p style="font-size: x-small; text-align: center;">Source: Map Data © 2019 Google</p>	 <p style="font-size: x-small; text-align: center;">Source: Map Data © 2019 Google</p>	 <p style="font-size: x-small; text-align: center;">Source: F. Broen</p>
<p>Medians improve safety by limiting left-turns and crossings to well-planned locations and providing a refuge for pedestrians to cross a major roadway.</p>	<p>Median treatments may increase the value of property by enhancing the appearance of a transportation corridor and increasing the flow of traffic into the area. Any treatment that improves traffic flow can benefit the economy in a variety of ways.</p>	<p>Installing a median often reduces through-traffic delay by reducing crashes and the amount of deceleration related to turns and crossing maneuvers.</p>	<p>Medians provide space for landscaping, art, and other aesthetic treatments that improve the character of a roadway corridor or gateway to a community.</p>

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 19

Purpose: The purpose of this slide is to introduce the topic of medians and median openings.

Key Message: This is one of the topic areas to be analyzed by the four pillars of safety, mobility, economy, and livability. The spreadsheets (where available) are included in the Toolkit.


Outcomes: Recognize that –

- 1) Medians afford a variety of benefits to the public.
- 2) Non-traversable medians are often opposed and/or openings demanded for convenience of access.
- 3) This convenience costs a great deal more in terms of delay and crashes than the small cost of adverse travel.

Suggestion: Point to the section on Medians in the final report that discusses the tools and their application.

VALUE OF MEDIANS

Safety



Source: St George News, Utah

Median Type and Driveway Density

Reducing Left-Turn Conflicts

- Medians reduce left-turn conflicts between motor vehicles and with other roadway users. More than two-thirds of all access-related collisions involve left-turning vehicles. Left turns represent the highest injury and fatality crashes on at-grade arterials.


Increasing Pedestrian and Bicycle Safety

- Medians increase pedestrian and bicycle safety by reducing left-turn conflicts and by incorporating safe crossing refuges into the median design.

Medians improve safety by reducing left-turn crashes and conflicts.


Converting a TWLTL to a raised median reduces yearly pedestrian crashes by

46%



Converting a TWLTL to a raised median reduces yearly crashes by

27%



Use spreadsheet to calculate your own values

Spreadsheet

[MedianTypeDwyDensity.xlsx](#)

Calculates reduction in crashes by installing a raised median on an undivided roadway or roadway with a two-way left-turn lane (TWLTL).

Impact of Median Installation:

Total Crashes (All Severities)	2.76
PDO Crashes	7.22


Base Condition: Absence of raised median.

TECHNIQUES

- Undivided
- TWLTL
- Divided

OUTPUTS

- Total Crashes
- PDO Crashes



[Spreadsheet](#) [FACTSHEETS](#)
[Median and TWLTL Fact Sheet.pdf](#)

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 20

Purpose: The purpose of this slide is to introduce the spreadsheet tool for medians.

Key Message: The spreadsheets are included in the Toolkit and their use is detailed in the final report.


Outcomes: Recognize that –

- 1) The spreadsheet tools are based on research and users should understand their basis and any limitations (see final report).
- 2) A Fact Sheet is provided in the Toolkit that illustrates tool outputs.
- 3) The outputs show how medians benefit safety performance and the infographics in this slide and PowerPoint on the Value of Medians can be used to communicate about your project.

Suggestion: Demonstrate the MedianType.xlsx safety tool.

VALUE OF MEDIANS

Median Openings




Source: Map Data © 2019 Google

MESSAGING

- Directional median openings offer opportunities for left-in, left-out, and/or U-turn movements, while reducing mid-block and severe crashes often associated with full openings that allow all movements.
- Too many driveways near a median opening with heavy turning volumes increase the frequency of vehicle conflicts and the potential for crashes.

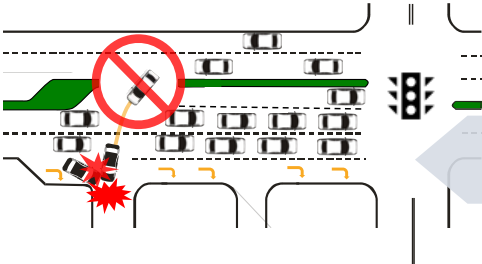
-NCHRP 929

TECHNICAL SUPPORT



Dixon, K., et al. (2020). *Unsignalized Full Median Openings in Close Proximity to Signalized Intersections*. NCHRP Report 929. Transportation Research Board of the National Academies.

When median openings are too closely spaced, they cause a variety of safety and operational problems.



Median openings across turn lanes and near signals are a crash waiting to happen.

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ACCESS MANAGEMENT COMMUNICATIONS TOOLKIT 21

Purpose: The purpose of this slide is to introduce the safety and operational issues associated with unsignalized full median openings.

Key Message: Median openings need to be managed or the safety performance of the medians can be compromised for the reasons shown.

Outcomes: Recognize that –

- 1) Research has been done to document the problems with unsignalized medians openings close to signalized intersections.
- 2) The results of this research are integrated into a spreadsheet tool.

Suggestion: See next slide.

VALUE OF MEDIANS Safety of Median Openings

223% increase
Crashes with 2 turn bays versus no median opening

Median Openings Near Signalized Intersections

- Full movement median openings that allow left-turns in and out of driveways can be dangerous.
- Left-turns out are the most dangerous maneuver resulting in the most serious injuries
- Left-turns in are the second most dangerous

28%
Left-turns in

44%
Left-turns out

About 72% of all driveway crashes involve left turns.
Source: FHWA, Access Management in the Vicinity of Intersections, FHWA-SA-10-002.

Spreadsheet

[Median Opening Near Signalized Intersection.xlsx](#)
 Calculate number of crashes for median openings near signalized intersections for:

- No median opening
- Median opening with one turn bay
- Median opening with two turn bays

Outputs:	
Total Number of Crashes	3.23

[MedianOpeningNearSignalizedIntersection.xlsx](#)

[Spreadsheet](#) [Fact Sheets](#)
[Median Opening Signal Int Fact Sheet.pdf](#)

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 22

Purpose: The purpose of this slide is to introduce the spreadsheet tool for median openings near signalized intersections.

Key Message: The spreadsheets are included in the Toolkit and their use is detailed in the final report.

Outcomes: Recognize that –

- 1) The spreadsheet tools are based on research and information on their basis and limitations is provided in the final report.
- 2) A Fact Sheet is provided in the Toolkit that illustrates tool outputs.
- 3) The outputs show how median openings and turn bays too close to signalized intersections adversely impact safety performance.
- 4) The infographics in this slide and PowerPoint on the Value of Medians and Median Openings can be used to communicate this issue.

Suggestion: Demonstrate the MedianOpeningNearSignalizedIntersection.xlsx tool.

VALUE OF MEDIANS

Safety of U-turns

study in Orlando shows most customers do not find U-turns an inconvenience

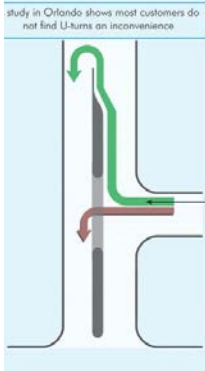


Photo by F. Broen

18%

total crash rate reduction

27%

injury fatality crash rate reduction

John Lu, Ph.D., P.E. University of South Florida 2001

MESSAGING

Medians support safe U-turns

- Studies show that on busy multilane arterial roadways, U-turns are a safer alternative to direct left-turns.
- Injury crashes were reduced by 27% with right-turns followed by U-turns, instead of direct left-turns out of driveways.

U-Turns are safer than direct left turns.

- Many new intersection types provide safe U-turn opportunities.
 - Roundabout
 - Bowtie
 - Michigan U-turn
 - Jughandle
 - Restricted Crossing U-Turn (RCUT)


TECHNICAL SUPPORT

A Florida study of 250 sites where drivers could either make a direct left-turn (DLT) out of a driveway or a right-turn followed by a U-turn (RTUT) at the next intersection or opening found that on six-lane arterials, RTUTs had an 18% lower crash rate and 27% lower injury and fatality rate than DLTs and U-turning drivers experienced less delay than those making direct left-turns from a driveway under high volume conditions. The findings were statistically significant at a 95% confidence level.

References:

Lu, J., S. Dissanayake, N. Castillo, and K. Williams. (2001). *Methodology to Quantify the Effects of Access Management on Roadway Operations and Safety*. (3 volumes). Florida Department of Transportation.

Right turns followed by U-turns are often much safer than direct left-turns from a driveway, especially on high-volume, high-speed, or congested roadways.



Source: Map Data © 2019 Google

Program **Medians** Turn Lanes Signals Driveways Network Examples

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 23

Purpose: The purpose of this slide is to introduce the topic of U-turn safety.

Key Message: Opponents of medians may question the safety of U-turns. Research shows the safety value of U-turns over direct left turns from driveways.

Outcomes: Recognize that –

- 1) U-turn safety is a topic that often needs to be communicated.
- 2) This slide and the research it references can help communicate that U-turns are often safer than direct left turns from driveways.
- 3) Unsafe U-Turn locations will be signed no U-turn.
- 4) The information in this slide and PowerPoint on the Value of Medians and Median Openings can be used to communicate this issue.

Suggestion: Mention that many new intersection types can accommodate U-turns safely, including roundabouts and Restricted Crossing U-turn openings.

VALUE OF MEDIANS

Economy



Source: City of Charlotte, NC – Charlotte WALKS Pedestrian Plan

Economic Value of Safety

- Median projects reduce the number of crashes and improve overall safety, reducing this cost to society.
- Crashes represent a cost to society in dollars from injuries, fatalities, and property damage.

What is the value of a life? Is it less than a direct left-turn into a business?

- Median treatments may increase the value of property by enhancing the appearance of a transportation corridor and by improving the efficiency of traffic flow through the area.
- Business activity may also increase, due to improvements in accessibility and traffic flow.

Spreadsheets

[Safety and Mobility Economic Value.xlsx](#)
[MedianTypeDwyDensity.xlsx](#)

The Safety and Mobility Economic Value spreadsheet tool calculates the cost savings of crash reductions calculated using other spreadsheet tools.

Costs to society:

- Medical
- Lost work time
- Impact to family
- Property damage
- Decreased mobility

Safety Economic Value

calculates economic value of crash reduction to society

[Spreadsheet](#)

FACTSHEETS

[Economic Fact Sheet.pdf](#)

Program Medians Turn Lanes Signals Driveways Network Examples

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 24

Purpose: The purpose of this slide is to introduce the economic value of safety associated with medians.

Key Message: The cost to society of crashes is a metric that can help demonstrate the economic value of median projects to society.

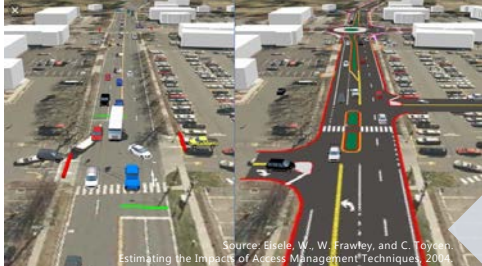
Outcomes: Recognize that –

- 1) A spreadsheet tool is included in the Toolkit for this purpose and is detailed in the final report.
- 2) The spreadsheet tools are based on research and users should understand their basis and any limitations.
- 3) A Fact Sheet is provided in the Toolkit that illustrates the tool calculations and outputs.
- 4) The value of human life and limb is much more than that of the convenience of or desire for a direct left turn into one’s business.
- 5) The tool outputs and messages can be used to communicate the value of medians.


Suggestion: Demonstrate the Safety and Mobility Economic Value.xls spreadsheet tool. Use of the tool to estimate the cost of delay will be discussed in the signal spacing module.

VALUE OF MEDIANS

← Mobility



Source: Eisele, W., W. Frawley, and C. Toyon. Estimating the Impacts of Access Management Techniques, 2004.



Source: Stratford Complete Street Plan, Stratford, NC

MESSAGING

- Installing a **raised median** on an undivided roadway may reduce delay to through traffic.
- A raised median and TWLTL yield similar delays to arterial drivers (although the raised-curb median yields slightly higher delays than the TWLTL at the highest left-turn and through volume levels).
- Simulation modeling is the most effective and most expensive method to demonstrate the proposed operational impact of adding a median.

By reducing crashes, travel time reliability is improved.

Medians simplify mid-block crossings for pedestrians, cyclists, and other users.

- It's not just about autos, it is also about pedestrians and cyclists.
- A raised median can improve the ability of pedestrians and cyclists to cross multilane roadways by supporting the design of a refuge in the middle of the roadway at key pedestrian crossings.

TECHNICAL SUPPORT

When a raised median is installed on an undivided roadway and left-turn lanes are provided at median openings, through traffic will experience less delay, because vehicles stopped to make a left-turn will no longer block through vehicles. The installation of a raised median may have a similar effect on buses as for motor vehicles.

A median can be designed with a bus-only turn lane to mitigate a potential negative impact to bus turning movements.

There are methods in Highway Capacity Manual (HCM6) for measuring the value of medians to mobility, include estimating:

- The change in motor vehicle free-flow speed resulting from converting an undivided roadway or TWLTL to a raised median.
- The change in average bus speeds and bus LOS resulting from improvements in midblock running speed due to the installation of a non-traversable median.

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 25

Purpose: The purpose of this slide is to introduce users to the mobility benefits of medians.

Key Message: Medians do improve mobility for both drivers and cyclists or pedestrians.

Outcomes: Recognize that –

- 1) Raised medians have mobility benefits to through traffic and to pedestrians or cyclists needing to cross a major road.
- 2) More advanced tools like simulation or Highway Capacity Manual methods are needed to measure the changes in vehicular delay.
- 3) The safety value of medians further increases their value to mobility, as crashes can cause lengthy delays.

Suggestion: Refer to the final report for more details on how to measure the mobility impacts of medians.

VALUE OF MEDIANS




Photo by K. Williams

The appearance and safety of an area is important to customers and investors, as it affects property values.

MESSAGING

- Medians provide space for landscaping, art, and other aesthetic treatments that improve the character of a major roadway corridor.
- Medians can also create an attractive gateway into a community or business district, especially when combined with a roundabout for sign placement.

TECHNICAL SUPPORT







SEARCH: "median beautification" for more ideas

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FACTSHEETS

[Livability Fact Sheet.pdf](#)

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 26

Purpose: The purpose of this slide is to introduce users to the livability benefits of medians.



Key Message: Medians can enhance the aesthetics of any corridor or district.

Outcomes: Recognize that –


- 1) Raised medians have aesthetic, safety, and related indirect economic benefits, that can increase the livability of a corridor or district.
- 2) The livability benefits of medians can be helpful in obtaining public support for these projects.
- 3) A livability Fact Sheet is provided with the Toolkit to convey the benefits of medians and other access management strategies to livability.

Suggestion: Explore the contents of the Livability Fact Sheet.

VALUE OF MEDIANS

StreetPlan.net is a free web-based tool for creating Complete Streets in just minutes. StreetPlan analyzes your design as you make it, giving you **Red / Yellow / Green** Best Practice guidance from *"Designing Walkable Thoroughfares."*


Another popular cross-section tool is Streetmix.net 

MESSAGING


Communicate livability benefits of medians using cross-section tools.

Free tools are available online that allow anyone to quickly generate ideas for redesigning a street. These tools can be used to explore alternatives, like medians versus continuous two-way left-turn lanes and communicate the relative impacts on livability. They can also help stakeholders more readily understand the access needs of different modes of transportation and the trade-offs involved when right-of-way is limited.

Cross section tools can show how medians add to complete streets and placemaking.




TECHNICAL SUPPORT



Guidance Based on ITE/CNU Best Practices

Introduction to StreetPlan.net



5 min tutorial

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 27

Purpose: The purpose of this slide is to highlight online cross-section tools that can be used to easily visualize medians and other treatments.

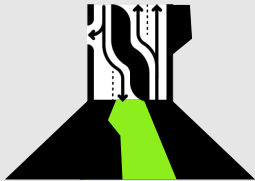
Key Message: Cross-section tools can be helpful in demonstrating how medians can enhance the aesthetics of a corridor or district and contribute to Complete Streets.

Outcomes: Recognize that –



- 1) Easy to use tools are available online that generate conceptual cross-section designs.
- 2) These simple visualizations can be helpful in obtaining public support for median projects by showing their aesthetic value.
- 3) The tools are not provided in the toolkit, but can be accessed at the websites noted in the slide.

Suggestion: Demonstrate the cross-section tools.

Turn Lanes



MESSAGING

Safety	Economy	Mobility	Livability
  <p style="text-align: center;">Excessive Deceleration</p> <p style="text-align: center; font-size: x-small;">Source: Florida DOT</p> <p style="font-size: x-small;">Excessive deceleration in the through lane by left-turning vehicles can increase crashes and the speed differential with through vehicles.</p>	 <p style="font-size: x-small;">Source: Map Data © 2019 Google</p> <p style="font-size: x-small;">Auxiliary lanes provide potential economic benefits by easing the flow of traffic resulting in travel time savings, improving safety, and reducing the likelihood of crashes, which results in safety cost savings.</p>	 <p style="font-size: x-small;">Source: Map Data © 2019 Google</p> <p style="font-size: x-small;">A left- or right-turn lane increases intersection capacity and decreases delay.</p>	 <p style="font-size: x-small;">Turn lanes reduce the need for drivers to decelerate in response to turning vehicles and then accelerate to continue forward. This reduces fuel consumption and emissions.</p>

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 28

Purpose: The purpose of this slide is to introduce the topic of turn lanes.

Key Message: This is one of the techniques to be analyzed by the four pillars of safety, mobility, economy, and livability. The spreadsheets in the Toolkit for turn lanes are discussed in this section.

Outcomes: Recognize that –

- 1) There are cautions and limitations to any research. The user is strongly cautioned to review the discussion of limitations found in the documentation.
- 2) Turn lanes can be very expensive to install but are very effective at reducing speed differential, which ties safety and mobility together.
- 3) Turn lanes can pose issues for bicyclists and pedestrians, and these effects should be weighed against benefits to motor vehicles.

Suggestion: None.

Left-turn Lanes

Photo by P. Demosthenes

In dense urban areas where turn lanes are not possible, **hardened-centerline treatments** can reduce conflicts between left-turning vehicles and pedestrians by **70%**, and slow down left-turning traffic at intersections.

Hardened-Centerline Treatment

Source: Insurance Institute for Highway Safety, Arlington, Virginia USA. www.iihs.org

Left-Turn Lanes

Turn lanes reduce the risk of serious rear-end collisions.

Signal Controlled Intersection

19%
fewer crashes

Stop Controlled Intersection

47%
fewer crashes

Examples represent urban/suburban 4-leg, AADT Major=40,000 vpd and AADT Minor= 1000 vpd, left-turn bay on two approaches

Spreadsheets

[LT_3LegIntersections.xlsx](#)
[LT_4LegIntersections.xlsx](#)

Spreadsheets estimate predicted crashes of adding a left-turn lane for different roadway and intersection types and traffic volumes.

Outputs:

Total Number of Crashes	2.27
Safety Effect of LT Lane Installation:	
Total Crashes (All Severities)**	2.05

Urban/Suburban- Signalized- 4-Leg

- Urban/Suburban- Stop Controlled- 4-Leg
- Rural Two Lane-Signalized- 4-Leg
- Rural Two Lane-Stop Controlled-4-Leg
- Rural MultiLane-Signalized- 4-Leg
- Rural MultiLane-Stop Controlled-4-Leg

TECHNIQUES

- Urban
- Rural
- 4-Leg
- Signalized
- Stop Controlled

OUTPUTS

- Total Crashes

[Spreadsheet](#) | [FACTSHEETS](#)

[Four-Leg](#) | [Three-Leg](#)

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 29

Purpose: The purpose of this slide is to introduce the safety implications of turn lanes and the left-turn lane safety spreadsheet tools.

Key Message: The difference in speed between turning and through vehicles creates a crash risk that can be moderated by installation of left-turn lanes.


Outcomes: Recognize that –

- 1) The spreadsheet tools are based on research and users should understand their basis and any limitations (see final report).
- 2) Two tools are included in your Toolkit (LT-3LegIntersections.xlsx, LT-4LegIntersections.xlsx) for use in estimating crash reduction of providing a left-turn lane(s) at three-leg intersections or four-leg intersections.
- 3) Two Fact Sheets are provided in the Toolkit that illustrate the tool calculations and outputs.
- 4) The tool outputs and messages here can be used to communicate the value of turn lanes.

Suggestion: Demonstrate the spreadsheet tools.

VALUE OF TURN LANES

Safety



Left-turn and Right-turn Lanes

Turn lanes reduce the potential for high-speed rear-end collisions by **removing stopped or slower turning vehicles from the through lanes.**

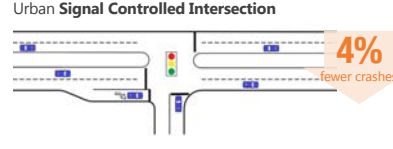
The difference in speed between vehicles on the roadway network or "speed differential" is a key predictor of crash potential.

This risk of crashes increases exponentially as the travel speed on a roadway increases. A speed differential of 20 mph increases the likelihood of a crash by 3.3 times compared to a speed differential of 10 mph. A speed differential of 35 mph makes the likelihood of a crash 90 times greater.

Right-Turn Lanes

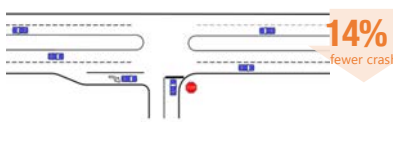
Turn lanes reduce the potential for rear-end crashes between turning and through vehicles.

Urban Signal Controlled Intersection



4% fewer crashes

Rural Multi-Lane Stop Controlled Intersection



14% fewer crashes

Examples represent AADT Major= 40,000 vpd and AADT Minor = 1000 vpd

Spreadsheets

[RT-3LegIntersections.xlsx](#)
[RT-4LegIntersections.xlsx](#)

Spreadsheets estimate predicted crashes of adding a right-turn lane for different roadway and intersection types and traffic volumes.

Outputs:

Total Number of Crashes	6.44
Safety Effect of RT Lane Installation:	
Total Crashes (All Severities)	5.54
Urban/Suburban- Signalized- 3-Leg	
Urban/Suburban- Stop Controlled- 3-Leg	
Rural Two Lane-Stop Controlled- 3-Leg	
Rural MultiLane-Stop Controlled- 3-Leg	

TECHNIQUES

- Urban
- Rural
- 3-Leg or 4-Leg
- Signalized
- Stop Controlled

OUTPUTS

Total Crashes

[Spreadsheet](#) [FACTSHEETS](#)
4-Leg RT 3-Leg RT

Program
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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 30

Purpose: The purpose of this slide is to offer additional details on the safety implications of turn lanes and introduce the right-turn lane safety spreadsheet tools.


Key Message: The difference in speed between turning and through vehicles creates a crash risk that can be moderated by installation of right-turn lanes.

- Outcomes:** Recognize that –
- 1) The spreadsheet tools are based on research and users should understand their basis and any limitations (see final report).
 - 2) Two tools are included in your Toolkit (RT-3LegIntersections.xlsx, RT-4LegIntersections.xlsx) for use in estimating crash reduction of providing a right-turn lane(s) at three-leg or four-leg intersections.
 - 3) Two Fact Sheets are provided in the Toolkit that illustrate the tool calculations and outputs.
 - 4) The tool outputs and messages here can be used to communicate the value of turn lanes.
 - 5) More details on the tools are provided in the final report.

Suggestion: Demonstrate the spreadsheet tools. Discuss their application and limitations.

VALUE OF TURN LANES

Economy



Source: Map Data © 2019 Google

MESSAGING

- Turn lanes benefit the economy by easing the flow of traffic into a site, reducing through traffic delay, and reducing the likelihood of crashes. These benefits can be represented in dollars as cost savings.

Turn lanes provide customers with safe and convenient access.

• Use this spreadsheet tool to evaluate the cost savings associated with fewer crashes when installing turn lanes.

TECHNICAL SUPPORT

Spreadsheet

[Safety and Mobility Economic Value.xlsx](#)

Transportation impact studies evaluate the need for turn lanes and require they be installed where indicated as part of the development plan. Many state and local agencies require applicants to install the turn lanes needed for safe access into a site as part of the development project. The latest warrants for auxiliary lanes recommended for agency use are based on benefit-cost analysis and can be found in the TRB Access Management Manual (Williams, et al., 2014).

Left-turning traffic is challenging to manage where demand is high. Alternative intersection designs (e.g., roundabout, Michigan U-Turn, RCUT, etc.) can address this issue by rerouting left-turns or accommodating them at locations where turning conflicts would be reduced.

[Safety and Mobility Economic Value.xlsx](#)

[Spreadsheet](#) [Fact Sheets](#)

[Economic Fact Sheet.pdf](#)

Program Medians **Turn Lanes** Signals Driveways Network Examples

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 31

Purpose: The purpose of this slide is to introduce the economic value of turn lanes.

Key Message: The cost to society of crashes is a metric that can help demonstrate the economic value of turn lane additions to society.

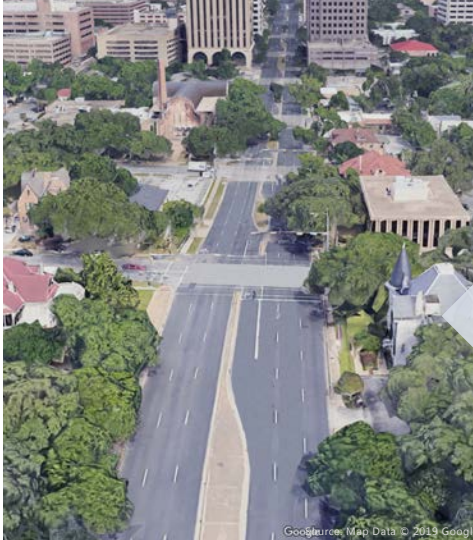
Outcomes: Recognize that –

- 1) The spreadsheet tools are based on research and users should understand their basis and any limitations (see final report).
- 2) A spreadsheet tool is included in the Toolkit for this purpose and is detailed in the final report.
- 3) A Fact Sheet is provided in the Toolkit that illustrates the tool calculations and outputs.
- 4) The tool outputs and messages can be used to communicate the value of turn lanes.

Suggestion: Demonstrate the Safety and Mobility Economic Value.xls spreadsheet tool.

VALUE OF TURN LANES

← Mobility

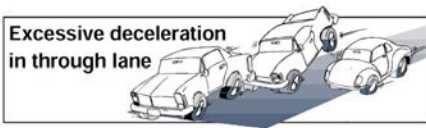


Google/Google Map Data © 2013 Google

Left-Turn Lanes


- When left-turns are made from a through lane, following vehicles are blocked and **significant delay** can occur.
- A left-turn lane increases intersection capacity and decreases delay.
- One of the basic principles of access management is the removal of slow-moving turning vehicles from faster moving through traffic. The difference in speed between vehicles on the roadway network or “speed differential” is a key predictor of crash potential.

Left-turn lanes decrease delay to through traffic.



Excessive deceleration in through lane

Spreadsheets

 [AM_Mobility_Tools_Final_Modules.xlsx](#)

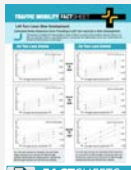
Spreadsheet options estimate predicted delay based on the presence of a left-turn lane


Outputs


Estimated intersection delay reduction for existing site	1.3	Seconds per Vehicle
Estimated intersection delay reduction for new development	2.6	Seconds per Vehicle

TECHNIQUES
Left-Turn Lane

OUTPUTS
Delay per vehicle



 Spreadsheet

 FACTSHEETS

[Mobility Fact Sheets Left-Turn Lanes \(Existing Intersection-Driveway\).pdf](#)

[Mobility Fact Sheets Left-Turn Lanes \(New Development\).pdf](#)

Program Medians **Turn Lanes** Signals Driveways Network Examples

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 32

Purpose: The purpose of this slide is to introduce the mobility implications of turn lanes and the left-turn lane spreadsheet tool in the mobility module.

Key Message: Installation of left-turn lanes can increase intersection capacity and decrease delay.


Outcomes: Recognize that –

- 1) The spreadsheet tools are based on research and users should understand their basis and any limitations (see final report).
- 2) The Left-turn Lane mobility module estimates reduction in delay from adding a left-turn lane at an unsignalized intersection at an existing site and at a new development site on four-lane and two-lane arterial roadways.
- 3) Two Traffic Mobility Sheets are provided in the Toolkit that illustrate the tool calculations and outputs.
- 4) The tool outputs and messages here can be used to communicate the value of turn lanes.

Suggestion: Demonstrate the spreadsheet tools.

VALUE OF TURN LANES

Mobility



Right-Turn Lanes

- When right-turns are made from a through lane, following vehicles are blocked and significant delay can occur.
- A right-turn lane increases intersection capacity and decreases delay by allowing right-turning vehicles to turn right and proceed through the intersection.

Turn lanes increase intersection capacity and decrease delay for right-turning vehicles.

Based on a peak-hour volume of 800 through vehicles, providing a right-turn lane on a two-lane roadway would reduce peak-hour delay by 30 minutes. If there are 4 peak hours per day (e.g. 2 morning and 2 afternoon), the **daily peak period reduction in delay would be 2 hours.**

Spreadsheets

[AM_Mobility_Tools_Final_Modules.xlsx](#)

Spreadsheet options estimate predicted delay based on the presence of a right-turn lane.

Outputs

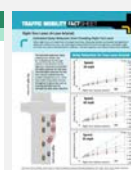
Estimated delay reduction for through vehicles	0.57	Seconds per through vehicle
Additional delay reduction due to pedestrian crossings (3)	1.69	Seconds per through vehicle
Total delay reduction (3)	2.26	Seconds per through vehicle

TECHNIQUES

Right-Turn Lane

OUTPUTS

Delay per vehicle



[Spreadsheet](#) [FACTSHEETS](#)
[Mobility Fact Sheets Right-Turn Lanes \(2L-arterial\).pdf](#)
[Mobility Fact Sheets Right-Turn Lanes \(4L-arterial\).pdf](#)

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 33

Purpose: The purpose of this slide is to introduce the mobility implications of turn lanes and the right-turn lane spreadsheet tool in the mobility module.

Key Message: Installation of right-turn lanes can increase intersection capacity and decrease delay.

Outcomes: Recognize that –

- 1) The spreadsheet tools are based on research and users should understand their basis and any limitations (see final report).
- 2) The Right-turn Lane mobility module estimates reduction in delay from adding a right-turn lane at an existing unsignalized intersection or one at a new development site on four-lane and two-lane arterial roadways.
- 3) Two Traffic Mobility Sheets are provided in the Toolkit that illustrate the tool calculations and outputs.
- 4) The tool outputs and messages here can be used to communicate the value of turn lanes.

Suggestion: Demonstrate and discuss the spreadsheet tools.



Roundabouts safely accommodate left or right turns, U-turns, and through movement with enhanced aesthetics.

MESSAGING

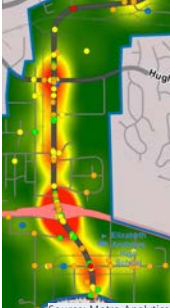
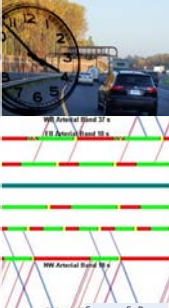


- Turn lanes reduce the need for drivers to decelerate in response to turning vehicles and then accelerate to continue forward. This reduces fuel consumption and emissions.
- At a driveway, right-turn lanes improve pedestrian safety by allowing turning vehicles to safely stop or slow down for pedestrian crossing movements.
- Keep in mind that left- or right-turn lanes at a signalized intersection increase pedestrian crossing distances. On wider roadways, longer pedestrian crossing signals, pedestrian islands, or other treatments may be needed for pedestrian safety and mobility.

TECHNICAL SUPPORT

No Trainer/Speaker Notes Required

Signalized Access Spacing

MESSAGING

Safety	Economy	Mobility	Livability
 <p style="font-size: x-small; margin: 0;">Source: Metro Analytics</p>	 <p style="font-size: x-small; margin: 0;">Source: F. Broen</p>	 <p style="font-size: x-small; margin: 0;">Source: F. Broen</p>	 <p style="font-size: x-small; margin: 0;">Source: Map Data © 2019 Google</p>
<p>Several studies have found that the number of crashes and crash rates increase as the frequency of traffic signals increases. Signals close to interchange off-ramps can also cause dangerous back-ups onto Interstate freeways.</p>	<p>Improved flow of people and goods due to signal spacing results in cost savings from less delay and fewer crashes. Commercial areas are more vital and have better market reach when roadways have reliable travel times. Too many signals on major roadways can stifle the economy of a state or region.</p>	<p>Long and uniform signal spacing can move traffic efficiently during both peak and off-peak traffic conditions. As signal frequency increases on major roadways, traffic progression becomes less efficient and congestion and delay increases. This is especially damaging to freight movement and commuting.</p>	<p>Managing the spacing of signalized access can reduce the need to widen major roadways. Signal spacing improves signal coordination, greatly reducing emissions and fuel consumption, which spike when vehicles decelerate and accelerate.</p>

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 35

Purpose: The purpose of this slide is to introduce the topic of signalized intersection control.

Key Message: This is one of the topic areas to be analyzed by the four pillars of safety, mobility, economy, and livability. The spreadsheets (where available) are included in the Toolkit.

Outcomes: Recognize that –

- 1) The spreadsheet tools are based on research and users should understand their basis and any limitations (see final report).
- 2) There are numerous options available for controlling flow of traffic at intersections. Signals are not always a good option.
- 3) Signals profoundly impact delay and safety at an intersection and along a corridor. The costs of installing signals are much greater than the hardware included.

Suggestion: None.

VALUE OF SIGNALIZED ACCESS SPACING

Safety




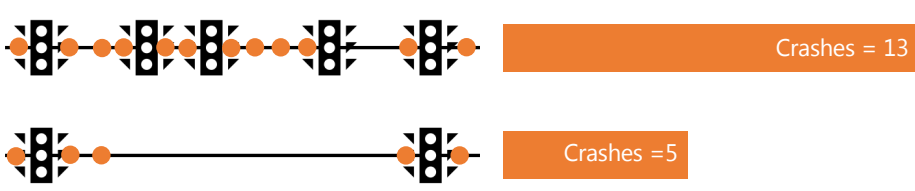
Photo by F. Broen

Signalized Intersection Density

Crash rates increase as signal density increases.

Several studies have found that the number of crashes and crash rates increase as the frequency of traffic signals increases.

Crash rates increase as signal density increases.



Spreadsheets

[SignalizedIntersectionDensity.xlsx](#)

This spreadsheet shows the safety effect of changing the number of signals. Use the text to change the infographic.

Outputs:

Total Number of Current Intersection Crash 5.13

Safety Effect

Total Crashes (All Severities)** 12.86

Program Medians Turn Lanes **Signals** Driveways Network Examples

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 36

Purpose: The purpose of this slide is to introduce the safety implications of signalized intersection density and the safety spreadsheet tools.

Key Message: Signals are often perceived as a safety device, but several studies show that crash rates increase as signal density increases.

Outcomes: Recognize that –

- 1) The SignalizedIntersectionDensity.xlsx tool estimates the number of crashes that may be expected when increasing the density of signalized intersections per mile from a base condition of two per mile for urban/suburban three-leg and four-leg intersections.
- 2) It is based on research and users should understand its basis and any limitations (see final report).
- 3) Outputs demonstrate that adding an additional signalized intersection within a mile, increases the total number of intersection crashes by 150%.
- 3) A Fact Sheet is provided in the Toolkit that illustrates the tool calculations and outputs.
- 4) The tool outputs and messages here can be used to communicate the value of turn lanes.

Suggestion: Demonstrate and discuss the spreadsheet tool.

VALUE OF SIGNALIZED ACCESS SPACING

Safety

MESSAGING

Why we separate signals from interchanges

- Signalized intersections too close to interchange ramps cause heavy volumes of weaving traffic, complex traffic signal operations, and traffic queues that impact mainline safety and operations. These problems cannot be solved by traffic signal coordination.
- Driveway access and median openings near interchange ramps compound these problems.

TECHNICAL SUPPORT

References:
CUTR, (1999), Land Development and Access Management Strategies for Florida Interchange Areas.

Program Medians Turn Lanes **Signals** Driveways Network Examples ACCESS MANAGEMENT COMMUNICATION TOOLKIT 37

Purpose: The purpose of this slide is to introduce the safety implications of signalized intersections too close to interchange off ramps.

Key Message: Signals too close to interchange ramps can result in a number of safety and operation problems, as shown in the slide.

Outcomes: Recognize that –

- 1) Signalized intersections need to be separated from interchange off ramps.
- 2) The photos and messages here can be used to communicate the value of this strategy.

Suggestion: Point out that the photo illustrates a signalized intersection near an off-ramp where traffic frequently queues causing backs up onto the interstate. Discuss similar situations in your area.

Economy

MESSAGING

- Improvements in traffic flow from managing signal spacing will result in **travel time savings** (in dollars) – time that could be better spent in productive activities.
- Improvements in highway safety from managing signal spacing will result in **cost savings to society** from fewer crashes (in dollars);
- Travel delay is **especially costly to the freight industry** in terms of wasted fuel, equipment costs, and labor – costs that are passed on to the consumer.
- Increases in travel time can explain why some **commercial areas have deteriorated** (resulting in declining property values), while others have prospered.

Without supporting network, arterials often become riddled with signals and driveways, delaying freight movement and shrinking retail market area.

TECHNICAL SUPPORT

Changes in travel time on different parts of the roadway network result in unstable land use activity patterns. This helps explain differences in commercial vitality on a corridor and shifting economic relationships between small towns and urban centers.

Reference: Stover and Koepke, (2002), Transportation and Land Development, Institute of Transportation Engineers, pp. 1-13 to 1-29.

Program
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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 38

Purpose: The purpose of this slide is to introduce the economic value of travel time savings associated with effective management of signal location and spacing, including signalized access.

Key Message: The cost to society of delay is a metric that can help demonstrate the economic value of signal spacing.


Outcomes: Recognize that –

- 1) A spreadsheet tool is included in the Toolkit for this purpose and is detailed in the final report.
- 2) The spreadsheet tools are based on research and users should understand their basis and any limitations.
- 3) A Fact Sheet is provided in the Toolkit that illustrates the tool calculations and outputs.
- 4) Delay is especially costly to freight movers.
- 5) The tool outputs and messages can be used to communicate the value of managing signal location and spacing.


Suggestion: Demonstrate use of the Safety and Mobility Economic Value.xls spreadsheet tool to estimate the cost of delay. Review the calculations in the final report.

VALUE OF SIGNALIZED ACCESS SPACING

← Mobility

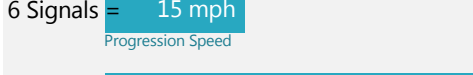


Source: Map Data © 2019 Google



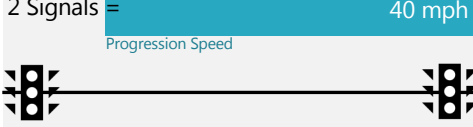
6 Signals = 15 mph

Progression Speed



2 Signals = 40 mph

Progression Speed



Source: Map Data © 2019 Google

Signal Progression and Signal Spacing

Signals can have a profound adverse impact on travel time.

- Long and uniform signal spacing** allows timing plans that can move traffic efficiently during both peak and off-peak traffic conditions.
- As signal frequency increases on major roadways, traffic progression becomes less efficient and delay increases.
- By managing the spacing and location of traffic signals, we can move traffic more efficiently at appropriate speeds and with less delay.
- Two tools are included in the Mobility spreadsheet module for estimating impacts of adding new signals – Signal Progression and Signal Spacing.

Spreadsheets

[AM_Mobility_Tools_Final_Modules.xlsx](#)

- The Signal Progression spreadsheet estimates progression speed when signals are closely or irregularly spaced.
- The Signal Spacing spreadsheet estimates travel time increases as signal density increases.
- Both tools are for planning level estimates. Detailed analysis is required for specific projects.
- Do not count the first signal when using these tools

Example Output: Signal Progression

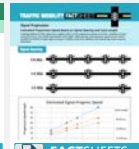
		Units
Estimated Progression Speed	20	Miles per Hour

TECHNIQUES

Number of Signals

OUTPUTS

Progression Speed



[Spreadsheet](#) [FACTSHEETS](#)
[Mobility Fact Sheets Signal Progression.pdf](#)
[Mobility Fact Sheets Signal Spacing.pdf](#)

Program Medians Turn Lanes **Signals** Driveways Network Examples

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 39

Purpose: The purpose of this slide is to introduce the mobility implications of adding signals on travel time and the two spreadsheet tools for measuring these impacts in the mobility module.

Key Message: As the frequency of signals increases, the progression efficiency of major arterial roadways can be seriously compromised.

Outcomes: Recognize that –

- 1) The spreadsheet tools are based on research and users should understand their basis and any limitations (see final report).
- 2) The Signal Progression tool in the mobility module estimates the impact of installing additional traffic signals on progression speeds using the relationship between cycle length, signal spacing, and progression speed. The Signal Spacing spreadsheet estimates travel time increases as signal density increases. Both tools are for planning level estimates. Detailed analysis is required for specific projects.
- 3) Traffic Mobility Fact Sheets are provided in the Toolkit to illustrate the tool calculations and outputs.
- 4) The tool outputs and messages here can be used to communicate the value of managing signal location and spacing.

Suggestion: Demonstrate and discuss the spreadsheet tools.

VALUE OF SIGNALIZED ACCESS SPACING

MESSAGING

Fewer Travel Lanes and Lower Emissions

A four-lane roadway with ½-mile signalized intersection spacing can carry the same volume as six lanes with ¼-mile signal spacing.

- Four-lane roadways pose less of a barrier to bicycles and pedestrians and are more conducive to community activity. Safe mid-block crossings between signalized intersections can help further reduce pedestrian travel distances.
- Reducing emissions and fuel usage are important to the environment. Each signal added to the roadway system adds to fuel consumption and emissions.

TECHNICAL SUPPORT

Fuel consumption increases rapidly as speeds decrease to less than 25 mph, and increases modestly up to 62 mph.

- Rakha, H. and Ding, Y. 2003. "Impact of stops on vehicle fuel consumption and emissions," *Journal of Transportation Engineering*, 129(1), pp. 23-32.

Research indicates that for every 1000 speed change cycles, braking to a stop from 30 mph results in excess fuel consumption of 9.5 gallons, whereas a reduction in speed from 30 mph to 20 mph results in 3.0 gallons excess fuel consumption – a 6.5 gallon savings (Dale 1981). At an initial speed of 50 mph, reducing speed by 10 mph saves 12.5 gallons for every 1000 speed change cycles compared to breaking to a stop.

- Dale, C. W. (1981). "Procedures for Evaluating Traffic Engineering Improvements." *ITE Journal*, Institute of Transportation Engineers.

Program

Medians

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 40

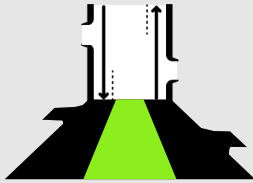
Purpose: The purpose of this slide is to explain how signal spacing can benefit livability from a variety of perspectives.

Key Message: Signal spacing must be context sensitive and for major roadways can reduce emissions, fuel usage, crashes and delay.

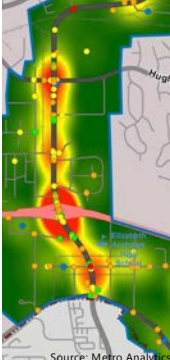



- Outcomes:** Recognize that –
- 1) Adding signals to a major regional arterial will adversely impact not only safety, but also the environment and the economy.
 - 2) There are numerous options available for controlling flow of traffic at intersections. Signals are not always a good option.
 - 3) Research shows that signals increase fuel consumption and emissions.
 - 4) The infographic can be printed and used to explain these issues.

Suggestion: None.

Driveway and Unsignalized Access Spacing



MESSAGING

Safety	Economy	Mobility	Livability
 <p style="font-size: x-small; text-align: center;">Source: Metro Analytics</p>	 <p style="font-size: x-small; text-align: center;">Source: F. Broen</p>	 <p style="font-size: x-small; text-align: center;">Source: T. Petritsch</p>	 <p style="font-size: x-small; text-align: center;">Source: Map Data © 2019 Google</p>
<p>As access density increases, crash rates increase. Closely spaced driveways and side streets can result in increased crashes involving pedestrians and cyclists.</p>	<p>Corridors with too many driveway access points cost society by increasing crashes. This cost can be measured using the spreadsheets in this toolkit.</p>	<p>Too much driveway access leads to delay on major roads needed for longer distance trips. They cause turbulence in the traffic stream, as vehicles enter and leave through traffic lanes. They also reduce the quality of service for cyclists and pedestrians.</p>	<p>Fewer access connections increase the area for landscaping and enhance the appearance of major corridors. Landscaping also provides a buffer between vehicular traffic and pedestrians.</p>

Program
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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 41

Purpose: The purpose of this slide is to introduce the topic of unsignalized intersection and driveway control.

Key Message: This is one of the topic areas to be analyzed by the four pillars of safety, mobility, economy, and livability. The spreadsheets are included in the Toolkit.

Outcomes: Recognize that –

- 1) The spreadsheet tools are based on research and users should understand their basis and any limitations (see final report).
- 2) As access density increases, so do crashes and the adverse impact on safety affects all modes.
- 3) Too many driveways and unsignalized intersections damage both the transportation system and the character of the built environment.

Suggestion: None.

VALUE OF DRIVEWAY AND UNSIGNALIZED ACCESS SPACING

Safety

Unsignalized Intersection and Driveway Density

Access Points per Mile	Index: Ratio to 10 Access Points per Mile
10	1
15	1.3
20	1.7
30	2.1
40	2.8
60	4.1

As access density increases, crash rates increase. In urban areas, a density of **60 or more access points per mile is associated with a crash rate that is 4.1 times greater** than for a similar roadway with 10 access points.

NCHRP Report 420

Every driveway introduces conflict points and potential crashes on an arterial.

- **Closely spaced driveways** and side streets:
 - **Intensify traffic conflicts** on major roads and can lead to driver information overload, increasing the potential for a crash.
 - **Make pedestrian and cyclists more vulnerable** to conflicts with turning vehicles.
- In rural areas, an increase from fewer than 15 access points to 30 access points per mile is associated with a 65% higher crash rate.

410% increase in crashes
From 10 to 60 access points per mile on urban 4 lane with TWLTL

Spreadsheets:

[UnsignalizedIntersectionDensity.xlsx](#)

Spreadsheets estimate crashes for unsignalized intersections and driveways.

Example Outputs (Unsignalized Intersection Density):

Outputs:	
Total Number of Crashes for the Current Condition*	10.19
<small>* Driveway related crashes are not included.</small>	
Safety Effect of Increasing Driveway Density	
Angle, Fixed object, Head on, Rear end, Run off road, Sideswipe, Single vehicle	14.61

INPUT

TWLT or Median

AADT

Segment length

Intersections/mi

OUTPUTS

Crashes

[Spreadsheet](#) [FACTSHEETS](#)

[Driveway Density Fact Sheet.pdf](#)

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 42

Purpose: The purpose of this slide is to introduce the safety implications of unsignalized intersection and driveway density and the safety spreadsheet tools.

Key Message: Decades of research has demonstrated the safety implications of unsignalized access density. These impacts relate to the number of traffic conflicts.

Outcomes: Recognize that –

- 1) Two tools are provided in the toolkit to estimate the safety performance of facilities under different intersection and driveway conditions.
- 2) It is based on research and users should understand its basis and any limitations (see final report).
- 3) Outputs vary depending on AADT and whether the facility has a TWLTL or raised median.
- 3) A Fact Sheet is provided in the Toolkit that illustrates the tool calculations and outputs.
- 4) The tool outputs and messages here can be used to communicate the value of turn lanes.

Suggestion: Demonstrate and discuss the spreadsheet tool.

VALUE OF DRIVEWAY AND UNSIGNALIZED ACCESS SPACING

Safety

Corner Clearance
Driveways should not be located close to signalized intersections. The potential for conflicts and crashes is especially great if driveway maneuvers overlap with intersection turning movements.

Driveways near signalized intersections are especially hazardous.

These driveways are too close to the intersection

Photo by J. Gattis

It is also difficult for drivers to turn right out of a driveway near a signal and then weave safely and quickly to make a left turn at the intersection.

Move driveways as far away from intersections as possible.

PHOTO: Demosthenes

TECHNICAL SUPPORT

Distances vary based on the type of road and whether a driveway is upstream or downstream from a signal.

If you must permit access in the functional area of an intersection, try these strategies to reduce the safety and operational impacts:

- Add permit conditions that restrict site traffic volume;
- Install a median or bollards at the intersection;
- Locate the driveway at the edge of the property;
- Share access with the adjacent site.

Program Medians Turn Lanes Signals **Driveways** Network Examples

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 43

Purpose: The purpose of this slide is to introduce the safety implications of driveways in the functional area of intersections.

Key Message: Driveways too close to signalized intersections can lead to hazardous conflicts and crashes between turning vehicles.

Outcomes: Recognize that –

- 1) Corner clearance is important to access management for safety reasons.
- 2) More research is needed to create safety performance functions and crash modification factors on this topic.
- 3) Photos and diagrams like those shown can help communicate this issue.
- 4) Methods to improve safety where access must be provided in the functional intersection area are shown under technical support.

Suggestion: None.

Safety

UNIGNALIZED INTERSECTION SAFETY STRATEGIES

SAFETY CONCERN	COST	
	Low	Moderate
High frequency of right-angle crashes attributed to:		
nearby driveways	A2,B12,C1,C2,C4	A1
traffic from minor street	B12,C1,C2,C4,D2	D1
skewed intersection		
poor sight distance	C1,C2,C4,H3	D1
drivers misjudging gaps	D2,H3	D1
not enough gaps for drivers	D3	
driver unaware of intersection	E1,E5-E9,E10,E11	E3
nighttime conditions	E10	
failure to yield at stop or yield sign	E1,E4-E9,E11	G1
possible signal location		
heavy but balanced traffic flow	F2	
speed differentials of vehicles	H3	H1,H2
High frequency of rear-end crashes attributed to:		
left turning vehicles hit from behind	B4	B1,B2
left opposing vehicles hit from behind		
trucks and RVs entering divided highway		B5
speed differential of entering vehicles		B5,B9
right turning vehicles hit from behind		B6,B7
approaching vehicles hit from behind		B19
no left turn lane and high opposing traffic	B11,B12	
driver unaware of intersection	E1,E5-E9,E10,E11	E3
nighttime conditions	E8,E10	
speed differentials of vehicles	H3	H1,H2
High frequency of left-turn crashes attributed to:		
left turn vehicles hit by opposing traffic	C2	B1,B17
trucks and/or RVs entering divided highway		B6
no left turn lane and high opposing traffic	B11,B12	
nighttime conditions	E10	
heavy but balanced traffic flow	F2	
Poor sight distance	C2, B11, B12	B17
High frequency of sideswipe crashes attributed to:		
speed differential of entering vehicles		B9
vehicles within intersection	I1,I2	
vehicles approaching intersection	I3	
High frequency of run-off road crashes:		
approaching intersection		B10
High frequency of pedestrian/bicycle crashes:		
Address overall safety issues:		
violation of traffic laws	G2	

TECHNICAL SUPPORT

The **Unsignalized Intersection Safety Strategies** quick reference brochure created by FHWA shows multiple options for addressing safety. Many are low cost solutions with high returns on investment. Click the link to explore the strategies:

https://safety.fhwa.dot.gov/intersection/other_topics/fhwas08008/intersection_guide12.pdf

Many low-cost countermeasures can be used to increase safety and access.


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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 44

Click on these useful resources for easy viewing.

VALUE OF DRIVEWAY AND UNSIGNALIZED ACCESS SPACING

Economy



Bridgeport Way in University Place, Washington
Photo by Malone

Multimodal corridor access improvements on Bridgeport Way in University Place, Washington yielded a 60% crash reduction, 8% increase in sales tax receipts following each construction phase, better pedestrian connections to transit, and a revitalized, more livable corridor. A local street network was also built off of the highway offering better access to businesses in a new town center, as shown in this image.

MESSAGING

Business Activity

- Business activity relates to how easily and safely a customer can reach a business. Improving access design to a site and connecting the overall network, increases the ability of customers to safely and easily access businesses in that area.


Land Use

- Overall improvements to access, such as improved local street networks, can support new land uses, such as retail and residential. These land uses provide tax revenue from property and sales taxes.

Property Values

- Property values can change after an access management treatment is applied due to improved access to the property or general land use changes that occur after access is improved or increased.

TECHNICAL SUPPORT



[Economic Fact Sheet.pdf](#)

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 45

Purpose: The purpose of this slide is to introduce the economic value to businesses of access management planning.

Key Message: Improving site access through street networks benefits the transportation system by reducing driveway-related conflicts and benefits businesses by making them easier and safer to access for all modes of transportation.

Outcomes: Recognize that –

- 1) A single well-designed driveway can often provide better access from a highway than many “curb cuts”.
- 2) Relocating site driveways onto local street networks offers safe, low speed access to businesses and improves sidewalk safety.
- 3) The Economic Fact Sheet provides additional information and methods that can be used to measure economic activity.

Suggestion: Consider the Bridgeport Way case example shown here. The economic value is improved by increased sales activity, safety and livability of the corridor and business district.

VALUE OF DRIVEWAY AND UNSIGNALIZED ACCESS SPACING

Economy

Photo courtesy of the Record-Journal

14%

87%

87% of time this car would not be able to exit the driveway

Corner Clearance

Corner Clearance

- Separating driveways from signalized intersections or consolidating driveways will improve the safety and ease of access to these business sites by reducing the chances that a driveway will be completely blocked or not adequately designed to handle the flow of traffic into and out of a business site.

Access that is frequently blocked may result in a loss of customers.

Estimated percentage of cycles during which a driveway in proximity to a signalized intersection will be blocked

Corner Clearance	50	100	250
Estimated percent of signal cycles during which the driveway will be blocked	98%	87%	14%

Spreadsheet

[AM_Mobility_Tools Final Modules.xlsx](#)

- Spreadsheet estimating frequency of driveway blockage near signalized intersection

Outputs

Estimated percent of signal cycles during which the driveway will be blocked	87%
--	-----

Techniques

Corner clearance

Outputs

% driveway blocked

[Spreadsheet](#) [FACTSHEETS](#)

[Mobility Fact Sheets Corner Clearance.pdf](#)

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 46

Purpose: The purpose of this slide is to introduce the mobility implications of access in the functional area of signalized intersections and the spreadsheet tool for measuring these impacts in the mobility module.

Key Message: Corner access on busy highways is not only less safe, it is often less functional and may ultimately result in a loss of customers.

Outcomes: Recognize that –

- 1) The spreadsheet tools are based on research and users should understand their basis and any limitations (see final report).
- 2) The Corner Clearance tool in the mobility module estimates the percentage of signal cycles during which a driveway near a signalized intersection will be blocked.
- 3) A Traffic Mobility Fact Sheet is provided in the Toolkit to illustrate the tool calculations and outputs.
- 4) The tool outputs and messages here can be used to communicate the value of managing signal location and spacing.

Suggestion: Demonstrate and discuss the spreadsheet tools.

VALUE OF DRIVEWAY AND UNSIGNALIZED ACCESS SPACING

Mobility

Driveway Spacing

- Inadequate control of access spacing on major roadways contributes to delay on rural and urban arterials.
- Uncontrolled development along a rural highway may produce multiple access points in a relatively short distance, and the need to lower the posted speed at this location, delaying long distance trips. A better option is to create an internal network.

Building on an internal network provides access without impeding through traffic.

Few driveways and good internal circulation improve the mobility of this shopping area.

Estimated impact of driveway spacing on right-lane, through-vehicle mobility

58% of these cars must slow down at least once per 1/4 mile

100'

58% @ 100 ft.

Only 16% of these cars must slow down at least once per 1/4 mile

500'

16% @ 500 ft.

Spreadsheet: [AM_Mobility_Tools_Final_Modules.xlsx](#)

- Spreadsheet estimates 3 different mobility outcomes.

Outputs:

Driveway Spacing	100 ft
% of right-lane, through-vehicles affected at a single driveway	6.3%
% of right-lane, through-vehicles affected at least once per 1/4 mile	57.9%
% of vehicles impacted by another driveway	63.5%

TECHNIQUES
Driveway spacing

OUTPUTS
% Through-vehicles affected

Spreadsheet [FACTSHEETS](#)
[Mobility Fact Sheets Driveway Spacing.pdf](#)

Program Medians Turn Lanes Signals Driveways Network Examples

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 47

Purpose: The purpose of this slide is to introduce the mobility impacts of driveway density and the spreadsheet tool for measuring these impacts.

Key Message: Experience shows that as driveways accumulate on major roadways, they gradually reduce the efficient flow of traffic and contribute to delay. This impact is real, but difficult to measure.

Outcomes: Recognize that –

- 1) The Driveway Spacing tool in the mobility module estimates the the proportional impact of turning traffic on the traffic stream. This provides insight into how driveways impact the flow of traffic.
- 2) The spreadsheet tools are based on research and users should understand their basis and any limitations (see final report).
- 3) A Traffic Mobility Fact Sheet is provided in the Toolkit to illustrate the tool calculations and outputs.
- 4) The tool outputs and messages here can be used to communicate the value of managing signal location and spacing.

Suggestion: Demonstrate and discuss the spreadsheet tools.



Each driveway connection takes the sidewalk for motor vehicle use and reduces space for landscaping.

Where would you want to live?

Reducing driveways, installing landscaped medians, and buffering parking lots from adjacent roadways creates a visually pleasing and functional corridor that attracts investment and protects property values.




Aesthetics with (top) and without (bottom) access management.





Showing images of roadways where access is properly managed and where it is not is an easy yet effective way to show how access management improves livability.

No Trainer/Speaker Notes Required

Network Connectivity



MESSAGING

Safety	Economy	Mobility	Livability
			
Source: FHWA	Source: J. Malone	Source: Metro Analytics	Source: Adobe Stock
Supporting network reduces the need for driveway access onto major roadways, thereby greatly improving safety of the major roadway and sidewalk for all users.	Providing shared access may improve on-site circulation and may increase the percentage of the site that is usable for development, on-site circulation, and parking.	Connected street networks allow motorized vehicles, cyclists, and pedestrians to easily circulate within neighborhoods, while reducing the need for vehicles to use a major roadway for short local trips.	Organizing land uses into activity centers on a connected street network improves access for all modes. These same strategies promote more livable places, by reducing driveways and strip development on major roadways.

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 49

Purpose: The purpose of this slide is to introduce the topic of network connectivity.

Key Message: This is one of the topic areas to be analyzed by the four pillars of safety, mobility, economy, and livability. A connected supporting network is the solution to arterial access management problems.

Outcomes: Recognize that –

- 1) Without connections available to collector and local roadways all pressure for access connections falls to the arterial roadways.
- 2) Less need for driveway access onto major roadways greatly improves safety of the major roadway for all users.
- 3) Bicycle and pedestrian connections from sidewalks and other pathways to development sites, transit stops, and midblock crossing locations are non-auto access management techniques.
- 4) Organizing land uses on a dense, connected street network is a placemaking strategy that advances access management principles.

Suggestion: None.

Safety

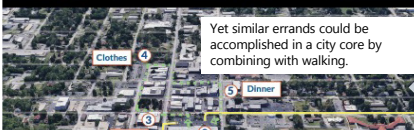
New development produces more traffic and requires more left turns, each one a potentially dangerous conflict.



This one trip might require five left turns across multiple travel lanes and sidewalks.



Yet similar errands could be accomplished in a city core by combining with walking.



Base aerial map: Google Earth, Google.com

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MESSAGING

- **Supporting street networks** reduce the need for driveway access onto major roadways, greatly improving safety of both the major roadway and the sidewalk.
- Local street networks allow safe access to major roadways at traffic signals and well-planned side street locations.
- Interconnected commercial development can give even small businesses access to a traffic signal and safer left-turns.
- Local streets and alleys have less traffic and lower speeds than major roadways and can provide a safe travel alternative for bicyclists, including potential locations for bicycle boulevards.
- Signalized mid-block crossings support safe pedestrian movement across suburban corridors with higher speed traffic and improve pedestrian access to transit stops.

Well-planned networks provide safer travel options for all users.

TECHNICAL SUPPORT




Source: Urban-Advantage.com

Connected street networks provide options for all modes to travel safely.

No Trainer/Speaker Notes Required

VALUE OF NETWORK CONNECTIVITY

Economy



Source: Utah DOT

Connected, supporting networks improve through movement on major roadways, and provide more opportunities to access businesses from the surrounding area. Better traffic flow means greater market reach.

MESSAGING

- **Providing shared access often** improves on-site circulation and can increase the percentage of the site that is usable for development, on-site circulation, and parking.
- Internal network can increase the development potential of interchange areas by providing access to interior lands within interchange area quadrants.
- Similarly, network along major corridors creates more activity centers for business that can connect into surrounding neighborhoods, as opposed to strips that are segregated and less accessible.

Networks can be improved through public-private partnerships to support profitable, high-value mixed-use developments.

- Bicycle and pedestrian improvements that provide connections to adjacent properties and integrate the network increase livability, which can lead to an increase in the value of those properties.

TECHNICAL SUPPORT

Complete networks could result in more intensive development and increased tax base and property values.

Improvements to the entire network or localized access improvements can make locations more desirable and therefore increase their overall value.

Property values may increase at varying rates depending on the treatment.

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 51

Purpose: The purpose of this slide is to introduce the value of network connectivity to the economy.

Key Message: A connected network of local and collector streets along arterials provides access to businesses, with improved accessibility, while protecting the transportation and economic functions of major roadways.

Outcomes: Recognize that –

- 1) Accessibility is more important to business and the economy than an individual access point.
- 2) The ability to gain access to a business from the surrounding area is greatly improved where access is provided on a side street and local street network.
- 3) This slide has several messages on the value of network connectivity to the economy.

Suggestion: Watch the video by clicking on the image.

VALUE OF NETWORK CONNECTIVITY

Mobility

Vehicles use **major roadway** to circulate

Local traffic uses **internal circulation** network

When neighborhoods lack a network, cars pile onto major roads even for very short trips.

MESSAGING

- **Connected street networks** provide more direct routes, shorter trip lengths and encourage non-motorized travel.
- Vehicles have less need to use major roadways for short local trips, improving the ability to move traffic.
- A robust network improves separation of motorized and non-motorized circulation.
- Promoting dense, connected local street and sidewalk networks and regular spacing of major streets are principles of access management and smart growth.

TECHNICAL SUPPORT

Access management promotes accessibility while preserving local and regional mobility.

Accessibility = land use proximity + network connectivity.

Mobility = ability to move around via multiple alternative paths and modes

Access = ability to enter and exit a site.

The blue area is where you can reach the center in a five-minute walk. Click on the graphic for more information.

Source: Dan Zack/plannerdan.com

Program Medians Turn Lanes Signals Driveways **Network** Examples

ACCESS MANAGEMENT COMMUNICATION TOOLKIT 52

Purpose: The purpose of this slide is to introduce the value of network connectivity to mobility.



Key Message: Local traffic is best accommodated on a lower-speed network of local and collector streets, preserving major roadways for longer trips.

Outcomes: Recognize that –

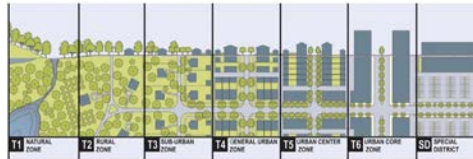
- 1) Connected street networks reduce access problems and improve mobility for all modes.
- 2) Access, accessibility, and mobility are not the same thing, but they are interrelated.
- 3) This slide has several messages on the value of network connectivity to mobility.

Suggestion: Discuss the implications of network shown in the figure.

VALUE OF NETWORK CONNECTIVITY

Context matters! Access management strategies vary by land use context. Livability is enhanced regardless of context. Although this image is highly urban, rural and suburban areas also benefit from good access management.



Source: Duany Plater-Zyberk & Company 2003

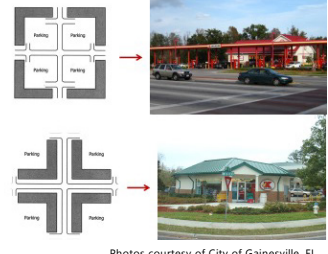
MESSAGING

Placemaking on a network

- Access management can be achieved through land use strategies that discourage strip development and promote activity centers organized on a street network. This creates a more accessible built environment that supports bicycle, pedestrian, and transit mobility.
- Pedestrian and transit access can be improved by orienting buildings to front on the street with parking in garages or at the side or rear of sites.

Dense and connected networks can support livable, walkable centers.

Buildings are more accessible to pedestrians and transit when they are closer to the curb. Parking can be placed in the rear of the property.



TECHNICAL SUPPORT

In rural and coastal areas, poorly planned access roads and driveways can damage scenic landscapes and sensitive ecosystems. Working together on a network plan can preserve the natural beauty of these areas.

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 53

Purpose: The purpose of this slide is to introduce the value of network connectivity to livability and access.

Key Message: Placemaking is best advanced by organizing land uses onto a network. Doing so also increases accessibility of the developed area for all modes, while reducing access problems on major roadways.


Outcomes: Recognize that –


- 1) Access management is a placemaking and smart growth strategy.
- 2) Different modes have different access needs that must be carefully managed.
- 3) Like street design, access management standards and strategies must be appropriate to land use context.
- 4) This slide has several messages on the value of network connectivity to livability and access.


Suggestion: Consider how the design of access differs by mode and how that can impact livability.

MESSAGING

Case Studies


PLANNING


PROJECT


PERMIT

Program Medians Turn Lanes Signals Driveways Network **Examples** ACCESS MANAGEMENT COMMUNICATION TOOLKIT 54

No Trainer/Speaker Notes Required

Driveway Spacing & Safety

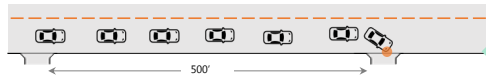
This example illustrates how driveway density impacts safety.

When establishing driveway spacing standards, planning agencies can use this spreadsheet to demonstrate the safety implications of different levels of access spacing. For example, an average driveway spacing of 500-foot would decrease the crash rate an estimated 61% over 100-foot driveway spacing on a 1-mile road with a TWLTL and 35,000 AADT.

100' driveway spacing shows 29 crashes with 8 Fatal & Injury crashes

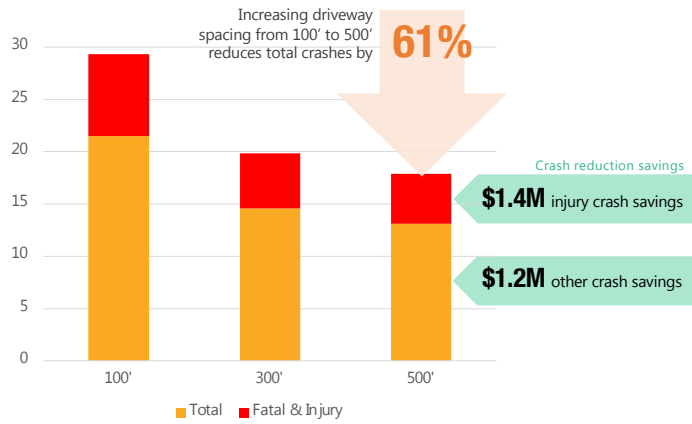


500' driveway spacing reduces crashes, savings \$2.6M yearly



Safety of Driveway Spacing

Driveway spacing



\$2.6M total savings over 100' driveway spacing

No Trainer/Speaker Notes Required (see final report for written summaries)

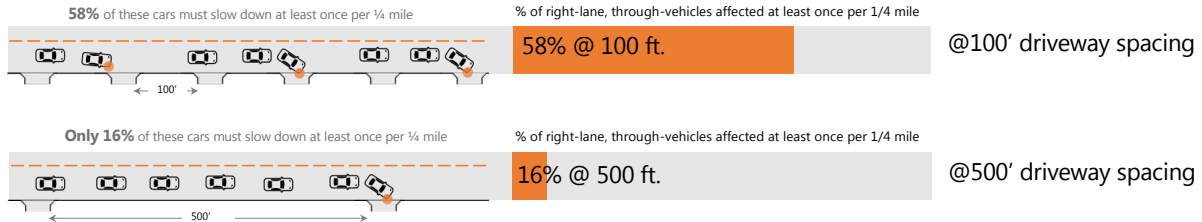
Driveway Spacing & Delay

This example illustrates the cumulative adverse impacts of driveways on delay and traffic flow. A planning agency could use this tool along with other methods to reinforce the importance of good driveway spacing. Each vehicle turning into a driveway can cause following vehicles to brake or change lanes to avoid a collision. This cumulative impact is a proxy for delay and can be demonstrated using the mobility tool for driveway spacing. For example, on a 50-mph roadway segment with an average driveway volume of 40 vehicles per hour and 100-foot driveway spacing, about 58% of drivers in the right lane would be impacted (need to brake or change lanes) by leading vehicles turning right into a downstream driveway. 500-foot driveway spacing significantly improves traffic flow.

Mobility of Driveway Spacing



Higher access spacing on major roadways not only improves safety – it reduces delay.



rainer/Spaker Notes Required (see final report for written summaries)

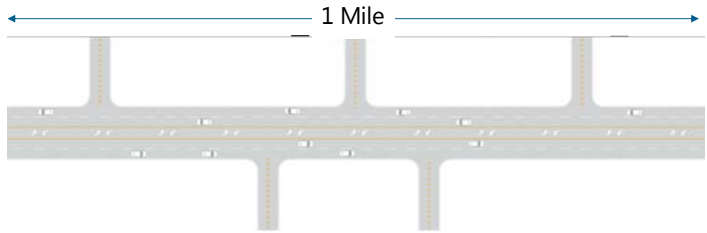
Unsignalized Intersections

The density of unsignalized street intersections directly impacts roadway safety. When developing an access management plan for a corridor, an agency can use the safety tool for unsignalized intersections to demonstrate the safety performance of different levels of unsignalized intersection density. This example is for a one-mile urban/suburban corridor segment with four through lanes and a continuous two-way left-turn lane (TWLTL), a 35-mph speed limit, and average annual daily traffic (AADT) of about 60,000 vehicles per day. This example illustrates how five unsignalized intersections would influence safety performance (in contrast to none).

For an urban/suburban corridor similar to the study site, the agency can anticipate 10.86 or about 11 crashes in comparison to no unsignalized intersections. The affected crash types include angle, fixed object, head-on, rear-end, sideswipe, and other single vehicle crashes. The monetized value of these crashes is \$1.5 million per year.

[UnsignalizedIntersectionDensity.xlsx](#)
[Safety Economic Value case studies.xlsx](#)

Safety of Unsignalized Street Intersections



Safety Effect of Increasing Unsignalized Intersection Density	
Angle, Fixed object, Head on, Rear end, Run off road, Sideswipe, Single vehicle	10.86

These 5 intersections would experience

11 crashes




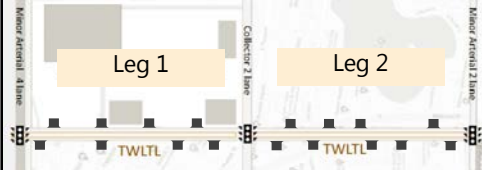
The affected crash types include angle, fixed object, head-on, rear-end, sideswipe, and other single vehicle crashes. The monetized value of these crashes is

\$1.5 million per year

No Trainer/Speaker Notes Required (see final report for written summaries)

PROJECT CASE STUDY

TWTL TO MEDIAN

Configuration	AADT (vpd)	Length – Leg 1 (mi)	Length – Leg 2 (mi)
Existing TWTL Section	35,000	0.25	0.25
Proposed Continuous Median	35,000	0.25	0.25

Number of Driveways:	2 major commercial 6 minor commercial	9 minor commercial
----------------------	--	--------------------


A five-lane suburban arterial has two lanes in each direction and a two-way left-turn lane (TWTL). The segment is ½-mile long with traffic signals at the beginning, middle (¼-mile point), and end.

Medians vs TWTL (Two-Way Left-Turn Lane)

	Segment #1 (crashes / yr)	Segment #2 (crashes / yr)	Total Roadway Segment (crashes / yr)	Total Number of Crashes	Number of Fatal and Injury Crashes	% Reduction
Existing TWTL Configuration						
Total crashes:	5.50	5.04	10.54	10.54		
Fatal and Injury Crashes:	1.46	1.33	2.79		2.79	
Proposed Continuous Median						
Total crashes:	2.21	2.13	4.34	- 4.34		
Fatal and Injury Crashes:	0.61	0.58	1.19		- 1.19	6.20/ 10.54
Predicted Reduction in Crashes (replace TWTL with Raised Median)						
Reduction in total crashes:	3.29	2.91	6.20	= 6.20		
Reduction in fatal + injury crashes:	0.85	0.75	1.60		= 1.60	=58.82%

Summary of Findings: Converting a TWTL to a continuous raised median for each ¼ mile segment shown can reduce total crashes by about 6 crashes per year and reduce the number of fatal and injury crashes by about 2 serious crashes per year.

Converting the TWTL to a raised median reduces yearly crashes by **59%**



The monetized value of these crashes is **\$1.5 million** per year.

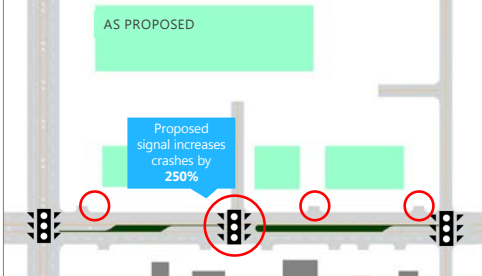
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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 58

No Trainer/Speaker Notes Required (see final report for written summaries)

Permit Review

PERMIT CASE STUDY EXAMPLE



Objective:
Communicate the safety and mobility impacts of this permit request and propose alternatives that represent good access management practices, using the tools in the toolkit.

Initial Request:
A developer has requested an access permit for a major retail development with several outparcels, each with a driveway connection. The request is to add a median opening for a signalized driveway and three additional unsignalized driveways on a major arterial.

Example infographic for this scenario

Safety Impacts of Traffic Signal Spacing

- **Signal Spacing:** For a half-mile segment, the addition of a traffic signal can be expected to **increase the number of crashes by 250%**.


Outputs:	
Total Number of Current Intersection Crashes per year	16.61
Safety Effect of Changing the Number of Signalized Intersections per Mile	
Total Crashes (All Severities)**	41.65

70 sec Cycle length
1320 ft spacing

70 sec Cycle length
660 ft spacing

Outcome A:
Using the safety tool to assess the signal request, the reviewing agency demonstrates that the proposed signal would more than double the number of crashes, indicating permit denial.

Adding a traffic signal increases crashes by



250%

At an additional cost of almost **\$3.4 million**

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 59

No Trainer/Speaker Notes Required (see final report for written summaries)

PERMIT CASE STUDY EXAMPLE

Permit Review

Permit Case Study

Outcome B:

The reviewing agency also uses the mobility tools to help show the impact of the proposed signal on progression speed of the arterial, and how the proposed corner driveway would be blocked much of the time.

Additional cost to society = **\$750,000** in travel delay

Traffic Signal Progression Corner Clearance

- Signal Progression:** For a half-mile segment, adding a traffic signal can be expected to reduce progression speed from 26 mph to 13 mph.
- Corner Clearance:** A driveway with only 50-feet of corner clearance can be expected to be blocked **96%** of the cycles in this example. At a 225-ft corner clearance, the driveway would only be blocked **14%** of the cycles. At 250-feet, it would be blocked only **8%** of the cycles.

Outputs		70 sec Cycle length 1320 ft spacing	
			Units
1	Estimated Progression Speed	26	Miles per Hour

Outputs		70 sec Cycle length 660 ft spacing	
			Units
1	Estimated Progression Speed	13	Miles per Hour

Maintaining the same number of traffic signals and progression speed translates to greater reliability in travel time, preventing market area erosion for businesses.

Outputs		Driveway 50' from corner	
1	Estimated percent of signal cycles during which the driveway will be blocked	96%	

Outputs		Driveway 225' from corner	
1	Estimated percent of signal cycles during which the driveway will be blocked	14%	

Driveway blocked 96% of cycles

Additional cost to society = **\$750,000** in travel delay

Speed reduced **50%** by signal

Driveway blocked **96%** of cycles

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ACCESS MANAGEMENT COMMUNICATION TOOLKIT 60

Purpose: The purpose of this slide is to demonstrate use of the mobility tools in a permit review scenario.

Key Message: Access decisions that accommodate the desires of an individual developer can have a high cost to the broader public and may not be beneficial for the development either.

Outcomes: Recognize that –

- 1) A spreadsheet tool is included in the Toolkit that monetizes the cost of delay to society and is detailed in the final report.
- 2) Delay also erodes market area, which adversely impacts retailers.
- 3) Corner access is not only unsafe for customers; it is less functional.
- 4) The tool outputs and messages can be used to communicate the value of access decisions to officials and permit applicants.

Suggestion: Demonstrate use of the Safety and Mobility Economic Value.xls spreadsheet tool to monetize the dollar value of delay.

PERMIT CASE STUDY EXAMPLE

Permit Review

Permit Case Study

Safety Impacts for Installation of a Right-Turn Lane

- **Right-turn Lane:** In this scenario, installing a right-turn lane had only a slight safety benefit.

Safety Effect of RT Lane Installation:	
Total Crashes (All Severities) w/Right-Turn Lane	3.55
Total Crashes (All Severities) w/o Right-Turn Lane	4.12

Base Condition: Intersection without right-turn lanes on major-road approaches.

The right-turn lane has little safety impact in this example.

Outcome C:

The applicant next requests a median opening instead of a signal. After a traffic analysis study verified the planning assumption shown by the tools, the agency decides to allow a directional opening with a left-turn lane into the site based on the safety benefits. A right-turn lane is also encouraged.

Adding a left-turn lane reduces crashes by 66%

Saving almost **\$3 million**

Program
Medians
Turn Lanes
Signals
Driveways
Network
Examples

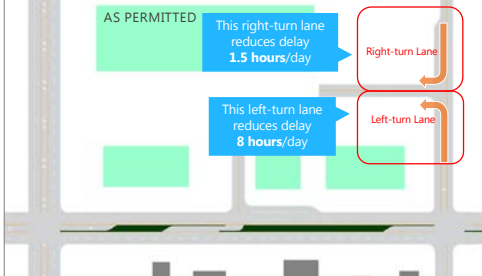
ACCESS MANAGEMENT COMMUNICATION TOOLKIT 61

No Trainer/Speaker Notes Required

PERMIT CASE STUDY EXAMPLE

Permit Review

Permit Case Study



Outcome D:

Encouraged to provide better alternative access, the permit applicant was asked to add a driveway on the collector road with a right-turn lane and left-turn lane into the site at that location, as the collector was a two-lane road with a high volume of pedestrian traffic. On the arterial, only one primary driveway was approved for safety reasons.

Mobility Impacts for Installation of a Right-Turn Lane

Mobility Impacts for Installation of a Left-Turn Lane

Right-turn lane: The installation of a right-turn lane can be expected to reduce delay by as much as **1.5 hours/day**.

Left-turn lane: The installation of a left-turn lane can be expected to reduce delay **about 8 hours/day**.



Outputs:		Units
1	Estimated delay reduction for through vehicles	0.6 Seconds per through vehicle
2	Additional delay reduction due to pedestrian crossings (3)	1.0 Seconds per through vehicle
3	Total delay reduction (3)	1.6 Seconds per through vehicle

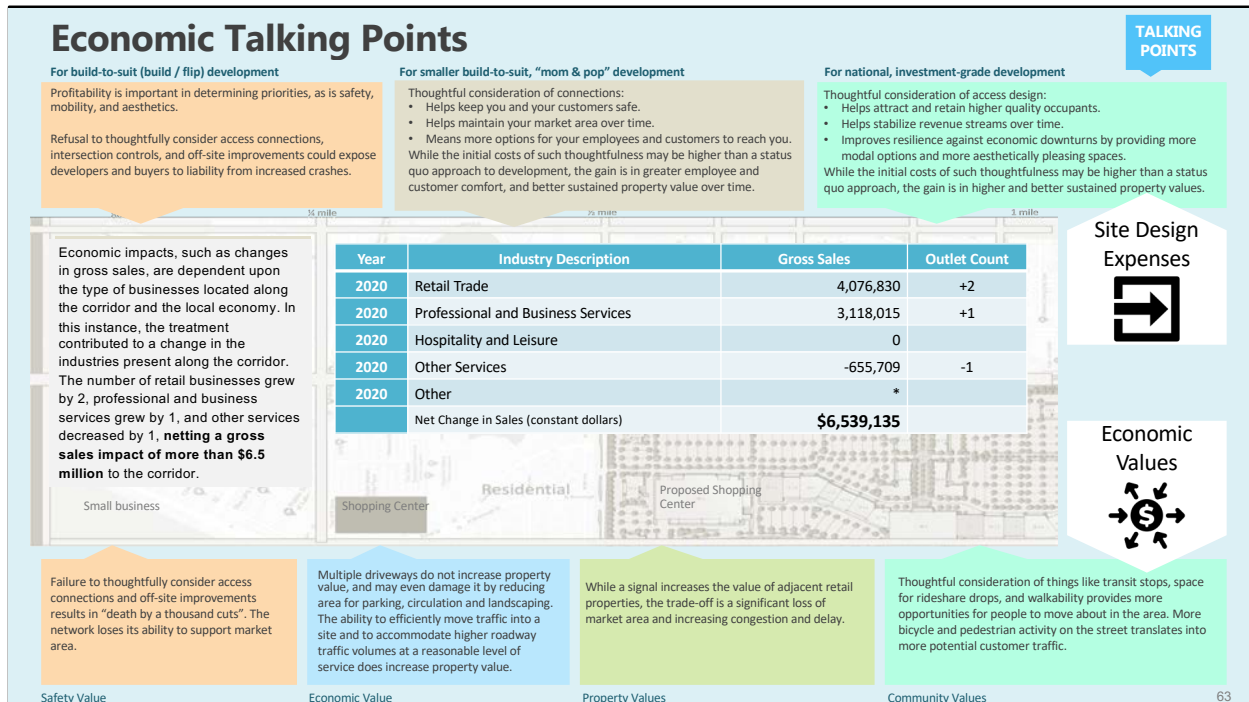
The delay reduction per vehicle is multiplied by the through volume in the direction of the right-turn movement where a right-turn lane would be provided to estimate the delay reduction for the peak hour. Based on a peak-hour volume of 800 through vehicles, providing a right-turn lane would reduce peak-hour delay 30 minutes. If there are 4 peak hours per day (e.g. 2 am and 2 pm), the daily peak period reduction would be 2 hours.



Outputs:		Units
1	Estimated intersection delay reduction for existing site	2.5 Seconds per Vehicle
2	Estimated intersection delay reduction for new development	4.7 Seconds per Vehicle

The estimated peak-hour total intersection volume is 1,640 vehicles (700 northbound through, 800 southbound through, and 140 southbound right turns). For a new development with no existing left-turn demand, providing a left-turn lane would result in a peak-hour delay reduction of about 2 hours. If there are 4 peak hours per day (e.g. 2 am and 2 pm), the daily peak period reduction would be about 8 hours.

No Trainer/Speaker Notes Required



Purpose: The purpose of this slide is to present some of the major talking points regarding economic effects in one place that ties all four pillars together.

Key Message: When access management, be it in the form of intersection control or spacing, turn lanes, or median openings is constructed for the sake of convenience or profit, the resulting costs to the public far outweigh the short-term gains of the development.

Outcomes: Recognize that –

- 1) When demands for inadvisable signals or direct access connections are made, or when demands are made to waive turn lane requirements or median openings, these are demands to indulge profit motives at the public expense.
- 2) Choosing short-term cost savings over longer term investments is ultimately self-defeating for both the public and the adjacent owners.
- 3) When major investments have to be made to recapture lost function it means that both public investments in transportation infrastructure and private investments in property development have already been lost.

Suggestion: It is advisable to carefully consider your target audience, their background, training, and their goals in customizing these talking points to any given situation.

Additional Resources



National Manuals and Guidelines

- Williams, K., Stover, V.G., Dixon, K., Demosthenes, P., Broen, F., Brown, L., Huntington, D., Layton, R., & Seggerman, K. (2014). Access Management Manual, 2nd Edition. Transportation Research Board of the National Academies, Washington D.C.
- Dixon, K., Layton, R., Huntington, D., Gattis, J. L., Brown, L., Butorac, M., & Ryus, P. (2016). Access Management Application Guidelines. Transportation Research Board of the National Academies, Washington D.C.
- Butorac, M., Bonneson, J., Connolly, K., Paul Ryus, Schroeder, B., Williams, K., Wang, Z., Ozkul, S., Gluck, J., National Academies of Sciences, Engineering, and Medicine. 2018. Guide for the Analysis of Multimodal Corridor Access Management. Washington, DC: The National Academies Press.

Federal Highway Administration

- FHWA. (2018). Safety Evaluation of Access Management Policies and Techniques. Publication No. FHWA-HRT-14-057
- FHWA. Proven Safety Countermeasures. <https://safety.fhwa.dot.gov/provencountermeasures/>
- FHWA. "Access Management: Driveways." n.d. Local and Rural Road Safety Briefing Sheets. FHWA-SA-14-080.
- FHWA, Technical Summary: Access Management in the Vicinity of Intersections, FHWA-SA-10-002 (Washington, DC: 2010).

MESSAGING

NCHRP Reports

- Bonneson, J. and P. McCoy. (1997). NCHRP Report 395: Capacity and Operational Effects of Mid-block Left-turn Lanes. Transportation Research Board, National Research Council, Washington, D.C.
- Duncan, C. et al. (2019). NCHRP Report 917: Right-Sizing Transportation Investments: A Guidebook for Planning and Programming. Transportation Research Board of the National Academies, Washington, DC.
- Fitzpatrick, K., et al. (2013). NCHRP Report 745: Left Turn Accommodations at Unsignalized Intersections. Transportation Research Board of the National Academies, Washington, D.C.
- Gluck, J. & Lorenz, M. (2010). NCHRP Synthesis 404: State of the Practice in Highway Access Management. Transportation Research Board of the National Academies, Washington, D.C.
- Gattis, J., et al. (2010). NCHRP Report 639: Guide for the Geometric Design of Driveways, Transportation Research Board of the National Academies, Washington, D.C.
- Gluck, J., H. Levinson, and V. Stover. (1999). NCHRP Report 420: Impacts of Access Management Techniques, Transportation Research Board of the National Academies, Washington, D.C.
- Potts, I.B., et al. (2004). NCHRP Report 524: Safety of U turns at Unsignalized Median Openings, Transportation Research Board, Washington, D.C.
- Williams, K. (2004). NCHRP Synthesis 337: Cooperative Agreements for Corridor Management, Transportation Research Board, Washington, D.C..
- Williams, K. (2002). NCHRP Synthesis 304: Driveway Regulation Practices, Transportation Research Board, Washington, D.C.

Local Government Programs

- Williams, K. (2020). NCHRP Synthesis 549 Incorporating Roadway Access Management into Local Ordinances. Washington, D.C.: Transportation Research Board of the National Academies.
- Williams, K. & Barber, J. (2017). Model Access Management Policies and Regulations for Florida Cities and Counties, 2nd Edition. Center for Urban Transportation Research.

State Manuals (recently updated)

- Florida Department of Transportation. (November 2019). Access Management Guidebook.
- Minnesota Department of Transportation. (March 2016). MnDOT Access Management Manual.
- Nevada DOT. (2017). Access Management Systems and Standards.

Go to www.accessmanagement.info for more resources and helpful information!

No Trainer/Speaker Notes Required

Toolkit Resources

Reports

NCHRP 1032 Final Report
Web Only Document

PowerPoints

[Economic Value of Access Management.pptx](#)
[Livability Value of Access Management.pptx](#)
[Mobility Value of Access Management.pptx](#)
[Safety Value of Access Management.pptx](#)
[Ten Ways to Manage Roadway Access.pptx](#)
[Top 10 AM Issues.pptx](#)
[Value of Access Management Policies.pptx](#)
[Value of Managing Driveway and Unsignalized Access.pptx](#)
[Value of Medians and Median Openings.pptx](#)
[Value of Network Connectivity.pptx](#)
[Value of Signal Spacing.pptx](#)
[Value of Turn Lanes.pptx](#)

Spreadsheets

MOBILITY TOOLS:

[AM_Mobility_Tools Final Modules.xlsx](#)

ECONOMY TOOLS:

[Safety and Mobility Economic Value.xlsx](#)

SAFETY TOOLS:

[LT_3LegIntersections.xlsx](#)
[LT_4LegIntersections.xlsx](#)
[MedianOpeningNearSignalizedIntersection.xlsx](#)
[MedianTypeDwyDensity.xlsx](#)
[RT-3LegIntersections.xlsx](#)
[RT-4LegIntersections.xlsx](#)
[SignalizedIntersectionDensity.xlsx](#)
[UnsignalizedIntersectionDensity.xlsx](#)

Brochures

[10WaysToManageAccess 0205.pptx](#)
[Access Management Brochure 2020.pdf](#)
[Safe Access is Good for Business FHWA.pdf](#)

Fact Sheets

[Economic Fact Sheet.pdf](#)
[Four-leg LT Lane Safety Fact Sheet.pdf](#)
[Four-leg RT Lane Safety Fact Sheet.pdf](#)
[Livability Fact Sheet.pdf](#)
[Median and TWLTL Fact Sheet.pdf](#)
[Median Opening Signal Int Fact Sheet.pdf](#)
[Signal Density Safety Fact Sheet.pdf](#)
[Three-Leg LT Lane Safety Fact Sheet.pdf](#)
[Three-leg RT Lane Safety Fact Sheet.pdf](#)
[Using Driveway Density Fact Sheet.pdf](#)
[Mobility Fact Sheets Corner Clearance.pdf](#)
[Mobility Fact Sheets Driveway Spacing.pdf](#)
[Mobility Fact Sheets Left-Turn Lanes \(Existing Driveway\).pdf](#)
[Mobility Fact Sheets Left-turn Lanes \(New Development\).pdf](#)
[Mobility Fact Sheets Right-Turn Lanes \(2L-arterial\).pdf](#)
[Mobility Fact Sheets Right-Turn Lanes \(4L-arterial\).pdf](#)
[Mobility Fact Sheets Signal Progression.pdf](#)
[Mobility Fact Sheets Signal Spacing.pdf](#)

No Trainer/Speaker Notes Required