U.S. Department of Transportation
Federal Highway Administration

LANE REPURPOSING WORKSHOP

Hosted by: Palm Beach Transportation Planning Agency (TPA)

PALM BEACH Transportation Planning Agency

February 15, 2019

PARTICIPANT NOTEBOOK

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Description

Urban streets must serve multiple modes of transportation and many types of users with differing ability levels. Good urban street design seeks to properly balance the needs of drivers, pedestrians, bicyclists, transit riders, emergency responders, and goods movement based on local context. To further complicate decisions on urban street design, oftentimes the ability to acquire additional right-of-way or expand the physical footprint of the roadway is limited due to surrounding development.

Recently there has been an increased desire by transportation agencies to better serve all users of urban streets and “rebalance” the usage of precious road space to meet mobility goals for multiple modes of travel. Lane repurposing and related strategies such as Complete Streets, offer opportunities to better share the limited street width among multiple users while frequently enhancing the economic viability of the surrounding businesses and the livability of the street for adjacent residents.

Lane repurposing often involves a reduction in the number of auto travel lanes on the street and using the freed-up space for safety, mobility, and accessibility improvements for multiple users. The most common type of lane repurposing is sometimes referred to as a “road diet” and involves converting an existing four-lane, undivided roadway segment that serves both through and turning traffic into a three-lane segment with two through lanes and a center, two-way left-turn lane (TWLTL). The reclaimed space can also be allocated for other uses such as bike lanes, pedestrian refuge islands, bus lanes and on-street parking.

Lane repurposing can support and complement several transportation priorities and policies such as Complete Streets, transit service enhancement, speed management, performance based practical design, and bicycle and pedestrian plans.

Charlotte Department of Transportation

Example of a lane repurposing project to better serve various users and modes of travel.

Who Should Attend

This workshop will be of interest to Transportation Planners and Engineers, Pedestrian and Bicycle Coordinators, Transit Route Coordinators, and Transportation Alternatives Program Managers.

Workshop Agenda

- What is Lane Repurposing? / Why consider it? / What are the benefits?
- Examples and case studies from around Florida and the US
- Feasibility Considerations: Under what conditions is Lane Repurposing applicable, and when are they not?
- Considerations for balancing service among competing users of the road: multimodal quality of service
- US 1 Multimodal Corridor Study: Overview and Next Steps
- Map of Palm Beach County's Lane Repurposing Candidates
- Assessing the traffic impacts of Lane Repurposing candidates
- Strategies for communicating and messaging Lane Repurposing to the public, business owners and elected officials
- "Next Steps" discussion and final Q&A

WELCOME AND INTRODUCTIONS

Workshop Facilitator:

Mark Doctor, PE
Senior Safety and Design Engineer
Federal Highway Administration - Resource Center
mark.doctor@dot.gov
404-562-3732

Logistics:

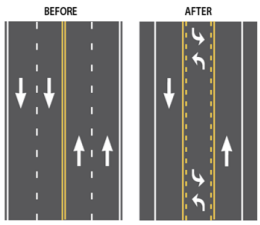
- Please silence cell phones
- Please ask questions
- Schedule
- Restrooms/Emergency exits
- Sign-in sheet and registration form

Source: Google Images

Increasingly, planners, engineers, decision makers, and citizens are recognizing the importance of designing and building Complete Streets. As defined by the National Complete Streets Coalition:

"Complete streets are designed and operated to enable safe access for all users. Pedestrians, bicyclists, motorists and transit riders of all ages and abilities must be able to safely move along and across a complete street."

What is "Lane Repurposing"?



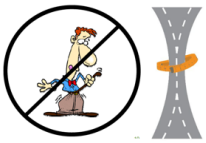
Reconfiguring the use of road space by reducing the number (or width) of lanes to provide space for other purposes such as:

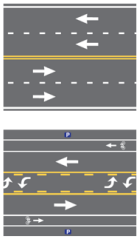
- Center Turn Lane (TWLTL)
- Median Islands
- Bicycle Lanes
- On-street Parking
- Bus Pull-outs
- Delivery Zones
- Wider sidewalks

Think about it like this:

- Lane reallocation
- Roadway reconfiguration
- Roadway user quality of service rebalancing
- Roadway "Right Sizing"
- "Road Diet"
- Restriping for Safety

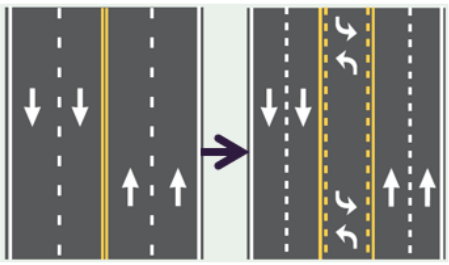
Lane repurposing typically doesn't shrink the overall "footprint" of the corridor



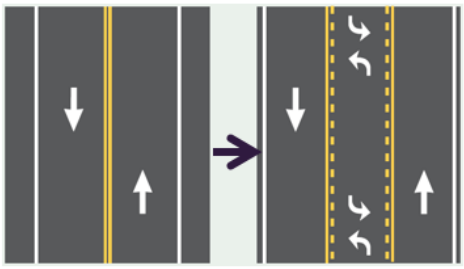


Many Possible Reconfigurations

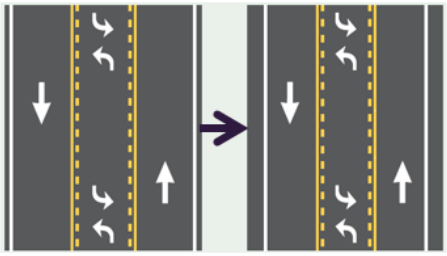
4-Lane to 5-Lane



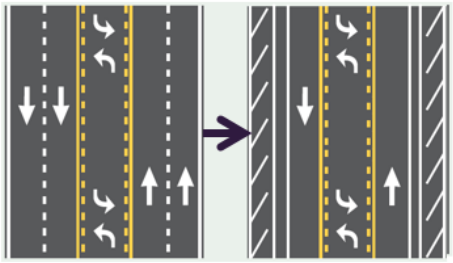
2-Lane to 3-Lane



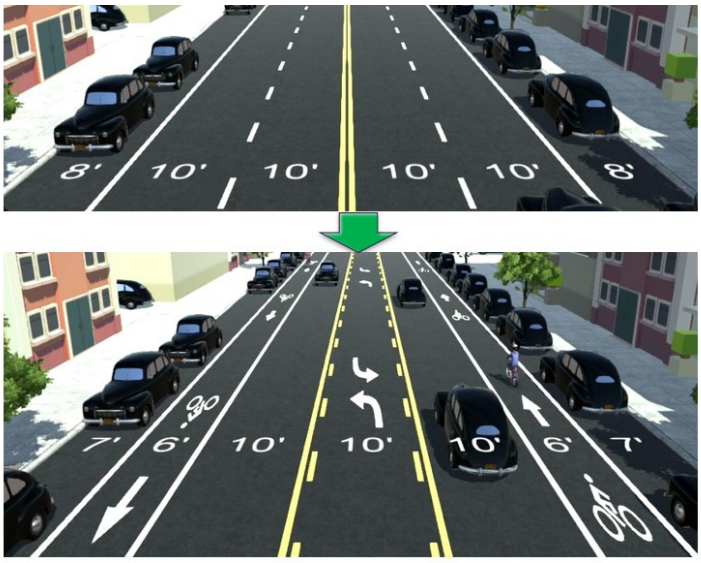
3-Lane to 3-Lane



5-Lane to 3-Lane



Lane Repurposing – Classic "Road Diet"



Four-lane undivided roads typically experience poor safety performance. Vehicle speeds can vary greatly between travel lanes with drivers frequently slowing or changing lanes due to vehicles stopped in the left lane waiting to turn left. On three-lane roads with center two-way left turn lanes (TWLTLs), vehicle speeds are more uniform (managed by the speed of the lead vehicle in the through lane), and through vehicles are separated from left-turning vehicles.

Why Consider Lane Repurposing?

- Crash reductions
- Promote more transportation choices
- Enhance economic vitality

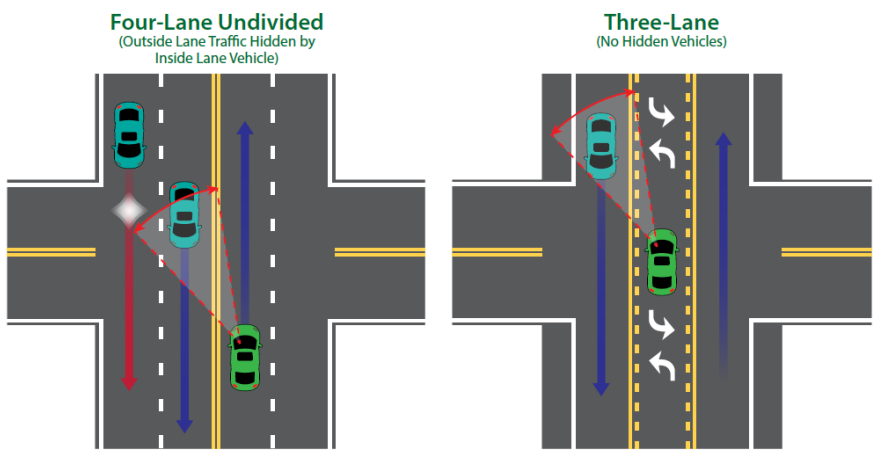
How can lane repurposing reduce crashes?

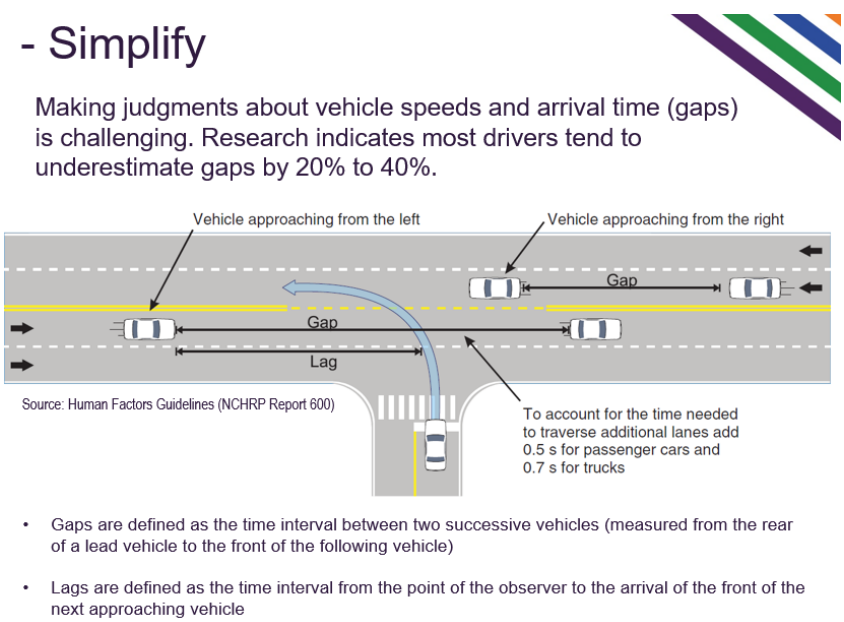
- Separate / Simplify / Slow

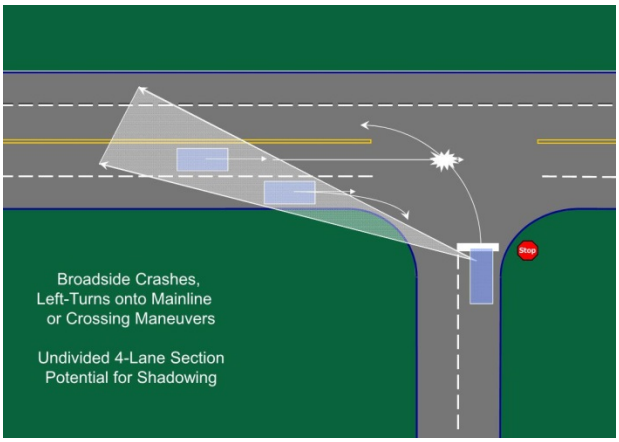
Separate

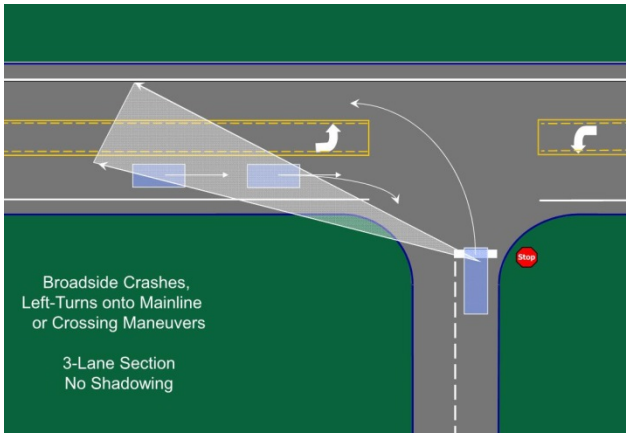
- Bicycle lanes create designated space for cyclists and relocate them from the vehicular travel lanes
- Center two-way left turn lanes (TWLTLs) remove left turning vehicles from a through lane
- TWLTLs provide separation for head-on vehicles

Simplify - Improved Sight Lines

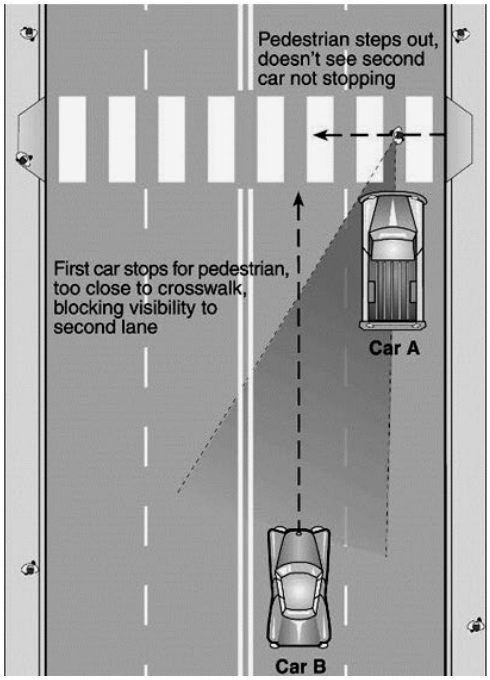








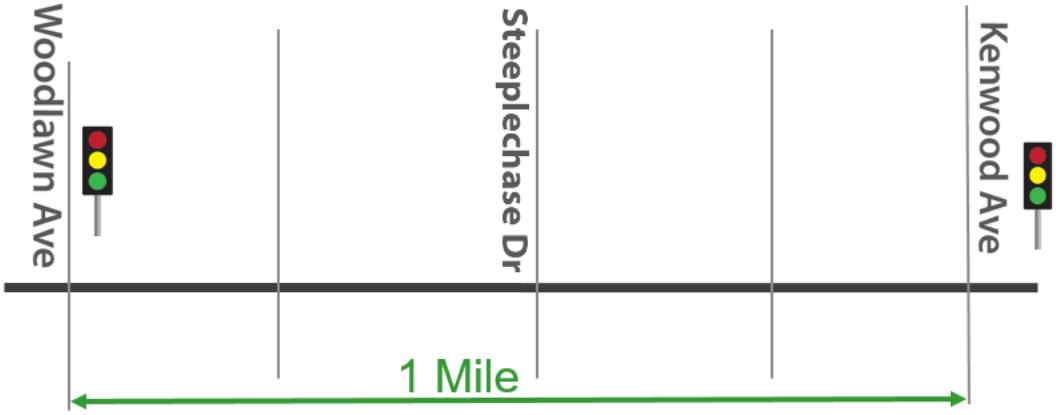
Improved Sight Lines at Unsignalized Crosswalks

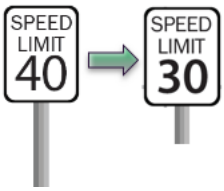


<u>Slow</u>

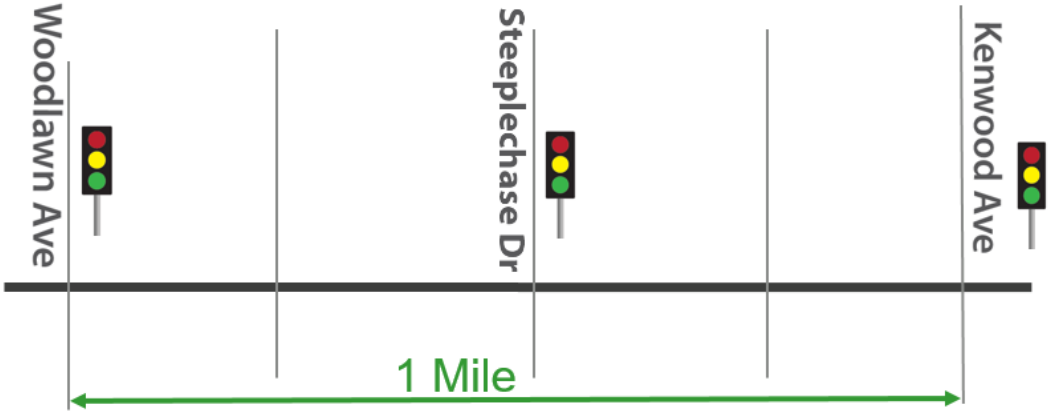
- Can reduce high-end speeding
- Signal progression can become more effective
- "***Go slower to get there quicker***"

What are the effects of reducing speed?

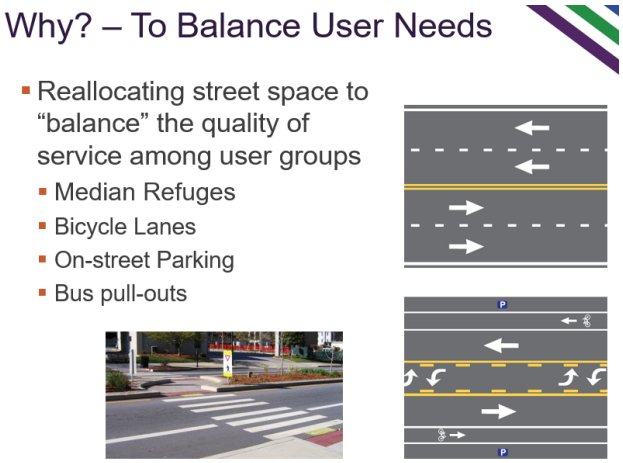




Lowering travel speeds from 40 MPH to 30 MPH adds 30 seconds of additional journey time per mile segment



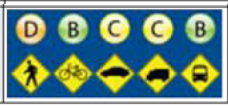
If a new signal was installed how much additional journey time would that create?

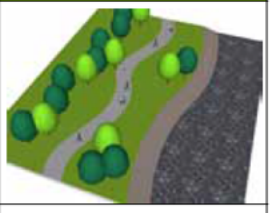
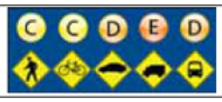
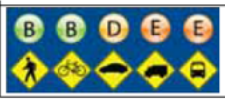
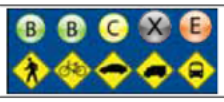


Lane repurposing can make crossing easier for pedestrians (fewer travel lanes to cross and they are exposed to moving traffic for a shorter period of time).

By adding pedestrian refuge islands - the crossing becomes shorter and less complicated (pedestrians only have to be concerned with one direction of travel at a time).

<u>Modal Based Performance Goals</u>

	Expressway	Arterial Corridor	Suburban Corridor	Activity Corridor
Example Cross-Sections				
Typical Design	• Restricted access • Divided highway • Grade-separated intersections	• Connecting routes • Median/boulevard • No on-street parking • Possible on-street bike lanes along some corridors	• Suburban cross-section • Continuous center left-turn lane • Restrict left turns in/out of some driveways	• Center turn lane at main intersections • Center lane median or no center lane • Crosswalk bump-outs • On-street parking
Users Served	MDOT jurisdiction provides efficient routes for regional and local traffic to traverse areas quickly to access destinations within or outside the city.	Serves autos/transit accessing other corridors and destinations.	Serves primarily autos and service vehicles accessing local and regional business.	Provides access to entertainment, businesses, and employment for motorists, transit users and pedestrians.
Desired Quality of Service (QoS) by Mode				

	Prime Connector	Neighborhood Connectors	Local Streets	Principal Non-Motorized Routes
Example Cross-Sections				
Typical Design	• On-street bike lanes • Bike lanes and on-street parking where both can fit • Crosswalk bump-outs	• On-street bike routes/ lanes • Bike boulevards/other facilities where needed (see also Lansing's *Non-Motorized Plan*)	• Pedestrian crossing visibility • On-street parking	• On-street: Local streets and short off-street segments that serve as parallel/cross-town routes • Off-street: Corridors along utility, natural or rail corridors
Users Served	Connects automobiles, bikes and pedestrians to other corridors via transit and enhanced facilities for all three modes.	Connects automobiles, bikes and pedestrians from neighborhood local streets to more major streets via bike routes/facilities, wide sidewalks and clear signage.	Local streets are all other public and private streets in the city. Very low traffic volumes with frequent stop-controlled intersections.	Provides connectivity for bikes and pedestrians; typically along local side streets or along natural features, utility or rail corridors.
Desired Level of Service (QoS) by Mode				

Source: City of Lansing, MI 2012 Comprehensive Plan

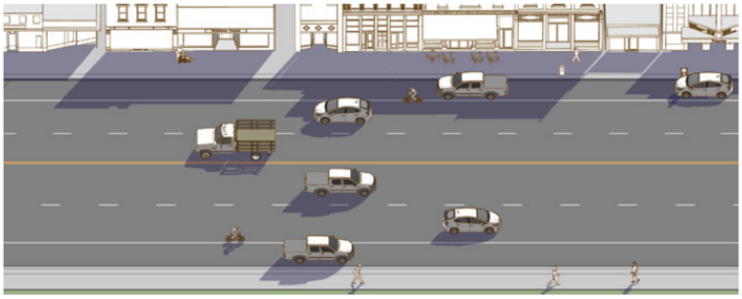
Relation to "Complete Streets"

- The concept of Complete Streets suggests the street should accommodate all users of the road and its surroundings
- Being "complete" is context inherent and will differ depending on the street's intended function
- Many communities have embraced this concept by adopting Complete Streets policies, establishing the expectation that future roadway projects will be designed with all users in mind rather than simply providing enough capacity for vehicle through-put

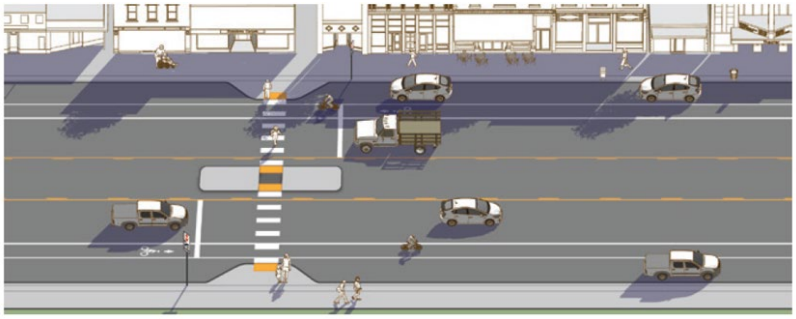
Why? – Promote Economic Enhancement

- Inviting and walkable setting
- On-street parking
- Access for customers and deliveries

On which of these “Main Streets” would you want to open a business?



Four-lane undivided:
- Higher travel speeds
- Erratic vehicle movements
- Bicycles mixed with vehicles and parking movements



Three-lane w/ bike lanes:
- Lower travel speeds and less erratic movements
- Separate bicycle lanes
- Improved pedestrian crossings

Expanded Streetscaping:
- Expanded sidewalk area

REVIEW OF KEY POINTS

What are some of the reasons agencies implement lane repurposing projects?

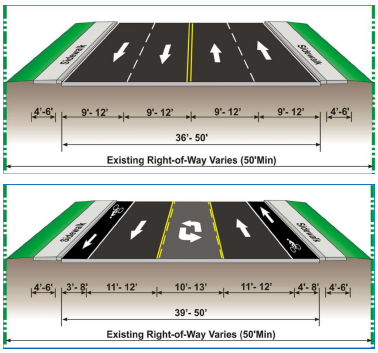
Explain how the concepts of **SEPARATE**, **SIMPLIFY** and **SLOW** contribute to reducing the frequency and severity of crashes for all road users. How can lane repurposing projects help achieve these concepts?

LANE REPURPOSING CASE STUDIES

Tampa - Nebraska Avenue

- 3.15 Miles
- Before: 4-lane undivided urban arterial
- After: 2-lane arterial with
  - Bike lanes
  - Combination of:
    - Two-way left turn lane
    - Painted/textured medians
    - Bus pull outs (Bus Bays)
- Construction 2007 -08
- $11.1 million (initially 3R project)

Nebraska Avenue



Nebraska Avenue

Nebraska Avenue – Before & After Data

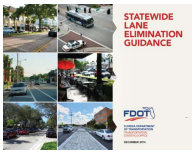
	Before 2004-06	After 2009-13
AADT	17,900	15,000
Crashes/Yr.	174	71
Severe Crashes/Yr.	13	6
Ped. Crashes/Yr.	7	<3

59% reduction in overall vehicle crashes.

57% reduction in pedestrian crashes.

FDOT Lane Elimination Guide

- Develop a statewide lane elimination review process
- Balance state & local interests
  - Multi-modal needs – Vehicles, Pedestrians, Bicycles & Transit
  - Economic development – wider sidewalks, parking
  - More livable environments – landscaping, aesthetics
- Identify profiles of issues & concerns
- Provide guidelines for development of the Concept Report



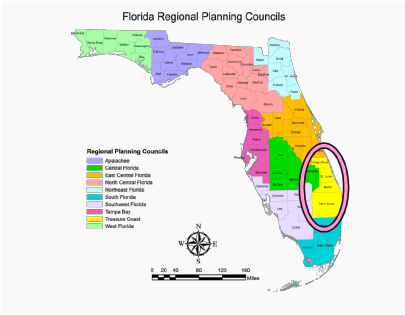
FDOT Lane Elimination Concept Reports

Sample of Current Lane Elimination Concept Reports

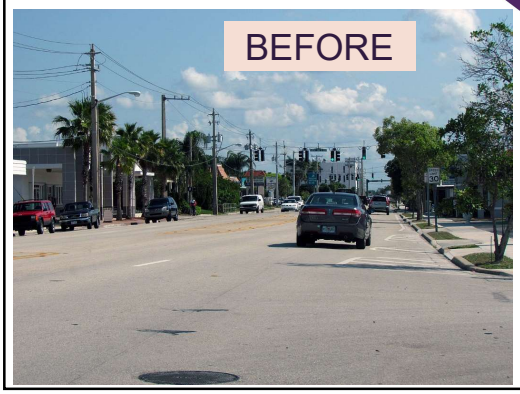
Status	Location	Description	Features
Approved	SR 5 / US Highway 1	From 6 to 4 lanes	Wider median, buffered bike lanes, landscape
Approved	SR 811 (Dixie Highway)	From 6 to 4 lanes	Buffered bike lanes, landscape
Approved	Hillsborough Boulevard	From 6 to 4 lanes	Buffered bike lanes, TWLT Median
Approved	SR 569/US Highway 41	From 6 to 4 lanes	Buffered bike lanes, intersection improvements
Under Review	SR 9(NW 27 Avenue)	From 6 to 4 lanes	Outside lane repurpose for Bus Rapid Transit
Under Review	SR 7/US Highway 441	From 6 to 4 lanes	On-street parking, bike lanes, landscape
Under Review	SR 804 (Boynton Beach Blvd)	From 4 to 2 lanes	TWLT Median, Bike Lanes
Under Review	SR 811 (Wilton Drive)	From 4 to 2 lanes	TWLT Median, Bike Lanes

Cervantes Street (US 90) - Pensacola

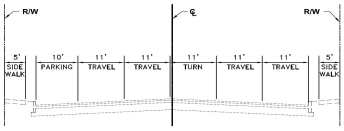
Southeast Florida Case Studies



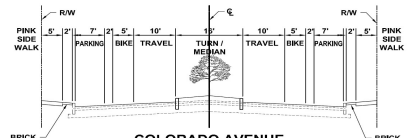
Stuart, FL – Colorado Avenue



Road "Makeover" Completed in 2013

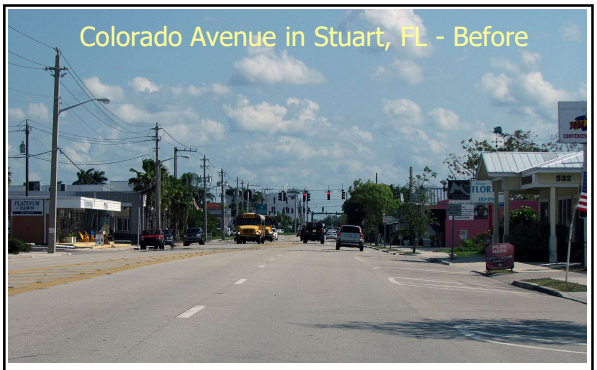


COLORADO AVENUE
EXISTING TYPICAL SECTION



COLORADO AVENUE
PROPOSED TYPICAL SECTION

Colorado Avenue in Stuart, FL - Before



Colorado Avenue in Stuart, FL - Now

Colorado Avenue in Stuart, FL

- More Pedestrians and Cyclists
- Traffic Counts ↑ by 1,000 cars/day (about 13,000 ADT)
- Store Vacancies ↓ from 14% to 3% (18 new businesses in 2 yrs)
- Commercial Market Values ↑ 25%
- Police Calls ↓ 54%

Original Condition

Original Condition

Original Condition

Tequesta Drive/US1

Original Condition

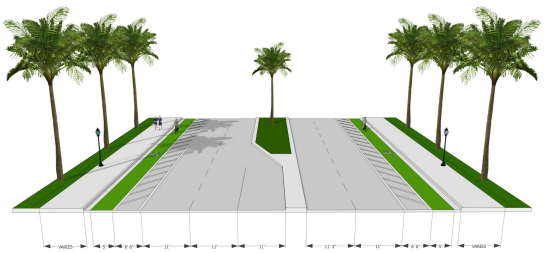
Tequesta Drive/US1

Improved

Tequesta Drive/US1

Original Condition (2017)

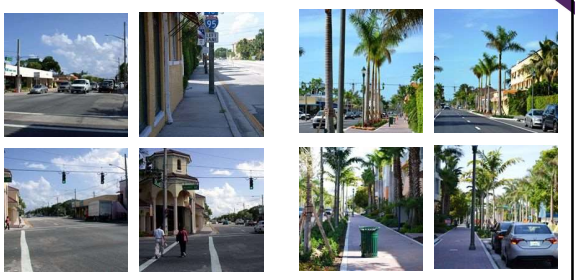
Future Condition (Spring 2019)



Lane Repurposing Workshop
February 2019

US1 / Delray Beach, FL

BEFORE *AFTER*

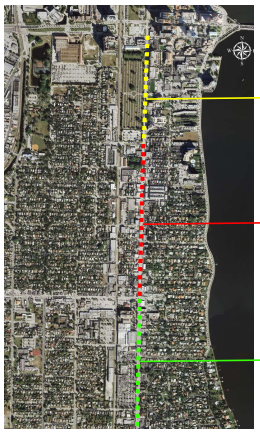


US 1 / Delray Beach

US 1 ~ Delray Beach

US 1 ~ Delray Beach

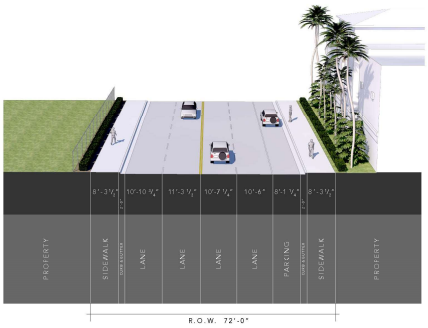
US 1 - WPB



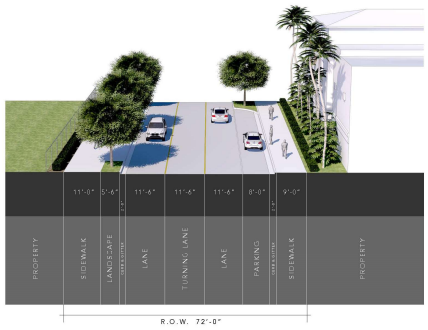
Northern Section
(Okeechobee to Palm Street)
Expanded Sidewalk and Shade Trees

Central Section
(Palm Street to Belvedere Road)
Bulb-outs, Shade Trees, On-Street Parking, and Flamingo Plaza

Southern Section
(Belvedere Road to Albemarle)
Cycle Track, On-Street Parking, and Shade Trees



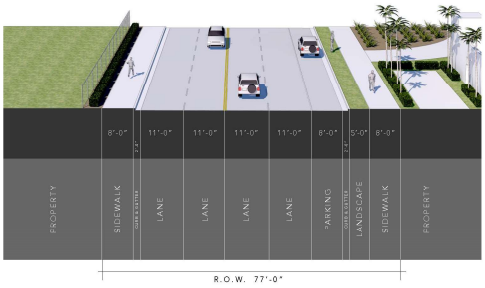
EXISTING STREET SECTION
DIXIE HIGHWAY NORTH OF GRUBER PL.



PROPOSED STREET SECTION
DIXIE HIGHWAY NORTH OF GRUBER PL.

West Palm Beach – Dixie Highway

West Palm Beach – Dixie Highway



EXISTING STREET SECTION
DIXIE HIGHWAY AT THE NORTON MUSEUM

PROPOSED STREET SECTION
DIXIE HIGHWAY AT THE NORTON MUSEUM

West Palm Beach – Dixie Highway

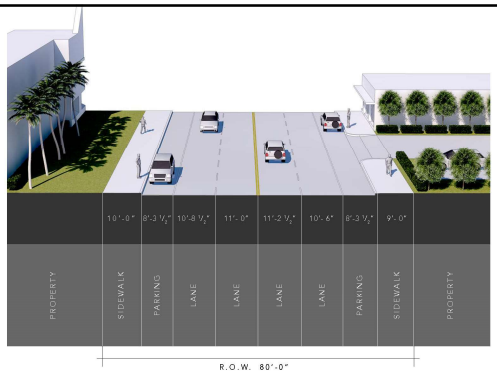
West Palm Beach – Dixie Highway

West Palm Beach – Dixie Highway

West Palm Beach – Dixie Highway

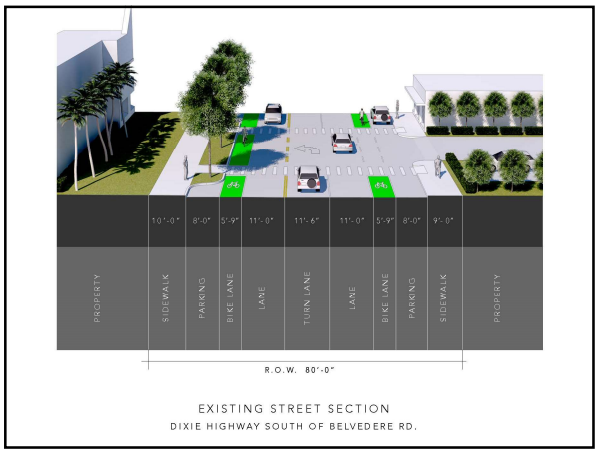
West Palm Beach – Dixie Highway

West Palm Beach – Dixie Highway



EXISTING STREET SECTION
DIXIE HIGHWAY SOUTH OF BELVEDERE RD.

Lane Repurposing Workshop
February 2019



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Lane Repurposing Workshop
February 2019

Road Diets - Guidelines for Assessing Candidate Locations

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Presentation at the Washington State LTAP Road Diet Peer Exchange
September 5, 2018 – Seattle, WA

Introduction

A Road Diet is an innovative and low-cost strategy for improving safety and for developing multi-modal corridors within existing right-of-way. Road Diets do not typically narrow the physical width of the roadway footprint, but instead re-arrange how the curb-to-curb space is used. There are many options for reconfiguring a roadway, but most Road Diet projects are applied to four-lane undivided roads that are converted into a single lane in each direction with a center two-way left-turn lane (TWLTL). Many reconfigurations also make room for features such as bicycle lanes, on-street parking, or transit stop pull-outs[1].

Road Diets are a proven safety measure[2] and are very effective in corridors with frequent crashes, high incidents of speeding, or for streets that pass through sensitive areas like school zones or recreation areas. Road Diets generally have a traffic calming effect that reduces travel speeds to effectively decrease crash severity. Road Diets that provide for a TWLTL can greatly reduce the risk of rear-end and angle collisions for mid-block left-turning motorists[3]. Decreasing the number of road lanes reduces pedestrian exposure to traffic when crossing the street and the extra space can be used to add pedestrian refuge islands. For bicyclists, Road Diets can provide an opportunity to add bicycle lanes to the street. A Road Diet may also provide the opportunity to install bus pullouts so transit users can enjoy safer stops that do not hinder the flow of traffic.

Road Diets can be relatively inexpensive to implement, especially when done through a resurfacing project where the Road Diet itself would consist primarily of restriping (or repainting) into the new configuration. Additional features such as building pedestrian refuge islands or modifying the intersections (perhaps into roundabouts), would influence the actual cost of a Road Diet.

Although Road Diets are a proven safety strategy and offer significant multi-modal benefits, they may not be appropriate or feasible in all locations[4]. There are numerous factors that transportation agencies should consider in terms of feasibility and the overall objectives of the corridor when deciding whether a Road Diet is an appropriate solution at a particular location.

This document offers key considerations and evaluative questions that transportation professions should assess when screening and evaluating Road Diet candidate projects. The assessment questions are presented in a worksheet format. This worksheet was developed for use in a training class exercise of a Road Diet workshop offered by the Federal Highway Administration. This worksheet may be of assistance to practitioners to guide and document a Road Diet feasibility assessment. The information presented is focused on reconfigurations of existing four-lane undivided roads, but may also be useful for considering other types of reconfigurations.

Road Diet Feasibility Assessment Worksheet

This worksheet provides a list of evaluative questions for assessing a potential road diet project. It is intended as a tool for examining the issues often relevant to road diet feasibility. Additional issues or more information about specific proposals may be needed and adapting this worksheet to meet your agency or project development needs is encouraged. Exercising professional judgement is critical to any assessment and it is critical to consider the trade-offs associated with these interrelated factors and to the desired goals and objectives of the project.

Project Name/Location: _____

Project Limits/Length: _____

Project Goals and Objectives

Intent: *By first identifying the objective(s), this will help determine whether a road diet is an appropriate alternative for the corridor being evaluated.*

Since Road Diets are essentially about reallocating precious roadway space to improve safety and better meet the needs of the various users, it sometimes requires making "trade-offs" in terms of the expected gains and detriments of the roadway change. There may be some negative effects associated with a reconfiguration. When assessing the levels of benefit (and possible detriment), it is critical to first consider the results or outcomes that are trying to be achieved with the project.

Clearly identifying and understanding the project goals and objectives (or "purpose and need") should be the first step to help determine if a Road Diet is the appropriate solution. Crash data, observational studies, and community feedback are all helpful methods to understand user needs. Good safety data can help identify the types of crashes that are occurring. Observational field studies can offer valuable insights on driver behavior, traffic patterns, presence of speeding vehicles, and clues for needs with regard to better pedestrian, bicyclist, and transit facilities.

Safety: *If safety improvement is a major objective, determine if the identified crash patterns are those that could be addressed with a Road Diet.*

Is safety improvement specifically a goal of this project? _____

If yes, then what are the current safety issues/problems including any concerns related to pedestrians, bicyclists and transit users? _____

Will the types of crashes that are occurring likely be reduced with a Road Diet conversion? _____

Is excessive speed and/or speed variability a concern for this road? _____

Multi-modal: *If enhancements in service to other user groups are the major objective, determine if a Road Diet is appropriate to help address those needs.*

Is multimodal service enhancement specifically a goal of this project? _____

Have any multimodal quality of service goals been established? _____

Is this proposal in support of a Complete Streets policy or objective? _____

Is there a desire to achieve reduced vehicular travel speeds and/or traffic calming? ___

Other Goals & Objectives

Are there any economic enhancement or livability goals for this project? _____

Is the proposal consistent with the applicable Long-Range Transportation Plan (LRTP), Transportation Improvement Program (TIP), Transit Development Plan (TDP), comprehensive plan, and/or any applicable bicycle plans, pedestrian safety plans, and Complete Streets initiatives? _____

What other goals and objectives are associated with this project? _____

_____

What Road Diet Configuration(s) Best Meets the Goals and Objectives?

Intent: *Based on the user needs for satisfying the goals and objectives, what reallocations of road space are appropriate? The types of changes proposed to the current cross section are important to know before proceeding with the feasibility analysis. Although many Road Diets involve reducing the number of travel lanes, it may be possible to achieve some goals by simply narrowing the width of lanes.*

What is the existing cross-sectional width (typically measured curb-to-curb)? _____

Sketch the existing cross-section below showing approximate widths:

What features are desired for a reconfigured cross section in order to achieve the project goals and objectives?

____ Two-way left-turn lane (TWLTL)
____ Painted or raised median
____ Pedestrian refuge islands
____ Bicycle Lanes
____ On-street parking
____ Delivery zones
____ Wider sidewalks
____ Bus pull-outs
____ Delivery zones
____ Other _____

Can the desired cross-sectional elements be implemented within the available width?

If not, is it possible to acquire additional right-of-way? _____

Sketch out one or more options for achieving the desired cross-section below showing approximate widths:

Road Function and Context

Intent: *The location context and major functions of the road should be understood with regard to assessing the possible tradeoffs among mobility and safety for all users. The functional classification of the roadway influences the design standards and criteria specific to the proposed project. The functional classification of the road may indicate the historical intended purpose of the corridor, but may not be indicative of the present context or the various purposes the roadway serves. The existing and intended function of the roadway and the surrounding land uses are important considerations for the feasibility of a Road Diet.*

What is the road's current Functional Classification? _____

Is a future change in Functional Classification expected or desired? _____

Is this a designated Truck Route? _____

What is the level of freight/large vehicle operation along the road? _____

What are the current and expected future levels of transit operation along the road? ___

_____

Is the adjacent land use expected to remain relatively stable? _____

Is this a designated Emergency Evacuation route? _____

Along the route, are there any:

- Hospitals?

- Fire stations?

- Schools?

- Major trip generators?

If YES to any of the above, consider involving these entities early in your project discussions.

Notes:

_____

_____

_____

Traffic Operational Considerations

A common misconception is that reducing the number of through lanes will automatically increase traffic delays. Although Road Diet reconfigurations that involve reducing the number of travel lanes have the potential to negatively impact traffic operations, this is not always the case. There are several factors besides the number of lanes and the volume of traffic that can greatly influence the actual traffic operations.

In the case of assessing a proposed Road Diet, perhaps the most critical factor is the pattern and volume of mid-block left-turning traffic. Many four-lane undivided roadways begin to operate in a manner similar to a three-lane roadway as the number of access points and mid-block left-turning movements increase. In this condition, the four-lane undivided roadway may be operating as a de facto three-lane roadway and the operational impacts of reconfiguring to a three-lane section may have no detrimental impact on traffic flow and actually improve conditions.

Other factors that greatly influence traffic operations is the number and spacing of signalized intersections and major driveways, the frequency of stopping and slow-moving vehicles through the corridor, the presence of on-street parking, and the existence of any at-grade railroad crossings.

Traffic Volumes

The overall volume of traffic on the roadway is just one consideration for assessing traffic operations - but an important one. Although some Road Diets going from four-lanes to two-lanes have been successfully implemented on corridors with volumes in excess of 26,000 vehicles per day (vpd), many agencies will limit their consideration of Road Diets to roads with 20,000 vpd or less.

Traffic volume provides a good initial screening factor for assessing Road Diet feasibility. Many agencies have established maximum thresholds based on either an average daily traffic (ADT) or a peak hour volume.

What are the current ADT volumes? _____

What are the current peak hourly volumes? _____

What is the projected future ADT (based on historical growth and/or the regional travel demand model)?

_____

Are these volumes within agency guidelines for a Road Diet? _____

Does the corridor periodically function as a “relief” route to a freeway or principal arterial and experience high volumes when those other facilities are congested? _____

Pedestrian and Bicycle Volumes

Pedestrian Counts: _____
If counts are unknown, provide a general classification such as high, moderate, or low

Bicycle Counts: _____
If counts are unknown, provide a general classification such as high, moderate, or low

Transit Operational Considerations

Intent: *Depending on the bus frequency and headways, with just one travel lane per direction, frequently stopping busses may have a significant impact on traffic flow. Constructing bus bulbs or pull-outs can mitigate these effects, although use of bus pull-outs may result in delays for busses when trying to merge back into the through lane.*

What are the bus volumes and headways in the corridor? _____

If a Road Diet is implemented, will stopping transit buses in the one through lane significantly impact traffic? _____

Are locations for bus pull-outs possible? _____

Do transit routes make turns within the corridor? (May need to assess turn radii and lane widths)

Mid-block Traffic Patterns

What is the approximate driveway density along the route? _____

What are the characteristics (commercial, residential) and approximate volumes of traffic entering and exiting from the mid-block driveways? _____

What are the patterns and turning volumes for vehicles to/from the minor streets?
_____

Is the existing roadway operating as a de facto three-lane roadway? _____

Speed Considerations

What is the current posted speed limit? _____

What are the current travel speeds along the road? (e.g., mean, 85th percentile, percent of vehicles traveling at high speeds) _____

Is a change in the posted speed limit proposed? _____

How frequent is the presence of slow-moving or frequently stopping vehicles, such as school busses, trash pick-up, curb-side mail delivery, etc.? _____

_____

On-Street Parking Considerations

Intent: *On-street parking can create a "tunnel effect" that naturally slows motorists' speeds. Providing on-street parking may also allow for construction of curb extensions at crosswalks, which reduce crossing distance for pedestrians.*

Does on-street parking currently exist? _____

Is on-street parking proposed (parallel, angle, back-in, mix)? _____

Note: *Angled parking uses less linear curb length per parking space than parallel parking (so more spaces may be provided on the same block). However, angled parking takes up more distance perpendicular to the curb. Back-in angled parking (as opposed to head-in angled parking) is beneficial to bicyclists as it is easier to make eye contact with drivers as they pull out of their parking spots.*

Will on-street parking reduce the ability of vehicles to turn in and out of minor streets and access points?

Intent: *On-street parking should not impede visibility for pedestrians, bicyclists, and other vehicles. This means that on-street parking spaces should be located carefully relative to intersections and crosswalks.*

Trucks and Freight Delivery Considerations

Intent: *Consider the potential impacts on trucks (including appropriateness of turn radii and lane widths and the possible relocation of designated truck routes).*

Consideration of the operating requirements of trucks and other large vehicles should be given when considering a Road Diet. Curb extensions or other non-traversable areas that may be added as part of a Road Diet project should be designed to accommodate the turning needs of large vehicles, but typically at slow speeds. Curb radii design should facilitate slow turning movements, but also not cause trailer off-tracking. If lane widths are decreased during a road diet, large trucks may have increased risk of involvement in sideswipe and mirror crashes, depending on the resulting width of the lane and the curvature of the road. Additionally, narrower lanes may create less space between trucks and other road users, which can create a sense of discomfort.

What is the character of the road with respect to trucks and freight delivery? Are truck volumes known? _____

Are there significant turning movements of trucks and large vehicles at the intersecting roads? _____

Consider the current and future needs for delivery zones and loading areas. Removal or relocation of delivery zones may impact truck access to businesses. Where there will be only one through lane per direction, trucks that stop for deliveries are likely to block auto traffic.

_____

_____

If applicable, how are truck deliveries currently made to businesses along the route?

_____

_____

Intersection Operational Considerations

Intent: *The major intersections within the corridor are likely to be of greatest concern with regard to capacity and operational performance risk for implementing a Road Diet. Performing a traffic analysis of the major intersections is a critical element of a Road Diet assessment to determine their expected operation under the proposed lane reconfigurations. Traffic analysis tools such as the Highway Capacity Manual (HCM) may be appropriate to evaluate intersection operations under most conditions, but for situations such as closely spaced intersections or coordinated signal systems, the use of micro-simulation models may produce better methods for adequately evaluating arrival patterns and queue formation and dissipation.*

Has a traffic analysis been performed for all the major intersections (signalized, roundabout or All-Way STOP) within the project study road segment? List the major intersections and summarize their projected operational performance (LOS, delay, max queue length, etc.).

_____

_____

_____

_____

_____

_____

Are any of the existing intersections experiencing operational problems such as excessive delays? If known, list the volume/capacity ratios of the intersection approaches:

_____

_____

_____

Are there any problematic geometric issues related to the existing intersections (e.g., intersection sight distance deficiencies, skew, approach grades, approach alignment and profile, proximity to adjacent intersections, etc.)?

_____

_____

Are there any plans to add, remove, or modify traffic signals within the corridor? _____

Note: *Road Diet projects may offer great opportunities to implement roundabouts at certain intersections. Roundabouts and Road Diets implemented concurrently offer exceptional safety co-benefits. On certain roadways, roundabouts may increase intersection capacity and reduce delay. The reduction of a four-lane road to a three-lane road could facilitate the use of single-lane roundabouts. One-lane roundabouts, and particularly mini-roundabouts, are frequently able to fit within existing right-of-way.*

At existing signalized intersections, are there opportunities to improve the signal timing, signal phasing, and/or presence of turn lanes?

_____

_____

_____

_____

When was the last time the signal timing or phasing was changed or optimized? _____

Are there any mid-block pedestrian crossings existing or proposed? _____

CAUTION: A greater risk for operational impacts (such as significantly more queuing and delay) may occur with lane eliminations in a downtown setting due to heavy side street volumes and closely spaced signals caused by short block lengths. Corridors with closely spaced signalized intersections may have greater risk for queuing affecting adjacent signalized intersections.

Special Conditions

Is the Road Diet conversion expected to divert significant traffic to parallel roadways?

Intent: *Traffic diversion to parallel streets may not be problematic for arterials or collectors with adequate reserve capacity, but could be very problematic for diversion to neighborhood residential streets.*

Are there any at-grade railroad crossings along the roadway? _____

If so, do trains regularly cross during peak travel periods and what is the typical delay time and queue length caused by a train crossing? _____

_____

Are there any other special conditions along this road that may jeopardize the feasibility of a Road Diet?

_____

Early Stakeholder Engagement

Intent: *Comprehensive public involvement and stakeholder engagement is critical to the successful implementation of Road Diet projects. Early outreach to stakeholders at a minimum should include neighborhood residents and businesses. Any anticipated increase in vehicular travel time delays on the candidate roadway, or potential overflow facilities, should be clearly communicated to the stakeholders, as well as the anticipated safety and livability benefits for all users. Visualizations can help explain proposed solutions, and in some instances, design charrettes and "demonstration days" activities could be held to address concerns.*

Initial public concern about Road Diets may be with a perceived reduction in roadway capacity and belief it will result in worse traffic congestion. Businesses may also object if they believe they'll have fewer customers due to congestion or a diversion of traffic onto other streets. Experience from case studies around the country indicates these concerns rarely come true.

Is there any known controversy associated with the project? _____

Have any concerns or supportive comments been voiced at public meetings from local businesses, residents and other stakeholders? _____

Have endorsements or documented project support been made by appropriate city, county, and/or regional bodies (e.g., a commission or board resolution)? _____

Do area drivers have familiarity with proper use of TWLTLs? _____

Systemic Implementation

The feasibility assessment worksheet is intended to assist practitioners in examining the feasibility of a Road Diet for a given location. Although some agencies may decide Road Diet feasibility on a case-by-case basis, another strategy is to implement Road Diets systemically by taking a proactive approach to assess every four-lane road within the agency's jurisdiction to determine and rate the feasibility for converting it to a three-lane road.

Whether Road Diets are assessed systemically or on an individual basis, an efficient way to implement a Road Diet is by incorporating the conversions into a resurfacing project. Including Road Diets as part of resurfacing projects can significantly reduce costs, but takes planning. A clear process is needed to determine if a reallocation of the roadway width should be made when it is resurfaced and the project timeline must allow for the appropriate public outreach. Consequently, some State and local agencies have incorporated the consideration of Road Diets into their process for reviewing roads for resurfacing.

Conclusion

Road Diets are a proven safety strategy and low-cost opportunity for developing multi-modal corridors within existing right-of-way. Implementation through a resurfacing project can be a cost-efficient way to reallocate the road space to improve conditions for multiple user groups of the facility. Although Road Diets most commonly involve restriping a four-lane undivided road to a three-lane road with two through lanes and a two-way left-tum lane (TWLTL), the concept may also be applied to other types of reconfigurations[5]. By reducing the number of lanes and/or lane widths, the created space can be used to implement bicycle lanes, on-street parking, pedestrian refuge medians, or widen sidewalks.

Operational considerations for vehicular traffic are important when assessing the feasibility of a Road Diet, but also of tremendous importance is consideration for the quality of service for other users within the facility. Methodologies for assessing quality of service for other users have evolved into the Highway Capacity Manual (HCM) to allow analysts to assess service measures for pedestrians, bicyclists, and transit users. Road Diets can be effective for improving the factors that affect travelers' perceptions of safety and comfort including:

- Reduced motor-vehicle speeds
- Increased space between motor-vehicle lanes and pedestrians and bicyclists
- Shorter crossing length for pedestrians
- Pedestrian refuge islands and dedicated bicycle lanes
- Safer and more comfortable access to transit stops

This paper provides an evaluative worksheet to guide practitioners through the many considerations for assessing the feasibility of a Road Diet at a particular location. The worksheet is intended to be a guide and practitioners are encouraged to modify the worksheet to fit local practices and policies of your agency. Decisions to implement a Road Diet may involve judgments more complex than a simple “yes/no” assessment of the factors contained in this worksheet.

Although the worksheet lists these considerations individually, the practitioner should consider these elements collectively within the larger context. Many of the feasibility factors involve making trade-offs. For example, if a roadway currently has a significant safety issue at four-lanes and has high traffic volumes, an agency may choose to implement a three-lane Road Diet in order to reduce crashes even thought it might increase travel delay. Such a trade-off may be acceptable and desirable if the safety benefit outweighs the operational detriment. Some implementation decisions may need to consider achieving a “balance” of the needs of all users of the facility and may require a shifting of the quality of service among the different user types. For example, implementing a Road Diet on a lower volume road may only marginally reduce service to vehicular traffic, but may greatly improve service to other user groups if features like bicycle lanes and pedestrian refuge islands are installed. So in such an instance, there is a minor detriment to one user group, but that is more than offset by the significant improvement for another user group.

This assessment worksheet has undergone several iterations and any feedback, comments and suggested revisions are greatly welcomed.

References

1. FHWA, *Road Diet Informational Guide,* FHWA-SA-14-028. (Washington, DC: 2014)

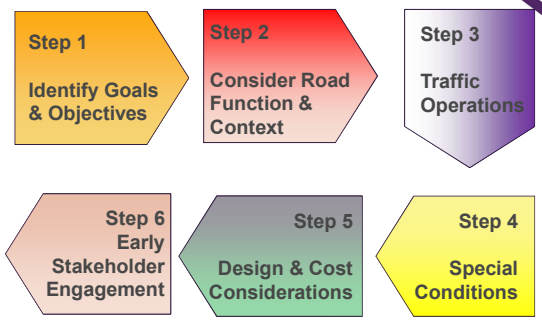
2. FHWA, “Proven Safety Countermeasures” web page. Available at: https://safety.fhwa.dot.gov/provencountermeasures/

3. FHWA, *Evaluation of Lane Reduction Road Diet Measures on Crashes,* FHWA-HRT-10-053. (Washington, DC: 2010)

4. New Mexico Department of Transportation, *Road Diet Guide*, 2016. Available at: http://dot.state.nm.us/content/dam/nmdot/Plans_Specs_Estimates/Design_Directives/2017/IDD-2017-16%20(Road%20Diet%20Guide).pdf

5. Florida Department of Transportation. Statewide Lane Elimination Guidance, 2014. Available at: http://www.fdot.gov/roadway/csi/Files/Lane-Elimination-Guide-Part1.pdf

Feasibility Worksheet Steps

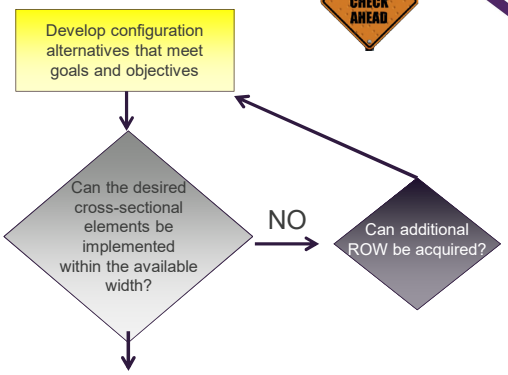


Feasibility Worksheet Steps

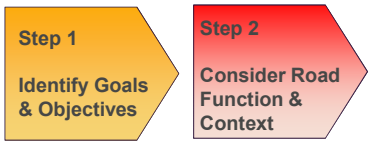
Project Goals & Objectives

- Understanding the project goals and objectives (along with their relative importance) is critical for evaluating the trade-offs that are often inevitable when reallocating valuable road space

Feasibility Assessment



Feasibility Worksheet Steps



Functional Classification

- Functional classification historically emerged as the predominant method for grouping streets and highways by their "character of service" and has been an important planning tool

Functional classification categories are related to "hierarchies of travel movements"

The functional classification category may not indicate the actual *context* of the roadway or match its *intended* or *designed* functions

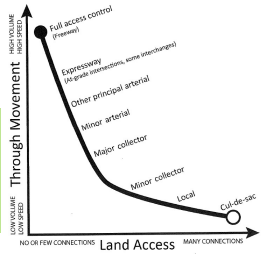


Figure Source: TRB Access Management Manual Second Edition

Functional Classification

Function classification helps define the street's "role" in the network and may be indicate:

- Typical trip purposes and trip lengths accommodated by the thoroughfare
- Appropriate level of access management
- Type of freight service

"While the accommodation of bicyclists, pedestrians, and transit users is an important consideration in the planning and design of highways and streets, the functional classification of a highway or street is primarily based on motor vehicle travel characteristics and the degree of access provided to adjacent properties."

AASHTO 2011 Green Book p 1-1

Potential Functions

- What is the level of freight operation?
  - Is this a designated Truck Route?
- Is this an Emergency Evacuation Route?
- Is this a heavy transit corridor?
- Along the route, are there any:
  - Hospitals?
  - Fire stations?
  - Schools?
  - Major event trip generators?
- Is the adjacent land use expected to remain relatively stable?

Feasibility Worksheet Steps

Step 1

Identify Goals & Objectives

Step 2

Consider Road Function & Context

Step 3

Traffic Operations

Traffic Operations

Traffic Operational Analysis

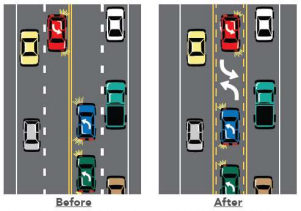
- ADT Volumes
- Peak Hour Volumes
- Transit Operations
- Mid-block Turning Patterns
- Vehicle Speeds
- On-street Parking
- Freight Delivery
- Slow Moving Vehicles
- At-grade RR Crossings

- Intersection Operations

Operational Considerations

A four-lane roadway may already operate like a three-lane road.

Some four-lane undivided roads operate essentially like a three-lane road (defacto one lane in each direction)



Before
A four-lane undivided road operating as a de facto three-lane cross section.

After
A Road Diet providing a two-way left-turn lane.

When a corridor contains a large number of access points (driveways) the majority of through traffic will tend to utilize the outside lanes to avoid being delayed by left-turning vehicles slowing and stopping in the inside lanes.

Operational Considerations

How many lanes are on the adjacent roadway segments?

Adding lanes onto road segments that don't have increased volumes and then reducing lanes downstream can create "bottlenecks" that lead to worse operations than having a consistent number of lanes.

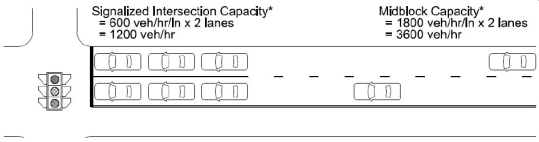
Plumbing Analogy: Where is the clog likely to occur?

General Guidelines for 4-Lane

LESS THAN 10,000 ADT	10,000 – 15,000 ADT	15,000 – 20,000 ADT	GREATER THAN 20,000 ADT
Great candidate for Road Diet	Very good candidate for Road Diet	Good candidate for Road Diet	Potential candidate for Road Diet
In most instances traffic will likely not be negatively affected.	Agencies should conduct intersection analysis to study potential traffic operational effects and consider signal retiming as needed.	Agencies should conduct a corridor analysis since traffic operations may be affected at this volume depending on the "before" condition.	Agencies should complete a feasibility study to determine whether this is a good location for a Road Diet. Operations may be affected at this volume.

There are examples across the country where Road Diets have been successful with ADTs as high as 26,000.

Intersection Operations

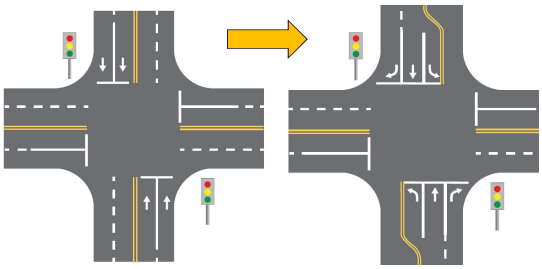


- The "capacity" of a street is determined by the operations at its signalized intersections (or stop-controlled).
- Capacity "rules of thumb"
  - single mid-block travel lane : 1,800 vehicles per hour
  - single travel lane through a signalized intersection: 600 vehicles per hour (dependent on the time allocated in the signal cycle)

Unless the street has 3x as many lanes at the intersections as it has mid-block, the intersections will be the limiting factor in terms of capacity.

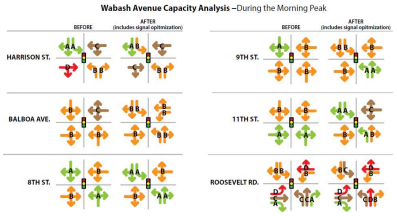
Turn Lane Reallocation

Lane reconfigurations may make it possible to install dedicated turn lanes at the intersections



Turn Lane Reconfigurations and Signal Timing Changes

- By carefully analyzing and improving operations at intersections it may be possible to reduce the number of lanes mid-block on a street without increasing delay for motor vehicle traffic.



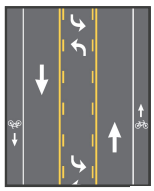
Traffic Signalization

Re-evaluate:

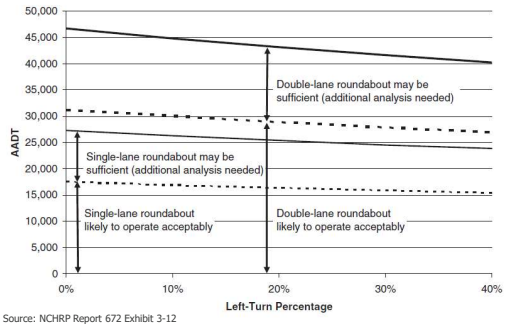
- Traffic signal phasing and timing
  - Mainline traffic may need additional green time
- Type and number of lanes on intersection approaches
  - Turn lane needs
- Signal head positioning

- Quantify and compare additional delays and queues

Road Diets and Roundabouts



Planning Level Volume Threshold for Single Lane Roundabouts



Source: NCHRP Report 672 Exhibit 3-12

LaJolla Blvd – Bird Rock Community (San Diego, CA)

- Prior to 2003, La Jolla Boulevard was a four-lane boulevard moving 20,000 cars per day with average speeds of 38-42 mph.
- The roadway configuration and speed of traffic created a setting uninviting for pedestrians and unable to stimulate growth among local businesses.
- In response to numerous community members demanding a safer walking environment, the City of San Diego, in partnership with the community, embarked upon a project to improve safety along the boulevard.

Source: Arnold, M., Chui, G., and Lupo, D., P.E. "Roundabout Product Demonstration Showcase" Presentation on December 10, 2008, City of San Diego Engineering & Capital Projects Department

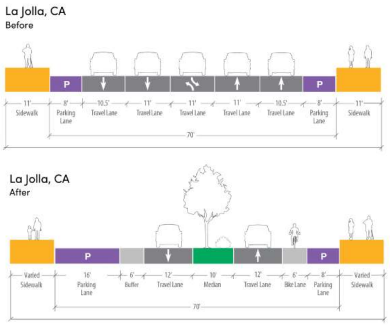
LaJolla Blvd – San Diego, CA

LaJolla Blvd – Bird Rock Community (San Diego, CA)

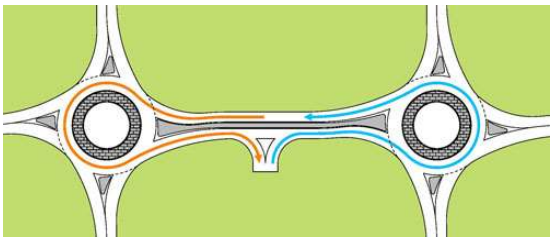
- Narrower travel lanes, five roundabouts, landscaped medians and angled parking have slowed traffic speeds, improved pedestrian safety, and also revitalized the businesses!!!

LaJolla Blvd – Photo Credit: Mark Doctor FHWA

LaJolla Boulevard Cross Section Before & After



Roundabouts and Access Management



Ashville, NC - College Street
"Before" as 5 lane

Ashville, NC - College Street – Current 2 lane

Overland Park, KS – "Before"

Overland Park, KS – "After"

Mini-Roundabouts

Considerations for Urban Corridor

- The operational impacts (such as significantly more queuing and delay) may be greater in a busy downtown setting due to heavy side street volumes and loss of left-turn capacity caused by the short block lengths


Photo Resource: Mark Doctor

Transit Considerations

- By going to a single-lane in each direction, frequent transit stops may cause additional delay
  - Reassess bus stop location and spacing
  - Consider bus pullouts

Photo Resource: Mark Doctor

On-street Parking

Consider:

- Impact on parking maneuvers
- Parking spot design (parallel vs diagonal)
- Interactions between bicyclist and parking vehicles


Photo Resource: Mark Doctor

Freight Considerations

- Current and future routine deliveries and transport
  - How will stores and restaurants receive deliveries?
- Freight related through-traffic
- Engage freight stakeholders
  - Business owners, commercial and industrial property owners

Delivery Zones

Consider the current and future needs for delivery zones and loading areas. Removal or relocation of delivery zones may impact truck access to businesses. Where there is only one through lane per direction, trucks that stop for deliveries are likely to block auto traffic.

Photo Resource: Mark Doctor

Feasibility Worksheet Steps

Step 1
Identify Goals & Objectives

Step 2
Consider Road Function & Context

Step 3
Traffic Operations

Step 4
Special Conditions

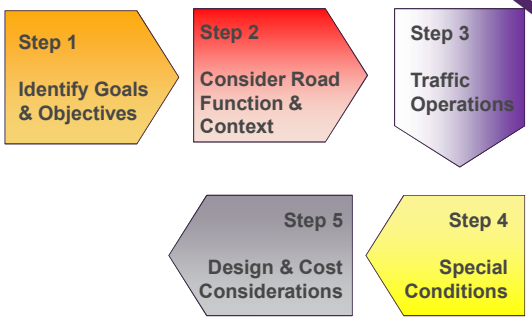
Parallel Roadways

- Potential diversion of traffic to parallel routes. Considerations include:
  - Distance to parallel route
  - Amount of increased delay from Lane Reduction
- Can apply traffic calming on parallel routes to offset impact

At-Grade Railroad Crossings

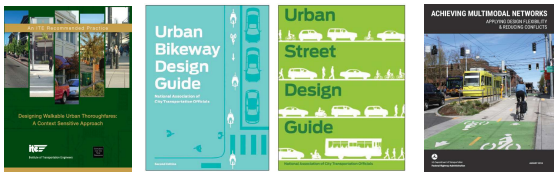
- May double the queue length at railroad crossings impacting other intersections
- May cause turning lane backup at parallel railroad crossings

Feasibility Worksheet Steps



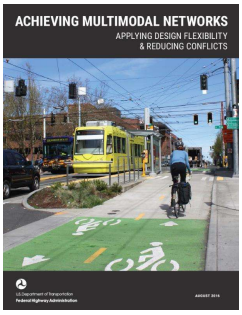
Important Design Resources

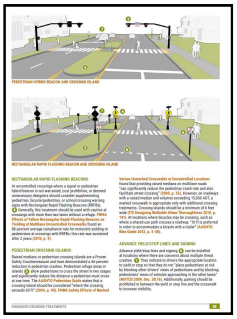
https://www.fdot.gov/roadway/fdm/default.shtm



Achieving Multimodal Networks

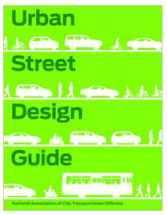
- 24 design topics in 2 Parts





https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/multimodal_networks/

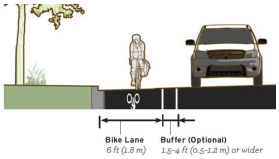
Lane Widths



"Lane width should be considered within the overall assemblage of the street. Travel lane widths of 10 feet generally provide adequate safety in urban settings while discouraging speeding. Cities may choose to use 11-foot lanes on designated truck and bus routes (one 11-foot lane per direction) or adjacent to lanes in the opposing direction."

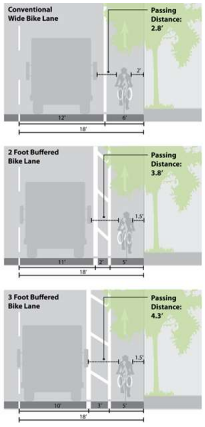
Bicycle Lane Widths

- Typical bike lane: 5-6 ft.
  - Min. width: 4 ft.
- If space is ≥ 7ft. consider adding buffer or protected bike facility



Consider drainage inlets and manholes

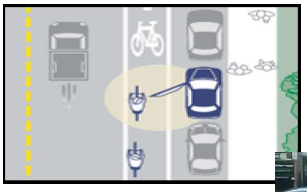
Buffered Bike Lanes



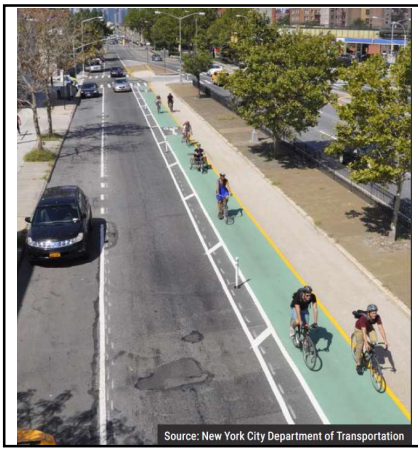
- Provides greater shy distance between motor vehicles and bicyclists
- Provides more space for bicycling without making the bike lane appear so wide that it is mistaken for a travel lane or a parking lane
- Encourages bicyclists to ride outside of the door zone when buffer is between parked cars and bike lane

Painted Buffer Zones Adjacent to Bike Lane

Cyclists "Doored"



Separated Bike Lanes



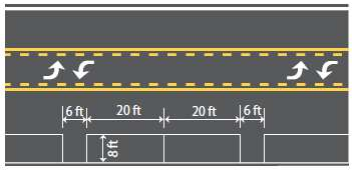
Two-way separated Bike Lane

Seattle, WA

On-Street Parking

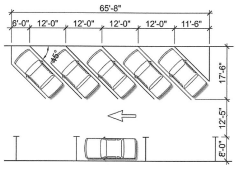
- Minimum width: 7-8 ft
- Desirable width: 10-12 ft
- Shared bicycle and parking = **13ft.**
- Solid white line between bikes and parking

Figure showing "Paired" Parallel Parking



Angled Parking

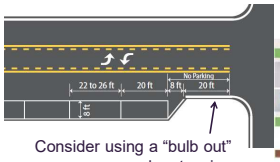
- Provides 60-75% more spaces than parallel parking
- Angled parking depth (measured perpendicular to the street) is dependent on the stall angle (17.5 feet for 45°, 19.0 feet for 60°, 19.5 feet for 75°)
- "Back-in" has advantages over "Head-in"



Source: ITE Traffic Engineering Handbook

Limit Parking Near Intersections

On-street parking should be restricted at least 20 feet in advance of the crosswalk for good visibility of pedestrians



Consider using a "bulb out" curb extension

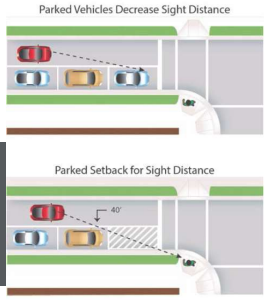
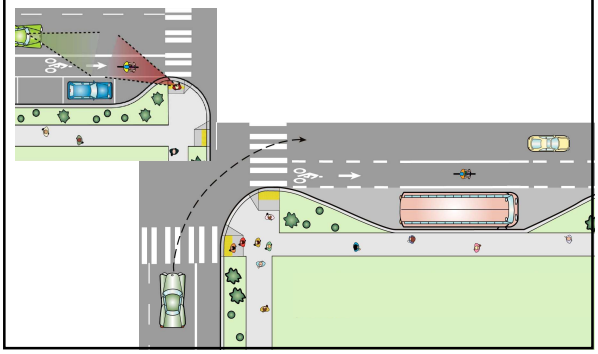


Figure Source: City of Honolulu Complete Streets Manual

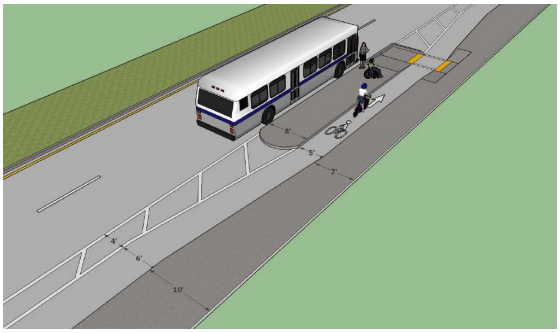
Curb extensions can help pedestrians, bicyclists and facilitate bus pullouts



Mid-Block Bus Turnouts

Desirable to provide turnouts about 50 feet in length for each bus with deceleration and entry tapers of about 5:1

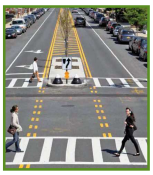
Bus Stop / Bike Lane Buffer Concept



Seattle, WA – Dexter Avenue Road Diet

Median

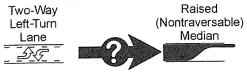
- The area between opposing travel lanes
- Can be a TWLTL
- If a flush median is used, expect crossing and turning movements around the median



Medians & TWLTLs

TWLTLs may be appropriate for:

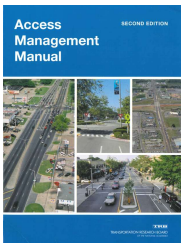
- ADT < 24,000 vpd
- Direct access to small abutting properties with ingress volumes < 100 vph



A non-traversable median is desirable for:

- Multilane roadways with ADT > 24,000 vpd
- Areas desirable to limit left turns to improve safety

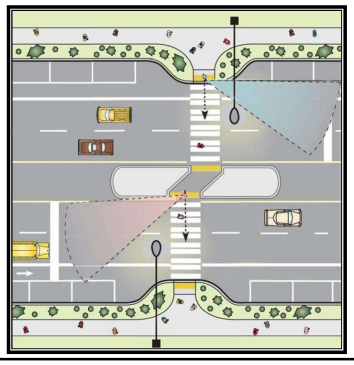
TRB Access Management Manual



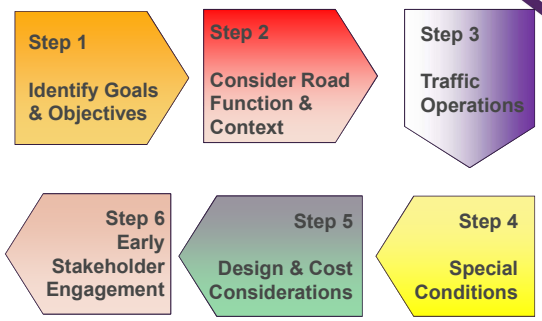
Pedestrian Refuge Islands

- Minimum 6 ft. wide / Preferred 8 – 10 ft. wide
- Include detectable warning tiles
- Can use the TWLTL space where turns are prohibited or at mid-block locations

Divides a complex crossing into two simpler crossings



Feasibility Worksheet Steps



Public Outreach

- Expect to encounter initial public opposition if Lane Eliminations are new and unfamiliar to your area

Common concerns:
- More congestion
- More crashes
- Bad for emergency response
- "Bicycles vs. Automobiles"
- Bad for business

Community fears need to be addressed!

Outreach to Elected Officials

Charlotte Observer, June 2004

Stakeholder Engagement Considerations

- Are there any known controversies associated with this area?
- Have endorsements or documented project support been made by appropriate city, county, and/or regional bodies (e.g., a commission or board resolution)?
- Have any concerns or supportive comments been voiced at public meetings from local businesses, residents and other stakeholders?

Media Tools

- Create a project web page
- Interactive blogs for public comments
- Social media to keep the community up-to-date on the project
- Webinars
- Education videos
- Visualizations

Public Workshops

Workshops offer a more engaged form of public participation and educational outreach.

Trial Period

- Powerful tool to “disarm” public concerns
- Opportunity to “validate” studies and analyses
- Can uncover unidentified issues and provide an opportunity to address them before final roll-out
- An effective means of monitoring should be developed

Evaluate Results

Example Evaluation Metrics

Operational	Safety	Livability/Economic Development
Daily traffic counts	Travel speeds	Transit ridership
Peak hour traffic counts	Percent of drivers over the speed limit	Availability of on-street parking
Turning movement traffic counts	Percent of top-end speeders (Greater than 10 mph over speed limit)	Overall public satisfaction
Intersection queue lengths (main street and side street)	Crash frequency, type, severity, and rate	Property values
Travel times (vehicles)	Perceived level of safety	Resident/public feedback
Travel time (transit)		Business feedback/sales records
Adjacent street traffic counts and speeds		Number of new businesses/ residences
Bicycle counts		
Pedestrian counts		

Non-Motorized Operations

Consider evaluating:

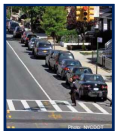
- Increased bicycle and pedestrian volumes
- Vehicle yield/ stop compliance rate for pedestrians crossing the street
- Perceived comfort

Safety Evaluation

- Crash frequency and severity
- Travel speeds
- Percent of speeders (10 mph + over limit)
- Perceived level of safety

Evaluation Complexities

- Complicating Factors:
  - Parallel parking maneuvers
  - Bus maneuvers
  - Left-turning vehicles
  - Cross-street traffic
  - Pedestrians crossing at non-crosswalk locations
- Analyze at and between signalized intersections



U.S. Department of Transportation Federal Highway Administration

On-Ramp to Innovation every day counts

ROADDIET

PEER EXCHANGE

2017 and 2018
Pensacola, Gainesville, and Tequesta FL

Attendee Perspectives

Lessons Learned from FL Peer Exchanges

- Lane elimination projects have evolved beyond just 4-lane to 3-lane conversions
  - Think creatively

Lessons Learned from FL Peer Exchanges

- Try to educate others in your agency about the benefits of Lane Eliminations
  - Having an agency "Champion" is important, but you can't do it all alone

Lessons Learned from FL Peer Exchanges

- Try to proactively review upcoming resurfacing projects for potential Lane Elimination candidates
  - Resurfacing projects are great opportunities

Lessons Learned from FL Peer Exchanges

- When presenting a Lane Elimination proposal to the public, rather than focus on Level of Service instead focus on the goals and desired outcomes for the community
  - *"Are you willing to accept another minute of travel time in return for these benefits?"*

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