Complete Streets

DESIGN Guidelines

metropolitan planning organization

PALM BEACH MPO

Complete Streets Working Group

August 10, 2017

Why are we doing this?

- Address the need for well-designed multi-modal facilities
- Connect with FDOT Complete Streets Implementation including Complete Streets Handbook anticipated December 2017
- Provide local practitioners with tools calibrated to provide context-sensitive designs

Schedule & Process

Final Document & Presentations

Multimodal Typology
Context & Street Framework

Inventory of Standards and Design Guidance

Typical Sections & Final Document

We are Here

Previous Meetings

- Benefits of Complete Streets
- Purpose and Need
- Goals
- Resources Consulted
- Street Types
- Land Use Types
- Maps
- Outline
- Draft Guidelines

Today's Meeting

- Highlights of the Interim Draft
  - Slides in this presentation display excerpts from pages of the Complete Streets Design Guidelines
  - Focuses on key items that have been modified

Complete Streets
DESIGN Guidelines

Table of Contents

Chapters

Sections

Links Take You Directly There

Acronyms and Glossary

AASHTO - American Association of State Highway and Transportation Officials

ADA - Americans with Disabilities Act

ADT - Average Daily Traffic

APBP - Association of Pedestrian and Bicycle Professionals

ASCE - American Society of Civil Engineers

Bicycle Box - Places bicycles at the front of the intersection and increases their visibility to vehicles behind them

Bicycle Lane - Delineated roadway space for preferential use by bicyclists and marked with the bicycle lane symbol and arrow

Acronyms and Glossary included with over 50 terms defined

Summary of Primary Topics

- Street Typology
- Land Use Typology
- Flexibility in Design
- Sidewalk Zones
- Lane Width
- Separated Bike Lanes

2-way, separated bicycle lane in Seattle, WA

Textured crosswalk with median crossing refuge in Boca Raton

Background

What are Complete Streets?

Complete Streets are roadways designed and operated for the safety, comfort, and convenience of people, allowing multimodal transportation for pedestrians, bicyclists, motorists, and transit riders of all ages and abilities. The Complete Streets terminology can be used to describe roadways that have been designed and planned as context sensitive solutions to meet the needs of all users. In recent history, roadway development has been automobile centric, with pedestrians, bicyclists, and transit alternatives being considered secondarily. An ideal Complete Street allows for the efficient movement of all transportation modes as determined by the design of the roadway and sidewalks. A typical Complete Street will have efficient vehicular travel while providing ample room for pedestrians and cyclists to safely utilize the route with reduced interaction with automobiles.

Source: Smart Growth America

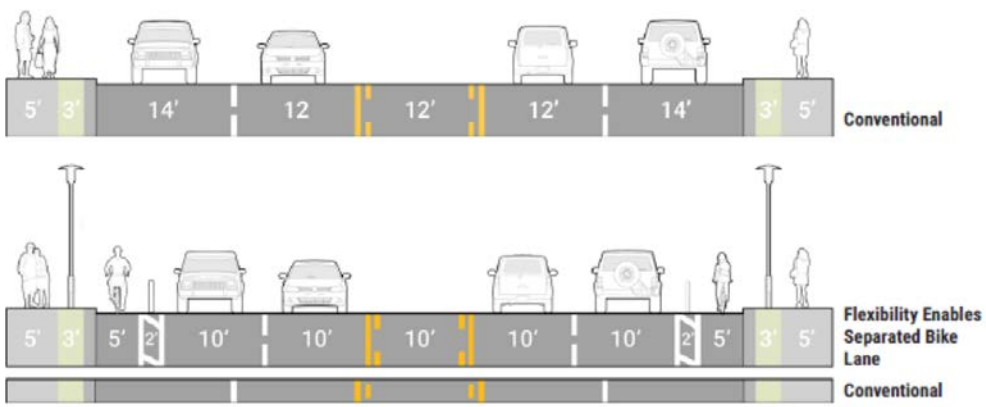
Benefits of Complete Streets

Complete Streets support a variety of local benefits, including improvements in safety, public health, the environment, and the economy. The Complete Streets philosophy presents an opportunity to use Palm Beach County's public rights-of-way to impart benefits to all its citizens, every day.

Safety

Crashes involving motor vehicles often seriously injure or kill pedestrians and bicyclists. As vulnerable road users, pedestrians and bicyclists greatly benefit from physical separation from vehicles. All road users, including vehicle occupants, are safer when road speeds are calmed. Reductions in speed can reduce both the frequency of crashes, by providing more time to see and react, and the severity of crashes by reducing the energy involved in a collision.

- Review of Example Design Guidelines
- Flexibility in Design
  - Controlling design criteria
  - “Bicycle and Pedestrian Facility Design Flexibility”
  - “Toward More Flexible Design”
  - FDOT Complete Streets Policy



Source: FHWA Achieving Multimodal Networks. Applying Design Flexibility & Reducing Conflicts

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Best Practices

Street Typology

Complete Streets are developed from a philosophy that streets have many different roles, functions, and characteristics depending on their context. Focus is placed on the type of trips served including pedestrian, bicyclist, transit, and motor vehicle trips. The design objectives for a particular street are revealed from a greater understanding and analysis of the different roles of the street. Based on an analysis specific to Palm Beach County roads and streets, a street typology consisting of five categories was developed. The table below shows the relationship between traditional functional classifications and the street typologies for these guidelines.

- Limited Access Facilities – LA
- Major Corridors – MC
- Main Connectors – CN
- Community Connectors – CC
- Neighborhood Streets - NS

Land Use Typology

Land uses are categorized more broadly than the traditional zoning designations. Streets can thus respond to changes in the building form and function, elements which transcend whether a particular building is an office or apartment building. These land use typologies focus on building and parking orientation, in addition to the potential uses, as the orientation can affect the types of trips a building supports.

- Urban Core – UC
- Urban General – UG
- Suburban – SB
- Rural Town – RT
- Rural – RU
- Natural - NA

Table 3-1 Generalized Relationship between Street Typology and Functional Classification Excluding LA Facilities

	Major Corridors	Main Connectors	Community Connectors	Neighborhood Streets
Principal Arterial		N/A	N/A	N/A
Minor Arterial	N/A		N/A	N/A
Collector	N/A			N/A
Local	N/A	N/A	N/A	

Blended Typology Approach

- Pedestrian Realm

- Roadway Realm

- Intersection Realm

Blended Typology Approach

- Analysis conducted by MPO staff reveals the relative frequency of each Typology combination

Table 3-2 Roadway Miles by Street Type and Land Use Excluding LA Facilities

	Major Corridors	Main Connectors	Community Connectors	Total
Urban Core	0.00	14.40	6.82	21.22
Urban General	7.10	71.92	46.02	125.04
Suburban	196.82	204.37	313.24	714.43
Rural Town	5.00	4.42	11.28	20.70
Rural	73.47	58.59	123.51	255.56
Natural	0.00	0.00	0.00	0.00
Total	282.38	353.69	500.87	1136.95

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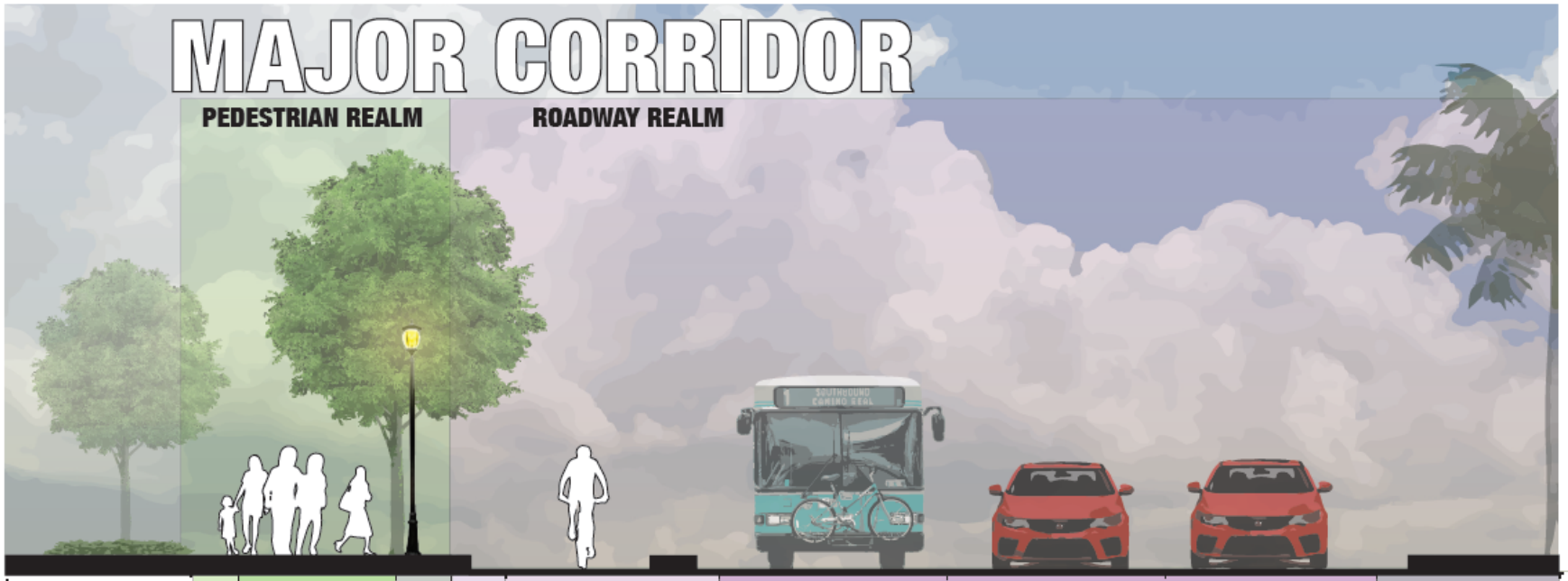

Typical (Constrained)	Frontage Zone (ft)	Pedestrian Zone (ft)	Furnishing Zone (ft)	Curb Zone (ft)	Bicycle Facility (ft)	Through Lane (ft)	Through Lane (ft)	Through Lane (ft)	Half of Center Median (ft)	Total ROW Width (ft)
Urban Core	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Urban General	0	7	0	2	8	11	11	11	10	120
Suburban	0	7 (6)	0	2	8 (4)	11	11	11	10	120 (110)
Rural Town	2	10	6	2	8	11	11	N/A	10	120
Rural	5	12	5	24*	10	12	12	N/A	30	220
Natural	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NOTES

- Dimensions shown in the table reflect typical values with constrained values shown in parentheses.
- Separated bicycle lanes are preferred because they are most likely to attract a wider range of bicyclists.
  Design speeds of 50 mph or greater may require greater separation between through lane and a raised separator.
  Where driveway density and/or drainage concerns prevent the introduction of separated bicycle lanes, buffered bicycle lanes are acceptable.
- Turn lane will exist in median space where applicable.
- When used, on-street parking should be provided in the roadway realm with a total width of 8 feet, which may be inclusive of an 18-inch gutter pan on curb-and-gutter roadways.
- In N/A cases refer to the applicable land use type which is higher up on the table.

*In Rural areas, curb zone accommodates swale and drainage.

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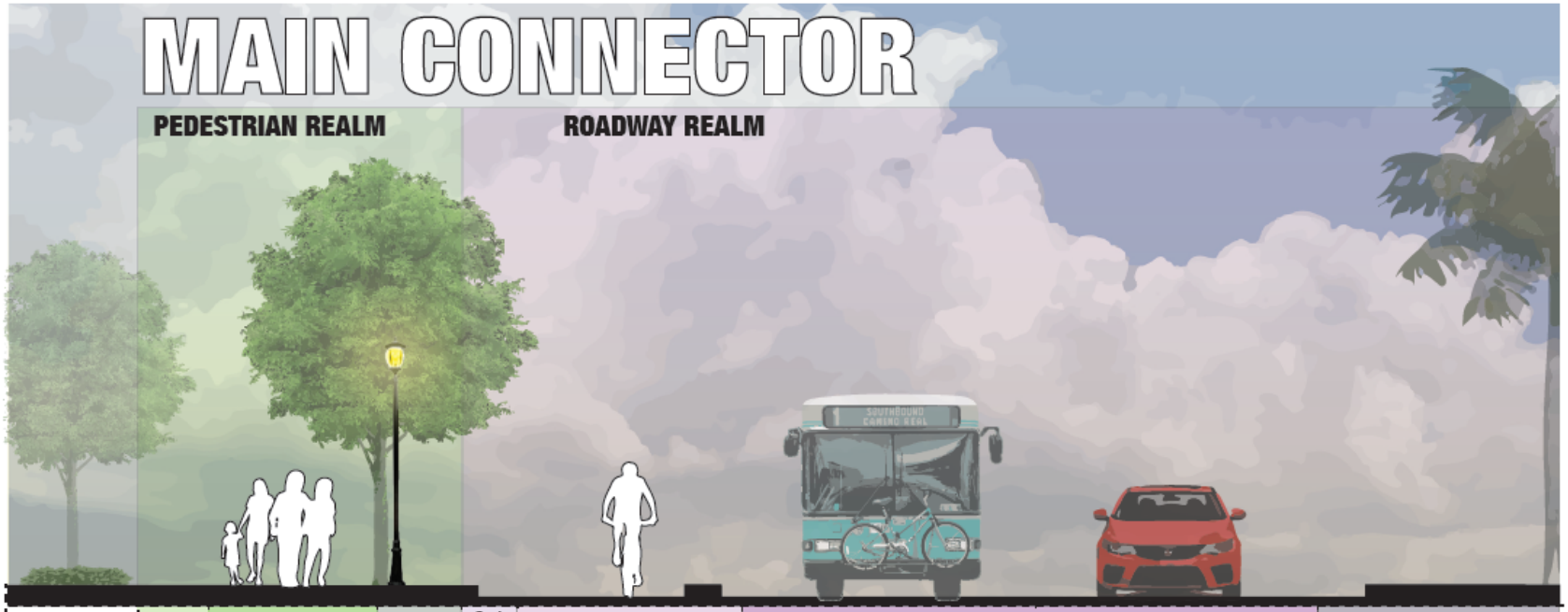
MAIN CONNECTOR



Typical (Constrained)	Frontage Zone (ft)	Pedestrian Zone (ft)	Furnishing Zone (ft)	Curb Zone (ft)	Bicycle Facility (ft)	Through Lane (ft)	Through Lane (ft)	Half of Center Median (ft)	Total ROW Width (ft)
Urban Core	1	6	2	2	4	10	10	5	80
Urban General	3 (1)	8	4	2	8 (4)	10	10	10	110 (80)
Suburban	3 (1)	10	5 (2)	2	8	11	11	10	120 (80)
Rural Town	3	12	9	2	8	11	N/A	15	120
Rural	1	6	2	15	8	11	N/A	15	120)
Natural	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NOTES

- Dimensions shown in the table reflect typical values with constrained values shown in parentheses.
- Design speed in urban core and urban general areas is assumed to be 35 mph or less.
- Separated bicycle lanes are preferred because they are most likely to attract a wider range of bicyclists.
  - Where driveway density and/or drainage concerns prevent the introduction of raised bicycle lanes, buffered bicycle lanes are acceptable.
- Turn lane will exist in median space where applicable.
- When used, on-street parking should be provided in the roadway realm with a total width of 8 feet, which may be inclusive of an 18-inch gutter pan on curb-and-gutter roadways.
- In Rural and Natural areas, curb zone accommodates swale and drainage.

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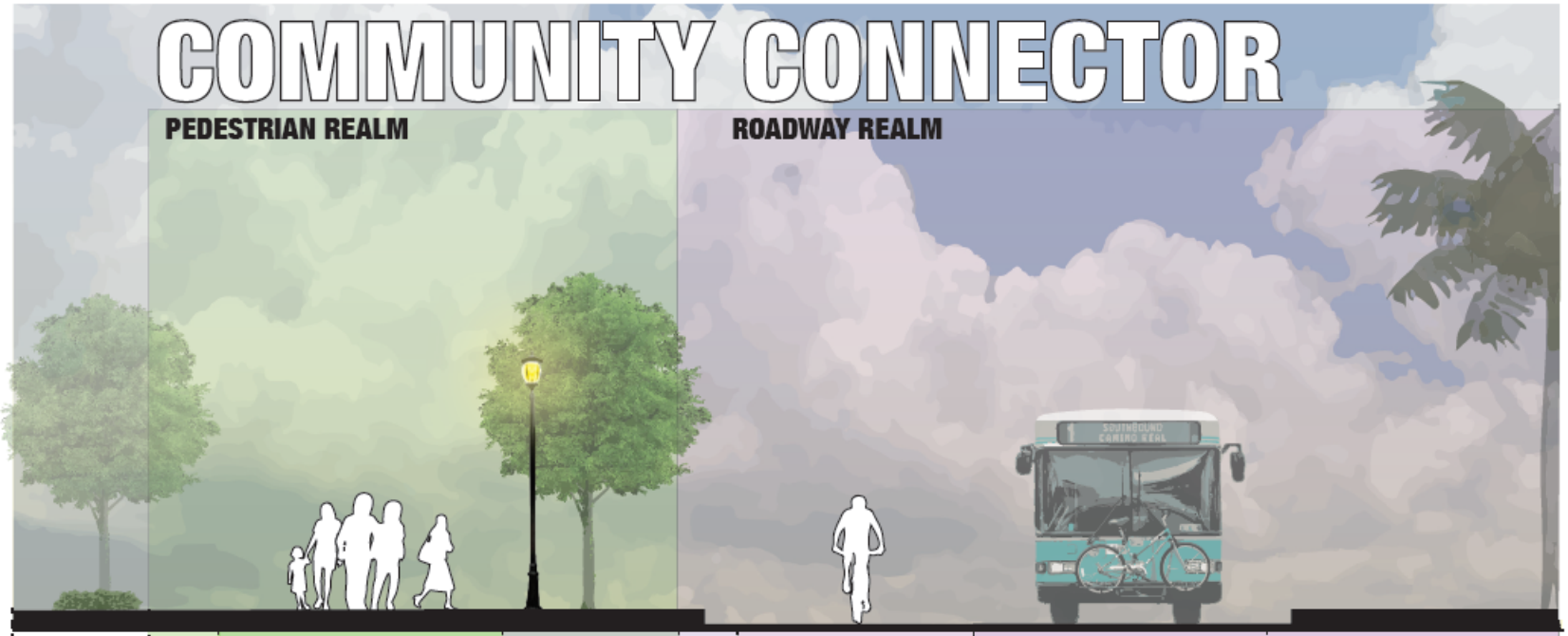
COMMUNITY CONNECTOR



Typical (Constrained)	Frontage Zone (ft)	Pedestrian Zone (ft)	Furnishing Zone (ft)	Curb Zone (ft)	Bicycle Facility (ft)	Through Lane (ft)	Half of Center Median (ft)	Total ROW Width (ft)
Urban Core	4	10	6	2	8	10	*N/A	80
Urban General	3	10	6	2	8	11	*N/A	80
Suburban	3 (1)	10 (8)	6 (3)	2	8 (5)	11	*N/A	80 (60)
Rural Town	3	12	9 (4)	2	8	11	15	120 (110)
Rural	1	6	2	15	8 (5)	11	15 (0)	120 (80)
Natural	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NOTES

- Dimensions shown in the table reflect typical values with constrained values shown in parentheses.
- Design speed in any land use with 10' lanes is assumed to be 35 mph or less.
- Separated or raised bicycle lanes are preferred because they are most likely to attract a wider range of bicyclists.
  Where driveway density and/or drainage concerns prevent the introduction of separated or raised bicycle lanes, buffered bicycle lanes are acceptable.
- When used, on-street parking should be provided in the roadway realm with a total width of 8 feet, which may be inclusive of an 18-inch gutter pan on curb-and-gutter roadways.

*Median not applicable for urban core, urban general, and suburban land uses. Opposing directions may be separated by traffic striping.

Curb Radii

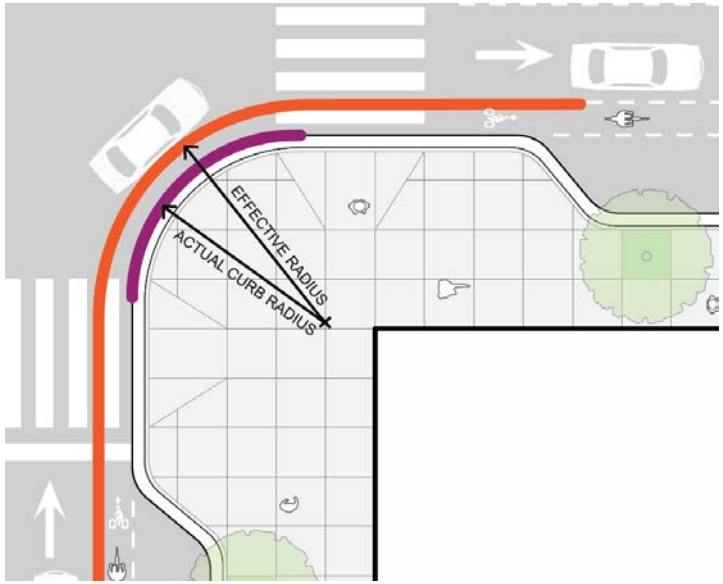
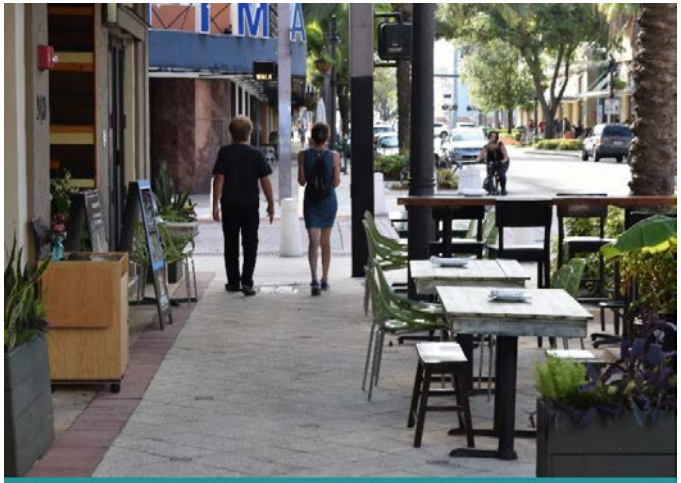


Table 4-1 Actual and Effective Curb Radii

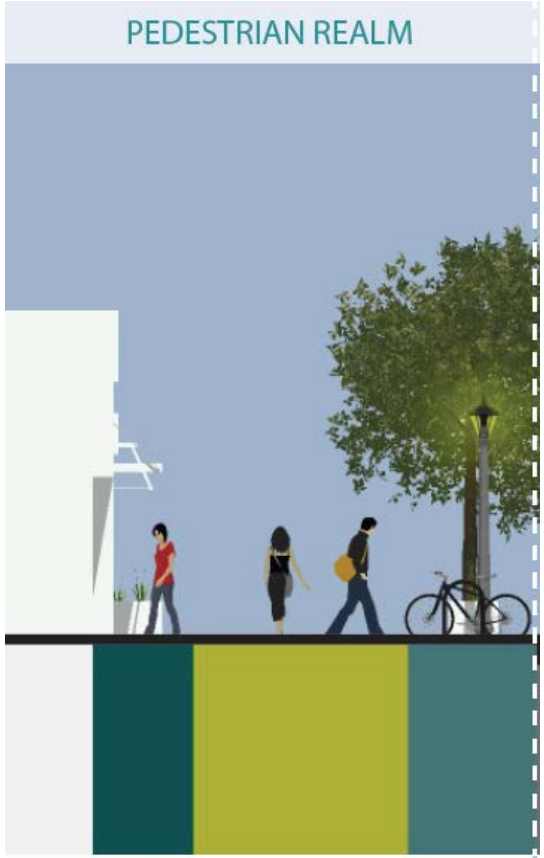
	Land Use Context	Actual Curb Radius	Effective Curb Radius (the vehicular path) (1),(2)
Major Corridor (4)	All intersection corners w/o vehicle turns	5'	N/A
	UC, UG	15'	20'
	SB, RT	25'	30'
	RU, NA	40'	45'
Main Connector (4)	All intersection corners w/o vehicle turns	5'	N/A
	UC, UG	15'	20'
	SB, RT (3)	25'	30'
	RU, NA	35'	40'
Community Connector	All intersection corners w/o vehicle turns	5'	N/A
	UC, UG	15'	25'
	SB, RT (3)	25'	30'
	RU, NA	25'	30'
Neighborhood Streets	All intersection corners w/o vehicle turns	5'	N/A
	UC, UG	15'	20'
	SB, RT	15'	20'
	RU, NA	15'	20'

Pedestrian Realm

- Three zone approach
  - Furnishing zone
  - Pedestrian zone
  - Frontage zone



Frontage, pedestrian, and furnishing zones on Clematis Street in West Palm Beach, Florida



Sidewalk/Shared Use Pathway
Street Trees
Benches/Furnishing
Bike Racks
Lighting
Parking Meters
Utilities

Pedestrian Realm

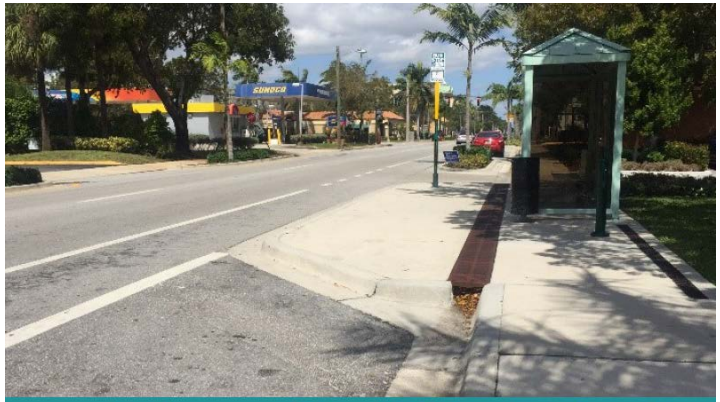
Example of an 8-foot sidewalk adjacent to a 7-foot furnishings zone

Sidewalk bicycle facility

Example of pedestrian wayfinding with heads-up map orientation and walking times displayed on concentric circles

Pedestrian Realm

Local jurisdictions can pursue easements to place bus shelters behind the sidewalk to reduce barriers to walking and increase the separation between transit patrons and moving traffic



Bus bulbs provide additional sidewalk space around bus shelters placed on a narrow sidewalk in Delray Beach, Florida

A well-lit bus shelter is important to improve the sense of security for nighttime operations

Roadway Realm

- Lane Width
  - Lane Width Reduction
  - Lane Elimination
- Design Speed
- Target Speed
- Curb Zone
- Bicycle Facilities
- Transit Facilities

Table 4-3 FDOT Green Book Lane Width Ranges

Road Type	FDOT Recommended Width Rural (feet)	FDOT Recommended Width Urban (feet)
Arterial Through Lane	12	11-12 (1)
Collector Through Lane	10-12	11 (1)
Local Through Lane	9-12	10
Turn Lane	11-12	10-12
Parking Lane	7	7
Conventional Bicycle Lane	5	4-5
Buffered Bicycle Lane	6-7	6-7

(1) In constrained areas where truck and bus volumes are low and speeds are less than 35 mph, lane widths of 10 feet may be used.

Bicycle Facility Widths

Table 4-4 Bicycle facility target and constrained widths

Element	Target		Constrained	
	Lane	Buffer	Lane	Buffer
Separated Bicycle Lane	7'	3'	5'	3'
Two-way Separated Bicycle Lanes	12'	3'	8'	3'
Raised Separated Bicycle Lane	6.5'	1' for vertical element 3' (next to parked cars)	4'	1' for vertical element 3' (next to parked cars)
Two-way Median Bicycle Lanes	12'	6' (3' for each side)	8'	6' (3' for each side)
Buffered Bicycle Lane	4'	3'	4'	2'
Conventional Bicycle Lane	6'	n/a	4'	n/a
Contra-Flow Bicycle Lane	6'	3'	5'	6"

Separated Bicycle Lanes

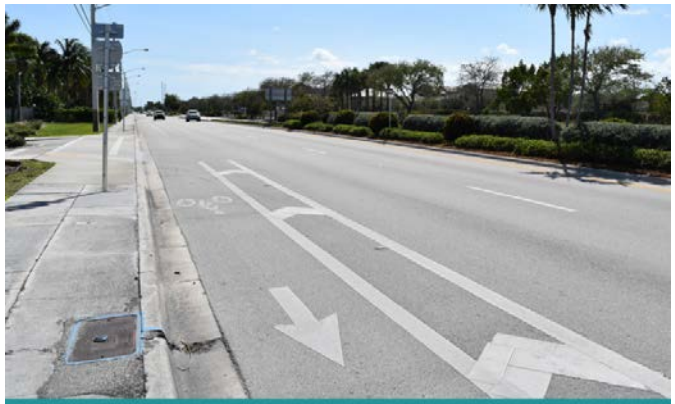
Separated bicycle lane in Tampa, Florida

Parking separated bicycle lane

Additional Bicycle Facilities

Raised, separated bicycle lane;

A median bicycle lane in Lima, Peru



Buffered bicycle lane on US-1 in Boynton Beach, Florida

Bicyclist in contra-flow bicycle lane with green sharrow lane in the opposite direction

Bicycle / Transit Interaction

- Ideal scenario for separated bicycle lanes to eliminate traffic conflicts with buses during loading

Roadway Realm Transit Elements

Dedicated transit facilities are effective tools for increasing the throughput capacity of a street. Transit vehicles are significantly more space efficient for the movement of people; a dedicated lane can greatly increase the efficiency of transit operations. Improved operations encourage ridership through faster travel times and increased on-time arrival reliability. Reductions in delays also help to lower operating costs.

Table 4-5 Bus Lane Widths

Bus-Only Lane Type	Constrained Width
Curb Lane	11'
Offset Lane (bulb-out stations)	11'
Dedicated Median Lane	11'
Combined Bicycle/Bus Lane	12'

Transit Facilities

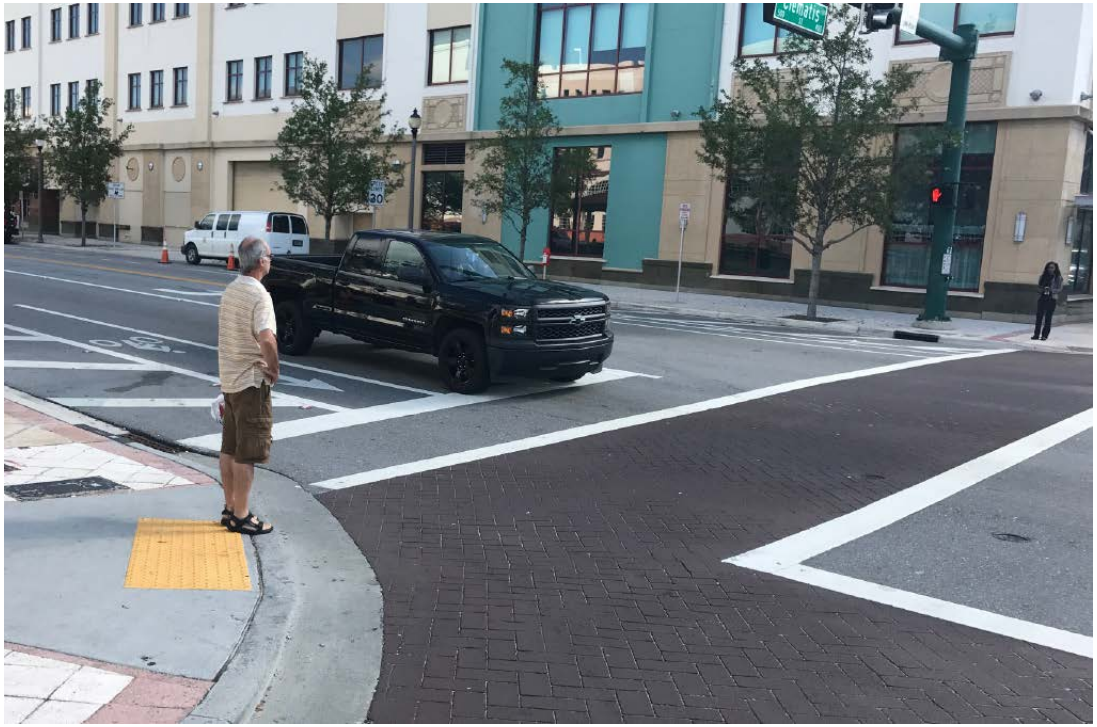
Curbside bus lane in New York; Source: NYC DOT

Bus bulb stop

Passenger waiting at a bus bulb stop in Delray Beach, Florida

Intersection Realm

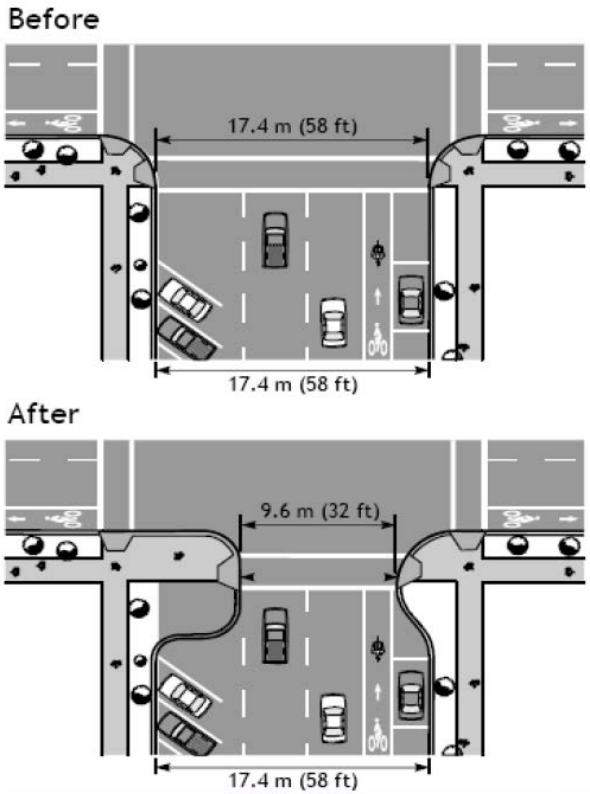
- Traffic Control Elements
- Intersection Geometry
- Intersection Safety
- Pedestrian Elements
- Bicycle Elements
- Transit Elements
- Placemaking



Curb Ramp

Table 4-6 Recommended Curb Ramp Dimensions

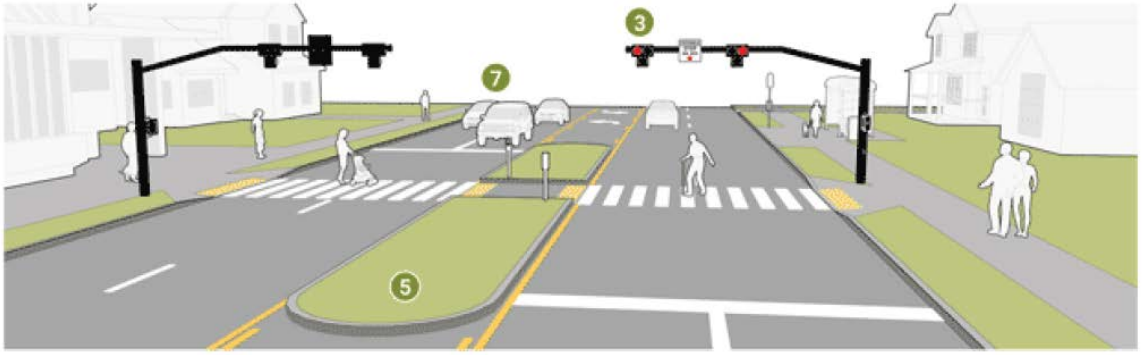
	Land Use Context	Constrained	Target	Maximum
Curb Ramp Width	All	4'	Width of Pedestrian Walking Zone	Width of Sidewalk Realm
Curb Extension Width	All	4'	8'	Do not block an existing or potential bicycle lane
Curb Extension Length	All	Width of Curb Ramp	20'	As needed to improve pedestrian visibility and prohibit parking near intersection
Crossing Refuge Island Width	All	6'	10'	Width of Median



Example of a curb extension reducing the pedestrian crossing distance; Source: FHWA

Uncontrolled Intersection Crossings

- Crosswalk Markings
- Signage
- Flashing Beacons
- Pedestrian Hybrid Beacons
- Signalization



Source: FHWA PHB Signal with Crossing Islands

Examples of RRFB crosswalks

Intersection Bicycle Elements

Pavement Markings through Intersections

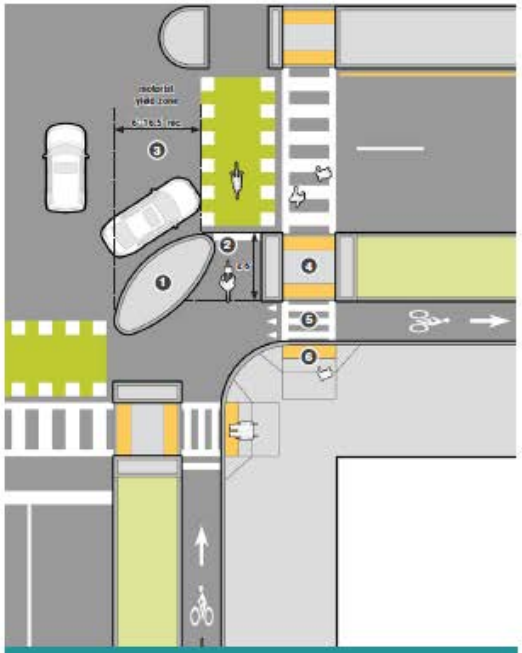
Pavement markings extend bicycle lane treatments through an intersection and reduce the comfort gap between protected facilities and intersections. Markings raise drivers' awareness of bicycles continuing through the intersection and show them where to expect bicycles. Treatments typically consist of dotted or striped lines of a width consistent with the bicycle facility to which they connect. Striping can be filled with green colored pavement to further highlight the markings. These treatments can also be applied at merges, driveways, keyholes, and conflict points where drivers may not be aware of oncoming bicycles.

Green bicycle conflict markings through an intersection

Example of bicycle lane markings extending through an intersection; Source: NACTO

Separated Bicycle Lanes at Intersections

Intersections can be designed to continue the comfort of separated bicycle lanes through the intersection. These intersections provide a clear travel path for bicyclists while shortening the exposed crossing distance. Concrete islands help to reduce the turning speed of drivers while also providing a space for drivers to wait for passing bicyclists without blocking the intersection.



Protected intersection for bicyclists. Source: MassDOT

Bicycle Boxes

Bicycle boxes prevent bicycles from mixing with queued vehicles and turning vehicles at intersections. Boxes place bicycles at the front of the intersection and increase their visibility to vehicles behind them. This allows for positioning for left turns and allows them an opportunity to enter the intersection ahead of cars and to be seen by turning vehicles. Bicycle boxes are recommended as 10-16 feet deep with pavement markings and signage to indicate that vehicles should stop behind the box.

Bicycle box with green color pavement. Santa Monica, California

Two-Stage Turn Boxes

Left turns can be dangerous for bicycles as they merge across traffic before turning. Two-stage turn boxes eliminate this danger by allowing bicycles to continue through the intersection before using a two-stage turn box to pull out of through traffic and continue left in a second movement. Two through movements replace a left turn and bicycles can use provided on-street bicycle facilities in the process. This treatment is generally best for high-speed roads and separated bicycle lane applications where bicycles cannot merge to turn left.

A two-stage turn box provides space for left-turning bicyclists to re-orient outside of the path of through moving bicyclists in a visible location in front of motor vehicle traffic; Source: SFMTA

Rendering of a green color bke lane connecting to a bike box; Source: NACTO

A two-stage turn box at an intersection with a protected bicycle lane. Source: NACTO

Intersection Transit Elements

Schematic drawing of a bus queue jump lane; Source: NACTO

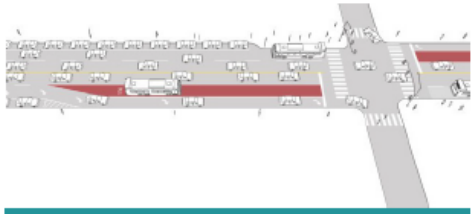
Queue Jump Lanes

Queue jump lanes create a dedicated lane immediately prior to an intersection to allow a vehicle to "jump" ahead of a queue at a traffic signal. A transit priority signal is used to give the vehicle an early green phase, allowing the bus to move ahead of queued traffic. A queue jump can also be combined with a near-side transit stop and will allow a bus to merge back into traffic more easily.

Transit Signal Priority (TSP)

TSP can accommodate frequent, high-quality transit service by reducing the running delay associated with signalized intersections. TSP is not the same as preemption – the system by which emergency vehicles and trains receive an exclusive phase immediately. Signal priority is triggered when a bus is determined to be behind schedule; a signal from the onboard GPS system is sent to the traffic signal which determines whether to provide priority. A green phase may be provided early to shorten the wait time or a green phase may be extended briefly to allow a vehicle to pass through the intersection. Further TSP requests are not granted until a signal recovers from the provision of the initial TSP.

Right-Turn Lane Conflicts



Bus only lane and an adjacent right-turn pocket; Source: NACTO

Bus-only lanes can conflict with right-turning vehicles at intersections. When right turn volumes are moderate, vehicles may be permitted to use the bus-only lane to turn. At intersections with greater right turn volumes the bus may experience delays. A right-turn pocket can be provided to allow cars to merge across the bus-only lane and into the turn pocket. In the case of a near-side bus stop, a floating bus bulb can provide a bus stop while still allowing for the right-turn pocket.

Placemaking

Placemaking pop-up project; Source: Congress for the New Urbanism

As defined by the Project for Public Spaces (PPS): "As both an overarching idea and a hands-on approach for improving a neighborhood, city, or region, Placemaking inspires people to collectively reimagine and reinvent public spaces as the heart of every community [...] and to see anew the potential of parks, downtowns, waterfronts, plazas, neighborhoods, streets, markets, campuses and public buildings." [3]

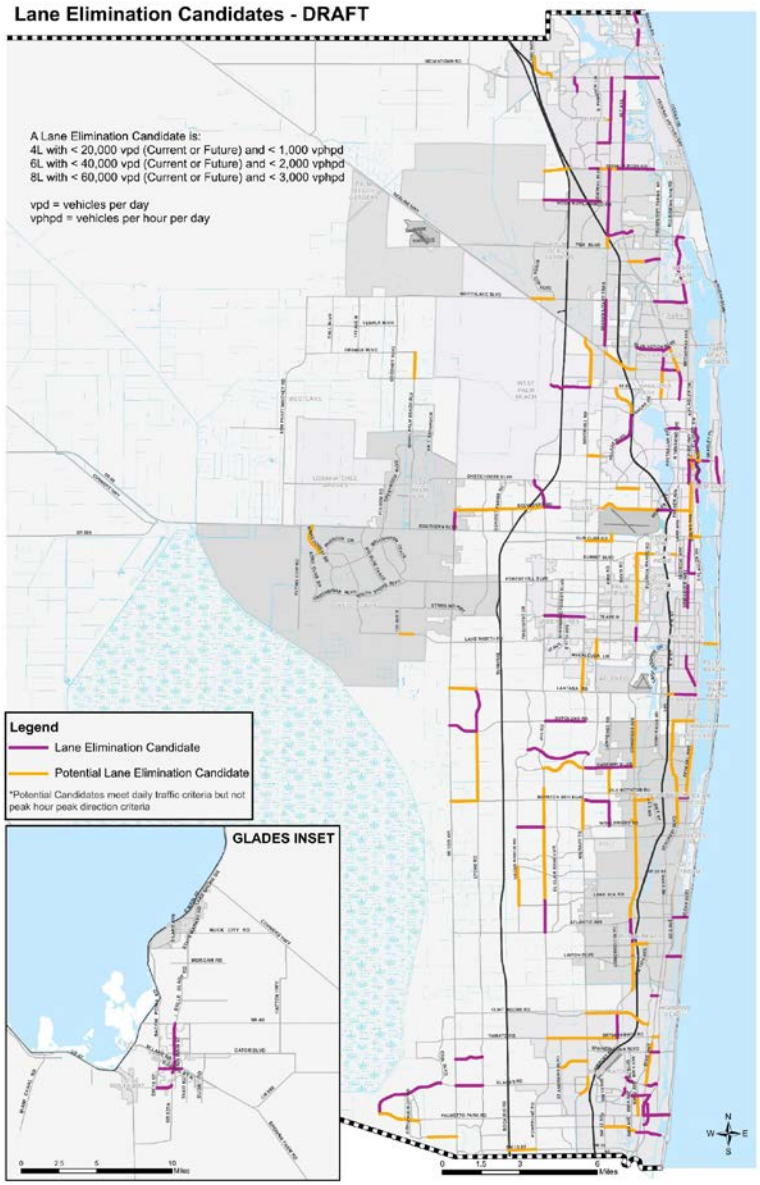
Placemaking through intersection art in Portland, OR. Source: Project for Public Spaces

Placemaking often involves the addition of art in public spaces through the addition of textures or paint through intersections and crosswalks and through the installation of public art, seating, and lighting. Placemaking can help to draw people to an intersection or district and increase the pedestrian activity of an area. Increasing the liveliness of Palm Beach County's streets and intersections is one strategy to increase the profile of walking as a transportation mode.

[3] https://www.pps.org/reference/what_is_placemaking/

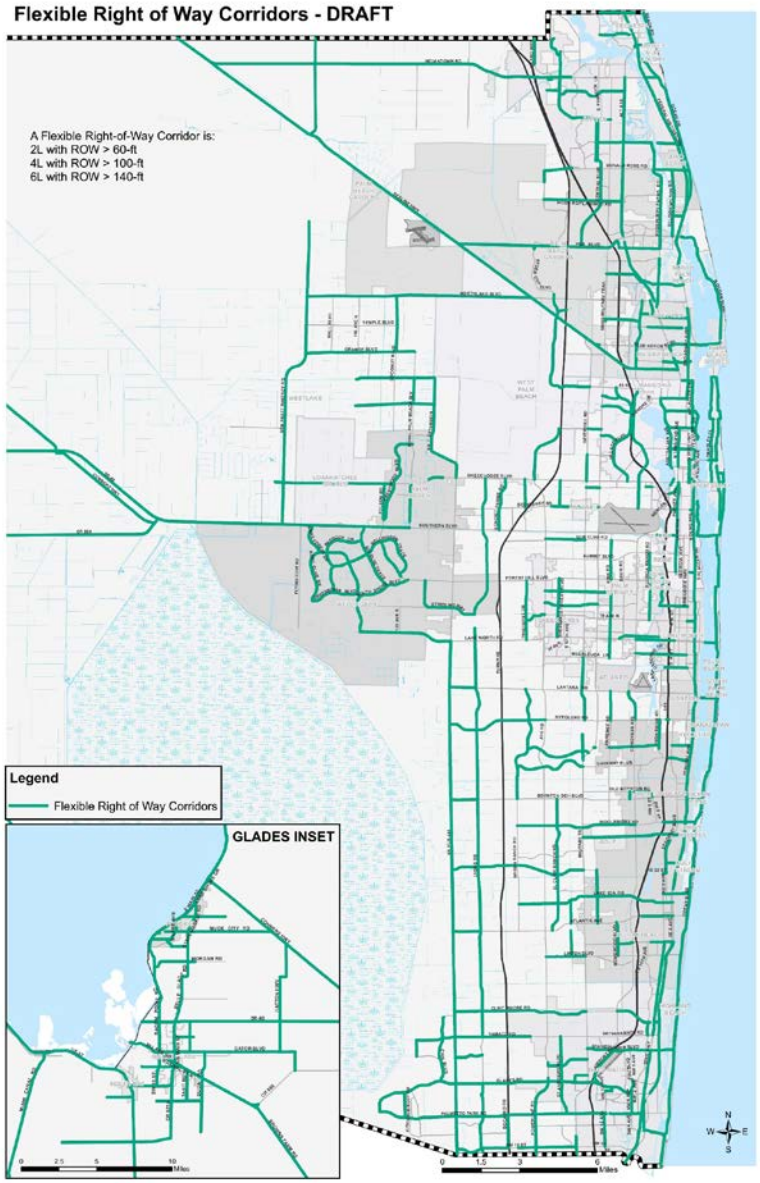
Opportunities Maps

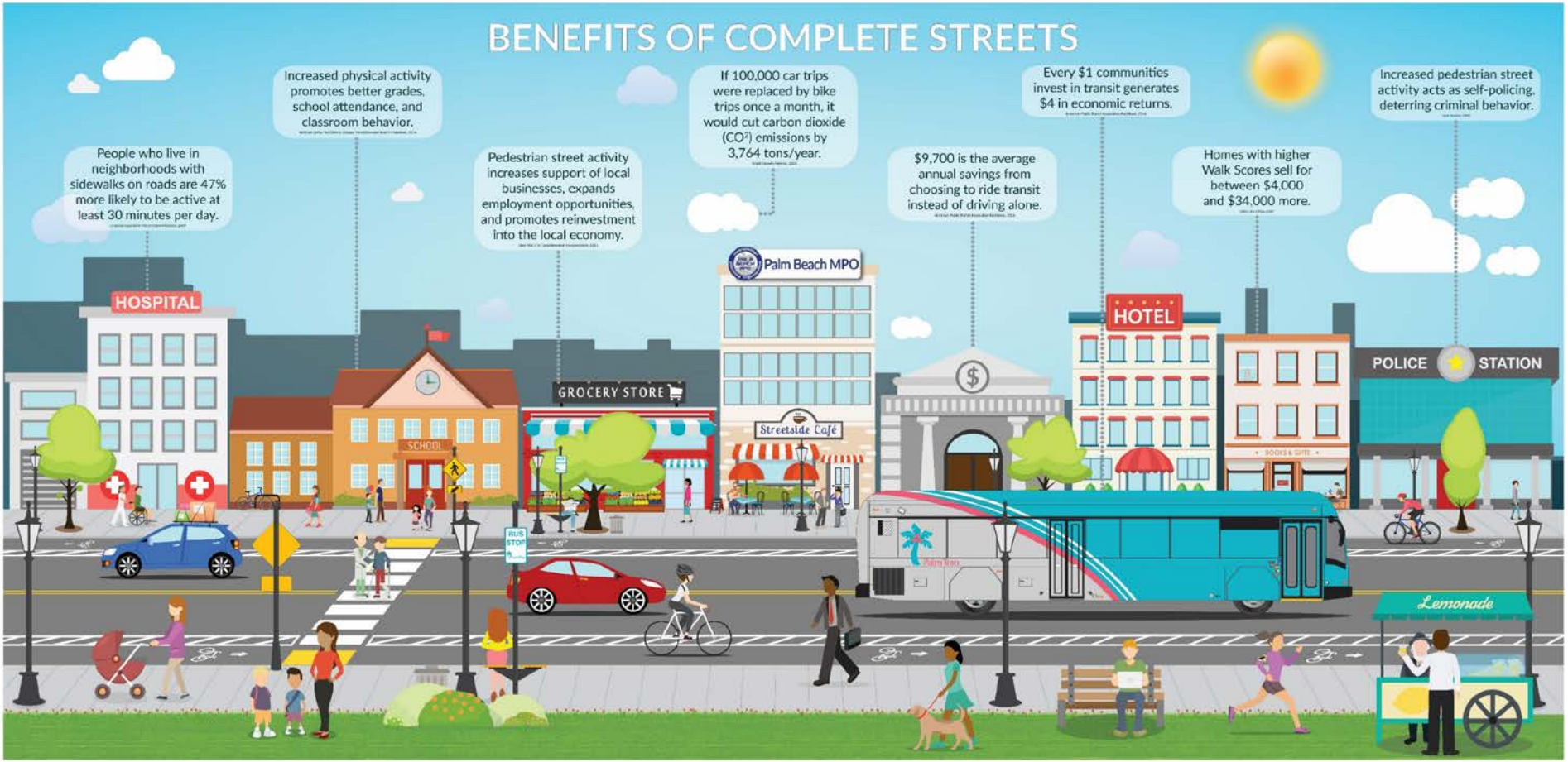
- Lane Elimination Candidates – Draft



Opportunities Maps

- Flexible Right-of-Way Corridors – Draft




BENEFITS OF COMPLETE STREETS
People who live in neighborhoods with sidewalks on roads are 47% more likely to be active at least 30 minutes per day.
Increased physical activity promotes better grades, school attendance, and classroom behavior.
Pedestrian street activity increases support of local businesses, expands employment opportunities, and promotes reinvestment into the local economy.
If 100,000 car trips were replaced by bike trips once a month, it would cut carbon dioxide (CO^2) emissions by 3,764 tons/year.
$9,700 is the average annual savings from choosing to ride transit instead of driving alone.
Every $1 communities invest in transit generates $4 in economic returns.
Homes with higher Walk Scores sell for between $4,000 and $34,000 more.
Increased pedestrian street activity acts as self-policing, deterring criminal behavior.
HOSPITAL
SCHOOL
GROCERY STORE
Palm Beach MPO
Streetside Café
HOTEL
POLICE STATION
BUS STOP
Lemonade

Implementation and Actions

- Receive and incorporate comments from Working Group by August 25
- MPO Committee review
  - October 4-5
- MPO Board adoption
  - October 19