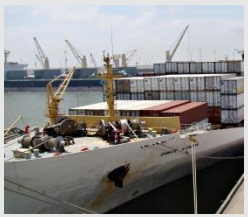
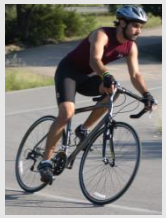
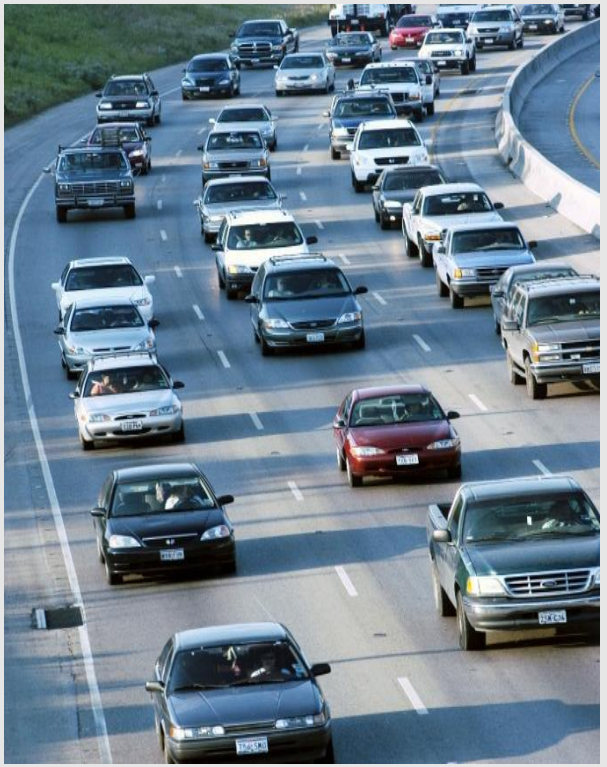





mobility 35 CAPITAL AREA



PEDESTRIAN SAFETY COUNTERMEASURES

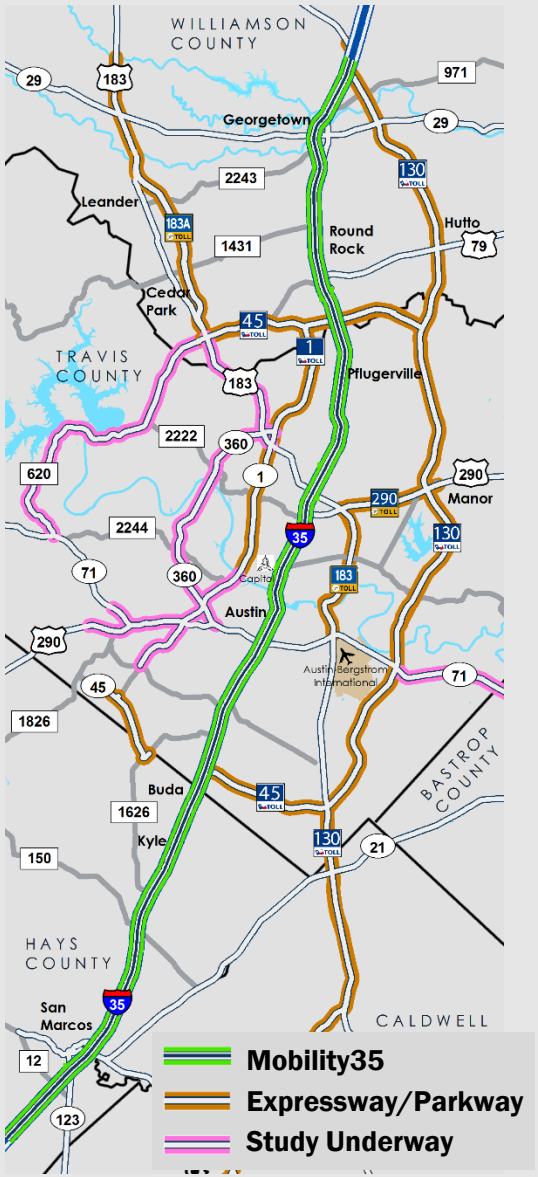
Brad Kwaterski, P.E.

Mobility35 Ready-To-Let Design Lead

August 22, 2019

MOBILITY35
PROGRAM SUMMARY

About the Mobility35 Program



- Region-wide effort to improve safety and mobility on 79 miles of I-35 through Williamson, Travis and Hays counties including five of the top 100 most congested roadways in Texas:
  - #3 – I-35 from US 290E to SH 71
  - #19 – I-35 from SH 71 to Slaughter Lane
  - #36 – I-35 from Parmer Lane to US 290E
  - #78 – I-35 from Slaughter Lane to SH 45SE
  - #87 – I-35 from RM 1431 to SH 45N/Louis Henna Blvd.
- Constraints to improving I-35 include:
  - Highly constrained urban environment
  - Need to maintain mobility during construction
  - Need for east/west connectivity
  - Diverse interests
  - Funding
- I-35 program includes 30+ projects, as part of the region's on-going transportation system upgrade
- Extensive public involvement since 2011

FHWA COUNTERMEASURES

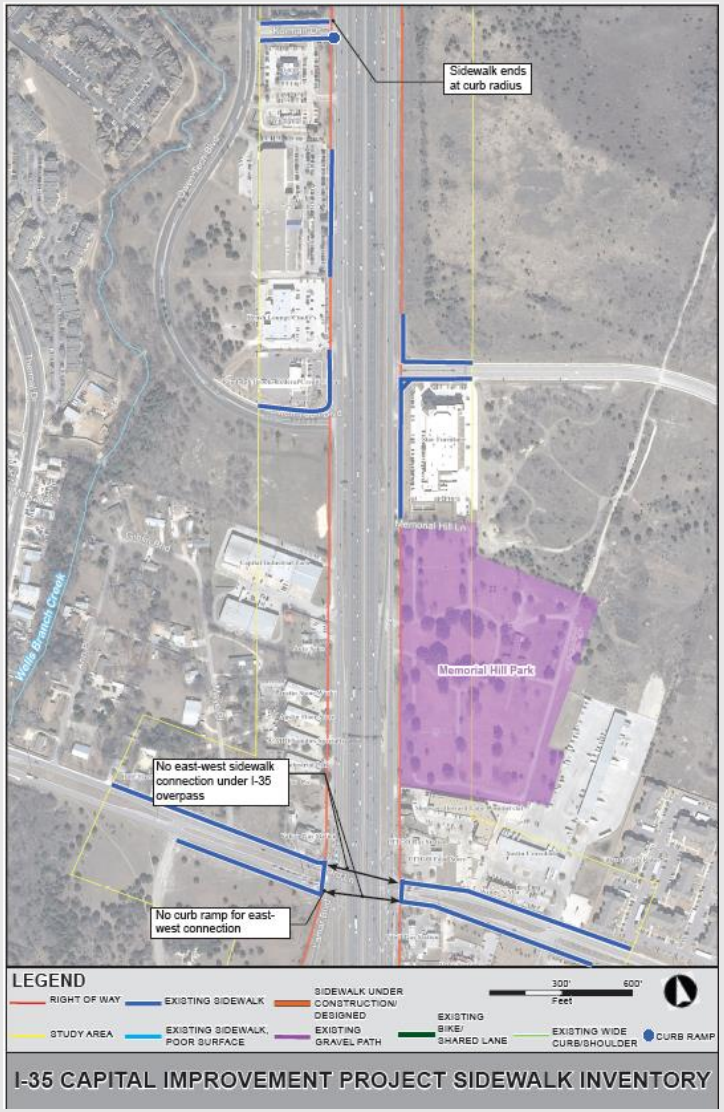
Walkways - FHWA Proven Safety Countermeasure #17

- Some suburban and rural locations have no sidewalk along the frontage roads, little or no paved shoulder
- Goat trails are evidence demand exists for a Walkway/SUP
- Walkway/Shared-Use Path (SUP) benefits
  - Reduction in crashes involving pedestrians walking along roadways
    - Sidewalks: 65%-89%

Example of a 'goat trail'

Existing Walkway Inventory

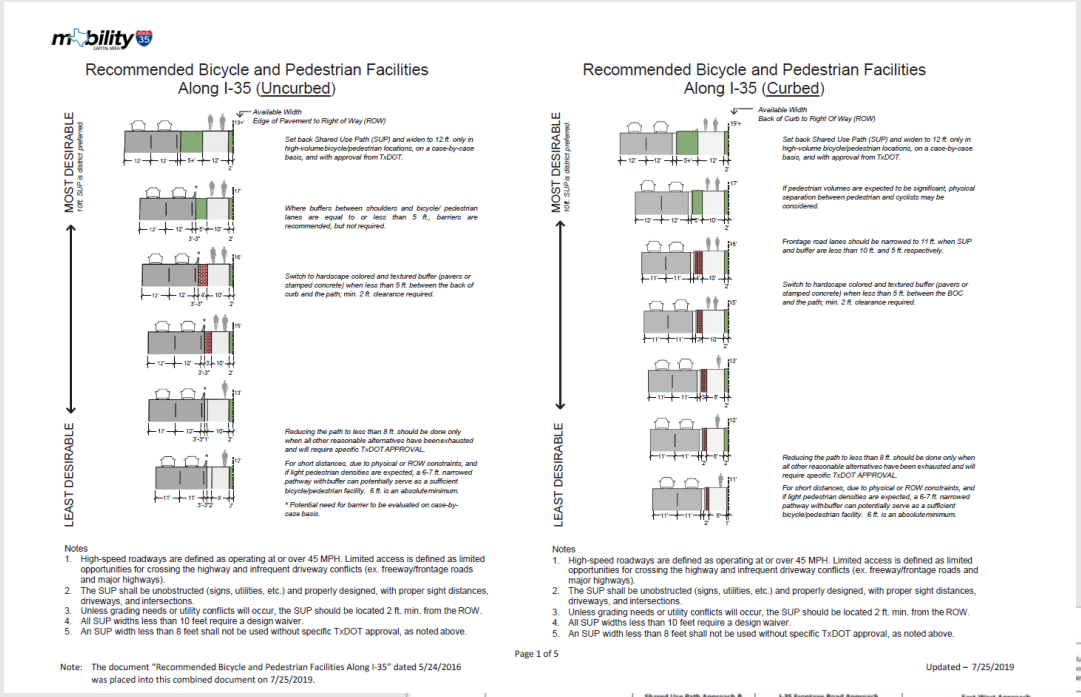
- Best way to determine gaps is to perform a full inventory of existing facilities
- Mobility35 has performed a field verified inventory from SH 45N to Slaughter Creek Overpass
- Inventory maps assist design decisions to ensure a fully connected network exists



Mobility35's Shared-Use Path Concept

- Partners:
  - FHWA
  - City of Austin
  - Bike and pedestrian advocacy groups
  - Area stakeholders
  - TxDOT

- Result:
  - Mobility35 shared-use path design guidance
  - Mobility35 shared-use path striping, signage and design treatments guidance



mobility35

Recommended Bicycle and Pedestrian Facilities Along I-35 (Uncurbed)

MOST DESIRABLE
LEAST DESIRABLE

Available Width
Edge of Pavement to Right of Way (ROW)

Set back Shared Use Path (SUP) and widen to 12 ft. only in high-volume bicycle/pedestrian locations, on a case-by-case basis, and with approval from TxDOT.

Where buffers between shoulders and bicycle/ pedestrian lanes are equal to or less than 5 ft., barriers are recommended, but not required.

Switch to hardscape colored and textured buffer (pavers or stamped concrete) when less than 5 ft. between the back of curb and the path; min. 2 ft. clearance required.

Reducing the path to less than 8 ft. should be done only when all other reasonable alternatives have been exhausted and will require specific TxDOT APPROVAL.

For short distances, due to physical or ROW constraints, and if light pedestrian densities are expected, a 6-7 ft. narrowed pathway with buffer can potentially serve as a sufficient bicycle/pedestrian facility. 6 ft. is an absolute minimum.

* Potential need for barrier to be evaluated on case-by-case basis.

Notes
1. High-speed roadways are defined as operating at or over 45 MPH. Limited access is defined as limited opportunities for crossing the highway and infrequent driveway conflicts (ex. freeway/frontage roads and major highways).
2. The SUP shall be unobstructed (signs, utilities, etc.) and properly designed, with proper sight distances, driveways, and intersections.
3. Unless grading needs or utility conflicts will occur, the SUP should be located 2 ft. min. from the ROW.
4. All SUP widths less than 10 feet require a design waiver.
5. An SUP width less than 8 feet shall not be used without specific TxDOT approval, as noted above.

Recommended Bicycle and Pedestrian Facilities Along I-35 (Curbed)

MOST DESIRABLE
LEAST DESIRABLE

Available Width
Back of Curb to Right Of Way (ROW)

Set back Shared Use Path (SUP) and widen to 12 ft. only in high-volume bicycle/pedestrian locations, on a case-by-case basis, and with approval from TxDOT.

If pedestrian volumes are expected to be significant, physical separation between pedestrian and cyclists may be considered.

Frontage road lanes should be narrowed to 11 ft. when SUP and buffer are less than 10 ft. and 5 ft. respectively.

Switch to hardscape colored and textured buffer (pavers or stamped concrete) when less than 5 ft. between the BOC and the path; min. 2 ft. clearance required.

Reducing the path to less than 8 ft. should be done only when all other reasonable alternatives have been exhausted and will require specific TxDOT APPROVAL.

For short distances, due to physical or ROW constraints, and if light pedestrian densities are expected, a 6-7 ft. narrowed pathway with buffer can potentially serve as a sufficient bicycle/pedestrian facility. 6 ft. is an absolute minimum.

Notes
1. High-speed roadways are defined as operating at or over 45 MPH. Limited access is defined as limited opportunities for crossing the highway and infrequent driveway conflicts (ex. freeway/frontage roads and major highways).
2. The SUP shall be unobstructed (signs, utilities, etc.) and properly designed, with proper sight distances, driveways, and intersections.
3. Unless grading needs or utility conflicts will occur, the SUP should be located 2 ft. min. from the ROW.
4. All SUP widths less than 10 feet require a design waiver.
5. An SUP width less than 8 feet shall not be used without specific TxDOT approval, as noted above.

Page 1 of 5

Note: The document "Recommended Bicycle and Pedestrian Facilities Along I-35" dated 5/24/2016 was placed into this combined document on 7/25/2019.

Updated – 7/25/2019

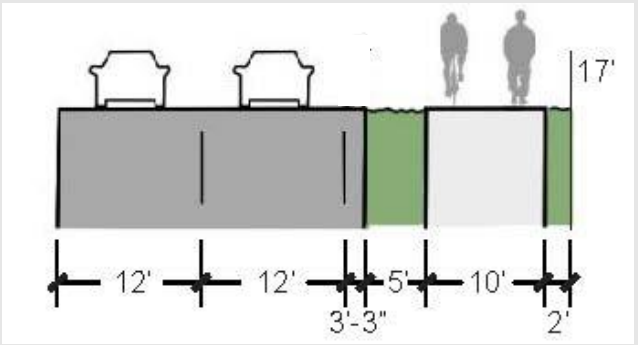
	Shared Use Path Approach & Crossing	I-35 Frontage Road Approach	East-West Approach	Based Upon Engineer Judgment and TxDOT Concurrence, also Consider:
...ways, private roads, and alleys without signals	No treatment beyond that required.	For new construction, the local city and developer may consider: painted crosswalk ("Continental"):	As necessary or required: Raised Detectable Pavers at each end of the crosswalk (ADA) In addition, for new construction, the local city and developer may consider, at crosswalk:	Additional treatment if deemed necessary (physical constraints, accident history, engineering judgment), including but not limited to: - Additional lighting - Plastic delineators The city, engineer, and TxDOT when consulted, should consider long-term maintenance and consistency with the rest of the path.
...ublic streets without signals	Stop sign/bar for vehicles IN ADVANCE (upstream) of painted crosswalk: STOP R1-1 For SUP, painted crosswalk ("Continental"):	Consider: LOOK R1-5 As a general note, use sparingly, for example if crash history indicates some benefit.	See minimum, plus, in advance of street, if not in conflict with other required signage: TURNING VEHICLES YIELD R10-15	See minimum, plus, as necessary or required: Raised Detectable Pavers at each end of the crosswalk (ADA) In addition, at crosswalk:	See above.
...ublic streets with ...gnals	Signal, stop bars, and pedestrian signals (with sound) as required plus: painted crosswalk ("Continental"):	Consider: USE PED SIGNAL R9-5	See minimum, plus, in advance of street: TURNING VEHICLES YIELD R10-15 When signal includes a permissive left turn or a right-turn where yield compliance is low, give SUP a head-start (leading pedestrian interval).	See minimum, plus, as necessary or required: Raised Detectable Pavers at each end of the crosswalk (ADA) In addition, at crosswalk: When signal includes a permissive left turn or a right-turn where yield compliance is low, give SUP a head-start (leading pedestrian interval).	See above.

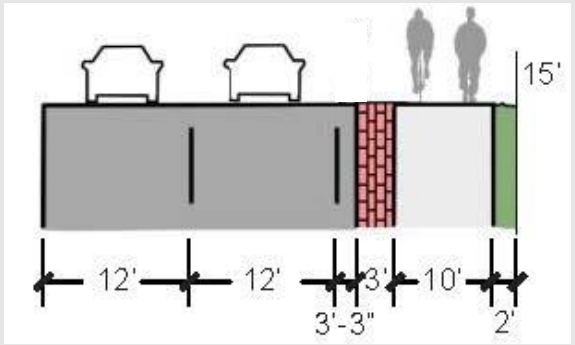
Page 1 of 2

Version date: 6/20/2018

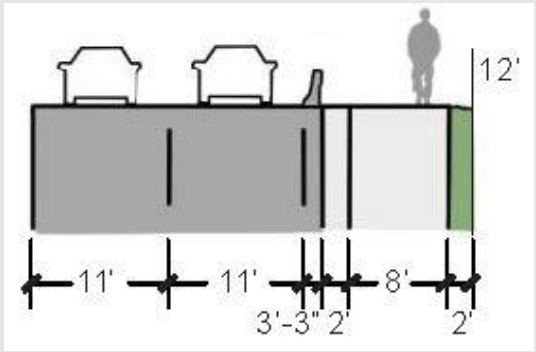
Mobility35 Shared-Use Path Scale

Preferred





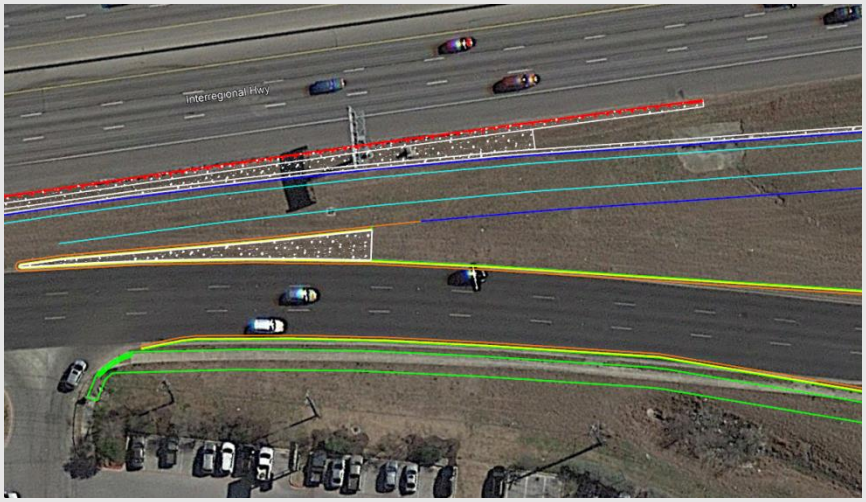
Acceptable



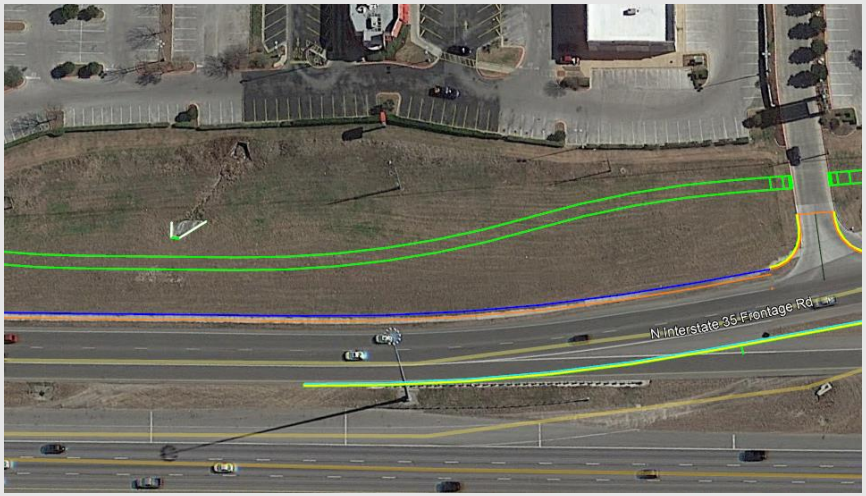
*Some locations have less than 12' due to corridor constraints

Placement of Walkway/SUP

- Expanding buffer zone from roadway to SUP increases SUP user safety
  - 10 ft. SUP with 5 ft. buffer preferred minimum
  - Place SUP as close to ROW as feasible
- This is the preferred option. Locations are limited, but TxDOT is working closely with partners to identify additional opportunities



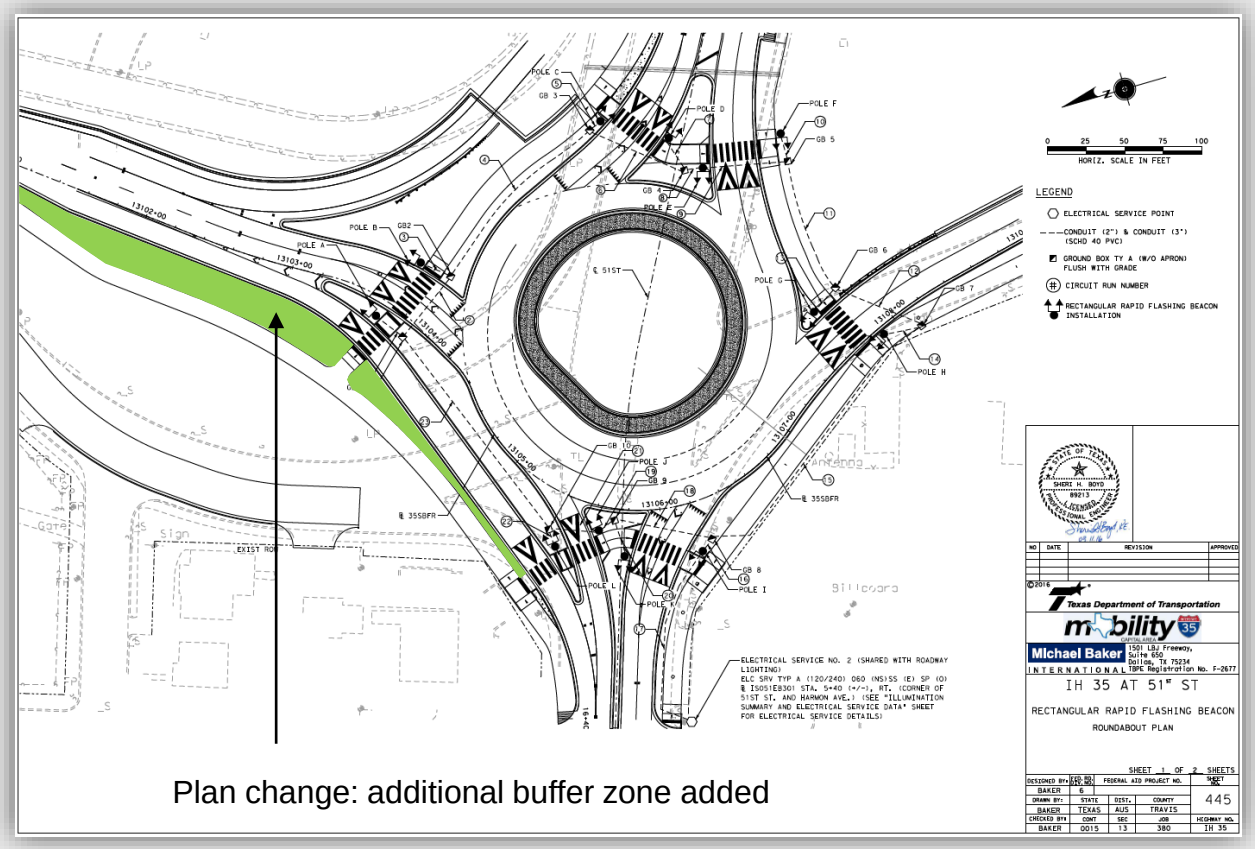
SUP with 5 ft. buffer, proposed improvements at Parmer Lane



SUP placed as close to ROW as possible

SUP – Preferred Example

- Existing right of way creates opportunities for increased buffer width



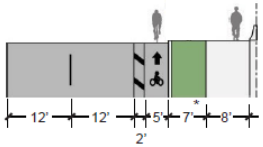
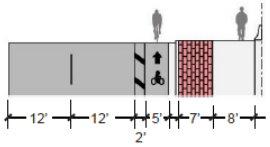
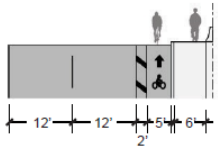
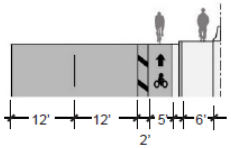
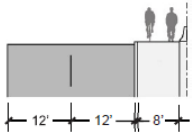
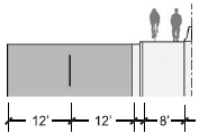
Plan change: additional buffer zone added

SUP – Acceptable Examples

- Constraints include: community assets, utilities, constructability, timing

Mobility35 Design Criteria – East/West Connections

- I-35 is a north/south route and can act as a bike/ped barrier if east/west connections are not provided
- Goal is to provide east/west connectivity to existing and proposed bike/ped routes along the corridor

	OVERPASSES	UNDERPASSES
DOWNTOWN (MLK BLVD. TO LADY BIRD LAKE)	 *15 ft. minimum behind back of curb.* ** Tree/landscape zone*	 *15 ft. minimum behind back of curb.*
PREFERRED		
MINIMUM		

Signage

- Contrast between design of Texas frontage roads and SUPs
  - SUPs are designed to be bi-directional pathways
  - Texas has one-way frontage roads
- Concern
  - Drivers tend to only look one way while merging
  - Drivers are not aware of bikes and pedestrians traveling the other direction
- Importance of Signage
  - Command attention from drivers
  - Convey a clear, simple meaning
    - Reminds drivers to look both ways while entering frontage road
  - Give adequate time for response (driver, bike, and ped)

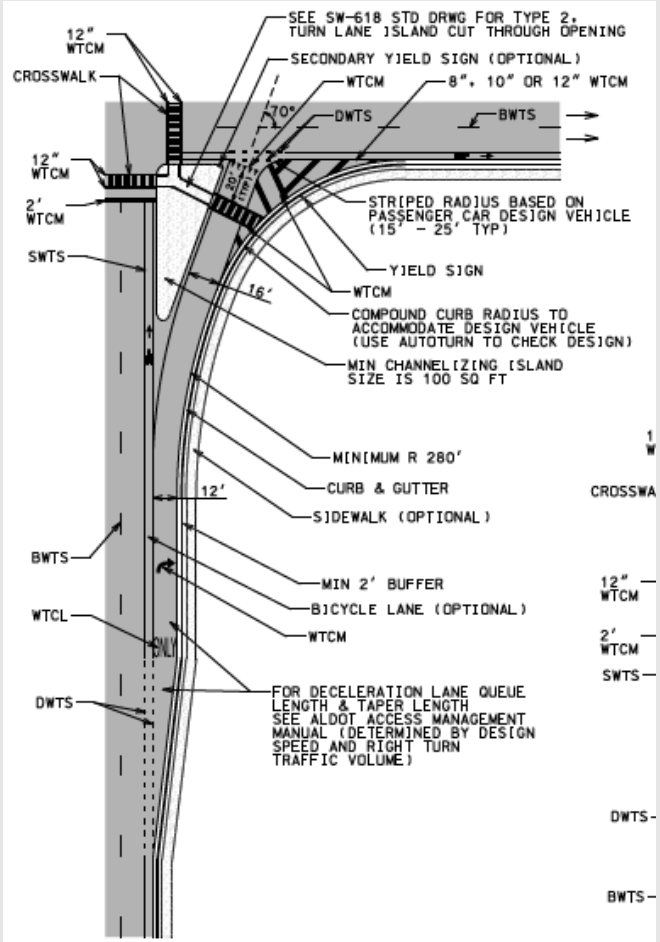
Mobility35 Recommended Signage

		Higher-Need Area Treatment Options		
Condition	**Minimum**	**SUP & Crossing**	**Frontage Road**	**East-West**
Driveways, private roads and alleys without signals	No treatment beyond that required	Painted crosswalk: 	In advance of driveway:  R10-15	Raised Detectable Pavers at each end of the crosswalk (ADA) and:  
Public streets without signals	Stop sign/bar <u>for vehicles</u> IN ADVANCE (upstream) of painted crosswalk:  R1-1 <u>For SUP</u>, painted crosswalk: 	Consider:  R15-8 *As a general note, use sparingly, for example, if crash history indicates some benefit	See minimum, plus, in advance of street, if not in conflict with other required signage:  R10-15	See minimum, plus, as necessary or required: Raised Detectable Pavers at each end of the crosswalk (ADA) In addition, at crosswalk:  
Public streets with signals	Signal, stop bars and pedestrian signals (with sound) as required, plus, painted crosswalk: 	Consider:  R9-5	See minimum, plus, in advance of street:  R10-15 When signal includes a permissive left turn or a right-turn where yield compliance is low, give SUP a head-start (leading pedestrian interval)	See minimum, plus, as necessary or required: Raised Detectable Pavers at each end of the crosswalk (ADA) In addition, at crosswalk:  
"Free-right" turns (FRT)	Anticipated new RDM design guidelines for tightened radii and narrower FRTs Signage:  R1-2  	See Minimum	See Minimum Plus, in ADVANCE of minimum signage with additional yield triangle pavement markings just ahead of crosswalk and at FRT crosswalk:  R10-15  	See Minimum Plus, in ADVANCE of minimum signage with additional yield triangle pavement markings just ahead of crosswalk and At FRT crosswalk:  R10-15  

ROADWAY DESIGN COUNTERMEASURES

Improved Right-Turn Slip Lanes

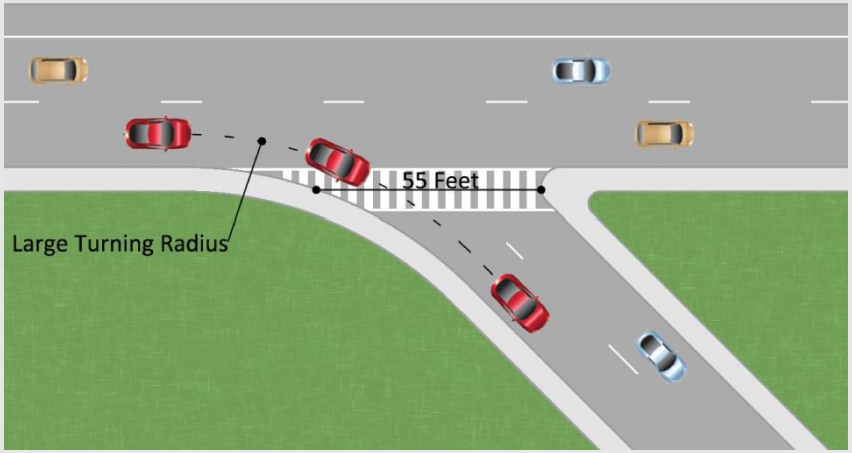
- Right-turn slip lanes slow turning vehicles to allow drivers and pedestrians to see each other more easily while reducing the complexity of an intersection
- Features
  - Island forms channelized right-turn lane; raised/large enough for waiting pedestrians
  - Direct line of sight with waiting pedestrians
  - Narrow turn lane design, accommodates larger vehicles
  - Crosswalk angle optimizes sight lines
  - Enhanced crosswalk striping, flashing beacons and/or signage amplifies visibility
  - Angle of right-turn lane to intersecting street reduces vehicle speeds for oncoming traffic
- Project examples under development: I-35 at Parmer Lane, I-35 at SH 123, and SH 71 at Pope Bend



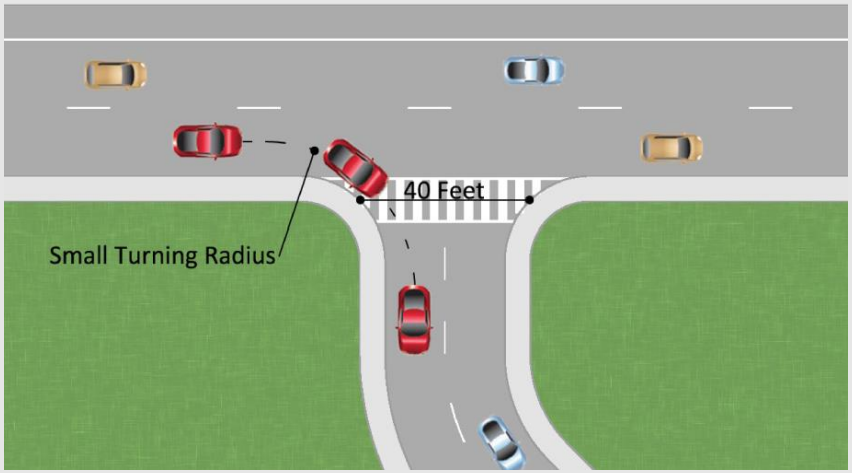
Source: Alabama DOT
https://www.dot.state.al.us/dsweb/divted/TrafficSOS/pdf/SmartChannel_040816.pdf

Modified Skewed Intersections

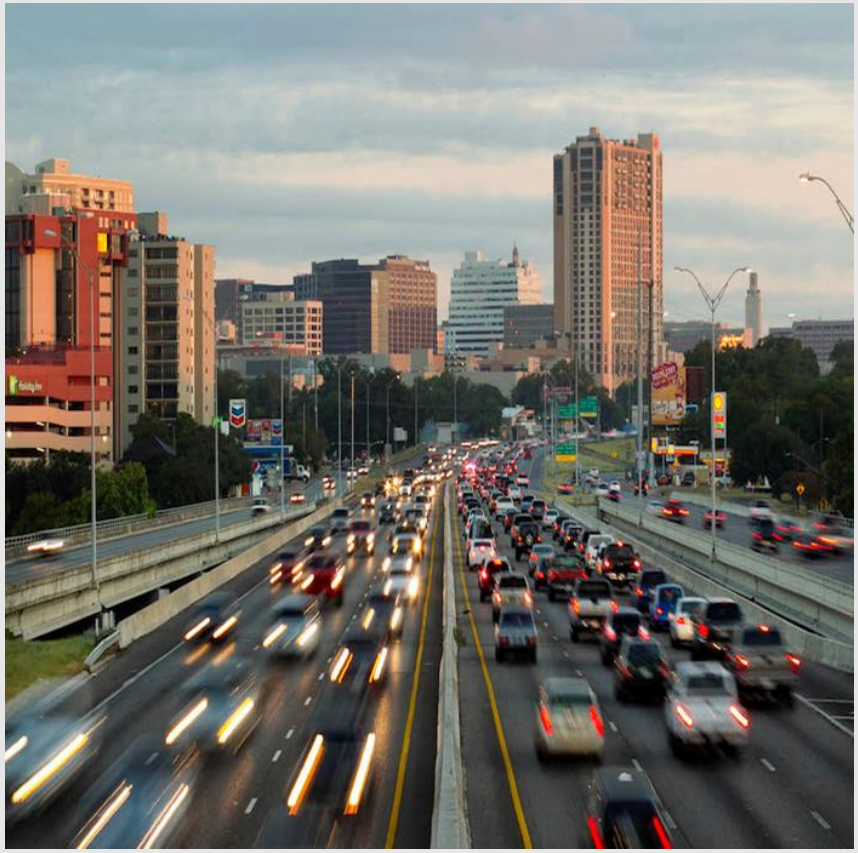
- Skewed intersections occur when streets intersect at angles other than 90 degrees.
- Result in longer crossing distances for pedestrians and facilitate higher speed turning movements by vehicles.
- Strategies for Improvement
  - Reconfigure the intersection by straightening the skewed approach
  - High visibility marked crosswalks
  - Adding medians or channelization islands to reduce crossing distance



Skewed intersection



Corrected skewed intersection



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