Traffic Operations Solutions for "Design" Projects

Traffic Operations

- Balancing:
  - Needs of the roadway users
  - Purpose of the roadway
  - Safety
  - Efficiency of the highway system

  through implementation of various roadway features and traffic control devices

Highlights

- Access Management
  - Near Intersections
  - Corridors
- Pedestrian Considerations
  - Curb Extensions & Raised Crosswalks
  - Visibility Enhancements

Highlights

- Innovative Intersections
  - RCUTs
  - Mini Roundabouts
- Re-allocating available footprint
  - Road Diets
  - Lane Diets
  - Offset Left Turn Lanes

Acess Management

- Controling the:
  - location, spacing, design and operations

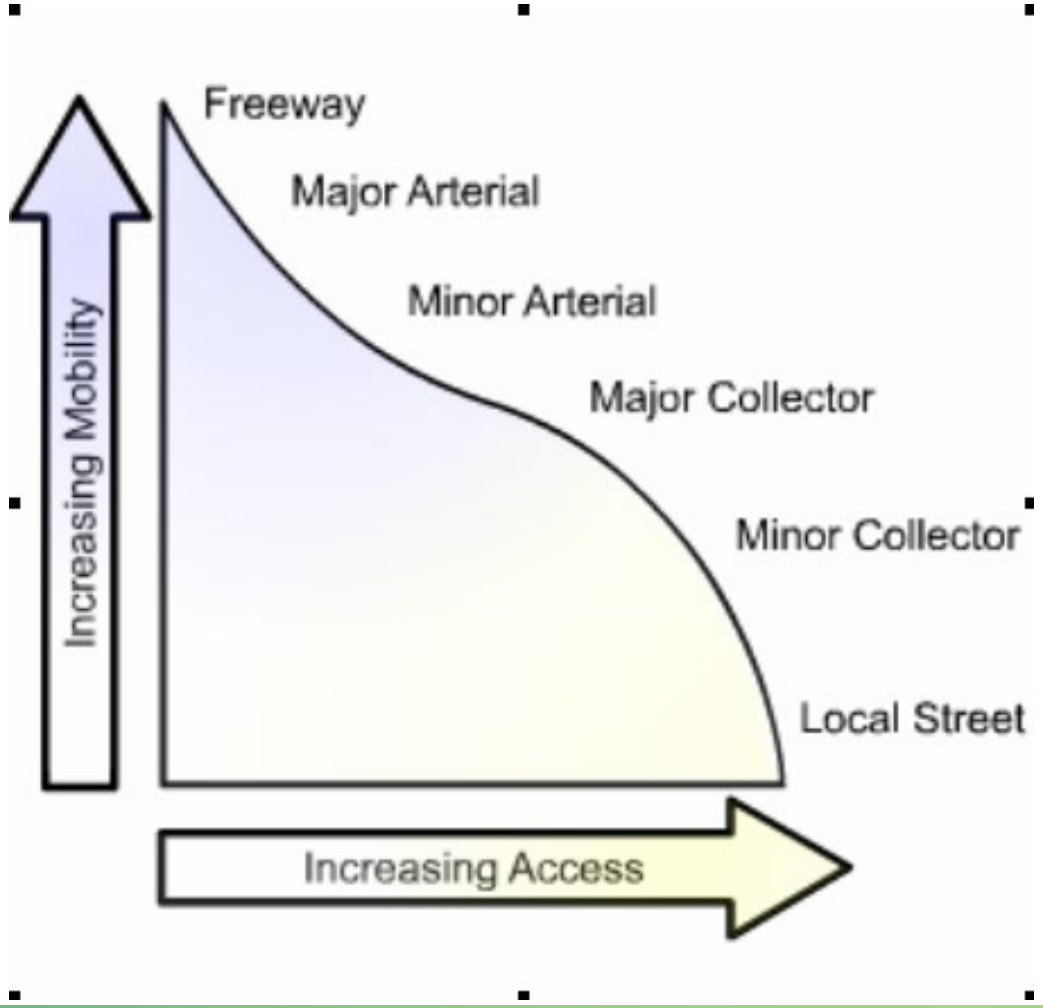
  of:

  - driveways, median openings, other roadways, traffic signals, and interchanges

  that connect to a roadway.

Access Management

- Mobility vs Accessibility



Access Management Near an Intersection

EXISTING

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Access Management Near an Intersection

EXISTING

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- Access Management Near an Intersection

PROPOSED

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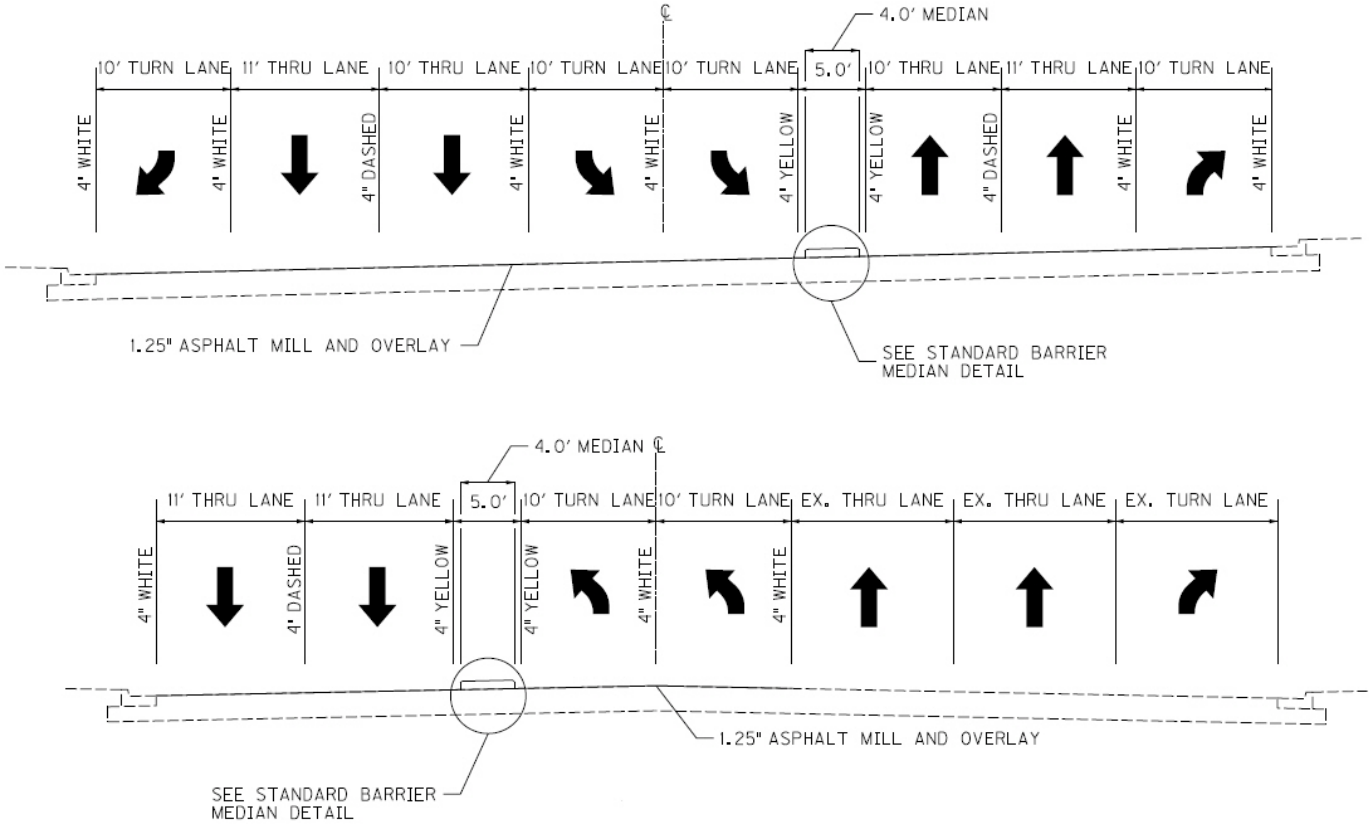
Access Management Near an Intersection

PROPOSED



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Acess Management

Question:

- What makes Access Management so effective?

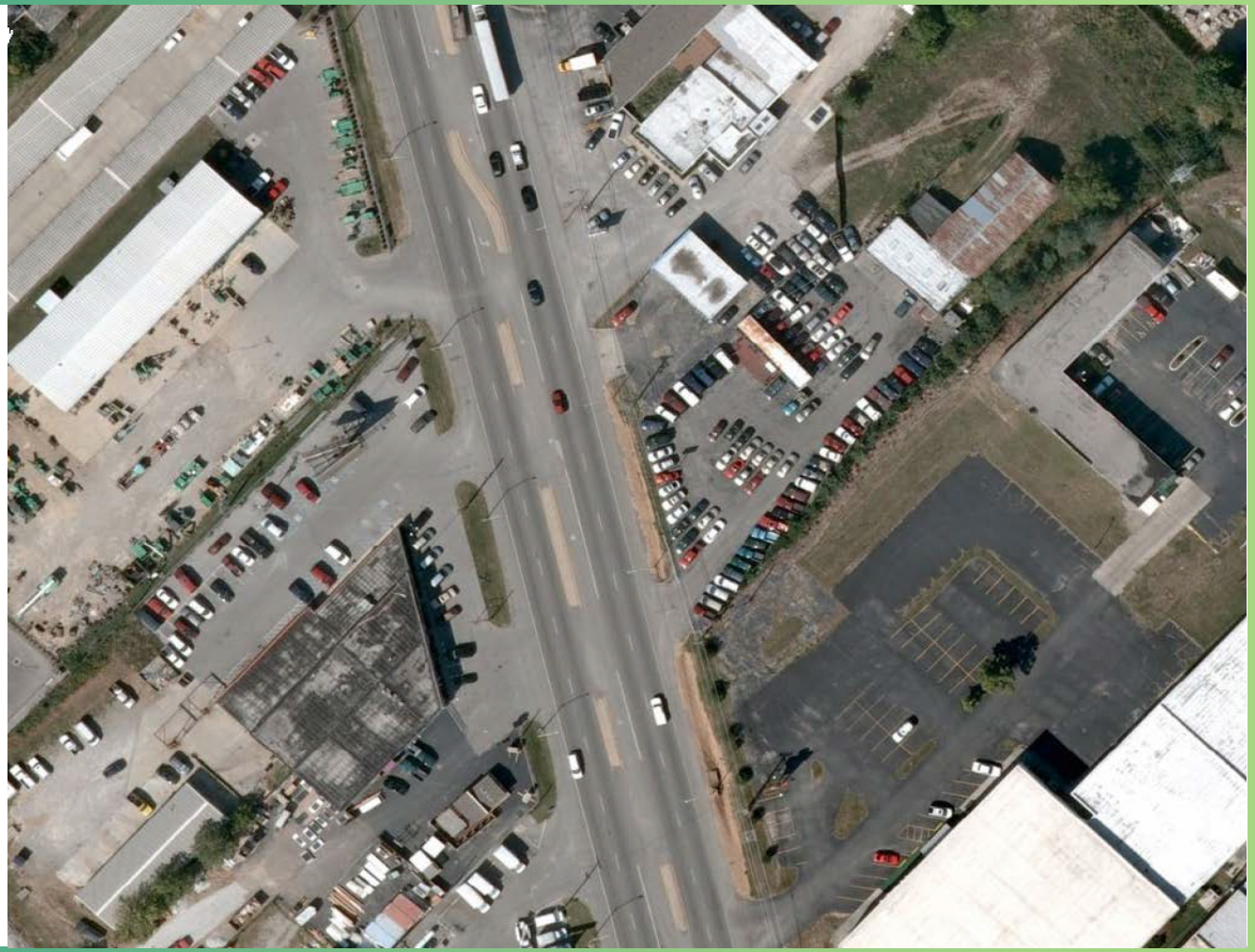
Answer:

- Improves the mangement of Traffic Conflicts

Think of a single traffic conflict as one rock being thrown into a pond. The ripples are easy to see and are predictable. But, if lots of rocks are thrown in at the same time, the ripples are hard to see and it is difficult to avoid one at the cost of another.

Access Management along a Corridor

BEFORE



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- Access Management along a Corridor

AFTER

- 10% reduction (all crashes)
- 22% reduction (injury crashes)

Acess Management

- Implementation challenge:
  - Business Owner Concerns

Acess Management

- Information / Handouts developed by FHWA:
  - A trifold brochure titled:
    ‘Benefits of Access Mangement’
  - A 15 page primer titled:
    ‘Safe Access is Good for Business’

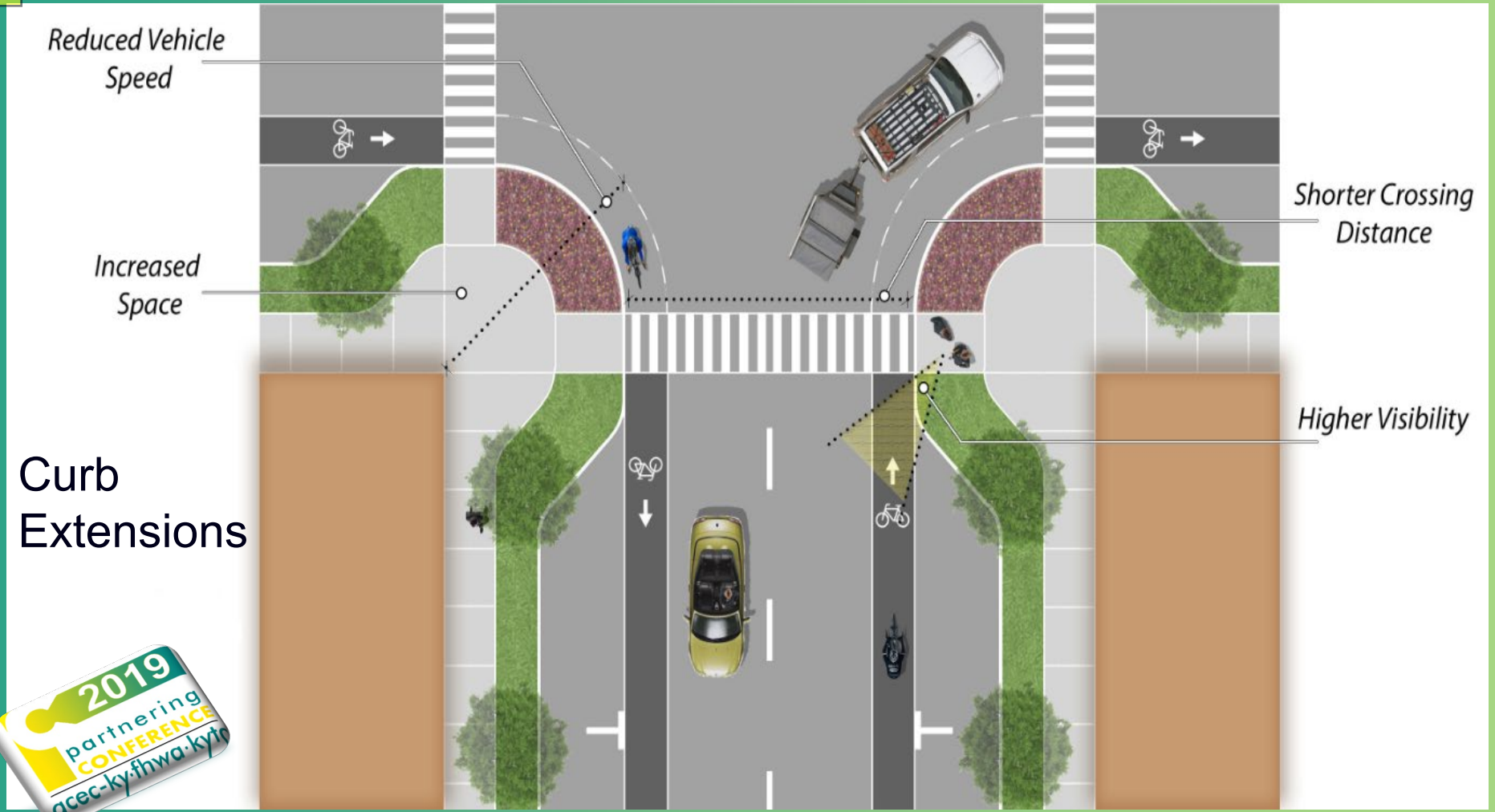
https://ops.fhwa.dot.gov/access_mgmt/resources.htm

Search: “Access Management Publications FHWA”

Pedestrian Considerations

- Curb Extensions
- Raised Crosswalks
- Visibility Enhancements
  - Markings
  - Lighting
  - RRFBs
  - Gateway Treatment

Curb Extensions



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Curb extensions being constructed

Downtown Paducah

Raised Crosswalks

- Reduces vehicle speeds
- Improves visibility of pedestrian
- Eliminates curb ramps

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Crosswalk Visibility Enhancements

- Longitudinal Style & Ladder Style Markings

Crosswalk Visibility Enhancements

- Lighting

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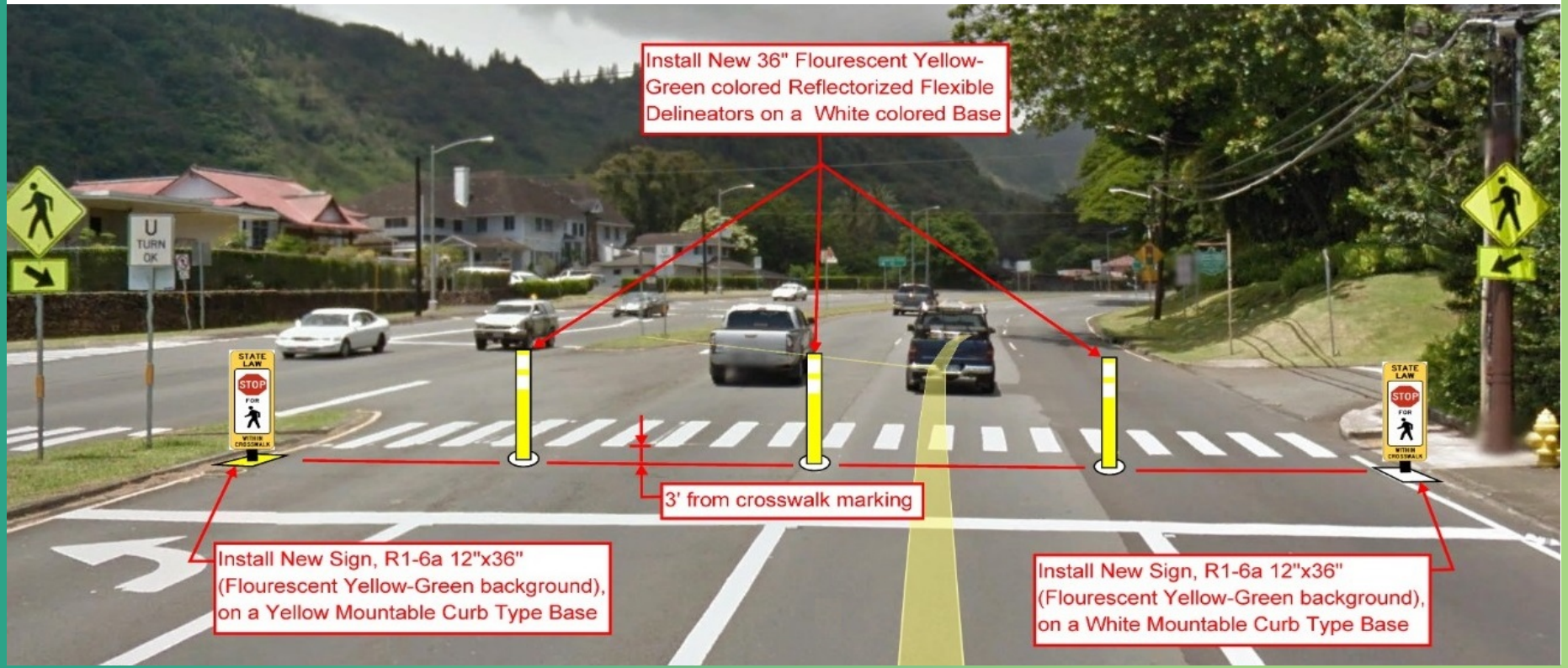
Crosswalk Visibility Enhancements

- Retangular Rapid Flashing Beacons (RRFBs)

Crosswalk Visibility Enhancements

- the Gateway Treatment

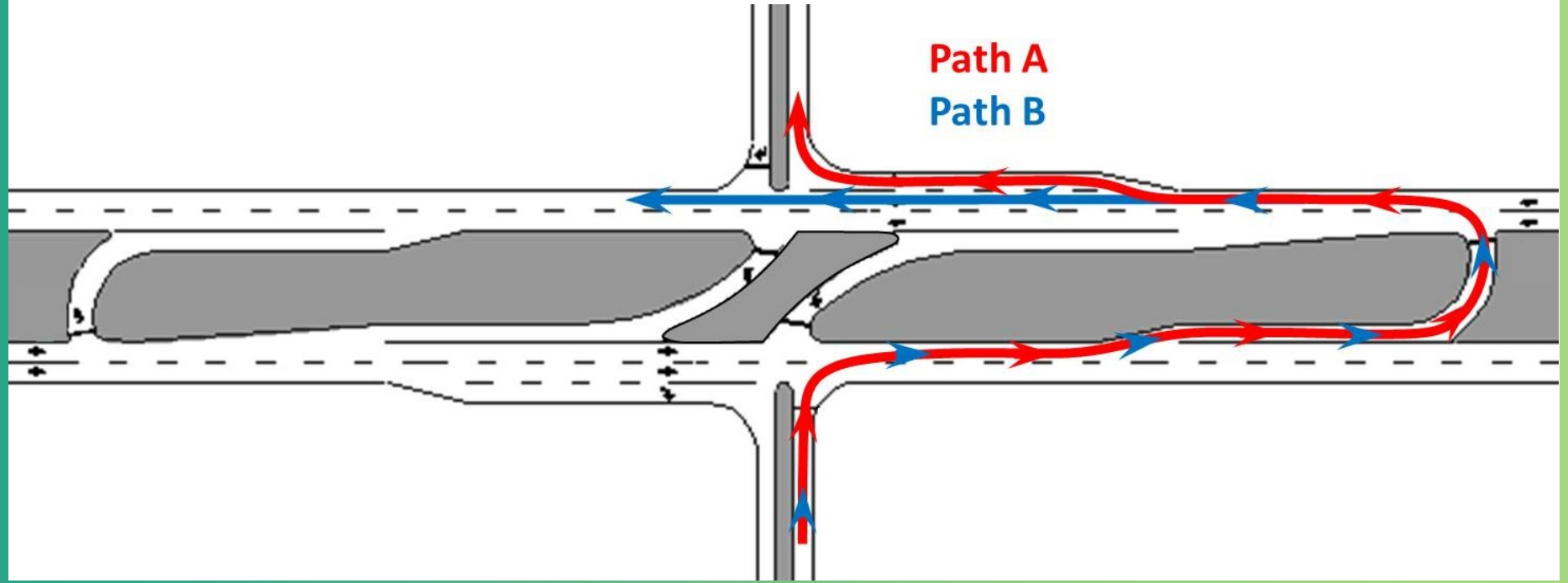


Innovative Intersections

- Reduced Conflict U-Turn – RCUT (aka Restricted Crossing U-Turn)
  - Very High Safety Benefits
  - Moderate Cost
  - Little to No Impact on LOS (sometimes improves LOS)

RCUT Operations

- Mainline traffic interacts the same as a conventional intersection
- Side street left turns and thrus are redirected to a U-Turn



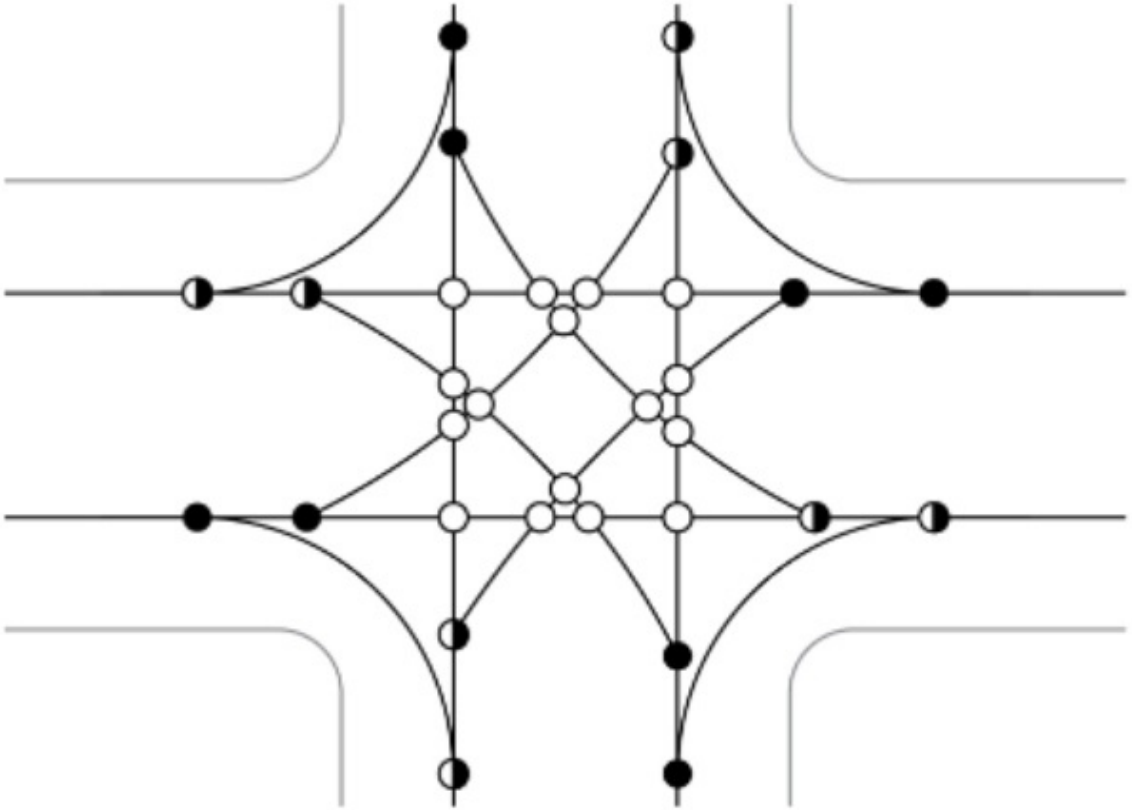
Safety Improvements of an RCUT

- Crash Reductions (Rural)
  - 30-40% reduction of all crashes
  - 40-60% reduction of injury crashes
  - 80-100% reduction of serious injury and fatal crashes

Safety Improvements of an RCUT

- Conflict Points
  - Conventional Intersection:
  - RCUT:

Conventional Intersection: Conflict Points



Legend

● = Diverging

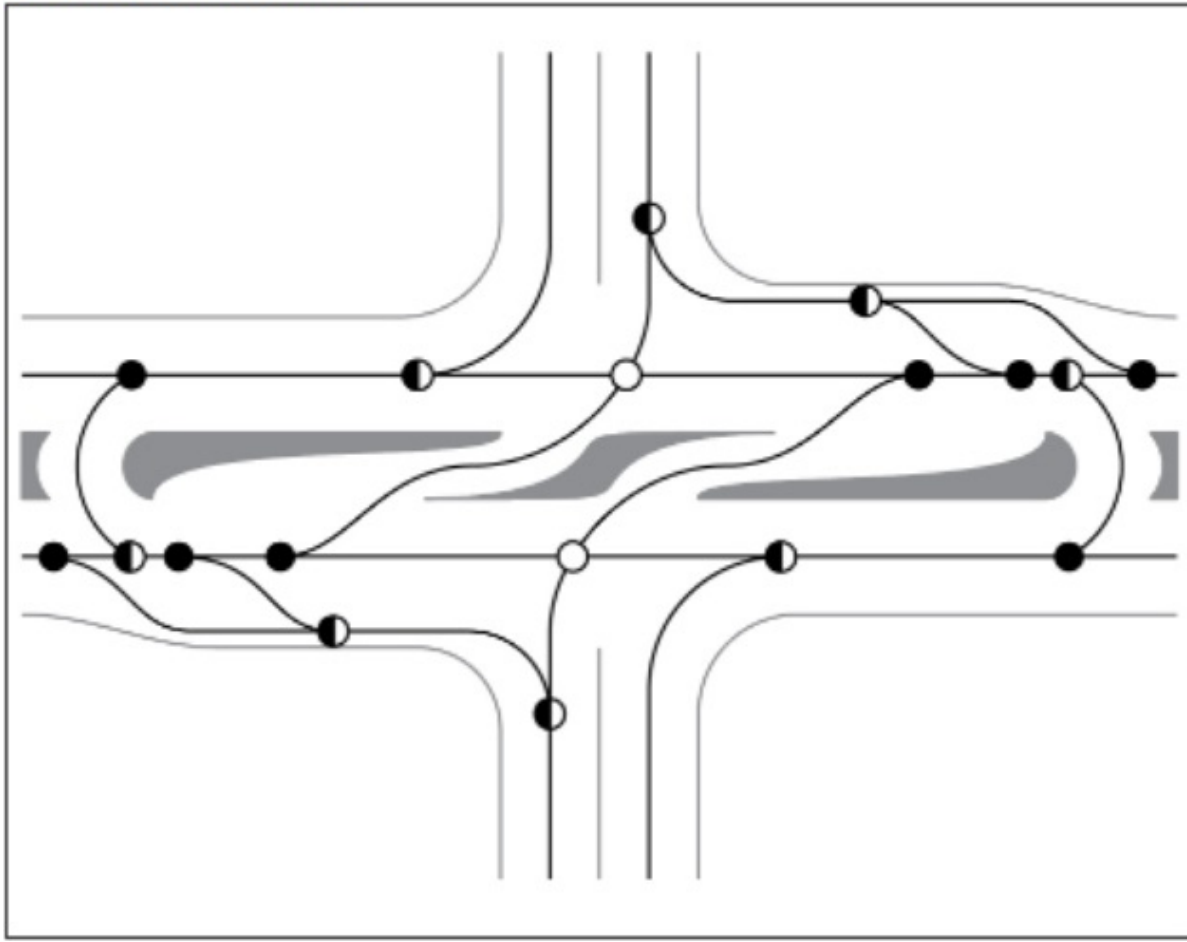
◑ = Merging

○ = Crossing

Conflict Type	Count
Crossing	16
Merging	8
Diverging	8
Total:	

32 Conflicts

RCUT: Conflict Points



Legend

● = Diverging

◑ = Merging

○ = Crossing

Conflict Type	Count
Crossing	2
Merging	8
Diverging	8
Total:	

18 Conflicts

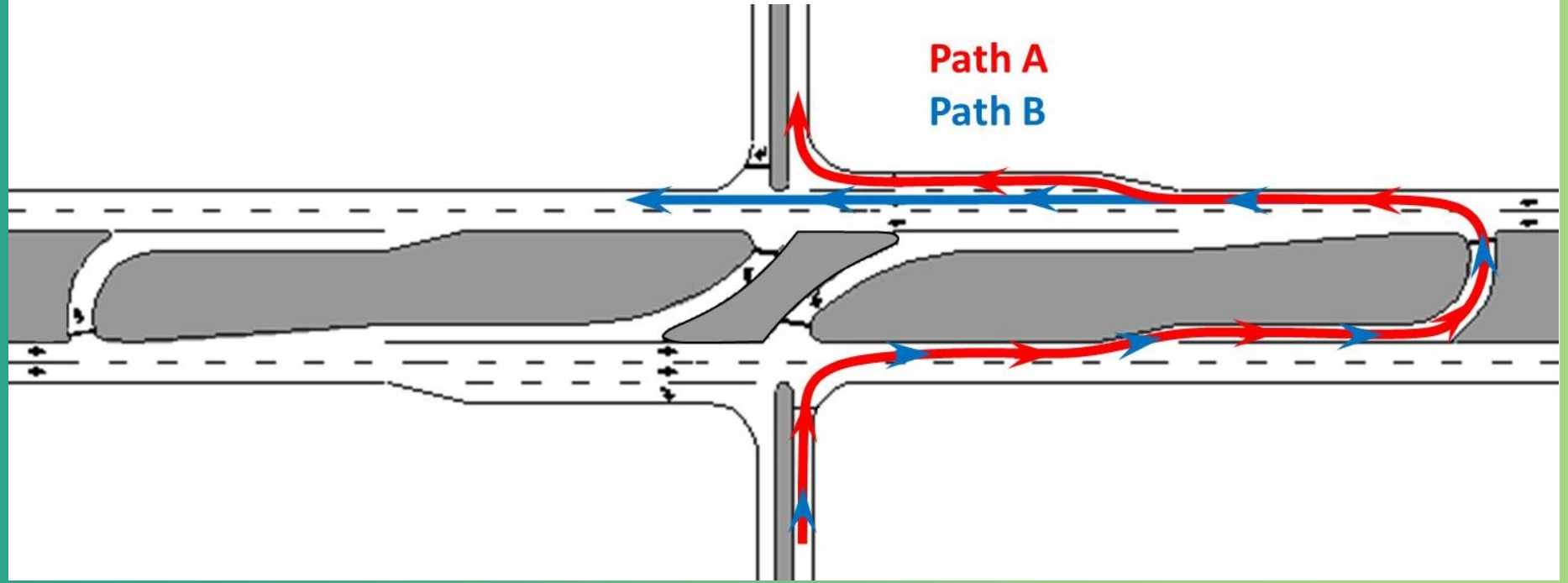
Safety Improvements of an RCUT

- Conflict Points
  - Conventional: 32 Conflict Points
  - RCUT: 18 Conflict Points

- Simplified operation
  (i.e. lower driver workload)

RCUT Operations for Side Street Traffic

- Thru and left turning traffic must execture a two stage movement to enter the flow of mainline traffic




SOUTH
233
STOP

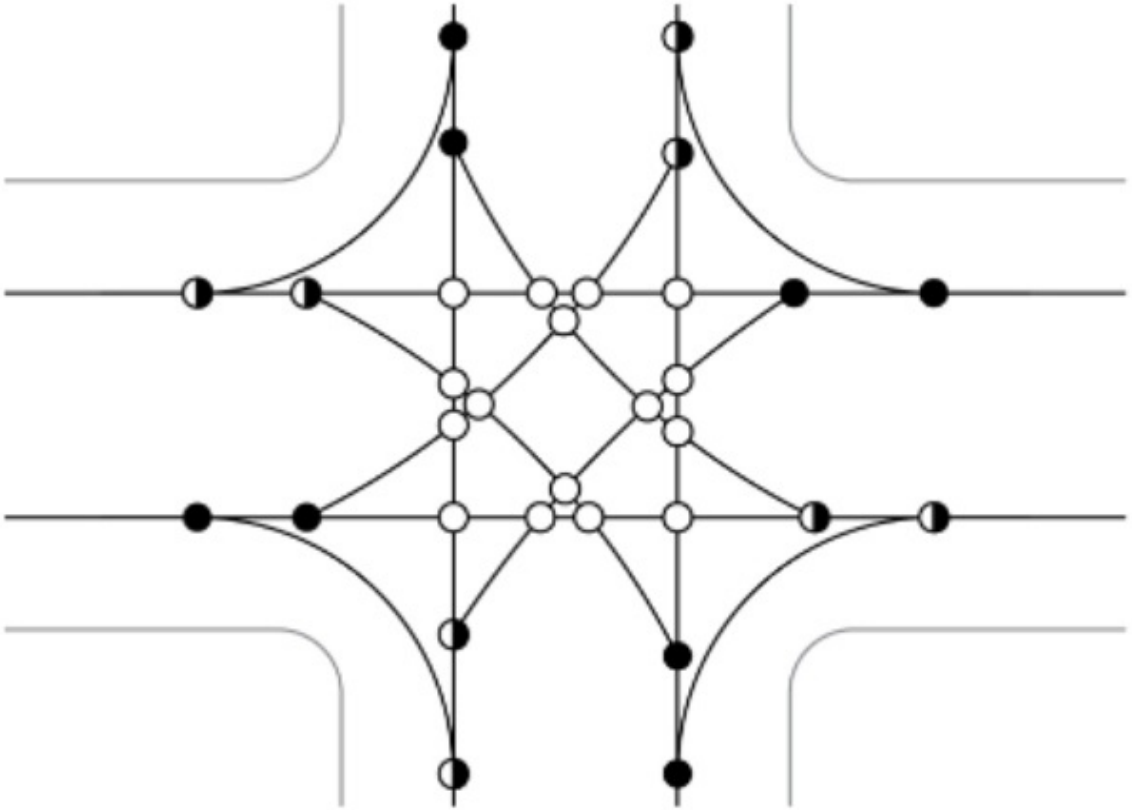
Innovative Intersections

- Mini Roundabout
  - Similar Benefits as traditional Roundabouts
  - Smaller Footprint
  - Less Cost (sometimes much less)

Mini Roundabouts

- Operational benefits
  - Less delay
  - Traffic calming
  - Access management
- Improved Safety
  - Crash rates tend to be 30% less than signalized intersections

Conventional Intersection: Conflict Points



Legend

● = Diverging

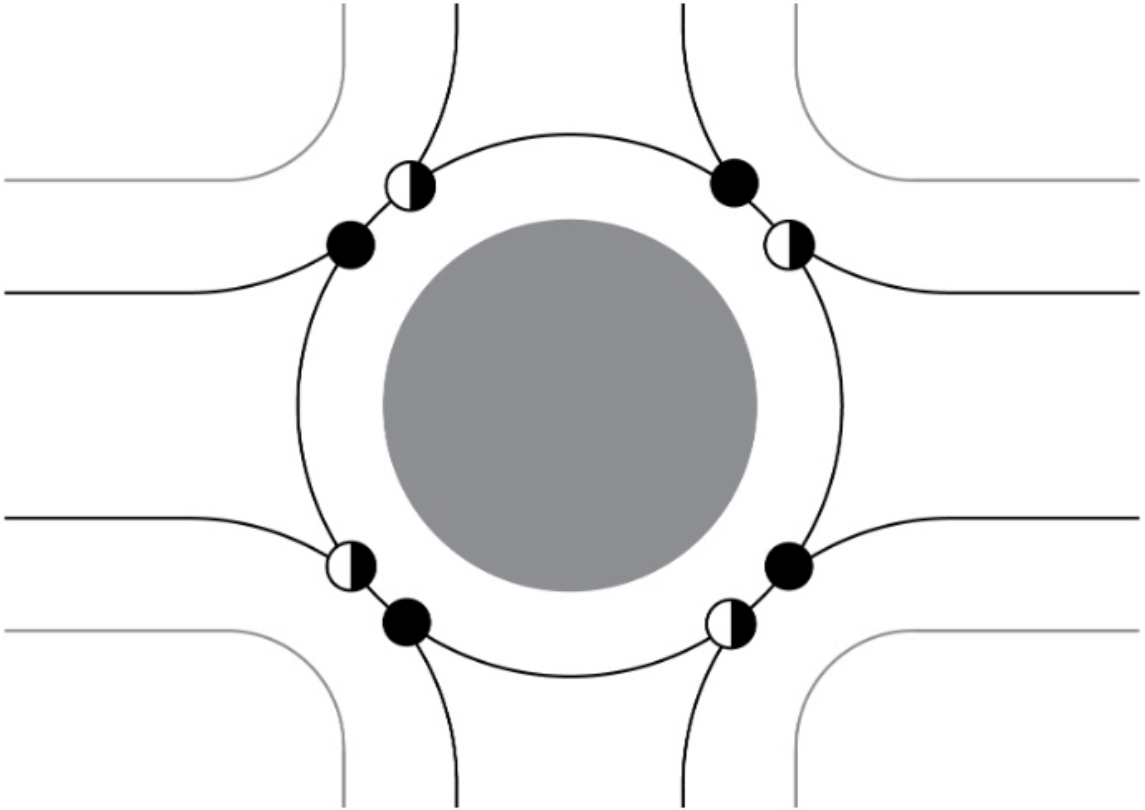
◑ = Merging

○ = Crossing

Conflict Type	Count
Crossing	16
Merging	8
Diverging	8
Total:	

32 Conflicts

Mini Roundabout: Conflict Points



Legend

● = Diverging

◑ = Merging

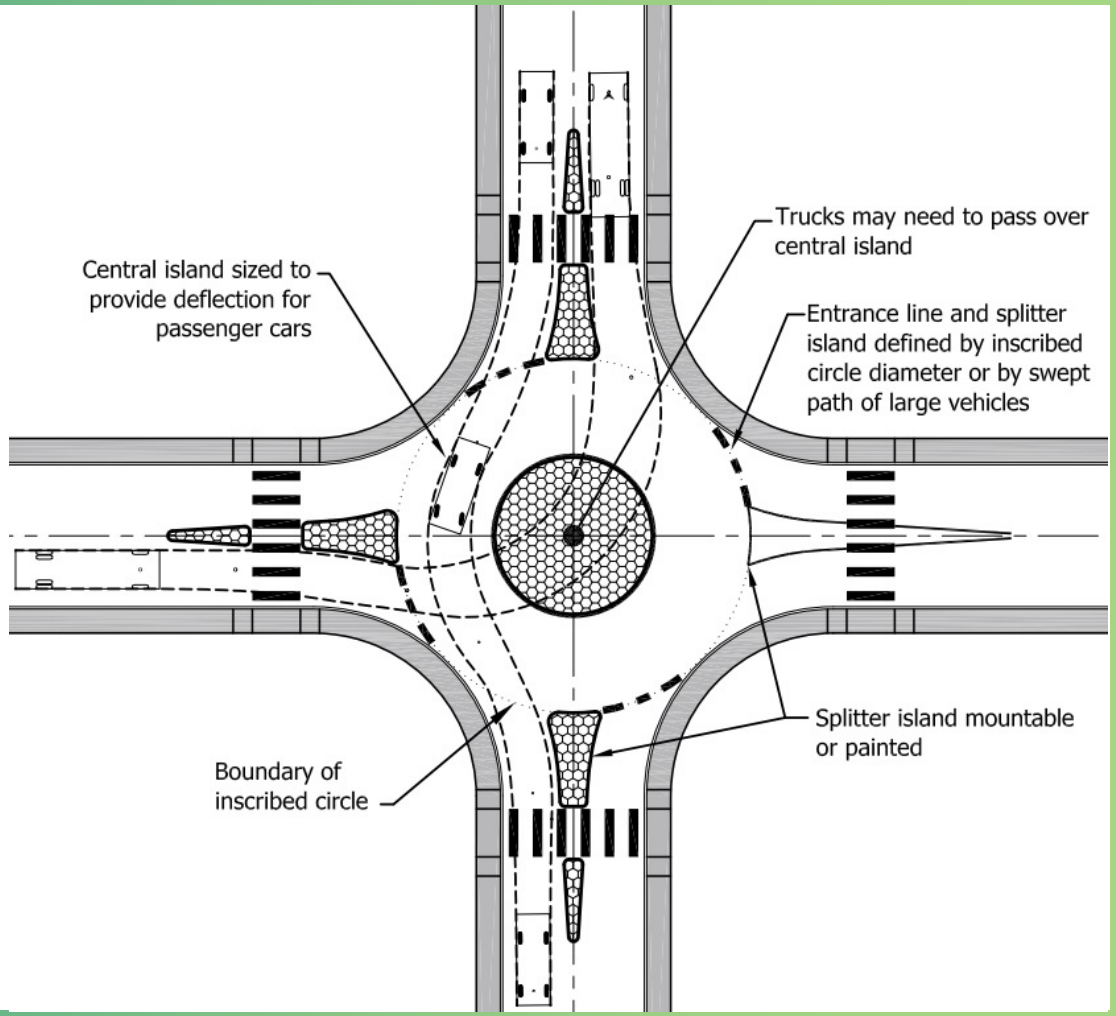
○ = Crossing

Conflict Type	Count
Crossing	0
Merging	4
Diverging	4
Total:	

8 Conflicts

Mini Roundabout Design Features:

- Inscribed circle dia. is typically 90’ or less
- Central island has a mountable design
- Splitter islands are mountable or are painted flush



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Mini Roundabout
Moon Rd at Bemis Rd
(south of Ann Arbor, MI):

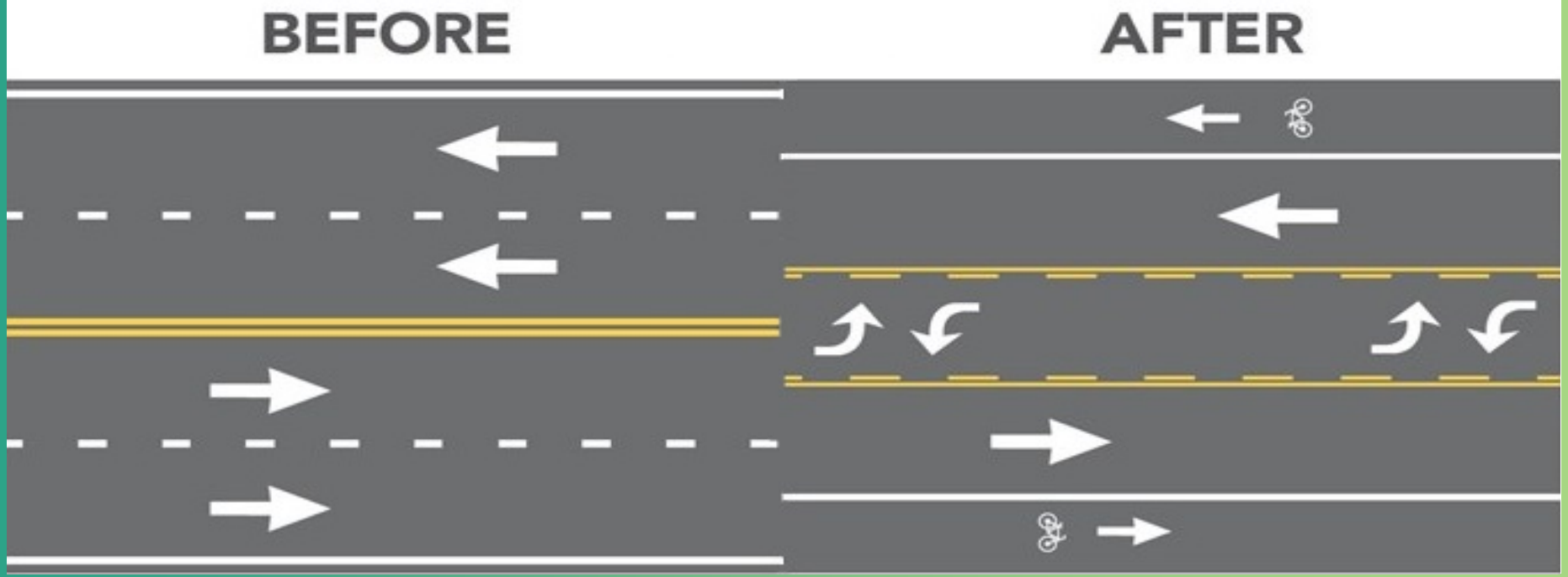
- ICD = 80’
- Splitter lengths = 75’
- ADTs:
  - Moon = 6,700
  - Bemis = 6,300
- Moon SL = 50 mph
- Bemis SL = 55 mph
- Cost = $325,000
- ROW Impacts: Temp Easement only

Re-allocating Pavement Width

- Road Diets
- Lane Diets
- Offset Left Turn Lanes

Road Diet

- Typically invovles converting a 4-Lane undivided roadway to a 3-Lane roadway with a two-way left-turn lane and bike lanes



Road Diets

- Benefits
  - Lower Operational Speeds
  - Improves Safety Performance
  - Improves Lane Use Efficiency
  - Small Impact to Travel Times

    (may improve travel times)

Road Diets

- Safety Benefits
  - 19-47% reduction in total crashes
  - Crash types most improved:
    - Rear-ends, Opposing Left-turns, and Angles
  - Fewer lanes for pedestrians to cross
- $0 Cost when planned with resurfacing

Re-allocating Pavement Width

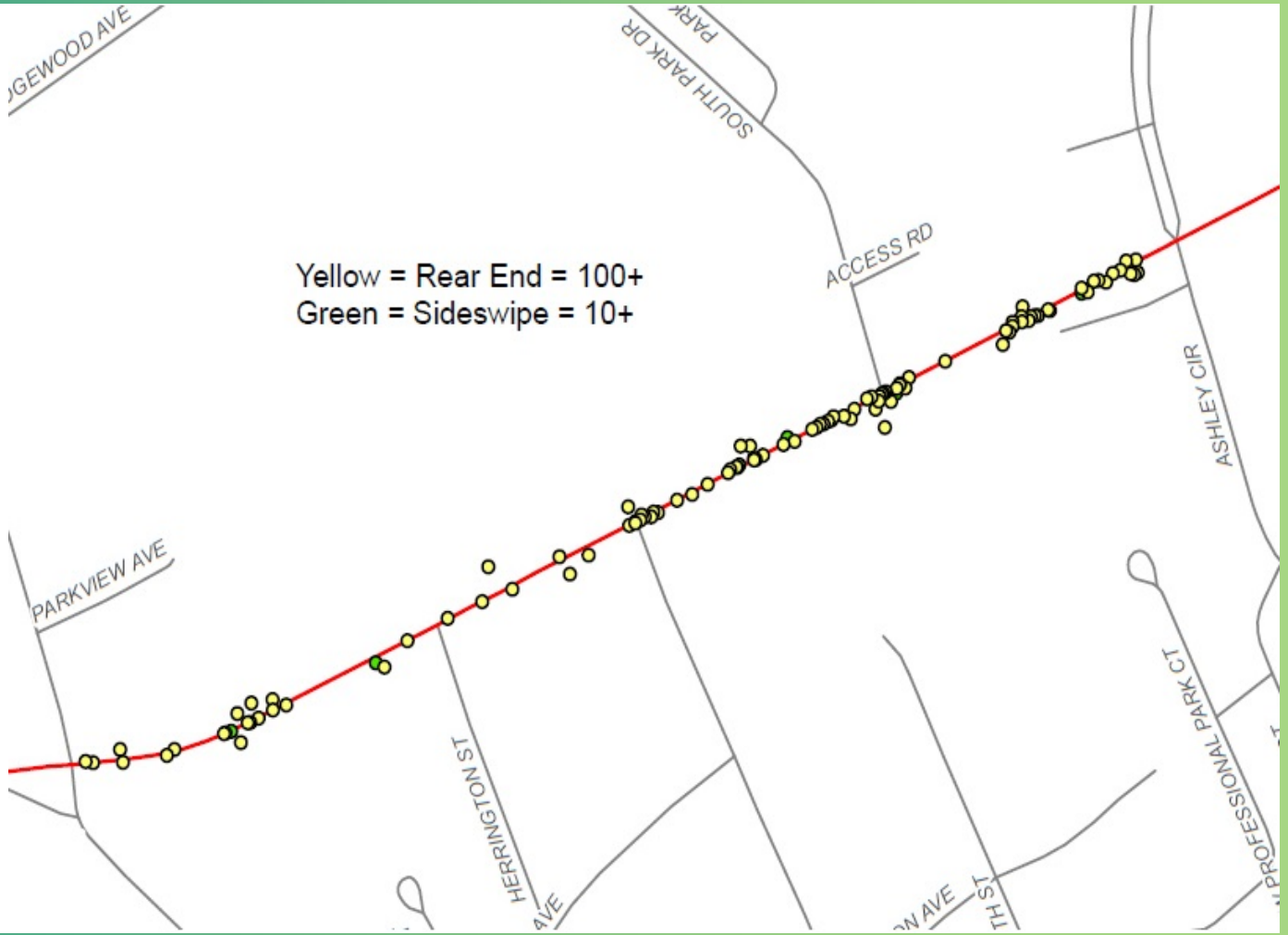
- Lane Diets
  - Narrowing Lane Widths to Add an Additional Lane (typically a TWLTL)
  - Narrow Lanes = Traffic Calming
  - Improves Safety Performance
  - Improves Efficiency & Travel Time

Lane Diet

- US 231X in Bowling Green
- 52 ft curb to curb – four 12 ft lanes & a 4 ft flush median

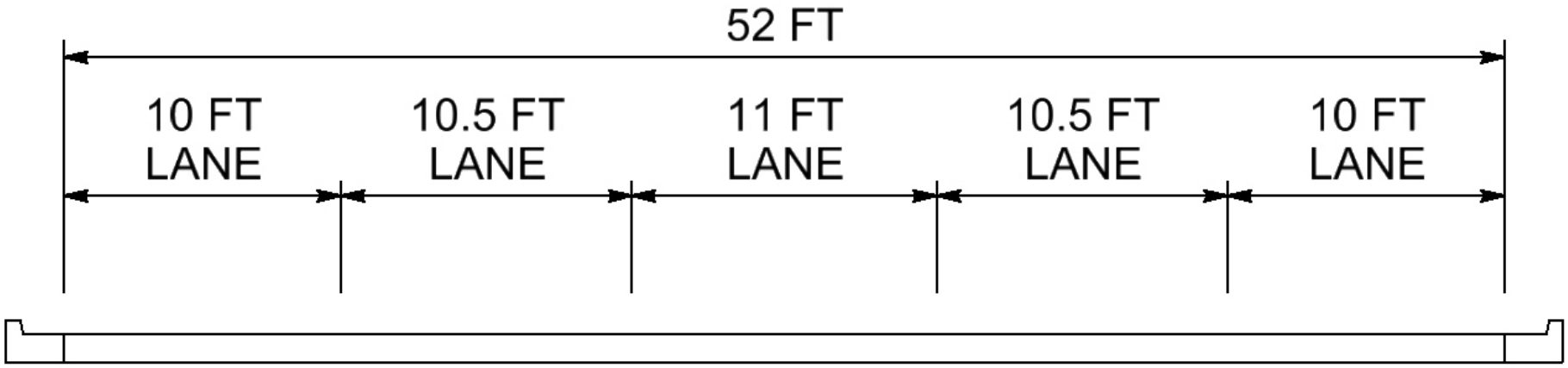
Lane Diet
US 231X

- Approx. 0.6 miles long
- Over 100 crashes since 2015
- Nearly all crashes have been rear-ends



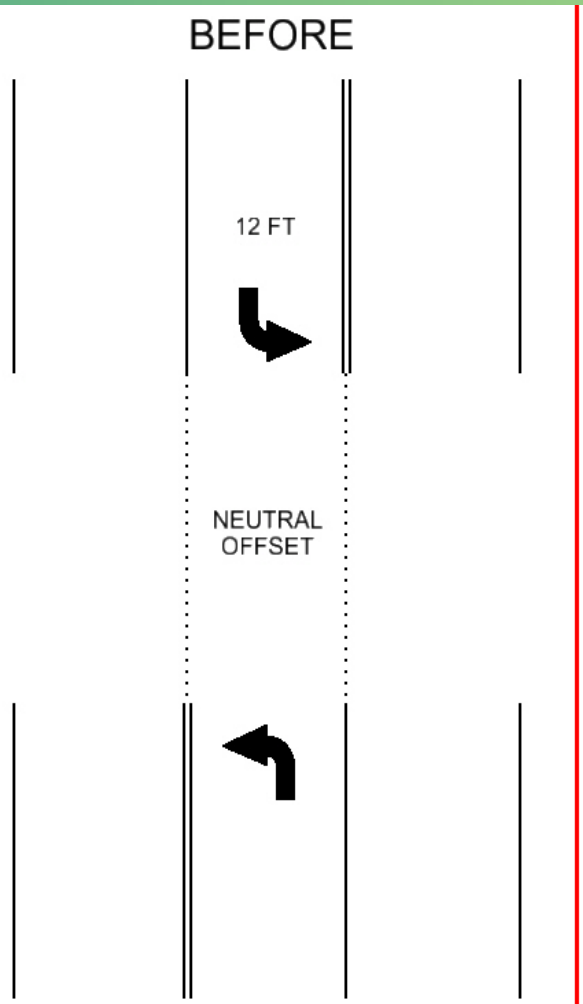
Lane Diet – Proposed

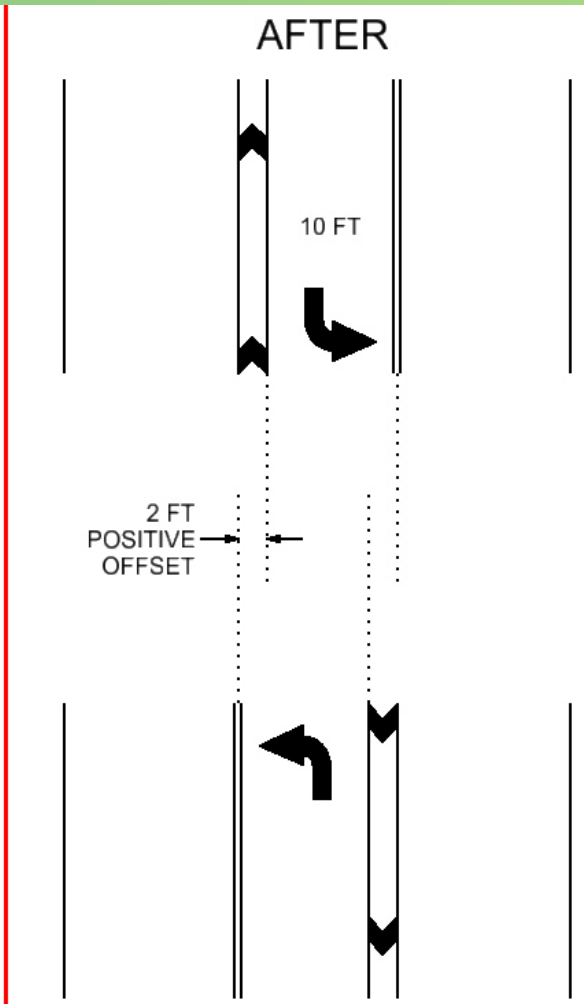
- 11 ft center TWLTL
- 10.5 ft “fast lanes”
- 10 ft “slow lanes” (gutter pans provide additional width)
- Estimate: $80k - $100k



Lane Diet to Create Offset Left-Turn Lanes

- Existing:
  - Opposing, 12 ft left turn lanes
- Proposed:
  - Stripe a 2 ft wide chevron hatch to create a 2 ft positive offset





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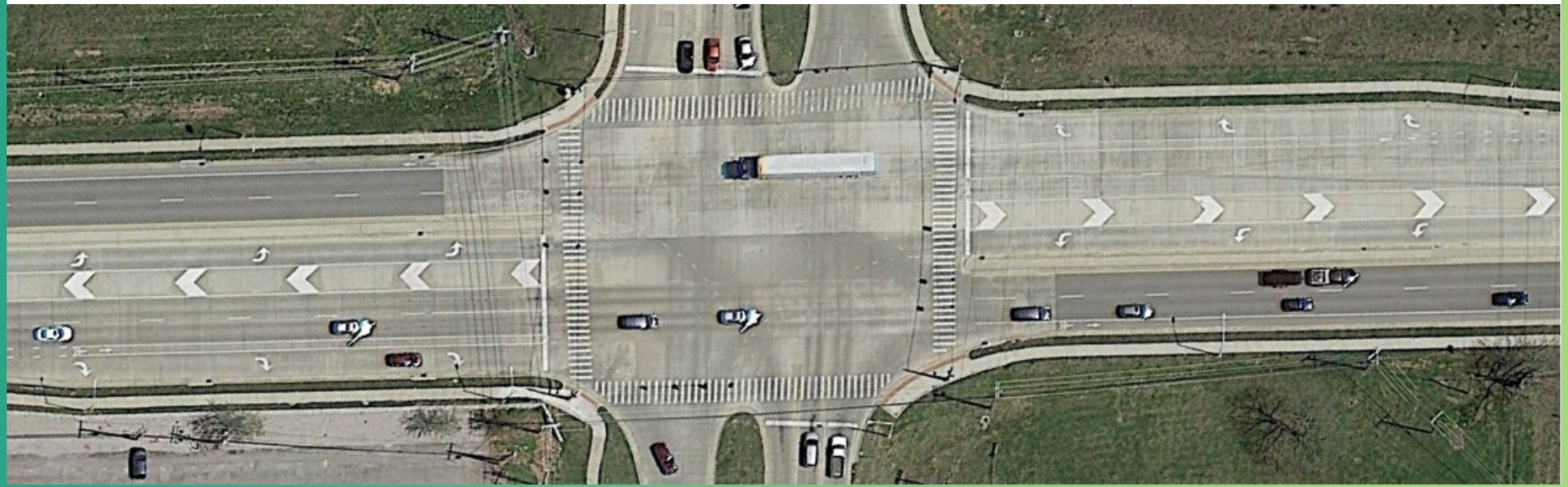
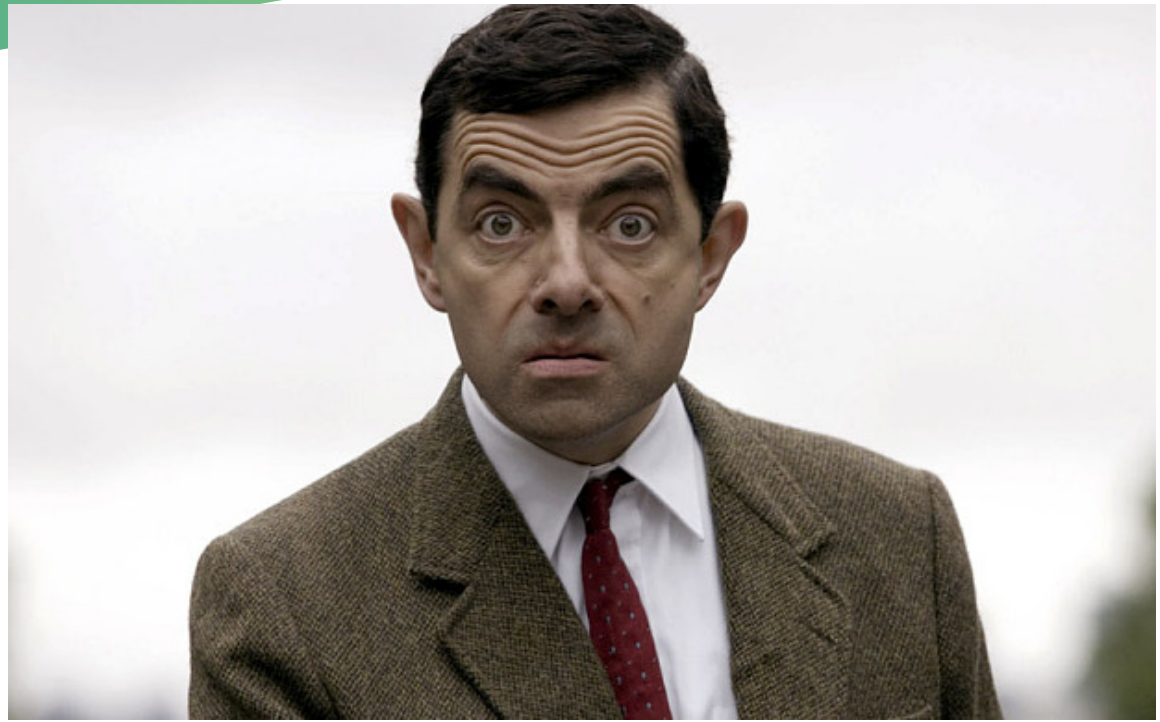
Design Year = Dual Lefts; Opening Year = Offset Lefts

- Advantage:
  - Protected-Permitted operations until dual lefts are required
  - Less delay



Questions?



Courtesy of Mr. Bean