

INDIRECT LEFT TURN INTERSECTIONS

Why are they catching on so rapidly?

Timothy C. Taylor
Fhwa Resource Center
Safety & Design Technical Service Team

DOWNSTREAM U-TURN

OUTLINE

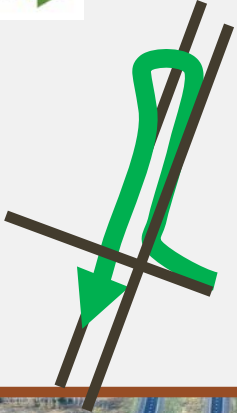
- List some Indirect Left Turn Intersections
- Provide three reasons why they are becoming a mainstay for many agencies
- Highlight one ALDOT project
- Show some emerging designs



U.S. Department of Transportation
Federal Highway Administration

every day counts

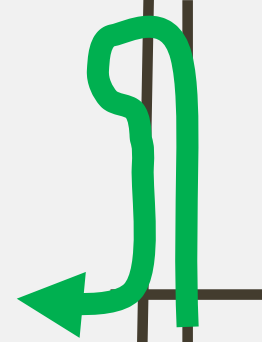
INDIRECT LEFTS



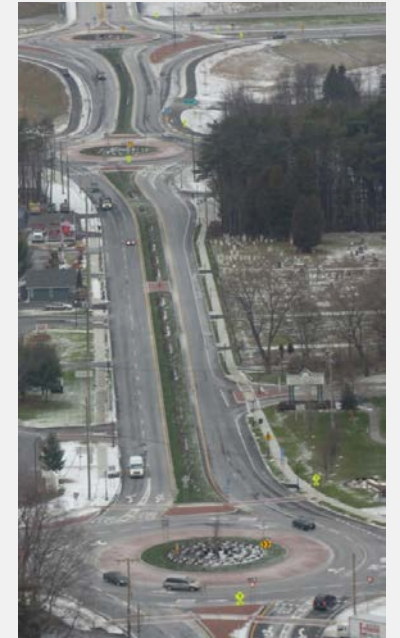
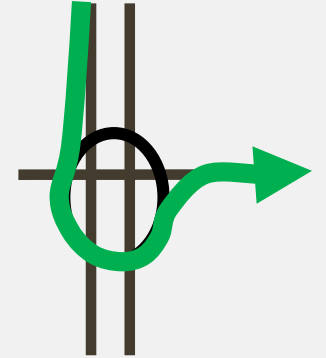
RCUT or J-Turn



DLT or CFI



Thru-U or Express Left



Roundabout Corridors

WE HAVE INTERSECTION PROBLEMS



- Increasing Congestion
- Alarming Crash statistics
- Not Enough Funding
- Time Consuming Projects
- Right-of-way limitations
- Escalating construction costs
- & just a few, well-worn tools in our toolbox...

INDIRECT LEFT TURN INTERSECTIONS

SAFER BY DESIGN – reducing or eliminating conflict points, reducing crash severity by geometrically altering vehicular speed and direction

FEWER STOPS/LESS DELAY – reducing the number of signal phases & increasing green time for all movements

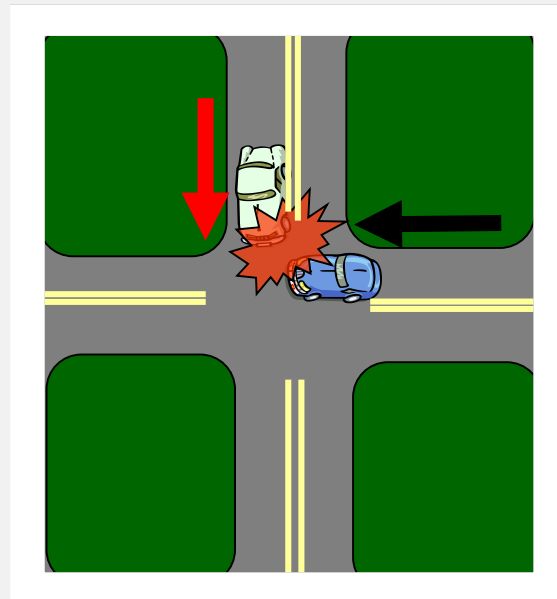
FASTER BUILT/LOWER COST – \$\$\$ (less ROW, retain existing structures, less environmental impacts, reduce project time)

INDIRECT LEFT TURN INTERSECTIONS

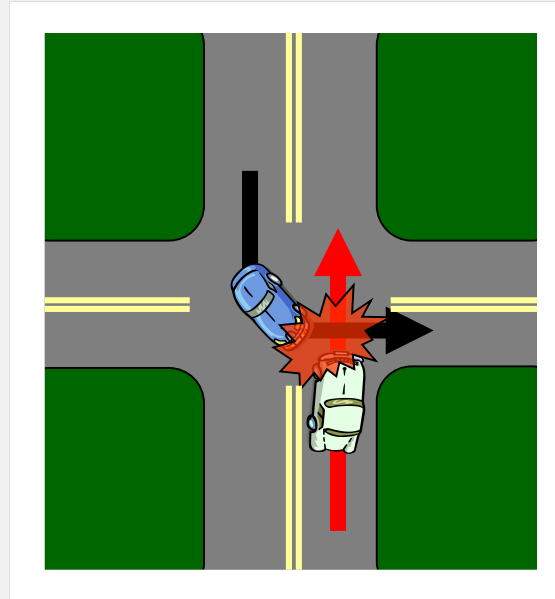
Safer by Design

INDIRECT LEFTS – SAFER BY DESIGN

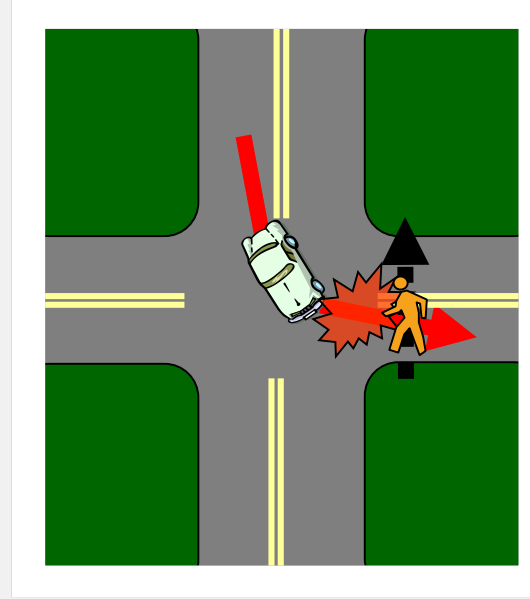
At our traditional four and three leg intersections



**Angle crashes
account for
over 40% of
fatal crashes at
intersections**



**Left turn crashes
account for over
20% of fatal
crashes at
intersections**



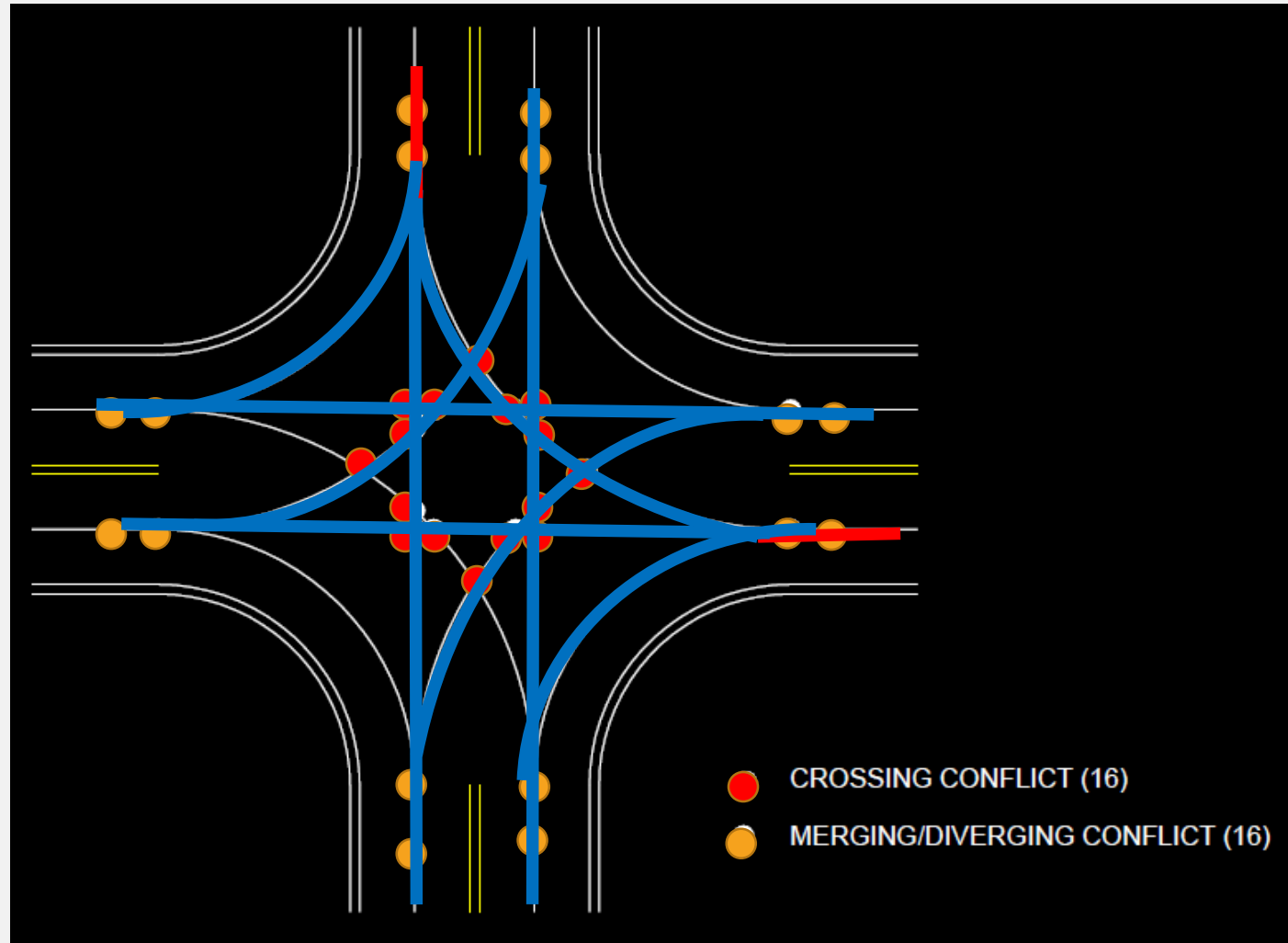
**Ped/Bike crashes
account for 25%
of fatal crashes at
signalized
intersections**

INDIRECT LEFTS – SAFER BY DESIGN

About half of
all severe crashes
occur at intersections

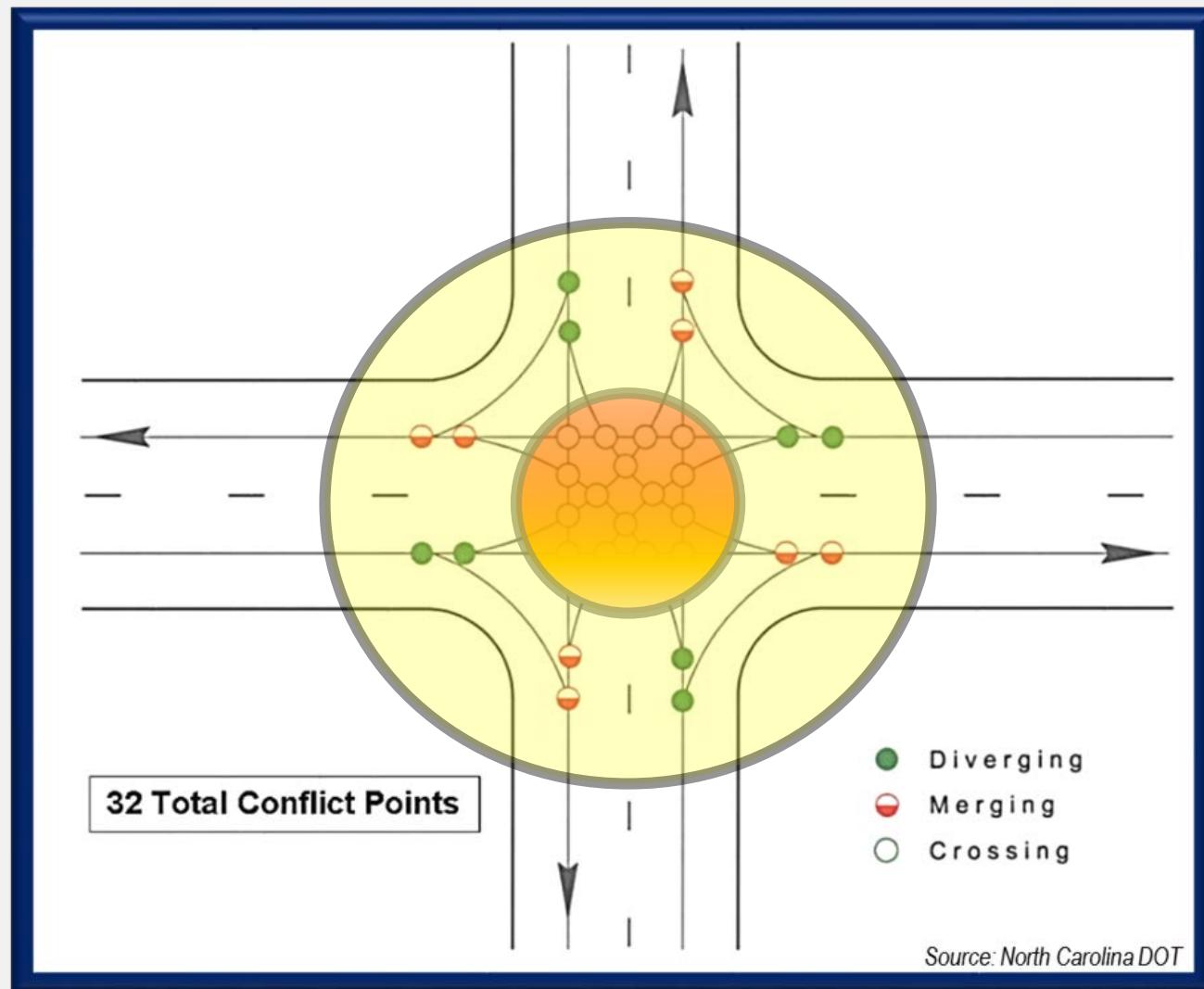
& 25% of all
roadway fatalities

INDIRECT LEFTS – SAFER BY DESIGN



Every conflict point is affected either directly or indirectly by a left turn movement

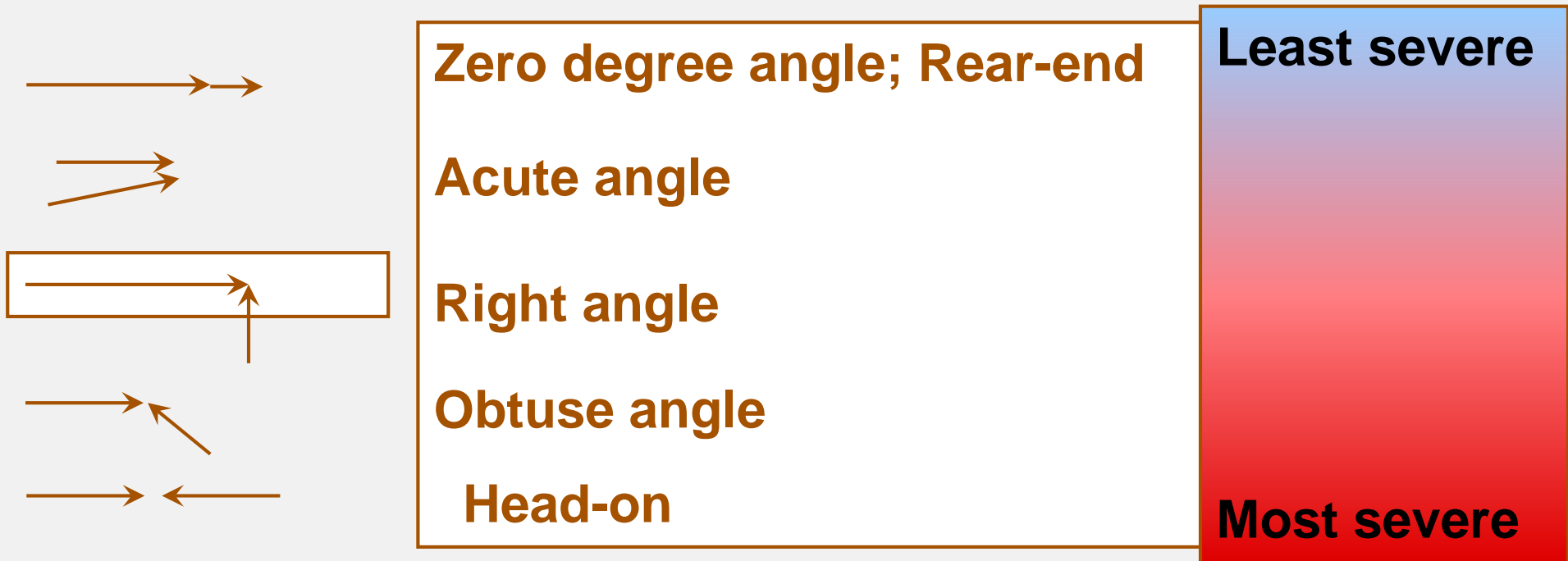
INDIRECT LEFTS – SAFER BY DESIGN



*It's not the
doughnut
but the
doughnut
hole*

INDIRECT LEFTS – SAFER BY DESIGN

Crash severity is commonly a function of speed and angle of impact



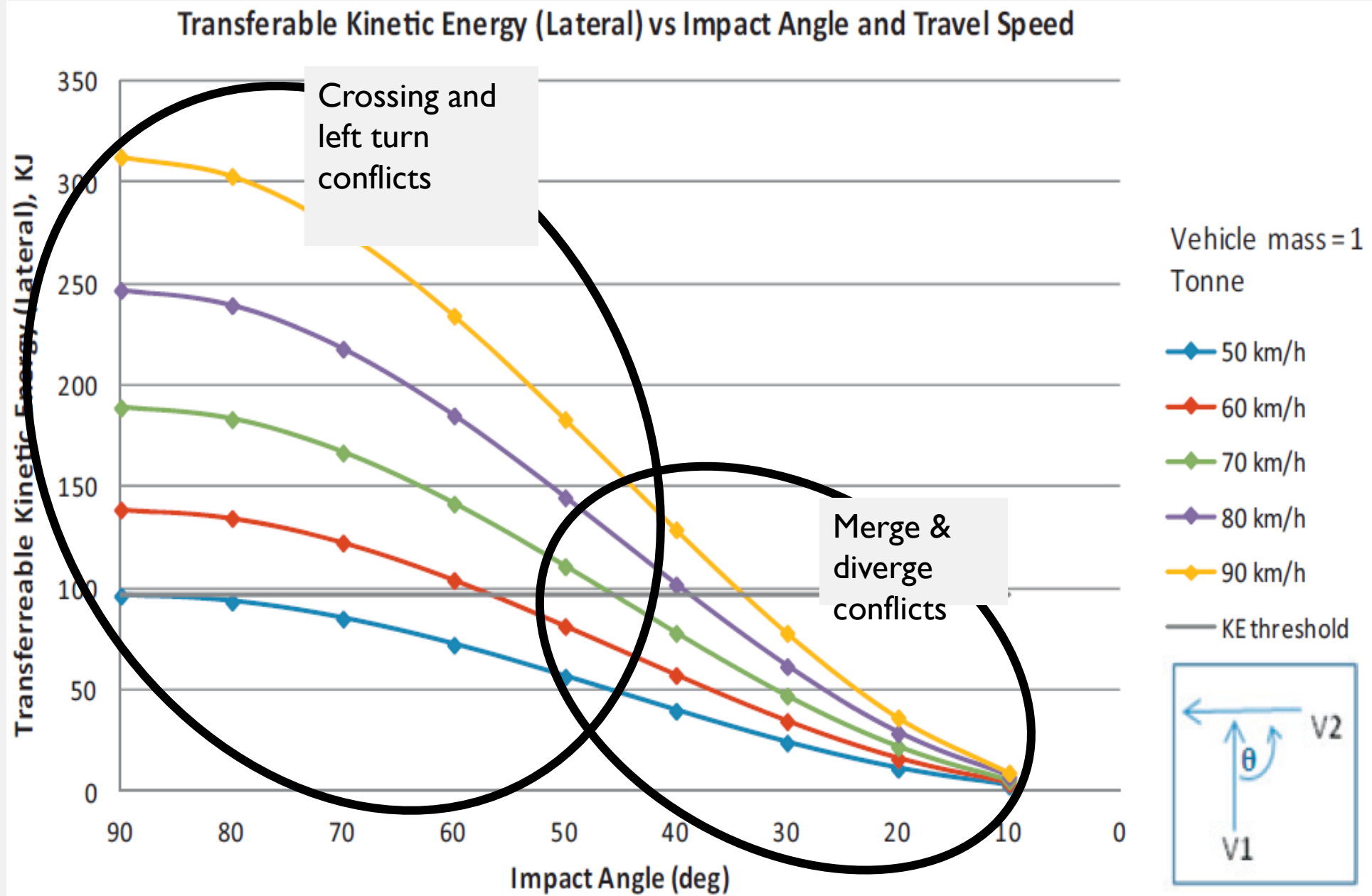


Fig. 1. Influence of impact angle on transferrable kinetic energy.

INDIRECT LEFTS – SAFER BY DESIGN

Reduction in Fatal and Severe Injury Crashes

RCUT	MUT	DLT	Roundabouts	Turbos
*44-54%	30%	*60%	44-72%	^76%
Comments				
MODOT & MSHA (multiple sites)	Fhwa Report (multiple sites)	UDOT Bangerter Dr., Salt Lake City	CMFClearinghouse, Elvik; Convert to single or multilane;	

* Corridor studies

^ all Crash severities (Netherlands)

INDIRECT LEFT TURN INTERSECTIONS

Fewer Stops/Less Delay

INDIRECT LEFTS – FEWER STOPS/LESS DELAY



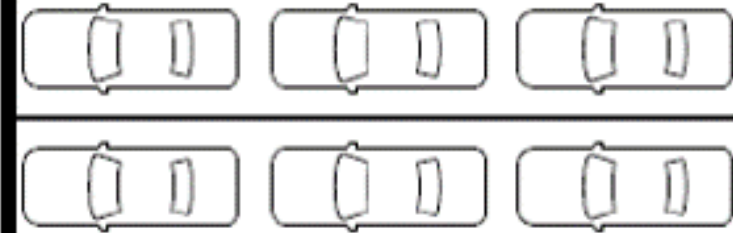
INDIRECT LEFTS – FEWER STOPS/LESS DELAY

Signalized Intersection Capacity

600 veh/hr/ln

Midblock Capacity

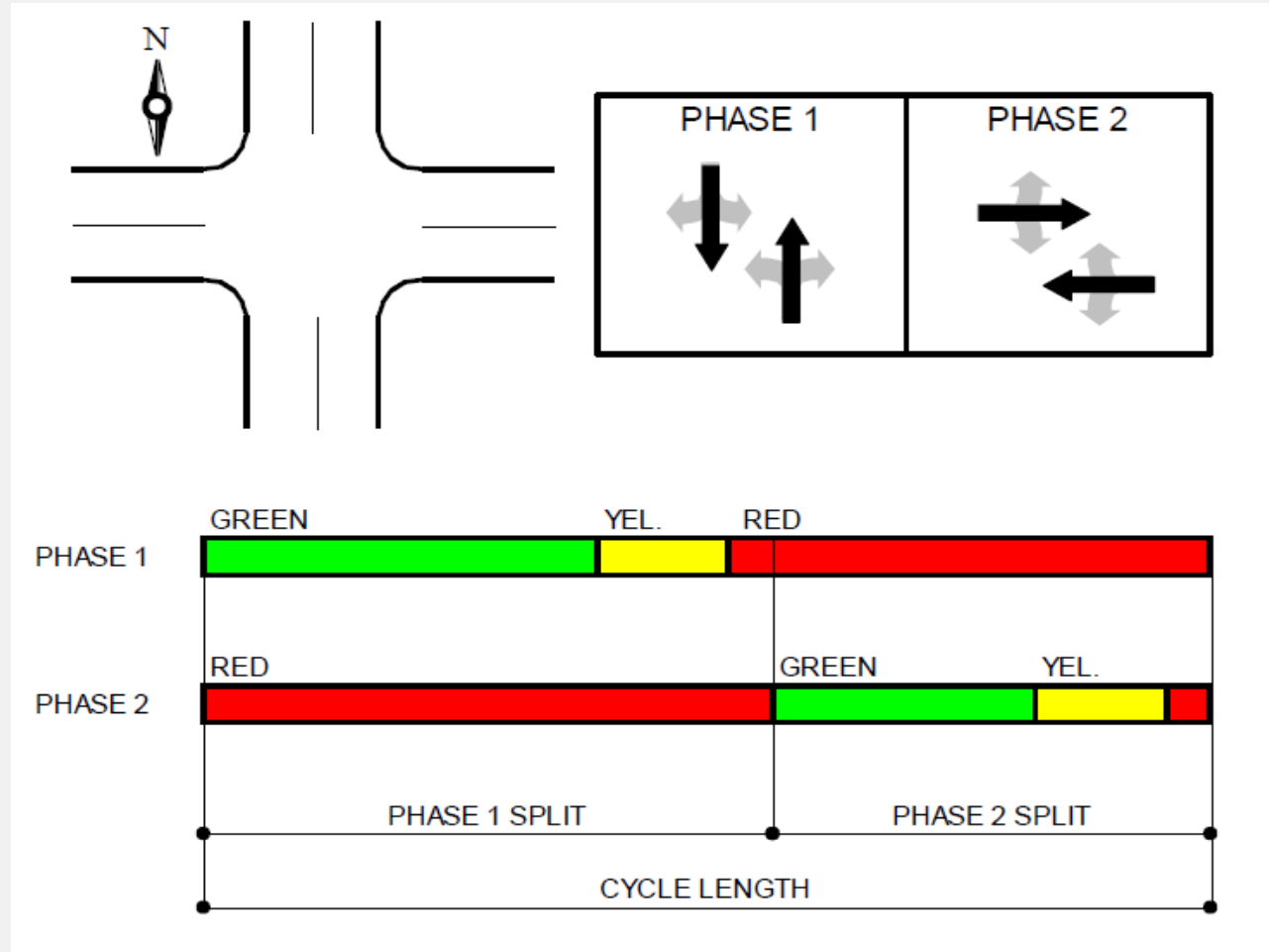
1800 veh/hr/ln



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.



INDIRECT LEFTS – FEWER STOPS/LESS DELAY

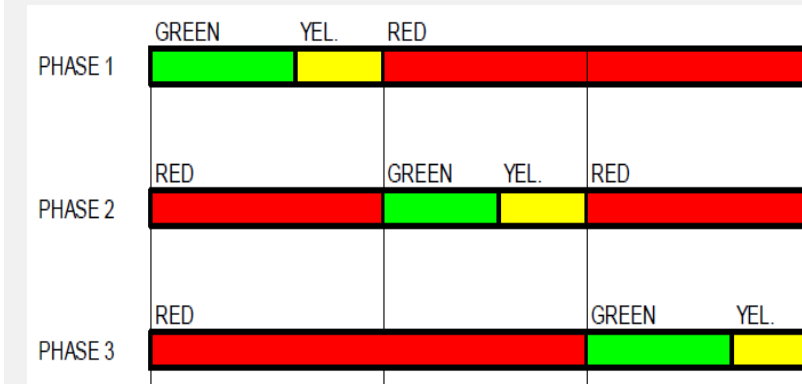
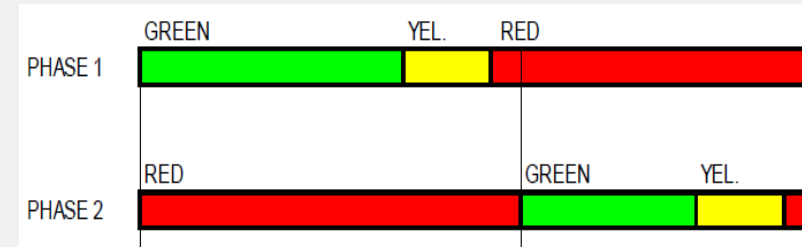
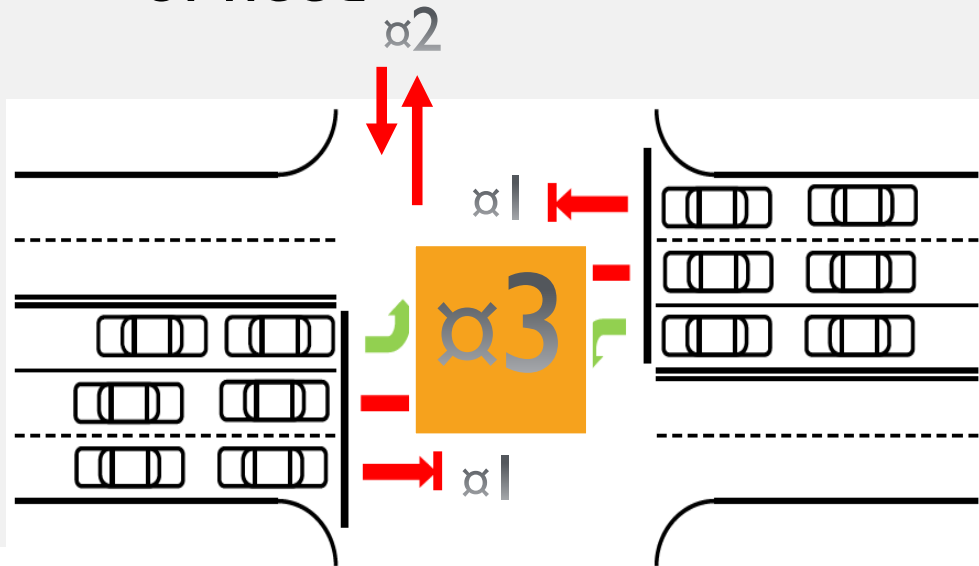


Basic two-phase signal operation

Source: MnDOT Traffic Signal Timing and Coordination Manual

INDIRECT LEFTS – FEWER STOPS/LESS DELAY

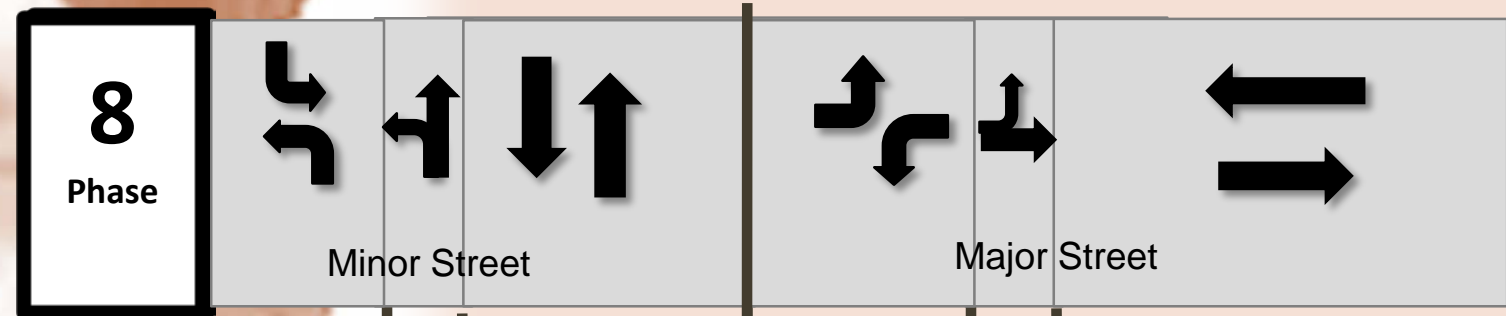
Adding “protected” left-turn phases is common on all approaches regardless of need



Source: MnDOT Traffic Signal Timing and Coordination Manual

INDIRECT LEFTS – FEWER STOPS/LESS DELAY

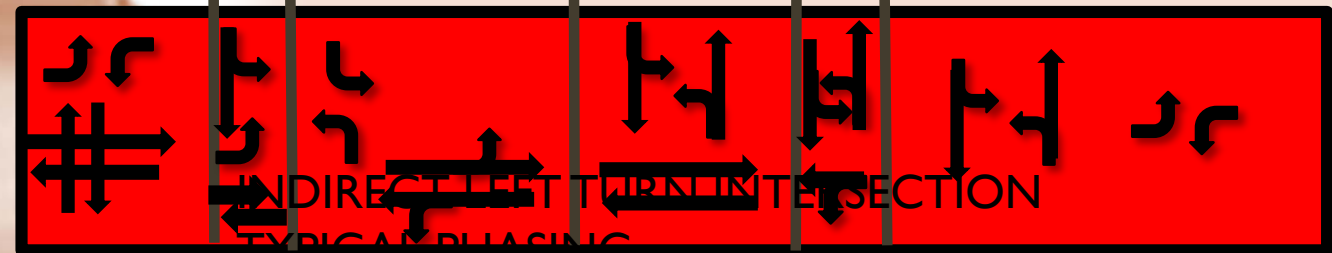
TRADITIONAL INTERSECTION PHASE SEQUENCING



reduce
delay for side street,
major lefts, and
thru traffic

allow
traditionally conflicting
movements to
operate
simultaneously

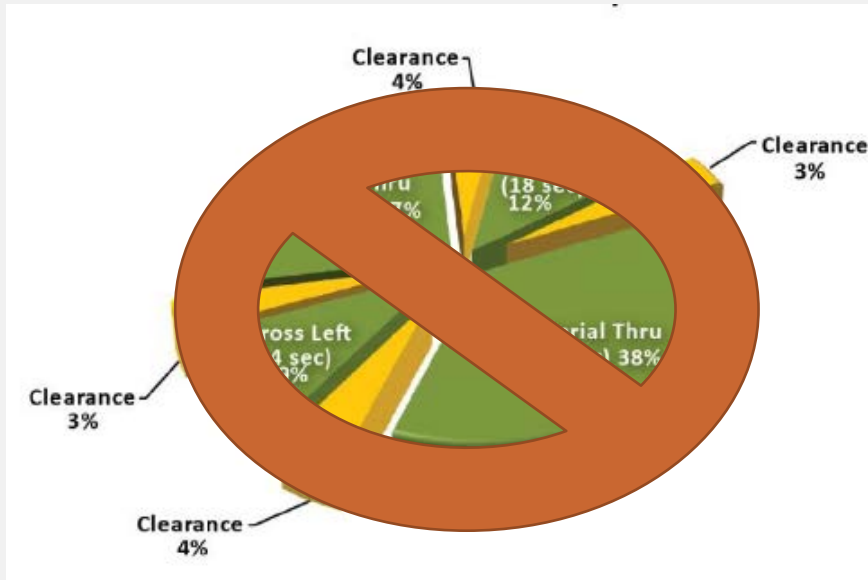
provide
more green
time for all
movements



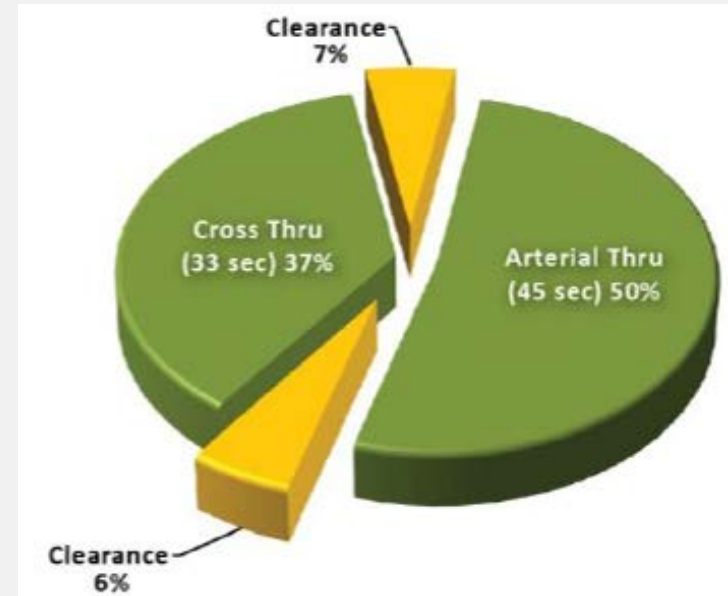
*Signal efficiency is not a matter of
who is moving but rather who **is**
waiting.*

INDIRECT LEFTS – FEWER STOPS/LESS DELAY

4 to 8 phases



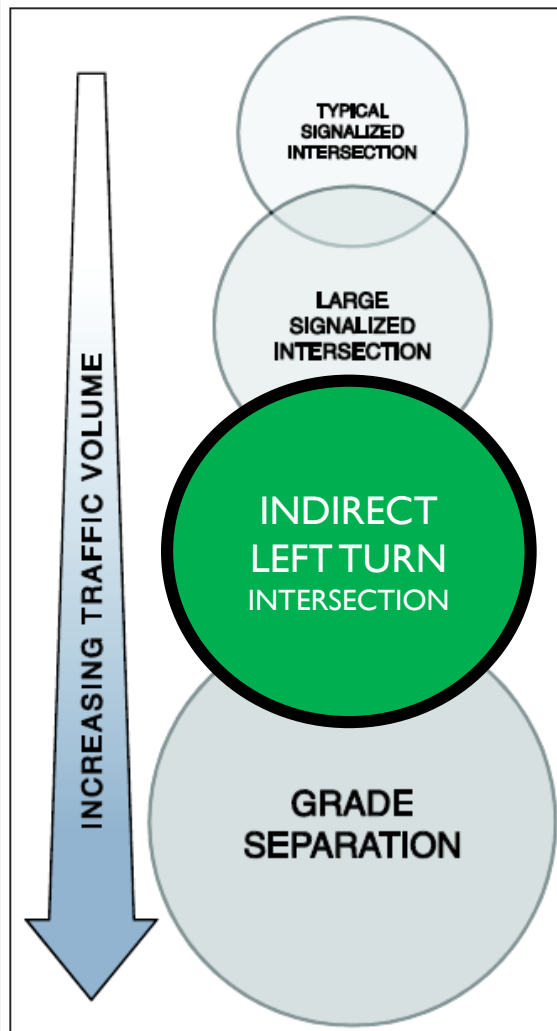
2 phases



Additional signal operational improvements are inherent with indirect left turn intersections:

- fewer clearance intervals
- Additional time gained to allocate to ped phases (where needed)
- Voids many left-turn phasing decisions (trap, prot-permissive, lead/lag)

INDIRECT LEFTS – FEWER STOPS/LESS DELAY

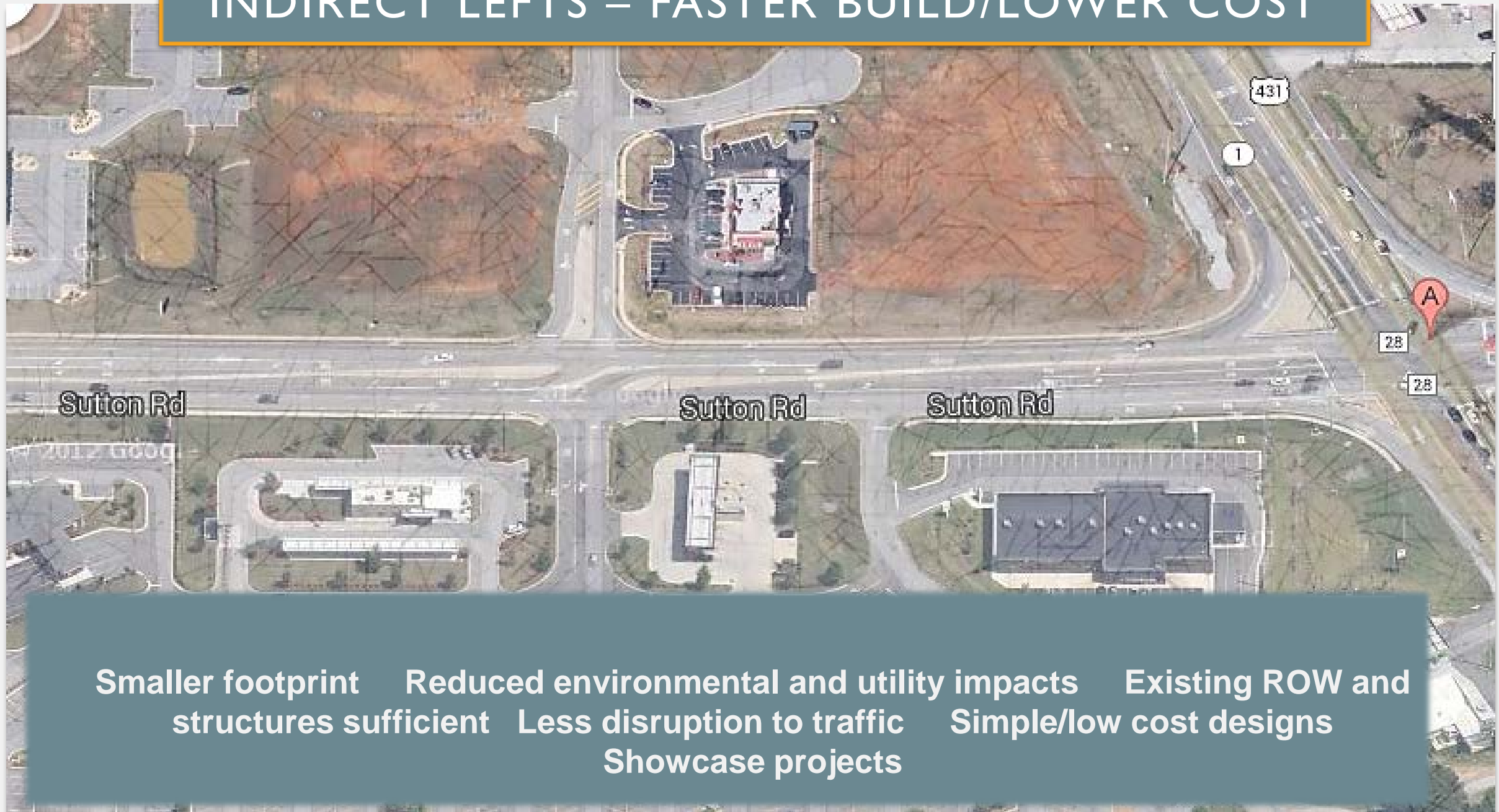


There is a conceptual relationship of conventional intersections, alternative intersections, and grade separations in their ability to serve increasing traffic volumes





INDIRECT LEFTS – FASTER BUILD/LOWER COST



Smaller footprint Reduced environmental and utility impacts Existing ROW and structures sufficient Less disruption to traffic Simple/low cost designs Showcase projects

ALDOT PROJECT HIGHLIGHT

US 82 @ AL 219

Centreville AL





Credit: Google





East U-Turn

Main Intersection
US 82 & AL 219





Credit: Andrew Harry, ALDOT

West U-turn



Credit: Andrew Harry, ALDOT

Int. US 82 at CR



Credit: Andrew Harry, ALDOT

East U-Turn Truck
Use of Loon



Credit: TTaylor, FHWA



Credit: TTaylor, FHWA



Credit: TTaylor, FHWA

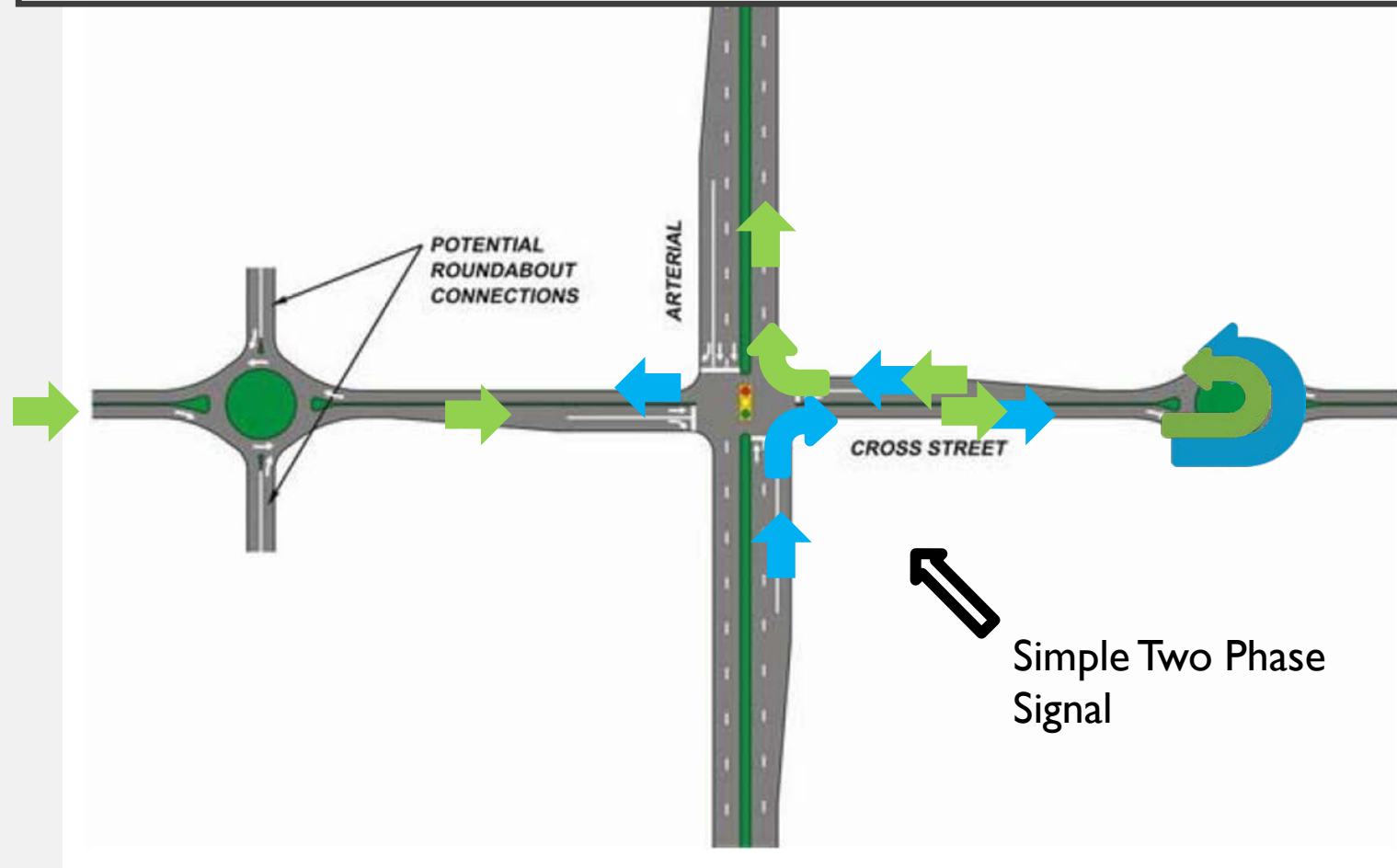


Credit: TTaylor, FHWA

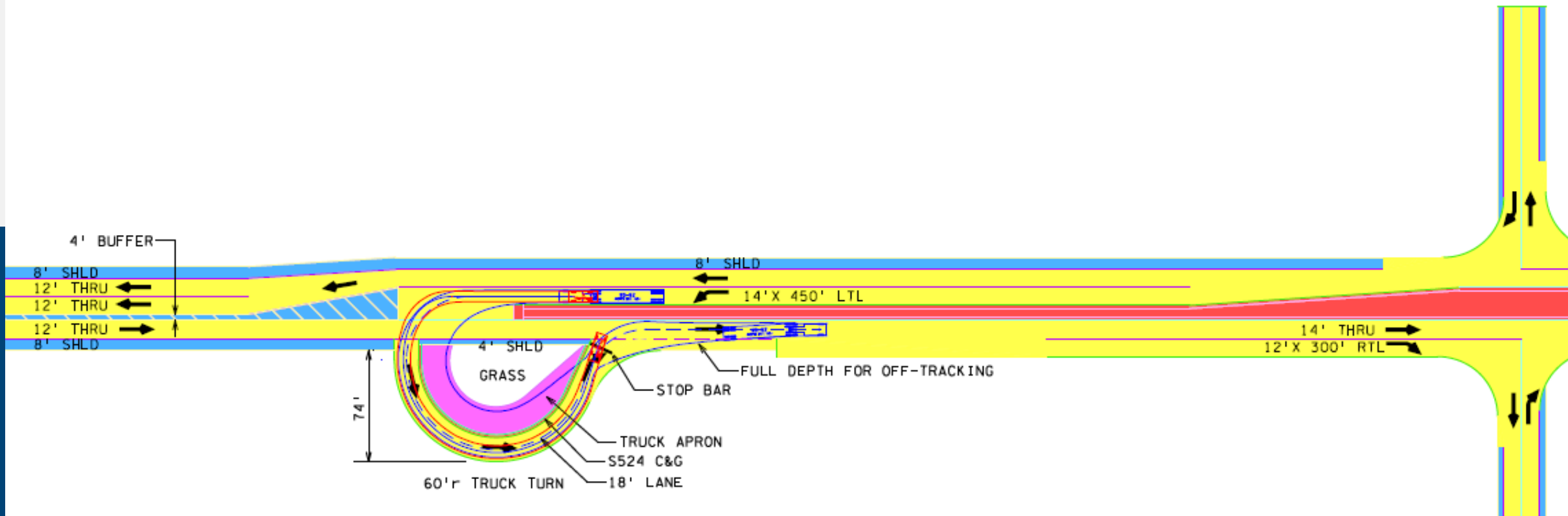
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Emerging Designs and Uses

BOWTIE ROUNDABOUTS



POTENTIAL 2-LANE RCUT APPLICATION



DUTCH TURBO ROUNDABOUTS



Concept emerged in The Netherlands in the late 1990s as a strategy to reduce lane changing on multi-lane roundabouts

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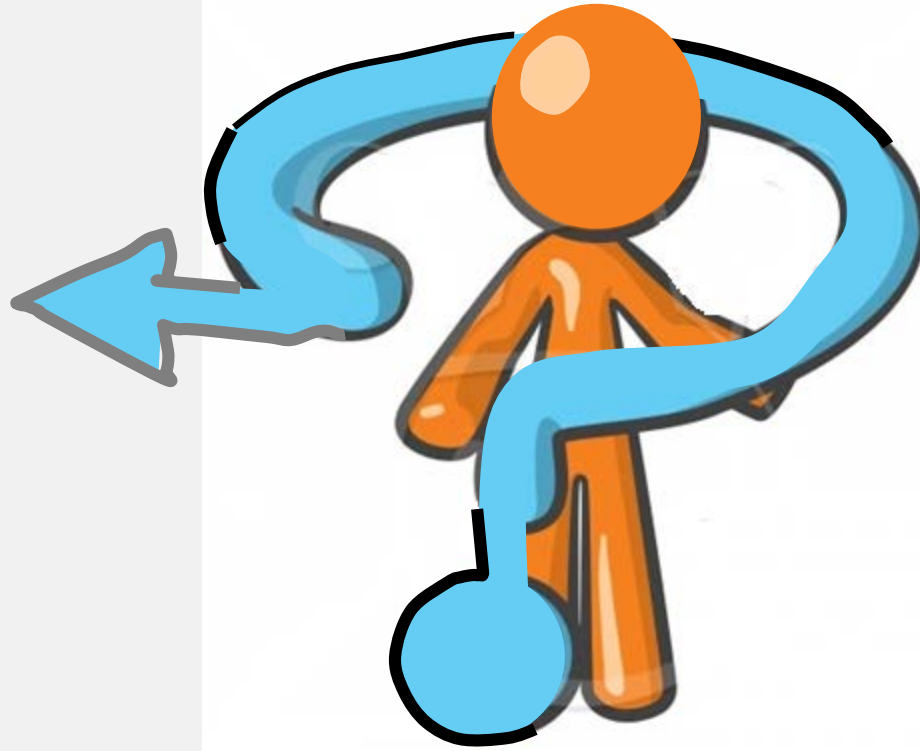
INDIRECT LEFT TURN INTERSECTIONS

What are some potential advantages of these intersections?



Learning
Check

- A. Fewer severe crashes
- B. Less congestion
- C. Reduced number of stops
- D. Increased green times
- E. Lower cost
- F. Faster to implement
- G. Fewer social, environmental and economic impacts
- H. All of the above



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