NC STATE UNIVERSITY

NCDOT NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

Urban Applications of Innovative Intersection Designs

Expert Focus Group

Chris Cunningham, PE (Principal Investigator, NCSU-ITRE)

Celen Pasalar, Ph.D. (Co-PI, NCSU-College of Design)

Michael R. Brown, PE, AICP (Co-PI, Urban Innovators)

ITRE

College of Design

URBAN Innovators

Begin Recording Now

February 10th and 13th, 2023

http://www.itre.ncsu.edu

Meet the PI's

Chris Cunningham, PE

ITRE
Institute for Transportation Research and Education

- Director, Highway Systems Group
- NC Professional Civil Engineer
- Co-author of ITE's *Manual of Transportation Engineering Studies*

Mike Brown, PE, AICP

URBAN Innovators

- UT and NC Professional Civil Engineer
- TRB Intersections Committee
- Founder of Urban Innovators
- Creator of below websites

Celen Pasalar, Ph.D.

NC STATE UNIVERSITY College of Design

- Associate Professor of Landscape Architecture and Environmental Planning
- Urban Design, Smart Cities, Community Design

Who have we invited to weigh in?

- Experts with insights and passion:
  - mixed-use developers, appraisers,
  - real estate market analysts,
  - walk / bike experts and advocates,
  - urban planning academics, high achievers,
  - planning and engineering staff (municipal and NCDOT)

What do we hope to learn?

- Insights regarding the need for walkable mixed-use development
- Challenges facing suburban commercial corridors (aka “Stroads”)
- Will our strategies succeed at converting auto-oriented areas into walkable mixed-use?

Write down questions, observations, and slide numbers that you may want to be displayed again during discussions.

Format and Agenda

Topic	Time	
Overview: (Now finished)	5	
Presentation: What is a "Stroad?" Why is it hard to create a "Complete Street?"	7	
Survey: Housing, Mobility, Commercial Areas, Parking, Vehicle Capacity (Qualtrix)	10	
Presentation: Parking, Slow Lanes, LEAN Networks (6-min). Survey & Discuss (20-min)	26	
Presentation: "Traffic Management, 101" Greenville / Smithfield Overview	5	
Presentation: Quadrant, U-Turn, and One-Way Intersections	10 x3	
Survey & Discuss: After each of three presentations	12 x3	
Total Time:	119!	

What is NCDOT Hearing?

- Communities are frustrated with “Stroads”
- Communities want more walkable “Places”

Almost walkable?

He’s walking… but is it “walkable”?

These are all “Stroads”

A **Stroad** is a *Street / Road* hybrid - the **Futon** of Transportation.

-- Charles Marohn, Founder of StrongTowns.org

Great Couch

Great Bed

Futon

- **Street**: where residents and businesses interact. Nostalgic "Norman Rockwell Main Street"
- **Road**: aims for high speeds
- **Stroad**: A Hybrid: tries to do both, but does neither very well.

Great Street

Great Road

Stroad

NCDOT's Dilemma

- **Lots of Traffic**: Many Stroads do and always will carry huge amounts of traffic
- **Concern over delay**: Engineers worry that slowing traffic for walkability may also exacerbate delay and congestion.
- **Lack of Tools**: Even when engineers are on-board with supporting walkable development, they don't know what to do.
  - NCDOT sponsored this research to expand their toolbox of techniques

Do Stroads Contribute to Blight?

- Probably… How much? Hard to say.
- If we reinvent Stroads, can we bring back prosperity?

Cheaper per Mile, but…

Fewer people to pay for it

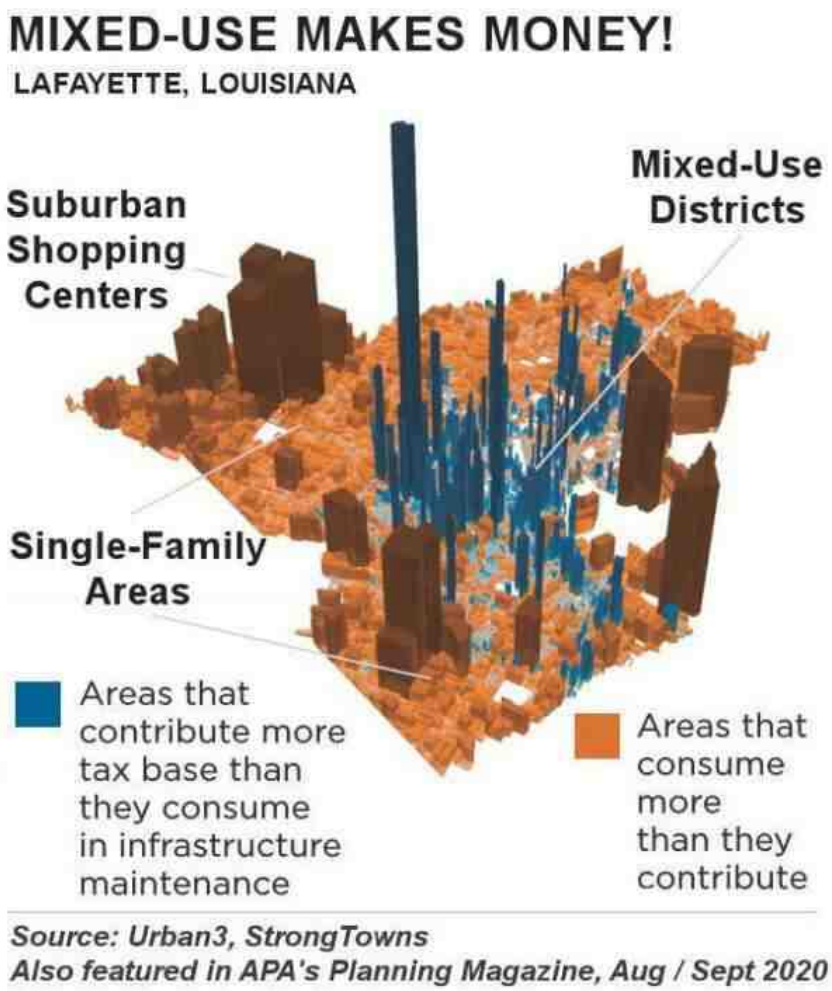
Higher cost per capita

Expensive per Mile, but…

More people to pay for it

Lower cost per capita

Higher density mixed-use areas produce enough in taxes to help offset the cost of lower density areas.



Pause

- Qualtrics Survey (10 mins)

We hope all here, including NCDOT and Municipal observers, will take this survey and tell us what you think!

LINK - https://tinyurl.com/Urban-AI

Our "Big Ideas" for Converting Stroads into Complete Streets & Catalyzing Mixed-Uses

- "Slow Lanes" for Bikes, Cars, Transit – anything going "Bike Speed"
- Convert private parking into on-street public parking
- Neighborhood Electric Vehicles (aka, "Tiny Cars" or "Glorified Golf Carts")
- Placemaking Alternative Intersections: Quadrants, U-Turns, One-Ways

Target: 3-Minutes

Next slides show ideas for:

- Converting private parking into on-street public parking
- Slow Lanes, where it's not the mode… it's the speed.

Pause – Discussion Complete Streets
Mike Update: No time to discuss. Slido only

- **DISCUSS:** What are the pros and cons of converting this “Stroad” into a “Complete Street”?
  - Will this Complete Street motivate slower vehicular traffic? Why or Why not?
  - Could this Complete Street increase traffic congestion? Why or Why not?
  - Will this Complete Street spur walkable mixed-use development?
  - Will this investment attract large numbers of retiring seniors who need access to attractive, walkable destinations for when they can't or shouldn't drive?
  - If this traverses a wealthy area, could it be a way to introduce more affordable housing into the area in a way the adjacent neighborhoods can accept?
  - If this traverses a blighted and struggling area, could it be a means of stabilizing the area?
  - What could prevent this transition from happening?

NEVs and LEAN networks

- What are “Neighborhood Electric Vehicles” (NEVs)?
- What is a “Low-Emission Alternative Network” (LEAN network)?

Target: 3-Minutes

Planetizen

The Disruptive Power of 'Minimobility'

Small, lightweight vehicles similar to golf carts could eliminate many Americans' need for a second car and make roads safer for all users.

Read Time: 1 minute
November 9, 2022, 6:00 AM PST
By Diana Ionescu @aworkoffiction

Jillian Cain Photography / Golf carts in The Villages, Florida

Planetizen

Why Golf Carts Could Quietly Revolutionize Transportation

More communities are catching on to the benefits of golf carts as a safe, low- emissions mode of transport for neighborhood trips.

Read Time: 2 minutes
August 16, 2022, 8:00 AM PDT
By Diana Ionescu @aworkoffiction

Golf carts in The Villages, Florida. | Jillian Cain Photography / Golf carts

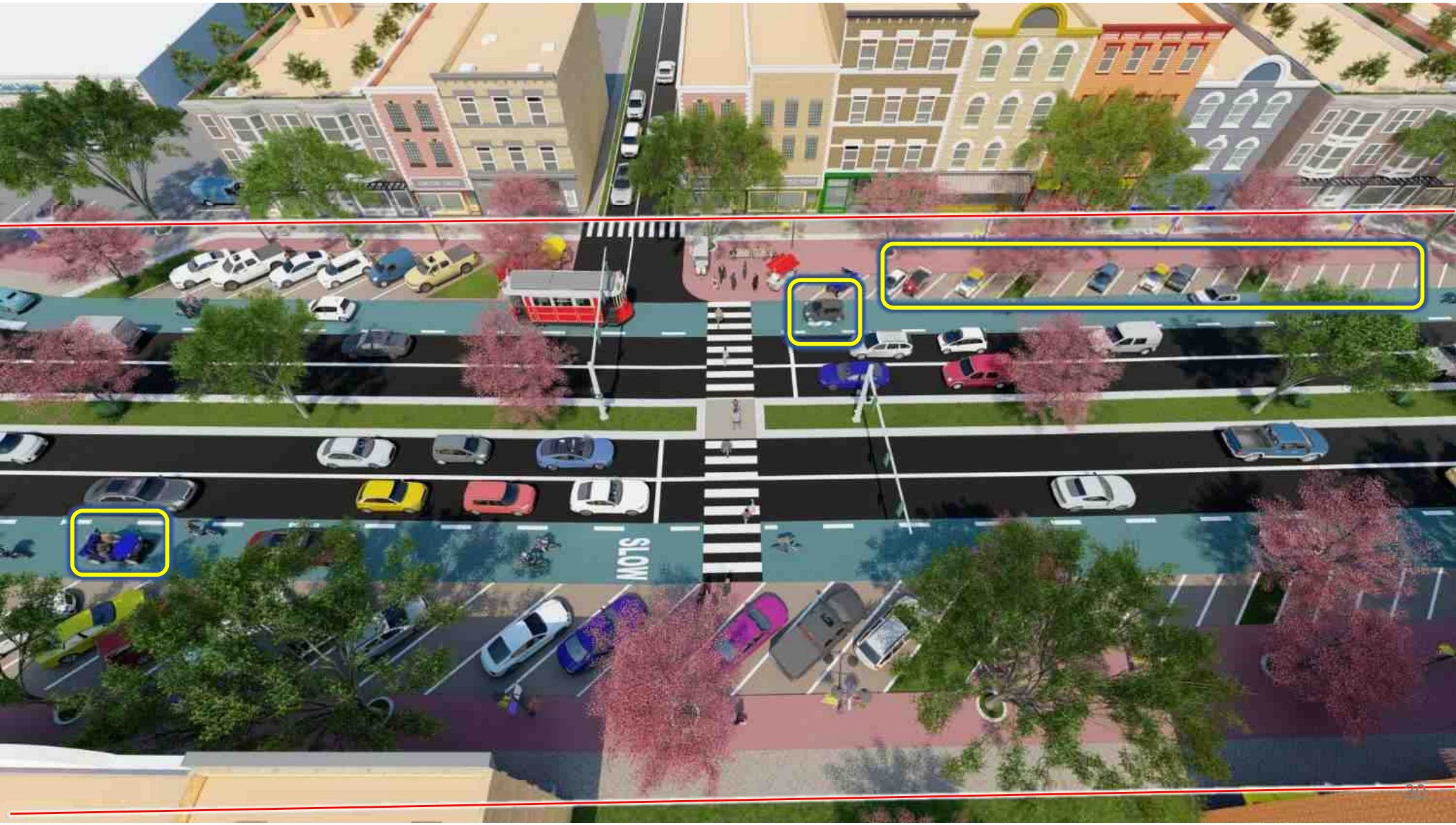
Neighborhood Electric Vehicles

Battery improvements are making "tiny cars" affordable and practical for short neighborhood trips – the majority of all trips.

"Moving Sidewalk" shuttle, and two tiny cars fit in one parking space, at "The Villages" in Florida

Golf carts and tiny cars are popular at McIntosh High School in Peachtree, Georgia. "2-car households," are becoming "1-car, 1-cart"

eye
eye


SLOW

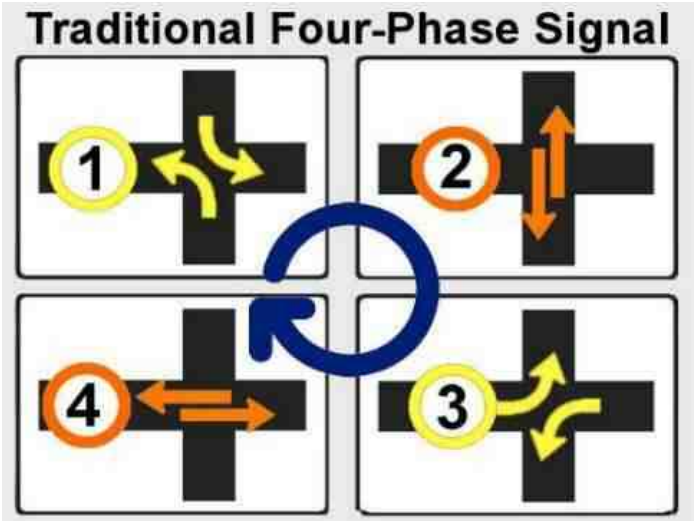
Traffic Engineering 101

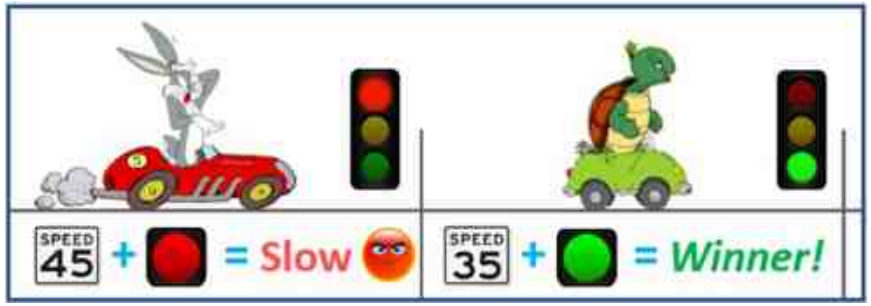
Target: 5-min

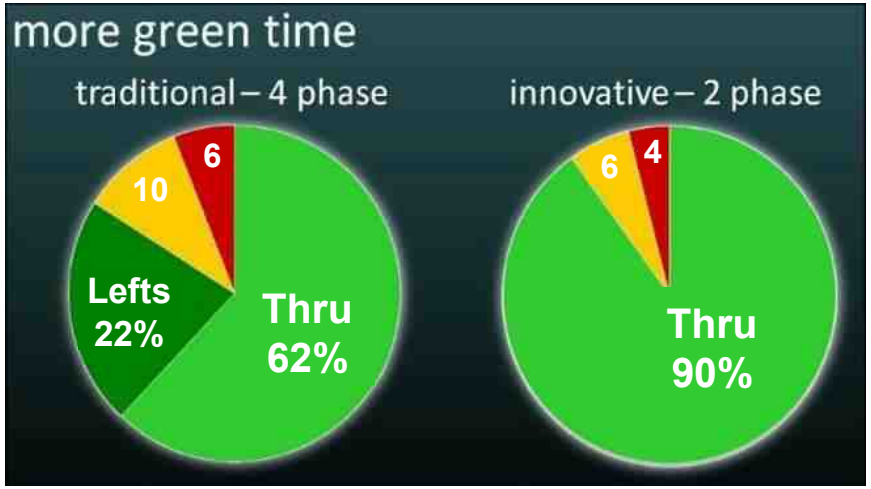
- Why are Stroads both Fast and Slow?
- Overview of Placemaking Alternative Intersections
  - Designs with potential to make things slower and safer, but also faster.

What Causes "Slow"?

- Four-phase signals are inefficient:
  - extra yellow and red time,
  - green for minor movements

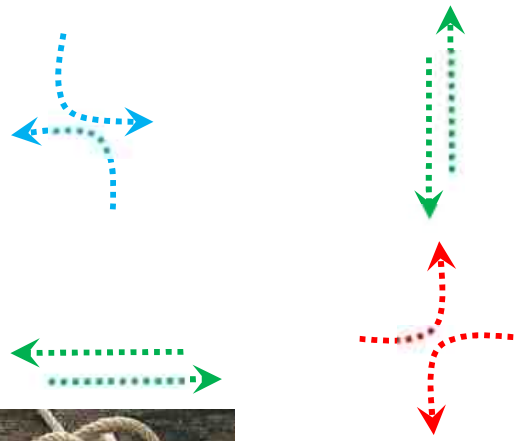




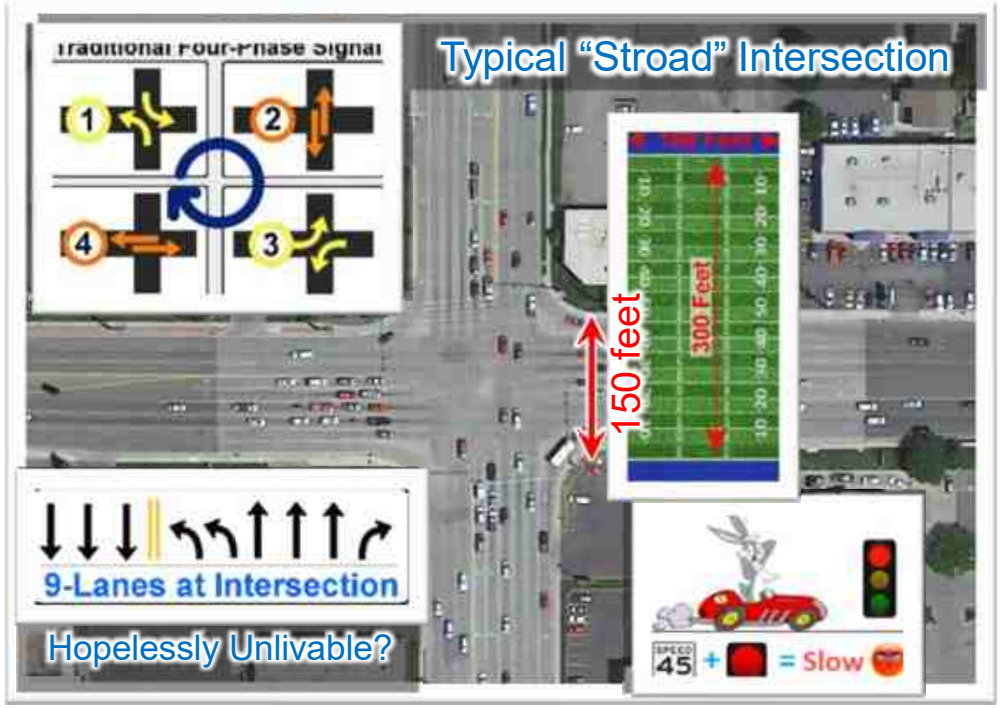


- To compensate for inefficiency, engineers "super-size" with lanes, lanes, lanes

Looks Fast and Furious,
but is Slow and Sad



This is why you can't
get through the light!

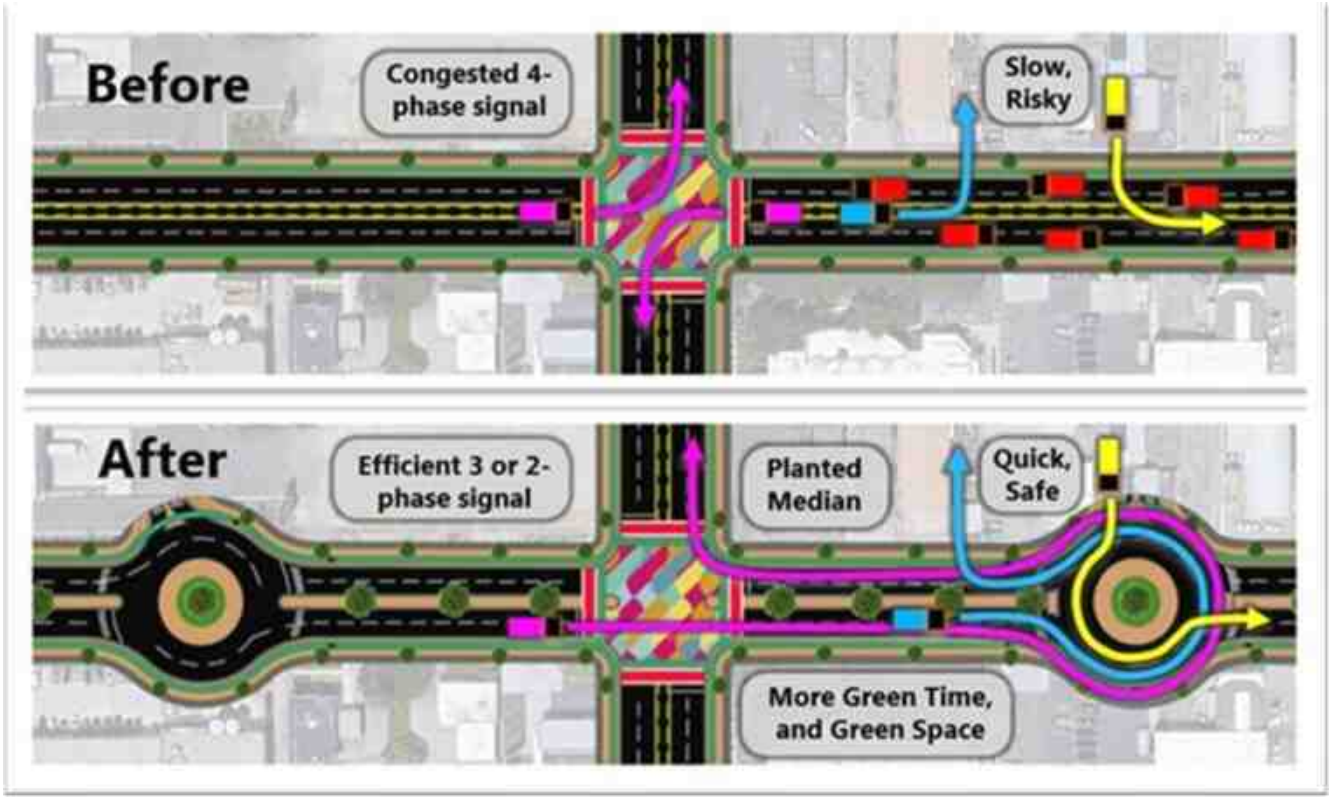


Quadrant Intersections

What is a Quadrant Intersection?

U-Turn Intersections

What is a U-Turn Intersection?

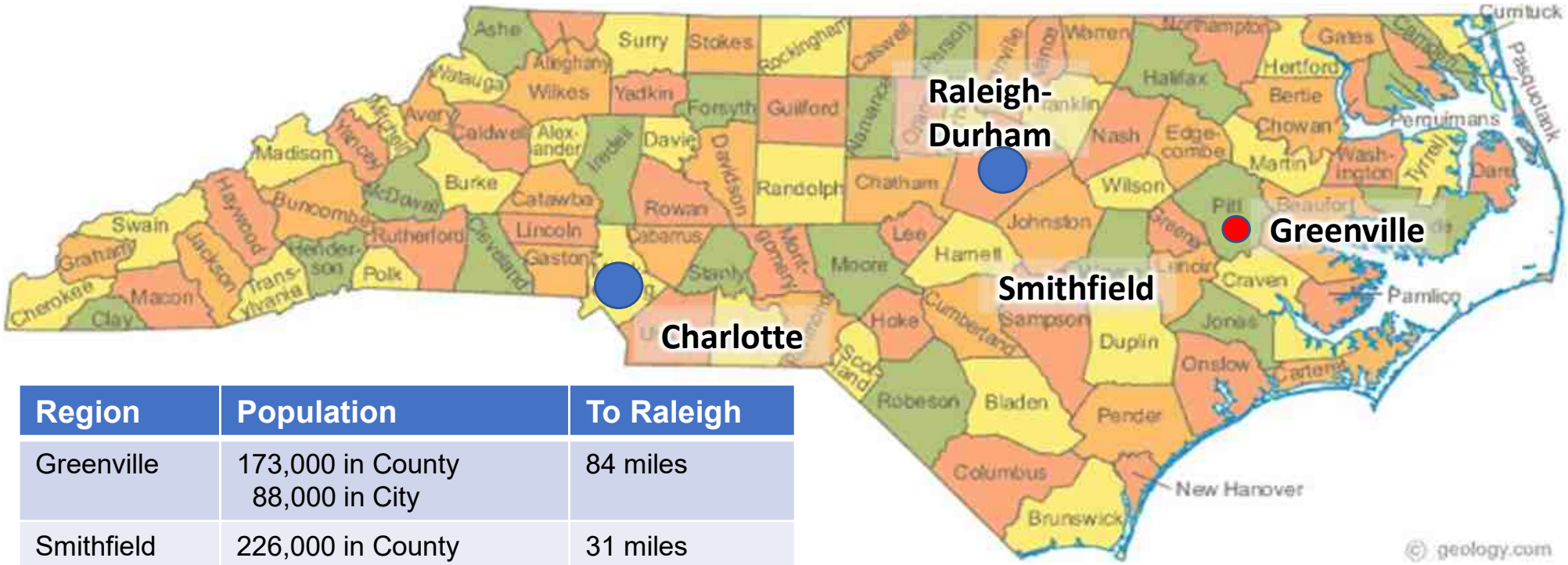


What is a One-Way Split Intersection?

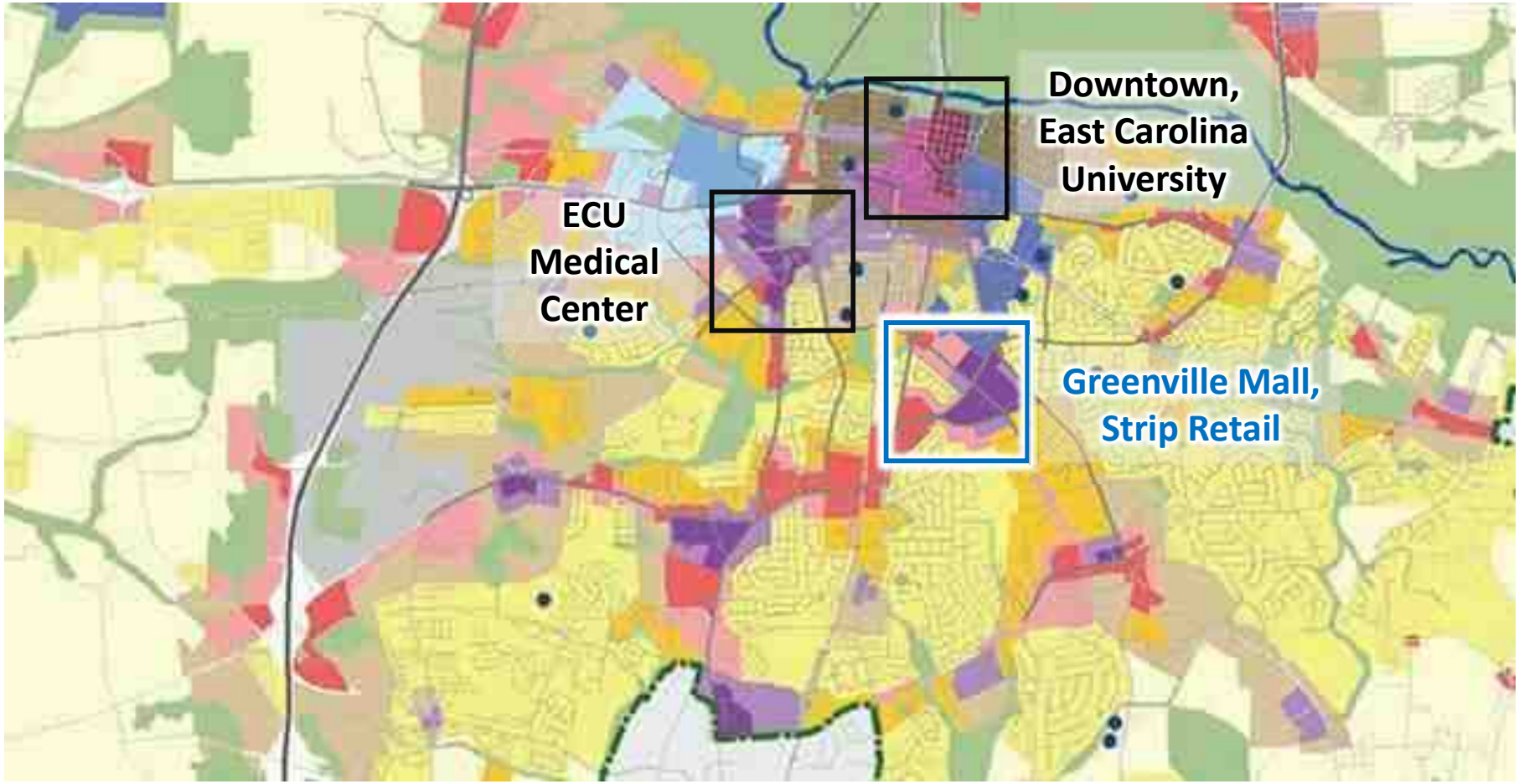
- Four small intersections better than one huge!
- Right-on-red AND Left-on-red

Completed Town Center Intersection: Elfin Forest Hwy & San Elijo Rd., San Marcos, CA

Context for Greenville and Smithfield



Region	Population	To Raleigh
Greenville	173,000 in County 88,000 in City	84 miles
Smithfield	226,000 in County 13,000 in City	31 miles
Raleigh	2.1 Million in MSA	
Charlotte	2.7 Million in MSA	


Downtown,
East Carolina
University
ECU
Medical
Center
Greenville Mall,
Strip Retail

Quadrant concepts in Greenville and Smithfield

Quadrant Intersections

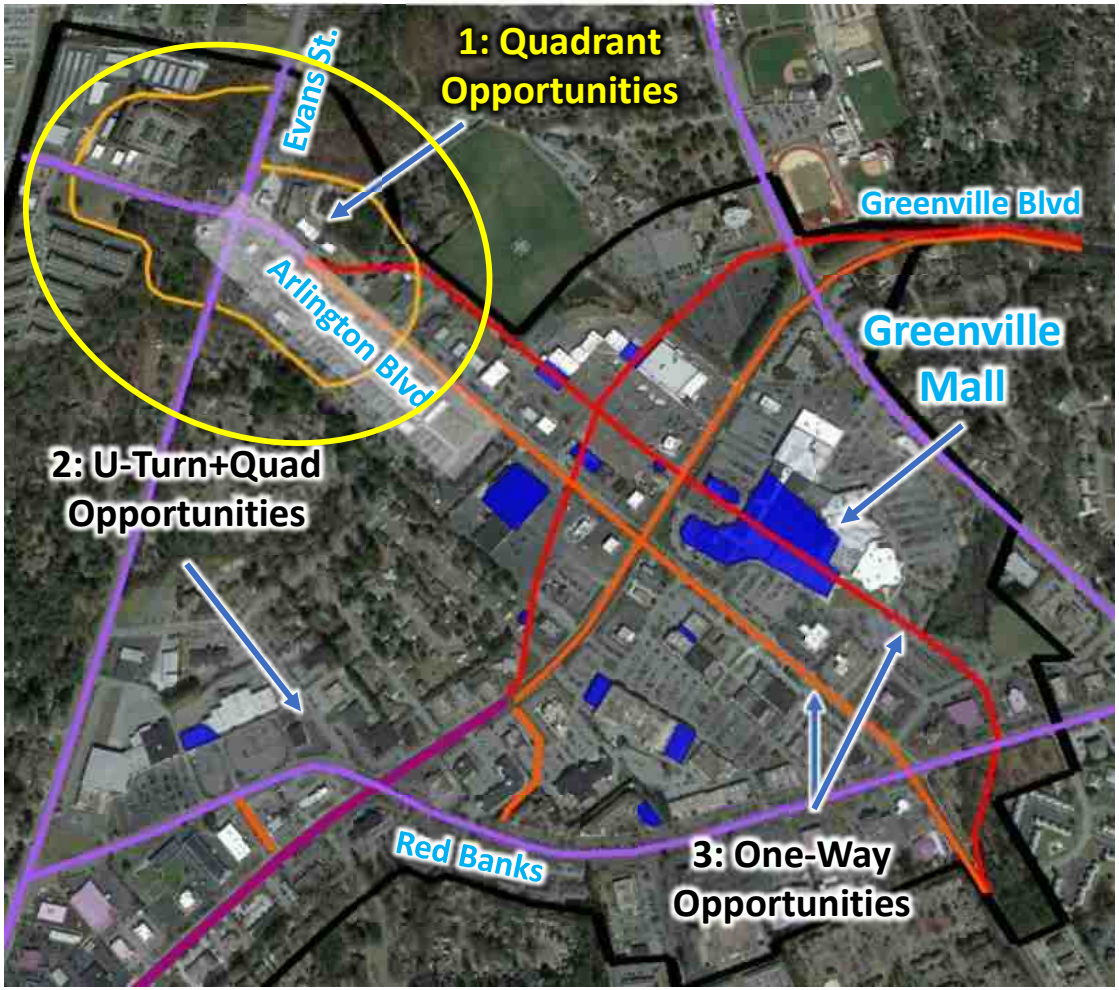
But also imagine them for Raleigh, Charlotte, or "Anywhere, USA"

During the presentation, please write down your questions, observations, and slide numbers that you may want to be displayed again during discussions.

Target: 3-min

Greenville Overview, Quadrant Study Area

- There are no examples in the country of Walkable Quadrants or U-Turns as we have designed them
- There are many walkable one-way streets, but few if any used to reinvent a two-way Stroad
- This photo has opportunity to demonstrate all three.



Hide if too long

TY

URBAN Innovators

Hide if too long

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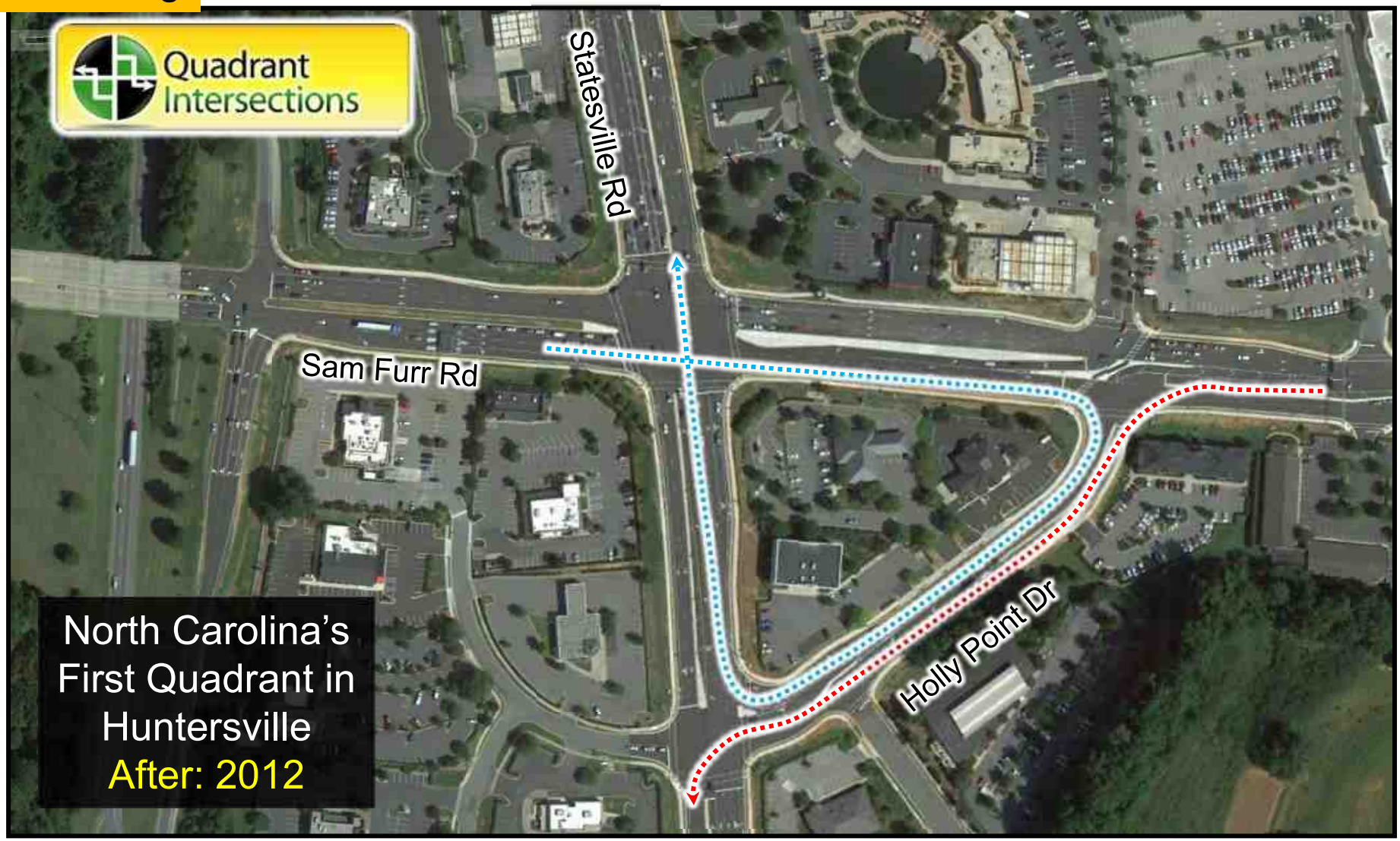
URBAN Innovators



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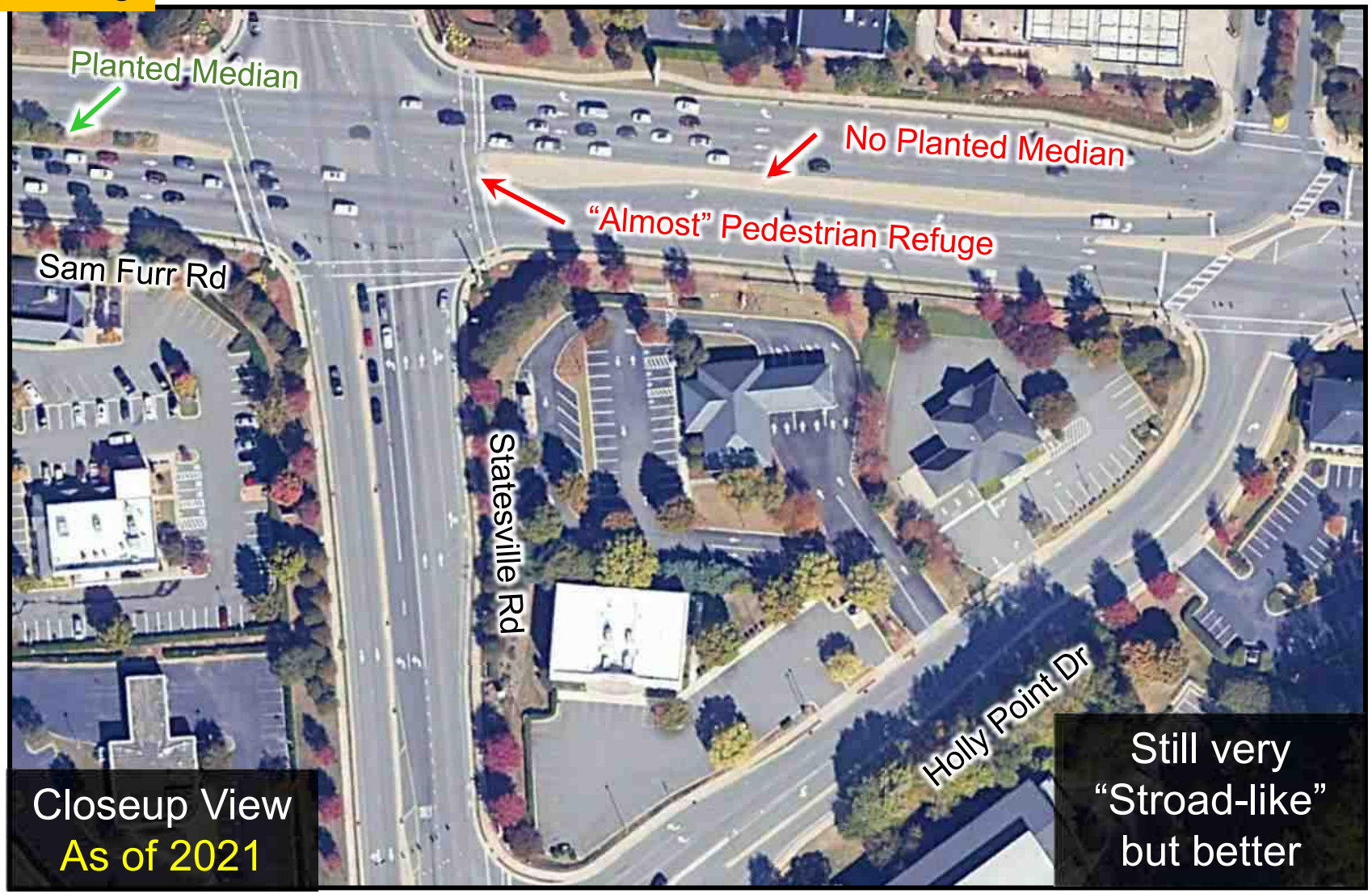

Quadrant Intersections
Evans
Arlington Blvd
Railroad
FAR 111 Acr
0.14
0.52
4x
Now
Max
Veh / Hr
3,700
5,700
+54%
Now
New

Quadrant Intersections
Evans
Arlington Blvd
Railroad
FAR 111 Acr
0.14
0.52
4x
Now
Max
Veh / Hr
3,700
5,700
+54%
Now
New

Can Offset
330 Acres
of suburbs, and
9 Miles of Road
Evans St
Clifton St
Arlington Blvd
Quadrant Intersections
FAR 111 Acr
0.52
0.14
4x
Now
Max
Veh / Hr
8k
7k
6k
5k
4k
3k
2k
1k
0k
5,700
3,700
+54%
Now
New

Can Offset
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Quadrant Intersections
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Max
Veh / Hr
8k
7k
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5k
4k
3k
2k
1k
0k
5,700
3,700
+54%
Now
New

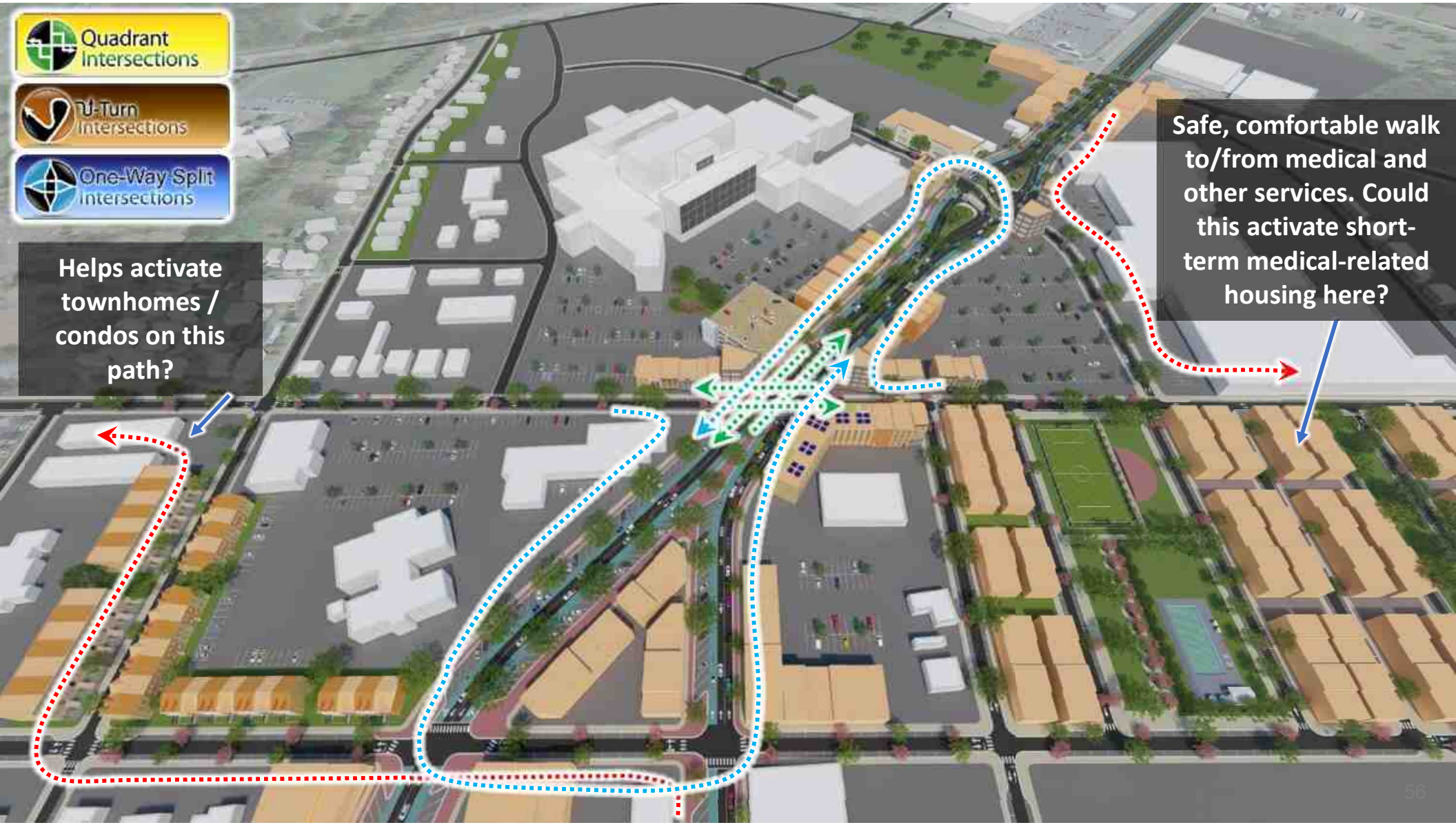
Clifton St
Quadrant Intersections
Arlington Blvd
Commerce St
Evans St

Clifton St
Quadrant Intersections
Arlington Blvd
Commerce St
Evans St

Target: 3-min

Smithfield Near UNC-Johnston Hospital

Combination of Quadrant, U-Turn, and One-Way


Quadrant Intersections
U-Turn Intersections
One-Way Split Intersections
Helps activate townhomes / condos on this path?
Safe, comfortable walk to/from medical and other services. Could this activate short-term medical-related housing here?

Quadrant Intersections
U-Turn Intersections
One-Way Split Intersections
Resiliency: Additional path options for lefts

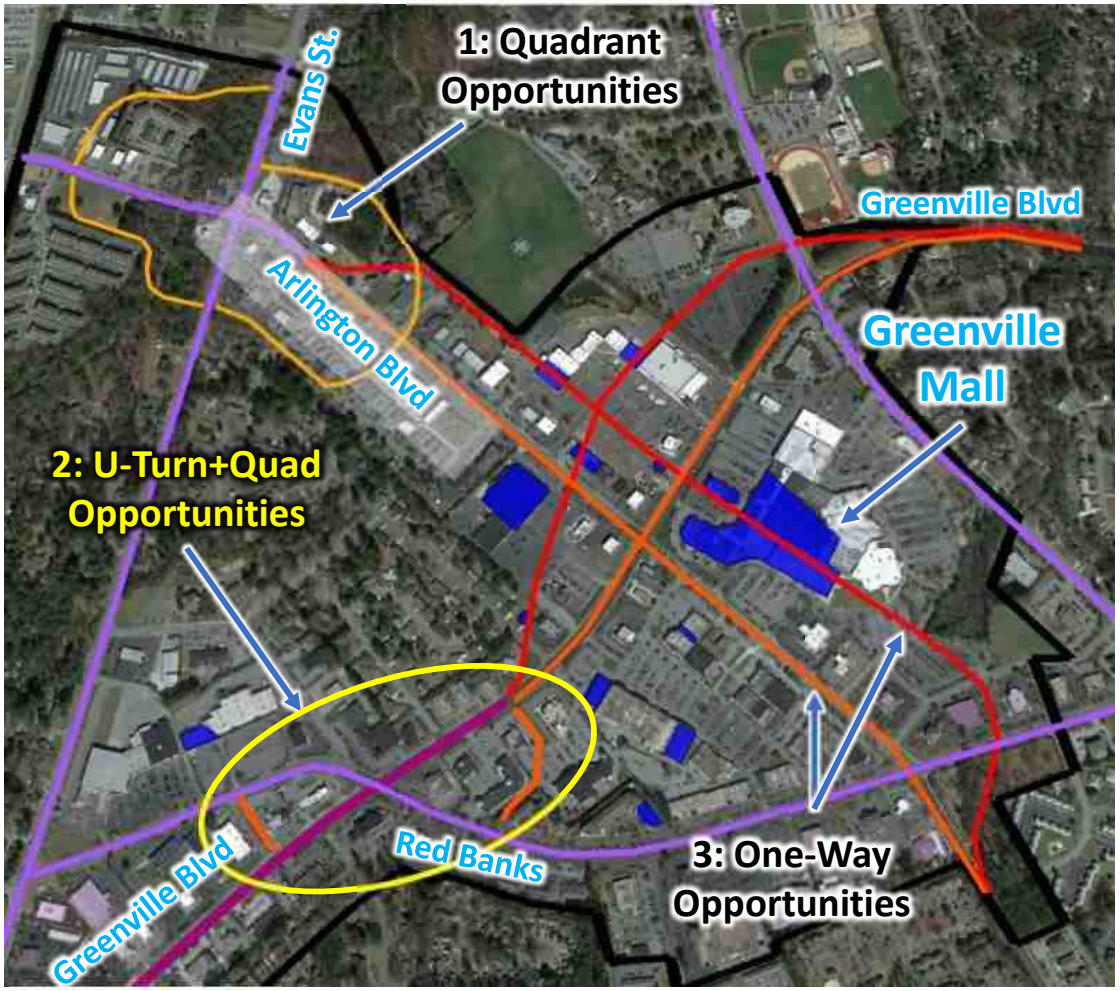
Quadrant Intersections
U-Turn Intersections
Resiliency: Additional path options for lefts

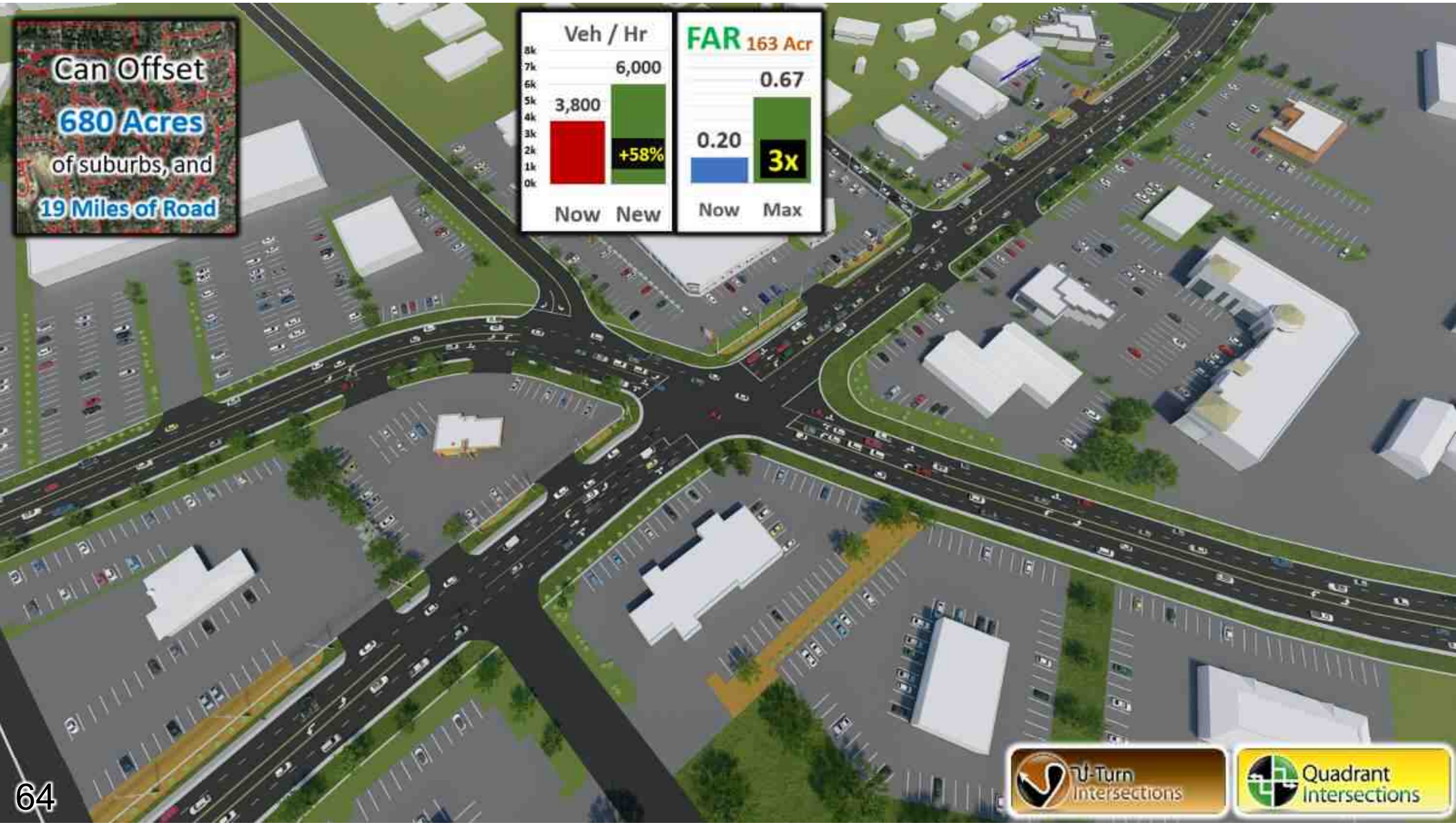
Quadrant
Intersections
U-Turn
Intersections

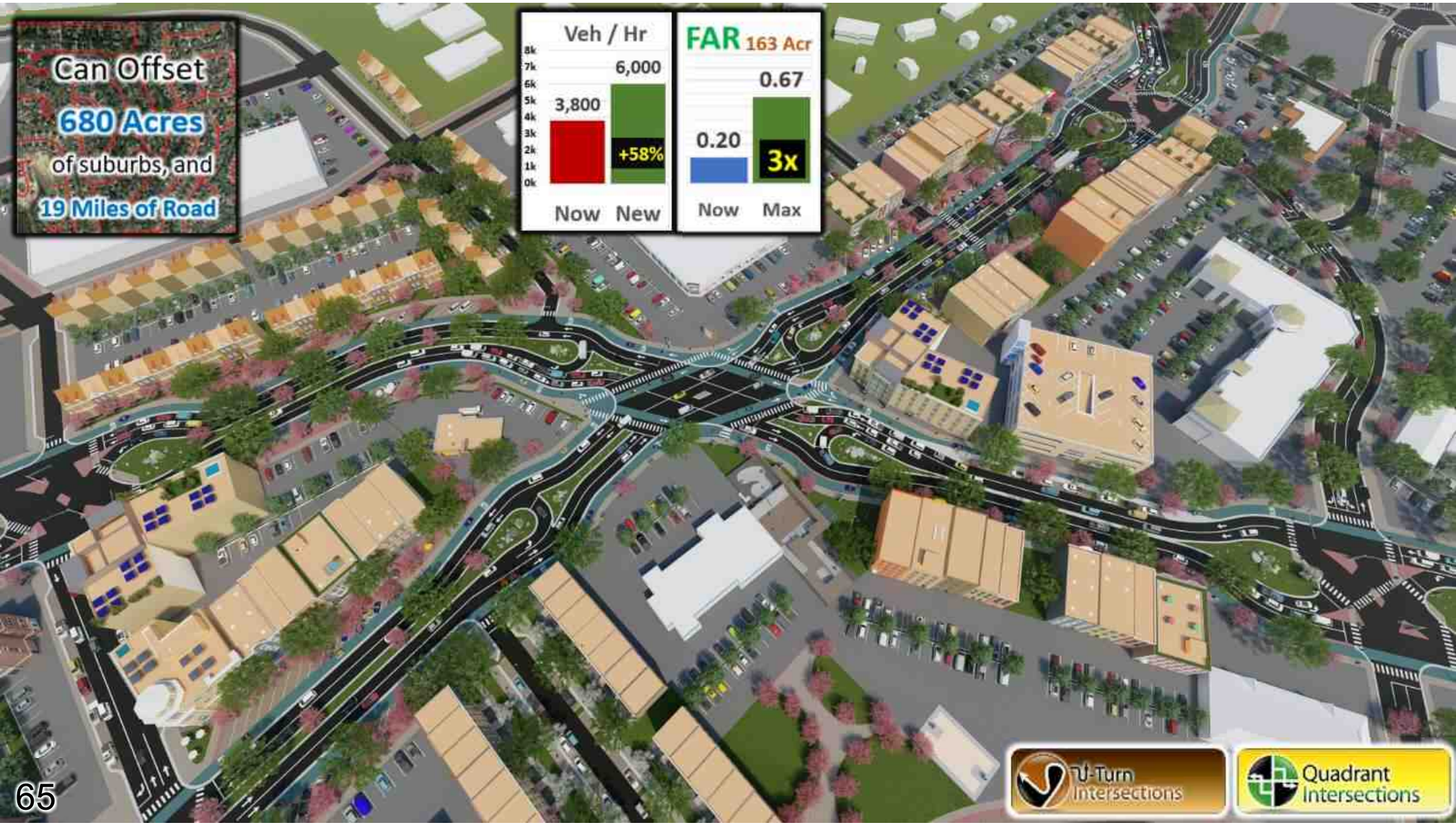
U-Turn Intersections

Greenville U-Turns

10-minute Target




Can Offset
680 Acres
of suburbs, and
19 Miles of Road
Veh / Hr
8k
7k
6k
5k
4k
3k
2k
1k
0k
3,800
6,000
+58%
Now
New
FAR 163 Acr
0.20
0.67
3x
Now
Max
U-Turn Intersections
Quadrant Intersections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+58%
Now
New
FAR 163 Acr
0.20
0.67
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Now
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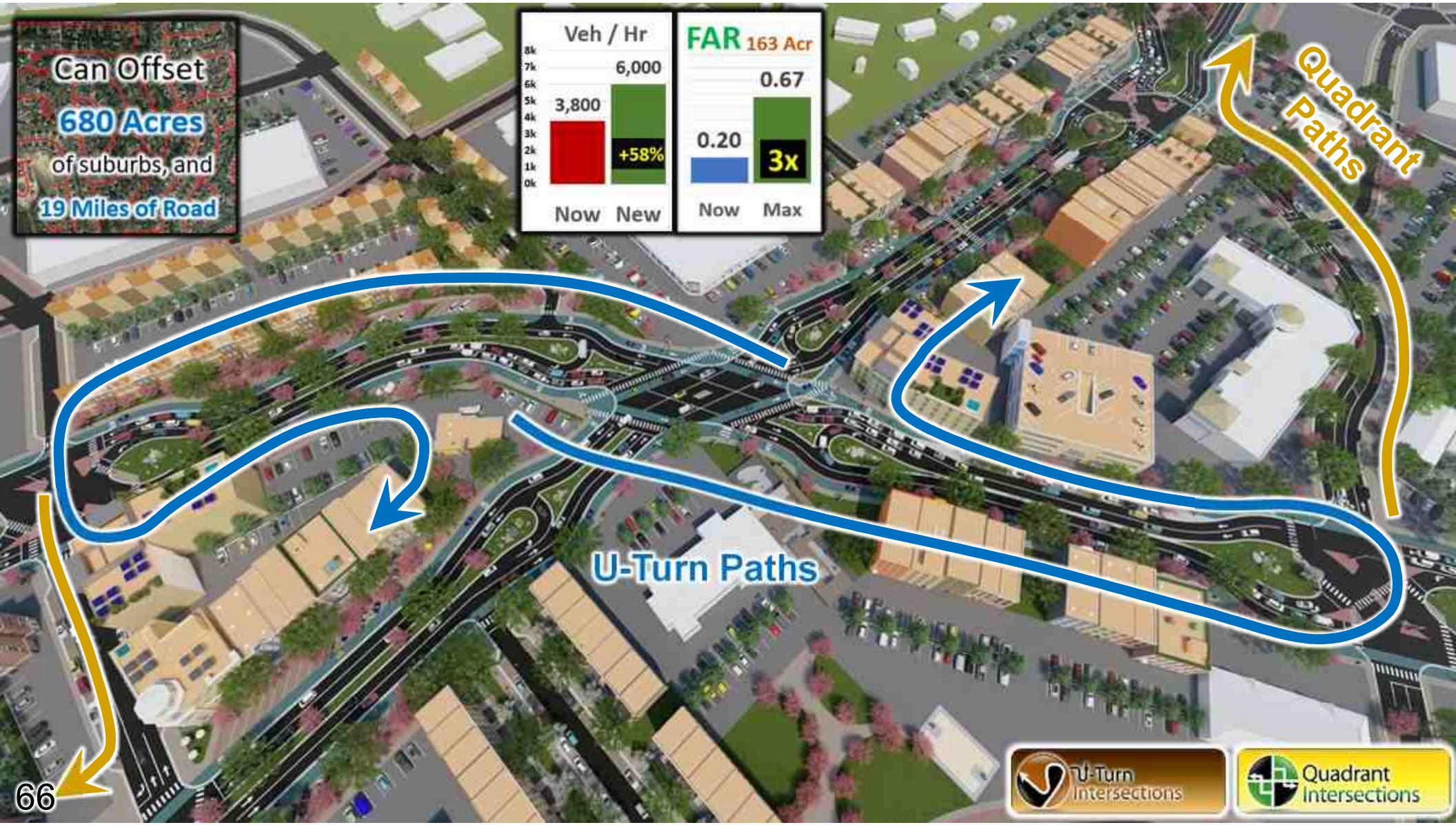
U-Turn Intersections
Quadrant Intersections


Can Offset
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3,800
6,000
+58%
Now
New
FAR 163 Acr
0.20
0.67
3x
Now
Max
Quadrant Paths
U-Turn Paths
U-Turn Intersections
Quadrant Intersections

Can Offset
680 Acres
of suburbs, and
19 Miles of Road
Veh / Hr
8k
7k
6k
5k
4k
3k
2k
1k
0k
3,800
6,000
+58%
Now
New
FAR 163 Acr
0.20
0.67
3x
Now
Max
Quadrant Paths
U-Turn Intersections
Quadrant Intersections

U-Turn
Intersections

U-Turns help reduce speed
going into main intersection, and
facilitate Access Management
U-Turn
Intersections

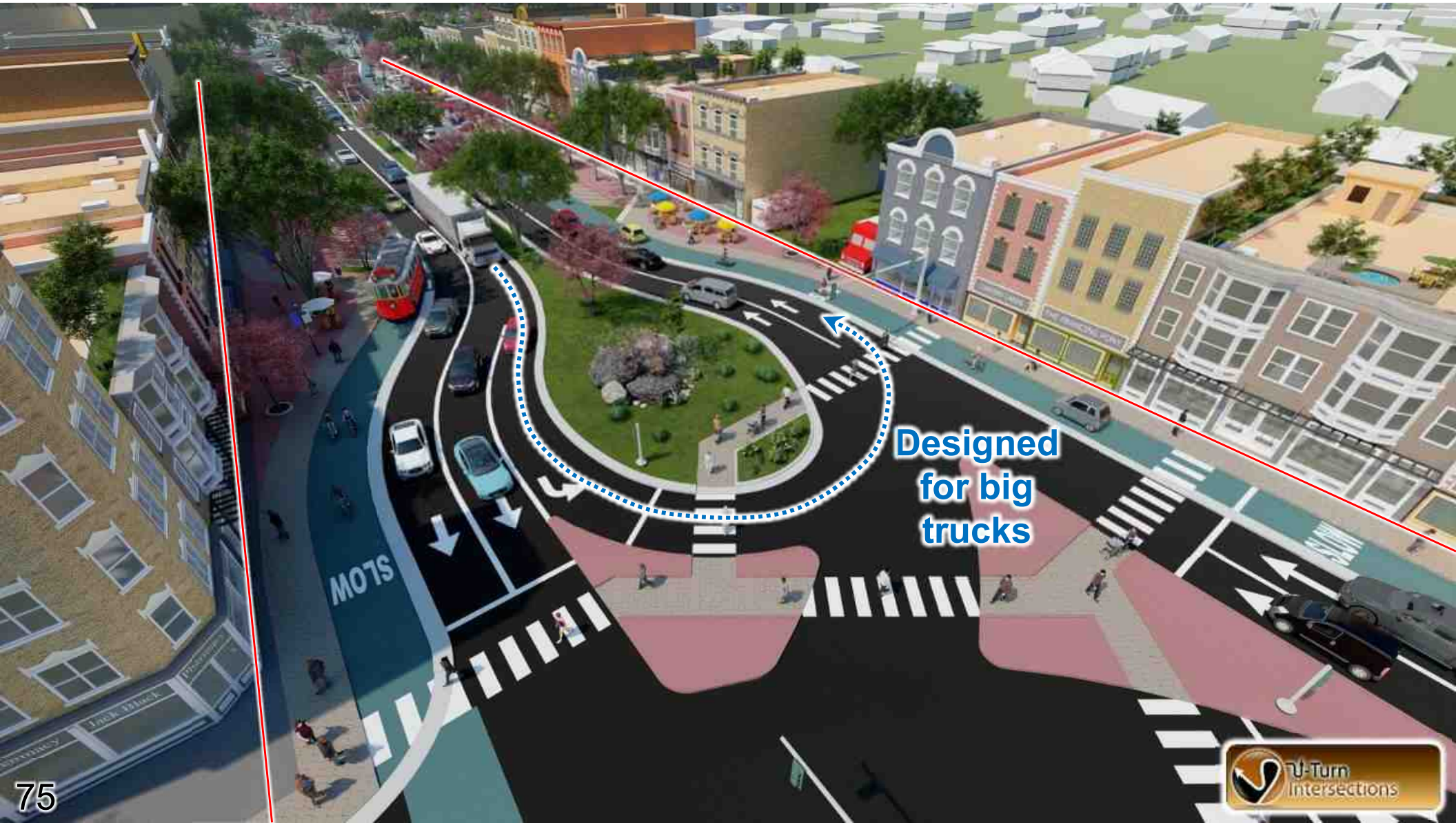
U-Turn
Intersections

U-Turn Intersections
"Bike Speed"
SLOW
SLOW

Long Delays,
Very Dangerous
U-Turn
Intersections

Longer Path, but
Faster and Safer
Truck
Turnaround
Reverse Angle
Parking
Mid-Block
Ped Crossing
U-Turn
Intersections

EYEMART
U-Turn
Intersections


Designed for big trucks
SLOW
Ψ-Turn Intersections

Mid-Block
Ped Crossing
Outdoor
Dining
SLOW
Mix of tiny
and standard
vehicles

Start One-Way
SLOW
SLOW
SLOW
SLOW

SLOW

Busy streets don't
always need to have
"ground floor commercial"

U-turns help convert 5-lane “Stroads” into 4-lane
“Complete Streets” by eliminating need for median
(and instead widening for parking and pedestrians).

Break up under-utilized
parking lots as
residential streets

One-Way concepts in Greenville

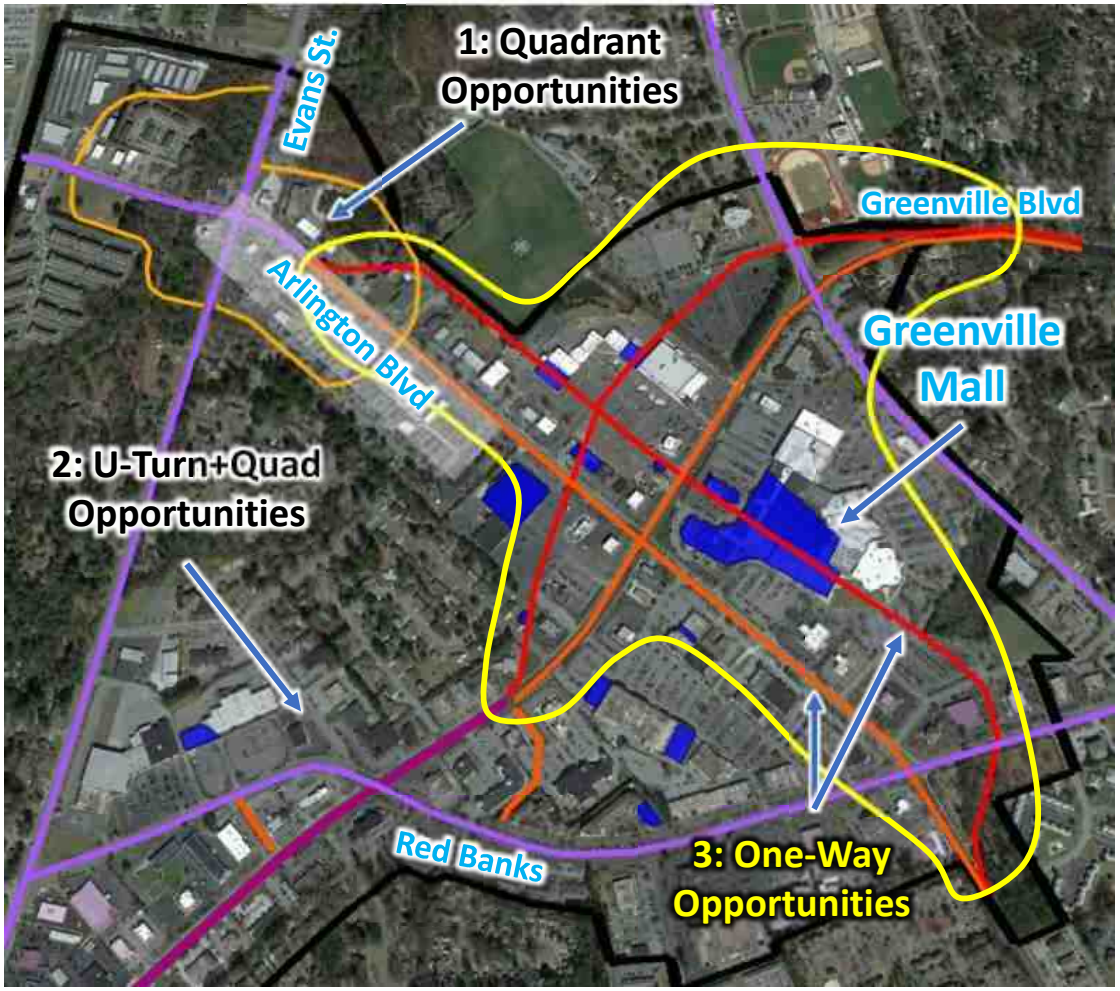
But also imagine them for Raleigh, Charlotte, or "Anywhere, USA"

5-minute target

Greenville One-Ways, Mall Area

One-Way Split Intersections

- Any alignment that impacts major buildings, such as the mall (big blue), would be enacted only when the owners want an “extreme makeover”.



FAR 190 Acr
0.92
0.17
5x
Now
Max
Veh / Hr
8k
7k
6k
5k
4k
3k
2k
1k
0k
3,600
7,100
+97%
Now
New
Publix
Mall
Greenville
Arlington
Can Offset
1150 Acres
of suburbs, and
32 Miles of Road

FAR 190 Acr
0.92
0.17
5x
Now
Max
Veh / Hr
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4k
3k
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3,600
7,100
+97%
Now
New
Publix
Small Mall
New WB
New SB
Greenville NB
Arlington EB
Can Offset
1150 Acres
of suburbs, and
32 Miles of Road

FAR 190 Acr
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0.17
5x
Now
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Veh / Hr
8k
7k
6k
5k
4k
3k
2k
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7,100
+97%
Now
New
Arlington Blvd
Can Offset
1150 Acres
of suburbs, and
32 Miles of Road
Publix
Greenville Blvd
Mall

FAR 190 Acr
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7,100
+97%
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New
Arlington Blvd
Can Offset
1150 Acres
of suburbs, and
32 Miles of Road
Publix
Greenville Blvd
Former
Mall

Arlington
Blvd
Greenville
Blvd
Mall
Floor Area Ratio: 0.17
3700 vph

Arlington
Blvd
Greenville
Blvd
Former
Mall
Floor Area Ratio: 0.92
7100 vph, +91%

Can Offset
330 Acres
of suburbs, and
9 Miles of Road
FAR 111 Acr
0.52
0.14
4x
Now
Max
Can Offset
1150 Acres
of suburbs, and
32 Miles of Road
FAR 190 Acr
0.92
0.17
5x
Now
Max
Greenville
Charles
Evans
Publix
Mall
Arlington
Red Banks

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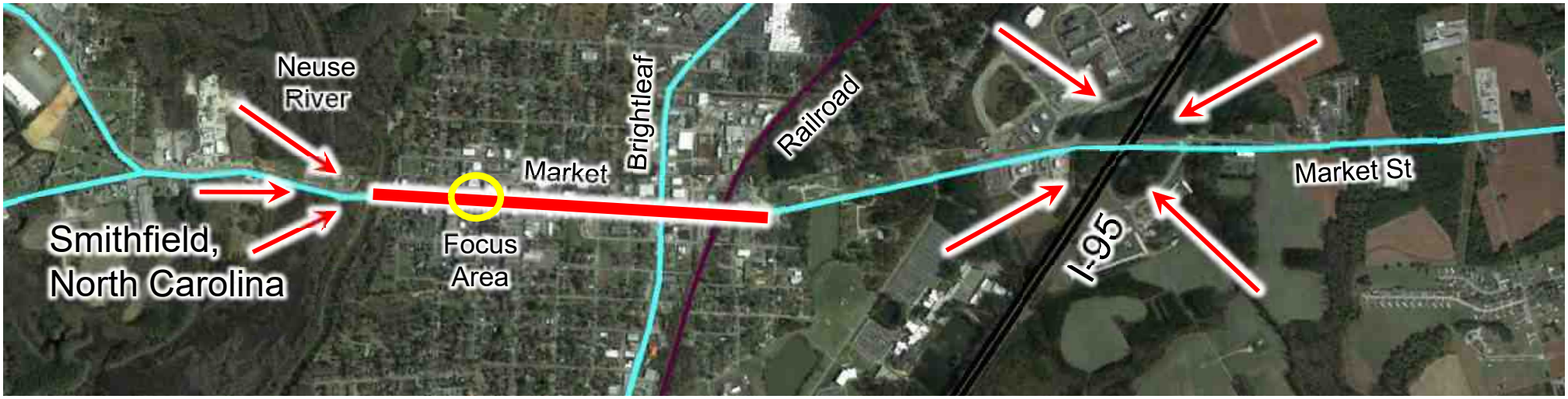
0.17
5x
Now
Max
Evans
Arlington
Greenville
Charles
Publix
Mall
Red Banks

One-Way concepts in Smithfield: Historic “Main Street”

But also imagine them for any small town, or even large cities with “small town” segments.

5-minute target


Neuse
River
Brightleaf
Railroad
Market
Market St
Smithfield,
North Carolina
Focus
Area
I-95

Neuse
River
Brightleaf
Railroad
Market
Market St
Smithfield,
North Carolina
I-95

Market Street as it is today

Downtown area today

Market Street, Smithfield, NC
Today's 4-Lane Stroad w/parking.
Typical speeds: 35-40 mph

One-Way creates space for “Slow Lane” bike + parking access, premium streetscape. Typical speeds: 25-30 mph.

SLOW
SLOW

Crossing One-Way concepts in Smithfield: “Town Square”

But also imagine them for Raleigh, Charlotte, or “Anywhere, USA”

5-minute target

9th
Brightleaf
Massey St
Market St

Market St
Brightleaf
Massey St
9th

THE PRANCING PONY
Pharmacy

Market St
Johnston / Massey
Brightleaf
9th

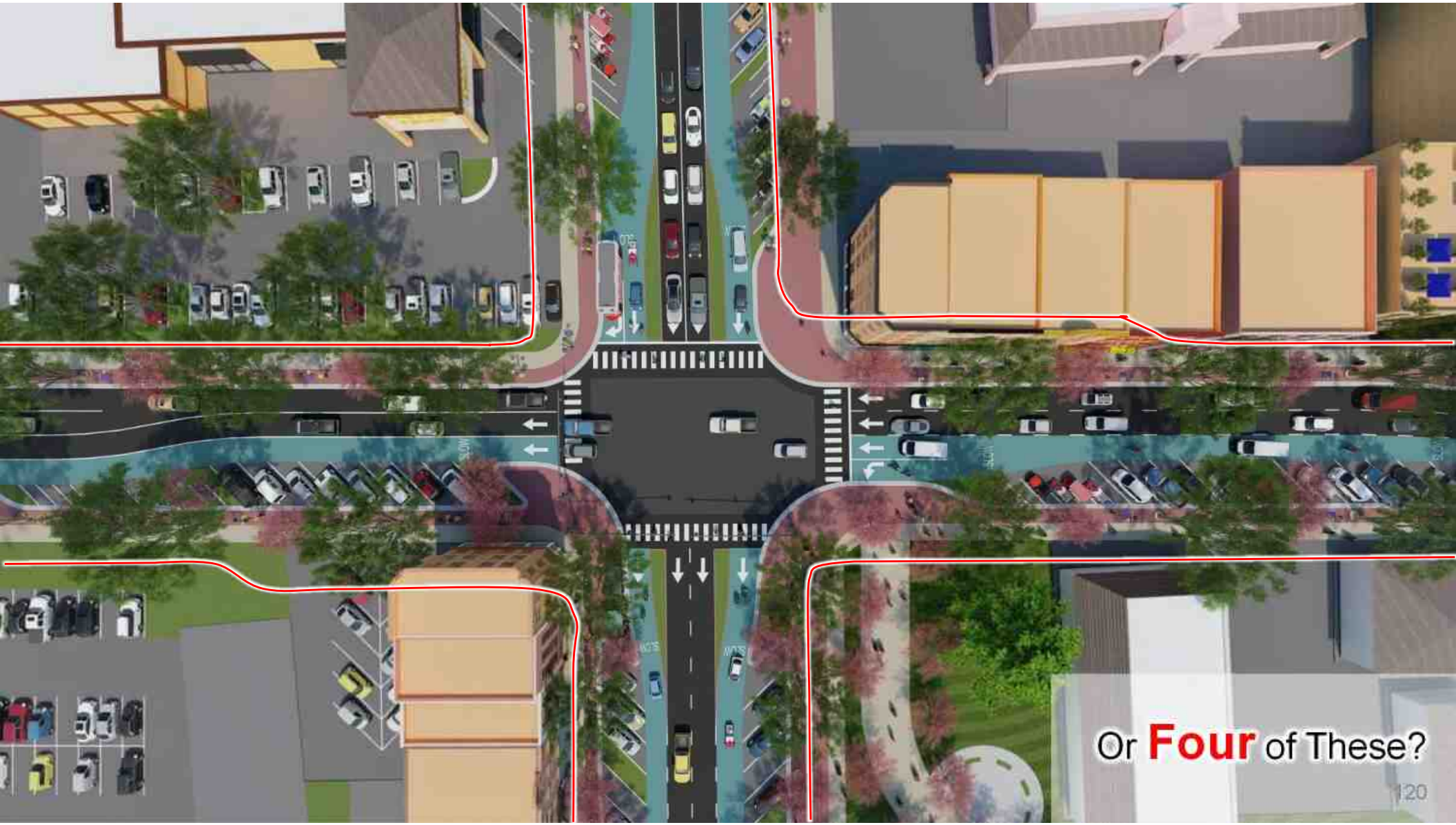
Market Street
This is Smithfield's largest Intersection
Brightleaf Blvd

Market Street
Default Future
Brightleaf Blvd

Market Street
Potential with
Crossing One-Ways
Brightleaf Blvd

What you've got
Now

Default Future
Would you rather have
one of these?


Or Four of These?
120