

Tennessee Section ITE Fall Meeting
Chattanooga, TN
November 6, 2019

Center Street (S.R. 36)
Road Diet
Kingsport, TN

Jason Carder, P.E. – Mattern & Craig



OUTLINE

BACKGROUND

CASE STUDY

CAPACITY ANALYSIS

RESULTS

LESSON LEARNED



BACKGROUND

BENEFITS OF ROAD DIET

Improve safety

Reduce speeds

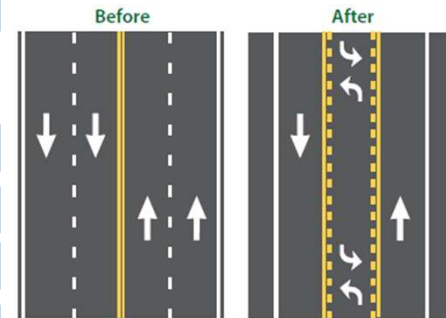
Mitigate queues associated with left-turning traffic

Improve pedestrian environment

Improve bicyclist accessibility

Enhance transit stops

Low-Cost solution



Source: FHWA Road Diet Informational Guide



BACKGROUND

HISTORY OF ROAD DIETS

System and capacity expansion was the main focus of roadway projects during the 1950s and 1960s.

Three-lane alternate wasn't considered during that time

First Road Diet occurred in **1979 in Billings, Montana.**

First installation of Road Diets in urban areas in 1990s in Seattle and Portland.

Now it's a **"PROVEN SAFETY COUNTERMEASURE"** by FHWA



CASE STUDY

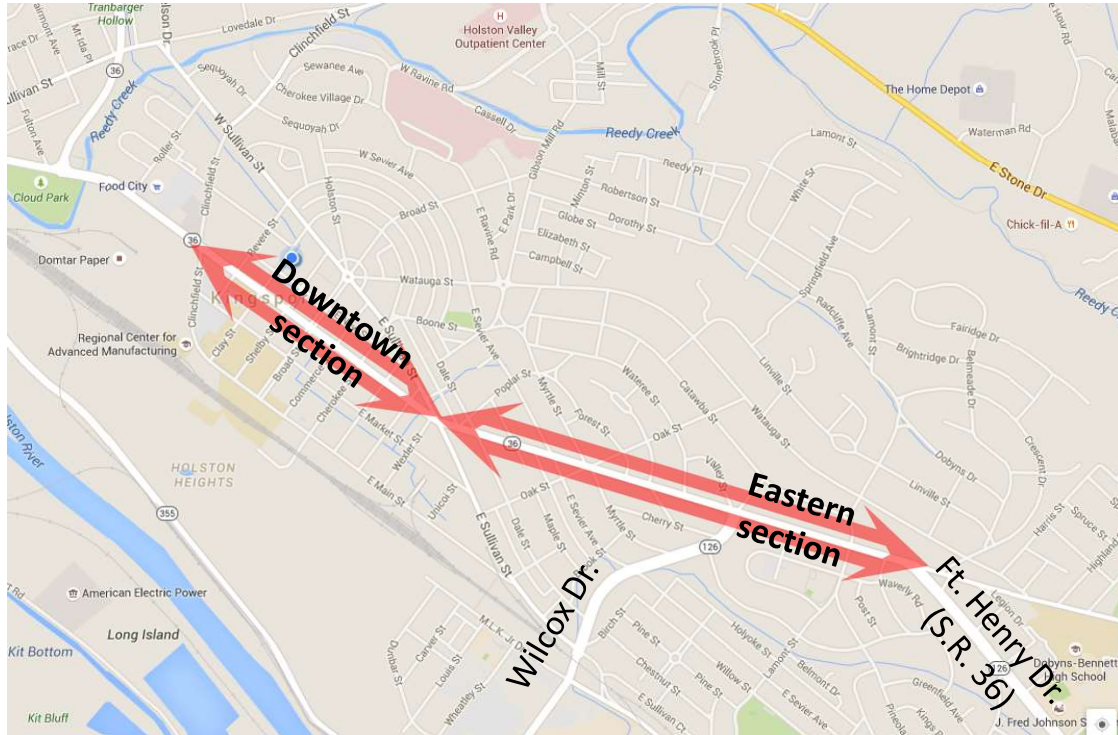
S.R. 36 (Center Street) scheduled to be resurfaced by TDOT in 2014

Before: 2 lanes each direction, no two-way left turn lane

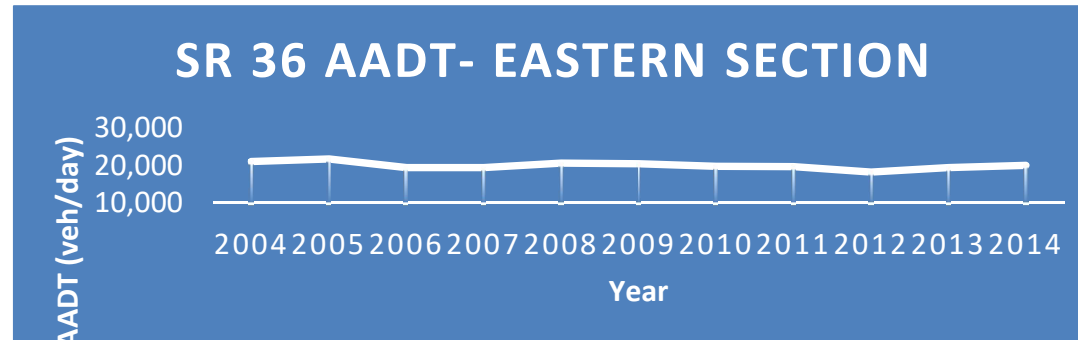
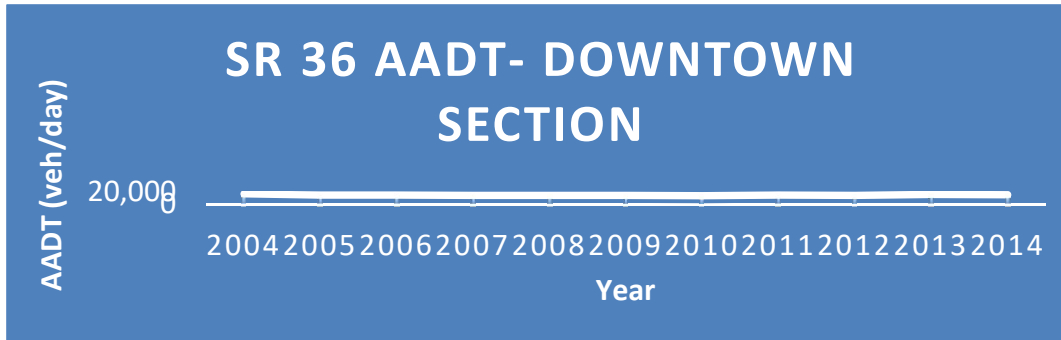
Traffic volumes (AADT, per TDOT):
Downtown section = 16,000 veh./day
Eastern section = 20,000 veh./day



CASE STUDY



CASE STUDY



CASE STUDY

Coalition of groups (Downtown Merchant Association, Parks & Rec, Housing Authority, others) along with Assistant City Manager saw this as a **once in lifetime opportunity to change the dynamics of downtown:**

Normalize speeds

Reduce crashes

Provide left turn refuge

On-street parking improvement

Improve pedestrian facilities/Bike Lanes



CASE STUDY

City realized that by acting in coordination with resurfacing project, the road diet would incur the City essentially no cost (only cost was for consulting fees)

Limited window of opportunity (repaving cycle is 15-20 years)

Thus, City investigated a road diet on Center Street, focused on the downtown portion



CASE STUDY

June 2013

- TDOT informed City that Center Street scheduled to be resurfaced
- City staff began discussions about possibility of road diet

July 2013

- City hired RPM Transportation Consultants and Mattern & Craig to determine if road diet was feasible and produce design plans

September 2013

- Plan submittal and begin review process with TDOT

October 2013

- Plans sent to TDOT design

April 2014

- TDOT Bid Letting

June 2014

- Construction begins

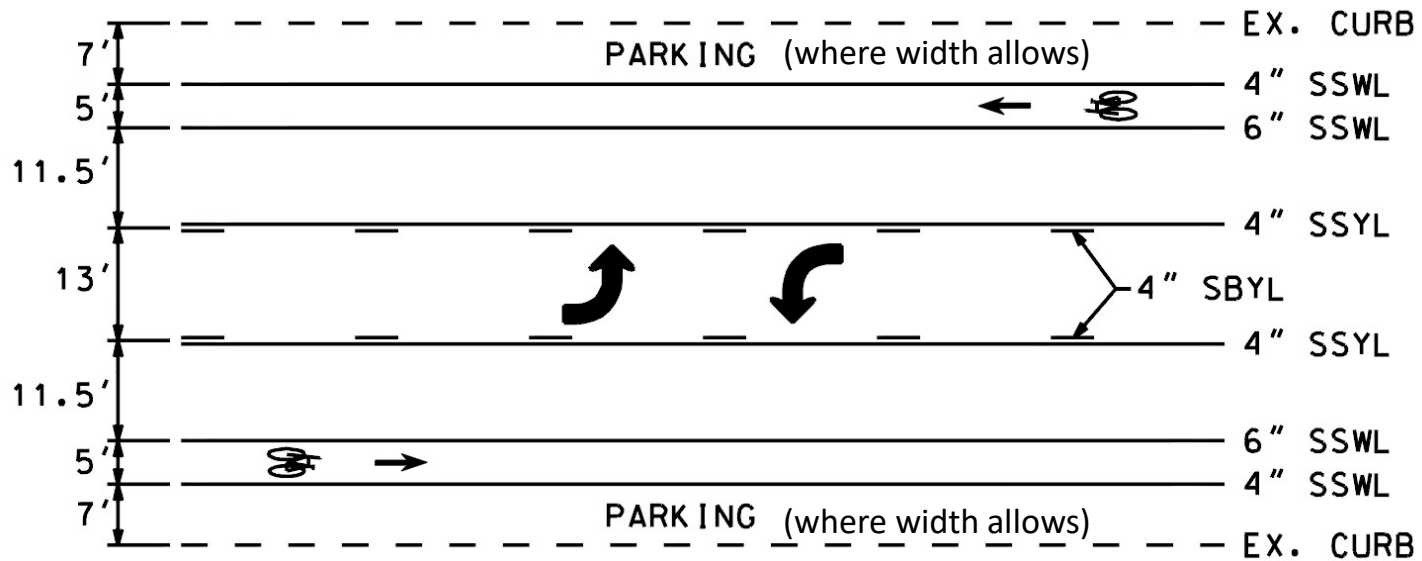
August 2014

- Construction complete



CASE STUDY

Typical Section



CAPACITY ANALYSIS

ROAD DIET FEASIBILITY DETERMINATION – OPERATIONAL FACTORS

Average Daily Traffic

- The FHWA advises that roadways with ADT of **20,000 veh/day** or less may be good candidates for a Road Diet and should be evaluated for feasibility.

De Facto Three-Lane Roadway Operation

- Approximately **80% of thru traffic used the outside lanes**, making the inner lanes defacto left turn lanes - suggesting operational success of a Road Diet.

Level of Service (LOS)

- Synchro and SimTraffic were used to measure delay and LOS along the corridor after conversion and to optimize the operational performance by signal timing and coordination between adjacent signals.

Bicycle and Pedestrians Considerations

- Bike routes were included in the typical section as one of the city's priorities to improve the livability of the corridor, specifically in downtown segments.



CAPACITY ANALYSIS

ANTICIPATED TRAVEL TIMES (BASED ON SYNCHRO/SIMTRAFFIC MODELS)								
DIRECTION		TRAVEL TIME						FREE-FLOW
		AM PEAK		MID-DAY PEAK		PM PEAK		
		4-LANE	ROAD DIET	4-LANE	ROAD DIET	4-LANE	ROAD DIET	
DOWNTOWN SECTION	Eastbound	02:30	02:18	02:25	02:24	02:24	02:10	01:18
	Westbound	02:31	02:14	02:30	02:24	02:21	02:30	
EASTERN SECTION	Eastbound	03:06	03:02	03:03	03:37	03:18	04:16	02:18
	Westbound	02:51	03:06	03:01	03:36	03:06	03:34	
ENTIRE CORRIDOR	Eastbound	05:36	05:20	05:28	06:01	05:42	06:26	03:36
	Westbound	05:22	05:20	05:31	06:00	05:27	06:04	

Scenario	Travel Time Difference (Avg)
AM Peak	3% Decrease
MD Peak	9% Increase
PM Peak	11% Increase
Total	6% Increase



At Clinchfield St., facing east



BEFORE

AFTER



At Clinchfield St., facing west



BEFORE

AFTER



At Clay St., facing east



BEFORE

AFTER



At Clay St., facing west



BEFORE

AFTER



At Shelby St., facing east



BEFORE

AFTER



At Broad St., facing east



BEFORE

AFTER



At Cherokee St.



At Wateree St.



BEFORE

AFTER



At Fort Henry Dr.



BEFORE

AFTER



RESULTS

Speeds have normalized

- Downtown section – 85% speed 31 mph *after* (posted 30) – no data before
- Eastern section – 85% speed 38 mph *before*, 35 mph *after* (posted 30)
- Anecdotal evidence suggests speeds prior to road diet were higher, with a significant speed differential between lanes

Crashes have decreased (frequency & severity)

- Angle & sideswipe (i.e. more severe) crashes decreased

TIME	# OF CRASHES BY TYPE					# OF CRASHES BY SEVERITY				SEVERITY INDEX (SI)
	REAR END	ANGLE	SIDE-SWIPE	BIKE-PED	TOTAL	INJURY (NON-INCAP)	INJURY (INCAP)	FATAL	TOTAL	
BEFORE (2011-2013)	151	83	34	6	303	92	5	0	303	0.34
AFTER (2015-2017)	168	67	11	6	276	52	2	0	276	0.20



RESULTS

Travel times have been affected

- No significant increase in travel times (decrease in several peak periods/directions)

DIRECTION		TRAVEL TIME (SECONDS)									FREE-FLOW
		AM PEAK			MID-DAY PEAK			PM PEAK			
		BEFORE	AFTER	Δ	BEFORE	AFTER	Δ	BEFORE	AFTER	Δ	
DOWNTOWN SECTION	EB	120	99	-21%	121	134	10%	151	120	-26%	78
	WB	116	137	15%	152	155	2%	118	121	2%	
EASTERN SECTION	EB	231	190	-22%	246	246	0%	236	260	9%	138
	WB	221	206	-7%	261	218	-20%	235	237	1%	
ENTIRE CORRIDOR	EB	351	289	-21%	367	380	3%	387	380	-2%	216
	WB	337	343	2%	413	373	-11%	353	358	1%	



Lessons Learned

More public education/advertisement was needed

- Although public notices were mailed, businesses were personally visited, and press releases made (newspaper, radio, TV), there were still people who seemed surprised by the change.

Help partner/supportive organizations to be more vocal & involved in promoting project

Better coordination with TDOT & contractor was needed

More data should have been collected prior to change

- Before/after travel time studies
- Volume/speed data

You can't please everyone!



Questions?

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TDOT

Department of
Transportation

Road Diets in Tennessee

Lane Reconfigurations

Andrew Padgett, TDOT Region 1 Project Development, November 6, 2019



STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
ROADWAY DESIGN DIVISION
3030 LAMAR PARK BUILDING, 303 DEARBORN STREET
NASHVILLE, TENNESSEE 37243-0008
(615) 741-2222

JOHN C. BRIDGES
COMMISSIONER

BILL HANLAN
DIRECTOR

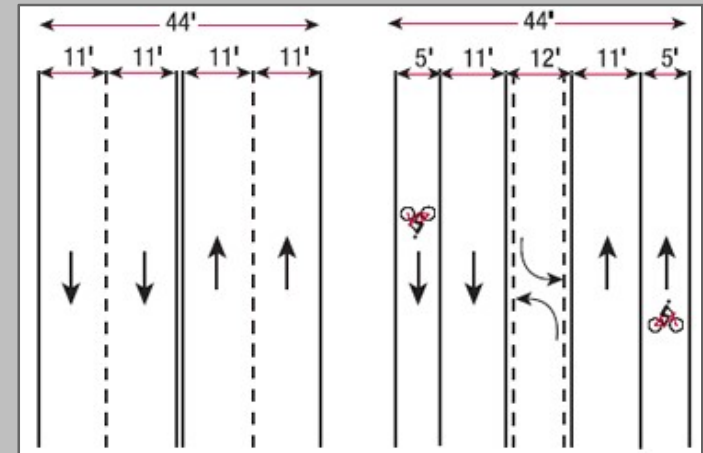
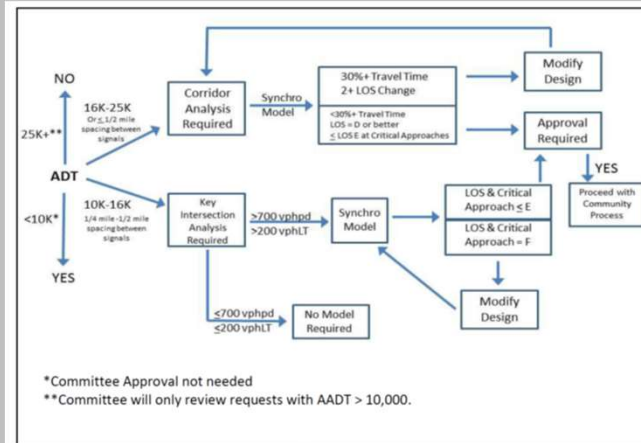
INSTRUCTIONAL BULLETIN NO. 18-05
REGARDING REVISED SECTIONS 1-400.00 ROAD RECONFIGURATION
AND 1-500.00 ROAD DIET

Effective immediately, Section 1-400.00 Road Reconfiguration and Section 1- 500.00 Road Diet have been revised to provide additional guidance on how to evaluate a Road Reconfiguration or Road Diet during rehabilitation, resurfacing, or reconstruction (3R) projects. The Roadway Design Guidelines Section 1 available online does not yet reflect these changes.

1-400.00 ROAD RECONFIGURATION

Road Reconfiguration is a change to the existing roadway that uses striping and reduced travel lane widths to slow operational speeds or uses the available pavement width to improve safety and to accommodate multimodal facilities. Road Reconfiguration provides the opportunity to address existing safety issues or multimodal accommodation in an expedited and cost effective manner. Additional information regarding Multimodal Design can be found in the Roadway Design Guidelines Chapter 9 – Multimodal Design Guidelines.

A Road Reconfiguration shall maintain the current Level of Service (LOS) without negatively impacting operational safety of the motorist and non-motorized users. All road reconfigurations must meet TDOT's minimum roadway design standards or require completion of a design deviation request justifying the reason for the deviation. All deviation requests shall be submitted to HQ Design Division as outlined under section 1-520.00 Plans Distribution and Review Process.



TM

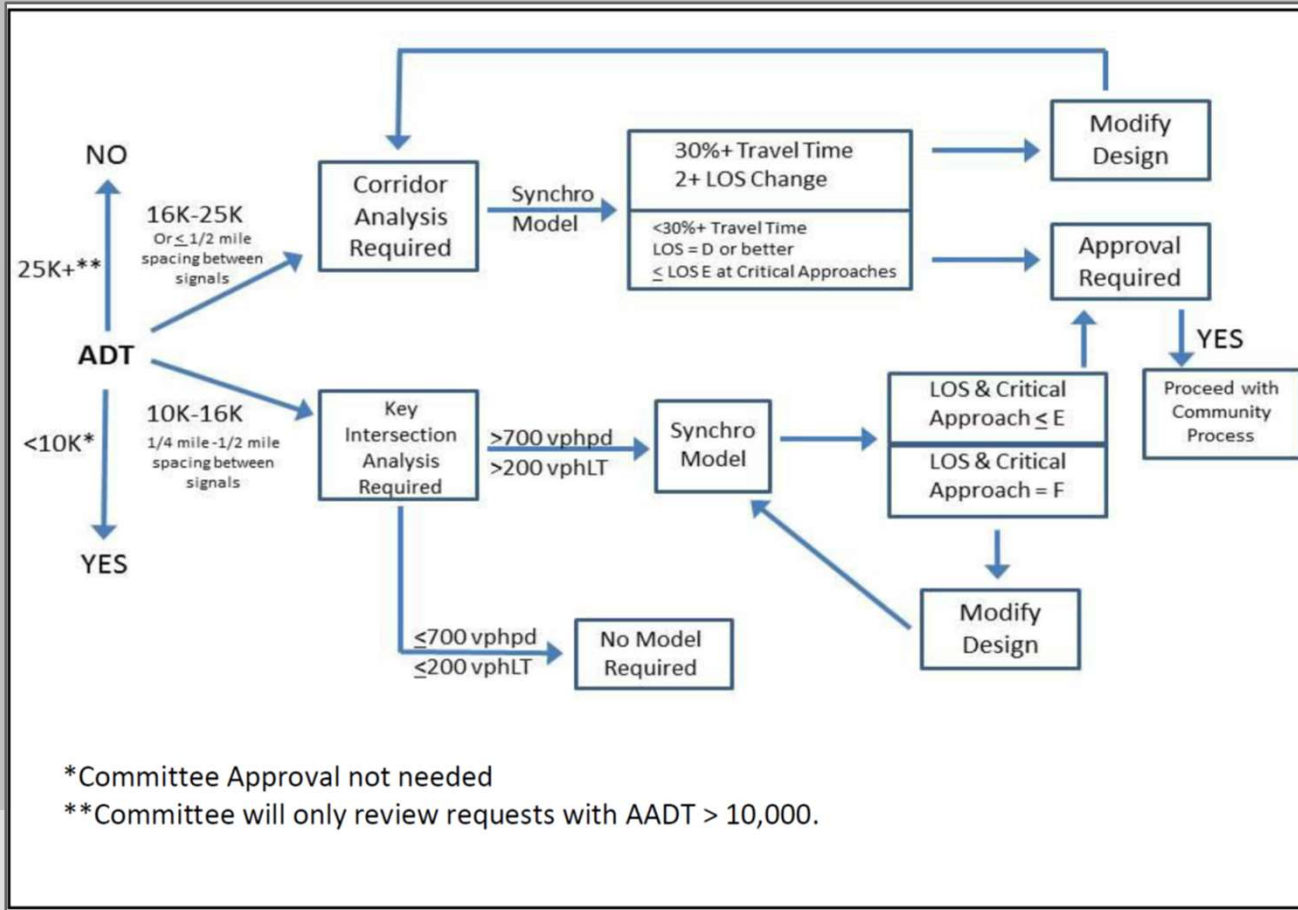
Road Diet Analysis

Road Diet Questionnaire

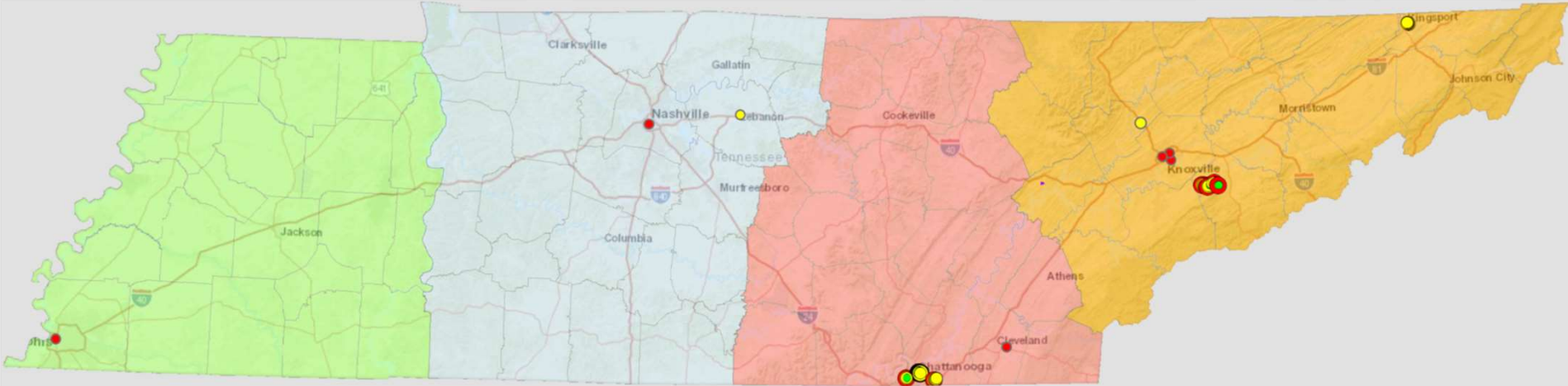
	YES	NO
Is the current Average Daily Traffic (ADT) greater than 25,000?		
Is the current posted speed limit greater than 45 MPH?		
Is the highway a diversionary route for an interstate highway?		
Is the existing per hour/per lane peak hour volume greater than 1700?		
Does the facility have a bus route with stops? (4 lanes to 3)		
Are there more than 10 driveways per mile present? (4 lanes to 3)		
Will the existing roadway pavement drainage be affected?		

Table 1-4

Evaluation



Statewide



Region 1 (Knoxville)

City of Knoxville

- Cumberland Ave
- N Central St.
- Broadway
- Broadway Viaduct
- Moody Ave

SR-35, US-411

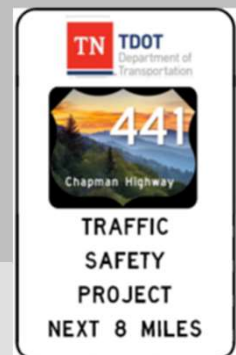


Google

Region 1 (Knoxville)

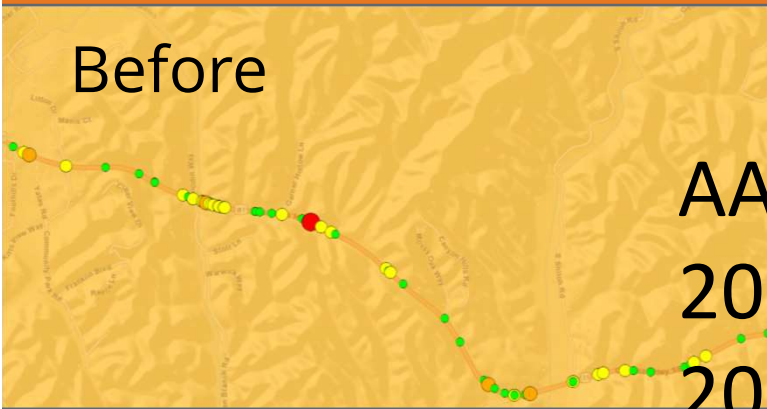
Chapman Highway - Sevier County (7.2-miles) 4-Lane undivided

- Goal: Targeted areas to reduce fatal and injury crashes, improve safety and access along the corridor
- January 21, 2015 - GHSO, TDOT and local law enforcement
- August 7, 2015 – Meeting with State Representative and Senator, County Mayor & Local and State Law Enforcement and TDOT
- October 5, 2015 – Meeting with Sevier County Transportation Committee
- June 10, 2016 – Plans finalized for project Turn-in
- August 26, 2016 – Project awarded to Charles Blalock and Sons \$2,006,667.71
- November 2016 – Project Complete



Region 1 (Knoxville)

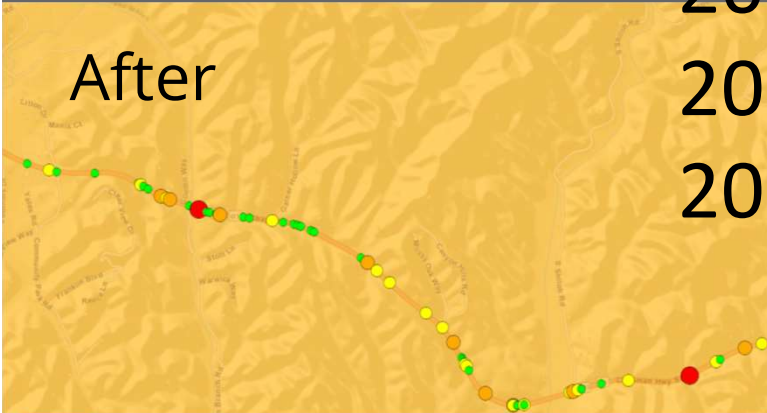
Before



AAADT
2015 – 15297
2016 – 15363

Manner of Collision	
Rear End:	63
Head On:	2
Rear-to-Side / Rear:	1
Angle:	33
Sideswipe Same Dir:	15
Sideswipe Opp Dir:	4
Unknown:	5

After



2017 – 15485
2018 – 15713

Manner of Collision	
Rear End:	29
Head On:	4
Rear-to-Side / Rear:	0
Angle:	22
Sideswipe Same Dir:	10
Sideswipe Opp Dir:	1
Unknown:	1

at Experience
 Fatal C
 Incapa
 Other
 Total C
 f Crashes w
 es or Fatal

on Facto
 Turn Lane
 - Reduction
 oulders
 duction of r
 nding on sh

Statistics	
Fatal Crashes:	2
Total Killed:	2
Incap Inju	9
Total In	62
Other Injury Crashes:	49
Total Other Injuries:	89
Prop Damage Crashes:	109
Total Crashes:	169

Statistics	
Fatal Crashes:	3
Total Killed:	4
Incap In	44
Total Incap injuries:	10
Other Injury Crashes:	31
Total Other Injuries:	50
Prop Damage Crashes:	76
Total Crashes:	120

Region 2 (Chattanooga)



City of Cleveland
Inman Rd



- Reduce four to three lanes
- Slow Traffic
- Future Downtown Redevelopment

Safety Improvements

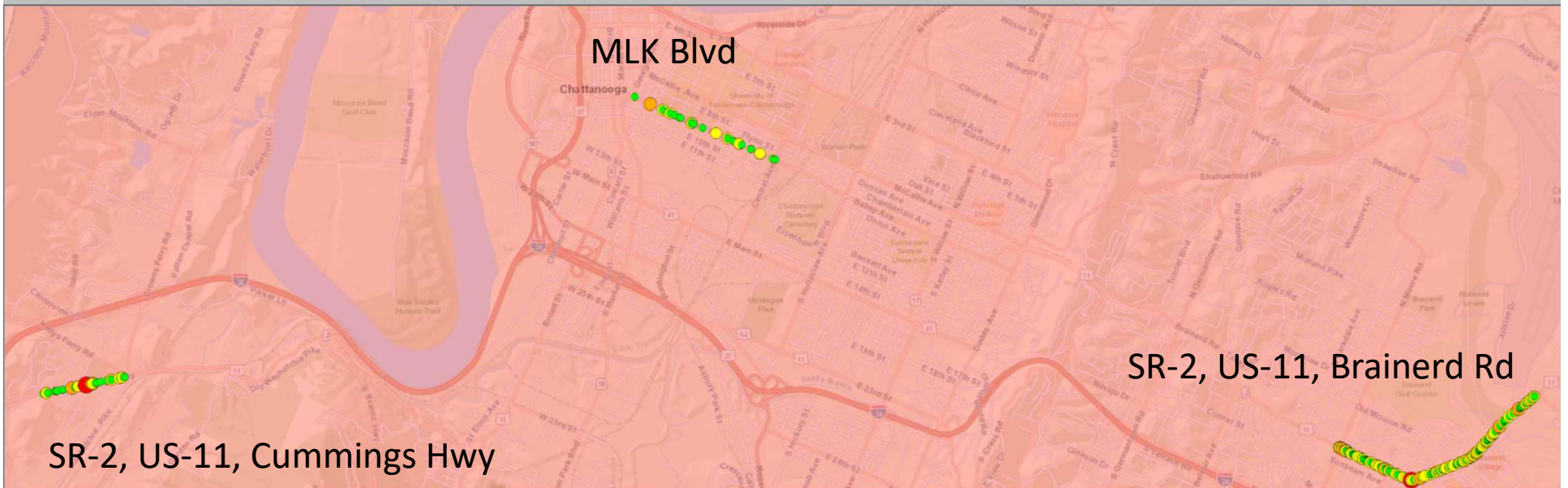
- Turn Lanes
- Roundabouts
- Medians

Aesthetic Features

- Greenspace
- Trees
- Upgraded Ped Facilities

Region 2 (Chattanooga)

- Hamilton Co and City of Chattanooga



Region 2 (Chattanooga)

- Cummings Hwy



Before



After

Region 2 (Chattanooga)

- Cummings Hwy

AADT

2015 – 13,081

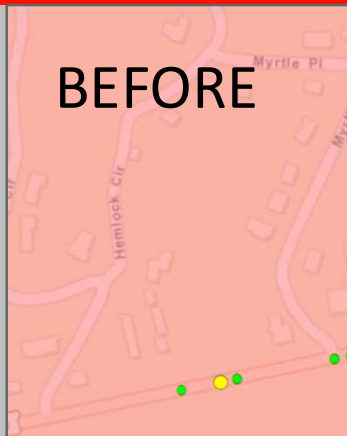
2016 – 13,320

2017 – 13,993

2018 – 12,628

2019 - ?

BEFORE



Manner of Collision	
Rear End:	7
Head On:	1
Rear-to-Side / Rear:	0
Angle:	6
Sideswipe Same Dir:	2
Sideswipe Opp Dir:	1
Unknown:	1

Statistics	
Fatal Crashes:	1
Total Killed:	1
Incap Inj	2
Total Ir	8
Other Injury Crashes:	5
Total Other Injuries:	10
Prop Damage Crashes:	12
Total Crashes:	20

87%

AFTER



Manner of Collision	
Rear End:	0
Head On:	1
Rear-to-Side / Rear:	0
Angle:	1
Sideswipe Same Dir:	1
Sideswipe Opp Dir:	0
Unknown:	0

Statistics	
Fatal Crashes:	0
Total Killed:	0
Incap Ir	1
Total Incap Injuries:	1
Other Injury Crashes:	1
Total Other Injuries:	3
Prop Damage Crashes:	2
Total Crashes:	3

85%

Region 2 (Chattanooga)

- Brainerd Rd



Before



After

Region 2 (Chattanooga)

- Brainerd Rd

AADT

2016 – 31,862

2017 – 31,646

2018 – 23,330

BEFORE

Manner of Collision

Rear End:	81
Head On:	6
Rear-to-Side / Rear:	0
Angle:	59
Sideswipe Same Dir:	35
Sideswipe Opp Dir:	2
Unknown:	3

Statistics

Fatal Crashes:	0
Total Killed:	0
Incap Injury	1
Total Inca	2
Other Injury Crashes:	35
Total Other Injuries:	43
Prop Damage Crashes:	154
Total Crashes:	190

23% (arrow from 36 to 190)

AFTER

Manner of Collision

Rear End:	45
Head On:	6
Rear-to-Side / Rear:	1
Angle:	44
Sideswipe Same Dir:	11
Sideswipe Opp Dir:	3
Unknown:	4

Statistics

Fatal Crashes:	0
Total Killed:	0
Incap Injur	0
Total Incap Injuries:	0
Other Injury Crashes:	28
Total Other Injuries:	41
Prop Damage Crashes:	90
Total Crashes:	118

38% (arrow from 28 to 118)

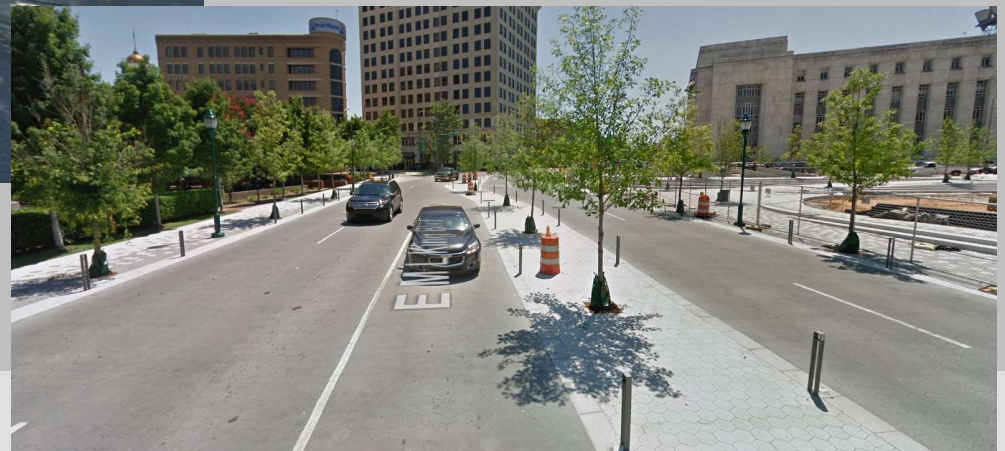
Region 2 (Chattanooga)

- MLK Blvd



Before

After



Region 2 (Chattanooga)

- MLK Blvd

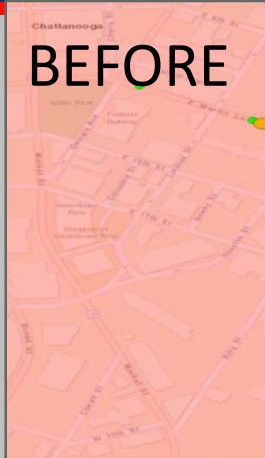
AADT

2017 – 11,738

2018 – 12,016

2019 – 10,988

BEFORE



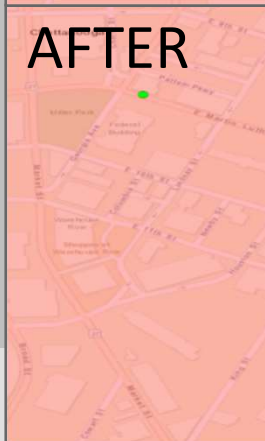
Manner of Collision

Rear End:	2
Head On:	0
Rear-to-Side / Rear:	0
Angle:	13
Sideswipe Same Dir:	5
Sideswipe Opp Dir:	0
Unknown:	1

Statistics

Fatal Crashes:	0
Total Killed:	0
Incap Injury Crashes:	0
Total Incap Injuries:	0
Other Injury Crashes:	7
Total Other Injuries:	7
Prop Damage Crashes:	15
Total Crashes:	22

AFTER



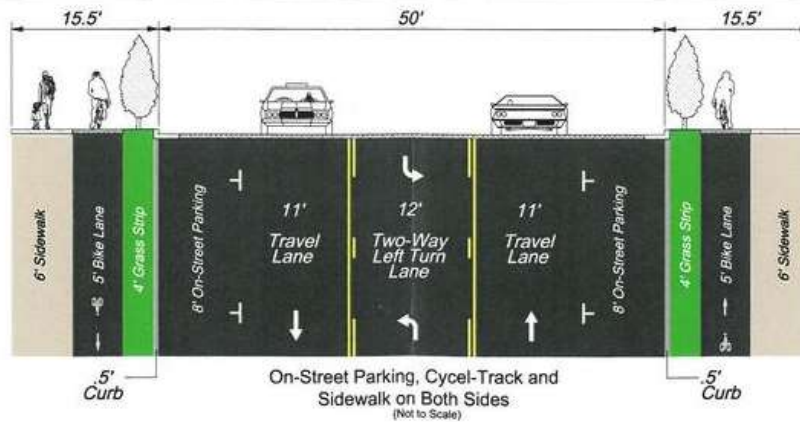
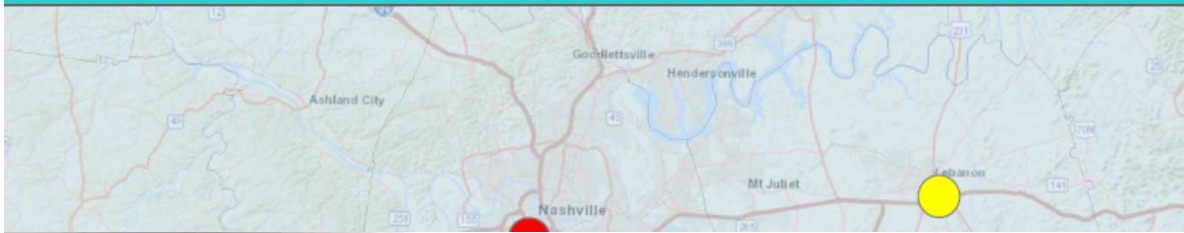
Manner of Collision

Rear End:	11
Head On:	0
Rear-to-Side / Rear:	0
Angle:	10
Sideswipe Same Dir:	0
Sideswipe Opp Dir:	0
Unknown:	1

Statistics

Fatal Crashes:	0
Total Killed:	0
Incap Injury Crashes:	0
Total Incap Injuries:	0
Other Injury Crashes:	6
Total Other Injuries:	8
Prop Damage Crashes:	18
Total Crashes:	24

Region 3 (Nashville)



Legend

- 6' Sidewalk
- 5' Bike Lane
- 4' Grass Strip
- On-Street Parking
- Roadway



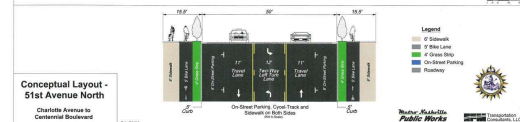
**Metro Nashville
Public Works**

**Transportation
Consultants, LLC**

Conceptual Layout - 51st Avenue North

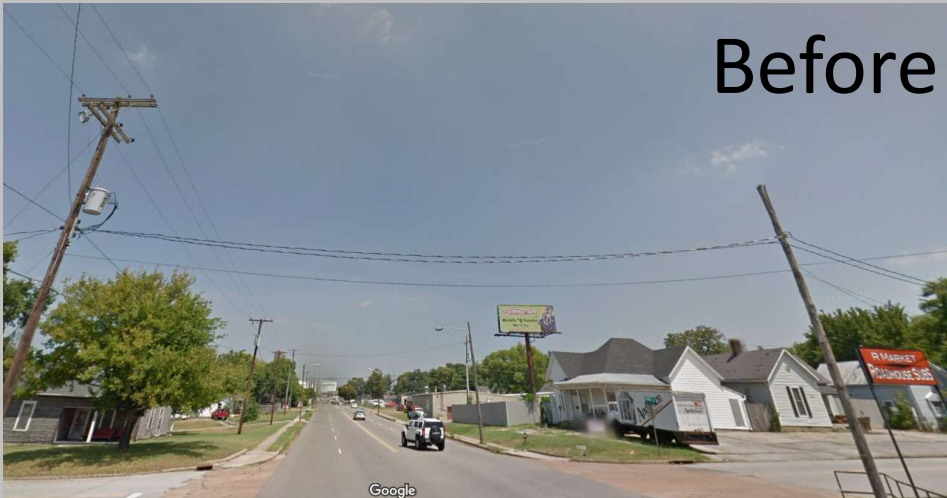
Charlotte Avenue to
Centennial Boulevard

Date: 7/11/16

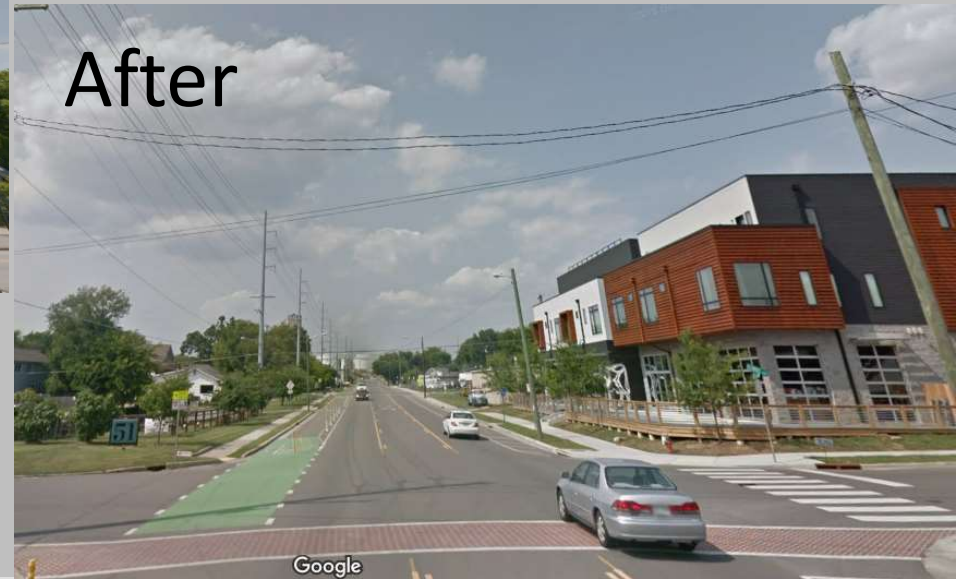


Region 3 (Nashville)

Before



After



Region 4 (Jackson/Memphis)



Manassas Street

- Reduction from five to three lanes
- Separated bike lanes
- New pedestrian infrastructure
- Curb extensions that allow for shortened crosswalks and
- Slower vehicle speeds



Summary

Analysis Category	Road Diet Before vs. After
AADT	Same or Reduced
Speeds	Reduced
Crash frequency	Average Reduction 35% Total Crashes
Crash Rates	Reduced
Crash Types	Severe Type Crashes Reduced (Rear-End, Angle, Side Swipes)



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