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

Jason Carder, P.E. – Mattern & Craig
**BACKGROUND**

<table>
<thead>
<tr>
<th>BENEFITS OF ROAD DIET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve safety</td>
</tr>
<tr>
<td>Reduce speeds</td>
</tr>
<tr>
<td>Mitigate queues associated with left-turning traffic</td>
</tr>
<tr>
<td>Improve pedestrian environment</td>
</tr>
<tr>
<td>Improve bicyclist accessibility</td>
</tr>
<tr>
<td>Enhance transit stops</td>
</tr>
<tr>
<td>Low-Cost solution</td>
</tr>
</tbody>
</table>

*Source: FHWA Road Diet Informational Guide*
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

SR 36 AADT - DOWNTOWN SECTION

SR 36 AADT - EASTERN SECTION
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:**

<table>
<thead>
<tr>
<th>Normalize speeds</th>
<th>Reduce crashes</th>
<th>Provide left turn refuge</th>
<th>On-street parking improvement</th>
<th>Improve pedestrian facilities/Bike Lanes</th>
</tr>
</thead>
</table>

[Image of Kingsport and Mattern & Craig logos]
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
<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 2013</td>
<td>TDOT informed City that Center Street scheduled to be resurfaced. City staff began discussions about possibility of road diet.</td>
</tr>
<tr>
<td>July 2013</td>
<td>City hired RPM Transportation Consultants and Mattern &amp; Craig to determine if road diet was feasible and produce design plans.</td>
</tr>
<tr>
<td>September 2013</td>
<td>Plan submittal and begin review process with TDOT</td>
</tr>
<tr>
<td>October 2013</td>
<td>Plans sent to TDOT design</td>
</tr>
<tr>
<td>April 2014</td>
<td>TDOT Bid Letting</td>
</tr>
<tr>
<td>June 2014</td>
<td>Construction begins</td>
</tr>
<tr>
<td>August 2014</td>
<td>Construction complete</td>
</tr>
</tbody>
</table>
CASE STUDY

Typical Section

- PARKING (where width allows)
- EX. CURB
- 4” SSWL
- 6” SSWL
- 4” SSYL
- 4” SBYL
- 4” SSYL
- 6” SSWL
- 4” SSWL

Kingsport, Tennessee

Mattern & Craig
ENGINEERS • SURVEYS
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

**Base on Synchro/SimTraffic Models**

<table>
<thead>
<tr>
<th></th>
<th>AM Peak</th>
<th>Mid-Day Peak</th>
<th>PM Peak</th>
<th>Free-Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4-LANE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Eastbound</strong></td>
<td>02:30</td>
<td>02:25</td>
<td>02:24</td>
<td>02:24</td>
</tr>
<tr>
<td><strong>Westbound</strong></td>
<td>02:31</td>
<td>02:30</td>
<td>02:24</td>
<td>02:21</td>
</tr>
<tr>
<td><strong>4-LANE ROAD DIET</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Eastbound</strong></td>
<td>03:06</td>
<td>03:03</td>
<td>03:37</td>
<td>03:18</td>
</tr>
<tr>
<td><strong>Westbound</strong></td>
<td>02:51</td>
<td>03:01</td>
<td>03:36</td>
<td>03:06</td>
</tr>
<tr>
<td><strong>4-LANE ROAD DIET</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Eastbound</strong></td>
<td>05:36</td>
<td>05:28</td>
<td>06:01</td>
<td>05:42</td>
</tr>
<tr>
<td><strong>Westbound</strong></td>
<td>05:22</td>
<td>05:31</td>
<td>06:00</td>
<td>05:27</td>
</tr>
</tbody>
</table>

### Scenario Travel Time Difference (Avg)

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Travel Time Difference (Avg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM Peak</td>
<td>3% Decrease</td>
</tr>
<tr>
<td>MD Peak</td>
<td>9% Increase</td>
</tr>
<tr>
<td>PM Peak</td>
<td>11% Increase</td>
</tr>
<tr>
<td>Total</td>
<td>6% Increase</td>
</tr>
</tbody>
</table>
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.

BEFORE

AFTER
At Wateree St.

BEFORE

AFTER

Kingsport, Tennessee

Mattern & Craig
Engineers • Surveyors
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

<table>
<thead>
<tr>
<th>TIME</th>
<th># OF CRASHES BY TYPE</th>
<th># OF CRASHES BY SEVERITY</th>
<th>SEVERITY INDEX (SI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>REAR END</td>
<td>ANGLE</td>
<td>SIDE-SWIPE</td>
</tr>
<tr>
<td>BEFORE (2011-2013)</td>
<td>151</td>
<td>83</td>
<td>34</td>
</tr>
<tr>
<td>AFTER (2015-2017)</td>
<td>168</td>
<td>67</td>
<td>11</td>
</tr>
</tbody>
</table>
RESULTS

Travel times have been affected

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

<table>
<thead>
<tr>
<th>DIRECTION</th>
<th>TRAVEL TIME (SECONDS)</th>
<th>FREE-FLOW</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM PEAK</td>
<td>MID-DAY PEAK</td>
</tr>
<tr>
<td></td>
<td>BEFORE</td>
<td>AFTER</td>
</tr>
<tr>
<td>EB</td>
<td>120</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WB</td>
<td>116</td>
<td>137</td>
</tr>
<tr>
<td>EB</td>
<td>231</td>
<td>190</td>
</tr>
<tr>
<td>WB</td>
<td>221</td>
<td>206</td>
</tr>
<tr>
<td>EB</td>
<td>351</td>
<td>289</td>
</tr>
<tr>
<td>WB</td>
<td>337</td>
<td>343</td>
</tr>
</tbody>
</table>

- EB: East; WB: West
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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Road Diets in Tennessee

Lane Reconfigurations

Andrew Padgett, TDOT Region 1 Project Development, November 6, 2019
Road Diet Analysis
<table>
<thead>
<tr>
<th>Question</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the current Average Daily Traffic (ADT) greater than 25,000?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the current posted speed limit greater than 45 MPH?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the highway a diversionary route for an interstate highway?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the existing per hour/per lane peak hour volume greater than 1700?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the facility have a bus route with stops? (4 lanes to 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are there more than 10 driveways per mile present? (4 lanes to 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will the existing roadway pavement drainage be affected?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1-4
Evaluation

*Committee Approval not needed
**Committee will only review requests with AADT > 10,000.
Region 1 (Knoxville)

City of Knoxville
- Cumberland Ave
- N Central St.
- Broadway
- Broadway Viaduct
- Moody Ave
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
Before

7.2 Mile Segment Experienced (10 years)

- 14 Fatal Crashes
- 48 Incapacitating Injury
- 198 Other Injury
- 685 Total Crashes
- 38% of Crashes were Severe with Injuries or Fatal

Crash Reduction Factors
- Adding a Center Turn Lane: Total Crashes – Reduction of 37%
- Adding Paved Shoulders: Up to 47% Reduction of roadway departure type crashes, depending on shoulder width

After

AADT
- 2015 – 15297
- 2016 – 15363
- 2017 – 15485
- 2018 – 15713

30% 62 44
30%
Region 2 (Chattanooga)

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

Safety Improvements
- Turn Lanes
- Roundabouts
- Medians

Aesthetic Features
- Greenspace
- Trees
- Upgraded Ped Facilities

City of Cleveland
Inman Rd
Region 2 (Chattanooga)

- Hamilton Co and City of Chattanooga

MLK Blvd
SR-2, US-11, Brainerd Rd
SR-2, US-11, Cummings Hwy
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**

**Statistics**

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

**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

**After**

**Statistics**

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

**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
Region 2 (Chattanooga)

- Brainerd Rd

Before

After
Region 2 (Chattanooga)

- Brainerd Rd

AADT
2016 – 31,862
2017 – 31,646
2018 – 23,330

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 Inca: 2
- Other Injury Crashes: 35
- Total Other Injuries: 43
- Prop Damage Crashes: 154
- Total Crashes: 190

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 Inca: 2
- Other Injury Crashes: 28
- Total Other Injuries: 41
- Prop Damage Crashes: 90
- Total Crashes: 118

BEFORE

38% 23%

AFTER

36% 28%
Region 2 (Chattanooga)

- MLK Blvd

Before

After
Region 2 (Chattanooga)

- MLK Blvd

AADT
2017 – 11,738
2018 – 12,016
2019 – 10,988

**BEFORE**

<table>
<thead>
<tr>
<th>Manner of Collision</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear End</td>
<td>2</td>
</tr>
<tr>
<td>Head On</td>
<td>0</td>
</tr>
<tr>
<td>Rear-to-Side / Rear</td>
<td>0</td>
</tr>
<tr>
<td>Angle</td>
<td>13</td>
</tr>
<tr>
<td>Sideswipe Same Dir</td>
<td>5</td>
</tr>
<tr>
<td>Sideswipe Opp Dir</td>
<td>0</td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Manner of Collision</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear End</td>
<td>11</td>
</tr>
<tr>
<td>Head On</td>
<td>0</td>
</tr>
<tr>
<td>Rear-to-Side / Rear</td>
<td>0</td>
</tr>
<tr>
<td>Angle</td>
<td>10</td>
</tr>
<tr>
<td>Sideswipe Same Dir</td>
<td>0</td>
</tr>
<tr>
<td>Sideswipe Opp Dir</td>
<td>0</td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
</tr>
</tbody>
</table>

**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
51st Avenue (The Nations)

- Opened July 2017
- Separated bike lanes
- On-Street Parking
- Curb extensions that allow for shortened crosswalks
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

<table>
<thead>
<tr>
<th>Analysis Category</th>
<th>Road Diet Before vs. After</th>
</tr>
</thead>
<tbody>
<tr>
<td>AADT</td>
<td>Same or Reduced</td>
</tr>
<tr>
<td>Speeds</td>
<td>Reduced</td>
</tr>
<tr>
<td>Crash frequency</td>
<td>Average Reduction 35% Total Crashes</td>
</tr>
<tr>
<td>Crash Rates</td>
<td>Reduced</td>
</tr>
<tr>
<td>Crash Types</td>
<td>Severe Type Crashes Reduced (Rear-End, Angle, Side Swipes)</td>
</tr>
</tbody>
</table>
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