Innovative Intersections
Frays Mill R-CUT
• Innovative Intersections
• Proposed Restricted Crossing U-Turn
• Questions and Discussion

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VDOT Culpeper District Planning Manager
# Innovative Intersections

<table>
<thead>
<tr>
<th>Intersection Type</th>
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<tbody>
<tr>
<td>Continuous Green-T (CGT)</td>
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<tr>
<td>Diverging Diamond Interchange (DDI)</td>
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<tr>
<td>Displaced Left Turn (DLT)</td>
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<tr>
<td>Median U-Turn (MUT)</td>
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<tr>
<td>Quadrant Roadway (QR)</td>
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<tr>
<td>Restricted Crossing U-Turn (RCUT)</td>
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<tr>
<td>Roundabout</td>
</tr>
<tr>
<td>Single-Point Urban Interchange (SPUI)</td>
</tr>
</tbody>
</table>

- **Improved Safety**
  - Reduced Conflict Points
- **Increased Efficiency**
- **Reduced Delay**
- **Increased Capacity**
What is an RCUT?

- Intersection design where all side street movements begin with a right turn
- Side street left-turn and through vehicles turn right and make a u-turn at a dedicated downstream median opening to complete the desired movement
- Main intersection and median u-turns can be designed as signalized, stop controlled, or yield controlled

When Should It Be Considered?

- On median-divided highways.
- At intersections:
  - With heavy through and/or left-turn traffic volumes on the major street
  - With low through and left-turn traffic volumes on the side street
  - With three or four legs

Benefits

- Improved safety: Reduces the number of points where vehicles cross paths and eliminates the potential for head-on crashes
- Increased efficiency: Each direction of the major street can operate independently, creating two one-way streets and increasing the overall intersection capacity
- Shorter wait times: Fewer traffic signal phases means less stopping for arterial vehicles and allowing only right turns from side street vehicles means less waiting
- Cost-effective: An RCUT can be more cost effective than adding lanes to improve capacity
- Alternative to signalized intersections
  - Can be Stop- or Yield- Controlled
- Corridor treatment
  - Major route integrity
  - Minimize travel time
  - Increase Capacity
- Can be Signalized

* Can also be stop- or yield- controlled

**Shorter wait times:** Fewer traffic signal phases means less stopping for mainline vehicles and right turns only from the side street vehicles means less time waiting
Navigating an R-CUT

Pedestrians use marked crosswalks to safely cross the intersection.

To make a left turn from the side street to the major street, turn right onto the major street, make a u-turn, and continue straight.

To continue straight on the side street, turn right onto the major street, make a u-turn, and turn right onto the side street.

From the major street, navigate the intersection like at a conventional intersection.

To turn right from the side street, turn right like at a conventional intersection.

Depending on their level of comfort, cyclists may navigate the intersection using vehicle or pedestrian paths.

Note: For simplicity, only two directions of traffic are shown. Opposing traffic follows similar routes.

https://www.youtube.com/watch?v=g1SA1mAXmIk&feature=youtu.be
## US29 & Burnley Station

### 5-year Crash History:
1. Deer Strike
2. Fixed Object Off Road
3. Non-Collision

### Targeted Crashes:
4. Angle
28. Rear Ends

### 9 - Injury Crashes

<table>
<thead>
<tr>
<th>Location</th>
<th>Intersection Count</th>
<th>Reduction Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maryland</td>
<td>9</td>
<td>44% reduction in total crashes</td>
</tr>
<tr>
<td>Minnesota</td>
<td>8</td>
<td>100% reduction in fatal and serious injury right-angle crashes</td>
</tr>
<tr>
<td>Missouri</td>
<td>5</td>
<td>35% reduction in total crashes</td>
</tr>
<tr>
<td>North Carolina</td>
<td>93</td>
<td>59% reduction in total crashes</td>
</tr>
</tbody>
</table>

**RCUT at US 301 and MD-313**: 92% crash reduction over a 10-year period

**100% reduction in right-angle collisions and fatal and injury crashes**

**77% reduction in all severity right-angle crashes**

**54% reduction in fatal and injury crashes**

**59% reduction in total crashes**

**71% reduction in fatal and injury crashes**

The study also showed that these crash reductions remained consistent over a range of intersection volumes.
## Summary Matrix

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Criteria</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Delay AM</td>
</tr>
<tr>
<td>Existing Condition</td>
<td>82.3 (F)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>2035 No-Build</td>
<td>104.4 (F)</td>
</tr>
<tr>
<td>2035 Signalized R-Cut Main NB</td>
<td>17.5 (B)</td>
</tr>
<tr>
<td>2035 Signalized NB U-Turn</td>
<td>27.4 (C)</td>
</tr>
<tr>
<td>2035 Signalized R-Cut Main SB</td>
<td>28.3 (C)</td>
</tr>
<tr>
<td>2035 Signalized SB U-Turn</td>
<td>2.8 (A)</td>
</tr>
</tbody>
</table>
Frequently Asked Questions

• Safety Concerns for vehicles having to merge through multiple lane of traffic to get to the u-turn location?

  The intersections are still signalized and the right turns can cross over when the signal cycles giving them a green right turn arrow

• Safety concerns for vehicle making the U-turn?

  The U-turn locations are also signalized to allow for the safe maneuvering of vehicles.

• Concerns of long delays/additional time needed for vehicles from the side streets?

  The current intersection operates at a Level of Service ‘F’ in the AM and E in the PM Peak Hour periods (based on the 2018 study) The operations will continue to decline in the future. This is mainly due to the growth in the traffic on Route 29. To address this affect the Innovation Intersection treatment like the R-Cut are installed to preserve the capacity of the main roadway and provide continue access from the side street into the future.
Frequently Asked Questions (cont.)

• Concerns that vehicles will need to travel to Greene County to make the U-turn movement?
  A new U-turn cross-over will be built just north of the current intersection (Approximately 900 ft.) about half way to the Albemarle County Sign.

• Concerns that US 29 traffic is being favored over local Albemarle County Traffic?
  US 29 is classified as Principal Arterial roadway. It traverses the State and provides access to this part of the Commonwealth. It accommodates local, regional and statewide travel as well as commerce and freight to and through the region. Yes we do favor US 29 as it is the only major thoroughfare through this part of the State and it needs to be preserved for all travelers. This is the reason the Innovative intersection treatment are evaluated as they maintain reasonable access for the side streets while continuing to preserves operations on the major roadway.
Frequently Asked Questions (cont.)

- Safety concerns for pedestrian and bicyclist crossing US 29 at the Intersection?

There are currently no Bicycle and Pedestrian facilities at or near the intersection. We currently were not including new facilities from those mode with this improvement. However we will evaluate options for a wider splitter median to accommodate a crossing of the intersection when facilities are built.
Questions and Discussion