U.S. 29 / NEW BALTIMORE BRIEFING
Intersection Improvement Projects

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History of Improvements

2001: In response to an increase in traffic crashes, flashing beacon installed at U.S. 29/Route 215 (Vint Hill Road)

2001: Environmental Impact Statement (EIS) process initiated for project to widen Route 215 & correct grade on NB approach

October 2004: Public hearing held for relocation & improvement of Vint Hill Road

Early 2005: Flashing beacons converted to full traffic signals with advance signal at crest of hill to regulate NB traffic

Late 2005: Advance signal converted to flashing warning beacons due to driver confusion & safety issues

2006: Rumble strips installed on NB lanes approach to Route 215
History of Improvements (continued)

2008: Intersection study recommends installation of “indirect left turn lanes” on U.S. 29 & addition of acceleration lane on U.S. 29 NB.

2009: EIS completed for Route 215 widening & 29 NB regrading; Fauquier Comprehensive Plan revised, Route 215 widening removed

2009: Route 29 Corridor Study accepted by Commonwealth Transportation Board, including designation of U.S. 29 as a Corridor of Statewide Significance

2009/2013: VTRANS 2035 mandates future viability & safety of corridor for regional & local traffic. Strategies include:

• Improve safety: Address high-crash areas & make improvements
• Increase capacity: Improve intersections, coordinate signals
• Evaluate alternative designs before installing additional traffic signals
History of Improvements (continued)

2014-2017: Facilitated review by stakeholder team of U.S. 29 corridor to develop strategic plan for improvements; ended without consensus

2016: Fauquier applies for SMART SCALE funding to correct grade on NB U.S. 29 approach to Vint Hill Road intersection

2017: Advance flashers coordinated with signal when queue reaches low area (blind spot) south of Vint Hill Road intersection

2017: VDOT proposes intersection improvements:

- Michigan Left intersection at Vint Hill Road using Highway Safety Improvement Program (HSIP) funds
- RCUT intersection at Broad Run Church Road approved by CTB, preliminary engineering (PE) pending
- RCUT at Route 693/838 considered for SMART SCALE application by Fauquier County.
Annual Crash Data, U.S. 29 / Vint Hill Road intersection

Crashes per year

- Signal Installed with advance signal on hill crest, early 2005
- Intersection warning flasher installed, 2001
- Advance signal converted to flashing beacons, late 2005
- Flashing beacons coordinated with intersection signals, 2017
Annual Average Daily Traffic Volumes, 1997-2017

<table>
<thead>
<tr>
<th>Year</th>
<th>AADT</th>
<th>% Change</th>
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<tbody>
<tr>
<td>1997</td>
<td>37,762</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>39,548</td>
<td>4.73%</td>
</tr>
<tr>
<td>1999</td>
<td>39,557</td>
<td>0.02%</td>
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<tr>
<td>2000</td>
<td>40,939</td>
<td>3.49%</td>
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<tr>
<td>2001</td>
<td>42,590</td>
<td>4.03%</td>
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<td>2002</td>
<td>43,760</td>
<td>2.75%</td>
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<tr>
<td>2003</td>
<td>43,699</td>
<td>-0.14%</td>
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<td>2004</td>
<td>44,575</td>
<td>2.00%</td>
</tr>
<tr>
<td>2005</td>
<td>43,727</td>
<td>-1.90%</td>
</tr>
<tr>
<td>2006</td>
<td>44,772</td>
<td>2.39%</td>
</tr>
<tr>
<td>2007</td>
<td>44,754</td>
<td>-0.04%</td>
</tr>
<tr>
<td>2008</td>
<td>43,397</td>
<td>-3.03%</td>
</tr>
<tr>
<td>2009</td>
<td>44,474</td>
<td>2.48%</td>
</tr>
<tr>
<td>2010</td>
<td>44,891</td>
<td>0.94%</td>
</tr>
<tr>
<td>2011</td>
<td>44,896</td>
<td>0.01%</td>
</tr>
<tr>
<td>2012</td>
<td>45,313</td>
<td>0.93%</td>
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<tr>
<td>2013</td>
<td>45,595</td>
<td>0.62%</td>
</tr>
<tr>
<td>2014</td>
<td>45,946</td>
<td>0.77%</td>
</tr>
<tr>
<td>2015</td>
<td>46,364</td>
<td>0.91%</td>
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<tr>
<td>2016</td>
<td>47,882</td>
<td>3.27%</td>
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<tr>
<td>2017</td>
<td>48,939</td>
<td>2.21%</td>
</tr>
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</table>

Avg. change per year 1.32%
Total 20 year increase 29.6%
Corridor crash history, Warrenton to PW Co. line

- Average 89 crashes/year within 3.5 mile section
- 180 injury crashes in 4.8 years, 280 people injured
U.S. 29 Corridor Crash Rates

U.S. 29 Statewide:
Crash: 113.04 crashes/million VMT*
Injury: 77.71 injuries/million VMT
Fatal: 0.26 fatalities/million VMT

U.S. 29 Fauquier Co:
Crash: 75.55
Injury: 38.78
Fatal: 0.19

*Vehicle Miles Traveled

North Warrenton Town Limit to Prince William Co:
Crash: 145.22
Injury: 72.31
Fatal: 0.30

Route 693 to Prince William Co:
Crash: 158.42 (+40% State Corridor)
Injury: 80.69 (+4% State Corridor)
Fatal: 0.00
U.S. 29 Corridor Facilitated Review

Focused on section of U.S. 29 from north of Warrenton to Prince William County line

Multi-year process involved VDOT, Fauquier County & stakeholder representatives with meetings led by outside facilitator

Specific locations identified for safety improvements

Corridor improvements identified to ensure safe and efficient traffic movement

Five alternative concepts developed to address identified safety and capacity issues at U.S. 29 / Vint Hill Road intersection

Study group was unable to reach consensus, review ended without recommendations
Combination of vertical curves, prevailing speed and queuing along US 29 results in an unsafe northbound condition at Vint Hill Road intersection.

**U.S. 29 / Vint Hill Road: Improvement Alternatives**

**Keep Vertical Curves**
- Speed Reduction Techniques: Alternative # 1
- Continuous Green T with channelized WB right: Alternative # 2
- WB Dual Rights, Left turns to SB 29 displaced: Alternative # 3A

**Alternative Intersection Design**
- R-Cut: Alternative # 3B
- WB Dual Rights, Left turns to SB 29 relocated: Alternative # 4

**Correct Vertical Curves**
- Safety benefit through Improved Sight Distance: Alternative # 5
- Michigan Lefts: Alternative # 3C
Alternative 1: Speed Reduction

Combination of vertical curves, prevailing speed and queuing along US 29 results in an unsafe northbound condition at Vint Hill Road intersection

- **Correct Vertical Curves**
  - Alternative # 5

- **Keep Vertical Curves**
  - Alternative # 1
    - **Speed Reduction Techniques**
      - Alternative # 1

- **Alternative Intersection Design**
  - Alternative # 2
    - Continuous Green T with channelized WB right
  - Alternative # 4
    - Michigan Lefts
  - Alternative # 3B
    - WB Dual Rights, Left turns to SB 29 relocated or displaced
  - Alternative # 3C
    - WB Single Right Channelized, Left turn to SB 29 relocated or displaced

- **R-Cut**
  - Alternative # 3A
    - WB Dual Rights, Left turns to SB 29 displaced
Alternative 1: Speed Reduction Techniques

**PROS**
- Very Low Cost
- Immediate Implementation

**CONS**
- Does not eliminate sight distance issue
- Difficult to Enforce

**SLOW Pavement Legend**
Speed decrease = 1-2 mph

**Optical Speed Bars**
Speed decrease = 1-2 mph

**Advanced Signal Flasher Improvements**
Speed decrease = 1-2 mph

**Speed Activated Warning Sign**
Speed decrease = 1-2 mph
Alternative 2: Continuous Green “T”

Combination of vertical curves, prevailing speed and queuing along US 29 results in an unsafe northbound condition at Vint Hill Road intersection.

Keep Vertical Curves

Speed Reduction Techniques
- Alternative # 1

Continuous Green T with channelized WB right
- Alternative # 2

Alternative Intersection Design
- Alternative # 3A: WB Dual Rights, Left turns to SB 29 displaced
- Alternative # 3B: WB Dual Rights, Left turns to SB 29 relocated

Correct Vertical Curves
- Alternative # 4: WB Single Right Channelized, Left turn to SB 29 relocated or displaced

Safety benefit through improved Sight Distance
- Alternative # 5

R-Cut
- Alternative # 3B: WB Dual Rights, Left turns to SB 29 relocated

Michigan Lefts
- Alternative # 4: WB Single Right Channelized, Left turn to SB 29 relocated or displaced
Alternative 2: Continuous Green T

**PROS**
- Improved Operations
- No stopping for SB Rte. 29
- Improved safety for NB Rte. 29 during PM

**CONS**
- Doesn’t eliminate PM sight distance issue to back of Queue.
Alternative 3A: RCUT w/ displaced WB lefts

Combination of vertical curves, prevailing speed and queuing along US 29 results in an unsafe northbound condition at Vint Hill Road intersection.

Keep Vertical Curves

- Speed Reduction Techniques
  - Alternative # 1

- Alternative Intersection Design
  - Continuous Green T with channelized WB right
    - Alternative # 2
  - R-Cut
  - Michigan Lefts
    - Alternative # 4

Correct Vertical Curves

- Safety benefit through Improved Sight Distance
  - Alternative # 5

Alternative # 3A
- WB Dual Rights, Left turns to SB 29 displaced

Alternative # 3B
- WB Dual Rights, Left turns to SB 29 relocated

Alternative # 3C
- WB Single Right Channelized, Left turn to SB 29 relocated or displaced
Alternative 3A: RCUT with displaced WB left turns

PROS
- Improved Operations
- No stopping for SB Rte. 29
- Improved safety for NB Rte. 29 during PM

CONS
- Doesn’t eliminate PM sight distance issue to back of queue.
- Location of AM back of queue within restricted stopping sight distance area
Alternative 3B: RCUT w/ relocated left turns

Combination of vertical curves, prevailing speed and queuing along US 29 results in an unsafe northbound condition at Vint Hill Road intersection.

- Keep Vertical Curves
  - Speed Reduction Techniques
    - Alternative # 1
  - Alternative Intersection Design
    - Continuous Green T with channelized WB right
      - Alternative # 2
    - R-Cut
      - Alternative # 3B
    - Michigan Lefts
      - Alternative # 4
- Correct Vertical Curves
  - Alternative # 5
  - Safety benefit through Improved Sight Distance
Alternative 3B: RCUT w/ left turns relocated to Riley Rd.

Additional Left Turns from WB Riley Rd.
AM Peak: 102 vehicles per hour
PM Peak: 101 vehicles per hour
Alternative 3C: RCUT w/ channelized right & acceleration lane

Combination of vertical curves, prevailing speed and queuing along US 29 results in an unsafe northbound condition at Vint Hill Road intersection

- Keep Vertical Curves
  - Speed Reduction Techniques
    - Alternative # 1
  - Alternative Intersection Design
    - Continuous Green T with channelized WB right
      - Alternative # 2
    - R-Cut
      - Alternative # 3
      - Alternative # 3A
      - Alternative # 3B
    - Michigan Lefts
      - Alternative # 4
  - Correct Vertical Curves
    - Alternative # 5
    - Safety benefit through Improved Sight Distance

- Alternative # 3C: WB Single Right Channelized, Left turn to SB 29 relocated or displaced
Alternative 3C: RCUT w/ channelized right & accel lane

**PROS**
- Improved Operations
- No stopping for SB Rte. 29
- Improved safety for NB Rte. 29 during PM

**CONS**
- May not be adequate gaps for U-Turns to SB 29 without separate acceleration lane or traffic signal
- Doesn’t eliminate PM sight distance issue to back of queue
- Location of AM back of queue within restricted stopping sight distance area

Note: Protected-Permissive Phasing with Flashing Yellow Arrow yields 95th percentile queues of 314 FT and 150FT for the AM and PM peaks respectively.
Alternative 4: Michigan Lefts

Combination of vertical curves, prevailing speed and queuing along US 29 results in an unsafe northbound condition at Vint Hill Road intersection

Keep Vertical Curves

Speed Reduction Techniques
- Alternative # 1

Alternative Intersection Design
- Continuous Green T with channelized WB right - Alternative # 2
- R-Cut - Alternative # 3
- Michigan Lefts - Alternative # 4

Correct Vertical Curves
- Safety benefit through Improved Sight Distance - Alternative # 5
- WB Dual Rights, Left turns to SB 29 displaced - Alternative # 3A
- WB Dual Rights, Left turns to SB 29 relocated - Alternative # 3B
- WB Single Right Channelized, Left turn to SB 29 relocated or displaced - Alternative # 3C
Alternative 4: Michigan (displaced) Lefts

**PROS**
- Minimal queues for both NB and SB Rte. 29
- Improved operations by splitting traffic signal into two.
- Improved safety since there are no sight distance problems for either traffic signal

**CONS**
- Increased travel distance for motorists to and from Vint Hill Road

Protected U-Turn for traffic wanting to access Vint Hill Rd
Existing traffic signal and crossover at Vint Hill removed
Protected U-Turn for traffic wanting to access SB Rte 29
Upstream traffic signal for NB Rte. 29 provides gap for Vint Hill traffic wanting to enter Rte. 29 NB
Alternative 4: Michigan (displaced) Lefts, continued

Traveling southbound on Rte. 29

AM 95% Queue=475'
AM 50% Queue=350'

PM 95% Queue=310'
PM 50% Queue=200'

AM 95% Queue=100'
AM 50% Queue=60'

Traveling northbound on Rte. 29

PM 95% Queue=225'
PM 50% Queue=190'

AM 95% Queue=475'
AM 50% Queue=350'

Virginia Department of Transportation
Alternative 5: Correct grade on NB approach

Combination of vertical curves, prevailing speed and queuing along US 29 results in an unsafe northbound condition at Vint Hill Road intersection.

- **Keep Vertical Curves**
  - **Speed Reduction Techniques**
    - Alternative # 1
  - **Alternative Intersection Design**
    - Continuous Green T with channelized WB right
      - Alternative # 2
    - R-Cut
      - Alternative # 3
      - Alternative # 3A
      - Alternative # 3B
    - Michigan Lefts
      - Alternative # 4
      - Alternative # 3C

Correct Vertical Curves

- Safety benefit through Improved Sight Distance
Alternative 5: Correct grade on NB approach
### Comparison of Alternatives

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3A</th>
<th>Alternative 3B</th>
<th>Alternative 3C</th>
<th>Alternative 4</th>
<th>Alternative 5</th>
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<tbody>
<tr>
<td>Project Cost</td>
<td>&lt;$100 K</td>
<td>$2.25 M</td>
<td>$1.90 M</td>
<td>$1.93 M</td>
<td>$2.10 M</td>
<td>$1.37 M</td>
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<td>R/W &amp; Utility Needs</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Some Utility Conflicts</td>
<td>Minimal</td>
<td>R/W Needed</td>
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<tr>
<td>Anticipated Sight Distance Safety Improvement</td>
<td>Minimal</td>
<td>Minimal</td>
<td>Minimal</td>
<td>Minimal</td>
<td>Minimal</td>
<td>Minimal</td>
<td>Substantial</td>
</tr>
<tr>
<td>AM Peak Hour Congestion Improvement (Delay)</td>
<td>No Change</td>
<td>Minimal</td>
<td>Substantial</td>
<td>Substantial</td>
<td>Substantial</td>
<td>Substantial</td>
<td>Substantial</td>
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<tr>
<td>Maintains Direct Access from SB Rt. 29 to Vint Hill Rd</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Time to Implement</td>
<td>Short</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Long</td>
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<tr>
<td>Benefit/Cost Ratio</td>
<td>Not Calculated</td>
<td>0.78</td>
<td>2.14</td>
<td>2.12</td>
<td>2.65</td>
<td>12.41</td>
<td>0.57</td>
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</table>

- **Less than $500 K**
- **Between $500 K and $5.0 M**
- **More than $5.0 M**

- **Improves from LOS E to LOS C or better**
- **Improves from LOS E to LOS D**
- **Degrades from LOS E to LOS F**

Queue length in green zone

Queue length shortens to but still in same zone (red or green) as existing condition or Queue changes zone but is short enough that there anticipated safety benefits

Queue length was in green zone but now in red zone
Traffic Engineering Basics

Traffic Signals

• Signals that have capacity issues will see increased crash rates due to congestion
• Signals in more rural, high speed areas or boundaries between rural & urban often see higher injury rates and more severe crashes
• Geometric design and roadway alignment are critical safety factors for signal operations
Alternatives to Conventional Intersection Improvements

Alternative Intersections/Interchanges: Informational Report

FHWA publication, April 2010
Median U-Turn (Michigan Left)

Advantages
• Improved safety: 20-60% crash reduction
• Improved Capacity: 20-30% reduction in stops/delay
• Simplified operation & reduced conflicts
• Lower cost of construction compared with widening or grade separation
• Less impact to surrounding property than larger scale projects

Disadvantages
• Reduced direct access
• Heavy vehicle accommodations
Restricted Crossing U-Turn (RCUT)

Advantages
• Improved Capacity for lower volume side streets (up to 30%)
• Improved Safety due to reduced conflict points (30-50% lower, MD 90-100%)
• Allows more access than MUT
• Generally can be done within ROW

Disadvantages
• Heavy vehicles
• Pedestrian accommodations
Summary

• A comprehensive plan for improvements to the section must be developed
• Access management is a critical component of the plan
• Innovative and alternative intersection designs can help solve problems at lower cost, reduced environmental impact and with a greater sense of place
Success Stories
U.S. 29 Corridor Improvements
Fosters Fork Rd. to Pepsi Co.
U.S. 29 Corridor Improvements
Grays Mill Rd. to Commerce Court
U.S. 29 Corridor Improvements
Riley Rd. to Vint Hill Rd.
U.S. 29 / Broad Run Church Rd. Signalized RCUT concept
U.S. 29 / Vint Hill Rd.
Michigan Left concept

Traffic signal does not apply to southbound Rte 29 traffic
Existing traffic signal and crossover at Vint Hill removed
Protected U-Turn for traffic wanting to access SB Rte 29
Protected U-Turn for traffic wanting to access Vint Hill Rd
Upstream traffic signal for NB Rte. 29 provides gap for Vint Hill traffic wanting to enter Rte. 29 NB
Why Alternative 4 (Michigan Left) Works

Current condition

Condition with Michigan (displaced) Left turn
Where We Are Today

- U.S. 29 at Route 600 (Broad Run Church Road): RCUT concept has been approved for funding by CTB. Preliminary engineering phase is pending.
- U.S. 29 at Route 215 (Vint Hill Road): Michigan Left concept submitted to Traffic Engineering for Highway Safety Improvement Program (HSIP) funding.
- Fauquier Board of Supervisors requested by resolution that “VDOT and Fauquier County work together to reach a design solution for the U.S. 15/29 corridor no later than May 1, 2019.”