Limited funding for transportation improvements requires strategic selection of projects to ensure resource allocation is optimized.
Trump Infrastructure Plan Wants to Stop ‘Overreliance’ on Federal Money

The president's long-awaited infrastructure plan pushes state and local governments to spend more but offers them a smoother path to getting federal regulatory approval.

BY DANIEL O. VOCK | FEBRUARY 11, 2018
Turning an infrastructure plan into a reality

BY RICK CAPKA, OPINION CONTRIBUTOR — 02/15/18 05:00 PM EST
THE VIEWS EXPRESSED BY CONTRIBUTORS ARE THEIR OWN AND NOT THE VIEW OF THE HILL
Solution

Develop project prioritization and implementation planning criteria to inform transportation investment decision-makers.
Project Prioritization

Approach
- Identify Goals & Performance Measures
- Conduct Data Collection
- Develop Evaluation & Prioritization Criteria
- Conduct Scenario Planning & Evaluation
- Prepare Recommendations & Implementation Plan

Strategies
- Quantitative Measures
- Qualitative Measures
- Benefit-Cost or Monetization
- BIG Data & Travel Time Reliability
- Stakeholder Input
Examples

Rural and urban case studies demonstrating project prioritization.
Recommend and prioritize locations for passing lanes along TH 15 based on:

- Need for improved safety and mobility
- Minimal ROW needs
- Low risk for drainage/wetland and environmental impacts
- Low risk for other project delivery issues
Data Collection

Traffic Characteristics:
- 2017 daily traffic = 4,600 AADT
- 2045 daily traffic projection = 7,000
- Existing heavy trucks = 9%

Existing No Passing Zones:
- Northbound = 25%
- Southbound = 21%

Passing Lanes Considered:
- 3-lane passing lane heading south from Kimball
- 3-lane passing lane heading north from Kingston
- 4-lane passing lane (north of TH 24)
Prioritization Approach

1. Ranked based on mobility, safety, and economic criteria (i.e. Benefit-Cost).
2. Considered regional traffic and spacing of passing lanes.
3. Potential risks identified.
Segment Prioritization

Priority #1 – Segments 1/2
- 3-lane passing lane heading north from Kimball
- 3-lane passing lane heading south from I-94

Priority #2 – Segment 3
- 4-lane passing lane (north of TH 24)

Priority #3 – Segment 5
- 4-lane passing lane mid-segment

Priority #4 – Segment 4
- 3-lane passing lane heading north from Dassel
Prioritize locations for widening shoulders of roadway segments that are not currently built to MnDOT Standards.

Includes all two-lane two-way State roadways within District 4 with shoulder widths less than six feet.
Evaluation Criteria

- Multimodal
- System Preservation
- Environmental Impacts
- Mobility
- Constructability
- Safety
- Functionality

Evaluation

D4 Shoulder Widening Prioritization
Evaluation Criteria – Safety

Crash Rates
- Existing crash rates and critical crash rates were calculated.
- Predicted future year crash rates were calculated.
- Segments with largest reduction in future year predicted crash rates received the highest score.

District Safety Plan
- Identified high priority segments from MnDOT’s District 4 Safety Plan.
- High Priority Segments with the largest number of risk factors scored the highest.
Evaluation Criteria – Multimodal Accommodations

Bicycle Corridors
- MnDOT District Bicycle Plan Sustainability Analysis routes were identified. Segments were rated in the plan as good, fair, or poor based on user comfort.

Unique Travel Corridors
- Includes unique travel corridors (i.e. Amish users, corridors within American Indian Reservations, high pedestrian corridors, etc.) that would benefit from wider paved shoulders.

Heavy Commercial Route
- Heavy commercial percentages were calculated. Shoulders provide an area for emergency parking and improve lateral separation for vehicles.

Agricultural or Recreational Route
- District 4 staff identified corridors with heavy agricultural or recreational use.

D4 Shoulder Widening Prioritization
Evaluation Criteria – System Preservation

Maintenance Issues

- District 4 staff identified maintenance issues:
  - Steep slopes
  - Narrow shoulders
  - Loose shoulder material
  - Shoulders prone to erosion
- Segments with identified maintenance issues received the highest score.
Prioritization Scenario Evaluation

1: Project Need

- SAFETY: 30%
- MOBILITY: 15%
- SYSTEM PRESERVATION: 30%
- ENVIRONMENTAL IMPACTS: 10%
- CONSTRUCTABILITY: 5%
- FUNCTIONALITY: 5%

2: Project Delivery

- SAFETY: 5%
- MOBILITY: 15%
- SYSTEM PRESERVATION: 5%
- ENVIRONMENTAL IMPACTS: 10%
- CONSTRUCTABILITY: 30%
- FUNCTIONALITY: 30%

3: Benefit-Cost Analysis

D4 Shoulder Widening Prioritization
D4 Shoulder Widening Prioritization

Ranking based on Project Need
- Tier 1 (1 - 20)
- Tier 4 (61 - 80)
- Tier 2 (21 - 40)
- Tier 5 (81 - 104)
- Tier 3 (41 - 60)

Ranking based on Project Delivery
- Tier A (1 - 30)
- Tier B (31 - 60)
- Tier C (61 - 104)

Project Benefit-Cost Ratio:
- X.X Benefit Cost Ratio

Legend:
- Pelican Rapids
- Fergus Falls
Develop a vision for an east-west arterial roadway design.

Develop implementation plan to address existing issues and accommodate future development needs.
Bailey Road Corridor

About the Bailey Road Corridor

- Primary connection to I-494 and US 10/61
- Access to businesses, schools, churches, healthcare, and residential properties
- Used by pedestrians and bicyclists
- Delays, access issues, and safety concerns with existing traffic
- More than 3000 new housing units anticipated by 2021 will directly increase traffic (see map)
## Corridor Priorities

<table>
<thead>
<tr>
<th>Current Need:</th>
<th>Details:</th>
<th>NEIGHBORHOOD GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of sidewalks/trails</td>
<td>Difficult to get around on foot or bike with lack of sidewalks/trails</td>
<td>Group 1 Group 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group 3 Group 4</td>
</tr>
<tr>
<td>Difficulty making left turns</td>
<td>Challenging to find gaps in traffic to make left turns onto Bailey, but</td>
<td>Group 1 Group 3</td>
</tr>
<tr>
<td></td>
<td>also making lefts from Bailey; some cars passing illegally on shoulder</td>
<td>Group 2 Group 4</td>
</tr>
<tr>
<td>Traffic congestion/delays</td>
<td>Some drivers experience delays and traffic backups</td>
<td>Group 1 Group 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group 2 Group 4</td>
</tr>
<tr>
<td>Military/Bailey intersection needs attention</td>
<td>Stop signs cause significant backups during rush hour; poor lines of</td>
<td>Group 1 Group 2</td>
</tr>
<tr>
<td></td>
<td>sight</td>
<td>Group 3 Group 4</td>
</tr>
<tr>
<td>Speeding</td>
<td>Some people are driving in excess of speed limit</td>
<td>Group 2 Group 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group 4</td>
</tr>
<tr>
<td>Posted speed</td>
<td>Some concerned that posted speed is too high, while others like the</td>
<td>Group 1 Group 2</td>
</tr>
<tr>
<td></td>
<td>mobility it provides</td>
<td>Group 3 Group 4</td>
</tr>
<tr>
<td>Traffic noise</td>
<td>Large trucks generate loud noises and cause vibrations</td>
<td>Group 1 Group 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group 3 Group 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future Concern:</td>
<td>Details:</td>
<td>NEIGHBORHOOD GROUP</td>
</tr>
<tr>
<td>Pedestrian crossings</td>
<td>Need more opportunity to cross Bailey Road safely</td>
<td>Group 1 Group 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group 3 Group 4</td>
</tr>
<tr>
<td>Impacts of wider roadway</td>
<td>Addition of lanes and trails may have impacts to private property</td>
<td>Group 1 Group 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group 3 Group 4</td>
</tr>
<tr>
<td>Development/growth</td>
<td>Continued growth and development will continue to strain Bailey Road</td>
<td>Group 1 Group 2</td>
</tr>
<tr>
<td></td>
<td>and limit mobility if nothing is done</td>
<td>Group 3 Group 4</td>
</tr>
<tr>
<td>Speed</td>
<td>Wider roadway may generate higher traffic speed</td>
<td>Group 1 Group 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group 3 Group 4</td>
</tr>
<tr>
<td>Increased traffic noise</td>
<td>Noise may increase with more traffic</td>
<td>Group 1 Group 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group 3 Group 4</td>
</tr>
</tbody>
</table>
## Prioritization Process

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Evaluation Criteria</th>
<th>Measures</th>
<th>Prioritization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>Crash History</td>
<td>Crash Rate or Correctable Crashes</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>Predicted Crashes based on Highway Safety Manual</td>
<td>Number of Crashes or Crash Modification Factor</td>
<td></td>
</tr>
<tr>
<td>Mobility</td>
<td>Future Traffic Growth</td>
<td>Growth Percentage from existing to 2040 AADT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2025 No Build Corridor Operations</td>
<td>LOS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improvement to Side-Street Delay</td>
<td>Reduction in Number of Intersections with Side-Street LOS E/F in AM or PM peak hours</td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>Reserve Capacity in 2025</td>
<td>No Build Volume/ Capacity</td>
<td>20%</td>
</tr>
<tr>
<td>Multimodal Accommodations</td>
<td>Pedestrian Network Connectivity</td>
<td>Reduction in Number of Gaps in Pedestrian Network</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Additional Pedestrian Crossings</td>
<td>Number of Additional Crossings of Bailey Rd</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>Improved Pedestrian Crossings</td>
<td>Delay of Pedestrians at Crossings</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improved Pedestrian Crossings</td>
<td>Safety of Pedestrian Crossings</td>
<td></td>
</tr>
<tr>
<td>Development</td>
<td>Timing of Development</td>
<td>Year of Construction</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>Intensity of Development</td>
<td>Number of Units</td>
<td></td>
</tr>
</tbody>
</table>
Corridor Vision & Implementation Plan

**Priority 1**
- 2020
- Construct traffic signal with turn lanes

**Priority 2**
- 2020
- Reconstruct to a 4-lane divided roadway with trails on both sides

**Ability to Leverage Local Funds**
- 2019
- Widen to the south and re-stripe roadway to include more turn lanes

Anticipated Construction Schedule:
- 2019
- 2020
- 2020

Bailey Road Corridor Management
Prioritize locations for the potential installation of ramp metering.

Strategically select locations where benefit is realized without major impacts.
Why Ramp Metering?

1. Capacity improvement opportunities limited to non-existent in certain sections of I-64.
2. History has shown increasing capacity not always the best answer for congestion problems.
3. Ramp Metering systems have a long track record of being a cost-effective success nationwide.
Prioritization Criteria

1. The severity of congestion and or crash hazard caused by the bottlenecks or interchange merging’s. The key element here is this should match driver’s perception that a significant problem exists.

2. The degree that a particular metering strategy can resolve the issue from a high-level perspective.

3. The effect, if any, on downstream corridor segments.

4. The ability to coordinate the improvement recommended with existing infrastructure and future maintenance/construction activities.

5. The ability of parallel routes to accommodate any potential traffic diversions.

6. The recommendation is consistent with MoDOT’s policies, goals and objectives.
Screening Process

1. The severity of congestion and or crash hazard caused by the bottlenecks or interchange merging’s. The key element here is this should match driver’s perception that a significant problem exists.

2. The degree that a particular metering strategy can resolve the issue from a high-level perspective.

3. The effect, if any, on downstream corridor segments.

4. The ability to coordinate the improvement recommended with existing infrastructure and future maintenance/construction activities.

5. The ability of parallel routes to accommodate any potential traffic diversions.

6. The recommendation is consistent with MoDOT’s policies, goals and objectives.

Corridor Speeds Density/LOS

<table>
<thead>
<tr>
<th>Corridor Component</th>
<th>Screening Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mainline Congestion</td>
<td>Do two or more lanes operate at volumes over 1,900 vph with speeds less than or equal to 45 mph for 15-minutes a day for 100 work days per year? or Does the freeway segment operate with a speed less than 45 mph for 15-minutes a day during a typical day? or Does the freeway segment operate with a density greater than or equal to 28 vpmpl for 15-minutes a day during a typical traffic day?</td>
</tr>
<tr>
<td>Right Lane + Ramp Congestion</td>
<td>Does the right-lane volume plus the ramp volume exceed 1,900 vph with densities of 35-40 pcpmpl for 15-minutes a day for 100 work days per year?</td>
</tr>
<tr>
<td>Ramp Volume</td>
<td>Do ramp volumes fall within 300 to 900 vph (practical limits for ramp metering) for single-lane ramps? Or, do ramp volumes fall within 300 to 1,800 vph for dual-lane ramps?</td>
</tr>
<tr>
<td>Total Volume</td>
<td>Is the ramp volume plus mainline volume greater than 1,500 vphpl? or Is the ramp volume plus mainline volume greater than the following? • Two mainline lanes in one direction – 2,650 vph • Three mainline lanes in one direction – 4,250 vph • Four mainline lanes in one direction – 5,850 vph • Five mainline lanes in one direction – 7,450 vph • Six mainline lanes in one direction – 9,050 vph</td>
</tr>
</tbody>
</table>

Crashes

<table>
<thead>
<tr>
<th>Screening Component</th>
<th>Screening Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crash History</td>
<td>Is there a higher than average number of crashes associated with the traffic flows indicated above? More specifically, high instances of side-swap, rear-end, and run-off-road crashes?</td>
</tr>
<tr>
<td>Metering Effectiveness</td>
<td>Will a ramp meter or a system of ramp meters contribute to the maintenance of a specific Level of Service (LOS)?</td>
</tr>
<tr>
<td>Ramp Spacing</td>
<td>Is there a high number and density of on-ramps (interchange spacing &lt; 1 mile or an interchange complex) that impact merging and weaving?</td>
</tr>
</tbody>
</table>
Phase IA

- Benefits both AM Peak and PM Peak
- Constrained area that could be impacted by capacity improvement projects elsewhere along the corridor
- Expected to improve downstream conditions (EB and WB I-64)
- Minimal improvements to existing ramps
- Consider implementation post I-64 widening west of I-270

Phase IB

- Directional peak period benefit
- Re-evaluate conditions post I-64 widening west of I-270
- Minimal improvements to existing ramps

Phase II

- Benefits both AM Peak and PM Peak
- Likely to require modifications to outer roads (impacts to ramp length, location, and access)

Phase III

- Benefits both AM Peak and PM Peak
- Re-evaluate conditions post I-64 widening west of I-270
- Likely to require modifications to outer roads (impacts to ramp length, location, and access)

Phase IV

- Evaluate during future downtown freeway reconstruction projects

Note: This graphic illustrates existing ramps in place at the time of this study. This graphic does not include improvements to Tower Grove and Boyle that are a part of the I-64 Reconstruction at Tower Grove project.
Strategically develop lower-cost/high-benefit solutions targeting high-priority problem locations.
Performance Measures – Recurring Congestion

- Loop detector and INRIX speed data
- Data obtained from MnDOT 2015 Congestion Report
- Segments mapped to MnDOT highway line layer
- Analyze data in coordination with other measures
Performance Measures – Travel Time Reliability

- One year of travel time data (full year 2015)
- Includes all conditions
  - Weather
  - Crashes
  - Road Work
- Standard deviation of travel time distribution
Performance Measures – Crash Density

- 3 years of crash records (Jul 2012-Jun 2015)
- Individual crashes assigned by highway milepost and direction
- Densities show high crash concentrations
### Monetization of Performance Measures

<table>
<thead>
<tr>
<th>Congestion Cost</th>
<th>Reliability Cost</th>
<th>Crash Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Vehicle speeds</td>
<td>• Travel time standard deviation</td>
<td>• Number of crashes by severity</td>
</tr>
<tr>
<td>• Traffic volume</td>
<td>• Traffic volume</td>
<td>• Crash cost by severity</td>
</tr>
<tr>
<td>• Influence distance</td>
<td>• Influence distance</td>
<td></td>
</tr>
<tr>
<td>• Congestion duration</td>
<td>• Value of reliability</td>
<td></td>
</tr>
<tr>
<td>• Value of time</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Congestion Cost**
- Vehicle speeds
- Traffic volume
- Influence distance
- Congestion duration
- Value of time

**Reliability Cost**
- Travel time standard deviation
- Traffic volume
- Influence distance
- Value of reliability

**Crash Cost**
- Number of crashes by severity
- Crash cost by severity
Prioritization Criteria

Methodology: Project Return Period

Cost of Improvements

Annual User Benefits
- Delay
- Reliability
- Safety

= Years until return on investment is realized
OMSP Opportunities

Return period – years until return in investment is realized (user cost savings equates to project cost).

Recommended spot mobility locations:
- 50 locations with desirable return period
- Locations carried forward to Transportation Policy Plan

RP: >12 yrs 26 projects
RP: 4-12 yrs 22 projects
RP: <4 yrs 38 projects
Key Takeaways

Lessons learned.
What you should remember…

- Prioritization of projects allows for efficient use of transportation investment dollars.
- Tailor approach/methodology to scope of project/need.
- Leverage existing data sources to the extent possible.
- Leverage planned and programmed projects to the extent possible.
- Understand local priorities.
- Reach out to ALL stakeholders (i.e. other agency departments, public, businesses).
- Include scenario planning and evaluation to build consensus.
- Use best practices and innovation with evaluation measures.
- Be open minded and flexible!
Thank You!

Leif Garnass, PE (MN IA MO), PTOE
Senior Associate | LGarnass@SRFConsulting.com