



Active Traffic Management in Minnesota

Brian Kary
MnDOT Freeway Operations





Congestion Management: Minnesota's New Approach

Technology, transit, express lanes and telework
make it *the commuter's choice* on avoiding
congestion when and where they want



Regional Transportation Management Center

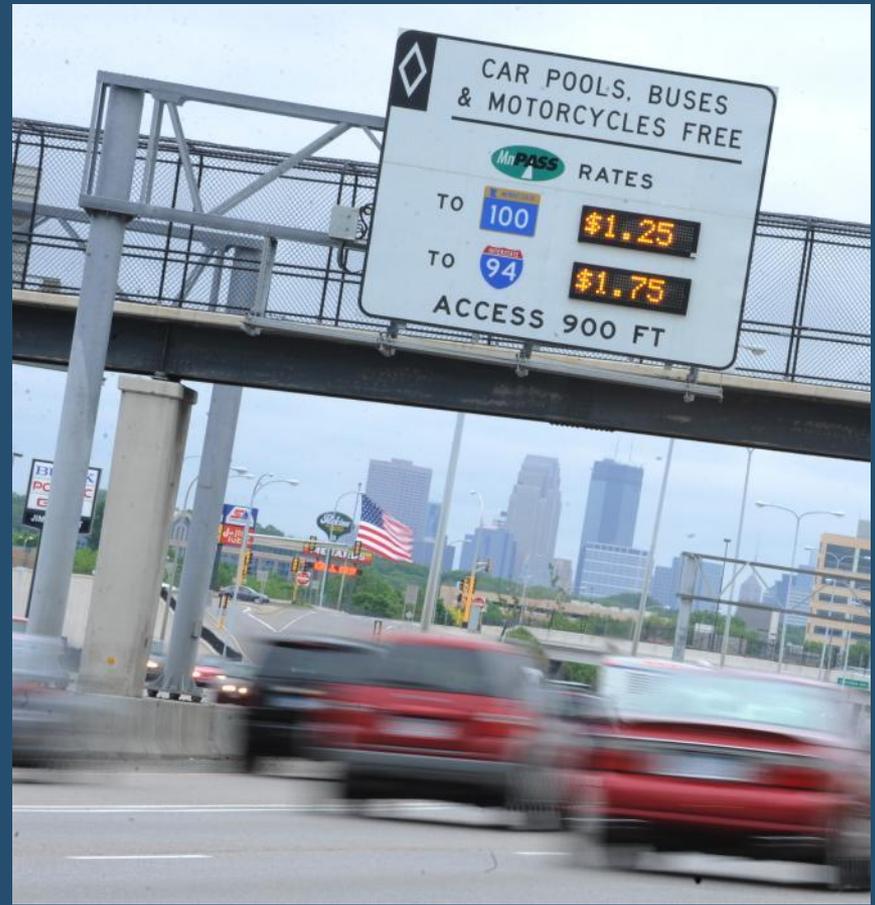
- Shared Operations Center
 - MnDOT and State Patrol
- 400 miles of freeway management system
- Backbone for ATM system



Congestion Pricing in Minnesota

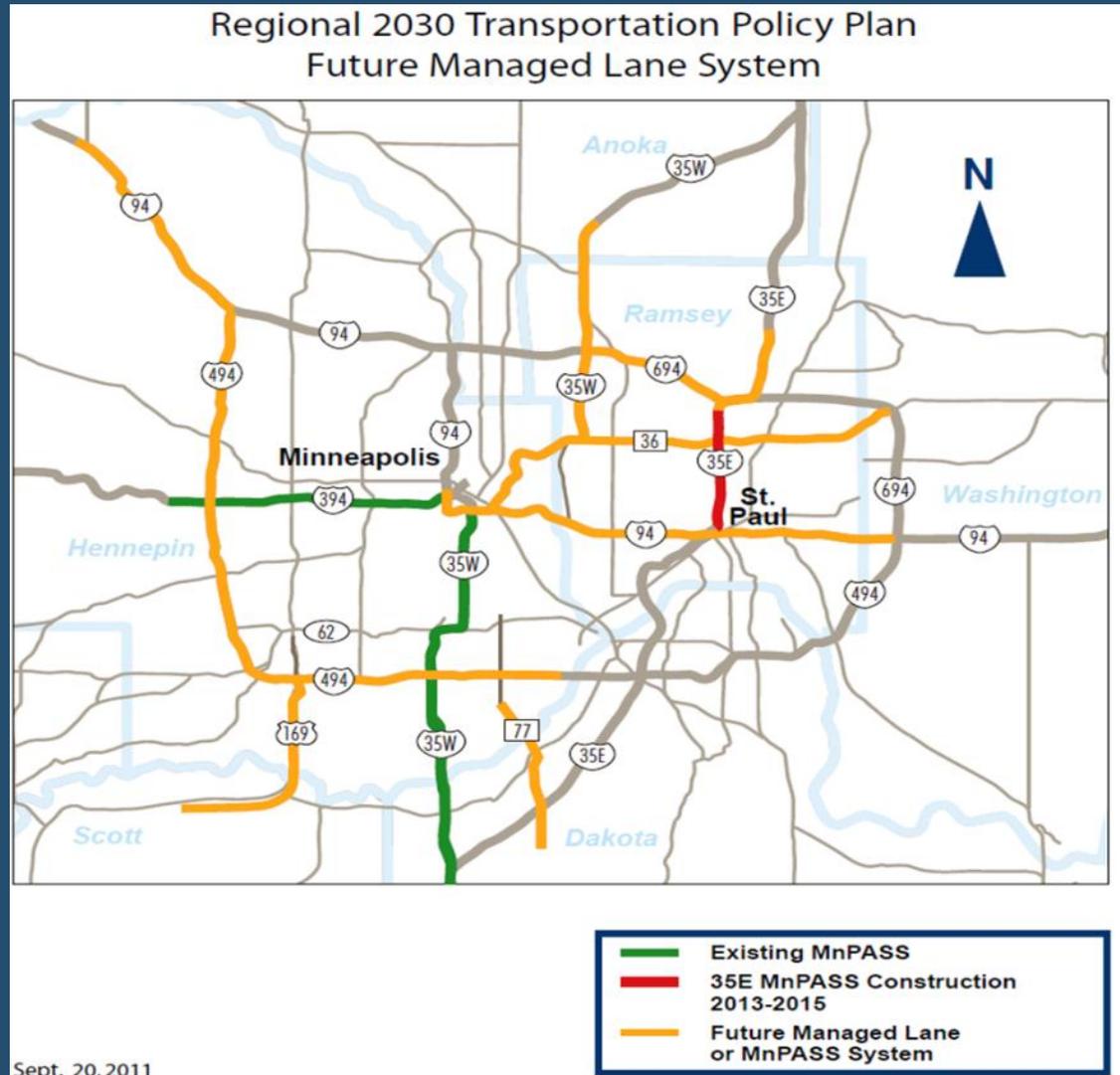


- High Occupancy Toll Lanes
- Provide for faster, safer and more reliable travel options
- Travel benefits for transit, carpoolers, motorcycles and MnPASS customers

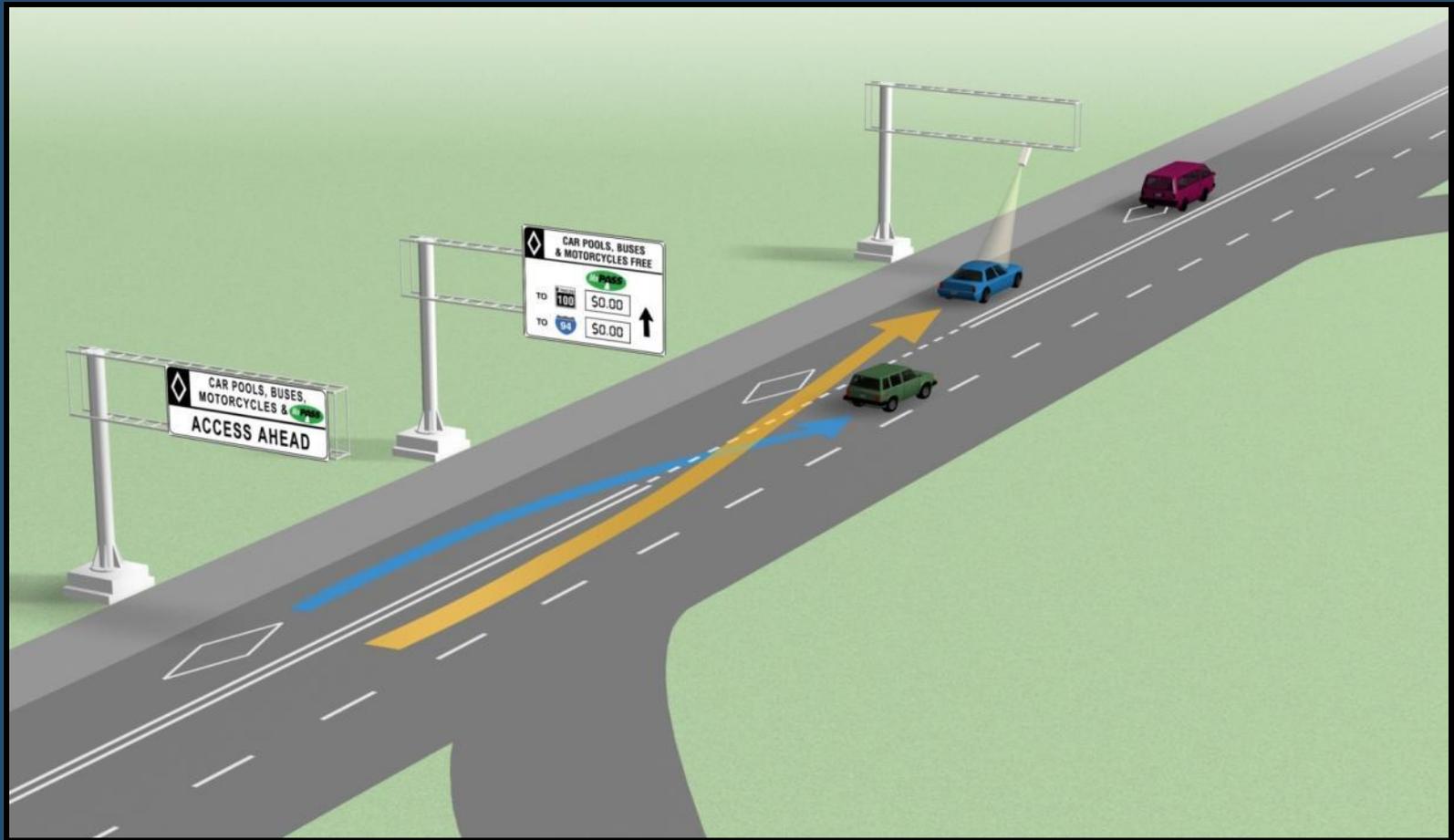


MnPASS System

- Opened 11 miles HOT lane on I-394 in 2005
- Opened 16 mile HOT lane on I-35W in 2009/2010
- Planned 4 mile HOT lane on I-35E in 2015



MnPASS I-394 Lane Design





Dynamic Pricing Overview

- Adjust the toll rate dynamically to encourage or discourage users
- Maintain free flowing traffic in MnPASS lane (speeds greater than 50 MPH) at all times
- Rates determined based on:
 - Number of vehicles in lane
 - Speed of the vehicles
 - Rate of change of traffic conditions





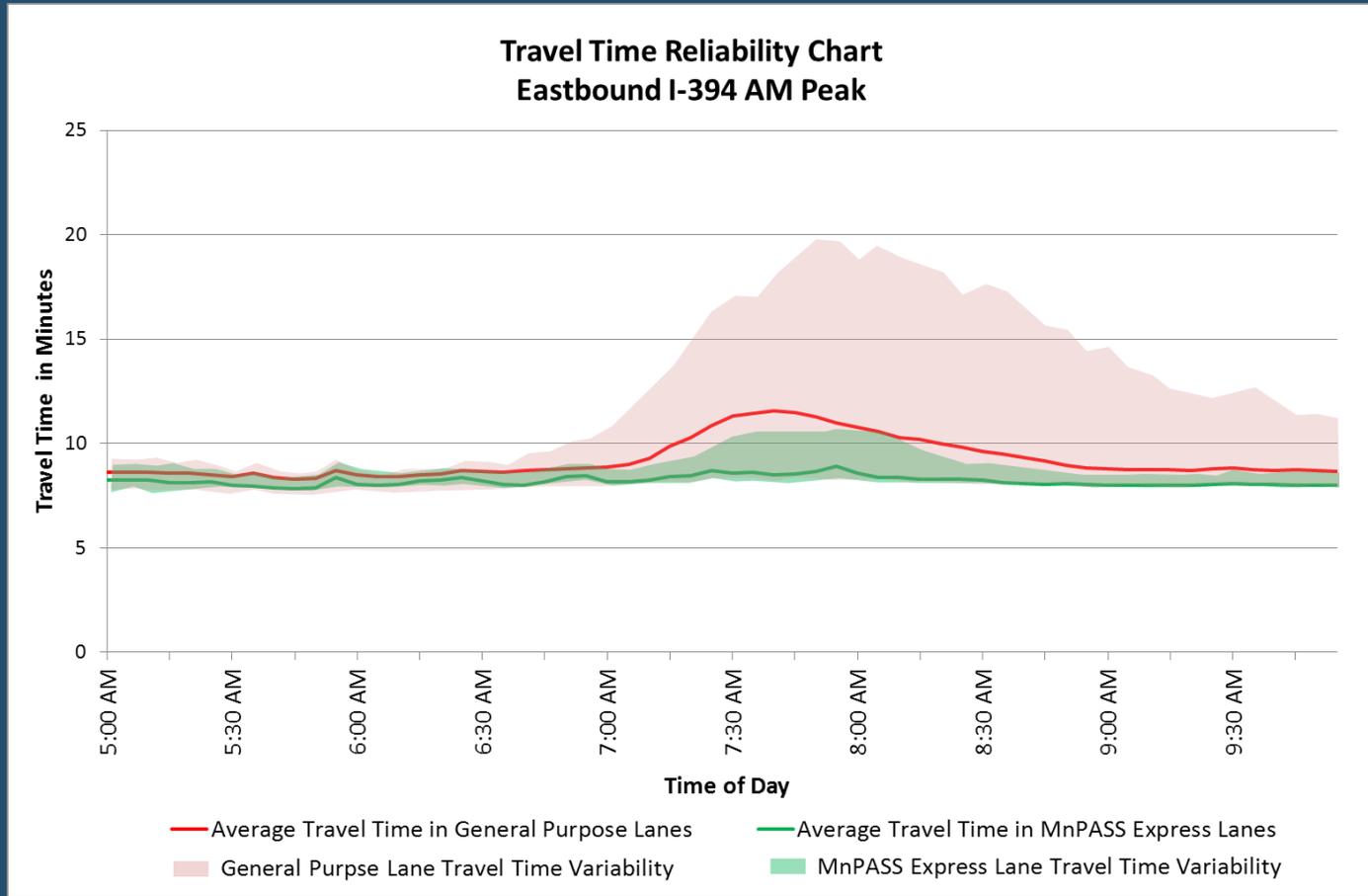
MnPASS Customer Satisfaction

- Transit users and operators strongly support system
- Over 90% satisfaction rate among customers
- Customers stay customers
- Customers strongly value reliability and choice that the MnPASS system provides

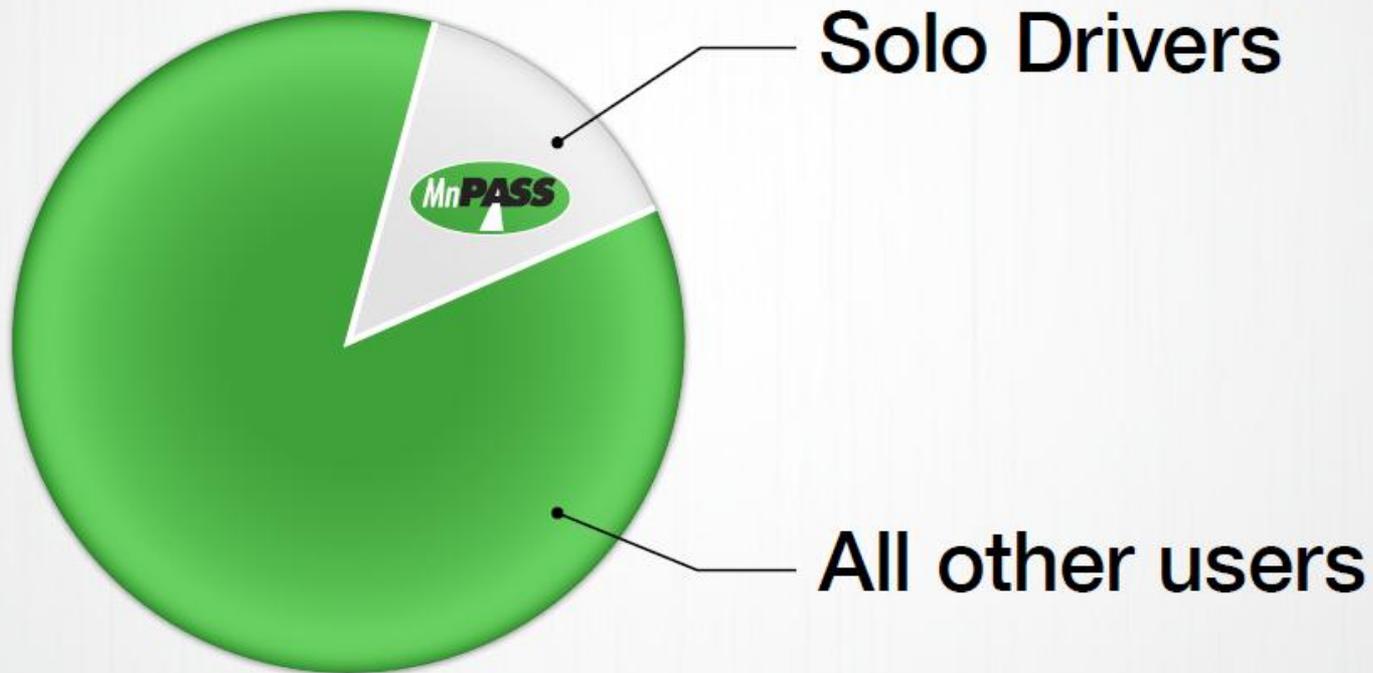




MnPASS Reliability



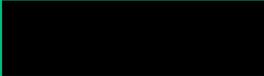
Transit, carpool and vanpool users outnumber single-occupant vehicle tollpayers by more than 7 to 1 on I-394.





I-35W HOT Lane Signing

 CAR POOLS, BUSES
MOTORCYCLES & 
ACCESS $\frac{3}{4}$ MILE

 RATE
TO DOWNTOWN 

 CAR POOLS, BUSES
MOTORCYCLES & 
6AM-10AM  MON-FRI
2PM-7PM

 RATE
TO  
TO DOWNTOWN 





MnPASS System Revenues/Expenditures

- 2011 Revenue
 - Tolls - \$2,236,180
 - Transponder Fees - \$ 404,504
- 2011 Operations & Maintenance Expenses
 - \$2,509,953
- Purpose is to efficiently and cost-effectively manage congestion, *not* to maximize revenue



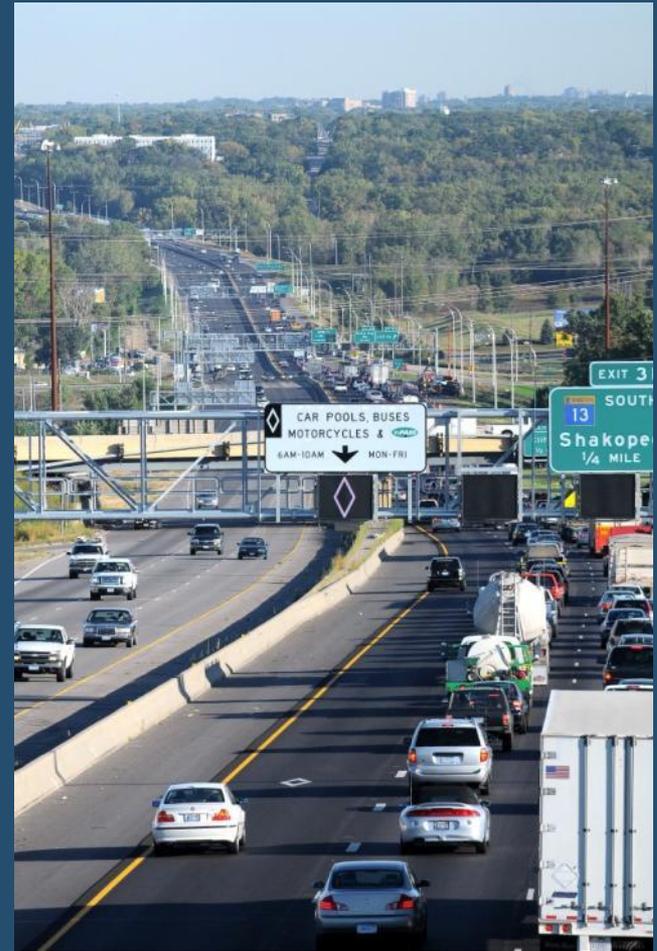
I-35W: Active Traffic Management





I-35W: The 21ST Century Highway

- Expanded MnPASS System
- Active Traffic Management
- Priced Dynamic Shoulder Lane
- Bus Rapid Transit and Stations
- Integrated Park and Rides
- Low cost/high benefit capacity





Minnesota UPA Project

- Combined \$133 M in Federal funds, with \$50.2 M in State Funds
- Funded 24 different projects and initiatives
 - Congestion Pricing
 - Tolling
 - Telecommuting
 - Technology
- Major program focus was on I-35W, Hwy 77 and Downtown Minneapolis



I-35W Intelligent Lane Control Signals

- ILCS located every $\frac{1}{2}$ mile over every lane.
- A total of about 174 ILCS.
- ILCS are a 4ft x 5ft full color matrix signs.
- Use of the ILCS is for incident management, speed harmonization and priced dynamic shoulder lane.





I-35W UPA Project Summary

- **Outcome: congestion free express lane from Burnsville Parkway to downtown Minneapolis**
- **Seven Projects for 35W**
 - 3 technology projects
 - 4 roadway projects
- **35W UPA Project Budget: \$65.7M**
 - Federal: \$42.2 M
 - State: \$23.5 M

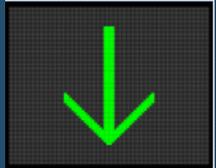




ILCS Sign Options



Blank – default



Green – Lane Open



Flashing Yellow – Caution



Red X – Closed



Yellow X – Closed Ahead



Merge



Speed Limit



White Diamond



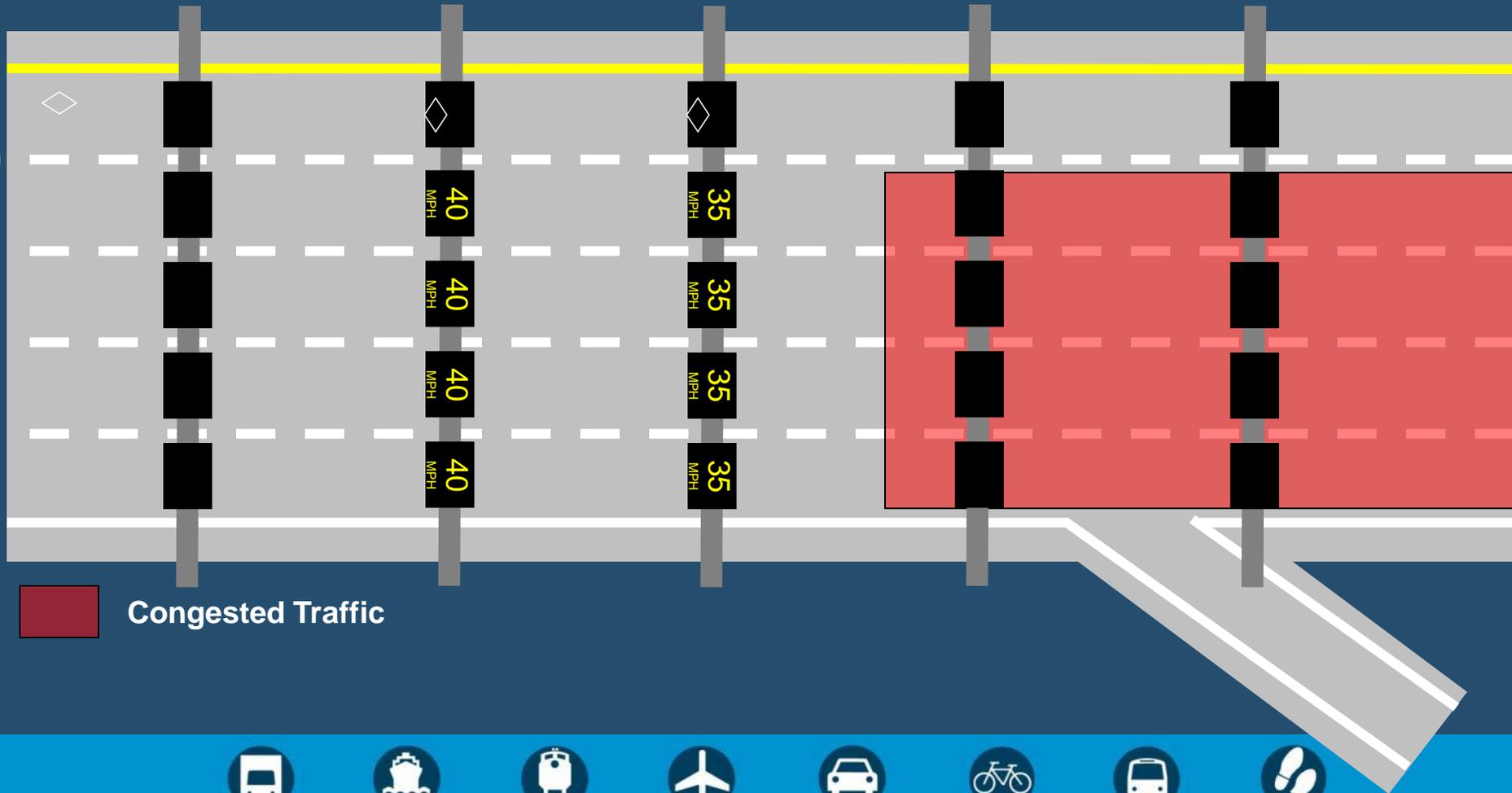
Variable Speed Limits



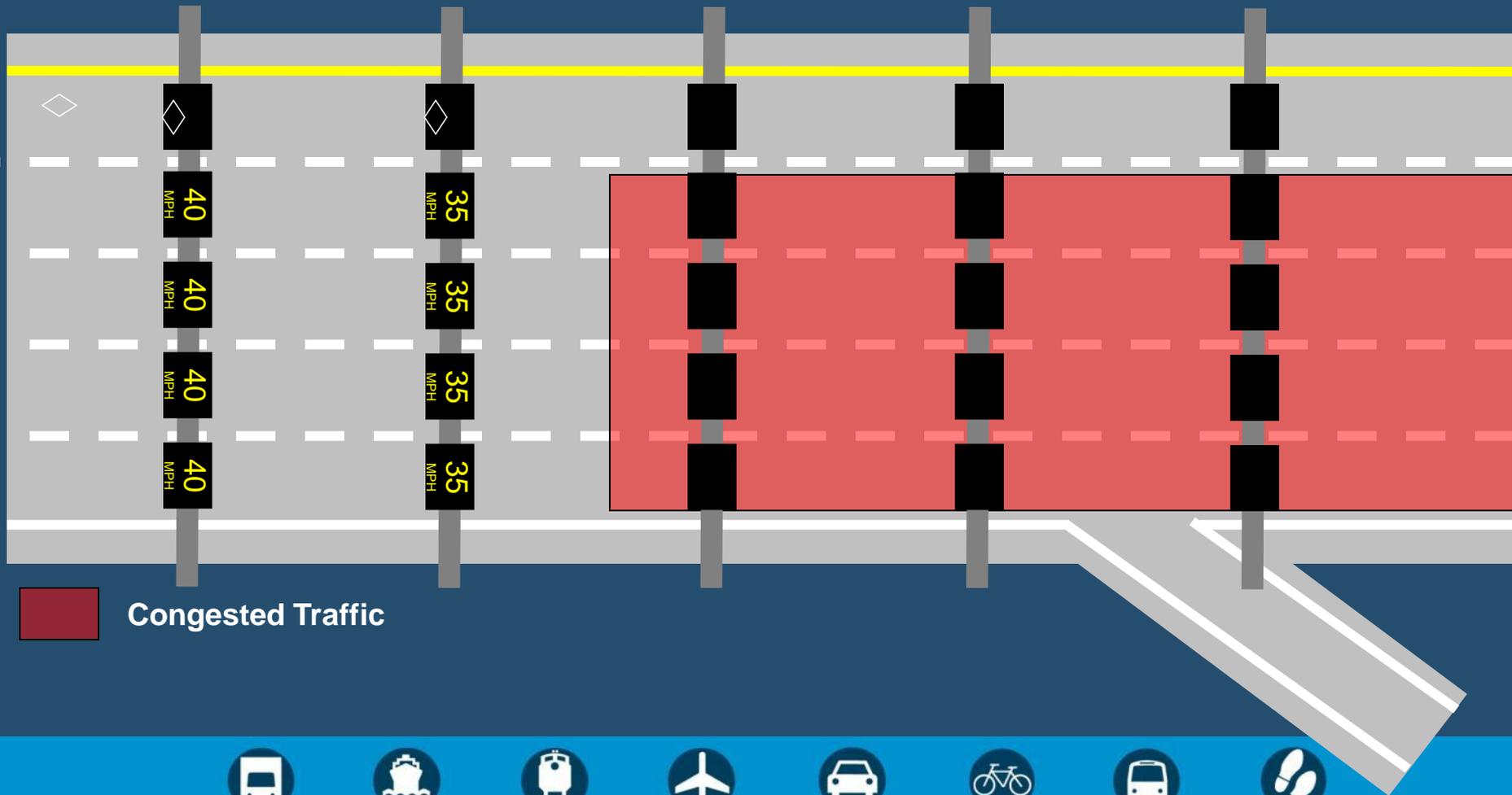
- **Advisory Only**
- **Detection measures traffic speeds downstream**
- **Speeds are posted up to 1 ½ miles upstream**



Advisory Variable Speed Limits



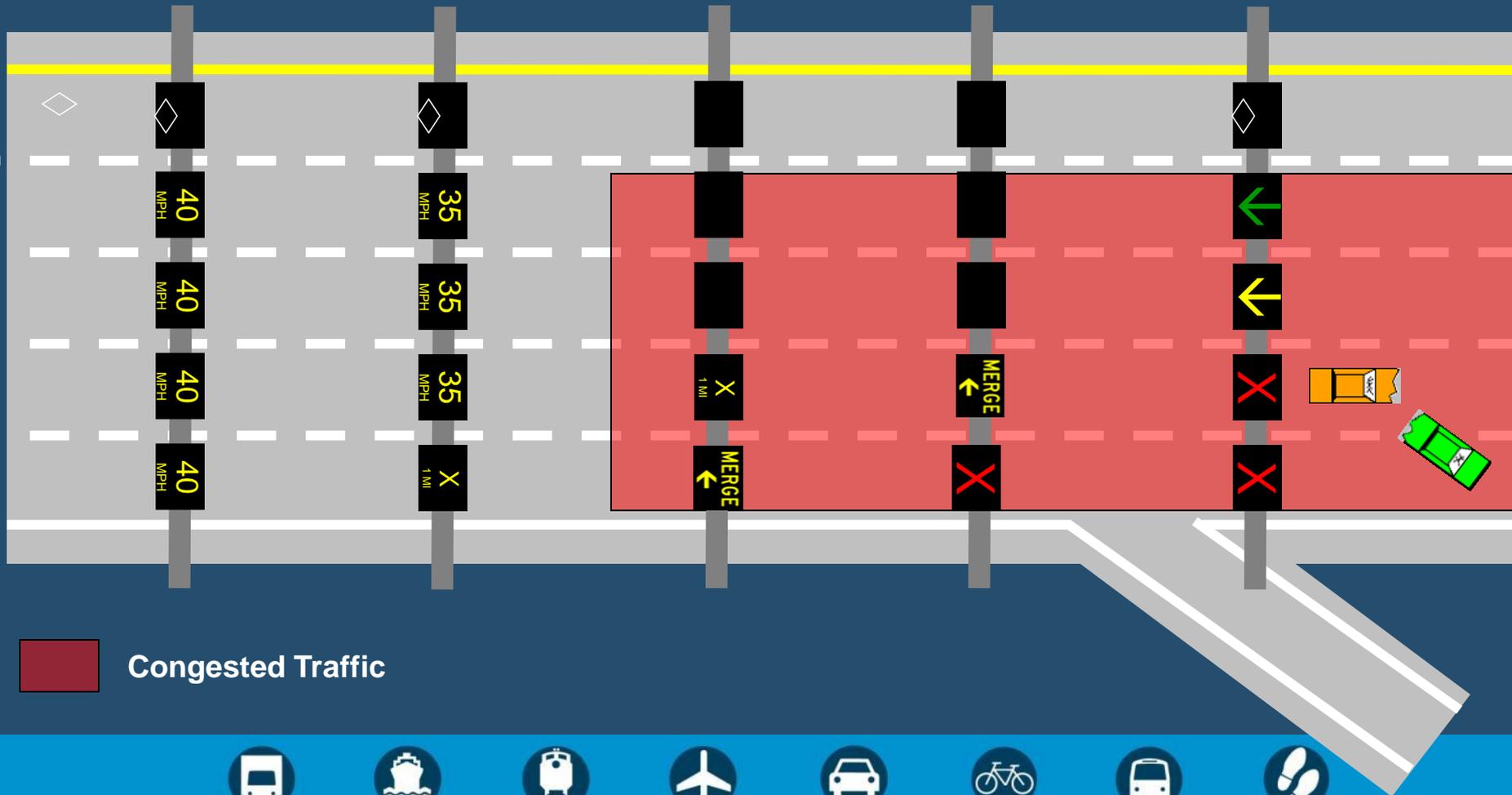
Advisory Variable Speed Limits



Advisory Variable Speed Limits



Use of ILCS During Incidents Right Two Lanes Closed





I-35W MnPASS: Active Traffic Management





I-35W MnPASS: Active Traffic Management



Priced Dynamic Shoulder Lane (PDSL):

- Priced Dynamic Shoulder Lane North of 42nd St on NB 35W
- Maintains existing 4 lanes with an added PDSL Lane
- Effectively extends the MnPASS lane to downtown Minneapolis using existing road space

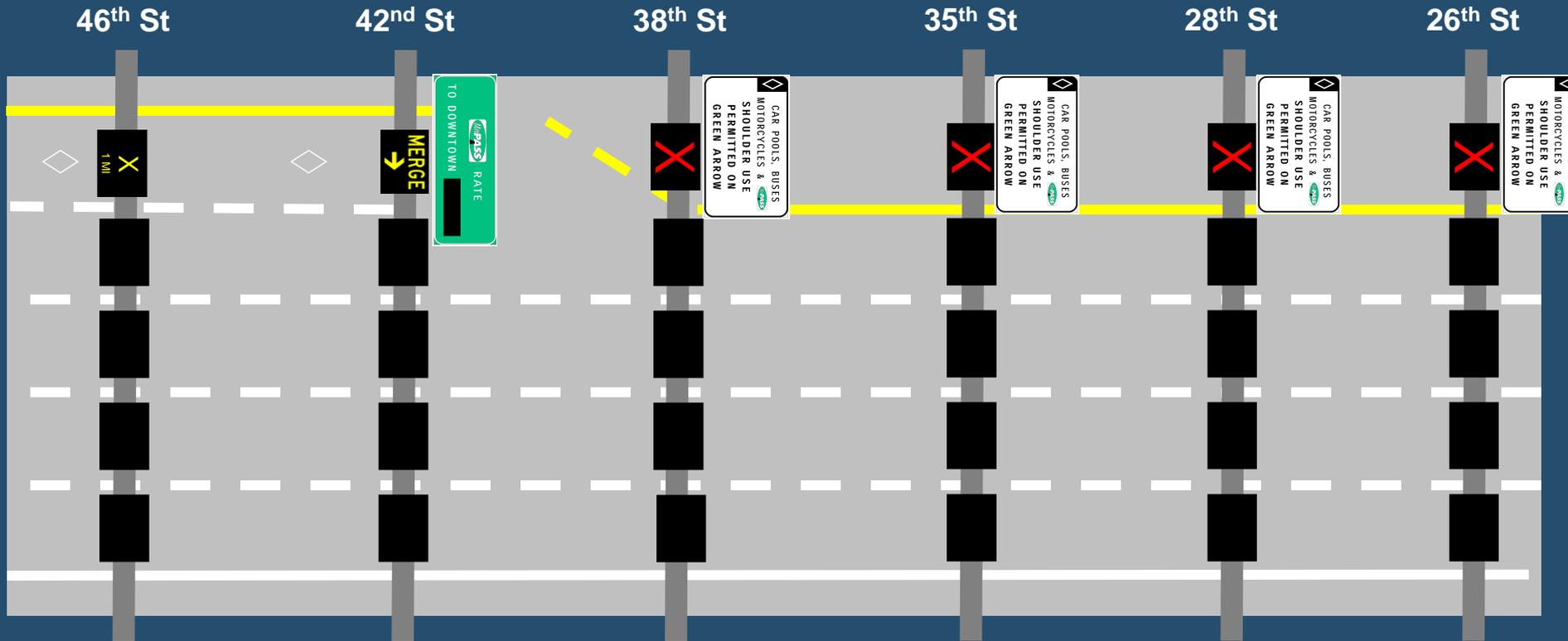




Innovative Use of Technology and Infrastructure

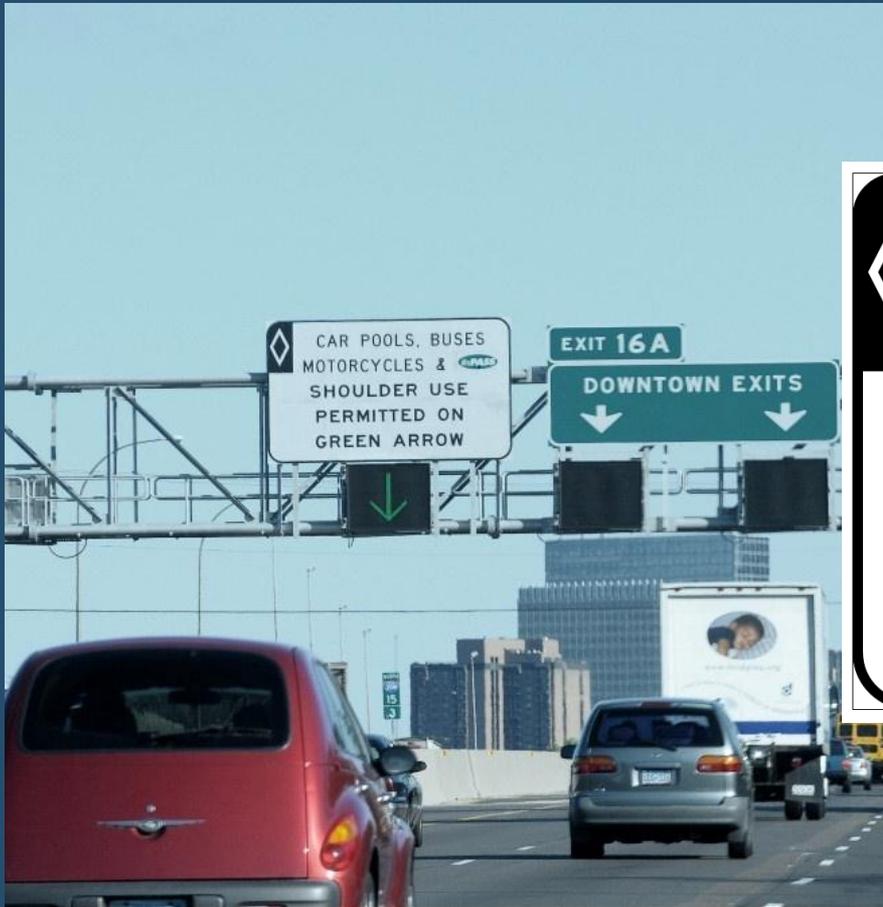


PDSL - CLOSED





I-35W MnPASS: Active Traffic Management PDSL Open



 CAR POOLS, BUSES
MOTORCYCLES & 
SHOULDER USE
PERMITTED ON
GREEN ARROW





I-35W MnPASS: Active Traffic Management PDSL Closed





I-35W MnPASS: In Pavement Lighting PDSL Closed





I-35W MnPASS: In Pavement Lighting PDSL Open





I-35W MnPASS: In Pavement Lighting PDSL Open





PDSL Hours of Operations

- **Monday – Friday**
 - AM Peak – 6:00 AM to 10:00 AM
 - PM Peak – 2:00 PM to 7:00 PM
- **Can be opened longer for extended congestion periods.**
- **Can be open on weekends or evenings for special events, or incidents.**



I-35W MnPASS: In Pavement Lighting Corrosion and Failure



Emergency Pull-Offs



Why we have them:

- Refuge for disabled vehicles and crashes
- Enforcement areas
- Co-located with Maintenance pull-offs

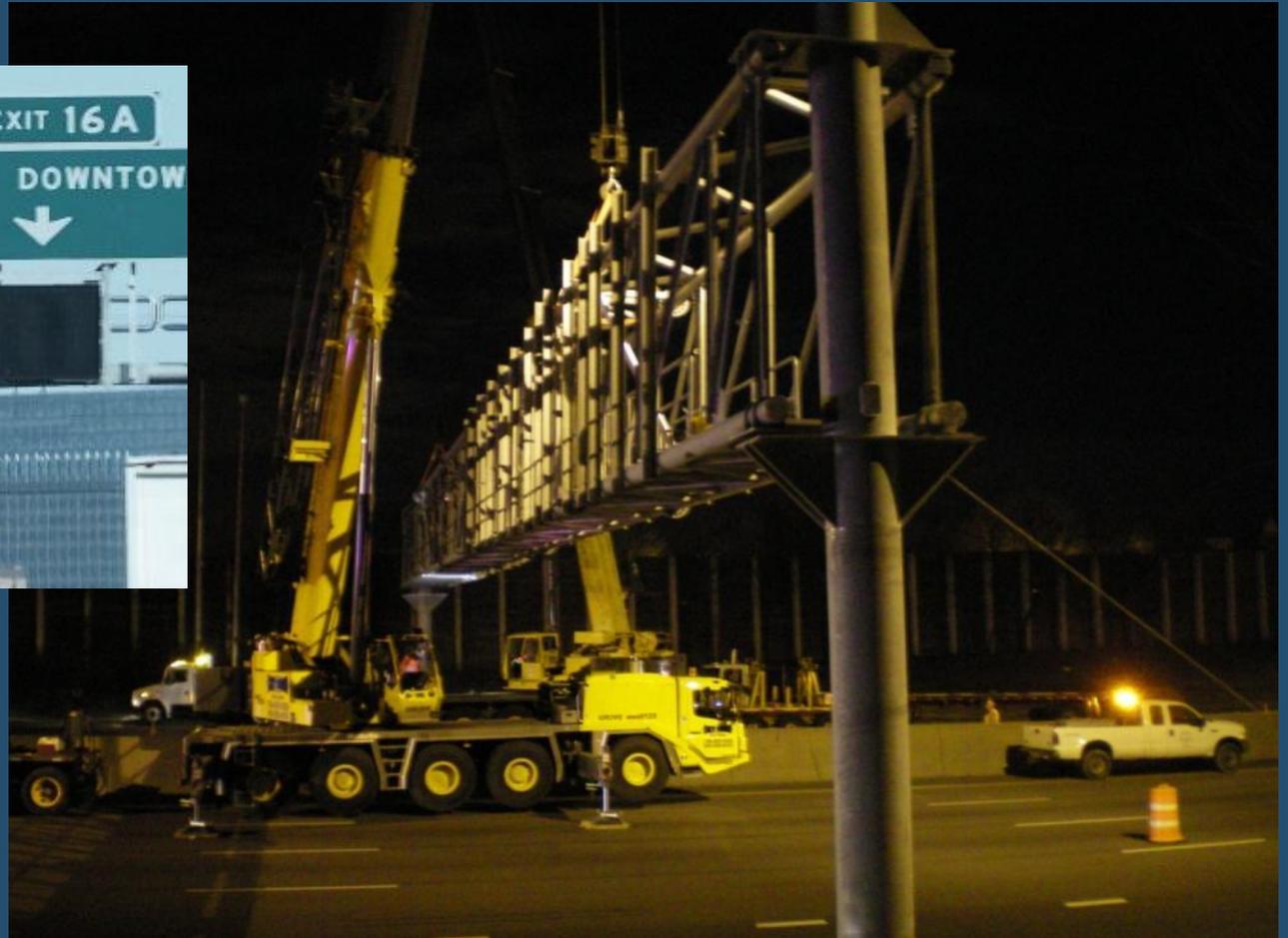


Design considerations:

- Goal to locate every ½ mile
- 14 ft width, min 200 ft long



Innovative Structure Design



CAR POOLS, BUSES
MOTORCYCLES & 
6AM-10AM ↓ MON-FRI

EXIT 8

82nd St
1 MILE

90th St



50
MPH

50
MPH

Dynamic Highways In Seattle



I-5 Active Traffic Management



I-5 Active Traffic Management



I-5 Active Traffic Management



CAR POOLS, BUSES
MOTORCYCLES & 
6AM-10AM ↓ MON-FRI

EXIT 8

82nd St
1 MILE

90th St



50
MPH

50
MPH

Dynamic Highways In Europe



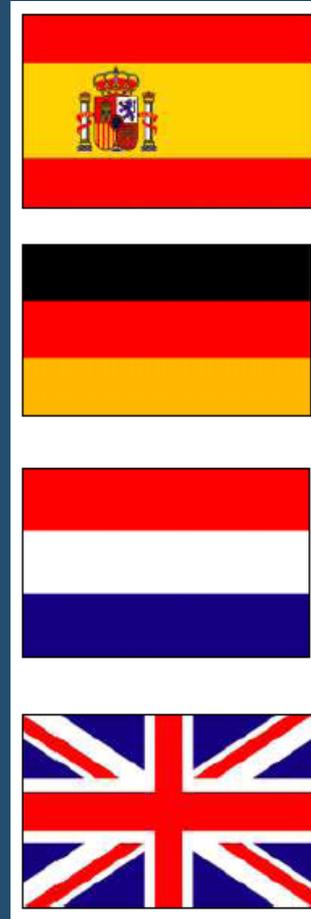
International Scan on Freeway Geometric Design

- To examine the use of innovative geometric design practices and techniques being used in other countries to improve the operational performance of congested freeway facilities, without compromising safety.



Countries Visited

- Spain
- Germany
- Netherlands
- United Kingdom





General Findings

- European nations are facing growing traffic and congestion on their freeway networks
- In England, the Netherlands, and Germany, highways agencies are responding to traffic growth by implementing:
 - Managed systems to better utilize the existing roadway footprint
 - Performance-based and risk-based approaches to making highway design choices





Hard Shoulder Running

- Utilizing the hard (paved) shoulder as an additional running lane during peak and congested periods to facilitate greater volumes of traffic, minimize congestion and improve trip time reliability



Netherlands Example



German Example



England Example





Shoulder Running Operational Strategies

- **Temporary Shoulder Use**
 - Between Interchanges
 - Through Interchanges
- **Permanent Shoulder Use**



England Example Between Interchanges

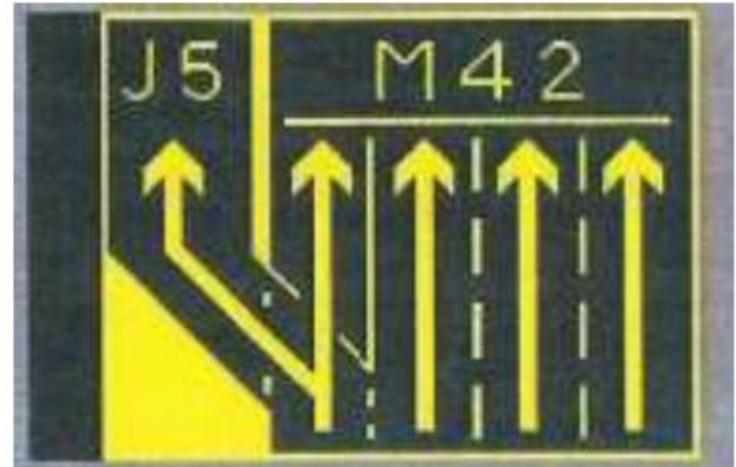


Use of Dynamic Signs in England

Shoulder Closed
thru Junction



Shoulder Open
thru Junction

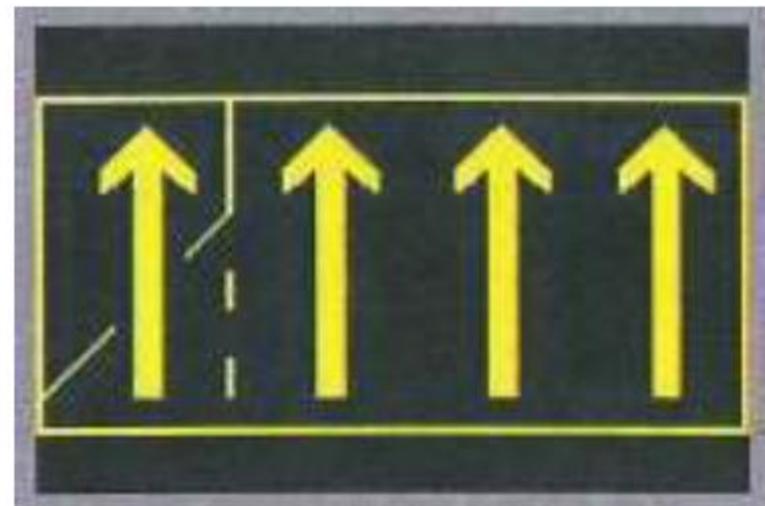


Use of Dynamic Signs in England

Shoulder Closed
Downstream



Shoulder Running On
(crossing edge line)



Shoulder Striping in England



 CAR POOLS, BUSES
MOTORCYCLES & 
6AM-10AM  MON-FRI

EXIT 8

82nd St
1 MILE

90th St



50
MPH

50
MPH

Dynamic Highways Future in Minnesota





Why dynamic highways?

- Better utilize existing infrastructure investments
- Enhance corridor safety
- Improve mobility
 - Preserve or enhance advantages for transit and carpoolers
 - Preserve or enhance advantages for general traffic
 - Provide a congestion-free choice for Single Occupant Vehicles





I-94 Managed Lanes Project

- I-94 between I-35W and I-35E (Summer 2012)
- Active Traffic Management
 - Advisory Variable Speed Limits
 - Traffic Control Messages
- 4th lane between Hwy 280 and 5th St/6th St ramps
 - Maintain 4th lane added after I-35W bridge collapse
 - Adds some shoulder width and emergency pull-offs where feasible

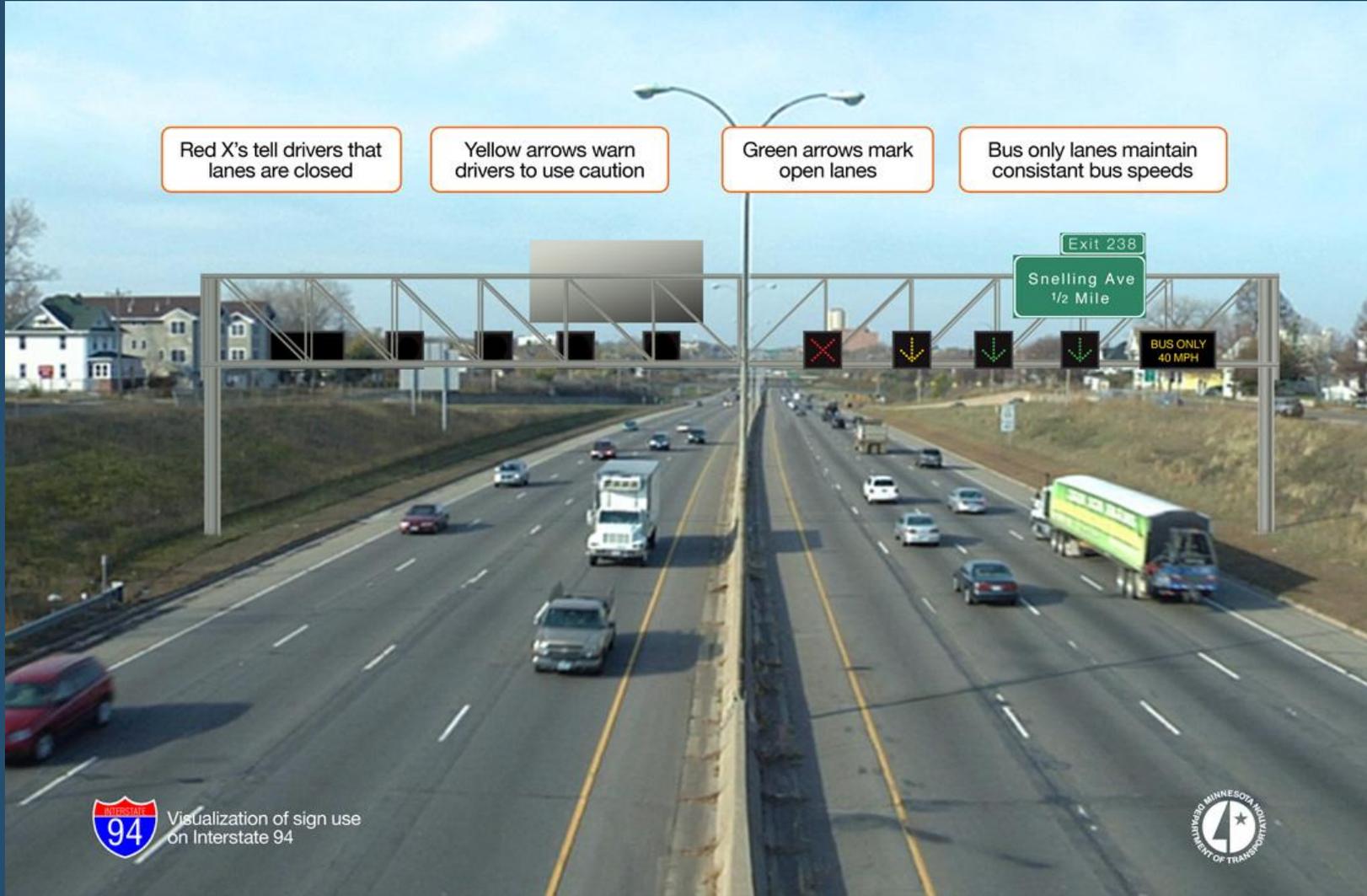


Red X's tell drivers that lanes are closed

Yellow arrows warn drivers to use caution

Green arrows mark open lanes

Bus only lanes maintain constant bus speeds



Visualization of sign use on Interstate 94





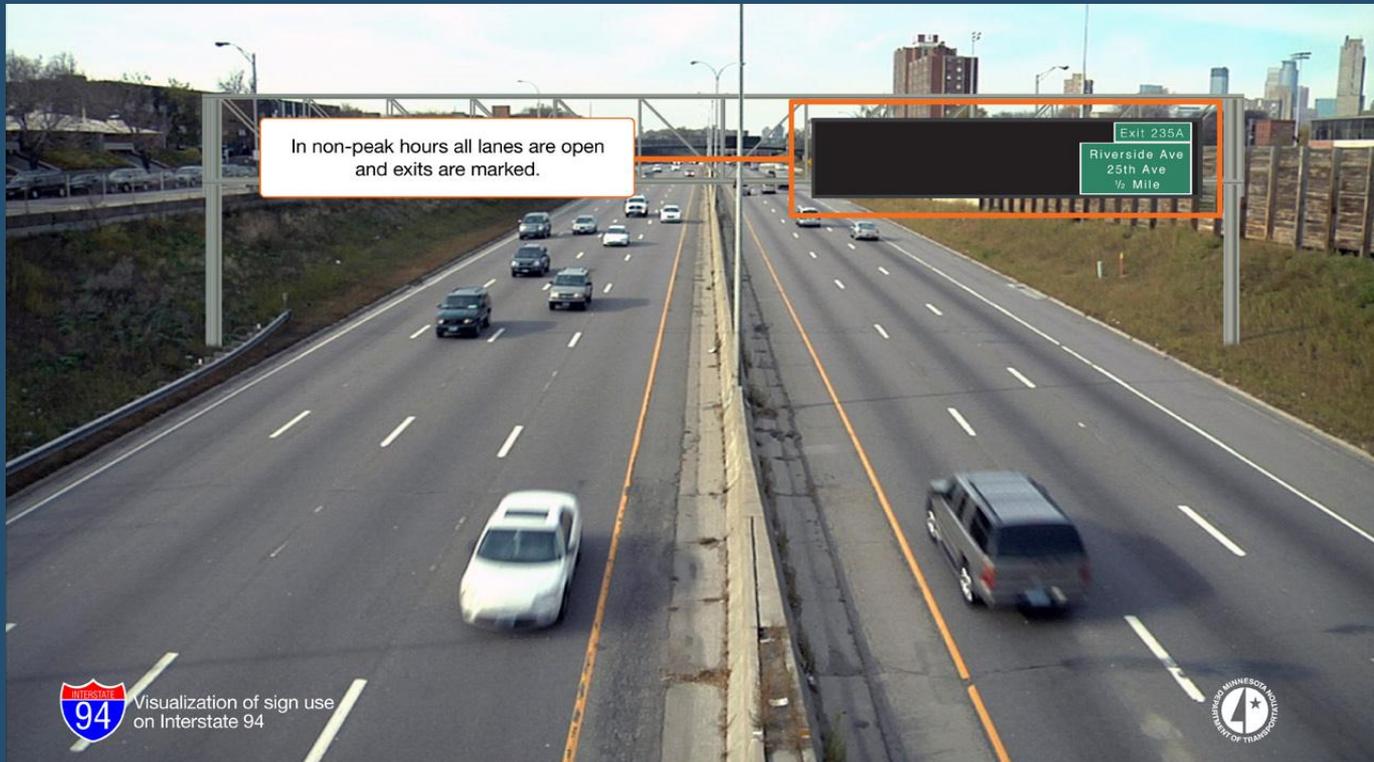
I-94 Managed Auxiliary Lane

- WB I-94 between Hwy 280 and 5th St Exit
- Goal is to maintain advantage for transit
- Manage traffic in the lane by encouraging through traffic to vacate lane
- Use of full color DMS technology to change static signing
 - 40 ft by 8 ft full color matrix sign
 - Located WB I-94 prior to Huron Blvd.



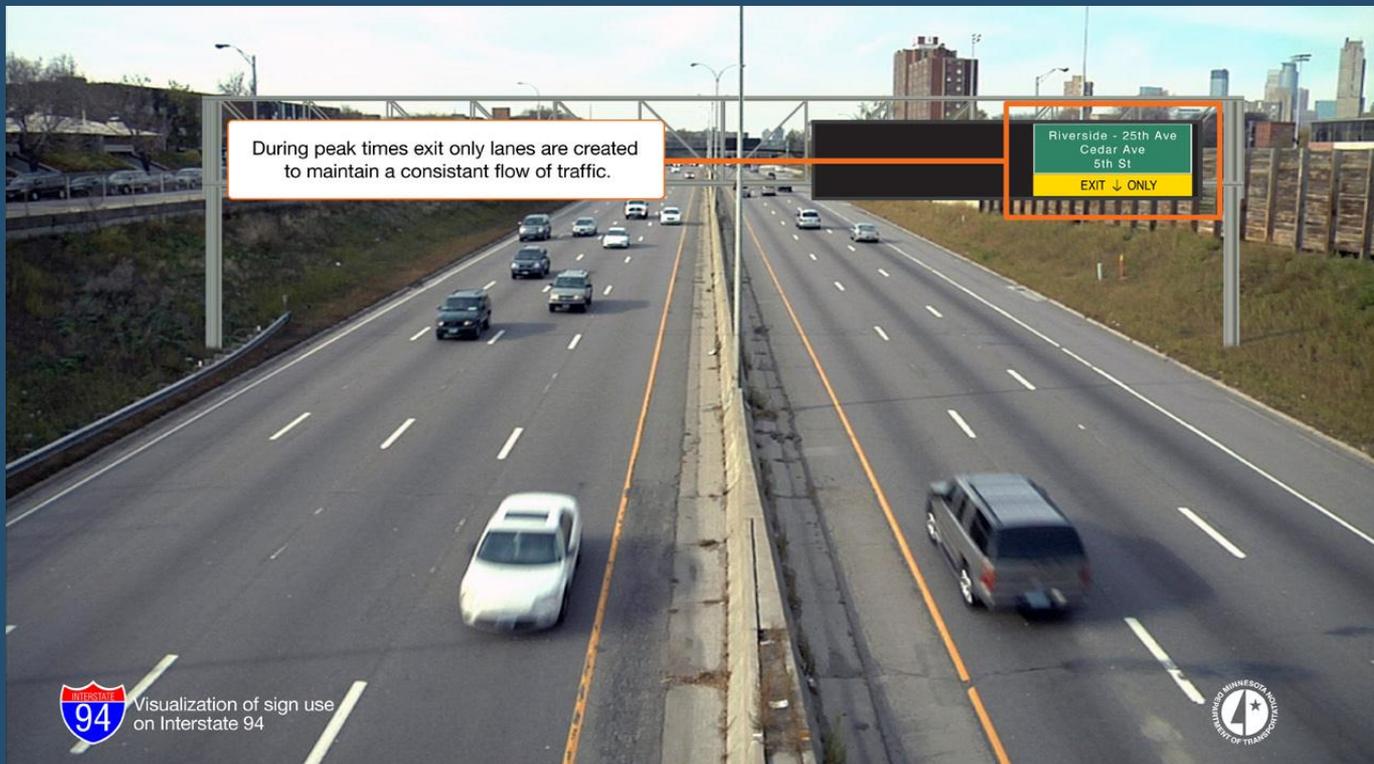
I-94 Managed Auxiliary Lane

Normal Operations



I-94 Managed Auxiliary Lane

PM Peak Period Operations



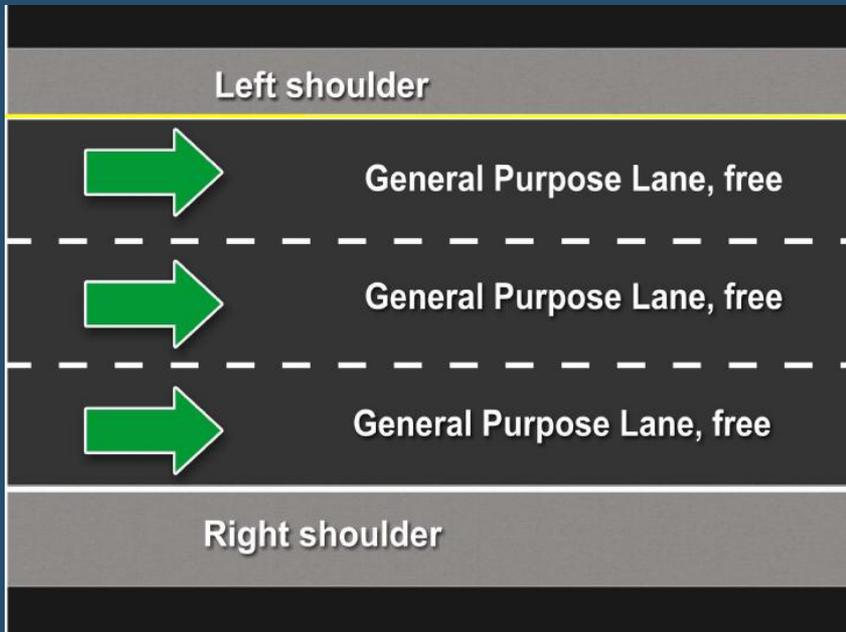
I-94 Managed Auxiliary Lane

Incident on Other Corridor

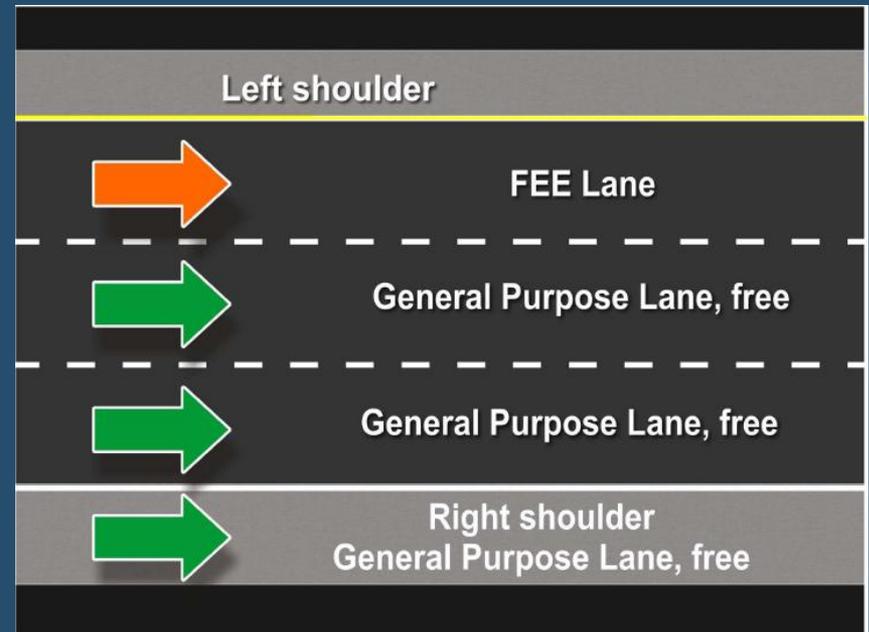


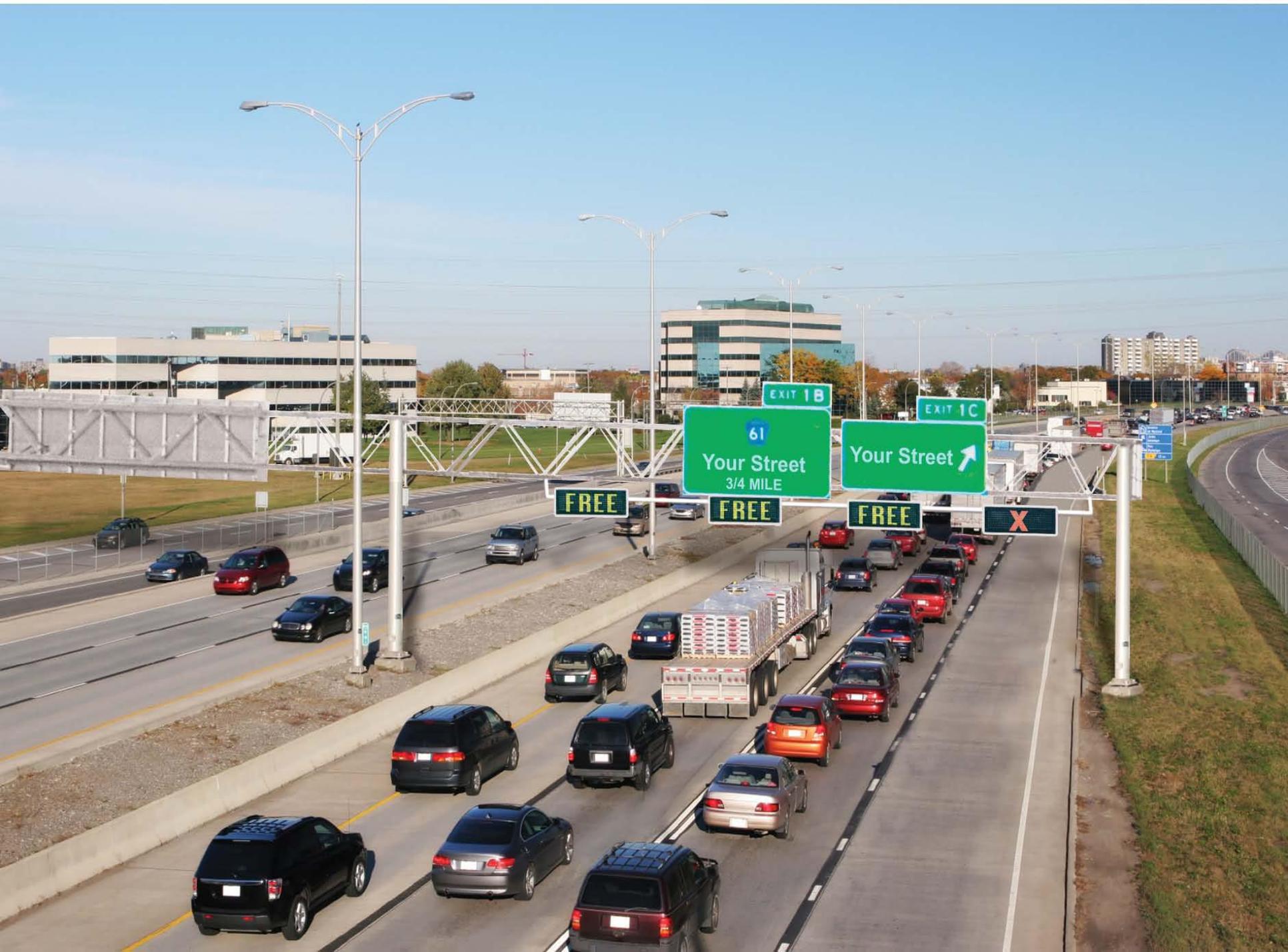
Fee Lane Concept

- Off-Peak Period



- Peak Period





61
Your Street
3/4 MILE

Your Street ↗

FREE

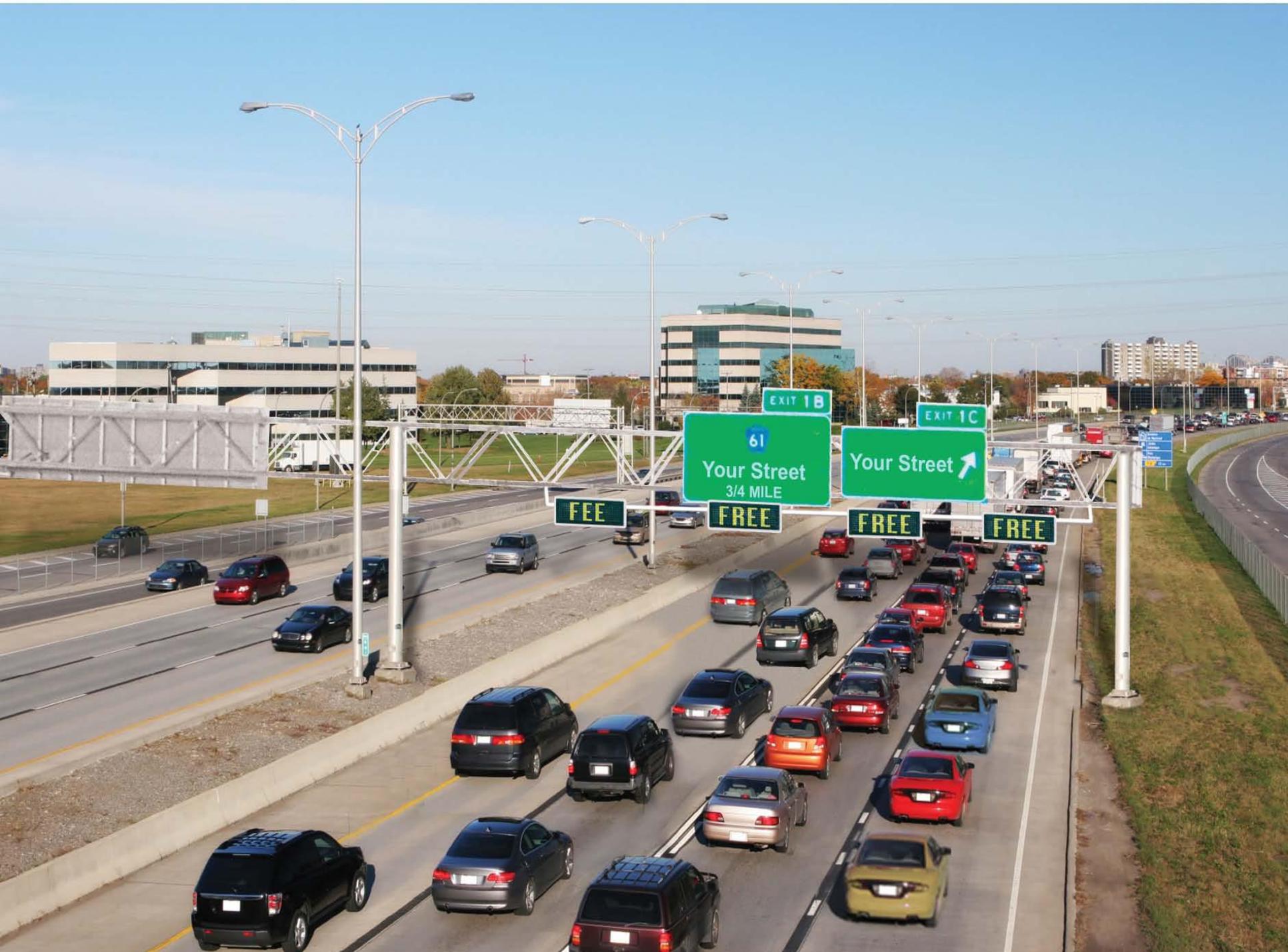
FREE

FREE

X

EXIT 1B

EXIT 1C



EXIT 1B
61
Your Street
3/4 MILE

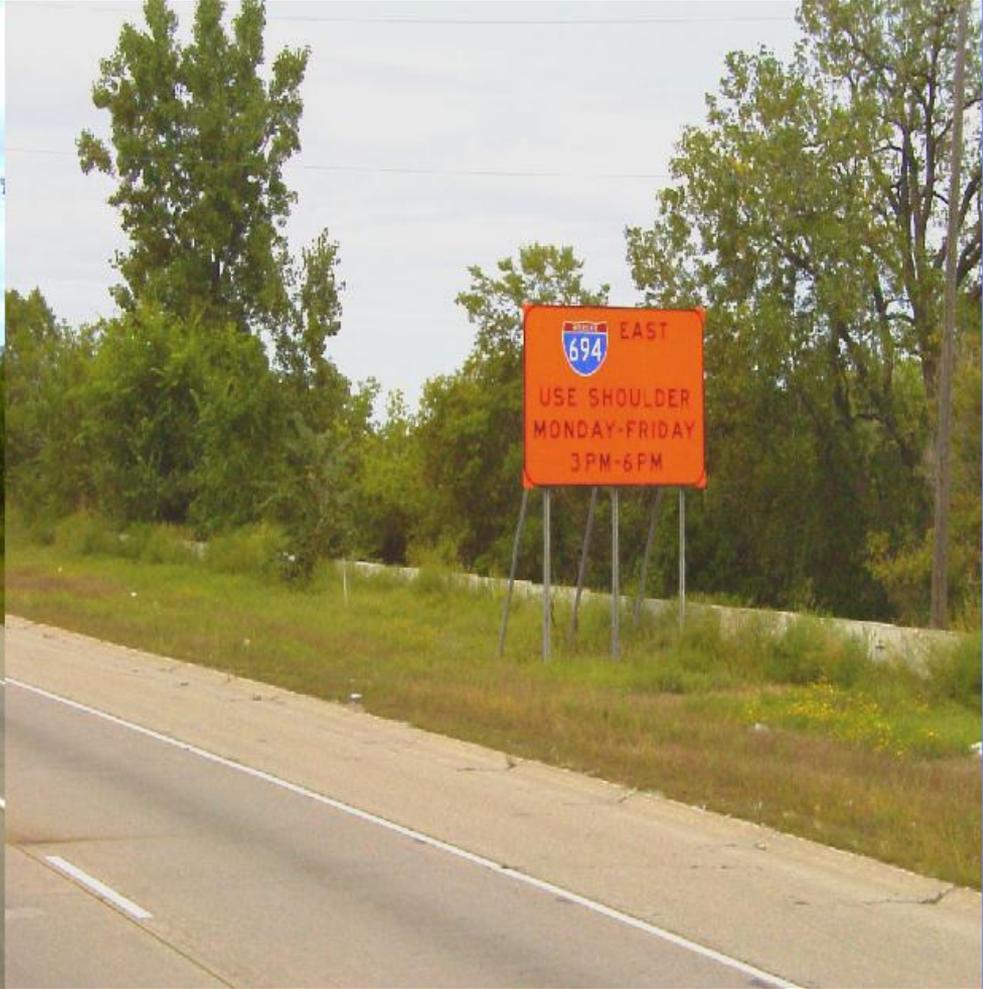
EXIT 1C
Your Street

FREE

FREE

FREE

FREE





CAR POOLS, BUSES
MOTORCYCLES & 
6AM-10AM  MON-FRI

EXIT 8

82nd St
1 MILE

90th St



50
MPH

50
MPH

Questions?

Bernie Arseneau
Deputy Commissioner
Minnesota Department of Transportation

