

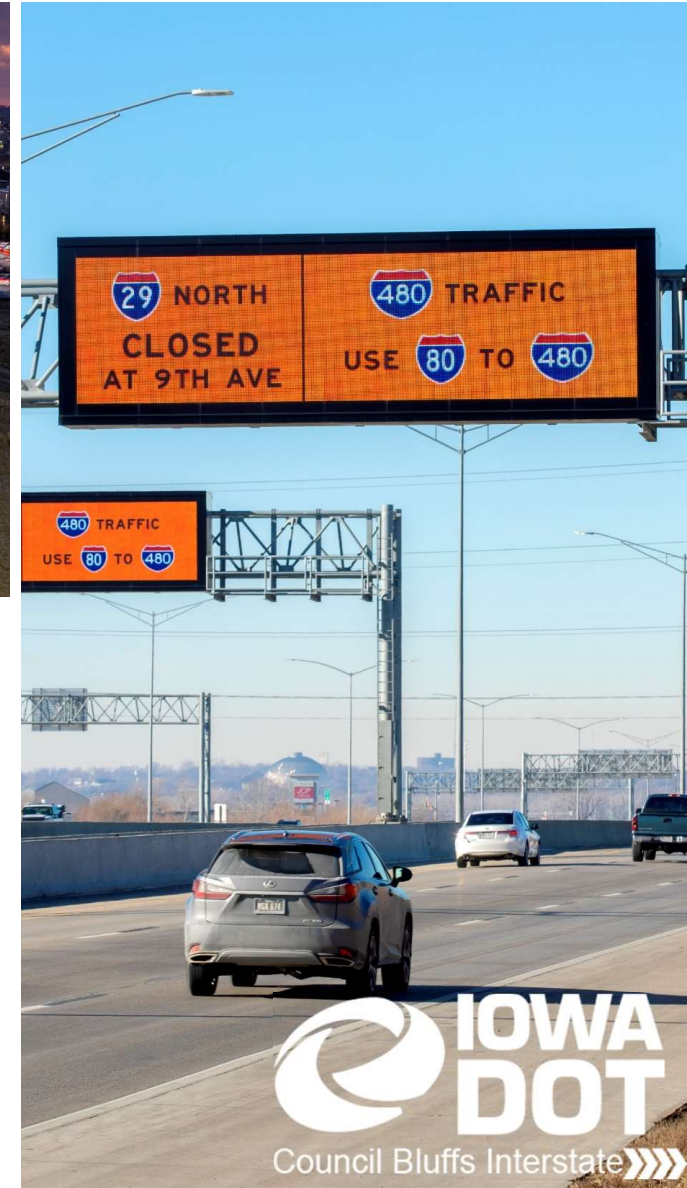


# Multi-Year Closure of Urban Interstates

## TSMO BEST PRACTICES AND LESSONS LEARNED

Austin Yates – Iowa DOT  
Nick Johnson – HDR

5/2/2023





TSMO  
(pronounced *TIZZ-moe*)



# FHWA Definition

- Transportation Systems Management & Operations
- Optimize existing infrastructure
- Multimodal
- Cross-jurisdictional
- Preserve capacity
- Improve
  - Safety
  - Security
  - Reliability





# IOO Assets

---



TSMO is  
Mobility as an Asset



# TOPICS

Project Background

Why Interstate Closures?

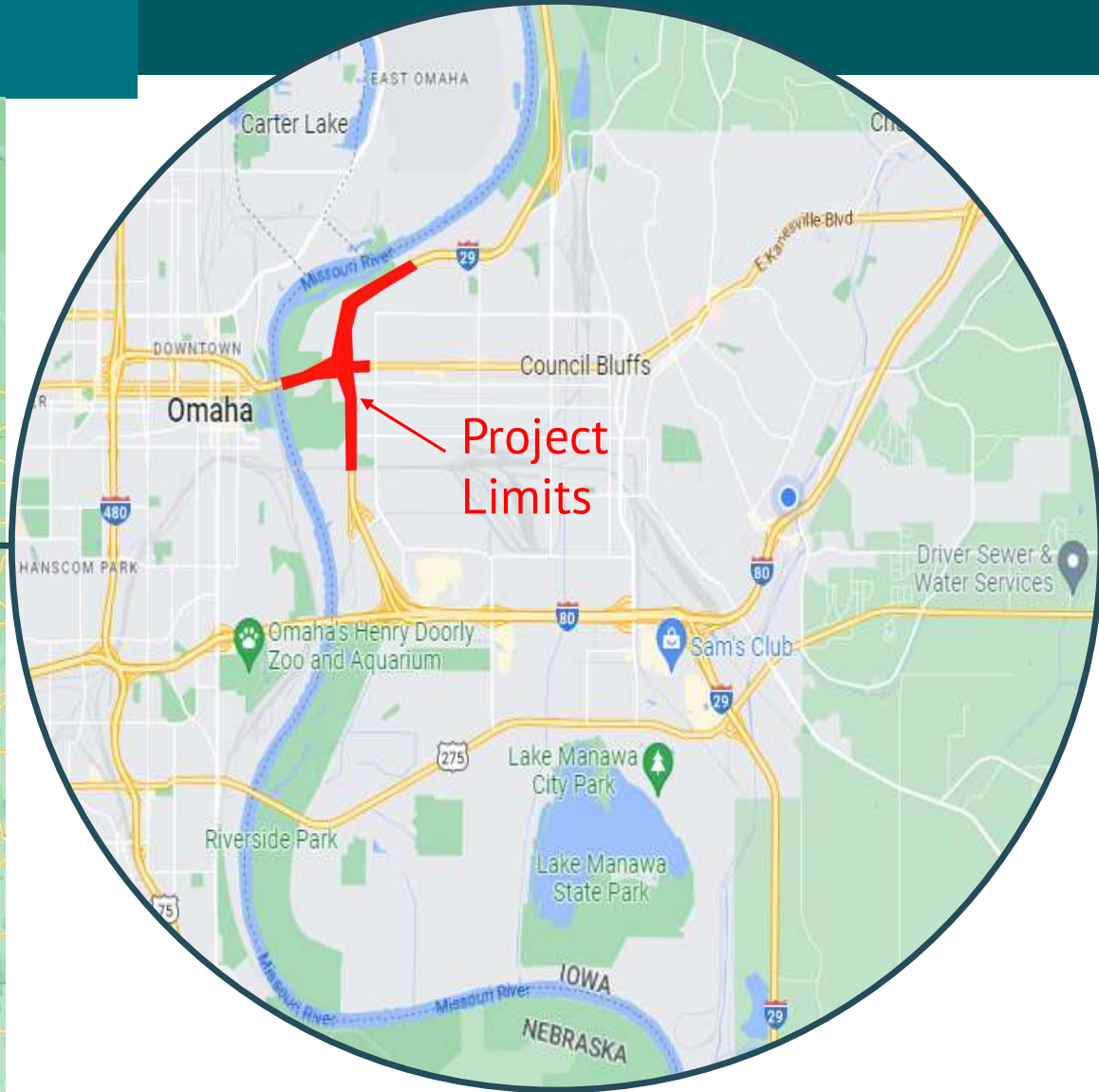
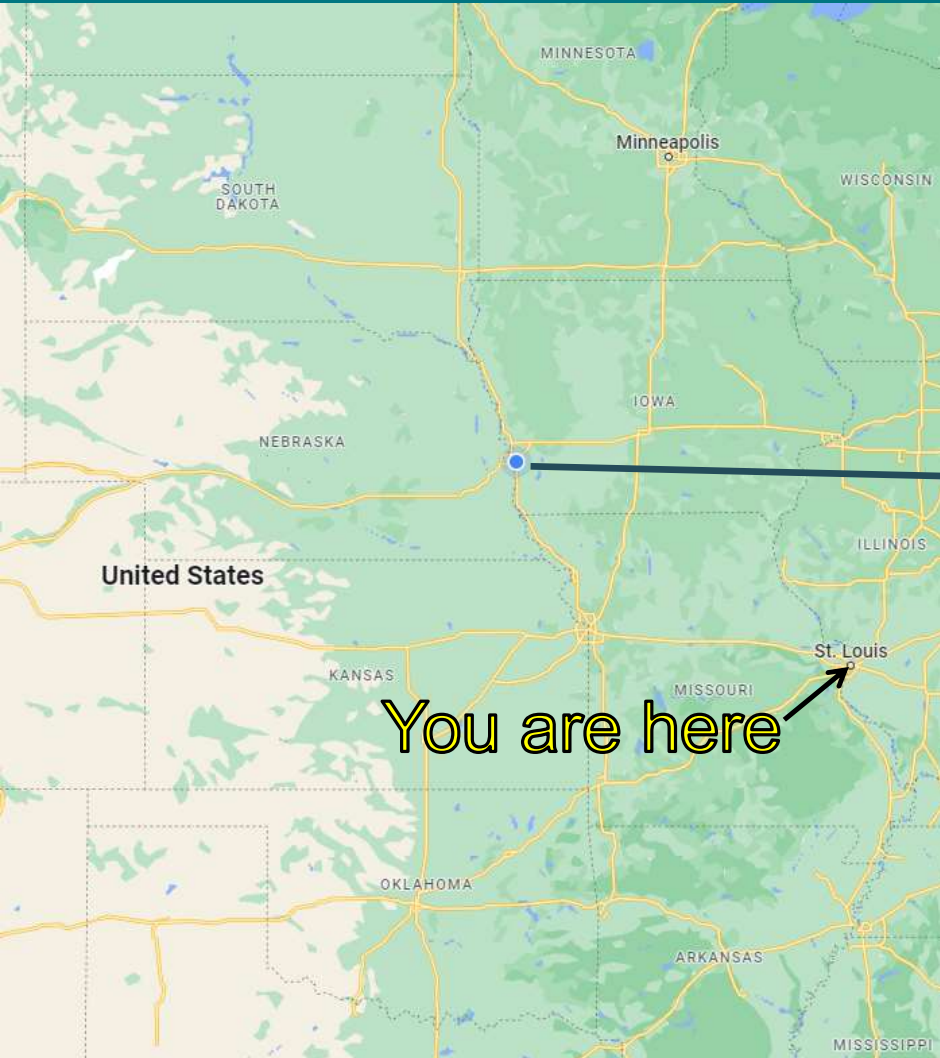
TSMO Best Practices

Lessons Learned



# Project Background

# PROJECT LOCATION

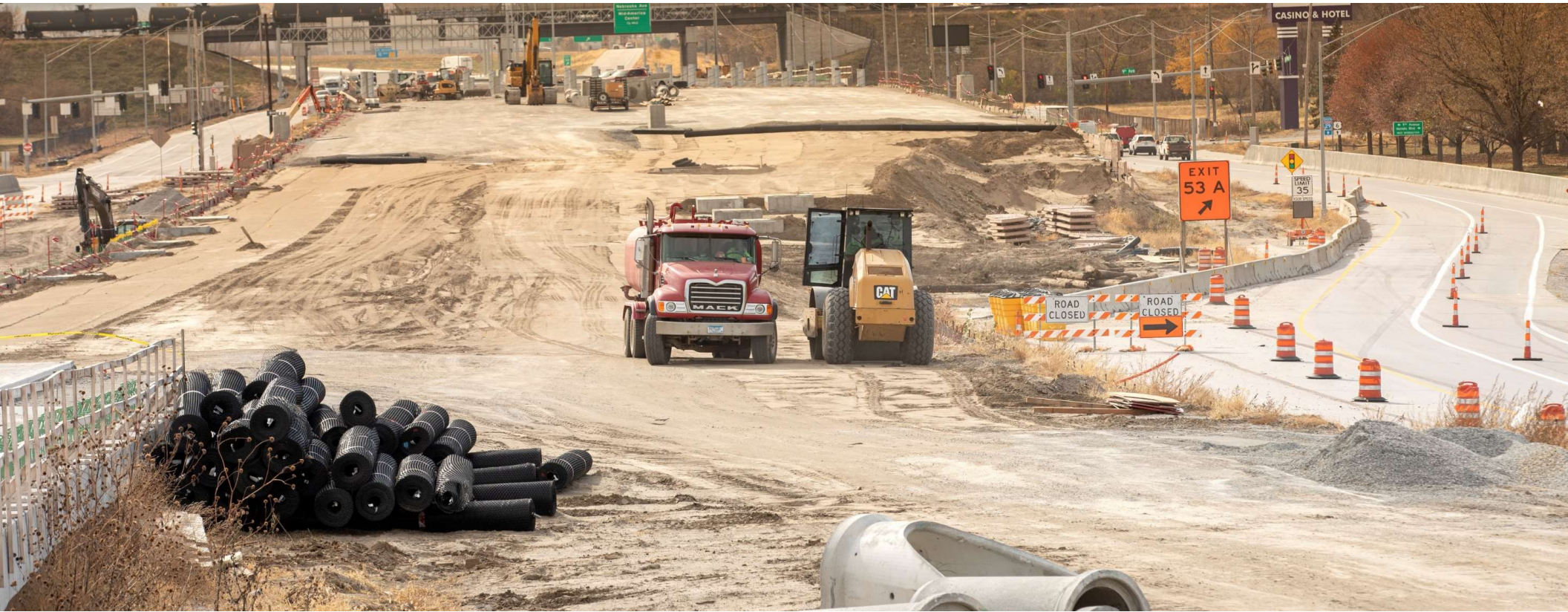




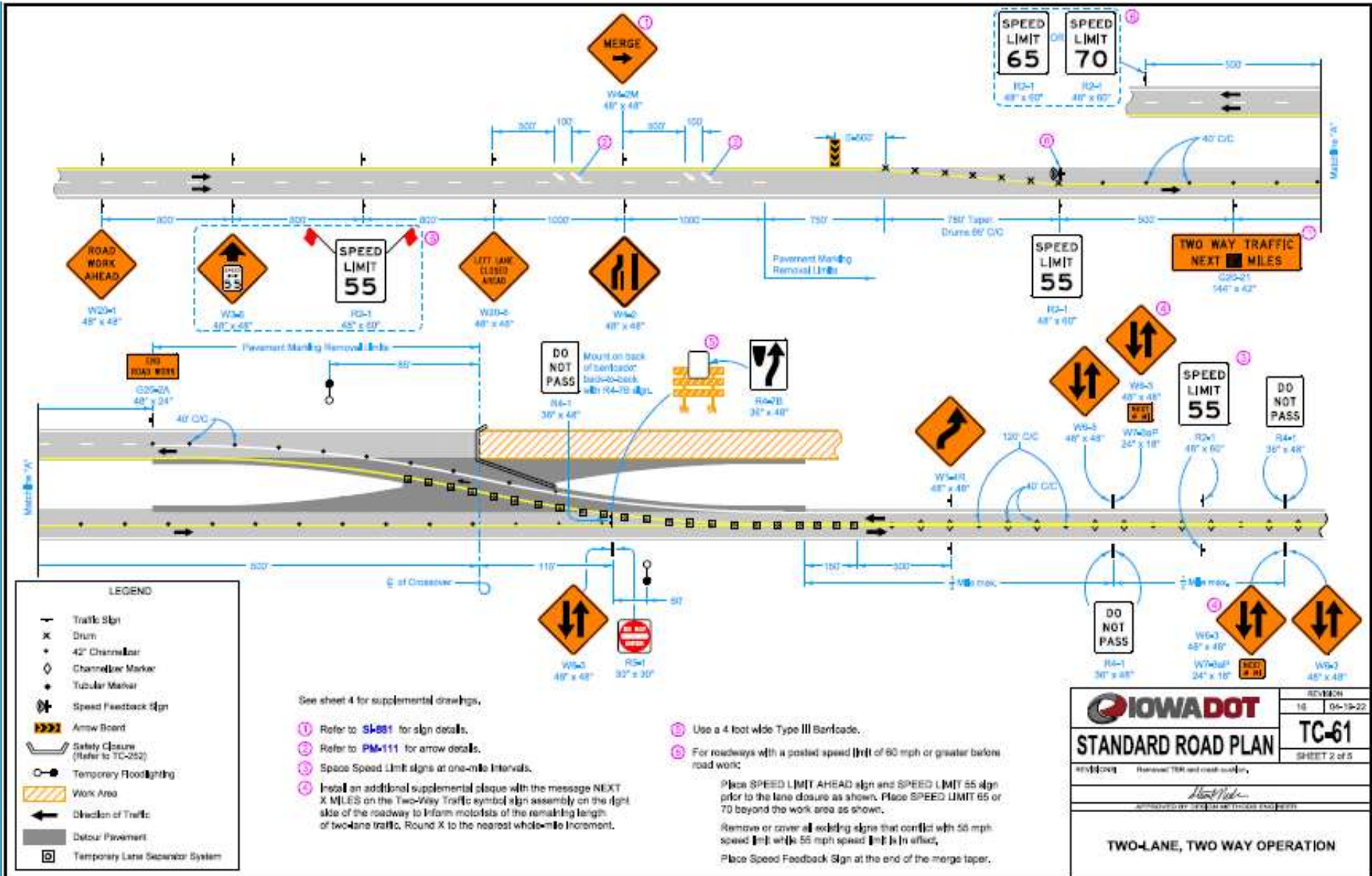
## Project Details

- \$180 million contract
- Just over 3-year Schedule – Started April 2021
- Reconstruction of the interchange between I-29 and I-480.
- Relocate 41st St interchange to 40<sup>th</sup> Street
- One-way frontage roadways provide access between I-29 and West Broadway.
- Removal of the interchange at 35th St.





# Full Interstate Closures?





**Traffic operations and safety drove the staging design.**

# TSMO-DRIVEN MOT

Maintenance of Traffic

- Safer: Min H2H
- Faster: 5.5y to 3y
- Better: TIM



I-29 closure at 9<sup>th</sup> Ave (looking north)

# Dynamic Traffic Assignment Modeling

A Powerful TSMO Analytical Tool

# DYNAMIC TRAFFIC ASSIGNMENT

Base

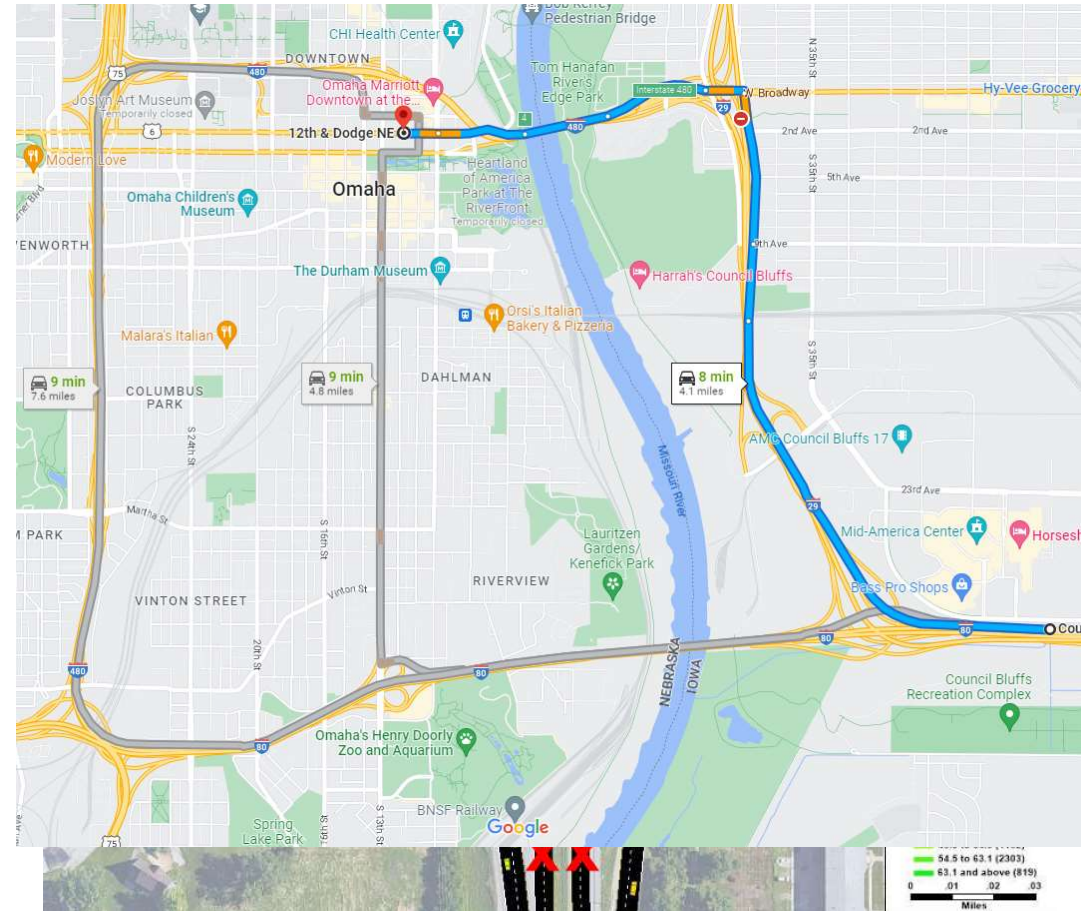
- Calibrated Simulation Model
- Volume, Speed, Travel Time



- Change the model
- e.g., Close a segment

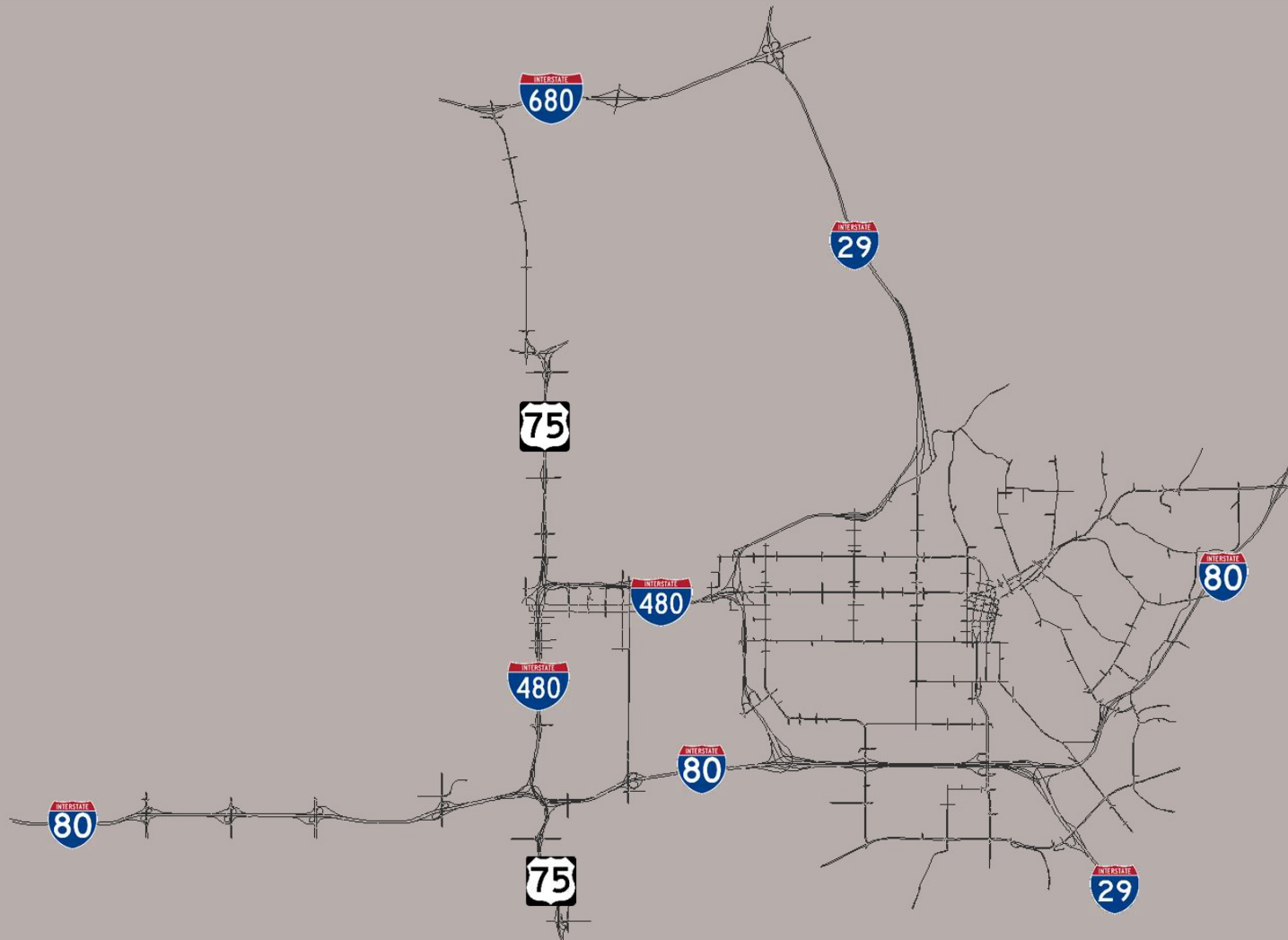
DTA

- Traffic dynamically adjusts route
- Capacity, Travel Time, Time of Day



# THE SIMULATION MODEL

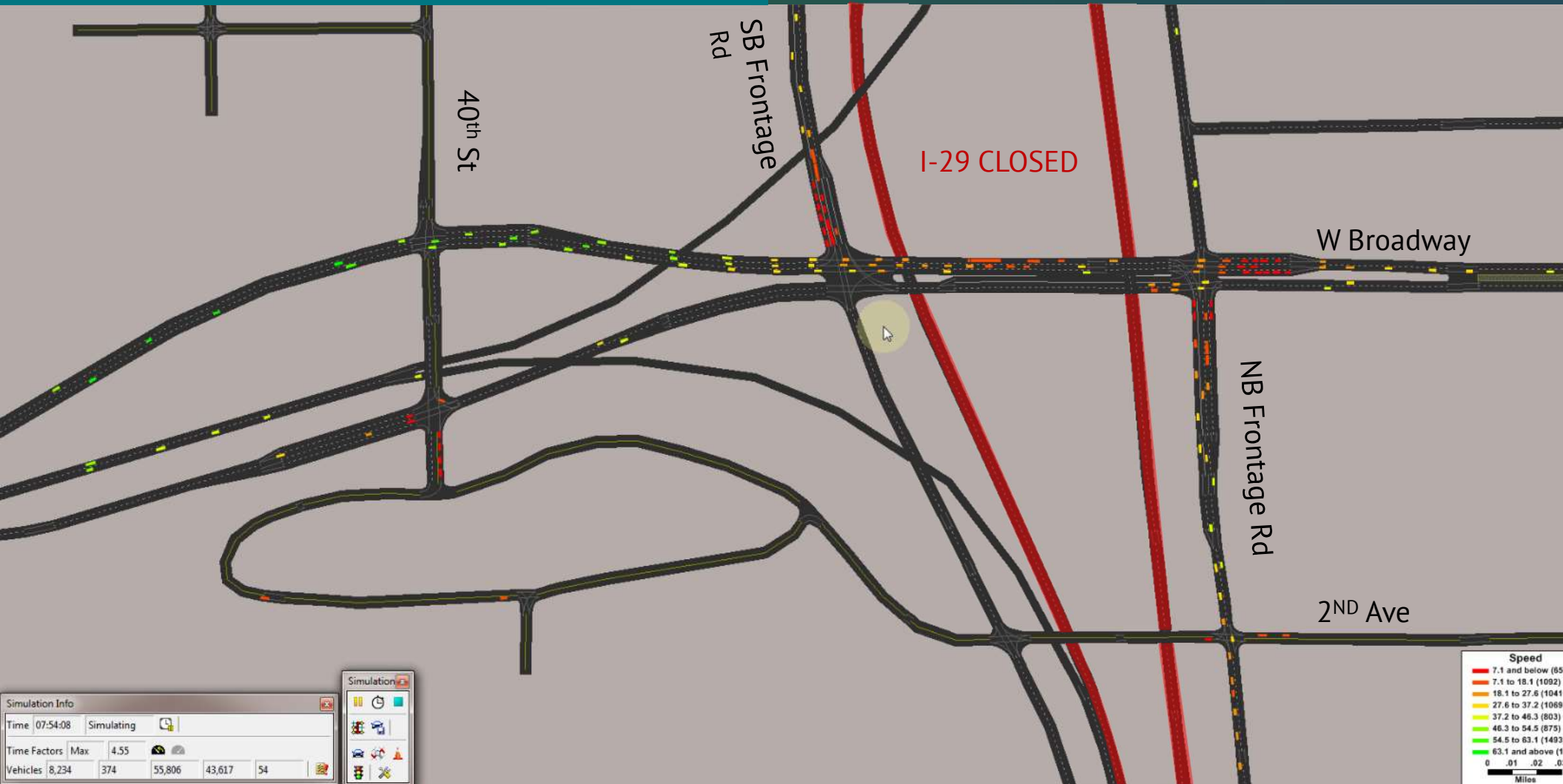
TransModeler





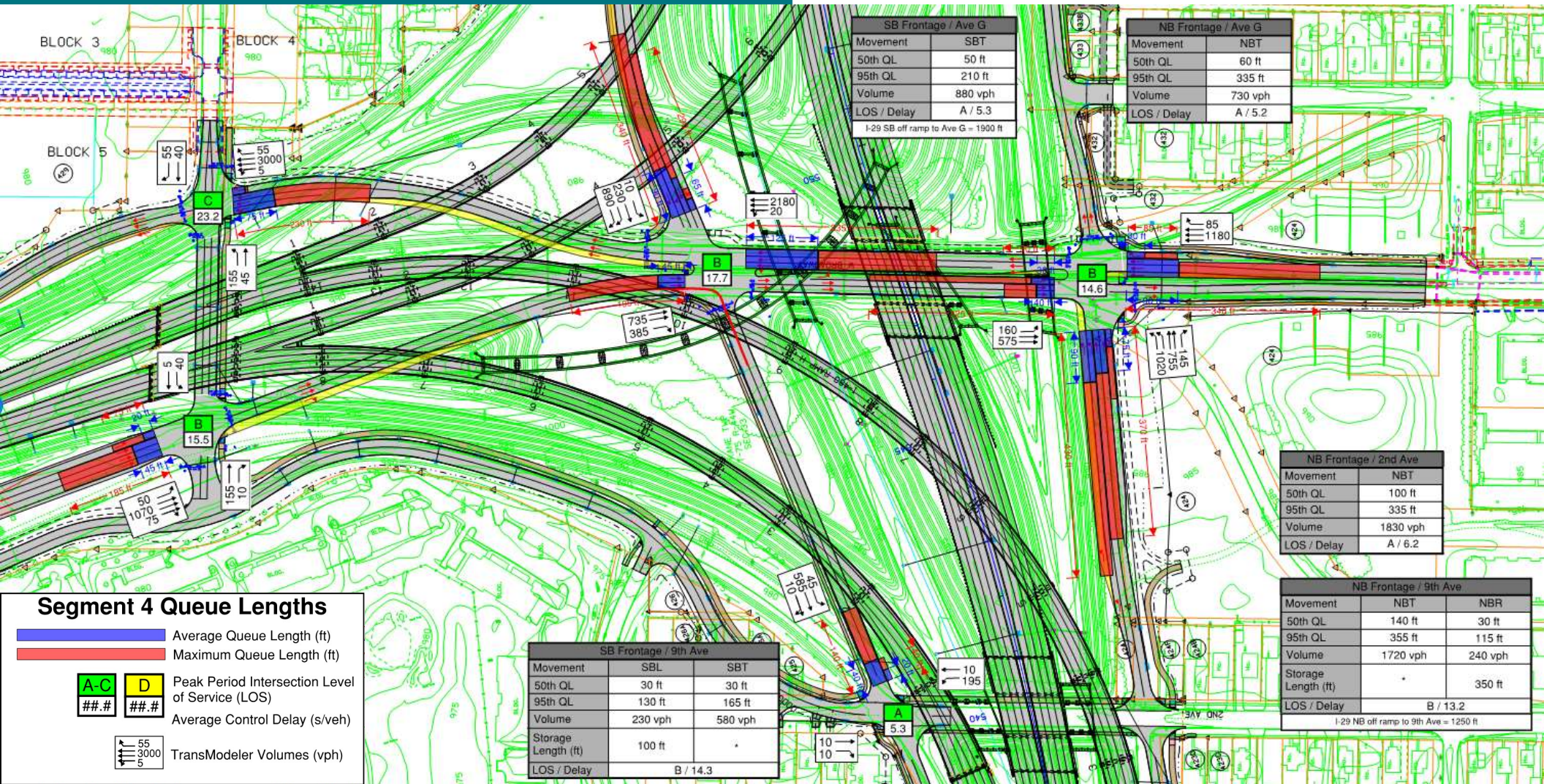
# PROVE IT CAN WORK

Used during preliminary staging design (2017)

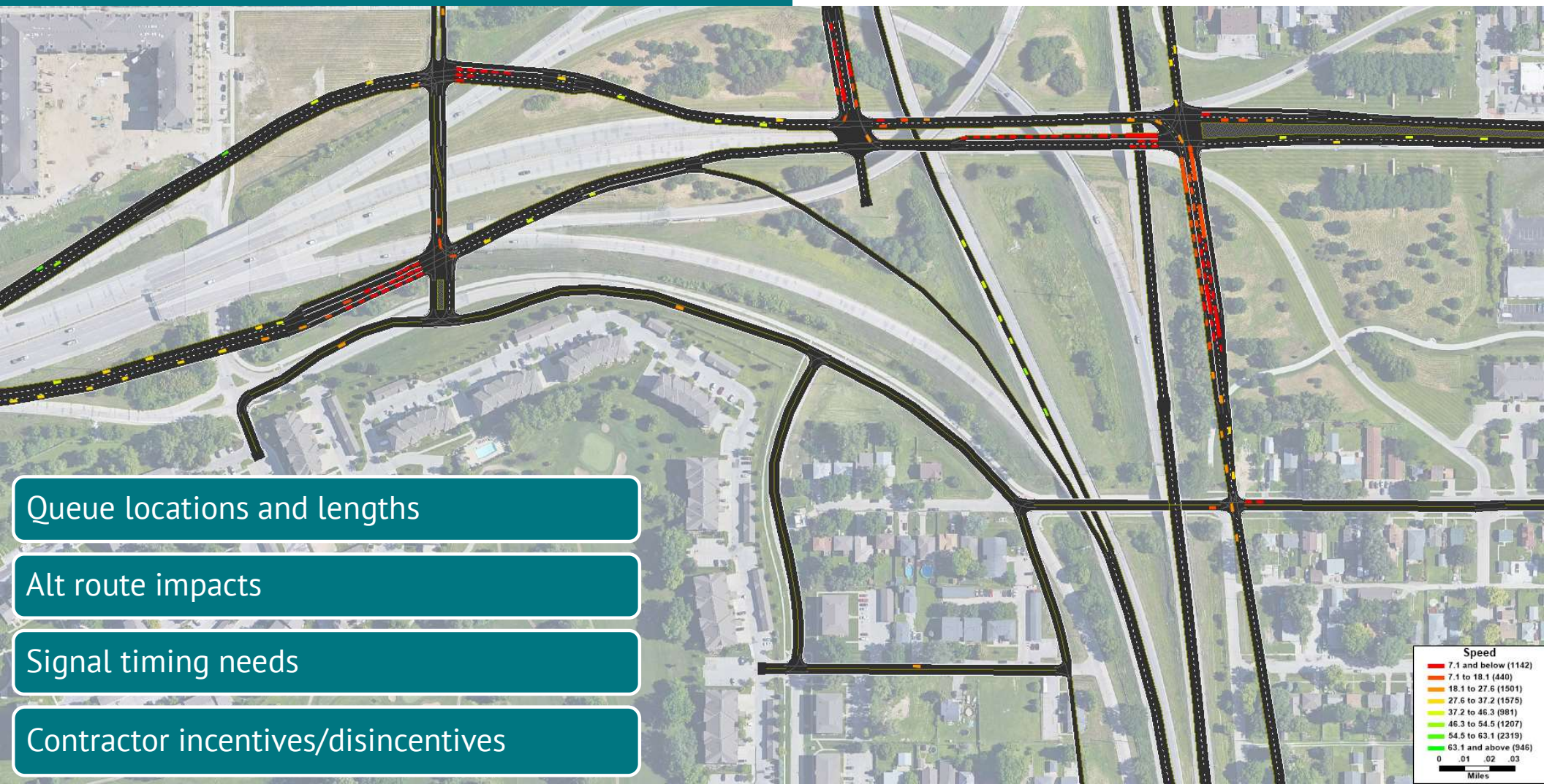


# USED THROUGHOUT FINAL DESIGN

# TransModeler AM Results



# DTA-KEAWAYS



Queue locations and lengths

Alt route impacts

Signal timing needs








Contractor incentives/disincentives

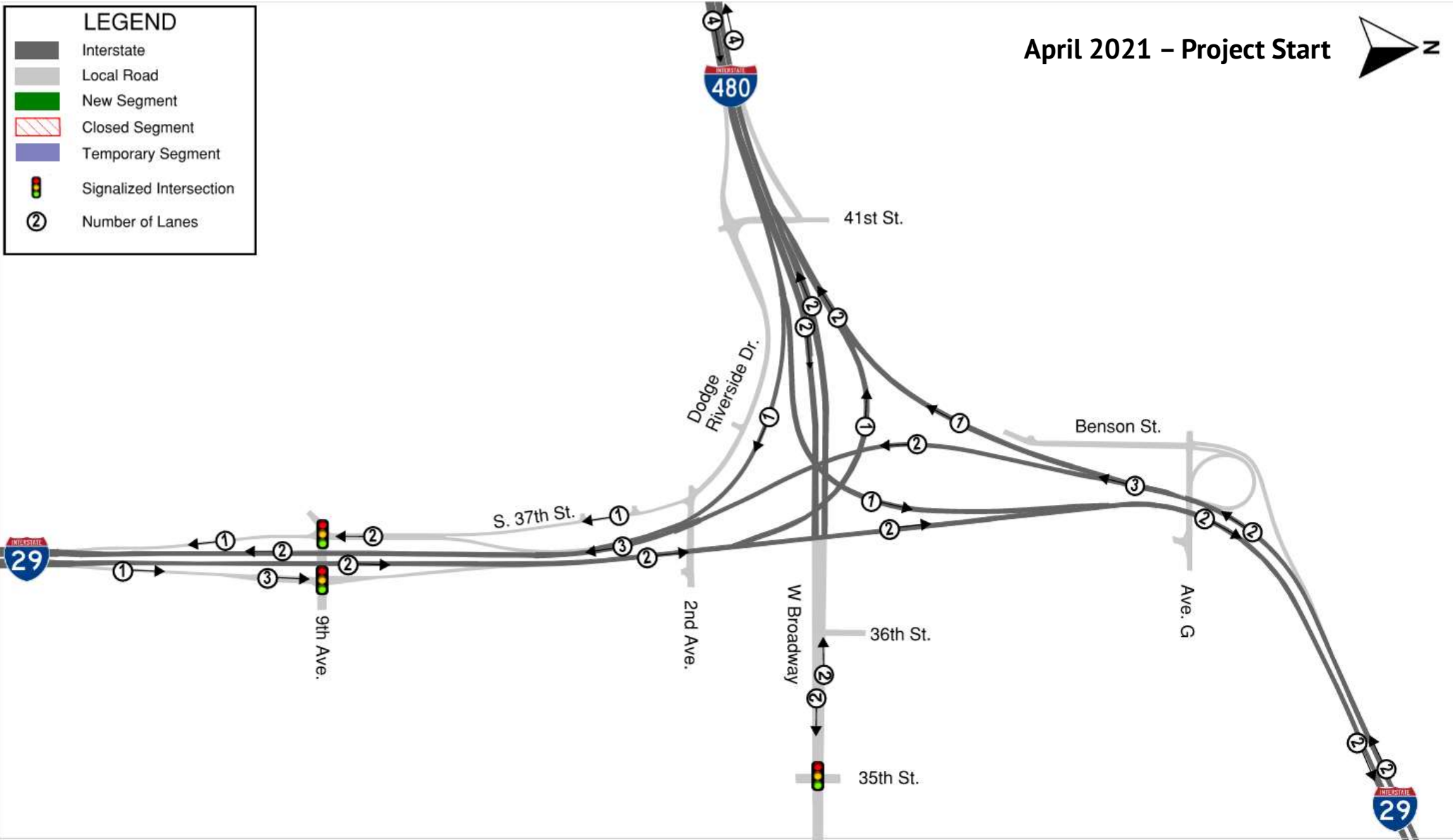
**What Did We Close?**

April 2021 – Project Start



**LEGEND**








-  Interstate
-  Local Road
-  New Segment
-  Closed Segment
-  Temporary Segment
-  Signalized Intersection
-  Number of Lanes

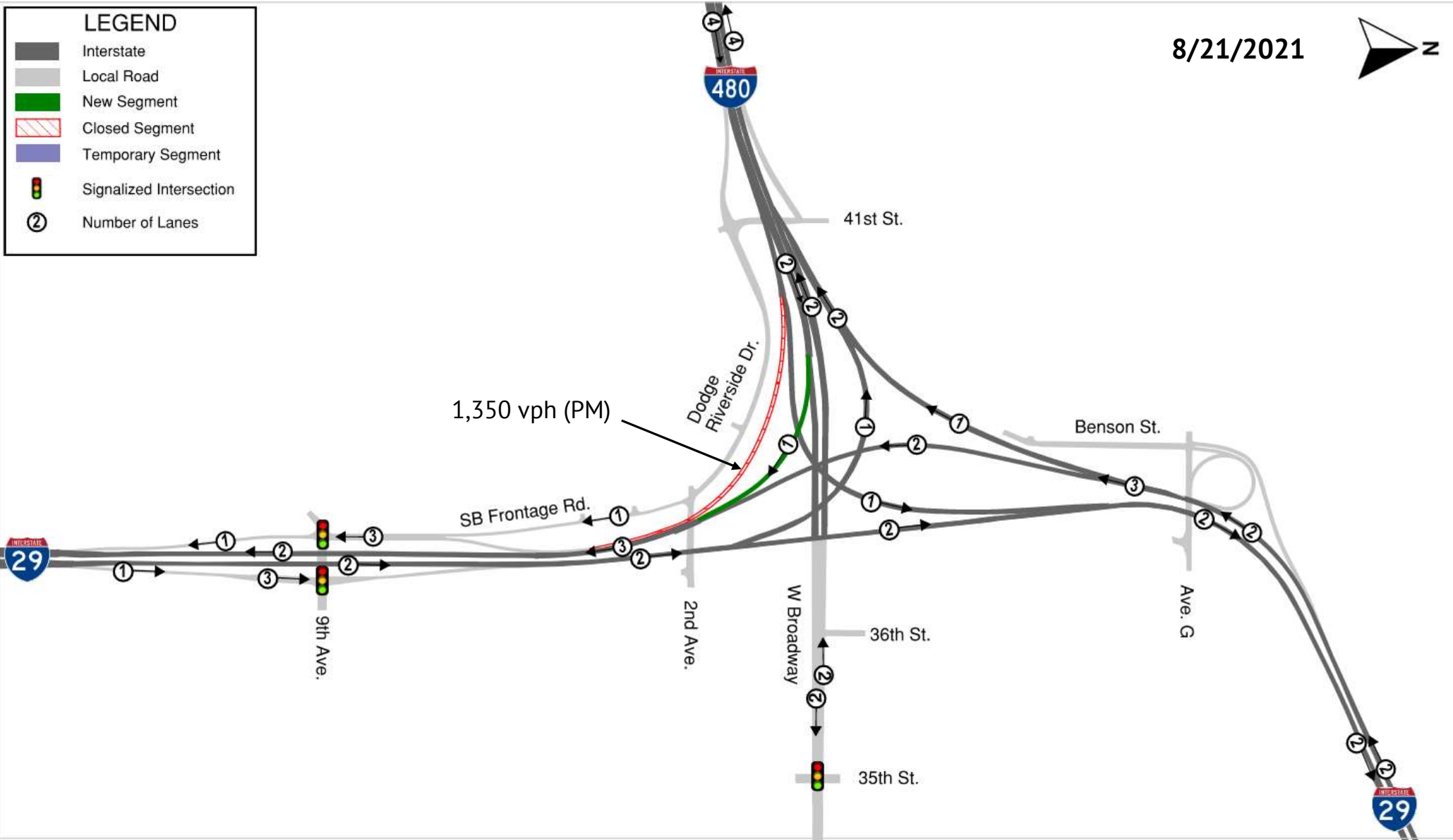


8/21/2021



**LEGEND**








-  Interstate
-  Local Road
-  New Segment
-  Closed Segment
-  Temporary Segment
-  Signalized Intersection
-  Number of Lanes

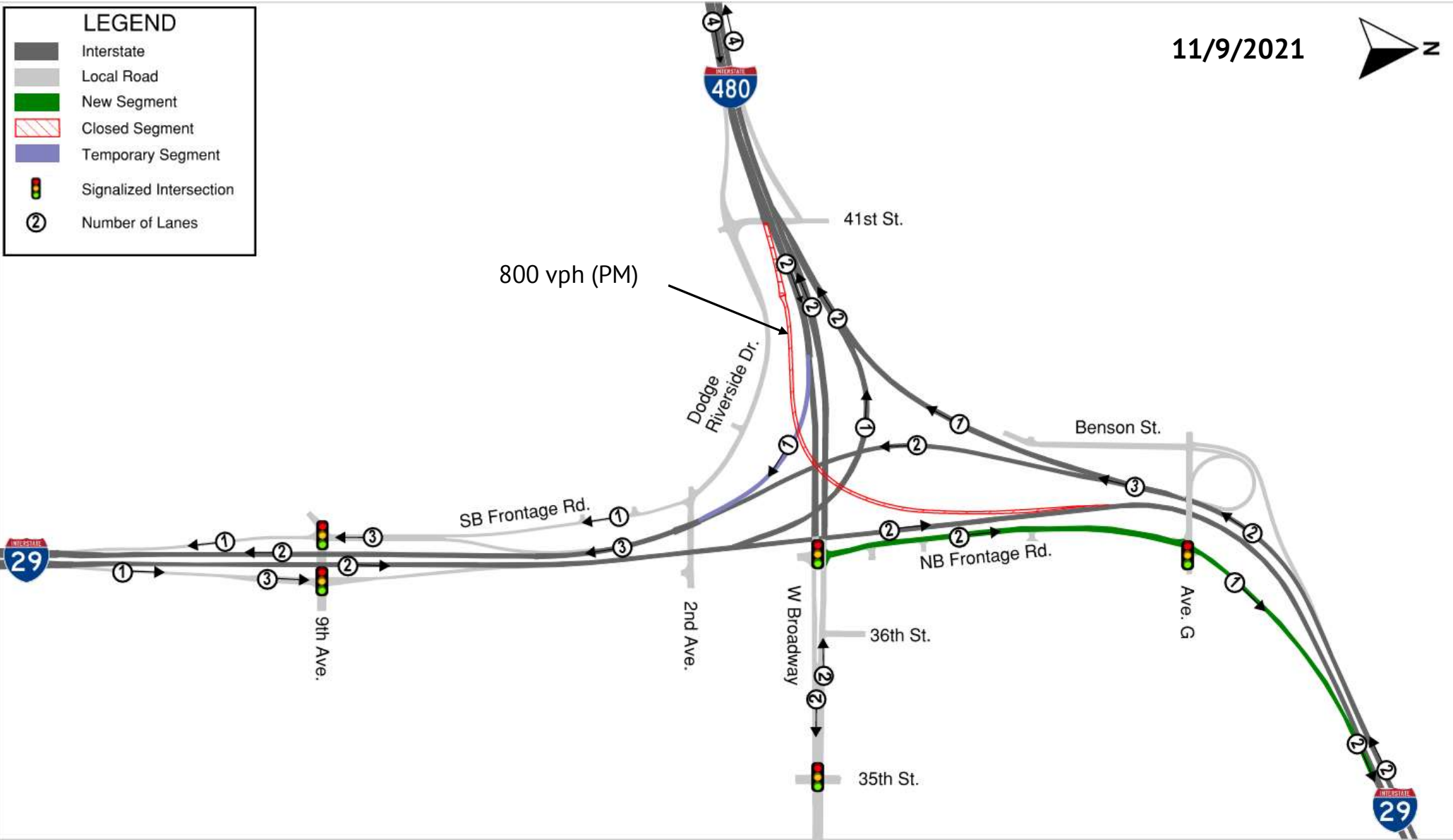


11/9/2021



**LEGEND**








-  Interstate
-  Local Road
-  New Segment
-  Closed Segment
-  Temporary Segment
-  Signalized Intersection
-  Number of Lanes

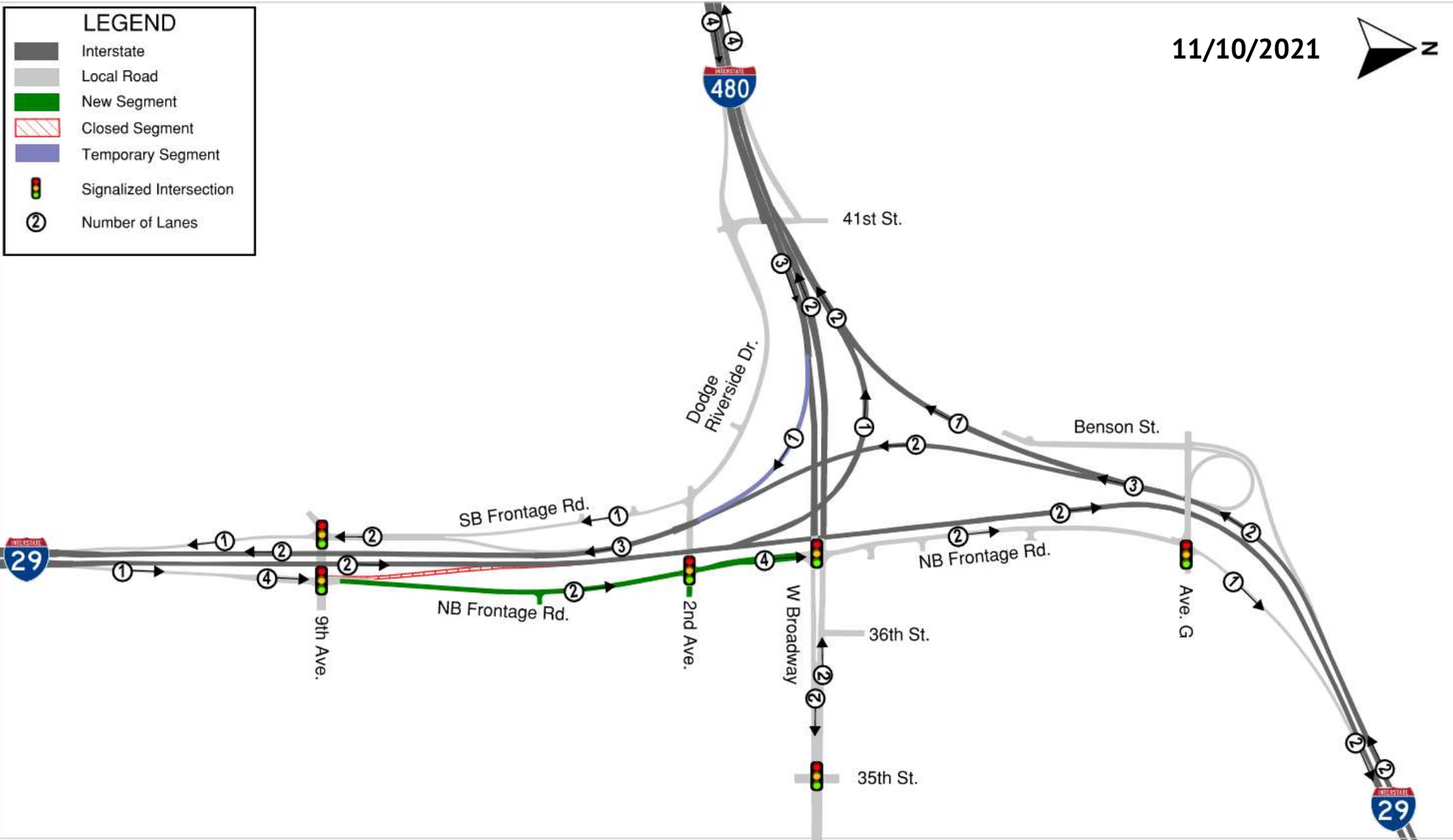


11/10/2021



**LEGEND**

-  Interstate
-  Local Road
-  New Segment
-  Closed Segment
-  Temporary Segment
-  Signalized Intersection
-  Number of Lanes










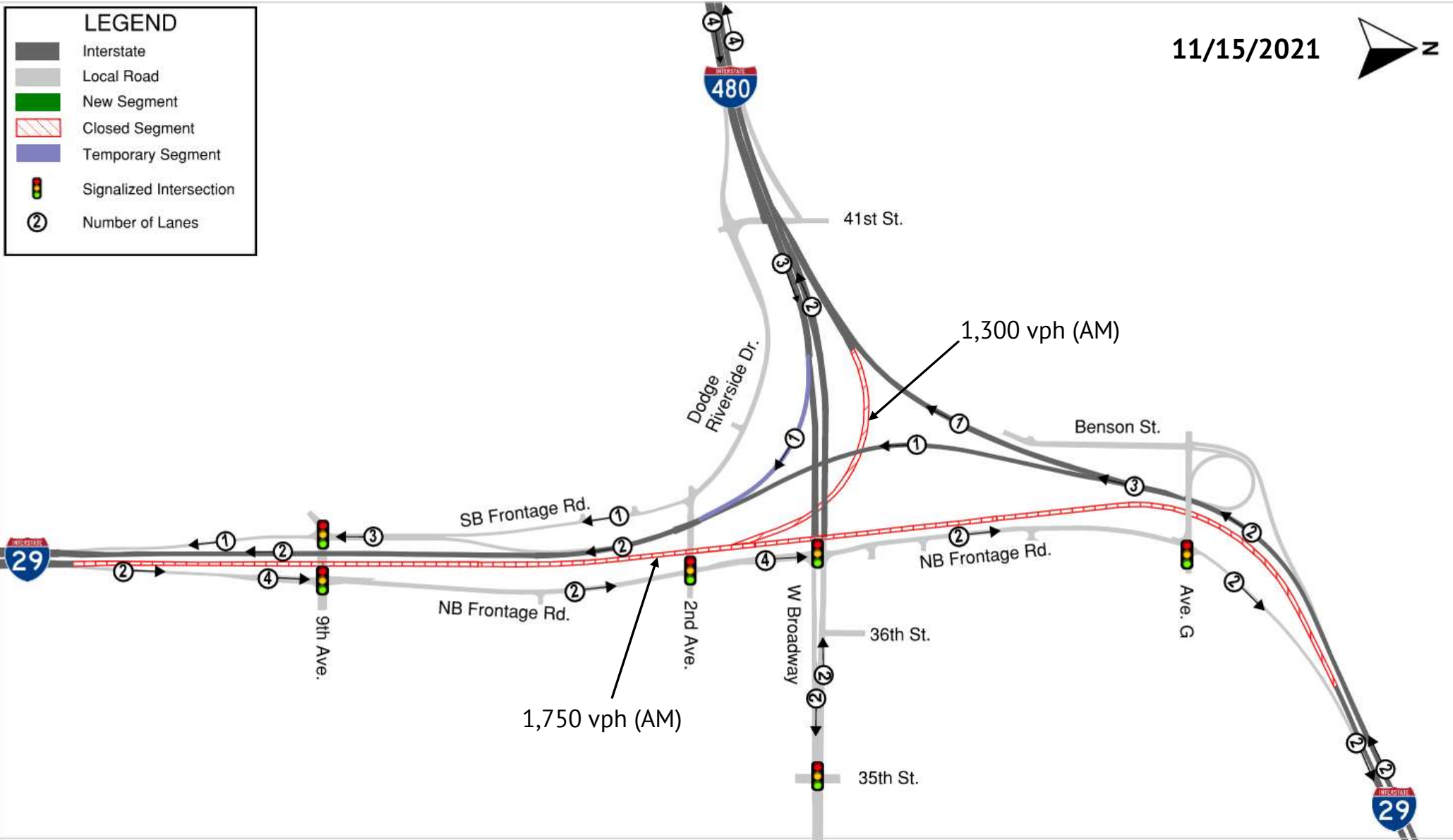


11/15/2021



**LEGEND**








-  Interstate
-  Local Road
-  New Segment
-  Closed Segment
-  Temporary Segment
-  Signalized Intersection
-  Number of Lanes

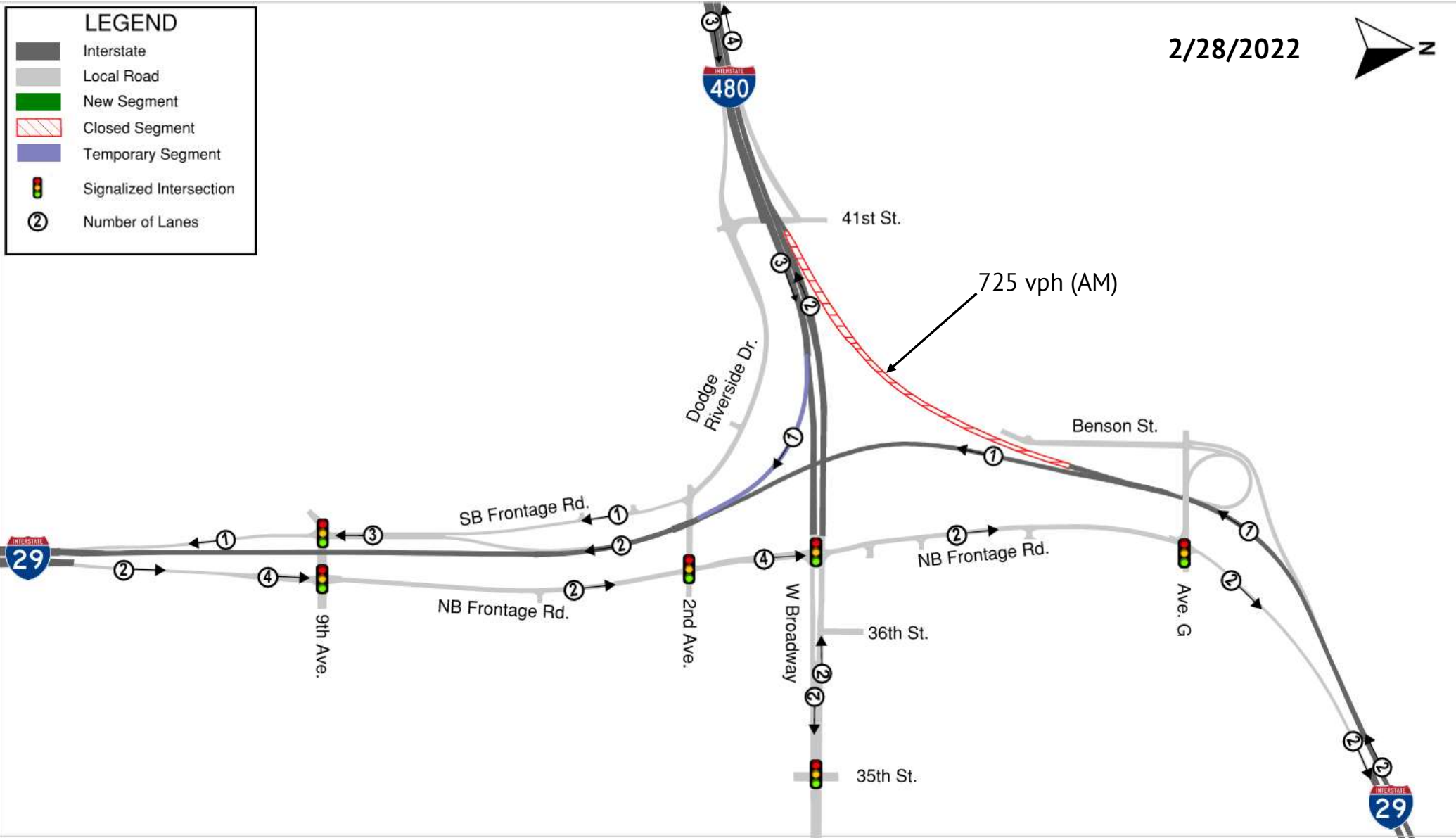


2/28/2022



**LEGEND**








-  Interstate
-  Local Road
-  New Segment
-  Closed Segment
-  Temporary Segment
-  Signalized Intersection
-  Number of Lanes

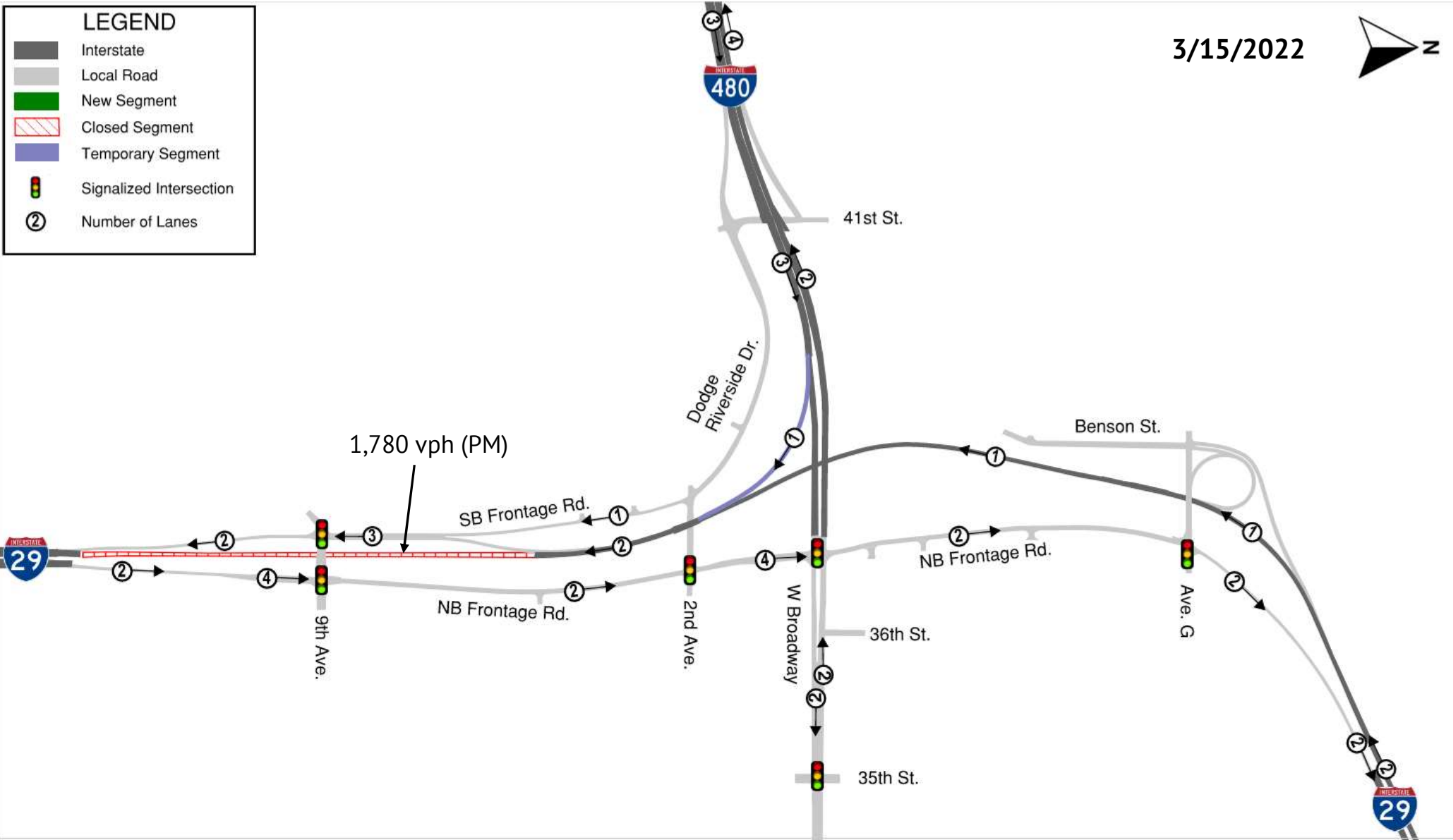


3/15/2022



**LEGEND**








-  Interstate
-  Local Road
-  New Segment
-  Closed Segment
-  Temporary Segment
-  Signalized Intersection
-  Number of Lanes

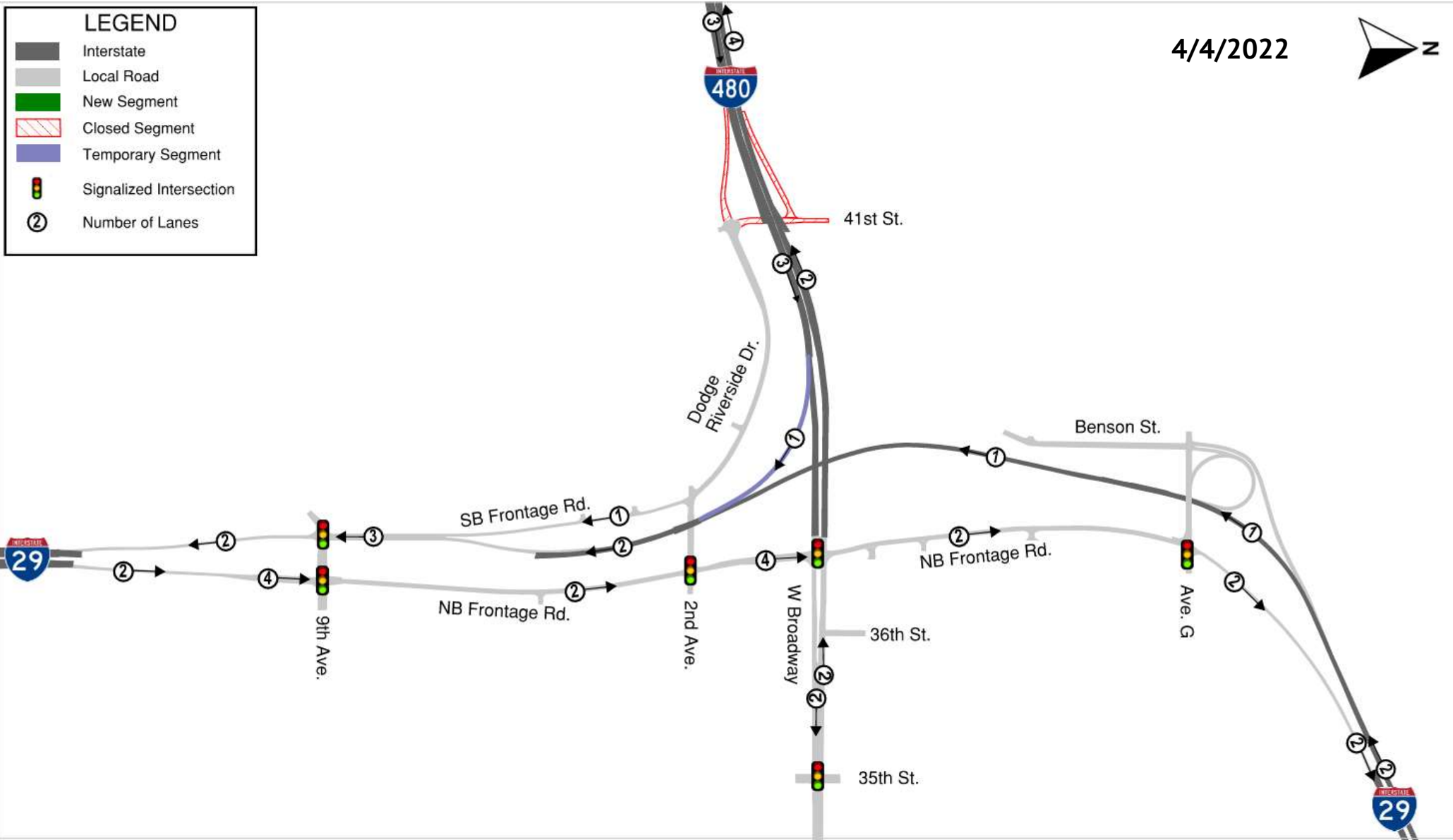


4/4/2022



**LEGEND**








-  Interstate
-  Local Road
-  New Segment
-  Closed Segment
-  Temporary Segment
-  Signalized Intersection
-  Number of Lanes

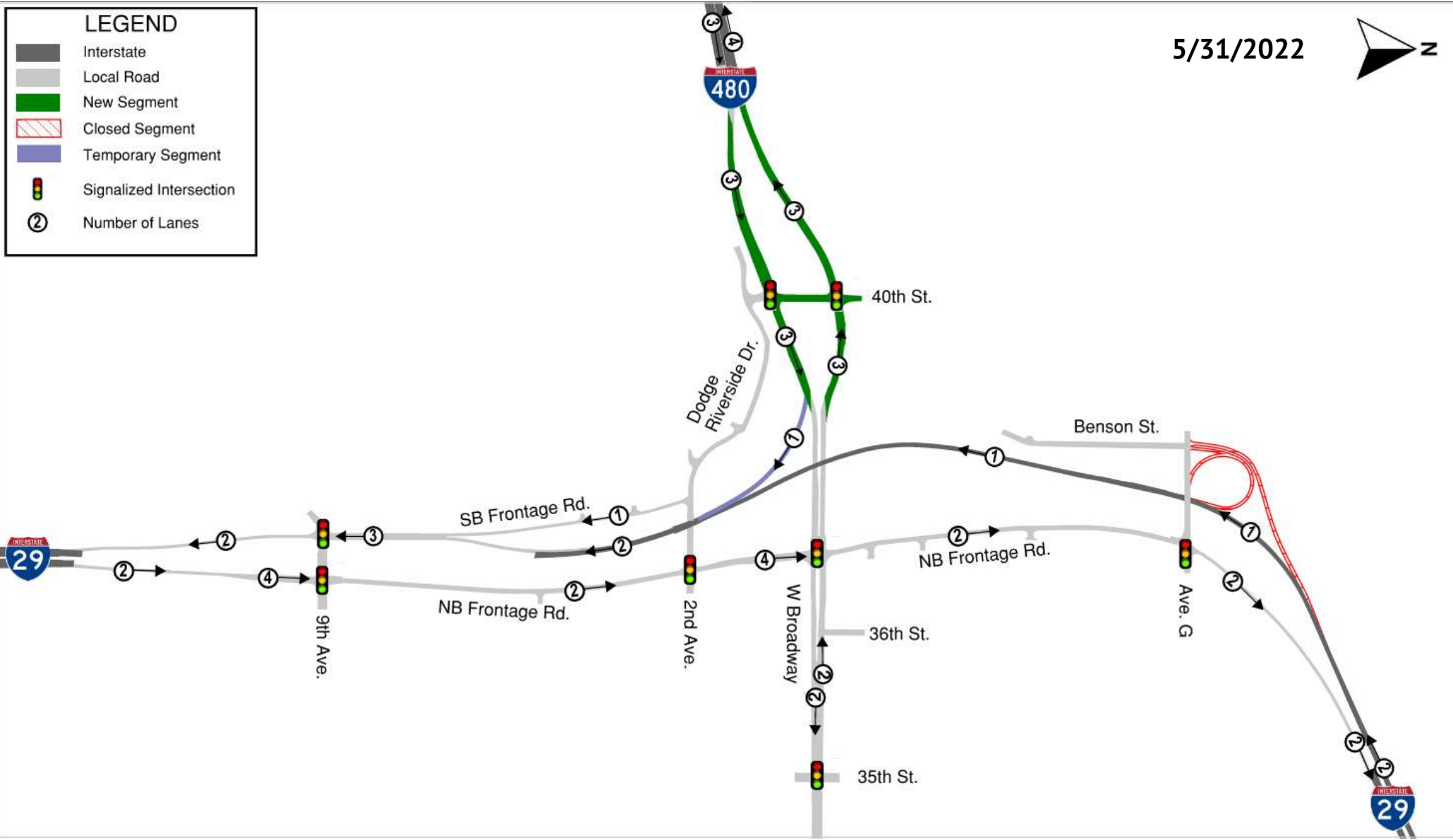


5/31/2022



**LEGEND**








-  Interstate
-  Local Road
-  New Segment
-  Closed Segment
-  Temporary Segment
-  Signalized Intersection
-  Number of Lanes

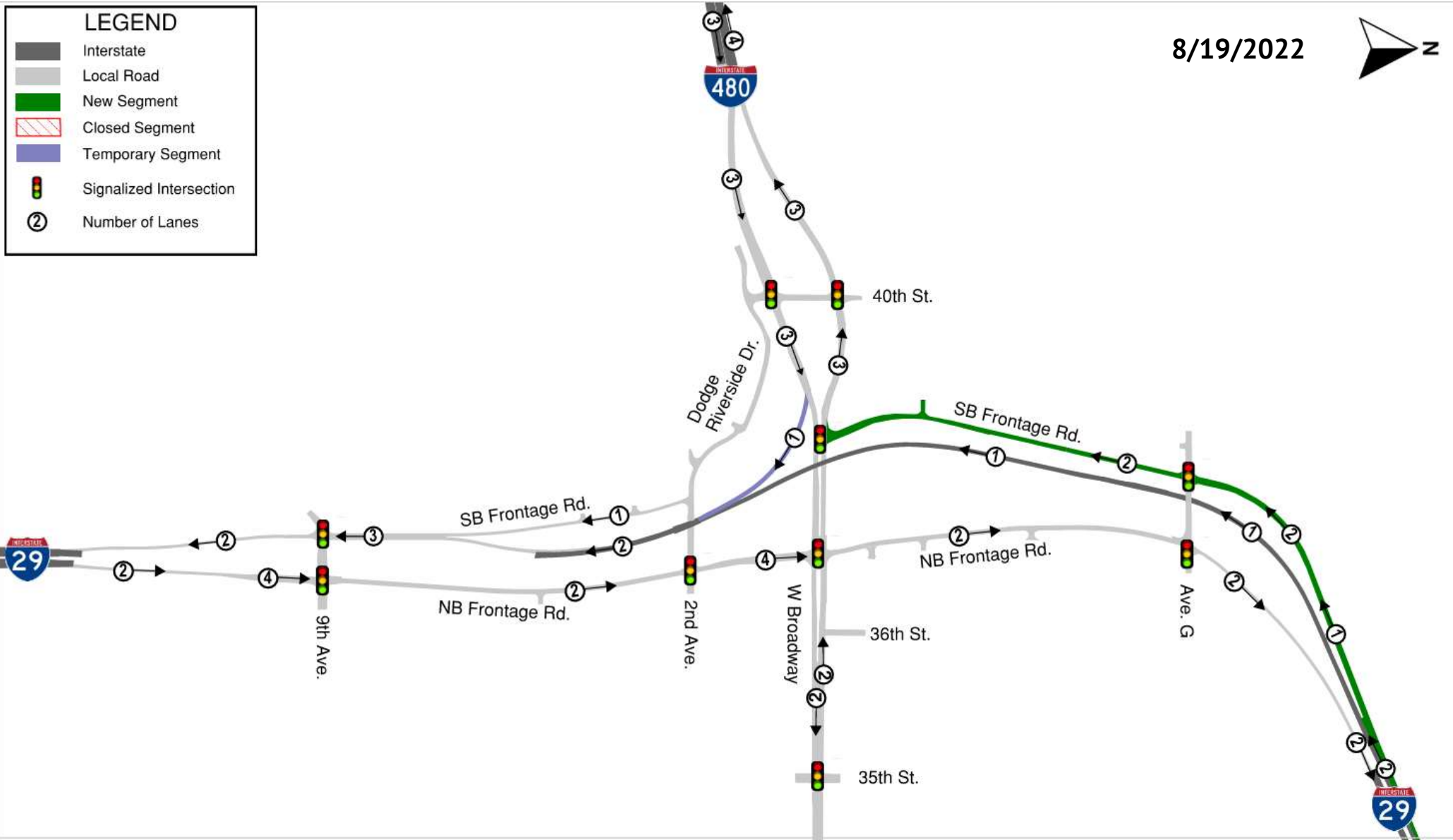


8/19/2022



**LEGEND**








-  Interstate
-  Local Road
-  New Segment
-  Closed Segment
-  Temporary Segment
-  Signalized Intersection
-  Number of Lanes

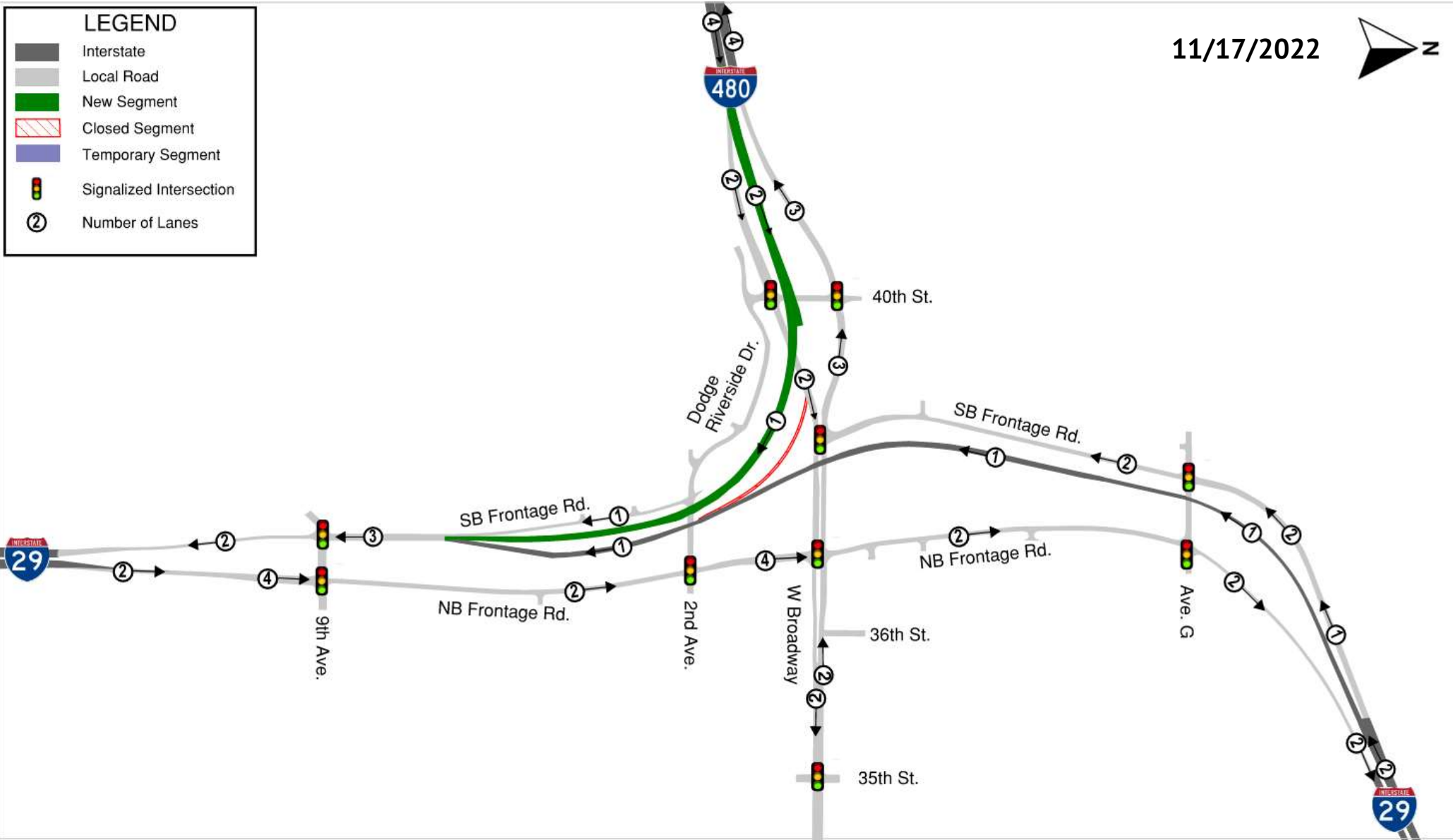


11/17/2022



**LEGEND**








-  Interstate
-  Local Road
-  New Segment
-  Closed Segment
-  Temporary Segment
-  Signalized Intersection
-  Number of Lanes

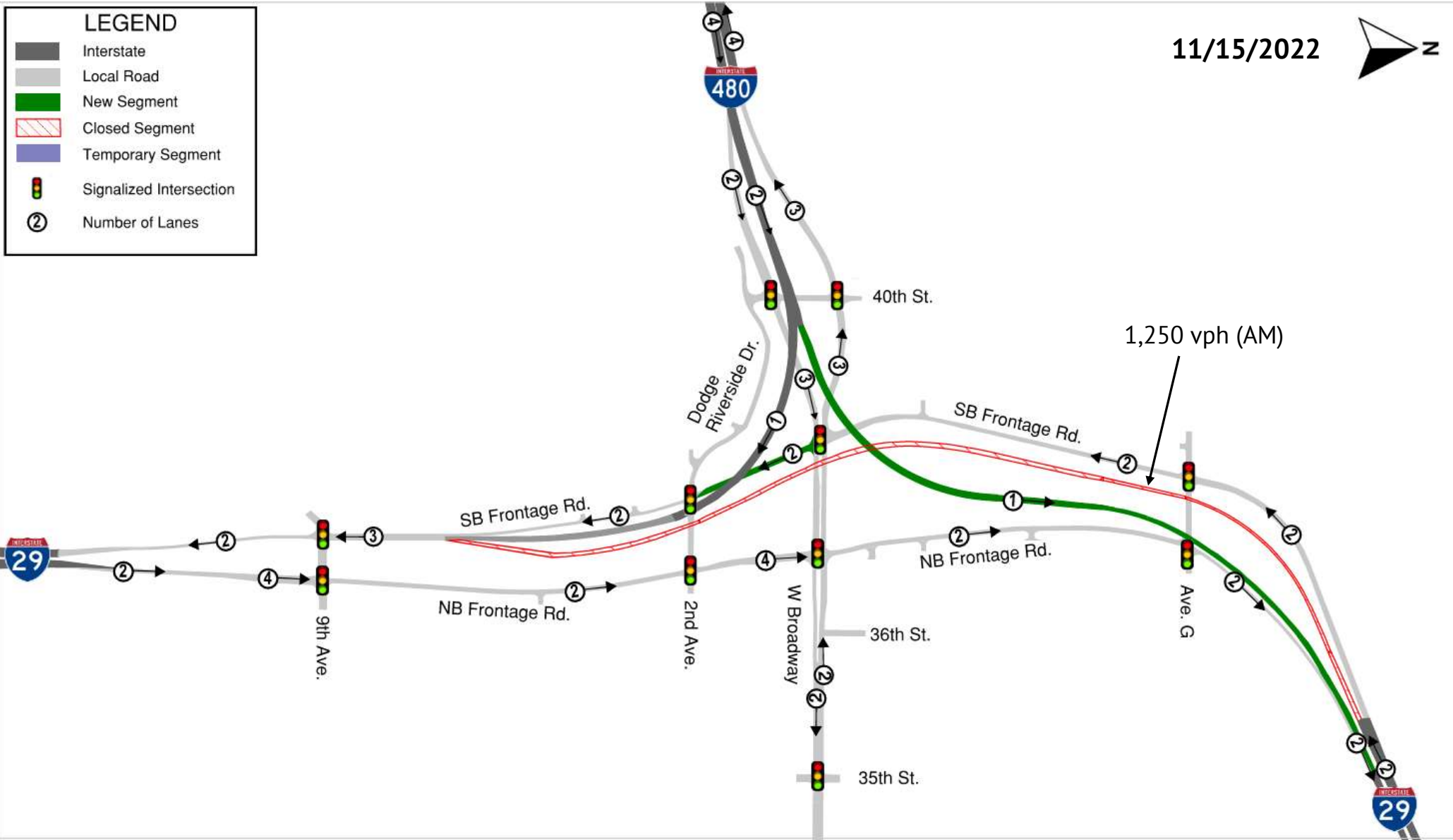


11/15/2022



**LEGEND**

-  Interstate
-  Local Road
-  New Segment
-  Closed Segment
-  Temporary Segment
-  Signalized Intersection
-  Number of Lanes





# **TSMO Strategies to Mitigate Traffic Impacts**

Contract Items

## CONTRACT INCENTIVE/DISINCENTIVES

- \$178M Contract
- \$3.6M Incentive (~2%)
- 13 Site Milestones
- DTA generates the per day cost
- Contractor maxing all incentives

**Accelerates the schedule**

**Minimize traffic impacts**

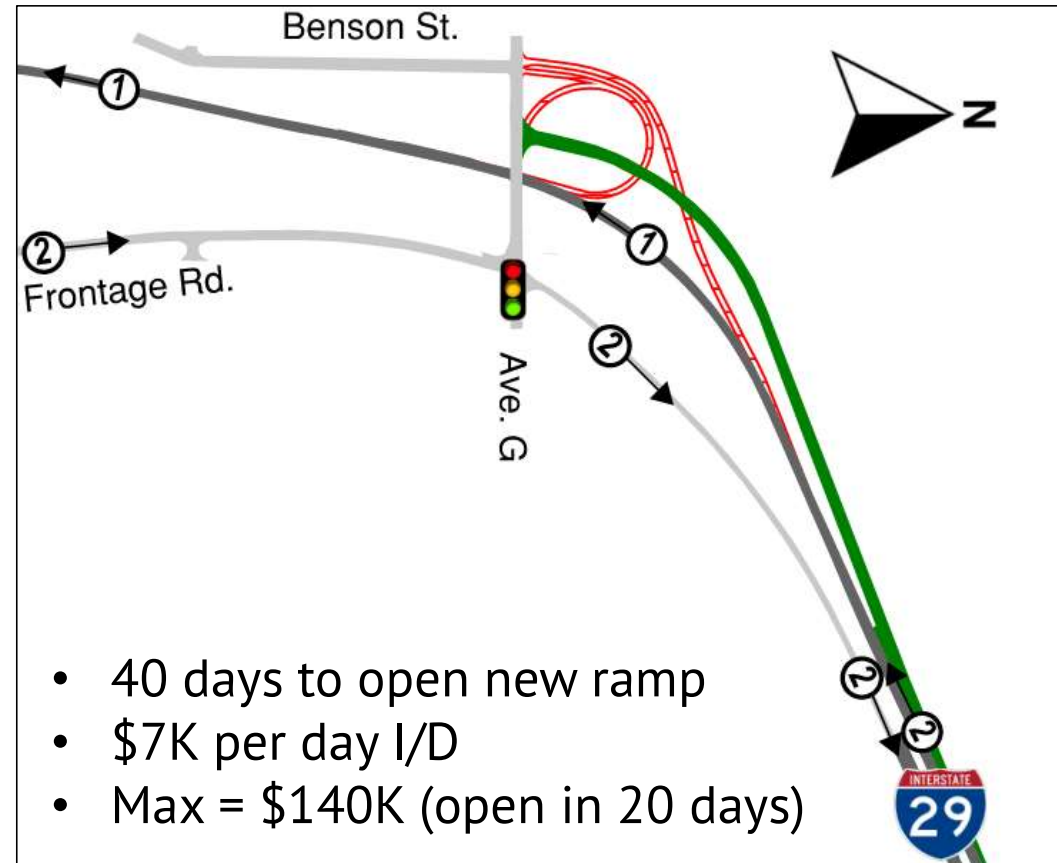
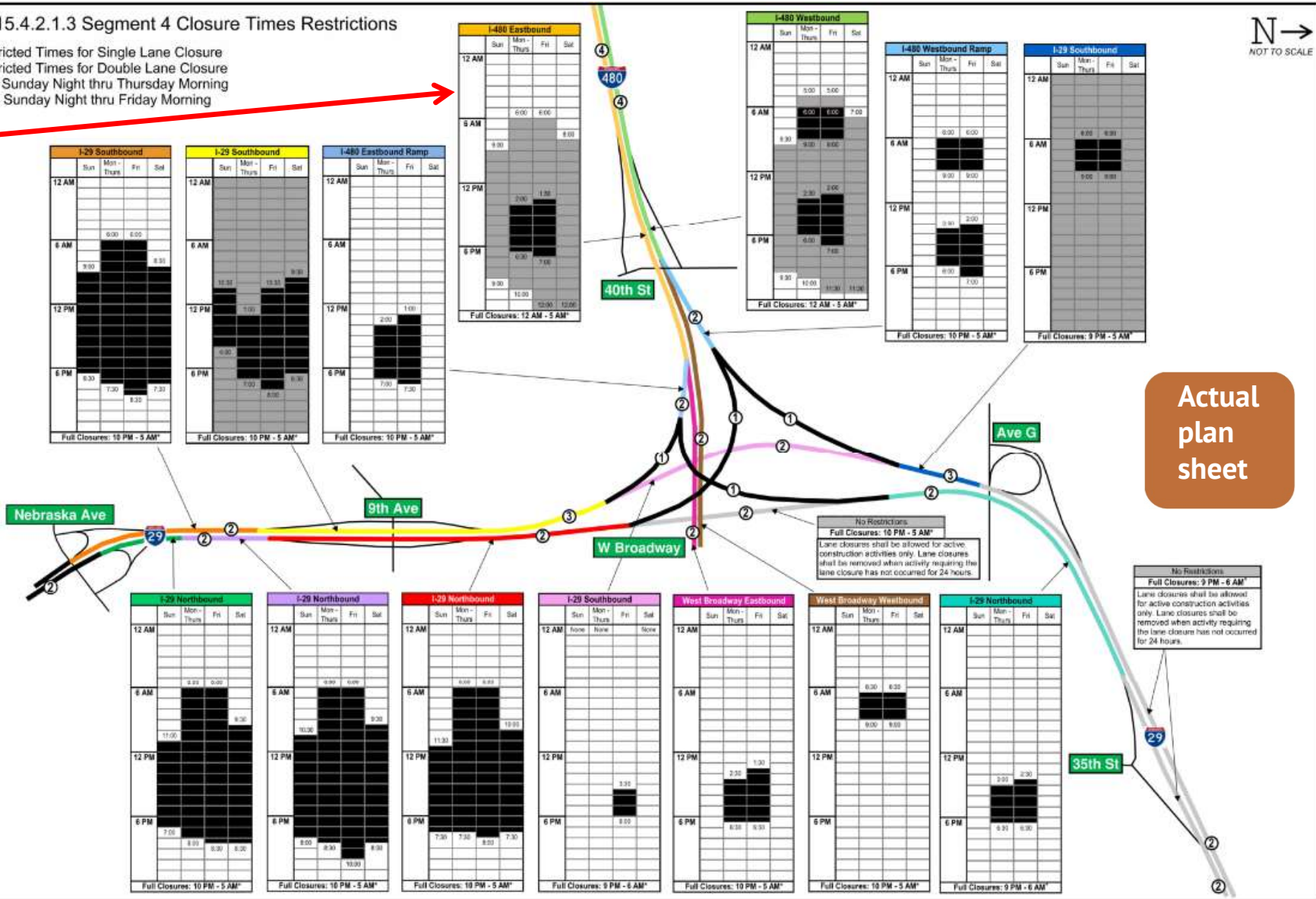


Figure 15.4.2.1.3 Segment 4 Closure Times Restrictions

Restricted Times for Single Lane Closure  
 Restricted Times for Double Lane Closure  
 \* Sunday Night thru Thursday Morning  
 + Sunday Night thru Friday Morning

N →  
NOT TO SCALE

I-480 Eastbound				
	Sun	Mon - Thurs	Fri	Sat
12 AM				
		6:00	6:00	
6 AM				8:00
	9:00			
12 PM		2:00	1:30	
6 PM		6:30	7:00	
	9:00			
		10:00		
			12:00	12:00
Full Closures: 12 AM - 5 AM*				

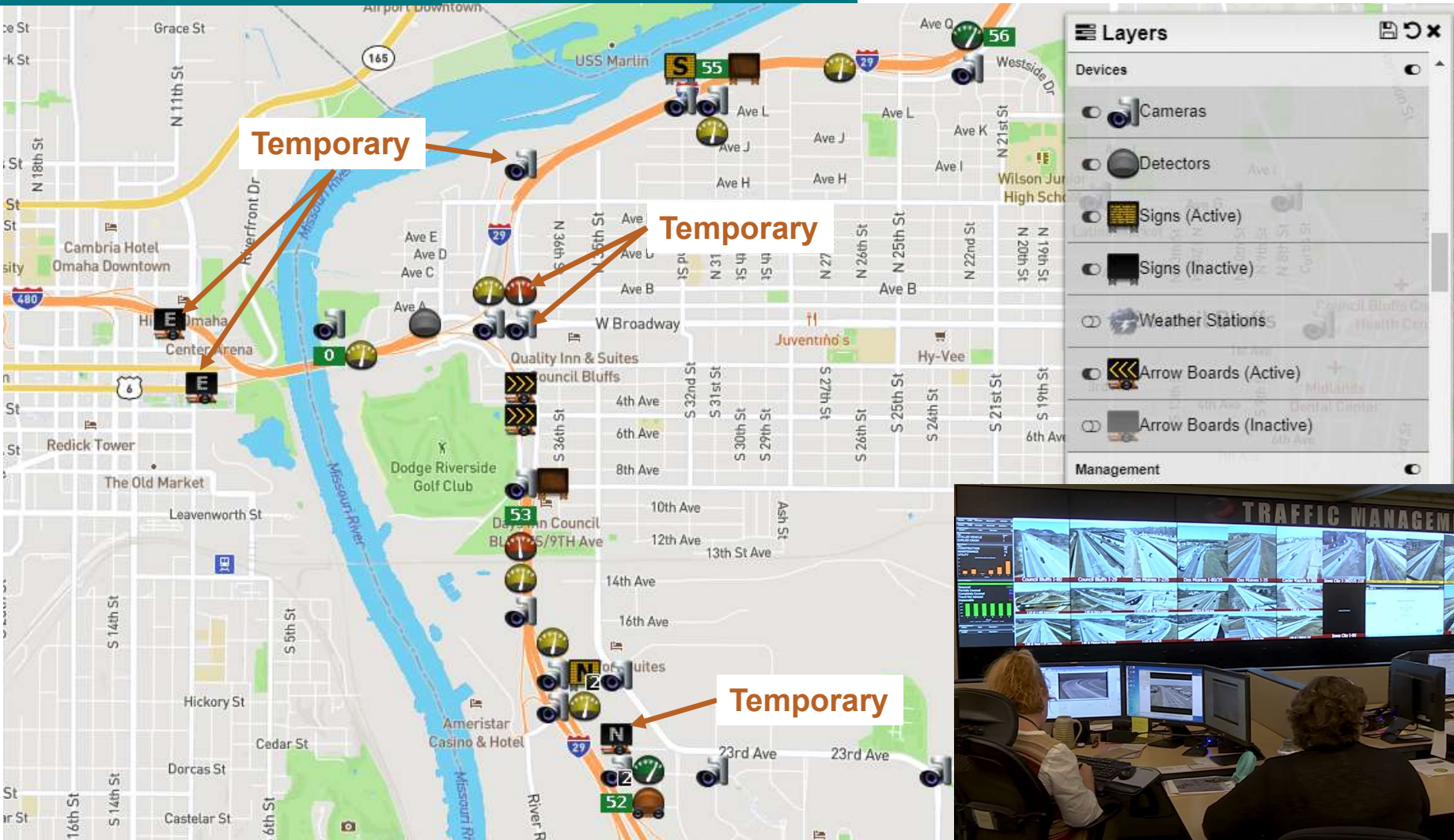


Actual plan sheet

# Intelligent Transportation Systems

# IOWA DOT - ATMS

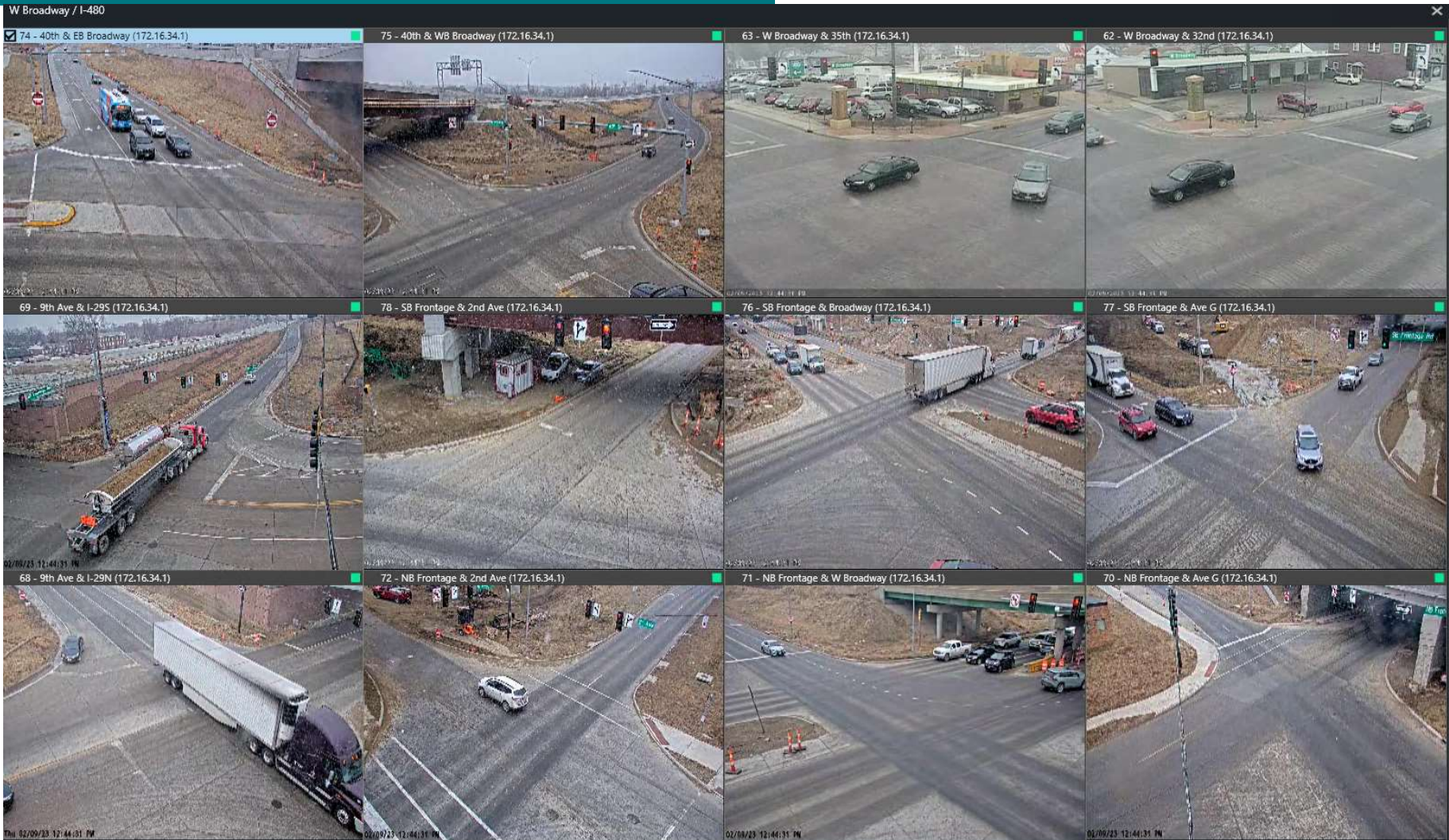
## Advanced Traffic Management System



# 100% CAMERA COVERAGE – DOT

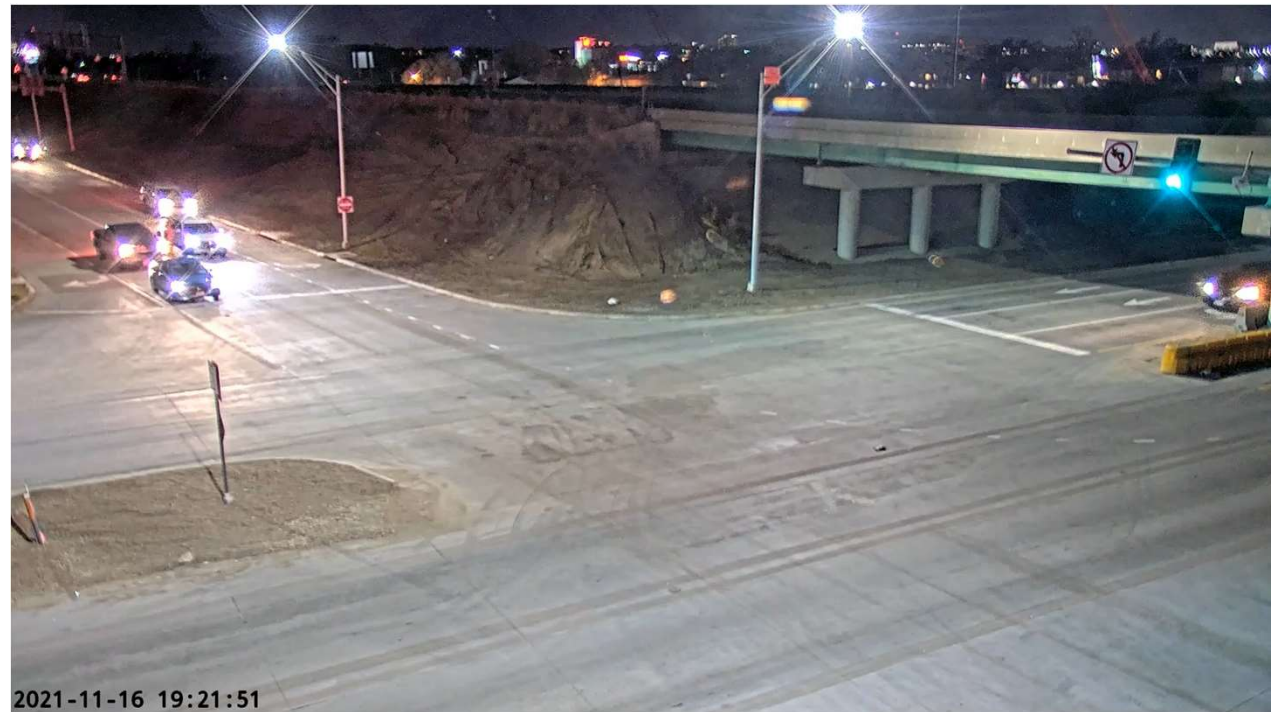


# 100% CAMERA COVERAGE - CITY



## ARCHIVED VIDEO IS BENEFICIAL

- Archive policies
  - Iowa DOT – 7 days
  - City ~ 10 days
- Review crashes
- Review construction activities
- Traffic counts
- After-Action Reviews
- Who's at fault?



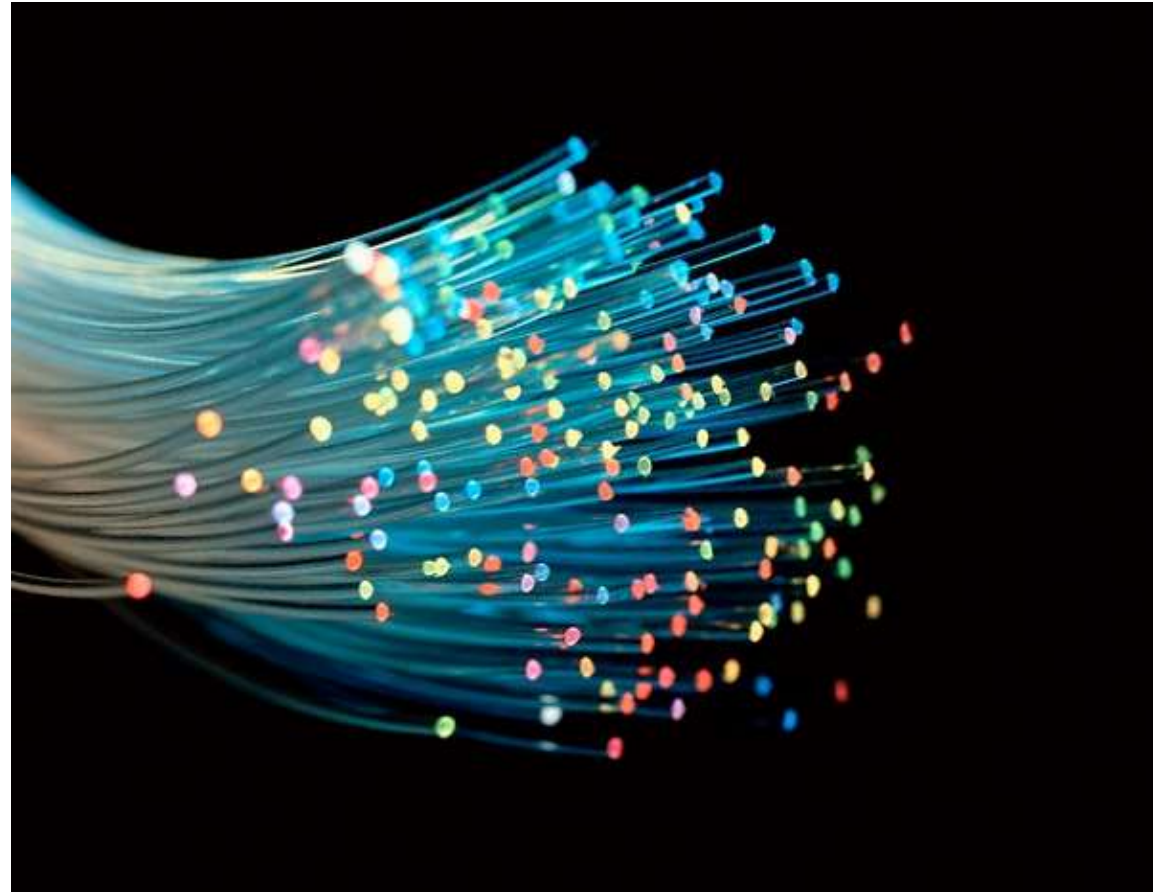
NB Frontage Rd and W. Broadway (facing south)



## COMMUNICATION IS KEY

- Fiber
  - All intersections on City Fiber Network
  - Almost all DOT devices on DOT fiber network
- Radio
  - Temporary devices (camera trailers, PDMS, sensor trailers)

**ITS staging set up to maximize use of existing devices and bring new devices online ASAP**





# Signals

**11 Total Signals**

**3 Existing**

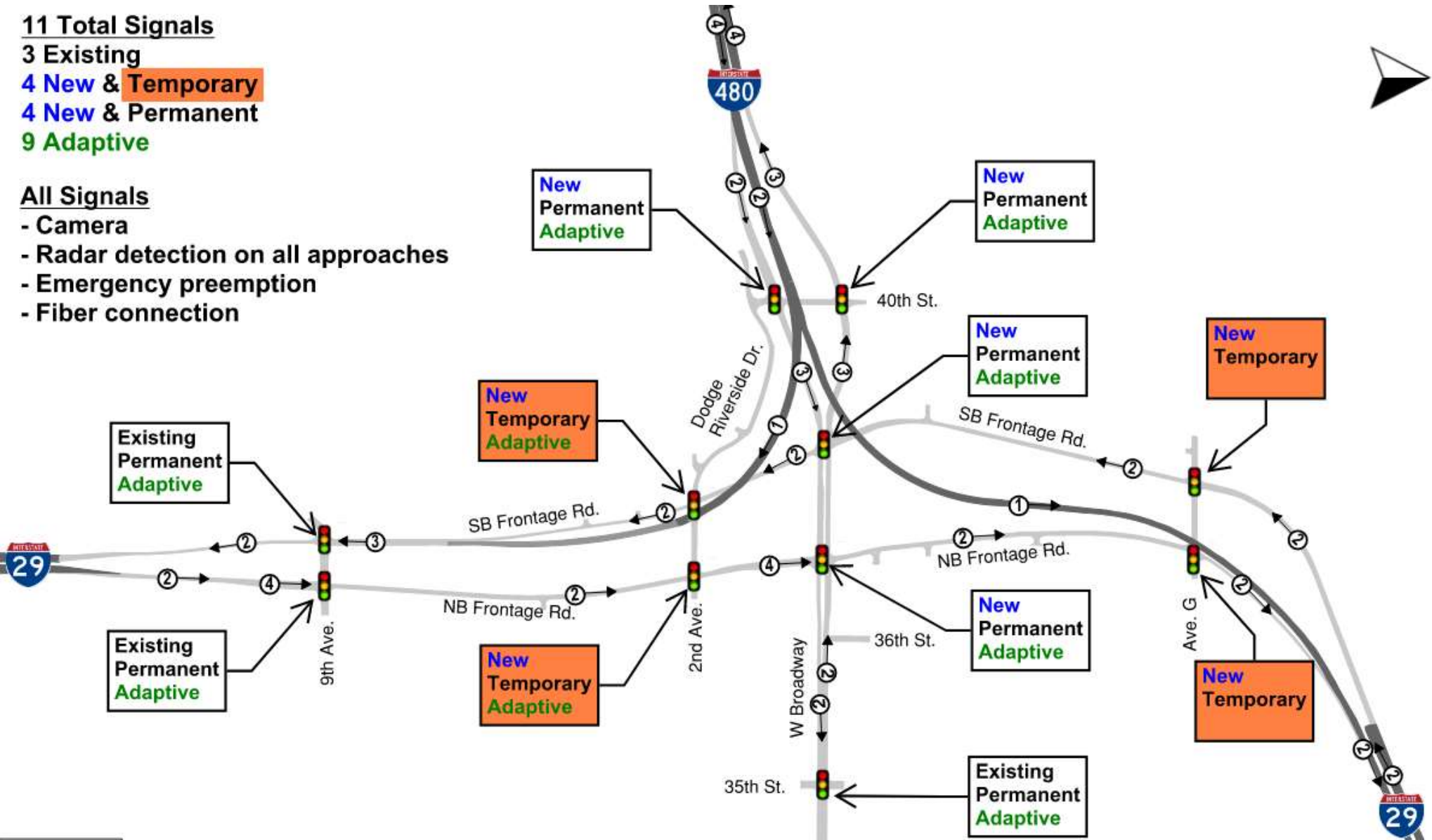
**4 New & Temporary**

**4 New & Permanent**

**9 Adaptive**

**All Signals**

- Camera
- Radar detection on all approaches
- Emergency preemption
- Fiber connection



# ADAPTIVE SIGNAL CONTROL TECHNOLOGY

- Implemented due to variability:
  - Interstate traffic
  - Construction traffic
  - Event traffic
- Cycle Length / Splits / Offsets adjust every cycle based on demand
- Volume ↑ Cycle/Split ↑ Queue ↓
- Volume ↓ Cycle/Split ↓ System Delay ↓
  - All while maintaining coordination



# CITY ATMS

# Advanced Traffic Management System

Live Adaptive View

Live Detector View

Live Controller View

Live Camera View

The screenshot displays the CITY ATMS interface with four distinct views:

- Live Adaptive View:** Shows a table with intersection status and phase utilization data.
- Live Detector View:** Displays a 'Sensor Setup' window for '3-Verification' with 8 detector lanes (1N-8P) and a map of the intersection.
- Live Controller View:** Shows a control panel for '1510 - NB Frontage @ Broadway' with various status indicators and a map of the area.
- Live Camera View:** Shows a live camera feed of the intersection with a timestamp '2022-05-16 16:35:02' and a notification: 'Could not find Current User's permissions for Bandwidth Customizations.'

ID	Status
Intersection Status	Active
Last Error	15:46 (33) Controller
Comm Pass%	100
Active Database	3
Active Pattern	23
Active Cycle	120
Active Offset	67

Phase	1	2	3	4
Next Split	45	40	0	35
Projected % Utilization	46	22	0	34
Target Split	45	40	0	35
Green Utilization	21	6	0	12
Green Utilization Error				

# AUTOMATED SYSTEM ALERTS

## Alarm Notification from ATMS Server



ATMS Admin <SignalAlert@councilbluffs-ia.gov>

To SignalAlert@councilbluffs-ia.gov

Reply

Reply All

Forward



Mon 8/29/2022 9:55 AM

Retention Policy 2019 0365 - Delete All 6 Months (6 months)

Expires 2/25/2023

This item will expire in 4 days. To keep this item longer apply a different Retention Policy.

ID : 1530      Name : 40th St @ EB Broadway/Ramp B

08/29/2022 09:54:55      On      [258] Communications Failure.(0)

### Important Alerts

- Communication Failure
- Detector Failure
- Signal Flash
- On Battery
- Door Open
- Congestion Warning

# Alternate Routes

Utilize the Entire Network

# GLOBAL AND LOCAL DETOURS



Northbound lanes of I-29 will be closed for reconstruction between 9th Avenue (Exit 53) and Avenue G in Council Bluffs.

A detour is in operation for thru-traffic, via I-80 and I-880.

Remember to slow down, read signs, and follow detours.

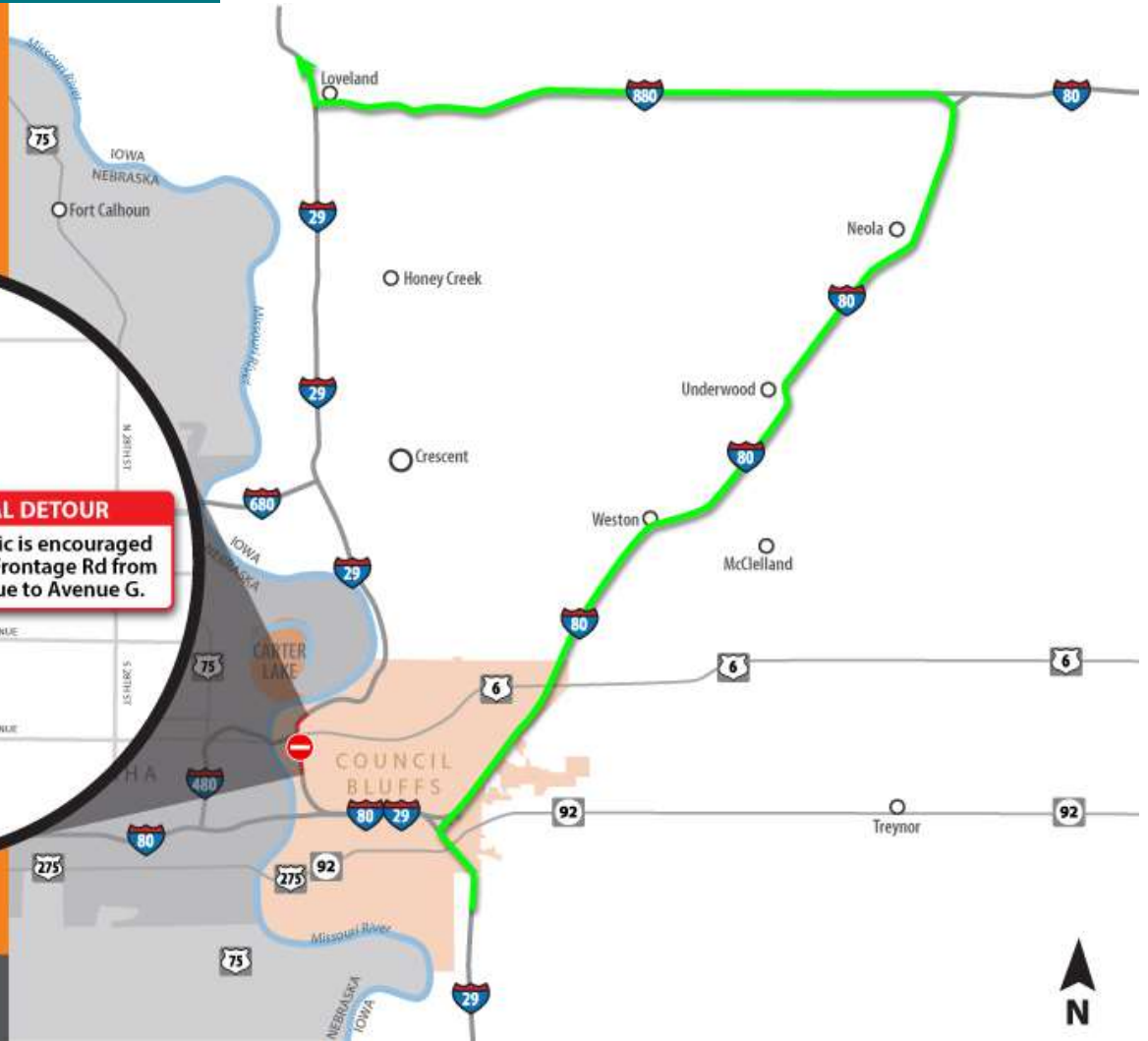


Ramp or Roadway Closed to Traffic



Designated Detour

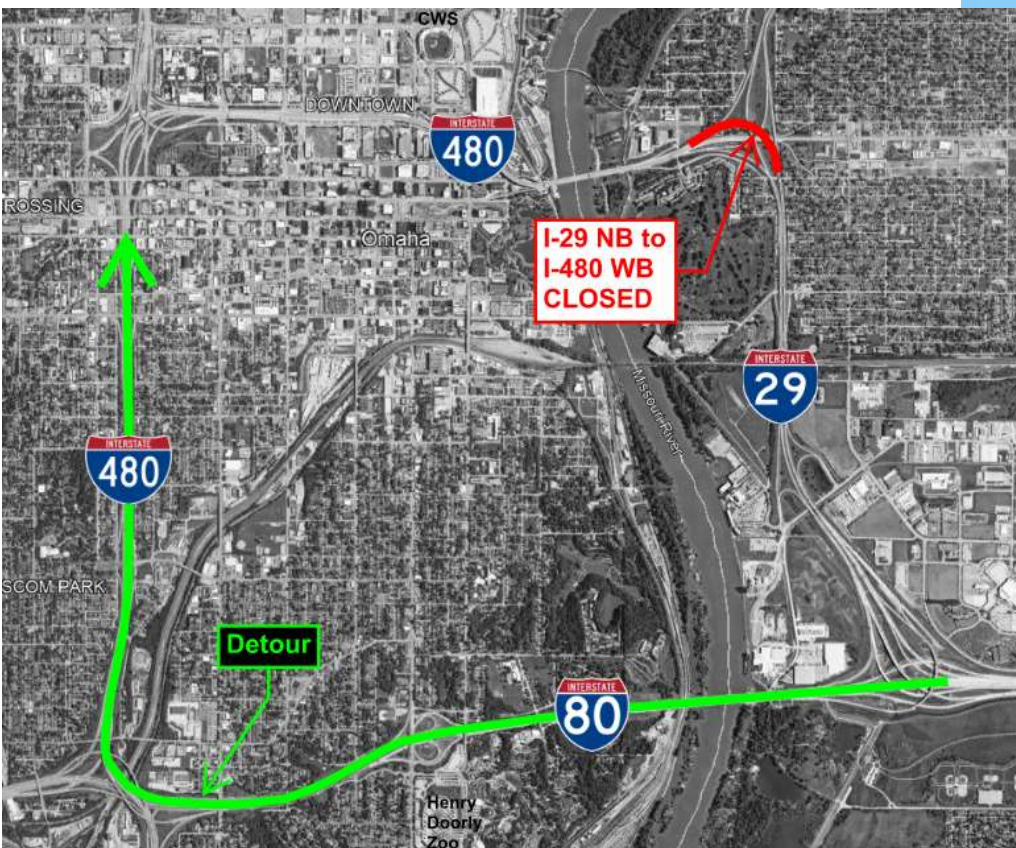
For current information on roadway conditions, visit [www.511ia.org](http://www.511ia.org).





# DOWNTOWN OMAHA DETOUR

- Majority local commuter traffic



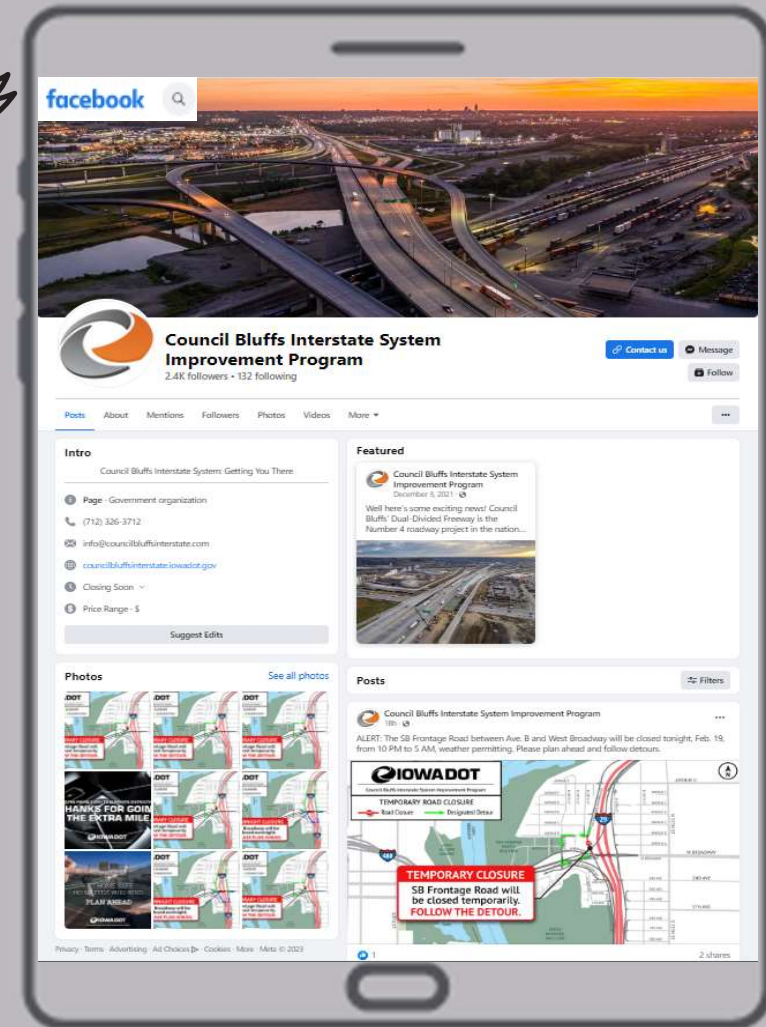
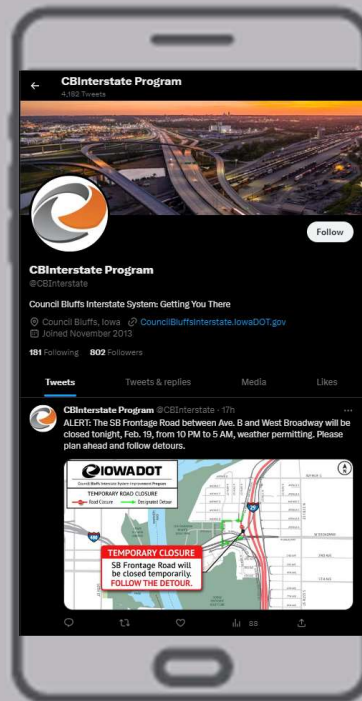
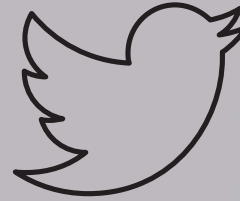
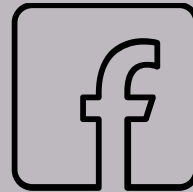
Utilizing Graphics and Color on Color DMS

# Public Information

No Surprises

# COMMUNICATE CHANGE

- Project website
- Sign up for email alerts, 511, follow on social media
- Outreach to local media outlets
- Emergency responders
- Local businesses



Public outreach is provided through the Program's social media channels, including Twitter and Facebook.

# COMMUNICATE CHANGE - MAPS



Council Bluffs Interstate System Improvement Program

## W. BROADWAY ROAD CLOSURE

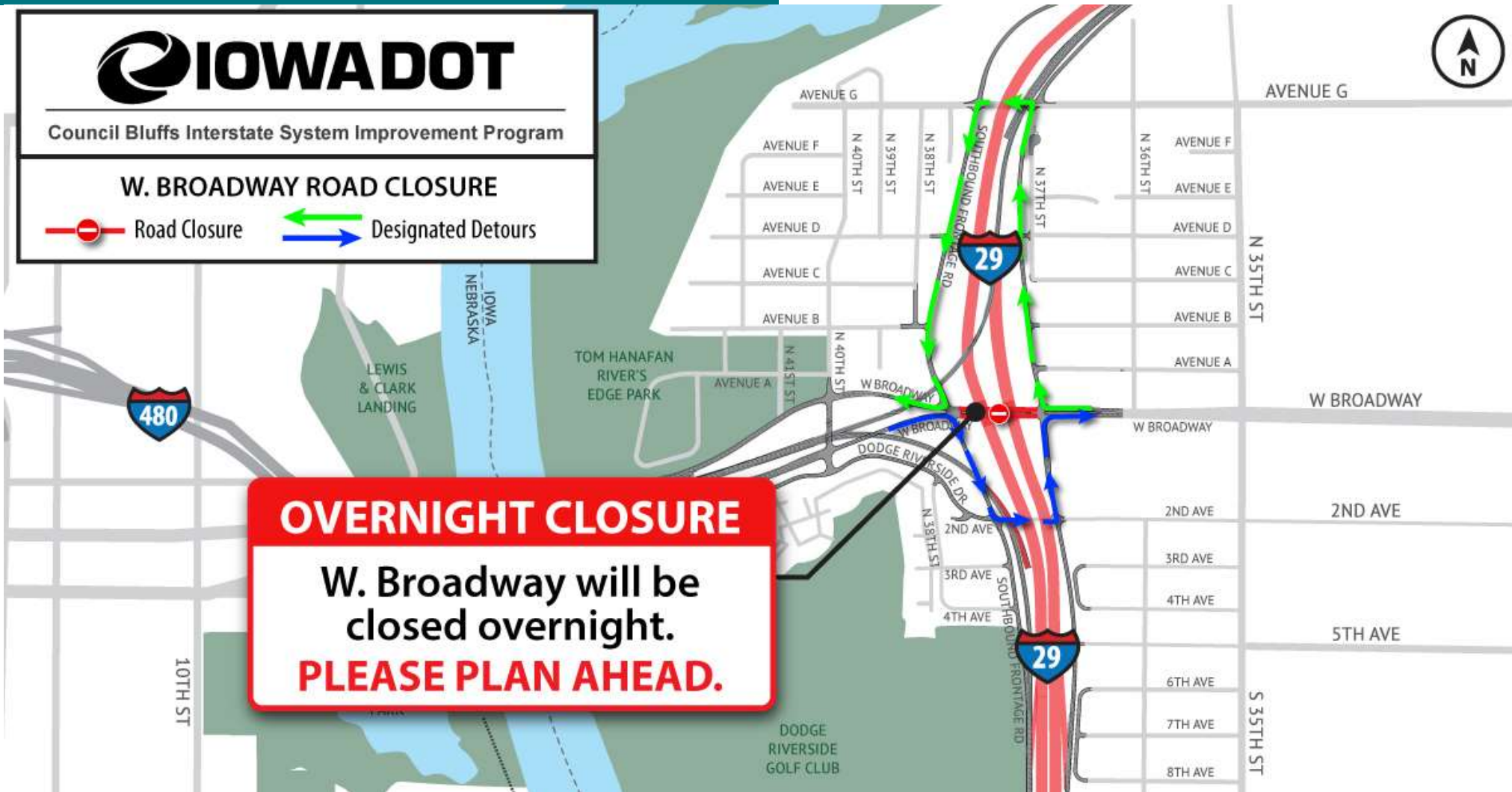
 Road Closure

 Designated Detours

**OVERNIGHT CLOSURE**

**W. Broadway will be closed overnight.**

**PLEASE PLAN AHEAD.**



# COMMUNICATE CHANGE - GRAPHICS

## PLAN AHEAD, Know Your Lane

**NORTH**



Choose the  
Right Lane


**SOUTH**



Choose the  
Center Lane




# COMMUNICATE CHANGE - VIDEOS



0:50 / 2:30

**NEW! Alternate I-29 Frontage Road System**

 Council Bluffs Interstate System  
16 subscribers

Subscribe

3 | Share | Save

This is a screenshot of a video showing an aerial view of a road construction site. A green highlighted path runs through the center of the site, labeled "NB Frontage Rd" in white text. To the right, a green sign with white text reads "W BROADWAY". The surrounding area includes a highway on the left, residential houses in the background, and a dirt road on the right. The video player interface at the bottom shows a progress bar at 0:50 / 2:30, a play button, and various control icons. Below the video, the title "NEW! Alternate I-29 Frontage Road System" is displayed, along with the channel name "Council Bluffs Interstate System" and "16 subscribers". A "Subscribe" button is visible. On the right side of the video player, there are icons for likes (3), share, and save.

## GPS / MAPPING COORDINATION

**waze** 


 **tomtom**

  
**Apple Maps**

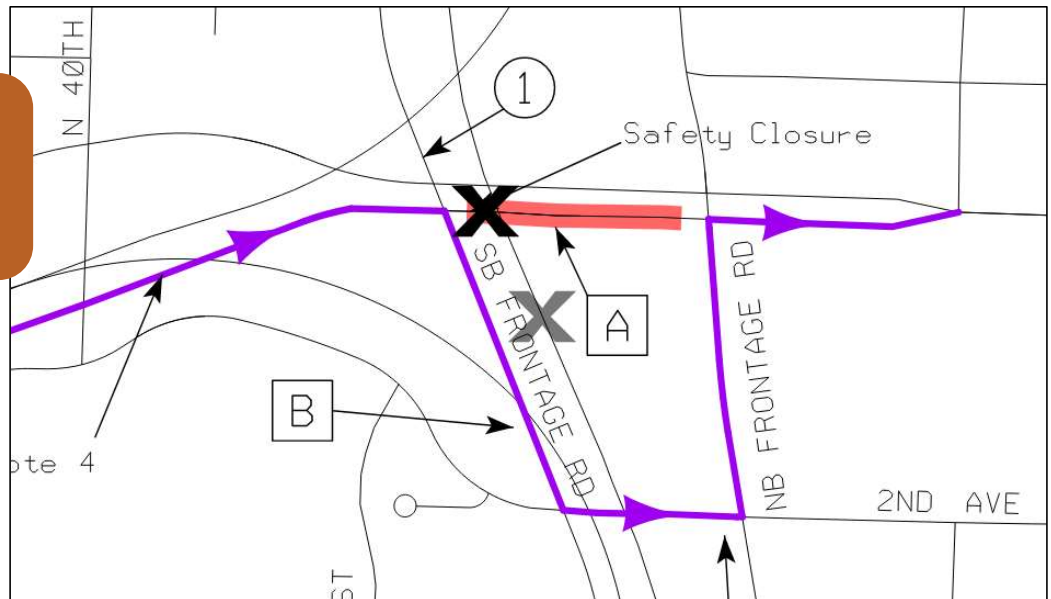


# DMS MESSAGING

- Info directly to the driver

EXIT 53-B  
TO  WEST  
CLOSING

MONDAY  
2/28 AT 10 PM  
FOR 1.5 YEARS

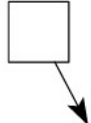


Included in the plans

PDMS

XXXXXXXXXX  
XXXXXXXXXX  
XXXXXXXXXX

PDMS  
LOCATION



---

Advanced Messages

3 Days Prior

A

THIS ROAD CLOSING \*  
\*\* TO  
\*\*\*

Day of Closure

A

THIS ROAD CLOSING TONIGHT \*  
\*\* TO  
\*\*\*

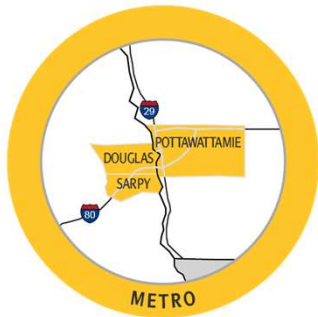
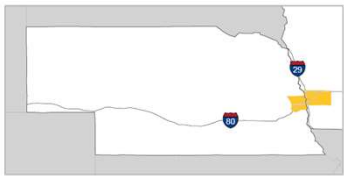
\*Day of Closure (e.g. THURSDAY)  
\*\*Start time of Closure (XX PM)  
\*\*\*End time/day of Closure (e.g. FRI 5 AM)



# Traffic Incident Management

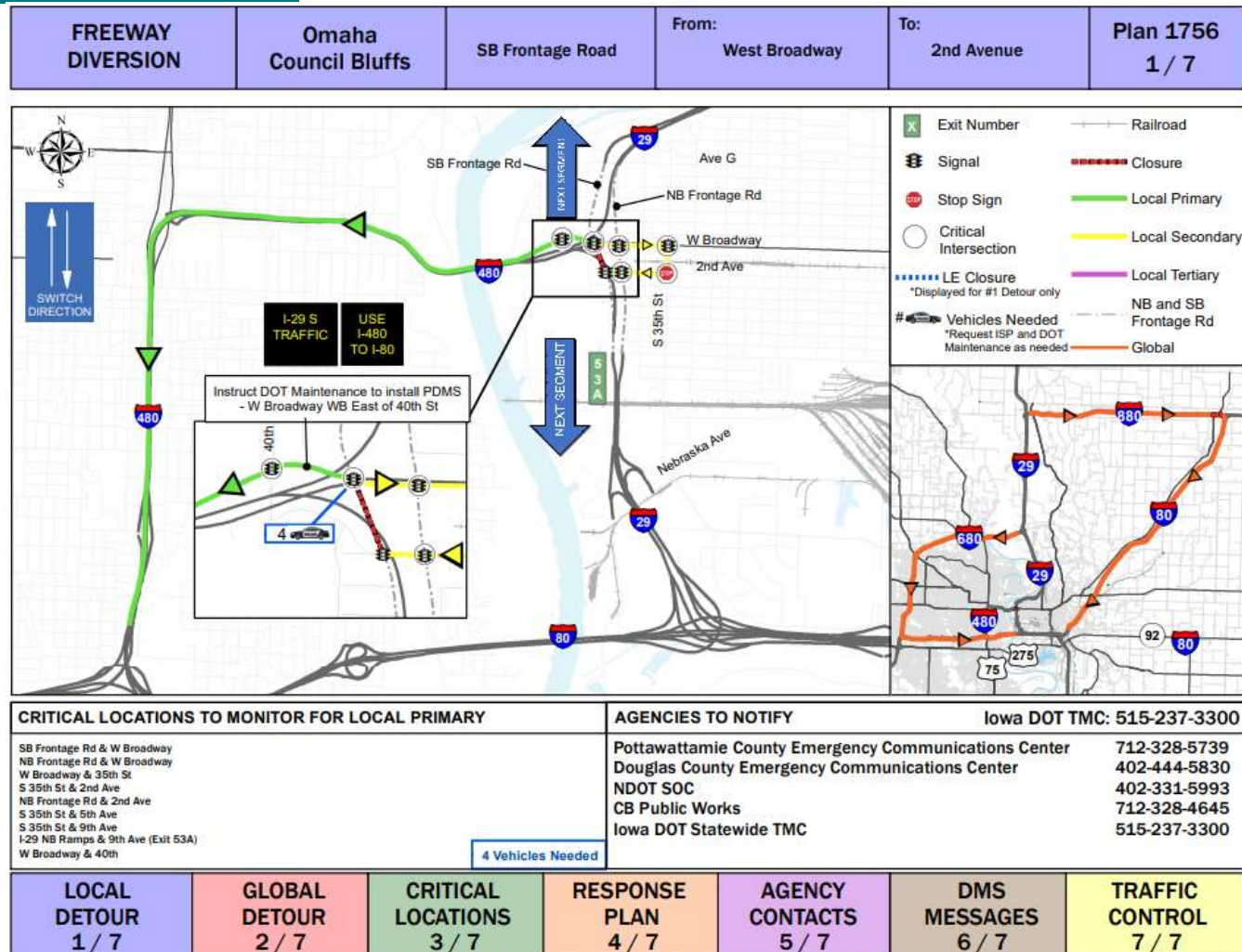
# METRO TIM GROUP

- Omaha-Council Bluffs Metro TIM
- Established 2014
- Engaged during Segment 4 planning, design, and construction



# TIM PLANS

- TIM plans developed for Frontage Rds and Broadway
- Developed and reviewed with emergency responders
- Updated as staging changes (e.g., ramp closures/opening)



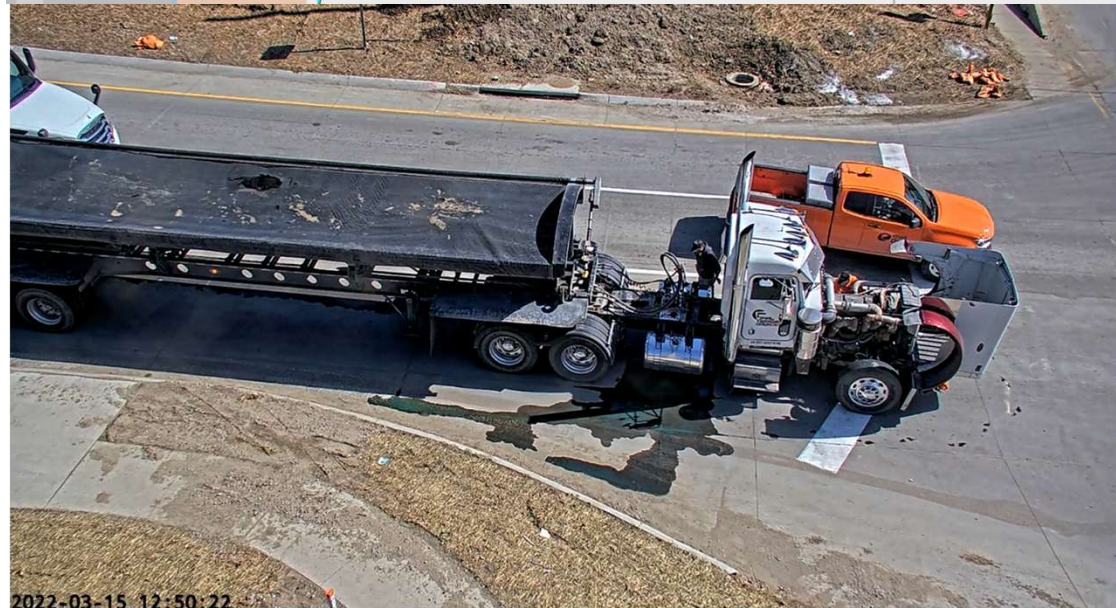
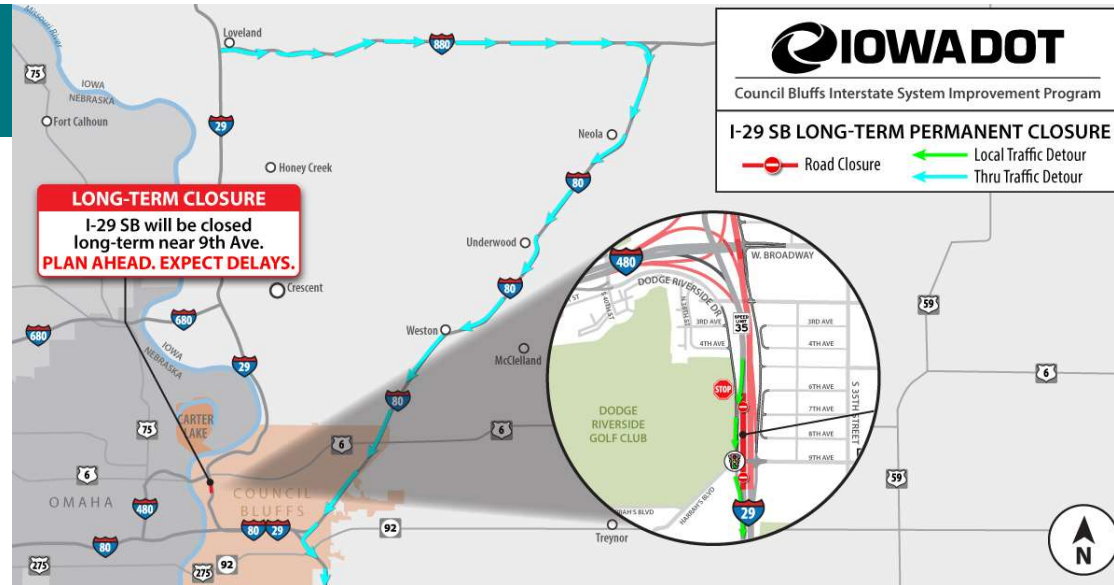
Iowa DOT TMC: 515-237-3300

ENSURE ALL OVERWEIGHT AND OVERSIZE VEHICLES ARE PARKED SAFELY

Last update: 11/9/2022

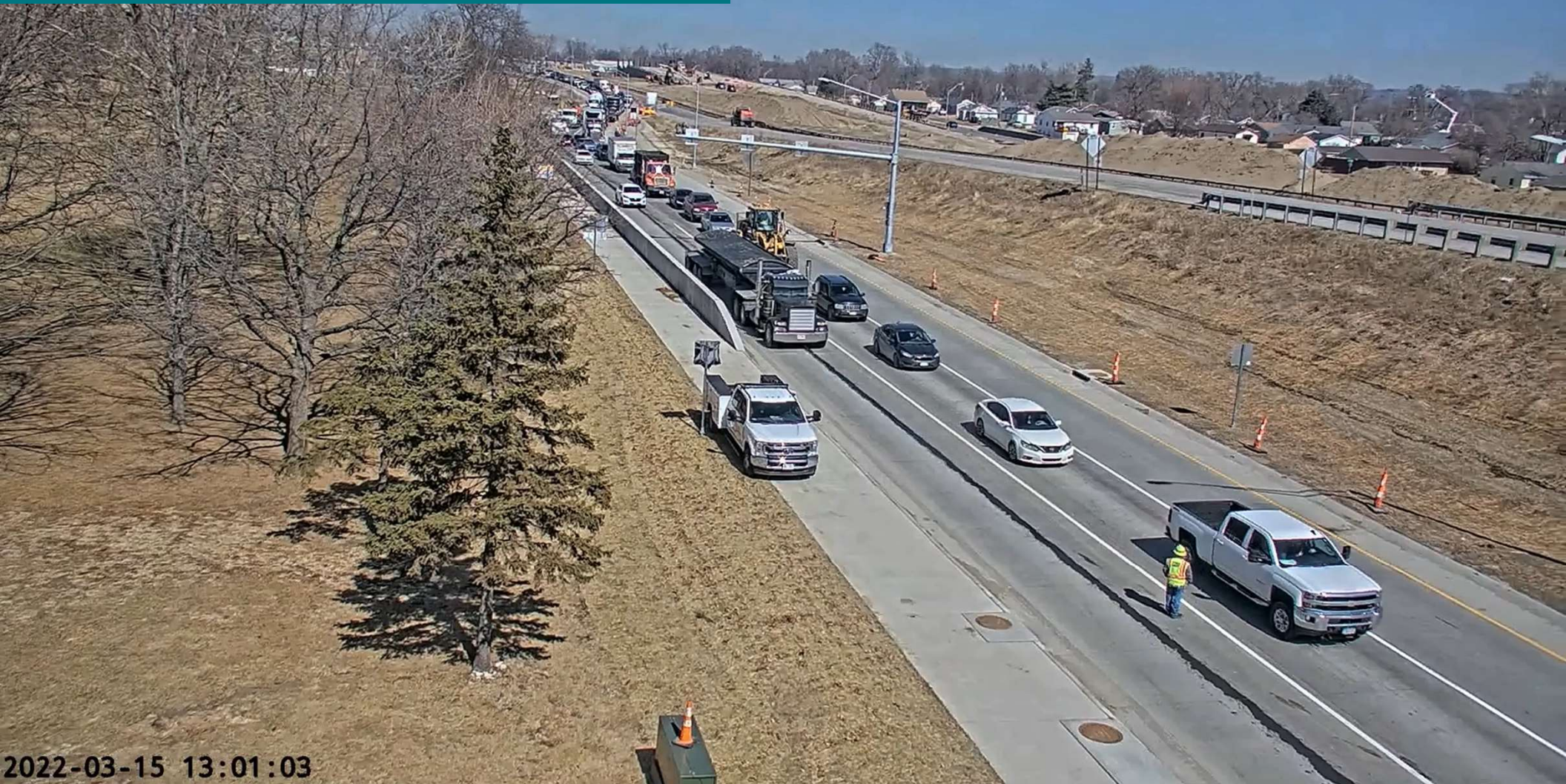
# AFTER ACTION REVIEWS

- Review actual traffic incidents at TIM meetings with responders
- Best Practices
- Lessons Learned



Quick clearance of incidents on the Frontage Roads is critical

# AFTER ACTION REVIEWS



2022-03-15 13:01:03

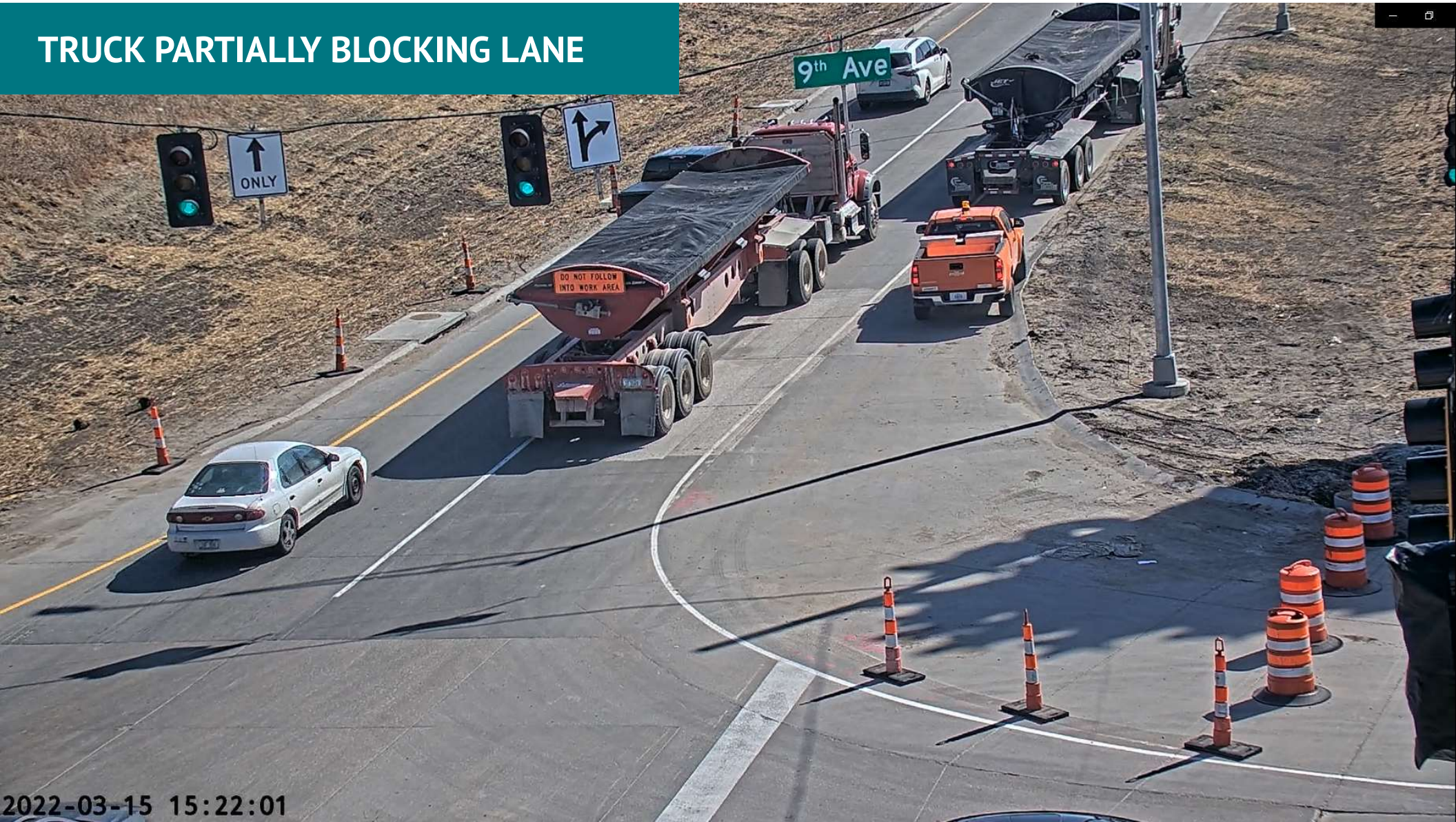
# TRAFFIC BACKS UP AGAIN



15:20 (+2h)

2022-09-16 15:20:19

# TRUCK PARTIALLY BLOCKING LANE



2022-03-15 15:22:01

# LESSON LEARNED TO BEST PRACTICE

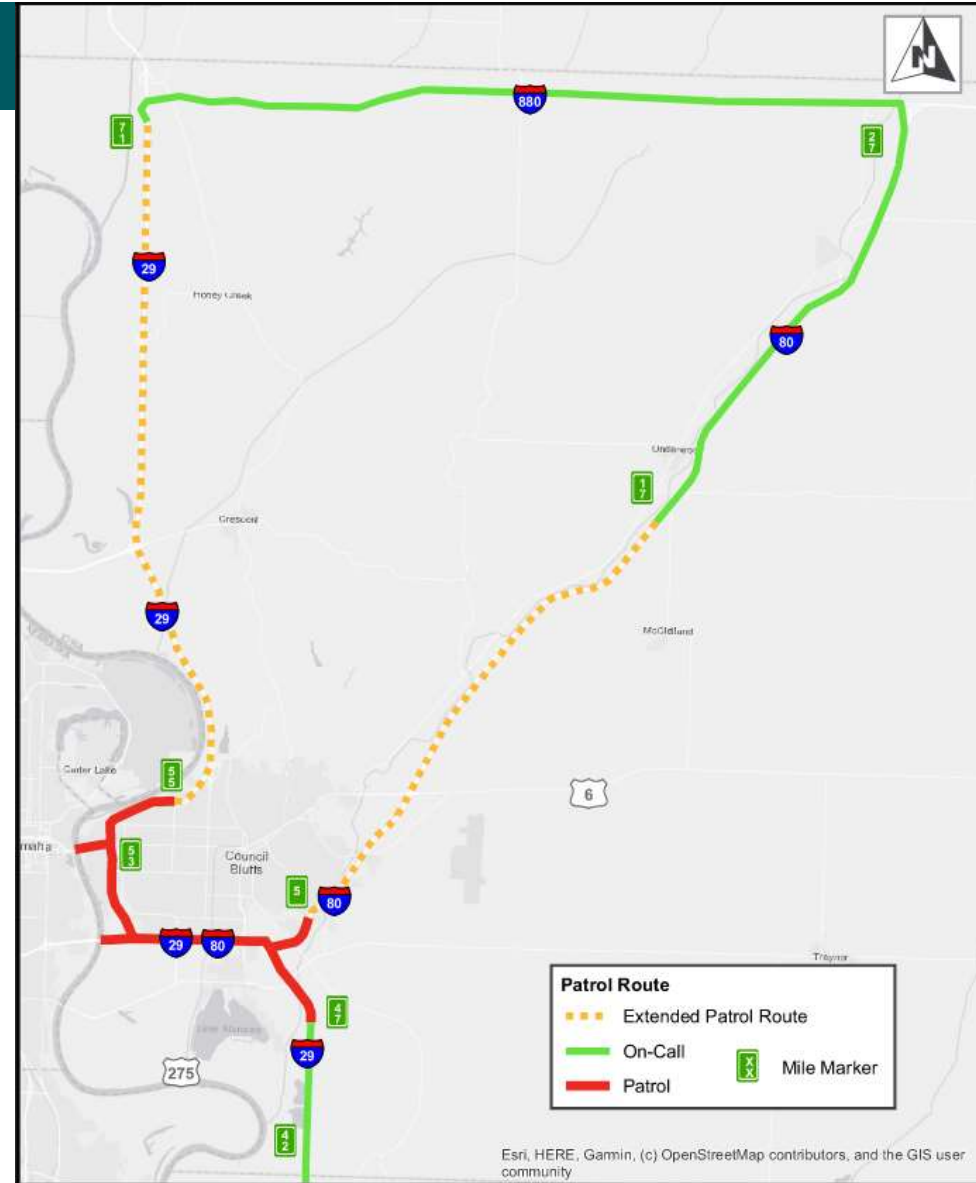


2022-05-24 14:52:04










# HIGHWAY HELPER

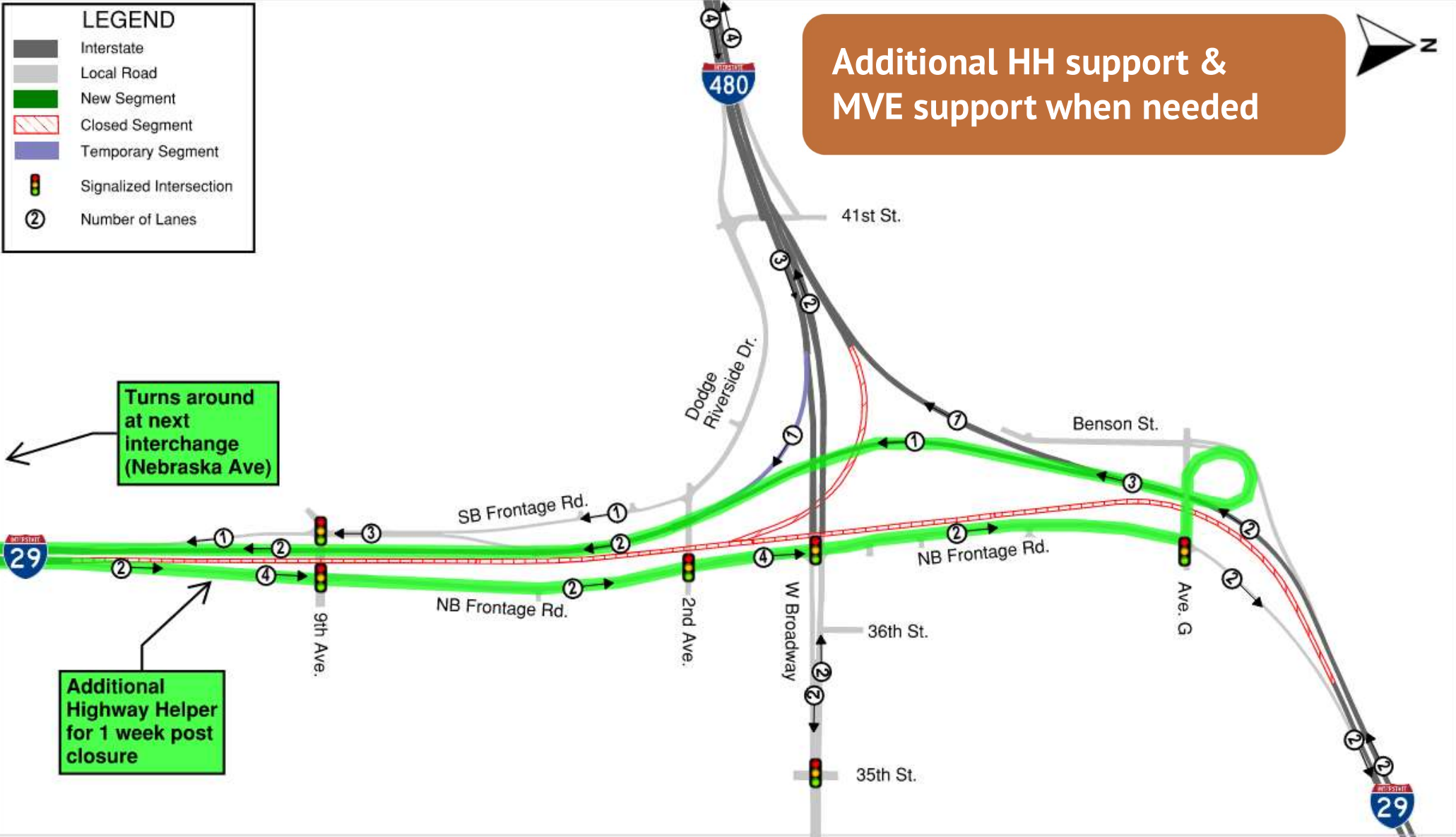
- 2 Units
- 5 a.m. to 9 p.m. Monday-Friday



**LEGEND**

-  Interstate
-  Local Road
-  New Segment
-  Closed Segment
-  Temporary Segment
-  Signalized Intersection
-  Number of Lanes

**Additional HH support & MVE support when needed**



**So, How Have Things Been Going?**

## GOING WELL

- June 2024 finish per contract
  - Tracking 4-6 months sooner
- Traffic operations
  - No queuing
  - Minimal delay
  - It's working



Live camera views



# Lessons Learned

## MODIFIED CLOSURE TIMES FOR BRIDGE DEMOS

- Contract – Overnight closure only
- First bridge demo



%#!\$& NOISE!

?\$@#\* SHAKING!

- Change – Weekend closure  
No hammering 9 p.m. to 7 a.m.



# TRUCKS FOLLOWING GPS



## ENGINE BRAKING

- Several complaints
- City passed ordinance
- DOT installed signs
  - Interstate
  - Frontage Roads





# SPEEDING – WHAT THE PLANS INCLUDED



Speed feedback signs installed after every speed reduction



**SPEEDING – ADDED RUMBLE STRIPS**

Temporary



**SPEEDING – ADDED RUMBLE STRIPS**



**Temporary – Kept Moving**



## SPEEDING – ADDED RUMBLE STRIPS

Temporary – Milled



Rumble strips milled into detour pavement at I-480 EB to W Broadway transition

# SPEEDING – FOCUSED ENFORCEMENT

## ← Tweet



**Council Bluffs Police Department**

@councilbluffspd

CBPD issued 78 citations and 46 warnings in the two day project in the I-29 construction area conducted last week. Fines for 1-10 over are \$279.25 and increase up to \$1,532.75. Please slow down in the construction area.



COUNCIL BLUFFS POLICE  
DEPARTMENT

**PRESS RELEASE**

**Tim Carmody**  
Chief of Police  
1 Ezra Jackson Way  
Council Bluffs, IA  
51503

## ← Tweet



**Iowa State Patrol** ✓

@iowastatepatrol

Alarming numbers from our recent project in Council Bluffs.

Over 150 of the vehicles stopped were in a construction zone. The highest speed in that specific area was 86 MPH in a 35 MPH. Work zone safety is EVERYONE'S responsibility. SLOW DOWN and BE ALERT.

**Council Bluffs MCSAP Project**

**August 24 - 25**

**Total Enforcement Contacts - 532**

**Speed Citations - 277**

**Failure to maintain Safety Belts - 12**

**CMV Inspections - 90**

**Out of Service Violations - 20**

**Written Warnings - 213**

# TOPICS

Project Background

Why Interstate Closures?

TSMO Best Practices

Lessons Learned





# Questions

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