GF/EGF Bridge Closure Management Study

GF/EGF MPO TAC Meeting

May 9, 2007

Photo by Lowell Kotko

Study Purpose

- Provide safe and efficient traffic flow during bridge closure events
  - Flooding
  - Maintenance activities/Incident management

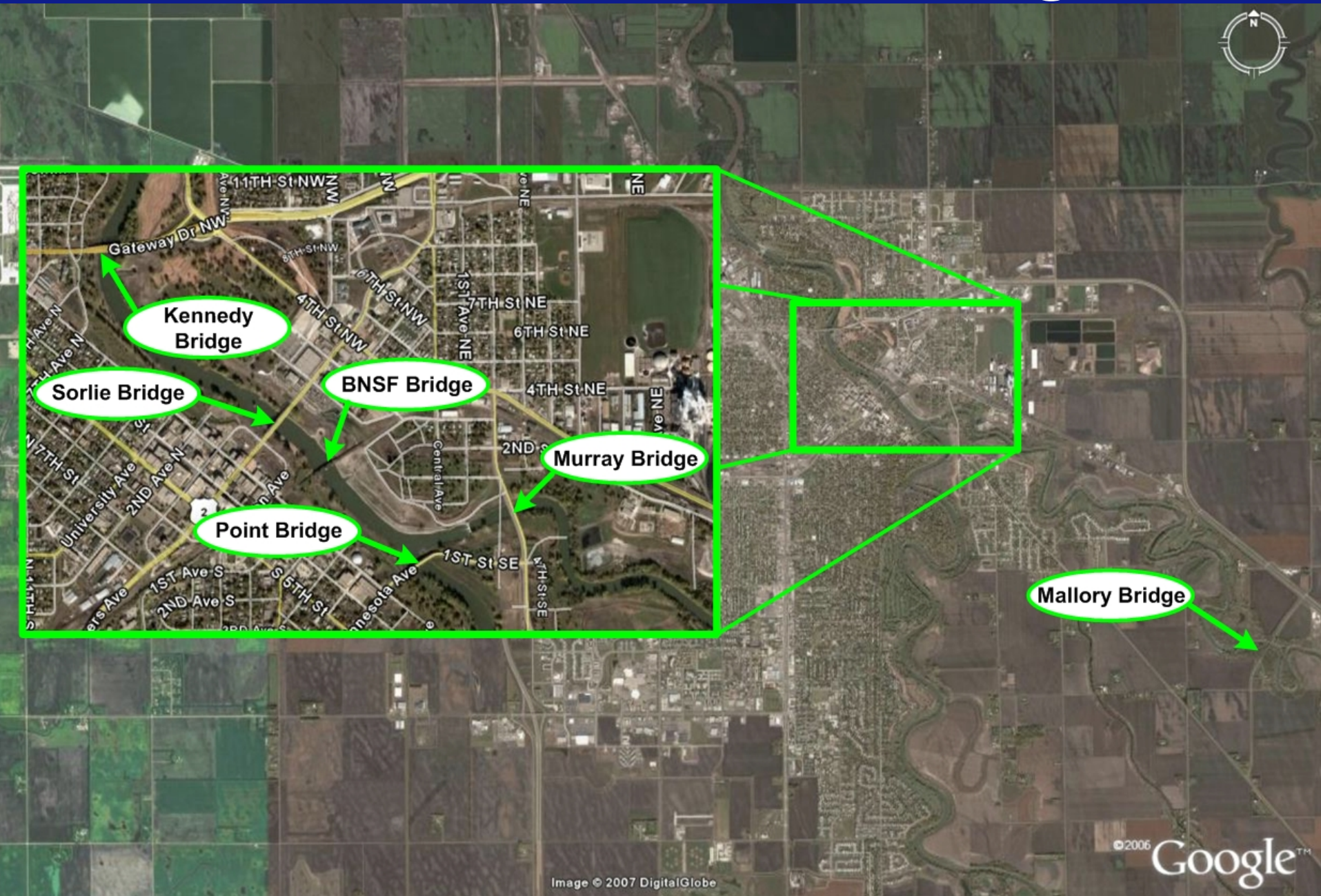
Agenda

- Draft Document
- Overall Concept of Operations
- Discussions/Comments
- Final Tasks

Draft Document Layout

- Report
  - History, data collection, closure scenarios and action levels, and traffic control modifications
  - Traffic detours and alternate timing plans
- Bridge Closure Sections (3 Flood / 6 Maint.)
  - Action levels and agency tasks
  - Detour sign layouts
  - Traffic Signal Timing Plans
  - Traffic Control Device Modifications

GF/EGF Vehicular Bridges



Bridge Closure Order (Flooding)

Study Area


Primary Study Area
Signalized Intersection
Gateway
Gateway Dr. (US 2)
14th St
10th St NE
Columbia
Washington
20th St
3rd St
4th St
5th St
2nd St
3rd St NW
4th St NW
2nd Ave NE
5th Ave NE
5th Ave N
University Ave
2nd Ave N
Demers Ave
Bruce Ave
Belmont
1st St S
4th Ave S
Cherry St
1
2
3
4
5
6
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Evaluation Scenarios

Bridge Closure Group	Bridge Closure Scenario	Traffic Management
Base Case	All Open	Do Nothing
Flood Scenarios	Point Bridge Closed	Detour routes (with traffic control adjustments) Signal timing updates (AM, midday, and PM peak periods)
	Point and Sorlie Bridges Closed	
	Point, Sorlie, and Murray Bridges Closed	
Maintenance Scenarios	Point Bridge Closed	
	Sorlie Bridge Closed	
	Murray Bridge Closed	
	Kennedy Bridge Closed	
	Kennedy Bridge 50% Closed	

Effects of Bridge Closures

Planning Model Scenario	Total VHT	Additional VHT	Additional User Cost
Base Case	55,588	--	**--**
Point Bridge Closed (Flood)	57,224	1,636	**$26,912**
Point & Sorlie Bridges Closed (Flood)	60,709	5,121	**$84,240**
Point, Sorlie & Murray Closed (Flood)	61,700	6,112	**$100,542**
Murray Bridge Closed	55,995	407	**$6,695**
Sorlie Bridge Closed	56,515	927	**$15,249**
Point Bridge Closed	56,589	1,001	**$16,466**
Kennedy Bridge Closed	60,231	4,643	**$76,377**

User Cost per hour = $16.45. Based on GF/EGF Travel Demand Model

Traffic Closure Action Levels

Bridge/Road Closure	Action 1 River Elev. (ft) / River Stage (ft)	Action 2 River Elev. (ft) / River Stage (ft)
Point Bridge	818.0 / 39.0	**819.0 / 40.0**
Sorlie Bridge	821.5 / 42.5	**822.5 / 43.5**
Murray Bridge-w/ berms	823.0 / 44.0	**824.0 / 45.0**
Kennedy Bridge	829.0 / 50.0	**831.0 / 52.0**

Notes:
Action 1: The cities shall contact each other, Mn/DOT, and NDDOT for installing the traffic closures and detours and inform the media of the event.

Action 2: The cities shall install traffic closures, detour signing, clay dikes, and stop logs. In addition, closure traffic signal plans should be implemented in the traffic controllers. Approximately 1 day can be expected between action 1 and action 2.

Traffic Reopening Action Levels

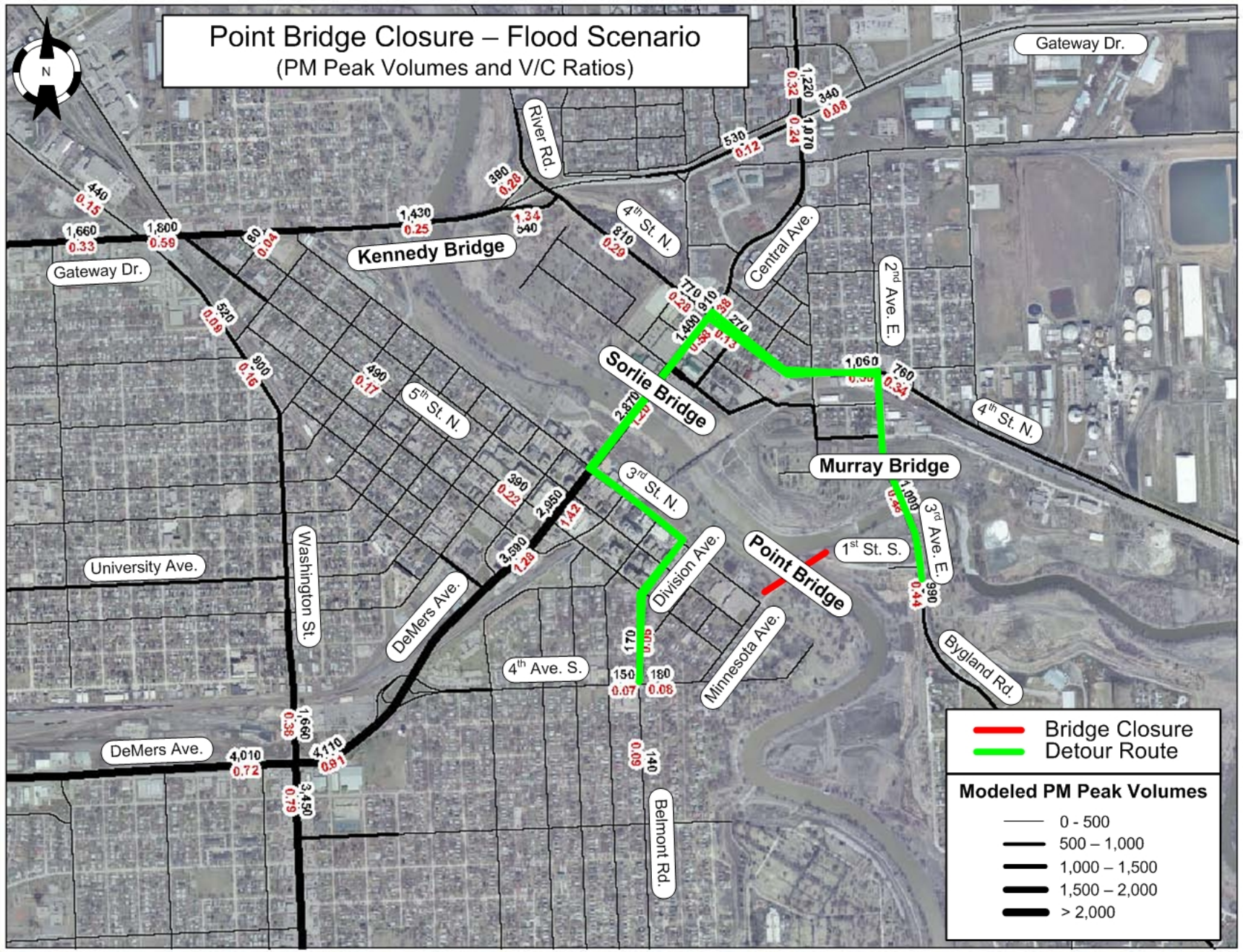
Bridge/Road Closure	Action 1 River Elev. (ft) / River Stage (ft)	Action 2 River Elev. (ft) / River Stage (ft)
Point Bridge	820.0 / 41.0	**819.0 / 40.0**
Sorlie Bridge	823.5 / 44.5	**822.5 / 43.5**
Murray Bridge-w/ berms	826.0 / 47.0	**824.0 / 45.0**
Kennedy Bridge	833.0 / 54.0	**831.0 / 52.0**

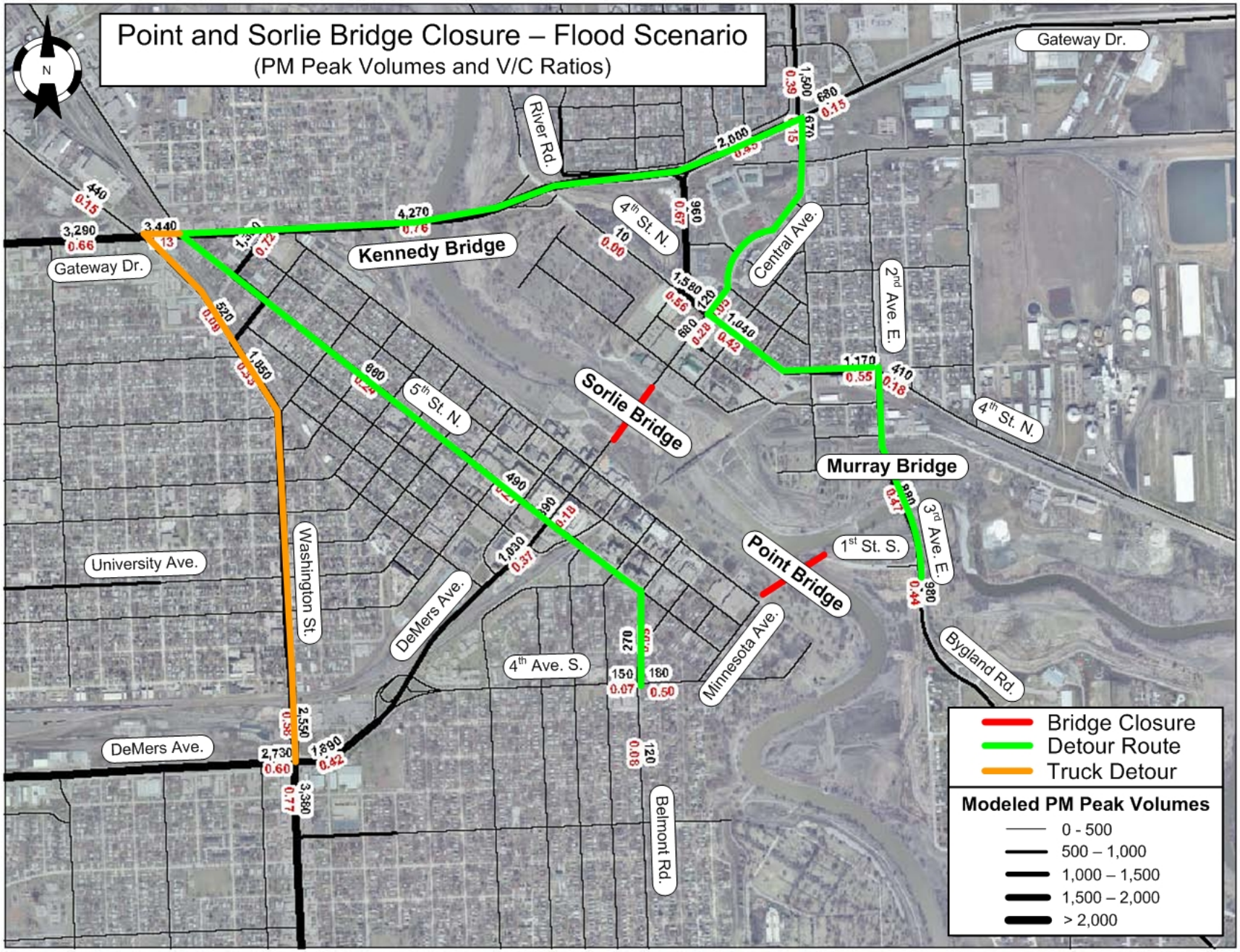
Notes:
Action 1: The cities shall contact each other, Mn/DOT, and NDDOT for reopening the bridges and inform the media of the event. Approximately 1 day is provided to remove the stop logs, clean roadway/bridge, and perform inspections. Two days are provided for Murray and Kennedy Bridges due to the removal of clay dikes.

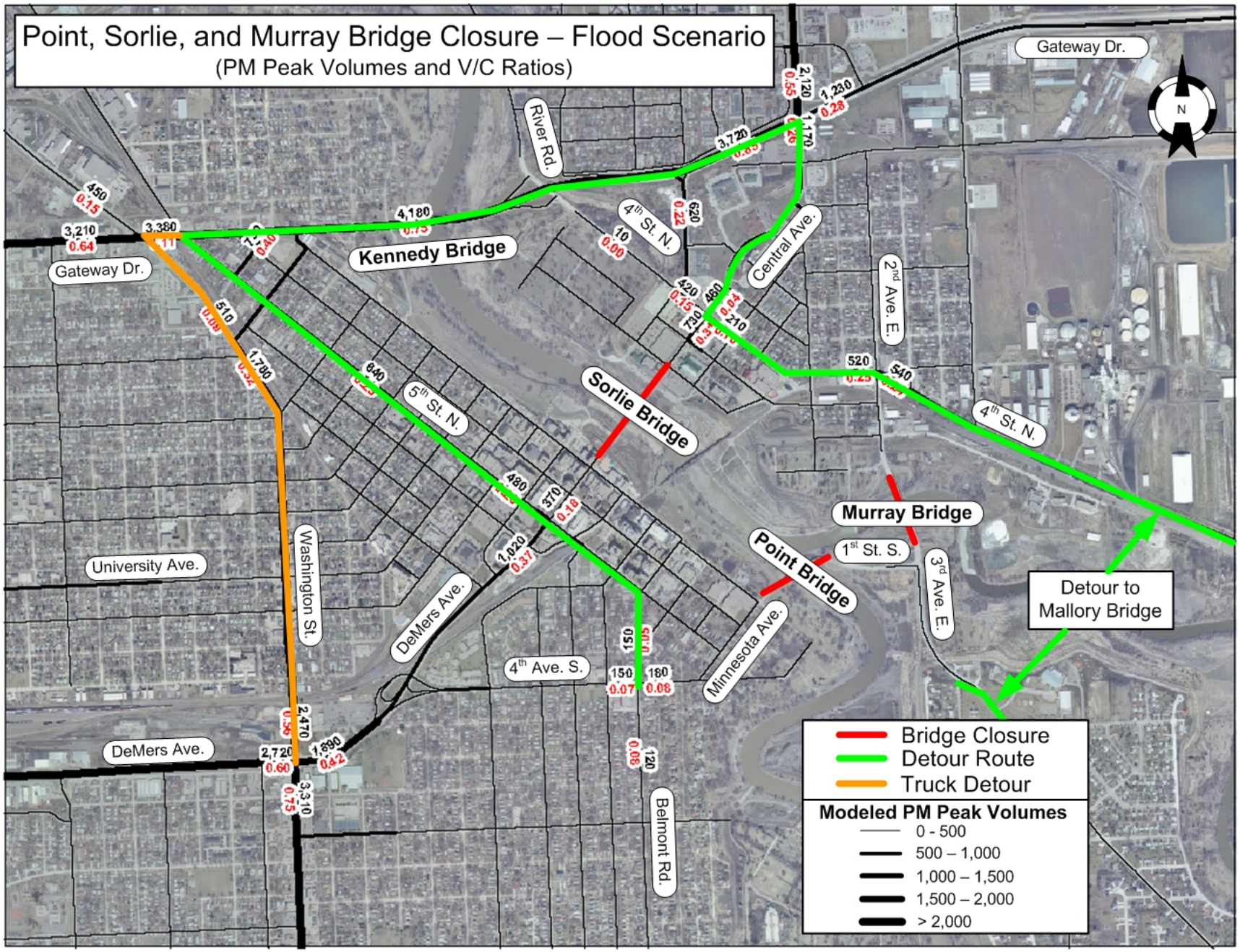
Action 2: Once NDDOT and Mn/DOT have approved opening the structure, open roadway/bridges, remove traffic detour signing, and change the traffic signal timing plans back to those used in pre-flood conditions.

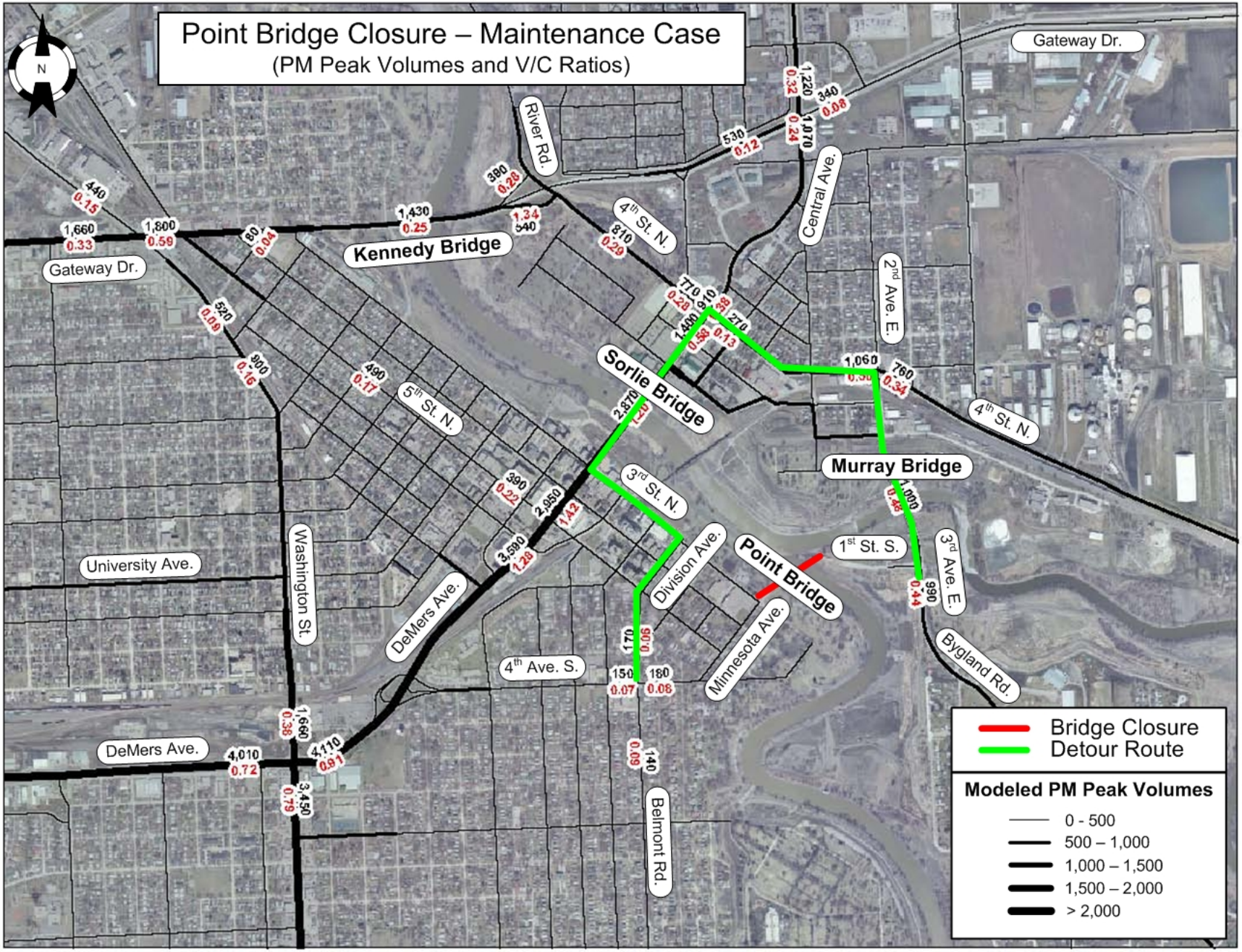
Traffic Detour Routes

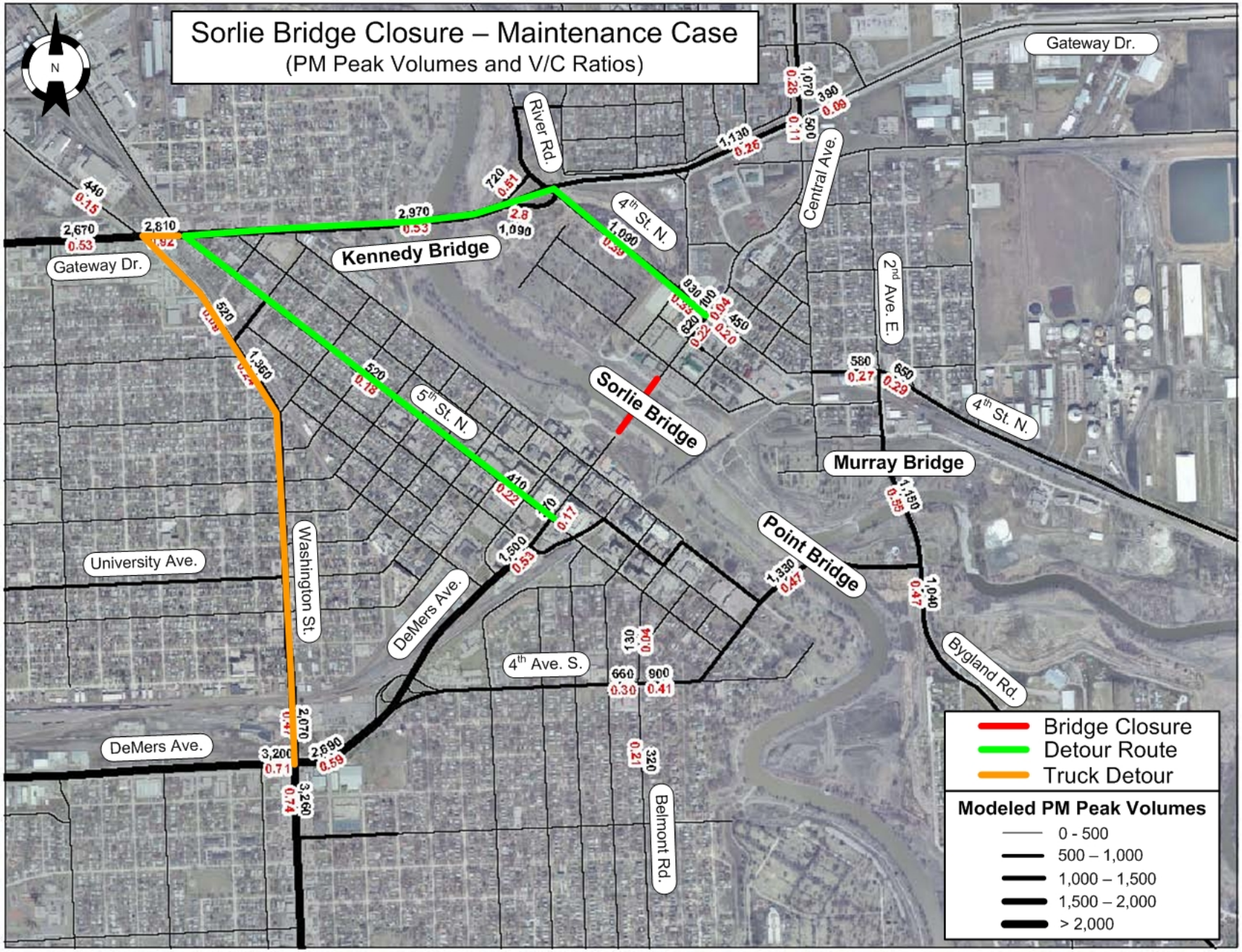
- Travel demand model
- Personal/professional experience
- Red/Red Lake River flooding
  - Point Bridge
  - Point and Sorlie Bridges
  - Point, Sorlie, and Murray Bridges
- Maintenance/Incidents
  - Point, Sorlie, Murray, and Kennedy Bridges

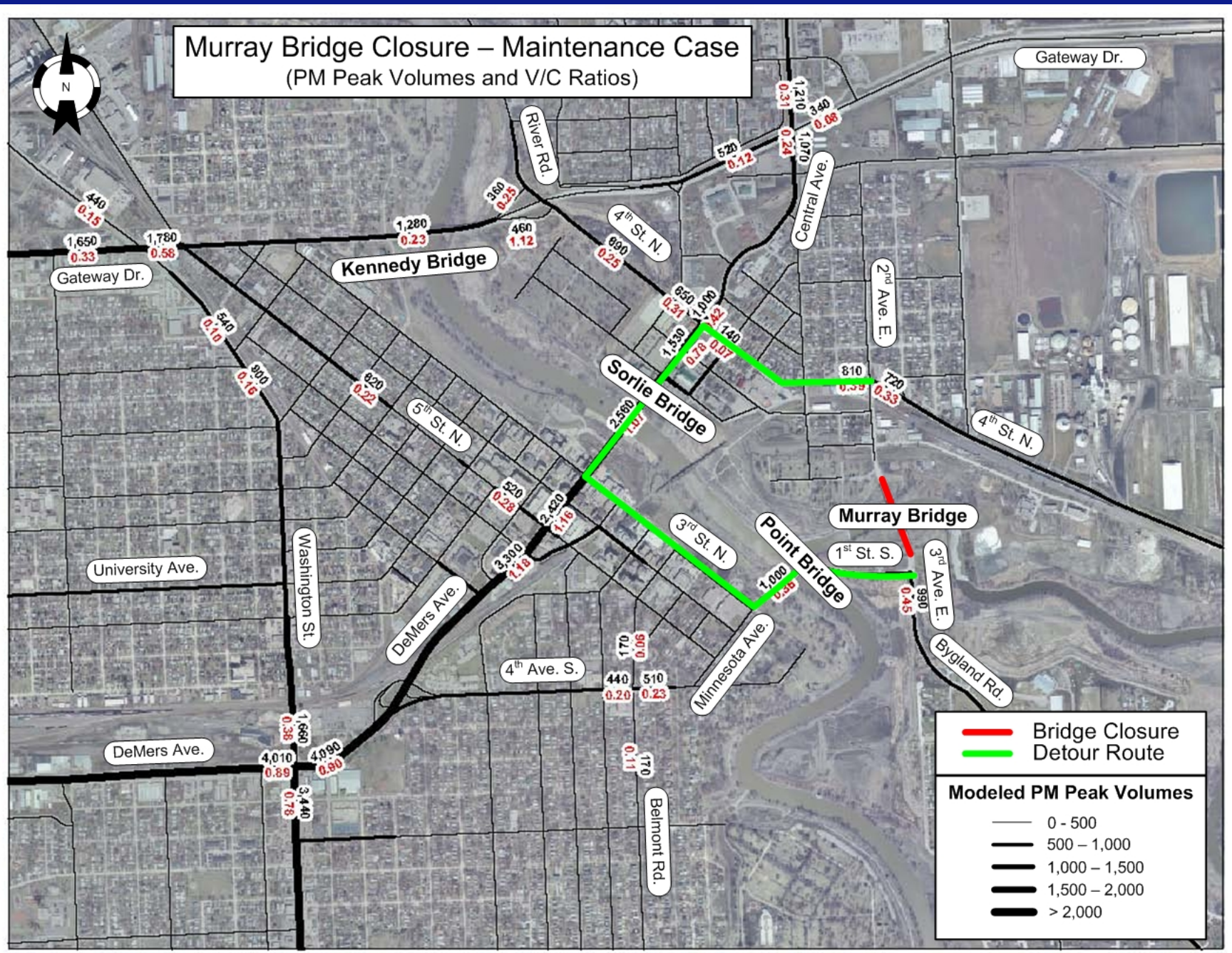

Point Bridge Closure – Flood Scenario
(PM Peak Volumes and V/C Ratios)
N
Gateway Dr.
River Rd.
Kennedy Bridge
4th St. N.
Central Ave.
2nd Ave. E.
Sorlie Bridge
Murray Bridge
3rd St. N.
5th St. N.
4th St. N.
1st St. S.
Point Bridge
3rd Ave. E.
Bygland Rd.
University Ave.
Washington St.
DeMers Ave.
Division Ave.
Minnesota Ave.
4th Ave. S.
Belmont Rd.
Bridge Closure
Detour Route
Modeled PM Peak Volumes
0 - 500
500 – 1,000
1,000 – 1,500
1,500 – 2,000
> 2,000

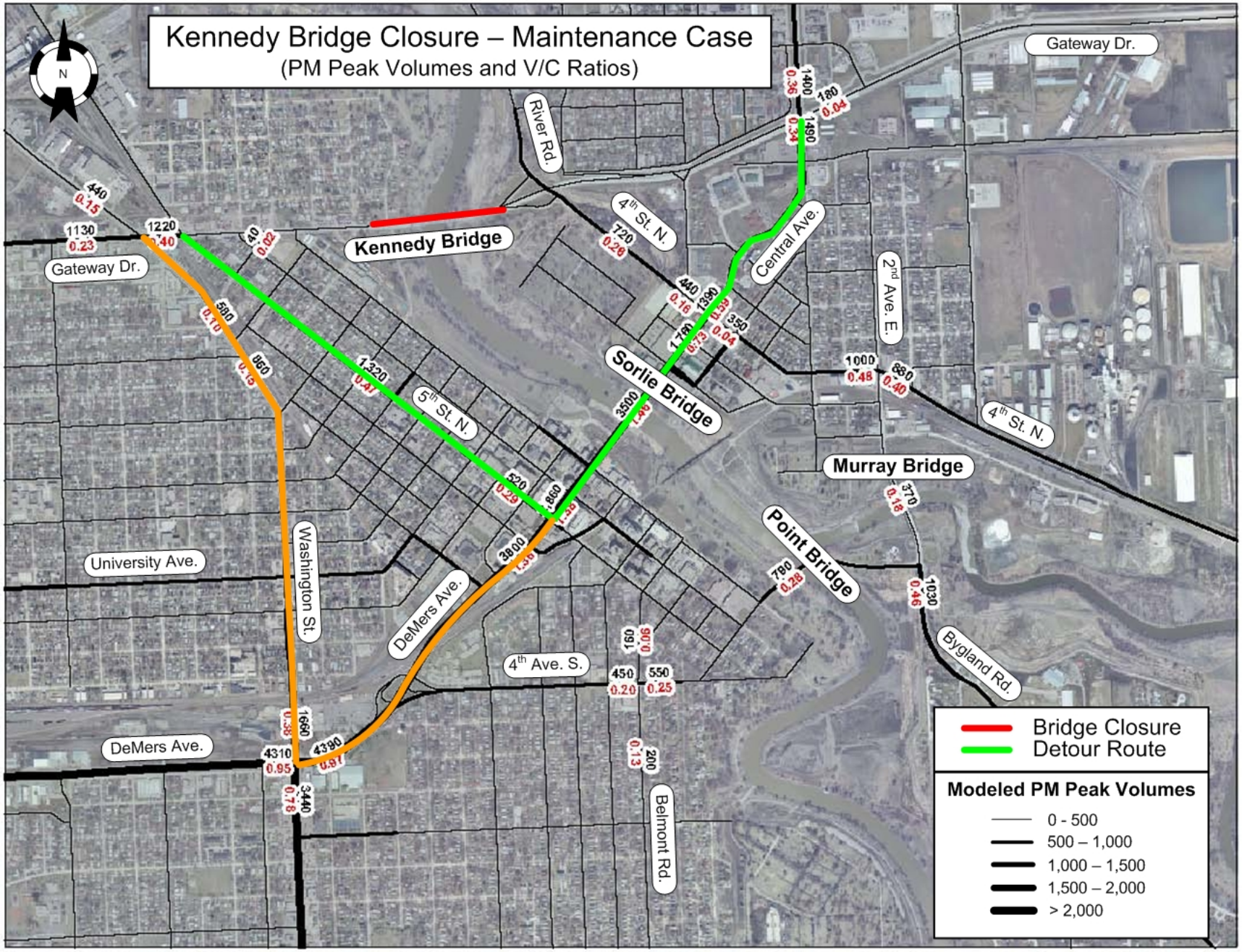

Point and Sorlie Bridge Closure – Flood Scenario
(PM Peak Volumes and V/C Ratios)
N
Gateway Dr.
River Rd.
Kennedy Bridge
4th St. N.
Central Ave.
2nd Ave. E.
Sorlie Bridge
5th St. N.
Murray Bridge
4th St. N.
3rd Ave. E.
1st St. S.
Point Bridge
Bygland Rd.
Minnesota Ave.
University Ave.
Washington St.
DeMers Ave.
4th Ave. S.
Belmont Rd.
Bridge Closure
Detour Route
Truck Detour
Modeled PM Peak Volumes
0 - 500
500 – 1,000
1,000 – 1,500
1,500 – 2,000
> 2,000


Point, Sorlie, and Murray Bridge Closure – Flood Scenario
(PM Peak Volumes and V/C Ratios)
Gateway Dr.
River Rd.
Kennedy Bridge
Sorlie Bridge
Murray Bridge
Point Bridge
4th St. N.
Central Ave.
2nd Ave. E.
3rd Ave. E.
1st St. S.
5th St. N.
University Ave.
Washington St.
DeMers Ave.
4th Ave. S.
Minnesota Ave.
Belmont Rd.
Detour to Mallory Bridge
N
Bridge Closure
Detour Route
Truck Detour
Modeled PM Peak Volumes
0 - 500
500 – 1,000
1,000 – 1,500
1,500 – 2,000
> 2,000


Point Bridge Closure – Maintenance Case
(PM Peak Volumes and V/C Ratios)
N
Gateway Dr.
River Rd.
Kennedy Bridge
4th St. N.
Central Ave.
2nd Ave. E.
Sorlie Bridge
Murray Bridge
4th St. N.
5th St. N.
3rd St. N.
1st St. S.
Point Bridge
3rd Ave. E.
Division Ave.
Minnesota Ave.
Bygland Rd.
University Ave.
Washington St.
DeMers Ave.
4th Ave. S.
Belmont Rd.
DeMers Ave.
Bridge Closure
Detour Route
Modeled PM Peak Volumes
0 - 500
500 – 1,000
1,000 – 1,500
1,500 – 2,000
> 2,000


Sorlie Bridge Closure – Maintenance Case
(PM Peak Volumes and V/C Ratios)
N
Gateway Dr.
River Rd.
Central Ave.
Kennedy Bridge
4th St. N.
2nd Ave. E.
Sorlie Bridge
5th St. N.
Murray Bridge
Point Bridge
University Ave.
Washington St.
DeMers Ave.
4th Ave. S.
Bygland Rd.
Belmont Rd.
Bridge Closure
Detour Route
Truck Detour
Modeled PM Peak Volumes
0 - 500
500 – 1,000
1,000 – 1,500
1,500 – 2,000
> 2,000


Murray Bridge Closure – Maintenance Case
(PM Peak Volumes and V/C Ratios)
N
Gateway Dr.
River Rd.
Kennedy Bridge
4th St. N.
Central Ave.
2nd Ave. E.
Sorlie Bridge
5th St. N.
Murray Bridge
Point Bridge
3rd St. N.
1st St. S.
3rd Ave. E.
Bygland Rd.
University Ave.
Washington St.
DeMers Ave.
4th Ave. S.
Minnesota Ave.
Belmont Rd.
Bridge Closure
Detour Route
Modeled PM Peak Volumes
0 - 500
500 – 1,000
1,000 – 1,500
1,500 – 2,000
> 2,000


Kennedy Bridge Closure – Maintenance Case
(PM Peak Volumes and V/C Ratios)
N
Gateway Dr.
River Rd.
Kennedy Bridge
4th St. N.
Central Ave.
2nd Ave. E.
Sorlie Bridge
5th St. N.
Murray Bridge
Point Bridge
Bygland Rd.
University Ave.
Washington St.
DeMers Ave.
4th Ave. S.
Belmont Rd.
Bridge Closure
Detour Route
Modeled PM Peak Volumes
0 - 500
500 – 1,000
1,000 – 1,500
1,500 – 2,000
> 2,000

Traffic Detour Layouts

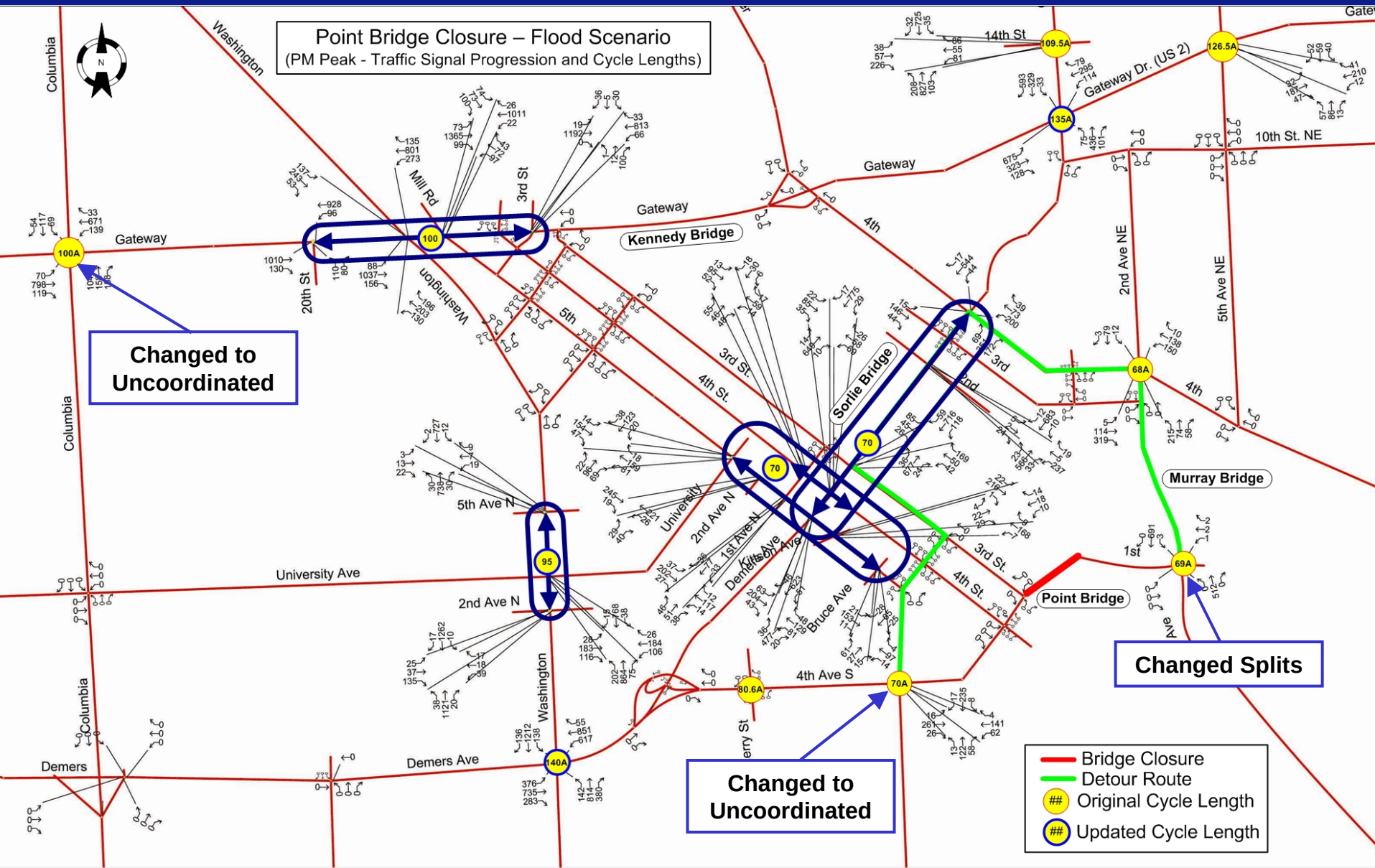
- Appropriate signing along detour routes for all 9 scenarios*
- Separated by direction of travel
- Based on 2003 MUTCD and 2005 Mn MUTCD

- *The Mallory Bridge was included

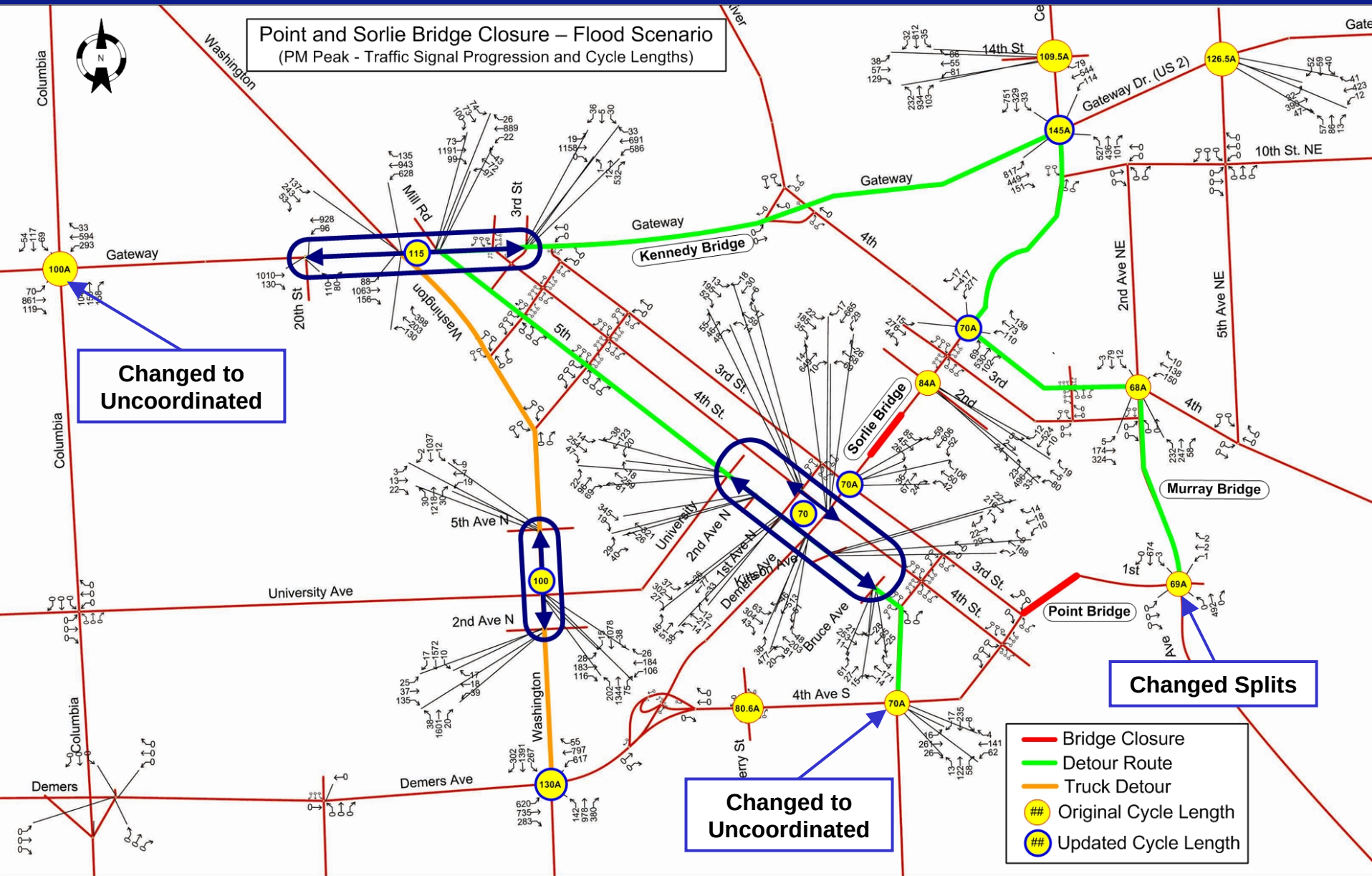
Traffic Signal Timing

- Alternate plans for 8 scenarios
- AM, midday, and PM peak periods
  - TMC and TDM volumes (SYNCHRO)
  - Plans were only adjusted when needed
- Actuated-coordinated/actuated-uncoordinated?
  - Phases, distance between intersections, link speed, v/c ratios

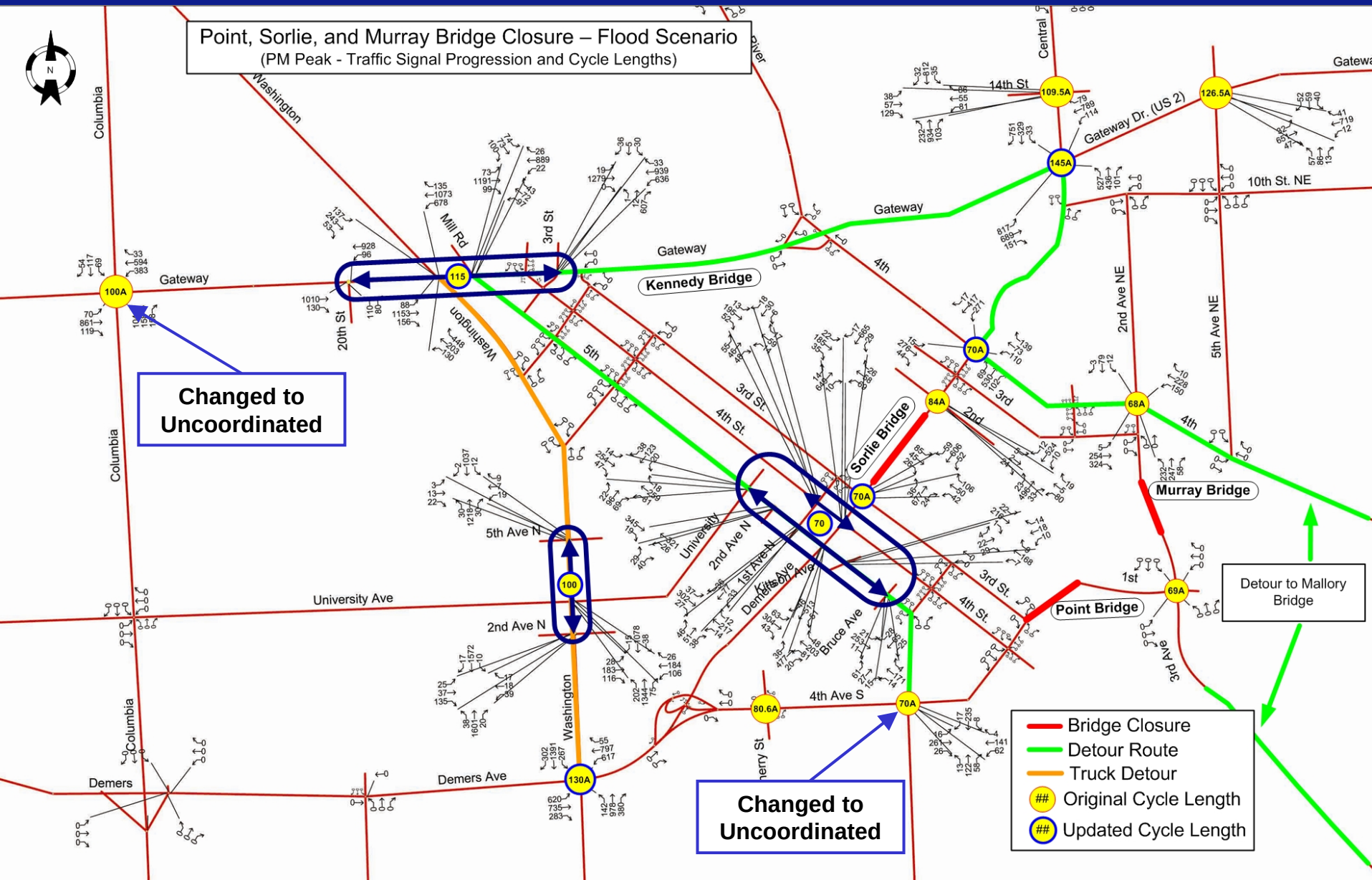
Overview of PM Flood (1) Closed



Overview of PM Flood (2) Closed



Overview of PM Flood (3) Closed



Effects of Alternate Signal Timing (3 Peak-Hour Periods)

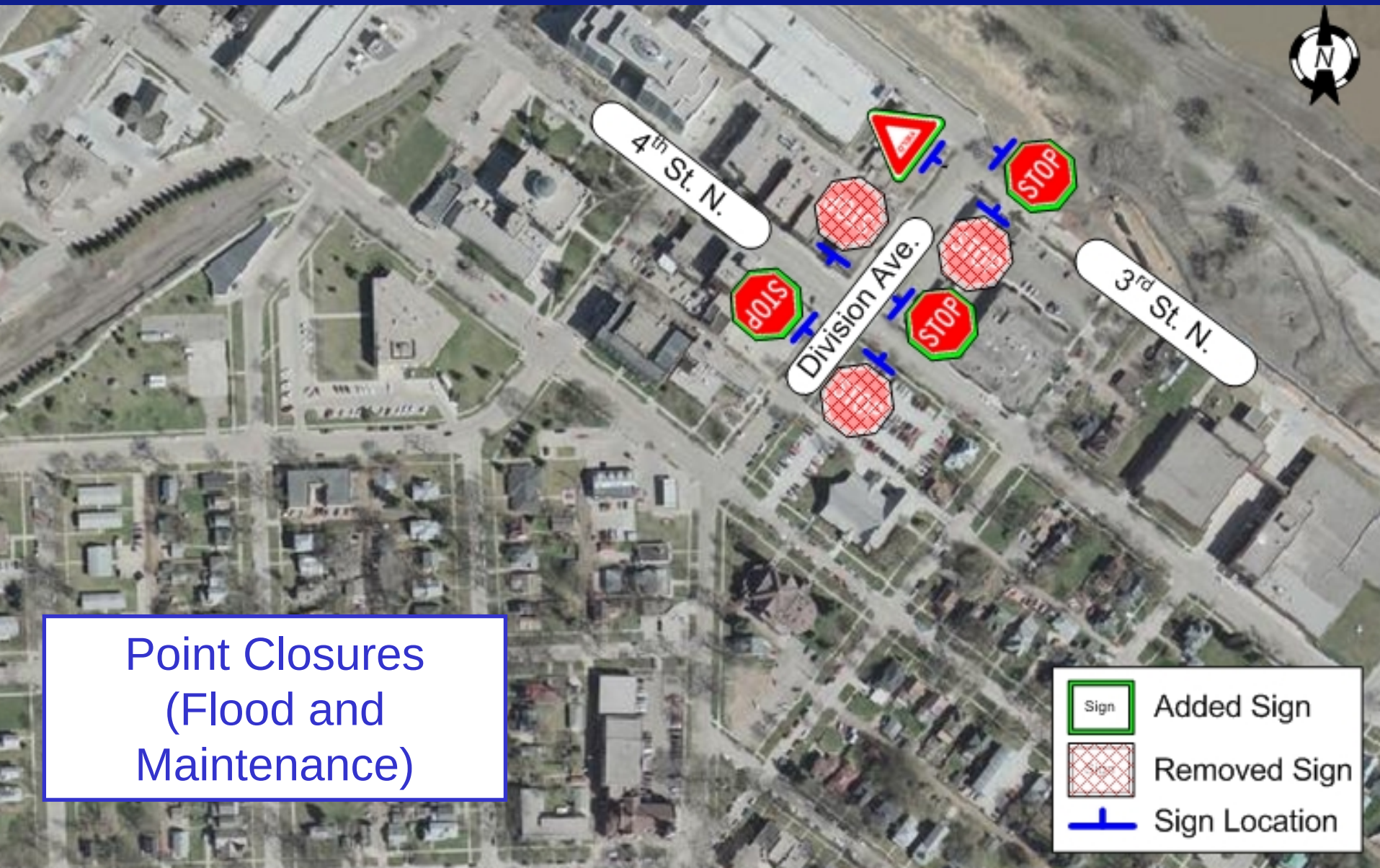
Bridge Closure Scenario	VHT Reduction	User Cost Reduction
Point Bridge Closed (Flood)	81	**$1,340**
Point & Sorlie Bridges Closed (Flood)	892	**$14,754**
Point, Sorlie & Murray Bridges Closed (Flood)	645	**$10,668**
Point Bridge Closed (Maintenance)	98	**$1,612**
Sorlie Bridge Closed (Maintenance)	106	**$1,744**
Murray Bridge Closed (Maintenance)	77	**$1,267**
Kennedy Bridge Closed (Maintenance)	178	**$2,928**
Kennedy Bridge 50% Capacity (Maintenance)	73	**$1,201**

User Cost per hour = $16.45. Based on SYNCHRO Network Delay

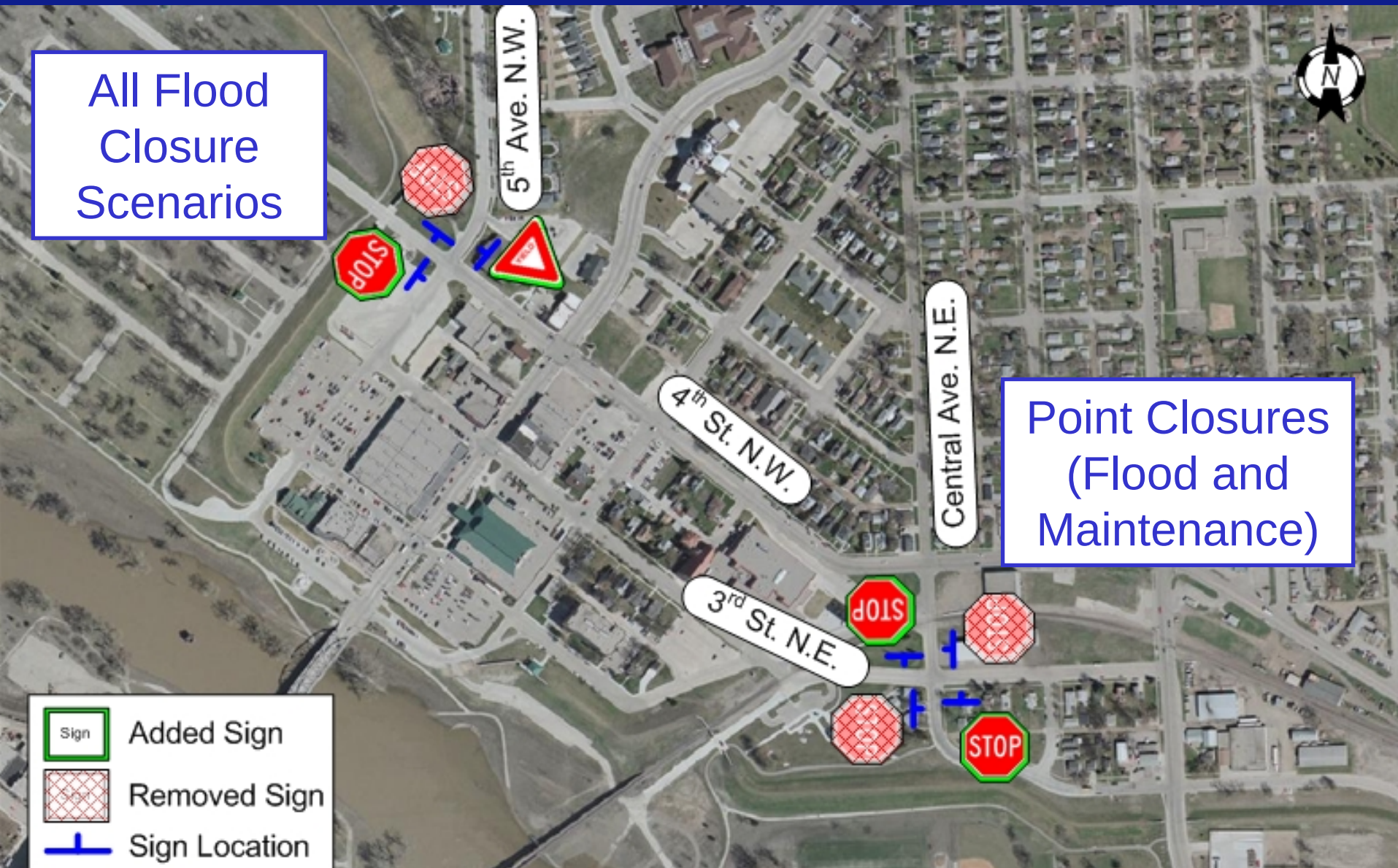
Signal Plan Implementation

- Update controller clocks during each closure event
- Proposed Time of Day Plans
  - 7:15 – 9:00 am (AM Peak)
  - 9:00 – 4:00 pm (Midday Peak)
  - 4:00 – 6:00 pm (PM Peak)
  - 6:00 – 10:00 pm (Midday Peak)
  - 10:00 – 7:15 am (Free/Act.-Uncoord.)

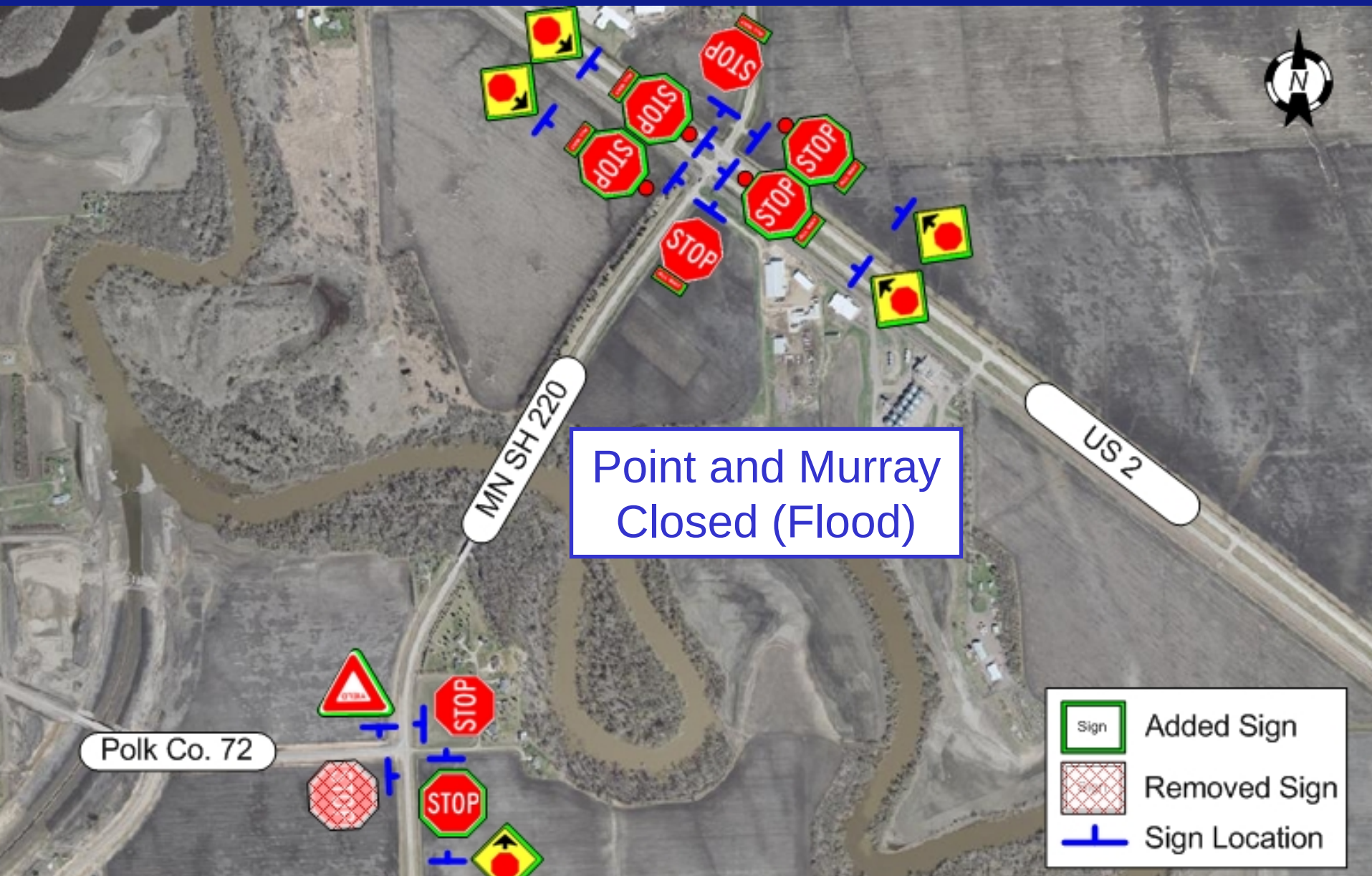
Traffic Control Modifications



Traffic Control Modifications



Traffic Control Modifications



Study's Major Tasks

- Finalize Detour Routes ✓
- Estimate Travel/Delay Time Impacts ✓
- Finalize Action Levels ✓
- Finalize Traffic Detour Signing ✓
- Develop Detour Signal Timing Plans ✓
- Develop Draft and Final Reports
- Stakeholder Training (June TAC?)

Discussions/Comments