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# Steubenville Central Business District Safety Study

City of Steubenville, OH



# Agenda

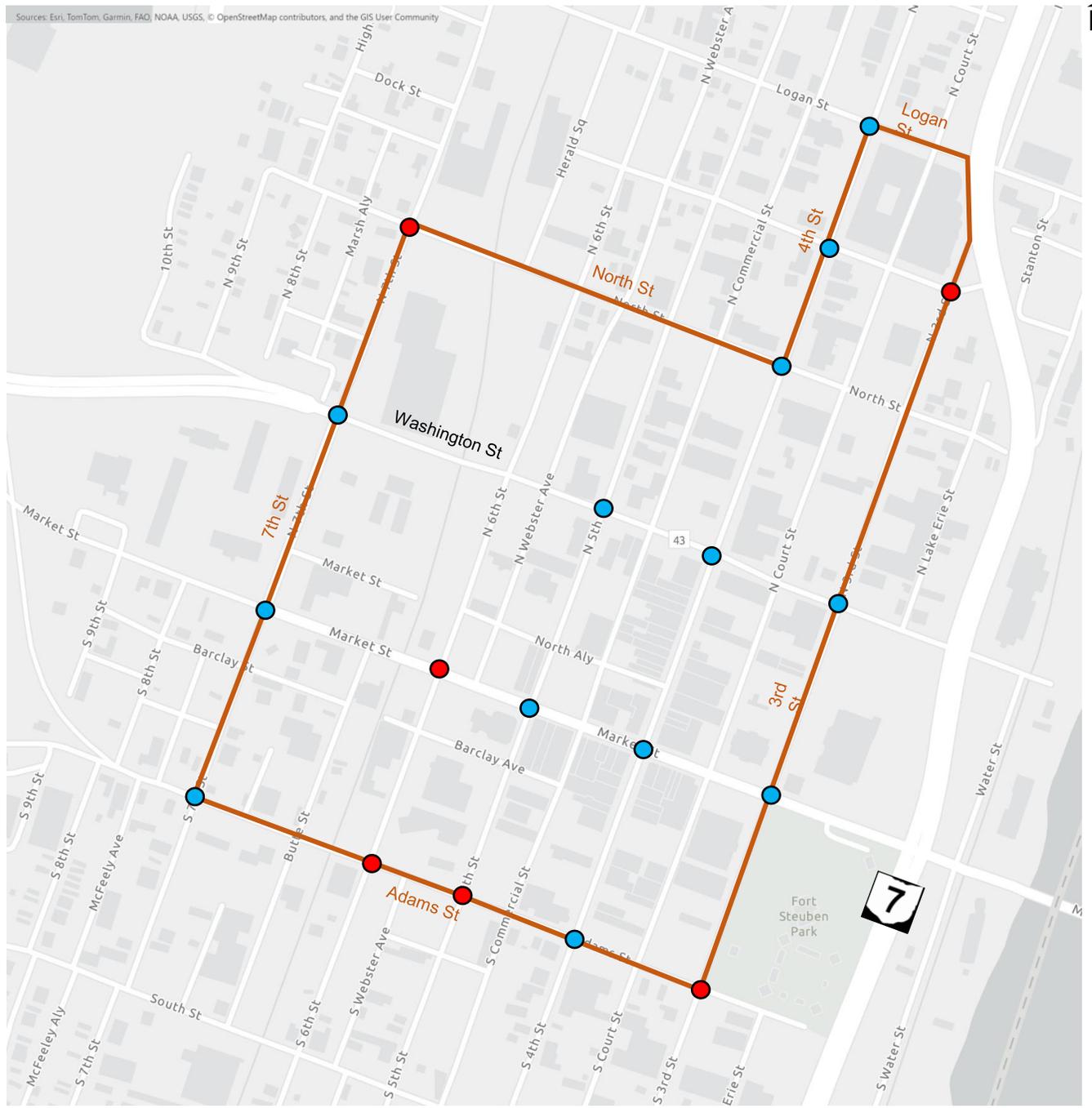
- Introductions
- Study Area Overview
- Data Collection
- Crash Analysis
- Warrant Analysis
- Capacity Analysis
- Conclusions

# Study Area Overview

- 13 signalized intersections
- 6 unsignalized intersections

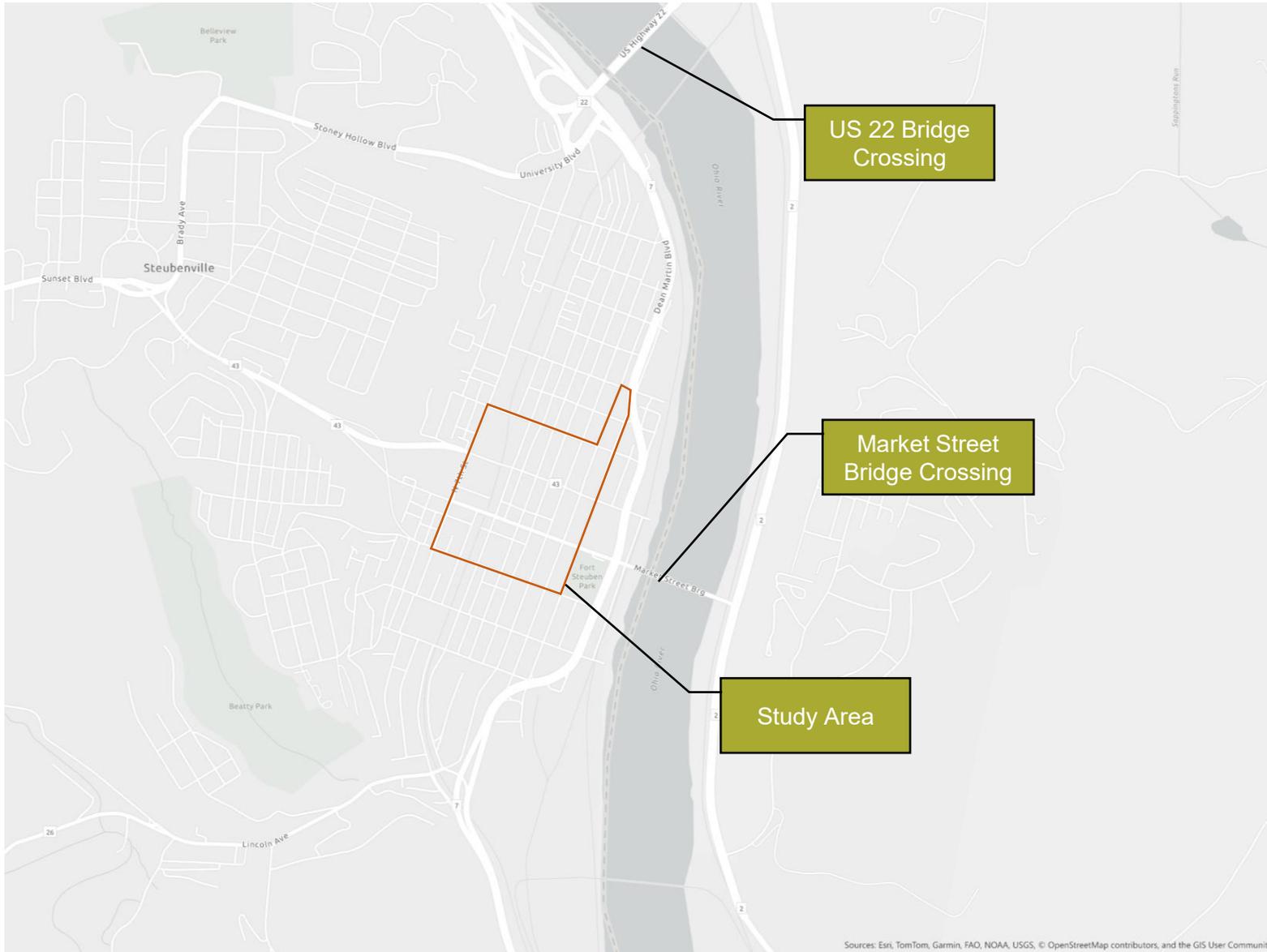
**Legend**

Study Area Boundary	—
Signalized Intersection	●
Two-way Stop Controlled Intersection	●



# Study Scope & Schedule Overview

- Market Street bridge closed in December 2023
- Study scope (initial phase)
  - Crash analysis
    - Crash rates
    - Intersection crash diagrams
  - Signal warrant analysis
  - Stop control warrant analysis
  - Traffic capacity analysis
- Study schedule
  - Volumes collected Sept. 2024
  - Crashes analyzed 2019-2023

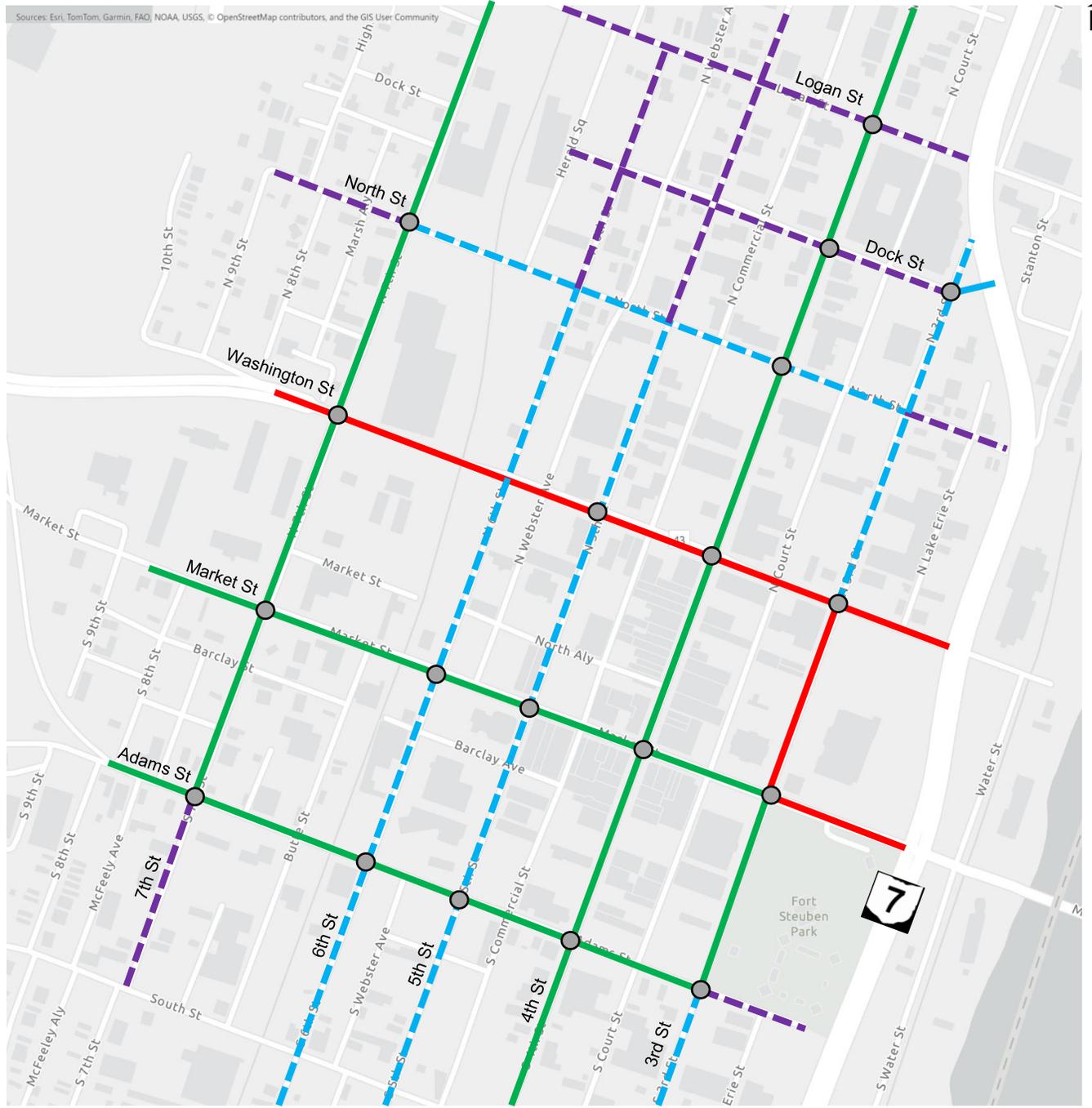




# Roadway Functional Class

- Functional classification obtained from ODOT TIMS

Functional Class Legend	
Class 3 – Principal Arterial	
Class 4 – Minor Arterial	
Class 5 - Collector	
Class 7 – Local	
Study Area Intersection	

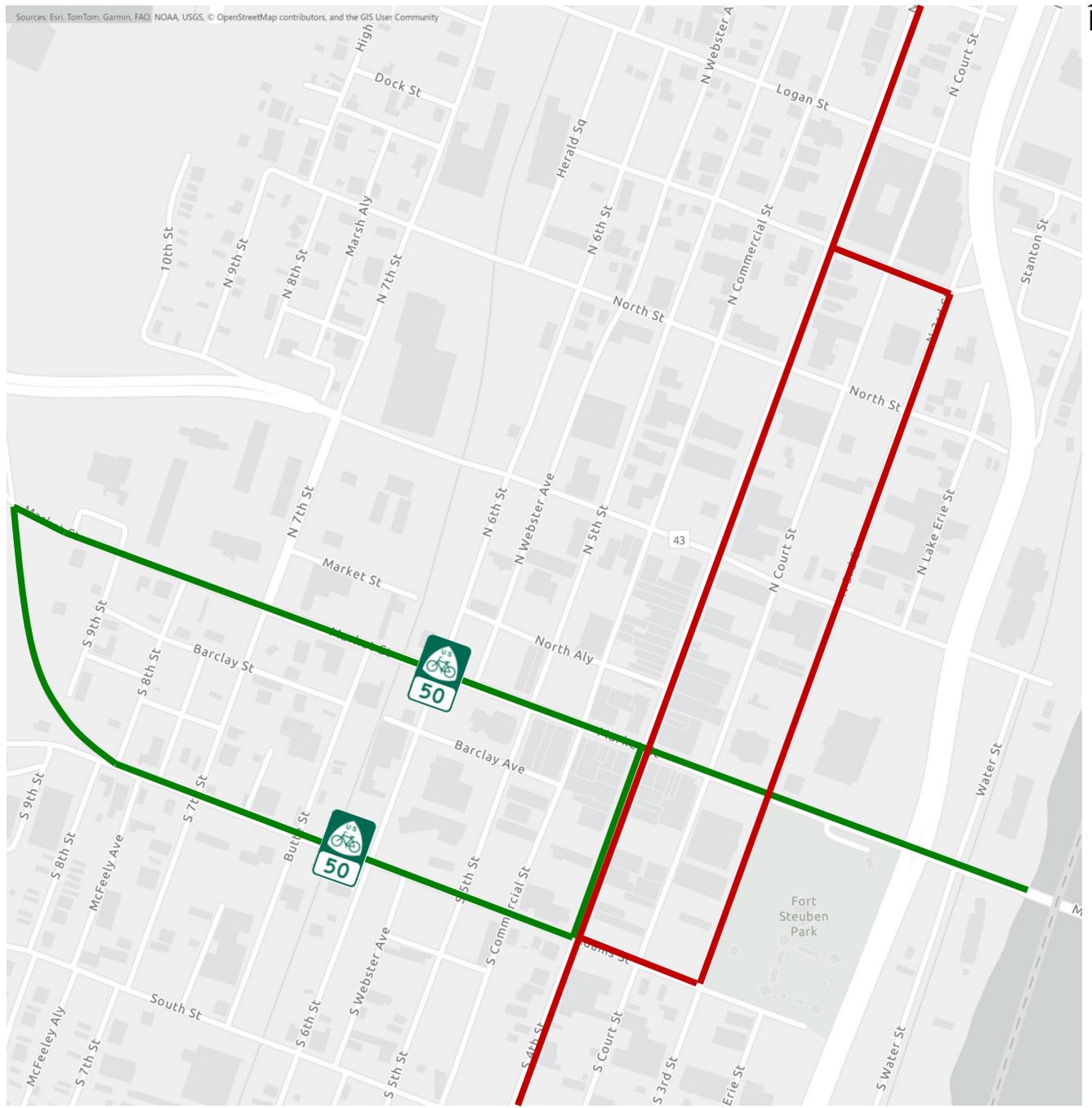


# Pedestrian and Bike Facilities

- Sidewalk present along all roads in study area
- Bike routes obtained from ODOT TIMS

**Bike Route Legend**

State Bike Route	
Heritage Trail	





## Data Collection

- Data collected in September 2024 while school was in session
- 12-hour turning movement counts collected at all intersections within study area
- Speed data collected at three locations
  - Market St between 6<sup>th</sup> St and 7<sup>th</sup> St
  - N 4<sup>th</sup> St between Washington St and Market St
  - Washington St between 3<sup>rd</sup> St and 4<sup>th</sup> St
- Signal equipment inventory performed

# Total AADT

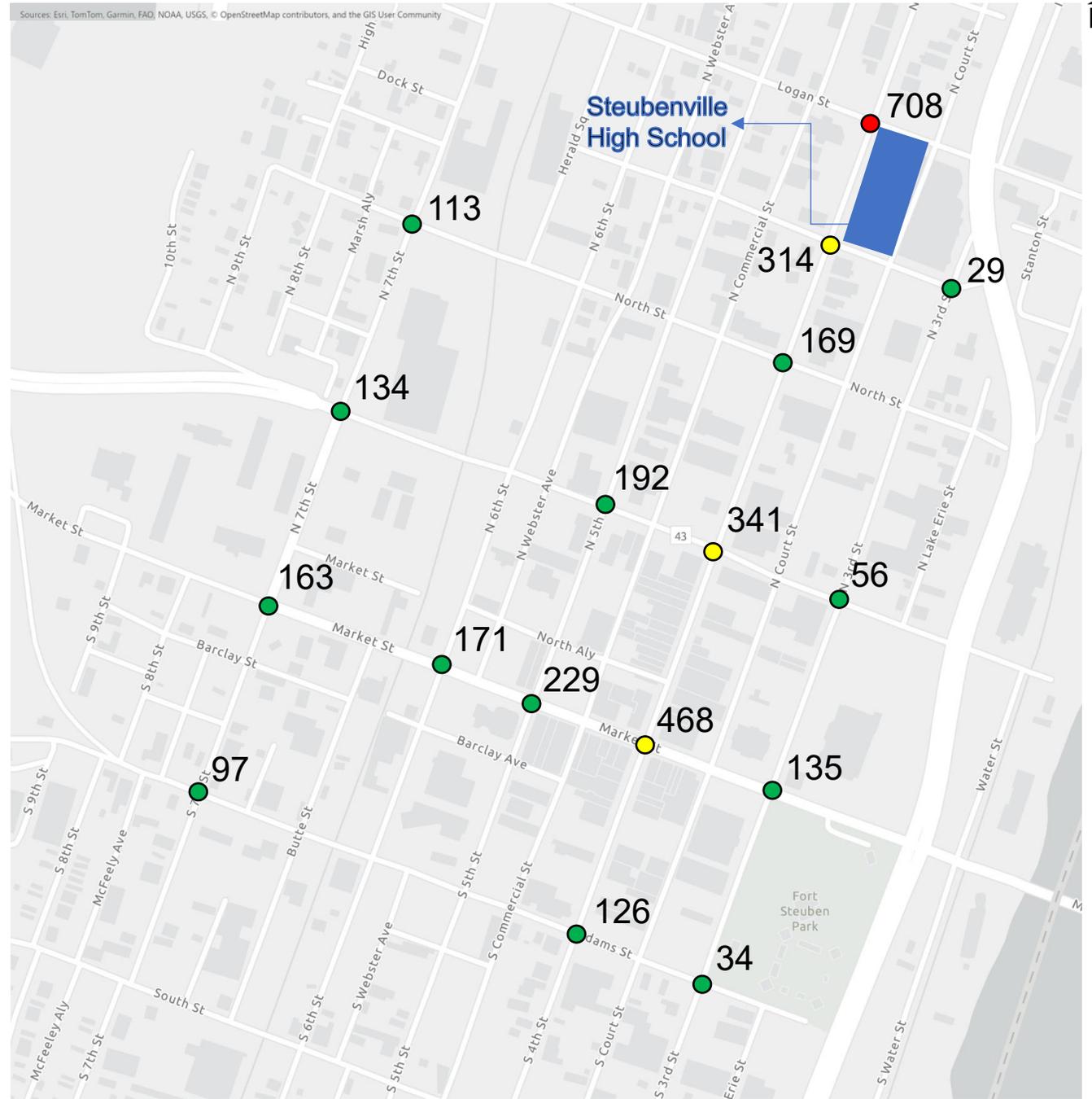
- 12-hour counts collected in September 2024, converted to AADT using ODOT partial count factor conversion
- **Bold** values higher than 4,000 AADT
- **Market St Bridge Closed as of December 2023**

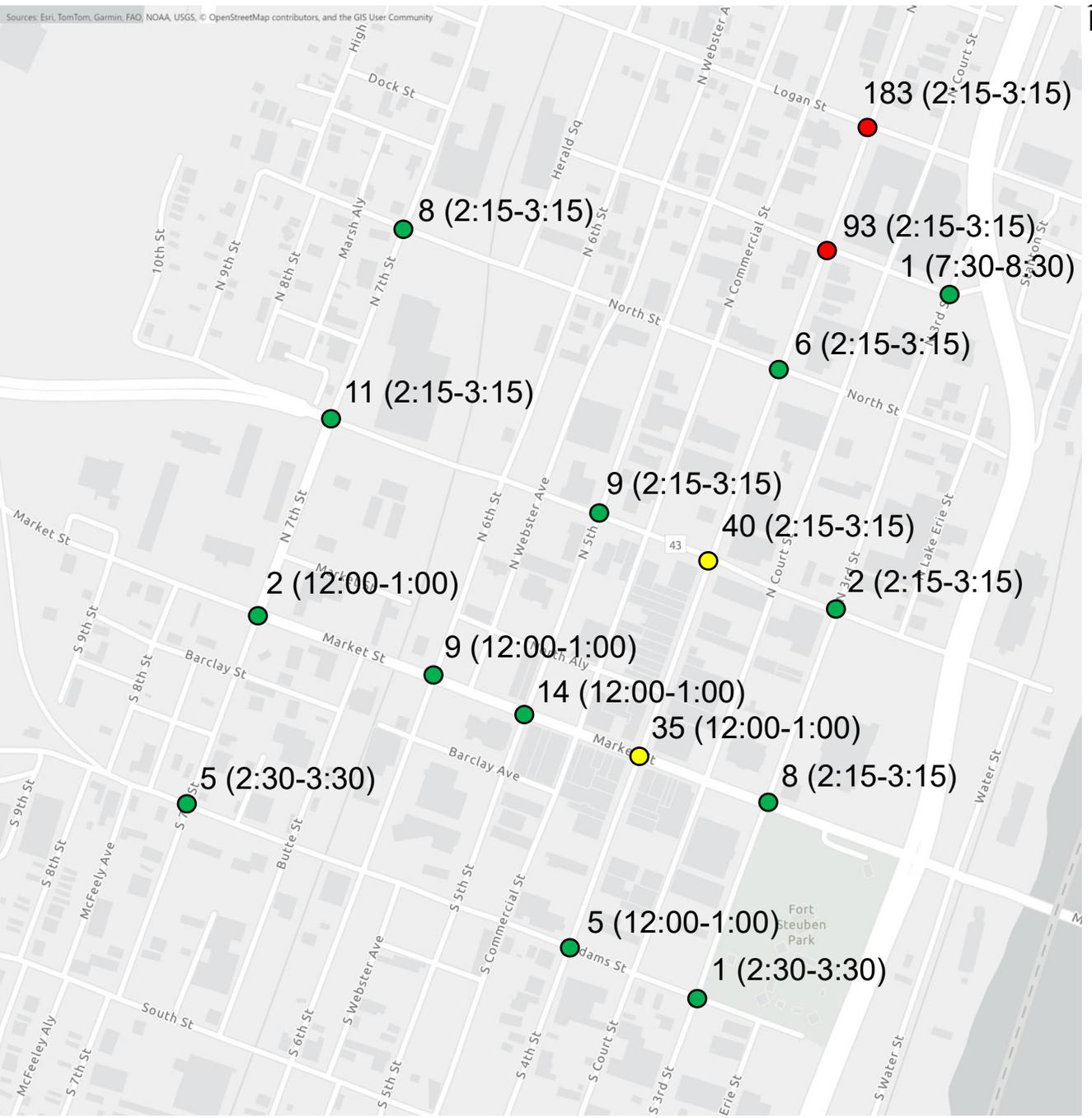


# 12-Hour Pedestrian Volumes

- Volumes are for all intersection crossings from 7am – 7pm
- Volumes collected September 2024

12-Hour Pedestrian Volume Legend	
< 250 pedestrians	●
250-500 pedestrians	●
> 500 pedestrians	●





# Peak Hour Pedestrian Volumes

- Volumes are for peak-hour major roadway crossings at intersections
- Volumes collected September 2024
- No intersections meet Warrant 4
- Highest pedestrian volumes at Steubenville High School

< 25 pedestrians	●
25-50 pedestrians	●
> 50 pedestrians	●

# Speed Statistics

- Speeds collected September 2024
- Red speeds above 25 mph
- No average speeds above 25 mph
- High speeds along Washington St from 6<sup>th</sup> St to 7<sup>th</sup> St



\*Average Speed (85<sup>th</sup> Percentile Speed)

\*\*Speed data from ODOT November 2022

# Signal Inventory

- Signals poles have 2 signal heads each
- Signals are pretimed – no pedestrian push buttons
- Detectable warnings present at most pedestrian ramps



Source: Google Maps

Northwest corner of Market St & 4<sup>th</sup> St

# Crash Analysis

- Crashes from most recent available five-year period evaluated (2019-2023)
- Crash signal warrant evaluated for all intersections within study area
- ODOT CAM tool utilized for analysis
- Total of 137 crashes occurred within study area during study period

# Segment Crash Frequency

- 36 (26%) crashes within segments
- All crashes that occurred just west of Market St bridge were prior to bridge closing

Yearly Crash Totals	
2019	7
2020	6
2021	9
2022	8
2023	6

Crash Frequency Legend	
< 5 crashes from 2019-2023	
5-10 crashes from 2019-2023	
11-15 crashes from 2019-2023	
16-20 crashes from 2019-2023	
> 20 crashes from 2019-2023	

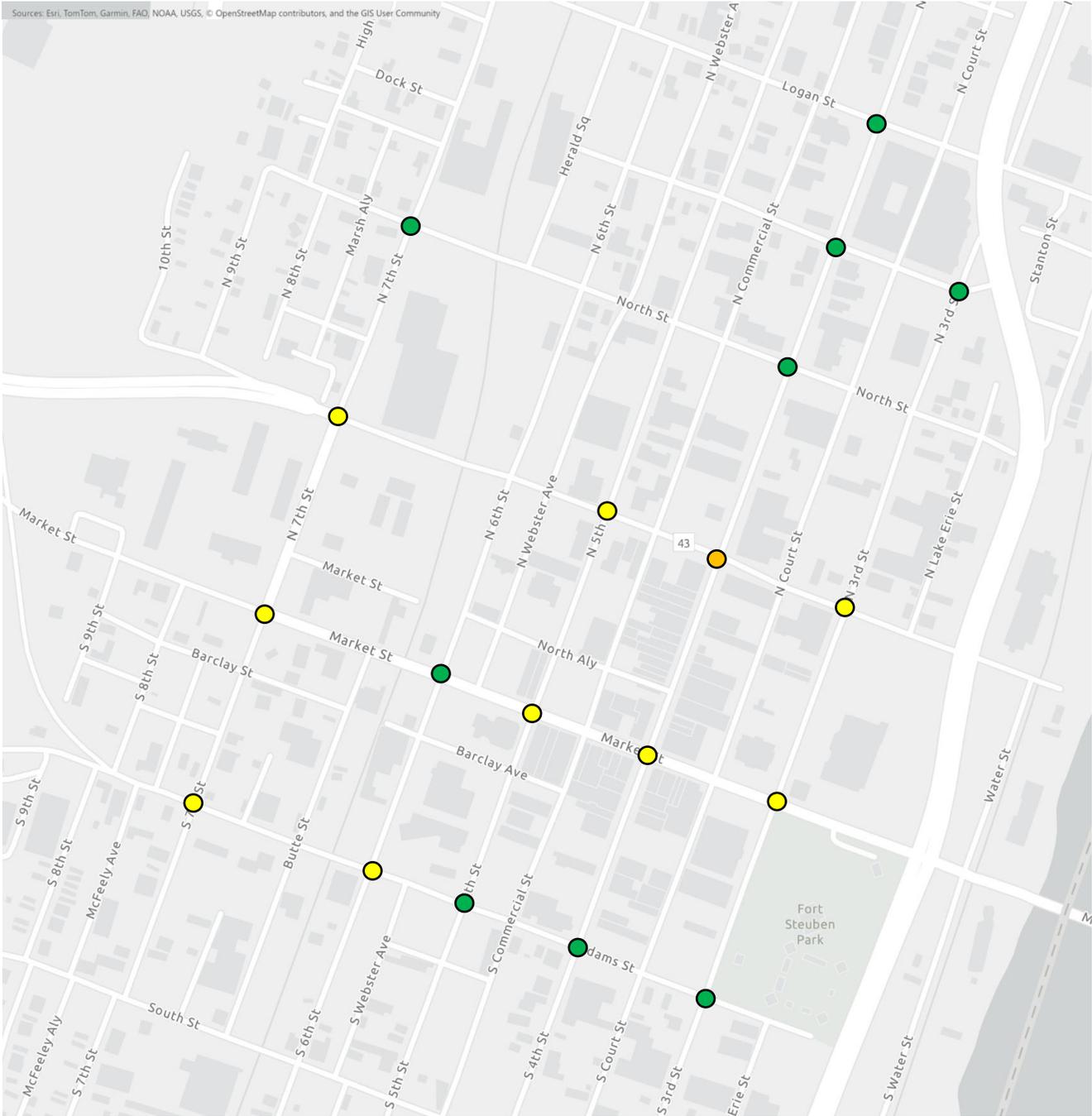


# Intersection Crash Frequency

- 84 (61%) crashes at signalized intersections
- 17 (13%) crashes at unsignalized intersections
- Angle crashes most common

Yearly Crash Totals	
2019	22
2020	17
2021	15
2022	26
2023	21

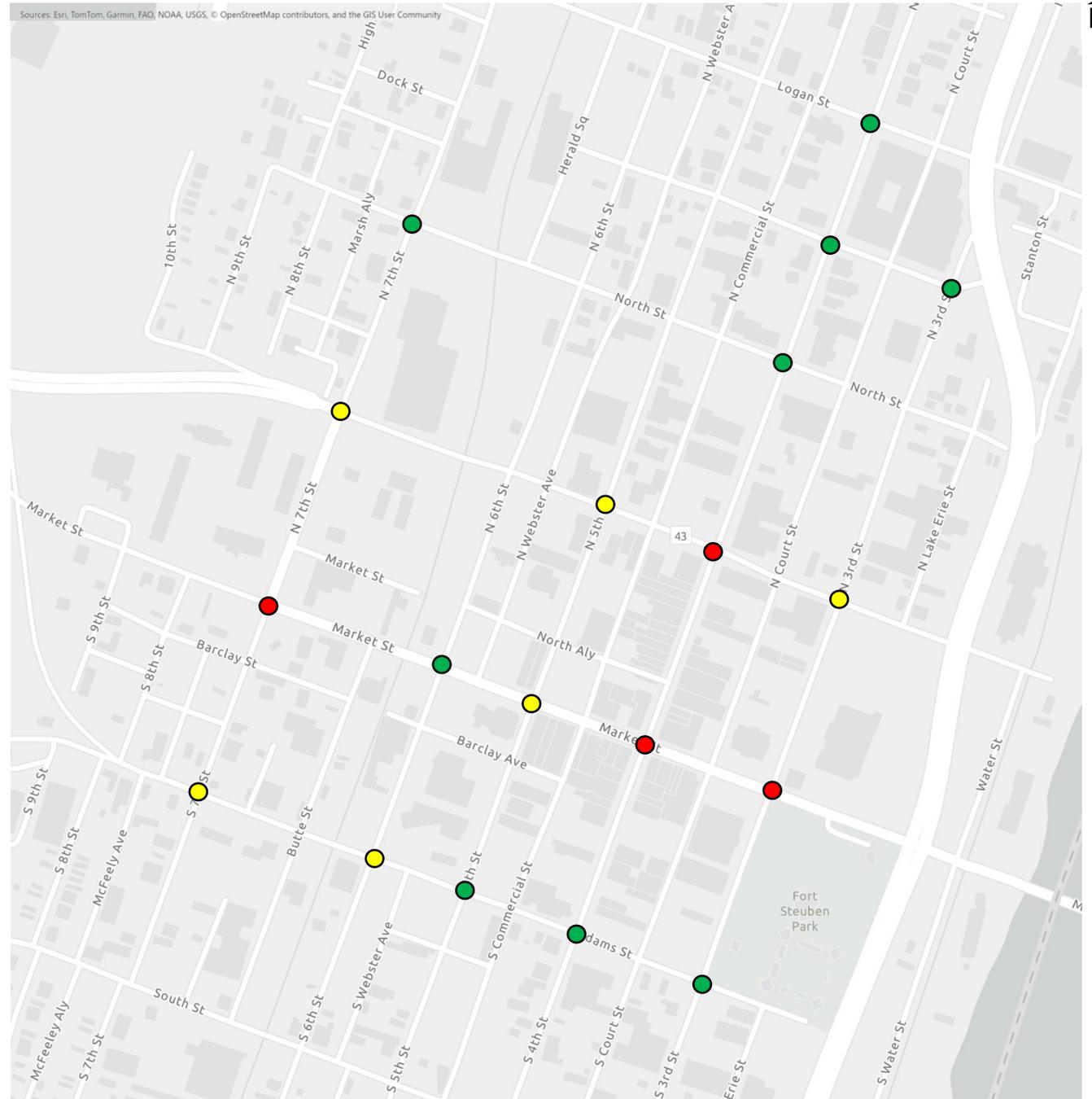
Crash Frequency Legend	
< 5 crashes from 2019-2023	●
5-10 crashes from 2019-2023	●
11-15 crashes from 2019-2023	●
16-20 crashes from 2019-2023	●
> 20 crashes from 2019-2023	●



# Intersection Crash Rates

- 9 intersections with green rating
- 6 intersections with yellow rating
- 4 intersections with red rating (3 along Market St)

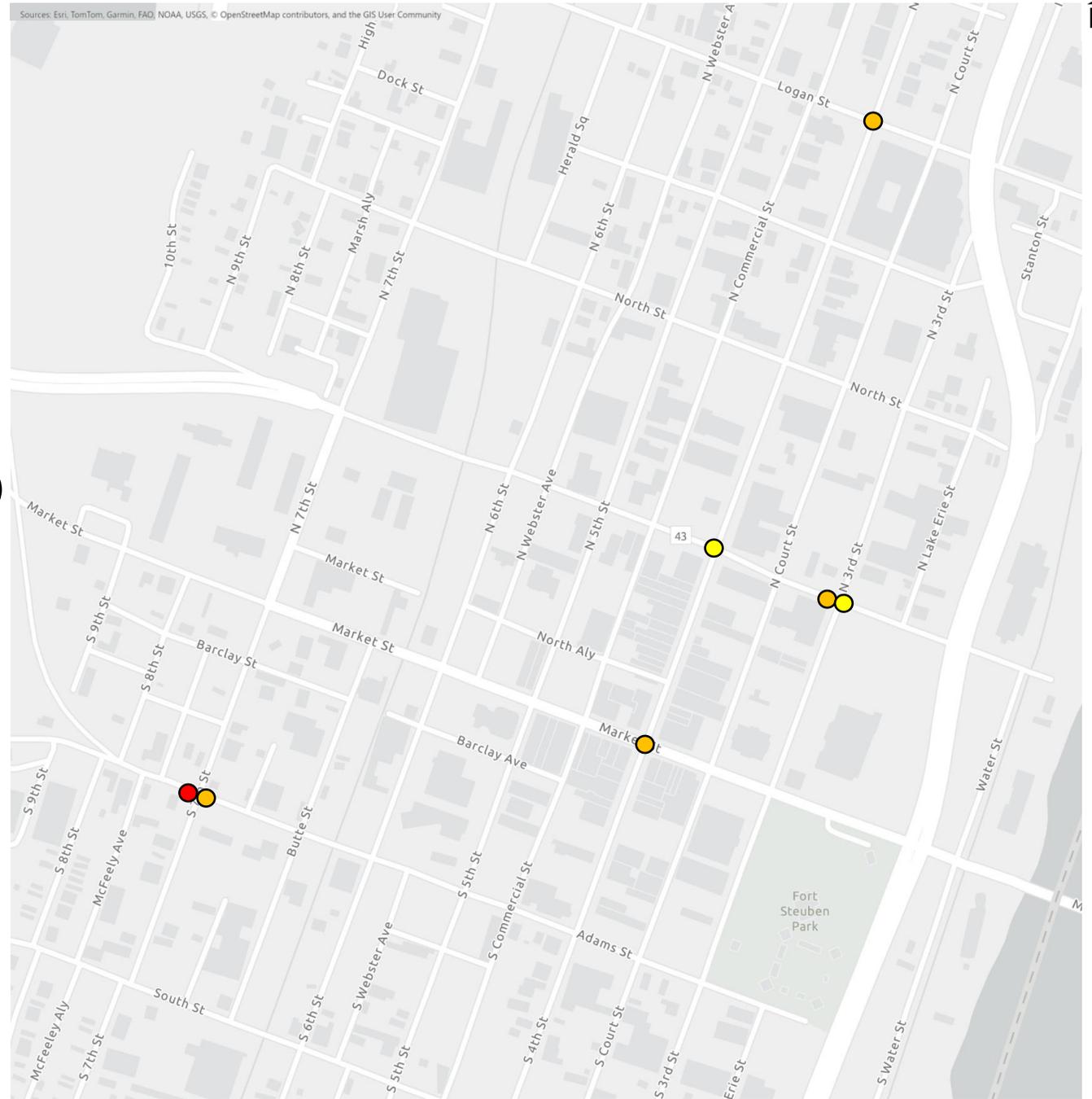
Intersection Crash Rate Legend	
< 0.5 intersection crashes per MEV	●
0.5-1.0 intersection crashes per MEV	●
> 1.0 intersection crashes per MEV	●

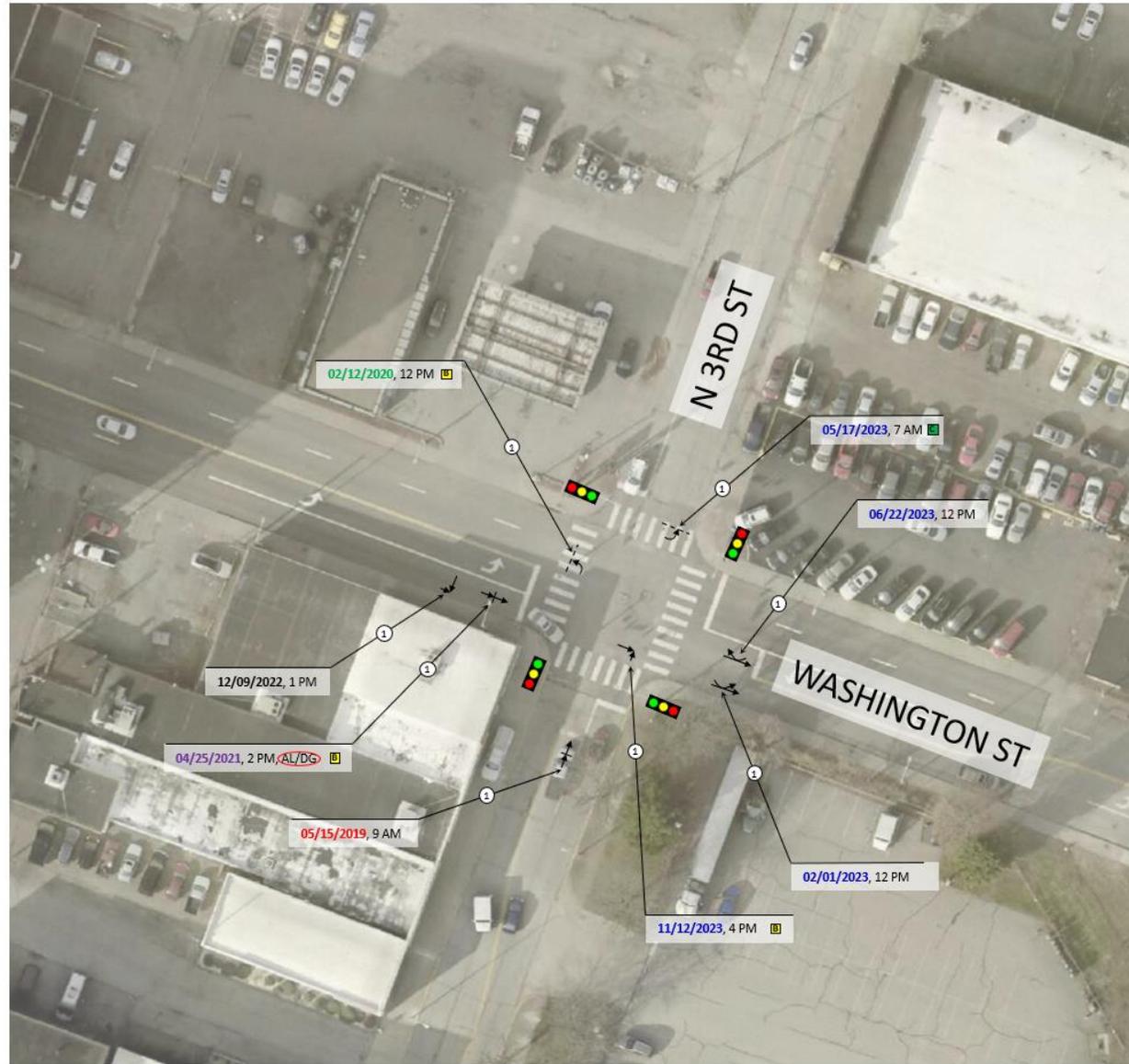


# Bicycle/Pedestrian Crash Locations

- 7 total bicycle/pedestrian crashes
- 5 KAB crashes
- All crashes occurred at intersections
- 1 serious injury crash (bicyclist) in the 5-year period (of all 137 total crashes)

Crash Severity Legend	
K – Fatal	●
A – Serious Injury Suspected	●
B – Minor Injury Suspected	●
C – Injury Possible	●





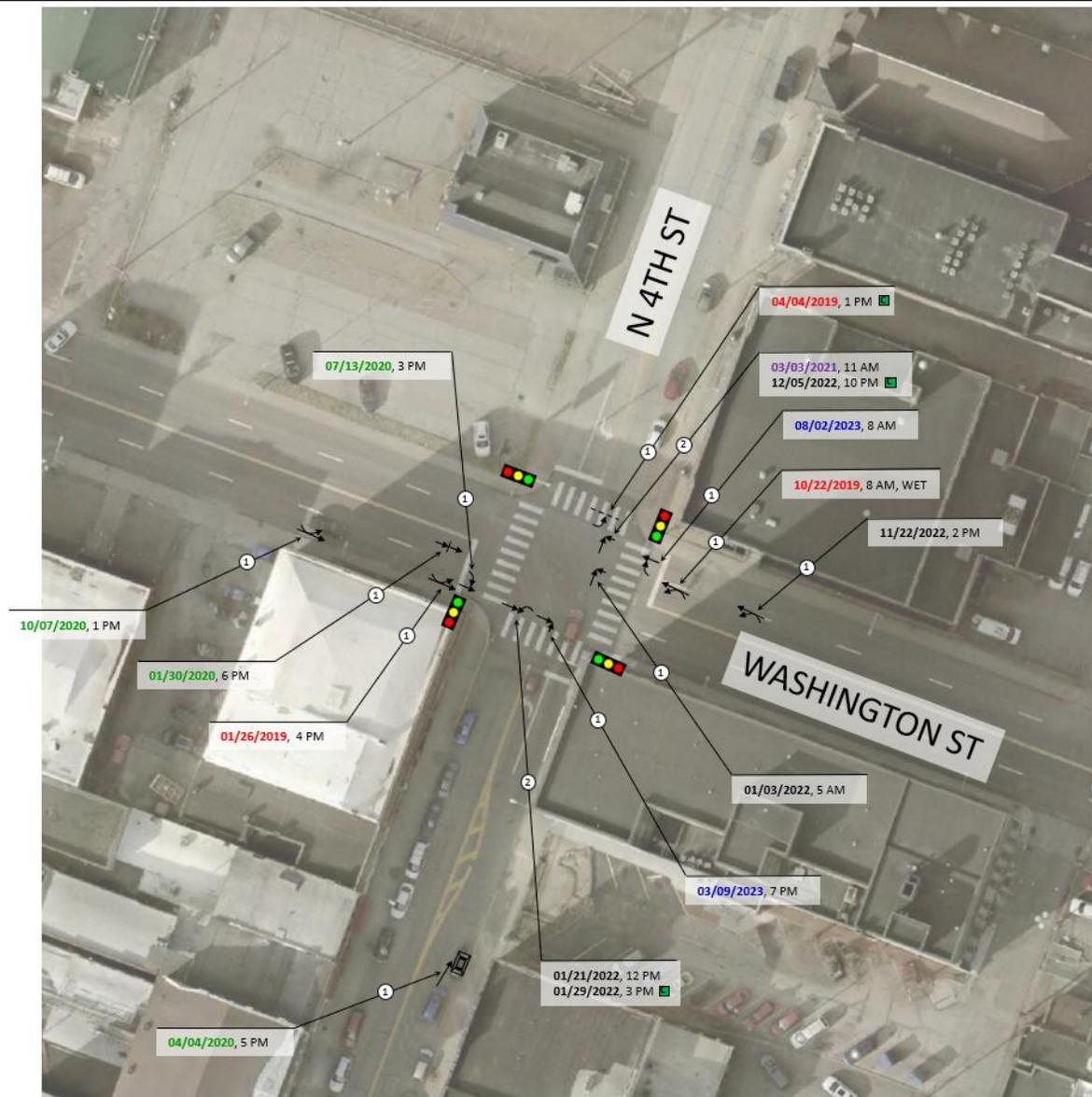
YEAR*
2019 RED
2020 GREEN
2021 PURPLE
2022 BLACK
2023 BLUE

CRASH FREQUENCY/SEVERITY	
8 Crashes	0 Fatal Crash(es) (K)
	0 Suspected Serious Injury (A-Level)
	3 Suspected Minor Injury (B-Level)
	1 Possible Injury (C-Level)
	4 Property Damage Only
0.74 Crashes Per Million Entering Vehicles	

LEGEND		
→ Moving Vehicle	🚦 Traffic Signal	↔ Angle (Right Angle)
↔ Backing Vehicle	🛑 Stop/Yield Sign	↔ Angle (Left-Turn)
- - - Pedestrian	🌳 Tree	↔ Angle (Right-Turn)
⚙ Bicycle	🚗 Fixed Object	↔ Sideswipe-Same
🚗 Parked Vehicle	📍 Non-Fixed Object	↔ Sideswipe-Opposite
		↔ Head-On
		↔ Rear-End
		↔ Out of Control
		↔ Overtake
		↔ Overturn

DATE OF CRASH	SEVERITY (SEE SEVERITY DEFINITIONS)	ROAD CONDITIONS (DRY IF BLANK)	LIGHT CONDITIONS (DAYTIME/LIGHTED IF BLANK)	ALCOHOL/DRUG INVOLVEMENT (AL/DG)	SPEED RELATED (NO SPEEDING IF BLANK)	WORK ZONE (NO WZ IF BLANK)
02/12/2020, 12 PM	1					
05/17/2023, 7 AM	1					
06/22/2023, 12 PM	1					
12/09/2022, 1 PM	1					
04/25/2021, 2 PM, AL/DG	1			AL/DG		
05/15/2019, 9 AM	1					
02/01/2023, 12 PM	1					
11/12/2023, 4 PM	1					

CRASH SEVERITY DEFINITIONS
🔴 = Fatal Crash
🟠 = Incapacitating Injury Crash
🟡 = Non-Incapacitating Injury Crash
🟢 = Possible Injury Crash
🟣 = Property Damage Only Crash



**YEAR\***  
2019 RED  
2020 GREEN  
2021 PURPLE  
2022 BLACK  
2023 BLUE

**CRASH FREQUENCY/SEVERITY**  
15 Crashes  
1.14 Crashes Per Million Entering Vehicles

- 0 Fatal Crash(es) (K)
- 0 Suspected Serious Injury (A-Level)
- 0 Suspected Minor Injury (B-Level)
- 3 Possible Injury (C-Level)
- 12 Property Damage Only

**LEGEND**

→ Moving Vehicle	🚦 Traffic Signal	↔ Angle (Right Angle)	🚗 Head-On
↔ Backing Vehicle	🛑 Stop/Yield Sign	↔ Angle (Left-Turn)	↔ Rear-End
--- Pedestrian	🌳 Tree	↔ Angle (Right-Turn)	↔ Out of Control
🚲 Bicyclist	📍 Fixed Object	↔ Sideswipe-Same	↔ Overtake
🚗 Parked Vehicle	⊘ Non-Fixed Object	↔ Sideswipe-Opposite	↔ Overturn

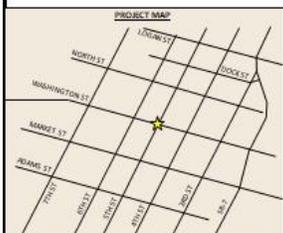
📍 = CRASH FREQUENCY

DATE OF CRASH  
HOUR  
SEVERITY (SEE SEVERITY DEFINITIONS)  
ROAD CONDITIONS (DRY IF BLANK)  
LIGHT CONDITIONS (DAYTIME/LIGHTED IF BLANK)  
ALCOHOL/DRUG INVOLVEMENT (AL/DC)  
SPEED RELATED (NO SPEEDING IF BLANK)  
WORK ZONE (NO WZ IF BLANK)

**CRASH SEVERITY DEFINITIONS**

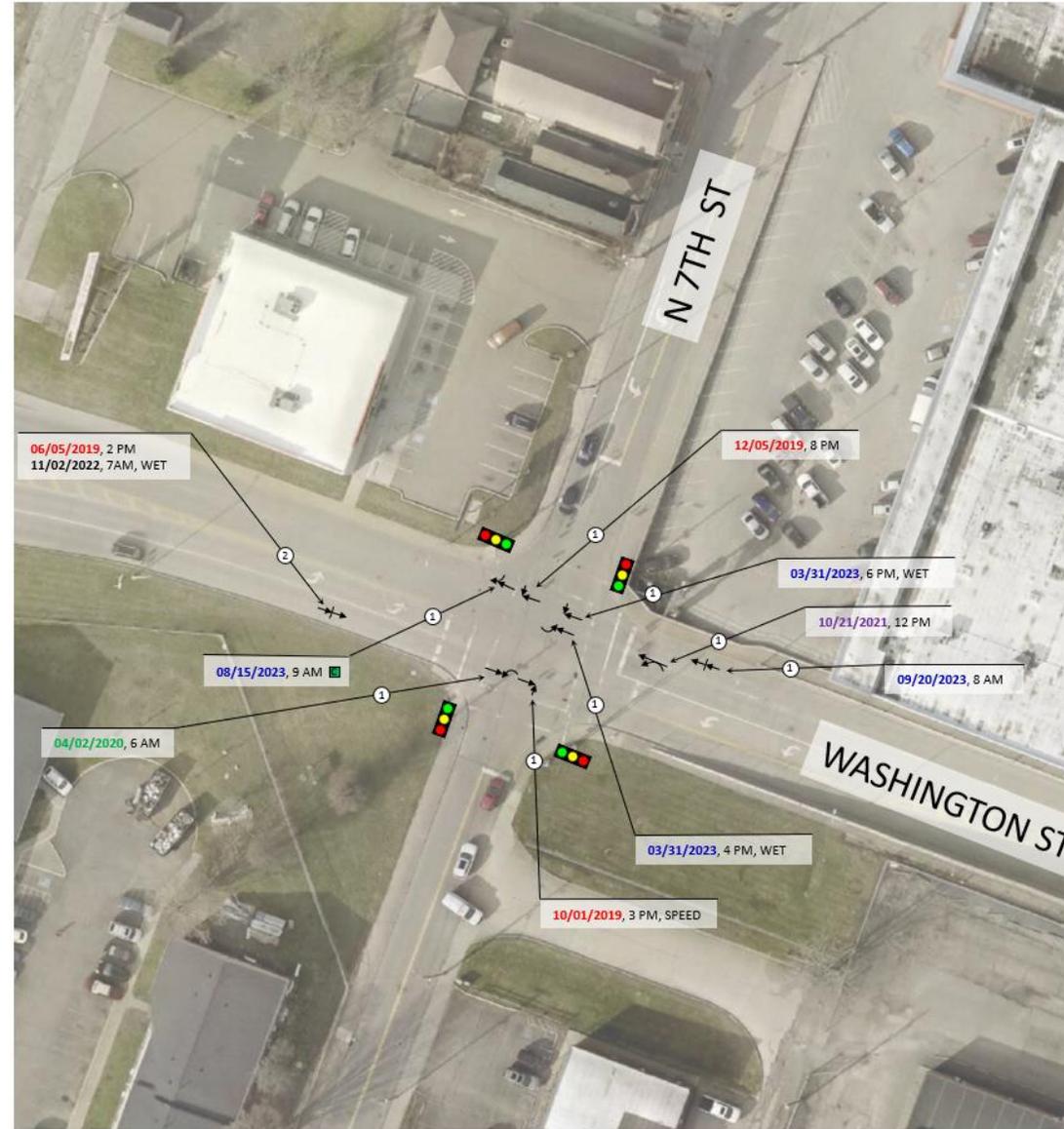
- 🔴 = Fatal Crash
- 🟠 = Incapacitating Injury Crash
- 🟡 = Non-Incapacitating Injury Crash
- 🟢 = Possible Injury Crash
- 🟤 = Property Damage Only Crash





	<b>YEAR*</b> 2019 RED 2020 GREEN 2021 PURPLE 2022 BLACK 2023 BLUE	<b>CRASH FREQUENCY/SEVERITY</b> 6 Crashes 0.52 Crashes Per Million Entering Vehicles	<b>LEGEND</b> → Moving Vehicle ← Backing Vehicle - - - Pedestrian --- Bicyclist [P] Parked Vehicle [T] Traffic Signal [Y] Stop/Yield Sign [Tree] Tree [Circle] Fixed Object [Circle] Non-Fixed Object ↘ Angle (Right Angle) ↙ Angle (Left-Turn) ↗ Angle (Right-Turn) ↔ Sideswipe-Same ↖ Sideswipe-Opposite ↔ Head-On ↘ Rear-End ↗ Out of Control ↗ Overtake ↘ Overtake ↘ Overtake	[Date] - CRASH FREQUENCY [Date] - SEVERITY (SEE SEVERITY DEFINITIONS) [Date] - ROAD CONDITIONS (DRY IF BLANK) [Date] - LIGHT CONDITIONS (DAYTIME/LIGHTED IF BLANK) [Date] - ALCOHOL/DRUG INVOLVEMENT (ALU/DS) [Date] - SPEED RELATED (NO SPEEDING IF BLANK) [Date] - WORK ZONE (NO WZ IF BLANK)	<b>CRASH SEVERITY DEFINITIONS</b> [Fatal] - Fatal Crash [Incap] - Incapacitating Injury Crash [Non-Incap] - Non-Incapacitating Injury Crash [Possible] - Possible Injury Crash [Property] - Property Damage Only Crash

**EXHIBIT 11**  
**CRASH HISTORY (2019-2023)**  
**WASHINGTON ST & N 5TH STREET**  
**CITY OF STEUBENVILLE, OHIO**



YEAR*
2019 RED
2020 GREEN
2021 PURPLE
2022 BLACK
2023 BLUE

CRASH FREQUENCY/SEVERITY	
10 Crashes	0 Fatal Crash(es) (K)
	0 Suspected Serious Injury (A-Level)
	0 Suspected Minor Injury (B-Level)
	1 Possible Injury (C-Level)
	9 Property Damage Only
0.56 Crashes Per Million Entering Vehicles	

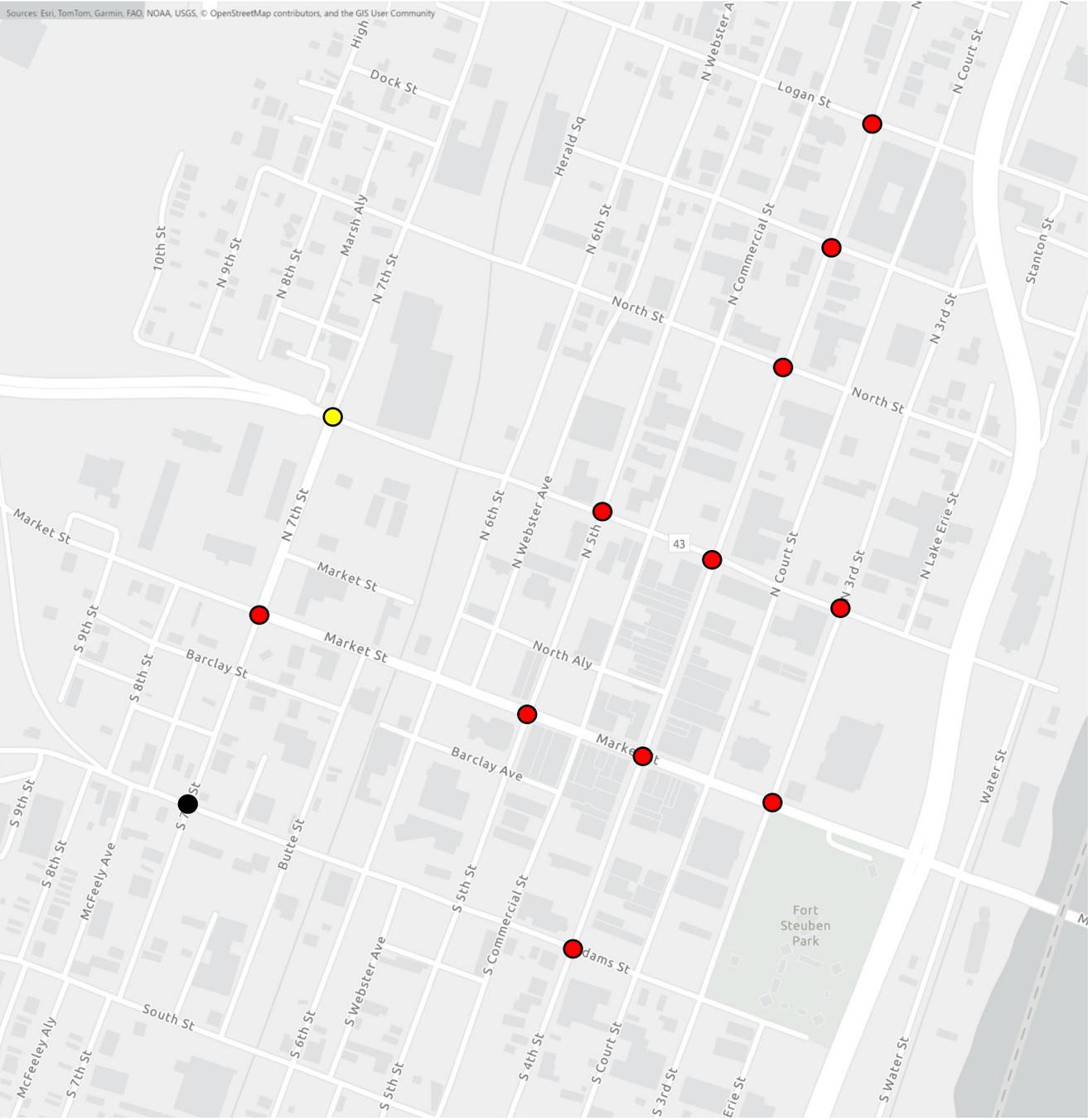
LEGEND	
→ Moving Vehicle	⚡ Traffic Signal
←←← Backing Vehicle	⛔ Stop/Yield Sign
--- Pedestrian	🌳 Tree
⚡ Bicyclist	🚗 Fixed Object
🚗 Parked Vehicle	⊖ Non-Fixed Object
↘ Angle (Right Angle)	↔ Head-On
↙ Angle (Left-Turn)	↔ Rear-End
↘ Angle (Right-Turn)	🌀 Out of Control
↔ Sideswipe-Same	↔ Overtake
↔ Sideswipe-Opposite	↔ Overturn

DATE OF CRASH	CRASH FREQUENCY
HOUR	⊖
SEVERITY (SEE SEVERITY DEFINITIONS)	
ROAD CONDITIONS (DRY IF BLANK)	
LIGHT CONDITIONS (DAYTIME/LIGHTED IF BLANK)	
ALCOHOL/DRUG INVOLVEMENT (AL/DG)	
SPEED RELATED (NO SPEEDING IF BLANK)	
WORK ZONE (NO WZ IF BLANK)	

CRASH SEVERITY DEFINITIONS	
🚗	Fatal Crash
🚑	Incapacitating Injury Crash
🚑	Non-Incapacitating Injury Crash
🚑	Possible Injury Crash
🚑	Property Damage Only Crash

# Warrant Analysis

- The following traffic signal warrants (needs studies) were evaluated:
  - Warrant 1: 8-hour vehicular volume
  - Warrant 2: 4-hour vehicular volume
  - Warrant 3: Peak hour vehicular volume
  - Warrant 4: Pedestrian volume
  - Warrant 5: School crossing (4<sup>th</sup> St and Dock St and 4<sup>th</sup> St and Logan St)
  - Warrant 7: Crash experience (5 or more crashes plus minimum volume thresholds)
- Warrants evaluated for all currently signalized intersections within study area
- Traffic volumes collected in September 2024
- ODOT Warrant Spreadsheet utilized for analysis



# Signal Warrant Analysis

- Evaluated at 13 intersections
- Purpose of analysis: Verify if signals should remain
- Warrants 1, 2, 3, and 4 not met except 7<sup>th</sup> St and Washington St
- Warrant 5 not met
- Warrant 7 not met
  - 4<sup>th</sup> St and Washington St met minimum of 5 crashes but not minimum volume thresholds

## Signal Warrant Legend

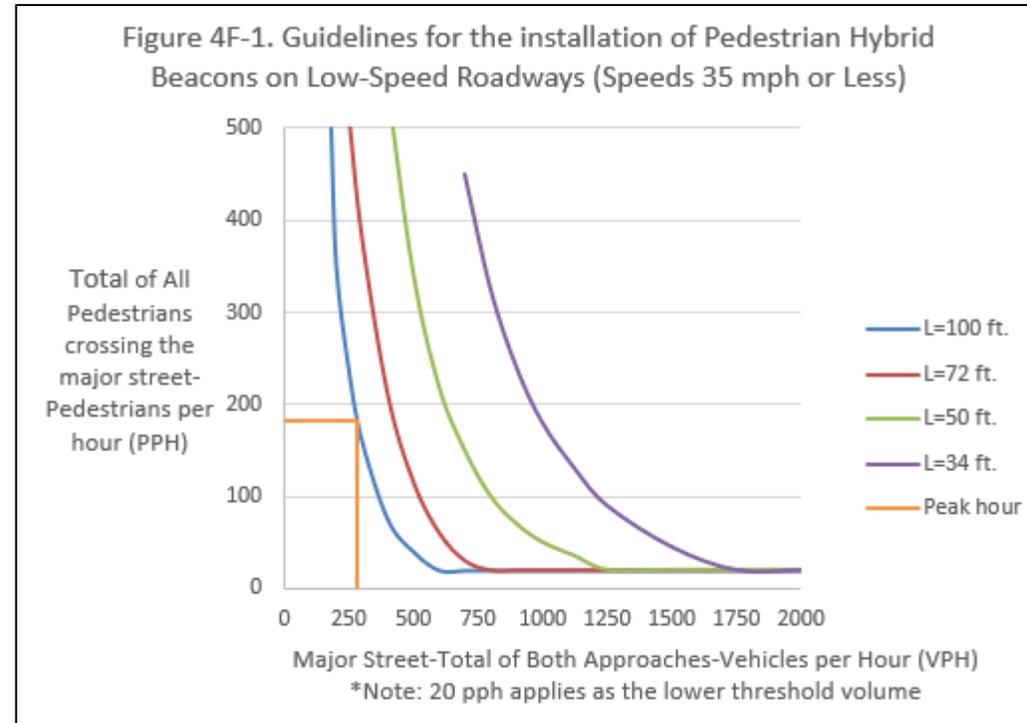
- 100% Volume Signal Warrants 2 and/or 3 Met ●
- 70% Volume Signal Warrants 2 and/or 3 Met ●
- Multi-Way Stop Warrant Met ●
- No Signal and Multi-Way Stop Warrants Met ●

# Multi-Way Stop Warrant Analysis

Warrant					
Intersection	Volume Thresholds Met	Left Turn Conflicts	High Pedestrian Volumes	Restricted Sightlines	5+ correctable crashes in any 12-month period
Market St & 3 <sup>rd</sup> St				X	
Washington St & 3 <sup>rd</sup> St				X	
Adams St & 4 <sup>th</sup> St				X	
Market St & 4 <sup>th</sup> St		X		X	X
Washington St & 4 <sup>th</sup> St		X		X	
North St & 4 <sup>th</sup> St				X	
Dock St & 4 <sup>th</sup> St		X		X	
Logan St & 4 <sup>th</sup> St				X	
Market St & 5 <sup>th</sup> St				X	
Washington St & 5 <sup>th</sup> St				X	
Market St & 7 <sup>th</sup> St		X			

# Pedestrian Hybrid Beacon Warrant Analysis

- Pedestrian hybrid beacon (PHB) evaluated using OMUTCD guidance
- Intersections around Steubenville HS (Logan St/4<sup>th</sup> St and Dock St/4<sup>th</sup> St) evaluated
- Neither intersection met guidelines, and PHB score was low (~30%) at both intersections



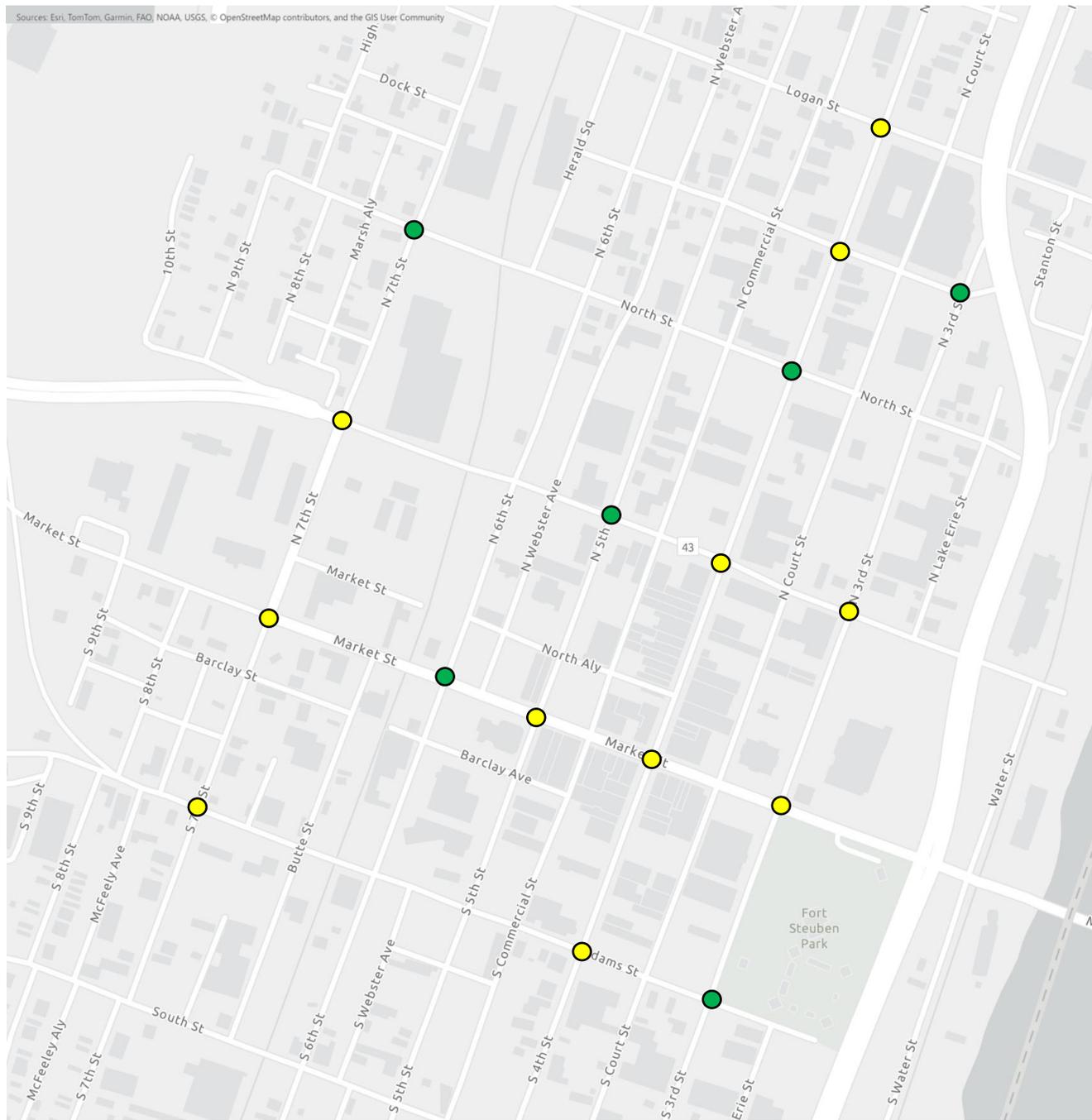
PHB Warrant at Logan St & 4<sup>th</sup> St (crossing distance of 32 ft)

# Capacity Analysis

- Intersection level of service (LOS) analyzed using Synchro 12, HCM 7<sup>th</sup> edition
- Weekday AM, midday, and PM peak hour periods analyzed
  - Peak hour periods vary by intersection
  - Market St corridor has highest volumes in midday peak (12:00 – 1:00)
  - Washington St corridor has highest volumes in PM peak (2:15 – 3:15)
  - Intersections near high school have highest volumes in AM peak
- Analysis performed for traffic signal and multi-way stop conditions

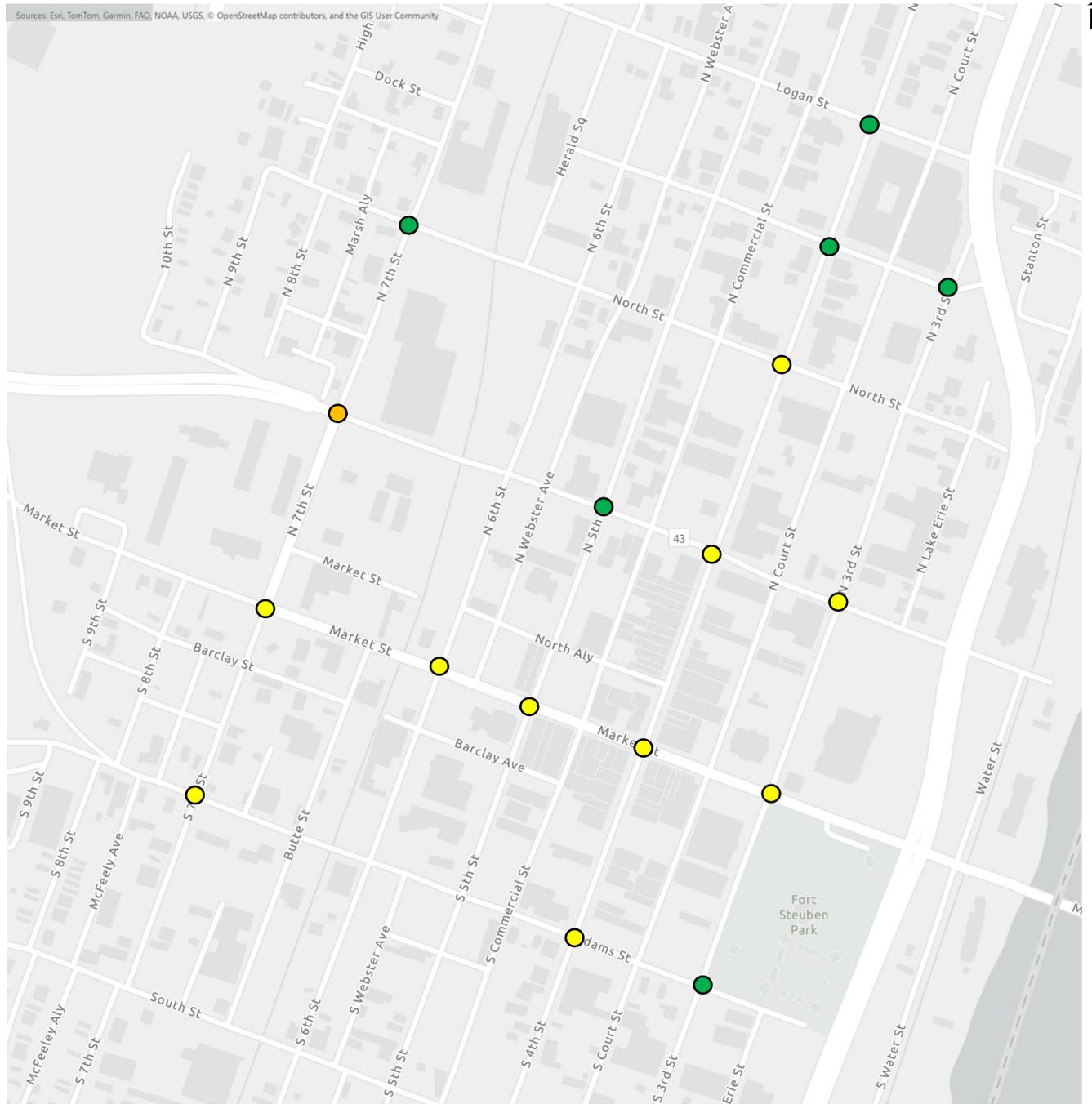
# AM Peak LOS – Existing Condition

Level of Service Legend	
LOS A	●
LOS B	●
LOS C	●
LOS D	●
LOS E, LOS F	●



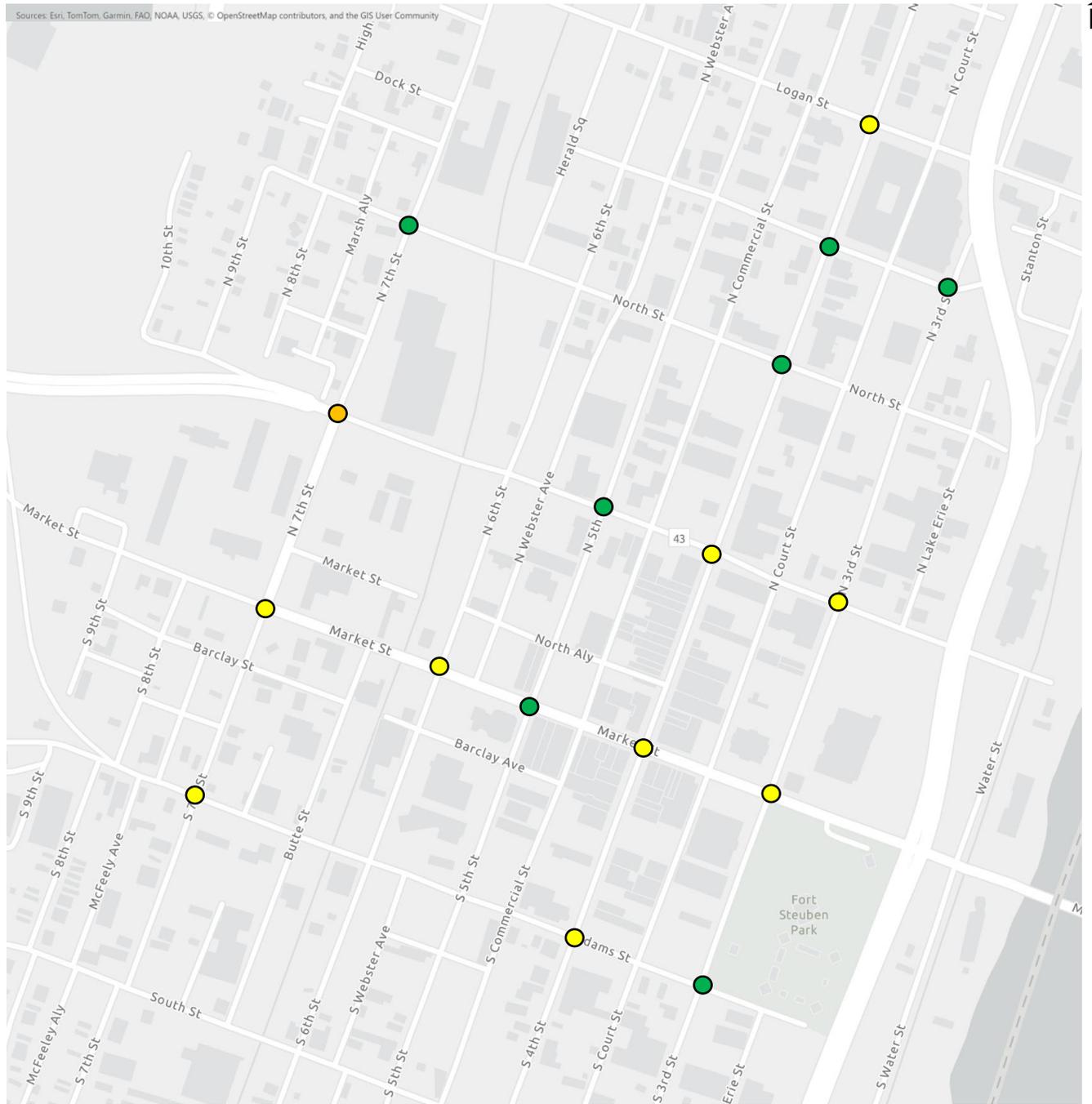
# Midday Peak LOS – Existing Condition

Level of Service Legend	
LOS A	●
LOS B	●
LOS C	●
LOS D	●
LOS E, LOS F	●



# PM Peak LOS – Existing Condition

Level of Service Legend	
LOS A	●
LOS B	●
LOS C	●
LOS D	●
LOS E, LOS F	●



# LOS Summary – 2024 Existing Condition

Intersection	AM Peak LOS	Midday Peak LOS	PM Peak LOS
Adams St & 3 <sup>rd</sup> St (u)	A	A	A
Market St & 3 <sup>rd</sup> St (s)	B	B	B
Washington St & 3 <sup>rd</sup> St (s)	B	B	B
Dock St & 3 <sup>rd</sup> St (u)	A	A	A
Adams St & 4 <sup>th</sup> St (s)	B	B	B
Market St & 4 <sup>th</sup> St (s)	B	B	B
Washington St & 4 <sup>th</sup> St (s)	B	B	B
North St & 4 <sup>th</sup> St (s)	A	B	A
Dock St & 4 <sup>th</sup> St (s)	B	A	A
Logan St & 4 <sup>th</sup> St (s)	B	A	B
Market St & 5 <sup>th</sup> St (s)	B	B	A
Washington St & 5 <sup>th</sup> St (s)	A	A	A
Market St & 6 <sup>th</sup> St (u)	A	B	B
Adams St & 7 <sup>th</sup> St (s)	B	B	B
Market St & 7 <sup>th</sup> St (s)	B	B	B
Washington St & 7 <sup>th</sup> St (s)	B	C	C
North St & 7 <sup>th</sup> St (u)	A	A	A

(u) = unsignalized intersection

(s) = signalized intersection

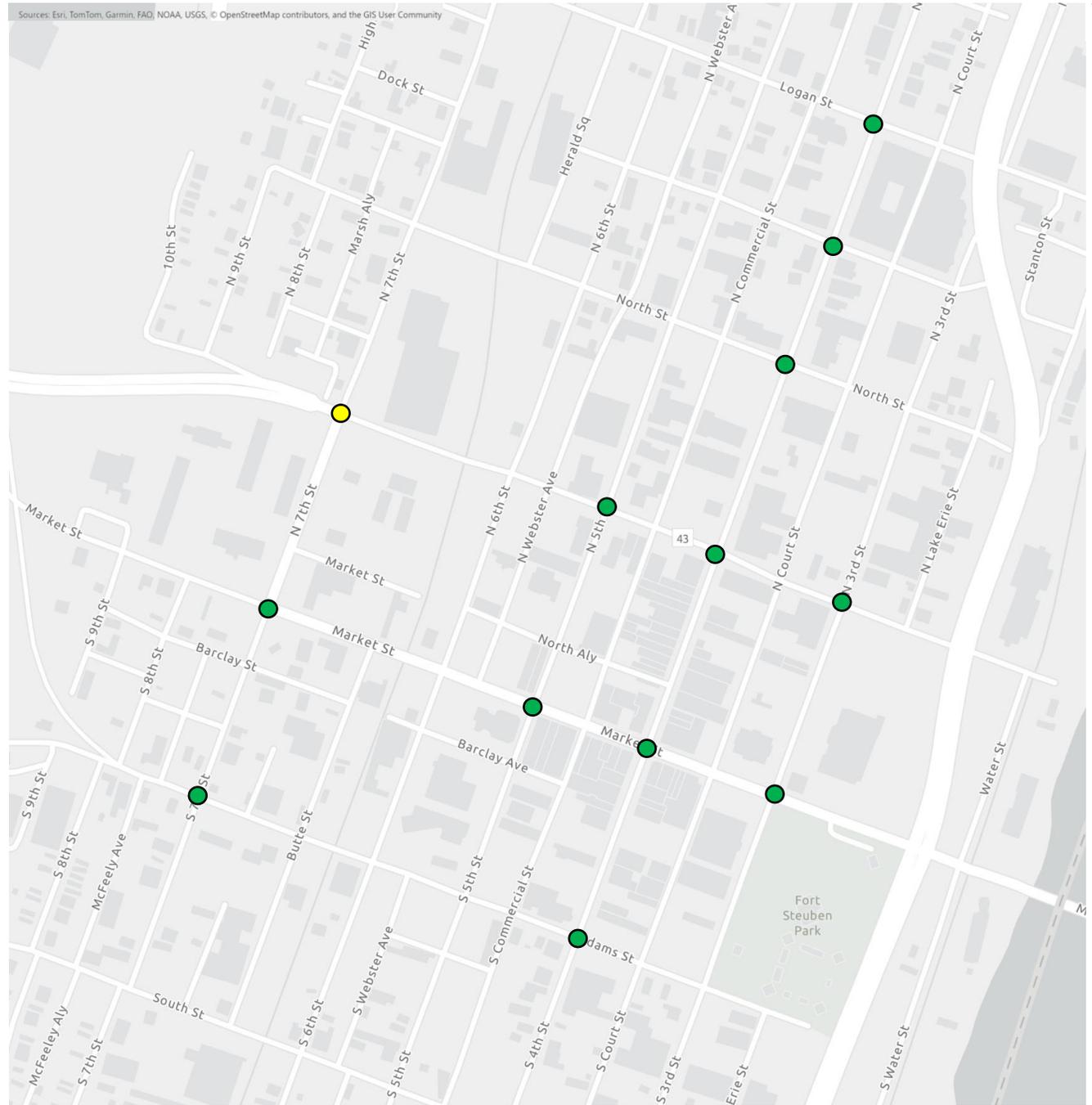
# LOS Summary – All-way Stop Condition

- All-way stop control LOS evaluated at intersections that are currently signalized
- Intersection level of service (LOS) analyzed using Synchro 12, HCM 7<sup>th</sup> edition
- Weekday AM, midday, and PM peak hour periods analyzed
  - All LOS C or better

# AM Peak LOS – Potential AWSC Condition

- All intersections LOS B or better

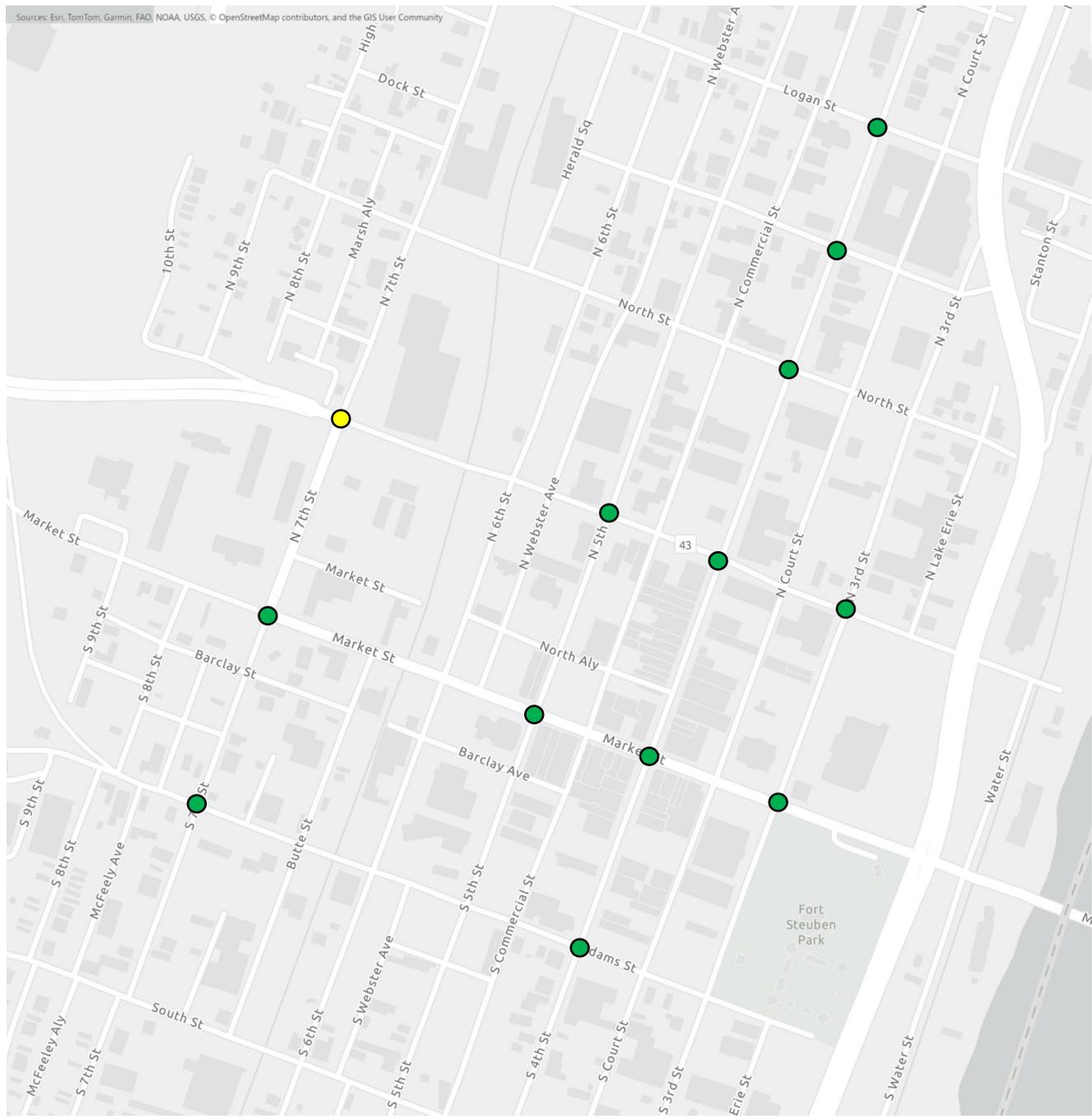
Level of Service Legend	
LOS A	●
LOS B	●
LOS C	●
LOS D	●
LOS E, LOS F	●



# Midday Peak LOS – Potential AWSC Condition

- All intersections LOS B or better

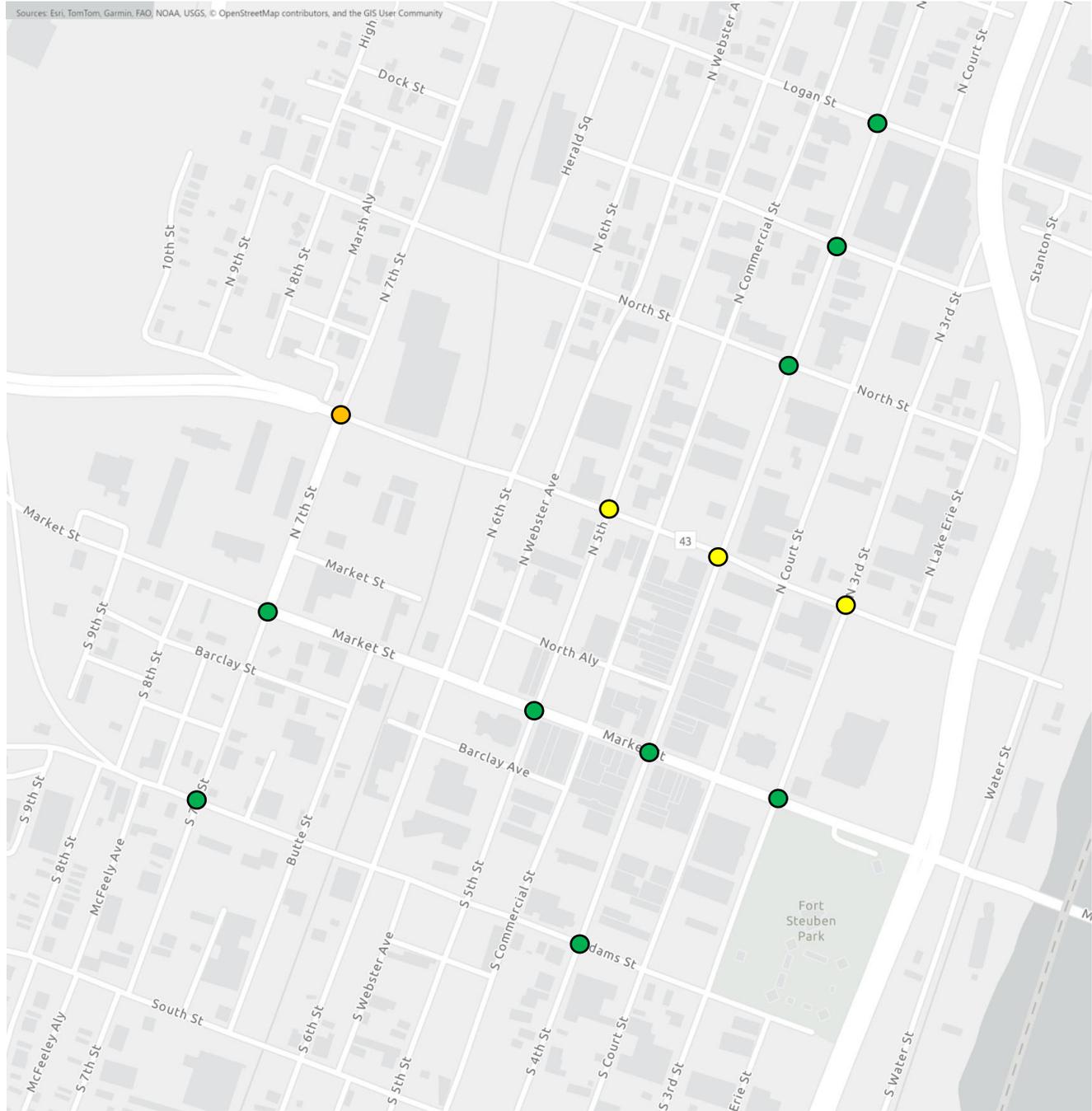
Level of Service Legend	
LOS A	●
LOS B	●
LOS C	●
LOS D	●
LOS E, LOS F	●



# PM Peak LOS – Potential AWSC Condition

- All intersections LOS C or better

Level of Service Legend	
LOS A	●
LOS B	●
LOS C	●
LOS D	●
LOS E, LOS F	●



# Conclusions

- Traffic signal warrants 1, 2, or 3 not met for all intersections except Washington St & 7<sup>th</sup> St
- Traffic signal warrants 4 and 7 not met at all intersections
- Traffic signal warrant 5 not met at 4<sup>th</sup> St and Dock St and 4<sup>th</sup> St and Logan St
- All-way stop control warrant met at all intersections except Adams St & S 7<sup>th</sup> St
- Average speeds align with 25 mph speed limit where data is available
- All intersections operating at LOS C or better
- Higher pedestrian volumes adjacent to Steubenville High School and along 4<sup>th</sup> St from Market St to Washington St
- No intersections meeting safety funding thresholds (10 crashes over 3 years and 30% injury crashes)

## Recommendations and Next Steps

- Remove unwarranted traffic signals (all existing signalized intersections within study area except Washington St & 7<sup>th</sup> St)
- Install all-way stop control at all intersections where traffic signals are removed
- Evaluate roadway cross section/re-striping options to implement in conjunction with signal removal
- Consider potential enhancements to crosswalks at 4<sup>th</sup> St and Dock St and 4<sup>th</sup> St and Logan St due to high pedestrian volumes
  - Curb extensions, raised crossings, etc.

# Traffic Signal Removal Procedure

- Determine appropriate traffic control after signal is removed (completed)
- Remove any sight-distance restrictions as necessary (N/A)
- Inform the public of the removal study
- Flash or cover the signal heads for a minimum of 90 days, and install stop control
- Remove the signal



# Potential Roadway Cross Section/Re-striping Options – No Bike Lanes







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