

**APPENDIX B:**  
NETWORK TRAFFIC  
MODEL ANALYSIS  
RESULTS



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# 1/INTRODUCTION

This technical report documents the traffic operations process and analysis performed under the Downtown St. Petersburg (DTSP) Mobility Study. The document outlines the methodology and tools used to perform the analysis and discusses the projects tested under three different scenarios. The performance of each of the future scenarios and the planned network (2045) was evaluated using three of the performance measures established for the study. This report provides a comparison of just these three measures. The full evaluation of each scenario is provided in the full report.

## Study Area/Modeling Limits

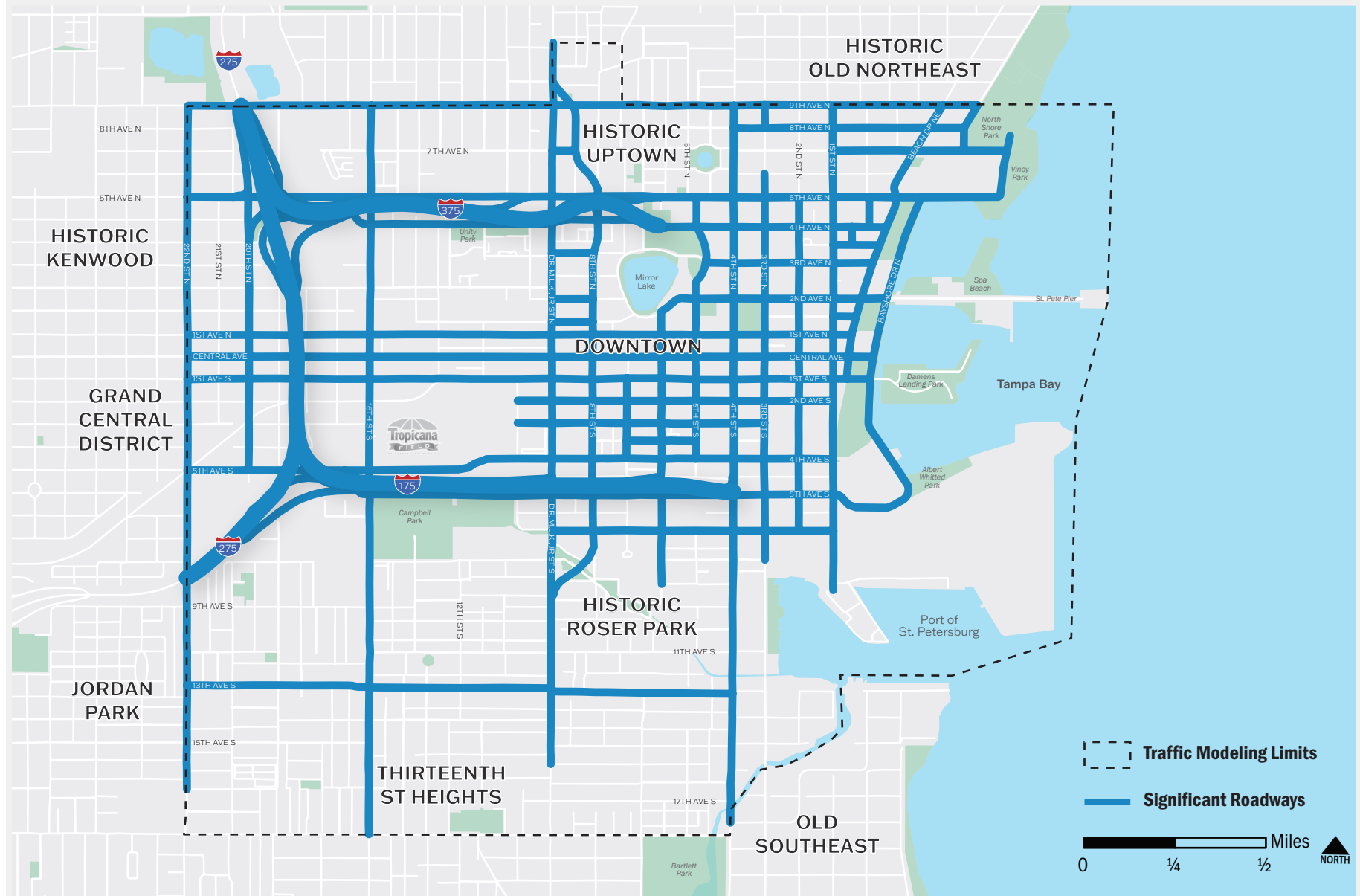
As shown in Figure 1, the traffic modeling limits for the network analysis are the same as the DTSP study area. The traffic modeling limits are from 22nd St to the waterfront and from 18th Ave S to 9th Ave N. The improvements tested in each Scenario involve several types of roadway and intersections improvement projects, such as interstate spur removal or redesign, one-way to two-way roadway conversions, and new streets at the Tropicana Field redevelopment site to improve grid connectivity. Key roadways shown on Figure 1 were included in the model to test operational differences between models. These roadways include I-275 and the I-175 and I-375 spurs, as well as the Dr. MLK Jr. St/8th St and 4th St/3rd St one-way pairs. The 4th/5th Aves S and N that parallel I-175 and I-375, respectively, were also included. Roadways that provide access into and out of DTSP were also included, such as 1st Ave S and N, Central Ave, 9th Ave N, 16th St, 1st St, and Beach Dr.

## Key Findings

The scenario evaluation process conducted as part of this study uncovered the following findings related to the projects and scenarios that were tested:

- The one-way to two-way conversion of either Dr. MLK Jr St/8th St or 4th St/3rd St will not result in negative operations. Two-way operations may result in slower speeds and more walkable streets with improved access to storefronts and businesses. Signalized intersections operate with low delay and the majority of these roadways are uncongested.
- Removing one interstate spur results in drivers shifting slightly to use the remaining spur, as it provides a higher speed, higher capacity route.
- When both spurs are removed, drivers use the new interchange at 5th Ave S that replaces the I-175 interstate spur.
- The partial removal of I-375 consolidates the on-/off-ramp to one location west of Dr. MLK, Jr St, which causes significantly more congestion and slightly higher delays on intersections along 5th Ave N, since the I-375 interstate spur is not in place to absorb drivers.
- If I-375 were removed and a new full interchange was constructed at 5th Ave N, traffic would need to be redistributed between 4th and 5th Aves N. 5th Ave N may require an uneven widening to provide adequate westbound lanes to as this is the primary route to access I-275. In addition, 16th St in this area should remain under its current configuration to maintain acceptable operations.
- If I-175 were removed and a new full interchange was constructed at 5th Ave S, traffic would need to be redistributed between 4th and 5th Aves S. This helps to distribute trips along cross streets and allows for low delay at signalized intersections with some areas of congested roadways, focused near the waterfront area where capacity is limited.

**FIGURE 1. DTSP MAJOR ROADWAYS FOR MODELING**



## 2/METHODOLOGY

### Aimsun Overview

Aimsun software was selected as the traffic analysis tool due to its ability to analyze changes in drivers' travel patterns within a large-scale area, such as the greater DTSP area, when improvement projects are implemented. The analysis can be performed quickly and there is no need to develop new volumes for each Scenario; the model will develop these based on user provided inputs and internal processes that determine the most logical paths under new roadway conditions.

### Process

The Aimsun model was developed using the Tampa Bay Regional Planning Model (TBRPM v8.2) and feedback from Forward Pinellas, the City of St. Petersburg, and the Florida Department of Transportation (FDOT). Model inputs such as vehicle routing information, signal timing plans, additional roadways missing from the TBRPM v8.2, and committed projects to be completed within the next three years were also provided by these sources. Using all these inputs, the Existing + Committed (E+C) Network model, was developed and reviewed by all agencies. This E+C Network served as the base model for the existing year (2020).

Following agency review and approval, results were gathered for the E+C Network and documented. Additional planned improvements to be completed by the future year (2045) were provided and added to the network to create the Planned Network model. Future year volumes were also developed and became the basis for all future year scenarios, so all scenarios were analyzed using a consistent set of volumes. The results of the Planned Network were used as a starting point to develop a list of potential projects to include in the three scenario networks. The scenarios were

created and tested and the results of each scenario were compared against the Planned Network to determine impacts of individual improvements and which ones should be further reviewed and analyzed under next steps.

### Performance Measures

The following performance measures produced by the Aimsun software were used to compare the scenarios and will be incorporated into the full study evaluation to help determine which projects should be recommended for further evaluation under additional, follow up studies.

**Roadway Utilization** – Roadway utilization can be represented by its volume-to-capacity (V/C) ratio. This value compares the volume of a roadway to its available capacity. The V/C ratios are presented graphically for all Scenarios for both the AM and PM peak periods. On these maps, V/C ratios are classified using thresholds proposed by members of the TAG to determine levels of congestion. It should be noted that throughout the analysis, some level of congested roadways is allowable, especially in areas within DTSP, near the waterfront, and along corridors near the newly developed Tropicana Field Site. These areas may show up graphically as congested roadways, but no improvements to these roadways were developed, as low-speed, low-capacity facilities within a downtown setting are expected to experience congestion regularly due to pedestrian and bicyclist impacts and drivers looking for parking or discerning routes through a grid composed of one-way streets.

**Intersection Performance** – Intersection delay can be expressed as the delay incurred along each of the approaches leading into an intersection, known as approach delay. It may also be expressed as the overall intersection delay, which represents an average value of all the approach delays. Both metrics were analyzed and presented graphically for all Scenarios for both the AM and PM peak periods. Delay thresholds were derived from the Highway Capacity Manual (HCM) Level of Service (LOS) for signalized

intersections. From these thresholds, approaches or intersections operating at a delay greater than 55 seconds are considered operating under unacceptable conditions. This indicates that an approach or intersection is failing and experiencing congestion.

**Travel Time** – Travel time results for select routes within the study area were extracted from the model. The routes assume drivers use I-275 to enter the network, but the start of the travel time begins when the vehicle enters the DTSP area, either via the I-175 or I-375 spur or the local street network, such as the 5th Ave N off ramp. This was done to provide travel time measures for drivers within the DTSP area and to exclude variability in travel time due to I-275. The travel times can be compared across Scenarios to show how certain routes are affected by the potential improvement projects. The routes end at four popular destinations within DTSP and are shown below:

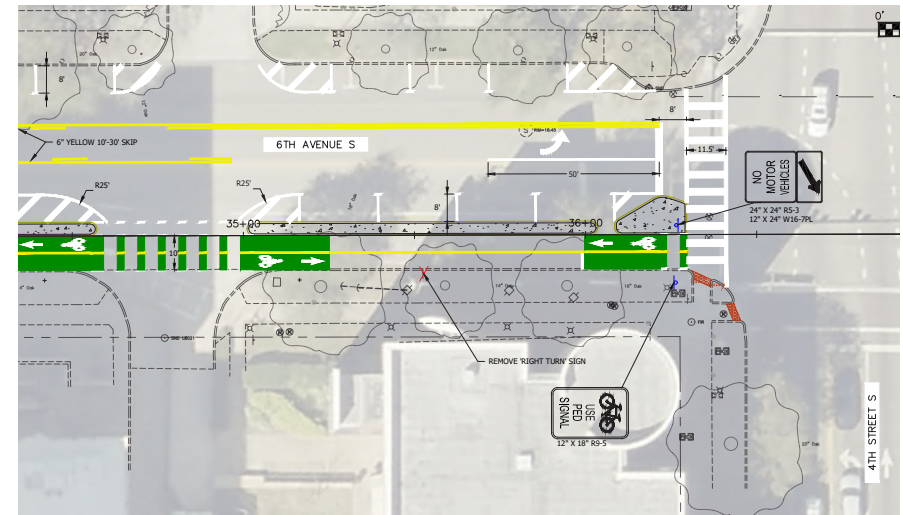
- Johns Hopkins All Children’s/Bayfront Hospitals
- St. Anthony’s Hospital
- St. Pete Pier
- Warehouse Arts District/Deuces Live

# 3/EXISTING NETWORK (2020)

## E+C Network Model Projects

The Existing + Committed (E+C) Network Model was developed using the existing roadway network along with existing or committed projects that are expected to be completed within the next three years. These E+C projects are described in Table 1 and shown graphically on Figure 2. Typical sections and design plan screenshots for each of the E+C projects are also shown in Figures 3-7, along with the graphics source.

FIGURE 2. 6TH AVE S SEPARATED BIKEWAY



Source: City of St. Petersburg 6th Ave S Separated Bikeway 90% Plans (Project No. 18108-112), April 2020

TABLE 1. E+C NETWORK (2020) PROJECT SUMMARY TABLE

MAP ID	PROJECT NAME	DESCRIPTION (SOURCE/LEAD AGENCY)
A	2nd Ave N Intersection Modifications	Replace signalized intersections at Beach Dr and Bayshore Dr (City of St. Petersburg)
B	SunRunner BRT Lane Re-allocation	Provide BAT lanes and intersection changes along 1st Ave N/S and 4th/3rd St (PSTA)
C	5th Ave N Lane Re-allocation	Reduce lanes from 3 to 2 lanes and re-allocate northern lane for parking between 4th St and 6th St (City of St. Petersburg)
D	6th Ave S Lane Re-allocation	Reduce to 1 lane and parallel parking in each direction, with a two-way buffered cycle track on the south side between Dr. MLK Jr St to 3rd St (City of St. Petersburg)
E	3rd St Intersection Modifications	Provide curb bulbouts at intersections between 5th Ave S and 5th Ave N to lower turning speeds (FDOT)
F	4th St Intersection Modifications	Provide curb bulbouts at intersections between 5th Ave S and 5th Ave N to lower turning speeds (FDOT)
G	Dr. MLK Jr St Lane Re-allocation	Reduce lanes from 4 to 3 lanes and re-allocate to add a buffered bike lane between 6th Ave S and 4th Ave N (City of St. Petersburg Complete Streets Implementation Plan, 2019)

**FIGURE 3. E+C NETWORK (2020) IMPROVEMENT PROJECT MAP**

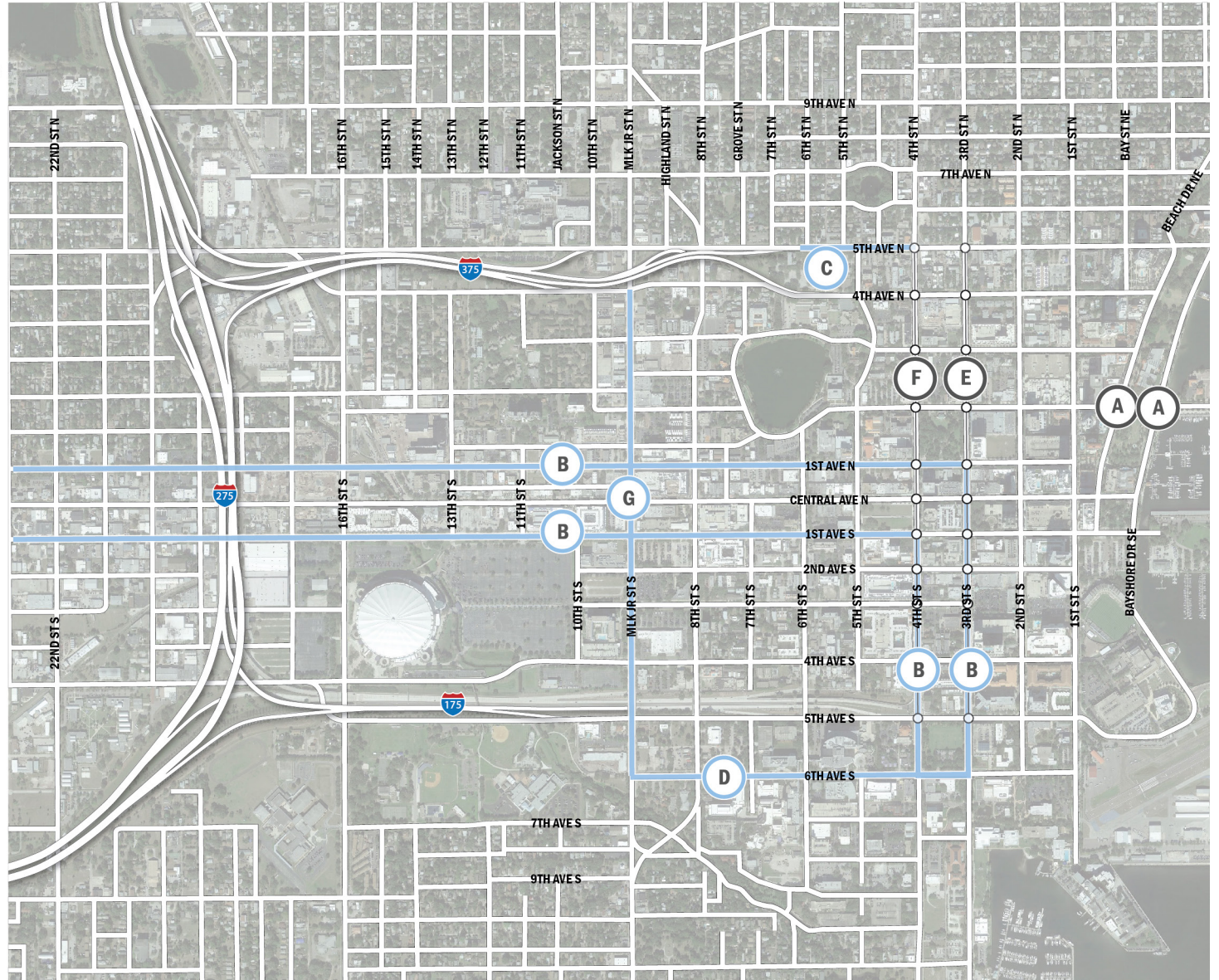
**E+C**

**E+C Project Key:**

- (A) 2nd Ave N Intersection Modifications
- (B) SunRunner BRT Lane Re-allocation
- (C) 5th Ave N Lane Re-allocation
- (D) 6th Ave S Lane Re-allocation
- (E) 3rd St Intersection Modifications
- (F) 4th St Intersection Modifications
- (G) Dr. MLK Jr St Lane Re-allocation

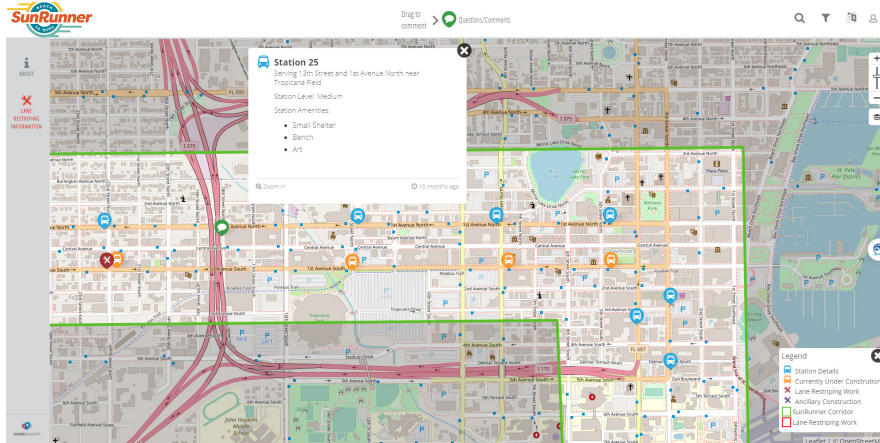
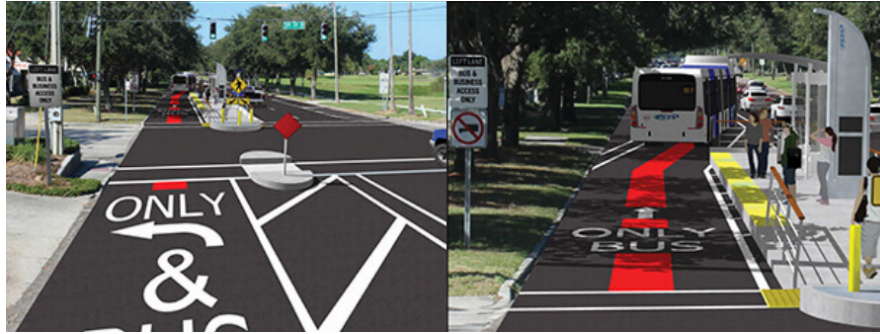
**Proposed Project Type Key:**

- Intersection Modification
  - Lane Re-allocation\*
  - Two-Way Conversion
  - New Street
  - New/Realigned Ramp
  - Vacated Roadway
  - Interstate Spur Modification
- \* for parking, transit, or bicycle facilities



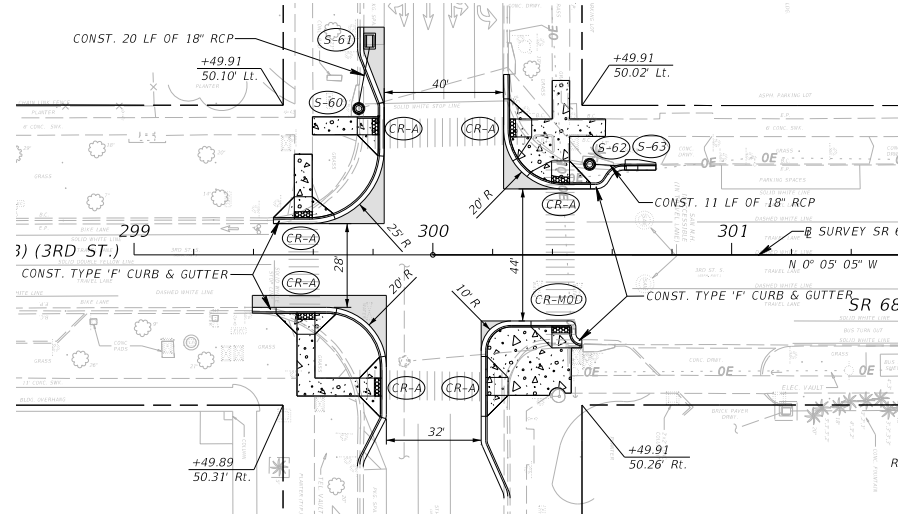


**FIGURE 4. SUNRUNNER BRT STATION CONCEPTS & CONSTRUCTION UPDATE MAP**



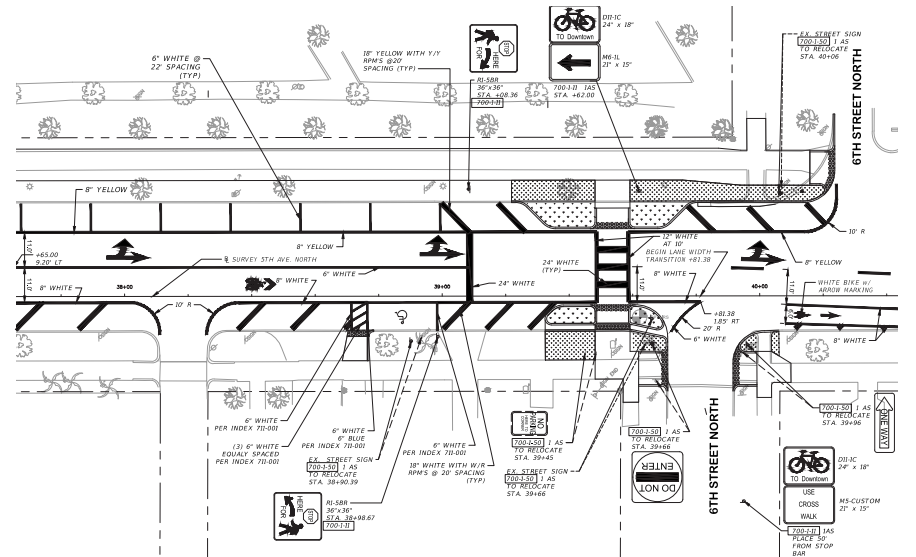
Source: PSTA: <https://psta.net/about-psta/projects/sunrunner/>;  
[https://psta.mysocialpinpoint.com/sunrunner\\_construction](https://psta.mysocialpinpoint.com/sunrunner_construction)

**FIGURE 5. 3RD/4TH STREET INTERSECTION MODIFICATION PLANS**



Source: FDOT Roadway Plans (FPID 437807-1-58-01), April 19, 2017

**FIGURE 6. 5TH AVE N LANE RE-ALLOCATION PLANS**

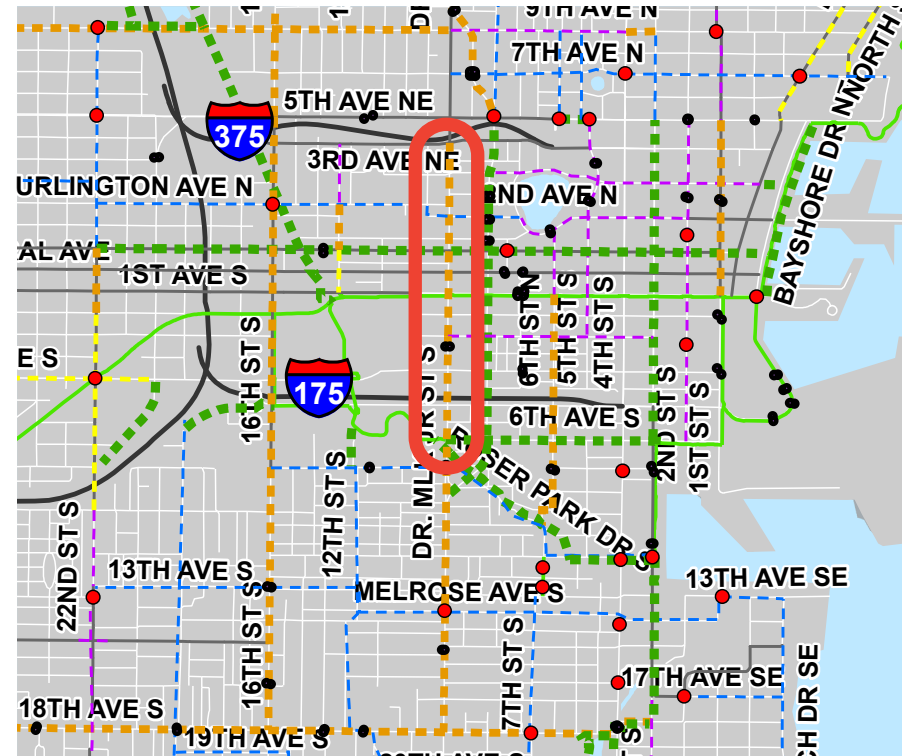


Source: City of St. Petersburg 5th Ave N Roadway Plans (Project No. 17041-112), January 8, 2020

**FIGURE 7. DR. MLK JR ST LANE RE-ALLOCATION CONCEPT**



Source: City of St. Petersburg Fast Implementation Parking-Separated Bike Lane Options Presentation, April 8, 2020



**Legend**

**Linear Recommendation**

- Trail: Two-way bicycle traffic with physical separation from travel lanes
- Separated Bike Lane: Includes striped or physical buffers
- Bike Lane: Portions of roadway designated for one-way bicycle traffic
- Neighborhood Greenway: Streets designated for bicycle priority and traffic calming
- Shared Lane Marking: Reminders that bicyclists should occupy full travel lanes

- Pedestrian Crossing, Greenway Connection, or Bridge

**Existing Infrastructure**

- Existing Bike Facility
- Existing Trails
- Existing RRFB Crossing

Source: City of St. Petersburg Complete Streets Implementation Plan, 2019

## E+C Network Performance Results

The results of the E+C Network performance evaluation were analyzed to illustrate how vehicles move through the network and isolate congestion hot spots by peak travel period. These performance measure results are detailed in the following sections.

### Roadway Utilization

Figures 8 and 9 show the congestion results of the E+C Network for the AM and PM peak periods, respectively. The AM peak period shows congestion along northbound I-275 within the I-175 interchange area and along southbound Dr. MLK Jr St, north of 9th Ave N. In the PM peak period, congestion is also present along southbound Dr. MLK Jr St, north of 9th Ave N. Additionally, portions of 1st St S and Beach Dr experience congestion, most likely due to these roadways leading to high destination areas, such as the St. Pete Pier. Congestion along these corridors within DTSP is expected since they are low-speed, low-capacity roadways that do not favor vehicular travel.

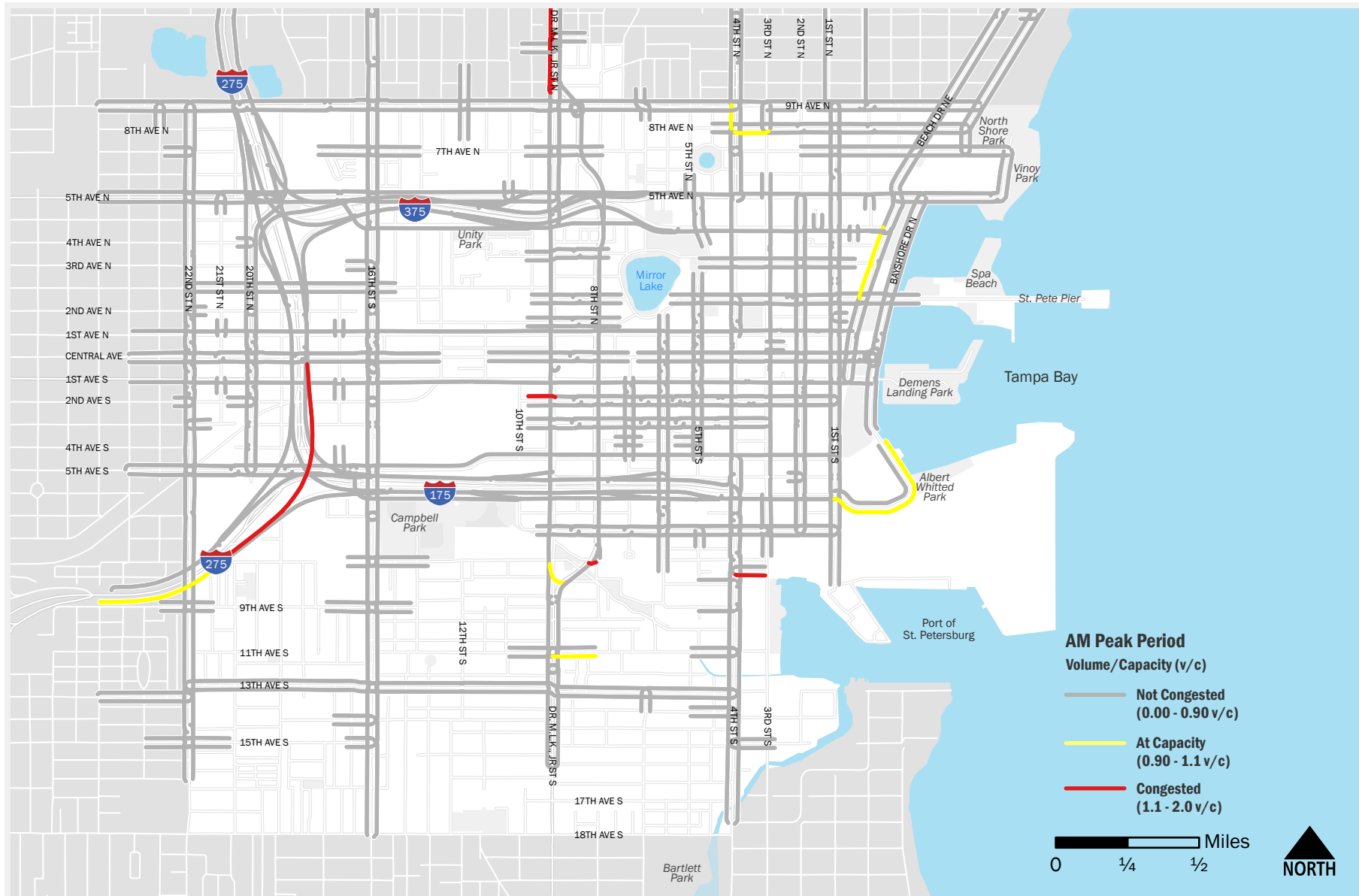
### Intersection Delay

Figures 10 and 11 show the delay results of the E+C Network for the AM and PM peak periods, respectively. In both the AM and PM peak period, all signalized intersections within the study area operate at acceptable levels of overall intersection delay. Some of the east-west approach delays within the study area exhibit higher levels of delay at intersections along 16th St, specifically at 4th Ave S and 5th, 7th, and 9th Aves N. However, none of these approach delays operate under unacceptable conditions.

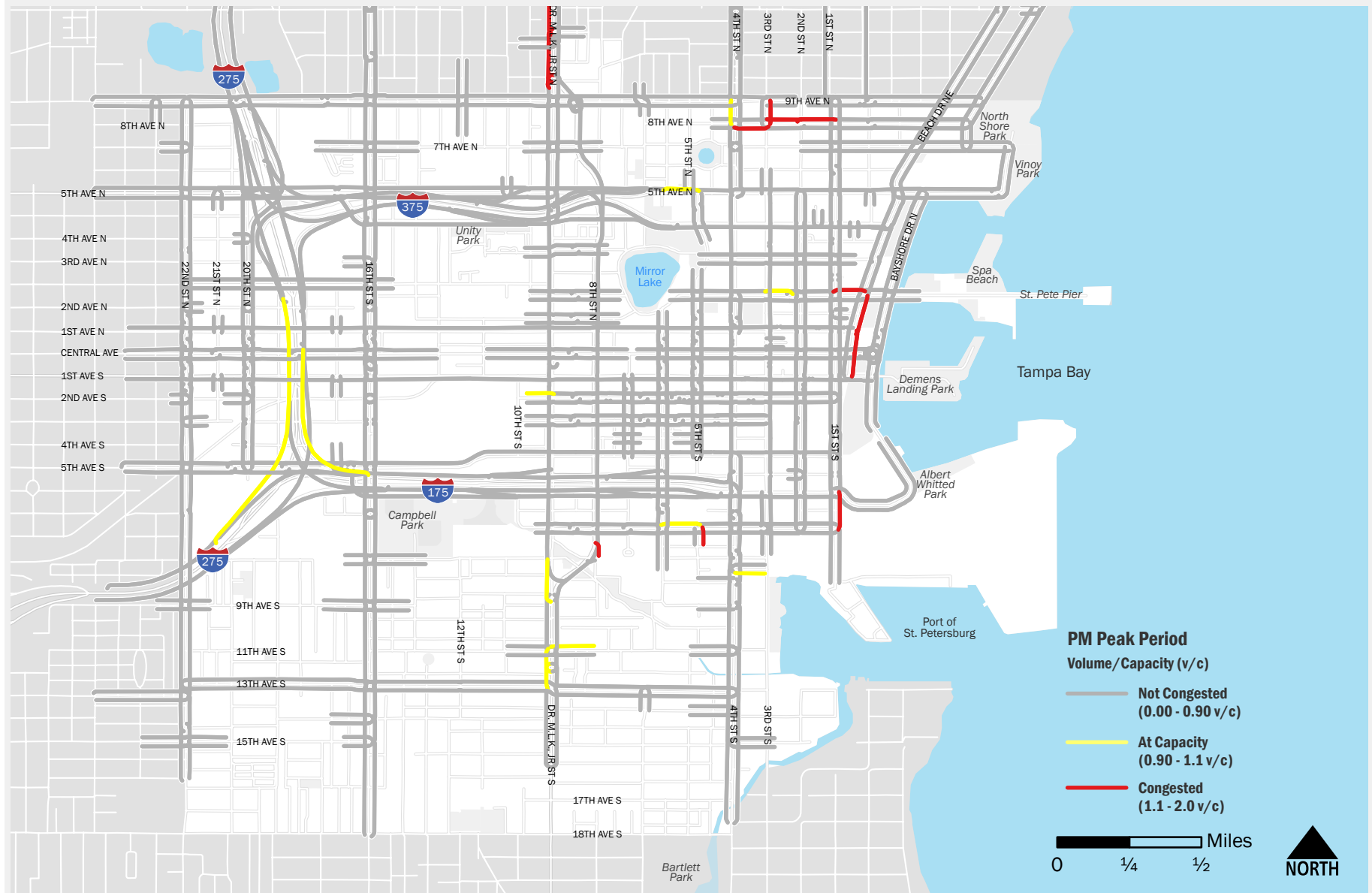
### Travel Time

Figure 12 shows the travel time results of the E+C Network. Between the AM and PM peak hours, there is no significant difference in travel time for each of the four destinations. Of the four destinations, only the Warehouse Arts District/Deuces Live destination allows for alternate routes depending on if the driver is approaching from the north or south; the other three are assumed to take either I-175 or I-375 and follow the same route, regardless of starting position on I-275. Because of this, the Warehouse Arts District/Deuces Live destination shows two travel time results, one originating from I-175 and the other from the southbound I-275 off ramp to 5th Ave N.

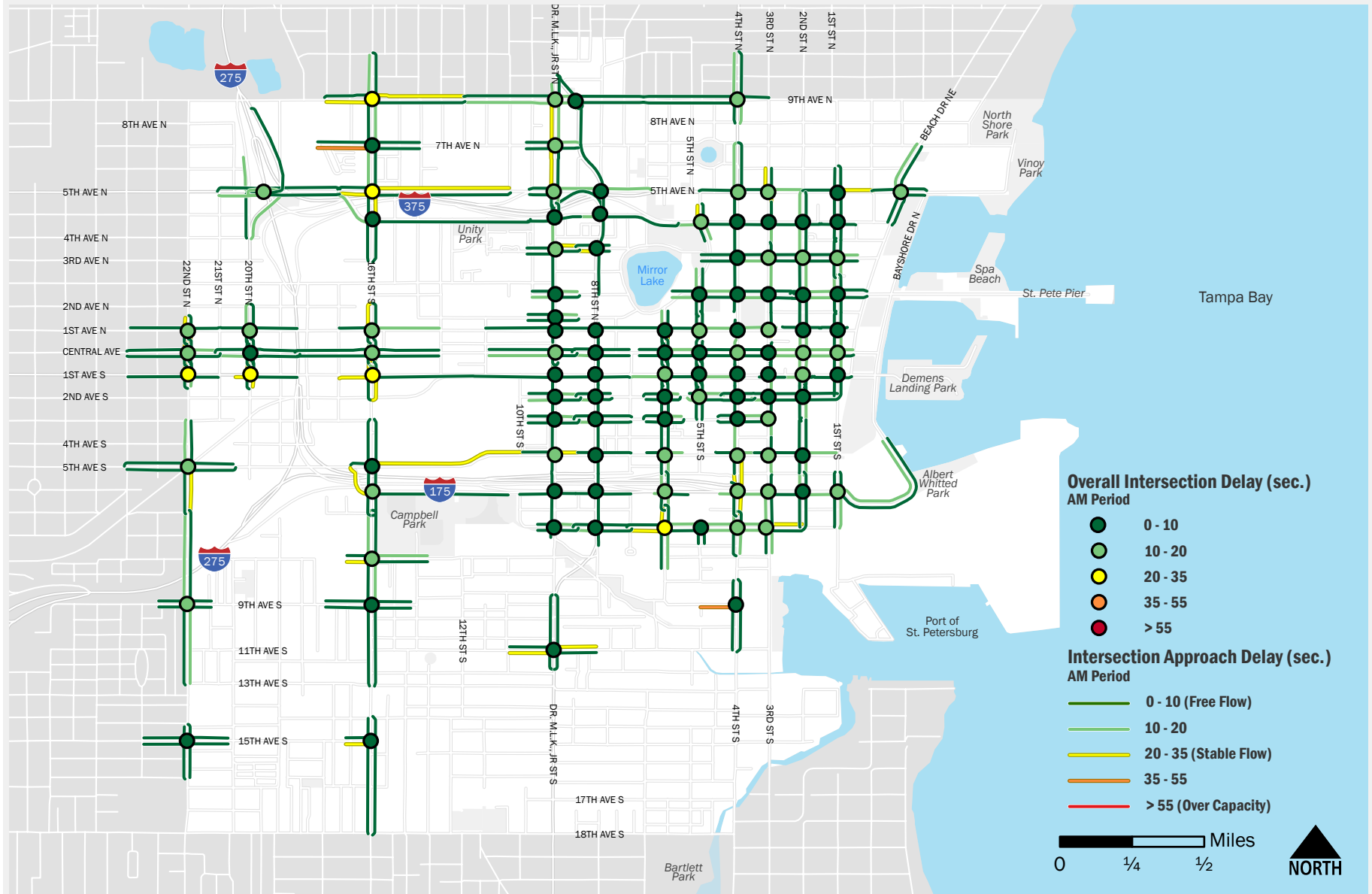
**FIGURE 8. E+C NETWORK (2020) EXISTING CONGESTION, AM PEAK**



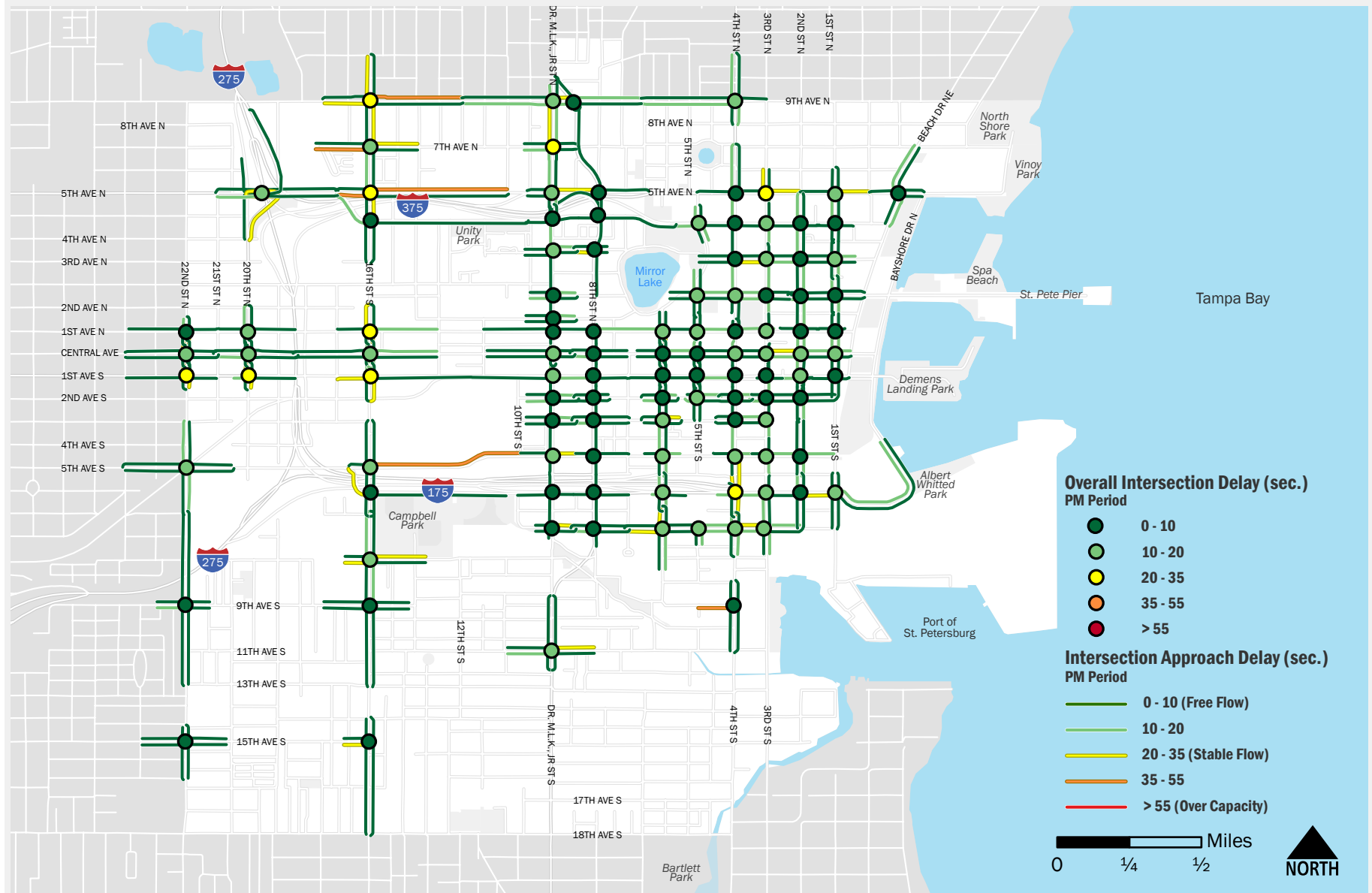
**FIGURE 9. E+C NETWORK (2020) EXISTING CONGESTION, PM PEAK**



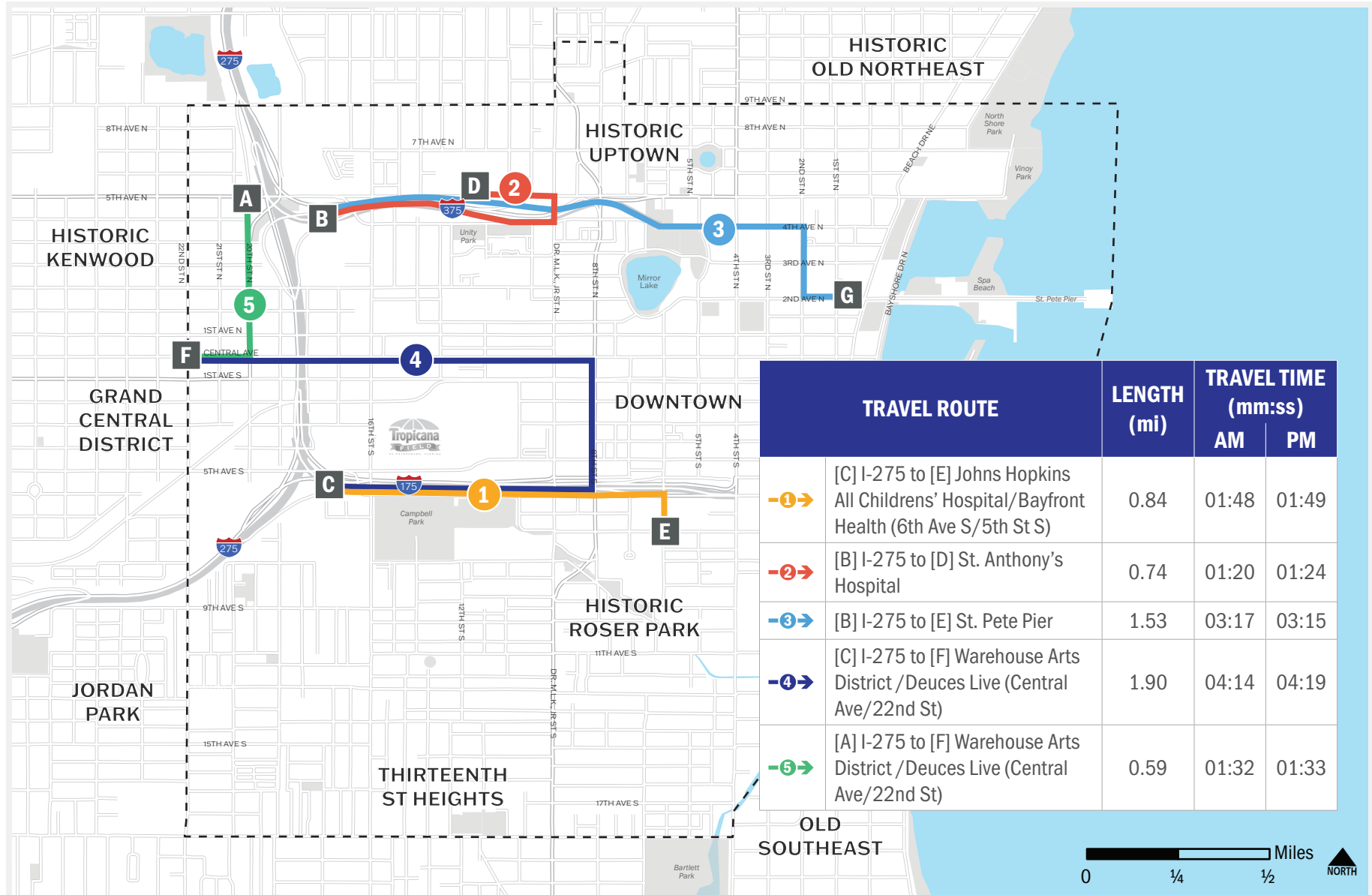
**FIGURE 10. E+C NETWORK (2020) INTERSECTION APPROACH DELAY, AM PEAK**



**FIGURE 11. E+C NETWORK (2020) INTERSECTION APPROACH DELAY, PM PEAK**



**FIGURE 12. E+C NETWORK (2020) TRAVEL TIMES FOR SELECT ROUTES MAP**





# 4/FUTURE NETWORK (2045)

## Planned Network Model Projects

In addition to the E+C projects presented previously, the City of St. Petersburg and FDOT have other planned improvements within the DTSP study area that are expected to be completed by the future year 2045. These projects, along with the E+C projects, were combined to create the Planned Network (2045) model, which serves as the base model for the future

analysis year (2045). The Planned Network (2045) projects are described in Table 2 and shown graphically on Figure 13. Typical sections and design plan screenshots for each of the Planned Network Model projects are also shown in Figures 14-18, along with the graphics source.

**TABLE 2. PLANNED NETWORK (2045) PROJECT SUMMARY TABLE**

ID	PROJECT NAME	DESCRIPTION (SOURCE/LEAD AGENCY)
*Includes Projects A-G described under Existing Network (2020) Projects		
H	6th St S Lane Re-allocation	Reduce to 1 lane, parallel parking, and buffered bike lanes in each direction between 6th Ave S and 1st Ave S (City of St. Petersburg <i>Complete Street Implementation Plan</i> , 2019)
I	22nd St Intersection Modifications	Remove NB and SB left turn lanes at 1st Ave N/S (City of St. Petersburg: <i>Warehouse Arts District-Deuces Live Joint Action Plan</i> , 2018)
J	5th Ave S Lane Re-allocation	Reduce to 1 lane in each direction between 31st St S and 16th St S (City of St. Petersburg: <i>Warehouse Arts District-Deuces Live Joint Action Plan</i> , 2018 and <i>Complete Street Implementation Plan</i> , 2019)
K	16th St Lane Re-allocation	Reduce to 1 lane and buffered bike lanes in each direction between 18th Ave S and 9th Ave N (City of St. Petersburg <i>Complete Street Implementation Plan</i> , 2019)
L	1st St Lane Re-allocation	Reduce to 1 lane and buffered bike lanes in each direction between 1st Ave S and 5th Ave N (City of St. Petersburg <i>Complete Street Implementation Plan</i> , 2019)
M	9th Ave N Lane Re-allocation	Reduce to 1 lane and buffered bike lanes in each direction between 22nd St and Dr. MLK Jr St (City of St. Petersburg <i>Complete Street Implementation Plan</i> , 2019)
N	5th Ave N Lane Re-allocation	Reduce to 1 lane in each direction and a two-way buffered cycle track on the north side between 16th St to Dr. MLK Jr St (FDOT)

**FIGURE 13. PLANNED NETWORK (2045) IMPROVEMENT PROJECT MAP**

**E+C+PLANNED**

**E+C Project Key:**

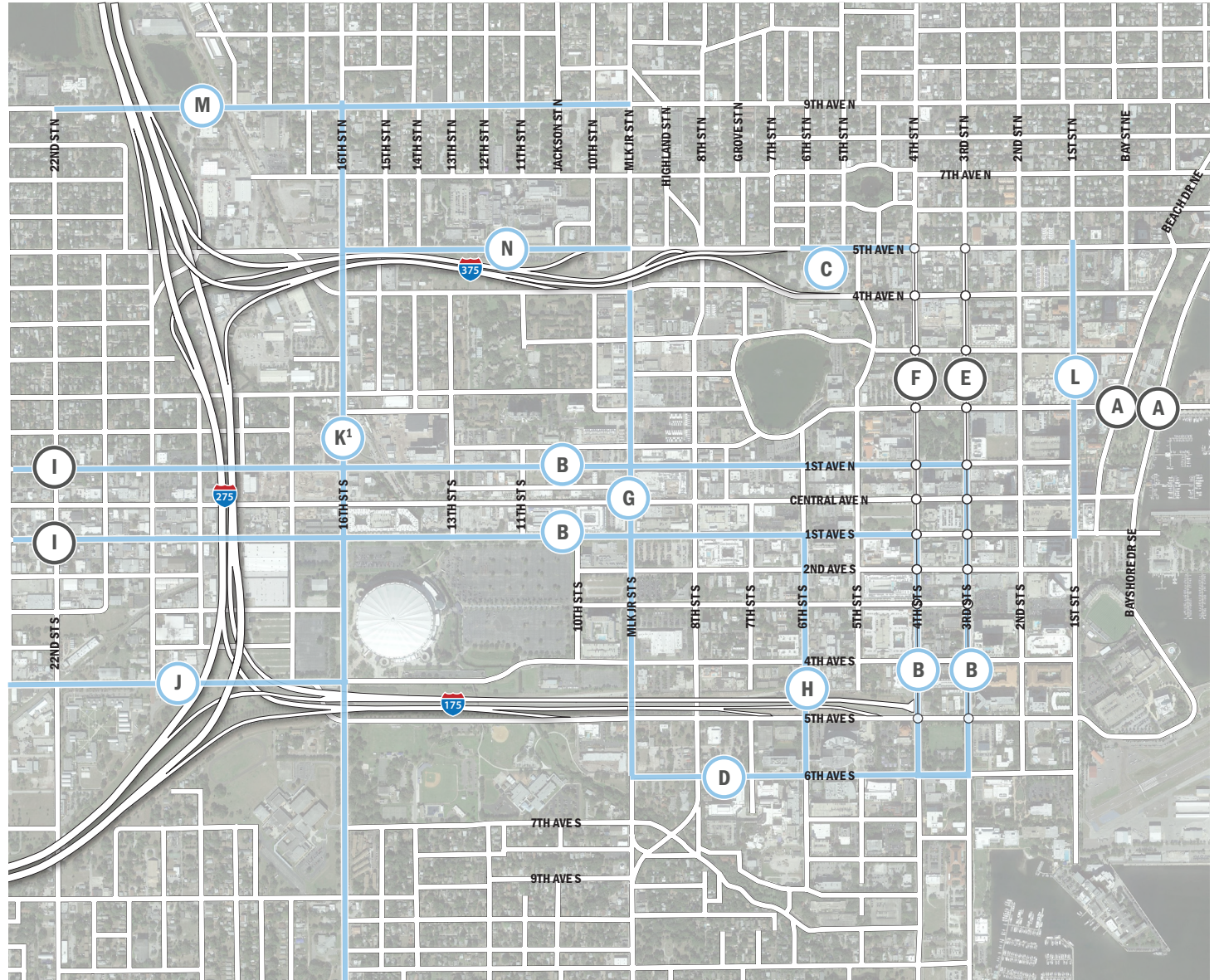
- (A) 2nd Ave N Intersection Modifications
- (B) SunRunner BRT Lane Re-allocation
- (C) 5th Ave N Lane Re-allocation
- (D) 6th Ave S Lane Re-allocation
- (E) 3rd St Intersection Modifications
- (F) 4th St Intersection Modifications
- (G) Dr. MLK Jr St Lane Re-allocation

**Planned Project Key:**

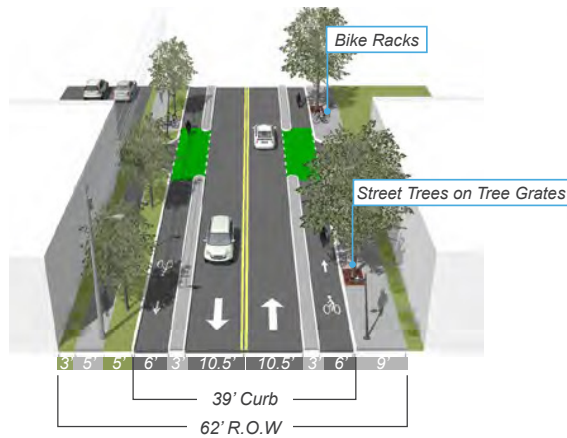
- (H) 6th St S Lane Re-allocation
- (I) 22nd St Intersection Modifications
- (J) 5th Ave S Lane Re-allocation
- (K<sup>1</sup>) 16th St Lane Re-allocation
- (L) 1st St Lane Re-allocation
- (M) 9th Ave N Lane Re-allocation
- (N) 5th Ave N Lane Re-allocation

**Proposed Project Type Key:**

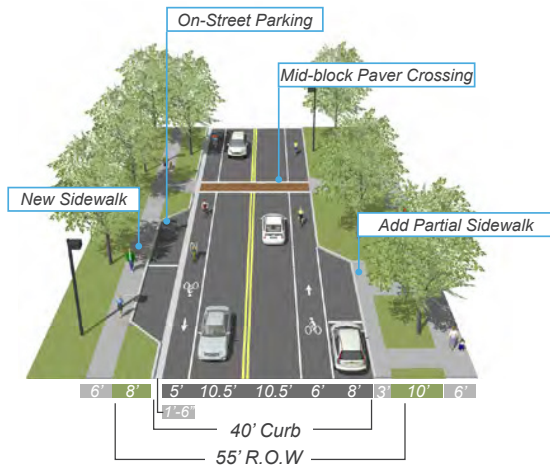
- Intersection Modification
  - Lane Re-allocation\*
  - Two-Way Conversion
  - New Street
  - Widen Street/New Lane(s)
  - New/Realigned Ramp
  - Vacated Roadway
  - Interstate Spur Modification
- \* for parking, transit, or bicycle facilities



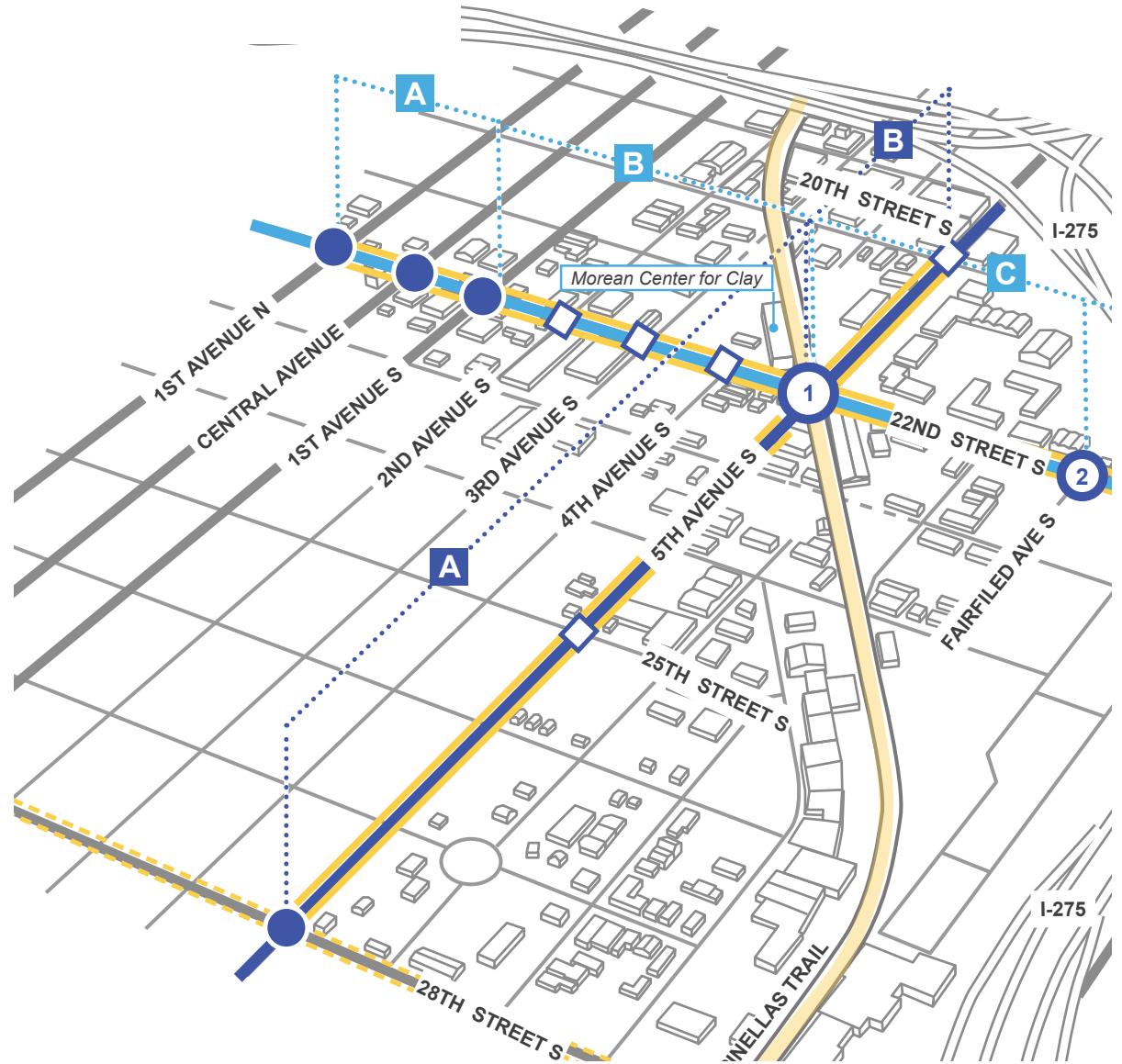
**FIGURE 14. 22ND ST INTERSECTION MODIFICATIONS (1ST AVE N/1ST AVE S) & 5TH AVE S LANE RE-ALLOCATION CONCEPTS**



**A 1ST AVENUE N TO 1ST AVENUE S  
PROPOSED CONDITION**  
Two Lane Road with Protected Bike Lanes



**B 22ND STREET S TO 20TH STREET S  
EXISTING CONDITION**  
Two Lane Road, with Bicycle Lanes, and On-Street Parking on Both Side of the Street



Source: City of St. Petersburg; Warehouse Arts District-Deuces Live Joint Action Plan, October 2018

FIGURE 15. 6TH AVE S LANE RE-ALLOCATION CONCEPT



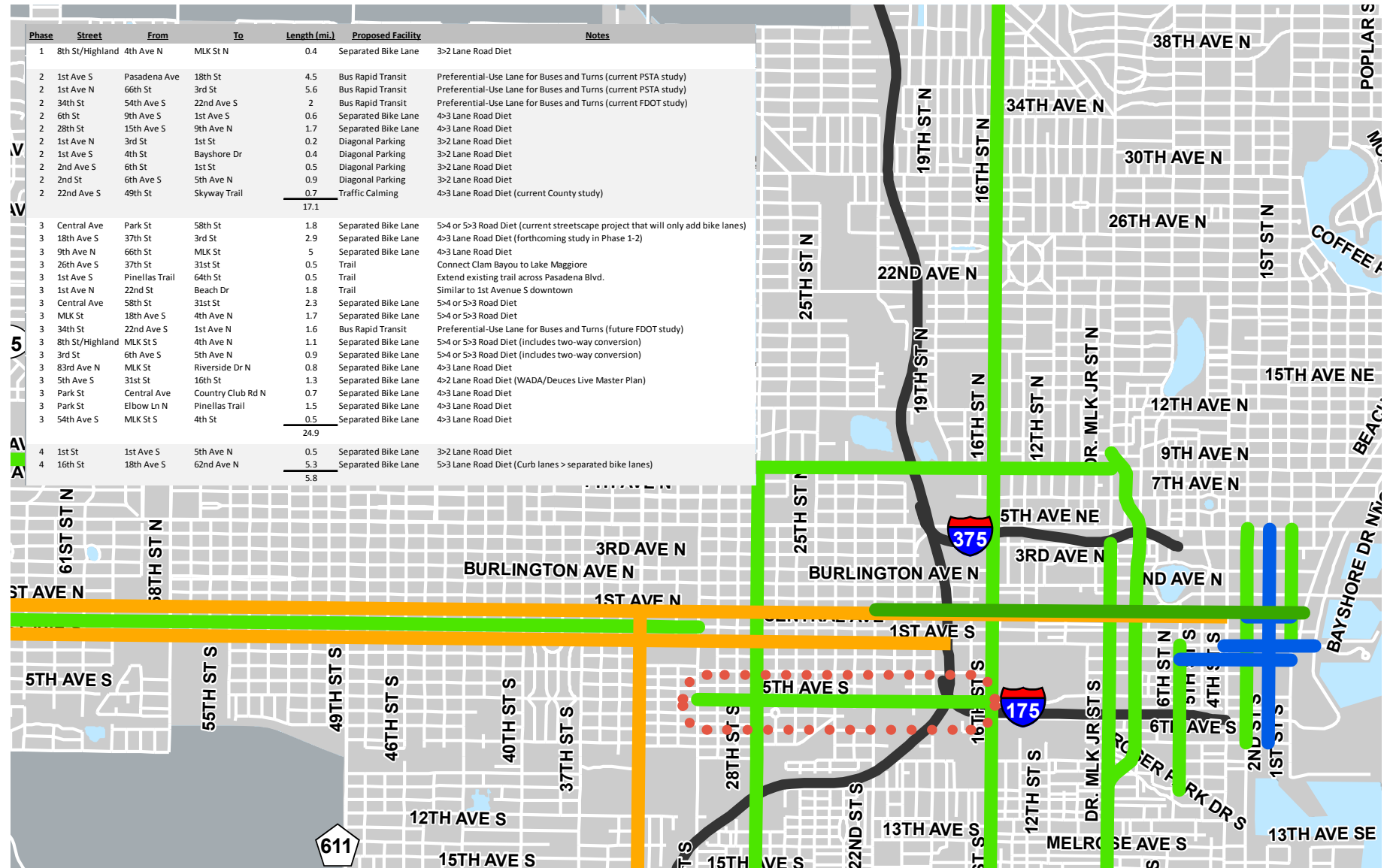
Source: City of St. Petersburg Fast Implementation Parking-Separated Bike Lane Options Presentation, April 8, 2020

FIGURE 16. 6TH AVE S, 9TH AVE N, 1ST ST & 16TH ST LANE RE-ALLOCATION



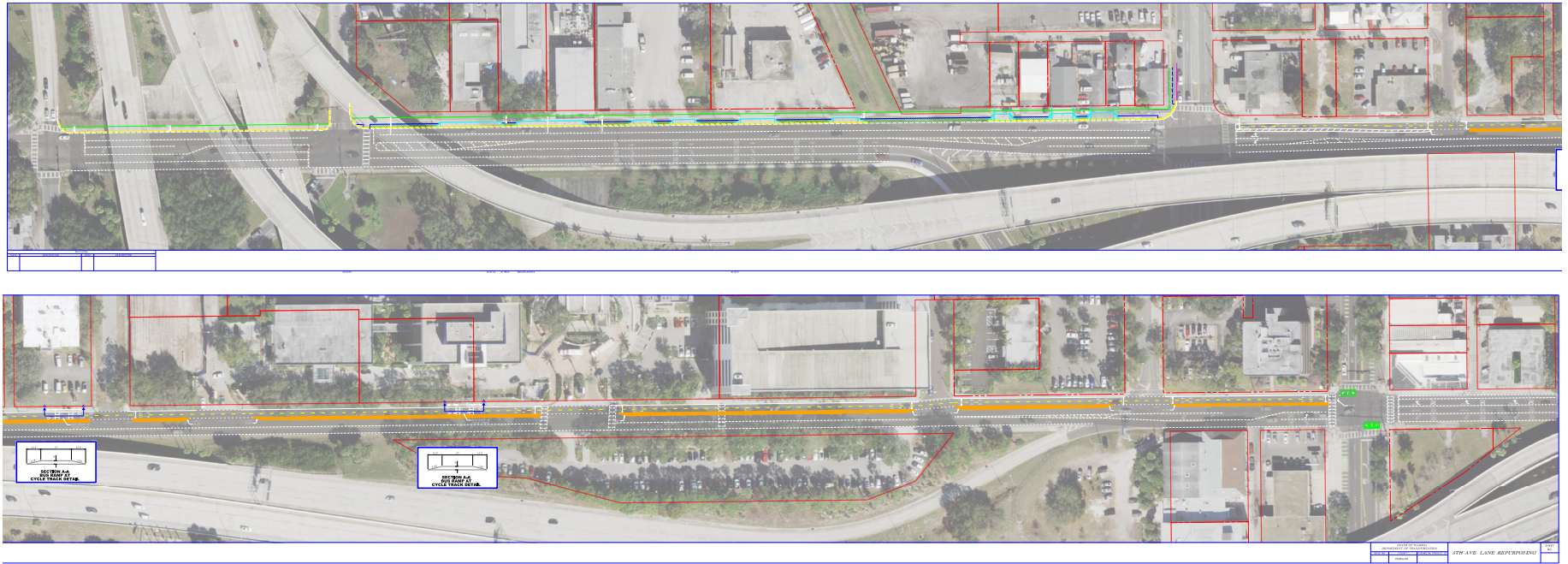
Source: City of St. Petersburg Complete Streets Implementation Plan, 2019

**FIGURE 17. 5TH AVE S LANE RE-ALLOCATION (FROM COMPLETE STREETS IMPLEMENTATION PLAN PROPOSED LANE RE-ALLOCATIONS)**



Source: City of St. Petersburg Complete Streets Implementation Plan, 2019

**FIGURE 18. 5TH AVE N LANE CYCLE TRACK RE-ALLOCATION CONCEPT**



Source: FDOT



## Planned Network Performance Results

The results of the Planned Network performance evaluation were analyzed to illustrate how vehicles would move through the network in 2045 and understand where congestion hot spots in each peak travel period (AM/PM). The results for three performance measures are detailed below.

### Roadway Utilization

Figures 19 and 20 show the congestion results of the Planned Network for the AM and PM peak periods, respectively. Under the Planned Network model, in the future year (2045), additional roadways are expected to operate under congested conditions. In the AM peak period, northbound I-275 within the I-175 interchange area and southbound Dr. MLK Jr St continue to operate as congested roadways. Northbound 22nd St and 16th St, south of 5th Ave S, and southbound 1st St, north of 4th Ave N are expected to operate under congested conditions. Portions of 5th Ave S and 9th Ave N are also expected to operate with high levels of congestion.

In the PM peak period, both directions of I-275 within the I-175 interchange area are expected to operate under congested conditions. This may be due to the higher number of expected drivers accessing the newly developed Tropicana Field site and using I-175 to enter and exit DTSP. Similar to the AM peak period, portions of 5th Ave S, 9th Ave N, 16th St, and 1st St are expected to see high levels of congestion. The PM peak period continues to see portions of Beach Dr and Bayshore Dr operate with heavy congestion, most likely due to these roadways leading to high destination areas.

Many of these roadways are currently planned for lane re-allocations, which will reduce the available roadway capacity, which may also contribute to these roadways experiencing future congestion. These roadways, along with others not currently planned for re-allocation, are expected to experience congestion, as these roadways are low-speed and low-capacity facilities that accommodate multi-modal travel. Additionally, the increased traffic within

the DTSP area in the future year (2045) will use underutilized roadways to avoid congested areas, which can contribute to new locations experiencing congestion, even without the corresponding lane re-allocations.

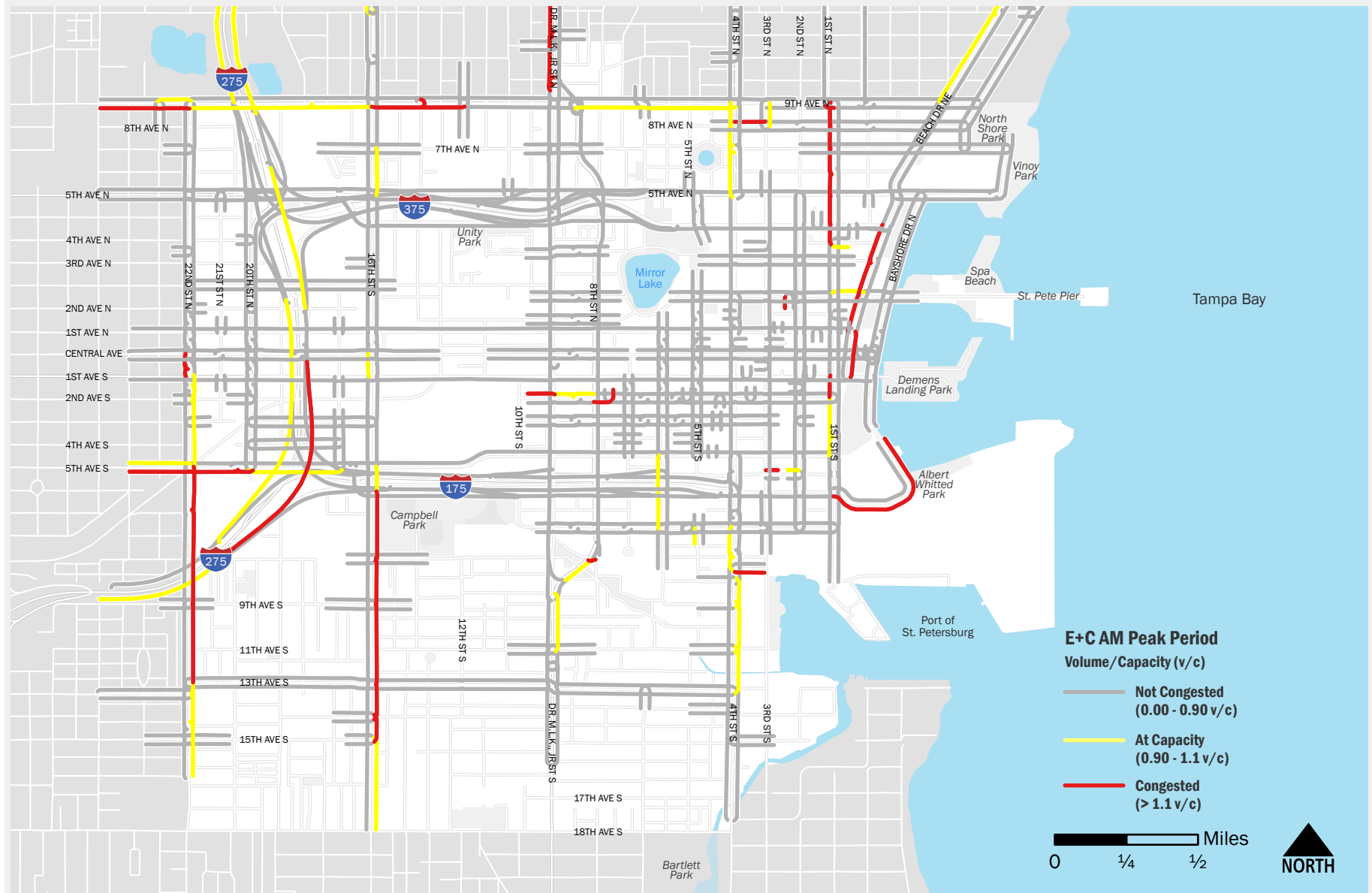
### Intersection Delay

Figures 21 and 22 show the delay results of the Planned Network for the AM and PM peak periods, respectively. In the AM peak period, one signalized intersection, located at 9th Ave N and 16th St, is not expected to operate at acceptable levels of overall intersection delay. In the PM peak period, three signalized intersections are not expected to operate at acceptable levels of overall intersection delay. These include 9th Ave N/16th St, 5th Ave N/16th St, and 5th Ave S/22nd St. These intersections are expected to see high levels of delay, most likely due to planned improvements in the area that re-allocate available roadway capacity. These intersections, along with others along 16th St in the PM peak period, experience approach delays that are expected to operate at unacceptable levels of delay. Again, these high approach delays can be attributed to lane re-allocations that reduce available roadway capacity and can affect operations.

### Travel Time

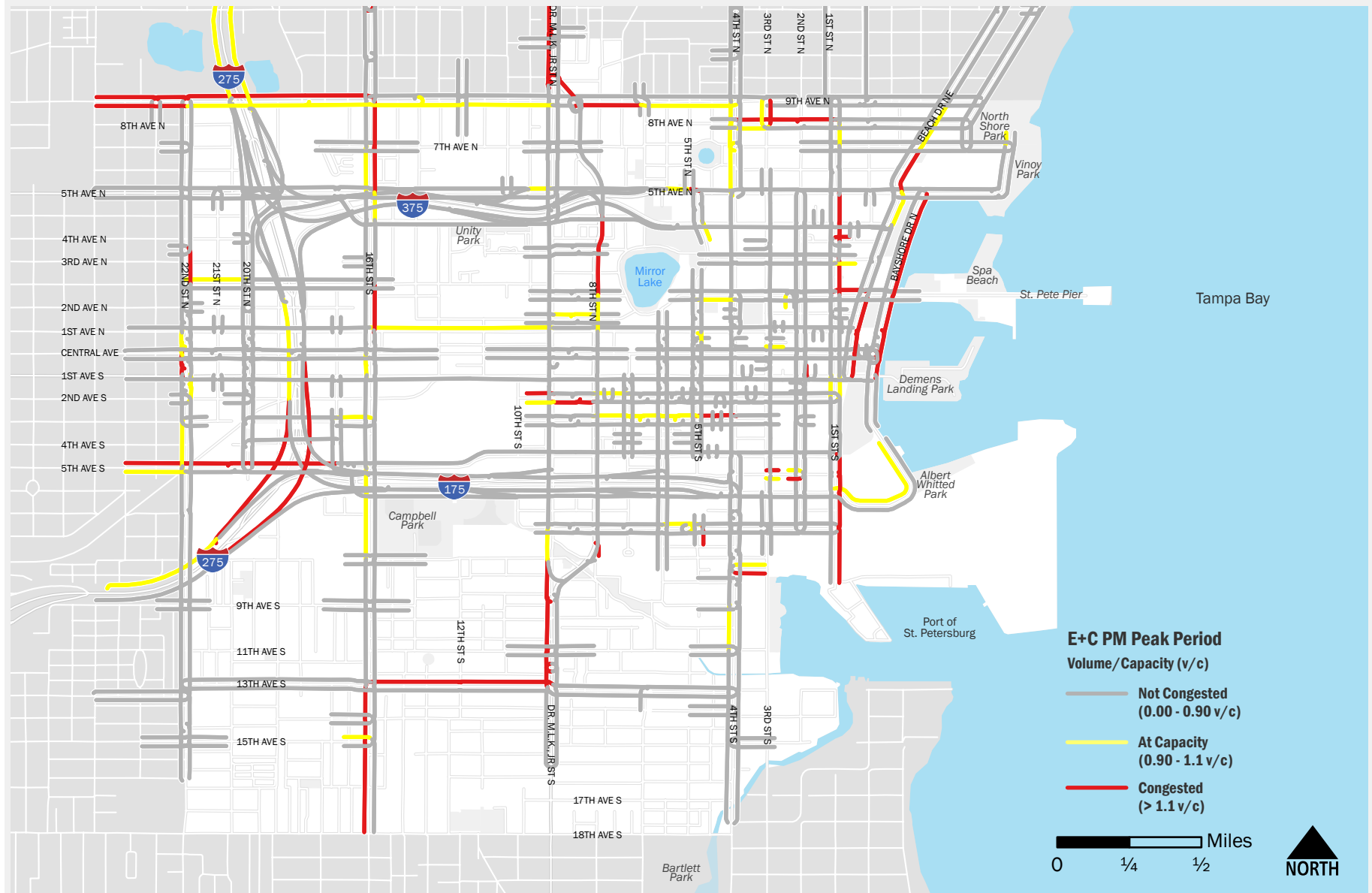
Figure 23 shows the travel time results of the Planned Network. Between the AM and PM peak hours, there is no significant difference in travel time for each of the four destinations. Of the four destinations, only the Warehouse Arts District/Deuces Live destination allows for alternate routes depending on if the driver is approaching from the north or south; the other three are assumed to take either I-175 or I-375 and follow the same route, regardless of starting position on I-275. Because of this, the Warehouse Arts District/Deuces Live destination shows two travel time results, one originating from I-175 and the other from the southbound I-275 off ramp to 5th Ave N. The travel time results for the Planned Network are similar to those of the E+C Network since the routes in both models are the same and these routes utilize roadways that do not experience high congestion or intersections with high delays.

**FIGURE 19. PLANNED NETWORK (2045) EXISTING CONGESTION, AM PEAK**

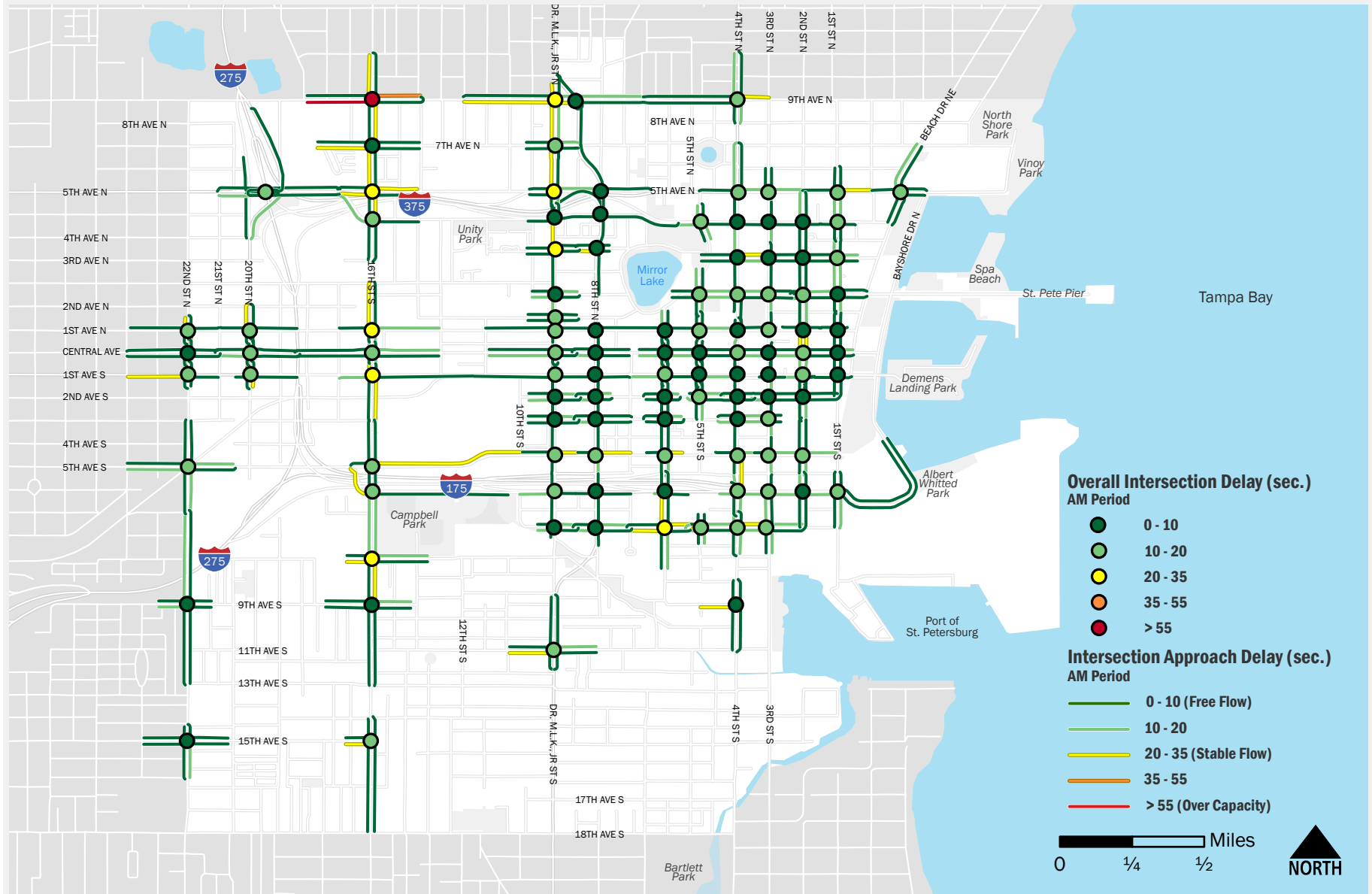




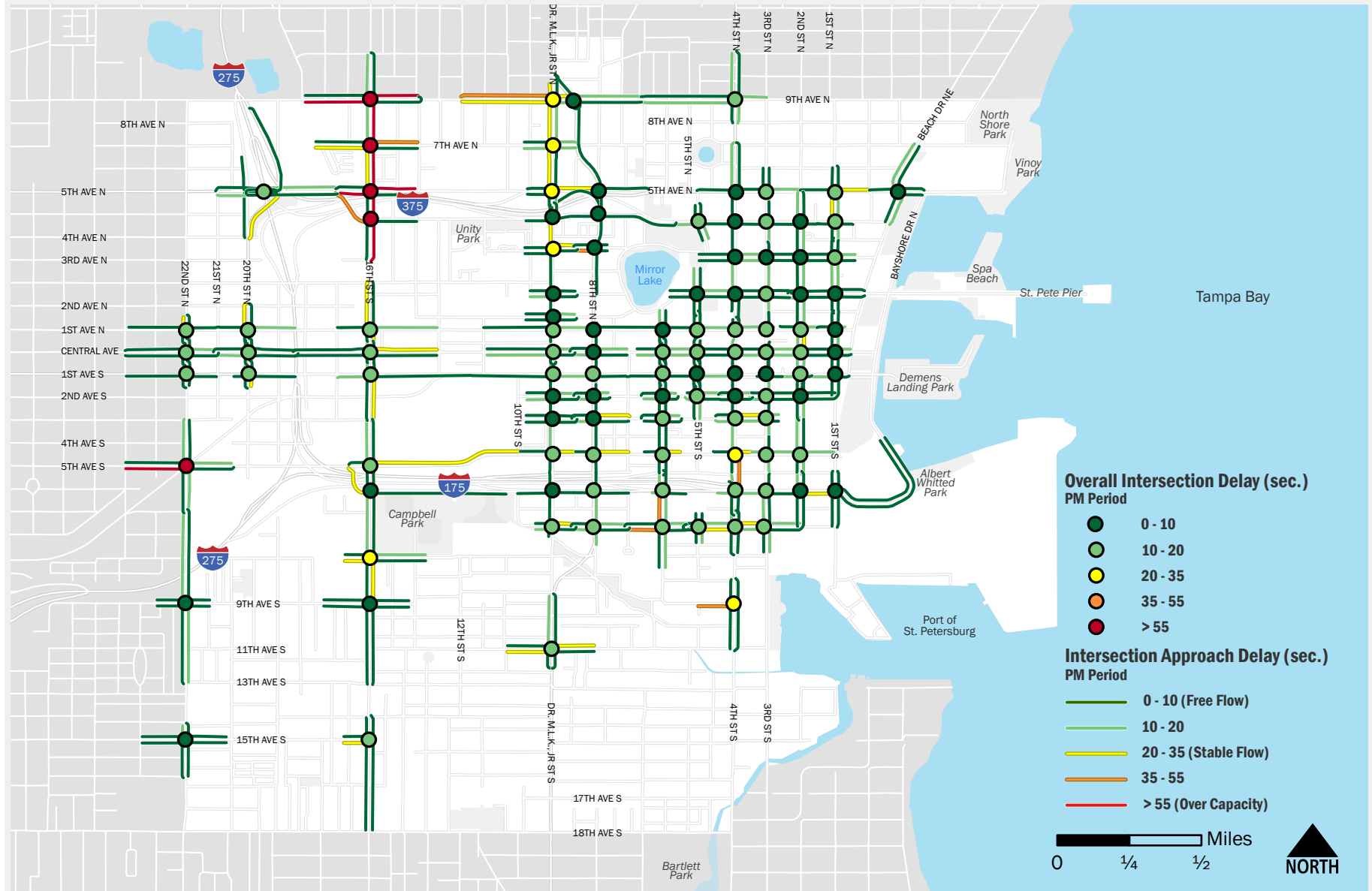
**FIGURE 20. PLANNED NETWORK (2045) EXISTING CONGESTION, PM PEAK**



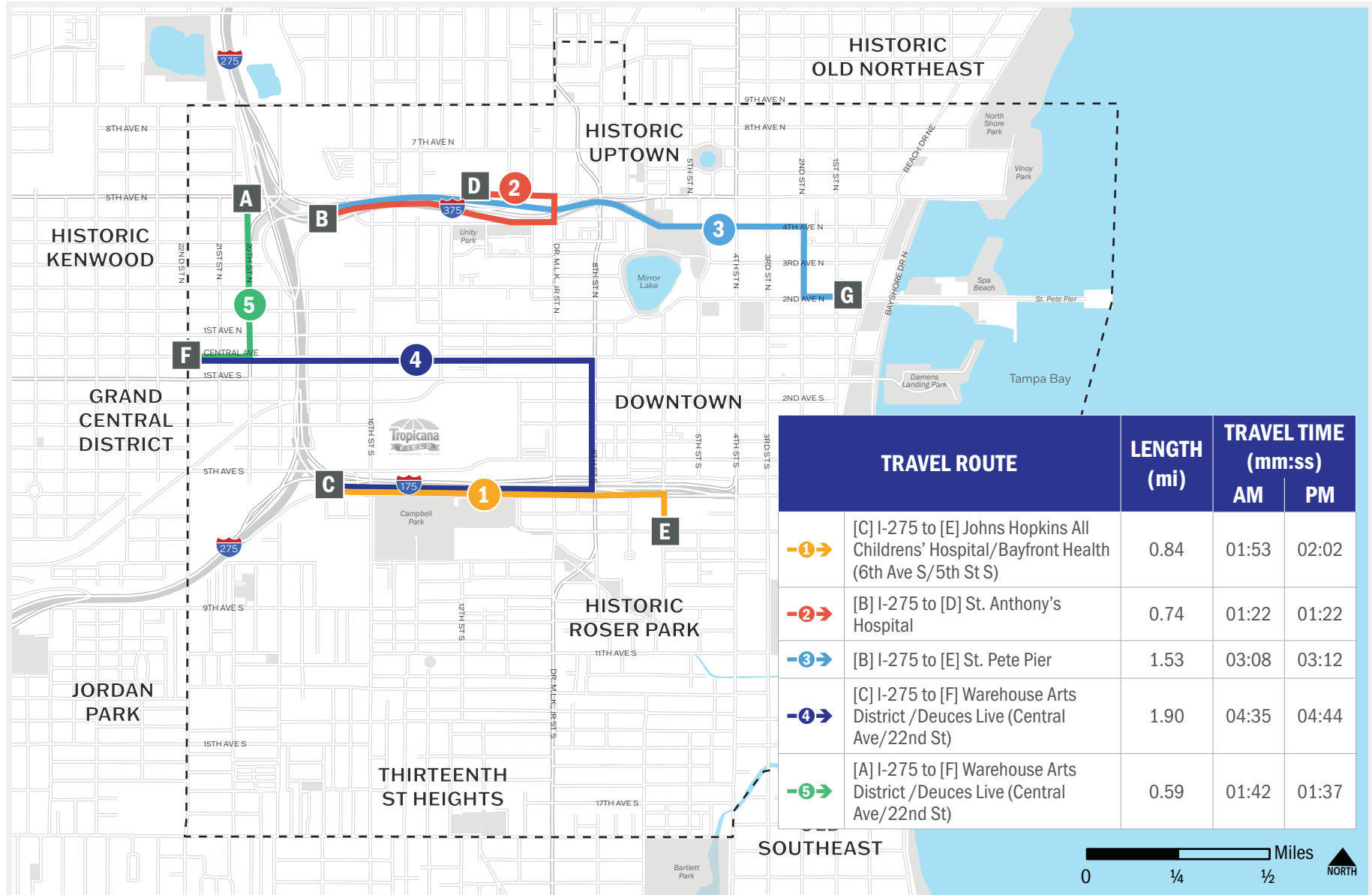
**FIGURE 21. PLANNED NETWORK (2045) INTERSECTION APPROACH DELAY, AM PEAK**



**FIGURE 22. PLANNED NETWORK (2045) INTERSECTION APPROACH DELAY, PM PEAK**



**FIGURE 23. PLANNED NETWORK (2045) TRAVEL TIMES FOR SELECT ROUTES MAP**



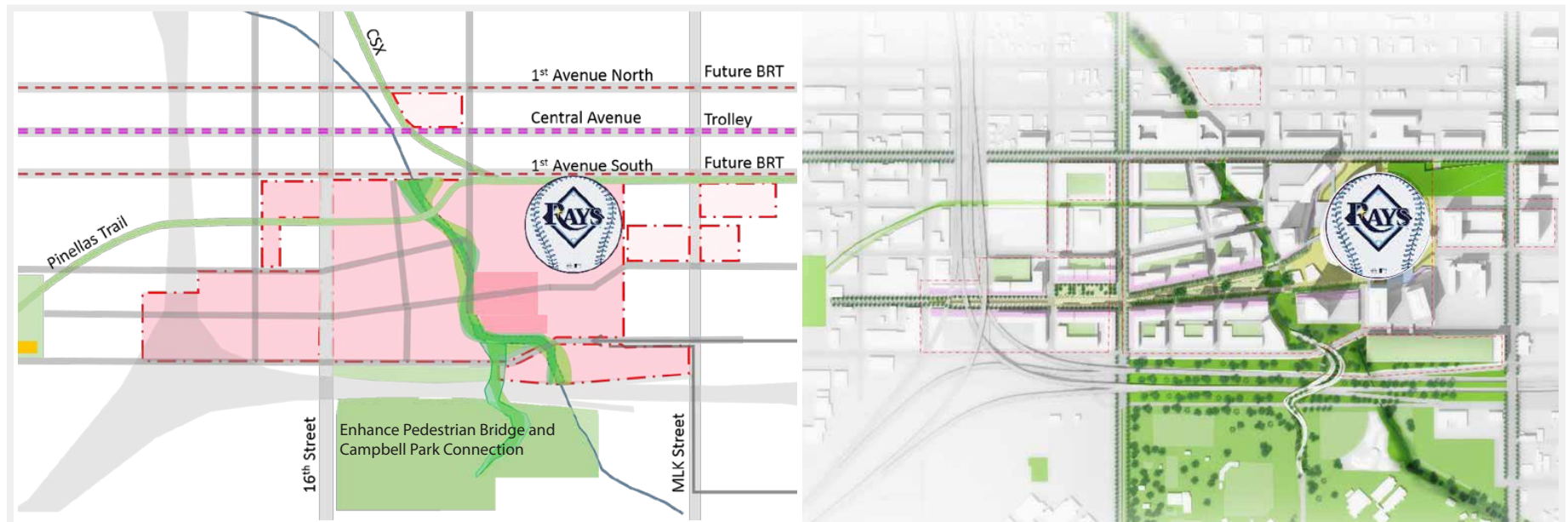
## Scenario Definition & Project Description

Based on a review of the Planned Network model results and discussions with the study partners, the study team developed a list of potential improvement projects to include in the five scenario models. These potential projects included interstate ramp reconfigurations, roadway capacity alterations, converting one-way roads to two-way roads, intersection geometry improvements, and new roadway corridors. Table 3 provides a comparison of the improvement projects used in the Planned Network and each of the Scenario Models. A detailed description of each project is provided below, along with graphics that depict a concept plan or typical section for each project, as applicable. Some projects are included in multiple Scenarios, while some Scenarios only share portions of an improvement. These subtle differences are also explained.

## Project 0 – Future Grid Connections at Trop Site

- Project 01 establishes a grid network based on the proposed Tropicana Field Master Plan (Figure 24) within the newly developed Tropicana Field site. This grid includes connecting 3rd Ave S between 16th St and 10th St, as well as additional northbound/southbound roadways between 4th and 1st Aves S. Intersections within the Tropicana Field Site are two-way stop controlled.
- Project 02 is an alternate configuration for the Tropicana Field site that builds off the grid network established in Scenario 1. In addition to the 3rd Ave S connection through the site, 2nd Ave S is also connected between 16th St and 10th St. One more northbound/southbound roadway between 4th and 1st Aves S is also provided. Major intersections within the Tropicana Field site are modeled as signalized with left turn bays.

**FIGURE 24. PROJECT 0 TROPICANA FIELD PROPOSED STREET NETWORK - FUTURE GRID CONNECTIONS AT TROPICANA FIELD SITE**



Source: City of St. Petersburg, Tropicana Field Master Plan, 2019

**TABLE 3. SCENARIO IMPROVEMENT PROJECT SUMMARY TABLE**

ID	PROJECT NAME	PLANNED	SCENARIO				
			1	2	3	4	5
A	2nd Ave N Intersection Modifications	X	X	X	X	X	X
B	SunRunner BRT Lane Re-allocation	X	X	X	X	X	X
C	5th Ave N Lane Re-allocation	X				X	
D	6th Ave S Lane Re-allocation	X	X	X	X	X	X
E	3rd St Intersection Modifications	X					
F	4th St Intersection Modifications	X					
G	Dr. MLK Jr St Lane Re-allocation	X					
H	6th St S Lane Re-allocation	X	X	X	X	X	X
I	22nd St Intersection Modifications	X	X	X	X	X	X
J	5th Ave S Lane Re-allocation	X	X				X
K <sup>1</sup>	16th St Lane Re-allocation (18th Ave S to 9th Ave N)	X	X	X	X		
K <sup>2</sup>	16th St Lane Re-allocation (18th Ave S to 3rd Ave N)					X	X
L	1st St Lane Re-allocation	X	X	X	X	X	X
M	9th Ave N Lane Re-allocation	X	X	X	X	X	X
N	5th Ave N Lane Re-allocation	X	X	X	X	X	
O <sup>1</sup>	Future Grid Connections at Tropicana Field Site		X				
O <sup>2</sup>	Alt. Future Grid Connections at Tropicana Field Site			X	X	X	X
P <sup>1</sup>	Remove I-375, Full Interchange at I-275/5th Ave N, 4th/5th Ave N Two-Way Conversion		X				
P <sup>2</sup>	Remove I-375, Alt. Full Interchange at I-275/5th Ave N, 4th/5th Ave N Two-Way Conversion of, 20th St Two-Way Conversion			X			
P <sup>3</sup>	Remove I-375, Alt. Full Interchange at I-275/5th Ave N, 4th Ave N Two-Way Conversion (1EB/1WB), 5th Ave N Widen (2EB/2WB between 16th St and Dr. MLK Jr. St) & Two-Way Conversion (2WB/1EB)						X
Q <sup>1</sup>	Remove I-175, New Full Interchange to 5th Ave S/16th St, 4th/5th Ave S Two-Way Conversion		X				
Q <sup>2</sup>	Remove I-175, Alt. New Full Interchange to 5th Ave S/16th St, 4th/5th Ave S Two-Way Conversion			X	X	X	
R	Dr. MLK Jr St/8th St Two-Way Conversion		X	X	X	X	X
S	4th St/3rd St Two-Way Conversion		X	X	X	X	X
T	13th Ave S/Dr. MLK Jr. St Intersection Modifications			X			
U	Partially Remove I-375 east of 11th St, New Ramps, 4th Ave N/5th Ave N Two-Way Conversion, New Roundabout at 16th Street/4th Ave N				X		
V	5th Ave N/2nd St N Intersection Modifications				X		
W	Beach Dr/4th Ave N Roundabout				X		
X	Burlington Ave/16th St Intersection Modifications				X		
Y	4th Ave S Two-Way Conversion						X

## Project P – Remove I-375, Provide New Interchange, and Two-Way Conversion of 4th/5th Ave N

Project P1 and P2 includes the removal of the I-375 spur and replacement with a new interchange at 5th Ave N. The existing 4th and 5th Aves N one-way streets are converted to two-way streets, where 5th Ave N becomes a two-lane Street from 16th St to 1st St, with one eastbound and one westbound lane. 4th Ave N becomes a two-lane street from 16th St to Beach Dr, with one eastbound and one westbound lane. Several northbound/southbound connections are made between 16th St and 7th St to reestablish the grid between 4th and 5th Aves N. Finally, the connection between 5th Ave N and 4th Ave N, west of 16th St is also removed.

- Project P1 includes the removal of the northbound portion of 20th St from 4th Ave N to 5th Ave N. To replace the I-375 ramps, a new northbound I-275 off ramp will connect to the existing northbound I-275 on ramp terminal intersection, where the newly removed portion of northbound 20th St once intersected. Traffic destined for southbound I-275 can access this from a newly created on ramp at 4th Ave N, off of 20th St.
- Project P2 leaves the current I-275/5th Ave N interchange intact. To replace the I-375 ramps, a new signalized intersection on 5th Ave N, between the northbound I-275 on ramp and 16th St is created. This intersection accommodates the northbound I-275 off ramp and the southbound I-275 on ramp traffic.
- Project P3 leaves the current I-275/5th Ave N interchange intact. To replace the I-375 ramps, a new signalized intersection on 5th Ave N, between the northbound I-275 on ramp and 16th St is created. This intersection accommodates the northbound I-275 off ramp and the southbound I-275 on ramp traffic. An additional ramp from northbound I-275 also connects to the 16th St/4th Ave N intersection. Finally, 5th Ave N is widened between 16th St and Dr. MLK, Jr St from

three lanes to four lanes with two eastbound lanes and two westbound lanes. Between Dr. MLK, Jr St and 1st St, 5th Ave N is widened to three lanes with one eastbound lane and two westbound lanes.

## Project Q – Remove I-175, Provide New Interchange, and Two-Way Conversion of 4th/5th Ave S

Projects Q1 and Q2 include the removal of the I-175 spur and replacement with a new interchange. The existing 4th and 5th Aves S one-way roadways are converted to two-way roadways, where 5th Ave S becomes a four-lane roadway from 16th St to 1st St, with two eastbound and two westbound lanes. 4th Ave S becomes a four-lane roadway from 16th St to Dr. MLK, Jr St, with two eastbound and two westbound lanes. East of Dr. MLK, Jr St, 4th Ave S becomes a three-lane roadway with two eastbound lanes and one westbound lane. Several northbound/southbound connections are made between 16th St and 5th St to reestablish the grid between 4th and 5th Aves S. Finally, the connection between 5th Ave S and 4th Ave S, west of 16th St is also removed.

- Project Q1 provides a new I-275 interchange along 5th Ave S and 16th St. Access to and from all directions of I-275 are possible but split among the two roadways to avoid overcrowding one low-capacity roadway. The southbound I-275 on ramp and northbound I-275 off ramp provide access at two, new signalized intersections along 5th Ave S. Northbound I-275 is accessed using a free-flow movement on-ramp along westbound 5th Ave S. Finally, the southbound I-275 off ramp connects with a ramp coming from northbound I-275 and forms the fourth leg at the 5th Ave S/16th St that was previously occupied by the connection between 5th Ave S and 4th Ave S that was removed.
- Project Q2 provides a new traditional urban diamond interchange along 5th Ave S. Under this scenario all directions of travel to and from I-275 are directed to two, new signalized intersections along 5th Ave S. An additional ramp from northbound I-275 also connects to the 5th Ave

S/16th St intersection via a newly constructed grid network in this area. Along 5th and 4th Aves S, various intersections are given left-turn bays and become signalized to allow better access into and out of the Tropicana Field site. To provide additional capacity enhancements east of Dr. MLK, Jr St, Delmar Terrace is converted from a one-way, unconnected roadway to a two-way, fully connected roadway from Dr. MLK, Jr St to 4th St.

### **Project R – Dr. MLK, Jr St/8th St Two-Way Conversion**

This project converts Dr. MLK, Jr St from four southbound lanes to two northbound lanes, two southbound lanes between 9th Ave S and 4th Ave N. 8th St is converted from predominantly three northbound lanes to one northbound lane, one southbound lane between 6th Ave S and 5th Ave N. The remaining space can be re-purposed into turn bays, parking, pedestrian/bicycle friendly features, etc. The southern and northern termini of the one-way pairs will be handled by removing connections, such as the bridge over Booker Creek to the south and portions of 8th St and Highland St in the north. Additional connections will be added to address these vacated roadways.

### **Project S – 4th St/3rd St Two-Way Conversion**

This project converts 4th St from four southbound lanes to two northbound lanes, two southbound lanes between 5th Ave S and 5th Ave N. 3rd St is converted from four northbound lanes to one northbound lane, one southbound lane. The remaining space can be re-purposed into turn bays, parking, pedestrian/bicycle friendly features, etc.

### **Project T – 13th Ave S/Dr. MLK Jr St Intersection Modification**

This project converts the two-way stop-controlled intersection at 13th Ave S/Dr. MLK, Jr St into a signalized intersection.

### **Project U – Partially Remove I-375 with New Ramps, Two-Way Conversion of 4th/5th Ave N, and Roundabout at 16th St/4th Ave N**

This project partially removes I-375 and creates one on-ramp from 5th Ave N and one off-ramp to 4th Ave N near 11th St. The existing 4th and 5th Aves N one-way roadways are converted to two-way roadways, where 5th Ave N becomes a two-lane roadway from 16th St to 1st St, with one eastbound and one westbound lane. 4th Ave N becomes a two-lane roadway from 16th St to Beach Dr, with one eastbound and one westbound lane. The I-375 ramps tie into 4th and 5th Aves N as roundabout ramp terminals. Finally, the diagonal, eastbound, one-way street from 5th Ave N connects to a new roundabout at the 16th St/4th Ave N intersection.

### **Project V – 5th Ave N/2nd St Intersection Modifications**

This project converts the two-way stop-controlled intersection at 5th Ave N/2nd St into a signalized intersection.

### **Project W – Beach Ave/4th Ave N Roundabout**

This project converts the minor street stop-controlled intersection at Beach Ave/4th Ave N into a roundabout.

### **Project X – Burlington Ave/16th St Intersection Modifications**

This project converts the two-way stop-controlled intersection at Burlington Ave/16th St into a signalized intersection.

### **Project Y – 4th Ave S Two-Way Conversion**

This project converts the existing 4th Ave S one-way roadway to a four-lane roadway from 16th St to Dr. MLK, Jr St, with two eastbound and two



westbound lanes. East of Dr. MLK, Jr St, 4th Ave S becomes a three-lane roadway with two eastbound lanes and one westbound lane.

## Scenario 1 Network Performance Results

The Scenario 1 Network model assumes a significant change that removes both the I-175 and I-375 spurs and adds new access to and from DTSP from relocated ramps and interchanges located closer to the I-275 mainline. The relocation of these ramps allows for redevelopment and completion of a grid network in these areas along 4th and 5th Aves S/ and 4th and 5th Ave N. The Scenario 1 Network also considers the Tropicana Field site redevelopment, with added street connectivity both within the site and to the adjacent street network. Finally, the Dr. MLK Jr St/8th St and 4th St/3rd St one-way pairs are converted to two-way roadways, with appropriate intersection geometry enhancements and signal timing updates. Figure 25 shows the location of the Scenario 1 Network projects graphically.

### Roadway Utilization

Figures 26 and 27 show the congestion results of the Scenario 1 Network for the AM and PM peak periods, respectively. Under the Scenario 1 Network, in the future year (2045), several roadways are expected to operate under congested conditions. In the AM peak period, northbound I-275 within the I-175 interchange area and southbound Dr. MLK Jr St continue to operate as congested roadways. Northbound 22nd St, south of 5th Ave S, and southbound 1st St, north of 4th Ave N are expected to operate under congested conditions. Portions of 5th Ave S, Burlington Ave N, 5th Ave N, and 9th Ave N are also expected to operate with high levels of congestion.

In the PM peak period, southbound I-275 near the I-175 interchange, as well as the new northbound I-275 ramp from 5th Ave S are expected to operate under congested conditions. Without I-175, drivers use the local road network to get to the newly created interchange at 5th Ave S. This puts strain on lower capacity roadways, such as 4th Ave S, which now supports

only one westbound lane, and the newly extended 3rd Ave S, which provides one westbound lane through the Tropicana Field site. Portions of 1st Ave N and 5th Ave N also see an increase in congestion as vehicles make their way westward through the network. Similar to previous models, the PM peak period continues to see portions of Beach Dr and Bayshore Dr operate with heavy congestion.

The congestion seen in both the AM and PM peak periods is mainly due to the removal of the high-capacity interstate spurs and planned lane re-allocation projects. Some congested roadways also coincide with high destination areas within the greater DTSP area that typically favor non-vehicular traffic. A certain level of congestion is to be expected on these roadways as vehicles navigate to find parking and maneuver through the extensive downtown grid system.

### Intersection Delay

Figures 28 and 29 show the delay results of the Planned Network for the AM and PM peak periods, respectively. In the AM peak period, two signalized intersections, are not expected to operate at acceptable levels of overall intersection delay, while five signalized intersections are not expected to operate at acceptable levels of delay in the PM peak period. Two of these intersections, the I-275 off ramp terminal at 16th St and 9th Ave N/16th St, have high delays in both peak periods. The removal of I-175 and I-375 puts additional constraints on the west side of the DTSP network. Drivers now access the local street network along 5th Aves S and N, and 16th St, which means all drivers must cross 16th St to reach destinations within central and east downtown. With additional vehicles using roadways with planned improvements designed to re-allocate roadway capacity, intersections along 16th St are expected to operate under heavy delays. In addition, converting 4th and 5th Aves N and S from one-way to two-way roadways adds phases to signals at these intersections with 16th St, which cuts into the amount of green time each movement receives, increasing delay time.

The intersections that are expected to experience high delay under the Scenario 1 Network, along with other intersections predominantly in the western DTSP study area, also experience approaches with high delays. These can be seen on approaches at intersections along 16th St at 5th Ave S, 4th Ave S, 4th Ave N, 5th Ave N, and 9th Ave N. Other intersections with high approach delays include the southbound I-275 off ramp terminal at 5th Ave N, 5th Ave S/22nd St, and 9th Ave S/22nd St.

## Travel Time

Figure 30 shows the travel time results of the Scenario 1 Network. Between the AM and PM peak hours, there is no significant difference in travel time for the routes destined for Johns Hopkins All Children's/Bayfront and the Warehouse Arts District/Deuces Live area. The other two destinations (St. Anthony's Hospital and St. Pete Pier) see approximately a minute increase in travel time in the PM peak period over the AM peak period. Three of the destinations allow for alternate starting points depending on if the driver is approaching from the north or south; the one destination that does not require alternate routes is to Johns Hopkins All Children's/Bayfront because all drivers coming from I-275 flow onto 5th Ave S. Since route lengths vary for these destinations, a range of values is presented in the table to indicate travel time variability.

## Key Findings

Under the Scenario 1 Network, I-175 and I-375 are removed and replaced with interchanges at 5th Ave S and 5th Ave N, which reduces the available east-west capacity within DTSP. Additional planned improvements along local roadways re-allocate existing capacity, further reducing vehicular capacity, and increasing the number of roadways operating with congestion. The number of signalized approaches, and correspondingly, the number of signalized intersections operating with high delay increases over the Planned Network.

Travel times in the Scenario 1 Network are also increased compared to the Planned Network, except for the Warehouse Arts District/Deuces Live destination, due to the new I-275 interchange at 5th Ave S. This new interchange provides direct access to western DTSP from northbound I-275, rather than using I-175 to reach this destination.



**FIGURE 25. SCENARIO 1 NETWORK (2045) IMPROVEMENT PROJECT MAP**

**SCENARIO 1**

**E+C Project Key:**

- A 2nd Ave N Intersection Modifications
- B SunRunner BRT Lane Re-allocation
- D 6th Ave S Lane Re-allocation

**Planned Project Key:**

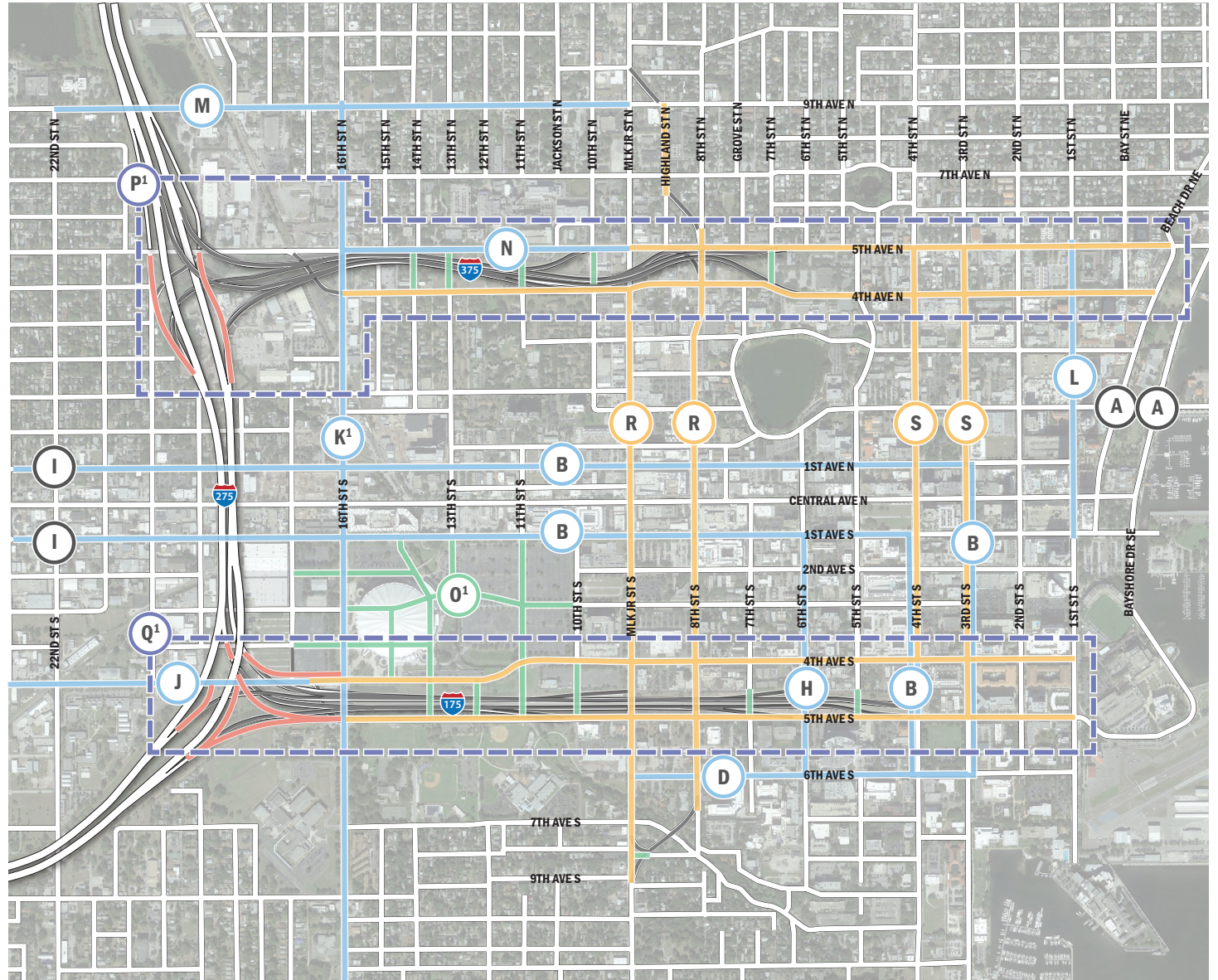
- H 6th St S Lane Re-allocation
- I 22nd St Intersection Modifications
- J 5th Ave S Lane Re-allocation
- K<sup>1</sup> 16th St Lane Re-allocation
- L 1st St Lane Re-allocation
- M 9th Ave N Lane Re-allocation
- N 5th Ave N Lane Re-allocation

**Scenario 1 Project Key:**

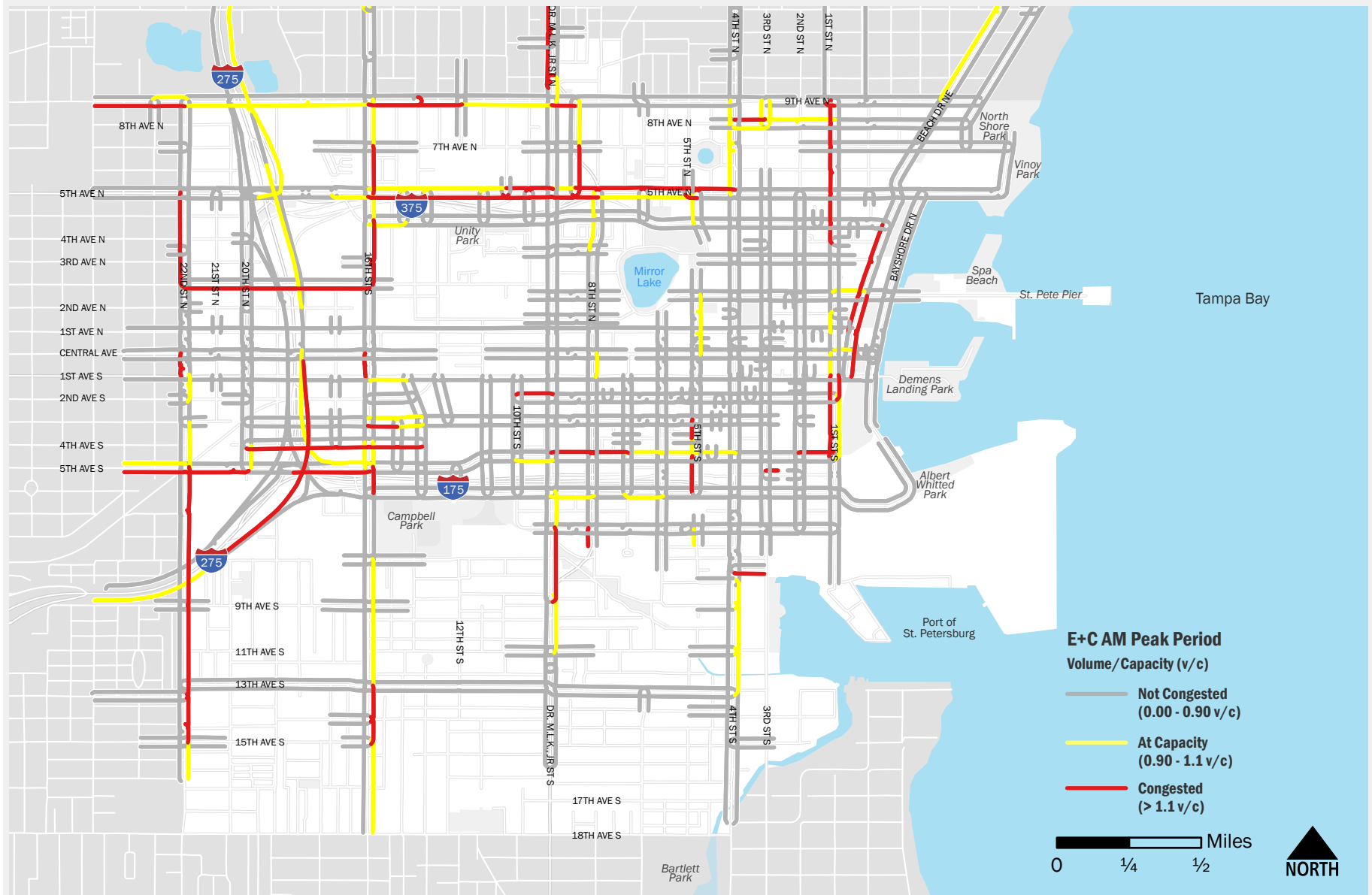
- O<sup>1</sup> Future Grid Connections at Tropicana Field Site
- P<sup>1</sup> Remove I-375, Full Interchange at I-275/5th Ave N, Two-Way Conversion of 4th/5th Ave N
- Q<sup>1</sup> Remove I-175, New Full Interchange to 5th Ave S/16th St, Two-Way Conversion of 4th/5th Ave S
- R Dr. MLK Jr St/8th St Two-Way Conversion
- S 4th St/3rd St Two-Way Conversion

**Proposed Project Type Key:**

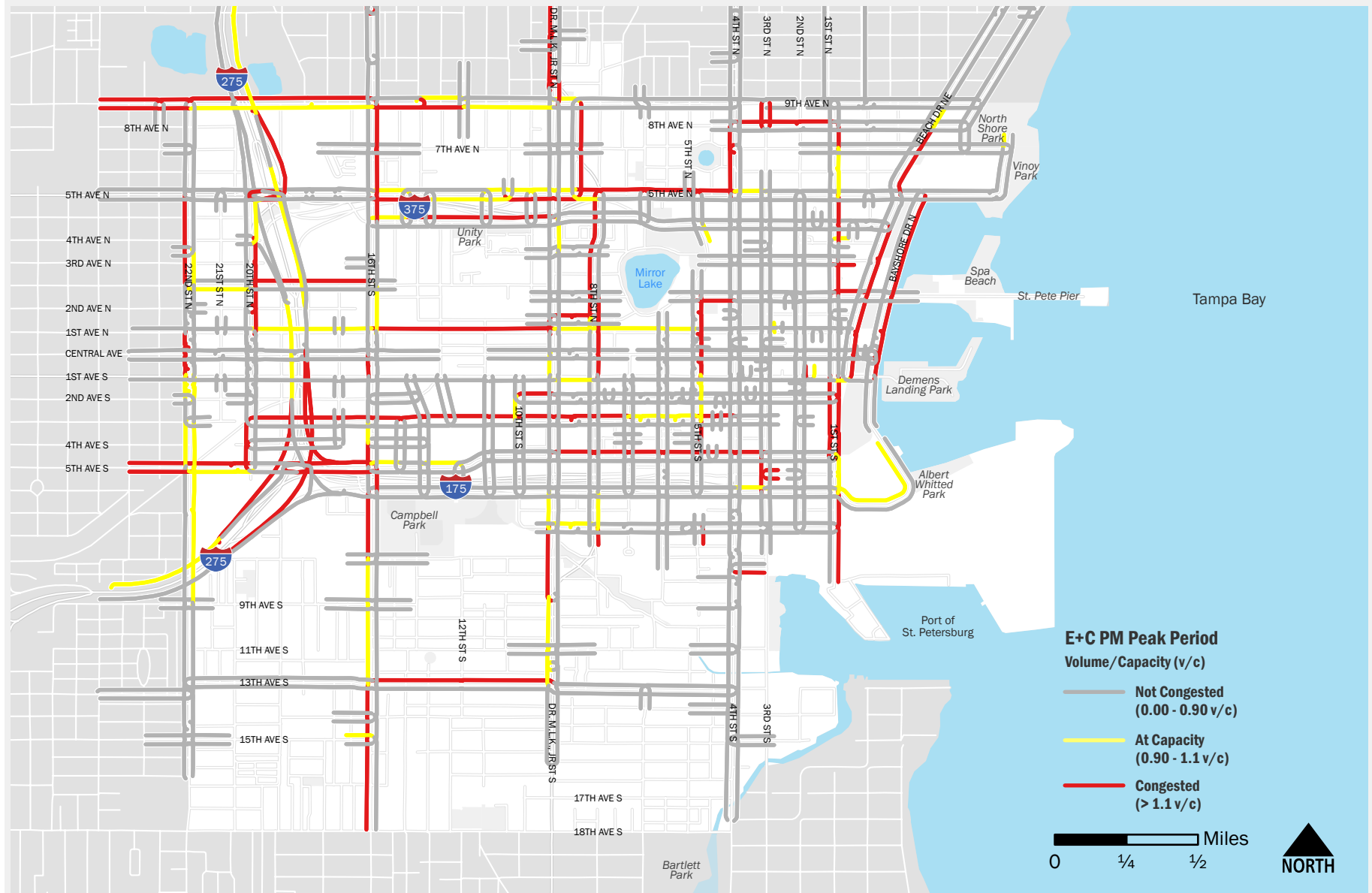
- Intersection Modification
  - Lane Re-allocation\*
  - Two-Way Conversion
  - New Street
  - Widen Street/New Lane(s)
  - New/Realigned Ramp
  - Vacated Roadway
  - Interstate Spur Modification
- \* for parking, transit, or bicycle facilities



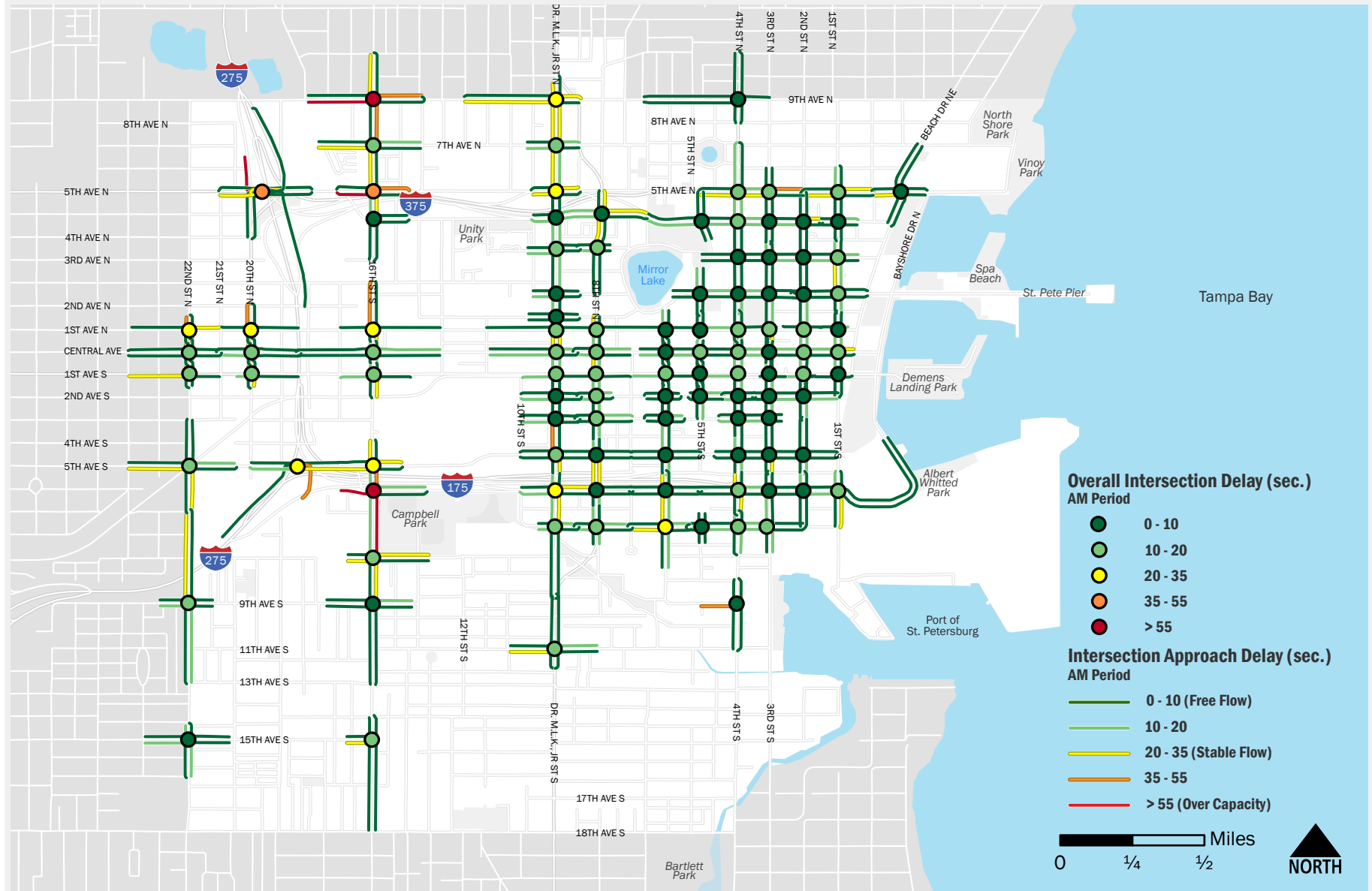
**FIGURE 26. SCENARIO 1 NETWORK (2045) CONGESTION, AM PEAK**



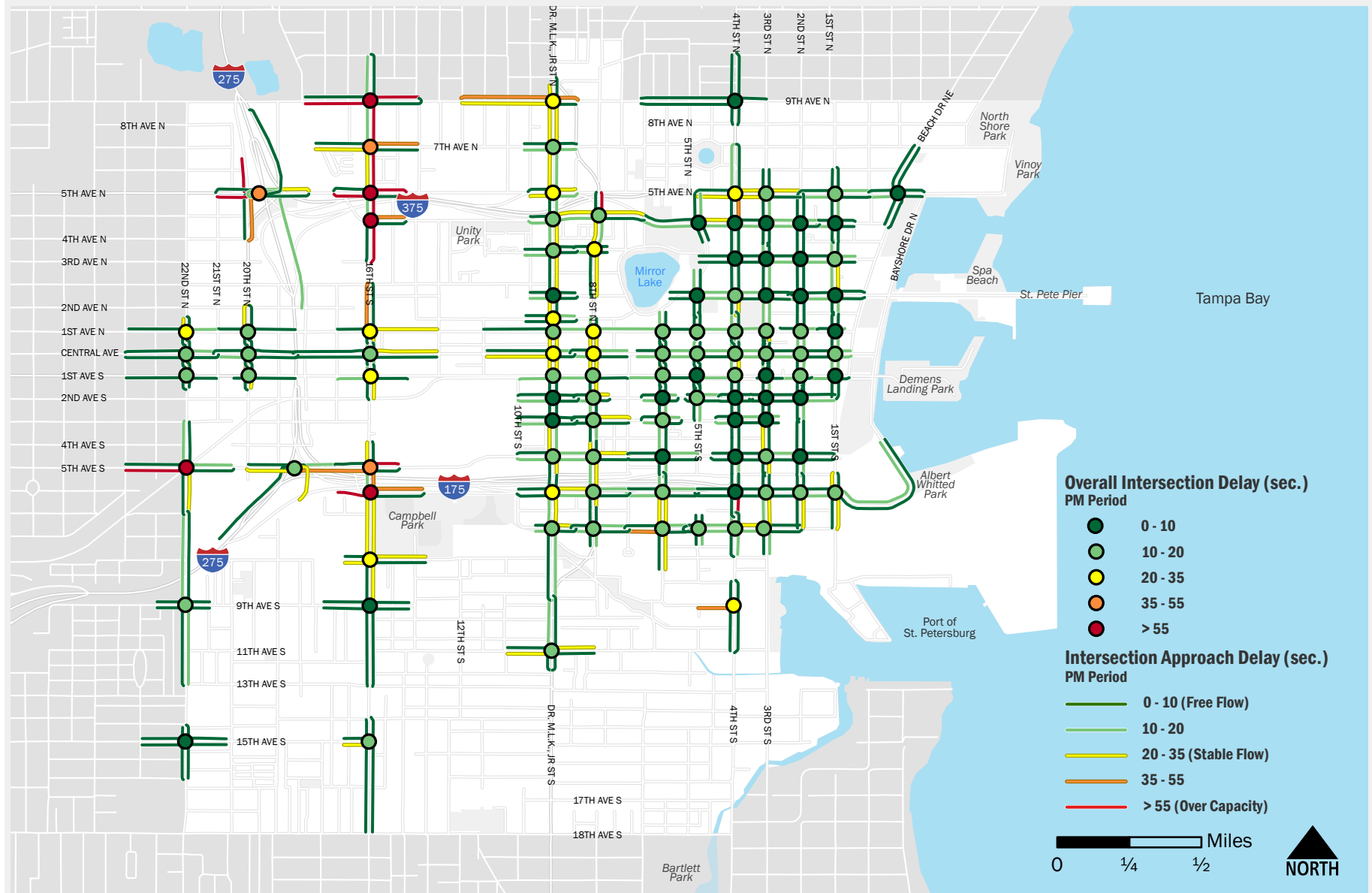
**FIGURE 27. SCENARIO 1 NETWORK (2045) CONGESTION, PM PEAK**



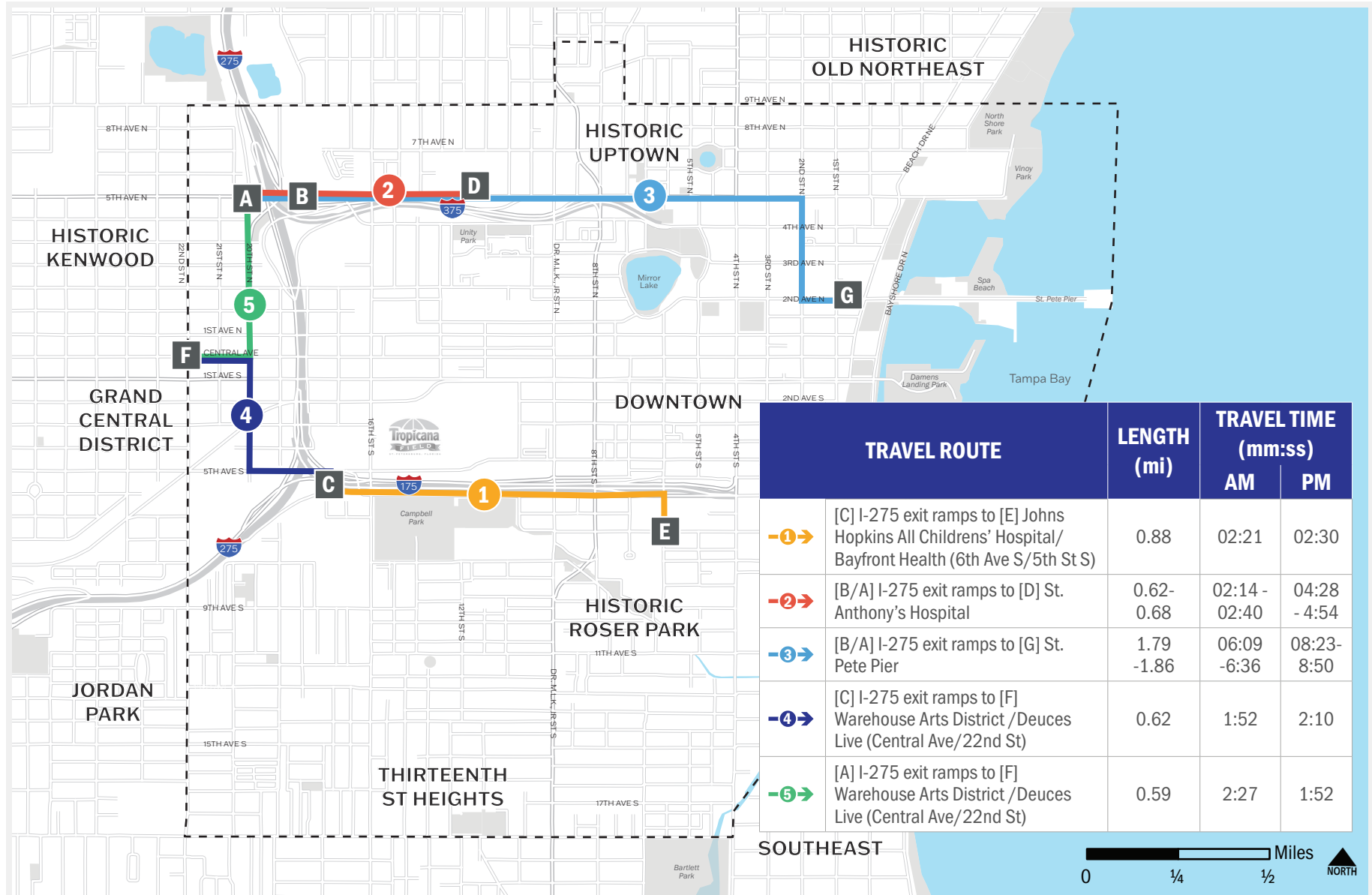
**FIGURE 28. SCENARIO 1 NETWORK (2045) INTERSECTION APPROACH DELAY, AM PEAK**



**FIGURE 29. SCENARIO 1 NETWORK (2045) INTERSECTION APPROACH DELAY, PM PEAK**



**FIGURE 30. SCENARIO 1 NETWORK (2045) TRAVEL TIMES FOR SELECT ROUTES MAP**





## Scenario 2 Network Performance Results

The Scenario 2 Network model builds upon the Scenario 1 Network; the I-175 and I-375 spurs are removed, and interstate access is relocated closer to the I-275 mainline. Under the Scenario 2 Network, the interchange configurations are different than under the Scenario 1 Network, with most of the ramps now providing direct access to and from 5th Aves N and S. In addition, changes are made to the Tropicana Field Site, such as providing signalized intersections and left turn lanes to improve access in and out of this newly developed area. Delmar Terrace is also converted from a one-way, unconnected roadway to a two-way, fully connected roadway from Dr. MLK Jr St to 4th St. Finally, the Dr. MLK Jr St/8th St and 4th St/3rd St one-way pairs are converted to two-way roadways, with appropriate intersection geometry enhancements and signal timing updates. Figure 31 shows the location of the Scenario 2 Network projects graphically.

### Roadway Utilization

Figures 32 and 33 show the congestion results of the Scenario 2 Network for the AM and PM peak periods, respectively. Under the Scenario 2 Network, in the future year (2045), several roadways are expected to operate under congested conditions. In the AM peak period, northbound I-275 within the I-175 interchange area and southbound Dr. MLK Jr St continue to operate as congested roadways. Portions of northbound 16th St and southbound 1st St, north of 4th Ave N are expected to operate under congested conditions. Portions of 2nd Ave S, 5th Ave N, and 9th Ave N are also expected to operate with high levels of congestion.

In the PM peak period, southbound I-275 within the I-175 interchange area, as well as the new northbound I-275 ramp from 5th Ave S are expected to operate under congested conditions. Without I-175, drivers utilize the local road network to get to the newly created interchange at 5th Ave S. This puts strain on lower capacity roadways, such as 4th Ave S, which now supports only one westbound lane, and portions of the newly extended

2nd Ave S, which provides one westbound lane through the Tropicana Field site. Westbound 5th Ave N between 16th St and 4th St sees an increase in congestion as vehicles make their way westward through the network. Drivers also make their way eastbound on 5th Ave N and 9th Ave N, with congestion dissipating once these roadways reach Dr MLK Jr St. Similar to previous models, the PM peak period continues to see portions of Beach Dr and Bayshore Dr operate with heavy congestion.

The congestion seen in both the AM and PM peak periods is mainly due to the removal of the high-capacity interstate spurs and planned lane re-allocation projects. Some congested roadways also coincide with high destination areas within the greater DTSP area that typically favor non-vehicular traffic. A certain level of congestion is to be expected on these roadways as vehicles navigate to find parking and maneuver through the extensive downtown grid system.

### Intersection Delay

Figures 34 and 35 show the delay results of the Scenario 2 Network for the AM and PM peak periods, respectively. In the AM peak period, all signalized intersections, are expected to operate at acceptable levels of overall intersection delay, while three signalized intersections are not expected to operate at acceptable levels of delay in the PM peak period. The failing intersections in the PM peak period are located along 16th St at 4th Ave N, 5th Ave N, and 9th Ave N. The removal of I-175 and I-375 puts additional constraints on the west side of the DTSP network. Drivers now access the local street network along 5th Aves S and N, and 16th St, which means all drivers must cross 16th St to reach destinations within central and east downtown. With additional vehicles using roadways with planned improvements designed to re-allocate roadway capacity, intersections along 16th St are expected to operate under heavy delays. In addition, converting 4th and 5th Aves N and S from one-way to two-way roadways adds phases to signals at these intersections with 16th St, which cuts into the amount of green time each movement receives, increasing delay time. The

intersections that are expected to experience high delay under the Scenario 2 Network, also experience approaches with high delays, particularly in the PM peak period.

## Travel Time

Figure 36 shows the travel time results of the Scenario 2 Network. Between the AM and PM peak hours, there is no significant difference in travel time for the routes destined for Johns Hopkins All Children's/Bayfront and the Warehouse Arts District/Deuces Live area. The other two destinations (St. Anthony's Hospital and St. Pete Pier) see approximately a minute and a half (90 seconds) increase in travel time in the PM peak period over the AM peak period. All four destinations allow for alternate starting points depending on if the driver is approaching from the north or south. Since route lengths vary for these destinations, a range of values is presented in the table to indicate travel time variability.

The biggest difference in travel times due to this variability in starting location is for the Johns Hopkins All Children's/Bayfront destination, due to the starting point for northbound I-275 at the 5th Ave S/16th St intersection, and the starting point for southbound I-275 at the 5th Ave S ramp terminal intersection. A driver coming from southbound I-275 must travel through three additional lights along congested portions of 5th Ave S before reaching the same starting point as the northbound I-275 driver. This is illustrated by the difference in travel time between the two routes is approximately two minutes in both the AM and PM peak periods, even though the additional route length is 0.30 miles.

## Key Findings

Under the Scenario 2 Network, I-175 and I-375 are removed and replaced with interchanges at 5th Ave S and 5th Ave N, which reduces the available east-west capacity within DTSP. Additional planned improvements along local roadways re-allocate existing capacity, further reducing vehicular capacity, and increasing the number of roadways operating with congestion. However, even with additional observed congestion, the number of signalized intersections operating with unacceptable delay do not increase compared to the Planned Network, even though the Scenario 2 Network has seven additional signals not found in the Planned Network.

Travel times in the Scenario 2 Network increased compared to the Planned Network, except for the Warehouse Arts District/Deuces Live destination, due to the new I-275 interchange at 5th Ave S. This new interchange provides direct access to western DTSP from northbound I-275, rather than using I-175 to reach this destination.



**FIGURE 31. SCENARIO 2 NETWORK (2045) IMPROVEMENT PROJECT MAP**

**SCENARIO 2**

**E+C Project Key:**

- (A) 2nd Ave N Intersection Modifications
- (B) SunRunner BRT Lane Re-allocation
- (D) 6th Ave S Lane Re-allocation

**Planned Project Key:**

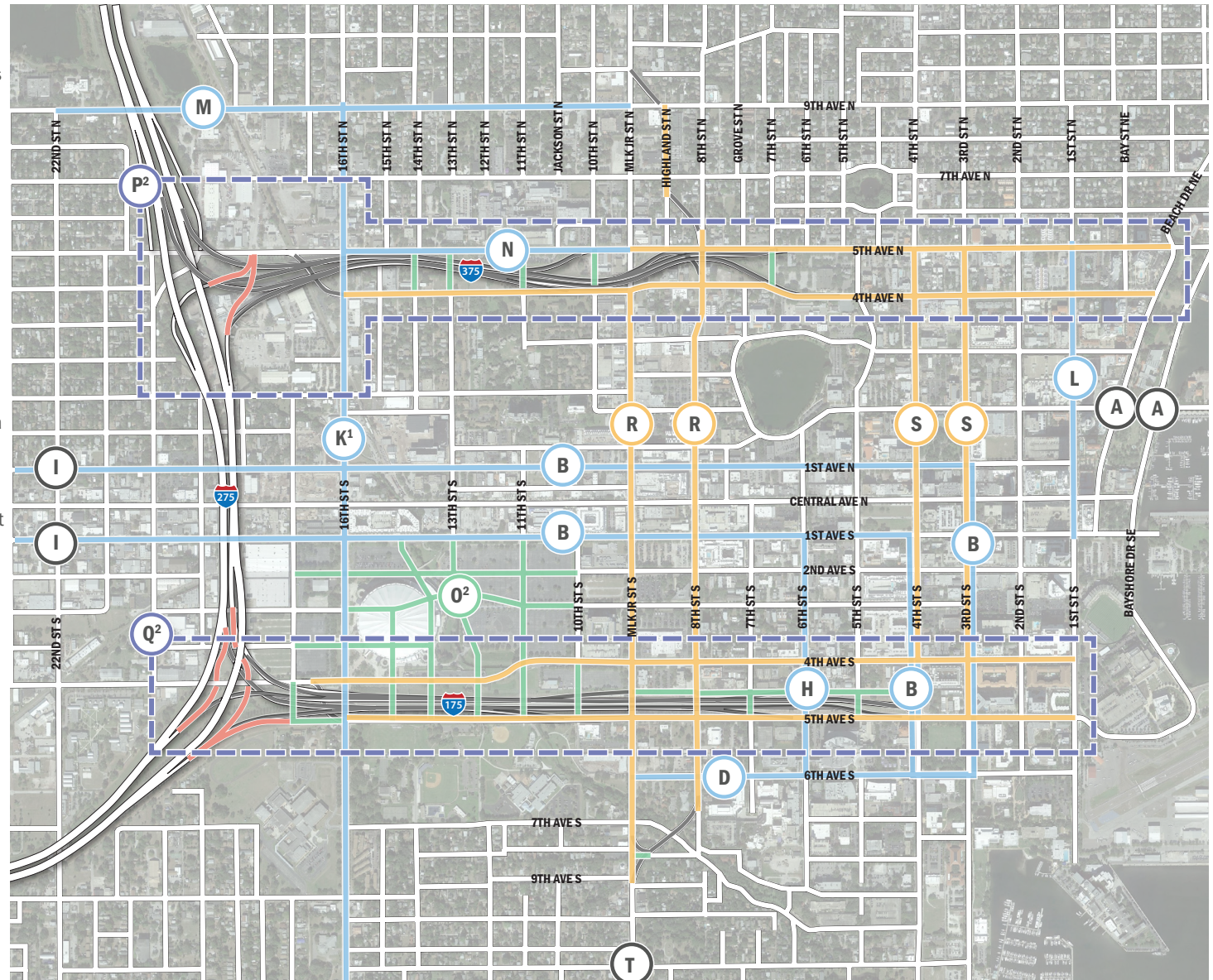
- (H) 6th St S Lane Re-allocation
- (I) 22nd St Intersection Modifications
- (K<sup>1</sup>) 16th St Lane Re-allocation
- (L) 1st St Lane Re-allocation
- (M) 9th Ave N Lane Re-allocation
- (N) 5th Ave N Lane Re-allocation

**Scenario 2 Project Key:**

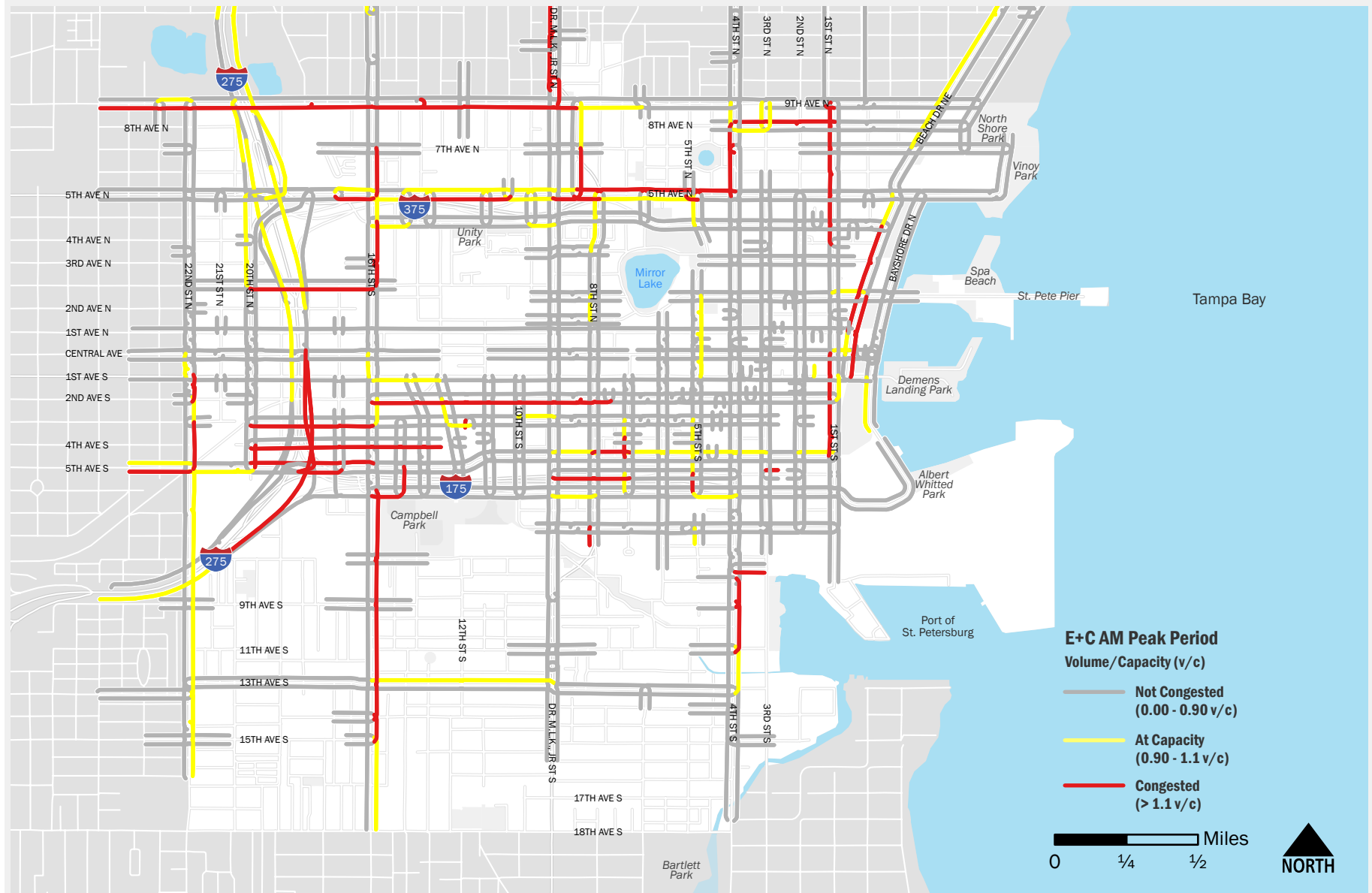
- (Q<sup>2</sup>) Future Grid Connections at Tropicana Field Site
- (P<sup>2</sup>) Remove I-375, Alt. Full Interchange at I-275/5th Ave N, Two-Way Conversion of 4th/5th Ave N/20th St
- (Q<sup>2</sup>) Remove I-175, Alt. New Full Interchange to 5th Ave S/16th St, Two-Way Conversion of 4th/5th Ave S
- (R) Dr. MLK Jr St/8th St Two-Way Conversion
- (S) 4th St/3rd St Two-Way Conversion
- (T) 13th Ave S Intersection Modifications

**Proposed Project Type Key:**

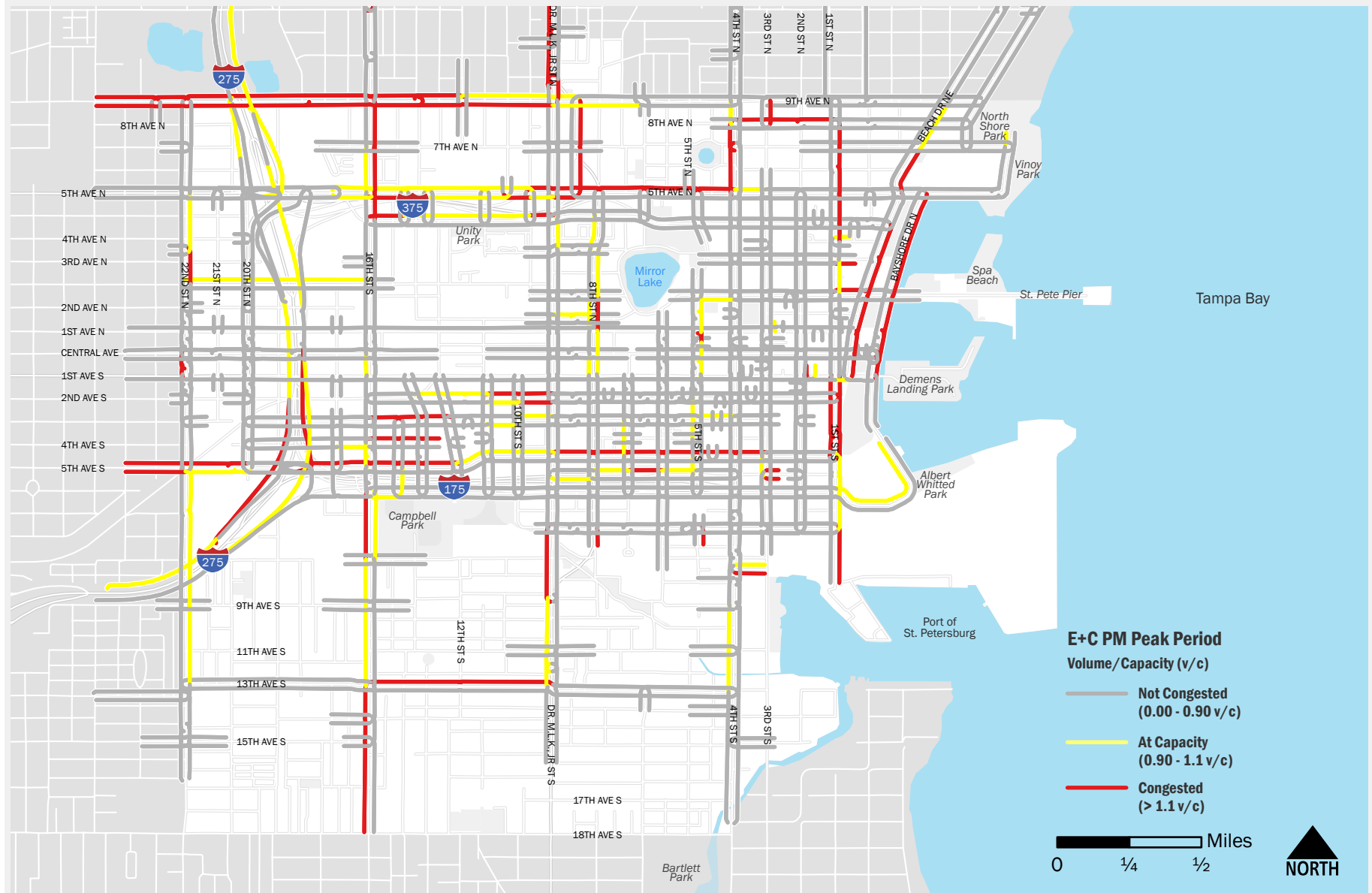
- Intersection Modification
  - Lane Re-allocation\*
  - Two-Way Conversion
  - New Street
  - Widen Street/New Lane(s)
  - New/Realigned Ramp
  - Vacated Roadway
  - Interstate Spur Modification
- \* for parking, transit, or bicycle facilities



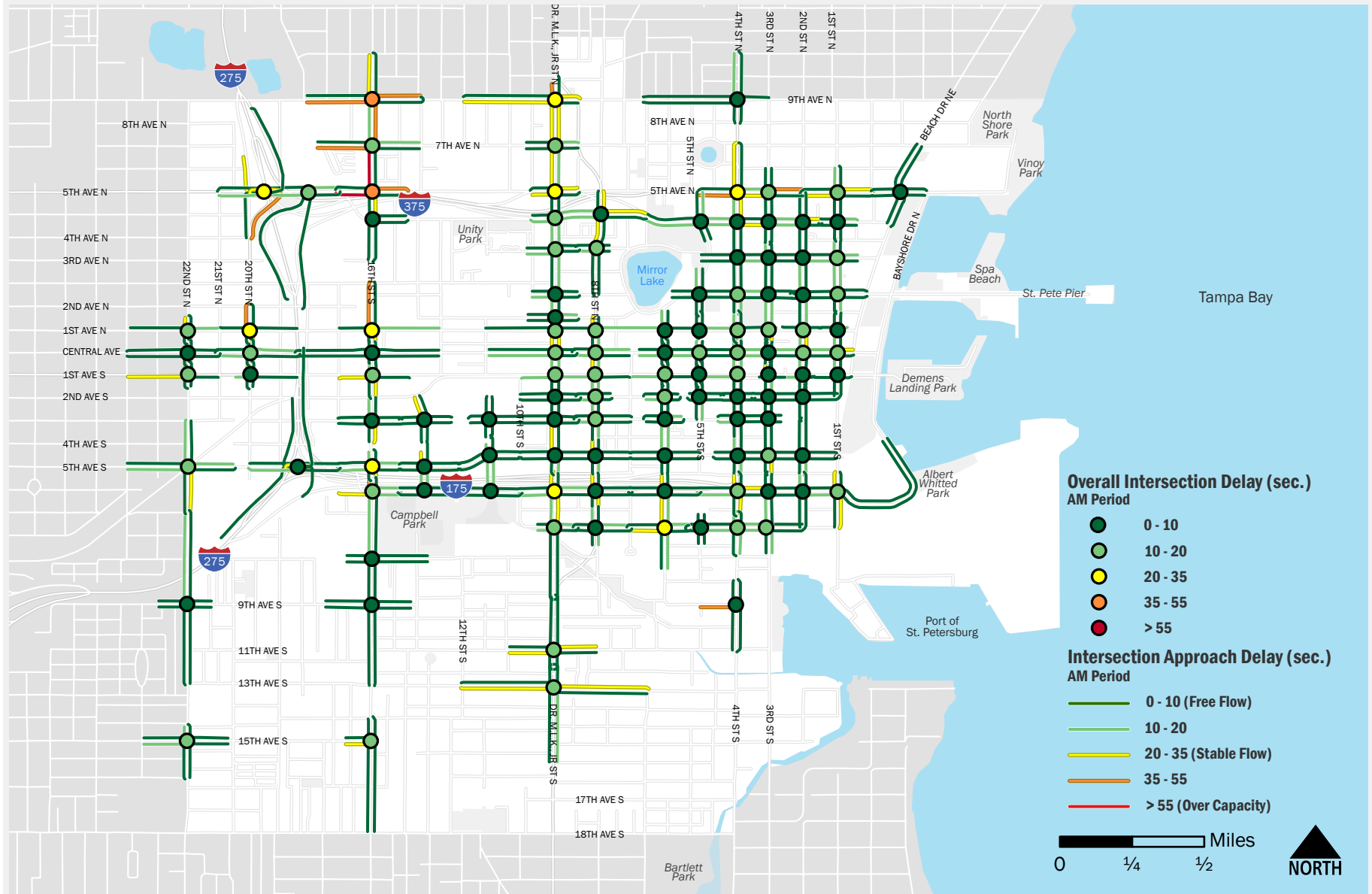
**FIGURE 32. SCENARIO 2 NETWORK (2045) CONGESTION, AM PEAK**



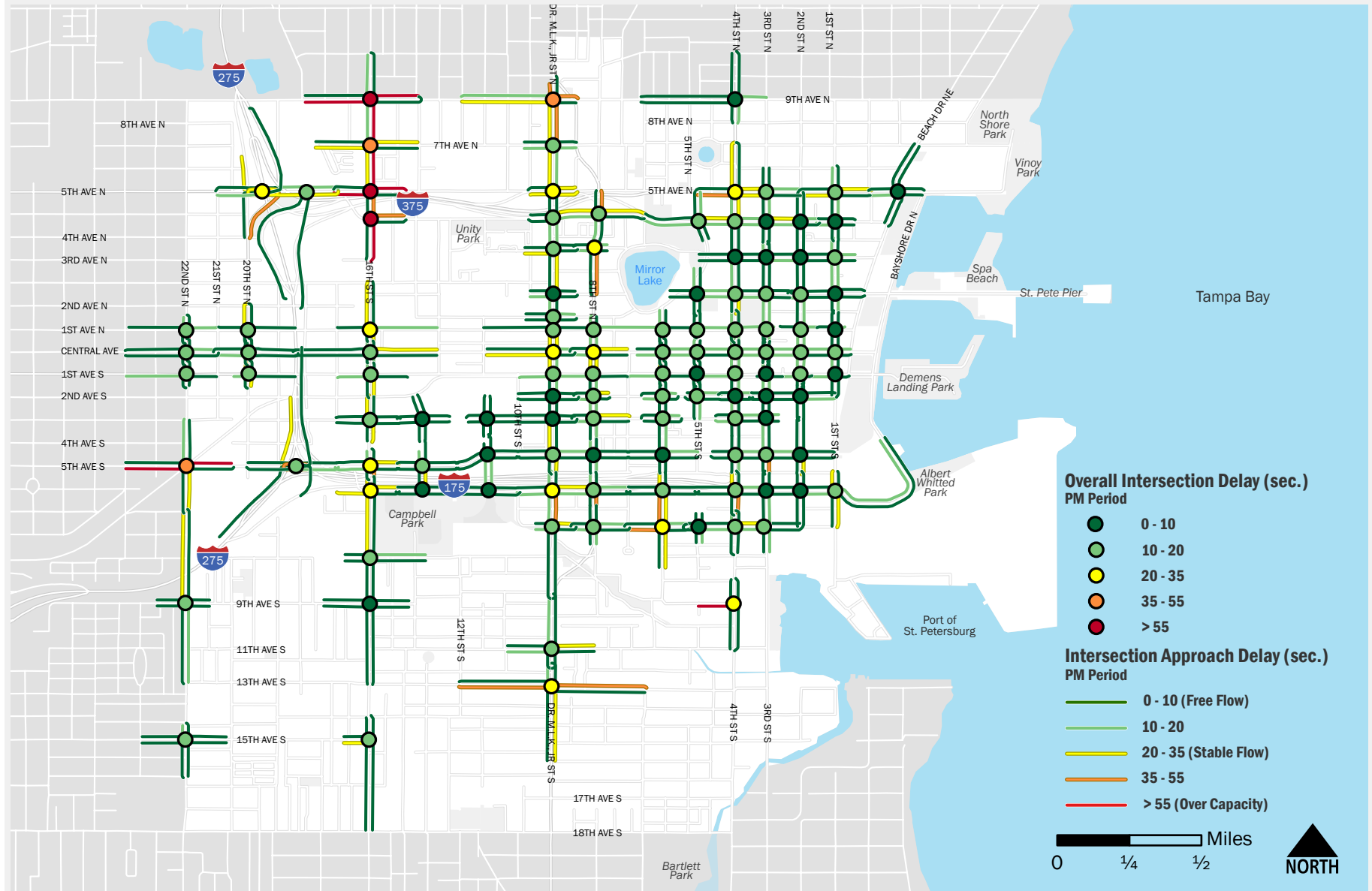
**FIGURE 33. SCENARIO 2 NETWORK (2045) CONGESTION, PM PEAK**



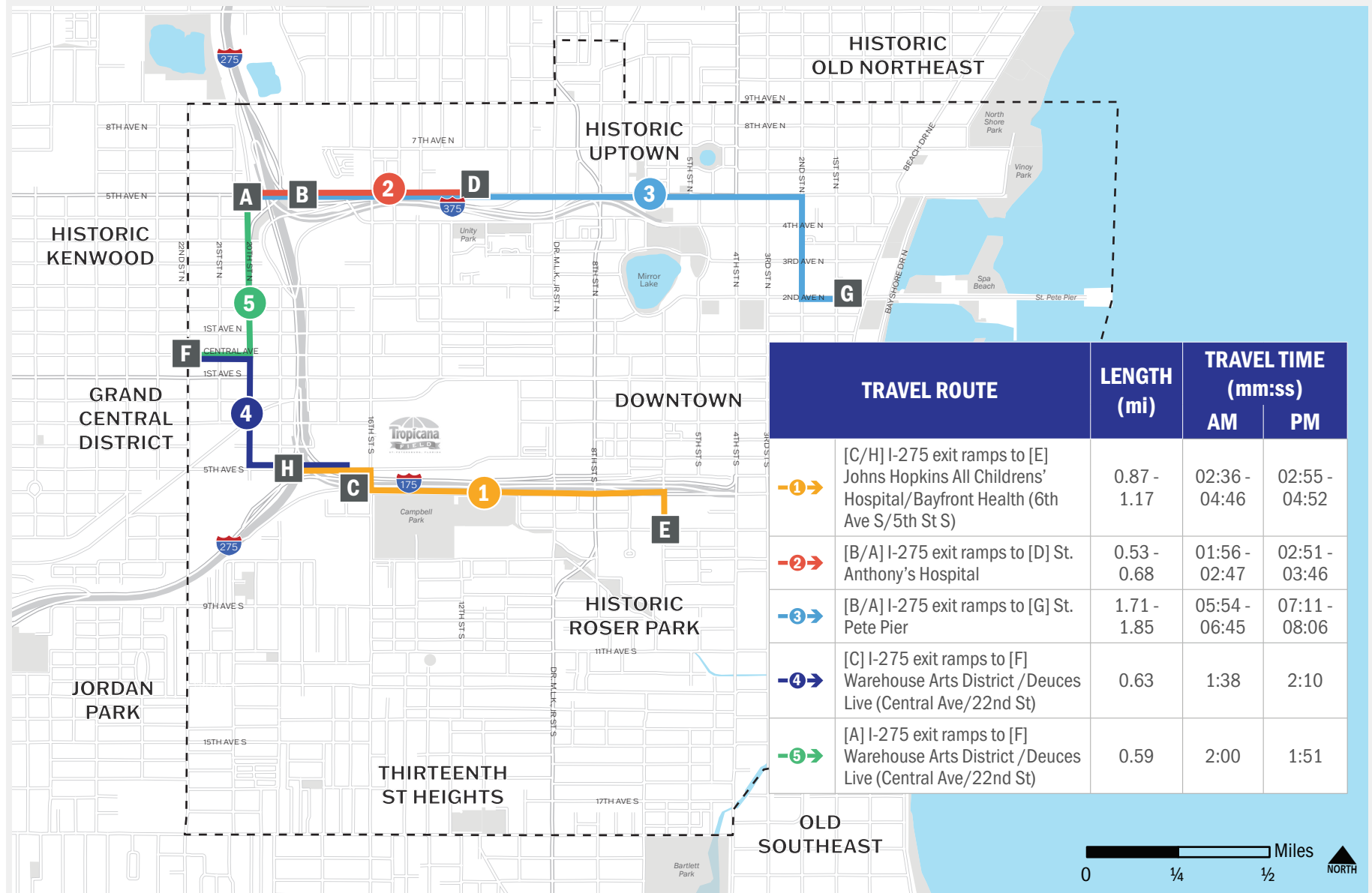
**FIGURE 34. SCENARIO 2 NETWORK (2045) INTERSECTION APPROACH DELAY, AM PEAK**



**FIGURE 35. SCENARIO 2 NETWORK (2045) INTERSECTION APPROACH DELAY, PM PEAK**



**FIGURE 36. SCENARIO 2 NETWORK (2045) TRAVEL TIMES FOR SELECT ROUTES MAP**





## Scenario 3 Network Performance Results

The Scenario 3 Network maintains the projects associated with the I-175 interstate spur from the Scenario 2 Network, such as the spur removal, interchange reconfiguration, Delmar Terrace conversion, and developing the grid within and to the south of the Tropicana Field Site. The I-375 interstate spur, however, is only partially removed in this Scenario. I-375 will terminate near 11th St with the eastbound off ramp flowing into a roundabout intersection along 4th Ave N, while vehicles can access westbound I-375 from a roundabout intersection along 5th Ave N. 4th and 5th Aves N are also converted from one-way roadways to two-way roadways from 16th St to where they terminate to the east. The diagonal, eastbound, one-way street from 5th Ave N connects to a new roundabout at the 16th St/4th Ave N intersection. The one-way to two-way conversions along Dr. MLK, Jr St/8th St and 4th St/3rd St from the previous Scenarios are left in place, with appropriate intersection geometry enhancements and signal timing updates. Finally, smaller intersection improvement projects requested by the City of St. Petersburg are also presented in the model. These includes converting three two-way stop-controlled intersections to signalized intersections. Figure 37 shows the location of the Scenario 3 Network projects graphically.

### Roadway Utilization

Figures 38 and 39 show the congestion results of the Scenario 3 Network for the AM and PM peak periods, respectively. Under the Scenario 3 Network, in the future year (2045), several roadways are expected to operate under congested conditions. In the AM peak period, northbound I-275 within the I-175 interchange area and southbound Dr. MLK Jr St continue to operate as congested roadways. Portions of northbound 16th St, south of 5th Ave S and southbound 1st St, north of 4th Ave N are expected to operate under congested conditions. Additionally, westbound 5th Ave N between 4th St and the westbound I-375 on-ramp and portions of 4th Ave N are also

expected to operate with high levels of congestion.

In the PM peak period, southbound I-275 within the I-175 interchange area, as well as the new northbound I-275 ramp from 5th Ave S are expected to operate under congested conditions. Without I-175, drivers utilize the local road network to get to the newly created interchange at 5th Ave S. This puts strain on lower capacity roadways, such as 4th Ave S, which now supports only one westbound lane from 1st St to Dr. MLK Jr St. Westbound 5th Ave N sees an increase in congestion as vehicles make their way to the only I-375 access point along 5th Ave N, just west of Dr MLK Jr St. Similar to previous models, the PM peak period continues to see portions of Beach Dr and Bayshore Dr operate with heavy congestion.

The congestion seen in both the AM and PM peak periods is mainly due to the changes made to the high-capacity interstate spurs. The replacement of I-175 with a full interchange at 5th Ave S and the partial removal of I-375 draws traffic to the remaining interchange spur. Portions of 4th Ave S and 5th Ave N see increased congestion as vehicles make their way to the 5th Ave S interchange and the consolidated on-ramp to I-375 from 5th Ave N, respectively. Some congested roadways also coincide with high destination areas within the greater DTSP area that typically favor non-vehicular traffic. A certain level of congestion is to be expected on these roadways as vehicles navigate to find parking and maneuver through the extensive downtown grid system.

### Intersection Delay

Figures 40 and 41 show the delay results of the Scenario 3 Network for the AM and PM peak periods, respectively. In the AM peak period, all signalized intersections, are expected to operate at acceptable levels of overall intersection delay, while one signalized intersection is not expected to operate at acceptable levels of delay in the PM peak period. The failing intersection in the PM peak period is located along 16th St at 9th Ave N. While not failing, other intersections along 16th St at 5th Ave N and 7th Ave

N operate with high delay, most likely due to the lane reallocations along 16th St and 9th Ave N. The removal of I-175 and the partial removal of I-375 puts additional constraints on the west side of the DTSP network. Drivers now access the local street network at interchanges along 5th Aves S and N or at the I-375 consolidated ramp terminals along 4th and 5th Aves N, the latter of which causes some more drivers to travel northbound through downtown to access 5th Ave N, causing some mild, yet acceptable delays along this corridor. The intersections that are expected to experience high delay under the Scenario 3 Network, also experience approaches with high delays, particularly in the PM peak period.

## Travel Time

Figure 42 shows the travel time results of the Scenario 3 Network. Of the four destinations, only the Warehouse Arts District/Deuces Live and Johns Hopkins All Children's/Bayfront allow for alternate starting points depending on if the driver is approaching from the north or south. Since route lengths vary for these destinations, a range of values is presented in the table to indicate travel time variability.

The biggest difference in travel times due to this variability in starting location is for the Johns Hopkins All Children's/Bayfront destination, due to the starting point for northbound I-275 at the 5th Ave S/16th St intersection, and the starting point for southbound I-275 at the 5th Ave S ramp terminal intersection. A driver coming from southbound I-275 must travel through three additional lights along congested portions of 5th Ave S before reaching the same starting point as the northbound I-275 driver. This is illustrated by the difference in travel time between the two routes is approximately three and a half minutes in the AM and approximately two minutes in the PM peak periods, even though the additional route length is 0.30 miles.

## Key Findings

Under the Scenario 3 Network, I-175 is fully removed and replaced with an interchange at 5th Ave S and I-375 is partially removed with the interchange at 5th Ave N remaining as is and providing a new, consolidated access point for I-375 along 4th and 5th Aves N. The full removal of I-175 and the partial removal of I-375 reduces the available east-west capacity within DTSP. Additional planned improvements along local roadways re-allocate existing capacity, further reducing vehicular capacity, and increasing the number of roadways operating with congestion. However, even with additional observed congestion, the number of signalized intersections operating with unacceptable delay do not increase compared to the Planned Network, even though the Scenario 2 Network has seven additional signals not found in the Planned Network.

Travel times in the Scenario 3 Network generally increased compared to the Planned Network, except for the Warehouse Arts District/Deuces Live destination, due to the new I-275 interchange at 5th Ave S. This new interchange provides direct access to western DTSP from northbound I-275, rather than using I-175 to reach this destination.

**FIGURE 37. SCENARIO 3 NETWORK (2045) IMPROVEMENT PROJECT MAP**

**SCENARIO 3**

**E+C Project Key:**

- (A) 2nd Ave N Intersection Modifications
- (B) SunRunner BRT Lane Re-allocation
- (D) 6th Ave S Lane Re-allocation

**Planned Project Key:**

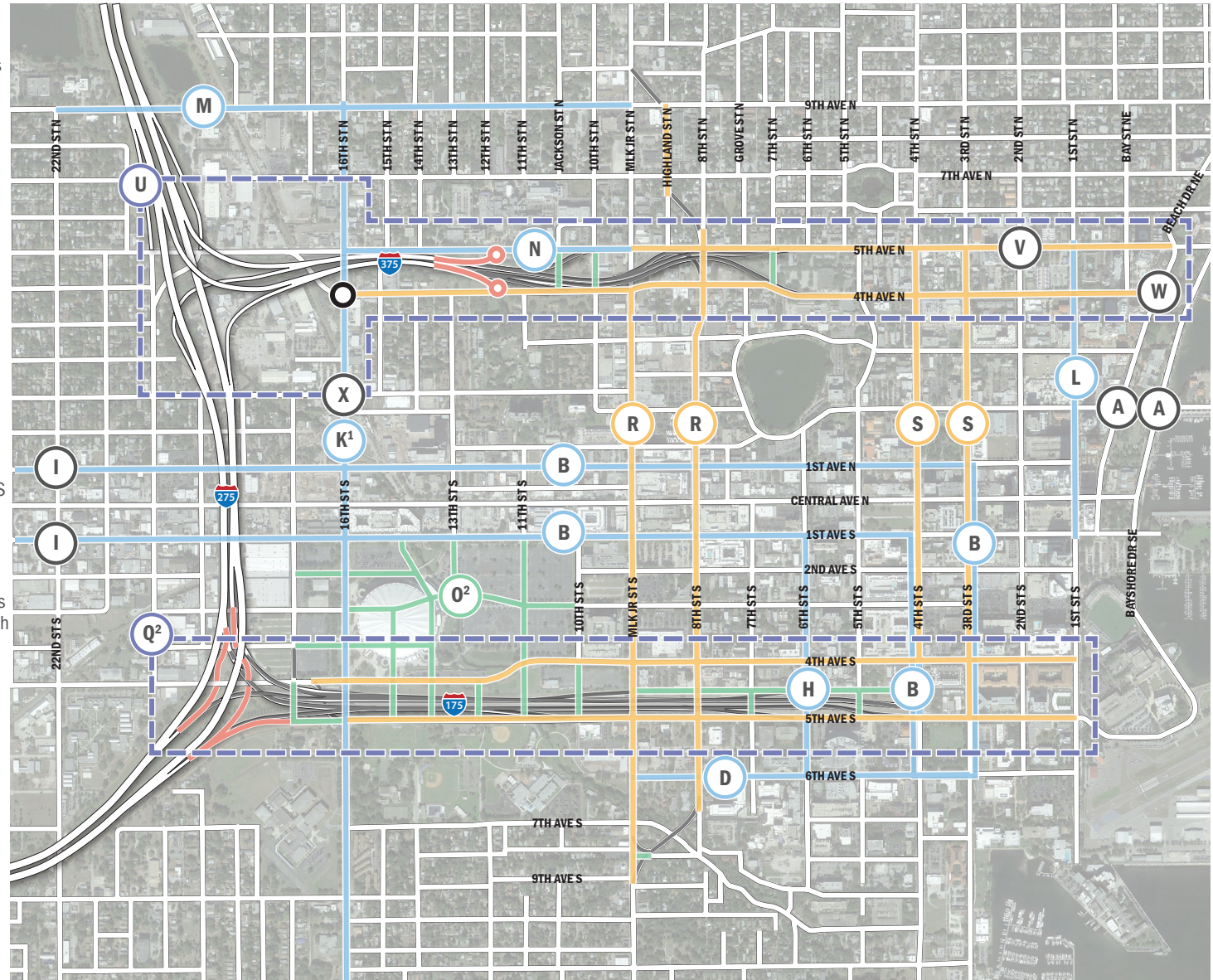
- (H) 6th St S Lane Re-allocation
- (I) 22nd St Intersection Modifications
- (K<sup>1</sup>) 16th St Lane Re-allocation
- (L) 1st St Lane Re-allocation
- (M) 9th Ave N Lane Re-allocation
- (N) 5th Ave N Lane Re-allocation

**Scenario 3 Project Key:**

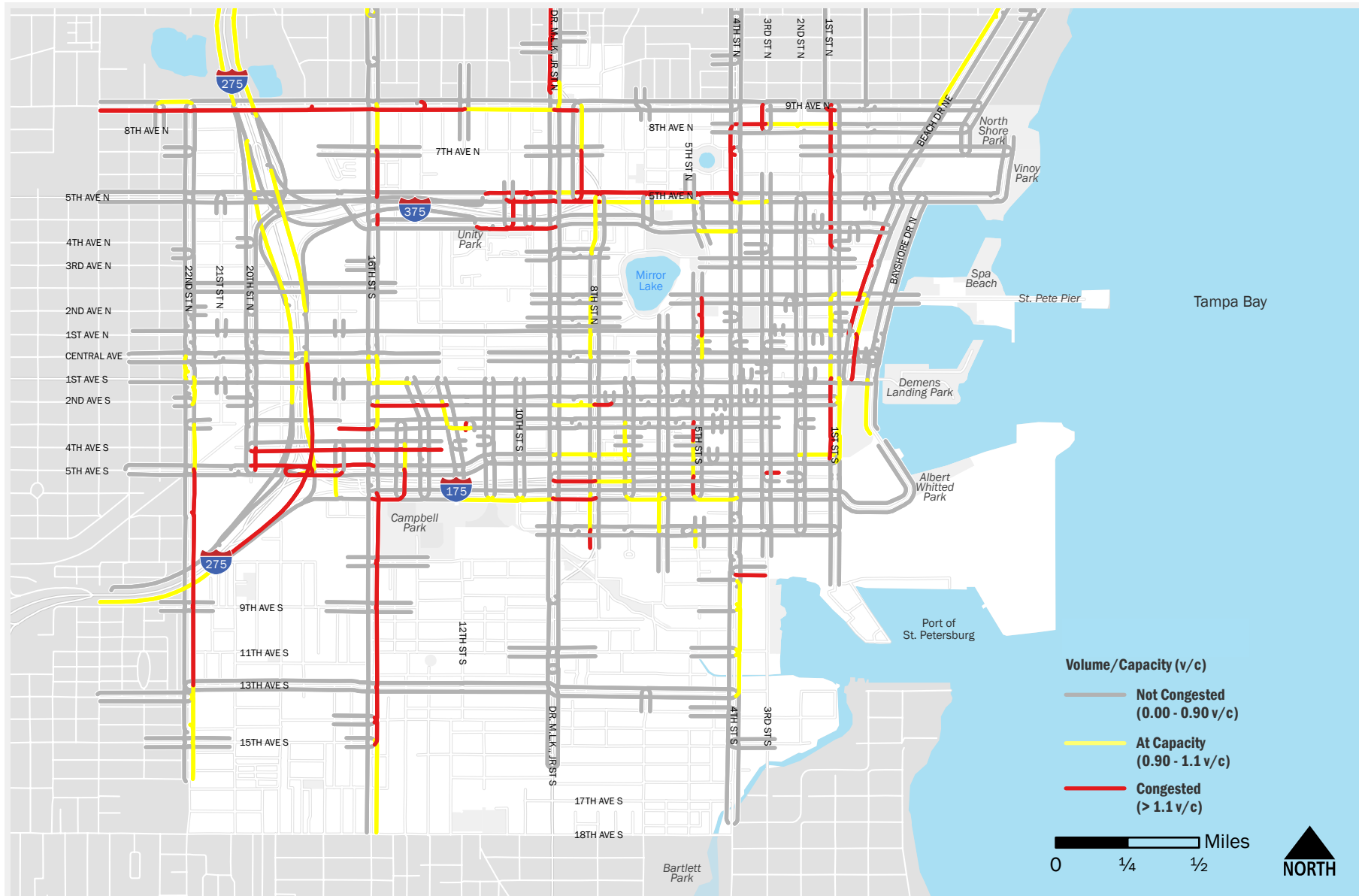
- (Q<sup>2</sup>) Alt. Future Grid Connections at Tropicana Field Site
- (Q<sup>2</sup>) Remove I-175, Alt. New Full Interchange to 5th Ave S/16th St, Two-Way Conversion of 4th/5th Ave S
- (R) Dr. MLK Jr St/8th St Two-Way Conversion
- (S) 4th St/3rd St Two-Way Conversion
- (U) Partial Removal of I-375, New Ramps to 12th St, Two-Way Conversion of 4th Ave S/5th Ave S, Roundabout at 4th Ave S/16th St N
- (V) 5th Ave Intersection Modifications
- (W) Beach Ave/4th Ave N Roundabout
- (X) 16th St Intersection Modifications

**Proposed Project Type Key:**

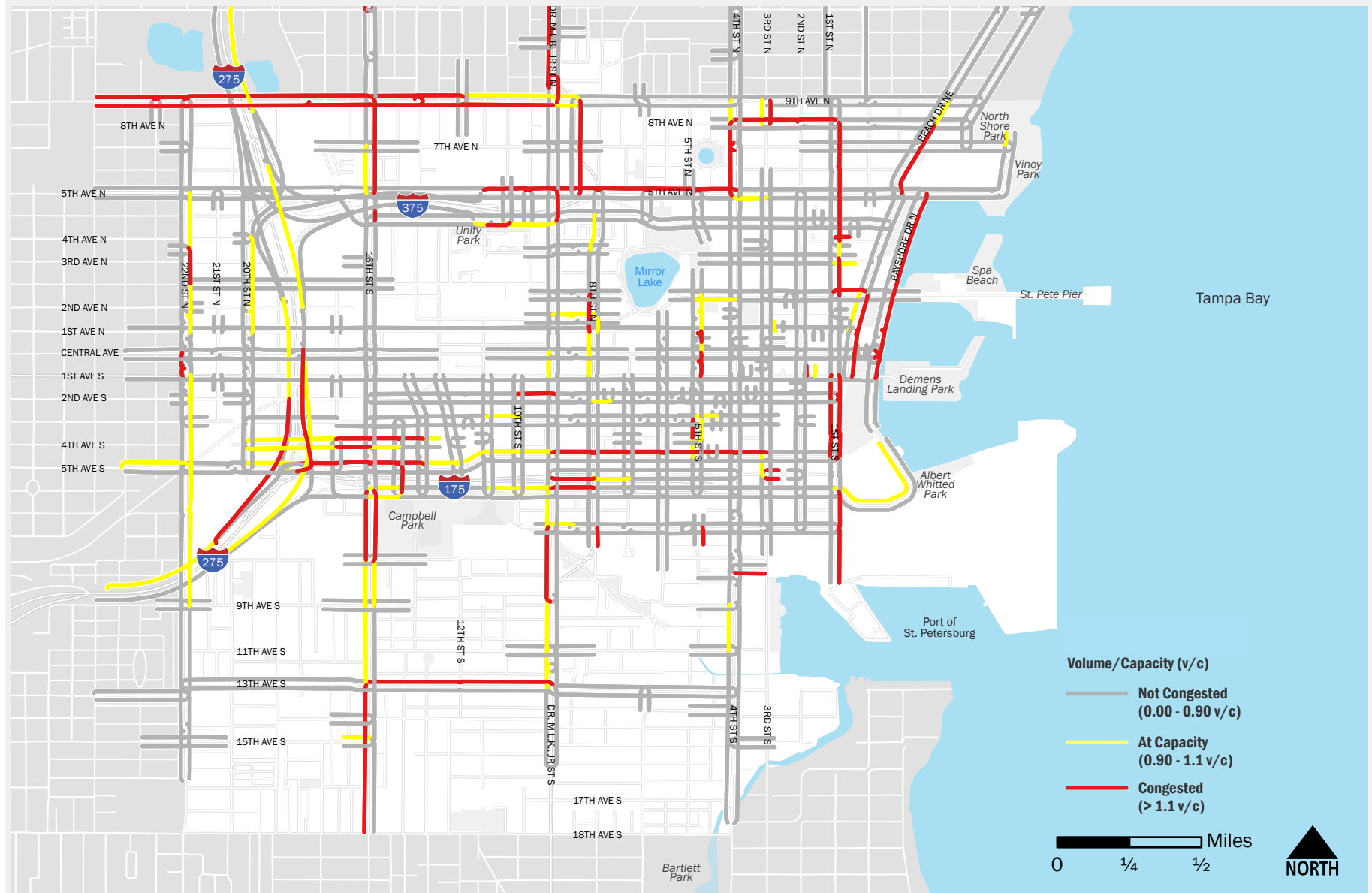
- Intersection Modification
  - Lane Re-allocation\*
  - Two-Way Conversion
  - New Street
  - Widen Street/New Lane(s)
  - New/Realigned Ramp
  - Vacated Roadway
  - Interstate Spur Modification
- \* for parking, transit, or bicycle facilities



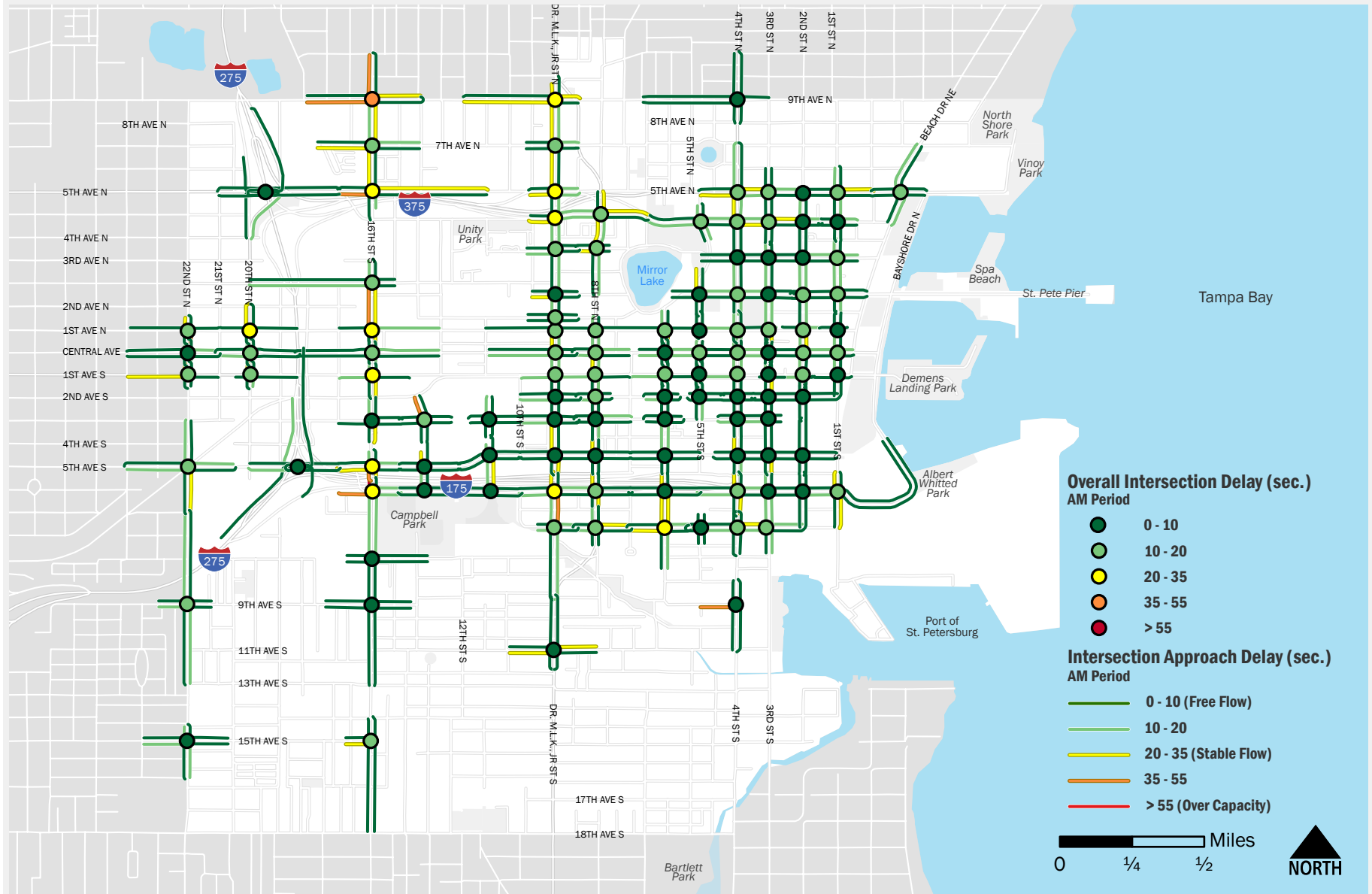
**FIGURE 38. SCENARIO 3 NETWORK (2045) CONGESTION, AM PEAK**



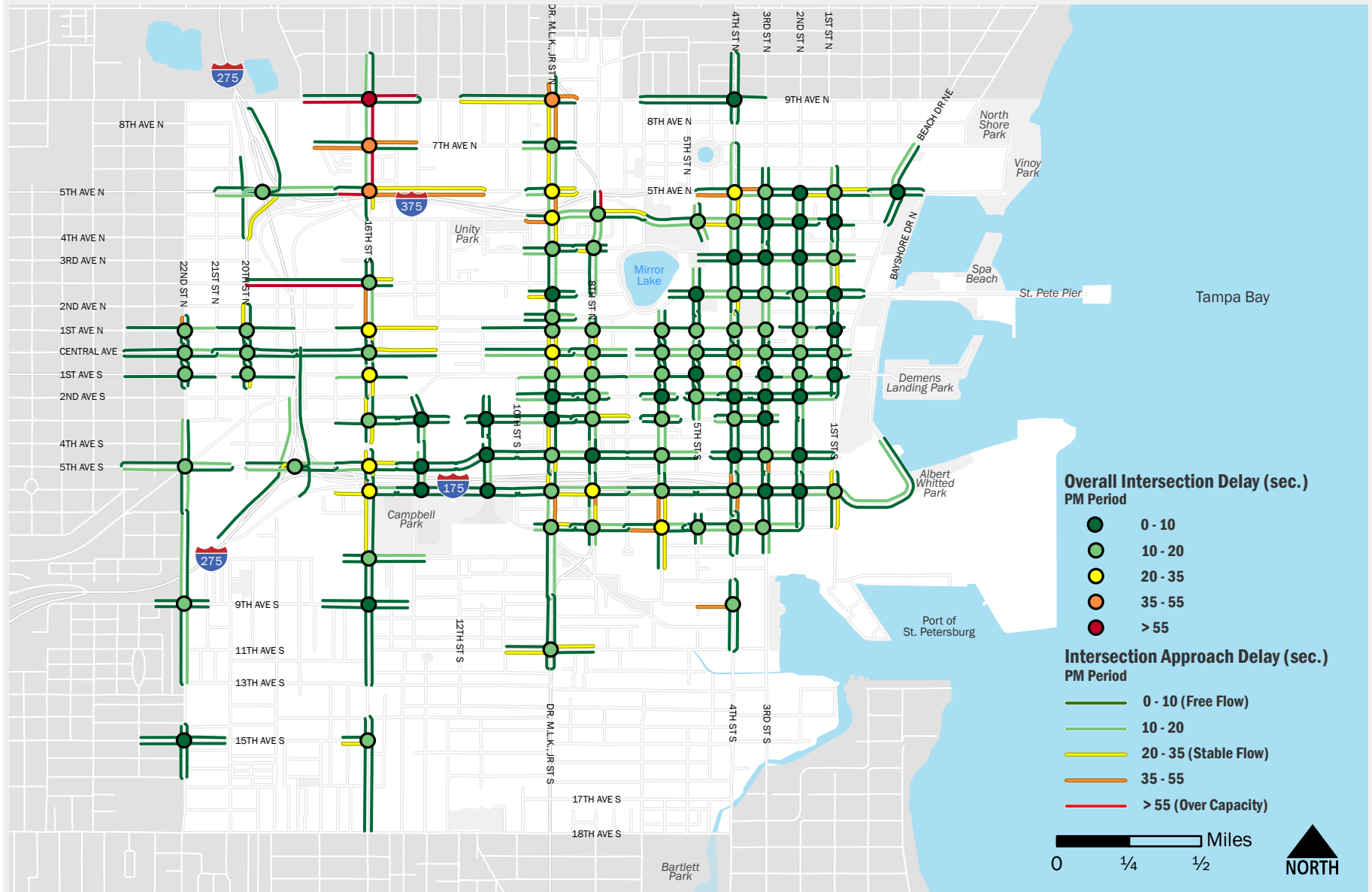
**FIGURE 39. SCENARIO 3 NETWORK (2045) CONGESTION, PM PEAK**



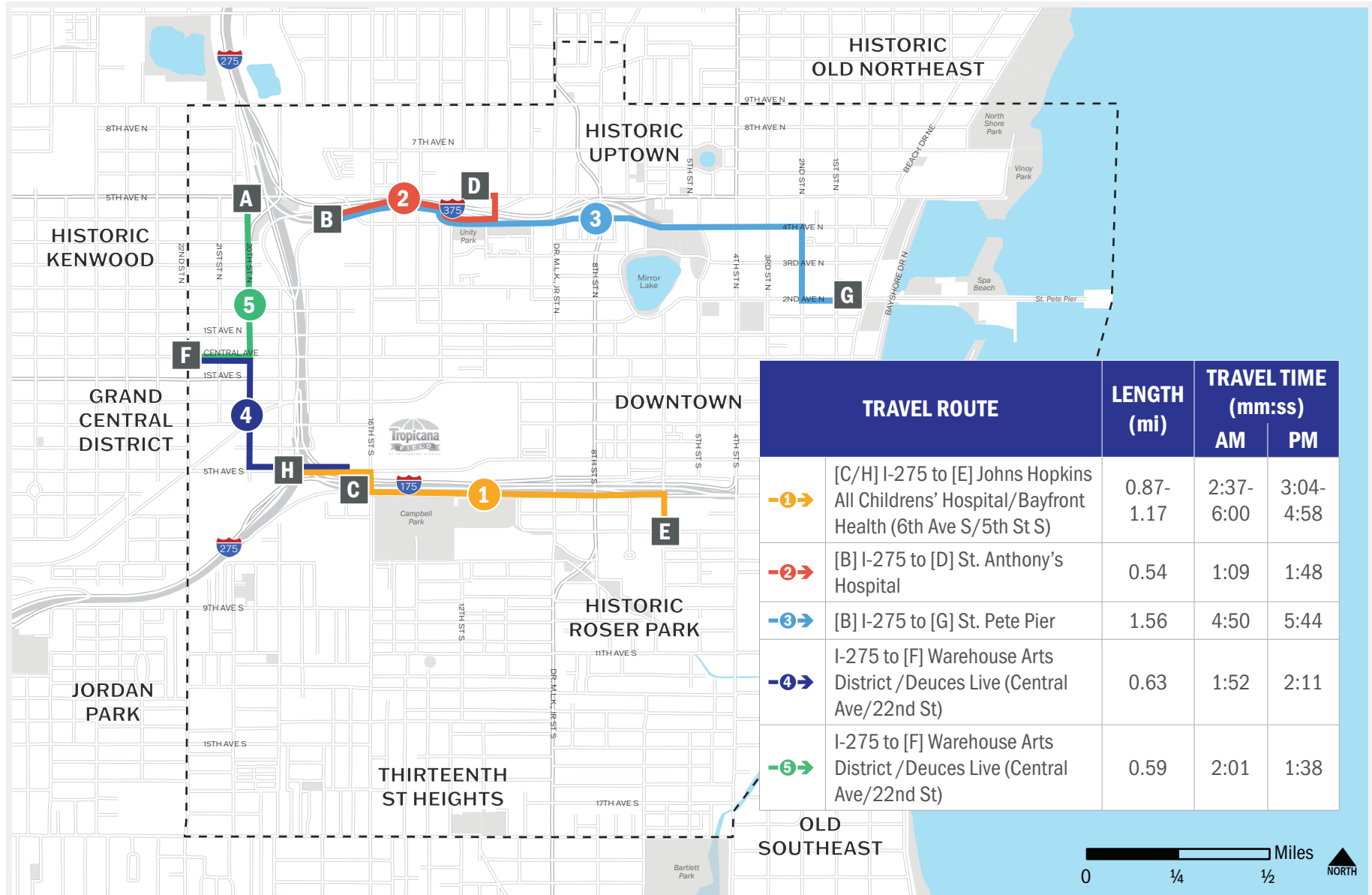
**FIGURE 40. SCENARIO 3 NETWORK (2045) INTERSECTION APPROACH DELAY, AM PEAK**



**FIGURE 41. SCENARIO 3 NETWORK (2045) INTERSECTION APPROACH DELAY, PM PEAK**



**FIGURE 42. SCENARIO 3 NETWORK (2045) TRAVEL TIMES FOR SELECT ROUTES MAP**





## Scenario 4 Network Performance Results

The Scenario 4 Network maintains the projects associated with the I-175 interstate spur from the Scenario 2 Network, such as the spur removal, interchange reconfiguration, Delmar Terrace conversion, and developing the grid within and to the south of the Tropicana Field Site. The I-375 interstate spur and interchange at 5th Ave N remain the same as in the Planned Network. The one-way to two-way conversions along Dr. MLK, Jr St/8th St and 4th St/3rd St from the previous Scenarios are left in place, with appropriate intersection geometry enhancements and signal timing updates. Finally, the 16th St lane re-allocation limits are altered from previous Scenarios, with the lane re-allocation project ending at 3rd Ave N, while north of 3rd Ave N, 16th St remains the same lane configuration as the existing roadway. Figure 43 shows the location of the Scenario 4 Network projects graphically.

### Roadway Utilization

Figures 44 and 45 show the congestion results of the Scenario 4 Network for the AM and PM peak periods, respectively. Under the Scenario 4 Network, in the future year (2045), several roadways are expected to operate under congested conditions. In the AM peak period, northbound I-275 within the I-175 interchange area and southbound Dr. MLK Jr St continue to operate as congested roadways. Portions of northbound 16th St, south of 5th Ave S and southbound 1st St, north of 4th Ave N are expected to operate under congested conditions.

In the PM peak period, northbound and southbound I-275 within the I-175 interchange area is expected to operate under congested conditions. Without I-175, drivers utilize the local road network to get to the newly created interchange at 5th Ave S. This puts strain on lower capacity roadways, such as 4th Ave S, which now supports only one westbound lane from 1st St to Dr. MLK Jr St. With I-375 remaining in place, along with two of the three existing on ramps, congestion along 5th Ave N is reduced over previous Scenarios, as the staggered access points help to distribute traffic. Similar to previous models, the PM peak period continues to see portions of Beach Dr and Bayshore Dr operate with heavy congestion.

The congestion seen in both the AM and PM peak periods is mainly due to the changes made to the high-capacity interstate spurs. The replacement of I-175 with a full interchange at 5th Ave S draws traffic to the remaining I-375 interchange spur. Portions of 4th Ave S see increased congestion as vehicles make their way to the 5th Ave S interchange. Some congested roadways also coincide with high destination areas within the greater DTSP area that typically favor non-vehicular traffic. A certain level of congestion is to be expected on these roadways as vehicles navigate to find parking and maneuver through the extensive downtown grid system.

### Intersection Delay

Figures 46 and 47 show the delay results of the Scenario 4 Network for the AM and PM peak periods, respectively. In the AM and PM peak periods, all signalized intersections, are expected to operate at acceptable levels of overall intersection delay. In both peak periods, the intersections that experience the highest delay are located along 16th St, north of 4th Ave N. These intersections operate at acceptable levels of delay but could be improved upon with turn bay or signal timing adjustments.

## Travel Time

Figure 48 shows the travel time results of the Scenario 4 Network. Of the four destinations, only the Warehouse Arts District/Deuces Live and Johns Hopkins All Children's/Bayfront allow for alternate starting points depending on if the driver is approaching from the north or south. Since route lengths vary for these destinations, a range of values is presented in the table to indicate travel time variability.

The biggest difference in travel times due to this variability in starting location is for the Johns Hopkins All Children's/Bayfront destination, due to the starting point for northbound I-275 at the 5th Ave S/16th St intersection, and the starting point for southbound I-275 at the 5th Ave S ramp terminal intersection. A driver coming from southbound I-275 must travel through three additional lights along congested portions of 5th Ave S before reaching the same starting point as the northbound I-275 driver. This is illustrated by the difference in travel time between the two routes is approximately two minutes in the AM and approximately one and a half minutes in the PM peak periods, even though the additional route length is 0.30 miles.

## Key Findings

Under the Scenario 4 Network, I-175 is fully removed and replaced with an interchange at 5th Ave S and I-375 remains as the existing configuration, except for the removal of the Dr MLK Jr St on ramp to I-375, due to the one-way to two-way conversion of Dr MLK Jr St. Retaining I-375 draws some traffic to this interchange spur, since it provides a higher capacity, faster speed route to I-275. The full I-275 interchange at 5th Ave S draws traffic since it provides better access for drivers to areas in southwestern downtown, such as the Warehouse Arts District/Deuces Live and Tropicana Field Site locations. In addition, the number of signalized intersections operating with unacceptable delay decreases compared to the Planned Network, even though the Scenario 4 Network has six additional signals not found in the Planned Network.

Travel times in the Scenario 3 Network generally increased compared to the Planned Network, except for the Warehouse Arts District/Deuces Live destination, due to the new I-275 interchange at 5th Ave S. This new interchange provides direct access to western DTSP from northbound I-275, rather than using I-175 to reach this destination.

**FIGURE 43. SCENARIO 4 NETWORK (2045) IMPROVEMENT PROJECT MAP**

**SCENARIO 4**

**E+C Project Key:**

- (A) 2nd Ave N Intersection Modifications
- (B) SunRunner BRT Lane Re-allocation
- (C) 5th Ave N Lane Re-allocation
- (D) 6th Ave S Lane Re-allocation

**Planned Project Key:**

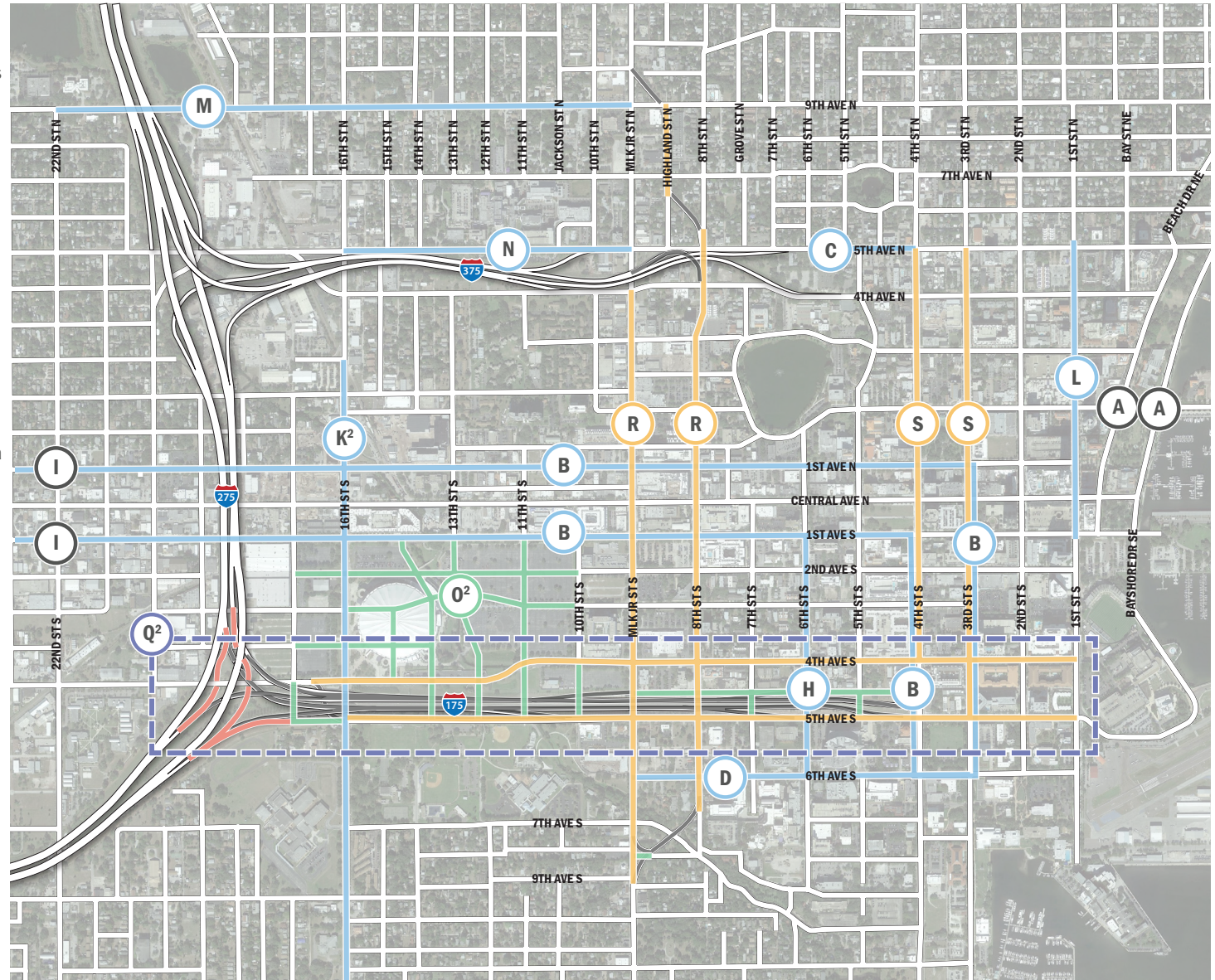
- (H) 6th St S Lane Re-allocation
- (I) 22nd St Intersection Modifications
- (K<sup>2</sup>) 16th St Lane Re-allocation
- (L) 1st St Lane Re-allocation
- (M) 9th Ave N Lane Re-allocation
- (N) 5th Ave N Lane Re-allocation

**Scenario 4 Project Key:**

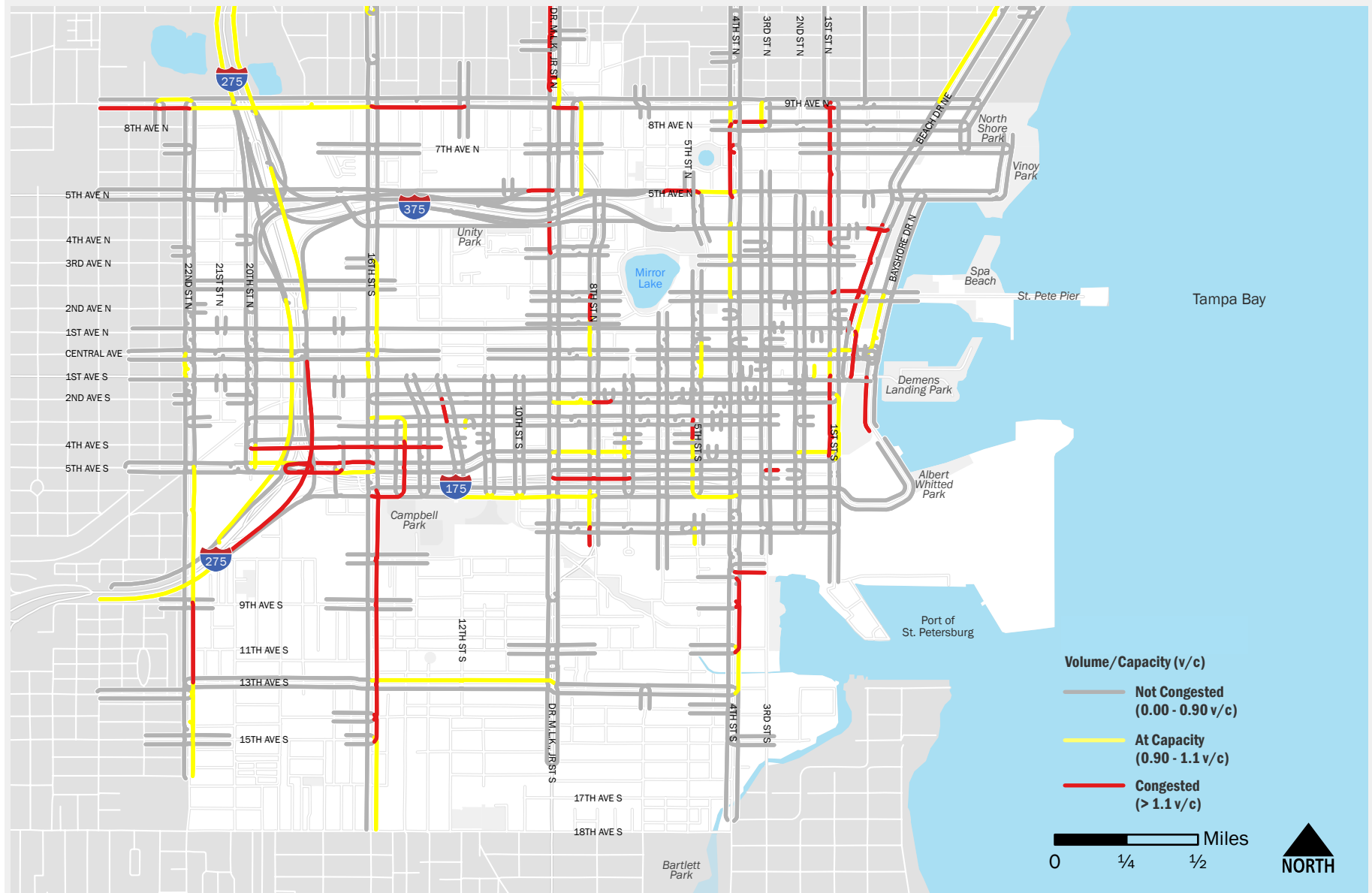
- (Q<sup>2</sup>) Future Grid Connections at Tropicana Field Site
- (Q<sup>2</sup>) Remove I-175, Provide New Interchange to 5th Ave S and 16th St, and Two-Way Conversion of 4th Ave S/5th Ave S
- (R) Dr. MLK Jr St/8th St Two-Way Conversion
- (S) 4th St/3rd St Two-Way Conversion

**Proposed Project Type Key:**

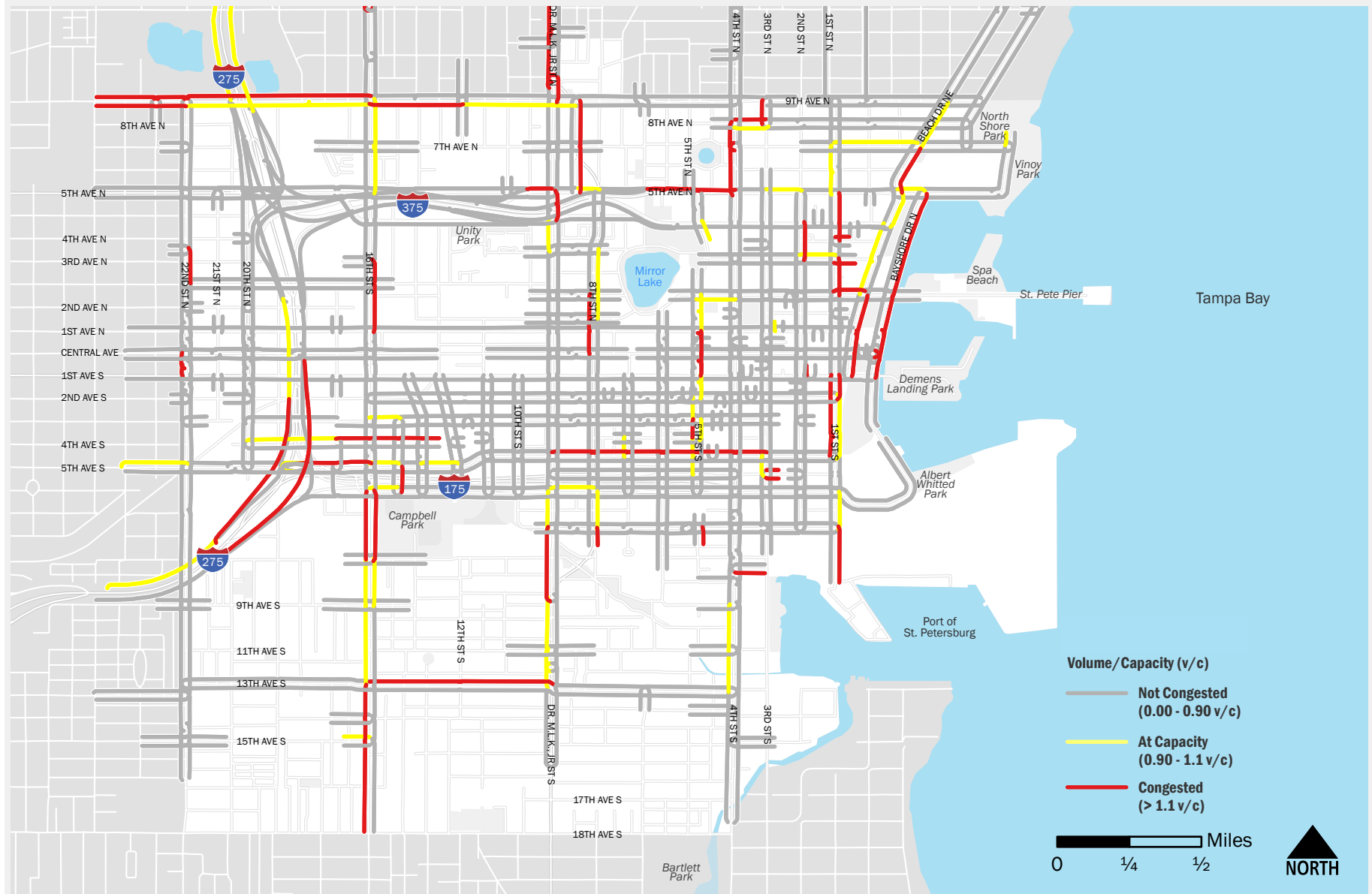
- Intersection Modification
  - Lane Re-allocation\*
  - Two-Way Conversion
  - New Street
  - Widen Street/New Lane(s)
  - New/Realigned Ramp
  - Vacated Roadway
  - Interstate Spur Modification
- \* for parking, transit, or bicycle facilities



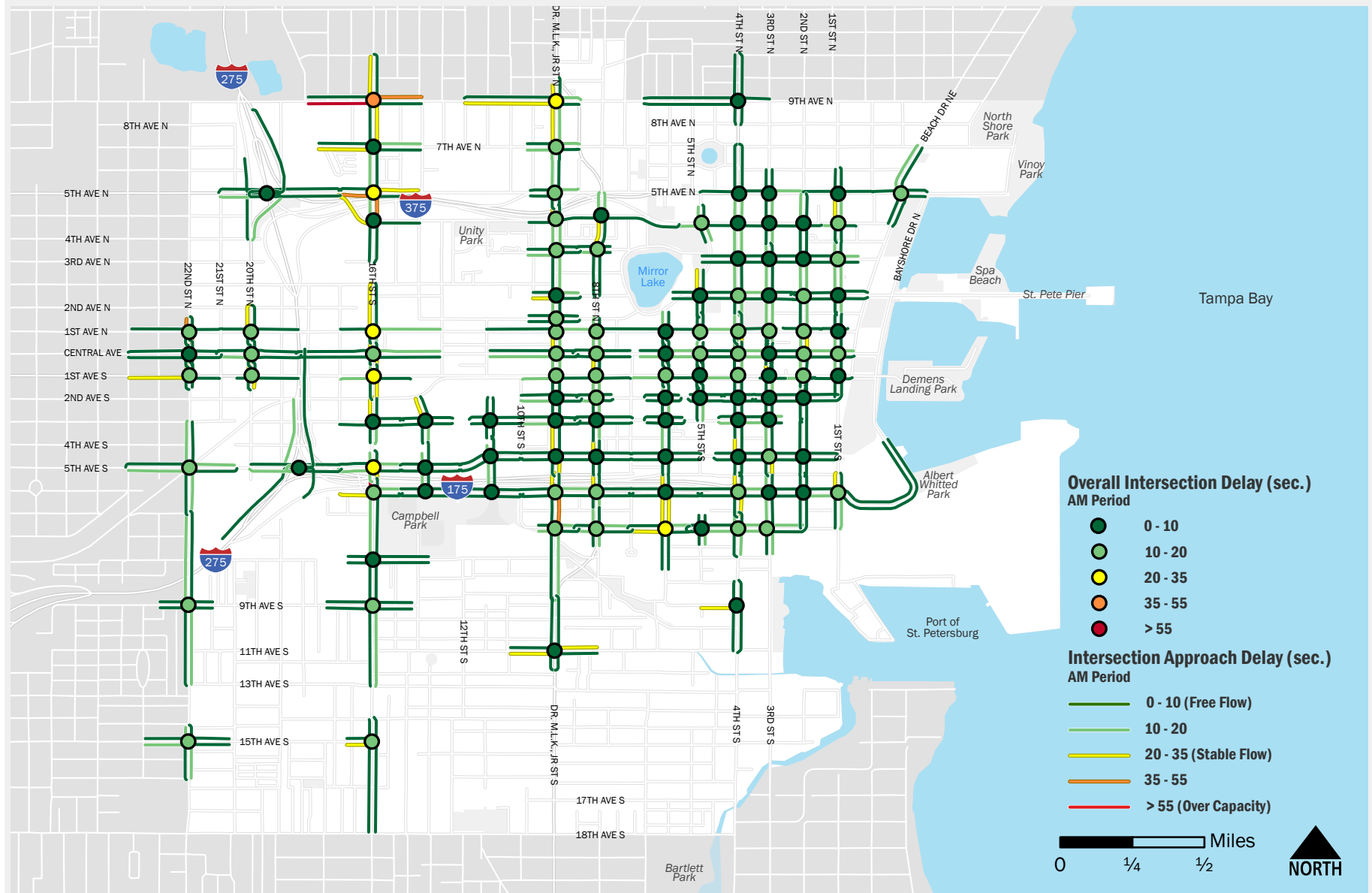
**FIGURE 44. SCENARIO 4 NETWORK (2045) CONGESTION, AM PEAK**



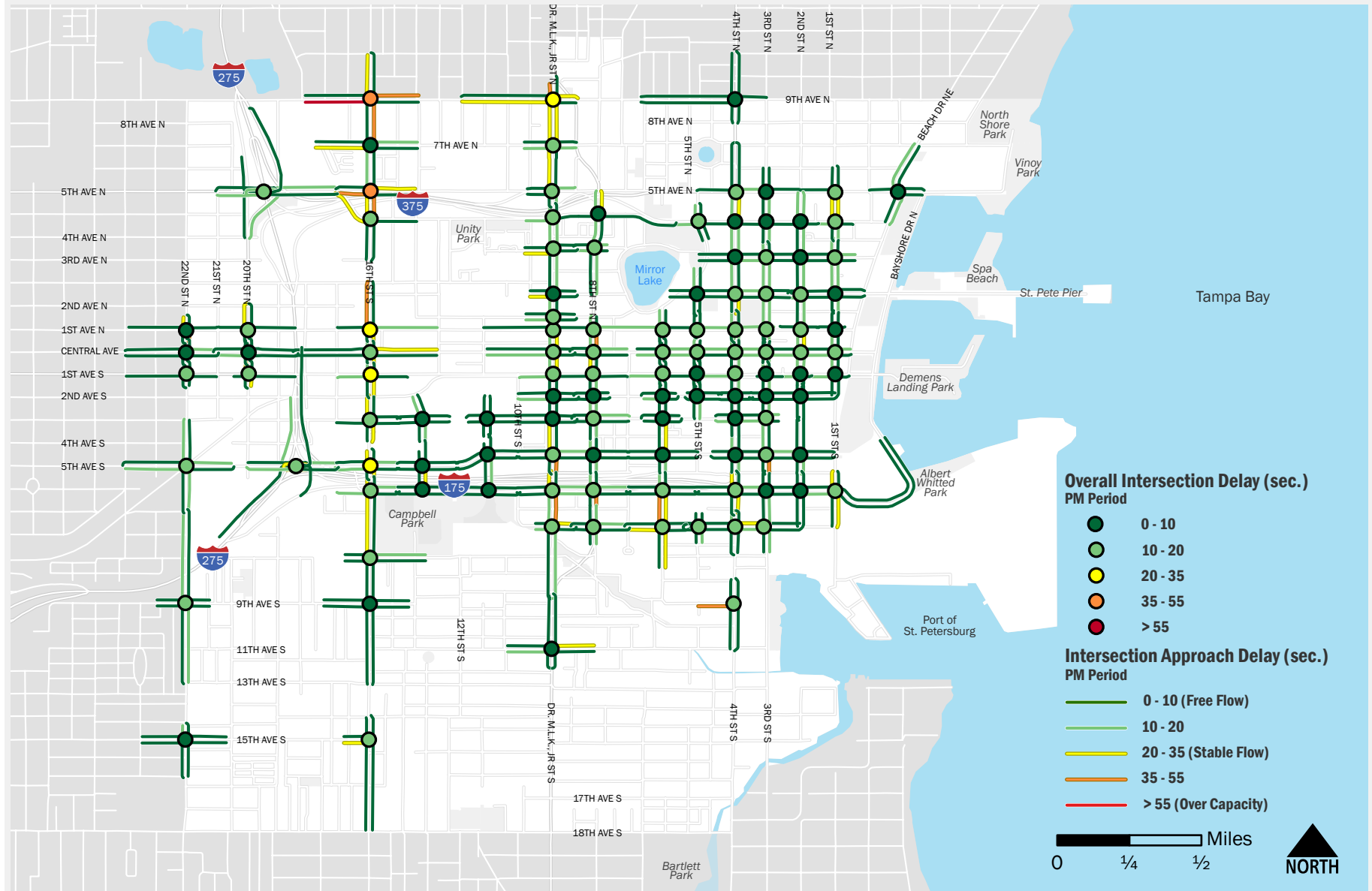
**FIGURE 45. SCENARIO 4 NETWORK (2045) CONGESTION, PM PEAK**



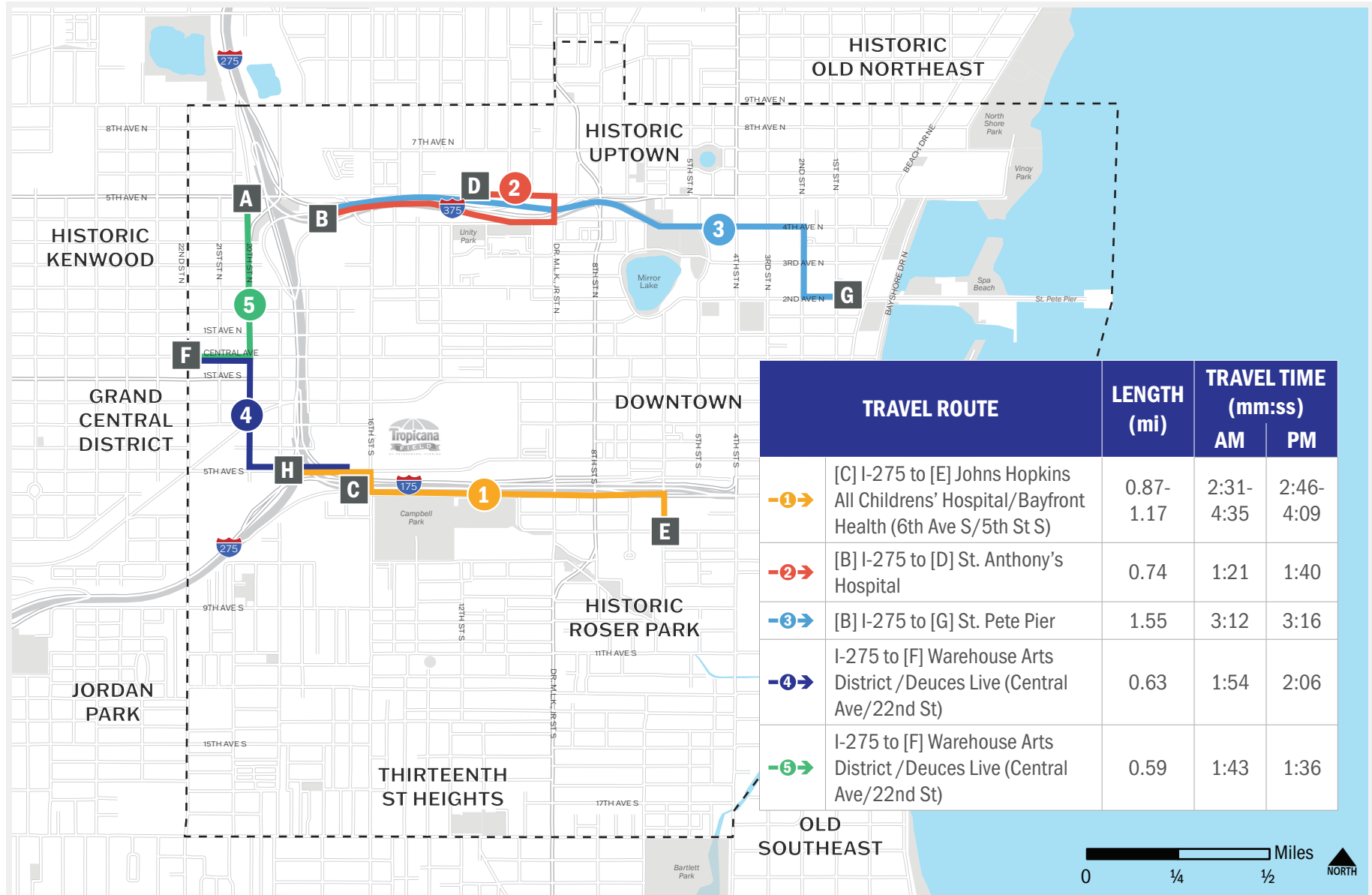
**FIGURE 46. SCENARIO 4 NETWORK (2045) INTERSECTION APPROACH DELAY, AM PEAK**



**FIGURE 47. SCENARIO 4 NETWORK (2045) INTERSECTION APPROACH DELAY, PM PEAK**



**FIGURE 48. SCENARIO 4 NETWORK (2045) TRAVEL TIMES FOR SELECT ROUTES MAP**





## Scenario 5 Network Performance Results

The Scenario 5 Network maintains the projects associated with the I-375 interstate spur from the Scenario 2 Network, such as the spur removal and one-way to two-way conversion of 4th and 5th Aves N. However, on top of the interchange developed in Scenario 2, an additional ramp from northbound I-275 will connect to the 16th St/4th Ave N intersection. 5th Ave N will also vary from Scenario 2; it will be widened to four lanes between 16th St and Dr MLK Jr St, with two lanes in each direction. East of Dr MLK Jr St, it will be a three-lane roadway with one eastbound and two westbound lanes. The I-175 interstate spur will remain in its current configuration. The one-way to two-way conversions along Dr. MLK, Jr St/8th St and 4th St/3rd St from the previous Scenarios are left in place, with appropriate intersection geometry enhancements and signal timing updates. Finally, smaller intersection improvement projects requested by the City of St. Petersburg are also presented in the model. Figure 49 shows the location of the Scenario 5 Network projects graphically.

### Roadway Utilization

Figures 50 and 51 show the congestion results of the Scenario 5 Network for the AM and PM peak periods, respectively. Under the Scenario 5 Network, in the future year (2045), several roadways are expected to operate under congested conditions. In the AM peak period, northbound I-275 within the I-175 interchange area and southbound Dr. MLK Jr St continue to operate as congested roadways. Portions of northbound 16th St, south of 5th Ave S and southbound 1st St, north of 4th Ave N are expected to operate under congested conditions.

In the PM peak period, southbound I-275 within the I-175 interchange area, as well as the northbound I-275 ramp from I-175 are expected to operate under congested conditions. Without I-375, drivers utilize the local road network to get to the newly created full interchange at 5th Ave N. This puts strain on lower capacity roadways, such as 5th Ave N, which sees some areas of congestion, but is mostly mitigated due to the additional westbound lane provided over the previous Scenarios. Similar to previous models, the PM peak period continues to see portions of Beach Dr and Bayshore Dr operate with heavy congestion.

The congestion seen in both the AM and PM peak periods is mainly due to the changes made to the high-capacity interstate spurs. The replacement of I-375 with a full interchange at 5th Ave N draws traffic to the remaining interchange spur at I-175. The local street network near I-175 is not expected to experience congestion, while the additional westbound lane along 5th Ave N, is expected to alleviate the majority of the congestion that is likely to occur with the removal of I-375. Some congested roadways also coincide with high destination areas within the greater DTSP area that typically favor non-vehicular traffic. A certain level of congestion is to be expected on these roadways as vehicles navigate to find parking and maneuver through the extensive downtown grid system.

### Intersection Delay

Figures 52 and 53 show the delay results of the Scenario 5 Network for the AM and PM peak periods, respectively. In the AM peak period, all signalized intersections, are expected to operate at acceptable levels of overall intersection delay, while one signalized intersection is not expected to operate at acceptable levels of delay in the PM peak period. The failing intersection in the PM peak period is located along 22nd St at 5th Ave S. While not failing, intersections along 16th St at 7th Ave S, 5th Ave N, and 9th Ave N operate with high delay. This shows that 16th St is a highly utilized roadway as drivers use it as a main roadway to access the interchange at 5th Ave N.

## Travel Time

Figure 54 shows the travel time results of the Scenario 5 Network. Of the four destinations, three allow for alternate starting points depending on if the driver is approaching from the north or south. The only one that allows for both northbound and southbound drivers to access the destination from the same starting point is Johns Hopkins All Children's Hospital. Since route lengths vary for the other three destinations, a range of values is presented in the table to indicate travel time variability.

The biggest difference in travel times due to this variability in starting location is for the Warehouse Arts District/Deuces Live area, due to drivers arriving from north of the study area having access via the southbound I-275 off-ramp to 5th Ave N, while the drivers from the south must use I-175 and travel through the center of downtown St. Pete to reach this destination. St. Anthony's Hospital also shows a wide range of travel times, since northbound I-275 drivers have more direct access to this destination, via the underutilized 4th Ave N. Southbound drivers must travel through four additional signals along 5th Ave N to access St. Anthony's Hospital.

## Key Findings

Under the Scenario 5 Network, I-375 is fully removed and replaced with an interchange at 5th Ave N while I-175 remains in its existing configuration. The full removal of I-375 reduces the available east-west capacity within DTSP, although providing an additional westbound lane along 5th Ave N, provides some relief over the previous Scenarios. Additional planned improvements along local roadways re-allocate existing capacity, further reducing vehicular capacity, and increasing the number of roadways operating with congestion. However, even with additional observed congestion, the number of signalized intersections operating with unacceptable delay decreases compared to the Planned Network, even though the Scenario 5 Network has four additional signals not found in the Planned Network.

Travel times in the Scenario 5 Network are generally similar compared to the Planned Network, except for the St. Anthony's and St. Pete Pier destinations, which are increased due to the removal of I-375.



**FIGURE 49. SCENARIO 5 NETWORK (2045) IMPROVEMENT PROJECT MAP**

**SCENARIO 5**

**E+C Project Key:**

- (A) 2nd Ave N Intersection Modifications
- (B) SunRunner BRT Lane Re-allocation
- (D) 6th Ave S Lane Re-allocation

**Planned Project Key:**

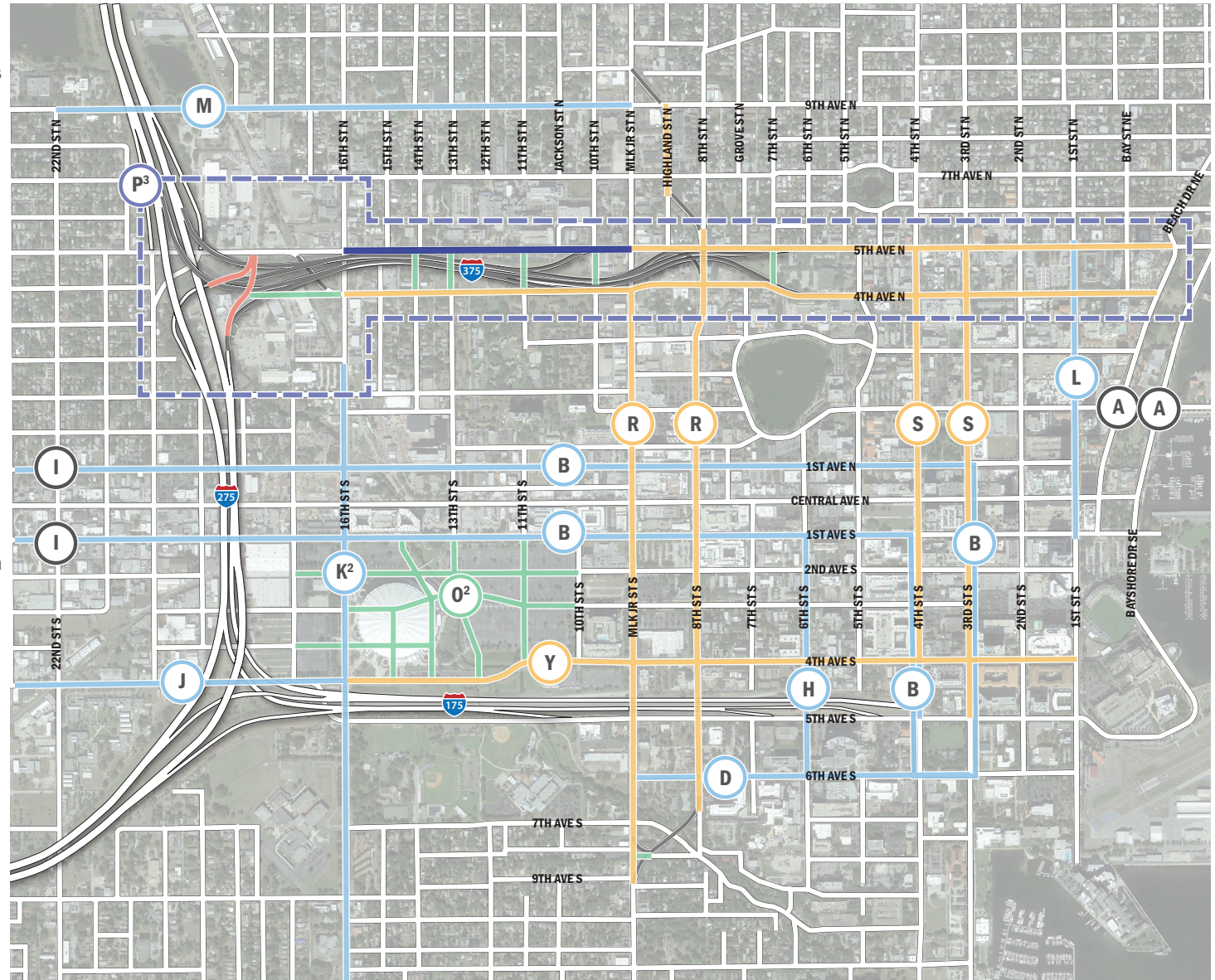
- (H) 6th St S Lane Re-allocation
- (I) 22nd St Intersection Modifications
- (J) 5th Ave S Lane Re-allocation
- (K<sup>2</sup>) 16th St Lane Re-allocation
- (L) 1st St Lane Re-allocation
- (M) 9th Ave N Lane Re-allocation

**Scenario 5 Project Key:**

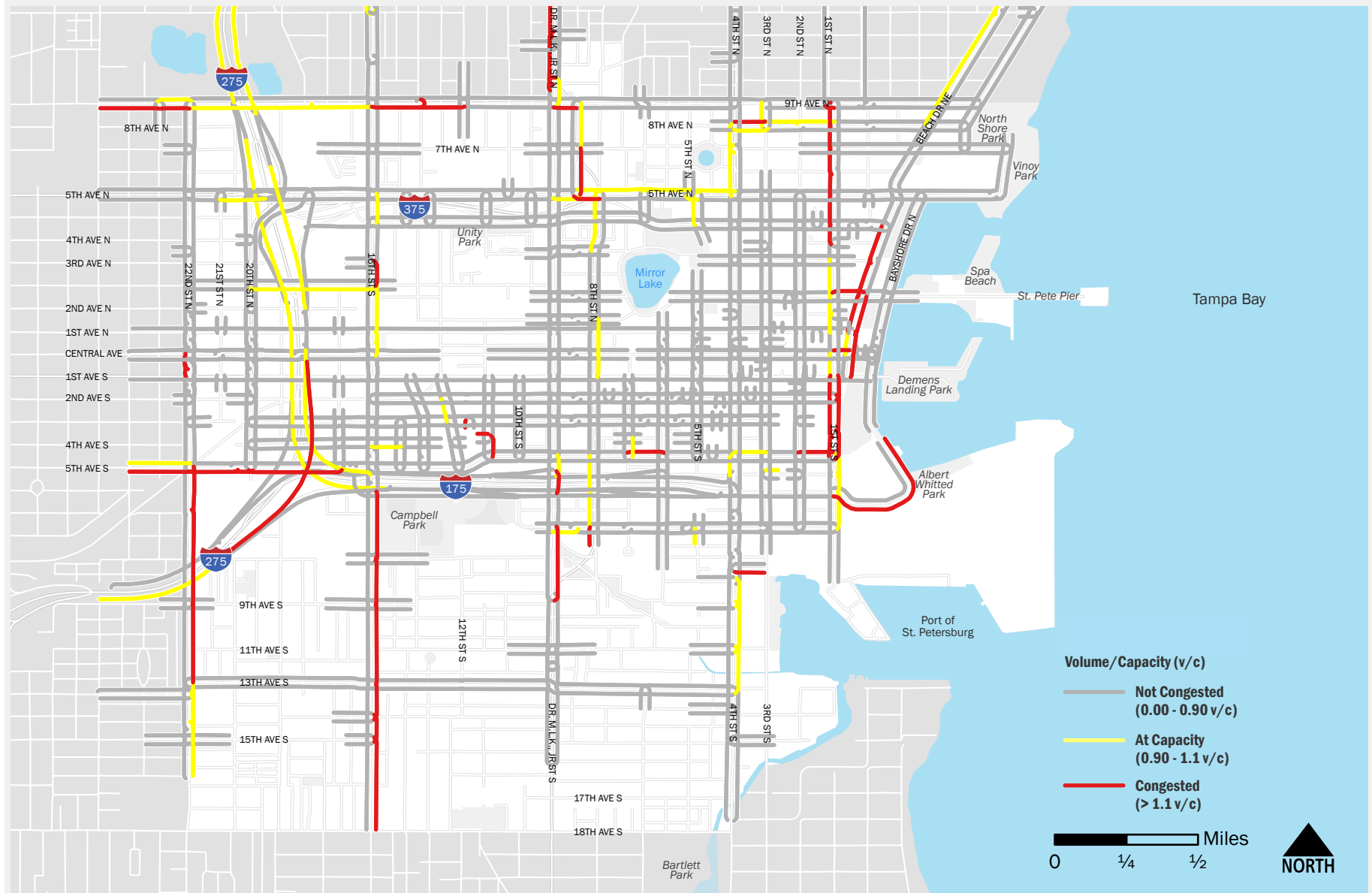
- (O<sup>2</sup>) Alt. Future Grid Connections at Tropicana Field Site
- (P<sup>3</sup>) Remove I-375, Alt. Full Interchange at I-275/5th Ave N, Two-Way Conversion of 4th (1EB/1WB) and 5th Ave N (2WB/1EB), Widen 5th Ave N (1 additional EB lane) between 16th St and Dr. MLK Jr. St
- (R) Dr. MLK Jr St/8th St Two-Way Conversion
- (S) 4th St/3rd St Two-Way Conversion
- (Y) 4th Ave S Two-way Conversion

**Proposed Project Type Key:**

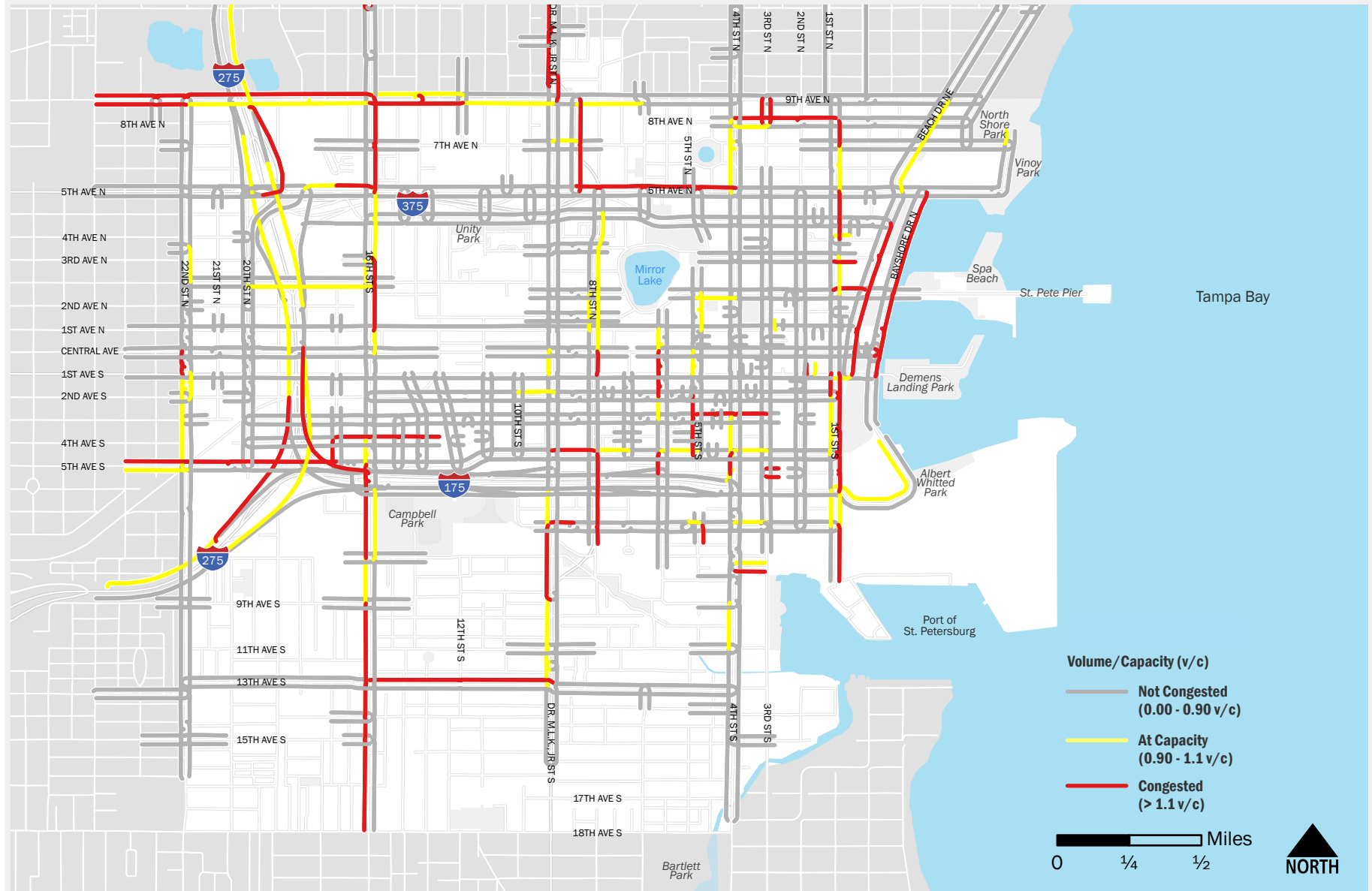
- Intersection Modification
  - Lane Re-allocation\*
  - Two-Way Conversion
  - New Street
  - Widen Street/New Lane(s)
  - New/Realigned Ramp
  - Vacated Roadway
  - Interstate Spur Modification
- \* for parking, transit, or bicycle facilities



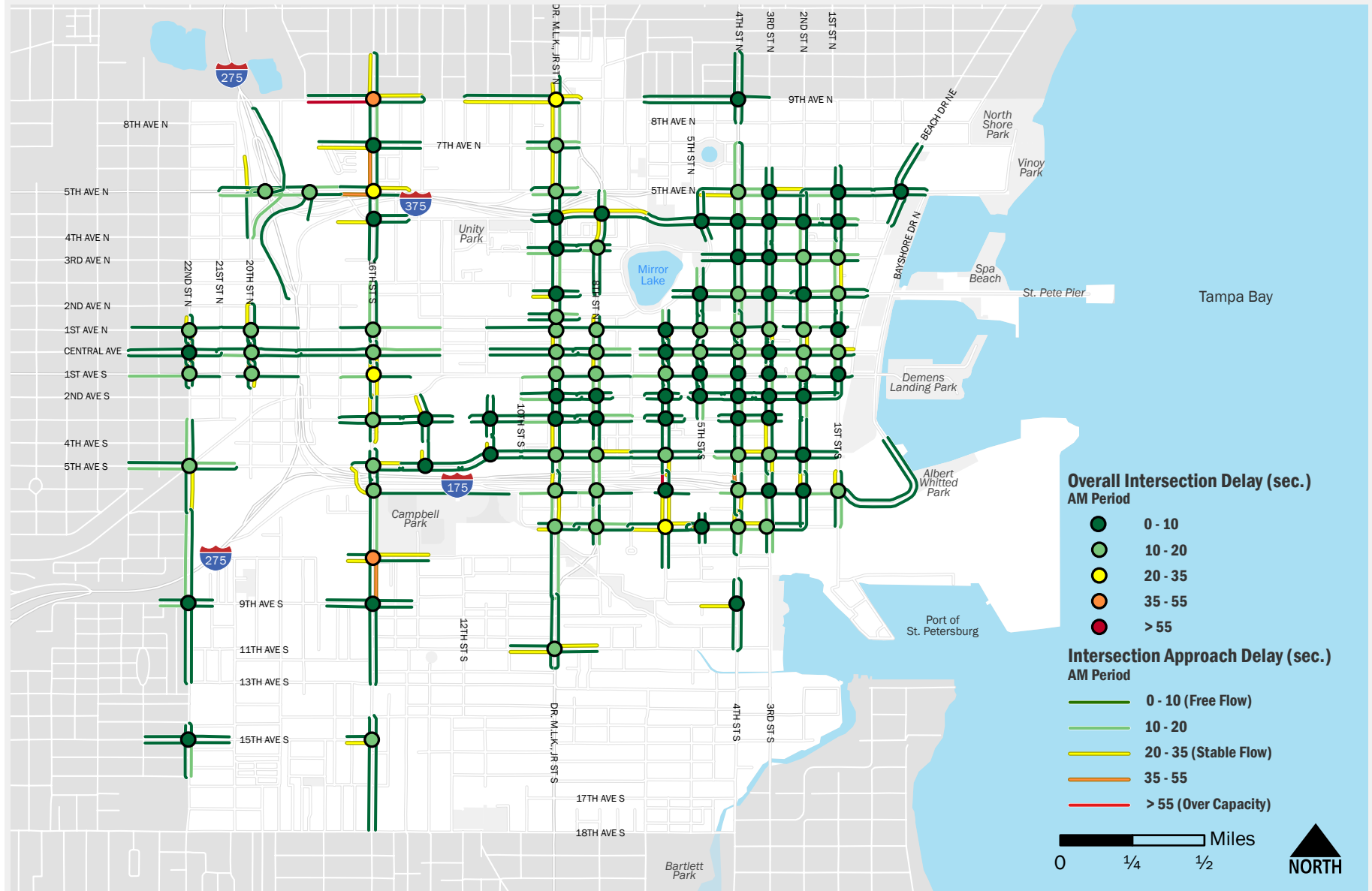
**FIGURE 50. SCENARIO 5 NETWORK (2045) CONGESTION, AM PEAK**



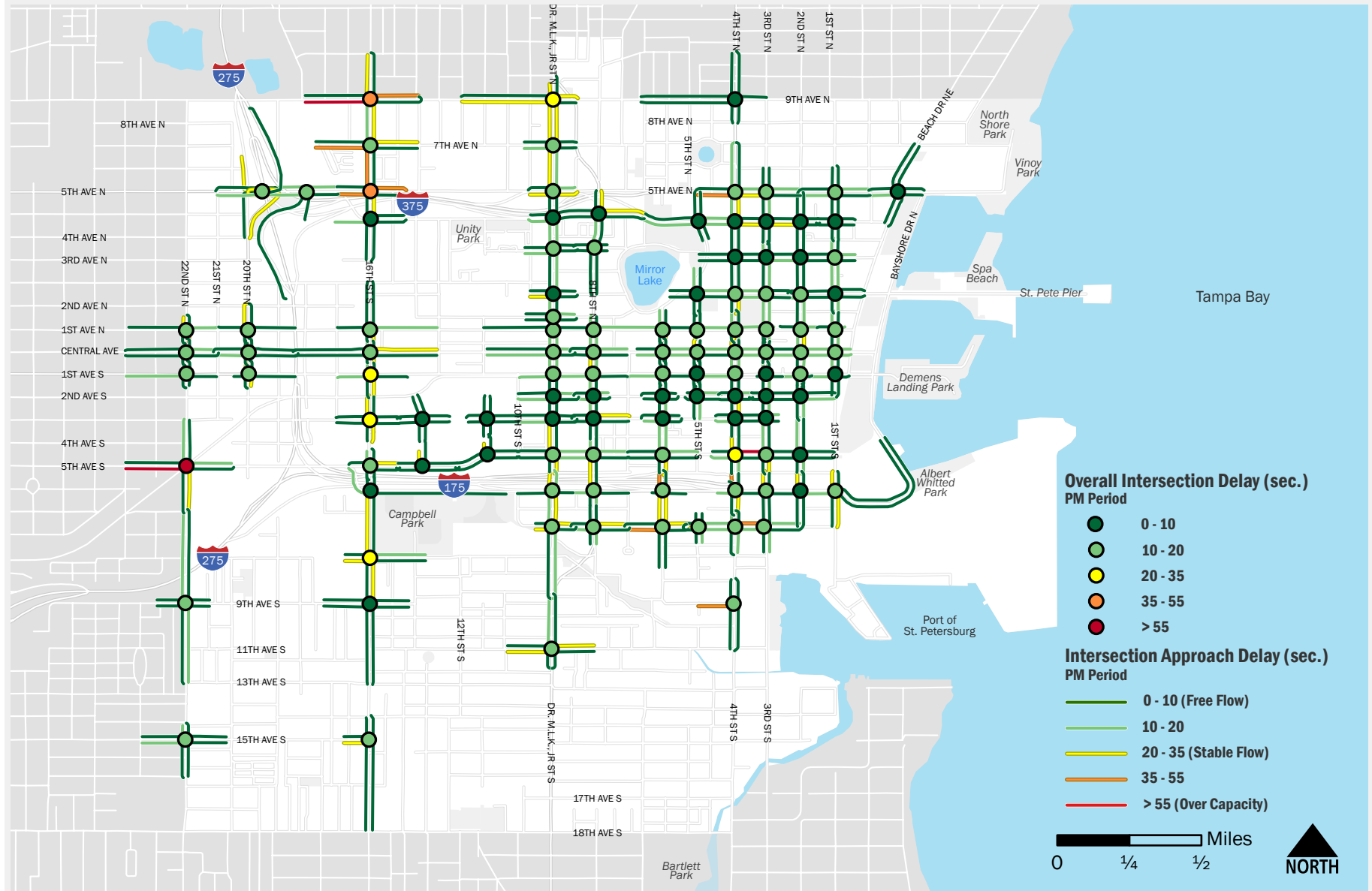
**FIGURE 51. SCENARIO 5 NETWORK (2045) CONGESTION, PM PEAK**



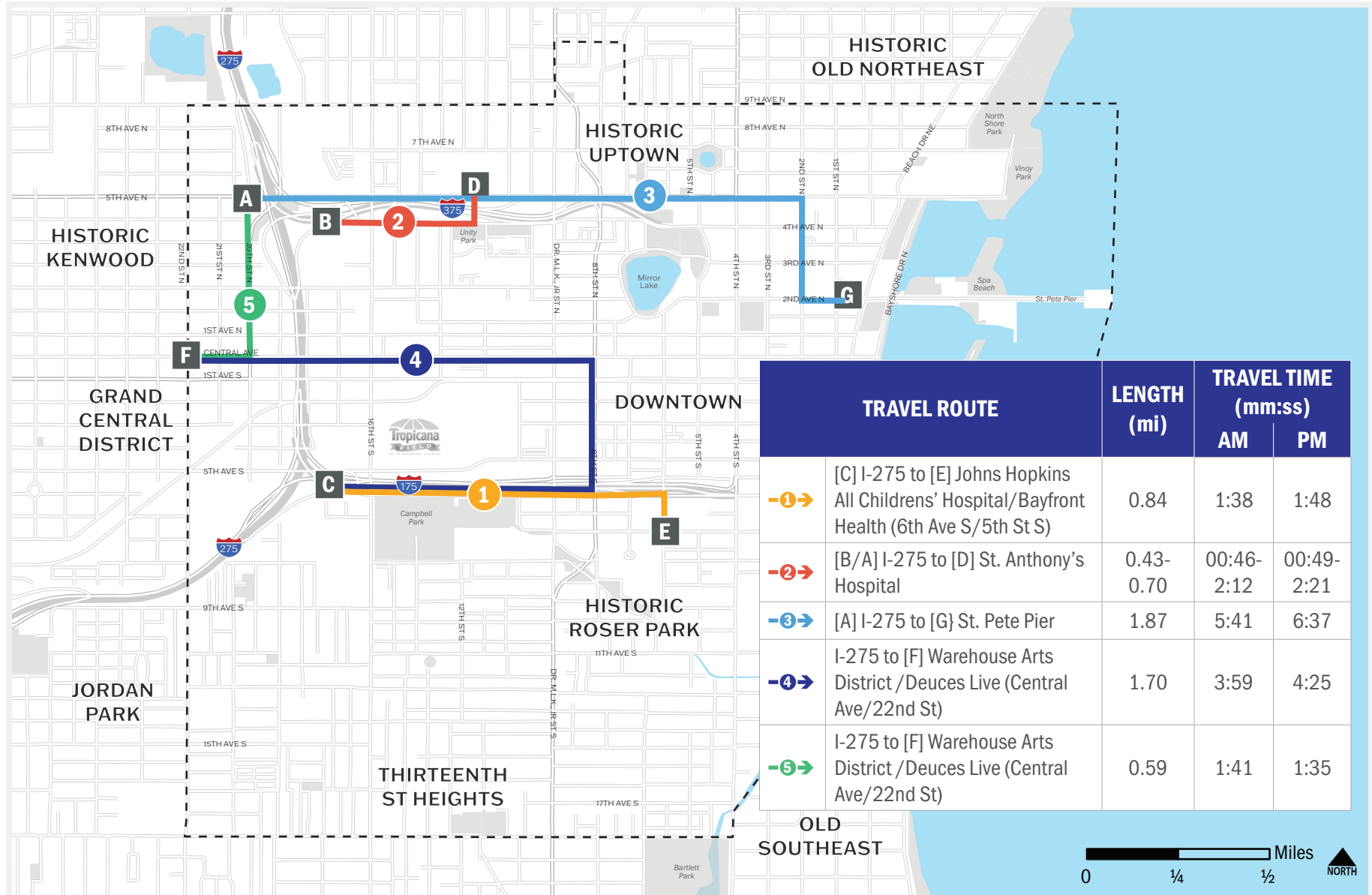
**FIGURE 52. SCENARIO 5 NETWORK (2045) INTERSECTION APPROACH DELAY, AM PEAK**



**FIGURE 53. SCENARIO 5 NETWORK (2045) INTERSECTION APPROACH DELAY, PM PEAK**



**FIGURE 54. SCENARIO 5 NETWORK (2045) TRAVEL TIMES FOR SELECT ROUTES MAP**





# 5/EVALUATION RESULTS

## Scenario Performance Comparison

A summary of the performance of each scenario as compared to the Planned Network model results is provided in Table 4.

**TABLE 4. SCENARIO PERFORMANCE COMPARISON TABLE**

Scenario Model	Congestion	Intersection Delay	Travel Time
Planned Network	<p>Network Roadway Miles: 98.4 mi</p> <p>AM Congestion (5% or 5.0 mi.)</p> <p>PM Network Congestion (8% or 8 mi.)</p> <p>DTSP Congested Roadways: SB Dr. MLK Jr St; NB 22nd St and 16th St (south of 5th Ave S); Beach Dr; Bayshore Dr; 9th Ave N</p>	<p>Signalized Intersections: 109</p> <p>AM Delay (1% or 1 intersections)</p> <p>PM Delay (5% or 5 intersections)</p> <p>DTSP Intersections with High Delay: 4th, 5th, 7th, and 9th Aves N at 16th St; 5th Ave S/22nd St</p>	<p>I-275 to St. Anthony’s via I-375 or I-275/5th Ave N interchange: 1:22 in AM peak</p> <p>I-275 to Johns Hopkins All Children’s/Bayfront via I-175 or new I-275/5th Ave S interchange: 1:53 in AM peak</p>
<b>The performance of each scenario below is compared to the Planned Network Model results.</b>			
Scenario 1	<p><b>Percent of network with congestion is higher than Planned. Without I-375, 5th Ave N is more congested.</b></p> <p>Network Roadway Miles: 105.6 mi</p> <p>AM Congestion (8% or 8.6 mi.)</p> <p>PM Network Congestion (15% or 15.8 mi.)</p> <p>DTSP Congested Roadways: SB Dr. MLK Jr St; NB 22nd St (south of 5th Ave S); Beach Dr; Bayshore Dr; 9th Ave N; 5th Ave N; 3rd, 4th, 5th Aves S; 8th St</p>	<p><b>The number of signalized intersections with significant delay is similar to Planned.</b></p> <p>Signalized Intersections: 108</p> <p>AM Delay (2% or 2 intersections)</p> <p>PM Delay (5% or 5 intersections)</p> <p>DTSP Intersections with High Delay: 5th Ave S and 4th, 5th, 9th Aves N at 16th St; 5th Ave S/22nd St</p>	<p><b>Slight increases (30 sec to 1:30 min) to travel times between I-275 and major hospitals.</b></p> <p>I-275 to St. Anthony’s via I-375 or I-275/5th Ave N interchange: 2:40 in AM peak</p> <p>I-275 to Johns Hopkins All Children’s/Bayfront via I-175 or new I-275/5th Ave S interchange: 2:21 in AM peak</p>
Scenario 2	<p><b>Percent of network with congestion is higher than Planned. Without I-375, 5th Ave N is more congested.</b></p> <p>Network Roadway Miles: 108.1 mi</p> <p>AM Congestion (10% or 10.3 mi.)</p> <p>PM Network Congestion (11% or 12.1 mi.)</p> <p>DTSP Congested Roadways: SB Dr. MLK Jr St; 16th St (south of 5th Ave S); Beach Dr; Bayshore Dr; 9th Ave N; 5th Ave N; 2nd Ave S</p>	<p><b>The number of signalized intersections with significant delay is similar to Planned.</b></p> <p>Signalized Intersections: 117</p> <p>AM Delay (0% or 0 intersections)</p> <p>PM Delay (3% or 3 intersections)</p> <p>DTSP Intersections with High Delay: 4th, 5th, 9th Aves N at 16th St</p>	<p><b>Modest increases (~ 1:30 min to 3 min) to travel times between I-275 and major hospitals.</b></p> <p>I-275 to St. Anthony’s via I-375 or I-275/5th Ave N interchange: 2:47 in AM peak</p> <p>I-275 to Johns Hopkins All Children’s/Bayfront via I-175 or new I-275/5th Ave S interchange: 4:46 in AM peak</p>

**TABLE 4 (CONT.) SCENARIO PERFORMANCE COMPARISON TABLE**

Scenario Model	Congestion	Intersection Delay	Travel Time
Scenario 3	<p><b>Percent of network with congestion is higher than Planned. With consolidated ramps to shortened I-375, 5th Ave N is more congested.</b></p> <p>Network Roadway Miles: 109.7 mi            AM Congestion (8% or 8.6 mi.)            PM Network Congestion (11% or 11.6 mi.)            DTSP Congested Roadways: SB Dr. MLK Jr St; 16th St and 22nd St (south of 5th Ave S); Beach Dr; Bayshore Dr; 9th Ave N; 5th Ave N; 4th Ave S; 5th Ave S</p>	<p><b>The number of signalized intersections with significant delay is less than Planned.</b></p> <p>Signalized Intersections: 116            AM Delay (0% or 0 intersections)            PM Delay (&lt;1% or 1 intersection)            DTSP Intersections with High Delay: 9th Ave N/16th St</p>	<p><b>Similar travel time between I-275 and St. Anthony's; modest increase (~ 3:30 min) to Johns Hopkins All Children's/Bayfront.</b></p> <p>I-275 to St. Anthony's via I-375 or I-275/5th Ave N interchange: 1:09 in AM peak            I-275 to Johns Hopkins All Children's/Bayfront via I-175 or new I-275/5th Ave S interchange: 6:00 in AM peak</p>
Scenario 4	<p><b>Percent of network with congestion is similar to Planned. Removal of I-175 does not adversely affect local street network with additional capacity on 5th Ave S/4th Ave S.</b></p> <p>Network Roadway Miles: 108.0 mi            AM Congestion (6% or 6.4 mi.)            PM Network Congestion (9% or 9.3 mi.)            DTSP Congested Roadways: SB Dr. MLK Jr St; 16th St (south of 5th Ave S); Beach Dr; Bayshore Dr; 9th Ave N; 4th Ave S</p>	<p><b>No signalized intersections with significant delay.</b></p> <p>Signalized Intersections: 115            AM Delay (0% or 0 intersections)            PM Delay (0% or 0 intersections)            DTSP Intersections with High Delay: none</p>	<p><b>Similar travel time between I-275 and St. Anthony's; modest increase (~ 2 min) to Johns Hopkins All Children's/Bayfront.</b></p> <p>I-275 to St. Anthony's via I-375 or I-275/5th Ave N interchange: 1:21 in AM peak            I-275 to Johns Hopkins All Children's/Bayfront via I-175 or new I-275/5th Ave S interchange: 4:35 in AM peak</p>
Scenario 5	<p><b>Percent of network with congestion is similar to Planned. Removal of I-375 does not adversely affect local street network if additional capacity is provided on 5th Ave N and no change to 16th St near new interchange.</b></p> <p>Network Roadway Miles: 107.7 mi            AM Congestion (6% or 6.8 mi.)            PM Network Congestion (10% or 10.4 mi.)            DTSP Congested Roadways: SB Dr. MLK Jr St; 16th St and 22nd St (south of 5th Ave S); Beach Dr; Bayshore Dr; 9th and 5th Aves N; 5th Ave S</p>	<p><b>The number of signalized intersections with significant delay is less than Planned.</b></p> <p>Signalized Intersections: 113            AM Delay (0% or 0 intersections)            PM Delay (&lt;1% or 1 intersection)            DTSP Intersections with High Delay: 5th Ave S/22nd St</p>	<p><b>Similar travel time between I-275 and Johns Hopkins All Children's/Bayfront; slight increase (~ 1 min) to St. Anthony's.</b></p> <p>I-275 to St. Anthony's via I-375 or I-275/5th Ave N interchange: 2:12 in AM peak            I-275 to Johns Hopkins All Children's/Bayfront via I-175 or new I-275/5th Ave S interchange: 1:38 in AM peak</p>

## Project Performance Results

In addition to the scenario testing and evaluation process, the performance of each of the two-way conversion and highway redesign projects was evaluated to understand the specific impacts related to these individual projects to better understand potential benefits and impacts on the DTSP network.

### Dr. MLK, Jr. St/8th St Two-Way Conversion

Based on the scenario modeling and evaluation effort, the two-way conversion on 8th St/Dr. MLK, Jr. St performs well. A comparison of the performance of this project in all scenarios is shown in Figures 55 and 56 and summarized below:

- Two-way conversion does not impact overall network performance, even with I-175 or I-375 removal.
- Congestion and delay remain within acceptable standards for operations in most scenarios.
- Stable traffic flow on both streets in most scenarios (*all signalized intersections operate at acceptable levels with <35 sec. delay*).
- Overall, streets will not be congested, but some northbound PM congestion north of 5th Ave N in all scenarios (*majority of streets operate with volume/capacity ratio <0.9. 8th St/ Highland St operate with volume/capacity ratio >1.2 in PM*).
- Slight travel time increase (*for entire drive through DTSP: <1 min. increase for southbound trips on Dr. MLK Jr. St; 1-2 min for northbound trips on 8th St*).

### 3rd St/4th St Two-Way Conversion

Based on the scenario testing and evaluation effort, the two-way conversion on 3rd St/4th St performs well. A comparison of the performance of this project in all scenarios is shown in Figures 57 and 58 and summarized below:

- Two-way conversion does not impact overall network performance, even with I-175 or I-375 removal.
- Congestion and delay remain within acceptable standards for operations in most scenarios.
- Stable traffic flow on both streets in most scenarios (*all signalized intersections operate at acceptable levels with <35 sec. delay*).
- Overall, streets will not be congested, but some AM & PM congestion on 4th St N (*majority of streets operate with volume/capacity ratio <0.9. Southbound 4th St N St operates with volume/capacity ratio >1.2*).
- Slight travel time increase on 4th St (*for entire drive through DTSP: <1 min. increase for southbound trips on 4th St; no travel time change on northbound 3rd St*).

**FIGURE 55. CORRIDOR PERFORMANCE SUMMARY: DR. MLK, JR. ST/8TH ST**

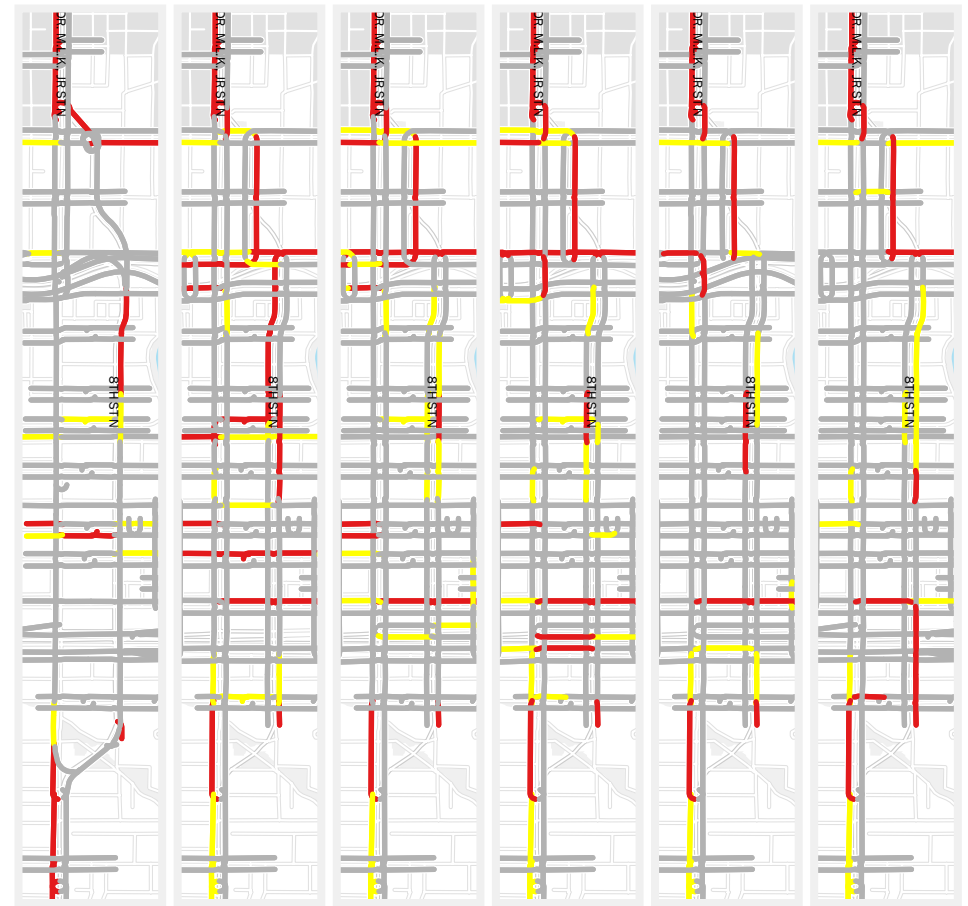
Congestion (AM)

Planned Scenario 1 Scenario 2 Scenario 3 Scenario 4 Scenario 5



Congestion (PM)

Planned Scenario 1 Scenario 2 Scenario 3 Scenario 4 Scenario 5



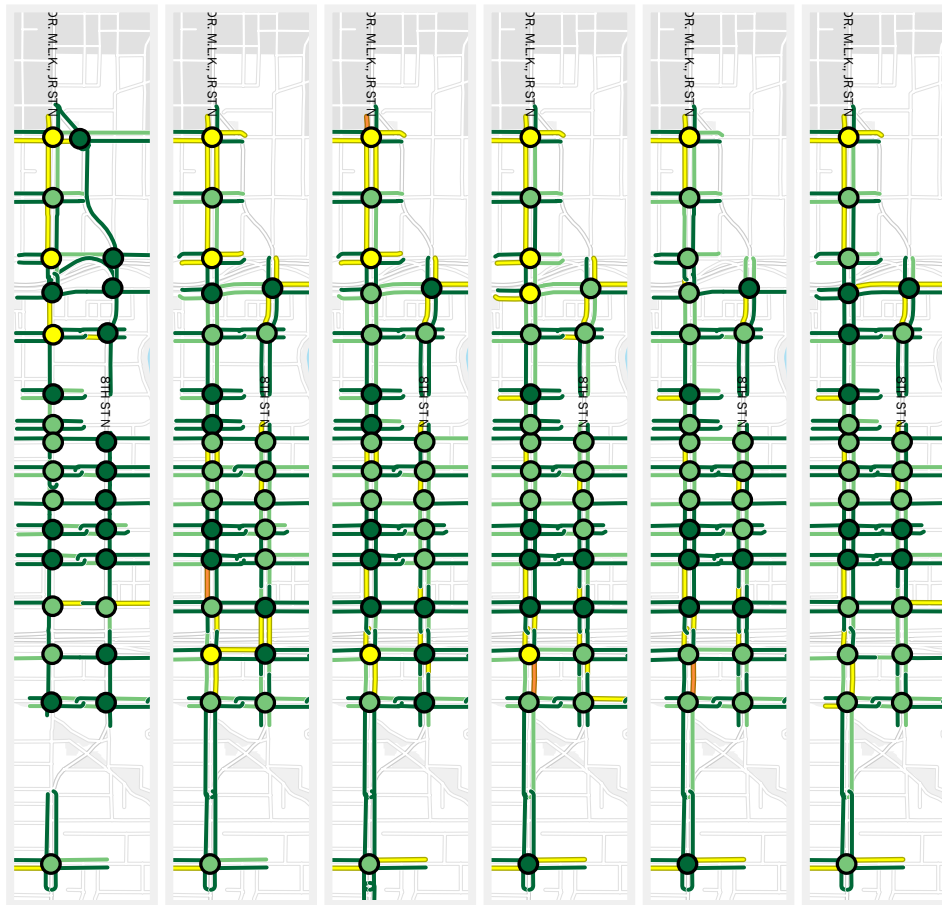
**Volume/Capacity (v/c)**

- Not Congested (0.00 - 0.90 v/c)
- At Capacity (0.90 - 1.1 v/c)
- Congested (1.1 - 2.0 v/c)

**FIGURE 56. CORRIDOR PERFORMANCE SUMMARY: DR. MLK, JR. ST/8TH ST**

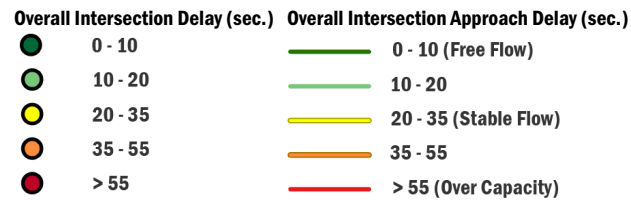
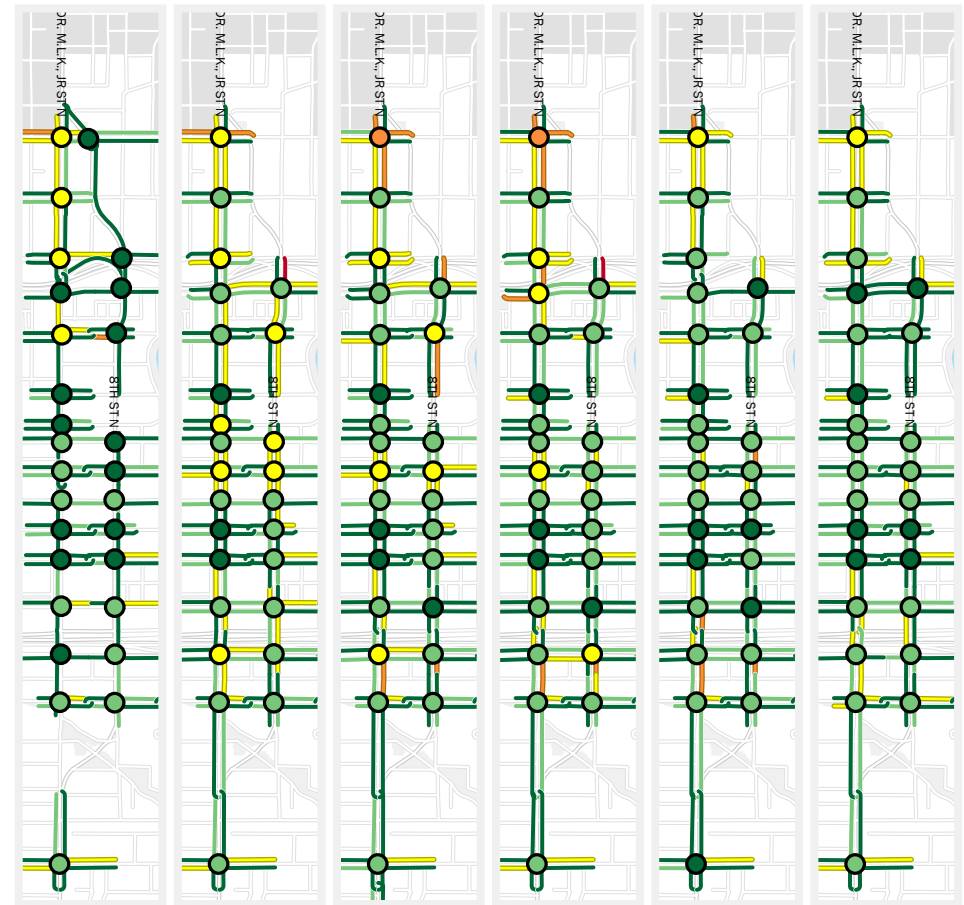
Intersection Delay (AM)

Planned Scenario 1 Scenario 2 Scenario 3 Scenario 4 Scenario 5



Intersection Delay (PM)

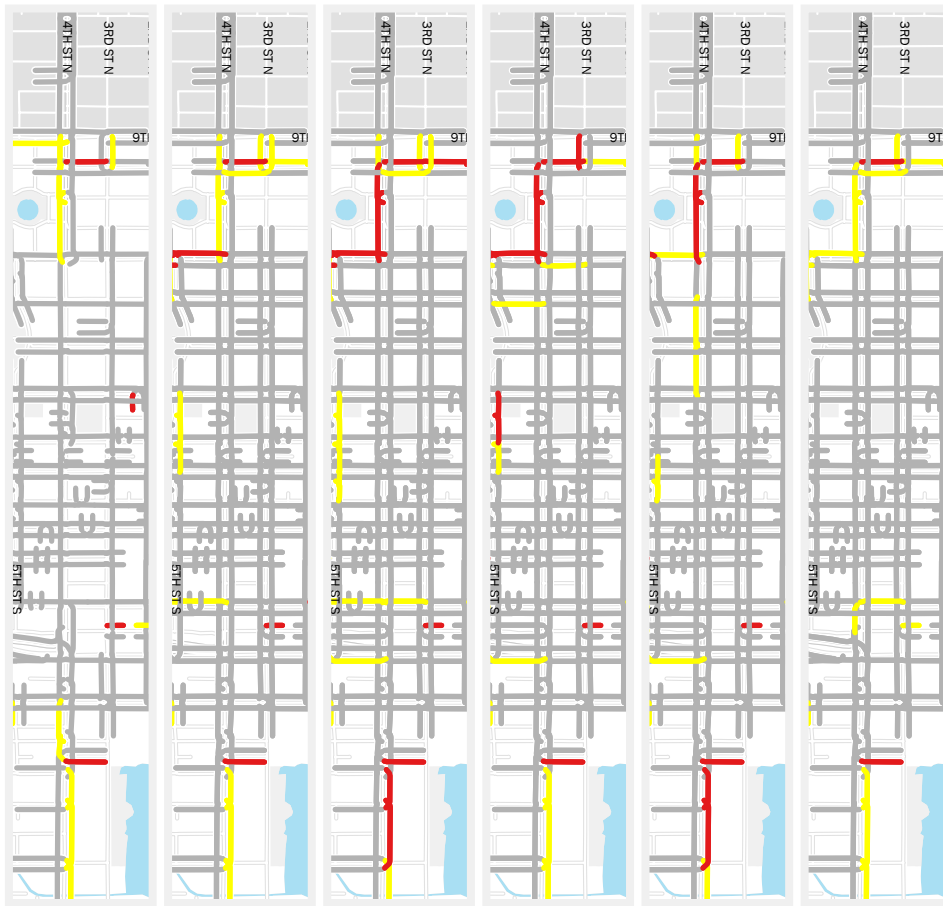
Planned Scenario 1 Scenario 2 Scenario 3 Scenario 4 Scenario 5



**FIGURE 57. CORRIDOR PERFORMANCE SUMMARY: 3RD ST/4TH ST**

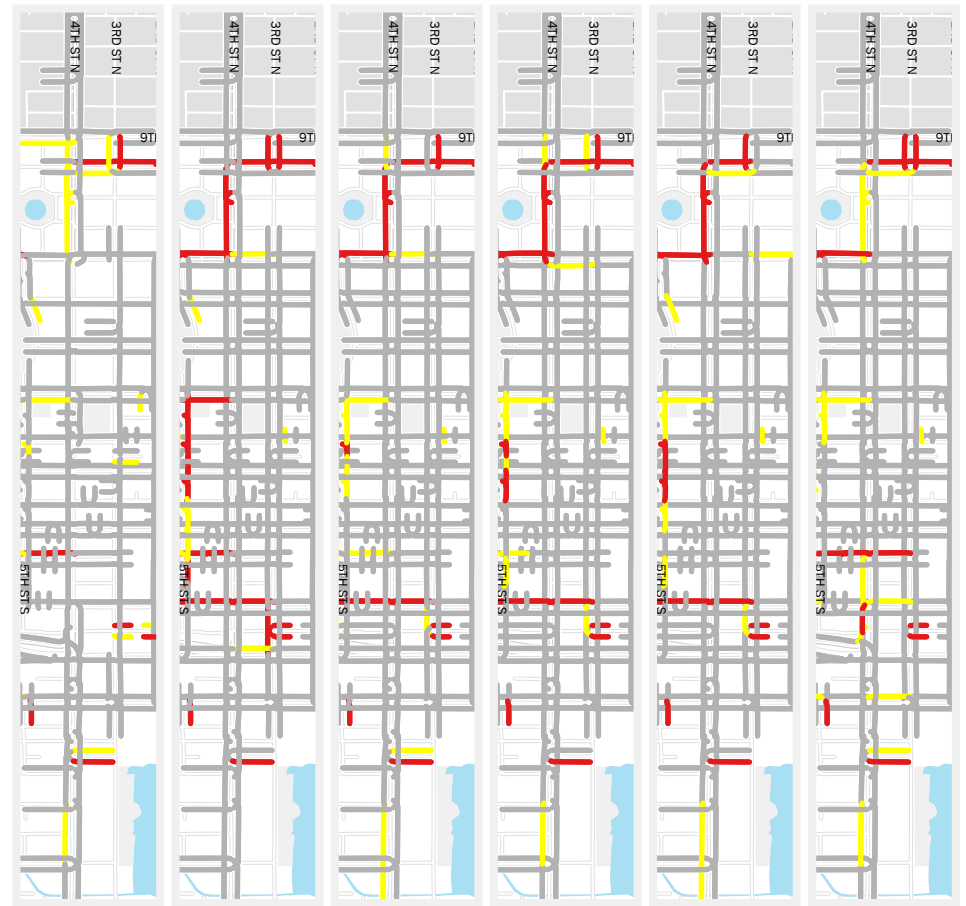
Congestion (AM)

Planned Scenario 1 Scenario 2 Scenario 3 Scenario 4 Scenario 5



Congestion (PM)

Planned Scenario 1 Scenario 2 Scenario 3 Scenario 4 Scenario 5

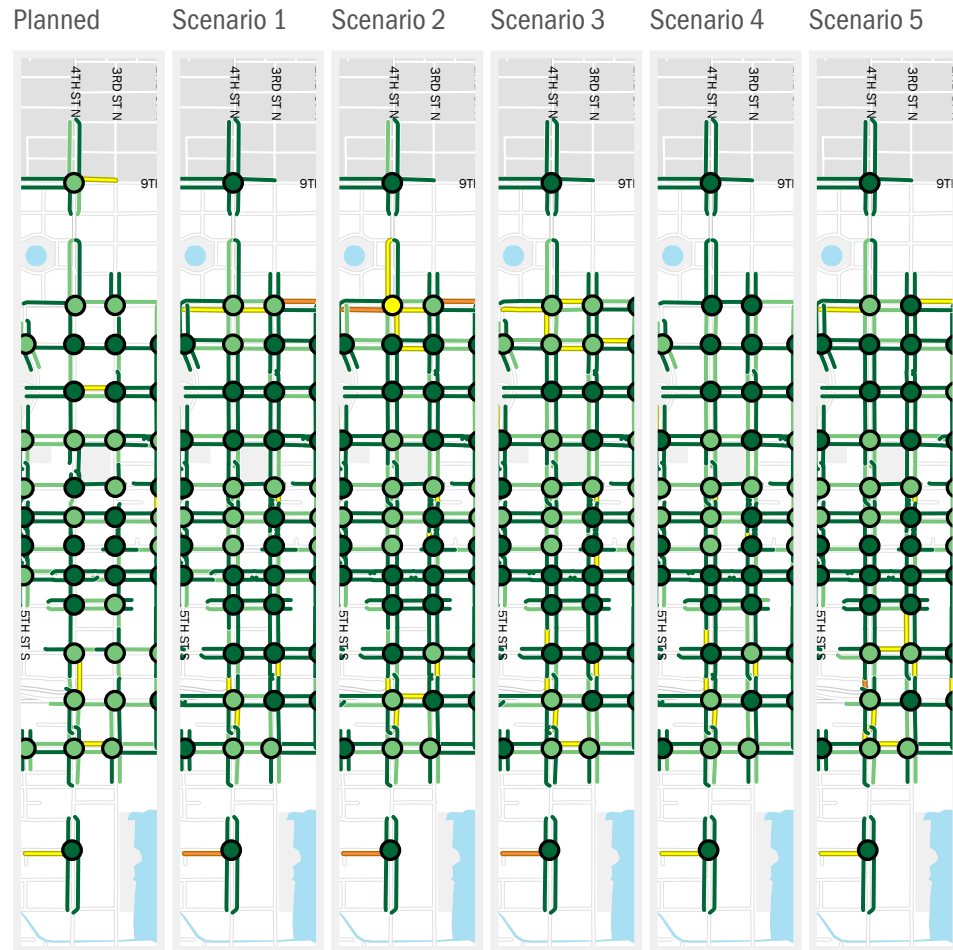


**Volume/Capacity (v/c)**

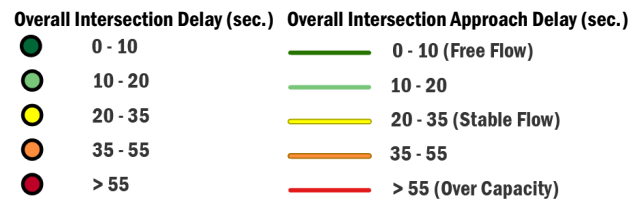
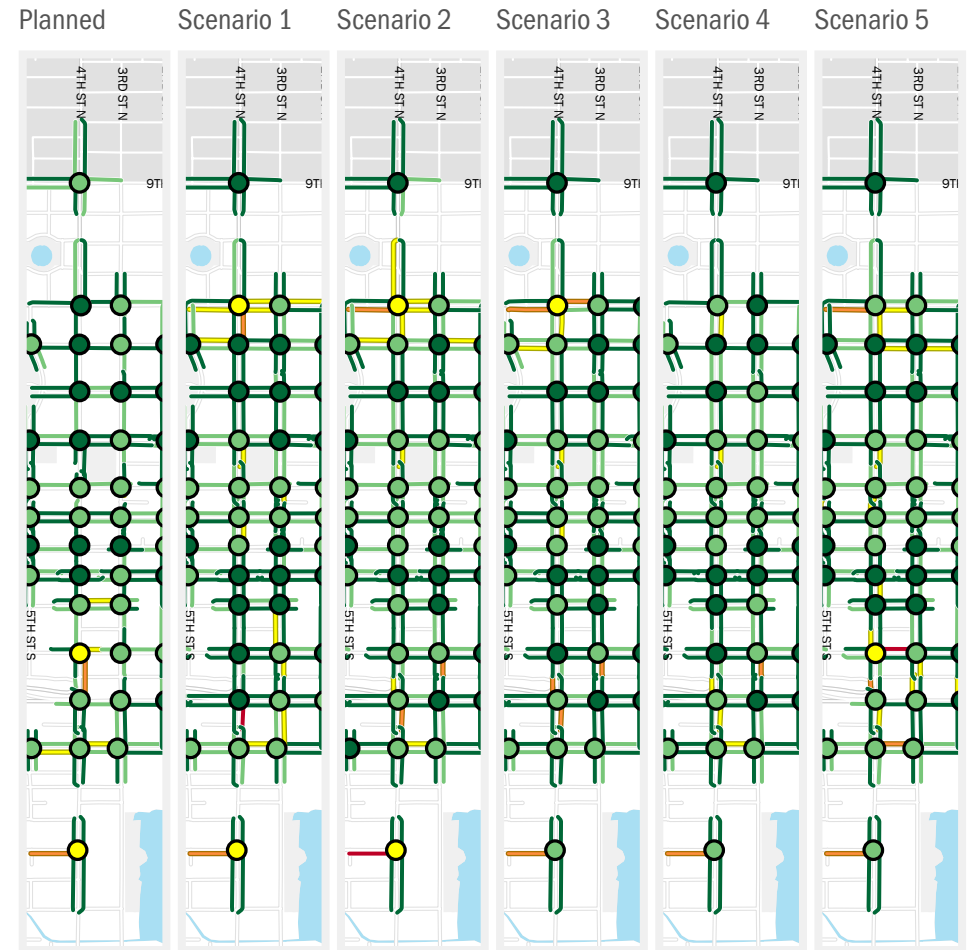
- Not Congested (0.00 - 0.90 v/c)
- At Capacity (0.90 - 1.1 v/c)
- Congested (1.1 - 2.0 v/c)

**FIGURE 58. CORRIDOR PERFORMANCE SUMMARY: 3RD ST/4TH ST**

Intersection Delay (AM)



Intersection Delay (PM)



## I-375 Removal, New Interchange, and 5th Ave N/4th Ave N Two-Way Conversion

Based on the scenario modeling and evaluation effort, the I-375 removal, addition of a new full interchange at 5th Ave N, and two-way conversion of 4th Ave N/5th Ave N performs well but is dependant on providing adequate capacity on the local streets adjacent to the new full interchange and along the east-west corridors. A comparison of the performance of this project (included in Scenarios 1, 2, and 5) compared to the partial highway removal (included in Scenario 3) and no changes (included Planned and Scenario 4) is shown in Figures 59 and 60 and summarized below:

- I-375 highway removal, limited opportunities to increase capacity along the parallel roadways, and the two-way conversion results in some congestion and operational issues on 4th Ave N/5th Ave N.
- Sufficient capacity on 5th Ave N, 16th St, 4th Ave N is required to distribute trips to/from the new I-275 interchange at 5th Ave N.
- Stable traffic flow on all roadways in most scenarios, except at the 4th Ave N and 5th Ave N intersections at 16th St (*lane removal results in >55 sec. delay at 2 intersections*). Additional capacity is needed at these intersections to help distribute trips from the I-275 interchange.
- I-375 removal causes PM congestion on westbound 5th Ave N unless additional capacity is provided (*with 1 westbound lane, 5th Ave N operates with volume/capacity ratio >1.2; with 2 westbound lanes, the majority of 5th Ave N operates with a volume/capacity ratio <0.9*).
- Slight travel time increase to St. Anthony's Hospital from new I-275 ramps to 5th Ave N (*approximate 1 minute increase from I-275 via 5th Ave N*).

## I-375 Partial Removal, New Interchange, and 5th Ave N/4th Ave N Two-Way Conversion

Based on the scenario modeling and evaluation effort, the I-375 partial removal and two-way conversion of 4th Ave S/5th Ave S does not perform that well. A comparison of the performance of this project (included in Scenario 3) compared to the complete highway removal (included in Scenario 1, 2, and 5) and no changes (included in Planned and Scenario 4) is shown in Figures 59 and 60 and summarized below:

- The partial removal creates bottlenecks at ramp terminals and along 5th Ave N. By creating a single access point, the partial I-375 removal causes congestion as drivers try to get to and from the ramps on 5th Ave N and 4th Ave N (*portions of 5th Ave N, 4th Ave N, 4th St S, Dr. MLK, Jr. St & 8th St operate with volume/capacity > 1.2*).
- In both the AM and PM, delay times are high at intersections along 5th Ave N as vehicles are trying to get to and from the new I-375 ramps.
- Slight travel time increase to St. Anthony's Hospital (*approximate 1 minute increase from I-275 via new I-375 ramps to 4th Ave N/5th Ave N*).



## I-175 Removal, New Interchange, and 4th Ave S/5th Ave S Two-Way Conversion

Based on the scenario modeling and evaluation effort, the I-175 removal, addition of a new interchange at 5th Ave S, and two-way conversion of 4th Ave S/5th Ave S performs well. A comparison of the performance of this project (included in Scenario 1, 2, 3, and 4) and no changes (Planned and Scenario 5) is shown in Figures 61 and 62 and summarized below:

- The local street network is sufficient to allow trips from new I-275 interchange at 5th Ave S to distribute quickly through the DTSP network. Adding a new interchange at 5th Ave S attracts more users, but congestion and delay remain within acceptable standards for operations.
- Overall network performance is not affected by I-175 removal if additional lanes are provided on 5th Ave S and uneven two-way conversion of 4th Ave S. Within DTSP, the majority of streets will not be congested (*volume/capacity ratio <0.9*).
- Along 4th Ave S/5th Ave S, even with highway removal, there is stable traffic flow on both streets (*most signalized intersections operate at acceptable levels with <35 second delay*).
- Slight travel time increase for regional commuters to hospitals (*approximately 1-3 minute increase in travel time from I-275 via 5th Ave S*).

## Summary of Highway Redesign/Impacts

The following observations related to I-175 and I-375 highway redesign or removal were made as a result of the scenario modeling effort. Figure 63 and 64 show how traffic to and from I-275 shifts depending on the changes to the interstate spurs.

- Removal of one interstate spur increases traffic volumes on other interstate spur. The increased traffic does not create a capacity issue on the remaining interstate spur.
- If both spurs are removed, more traffic is drawn to the new interchange at 5th Ave S than to the the full interchange at 5th Ave N.
- Regardless of the type of changes to I-275, I-375, or I-175, the streets adjacent to the ramps need to have sufficient capacity to distribute trips to the rest of the local street network (applies to all projects/scenarios). Delay and congestion are caused by drivers not being able to quickly distribute to the rest of the network.
- Removing the interstate spurs and creating a consolidated interchange creates challenges in distributing trips if the adjacent streets don't have the capacity needed to receive trips from I-275.
- Maintaining the lane capacity on 16th Street is important if I-375 is removed to move vehicles from the interchange on 5th Ave N to the adjacent street network.
- Changes to interstate spurs and converting the adjacent one-way pairs do not create capacity issues in the local network if sufficient capacity is provided on the converted two-way streets (e.g., 4th Ave N/5th Ave N and 4th Ave S/5th Ave S).

**FIGURE 59. CORRIDOR PERFORMANCE SUMMARY: I-375, 5TH AVE N & 4TH AVE N**

**Volume/Capacity (v/c)**

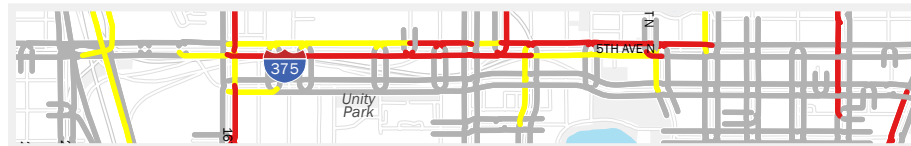
- Not Congested (0.00 - 0.90 v/c)
- At Capacity (0.90 - 1.1 v/c)
- Congested (1.1 - 2.0 v/c)

Congestion (AM)

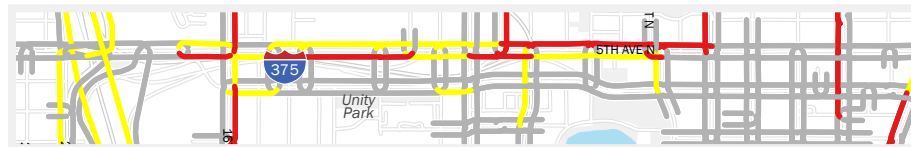
Planned



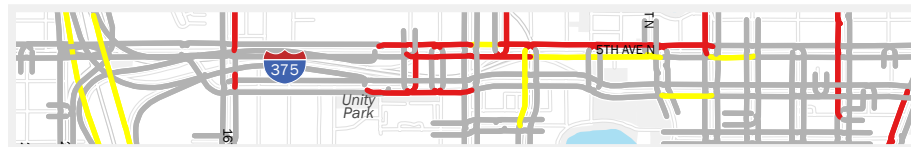
Scenario 1



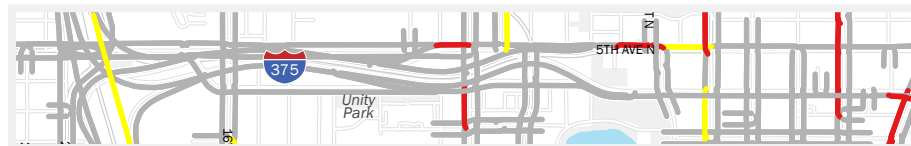
Scenario 2



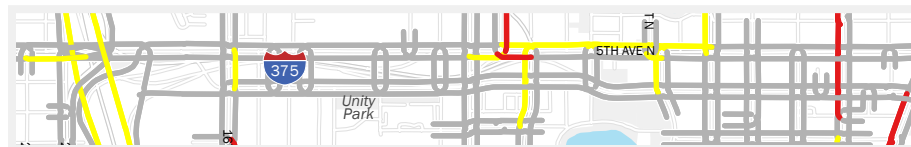
Scenario 3



Scenario 4

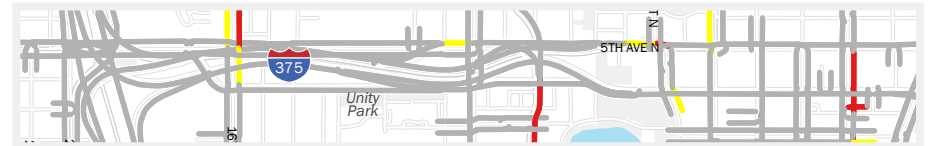


Scenario 5

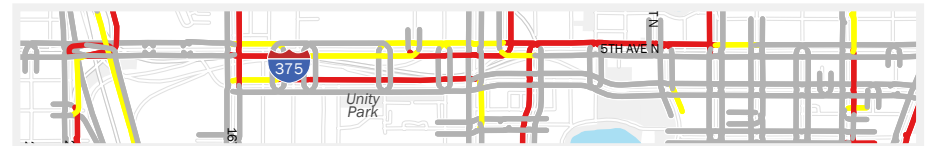


Congestion (PM)

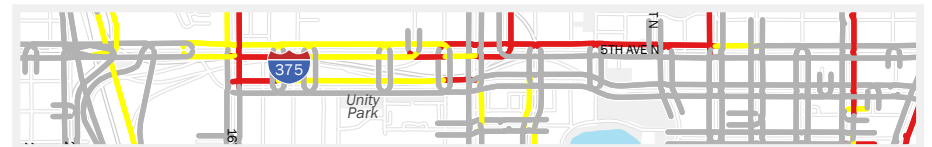
Planned



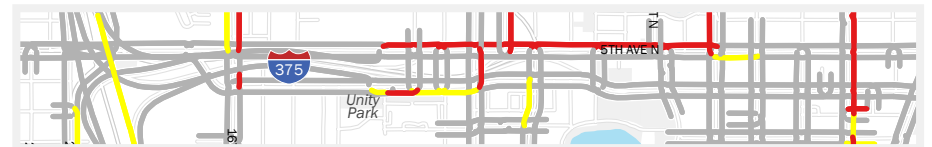
Scenario 1



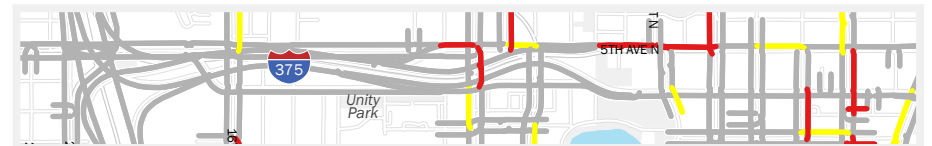
Scenario 2



Scenario 3

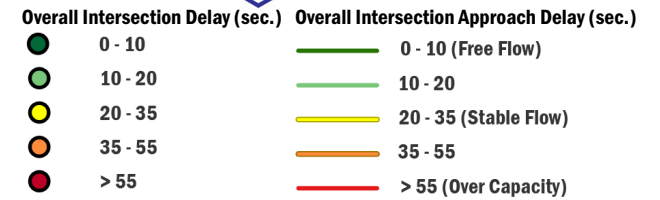


Scenario 4



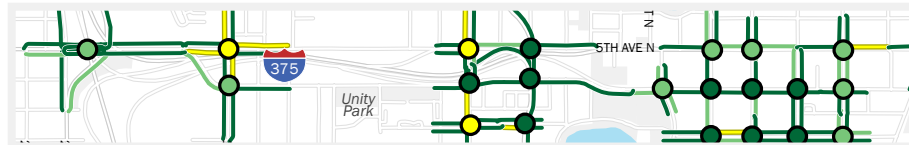
Scenario 5



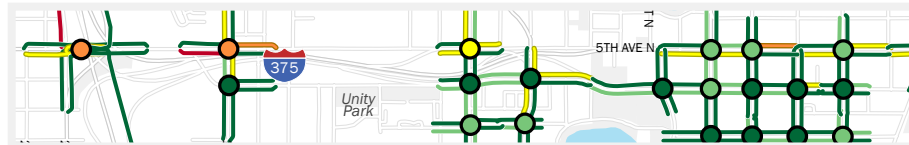


**FIGURE 60. CORRIDOR PERFORMANCE SUMMARY: I-375, 5TH AVE N & 4TH AVE N**

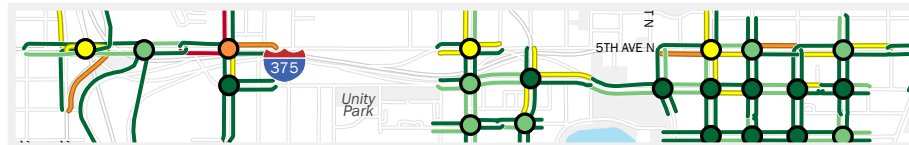
Intersection Delay (AM)  
Planned



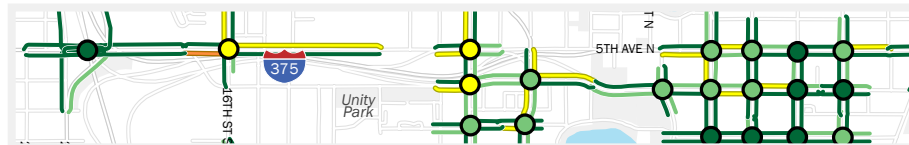
Scenario 1



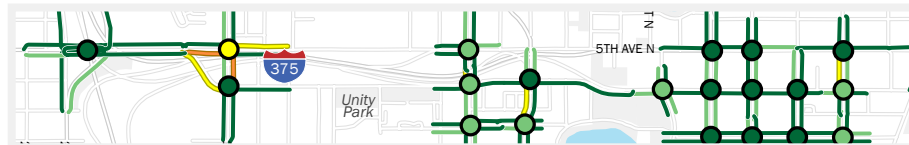
Scenario 2



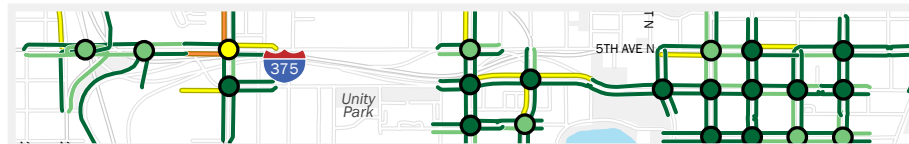
Scenario 3



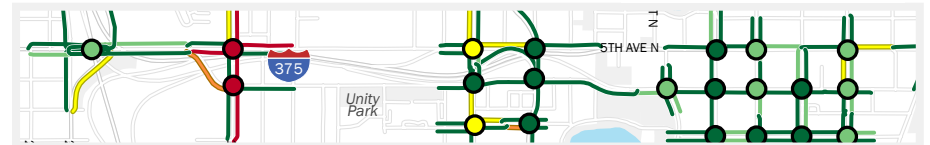
Scenario 4



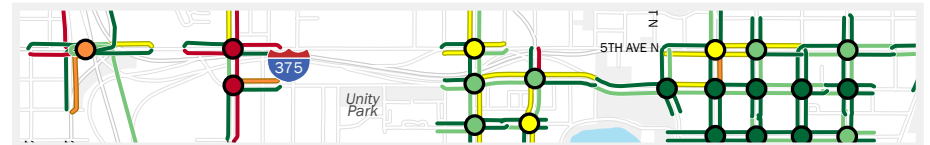
Scenario 5



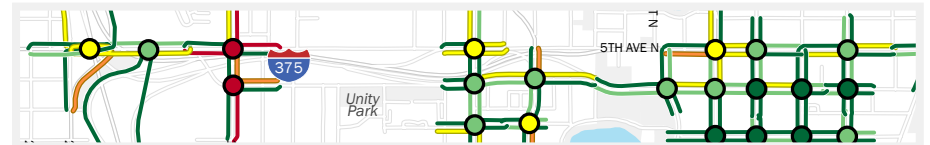
Intersection Delay (PM)  
Planned



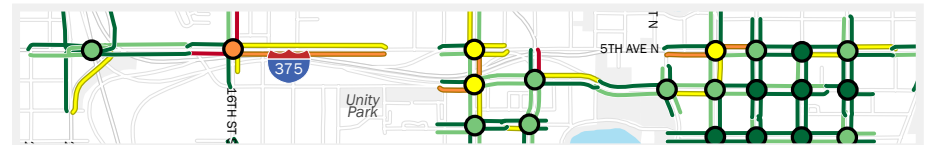
Scenario 1



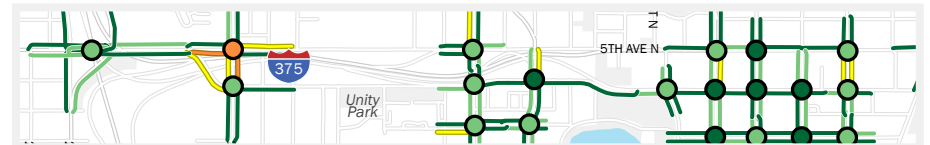
Scenario 2



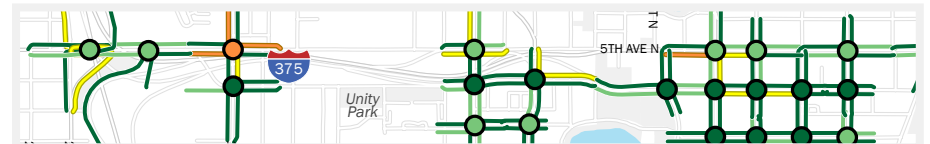
Scenario 3



Scenario 4



Scenario 5

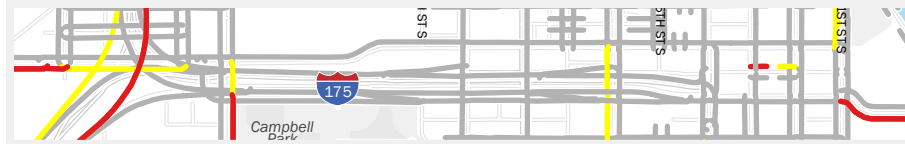


**FIGURE 61. CORRIDOR PERFORMANCE SUMMARY: I-175, 5TH AVE S & 4TH AVE S**

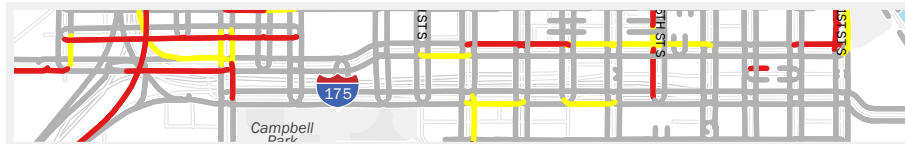
**Volume/Capacity (v/c)**

- Not Congested (0.00 - 0.90 v/c)
- At Capacity (0.90 - 1.1 v/c)
- Congested (1.1 - 2.0 v/c)

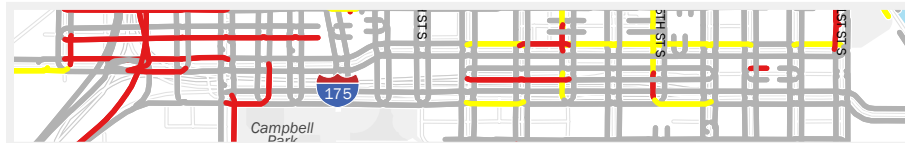
Congestion (AM)  
Planned



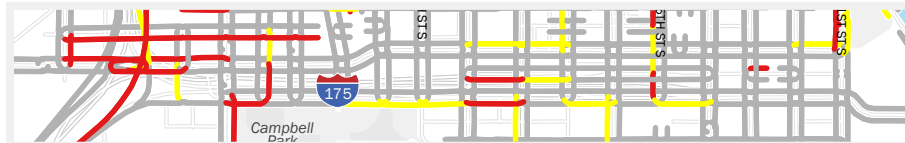
Scenario 1



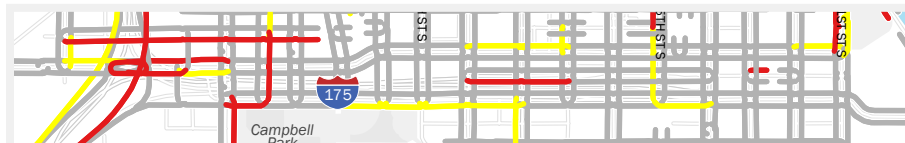
Scenario 2



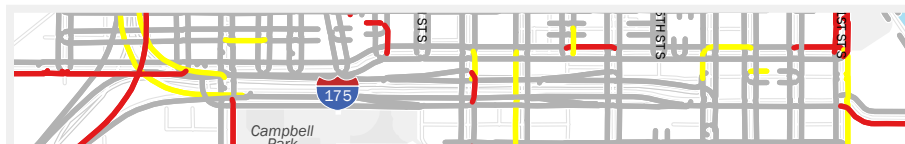
Scenario 3



Scenario 4



Scenario 5



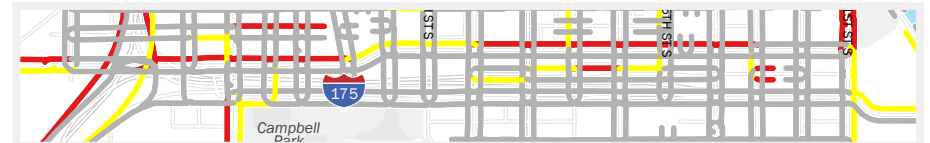
Congestion (PM)  
Planned



Scenario 1



Scenario 2



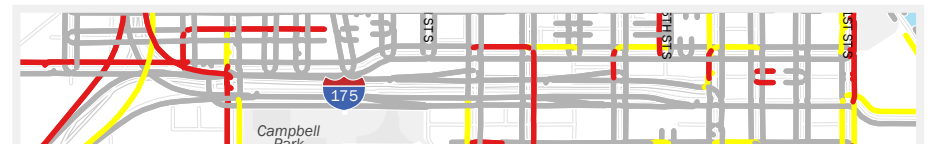
Scenario 3



Scenario 4



Scenario 5

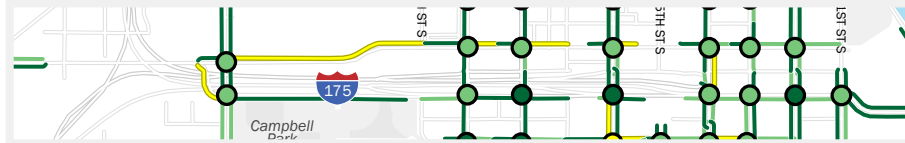




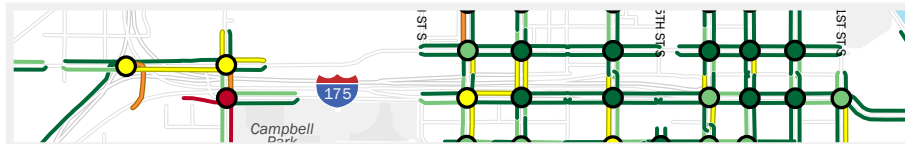
**FIGURE 62. INTERSECTION PERFORMANCE SUMMARY: I-175, 5TH AVE S & 4TH AVE S**

Intersection Delay (AM)

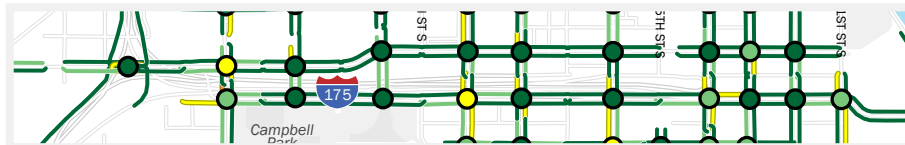
Planned



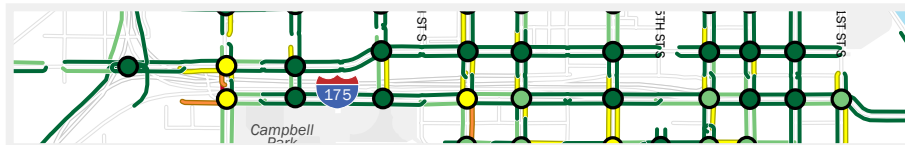
Scenario 1



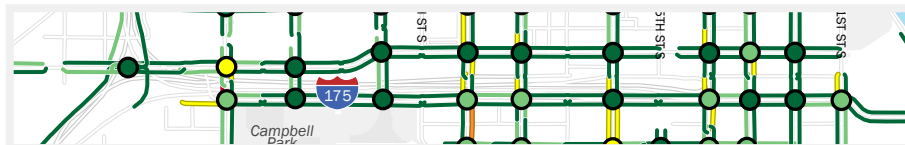
Scenario 2



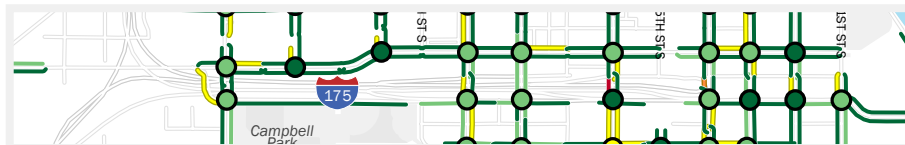
Scenario 3



Scenario 4

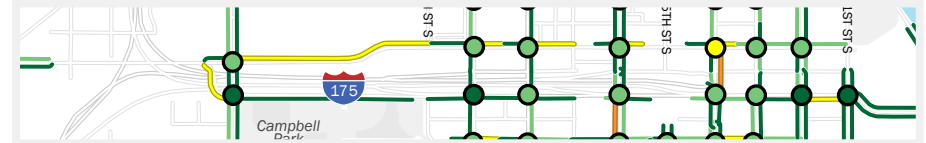


Scenario 5

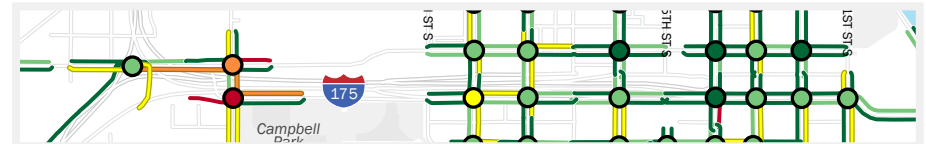


Intersection Delay (PM)

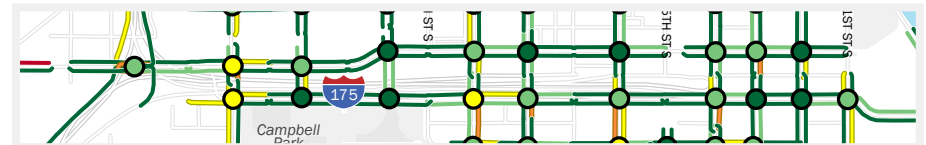
Planned



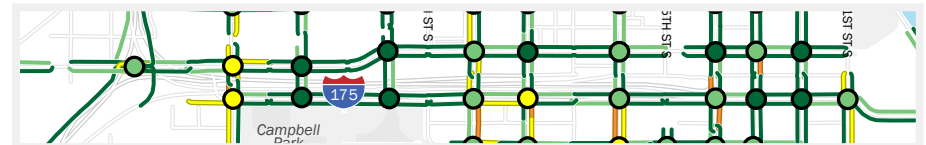
Scenario 1



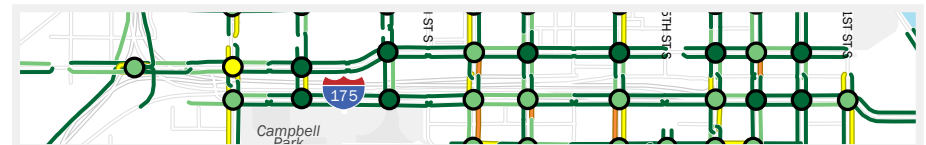
Scenario 2



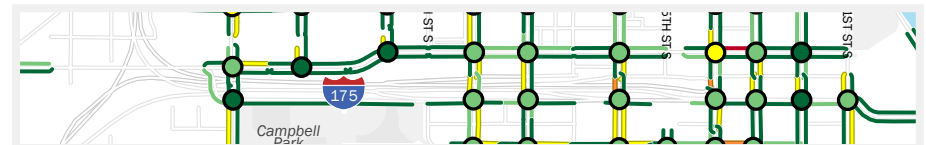
Scenario 3



Scenario 4



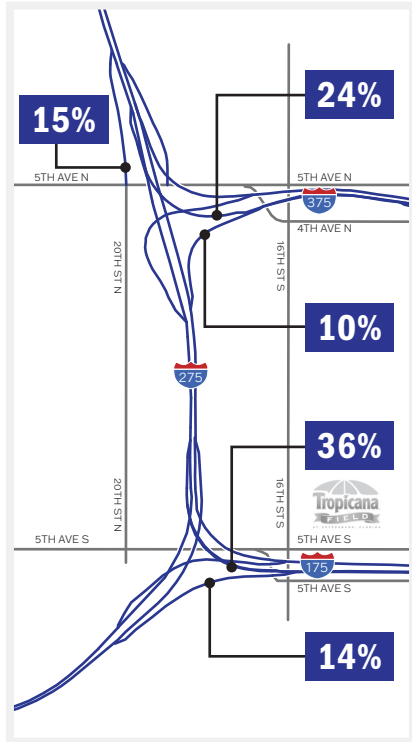
Scenario 5



**FIGURE 63. COMPARISON OF INBOUND TRIPS FROM I-275 TO DTSP**

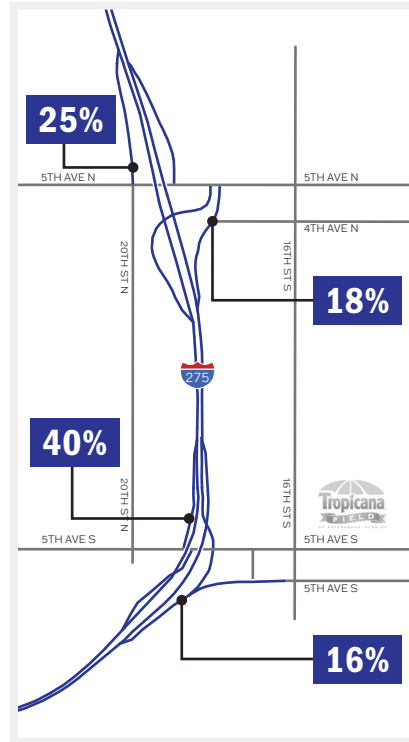
**NO CHANGE TO I-375 & I-175**

Percentage of Inbound Trips (AM)



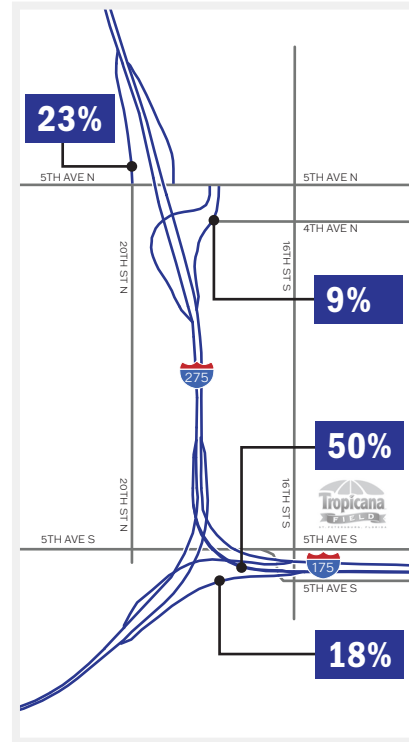
**REMOVAL OF I-375 & I-175 (NEW FULL INTERCHANGES)**

Percentage of Inbound Trips (AM)



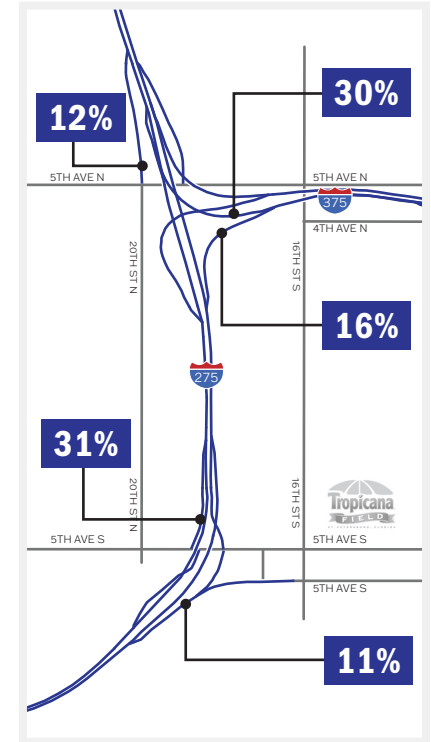
**REMOVAL OF ONLY I-375 (NEW FULL INTERCHANGE)**

Percentage of Inbound Trips (AM)



**REMOVAL OF ONLY I-175 (NEW FULL INTERCHANGE)**

Percentage of Inbound Trips (AM)

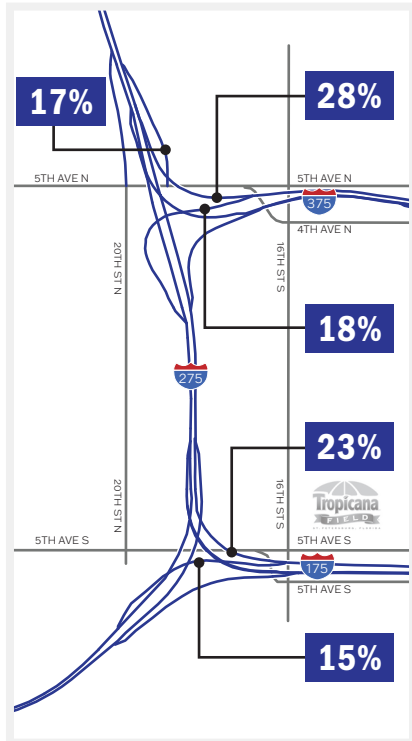


Note: All percentages show breakdown of inbound AM peak period trips to DTSP from I-275. Model simulation includes approximately 5,500 vehicles between 7:15-8:15 a.m.

**FIGURE 64. COMPARISON OF OUTBOUND TRIPS FROM DTSP TO I-275**

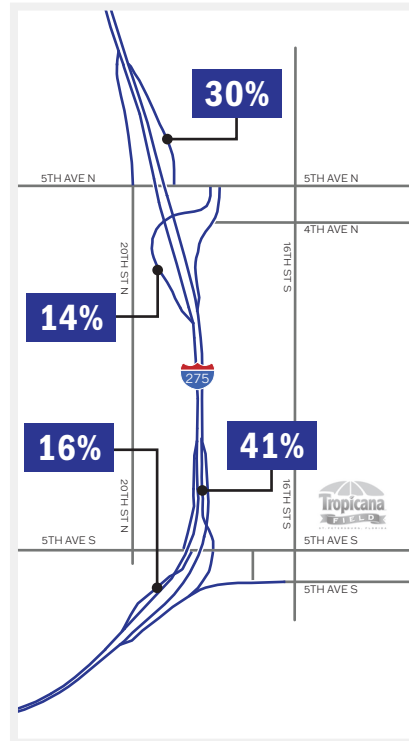
**NO CHANGE TO I-375 & I-175**

Percentage of Outbound Trips (PM)



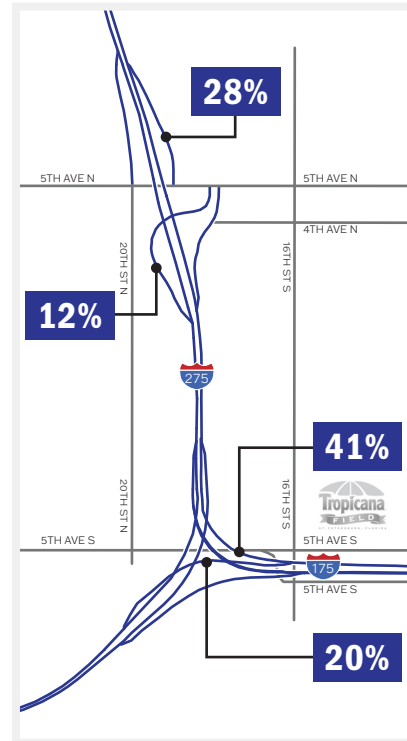
**REMOVAL OF I-375 & I-175  
(NEW FULL INTERCHANGES)**

Percentage of Outbound Trips (PM)



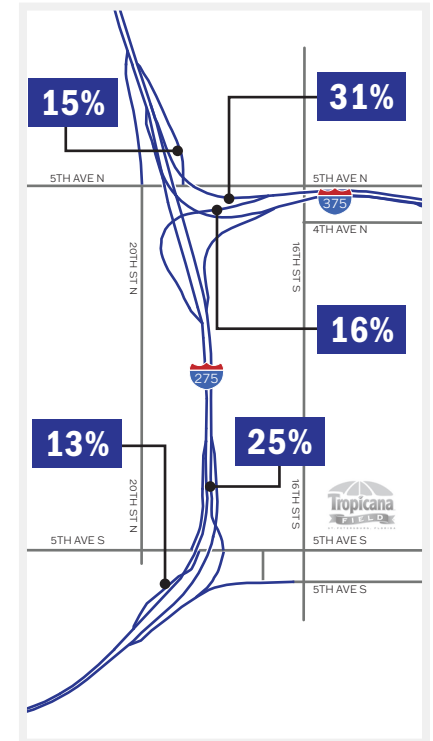
**REMOVAL OF ONLY I-375  
(NEW FULL INTERCHANGE)**

Percentage of Outbound Trips (PM)



**REMOVAL OF ONLY I-175  
(NEW FULL INTERCHANGE)**

Percentage of Outbound Trips (PM)



Note: All percentages show breakdown of outbound PM peak period trips from DTSP to I-275. Model simulation includes approximately 5,500 vehicles between 4:30-5:30 p.m.