



Existing Conditions Review

Transportation Systems Management & Operations (TSM&O) Master Plan



January 19, 2023
Final

CONTENTS

1	Introduction	3
2	The Role of MetroPlan Orlando	3
3	TSM&O Strategies	4
4	Existing Conditions	4
4.1	FDOT District Five	8
4.2	Orange County	9
4.3	Osceola County	13
4.4	Seminole County	17
4.5	City of Orlando	20
4.6	Florida’s Turnpike	24
4.7	LYNX	29
4.8	Central Florida Expressway Authority	34

FIGURES

Figure 4-1:	MetroPlan Orlando Planning Area Traffic Signals	6
Figure 4-2:	MetroPlan Orlando Planning Area Fiber Optic Communications Network	7
Figure 4-3:	Orange County Traffic Signals	10
Figure 4-4:	Orange County Fiber Optic Communications Network	11
Figure 4-5:	Orange County CCTV Camera and DMS Locations	12
Figure 4-6:	Osceola County Traffic Signals	14
Figure 4-7:	Osceola County Fiber Optic Communications Network	15
Figure 4-8:	Osceola County CCTV Cameras and Local Municipality Traffic Device Locations	16
Figure 4-9:	Seminole County Traffic Signals and Fiber Optic Communications	18
Figure 4-10:	Seminole County CTV Camera and DMS Locations	19
Figure 4-11:	City of Orlando Traffic Signals	21
Figure 4-12:	City of Orlando Fiber Optic Communications Network	22
Figure 4-13:	City of Orlando CCTV Camera and DMS Locations	23
Figure 4-14:	Florida’s Turnpike ITS Device Locations in Orange County	25
Figure 4-15:	Florida’s Turnpike ITS Device Locations in Osceola County	26

Figure 4-16: Florida’s Turnpike ITS Device Locations in Seminole County27

Figure 4-17: Florida’s Turnpike ITS Device Locations in the City of Orlando28

Figure 4-18: LYNX Routes and Bus Stop Locations in Orange County30

Figure 4-19: LYNX Routes and Bus Stop Locations in Osceola County31

Figure 4-20: LYNX Routes and Bus Stop Locations in Seminole County32

Figure 4-21: LYNX Routes and Bus Stop Locations in the City of Orlando.....33

Figure 4-22: CFX Device Locations in Orange County35

Figure 4-23: CFX Device Locations in Osceola County36

Figure 4-24: CFX Device Locations in the City of Orlando37

TABLES

Table 4-1: FDOT District Five Device Summary..... 9

Table 4-2: Orange County Device Summary..... 9

Table 4-3: Osceola County Device Summary13

Table 4-4: Seminole County Device Summary17

Table 4-5: City of Orlando Device Summary.....20

Table 4-6: Florida’s Turnpike Device Summary24

Table 4-7: LYNX Device Summary.....29

Table 4-8: CFX Device Summary34

1 Introduction

The purpose of this technical memorandum is to summarize the existing Transportation Systems Management and Operations (TSM&O) systems, devices, and infrastructure currently being operated and maintained within MetroPlan Orlando's planning area. The planning area includes Orange, Osceola, and Seminole counties, as well as their incorporated jurisdictions. TSM&O is an integrated set of strategies intended to optimize the performance of existing transportation infrastructure and systems. This is achieved through implementation of multimodal, intermodal, and cross-jurisdictional systems and services.

2 The Role of MetroPlan Orlando

MetroPlan Orlando is the metropolitan planning organization (MPO) leading transportation planning within Orange, Osceola, and Seminole counties. MetroPlan Orlando coordinates closely with elected officials, industry experts, and the community to shape a future transportation system that provides travel choices. This is conducted through various MPO efforts and initiatives that lead to prioritization of federal and state transportation dollars and allocation of these funds towards regional transportation improvements.

MetroPlan Orlando develops various plans and technical documents to facilitate planning, programming, and implementation of projects within the transportation network. These plans include:

- Metropolitan Transportation Plan (MTP)
 - Updated every five years, this plan identifies current and future transportation needs.
- Prioritized Project List (PPL)
 - Updated annually, the PPL shows which unfunded projects are the highest priority for inclusion in the Transportation Improvement Program.
- Transportation Improvement Program (TIP)
 - Updated annually, the TIP identifies programmed transportation projects and improvements over the next five years in alignment with FDOT's Five-Year Work Program.
- Unified Planning Work Program (UPWP)
 - Developed every two years, the UPWP identifies major task areas, planning activities to carry out those tasks, and the related budget allocated to each.

MetroPlan Orlando develops plans and supports the coordination of planning, programming, and implementation of projects to support expansion of the TSM&O network. Importantly, MetroPlan Orlando administers the *Transportation Systems Management & Operations Advisory Committee* which is advisory to the Governing Board regarding TSM&O activities and consists of agency partners that participate in and review MPO planning activities. The Committee consists of members (voting and non-voting) representing over 30 jurisdictions.

TSM&O related plans and studies developed by MetroPlan Orlando include:

- Intelligent Transportation System (ITS) Master Plan (2017) – predecessor to the TSM&O Master Plan, identified 34 ITS projects totaling over \$48 million
- 2020-2021 Signal Retiming Before/After Study and Benefit Cost Analysis (2022) – evaluated metrics for corridor signal retiming projects across the planning area
- Connected and Autonomous Vehicle (CAV) Readiness Study (2020) – evaluated preparedness of planning area counties and cities for emergence of CAVs

More information about these studies is provided in the Documentation Review (**Appendix 1**).

3 TSM&O Strategies

TSM&O improvements in this plan include any non-capacity project designed to improve safety and travel time reliability, facilitate data sharing, or enhance “future readiness”. The primary systems that support the TSM&O network within the MetroPlan Orlando planning area rely on ITS technologies and institutional cooperation. The systems, strategies, and networks that are currently being operated and maintained within the planning area include the following:

TSM&O Strategies

- Connected Vehicle (CV) Traffic Signal System
- Work Zone Management
- Truck Parking Availability System (TPAS)
- Parking Space Management
- Ramp Metering
- Wrong Way Driving Detection System (WWDDS)
- Manages Lanes
- Traffic Incident Management
- Transit Vehicle Tracking
- Emergency Vehicle Preemption (EVP)
- Roadway Service Patrols
- Automatic Vehicle Identification (AVI)
- Transit Signal Priority (TSP)
- Adaptive Traffic Signal Control (ATSC)

ITS Devices that support TSM&O strategies

- Fiber optic network communications
- Advanced Transportation Controller (ATC) Standard
- Closed Circuit Television (CCTV) Cameras
- Dynamic Message Signs (DMS)
- Microwave Vehicle Detectors (MVDS)
- Bluetooth Readers

4 Existing Conditions

This section details the current state of deployment for systems and infrastructure based on the existing TSM&O networks of the following agency stakeholders:

- Florida Department of Transportation (FDOT) District Five
- Orange County
- Osceola County
- Seminole County
- City of Orlando
- Florida’s Turnpike
- LYNX
- Central Florida Expressway Authority (CFX)

These stakeholders collectively support traffic signal systems, ATMS, transit operations, freeway, and expressway operations within the region. The projects that deploy and support TSM&O are rooted in technology and operations. These projects preserve capacity and improve security, safety, and reliability of the transportation system. The success of these projects is predicated on the capabilities of the stakeholders to support TSM&O projects and services.

The eight members of the MetroPlan TSM&O Mater Plan steering committee are primary stakeholders in the development of the plan. These stakeholders are responsible for operating and maintaining infrastructure associated with the traffic signal system and ITS devices. These agencies are considered active stakeholders of the transportation network within the MetroPlan region.

Other municipalities/agencies operate and maintain smaller traffic signal system networks within their respective boundaries, with maintenance performed by a mix of in-house and contracted staff. These municipalities/agencies are consulted on an as-needed basis for the purposes of the development of the TSM&O Master Plan. These stakeholders include the cities of Apopka, Kissimmee, Ocoee, Maitland, Winter Park, and the Reedy Creek Improvement District (RCID).

The existing conditions information provided by stakeholder agencies helps to document and define:

- The baseline conditions of regional ITS field deployments
- The programmatic capabilities of each stakeholder
- The appropriate information to be considered during assessment of needs, issues, problems, and opportunities

The documented existing assets and devices for each stakeholder are listed in the following sections. Any quantities listed only consider those assets or devices located within the planning area.

The categories and items requested from agencies to complete this inventory were:

- Existing Infrastructure/Assets
 - ITS devices
 - Traffic Signal System
 - Detection type
 - Tolling Systems
 - Advanced Systems
 - Adaptive Signal Control Technology (ASCT)
 - Automated Traffic Signal Performance Measures (ATSPM)
 - Connected Vehicle applications
- Services
 - Traffic Incident Management
 - Road ranger service patrol
- Transit Strategies
 - Advanced Systems (e.g., Transit Signal Priority and Automated Vehicle Location (AVL))
 - Route and passenger data (e.g., Automated Passenger Counters (APC))
- Agency Data
 - Organizational chart
 - Consultants/contract resources available
 - Upcoming projects (if not represented in RITSA)
 - Design standards and local specifications
 - Software types/manufacturers

Figure 4-1 and **Figure 4-2** provide an overview map of signal systems and fiber optic network within the MetroPlan Orlando planning area.

Figure 4-1: MetroPlan Orlando Planning Area Traffic Signals

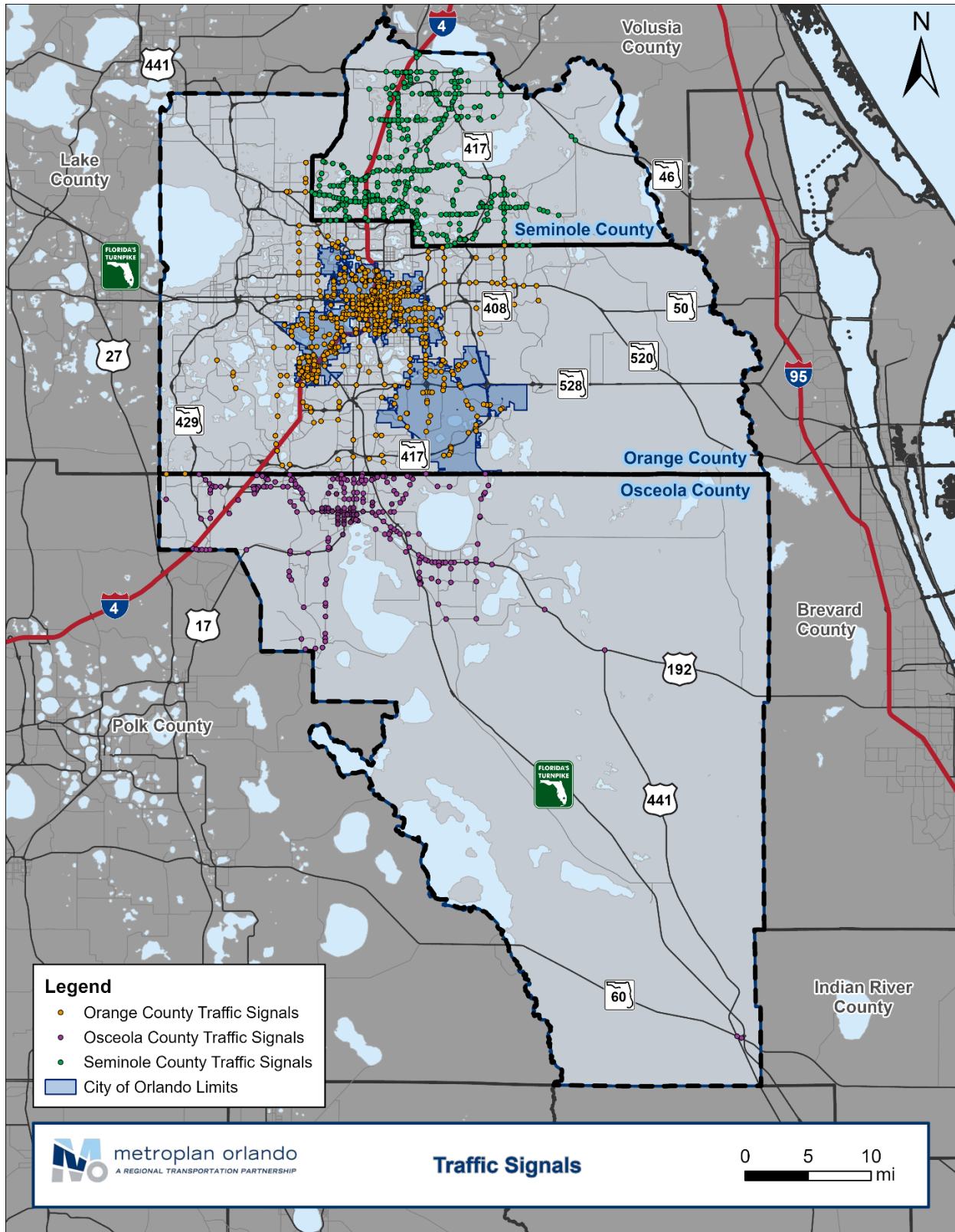
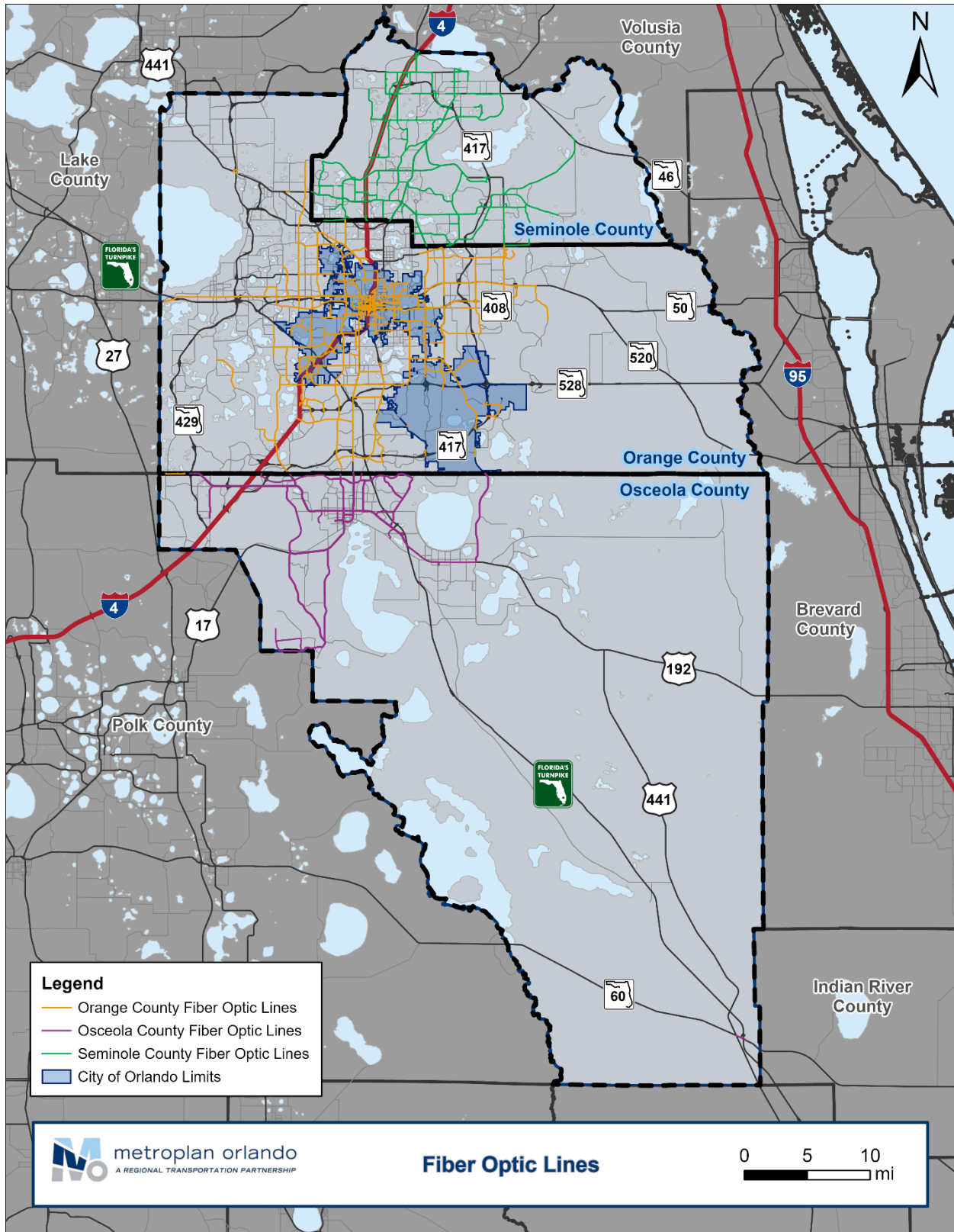


Figure 4-2: MetroPlan Orlando Planning Area Fiber Optic Communications Network



4.1 FDOT DISTRICT FIVE

FDOT District Five actively manages a TSM&O program for the multimodal transportation network in its nine-county region that includes MetroPlan Orlando's three-county planning area. District Five promotes TSM&O collaboration to deliver safety and mobility outcomes, continuously measure performance, streamline and improve existing systems, and identify future needs.

Operators monitor and manage traffic along Interstates and State Roads (SR) 24 hours a day, 7 days a week from a state-of-the-art Regional Traffic Management Center located at 4975 Wilson Road, Sanford, FL 32771. Operations staff work with Florida Highway Patrol, Road Rangers Safety Patrol, FDOT's statewide 511 traveler information service, contracted tow service companies, traffic media, FDOT's Public Information Office and other agencies to disseminate accurate and timely information.

The devices and systems used for operations communicate using an expansive fiber optic network that allows District Five the ability to actively manage 795 miles of the transportation network. Additionally, wireless radio communications are used to communicate statewide with other RTMCs using the Florida ITS Operations Network. This network takes advantage of FDOT installed fiber optic facilities, where available, along with the SMS in other areas, to effectively complete interconnections.

The traffic signals owned by FDOT within the MetroPlan Orlando planning area are operated and maintained by various local agencies. Within the planning area there are seven signal maintaining agencies. These agencies are responsible for operating and maintaining the signals owned by FDOT through the Traffic Signal Maintenance and Compensation Agreement (TSMCA). Through this agreement agencies are reimbursed for the operation and maintenance of traffic signals and travel time detectors. Additionally, traffic signals that are interconnected and monitored are eligible for additional compensation per device.

FDOT District Five maintains more than 700 miles of fiber optic network communications for hundreds of Intelligent Transportation Systems on freeways and arterials that are part of the state highway system.

FDOT District Five has a dynamic Traffic Incident Management (TIM) program that utilizes ITS devices, communication networks, and other systems from the RTMC. These programs facilitate a coordinated response from state and local personnel to clear traffic incidents as safely and quickly as possible. The goals of these programs include reducing the risk of secondary crashes and maintaining the efficiency of the roadway network. The portion of FDOT District Five comprising the MetroPlan Orlando planning area is served by the I-4 Area TIM Team. TIM Services include road rangers, asset maintenance teams, and the Rapid Incident Scene Clearance program.

Table 5-1 summarizes FDOT's ITS network devices and communications network coverage.

Table 4-1: FDOT District Five Device Summary

Device	Number
Miles of Fiber Optic Network	795
Traffic Signals	660
Closed Circuit Television (CCTV) Cameras	361
Microwave Vehicle Detectors (MVDS)	302
Bluetooth Readers	90
Dynamic Message Signs (DMS)	97
Truck Parking Availability System (TPAS)	1

4.2 ORANGE COUNTY

Orange County is a signal maintaining agency within the MetroPlan Orlando planning area that is responsible for the operations and maintenance of the signal system within the County. Within Orange County there are eight other agencies that are individually responsible for signal operations and maintenance. Approximately 44% of the signals maintained are owned by other agencies, both local municipalities and FDOT. The City of Orlando is the largest individual agency within the County that is responsible for the signal operations and maintenance.

Orange County has 559 traffic signals which communicate over primarily using fiber optic cable with a few wireless locations. More detailed information related to the traffic signal operations is listed below.

- 535 traffic signals are interconnected using fiber optic networks or wireless networks
- 413 traffic signals are coordinated
- 544 Traffic signals in accommodate emergency vehicle preemption
- 58 traffic signals apply Transit Signal Priority

All traffic signals utilize Intelight Q-Free MaxView traffic management software. Operations and Maintenance work is accomplished with Orange County staff which includes 19 International Municipal Signal Association (IMSA) certified employees. Current traffic signal maintenance and Traffic Management Center staffing includes approximately 30 employees.

Funding for the operation and maintenance of the signal and ITS systems include Orange County tax funds, impact fees from private developments, and various grants.

Table 4-2 summarizes Orange County’s ITS network devices and communications network coverage. **Figure 4-3** through **Figure 4-5** include maps depicting the locations of traffic signals, the fiber optic communications network, and ITS devices by type within Orange County.

Table 4-2: Orange County Device Summary

Device	Number
Number of Traffic Signals Using Fiber Optic Network	535
Traffic Signals	654
Closed Circuit Television (CCTV) Cameras	286
Transit Signal Priority (TSP) Intersections	58
Bluetooth Readers	112
Dynamic Message Signs (DMS)	6
Adaptive Traffic Signal Control (ATSC) Intersections	98

Figure 4-3: Orange County Traffic Signals

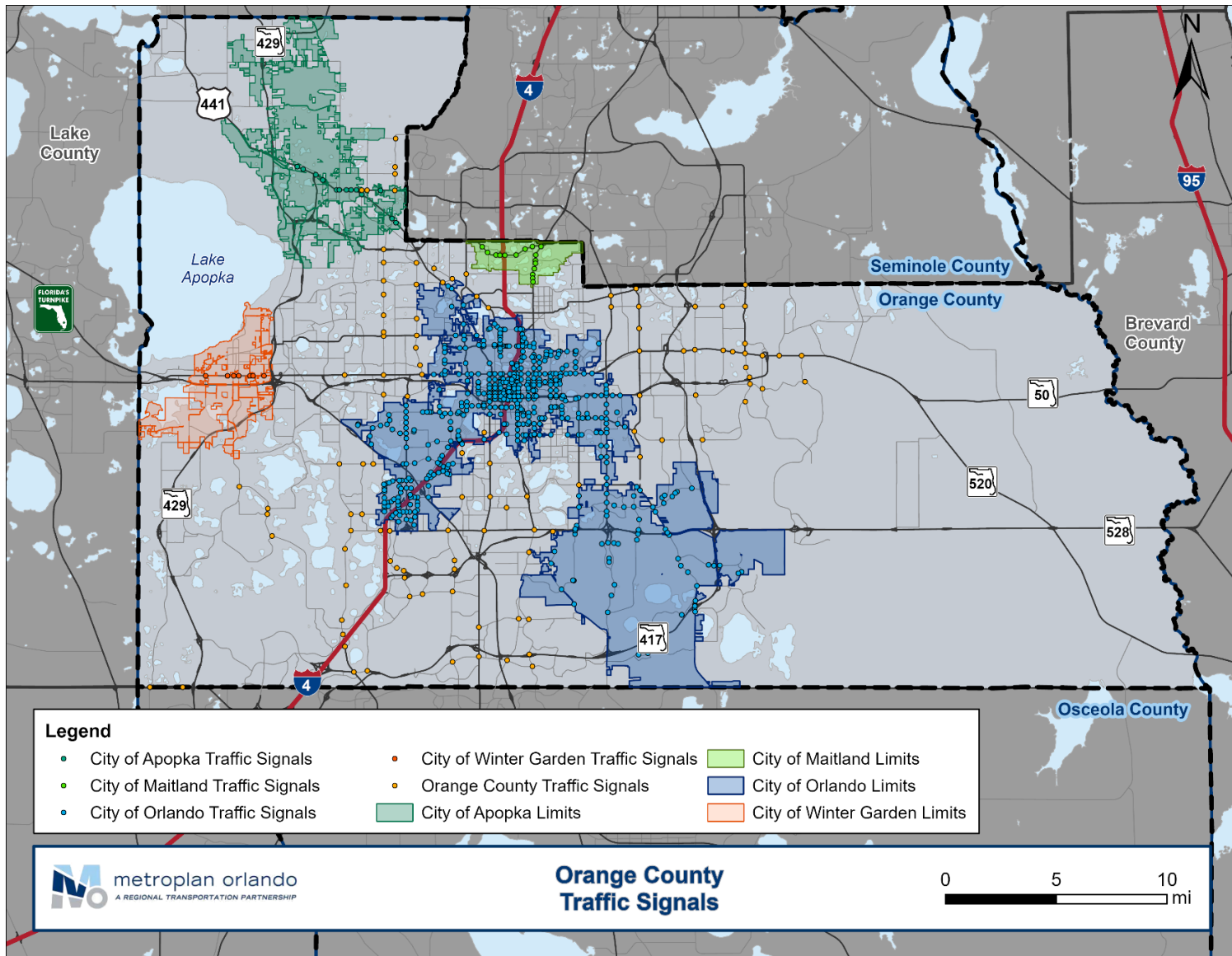


Figure 4-4: Orange County Fiber Optic Communications Network

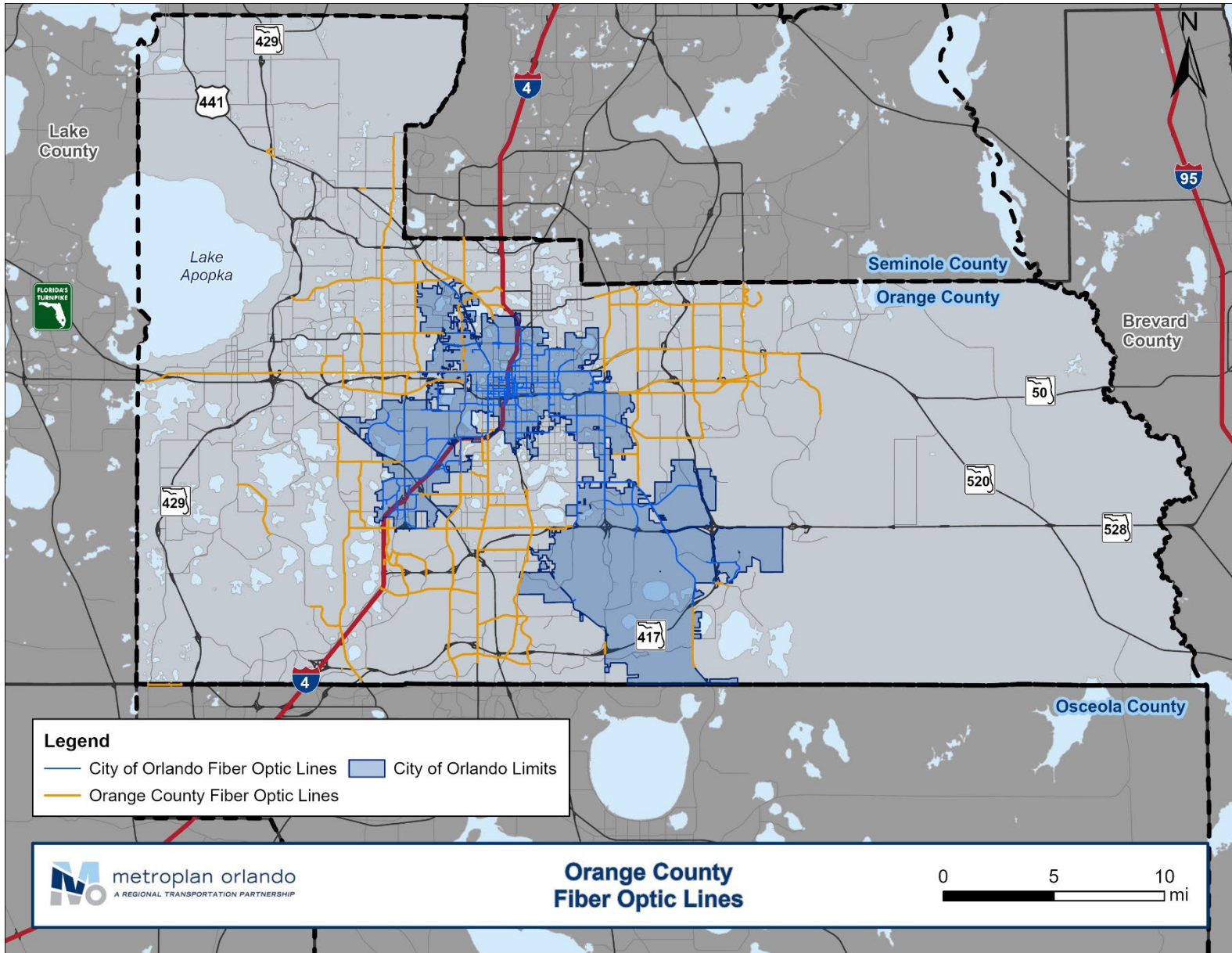
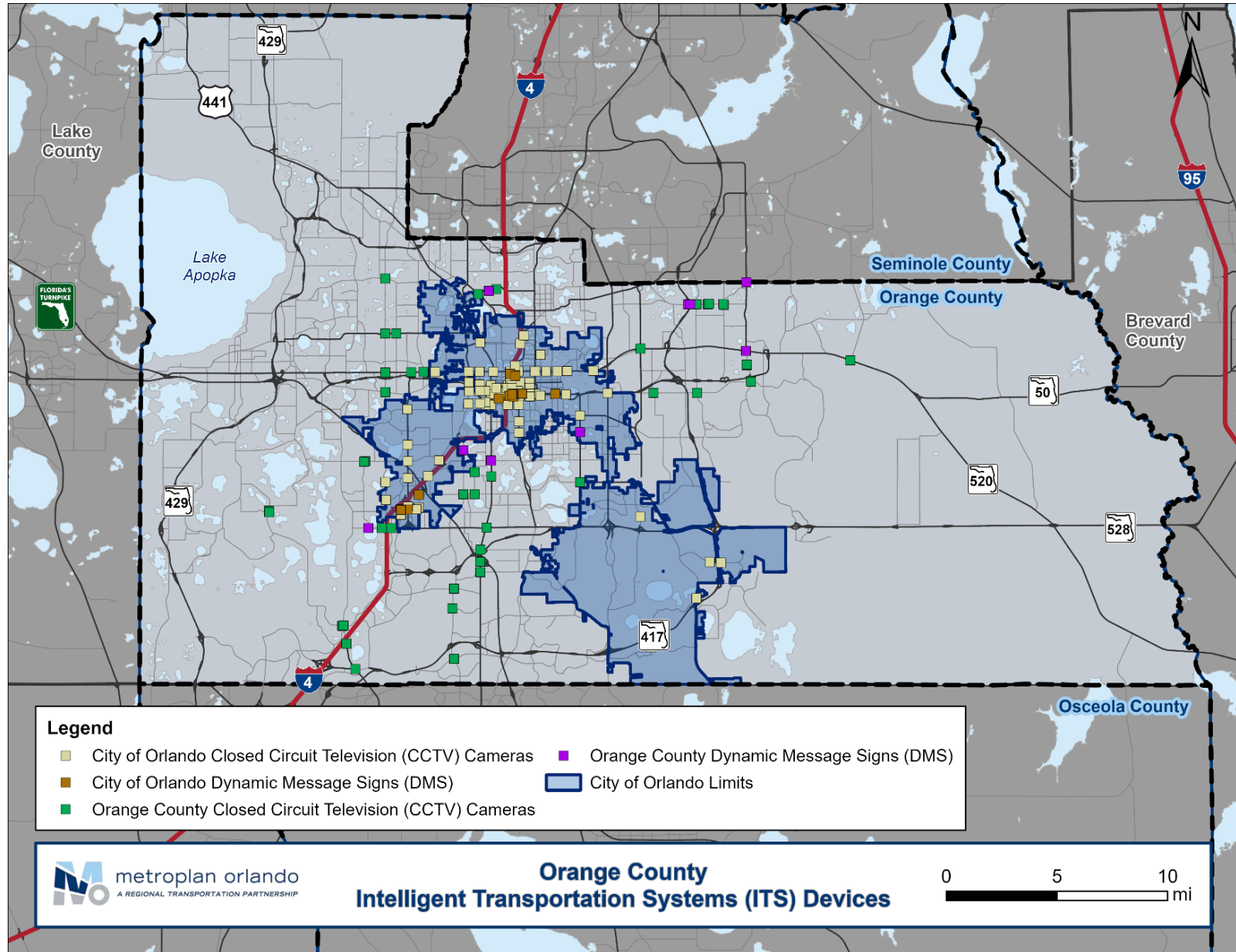


Figure 4-5: Orange County CCTV Camera and DMS Locations



4.3 OSCEOLA COUNTY

Osceola County operates and maintains 230 signals. More detailed information related to the traffic signal operations is listed below.

- 192 traffic signals are interconnected using fiber optic networks or wireless networks
- 42 traffic signals are coordinated
- 58 adaptive traffic signals

Additionally, the County's ITS program includes 155 CCTVs, 10 DMSs, and 10 Bluetooth readers.

The Osceola County Traffic Management Center (TMC) controls traffic signals and is responsible for the continuous operation of all ITS equipment located throughout the County. Operations and Maintenance staff for Osceola County's system include three County employees who work at the County TMC, one supervisor and two operators. Additional staff includes part-time and in-house consultants who support signal timing and transportation network analysis. The County has a traffic signal supervisor who oversees the operations and maintenance of the traffic signals which is achieved with County technicians and foremen. Additionally, network maintenance is conducted by contracted employees and the TMC is operated by a staff of three that includes engineers and operators. Osceola County uses Econolite controllers operating the Centrac's central software.

Osceola County performs the preventive maintenance for the traffic signals countywide. All fiber and ITS related equipment is maintained and operated by the County. Funding sources for the signal system and ITS components include funds allocated through MetroPlan Orlando, various grants and other County funds.

Table 4-3: Osceola County Device Summary includes a summary of the devices in Osceola County. **Figure 4-6 through Figure 4-8** include maps depicting the locations of traffic signals, the fiber optic communications network, and ITS devices by type within Osceola County.

Table 4-3: Osceola County Device Summary

Device	Number
Traffic Signals	230
Closed Circuit Television (CCTV) Cameras	155
Travel Time Detection	27
Dynamic Message Signs (DMS)	10
Adaptive Traffic Signal Control (ATSC) Intersections	45

Figure 4-6: Osceola County Traffic Signals

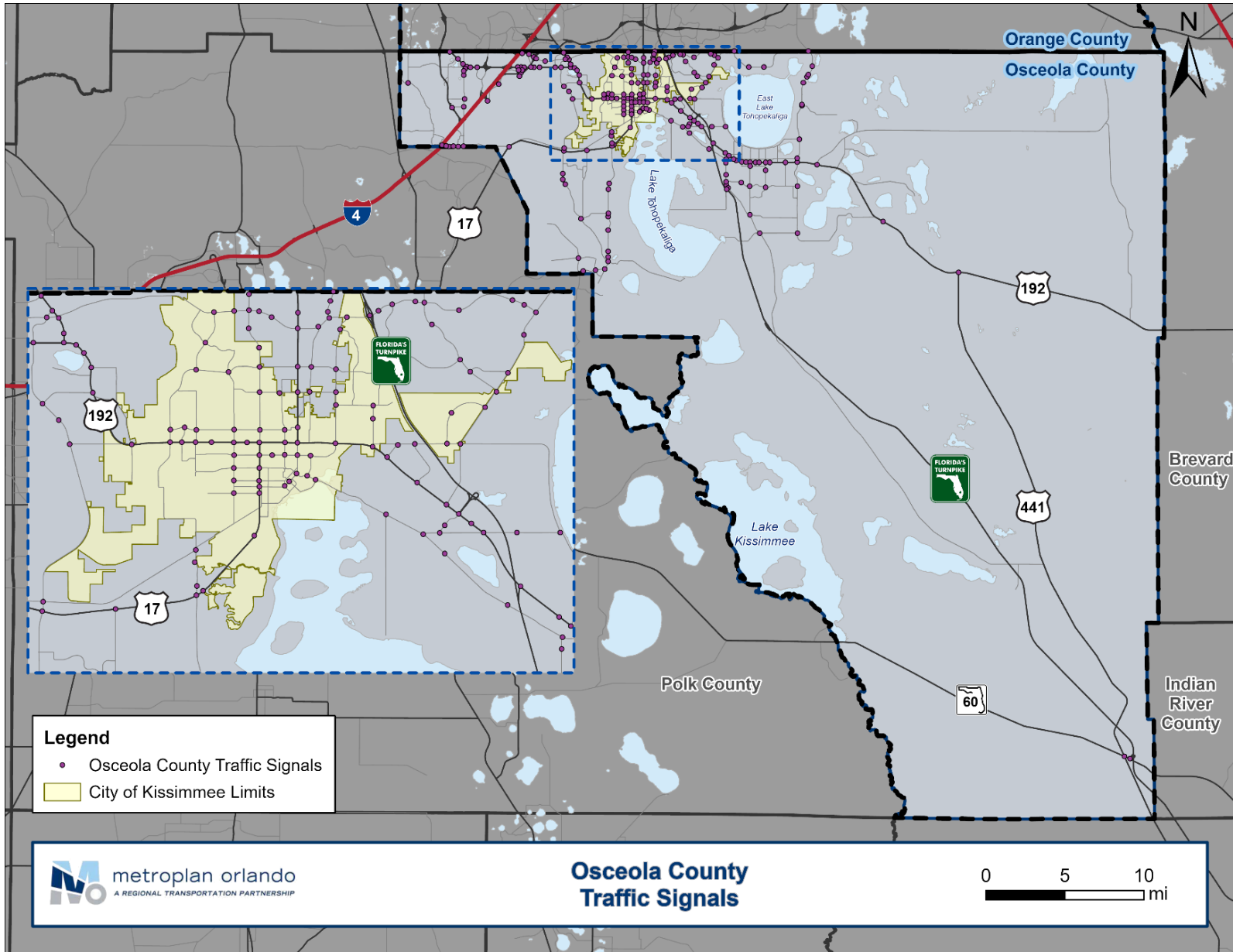


Figure 4-7: Osceola County Fiber Optic Communications Network

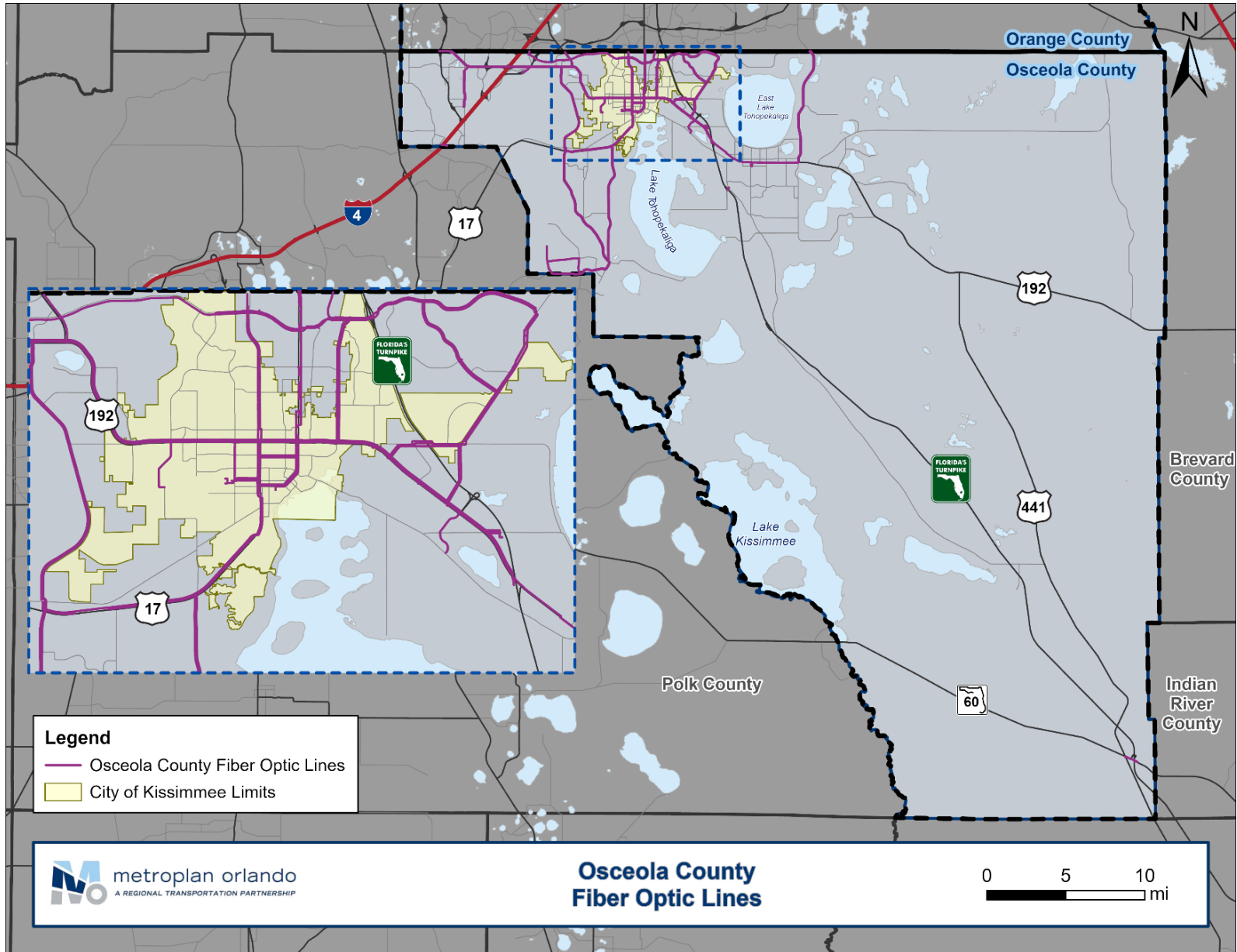
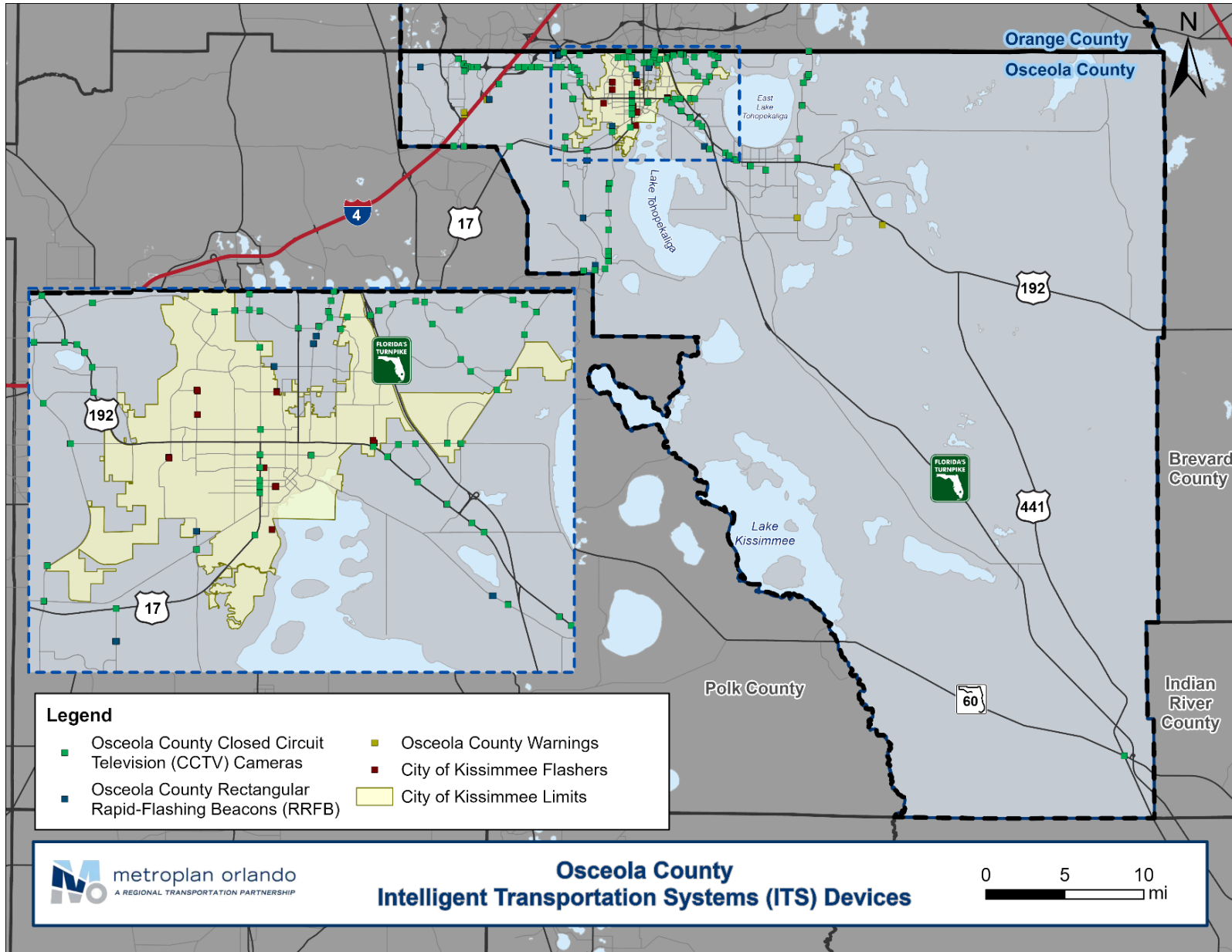


Figure 4-8: Osceola County CCTV Cameras and Local Municipality Traffic Device Locations



4.4 SEMINOLE COUNTY

Seminole County operates and maintains their transportation network from the County's Traffic Management Center (TMC) located in the Traffic Engineer's building on US 17/92 in Sanford. The TMC includes a video display wall, two workstations, and is staffed by one full-time operator.

Seminole County operates and maintains 400 traffic signals with a fiber optic network that extends over 400 miles throughout the County. More detailed information related to the traffic signal operations is listed below.

- 394 traffic signals are interconnected using fiber optic networks
- 286 traffic signals are coordinated
- 62 adaptive traffic signals

A staff of 9 technicians and 2 engineers oversees traffic signal maintenance. ITS deployments that support TSM&O strategies include upgraded cabinets, controllers (ATC) and switches, Bluetooth devices, CCTV cameras, and DMS and adaptive signal control on select corridors. For Transit Signal Priority (TSP), 78 signals use GPS detection, and 353 signals use infrared and/or GPS detection for emergency vehicle preemption functions.

Funding for TSM&O strategies, ITS devices, and signal system operations are provided by funds allocated by MetroPlan Orlando, the County's sales tax, and various maintenance agreements with FDOT and other municipalities within the County.

Table 4-4 summarizes Seminole County's devices. **Figure 4-9** and **Figure 4-10** include maps depicting the locations of traffic signals, the fiber optic communications network, and ITS devices by type within Seminole County.

Table 4-4: Seminole County Device Summary

Device	Number
Traffic Signals	400
Closed Circuit Television (CCTV) Cameras	224
Travel Time Detection	140
Dynamic Message Signs (DMS)	29
Adaptive Traffic Signal Control (ATSC) Intersections	62
Bluetooth Readers	117

Figure 4-9: Seminole County Traffic Signals and Fiber Optic Communications

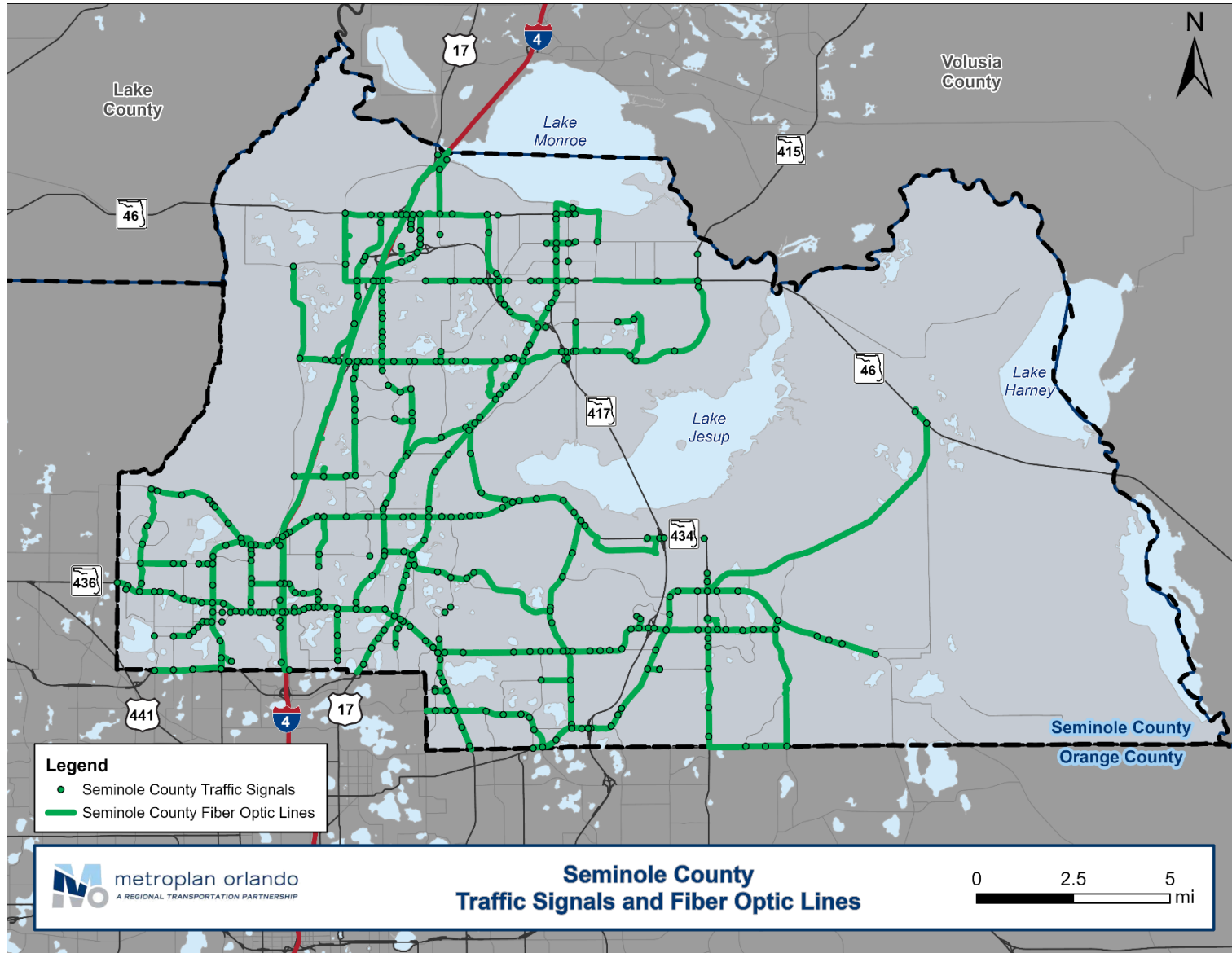
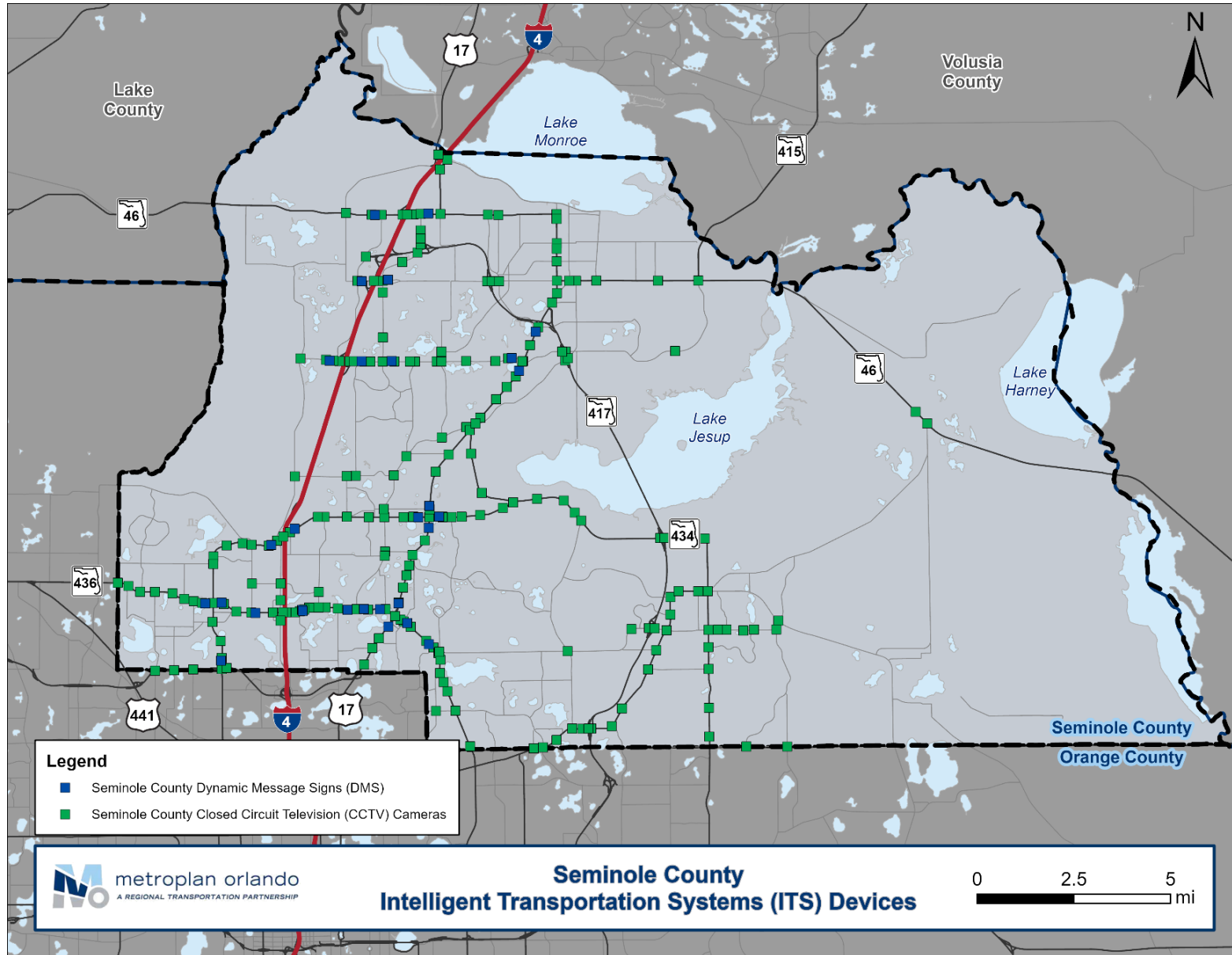


Figure 4-10: Seminole County CTV Camera and DMS Locations



4.5 CITY OF ORLANDO

The City of Orlando operates and maintains 537 traffic signals within the city limits. The City uses Naztec controllers that are connected to a fiber optic communications network. This network is approximately 55 miles long. More detailed information related to the City's traffic signal operations is listed below.

- 460 traffic signals are interconnected using fiber optic networks
- 368 traffic signals are coordinated

Additional ITS equipment includes 102 CCTVs, 11 DMSs and 85 Bluetooth readers. Current staff includes seven TMC employees and ten field maintenance staff. Funding sources include allocations through MetroPlan Orlando, FDOT and the City's capital improvement budget.

The City of Orlando operates and maintains their traffic signal system as part of their Transportation Systems Manager duties. Their staff has two sections- signal systems and traffic operations. The signal system engineer oversees their signal timing engineer, six operators and their supervisor. The traffic operations manager oversees six technicians and signal inspectors.

Table 4-5 includes a summary of the City of Orlando's devices. **Figure 4-11 through Figure 4-13** provide maps depicting the locations of traffic signals, the fiber optic communications network, and ITS devices by type within the City of Orlando.

Table 4-5: City of Orlando Device Summary

Device	Number
Number of Traffic Signals Using Fiber Optic Network	460
Traffic Signals	537
Closed Circuit Television (CCTV) Cameras	101
Travel Time Detection	80
Dynamic Message Signs (DMS)	11
Adaptive Traffic Signal Control (ATSC)	0

Figure 4-11: City of Orlando Traffic Signals

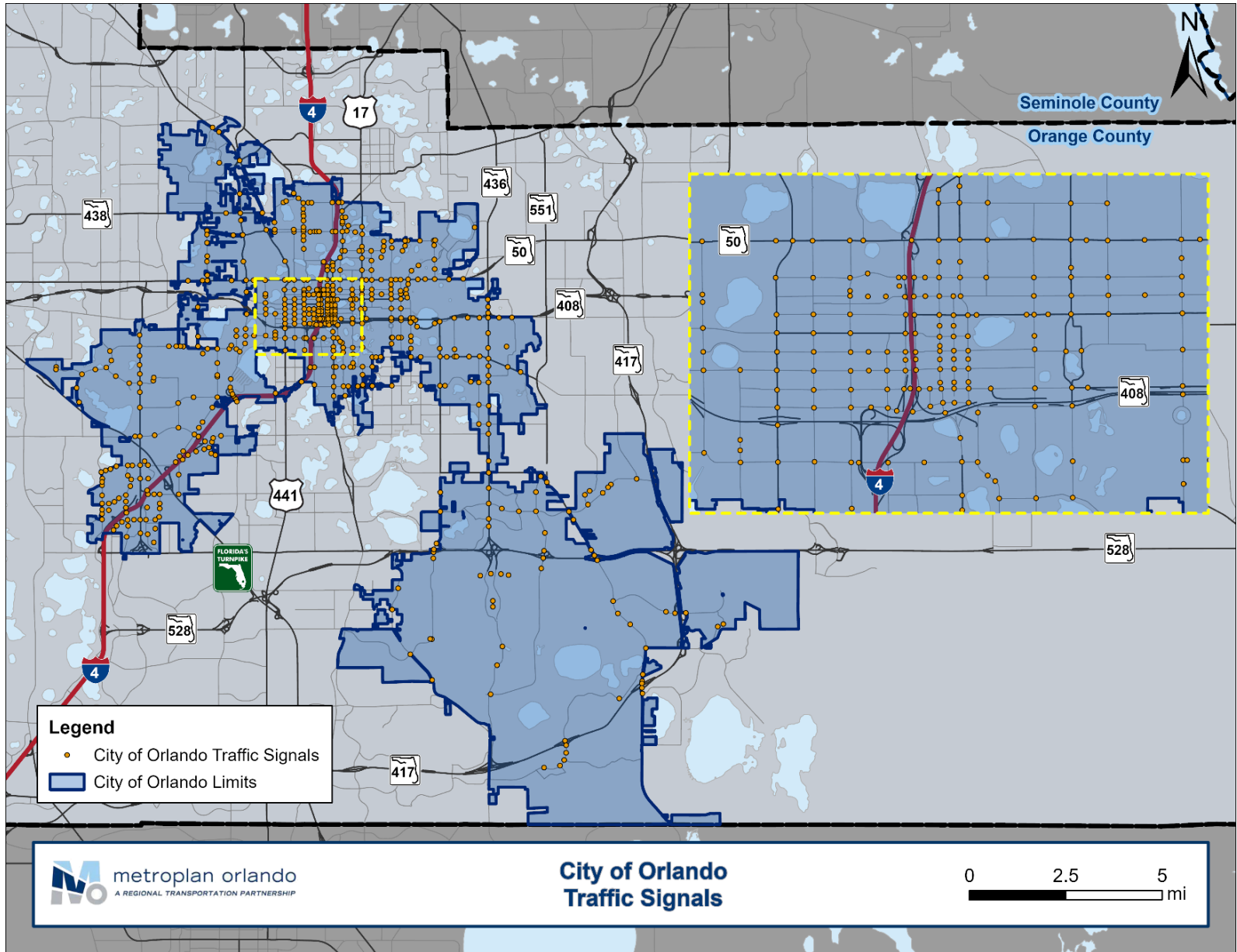


Figure 4-12: City of Orlando Fiber Optic Communications Network

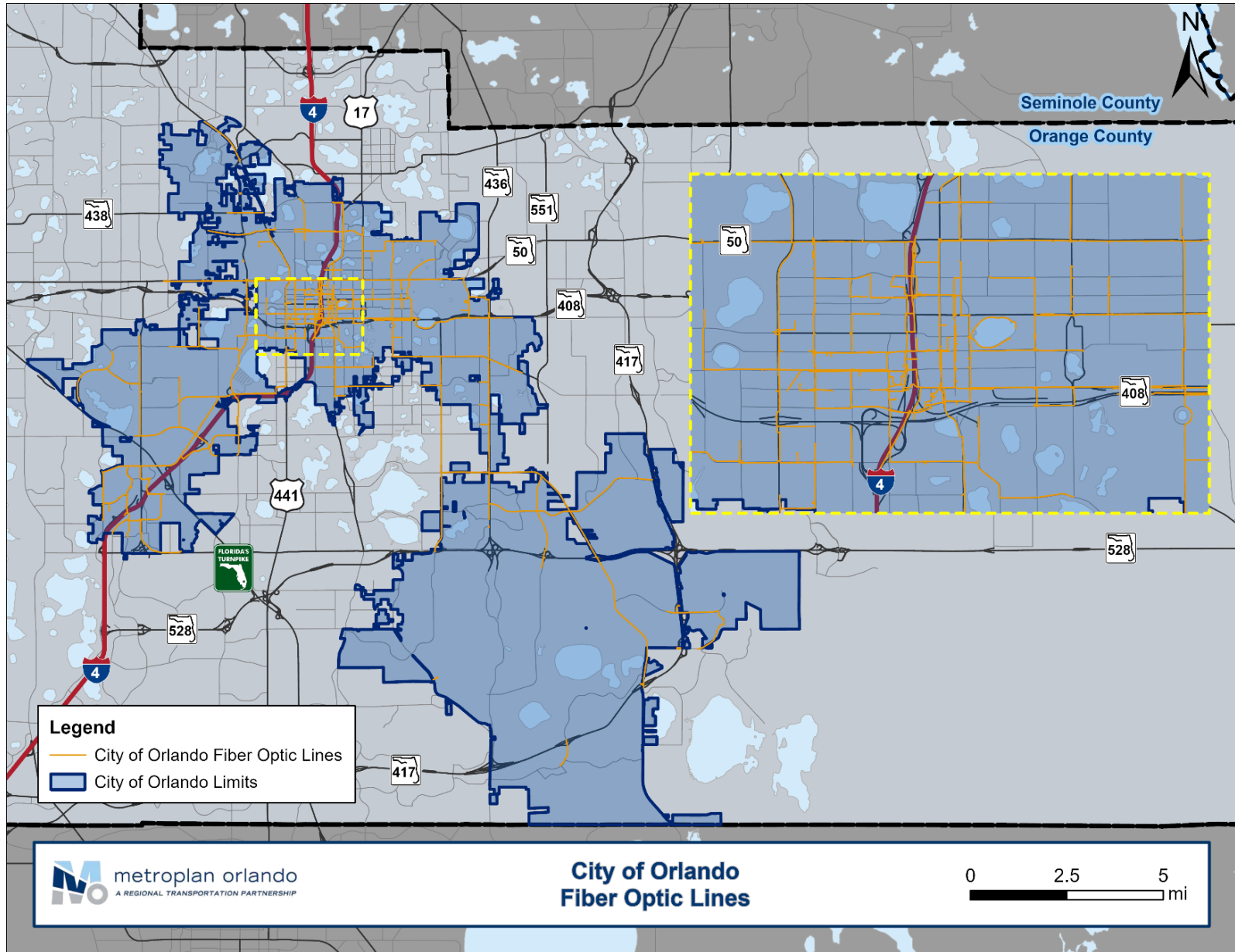
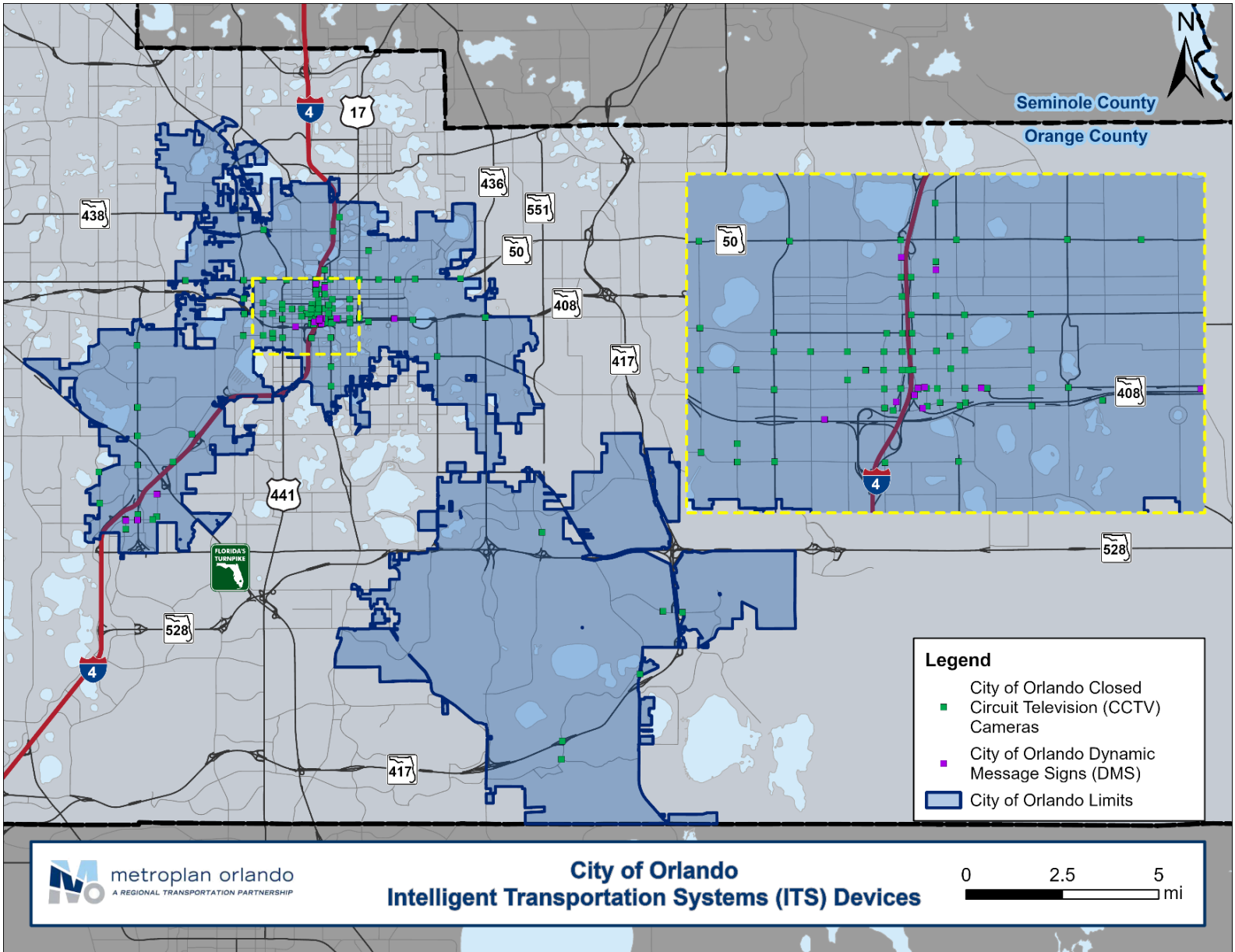


Figure 4-13: City of Orlando CCTV Camera and DMS Locations



4.6 FLORIDA'S TURNPIKE

Florida's Turnpike (Turnpike) operates two Regional Traffic Management Centers (RTMCs) within the state. One is located along the Turnpike mainline in South Florida at the Pompano Beach Turnpike Operations Center located at Mile Post 65. The other RTMC is located in Central Florida at the Turkey Lake with the Florida Turnpike Headquarters complex at Mile Post 263. Operators monitor and manage traffic along Florida's Turnpike System roadways 24 hours a day, 7 days a week. Turnpike staff works closely with Florida Highway Patrol, the Road Rangers Safety Patrol, the statewide 511 traveler information service, contracted tow service companies, traffic media, the Public Information Office (PIO) and other agencies to provide accurate and timely information.

Florida's Turnpike operates and maintains more than 500 miles of fiber optic communications lines and for expressways in the planning area that include SR 91 (Florida Turnpike Mainline), as well as portions of SR 408, SR 417, SR 429, and SR 528. In total, Florida's Turnpike operates and maintains over 2,200 ITS devices. Additionally, Florida's Turnpike has also implemented Wrong Way Driver Detection Systems at more than 30 locations. These devices are operated from both RTMCs in conjunction with regional partners to facilitate cross-jurisdictional operations.

Funding for ITS and TSM&O projects are based on needs identified in the Ten-Year ITS Cost Feasible Plan. Projects are then funded through the adopted Five-Year Work Program. This is the current plan for Florida's Turnpike System improvement projects that are funded for the next five fiscal years, starting with the current fiscal year that began July 1.

Table 4-6 summarizes the Turnpike's network devices and communications network coverage. **Figure 4-14** through **Figure 4-17** provide maps depicting the locations of the Turnpike's ITS devices by type within the planning area.

Table 4-6: Florida's Turnpike Device Summary

Device	Number
Miles of Fiber Optic Network	521
Closed Circuit Television (CCTV) Cameras	678
Microwave Vehicle Detectors (MVDS)	1241
Dynamic Message Signs (DMS)	128

Figure 4-14: Florida's Turnpike ITS Device Locations in Orange County

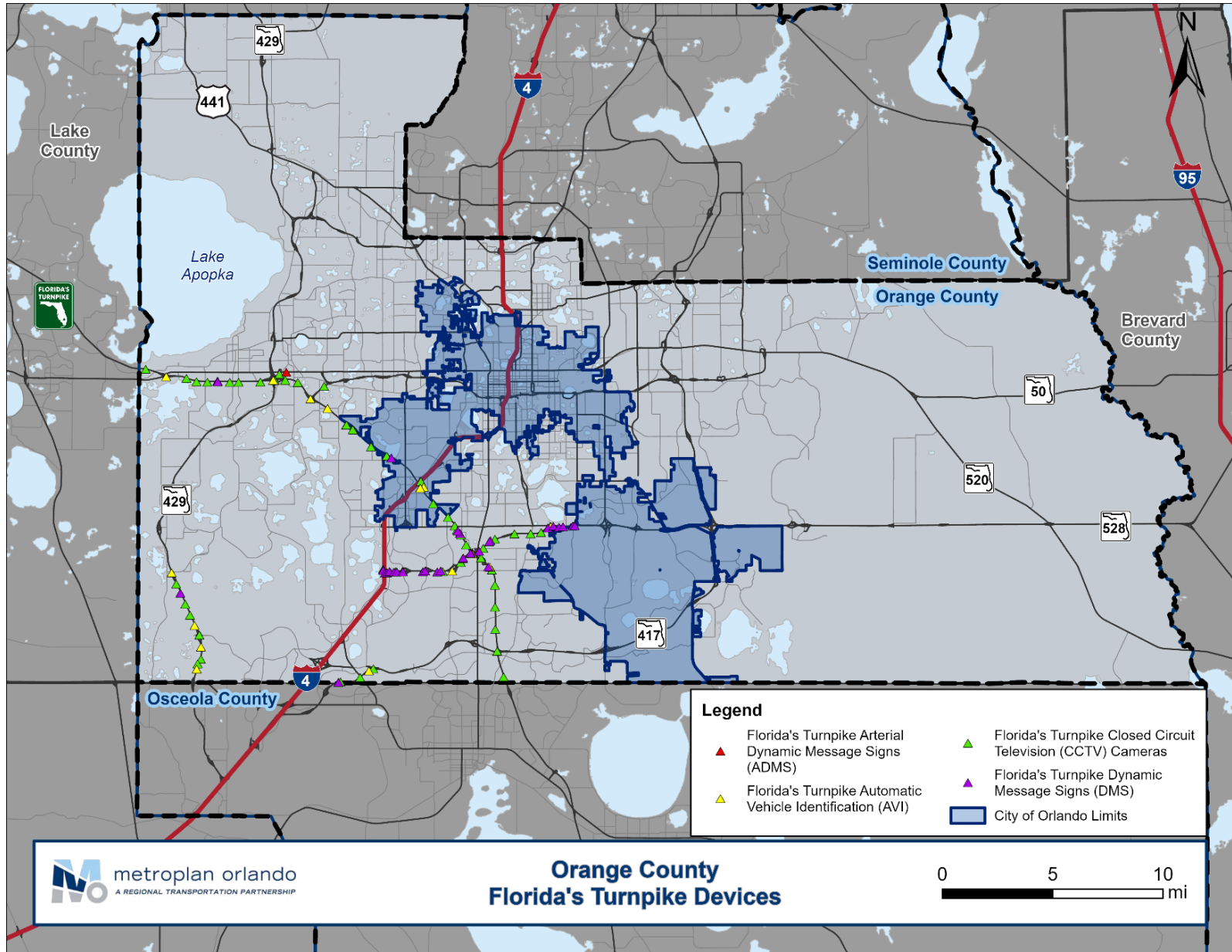


Figure 4-15: Florida's Turnpike ITS Device Locations in Osceola County

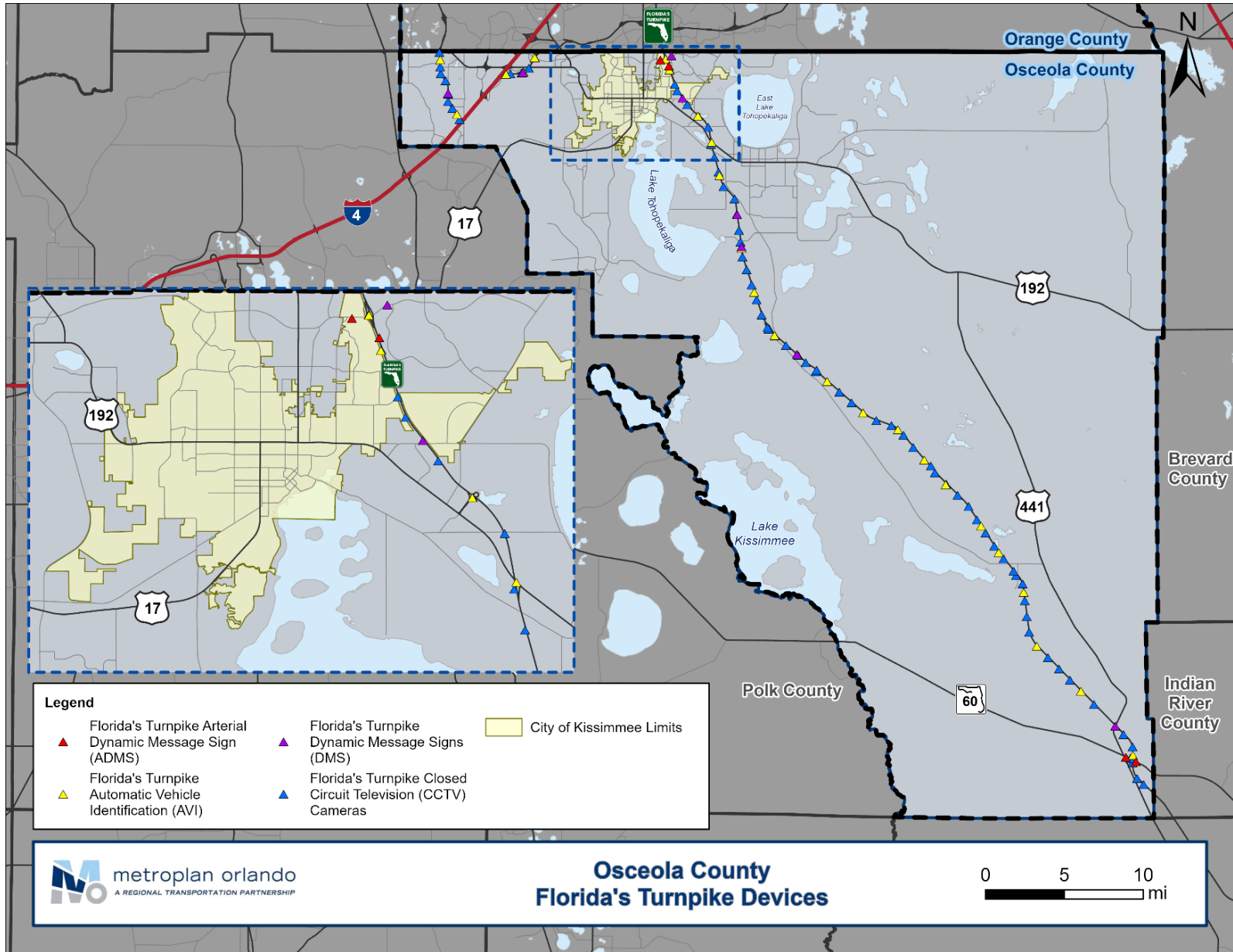


Figure 4-16: Florida's Turnpike ITS Device Locations in Seminole County

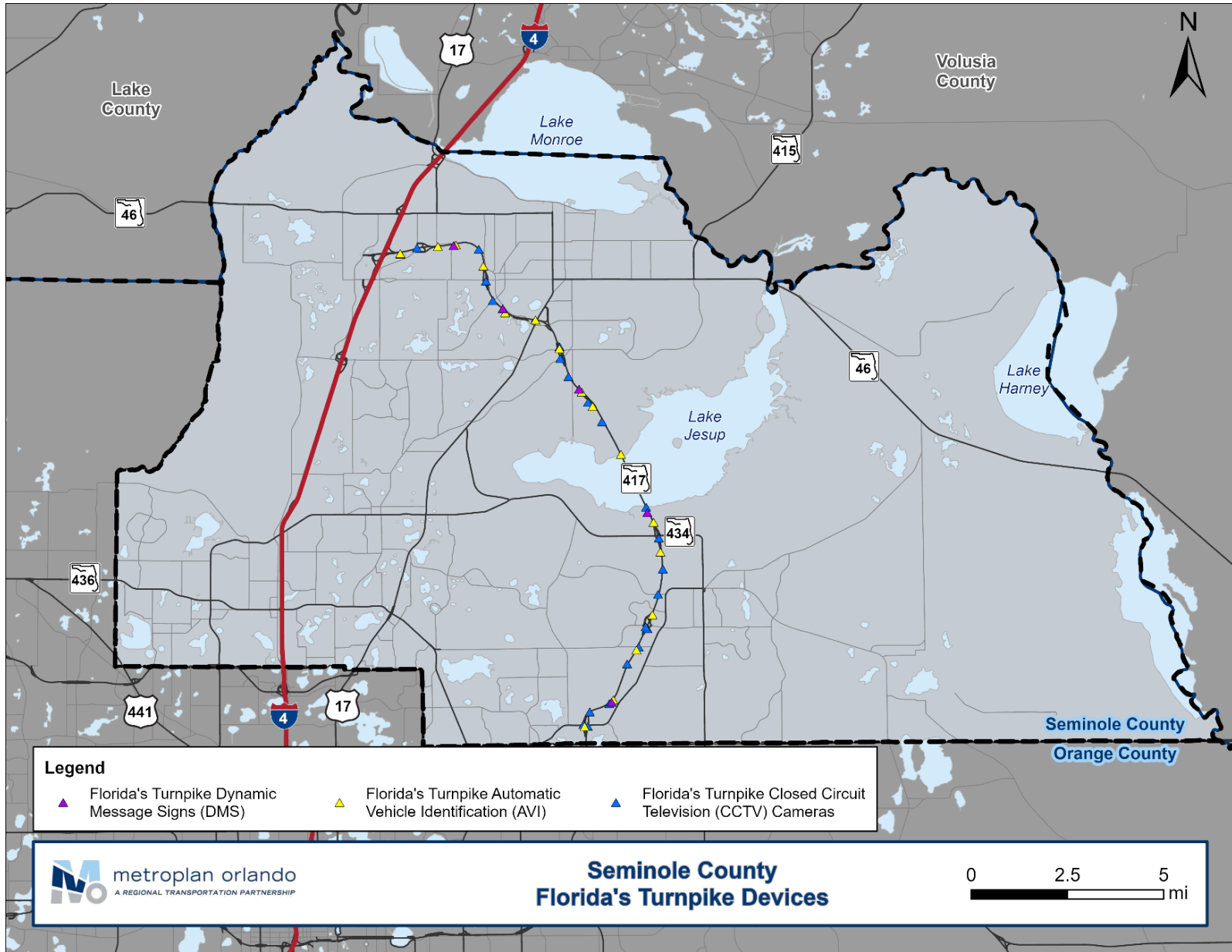
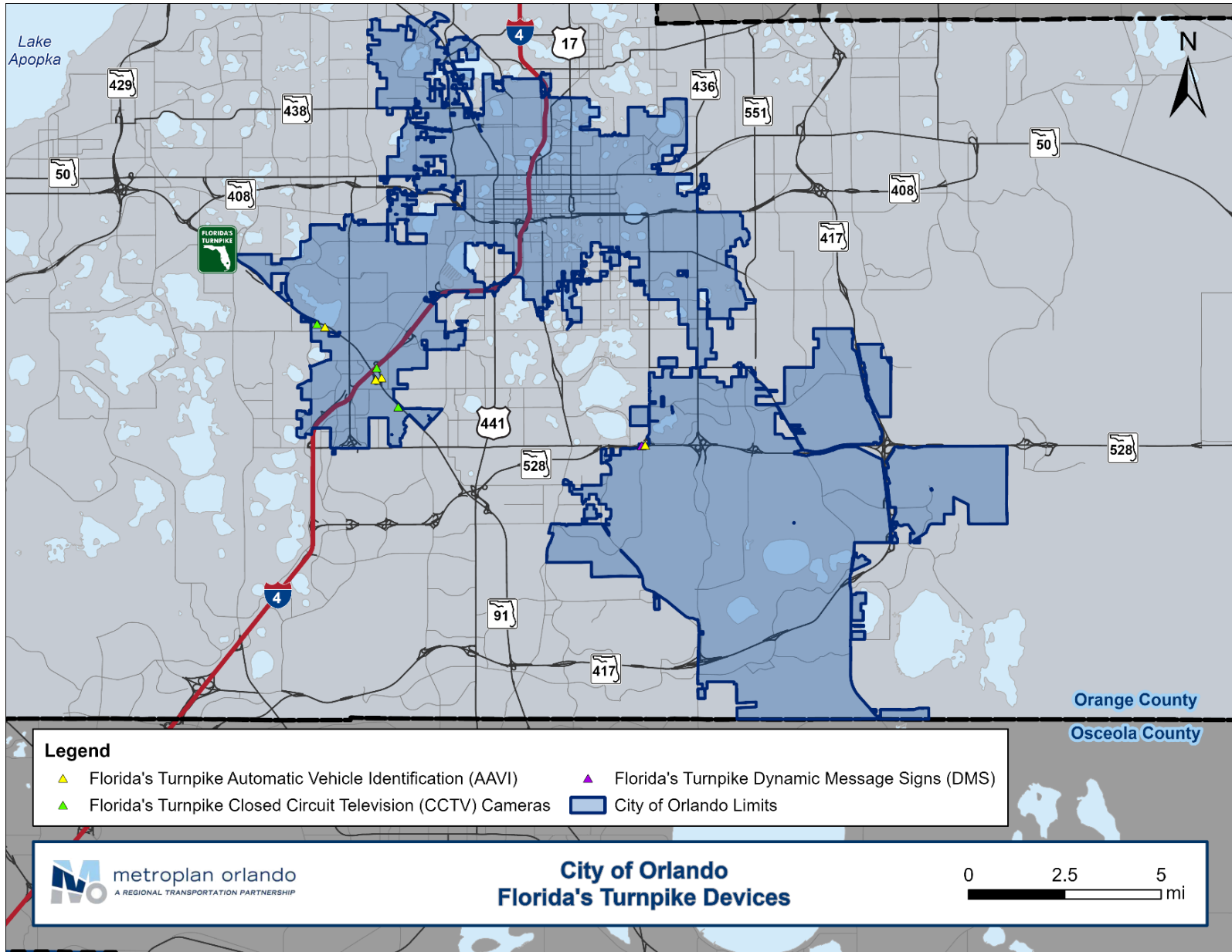


Figure 4-17: Florida's Turnpike ITS Device Locations in the City of Orlando



4.7 LYNX

LYNX is a transit service provided by the Central Florida Regional Transportation Authority and serves Orange, Osceola, and Seminole counties with local fixed route bus service, express fixed route bus service (FastLink) public on-demand (NeighborLink) service, paratransit service (ACCESS LYNX) and Bus Rapid Transit (LYMMO) services in downtown Orlando. LYNX also administers the Road Ranger and LYNX Vanpool programs. LYNX provides more than 53,000 rides each weekday, with 16,722,189 total passenger trips in FY 22. Most routes are served every 20 to 30 minutes. LYNX utilizes technology to ensure reliable and efficient service with a focus moving forward on expanding the number of signals and buses with TSP-activating equipment. LYNX also provides open access to schedule data in the standard General Transit Feed Specification (GTFS) and real-time bus location information in the Real-time extension (GTFS-RT) through its website for use in planning, operations, and provision of transit information by third parties.

LYNX recently completed its 2022 ITS Strategic Plan Update. The plan identifies ITS systems and other advancements that are necessary for LYNX to operate and maintain a secure and safe transit system. Their strategic plan provides a roadmap for implementing dynamic software and hardware systems and services. The goal is to keep up with any state, local, and federal standards and requirements associated with the delivery of efficient transit services that rely on technology.

Other systems or devices that LYNX currently utilizes to support TSM&O include:

- Transit Signal Priority
 - Opticom Multi-mode 2101 low priority emitters with GPS on bus, integrated to Trapeze CAD system
- Computer-Aided Dispatch/Automatic Vehicle Location (CAD/AVL)
- Closed-Circuit Television Cameras
- Ridership from automatic passenger counters (Trapeze CAD buses)
- Mobile Data Terminals for onboard real-time information for operators

Table 4-7 summarizes the devices operated and maintained by LYNX. **Figure 4-18 through Figure 4-21** provide maps depicting the routes and bus stop locations operated by LYNX.

Table 4-7: LYNX Device Summary

Device	Number
CAD	486
Closed Circuit Television (CCTV) Cameras	174
Automated Passenger Counters (APC)	295
Automated Vehicle Location (AVL)	486
Transit Signal Priority (TSP) Enabled Intersections	134

Figure 4-18: LYNX Routes and Bus Stop Locations in Orange County

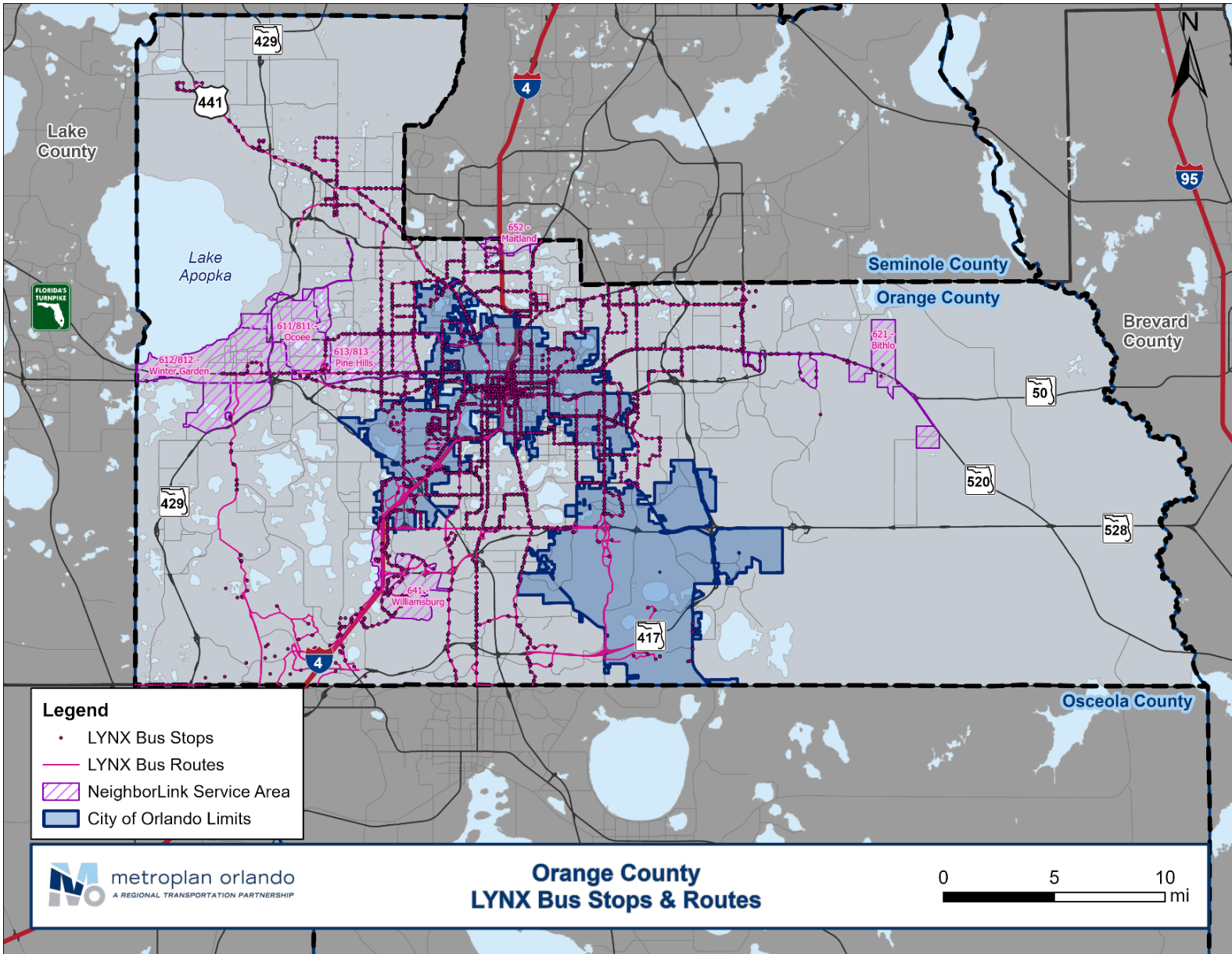


Figure 4-19: LYNX Routes and Bus Stop Locations in Osceola County

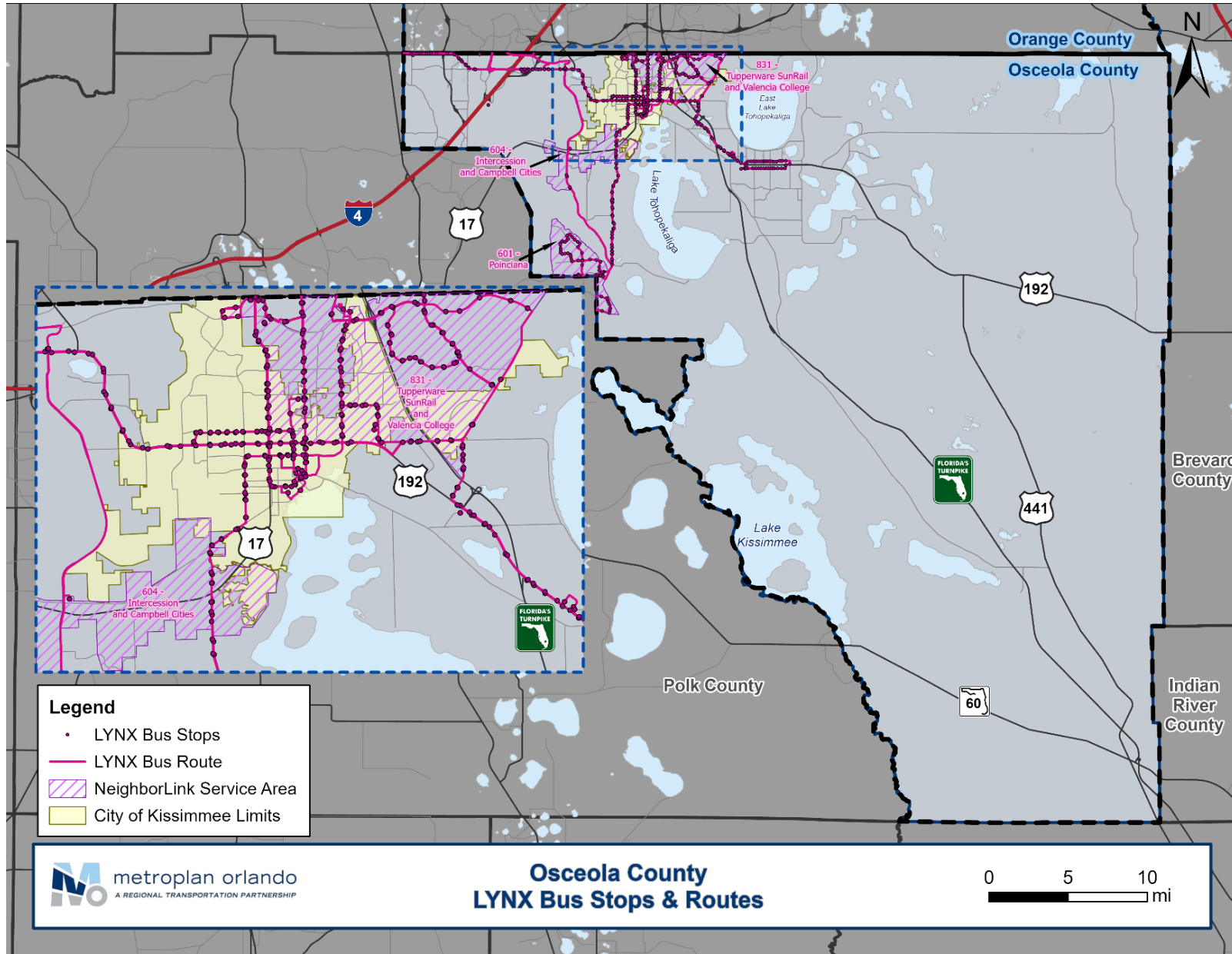


Figure 4-20: LYNX Routes and Bus Stop Locations in Seminole County

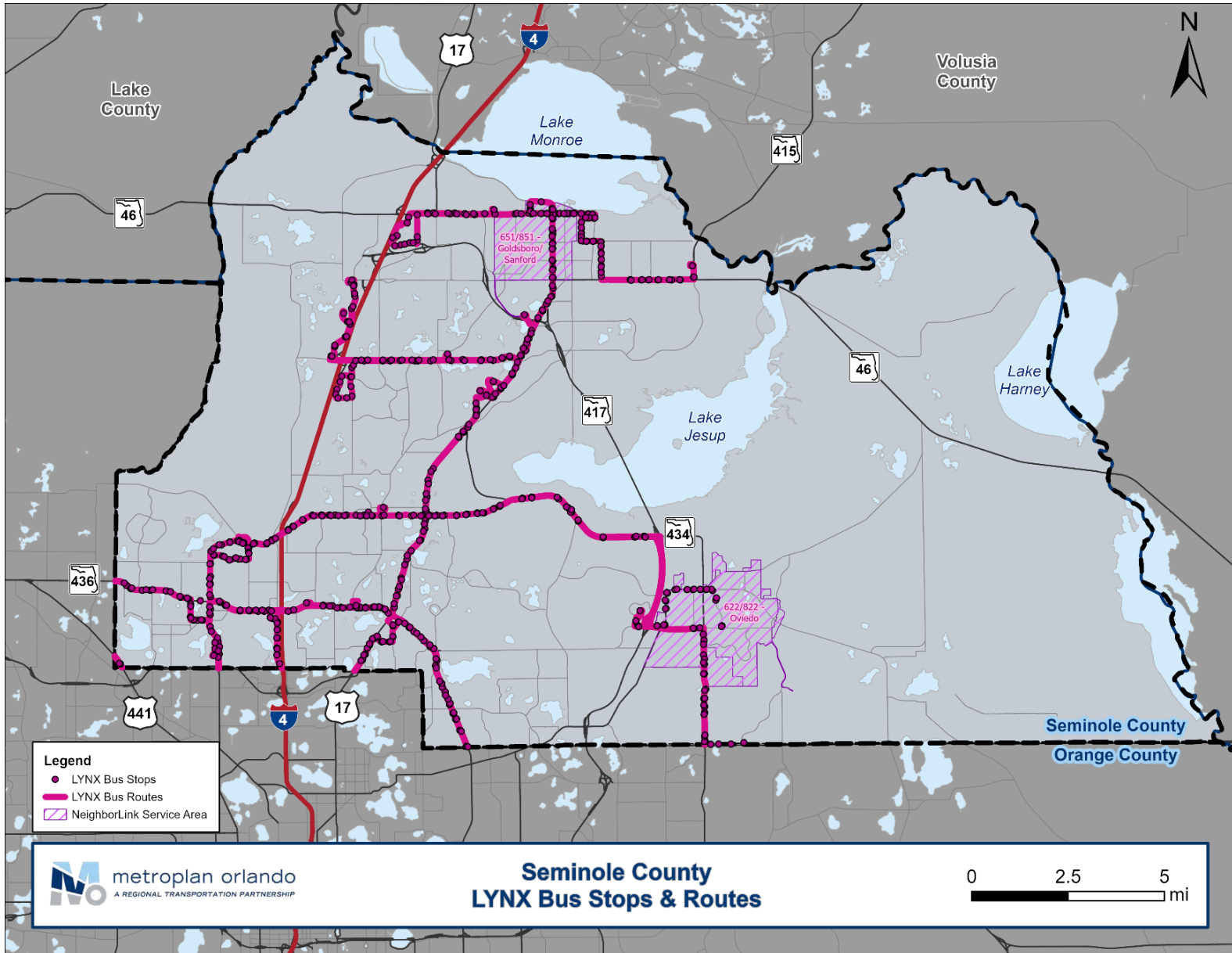
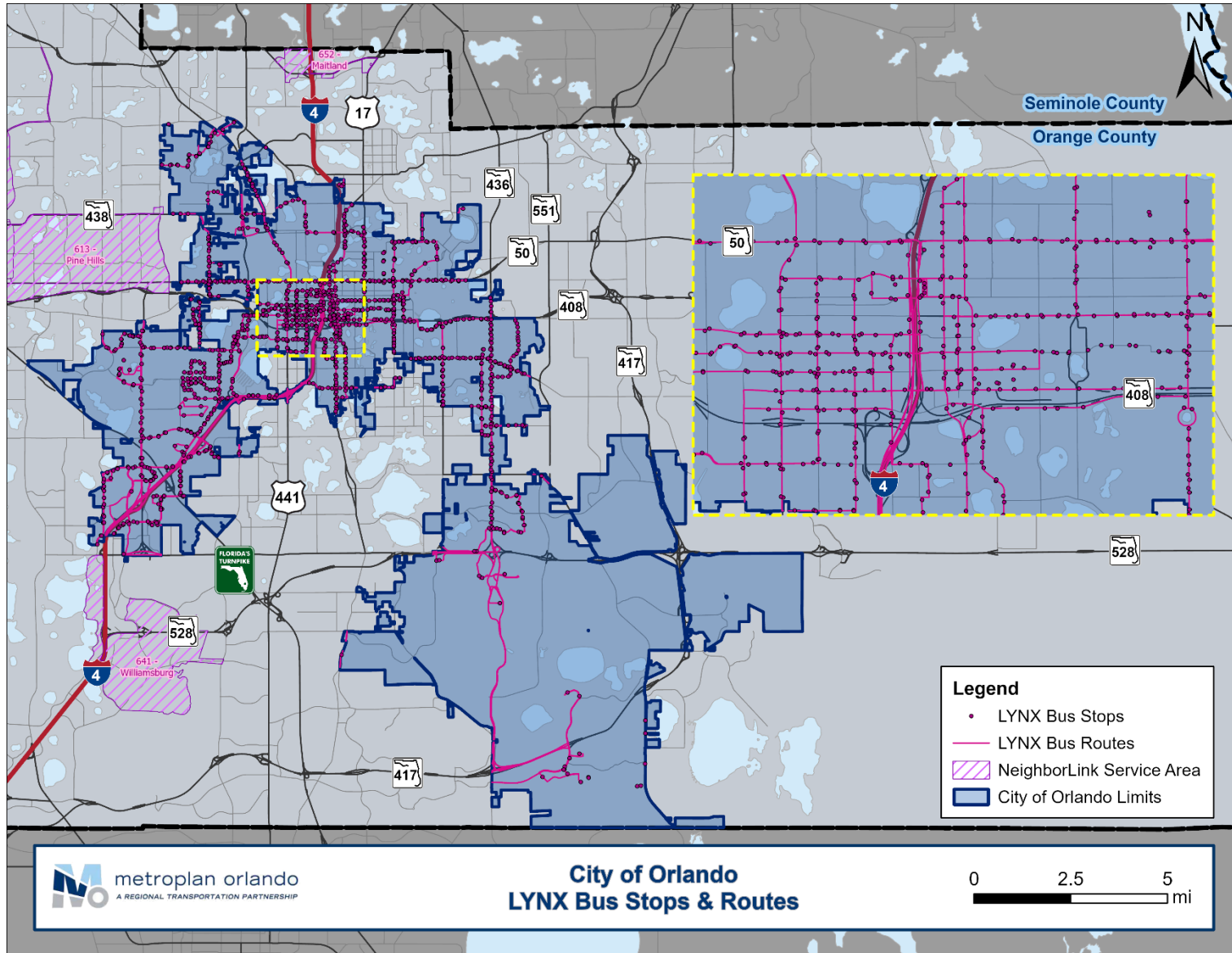


Figure 4-21: LYNX Routes and Bus Stop Locations in the City of Orlando



4.8 CENTRAL FLORIDA EXPRESSWAY AUTHORITY

The Central Florida Expressway Authority (CFX) is an independent agency of the state that owns, operates and maintains a regional network of expressways for 3.3 million residents and more than 72 million visitors in Brevard, Lake, Orange, Osceola and Seminole Counties. CFX's 125-mile user-funded system includes 865 lane miles, 73 interchanges, 14 mainline toll plazas, 5 mainline gantries, 74 ramp toll plazas and 343 bridges and eight named expressways.

FDOT Operators monitor and manage traffic along CFX roadways (SR) 24 hours a day, 7 days a week from the D5 Regional Traffic Management Center located at 4975 Wilson Road, Sanford, FL 32771. Operations staff work with Florida Highway Patrol, Road Rangers Safety Patrol, FDOT's statewide 511 traveler information service, contracted tow service companies, traffic media and other agencies to disseminate accurate and timely information.

CFX published an updated ITS Master Plan in February of 2022. The document details existing conditions and identifies strategies for advancing ITS over the next ten years. Future ITS projects are identified in the five-year work plan which is updated every year.

CFX has approximately 500 miles of fiber optic communications lines along the expressways under its jurisdiction. These expressways include SR 408, SR 414, portions of SR 417, portions of SR 429, SR 451, SR 528, SR 453, and SR 538. **Table 4-8** summarizes the devices operated and maintained by CFX. **Figure 4-22 through Figure 4-24** provide maps depicting the locations of ITS devices on CFX facilities in the planning area.

In addition, CFX has a current deployment of 55 Wrong Way Driving systems on exit ramps throughout the CFX roadway system and an additional 10 Wrong Way Driving detection locations along the mainlines.

Table 4-8: CFX Device Summary

Device	Number
Miles of Fiber Optic Network	500
Closed Circuit Television (CCTV) Cameras	274
Microwave Vehicle Detectors (MVDS)	441
Bluetooth Readers	71
Dynamic Message Signs (DMS)	125
Data Collection System (DCS)	186

CFX maintains signals at ramp terminals for CFX roadways on a case-by-case basis. It is important to note that where possible these signals are tied into the corresponding local agency's ATMS system for signal timing and control of the intersection.

Figure 4-22: CFX Device Locations in Orange County

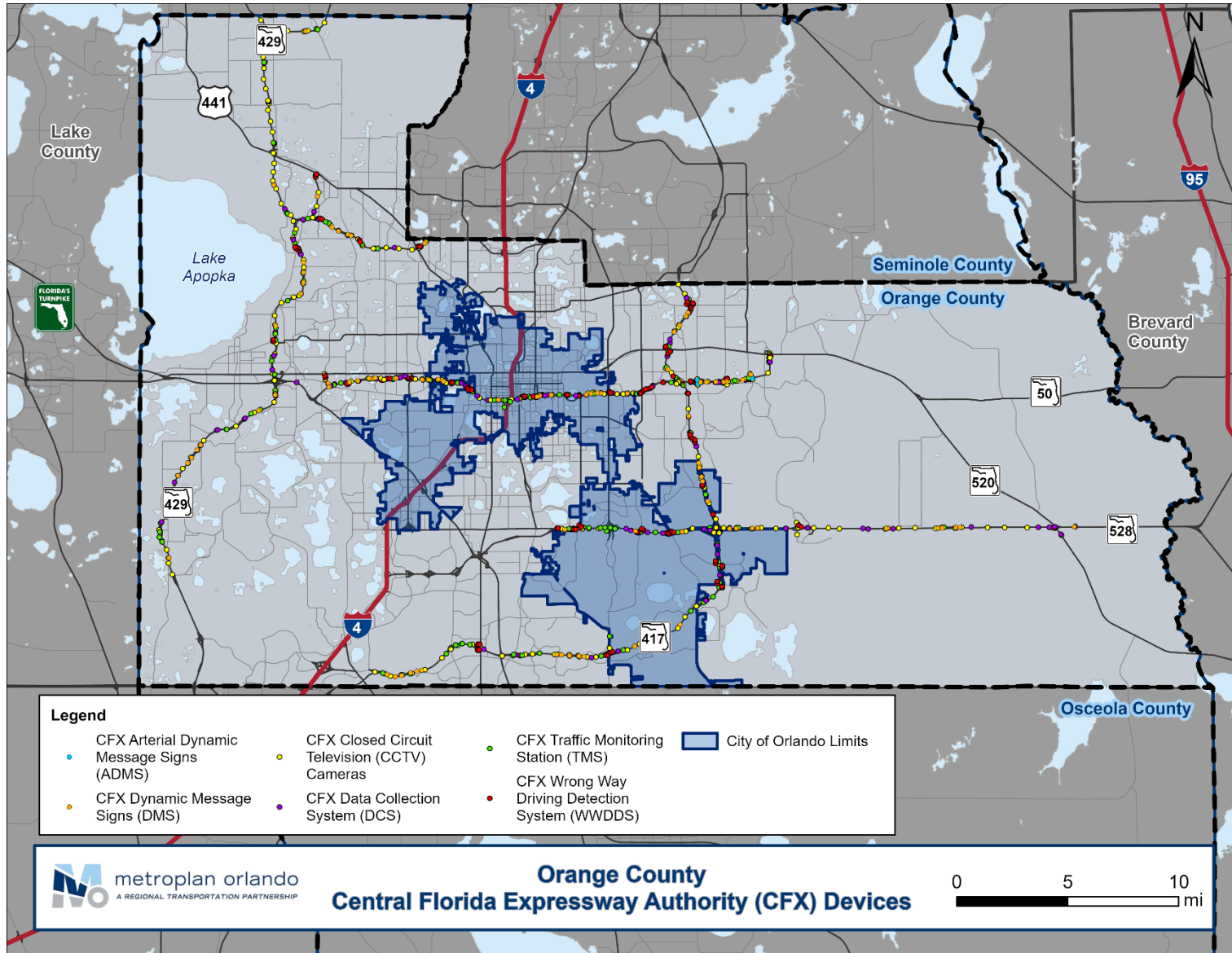


Figure 4-23: CFX Device Locations in Osceola County

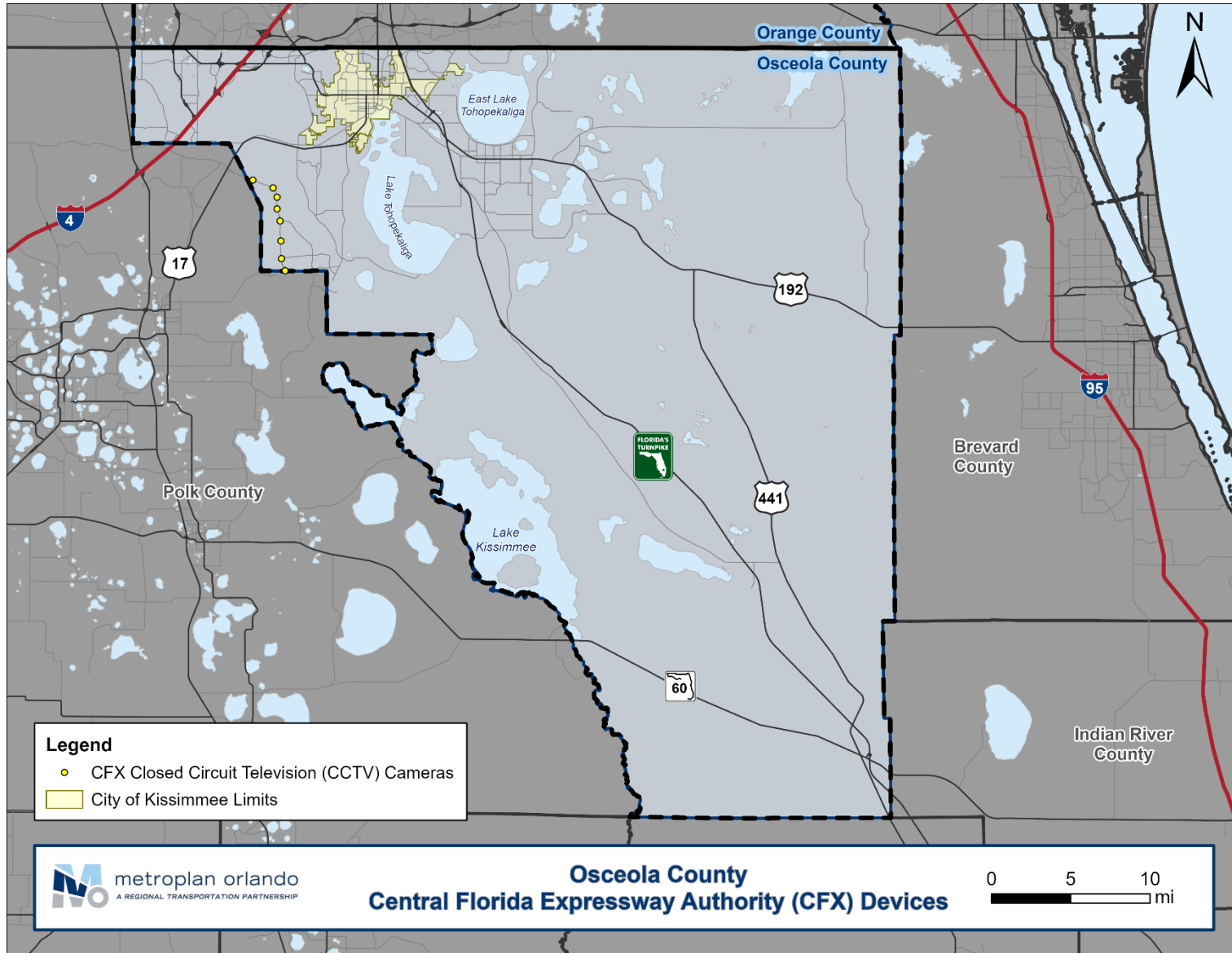
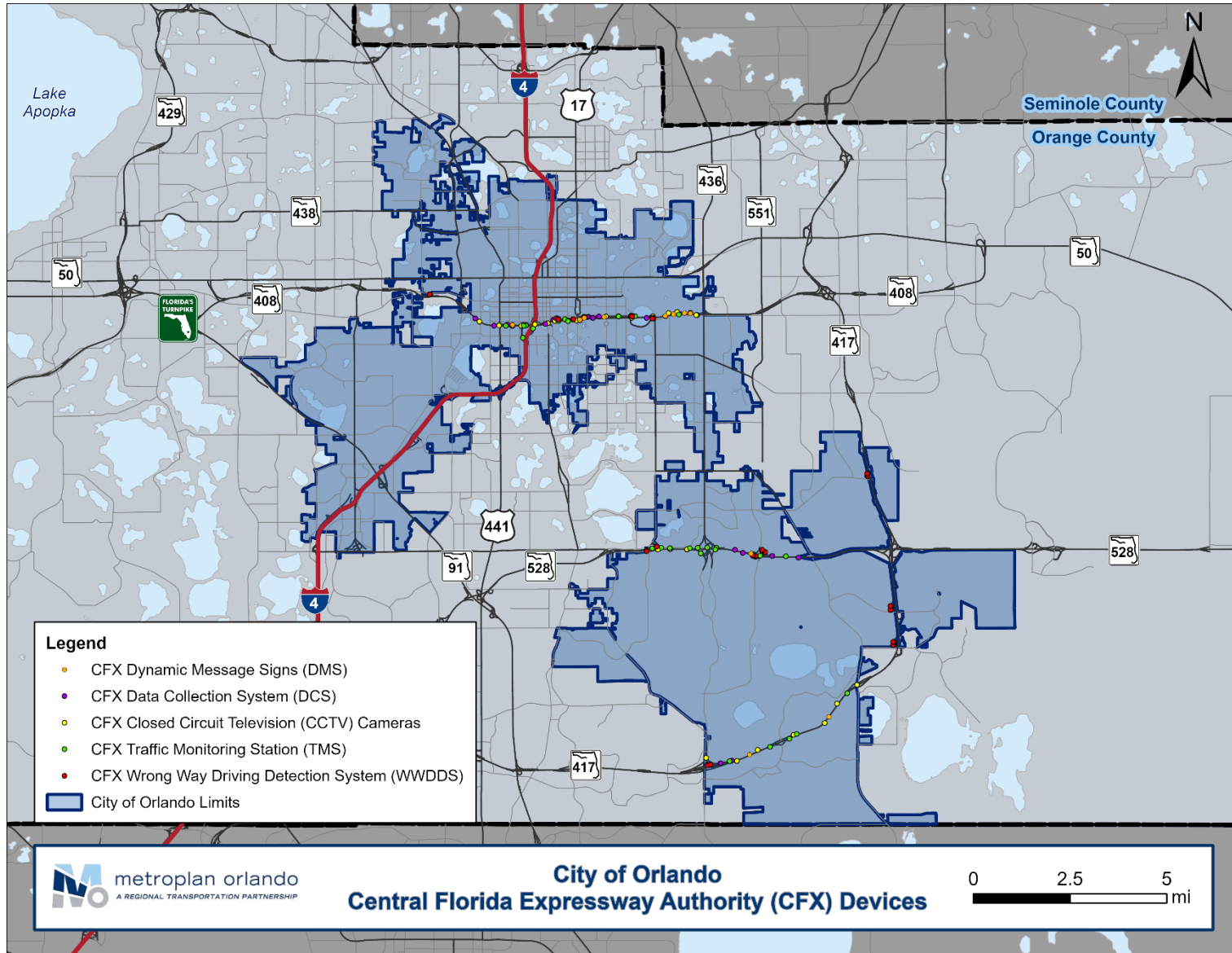


Figure 4-24: CFX Device Locations in the City of Orlando





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