REGIONAL FREIGHT TRANSPORTATION PLAN UPDATE

REGIONAL FREIGHT PROFILES AND ASSESSMENT

OCTOBER 2022

CORE
COASTAL REGION MPO

Regional Freight Transportation Plan Update

Regional Freight Profiles and Assessment

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1 INTRODUCTION

The Coastal Region Metropolitan Planning Organization (CORE MPO) region serves as a gateway for global trade and for freight movement in the Southeast USA, due in large part to the Port of Savannah – the nation's 4th largest container port. In addition to the Port of Savannah, the region contains a comprehensive multimodal network of freight railroads and railyards, major highways, cargo-serving airports, as well as a substantial warehousing/distribution/logistics industry to manage freight movements over that network. The region leverages this unique multimodal freight network to create a manufacturing hub for businesses looking to create and ship a diverse portfolio of finished products to clients around the globe. Overall, goods movement in the Savannah region has a major impact on the regional and state economy.

In support of the region's multimodal freight network and the people and businesses that rely on it, the CORE MPO is conducting an update of its Regional Freight Transportation Plan. The study area is the Savannah Metropolitan Statistical Area which comprises of Chatham, Bryan and Effingham Counties. The purpose of this technical memorandum is to identify the existing multimodal freight assets of the CORE MPO region and assess their performance and conditions. Documenting existing challenges helps identify strategies and solutions to aid the region going forward.

1.1 Recent and Ongoing Major Freight Investments

Since the 2015 Regional Freight Transportation Plan was completed, much has changed in the region and across Georgia that impacts the Savannah region's multimodal freight network. Recent completed and ongoing major freight investments include the Savannah Harbor Expansion Project (SHEP), the Mason Mega Rail Project, the Appalachian and Northeast Georgia regional ports, and the Major Mobility Investment Program. Each of these impacts the manner and the magnitude of freight flowing through the study area.

The Savannah Harbor Expansion Project (SHEP) was completed in March 2022. The SHEP deepened the Port of Savannah's main navigation channel from 42 feet to 47 feet. This allows the harbor to accommodate deeper draft vessels without tidal restrictions. Vessels carrying as many as 16,000 containers are now able to call on the port at low tide.

The Mason Mega Rail Project was completed in 2022 and has substantially increased on-dock rail capacity at the Port of Savannah. The project increased the number of working tracks from 8 to 18 and added about 97,000 feet of new rail to the Garden City Terminal. This brings the total amount of on-dock rail at the terminal to approximately 34 miles. In addition, the Mason Mega Rail Project increases the lift capacity at the Port of Savannah to approximately 1 million containers per year.

The Appalachian Regional Port opened in 2018 and is joint venture between Murray County, the Georgia Ports Authority and CSX Transportation. The port was conceived, in part, to provide an alternative to trucking for freight trips between the Port of Savannah and northwest Georgia. The facility has an annual capacity of about 50,000 containers and has a direct rail route via CSX Transportation to the Port of Savannah.

Though not yet complete, another inland port is being developed in Hall County. The Northeast Georgia Inland Port will provide a rail alternative to trucking for freight trips between the Port of Savannah and northeast Georgia. The facility will have an annual lift capacity of about 80,000 containers and will have a direct rail route via Norfolk Southern to the Port of Savannah.

Another freight investment currently under development that impacts the Savannah region is the Georgia Department of Transportation's (GDOT's) Modern Mobility Improvement Program (MMIP). The MMIP is expanding the region's highway network and implementing operational improvements through the "16@95" project. The project is scheduled to be completed in 2023 and key components include:

- Widening I-16 mainline corridor toward the inside median from two to three lanes in each direction from I-95 to I-516;
- Replacing the existing (I-95 southbound to I-16 eastbound and the I-16 westbound to I-95 southbound) loop ramps located on the west side of I-95 with "partial turbine" configuration ramps to provide smoother, more direct connections;
- Adding a collector-distributor (CD) lane on I-95 northbound to help improve traffic flow and safety to and from I-16 and I-95;
- Adding lighting at the I-16/I-95 Interchange;
- Installing Intelligent Transportation System (ITS) technology, including cameras, and changeable message signs to provide real-time driving conditions;
- Installing ramp meters at SR 307/Dean Forest Road and Chatham Parkway on-ramps;
- Constructing a two-lane, emergency-use median crossover on I-16 between I-95 and SR 307/Dean Forest Road to aid in evacuations; and
- Constructing/rehabilitating 13 bridges.

The implication of these investments for the region is that they help it to facilitate greater volumes of freight, enhancing its role as a global logistics hub. Recent and ongoing investments in inland ports may have the long-term impact of diverting to rail freight shipments that would have otherwise been transported by truck.

1.2 Memorandum Organization

The remainder of this report is organized as follows: section 2 presents an inventory of highway freight assets as well as their condition and performance; section 3 contains a modal profile for rail; sections 4 and 5 discuss the region's port and air cargo assets; section 6 summarizes the information presented in sections 1 through 5 and discusses the implications of the findings for the region's freight needs and opportunities.

2 HIGHWAYS

In the Savannah region, freight moves through a transportation system that encompasses all modes. The region is served by a deepwater port, two Class I railroads, three rail terminals (including the Mason Mega Rail Terminal), and one commercial service airport that also provides cargo services. The region's roadway network connects all these assets to provide truck access from the intermodal terminals (seaports, rail yards, and airports) to origins or destinations of goods. This section of the report describes the condition and performance of the Savannah region's highway freight assets.

2.1 Inventory of Assets

The roadway network provides a critical connection between users and producers of goods throughout the state, the nation, and the world. The Savannah region's roads provide nearly 8,700 centerline miles. This section of the report provides an inventory of highway networks in the Savannah region. It also discusses other critical elements of these networks, specifically intelligent transportation systems (ITS).

Functional Classification

There are approximately 8,694 miles of roadways in the study area as shown in Table 2.1 and Figure 2.1[1]. Nearly 71 percent of these roadways are classified as local. Local roadways can be described as smaller roadways not intended for use in long distance travel, except at the origin or destination end of a trip.[2] Collectors are the next largest category of roadways in the study area at just over 13 percent. These roadways primarily facilitate intra-county travel and funnel traffic from local roads to the arterial network. About 8 percent of the region's roadways are minor arterials which function to distribute traffic to smaller geographic areas. Just over 5 percent of the study area's roadways are classified as principal arterials, which provide for travel over multiple counties at relatively high speeds. Nearly 2.4 percent of the study area's roadways are Interstate highways. Interstate highways provide for travel over much longer distances and at higher speeds. Goods movement relies primarily on the interstate and arterial networks. However, collector and local roadways often represent the first and last miles for freight shipments.

TABLE 2.1 FUNCTIONAL CLASSIFICATION OF ROADWAYS IN THE STUDY AREA, 2020

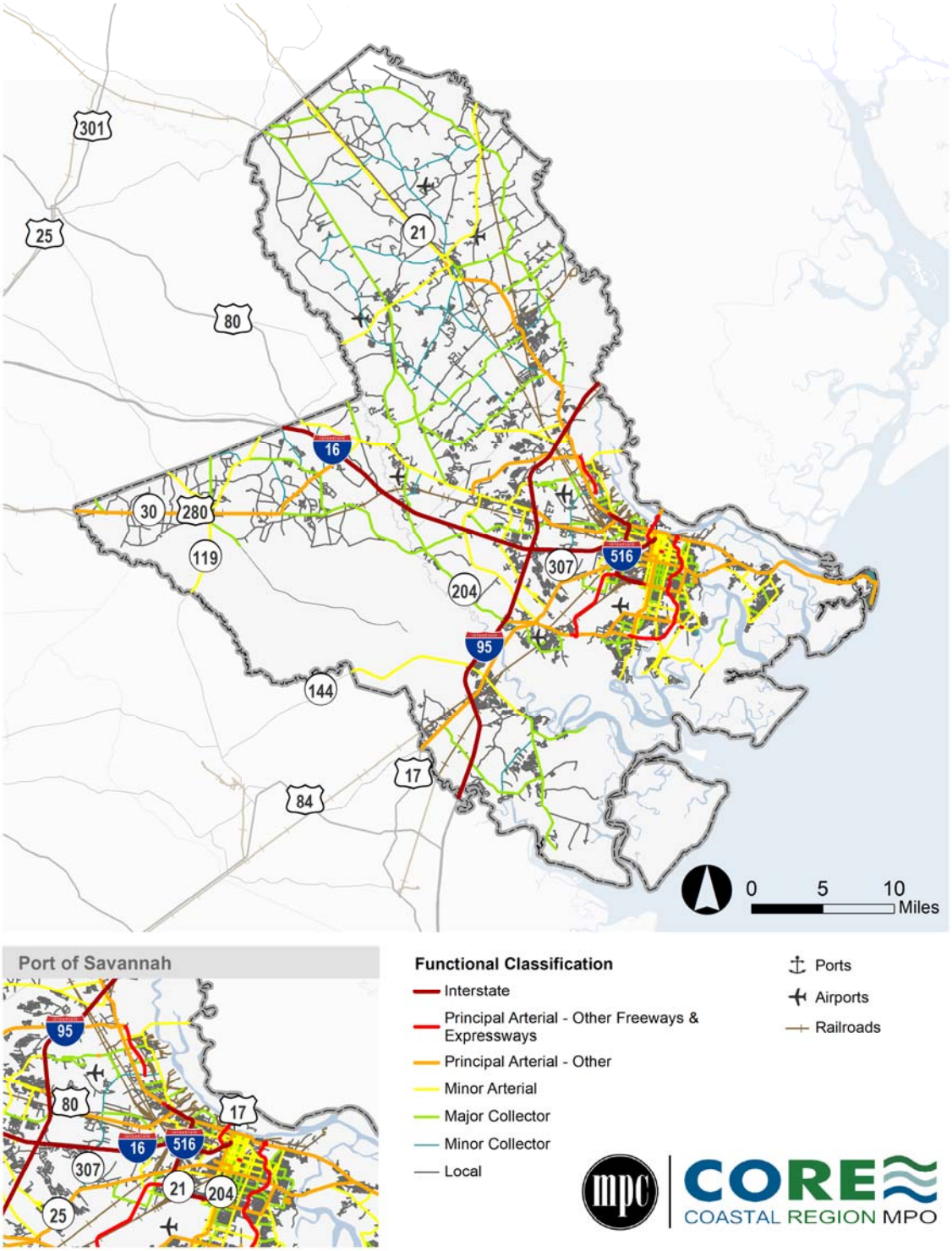
Functional Classification	Miles	Percent of Total
Interstate	207.92	2.4%
Principal Arterial – Other Freeways and Expressways	71.25	0.8%
Principal Arterial – Other	407.44	4.7%
Minor Arterial	688.97	7.9%
Major and Minor Collector	1,140.37	13.1%
Local	6,179.02	71.1%
Total	8,693.96	**100.0%**

Source: Federal Highway Administration, HPMS, 2020.

1 Highway Performance Monitoring System, Year 2020.

2 Federal Highway Administration, *Highway Functional Classification Concepts, Criteria and Procedures*, 2013 Edition.

FIGURE 2.1 FUNCTIONAL CLASSIFICATION OF ROADWAYS IN THE STUDY AREA



Source: Federal Highway Administration, HPMS.

Highway Freight Networks

The National Highway Freight Network (NHFN) was defined at the national level by the Fixing America's Surface Transportation (FAST) Act passed in 2015 for the purpose of strategically directing federal resources and policies toward improved performance of highway portions of the U.S. freight transportation system. The NHFN includes the following subsystems of roadways:

- **Primary Highway Freight System (PHFS):** This is a network of highways identified as the most critical highway portions of the U.S. freight transportation system determined by measurable and objective national data. The network consists of 41,518 centerlines miles Interstate and non-Interstate roads such as National Highway System (NHS) freight intermodal connectors. Georgia has just under 1,170 miles of roadway included on the PHFS. In the Savannah region, this includes I-16, I-95, and portions of I-516, SR 21, and SR 25.

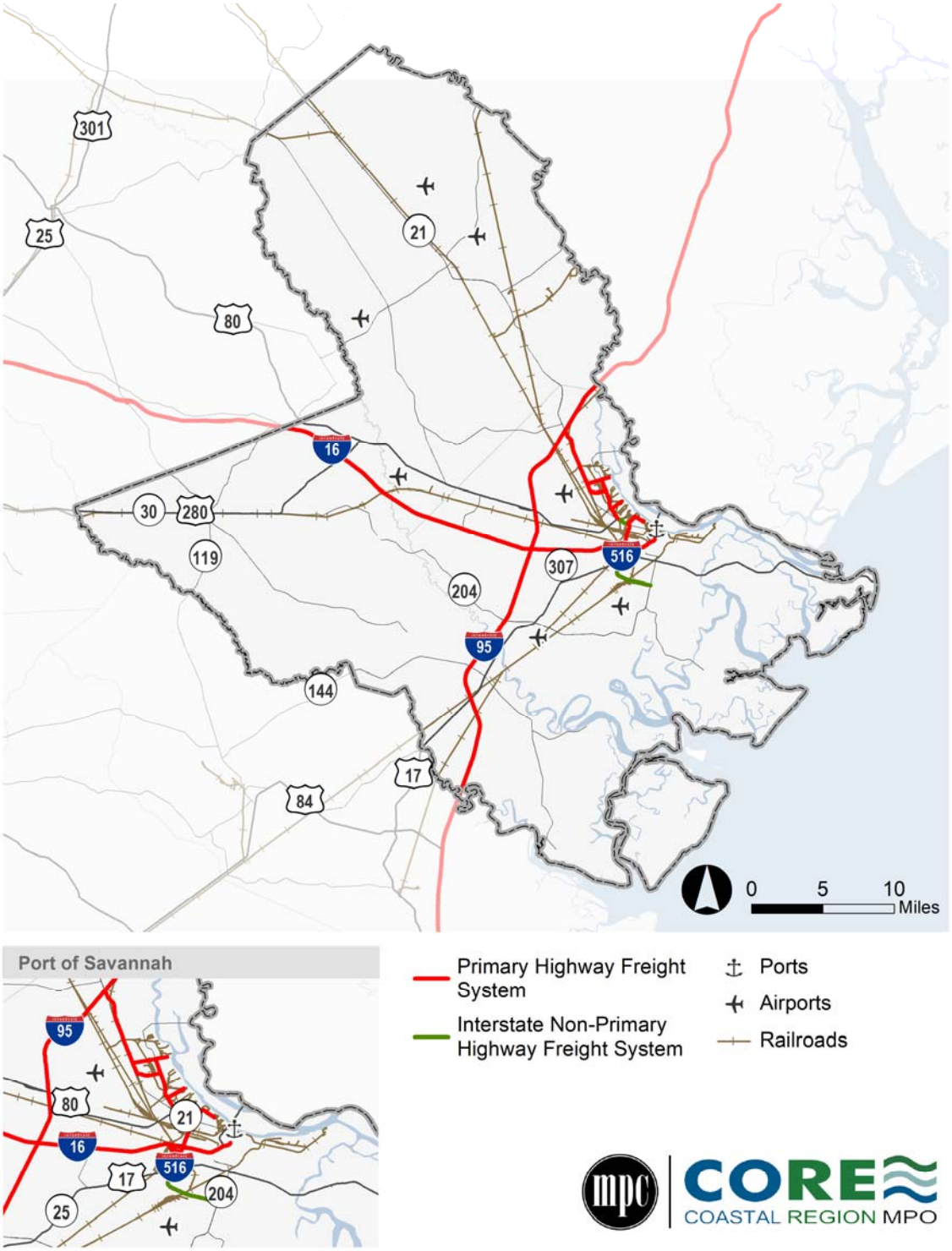
- **Other non-PHFS Interstate:** These highways consist of the remaining portion of Interstate roads not included in the PHFS. These routes provide important continuity and access to freight transportation facilities. I-516 between US 80 and W. Lathrop Ave. is included in this subsystem.

- **Critical Rural Freight Corridors (CRFCs):** These are public roads not in an urbanized area which provide access and connection to the PHFS and the Interstate with other important ports, public transportation facilities, or other intermodal freight facilities. Georgia has not designated any CRFCs.

- **Critical Urban Freight Corridors (CUFCs):** These are public roads in urbanized areas which provide access and connection to the PHFS and the Interstate with other ports, public transportation facilities, or other intermodal transportation facilities. Georgia has not designated any CUFCs.

The NHFN in the Savannah region is shown in Figure 2.2.

FIGURE 2.2 NATIONAL HIGHWAY FREIGHT NETWORK



Source: Federal Highway Administration.

NHS intermodal connectors, also known as the “first or last mile” linkages, provide critical connections between major freight nodes and designated NHS highways. This designation assists federal, state, and local governments with prioritizing operations, maintenance, and improvements of these key arterial connections to ensure that these networks support the ports, rail yards, airports, and other freight-intensive nodes efficiently. When designed, maintained, and operated with freight in mind, connector routes facilitate the best use of individual modes and improve the overall efficiency of regional highway networks.

Designation as a freight intermodal connector depends on a roadway meeting one of several primary and/or secondary criteria established by FHWA, which are summarized in Table 2.2 for facilities that serve freight movements. These criteria primarily revolve around terminals meeting volume thresholds for trucks, twenty-foot equivalent units (TEUs), or tonnages. Roadways that are designated as NHS freight intermodal connectors are included on the PHFS.

TABLE 2.2 FHWA CRITERIA FOR NHS INTERMODAL CONNECTOR DESIGNATION FOR FREIGHT TERMINALS

Freight Terminal	Primary Criteria	Secondary Criteria
Airports	100 trucks per day in each direction on the principal connecting route; or 100,000 tons per year arriving or departing by highway mode.	• Intermodal terminals that handle more than 20 percent of freight volumes by mode within a state. • Intermodal terminals identified either in the Intermodal Management System or the state and metropolitan transportation plans as a major facility. • Significant investment in, or expansion of, an intermodal terminal. • Connecting routes targeted by the state, metropolitan planning organization (MPO), or others for investment to address an existing, or anticipated deficiency because of increased traffic.
Ports	Terminals that handle more than 50,000 20-foot equivalent units (TEU) per year, or other units measured that would convert to more than 100 trucks per day in each direction; or bulk commodity terminals that handle more than 500,000 tons per year by highway or 100 trucks per day in each direction on the principal connecting route.	
Rail	50,000 TEUs per year, or 100 trucks per day, in each direction on the principal connecting route, or other units measured that would convert to more than 100 trucks per day in each direction.	
Pipelines	100 trucks per day in each direction on the principal connecting route.	

Source: Federal Highway Administration.

As shown in Table 2.3, there are 4 freight-related NHS intermodal connectors (i.e., those facilities connecting to an airport, port, or rail/truck terminal) in the Savannah region. These connectors contain multiple roadway segments to comprise a route leading from the freight terminal to the mainline NHS. In addition, some freight terminals are served by multiple connector routes as indicated by the connector number column in Table 2.3. Near the Port of Savannah, portions of SR 21, SR 25, SR 307, and River Street are designated as intermodal connectors serving the Garden City and Ocean Terminals. Tremont Road west of I-516 and Safety First Road are designated as freight intermodal connectors serving the CSX Savannah Yard.

TABLE 2.3 FREIGHT INTERMODAL CONNECTORS

Facility	Type	Connector No.	Description	Length	Facility ID
Garden City Terminal	Port Terminal	1	From SR 25/SR 21 northwesterly on SR 25, westerly on SR 307 (Bourne Ave) to SR 21/SR 17	4.88	GA24P

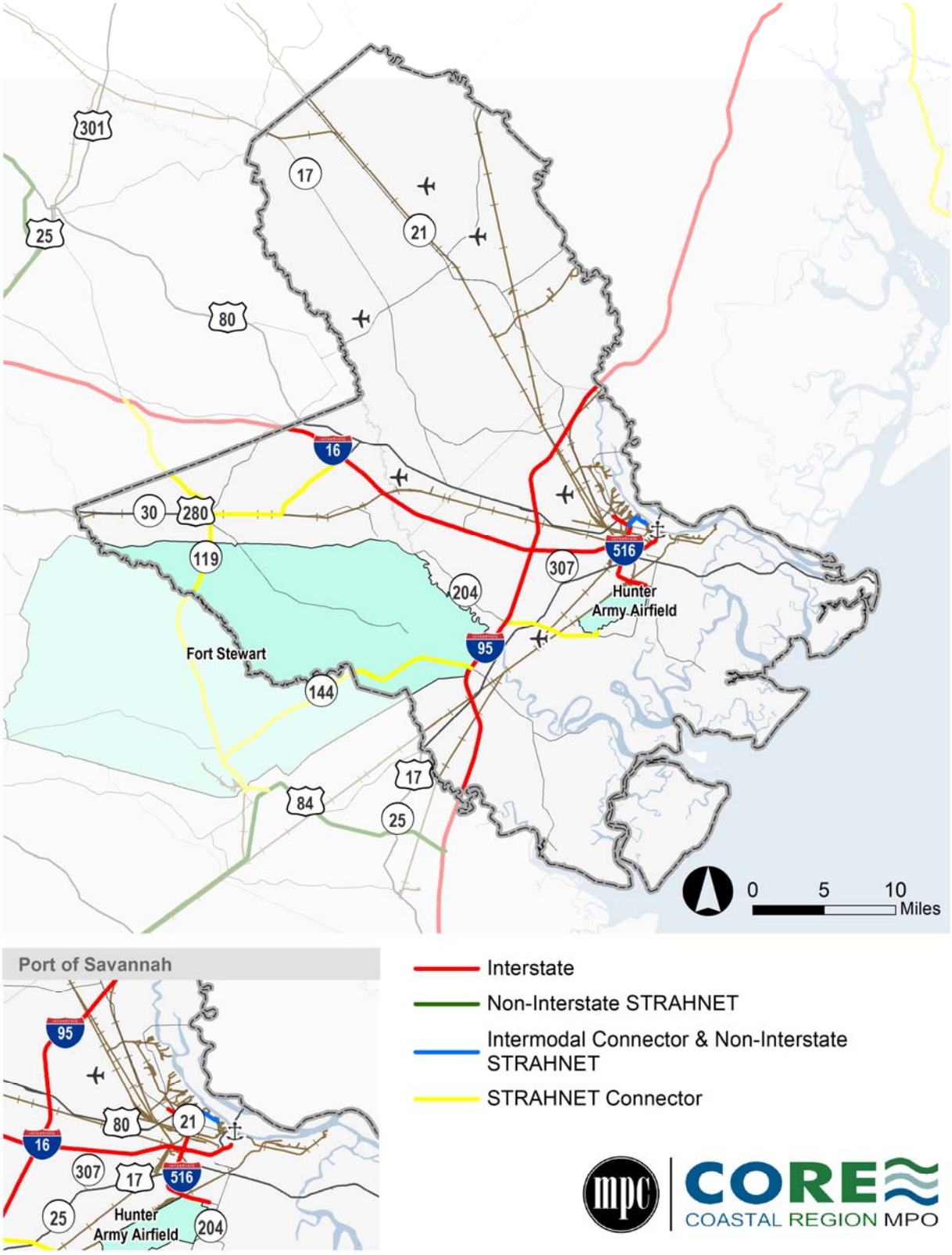
Ocean Terminal	Port Terminal	2	From W Lathrop Ave (CR 1142); SE on Lathrop Ave (CR 740), continue on River St. (Savannah City St. 145) to the terminal	1.52	GA25P
CSX Intermodal Terminal	Truck/Rail Facility	1	From I-516: N&W 0.70 mi on Tremont Rd, N 0.1 mi on Tremont Ave, W 0.2 mi on Safety First Rd.	1.00	GA26R
Port of Savannah	Port Terminal	2	From SR 21 northeasterly on Grange Road to terminal facilities	1.09	GA33P

Source: Federal Highway Administration.

Another important highway freight network is the Strategic Highway Network (STRAHNET). The STRAHNET is a system of roads deemed necessary for emergency mobilization and peacetime movement of heavy armor, fuel, ammunition, repair parts, food, and other commodities to support U.S. military operations. It provides defense, continuity, and emergency capabilities for the nation's military installations. There are over 62,000 miles of STRAHNET roadways which consists of both Interstate and non-Interstate routes.

The STRAHNET through the Savannah region is shown in Figure 2.3. It includes all the region's Interstate highways. It also includes corridors that provide access to Hunter Army Airfield and Fort Stewart in Bryan and Liberty Counties. These corridors include US 280, SR 67, SR 119, SR 144, and SR 204.

FIGURE 2.3 STRAHNET



Source: Federal Highway Administration HPMS; U.S. Census Bureau, TIGER/Line Shapefiles Database.

Intelligent Transportation Systems

This section of the report inventories the current intelligent transportation system (ITS) and technology programs in the study area. Specifically, it summarizes the devices, systems, and data available within GDOT's existing ITS program. This is important for freight as most of the state's goods travel on the highway system. In this regard, the state's ITS is critical for facilitating the efficient movement of goods and for mitigating disruptions on the system due to crashes and other forms of non-recurring congestion.

GDOT NaviGAtor

GDOT ITS assets located within the study area, or that are physically outside the study area but provide coverage, include the GDOT NaviGAtor, Traffic Management Center (TMC), and various field equipment. The GDOT NaviGAtor is the State's Advanced Traffic Management System (ATMS). The NaviGAtor system was first incepted in 1996 for the Olympic Games to help handle the expected influx of roughly 2 million visitors. The NaviGAtor system provides real time speed, volume, and travel time data by using field devices like closed circuit television and detection cameras, ramp meters and dynamic message signs.

GDOT Traffic Management Center

The various elements of the state's ITS are managed by the GDOT Traffic Management Center (TMC). TMCs serve as operational centers with one or more human operators that provide access to all data collection, processing, and dissemination equipment available. In this sense, they serve as a hub for data movement in traffic management systems. Typically, TMCs correspond to larger metropolitan areas that experience higher traffic volumes.

The GDOT TMC is the headquarters and information clearinghouse for NaviGAtor. It monitors travel conditions on the State's roadways and collects real-time information from video detection system cameras and other field devices. The GDOT TMC then communicates to the traveling public (i.e., via dynamic message signs, the NaviGAtor web, and other means) useful information to improve safety, improve travel time reliability, and mitigate congestion, among others.

It should be noted that the City of Savannah and GDOT are in the process of developing a traffic control center (TCC) that will be integrated into the broader statewide system.[3] The TCC would serve as a regional traffic management center supporting ITS infrastructure and operational improvements throughout the region.

ITS Field Devices

Table 2.4 identifies the ITS field devices that are throughout the study area. Though not included in the inventory of devices, it should be noted that several traffic signals throughout the region are monitored and managed as part of GDOT's Regional Traffic Operations Program (RTOP). RTOP uses cameras and remote communication capabilities to actively manage arterial traffic flows thereby relieving congestion and improving reliability.

[3] GDOT PI #0017973, https://www.dot.ga.gov/applications/geopi/Pages/Dashboard.aspx?ProjectID=0017973.

TABLE 2.4 ITS DEVICE TYPES

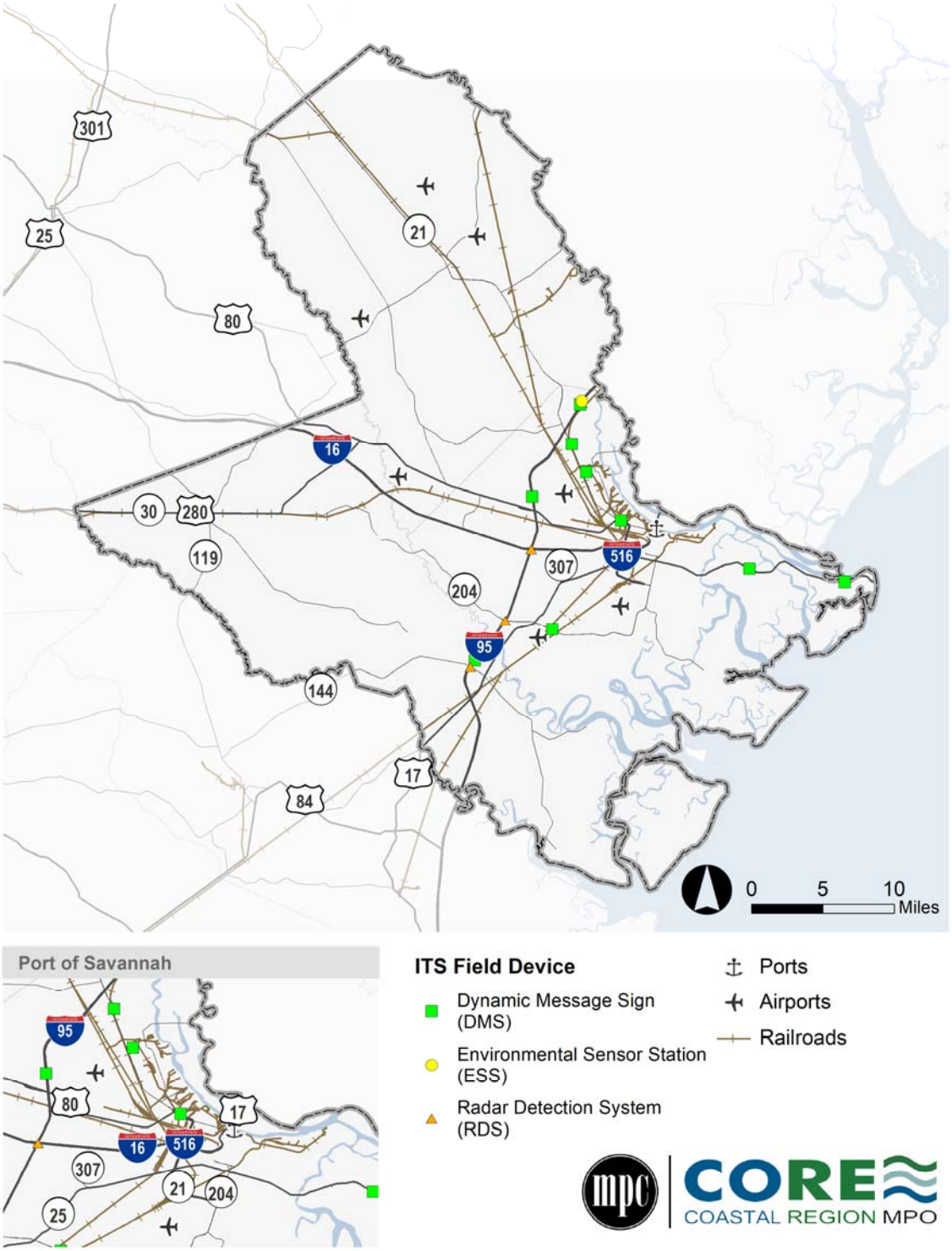
Device	Description
Closed-Circuit Television (CCTV) Camera	CCTV cameras provide coverage on high-traffic corridors. They feed back to the traffic management centers, allowing for quick response times to incidents on the road network.
Dynamic Message Signs (DMS)	Dynamic message signs display important messages to drivers on key corridors.
Weigh in Motion Stations (WIM)	WIM stations capture and record truck axle weights and gross vehicle weights as they drive over a sensor. They can also be used to provide vehicle counts.
Classification Count Stations (CCS)	Classification count stations provide information on both the volume of vehicles traversing a section of roadway and their classification according to the FHWA 13-vehicle classification system.
Radar Detection System (RDS)	Radar detection systems provide information on traffic conditions such as volume and speed.
Environmental Sensor Stations (ESS)	Environmental sensor stations are fixed roadway locations with one or more sensors measuring atmospheric, surface (i.e., pavement and soil), and/or hydrologic (i.e., water level) conditions.

Dynamic message signs (DMS) are electronic signs that have the capability of changing part or all of a sign's message. Most DMS are the large electronic signs that appear over highways, but smaller versions can be found on other routes. DMS can be used for many applications regarding traffic management, public safety, and evacuation. Together with CCTV cameras, DMS are important for mitigating disruptions on the system due to incidents and other unpredictable events as they allow GDOT to convey timely information on travel conditions to the traveling public. As shown in Figure 2.4Figure 2.4, there are 9 DMS deployed at the following locations throughout the region:

- SR 21 Southbound south of International Trade Parkway;
- Jimmy Deloach Parkway Southbound at Crossgate Road;
- I-95 Northbound north of SR 144;
- I-95 Southbound near US 80;
- I-95 Southbound south of the South Carolina state line;
- SR 204 Westbound 3 miles before I-95;
- I-516 Northbound before SR 25;
- US 80 Westbound at Old US 80; and
- US 80 Eastbound east of Bryan Woods Drive.

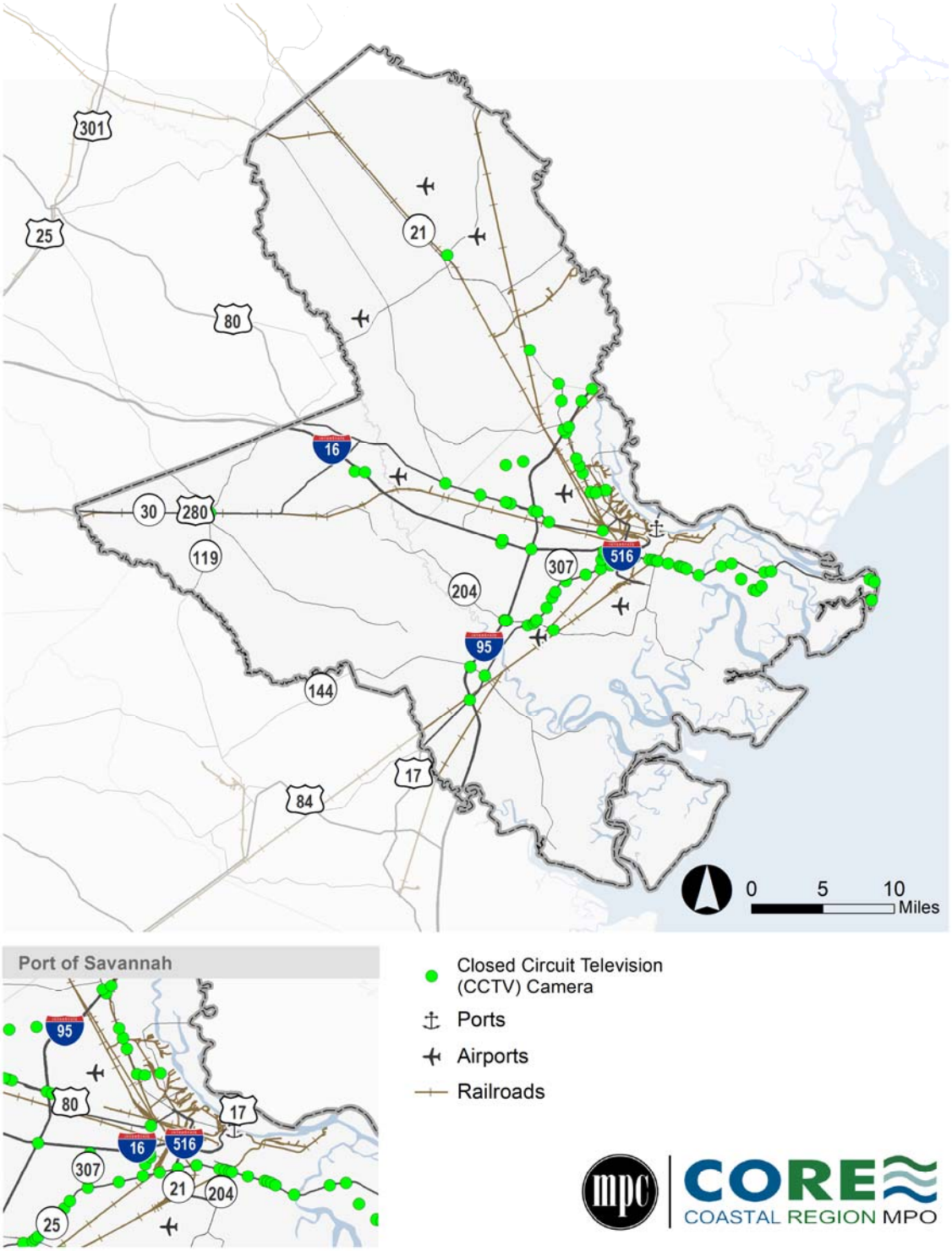
There are 77 CCTV cameras in the region as shown in Figure 2.5.

FIGURE 2.4 ITS FIELD DEVICES



Source: GDOT, Transportation Management Center.

FIGURE 2.5 CCTV CAMERAS



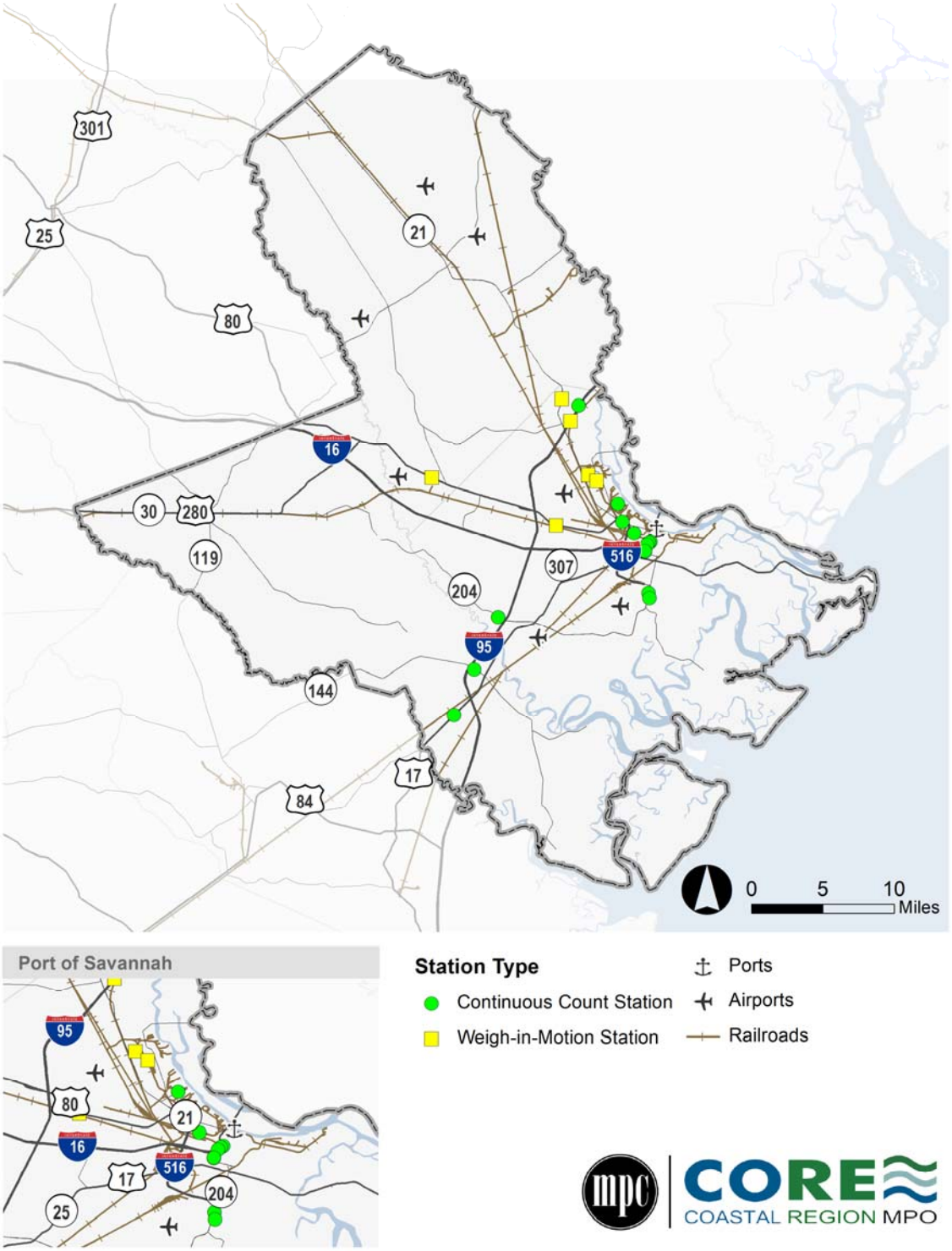
Source: GDOT, Transportation Management Center.

Environmental sensor stations (ESS) are fixed roadway locations with one or more sensors measuring atmospheric, surface (i.e., pavement and soil), and/or hydrologic (i.e., water level) conditions. As shown in Figure 2.4, there is one ESS deployed along I-95 south of the Georgia-South Carolina state line.

Radar detection systems (RDS) are roadside devices that capture and transmit data on traffic conditions such as volume and speed. There are 3 RDS deployed in the Savannah region as shown in Figure 2.4. Two are located on I-95 at its interchanges with SR 144 and SR 204; the remaining RDS is located along I-16 at its interchange with I-95.

GDOT owns dedicated Weigh-In-Motion (WIM) and continuous count stations (CCS) around the state that are used to collect data for planning purposes. While CCS are both owned and operated by GDOT, WIM stations are owned by GDOT but jointly operated with the Department of Public Safety's Motor Carrier Compliance Division. WIM is a technology that estimates vehicle weights of at-speed trucks to (1) inventory the percentage of overweight vehicles at a given location, (2) collect and classify traffic data for planning activities, and (3) provide notification of a likely overweight vehicle for law enforcement to investigate. Continuous count stations collect average annual daily traffic information and other data, typically through loop detectors. Figure 2.6 shows the deployment of WIM and continuous count stations in the region. There are 6 WIM stations and 15 CCS deployed throughout the region.

FIGURE 2.6 PERMANENT COUNT STATIONS



Source: Georgia Department of Transportation, Traffic Analysis and Data Application.

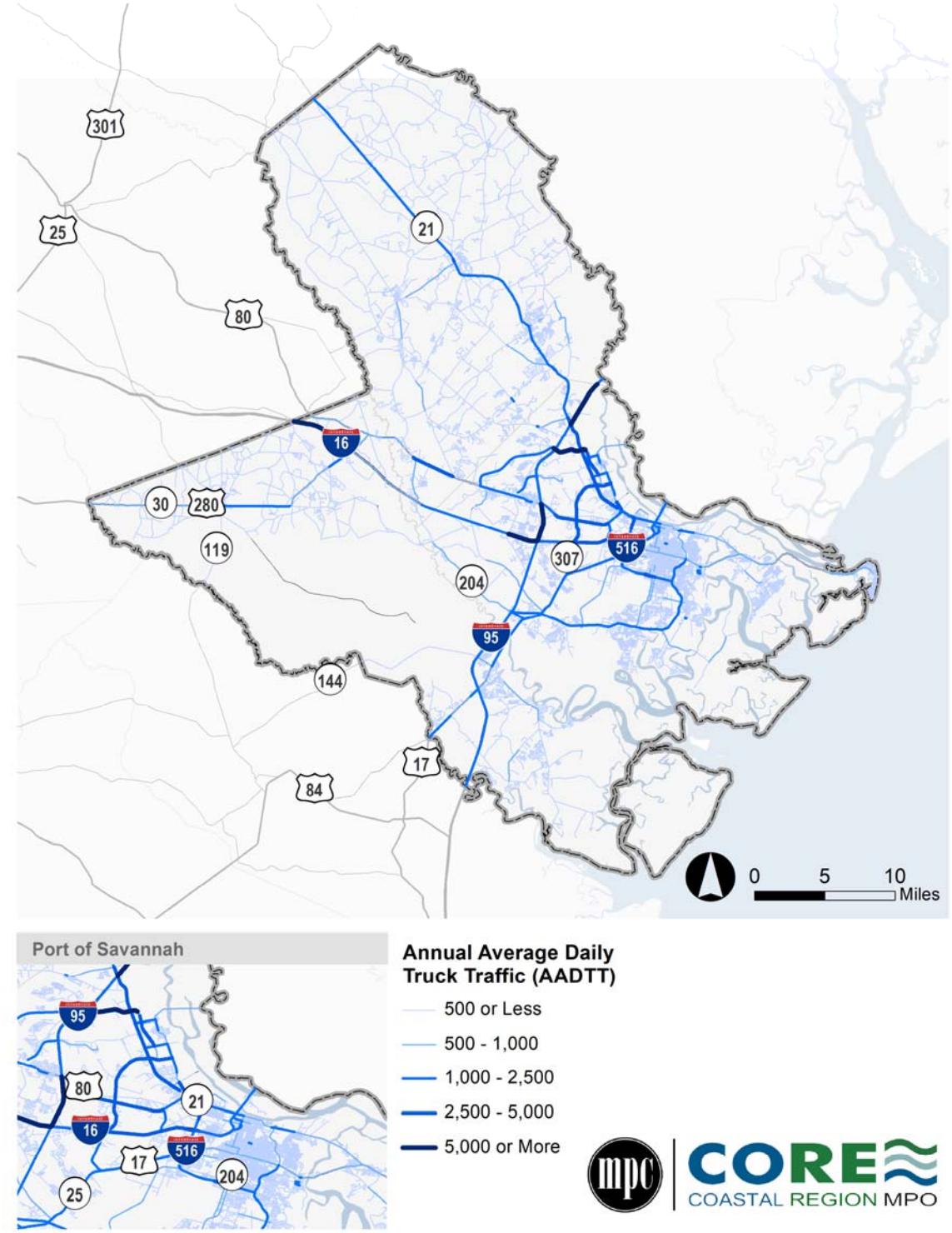
2.2 Conditions and Performance

This section of the report examines the condition and performance of the region's highway network. Specifically, it investigates usage as reflected by truck traffic volumes; performance as captured by truck travel time reliability on Interstate corridors, safety, and the prevalence of at-grade crossings; and conditions as captured by bridge and pavement conditions. It should be noted that while a truck travel time reliability analysis is included in this report, it focuses on Interstate corridors and a more detailed analysis of truck bottlenecks and highway performance will be performed as part of Task 2.5: Freight Network Congestion, Bottleneck, and Safety and Security Issues. Task 2.5 will also include a detailed safety analysis for the region's highways.

Truck Traffic Volumes

Truck traffic count data is important as it provides insight on where trucking activity is most prevalent in the state. This can be one factor in determining which portions of the highway freight network are most important for goods movement and where investments should be focused. Figure 2.7 shows the annual average daily truck traffic (AADTT) for the region using data from the 2020 Highway Performance Monitoring System (HPMS).

FIGURE 2.7 ANNUAL AVERAGE DAILY TRUCK TRAFFIC, 2020



Source: Federal Highway Administration, HPMS.

I-95 is the busiest freight corridor in the Savannah region. The data indicate that I-95 between I-16 and US 80 carries over 10,700 trucks per day. Between SR 21 and the Georgia-South Carolina state line, I-95 carries nearly 10,000 trucks per day. The prevalence of truck traffic on I-95 implies a strong north-south

directionality to the region's truck activity. After I-95, I-16 west of US 280 in Bryan County is the second busiest freight corridor in the region as it handles nearly 7,000 trucks per day. Just west of I-95, about 6,700 trucks per day travel on I-16.

Several non-Interstate roadways also carry significant freight volumes throughout the Savannah region. Non-Interstate routes that provide access to the Port of Savannah exhibit some of the region's highest truck volumes. For example, SR 17/Jimmy Deloach Parkway between I-95 and SR 21 carries over 5,400 trucks per day. In addition to providing access to the port, this route also serves multiple warehouses and distribution centers. SR 307/Bourne Ave., which provides direct access to Gate 4 at the Port of Savannah, is estimated to carry over 4,700 trucks per day.

Truck Travel Time Reliability

Truck travel time reliability on the CORE MPO region's Interstate highway system is captured by calculating the Truck Travel Time Reliability (TTTR) metric. The TTTR is the freight performance metric adopted by the Federal Highway Administration (FHWA) that must be reported for Interstate highways.[4] It is calculated as the ratio of the 95th percentile travel time to the 50th percentile travel time: TTTR = 95th Percentile Truck Travel Time/50th Percentile Truck Travel Time. High TTTR values indicate unreliable truck travel times while low TTTR values indicate more reliable travel times. For example, a TTTR value equal to two indicates that truck travel times may be twice as long as average travel times for a given time period. Per 23 CFR 490.611, the TTTR metric is calculated over the following time periods:

- AM Peak: 6 a.m.–10 a.m. Monday–Friday.
- Midday: 10 a.m.–4 p.m. Monday–Friday.
- PM Peak: 4 p.m.–8 p.m. Monday–Friday.
- Overnight: 8 p.m.–6 a.m. Monday–Friday; and
- Weekend: 6 a.m.–8 p.m. Saturday–Sunday.

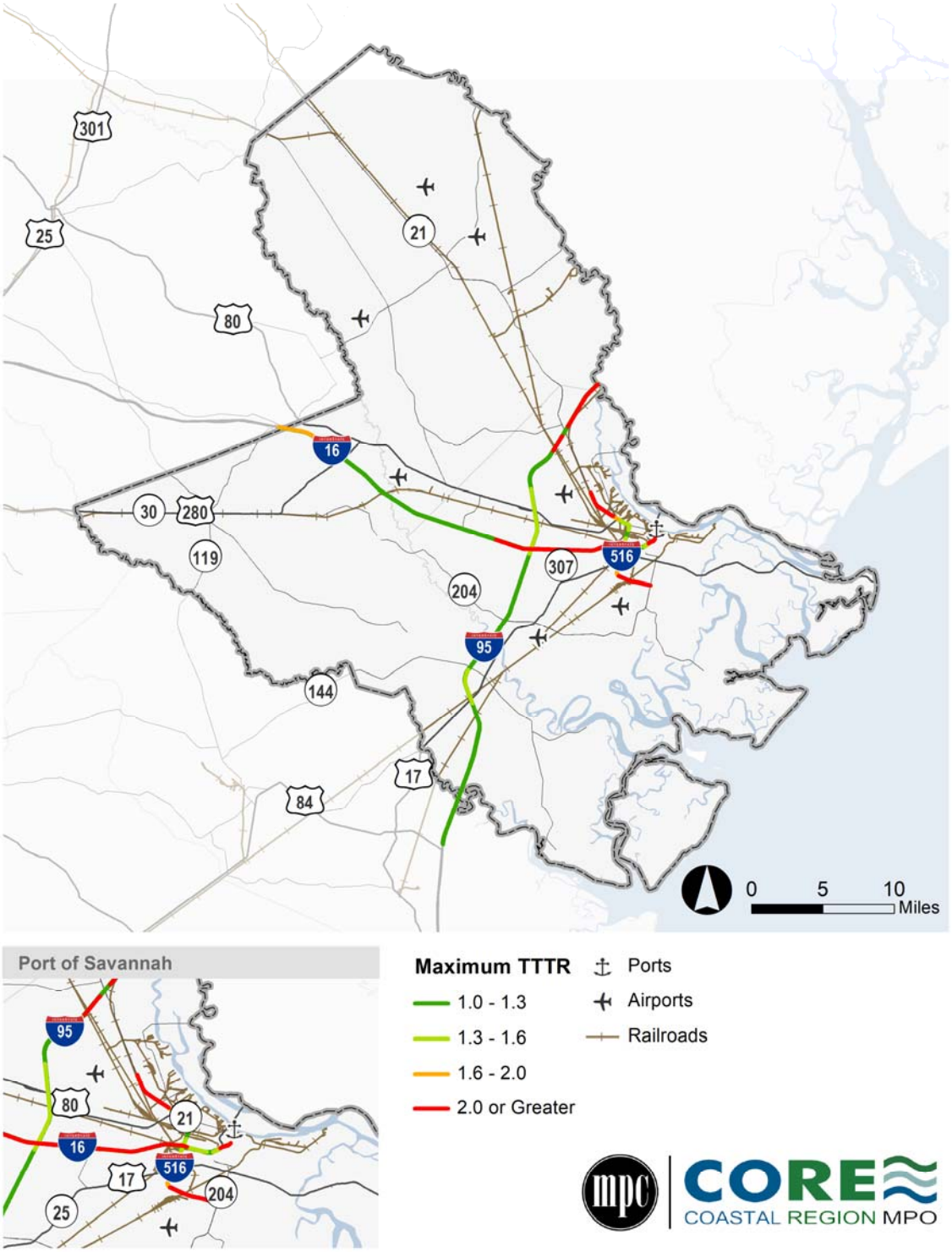
The TTTR metric is an indicator of how variable travel times are on the highway network. Highly variable, or inconsistent, truck travel times result in unreliable service over the highway network. Unreliability is a direct cost to motor carriers as they must hedge against unreliable travel times by budgeting additional time into their schedules. This translates into higher transportation costs that may be passed on to shippers. In addition, wasted time resulting from the needed buffer time reduces available hours of service for truck drivers. The TTTR metrics are derived from travel time data from the National Performance Management Research Data Set (NPMRDS).

Figure 2.8 shows the maximum TTTR index observed over all time periods for Interstate highways in the Savannah region. The results indicate that trucks experience poor reliability on I-16 between Pooler Parkway and I-516 and also west of US 280 in Bryan County. I-16 exhibits a TTTR exceeding 2.0 at both of these locations indicating very unreliable travel times. These locations are also two of the region's busiest corridors

[4] National Performance Management Measures: Assessing Performance of the National Highway System, Freight Movement on the Interstate System, and Congestion Mitigation and Air Quality Improvement Program, *Federal Register*, Volume 82, Number 11, January 18, 2017, https://www.federalregister.gov/documents/2017/01/18/2017-00681/national-performance-management-measures-assessing-performance-of-the-national-highway-system.

for freight traffic. This is important as it implies that many motor carriers must plan around uncertain travel times.

FIGURE 2.8 MAXIMUM TRUCK TRAVEL TIME RELIABILITY (TTTR) ON INTERSTATE HIGHWAYS



Source: National Performance Management Research Data Set; Cambridge Systematics, Inc analysis.

I-95 north of SR 17/Jimmy Deloach Pkwy. also experiences poor reliability with maximum TTTR values exceeding 2.0. Some amount of this performance challenge may be attributed to trucks and other vehicles accessing the Port of Savannah and the large cluster of warehouses and distribution centers located along SR 17/Jimmy Deloach Pkwy. and SR 21. However, the unreliability exhibited by this portion of I-95 is likely due to the reduction in number of lanes as the highway crosses into South Carolina – dropping from a 6-lane to a 4-lane highway.

Table 2.5 shows how TTTR varies across the region's Interstate highways. It contains length-weighted averages of TTTR by time period for I-16, I-95, and I-516. The results show that I-95 generally provides better reliability than I-16 and I-516. For I-95, the length-weighted average TTTR does not exceed 1.3 across time periods while values for I-16 and I-516 mostly exceed that threshold. The results for I-16 indicate that reliability is poorest during the midday period with an average TTTR of 1.63. For I-516, the PM peak is the most unreliable time period for truck travel, but performance is generally challenged throughout the day on this corridor.

TABLE 2.5 WEIGHTED AVERAGE TRUCK TRAVEL TIME RELIABILITY (TTTR) BY INTERSTATE HIGHWAY

Interstate	AM Peak TTTR	Midday TTTR	PM Peak TTTR	Overnight TTTR	Weekend TTTR
I-16	1.37	1.63	1.32	1.20	1.14
I-95	1.06	1.13	1.15	1.07	1.22
I-516	1.46	1.45	1.73	1.56	1.63

Source: National Performance Management Research Data Set; Cambridge Systematics, Inc analysis.

Table 2.6 contains the share of Interstate highway directional miles by time period for four categories of TTTR values: 1.0 – 1.3, 1.3 – 1.6, 1.6 – 2.0, and 2.0 or greater. The results show that the majority of the region's directional miles of Interstate highway are performing at the highest levels of reliability for truck travel. Over three quarters of Interstate directional miles exhibit TTR values less than 1.3 during the AM, midday, and PM peak periods. The results also show that the midday period is the most challenging time period for reliable truck travel. Over 18 percent of the region's Interstate highway directional miles exhibit a TTTR exceeding 1.6. This is substantially higher than the 10.3 and 14.5 percent of directional miles experiencing these conditions during the AM and PM peak periods.

TABLE 2.6 TRUCK TRAVEL TIME RELIABILITY (TTTR) BY SHARE OF DIRECTIONAL MILES ON INTERSTATE HIGHWAYS

Analysis Period	1.0 - 1.3	1.3 - 1.6	1.6 - 2.0	>= 2.0	Total
	Percent of Interstate Highway Directional Miles				
AM Peak	85.7%	4.1%	3.6%	6.7%	**100.0%**
Midday	76.7%	5.2%	8.2%	10.0%	**100.0%**
PM Peak	78.4%	7.1%	5.7%	8.8%	**100.0%**

Source: National Performance Management Research Data Set; Cambridge Systematics, Inc analysis.

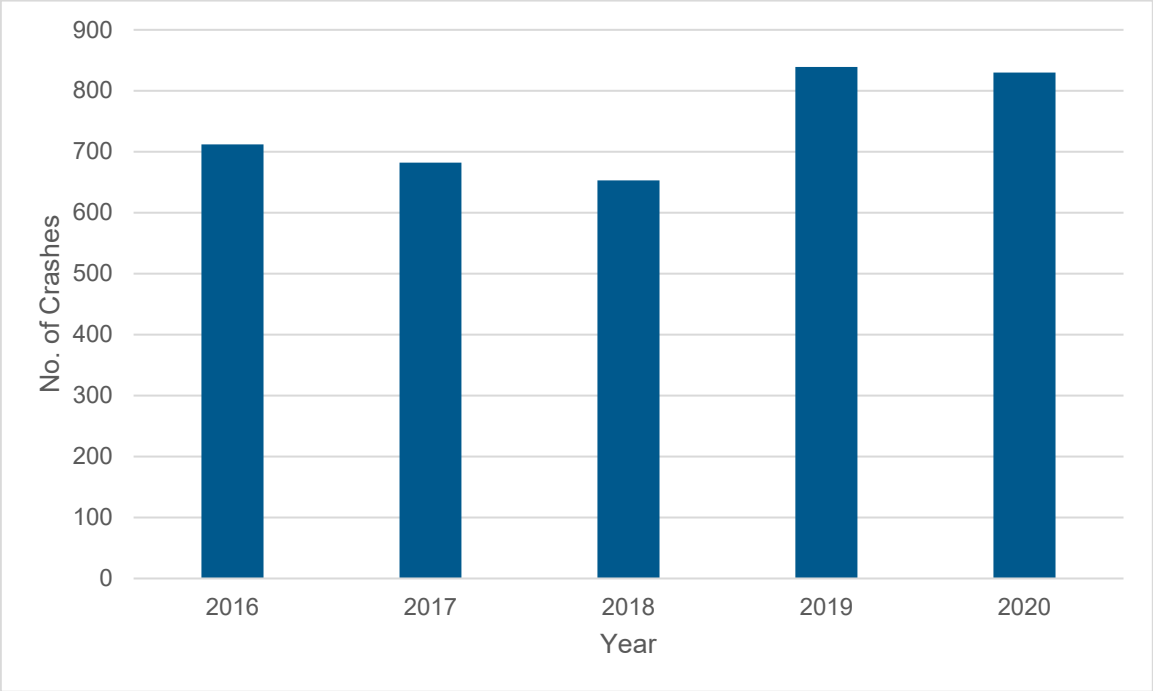
Safety

This section of the report examines the safety performance of the study area's highway network. Transportation safety is extremely important and is one of the highest priorities at all levels of transportation

planning and engineering – national, statewide, regional and local. The safety analysis was conducted using data provided by the GDOT Numetrics database for the 2016 to 2020 time period. This analysis provides an overview of truck-involved crashes[5] on the region's highway network while a more detailed analysis will be conducted as part of Task 2.5.

There were 3,716 crashes involving trucks in the 3-county region based on 2016-2020 data as shown in Figure 2.9. This represents about 6.5 percent of all crashes in the study area. In comparison, between 2016 and 2020 commercial vehicle crashes averaged about 4.4 percent of total crashes statewide.[6] Crashes declined from 2016 to 2018 before experiencing an increase in 2019 and remaining nearly constant in 2020. Over the analysis period, the annual number of truck-involved crashes in the region ranged from a low of 653 crashes in 2018 to a high of 839 in 2019.

FIGURE 2.9 TRUCK-INVOLVED CRASHES BY YEAR, 2016 - 2020



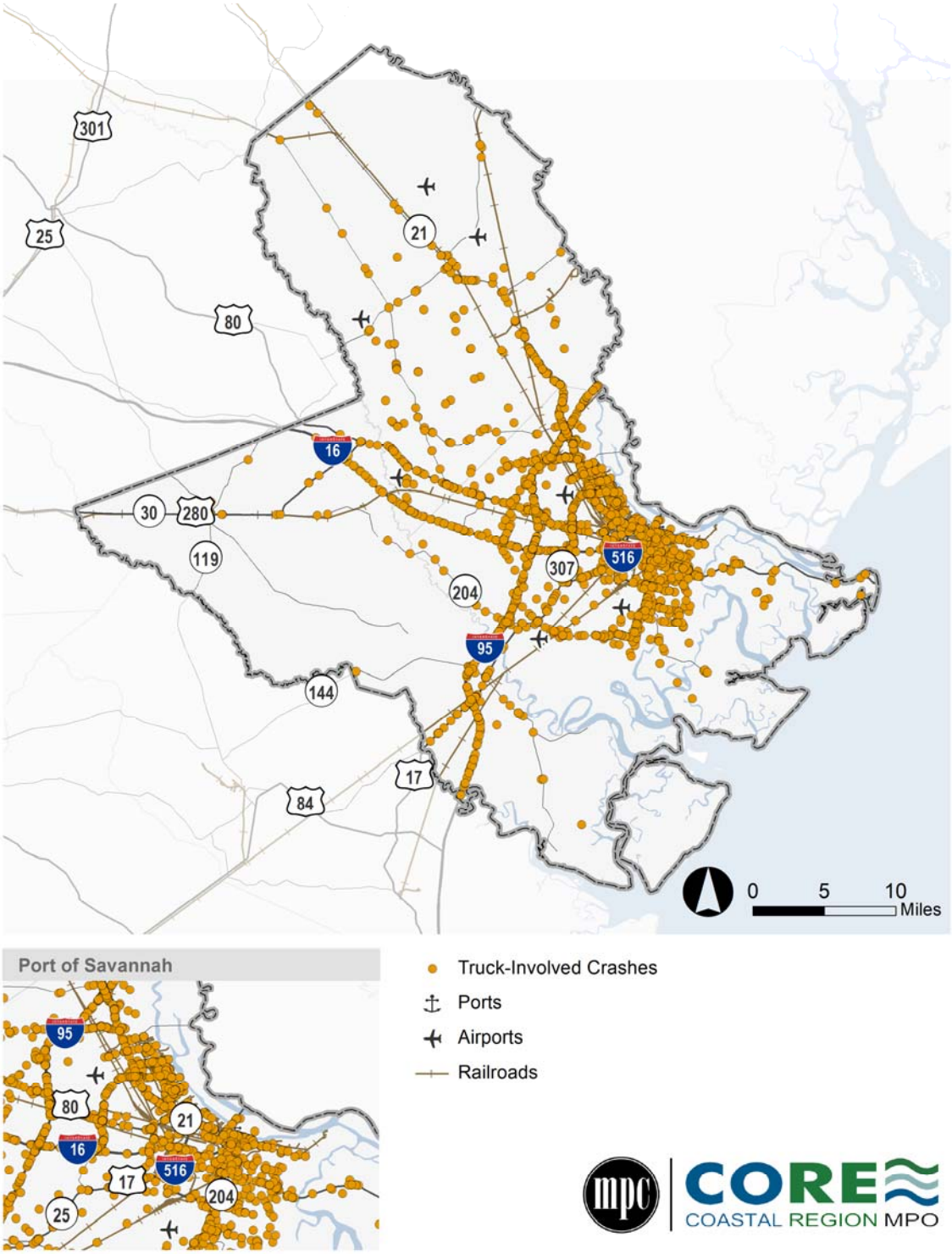
Source: GDOT Numetrics Database; Cambridge Systematics, Inc. analysis.

Figure 2.10 depicts 2016-2020 truck-involved crashes in the study area. Over 83 percent of those crashes occurred in Chatham County as shown in Table 2.7. This is driven, in part, by Chatham County containing a substantial share of the region's highway freight network and freight activity. Chatham County contains approximately 55 percent of the region's lane-miles and 67 percent of truck vehicle-miles traveled based on FHWA HPMS data.

[5] For this analysis, the following vehicle types in the GDOT Numetrics database are considered trucks: tractor/trailer, single unit truck, panel truck, truck tractor (bobtail), logging tractor/trailer, tractor with twin trailers, and logging truck.

[6] GDOT Georgia Electronic Accident Reporting System (GEARS) Database, www.gearsportal.com, accessed May 15, 2021.

FIGURE 2.10 TRUCK-INVOLVED CRASHES, 2016 - 2020



Source: GDOT Numetrics Database; Cambridge Systematics, Inc. analysis.

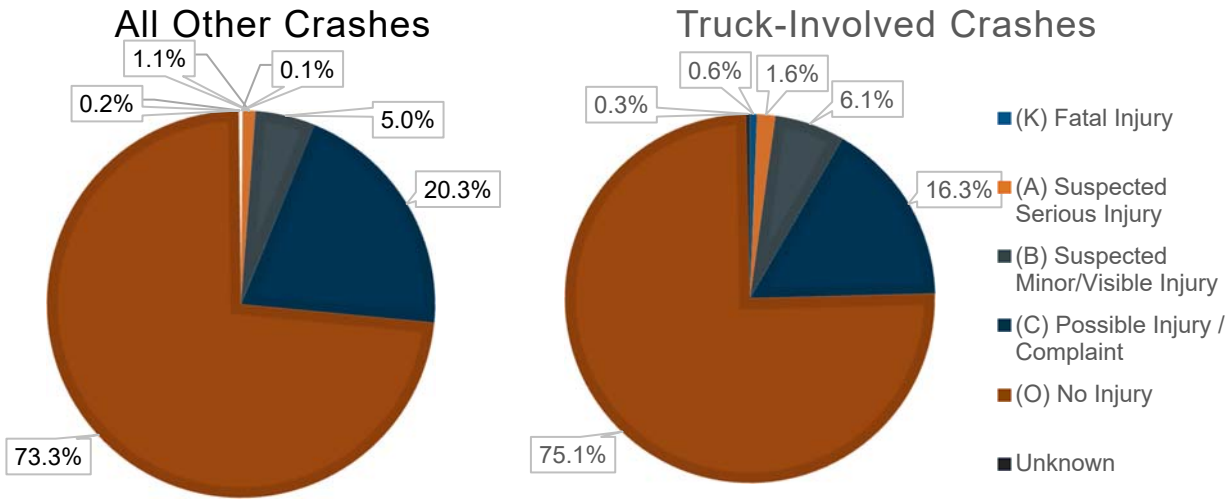
TABLE 2.7 TRUCK-INVOLVED CRASHES BY COUNTY, 2016 - 2020

County	No. of Truck-Involved Crashes	Percent of Total
Chatham	3,094	83.3%
Bryan	323	8.7%
Effingham	299	8.0%
Total	**3,716**	**100.0%**

Source: GDOT Numetrics Database; Cambridge Systematics, Inc. analysis.

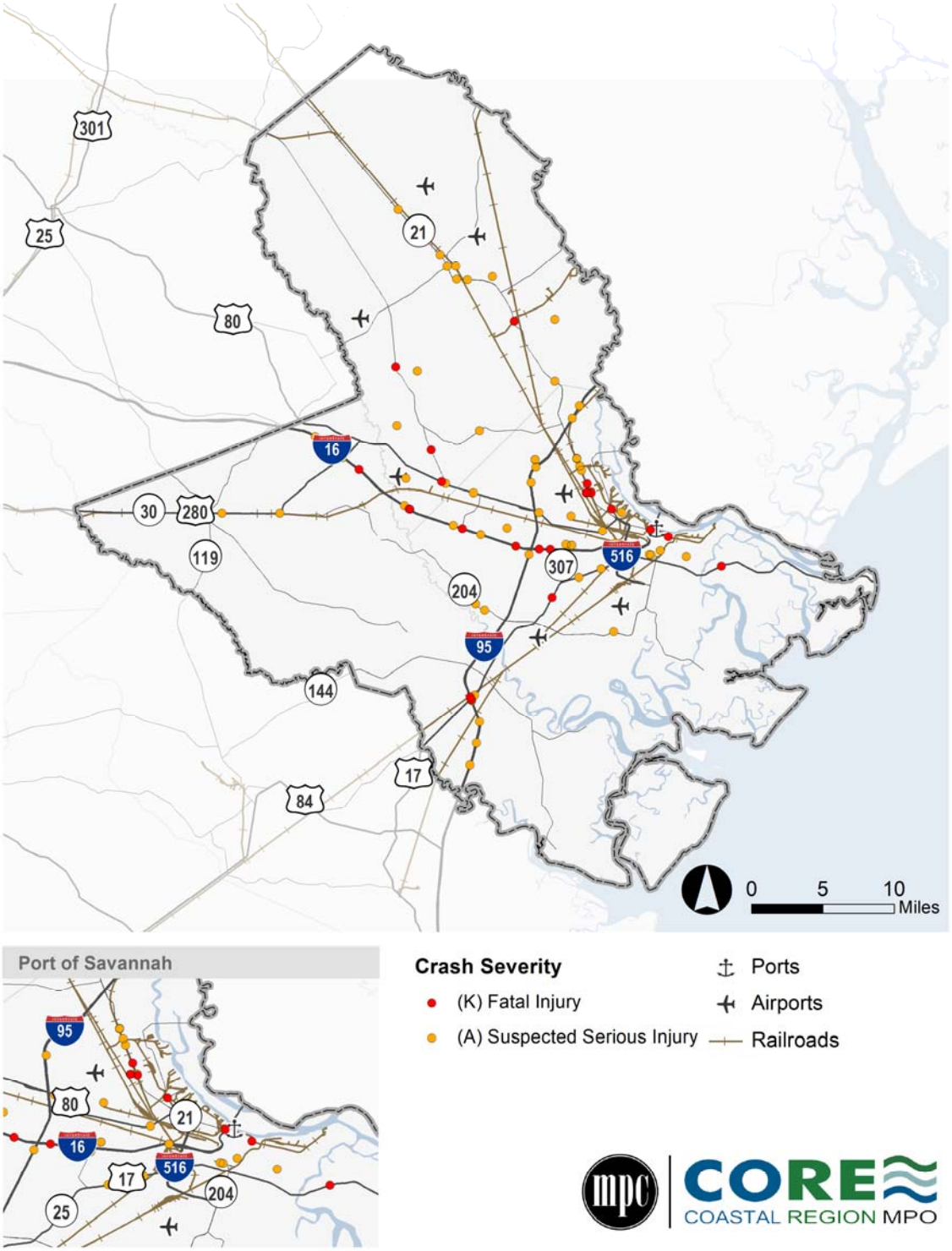
Most crashes in the region did not result in an injury. As shown in Figure 2.11, over 75 percent of truck-involved crashes and 73 percent of non-truck-involved crashes did not result in an injury. About 2.2 percent truck-involved crashes (82 in total) did result in a serious injury or fatality. This is higher than the total percentage of non-truck-involved crashes resulting in serious injury or death (about 1.2 percent). Fatal and serious injury truck crashes are shown in Figure 2.12.

FIGURE 2.11 CRASHES BY SEVERITY, 2016 - 2020



Source: GDOT Numetrics Database; Cambridge Systematics, Inc. analysis.

FIGURE 2.12 FATAL OR SEVERE TRUCK-INVOLVED CRASHES, 2016 - 2020



Source: GDOT Numetrics Database; Cambridge Systematics, Inc. analysis.

For crashes involving trucks, angle, sideswipe - same direction, and rear end collision types were the most prevalent as shown in Figure 2.13 (refer to Table 2.8 for descriptions of collision types). These accounted for nearly 67 percent of truck-involved crashes observed during the analysis period. Head - on and angle

collisions (left, right, and other) are the most severe crash types, accounting for approximately 1.4 percent and 27.5 percent of truck-involved crashes, respectively. The prevalence of angle crashes may be due to many factors, including excessive speed, drivers not obeying traffic signals, and poor visibility of traffic signals due to the prevalence of large trucks.[7] Lane width and worn or inadequate pavement markings are typical contributing factors for sideswipe crashes.[8] For rear end crashes, congestion and inappropriate approach speeds are contributing factors.[9]

Angle, sideswipe - same direction, and rear end were also the most common collision types for crashes that did not involve trucks. They accounted for about 96 percent of crashes for all other vehicles. However, rear end was a much more prevalent collision type and sideswipe (same direction) was a much less prevalent collision type when compared to truck-involved crashes. Nearly 46 percent of crashes for all other vehicle types were rear end compared to 32 percent for truck-involved crashes. About 13 percent of crashes for all other vehicle types were sideswipe - same direction, compared to 34 percent for truck-involved crashes. The differences between the physical and operational characteristics of trucks compared to passenger vehicles likely contribute to this observation. For instance, because trucks are much larger than passenger vehicles and occupy a greater share of lane width, they may be more susceptible to sideswipe crashes.

TABLE 2.8 MANNER OF COLLISION DESCRIPTIONS

Manner of Collision	Description
Angle	Collision results from two or more motor vehicles traveling in directions that are perpendicular.
Rear End	Collision results from two motor vehicles traveling in the same direction.
Head-on	A collision in which the front end of one motor vehicle collides with the front end of another motor vehicle, while the two vehicles are traveling in opposite directions.
Sideswipe – Same Direction	A collision where two motor vehicles collide side to side while proceeding in the same direction.
Sideswipe – Opposite Direction	A collision where two motor vehicles collide side to side while proceeding in the opposite direction.
Not a Collision with a Motor Vehicle	A motor vehicle collision that does not involve another motor vehicle, overturning, or pedestrian.

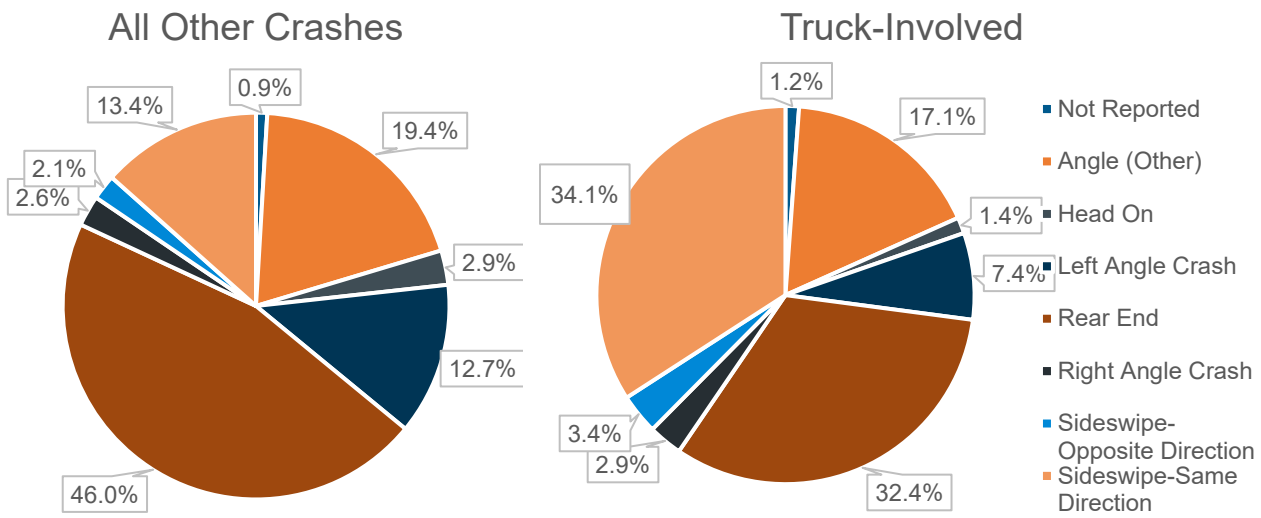
Source: Georgia Uniform Motor Vehicle Accident Report Training Manual, version 3.0, January 2018.

[7] American Association of State Highway and Transportation Officials (2009). *Highway Safety Manual*. Exhibit 6-4 and Exhibit 6-5, pgs. 6-6 to 6-7, 1st edition.

[8] Ibid.

[9] Ibid.

FIGURE 2.13 CRASHES BY MANNER OF COLLISION, 2016 - 2020

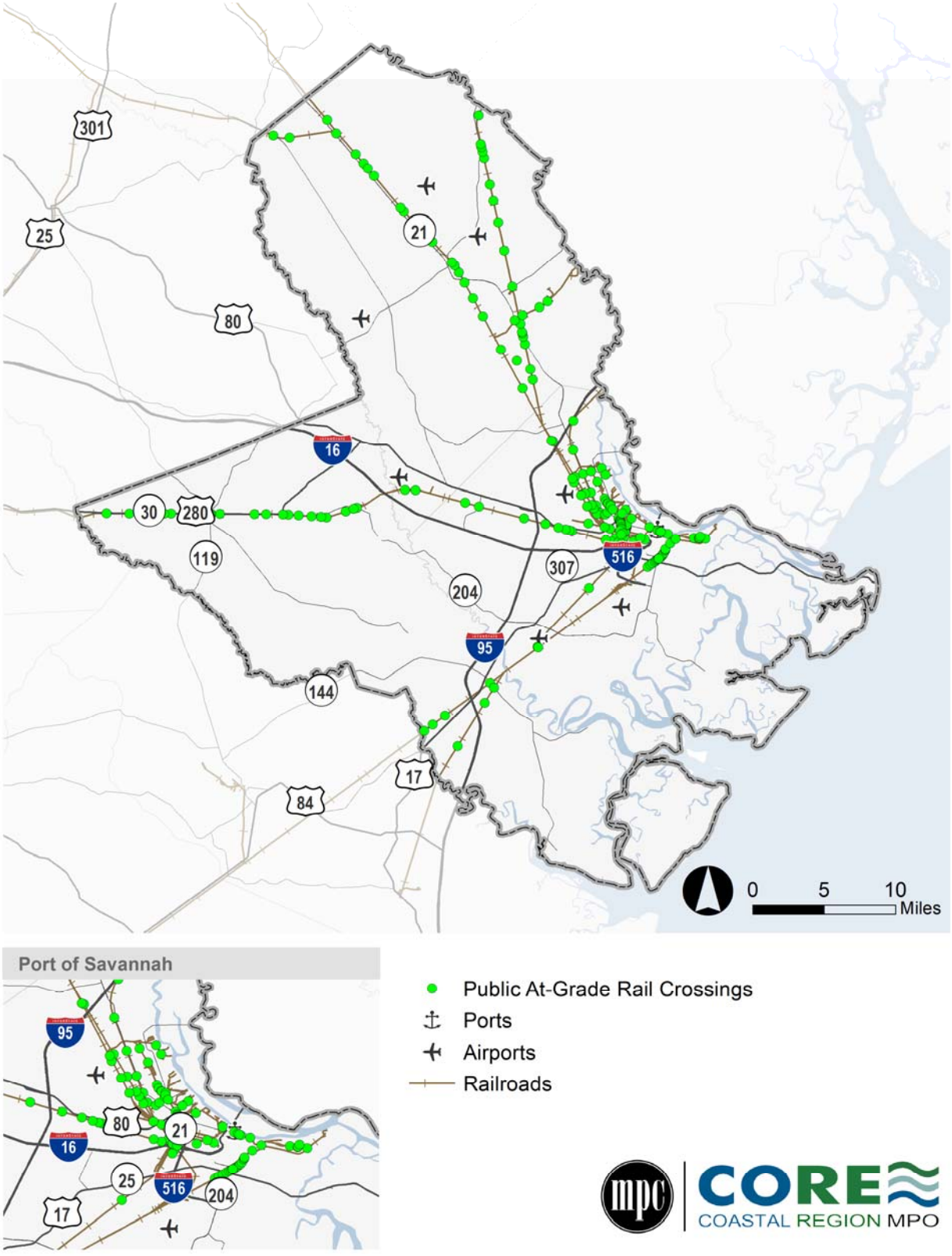


Source: GDOT Numetrics Database; Cambridge Systematics, Inc. analysis.

At-Grade Rail Crossings

At-grade rail crossings represent points where the highway and rail systems interact and have the potential for conflict (see Figure 2.14). Grade-level rail crossings can impose significant delays to trucks and other vehicles as they wait for trains to pass. In addition, trucks idling at crossings emit more pollutants especially as they must accelerate from a complete stop. Furthermore, at-grade crossings are a potential safety hazard as they present an opportunity for trains to collide with vehicles, pedestrians, or other roadway users. In total, there are 192 public at-grade rail crossings in the 3-county region which are shown in Figure 2.14.

FIGURE 2.14 PUBLIC AT-GRADE RAIL CROSSINGS



Source: Federal Railroad Administration, Highway-Rail Crossing Inventory, 2022; AECOM; Cambridge Systematics, Inc.

Table 2.9 shows the busiest at-grade rail crossings in terms of total trains (i.e., through and switching train movements) for the region. The busiest at-grade rail crossing is crossing 641179A on Telfair Road near the I-16/I-516 interchange in the City of Savannah. The crossing is located on the CSX Transportation network and it is adjacent to a substantial amount of freight-intensive land uses. On average, about 40 trains per day (30 through movements and 10 switching) use this crossing. Telfair Rd. also has a substantial amount of truck activity as about 25 percent of the estimated 2,730 vehicles per day using this roadway (over 680 trucks per day) consists of trucks.

TABLE 2.9 BUSIEST PUBLIC AT-GRADE RAIL CROSSINGS

Crossing ID	Railroad	County	Location	AADT	AADTT	Trains per Day
641179A	CSX	Chatham	Telfair Road, Savannah (Near Tremont Road)	2,730	683	40
734148K	NS	Chatham	Big Hill Road, Garden City (Near Charlie Gay Dr.)	1,569	63	31
637579L	CSX	Bryan	SR 144/Ford Ave, Richmond Hill (Near Richard Davis Dr.)	23,300	1,864	24
734152A	NS	Chatham	Crossgate Drive, Port Wentworth (Near Ray St.)	800	48	22
957126C	NS	Chatham	Oxnard Drive, Port Wentworth (Near Sugar Ave and Imperial Sugar Company)	250	No Estimate	22
637338X	CSX	Bryan	Cartertown Road, Richmond Hill (Near Bryan and Liberty County line and Mt. Hope Circle)	350	11	21
637588K	CSX	Bryan	Daniel Siding Road, Richmond Hill (Between Daniel Siding Loop Rd. and Roger Clark Rd.)	600	18	21
637337R	CSX	Bryan	Clarktown Road, Richmond Hill (Near David Myrick Rd.)	600	18	21
641187S	CSX	Chatham	Nelson Avenue, Garden City (Near SR 25)	500	10	21
632473Y	CSX	Chatham	SR 307/Bourne Avenue, Garden City (Near SR 21)	18,000	3,600	19

Source: Federal Railroad Administration, Highway-Rail Crossing Inventory, 2022; Cambridge Systematics, Inc. analysis.

Crossing 734148K is the second busiest rail crossing in the region. It is located on the Norfolk Southern network and sits along Big Hill Road near Charlie Gay Drive (a private road which provides access to the nearby NS Savannah Yard) in Garden City. About 31 trains per day (17 through trains and 14 switching movements) use this crossing. Traffic volumes on the roadway are relatively low as the roadway terminates just west of the crossing and the adjacent land uses are primarily undeveloped land and low-density residential.

Crossing with substantial train and traffic volumes include crossings 637579L and 632473Y. Crossing 637579L is the third busiest in the region and sits along SR 144/Ford Ave. between Richard Davis Drive and

Frances Meeks Way in Richmond Hill. It is on the CSX Transportation network and carries about 24 trains per day, primarily through movements, on average. A large amount of vehicle traffic also uses this crossing as SR 144/Ford Ave. carries over 23,000 vehicles per day. Crossing 632473Y is SR 307/Bourne Ave. west of SR 21/Augusta Rd. in Garden City. In addition to 19 trains per day, this crossing carries approximately 18,000 vehicles per day including about 3,600 trucks per day. This roadway provides direct access to Gate 4 at the Port of Savannah.

Bridge Conditions

Bridges which cannot handle typical truck sizes or weights may contribute to congestion and lead to significant re-routing as trucks find alternative detours. If a truck cannot pass over a bridge and does not have a close alternative route, the detour can prove costly in both time and money. One of the reasons a bridge can be a barrier for certain trucks is if the bridge is in poor condition. The National Bridge Inventory rates bridges on a 0-10 scale (10 being best condition and 0 being worst) based on numerous factors including their:

- Deck condition;
- Superstructure condition;
- Substructure condition; and
- Culvert condition.

Per federal inspection standards, bridges are assigned a rating that represents the general condition of the structure. In accordance with the bridge performance measures final rulemaking, published in January of 2017[10], bridge condition is determined by the lowest rating of National Bridge Inventory (NBI) condition ratings for Item 58 (Deck), Item 59 (Superstructure), Item 60 (Substructure), or Item 62 (Box Culvert). If the lowest rating is greater than or equal to 7, the bridge is classified as Good; if it is less than or equal to 4, the classification is Poor; if the lowest rating is 5 or 6 the classification is Fair.

There are 311 bridges and 96 box culverts in the study area as shown in Table 2.10. Figure 2.15 shows the locations of bridges in the study area. About 29 percent of the region's bridges are located on Interstate highways, approximately 43 percent are on arterials (i.e., minor, principal, and other freeways/expressways), 24 percent are on collector routes, and about 21 percent are on local roads. The region's box culverts are primarily located on arterials, collectors, and local roads as only about 8 percent of box culverts carry Interstate highways.

TABLE 2.10 STRUCTURES BY HIGHWAY FUNCTIONAL CLASS, 2021

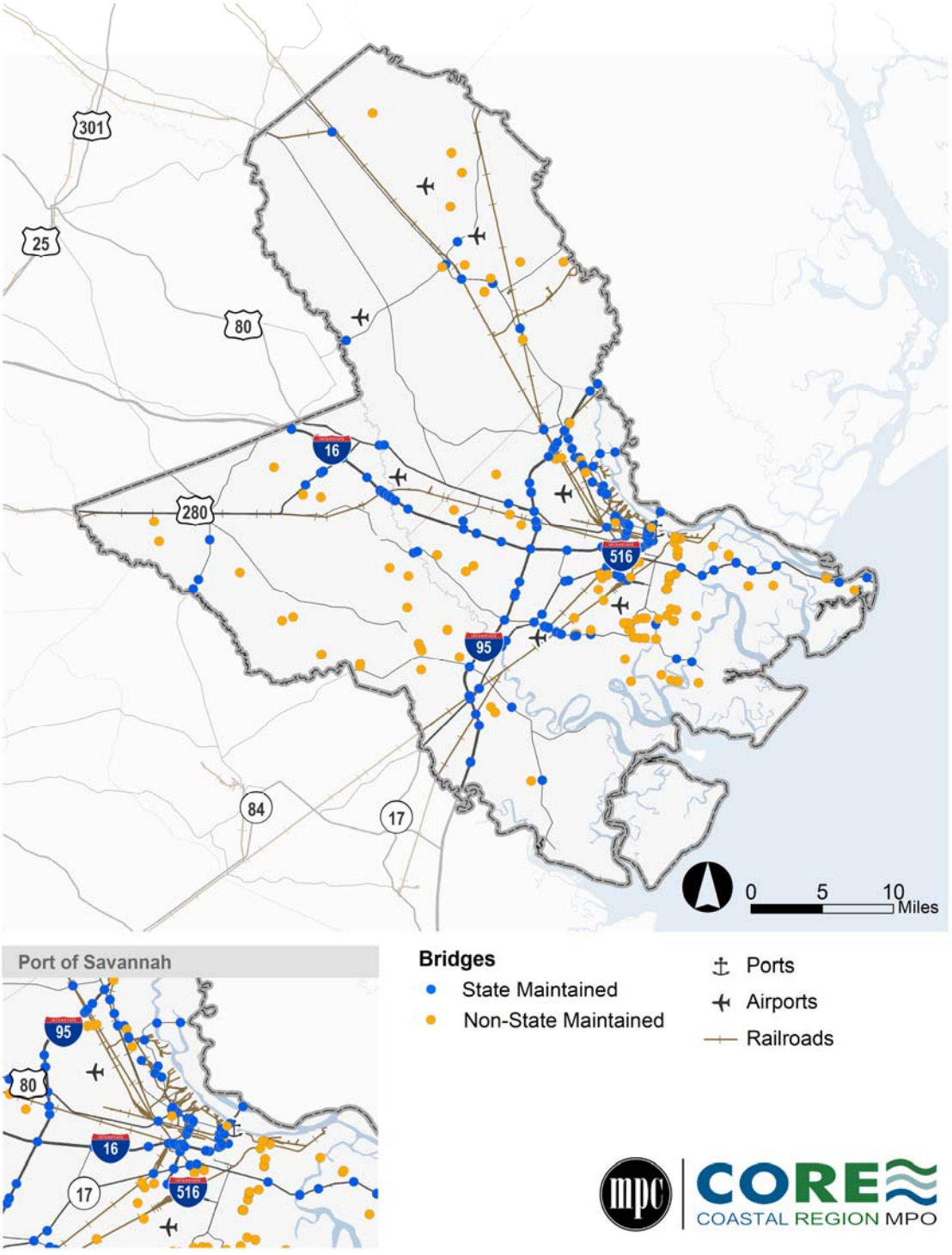
Functional Class	Bridges	Percent of Total	Box Culverts	Percent of Total
Interstate	89	29%	8	8%
Other Freeways and Expressways	4	1%	0	0%
Other Principal Arterial	88	28%	20	21%

[10] U.S. Department of Transportation. Federal Highway Administration. Bridge Performance Measures. Final Rulemaking. Available at: https://www.fhwa.dot.gov/tpm/pubs/PM2BridgeFactSheet.pdf.

Minor Arterial	42	14%	20	21%
Collector	24	8%	23	24%
Local	64	21%	25	26%
Total Structures	**311**	**100%**	**96**	**100%**

Source: U.S. Department of Transportation, National Bridge Inventory, 2022.

FIGURE 2.15 LOCATION OF BRIDGES IN THE STUDY AREA, 2021



Source: U.S. Department of Transportation, National Bridge Inventory, 2022.

Table 2.11 shows the distribution of the condition ratings of bridges and box culverts by the entity responsible for their maintenance. Over 82 percent of the region's 311 bridges are in good condition. Of the 256 bridges in good condition, nearly two-thirds are maintained by the state and the remainder are maintained by counties, cities, and other entities in the region. Only 2 bridges, less than 1 percent, are in

poor condition. Both of these bridges are maintained by the state and are located along SR 25 in Port Wentworth as shown in Figure 2.16. Bridge ID #5100540 is the historic Houlihan Bridge which carries SR 25 over the Savannah River. Bridge #5100550 carries SR 25 over the Middle River. Both bridges are in the process of being replaced[11]. Once replaced, bridge ID #5100540 will be raised so that it has about 65 ft. of clearance above the Savannah River.

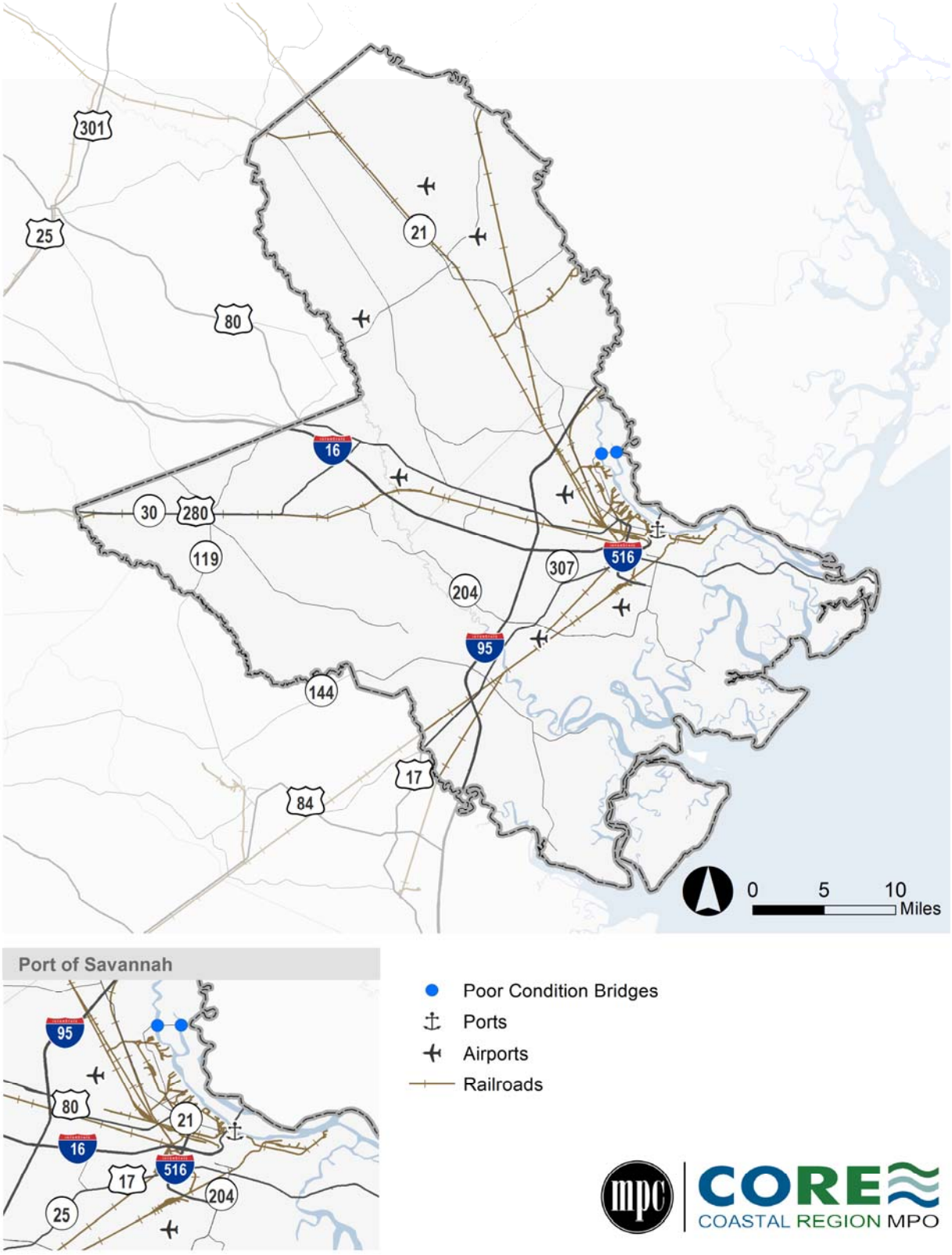
TABLE 2.11 CONDITION RATING OF STRUCTURES BY AGENCY RESPONSIBLE FOR THEIR MAINTENANCE, 2021

Maintenance Responsibility	In Good Condition	Share of Structures in Good Condition	In Fair Condition	Share of Structures in Fair Condition	In Poor Condition	Share of Structures in Poor Condition	Total Number
Bridges							
State	164	64%	27	51%	2	100%	193
County	56	22%	9	17%	0	0%	65
City	27	11%	5	9%	0	0%	32
Others	9	4%	12	23%	0	0%	21
Total Bridges	**256**	**100%**	**53**	**100%**	**2**	**100%**	**311**
Box Culverts							
State	41	47%	5	63%	0	0%	46
County	40	46%	1	13%	0	0%	41
City	2	2%	1	13%	0	0%	3
Others	4	5%	1	13%	1	100%	6
Total Box Culverts	87	100%	8	100%	1	100%	96
Total Structures	**343**	**100%**	**61**	**100%**	**3**	**100%**	**407**

Source: U.S. Department of Transportation, National Bridge Inventory, 2022; Cambridge Systematics, Inc.

[11] Georgia Department of Transportation, GeoPI Database, Project ID #0013741, https://www.dot.ga.gov/applications/geopi/Pages/Dashboard.aspx?ProjectID=0013741; Project ID #0013742, https://www.dot.ga.gov/applications/geopi/Pages/Dashboard.aspx?ProjectID=0013742.

FIGURE 2.16 LOCATION OF BRIDGES IN POOR CONDITION, 2021



Source: U.S. Department of Transportation, National Bridge Inventory, 2022; Cambridge Systematics, Inc.

Vertical clearance is another issue that can impact freight mobility as trucks are forced to divert to less efficient routes if a facility does not have sufficient vertical clearance. Specific requirements vary by daily volumes, urban versus rural setting, design speed, and other factors, but the GDOT Design Policy Manual[12] generally calls for the following vertical clearances by functional class:

- Local: minimum vertical clearance of 14.5 ft., but 16.75 ft. is desirable.
- Collectors and Arterials: minimum vertical clearance of 16.5 ft., but a clearance of 16.75 ft. is desirable.
- Freeways: minimum vertical clearance of 16.5 ft., but a clearance of 17 ft. is desirable.

In general, bridges with less than 16.5 feet of vertical clearance can impose significant challenges to the movement of goods. Of the region's 311 bridges, 104 cross over roadways (including bridges that cross roadways in addition to other features such as railroads or water bodies). Table 2.12 summarizes the distribution of vertical clearances for these bridges.

TABLE 2.12 DISTRIBUTION OF VERTICAL CLEARANCE ON ROADWAY BRIDGES BY FUNCTIONAL CLASS, 2021

Roadway Type	14.5 ft. – 16.5 ft.	16.5 ft. - 17 ft.	>=17 ft.	Total
Local	0	4	5	**9**
Minor or Major Collector	1	5	2	**8**
Minor Arterial	1	4	4	**9**
Other Principal Arterial (incl. Freeways and Expressways)	3	6	25	**33**
Interstate	4	14	27	**45**
Total	**9**	**33**	**62**	**104**

Source: U.S. Department of Transportation, National Bridge Inventory, 2022.

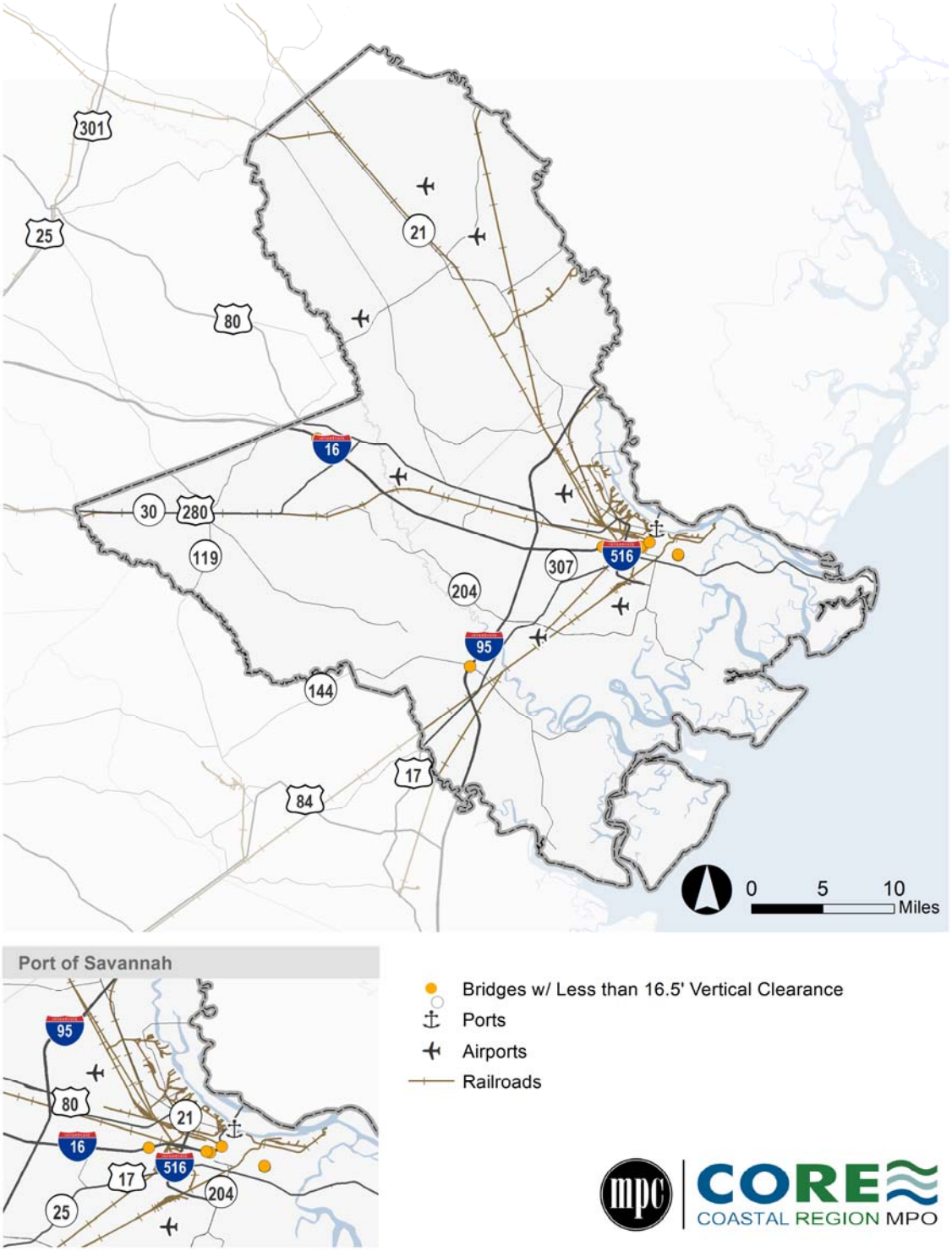
Importantly, the results show that 9 bridges across the region do not meet the current GDOT standard for minimum vertical clearance. Some of these bridges cross over arterials, which typically carry substantial volumes of freight traffic. The 9 bridges that do not meet current standards are listed below and shown in Figure 2.17:

- Minor and Major Collectors
  - Structure No. 2900020: Olive Brand Road over I-16 in Bryan County north of Ellabell.
- Minor Arterials
  - Structure No. 5101560: Chatham Parkway over I-16 in at Garden City-City of Savannah border.
- Other Principal Arterials

[12] GDOT Design Policy Manual, 6/8/2022, Revision 6.9, http://www.dot.ga.gov/PartnerSmart/DesignManuals/DesignPolicy/GDOT-DPM.pdf

  - Structure No. 5100780: W. 37th St. over I-16 in the City of Savannah.
  - Structure No. 5150440: Truman Parkway over Anderson St. in the City of Savannah.
  - Structure No. 5150450: Truman Parkway over Henry St. in the City of Savannah.
- Interstates
  - Structure No. 2900430: I-95 over SR 144 in Bryan County north of Richmond Hill.
  - Structure No. 5100070: I-516 over SR 25/US 17 in the City of Savannah.
  - Structure No. 5100950: I-16 over Stiles Ave. in the City of Savannah.
  - Structure No. 5101000: I-16 over Boundary St. in the City of Savannah.

FIGURE 2.17 HIGHWAY BRIDGES WITH LESS THAN 16.5' OF VERTICAL CLEARANCE, 2021

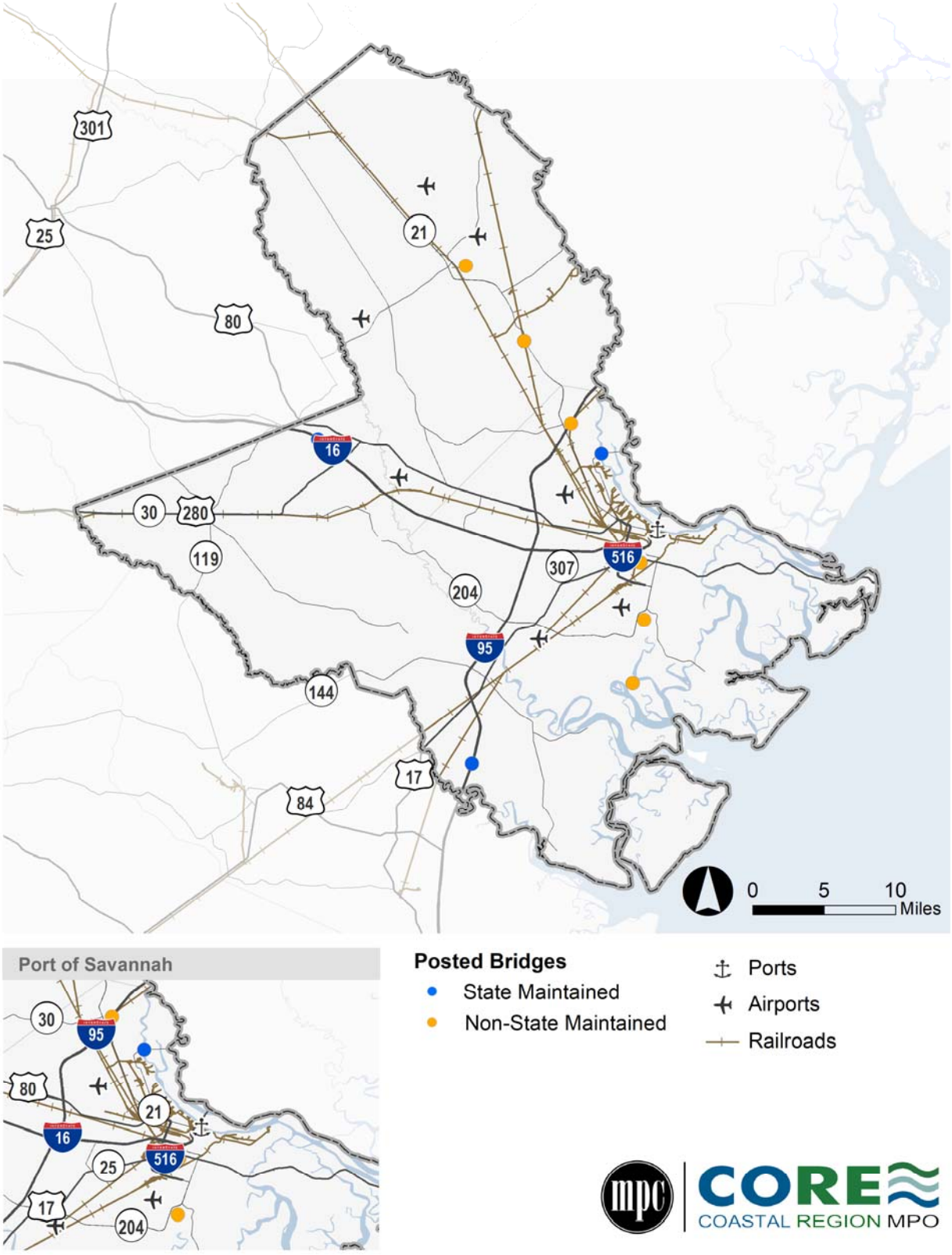


Source: U.S. Department of Transportation, National Bridge Inventory, 2022.

Posted bridges are another challenge to efficient freight movement. A posted bridge is one that has a weight limit below the standard truck axle distribution weight, which means heavier trucks may not be able to use the bridge. The heavier truck must either detour around the bridge or reduce its payload, which would lead to more trucks on the road for the same haul. In total, there are 9 posted bridges in the region as listed below and shown in Figure 2.18.

- Local
  - Structure No. 5150820: Rose Dhu Island Drive over Houston Creek on Rose Dhu Island.
  - Structure No. 10350280: Carolina Ave. over Dasher Creek in the City of Rincon.
  - Structure No. 5150010: O'Leary Road over Black Creek in the City of Port Wentworth.
  - Structure No. 5150190: 48th Street over Springfield Canal in the City of Savannah.
- Minor and Major Collectors
  - Structure No. 2900150: Belfast Keller Road over I-95 south of Richmond Hill.
  - Structure No. 10300330: Stillwell Road over Ebenezer Creek in the City of Springfield.
  - Structure No. 2900020: Olive Brand Road over I-16 in Bryan County north of Ellabell.
  - Structure No. 5101480: Atwood St. over the Vernon River in the City of Savannah.
- Other Principal Arterials
  - Structure No. 5100540: SR 25 over the Savannah River.

FIGURE 2.18 POSTED BRIDGES, 2021



Source: U.S. Department of Transportation, National Bridge Inventory, 2022.

Pavement Conditions

Roadway pavement condition can impact the cost and safety of travel for passengers and freight. Cracked and rutting roadway surfaces can cause additional wear and tear on freight vehicles as well as damage the goods they are transporting. Poor pavement conditions can also impact travel time-based performance measures if vehicles must decrease their speeds to avoid potholes or other condition-related hazards. Pavement conditions may also impact safety performance.

The U.S. Department of Transportation under the Moving Ahead for Progress in the 21st Century Act (MAP-21) and the Fixing America's Surface Transportation (FAST) Act requires states to submit pavement performance measure data in a variety of areas to the Federal Highway Administration (FHWA). These last two laws have introduced reforms into the Federal-Aid Highway Program by establishing new requirements for pavement performance management to foster efficient investment of federal transportation funds. Pavement condition performance measures based on the FHWA rulemaking are shown in Table 2.13.

TABLE 2.13 FHWA PAVEMENT PERFORMANCE RATING AND THRESHOLD

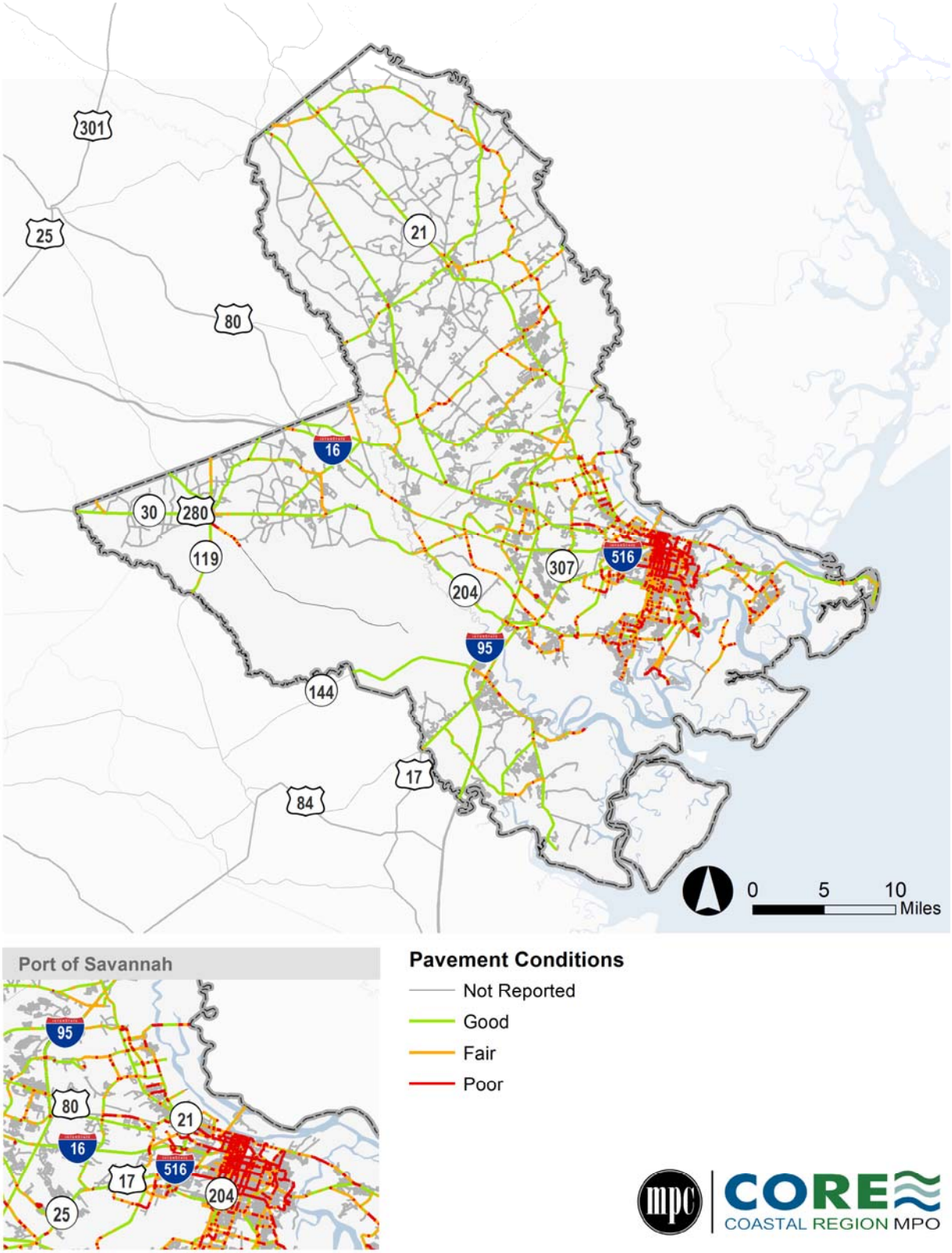
Metric	Good	Fair	Poor
IRI (inches/mile)	< 95	95–170	> 170
PSR (0.0–5.0 value)	≥ 4.0	2.0–4.0	≤ 2.0
Cracking Percent (%)	< 5	CRCP: 5–10 Jointed Concrete: 5–15 Asphalt: 5–20	> 10 > 15 > 20
Rutting (inches)	< 0.20	0.20–0.40	> 0.40
Faulting (inches)	< 0.10	0.10–0.15	> 0.15

Source: Federal Highway Administration (FHWA) Rulemaking for pavement.

Notes: IRI stands for International Roughness Index; PSR stands for Present Serviceability Index and may be used only on routes with posted speed limit <40 mph; CRCP stands for Continuously Reinforced Concrete Pavement.

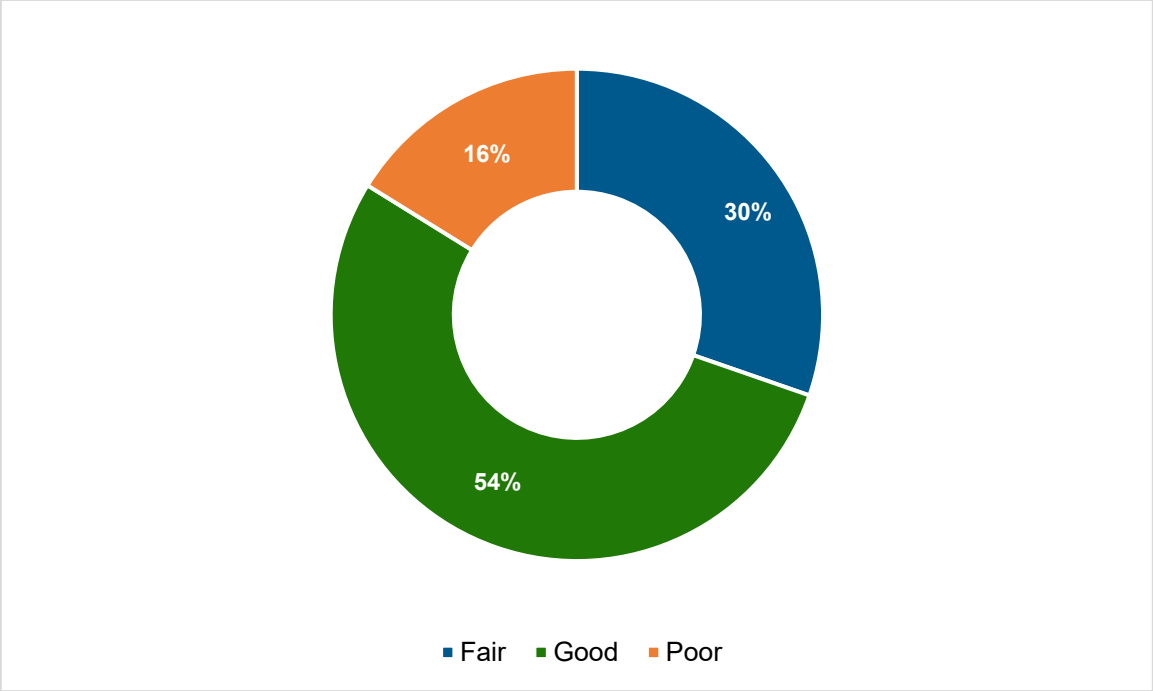
Pavement conditions throughout the CORE MPO region are depicted in Figure 2.19. It shows that poor pavements are largely concentrated in the urban center of the region in the City of Savannah. Corridors in this part of the region generally have IRI values that exceed 170. Poor pavement conditions can also be observed on corridors throughout the region including those with heavy volumes of freight traffic. Examples include SR 21 near the Port of Savannah and portions of SR 307/Bourne Avenue. However, as shown in Figure 2.20 the majority of the region's roadway network has pavements that are in good to fair condition - about 84 percent.

FIGURE 2.19 PAVEMENT CONDITIONS ON STUDY AREA ROADWAYS, 2020



Source: Federal Highway Administration, Highway Performance Monitoring System, 2020; Cambridge Systematics, Inc.

FIGURE 2.20 PERCENT OF LANE-MILES BY CONDITION CATEGORY, 2020



Source: Federal Highway Administration, Highway Performance Monitoring System, 2020; Cambridge Systematics, Inc.

Table 2.14 shows pavement conditions in the region by functional classification. Generally, poorer pavements are concentrated on minor arterials and major collectors. These roadways have over 20 percent of lane-miles that are in poor condition compared to 11-12 percent for minor collectors and principal arterials. Often, minor arterials and major collectors represent the first and last miles for freight shipments. It should be noted that although the HPMS data indicate that over 60 percent of lane-miles of local roads are in poor condition, data was reported for only a small portion of these corridors.

TABLE 2.14 PERCENT OF LANE-MILES BY FUNCTIONAL CLASS AND CONDITION CATEGORY, 2020

Roadway Type	Local[13]	Minor Collector	Major Collector	Minor Arterial	Principal Arterial	Interstate	Total
Good	9.4%	49.6%	39.0%	46.0%	56.1%	84.7%	**53.5%**
Fair	30.4%	38.0%	38.9%	29.9%	32.3%	12.9%	**30.3%**
Poor	60.2%	12.5%	22.1%	24.1%	11.5%	2.4%	**16.2%**
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

[13] Note that pavement condition data was available only for a small share of local roadways.

Source: Federal Highway Administration, Highway Performance Monitoring System, 2020; Cambridge Systematics, Inc.

3 RAIL

With a history of service that dates to the 1830's, freight rail in Georgia has been a prominent and critical economic driver for the state and the southeast region more broadly. Bryan, Chatham, and Effingham Counties represent a key node in the statewide freight rail system, a status that is only growing as the Port of Savannah continues to experience record freight volumes year over year. Ongoing rail capacity expansion projects at the Port of Savannah should further cement the region's status as a critical freight hub for Georgia and the southeastern United States, and freight rail service will continue to play a major role in this dynamic in the years ahead. This section details the current features, resources, service assets, conditions, performance, and safety records related to freight rail lines in the region.

3.1 Inventory of Assets

The statewide rail network has 4,684 miles of track, which places Georgia as the seventh-largest network in the country.[14] Of that total, 278.9 miles of the state's system are located within the three-county region. Freight railroads are categorized as Class I, Class II, or Class III based on their annual revenues.[15] Class I railroads are the largest, and generally include those operators that carry freight longer distances across state lines and into other regions of the United States or internationally into Canada and Mexico. As shown in Table 3.1 and Figure 3.1, there are two Class I railroads operating in the region, Norfolk Southern and CSX Transportation. The remaining five railroads operating in the study area are Class III railroads and include: the Georgia Central Railway, the PVTX (a private railroad serving Georgia Power and Georgia Pacific facilities in the study area), Savannah Port Terminal Railroad, Savannah & Old Fort Railroad, Riceboro Southern Railway, Ogeechee Railroad Company, and Allegheny & Western Railway Company. Class III railroads are typically short-line operations that provide direct, last-mile connections to key destinations in the freight network, including ports, industrial facilities, and warehousing and distribution centers. Each of these freight rail operators are described in more detail in the subsections that follow, as are the major terminals that make up the freight rail network in the three-county region.

TABLE 3.1 STUDY AREA RAILROADS

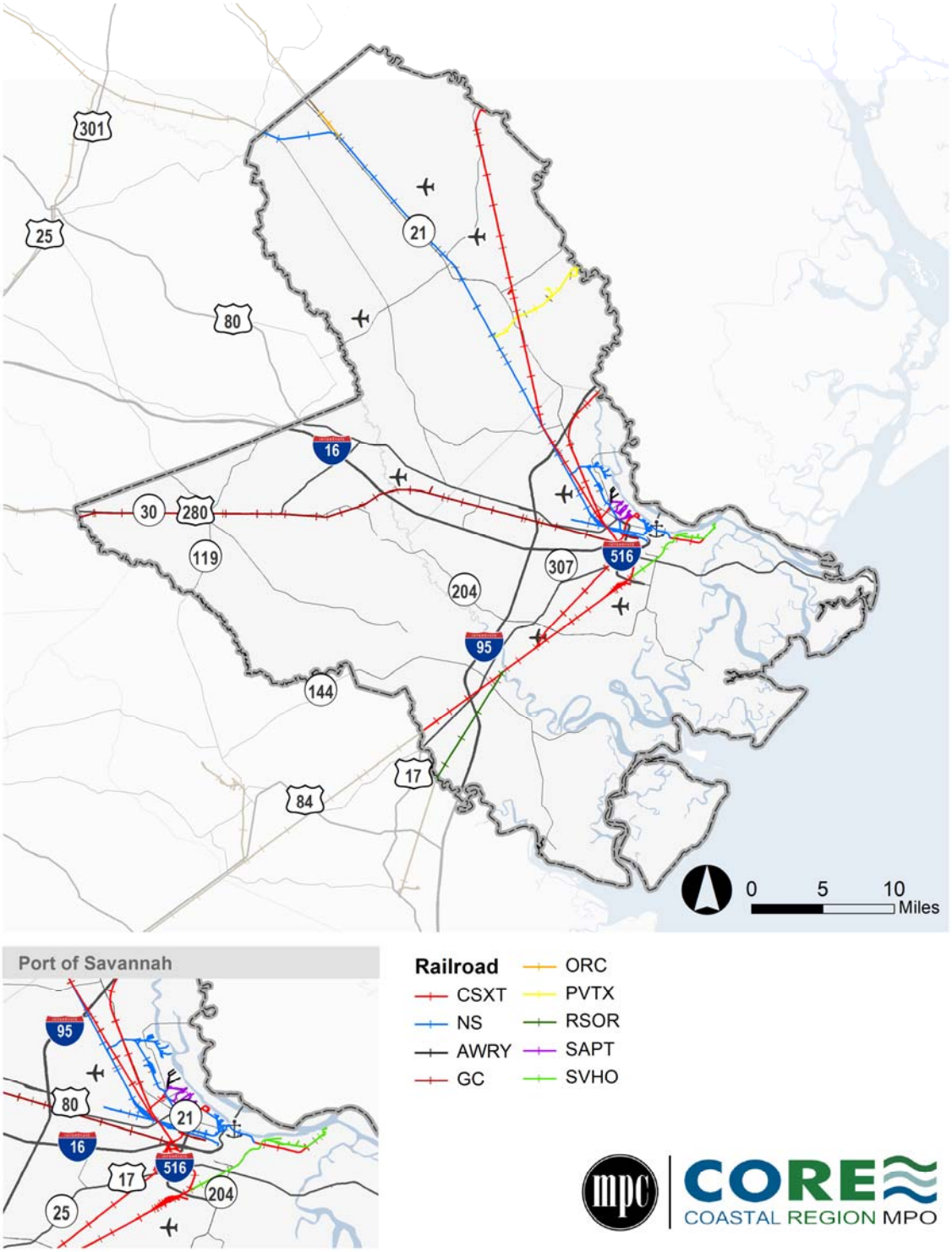
Railroad	Reporting Mark	Miles
Class I Railroads		
CSXT Transportation	CSXT	104.0
Norfolk Southern Railway Company	NS	80.5
Class III Railroads		
Georgia Central Railway	GC	42.9
Savannah Port Terminal Railroad	SAPT	15.3
PVTX	PVTX	11.0
Savannah & Old Fort Railroad	SVHO	10.3
Riceboro Southern Railway	RSOR	8.8
Ogeechee Railroad Company	ORC	2.3
Allegheny & Western Railway Company	AWRY	3.6
Total		**278.9**

[14] GDOT, Georgia State Rail Plan, 2021.

[15] Current Surface Transportation Board thresholds establish Class I carriers as any carrier earning revenue greater than $943.9 million, Class II carriers as those earning revenue between $42.4 million and $943.9 million, and Class III carriers as those earning revenue less than $42.4 million (https://www.stb.gov/reports-data/economic-data/).

Source: Bureau of Transportation Statistics, National Transportation Atlas Database, 2022; AECOM; Cambridge Systematics.

FIGURE 3.1 STUDY AREA RAILROADS, 2022



Source: Bureau of Transportation Statistics, National Transportation Atlas Database, 2022.

Class I Railroads

CSX Transportation

CSX Transportation (CSXT) operates the nation's third-largest rail network serving all major metropolitan areas east of the Mississippi River with extensions into the Canadian provinces of Ontario and Quebec. CSXT operates 21,000 route miles across 23 states, including the District of Columbia. CSXT provides rail, intermodal and rail-to-truck transload services to customers across a broad array of markets, including energy, industrial, construction, agricultural, and consumer products.

CSXT has access to more than 70 ocean, river, and lake port terminals along the Atlantic and Gulf Coasts, the Mississippi River, the Great Lakes, and the St. Lawrence Seaway. CSXT also serves thousands of production and distribution facilities through track connections to 230 short line railroads.

CSXT owns and operates nearly 1,500 miles of freight rail in Georgia, including 104 miles of rail within the three-county study area. CSXT's assets in the study area include rail lines heading north and southwest from the Port of Savannah, Savannah Yard near the I-16/I-516 interchange, Southover Yard adjacent to Hunter Army Airfield, and spur line connections to key destinations on the Savannah River such as Colonial Terminals. In addition, CSXT and Norfolk Southern jointly operate the Mason Mega Rail Terminal, the Port of Savannah's Garden City Terminal on-dock rail terminal that replaced CSXT's standalone Chatham Intermodal Container Transfer Facility (ICTF).

Norfolk Southern Railway

Norfolk Southern Railway (NS), owned and operated by Norfolk Southern Corporation, operates 21,000 route miles in 22 eastern states, the District of Columbia, and the Province of Ontario. Its service network, which generated over $11.3 billion in railroad operating revenue in 2019, blankets the eastern United States, with principal western gateways at Chicago, St. Louis, Kansas City, Memphis, and New Orleans.[16] With headquarters in Atlanta, Georgia, Norfolk Southern owns and operates approximately 1,735 miles of freight rail statewide, including 80.5 miles within the study area.[17]

NS's network in the study area includes Dillard Yard in Garden City and a rail line extending northwest from Dillard Yard through Effingham County to points further west. Other key NS assets in the study area include the S Line Yard along Louisville Road in Savannah and several spur lines connecting to industrial locations along the Savannah River. Norfolk Southern also jointly operates Mason Mega Rail Terminal with CSXT.

Class III Railroads

Savannah Port Terminal Railroad

Savannah Port Terminal Railroad (SAPT) has provided contracted rail intermodal and merchandise service, railcar switching and yardmaster services, and track inspection and maintenance to the Port of Savannah since 1998. SAPT is owned by Genesee & Wyoming, a railroad operator that owns or operates more than 13,000 track miles of freight rail across 43 US states and four Canadian provinces and who specializes

[16] Norfolk Southern reports fourth-quarter and full-year 2019 results. Available from: http://nscorp.com/content/nscorp/en/news/norfolk-southern-reports-fourth-quarter-and-full-year-2019-resul.html

[17] GA State Rail Plan page 2-5.

shortline services. [18] SAPT currently operates 24/7 over 18 track-miles inside the Port. The railroad interchanges with CSX and Norfolk Southern, offering port customers broader access to the North American rail-freight network and additional markets. Starting in April 2021, SAPT expanded their services to include services to the new Mason Mega Rail Terminal which includes 15 track-miles and the ability to build and receive six 10,000-foot trains. The SAPT has a track capacity of 286,000 lbs.

Georgia Central Railway

The Georgia Central Railway (GC) is a subsidiary of Genesee & Wyoming, Inc. The GC operates a regional rail line that connects CSX's Savannah Yard to points west of the study area, including interchanges with the Heart of Georgia Railroad in Vidalia and Norfolk Southern in Macon. GC primarily hauls agricultural products, lumber, stone, minerals, pulp, and paper. GC's route also features connections to key distribution hubs such as the Savannah Port Logistics Center in Pooler, Georgia, with direct service to Plastic Express and other key industrial clients.[19] The GC has a track capacity of 286,000 lbs.

Savannah & Old Fort Railroad

The Savannah & Old Fort Railroad (SVHO) is a short-line railroad that runs from points along the industrial waterfront east of downtown Savannah to CSX's Southover Yard on the northern edge of Hunter Army Airfield. SVHO is owned and operated by Watco, a global transportation and supply chain services company with facilities throughout North America and Australia and headquarters in Pittsburg, Kansas. SVHO's connection to Southover Yard allows for the movement of a range of commodities from this line to CSX's broader network. Goods including sulfuric acid, sulfur, gypsum, pulpboard, wood pellets, and petroleum shipped to and from facilities on the Savannah River. [20] These include the Peeples Industries' East Coast Terminal, Georgia-Pacific's Savannah Gypsum facility, and Conoco Phillips' Savannah terminal. The SVHO has a track capacity of 286,000 lbs.

Ogeechee Railroad Company

Ogeechee Railroad Company (ORC) operates a short-line railroad in northwest Effingham County that connects to industrial facilities in Screven County, including a spur connection to Evans Concrete's plant in Sylvania, Georgia. ORC's line connects with Norfolk Southern's line in Effingham County, allowing ORC access to the larger freight rail network in the Savannah region. This line is owned by GDOT and leased to ORC. This is one of eight such lines in the state, and the only GDOT-owned line within the three-county study area.[21]

Allegheny & Western Railway Company

Allegheny & Western Railway Company (AWRY) is a subsidiary of CSX Transportation with operations in the study area. AWRY is a short-line railroad that manages several spur lines that run into the Port of Savannah. These spurs connect to both the CSXT and NS rail networks just outside the Port, allowing direct access to

[18] www.gwrr.com/about-us/

[19] https://www.gwrr.com/gc/

[20] https://www.watco.com/service/rail/savannah-old-fort-svho/

[21] Georgia State Rail Plan, Final Report, 2021.

the regional rail system for freight entering and leaving the Port. AWRY is based in Chicago, Illinois, with operations in several states.[22]

Riceboro Southern Railway

The Riceboro Southern Railway (RSOR) is a short-line railroad (i.e., Class II and III railroads) which operates in the study area. It is a subsidiary of Genesee & Wyoming, Inc.[23] The RSOR interchanges with CSX in Richmond Hill, providing access to the Port of Savannah and the entire CSX network. Outside of the study area in Liberty County, major shippers including Interstate Paper Corporation, SNF, and International Greetings USA have spurs connecting them to the RSOR rail line. The RSOR has a track capacity of 286,000 lbs.

PVTX

This is a private railroad in Effingham County that serves Georgia Power's Plant McIntosh and Georgia Pacific. It is operated by Norfolk Southern and CSX Transportation.

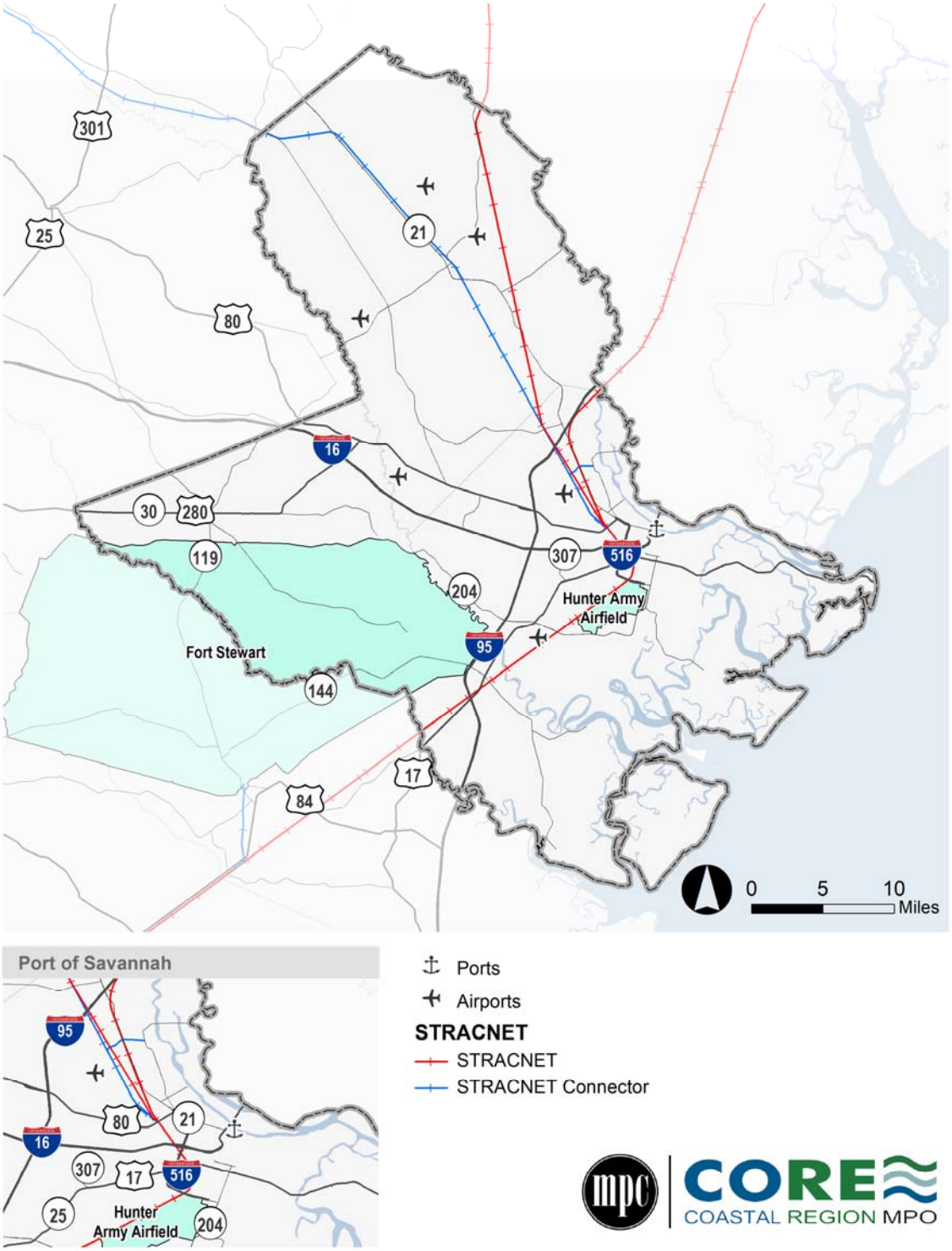
Strategic Rail Corridor Network

Fort Stewart and Hunter Army Airfield are the two military installations in the region. The transportation needs of those, and other military installations outside the region and state, are served by the STRAHNET (discussed in section 2.1) and the Strategic Rail Corridor Network (STRACNET). The STRACNET (see Figure 3.2) is an interconnected and continuous rail line network consisting of over 36,000 miles of track serving over 120 defense installations. It ensures the readiness capability of the national railroad network to support defense deployment and peacetime needs.

[22] awrail.com

[23] https://www.gwrr.com/railroads/north_america/riceboro_southern_railway#m_tab-one-panel

FIGURE 3.2 STRACNET, 2022



Source: Bureau of Transportation Statistics, National Transportation Atlas Database, 2022; U.S. Census Bureau, TIGER/Line Shapefiles Database.

Major Freight Rail Terminals

Multimodal freight facilities are defined as facilities where any transfer of freight between transportation modes occurs, including but not limited to the movement of containers and trailers, bulk transloads, and automobile distribution. These facilities are critical components in the study area's freight system. This subsection discusses major rail terminals in the study area. However, in addition to these there are multiple rail-served facilities in the region.

Rail Intermodal Terminals

Rail intermodal terminals are those facilities that allow for the transfer of shipping containers between rail and other modes, including cargo ships and tractor trailers. Two rail intermodal terminals are components of the freight rail system in the three-county study area. Those facilities include:

- **Mason Mega Rail Terminal.** The Mason Mega Rail Terminal is a rail intermodal terminal adjacent to the Port of Savannah's Garden City Terminal that opened at full capacity in 2022. This terminal combines the existing Chatham Intermodal Container Transfer Facility (ICTF), operated by CSX, and the existing Mason ICTF, operated by Norfolk Southern. Combining these two formerly separate facilities allows for the addition of 97,000 new feet of rail at Garden City Terminal, a more efficient terminal design that can use higher productivity loaders shortening freight transfer times while doubling the Port of Savannah's rail lift capacity to 1 million containers annually. Both Class I railroads will continue to operate from this location and benefit from the resulting expansion of the Port of Savannah's service area, which now stretches west to Dallas and Memphis and into the midwestern United States.[24]

- **CSX Savannah Yard.** Savannah Yard is a rail intermodal terminal operated by CSX. It is located southwest of the I-16/I-516 interchange. The CSX Savannah Yard has approximately 4,800 feet of loading track and can handle as many as 50,000 lifts per year.

Rail Bulk and Other Terminals

In addition to rail intermodal terminals, rail bulk and carload terminals also comprise important components of the regional freight rail network. Rail bulk terminals are those facilities that allow for the transfer of dry or liquid bulk goods such as petroleum products and minerals between rail and trucks. Other types of terminals include roll-on roll-off facilities and breakbulk terminals, which allow for the transfer of automobiles and other types of goods on and off of the freight rail network. Key facilities in the study area include:

- **Colonial Terminals.** Colonial Terminals operates two bulk goods terminals southeast of the Port of Savannah on the Savannah River. Terminal 1 supports the storage and transfer of liquid bulk goods via a 55-acre facility with capacity for 2.65 million barrels, including products ranging from acids and alcohols to petroleum and food-grade materials. Terminal 1 is serviced by spur routes operated by Norfolk Southern. Terminal 2 accommodates both liquid and dry bulk goods on a 90-acre facility, with storage capacity for 1.03 million barrels of liquids alongside 40 storage silos and 70,000 square feet of warehouse space for dry commodities. Products supported at Terminal 2 include asphalt, chemicals,

[24] Mason Mega Rail - Georgia Ports Authority (gaports.com)

renewable fuels, fertilizer, grain, and wood pellets, among others. Terminal 2 features direct rail access via spur lines operated by CSX.[25]

- **CSX TRANSFLO.** Co-located with CSX's Savannah Yard, CSX Transportation's TRANSFLO terminal supports the transfer of bulk goods between railcars and trucks. CSX Transportation's TRANSFLO facility is capable of handling a range of commodities, including chemicals, oil, dry goods, food-grade products, and other materials. This terminal has a capacity of 45 railcars.[26]

- **CSX Southover Yard.** CSX Transportation also operates the Southover Yard which is located south of I-516 near the Hunter Army Airfield. The facility occupies over 200 acres and has connections to the Savannah & Old Fort Railroad (SVHO). The Southover Yard likely primarily handles goods including sulfuric acid, sulfur, gypsum, pulpboard, wood pellets, and petroleum shipped to and from facilities on the Savannah River as those are the main commodities shipped on the SVHO.

- **NS Dillard Yard.** Dillard Yard formerly operated as a Norfolk Southern rail intermodal terminal. It is located approximately one and a half miles from the Port of Savannah. Recently, it has been used as a container yard to relieve overflow at the Port of Savannah.[27]

- **Vopak Terminal Savannah.** Vopak Terminal Savannah is a bulk goods terminal located immediately adjacent to the Port of Savannah on the Savannah River. Vopak's terminal features 56 tanks that can accommodate asphalt, vegetable oils, biofuels, chemicals, and petroleum products.[28] The terminal has direct access to the larger regional freight rail network via spur lines operated by the Savannah Port Terminal Railroad.

- **Georgia Ports Authority Ocean Terminal.** The Georgia Ports Authority operates the Ocean Terminal at the Port of Savannah, a 200-acre terminal offering roll-on, roll-off and breakbulk, and container services with direct intermodal connections to Norfolk Southern's rail network via spur lines at the terminal. The terminal offers four shipping berths, open storage, and more than 1.4 million square feet of warehouse space, among other amenities.[29] The Ocean Terminal is in the process of being converted to primarily serve container traffic.

- **Southeastern Ship Terminal.** The Southeastern Ship Terminal is located along N. Lathrop Ave. east of I-516 in the City of Savannah. [30] The facility handles bulk and breakbulk cargo and has approximately 200,000 sq. ft. of warehousing space.

- **Savannah Marine Terminal.** The Savannah Marine Terminal is a 40-acre transloading complex that is served by both CSXT and Norfolk Southern.[31] It is located northeast of the I-16/I-516 along Magazine Ave. and Feeley Ave. in the City of Savannah. The Savannah Marine Terminal has approximately 80,000 sq. ft. of warehousing space. Agricultural products, forest products and logs, animal and vegetable

[25] Terminal 1 – Liquid Bulk – Colonial Terminals Inc.
[26] Georgia-Savannah | Transflo
[27] https://gaports.com/press-releases/kemp-georgia-ports-mark-mega-rail-milestone/
[28] Vopak Terminal Savannah | Royal Vopak
[29] Ocean Terminal - Georgia Ports Authority (gaports.com)
[30] http://ssterminal.com/index-1.html
[31] https://www.savannahmarineterminal.com/

products, liquid bulk products, stone and other dry bulk goods, and pipes are among the primary commodities served by this facility.

- **Seaonus Stevedoring-Savannah.** Seaonus Stevedoring-Savannah is located along Altamaha St. east of downtown Savannah.[32] It specializes in breakbulk, forest products, and project cargo. The facility is owned and operated by Patriot Rail.

3.2 Conditions and Performance

This section of the report discusses current conditions and performance of freight rail corridors in the Savannah region. Freight rail network capacity is critical in keeping the study area's network economically competitive. Potential for growth is dependent on sufficient excess capacity to handle increased movements. Key elements that determine physical capacity limits are as follows:

- **Weight limits.** The gross (total) weight of a rail car plus any cargo it is carrying. Railcars continue to increase in weight, with standard for a four-axle car reaching 286,000 pounds.

- **Vertical clearances.** Distance between the rail bed and the bottom of overhead structures. Modern railcars, including double-stacked containers and tri-level auto-rack cars need more space than previous generations of equipment.

- **Traffic control and signaling.** Signaling systems help ensure safe operations and affect permissible passenger and freight train speeds, while traffic control systems improve capacity utilization in an efficient manner. Traffic management systems can range from simple to complex, with lines experiencing higher traffic volumes benefiting from more advanced systems. These include automated technologies that help ensure operational safety (such as automatic block signals) and computerized dispatching systems that help manage the flow of trains over a route.

The analysis also has a focus on rail safety. Transportation safety is one of the highest priorities for transportation planning and engineering and is a key consideration for a range of stakeholders. An overview of freight rail safety is included in this section with a more detailed analysis to be provided as part of Task 2.5: Freight Network Congestion, Bottleneck, and Safety and Security Issues.

Weight-Limited Rail Lines

Rail lines that have not been abandoned but are either out of service (i.e., embargoed) or of such condition that they cannot handle standard 286,000-pound (i.e., 286K) railcars can have an adverse impact on shippers and the local economies that rely on the shippers for jobs and revenues. As traffic on rail lines diminishes, or as funds are not available for needed maintenance, lines are sometimes taken out of service or are abandoned. In some cases, abandoned lines are rail-banked, meaning they are converted to other uses, to retain the underlying right of way for future rail use.

Data available from the 2021 Georgia State Rail Plan, the 2018 Georgia Statewide Freight and Logistics Action Plan, and various railroad websites indicate that nearly all of the freight rail corridors in the Savannah region meet the 286K standard. Based on information from the 2018 Georgia Statewide Freight and Logistics Action Plan, the only corridor that does not meet this standard is the Ogeechee Railroad Company (ORC)

[32] https://patriotrail.com/patriot-ports/ports/savannah/

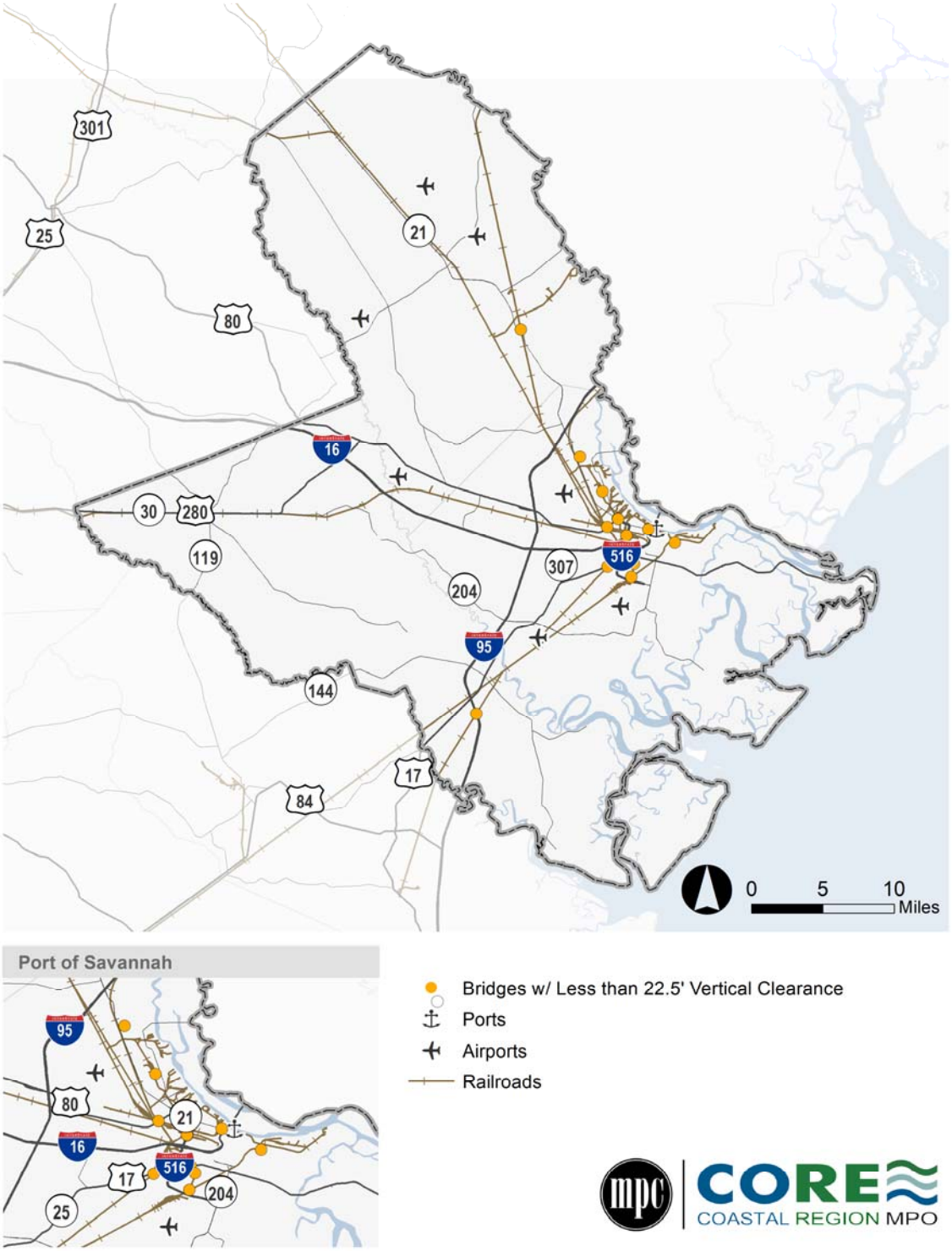
corridor in Effingham County which connects to the Norfolk Southern network. However, track capacity on this line may have been increased since the completion of the 2018 Statewide Freight and Logistics Action Plan but public information was not released.

Vertical Clearances

To allow unrestricted access for all standard rail car configurations, including double-stacked intermodal cars and tri-level auto carriers, 22 feet 6 inches is needed between the rail bed and the underside of any overhead structure. For lines handling intermodal traffic, double-stacked domestic containers can fit under a vertical clearance of 20 feet 8 inches—anything less than this restricts the corridor to single-stacked containers with accompanying efficiency and competitiveness issues.

There are 57 bridges in the region that intersect rail corridors. Of this total, 15 do not provide the ideal vertical clearance of 22’-6” as shown in Figure 3.3. Twelve of these bridges are maintained by GDOT, 2 are maintained by Chatham County, and 1 is maintained by the City of Savannah. Despite not having the ideal vertical clearance, only two bridges intersecting rail corridors do not meet the minimum standard of 20’-8” for double-stacked operations. These include structure #5150980 which carries Jimmy Deloach Parkway over CSXT in the City of Port Wentworth and structure #5100110 which carries I-516 over CSXT and Gwinnett Street in the City of Savannah.

FIGURE 3.3 VERTICAL UNDERCLEARANCE ISSUES ON BRIDGES OVER RAILROADS, 2022



Source: U.S. Department of Transportation, National Bridge Inventory, 2022.

Traffic Control Systems

Positive Train Control (PTC) technology can prevent train-to-train collisions, over-speed derailments and casualties or injuries to roadway workers (e.g., maintenance of way workers, bridge workers, and signal maintainers). The technology combines GPS locating of trains, infrastructure, speed restrictions, and traffic conditions with real-time wireless communications between locomotives and other operating equipment, dispatchers, and work crews. The Rail Safety Improvement Act of 2008 (RSIA) mandated the widespread installation of PTC systems on all lines handling passenger trains or hazardous materials, a network totaling approximately 80,000 miles.[33]

The mandate for PTC excludes all Class II and III railroads regardless of tonnage or number of cars transporting TIH materials if no passenger trains travel over the lines. However, some Class II and Class III railroads must access Class I rail lines. Class I railroads may require these carriers to equip their locomotives with PTC as prerequisite to access their lines. As of July 1, 2019, Class I railroads had equipped all relevant locomotives with PTC, installed wayside units, towers, and trained employees.

Rail Safety Incident History

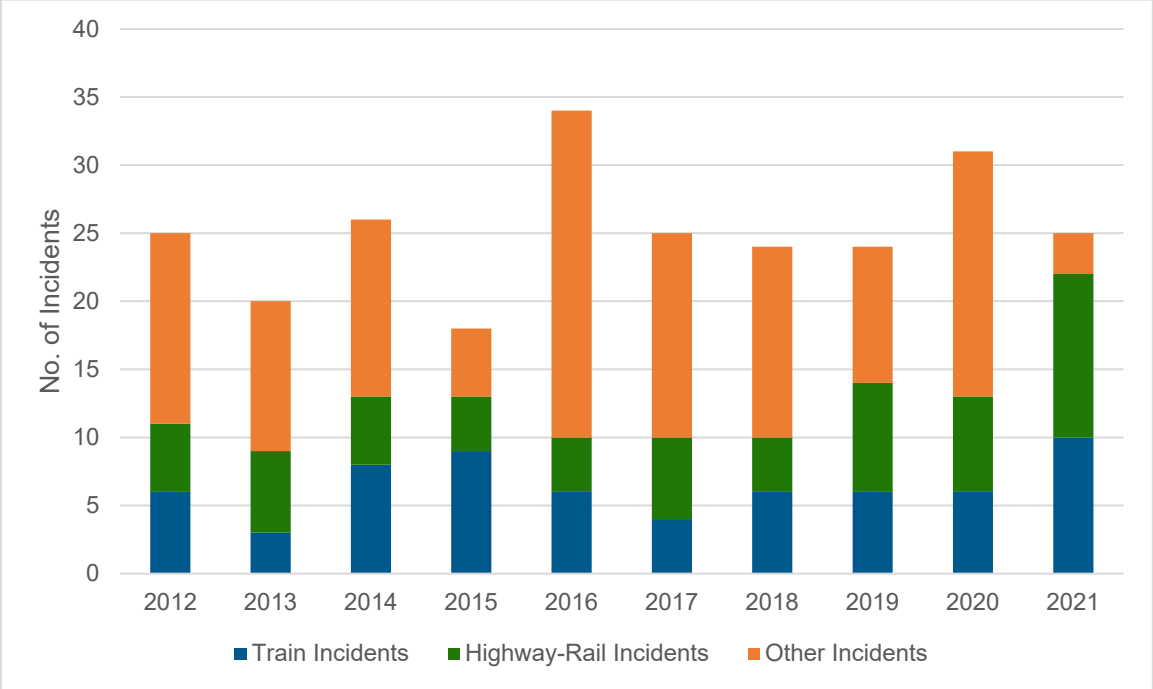
Railroad incidents for the last full 10-year period 2012-2021 in the study area are summarized in Figure 3.4. The Federal Railroad Administration (FRA) assigns rail-related accidents/incidents to one of three categories:

- Train accidents are train collisions, derailments of trains or other incidents that cause damage to railroad equipment, track, or structures.
- Highway-rail accidents are collisions where trains hit or are struck by cars, bicycles, or pedestrians at highway-rail grade crossings.
- Other accidents/incidents do not fit into the first two categories. Railroad employees are required to report any work-related injuries or sickness, which are categorized as “other accidents/incidents.” Situations where trespassers, railroad employees, or contractors are struck by trains also fall into the “other” category.

Passenger rail data was included to present a full history of rail incidents as AMTRAK uses CSXT and Norfolk Southern owned and maintained rail lines. Reportable incidents include highway-rail grade crossing accidents or incidents as well as train derailments, collisions, and any accident involving railroad employees or trespassers that occur on railroad property and result in fatalities, injuries, or property damage exceeding an amount established by FRA. Because property damage-only crashes are included, there is no direct correlation between the number of fatalities/non-fatalities and the total number of incidents.

[33] FRA, 49 CFR 236.1005.

FIGURE 3.4 FRA REPORTABLE RAILROAD INCIDENTS 2011 – 2020



Source: FRA Office of Safety Analysis, 10-Year Accident/Incident Overview 2012-2021; AECOM.

More detailed information on the severity of railroad incidents is summarized in Table 3.2. This 10-year look at incident history shows a general decrease in incidents resulting in fatalities. In particular, there has not been an incident at a highway-rail crossing resulting in a fatality since 2016. However, while there appears to be a reduction in the severity of crashes, the overall rate of incident occurrence remains relatively steady.

TABLE 3.2 FRA REPORTABLE RAILROAD INCIDENTS 2011 – 2020

Incident	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total Incidents	25	20	26	18	34	25	24	25	32	26
Deaths		3	1	1	1	1	1			
Injuries	14	19	15	7	24	14	18	12	18	6
Train Incidents	6	3	8	9	6	4	6	6	6	10
Deaths										
Injuries		2					4			
Highway-Rail Incidents	5	6	5	4	4	6	4	8	7	12
Deaths		2	1	1						
Injuries		7	2	2	1			1		3
Other Incidents	14	11	13	5	24	15	14	10	18	3
Deaths		1			1	1	1			

Injuries	14	10	13	5	23	14	14	10	18	3

Source: FRA Office of Safety Analysis, 10-Year Accident/Incident Overview 2012-2021; AECOM.

4 PORTS

The Savannah River and the region's coastal location provides a valuable waterborne connection to national and international markets. The Port of Savannah is critically important to the regional and state economy and generates much of the freight traffic through the region. This section of the report discusses the region's port and waterway assets.

4.1 Inventory of Assets

The Port of Savannah is the largest and fastest growing container terminal in America and the 3rd busiest container port complex in U.S., after L.A./ Long Beach and New York-New Jersey.[34] It is the largest gateway for agricultural exports. In 2021, despite the COVID-19 pandemic's substantial disruption of national and international supply chains, the Georgia Ports Authority handled 41.6 million tons of trade including 5.6 million twenty-foot equivalent container units (TEUs).

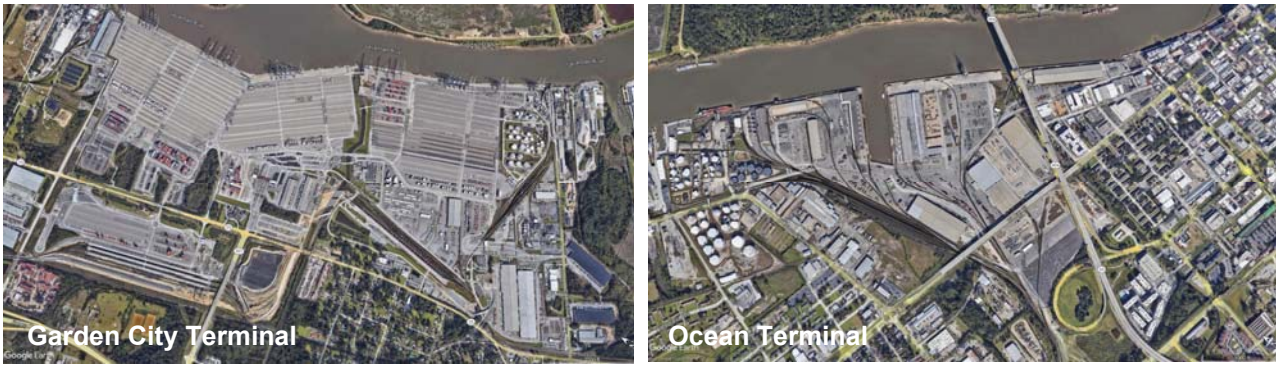
The Port of Savannah is comprised of two terminals: Garden City and Ocean (see Table 4.1). As indicated in Table 4.1, the Garden City Terminal handles container traffic and has on-terminal rail intermodal access. Both Norfolk Southern (NS) and CSX Transportation operate at the Mason Mega Rail Terminal located on the Garden City Terminal. The Ocean Terminal handles breakbulk, roll-on/roll-off (Ro/Ro), and container traffic. However, this facility is in the process of being converted to primarily handle containers. It also has on-dock rail access via NS and CSX.

TABLE 4.1 DEEPWATER TERMINALS AT THE PORT OF SAVANNAH, 2022

	Garden City Terminal	Ocean Terminal
Terminal Area	1,345 acres	200.4 acres
Commodities Handled	Containers	Breakbulk, Ro/Ro, Containers, Heavy Lift, and Project Cargo

Source: Georgia Ports Authority.

FIGURE 4.1 DEEPWATER TERMINALS AT THE PORT OF SAVANNAH



Source: Google Earth.

[34] Georgia Ports Authority, https://gaports.com/facilities/port-of-savannah/.

The Ocean Terminal serves breakbulk, Roll-on / Roll-off, and containers. It covers 200.4 acres and provides more than 1.4 million square feet of storage[35]. The Garden City Terminal is the Port of Savannah's primary container handling facility and is the 4th busiest container terminal in the United States. It occupies about 1,345 acres and handled approximately 538,000 rail containers in 2021[36]. Over 1.1 million square feet of warehousing is located at the Garden City Terminal.[37] There are ongoing efforts to expand the Garden City Terminal (i.e., Garden City Terminal West) to include a container yard with a capacity of 750,000 TEUs.

While the inventory of assets focuses on facilities owned by the Georgia Ports Authority, it is important to note that there are several rail terminals, truck terminals, rail-served docks, and other facilities that effectively expand the footprint of the port and the amount of capacity it may handle. This is apparent when viewing the cargo-serving docks (i.e., as opposed to docks used for maintenance, tourism, or other purposes) and industrial zoned properties within the port statistical area (see Figure 4.2). The port statistical area represents the port limits as defined by legislative enactments of state, county, or city governments. Along with the cargo-serving docks and industrial zoned properties, the port statistical area provides an indication of the broader reach of the port in terms of the facilities that support port operations.

[35] https://gaports.com/facilities/port-of-savannah/ocean-terminal/

[36] Georgia Ports Authority, 2021 Annual Report, https://gaports.dcatalog.com/v/FY21-Annual-Report/?1655986353.

[37] Georgia Ports Authority, https://gaports.com/facilities/port-of-savannah/garden-city-terminal/

FIGURE 4.2 INDUSTRIAL PROPERTIES AND CARGO-SERVING DOCKS WITHIN THE PORT OF SAVANNAH'S PORT STATISTICAL AREA, 2022

Source: U.S. Army Corps of Engineers; CORE MPO; Cambridge Systematics, Inc. analysis.

4.2 Conditions and Performance

This section of the report examines the condition and performance of the region's port assets. Specifically, it investigates port capacity, throughput, and vessel dwell times. These three dimensions of performance are measured by the Bureau of Transportation Statistics as part of the Port Performance Freight Statistics Program, which was established by the Fixing America's Surface Transportation (FAST) Act of 2015.

Port Capacity and Throughput

Port capacity is a measure of the maximum throughput that a port and its marine terminals can handle over a given time period[38]. This maximum can be set by physical constraints and factors such as air draft restrictions, channel depths, the number and type of container cranes, and the proximity of rail connections. Port throughput can be measured by the amount of cargo or the number of vessels that a port handles over a given time period.

Air draft restrictions can limit port capacity, especially as increasingly larger vessels come into service[39]. These restrictions may not affect all terminals in a port as some ports might have terminals with no air draft restrictions because no bridges cross their navigation channels. Air draft restrictions may be eliminated or reduced as bridges are either raised or replaced. In general, bridges with higher vertical clearances allow more stacked containers to pass under. The Port of Savannah's air draft is 185 feet due to the Talmadge Memorial Bridge which carries SR 404/US 17 over the Savannah River. GDOT is currently considering improvements to the Talmadge Memorial Bridge (alternatives include raising the existing bridge, building a new bridge or building a tunnel) to increase the air draft to 215-220 feet.[40]

The number and type of container cranes are another indicator of port capacity. Container cranes link the waterside and landside port assets, including truck and rail connections or the container yard used for short-term storage[41]. The number and size of cranes affects the number and sizes of container vessels a terminal can service simultaneously. The Port of Savannah has 38 ship-to-shore cranes. Of that total, 30 are Super Post-Panamax cranes, a class of crane that can fully load and unload containers from the largest container vessels currently in operation that can be up to 24-rows of containers in width.

Port capacity is also impacted by the proximity of rail connections. All major ports are either directly connected to the rail system or have facilities that are nearby. The Port of Savannah's on-terminal facility at the Garden City terminal is the Mason Mega Rail Terminal. It is served by Norfolk Southern and CSX Transportation and replaced the Chatham Intermodal Container Transfer Facility (ICTF) and the James D. Mason ICTF. The Ocean Terminal also has an on-terminal facility that is served by both Norfolk Southern and CSX Transportation.

Regarding throughput, 2020 data from the U.S. Army Corps of Engineers Waterborne Commerce Center indicate that the Port of Savannah ranked 13th in total tonnage among U.S. ports. This is an increase over its 2016 ranking at number 18. In 2020, the Port of Savannah handled over 43.4 million tons of goods as shown

[38] https://data.bts.gov/stories/s/mign-rc8p

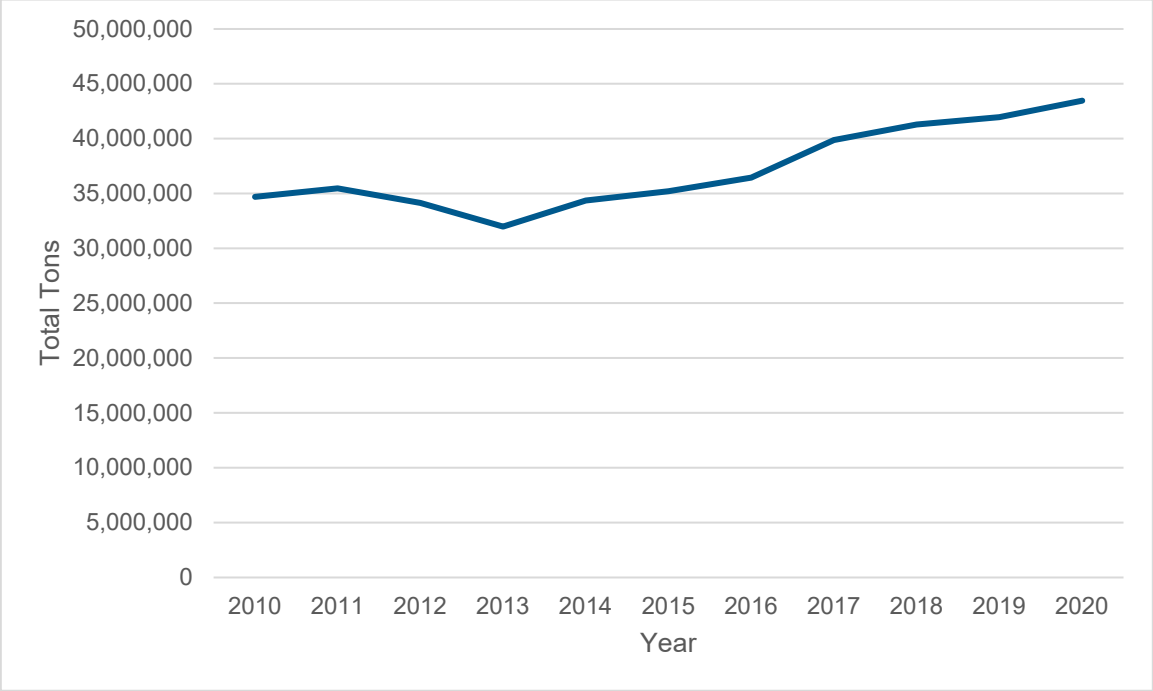
[39] https://data.bts.gov/stories/s/Air-Draft-Channel-Depths/prsc-k6eu

[40] Merrigan, J. and D. Jones, "State studying Talmadge Bridge: Accommodating all large ships, possible replacement," WSAV, https://www.wsav.com/news/local-news/savannah/state-studying-whether-talmadge-bridge-can-accommodate-all-large-ships-looking-for-possible-replacement-alternatives/

[41] https://data.bts.gov/stories/s/Container-Cranes/r3bp-uzdb

in Figure 4.3. Of that total, about 56 percent were imports, 41 percent exports, and nearly 3 percent domestic shipments. Top commodities for the Port of Savannah include manufactured products, pulp and waste paper, rubber and plastics, textile products, and paper and paperboard. The Port of Savannah is the top U.S. port for agricultural exports (e.g., forest products, clay, cotton, poultry) as it accounted for nearly 16 percent of the nation's agricultural container exports in 2019.[42]

FIGURE 4.3 PORT OF SAVANNAH TONNAGE, 2011-2020

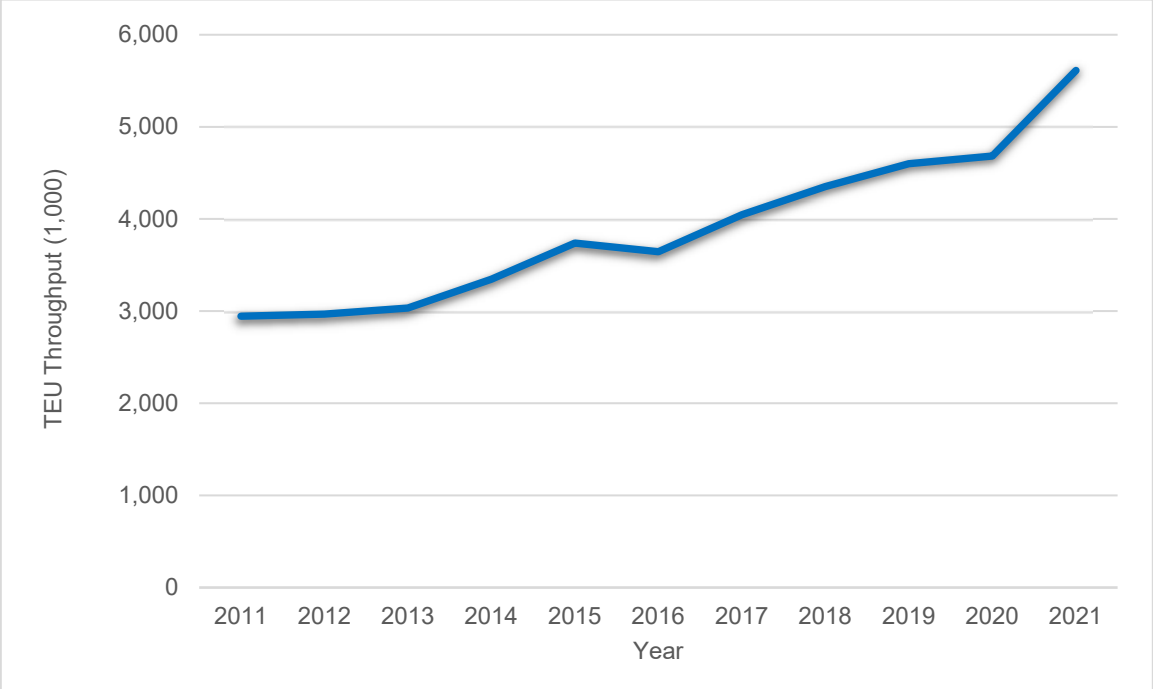


Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center.

The Port of Savannah's throughput (measured in the number of import, export, and empty containers processed) has steadily increased over the 2011-2021 time period as shown in Figure 4.10. Total growth in throughput (TEUs) over this period was approximately 90 percent. In 2021, Savannah's total container trade expanded 19.9 percent over the 2020 value to reach 5.61 million TEUs. From 2017 to 2021, total container trade at the Port of Savannah grew 39 percent with an annual compound growth rate of about 8.5 percent.

[42] https://gaports.com/press-releases/savannah-now-the-top-us-port-for-ag-exports/

FIGURE 4.4 PORT OF SAVANNAH THROUGHPUT (TEUS), 2011-2021

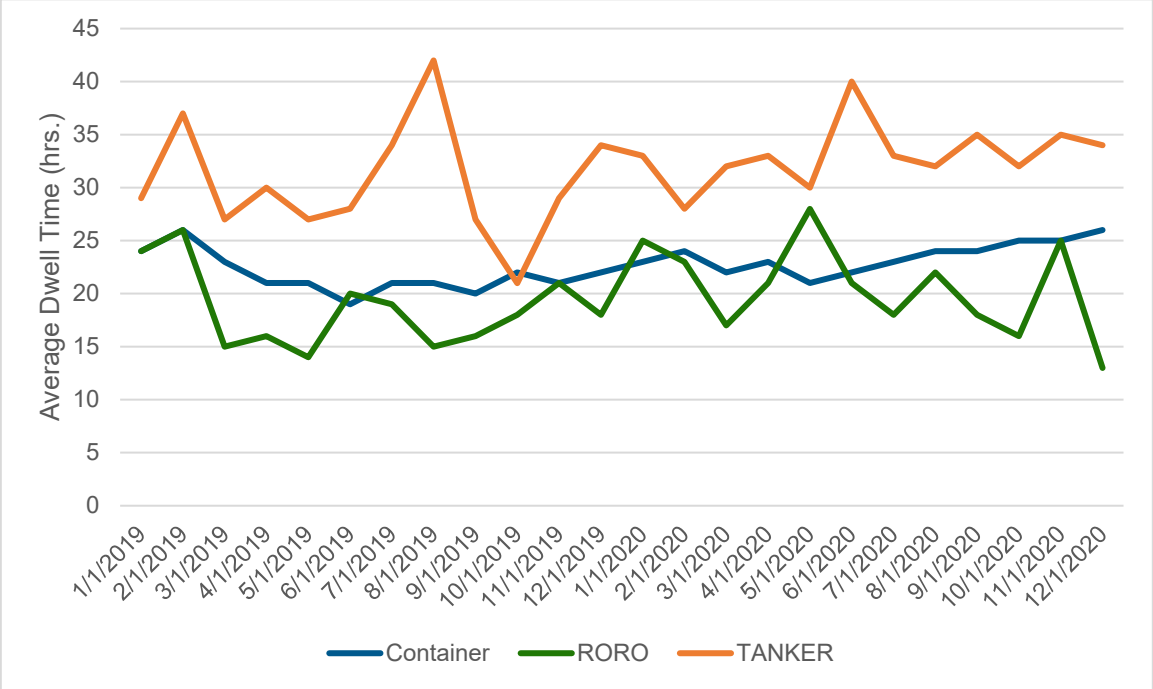


Source: Georgia Ports Authority.

Vessel Dwell Times

The amount of time a vessel spends in a port is a major factor contributing to cargo throughput and performance. Vessel dwell time reveals the amount of time a vessel spends at the port terminal. The Bureau of Transportation Statistics estimates dwell times at select U.S. ports for container, liquid bulk (tanker), and roll-on/roll-off (Ro/Ro) vessels using U.S. Coast Guard Automatic Identification System (AIS) data. Monthly average vessel dwell times by cargo type for 2019-2020 are shown for the Port of Savannah in Figure 4.5.

FIGURE 4.5 PORT OF SAVANNAH MONTHLY AVERAGE VESSEL DWELL TIME (HOURS), 2019-2020



Source: Bureau of Transportation Statistics, Port Performance Freight Statistics Program.

The data indicate that average vessel dwell times for container cargo has largely been consistent over the 2019-2020 time period, while dwell times for Ro/Ro and tanker vessels have greater fluctuation. Monthly average container vessel dwell times over the analysis period ranged from 20 to 26 hours with a 2020 annual average of 23.5 hours. For comparison, the 2020 average container vessel dwell time at the top 25 U.S. container ports was 28.1 hours[43]. The monthly average vessel dwell times for tankers ranged from 21 hours to as high as 42 hours. The 2020 annual average for the Port of Savannah was just over 33 hours which was less than the national average of about 41.4 hours[44]. In general, tanker dwell times are longer than container vessel dwell times most likely because it takes more time to pump petroleum and crude oil than to lift shipping containers from a vessel of similar size[45]. For Ro/Ro, the range over this time period was 14 to 28 hours with a 2020 annual average of about 20.5 hours. This was lower than the national average of about 23 hours in 2020[46].

Planned Capacity Investments

Georgia Ports Authority (GPA) has multiple ongoing and planned capacity investments for the Port of Savannah. These investments will increase the port's annual operating capacity from about 6 million TEUs to 10.7 million TEUs per year.[47] These investments include:

[43] https://data.bts.gov/stories/s/Container-Vessel-Dwell-Times/pbag-pyes

[44] https://data.bts.gov/stories/s/Tanker-Vessel-Dwell-Times/ari2-ub6a

[45] Ibid

[46] https://data.bts.gov/stories/s/Ro-Ro-Vessel-Dwell-Times/mu69-gcck

[47] Georgia Ports Authority, 2021 Annual Report.

- **Ship-to-Shore Cranes.** The Garden City Terminal will receive 8 additional ship-to-shore cranes. This will bring the terminal's total number of ship-to-shore cranes to 38.
- **Garden City Terminal West Expansion.** Garden City Terminal West opened in January 2022 with a new chassis yard. The 92-acre facility will be expanded to include a container yard with a capacity of 750,000 TEUs in 2024.
- **SR 21 Chassis Yard.** A 25-acre chassis yard is planned along SR 21.
- **Cross Dock Facility.** The Port of Savannah will add a transloading facility on a 90-acre parcel just upriver from Garden City Terminal. A cross-docking warehouse will be served by a yard with nine rubber-tired gantry cranes and an annual capacity of 400,000 TEUs.
- **Peak Capacity Project.** The project will add 1.2 million TEUs of annual capacity and includes three new rubber-tired gantry crane rows and 2,100 container slots. This project is located along SR 25 east of the Mason Mega Rail Terminal.
- **Berth 1 Improvements.** This project will add a new dock which will provide a new big ship berth. This will allow the Port of Savannah to simultaneously serve four 16,000-TEU vessels, and three additional ships. The Berth 1 Improvements project is expected to be completed in 2023.
- **Northeast Georgia Inland Port.** This project will develop an inland rail yard in Hall County. Providing a rail alternative for shippers in and near northeast Georgia can lower costs and help to relieve highway congestion. This project is expected to be completed in 2024.

Other projects represent major expansions to meet long-term demand. These include the proposed Savannah Container Terminal and the Jasper Ocean Terminal. The Savannah Container Terminal would be a new facility on Hutchinson Island and provide an additional 2.7 million TEUs of capacity.[48] The GPA has purchased 152 acres of land on the island for the Savannah Container Terminal and other future expansion needs.[49] The first phase of the proposed terminal is expected to be completed in 2025.

Though located in South Carolina, the proposed Jasper Ocean Terminal would represent a major expansion in capacity for the Port of Savannah.[50] The proposed Jasper Ocean Terminal includes the construction and operation of a marine container terminal on an approximately 1,500-acre site along the north bank of the Savannah River in Jasper County, South Carolina – about 8 miles upriver from the Garden City Terminal. One of the primary motivations for Jasper Ocean Terminal are capacity limitations at existing Georgia Ports Authority and South Carolina Ports Authority assets. Development of the Jasper Ocean Terminal would provide an additional 7 million TEUs of capacity to both states. In 2008, the Joint Project Office (JPO) for the Jasper Ocean Terminal was created under an Intergovernmental Agreement between South Carolina and Georgia and purchased the 1,500-acre site from GDOT.

[48] https://gaports.com/press-releases/gpa-details-capacity-operations-expansion/

[49] https://gaports.com/timeline/hutchinson-island-land-purchased/

[50] http://www.jasperoceanterminaleis.com/Project.aspx

5 AIR CARGO

Air cargo has a significant role in the multimodal freight network as it provides the fastest service for long-distance shipments of goods. The high service quality provided by air cargo results in higher shipping costs for this mode. As a result, air cargo tends to be limited to high-value and low-weight goods such as medical supplies, flowers, and electronics. This section of the report describes the condition and performance of air cargo assets in the Savannah region. It also identifies major cargo carriers and cargo handling airports throughout the region.

5.1 Inventory of Assets

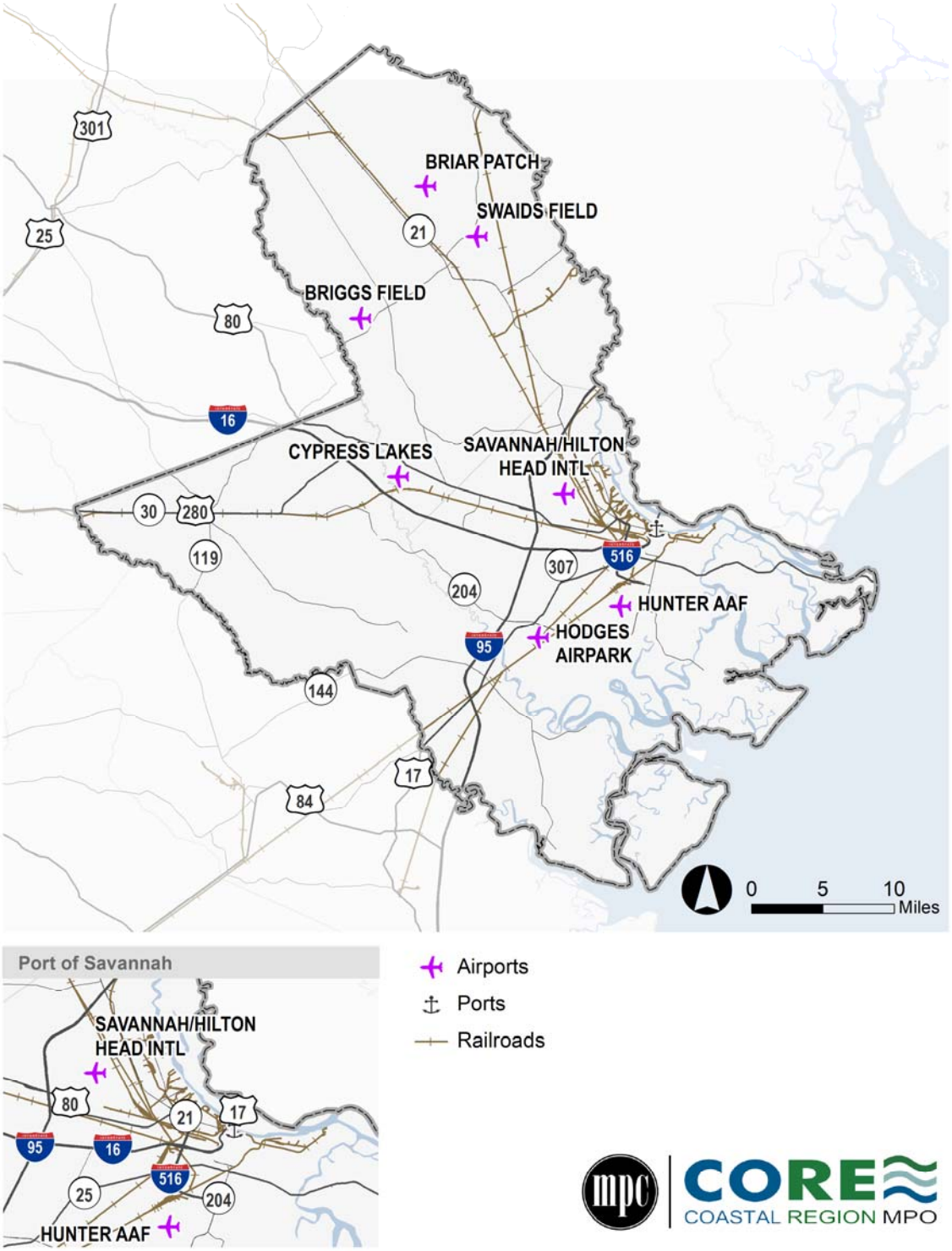
There are seven airports in the 3-county region. These include Cypress Lake, Swaids Field, Hodges Airpark, Briggs Field, and Briar Patch which are privately owned and do not handle cargo. Savannah-Hilton Head International Airport (SAV) is the only public airport and the only one that handles cargo in the region. Dedicated cargo carriers at SAV include Air Cargo Carriers, Federal Express (FedEx), Martinaire Aviation, Sky Way Enterprises, and Suburban Air Freight.[51,52] In total, there is about 138,000 square feet of air cargo warehouse space at SAV.[53] This includes an approximately 80,000-square foot general cargo building open to all carriers as well as an approximately 58,000-square foot air cargo facility dedicated to a single tenant. Both facilities are along Bob Harmon Road which is accessed by SR 307/Dean Forest Road. As air cargo is typically interchanged with highway freight, SAV impacts these and surrounding roadways by generating truck traffic to and from its air cargo facilities.

[51] Savannah-Hilton Head International Airport, *Comprehensive Annual Financial Report*, 2020, https://savannahairport.com/wp-content/uploads/2021/07/Savannah-Airport-Commission-2020-Comprehensive-Annual-Financial-Report.pdf .

[52] http://savannahairport.com/about/general-aviation

[53] Savannah/Hilton Head International Airport Short-Term Development Program Draft Environmental Assessment, November 2019, https://savannahairport.com/wp-content/uploads/2019/11/191111_SAV-Short-Term-CIP-Draft-EA_rev1a_2s_rfs.pdf

FIGURE 5.1 AIRPORTS IN THE STUDY AREA, 2022

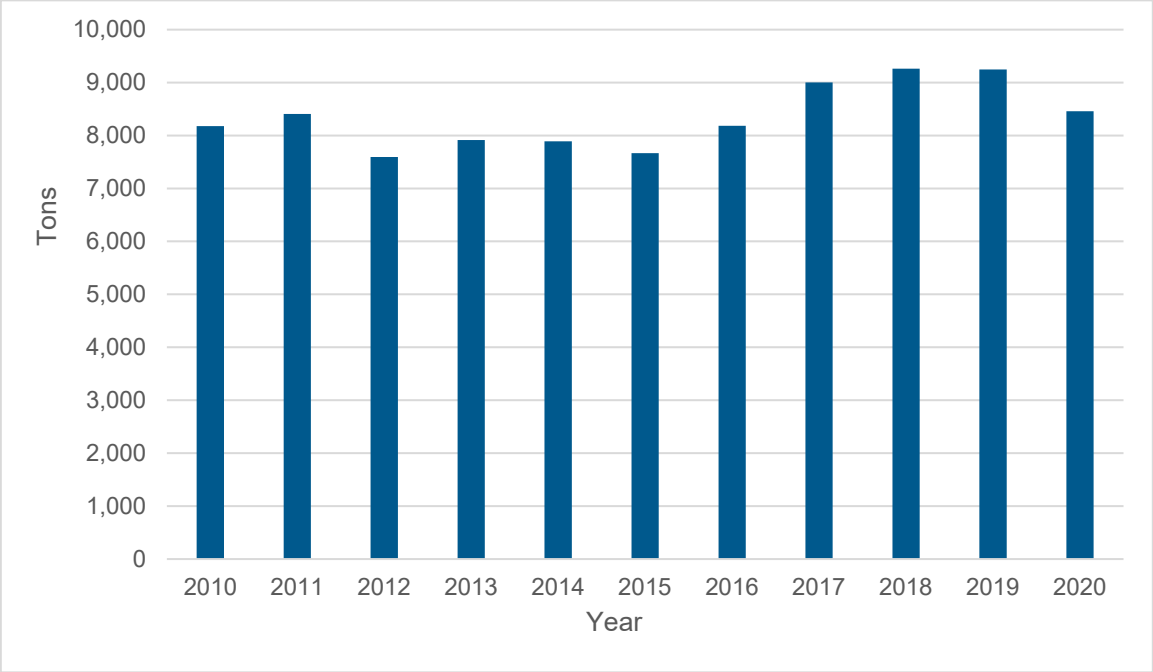


Source: Bureau of Transportation Statistics, National Transportation Atlas Database, 2022.

5.2 Conditions and Performance

Throughput is an important indicator of air cargo performance and is measured by the annual tonnage served by an airport. Figure 5.2 presents historical data on tonnage served by SAV for 2010- 2020. Air cargo usage exceeded 8,000 tons in 2010 and 2011 before experiencing significant decline over the 2012 to 2015 time period. Air cargo usage recovered to pre-2012 levels in 2016 as the 8,000-ton threshold was exceeded. Overall, throughput is largely stable over the analysis period as values range from a low of 7,595 tons in 2012 and a peak of 9,262 in 2018. The 2010-2020 average was about 8,346 tons.

FIGURE 5.2 AIR CARGO TONNAGE AT SAV, 2010-2020



Source: Savannah-Hilton Head International Airport Annual Reports, 2010-2020.

In 2020, the Savannah-Hilton Head International Airport had a throughput of about 0.06 tons of cargo per square foot of warehouse space. As a point of comparison, in 2020 throughput at the Hartsfield-Jackson Atlanta International Airport (which processed about 660,482 short tons of cargo in 2020[54] and has approximately 1.3 million square feet of warehouse space[55]) was 0.51 tons of cargo per square foot of warehouse space. This implies that current warehouse facilities could handle substantially more demand.

[54] https://www.atl.com/business-information/statistics/

[55] Hartsfield-Jackson Atlanta International Airport, http://www.atl.com/about-atl/atl-factsheet/.

6 SUMMARY

This technical memorandum identified the CORE MPO region's existing multimodal freight assets and assessed their performance and conditions. More detailed assessments of freight bottlenecks, safety, and land use will be performed as part of later tasks. However, the analyses performed in this report serve as a first step towards identifying the region's freight needs and opportunities.

There are a few key insights that can be taken away from the technical memorandum:

- **Highway Freight Volumes.** I-95 is the busiest freight corridor in the Savannah region. It carries over 10,700 trucks per day along certain segments. After I-95, I-16 is the second busiest freight corridor in the region as it handles up to nearly 7,000 trucks per day. Several non-Interstate roadways also carry significant freight volumes throughout the Savannah region including SR 17/Jimmy Deloach Parkway and SR 307/Bourne Ave. near the Port of Savannah.

- **Truck Travel Time Reliability.** Overall, the region's highway network provides for reliable truck travel. However, there are challenges as portions of I-16, I-516, and I-95 exhibit poor truck travel time reliability. Some of these locations with poor reliability coincide with the highest volume locations for freight traffic. This implies that many motor carriers experience this unreliability and must plan around it. Task 2.5 will perform a more detailed analysis of congestion and bottlenecks in the region.

- **Highway Safety.** About 2.2 percent of truck-involved crashes resulted in a serious injury or fatality. This is higher than the total percentage of non-truck-involved crashes resulting in serious injury or death (about 1.2 percent). In addition, truck-involved crashes comprise a higher share of total crashes in the region compared to statewide totals. Task 2.5 will perform a more detailed analysis of safety challenges.

- **Highway Infrastructure Conditions.** An estimated 84 percent of the region's lane-miles of pavement and over 99 percent of its bridges are in good to fair condition. Pavement condition challenges are largely concentrated on the region's collectors and minor arterials.

- **Railroad Infrastructure Conditions.** With the exception of the Georgia Central Railway, all of the region's rail corridors meet the 286K standard for weight capacity, which is critical to accommodating modern railcars. In addition, there are several bridges intersecting freight rail corridors with less than 22'-6" of vertical clearance which is the ideal height for fully unrestricted double stack operations.

- **Port Conditions and Performance.** Over 43.4 million tons of goods were handled at the Port of Savannah in 2020. Throughput at the port has generally increased since 2010. Also, vessel dwell times at the Port of Savannah were consistently lower than national averages for 2020.

- **Air Cargo Conditions and Performance.** Air cargo throughput at Savannah-Hilton Head International Airport has largely been stable over the 2010-2020 time period. It has ranged from a low of 7,595 tons in 2012 and a peak of 9,262 in 2018. Based on the volume of on-site warehouse space, the airport could likely handle substantially more demand.