2045
Metropolitan Transportation Plan

Technical Report #7
Congestion Management Process

Gulf Regional Planning Commission
Metropolitan Planning Organization

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Table of Contents

List of Tables

List of Figures

1.0 Introduction

1.1 Foreword/Background

A Congestion Management Process (CMP) is an analytical process that measures the operational effectiveness of major transportation facilities located within a Transportation Management Area (TMA). A TMA is an urbanized area with a population greater than 200,000 people. A CMP proposes strategies required to address congested areas identified within a TMA.

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) required each TMA to develop a Congestion Management System (CMS). The following subsequent legislation has continued this requirement:

- The Transportation Equity Act for the 21st Century (TEA-21) in 1998
- Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) in 2005
- Moving Ahead for Progress in the 21st Century Act (MAP-21) in 2012

When SAFETEA-LU was passed, the CMS became the CMP, reflecting that the goal of the laws passed is to utilize a process that is an integral component of metropolitan transportation planning. Prior to the CMP, the CMS was often treated as a stand-alone data analysis exercise or report on congestion. Since the creation of the CMP, it is intended to be an on-going process, fully integrated into the metropolitan transportation planning process[1]. The previous CMP effort for the Gulf Coast Urbanized Area was conducted in 2015 to:

- Analyze the Gulf Coast Metropolitan Planning Area's (MPA's) transportation system.
- Determine which areas experience the greatest mobility and maneuverability issues associated with traffic congestion.
- Identify a wide range of congestion reduction scenarios that, if implemented, can aid in improving free flow traffic conditions.

[1] https://www.fhwa.dot.gov/planning/congestion_management_process/cmp_guidebook/cmpguidebk.pdf

1.2 Definition of Congestion and Purpose of Congestion Management Process

Congestion is defined as the delay compared to normal free-flow traffic conditions on major transportation systems that impedes traffic mobility and maneuverability. Traffic congestion has several negative side effects, such as an increase in goods transportation costs, increased fuel consumption, and lost work productivity. It also contributes to air pollution, negatively impacting the health of the MPA's residents and workers, and the environment.

A CMP is an effective tool that assists in the management of new and existing transportation facilities. It does so through the use of travel demand reduction scenarios and supply management strategies that promote traffic mobility and accessibility in the MPA.

1.3 Federal Guidance/Federal Legislation

Section 450.322 (a) of Subpart C (Metropolitan Transportation Planning and Programming), 23 CFR (Final Rule), states that:

> "The transportation planning process in a Transportation Management Area (TMA) shall address congestion management through a process that provides for safe and effective integrated management and operation of the multimodal transportation system, based on a cooperatively developed and implemented metropolitan-wide strategy, of new and existing transportation facilities eligible for funding under title 23 U.S.C. and title 49 U.S.C. Chapter 53 through the use of travel demand reduction (Including Intercity bus operators, employer-based commuting programs such as a carpool program, vanpool program, transit benefit program, parking cash-out program, shuttle program, or telework program), job access projects and operational management strategies."

Section 500.109 (a) of Subpart A (Management Systems), 23 CFR (Final Rule), states that:

> "For purposes of this part, congestion means the level at which transportation system performance is unacceptable due to excessive travel times and delays. Congestion management means the application of strategies to improve system performance and reliability by reducing the adverse impacts of congestion on the movement of people and goods in a region. A congestion management system or process is a systematic and regionally accepted approach for managing congestion that provides accurate, up-to-date information on transportation system operations and performance and assesses alternative strategies for congestion management that meet State and local needs."

Section 500.109 (b) states of Subpart A (Management Systems), 23 CFR (Final Rule), states that:

> "The development of a congestion management system or process should result in performance measures and strategies that can be integrated into transportation plans and programs. The level of system performance deemed acceptable by State and local officials may vary by type of transportation facility, geographic location (metropolitan area or subarea and/or non-metropolitan area), and/or time of day. In both metropolitan and non-metropolitan areas, consideration needs to be given to strategies that manage demand, reduce single occupant vehicle (SOV) travel, and improve transportation system management and operations. Where the addition of general-purpose lanes is determined to be an appropriate congestion management strategy, explicit consideration is to be given to the incorporation of appropriate features into the SOV project to facilitate future demand management strategies and operational improvements that will maintain the functional integrity of those lanes."

1.4 Causes and Types of Congestion

Within United States urbanized areas, people are migrating from the core areas to the “outer rings” and suburbs. This out-migration trend has placed a strain on the existing infrastructure—not just roadways but all other. This has affected other public facilities including transit, rental cars, bicycle lanes, and taxis.

The strategic location of the MPA causes additional congestion within the Gulf Coast MPA, The Gulf Coast MPA is located within 250 miles of several large metropolitan areas, notably:

- New Orleans, Louisiana;
- Jackson, Mississippi;
- Mobile, Alabama; and
- Birmingham, Alabama.

This results in additional through traffic as travelers head from one major metropolitan area to another. It also generates stops in the MPA to rest or conduct other business while in the area. These additional trips created a large increase in traffic on I-10, US 49, and US 90.

Congestion can be generally classified as either recurring or non-recurring.

Recurring Congestion

- **Recurring congestion is regularly occurring traffic congestion that happens at the same time every day during peak hours. This congestion occurs due to traffic demand exceeding roadway capacity.**

Non-Recurring Congestion

- **Non-recurring congestion occurs due to accidents, adverse weather, special events, work zones, and other factors that do not follow a predictable pattern. As such, non-recurring congestion is caused by non-standard or random events.**

1.5 Previous and Existing Congestion Management Strategies

Strategies in the 1970s proposed to reduce traffic congestion in the MPA by decreasing the number of single occupancy vehicles (SOVs) on the roadways. These efforts were guided by proposed alternative travel methods and travel demand strategies, such as carpooling/vanpooling and transit park-and-ride facilities. However, motorists preferred the convenience that SOVs provide and the strategies proved ineffective.

Alternative congestion reduction methods have since been proposed, such as the use of alternative routes and more effective use of Intelligent Transportation Systems (ITS). By promoting the use of alternative routes, and creating additional access to those routes, the MPA has achieved some congestion reduction on the existing roadway network.

Advancements in ITS have had a substantial impact on improving free-flow traffic conditions in the MPA, resulting in a noticeable decrease in traffic congestion along transportation corridors throughout the areas. The use of ITS within the MPA is comprised of:

- Dynamic Message Signs (DMS),
- Coordinated traffic signal improvements,
- Text message alerts for motorists, and
- Modernized existing infrastructure that uses new technologies

The addition of DMS and text message alerts provides motorists with real-time traffic data on events such as construction, potential safety conflicts, and traffic incidents. Disseminating this information in a timely manner provides motorists an opportunity to make informed decisions and select alternate routes that avoid congestion. It also allows drivers to prepare for unavoidable slow-moving traffic.

Traffic signal coordination has improved traffic flow along major corridors by synchronizing multiple traffic signals along the corridor. These low-cost improvements make it easier for motorists to travel the length of a segment in a timely manner. While the improvements do not guarantee a motorist will not be stopped at multiple signals, they reduce the potential for being stopped. These signal improvements “open up” intersections along the corridor, providing additional time for motorists to travel the corridor at a quicker pace. Coordinated traffic signals is necessary, and sometimes the only alternative, for reducing traffic congestion where capacity improvements are not possible due to land use restrictions or inadequate space.

1.6 Goals and Objectives

A goal is a broad statement that describes a desired end state, while an objective is a specific, measurable statement that supports the achievement of a goal. The goals and objectives of the CMP are:

Goal 1: Provide an efficient transportation system

- Support projects and policies that can reduce travel time delay
- Support projects and policies that address future transportation needs

Goal 2: Provide a safe transportation system

- Support projects and policies that can improve the safety for the transportation system user within the MPA

Goal 3: Promote transportation alternatives

- Support projects, policies, and programs to increase transit ridership
- Support projects, policies, and programs that promote use of bicycle and pedestrian facilities
- Promote awareness of multimodal facilities

2.0 Data and Network

2.1 Congestion Data Sources

The following data sources were used to conduct the congestion analysis within the MPA.

National Performance Management Research Data Set (NPMRDS)

The NPMRDS is a vehicle probe-based data set used by the Federal Highways Administration (FHWA) to support Transportation Performance Measures (TPM) reporting requirements, Freight Performance Measures (FPM), and Urban Congestion Report (UCR) programs. The data uses GPS information obtained from mobile phones, vehicles, and portable navigation devices to provide monthly passenger and freight vehicle average travel time in 5-minute intervals along the reported National Highway System (NHS).

INRIX

The INRIX data, which is used in the NPMRDS, provides probe-based data obtained from GPS. The traffic data is presented in 5-minute intervals along the NHS, while the expanded network includes some arterials and collectors. The expanded INRIX network was used as part of this CMP effort.

Travel Demand Model (TDM)

The Metropolitan Planning Organization's (MPO) TDM predicts trip-making behavior such as the number of trips, their origins and destinations, and most probable trip routes. The TDM used for this CMP has an existing year of 2018 and has a horizon year of 2045. The TDM contains data on existing conditions, socioeconomic forecasts, and anticipated growth in external trips to replicate current travel demand and develop forecast travel demand on the MPA's roadway network. The TDM can be used to conduct an existing conditions congestion analysis where NPMRDS and INRIX data is unavailable. It can also be used to conduct a congestion analysis for future conditions.

Google Traffic

A feature in Google Maps, Google Traffic, displays traffic data using colored overlays on top of roads to represent the speed of traffic. It uses crowdsourcing to obtain the GPS locations of cellphone users and generates live traffic maps along roadway segments. This data, shown on a scale from fast (representing little congestion) to slow (representing heavy congestion), is displayed on a map. The data displays traffic conditions along a particular section of road at specific times on specific days. Google Traffic was used to corroborate the congested segment results obtained from the INRIX and TDM data.

Crash Data

Crash data obtained from the Mississippi Department of Transportation's (MDOT) Safety Analysis Management System (SAMS) was used to identify non-recurring congestion, since incidents along a network may result in excessive delays. The crash records included latitude and longitude data, as well as the:

- Time
- Location
- Severity
- Crash type
- Location conditions

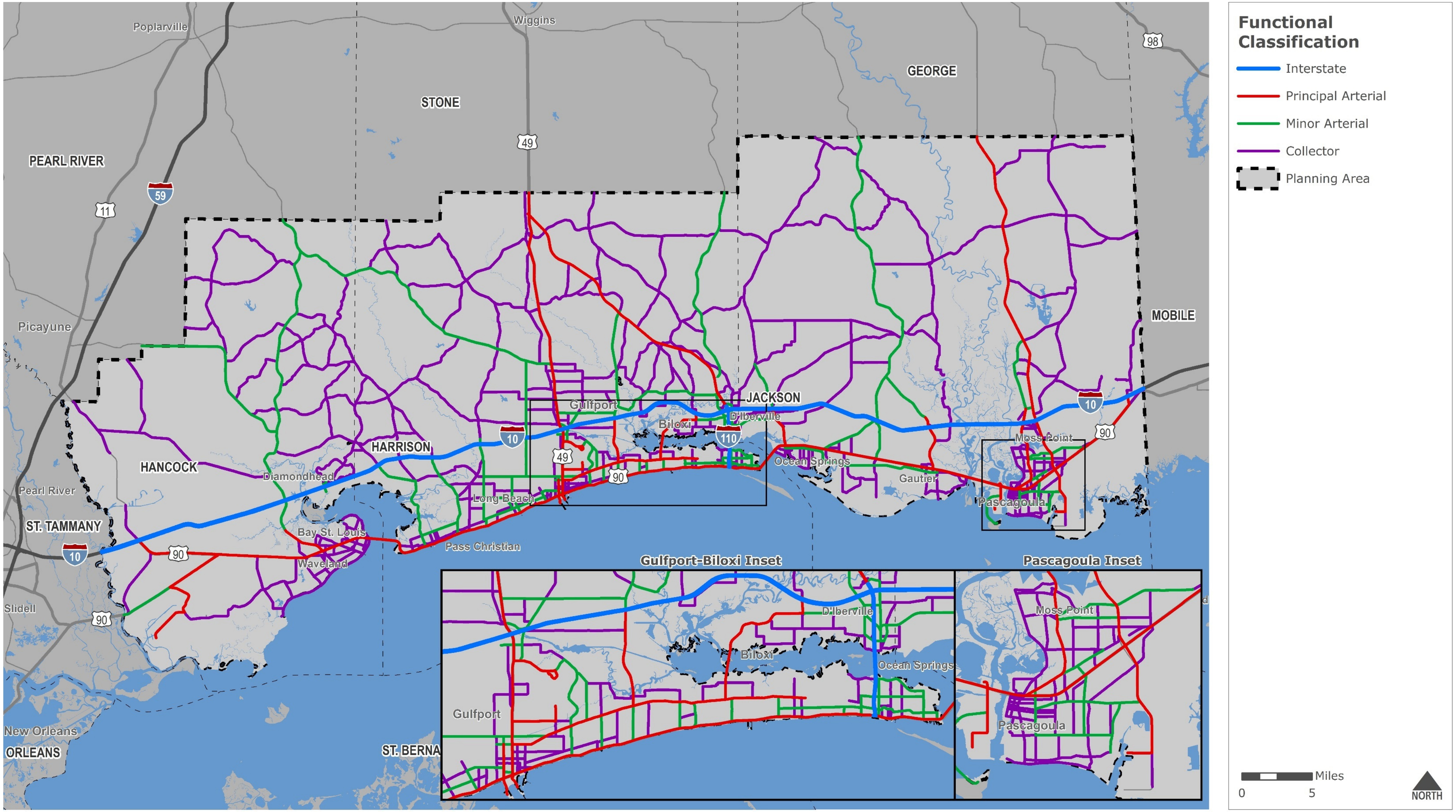
2.2 Network

The MPA's roadway network consists of five facility types. The facility types are:

- Interstates
- Principal Arterials
- Minor Arterials
- Collectors
- Local Roads

Each facility type provides separate and distinct traffic service functions, which are described in *Technical Report #2: Existing Conditions Analysis*. Their designs vary in accordance to the characteristics of traffic to be served by the facility. The CMP network includes all roadways within the TDM network that are functionally classified as a Collector or above. The boundaries of the MPA, and its CMP network, are shown in Figure 2.1.

Figure 2.1 Gulf Coast MPA and CMP Network



Data Sources: MDOT

Disclaimer: This map is for planning purposes only.

2.3 Multimodal Mobility

The traditional understanding of congestion has been focused largely, if not solely, on automobiles. Typically, the standard solution for congestion reduction has been widening roads for automobiles. However, this solution usually induced more automobile travel, which may worsen the level of congestion that existed before the capacity expansion. By understanding congestion from a multimodal perspective, all modes can be considered as potential sources and remedies for congestion. Several studies have indicated that transit[2], walking, and cycling[3,4] can be tools to relieve automobile congestion.

Congestion also affects economic productivity. Growing freight demand increases congestion on the highway system as trucks and automobiles compete for space on the highway system while commuter trains and freight trains compete for space on the railroad network. This congestion affects both businesses and consumers as businesses require more operators and equipment to deliver goods while consumers wait longer for inventory deliveries[5].

Freight

The Gulf Coast MPA is home to a large number of freight-generating establishments and is within proximity of several large metropolitan areas within the southern United States. These two factors mean that freight traffic has a major impact within the MPA. The major freight network within the Gulf Coast MPA includes:

- Mississippi Freight Network Tier I Corridors
  - I-10/CSX Transportation (CSXT) Gulf Coast Corridor
  - US 49/Kansas City Southern (KCS) Jackson-Hattiesburg-Gulfport Corridor
- Additional major roadways
  - I-110
  - US 90
  - MS 57
  - MS 63
  - MS 605
  - MS 607

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[2] Nakamura, K., Hayashi, Y. (2013). Strategies and instruments for low-carbon urban transport: An international review on trends and effects. Transport Policy. 29, pp. 264–274

[3] Litman, T. (2014). Congestion Evaluation Best Practices. In: International Transportation Economic Development Conference. Sheraton Dallas Hotel, Dallas, USA. Apr. 09-11, 2014. pp. 1–20.

[4] Litman, T. (2018). Smart Congestion Relief - Comprehensive Evaluation of Traffic Congestion Costs and Congestion Reduction Strategies. Victoria Transport Policy Institute, Victoria, Canada

[5] https://ops.fhwa.dot.gov/freight/freight_analysis/freight_story/congestion.htm

- MS 609
- MS 613
- MS 619

- Additional major railroads such as the Mississippi Export Railroad between Moss Point and Lucedale
- Public airports
  - Stennis International Airport in Kiln
  - Gulfport-Biloxi International Airport in Gulfport
  - Trent Lott International Airport in Moss Point

The economic consequences of delayed freight goods caused by congestion are very significant to the Gulf Coast MPA. Data from the Gulf Coast MPO TDM indicates that on the CMP Network, the auto Vehicle Hours Delay (VHD) and auto congestion costs will increase by 96 percent from 2018 to 2045 and that truck VHD and truck congestion costs will increase by 104 percent during the same time period. *Technical Report #4: Needs Assessment* identified locations that experience freight congestion. Segments currently experiencing freight congestion, or are expected to experience freight congestion in 2045, are identified in Figure 5.3 and Figure 5.4 of *Technical Report #4* respectively.

Transit

Transit can provide people with mobility and access to employment, shopping, medical care, and other destinations and opportunities. For some, transit is a lifeline service for those who have no other choice due to economic or physical limitations. For others, transit serves as an alternative to driving as well as a cheaper method of travel. Using transit removes SOVs from the roadway network and reduces overall network congestion. This congestion reduction can also improve the reliability for transit. Projects that promote the use of transit help reduce congestion and eliminate the need for costly capacity improvements while reducing induced demand.

The Coast Transit Authority (CTA) is the primary public transportation provided in the MPA. CTA provides bus service and paratransit primarily within the MPA. Intercity bus service is provided by private bus companies (e.g. Greyhound). Although Amtrak has not provided service on the "Sunset Limited" route through the MPA since Hurricane Katrina, there are plans to restore the service between New Orleans and Mobile.

The current transit conditions in the MPA can be found in Section 5.0: Public Transit of *Technical Report #2: Existing Conditions Analysis*, and the transit needs can be found in Section 7.0: Public Transit of *Technical Report #4: Needs Assessment*.

Bicycle and Pedestrian

Though bicycling and walking account for a relatively small portion of commuting patterns in both Mississippi and the United States as a whole, infrastructure that supports these modes expands commuter's transportation options. A seamless bicycle and pedestrian network would provide the MPA with a viable alternative to motor vehicle transportation and reduce the level of congestion by removing SOVs from the roadway network. Additionally, this network would produce benefits for the health of the MPA's residents and workers while improving regional air quality.

Bicycle facilities can include:

- Bicycle Lanes
- Paved Shoulders
- Marked Shared Lanes
- Shared Use Paths
- Cycle Tracks
- End of Trip Facilities

Pedestrian facilities can include:

- Sidewalks
- Crosswalks
- Enhanced Pedestrian Treatments
- Pedestrian Overpasses
- Pedestrian Amenities
- Shared Used Paths
- Curb Ramps
- Transit Stops
- Pedestrian Signals

More information on the current status of bicycle and pedestrian conditions in the MPA can be found in Section 4.0: Bicycle and Pedestrian of *Technical Report #2: Existing Conditions Analysis*, while bicycle and pedestrian needs can be found in Section 6.0: Bicycle and Pedestrian of *Technical Report #4: Needs Assessment*.

3.0 Congestion Measurement

3.1 Federal Guidelines for Measuring Congestion

Section 450.322 (d)(3) of Subpart C (Congestion Management Process in Transportation Management Areas), 23 CFR (Final Rule) states that a Congestion Management Process shall include:

"Establishment of a coordinated program for data collection and system performance monitoring to define the extent and duration of congestion, to contribute in determining the causes of congestion, and evaluate the efficiency and effectiveness of implemented actions. To the extent possible, this data collection program should be coordinated with existing data sources (including archived operational/ITS data) and coordinated with operations managers in the metropolitan area."

The following performance metrics are the calculated parameters used in this CMP effort. They serve as indicators to characterize the usage of a transportation facility or the characteristics of travelers using the system. These metrics were used to determine which roadways segments are congested, with the methodology described in later sections.

Volume-to-Capacity Ratios

The Volume-to-Capacity (V/C) ratio is defined as the demand flow rate over the capacity available for a traffic facility. The V/C ratio can be used independently as measure of congestion in many studies; however, this CMP effort identifies other measures to supplement the V/C ratio.

Travel Time Index

The Travel Time Index (TTI) measures the amount of time delay that occurs when travelling a roadway segment. It is calculated by dividing the highest peak travel time (morning, midday, or afternoon) by the free-flow travel time. The TTI represents the increased travel time drivers experienced when travelling compared to the free-flow travel time.

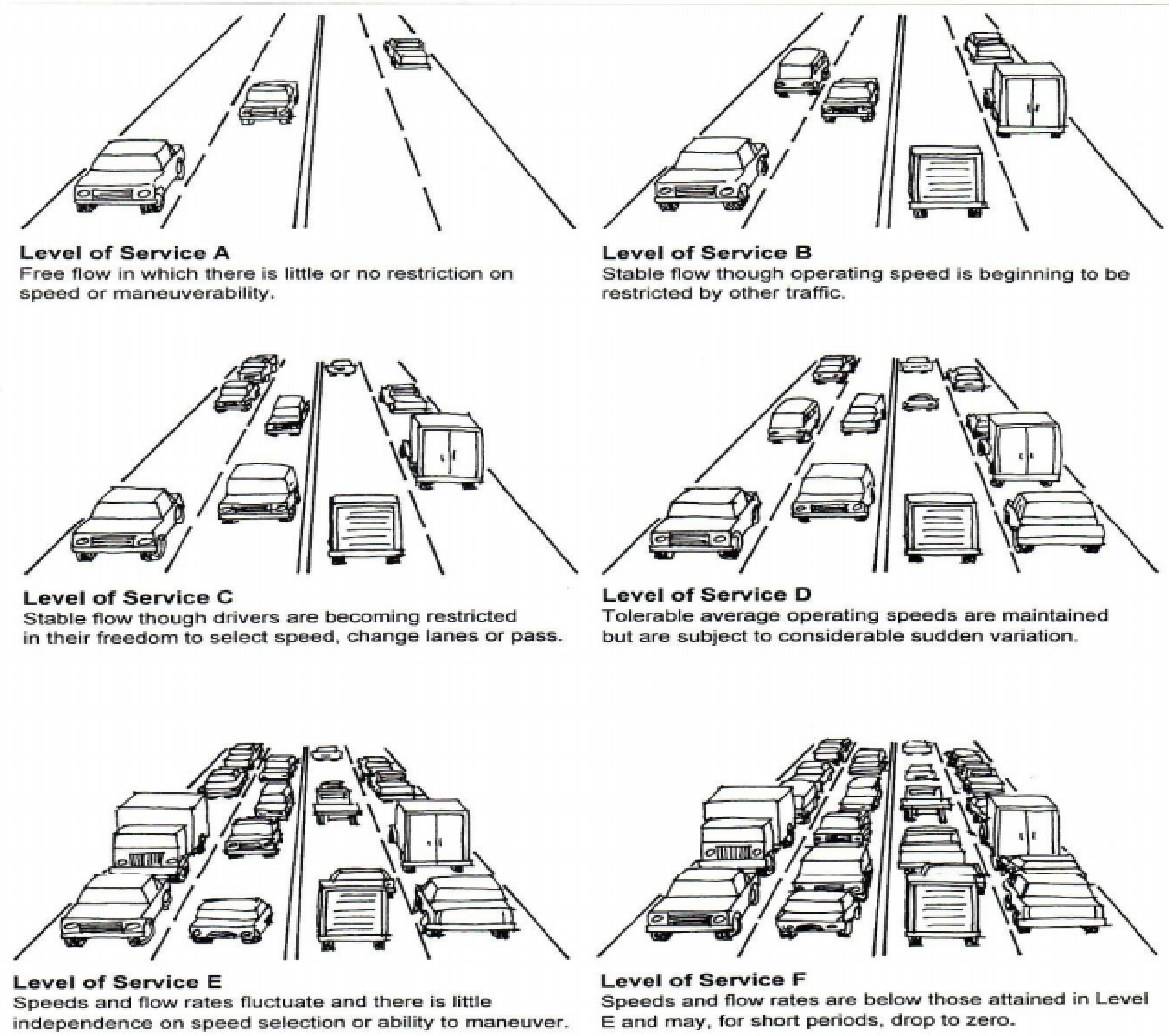
Facility Type Level of Service

The Level of Service (LOS) is a qualitative process used to analyze and assess a transportation facility's ability to efficiently service its daily traffic demand. There are six levels of service that can be assigned to a roadway segment; ranging from LOS A to LOS F. LOS A represents ideal free-flow traffic conditions, whereas a LOS F represents total gridlock. The assigned value for each level is based on:

- Speed,
- Travel time,
- Freedom to maneuver,
- Traffic interruptions,
- Driver comfort, and
- Convenience.

The LOS definitions are shown in Figure 3.1.

Figure 3.1 Level of Service Definitions



Safety

Non-recurring congestion is a result of crashes, which impact travel time and cause delay. The SAMS crash data was used to locate the high crash frequency corridors and intersections.

3.2 V/C Ratios

For this CMP effort, the TDM volumes and capacities for each network link were used to develop the V/C ratio, which compares the existing traffic volumes to the capacity the roadways were designed to handle. The time of day (Morning, Midday, Afternoon, and Night) capacity factors developed in the TDM are discussed in *Technical Report #1: Model Development Report*. The model volumes and capacities can be found in the TDM's network files.

Segments with a V/C ratio greater than 1.00 are considered over capacity. The results of the V/C ratio study are shown in Appendix A.

Many corridors in the MPA have received capacity improvements between 2013, the base year of the previous Metropolitan Transportation Plan (MTP), and 2018, the year of existing conditions in the 2045 MTP. Table 3.1 displays the corridors in the CMP network that have received capacity improvements between 2013 and 2018. The table displays each corridor's previous capacity, capacity after improvement, and change in capacity as a result of the improvement.

Table 3.1 Roadways with Increased Capacity between 2013 and 2018

Location	Limits	Previous Facility Type (2013)	Previous Capacity (2013)	New Facility Type (2018)	New Capacity (2018)	Capacity Increase/Decrease
I-10	MS 609 to MS 57	4-Lane Divided	103,000	6-Lane Divided	161,000	58,000
I-10 Eastbound	C-D Road at I-110/MS 15/MS 67	N/A	0	1-Lane One-Way	11,000	11,000
I-10 Eastbound	Off-Ramp to D'Iberville Blvd	N/A	0	1-Lane Off-Ramp	11,000	11,000
I-10 Eastbound	On-Ramp from Lamey Bridge Rd	N/A	0	1-Lane On-Ramp	11,000	11,000
I-10 Westbound	Off-Ramp to Lamey Bridge Rd	N/A	0	1-Lane Off-Ramp	11,000	11,000
I-10 Westbound	On-Ramp from D'Iberville Blvd	N/A	0	1-Lane On-Ramp	11,000	11,000
I-110 Northbound	Off-Ramp to Popps Ferry Rd	N/A	0	1-Lane Off-Ramp	11,000	11,000
I-110 Southbound	On-Ramp from Popps Ferry Rd	N/A	0	1-Lane On-Ramp	11,000	11,000
MS 607	Stennis Space Center North Entrance to Pearl River County Line	2-Lane Undivided	27,000	4-Lane Divided	72,000	45,000
28th Ave	33rd Ave to 22nd Ave	2-Lane Divided	31,000	4-Lane with Two-Way Left Turn Lane	46,000	15,000
Creosote Rd	US 49 to Three Rivers Rd	2-Lane with Two-Way Left Turn Lane	22,000	4-Lane with Two-Way Left Turn Lane	64,000	42,000
Seaway Rd	Three Rivers Rd to 1.26 miles east of Three Rivers Rd	2-Lane Undivided	20,000	4-Lane Divided	55,000	35,000
Popps Ferry Rd	Cedar Lake Rd to Lamey St	2-Lane with Two-Way Left Turn Lane	32,000	4-Lane Divided	64,000	32,000
Popps Ferry Rd	D'Iberville Blvd to Lamey Bridge Rd	2-Lane Undivided	22,000	4-Lane Divided	64,000	42,000
D'Iberville Blvd	Auto Mall Pkwy to Popps Ferry Rd (West)	2-Lane with Two-Way Left Turn Lane	21,000	4-Lane with Two-Way Left Turn Lane	64,000	43,000
D'Iberville Blvd	Popps Ferry Rd (West) to Popps Ferry Rd (East)	2-Lane Divided	29,000	4-Lane with Two-Way Left Turn Lane	64,000	35,000
D'Iberville Blvd	Popps Ferry Rd (East) to Promenade Pkwy	2-Lane Undivided	22,000	4-Lane with Two-Way Left Turn Lane	64,000	42,000
Promenade Pkwy	MS 15/MS 67 Overpass	N/A	0	4-Lane Divided (Bridge)	50,000	50,000

3.3 Travel Time Index

The TTI is a measurement of the time delay that occurs when driving a particular roadway segment during peak compared to non-peak hours. The TTI was measured using the INRIX data where available and the TDM where INRIX data was unavailable. The TTI was measured by:

- Calculating the average travel time for three different time periods:
    - The morning "AM" peak traffic hours from 6:00 A.M. until 9:00 A.M.
        - The AM peak reflects traffic entering the urbanized core, often coming from the suburbs or from outside the MPA.
    - The Midday "MD" peak traffic hours from 9:00 A.M. to 3:00 P.M.
    - The afternoon "PM" peak traffic hours from 3:00 P.M. until 6:00 P.M.
        - The PM peak reflects traffic leaving the urbanized core to return home or travel to another location.
    - These time periods were chosen for consistency with the TDM's time periods.
    - Due to the low travel volumes the nighttime travel hours, 6:00 P.M. until 6:00 A.M., were not used in calculating the off-peak travel time.
- Calculating the travel time it would take to travel a segment at its free-flow speed.
- Dividing the highest of the three peak travel times (AM, MD, or PM) by the free-flow travel time.

The formula used to calculate TTI is shown below.

$$TTI = \frac{Highest\ Travel\ Time}{Free\text{-}flow\ Travel\ Time}$$

Where:

- *TTI* is travel time index
- *Highest travel time* is the highest of the three peak travel times (AM, MD, or PM)
- *Free-flow travel time* is the travel time at free-flow speed

TTI Example

- The highest peak travel time on A Street between B Avenue and C Street is 3 minutes.
- The free-flow travel time on this segment is 1 minute.
- Divide 3 minutes, the highest peak travel time, by 1 minute, the free-flow travel time.
- This results in a TTI of 3.0.

The results from the TTI study are shown in Appendix B.

3.4 Level of Service Index

The LOS measure is used to analyze and assess each facility by its ability to efficiently service its daily traffic demand. Each roadway link was assigned a LOS letter value from A to F.

Data for each roadway segment was collected for both travel directions using the same peak and off-peak periods described in Section 3.3. The data was then used to develop the LOS for each segment, for each of the three time periods, based on its facility type. The LOS values were then converted to numeric scores for the purpose of the CMP analysis, allowing them to be used in conjunction with the other criteria. Table 3.2 displays the numeric score assigned to each LOS.

Table 3.2 Level of Service Rating System

Alphabetic Ranking	Numeric Value
F	6
E	5
D	4
C	3
B	2
A	1

Defining LOS by Facility Type

The LOS was calculated for the following facility types:

- Freeways,
- Uninterrupted flow multi-lane highways (multi-lane highways),
- Uninterrupted flow two-lane highways (two-lane highways), and
- Interrupted flow streets (streets).

> *Any facility that has a v/c ratio greater than 1.00 has a LOS of F, regardless of any other criteria (e.g. density, speed) for that facility.*

Freeways

Freeways are separated highways with full access control and have two or more lanes in each direction dedicated to the exclusive use of motorized traffic. Traffic flow on freeways does not typically stop under normal traffic conditions, experiencing stoppage only during times of excessive traffic congestion or serious motor vehicle accidents. The MPA has two freeways: I-10 and I-110.

The LOS criteria for freeway facilities, displayed in Table 3.3, is based on the density of the freeway segment, expressed in passenger cars per mile per lane. The freeway density formula is:

$$Density = \frac{V/C\ Ratio\ \times\ Capacity_f}{Peak\ Period\ Speed}$$

Where:

Density is in Passenger Cars per Mile per Lane
Capacity is in Passenger Cars per Hour per Lane
Peak-Period Speed is in Miles per Hour (MPH)
f = Free-Flow Speed

Density Example

- The V/C ratio of a freeway segment is **0.7**.
- The free-flow speed of the freeway segment is 70 MPH; based on the Highway Capacity Manual, the capacity for this freeway segment at 70 MPH would be **2,400** passenger cars per hour per lane.
- The peak-period speed for the segment is **65** MPH.
- Therefore, the density is (0.7 X 2,400)/65, or ***25.8*** passenger cars per mile per lane.

Table 3.3 Freeways LOS Criteria

Level of Service		
Level of Service	Density (Passenger Cars per Mile per Lane)	V/C ratio
A	≤ 11	≤ 1.00
B	> 11 - 18	≤ 1.00
C	> 18 - 26	≤ 1.00
D	> 26 - 35	≤ 1.00
E	> 35 - 45	≤ 1.00
F	> 45	> 1.00

Freeway Capacities	
Free-Flow Speed (MPH)	Capacity (Passenger Cars per Hour per Lane)
55	2,250
60	2,300
65	2,350
70	2,400

SOURCE:
Highway Capacity Manual

Multi-lane Highways

Multi-lane highways, like freeways, have two or more lanes in each direction and traffic flow on multi-lane highways does not stop under normal traffic conditions. However, multi-lane highways may or may not be separated, do not have full access control, and can serve modes other than motorized traffic. This may result in a slowdown of through traffic due to traffic entering, exiting, or crossing the highway. Examples of multi-lane highways within the MPA are US 49, MS 63, and MS 67.

The LOS criteria for uninterrupted flow multi-lane highways is based on the density of the multi-lane highway segment, expressed in passenger cars per mile per lane. The multi-lane highway density is calculated using the same formula as the freeway density. Table 3.4 displays the LOS criteria for multi-lane highways.

Table 3.4 Multi-Lane Highways LOS Criteria

Level of Service		
Level of Service	Density (Passenger Cars per Mile per Lane)	V/C Ratio
A	≤ 11	≤ 1.00
B	> 11 - 18	≤ 1.00
C	> 18 - 26	≤ 1.00
D	> 26 - 35	≤ 1.00
E	> 35 - 45	≤ 1.00
F	> 45	> 1.00
Multi-Lane Highway Capacities		
Free-Flow Speed (MPH)	Capacity (Passenger Cars per Hour per Lane)	
45	1,900	
50	2,000	
55	2,100	
60	2,200	
65	2,300	

SOURCE:
Highway Capacity Manual

Two-lane Highways

Two-lane highways have one lane in each direction for traffic use. Passing on two-lane highways occurs in the opposing lane of traffic. Passing maneuvers are limited by the availability of gaps in the opposing traffic stream and the availability of sufficient sight distance for a driver to discern the approach of an opposing vehicle. Examples of uninterrupted flow two-lane highways within the MPA are US 90 between the Louisiana State Line and MS 607, MS 15, and MS 57 north of I-10. The LOS criteria for two-lane highways, which are displayed in Table 3.5, is based on percent free-flow speed.

Table 3.5 Two-Lane Highways LOS Criteria

Level of Service	Percent Free-Flow Speed	V/C ratio
A	> 91.7%	≤ 1.00
B	> 83.3% - 91.7%	≤ 1.00
C	> 75.0% - 83.3%	≤ 1.00
D	> 66.7% - 75.0%	≤ 1.00
E	≤ 66.7%	≤ 1.00
F	-	> 1.00

SOURCE: Highway Capacity Manual

Streets

Streets are facilities where traffic signals, stop or yield signs, or roundabouts interrupt through traffic flow. Additionally, these facilities can serve multiple modes of transportation, such as:

- Motorized vehicles
- Pedestrians
- Bicycles
- Transit

Examples of streets within the MPA are US 90 in Harrison County, MS 605 south of I-10, and Pass Rd. The LOS criteria for streets is based on percent free-flow speed and the street's v/c ratio. Table 3.6 displays the LOS criteria for streets.

Table 3.6 Streets LOS Criteria

Level of Service	Percent Free-Flow Speed	V/C ratio
A	> 80%	≤ 0.60
B	> 67% - 80%	> 0.60 – 0.70
C	> 50% - 67%	> 0.70 – 0.80
D	> 40% - 50%	> 0.80 – 0.90
E	> 30% - 40%	> 0.90 – 1.00
F	< 30%	> 1.00

SOURCE:
Highway Capacity Manual

The results from the LOS study are shown in Appendix C.

Calculating the LOS Index Rating

The segment's LOS Index was developed by:

- Establishing two records for each segment, one for each direction.
- Adding the numeric LOS values of all three time periods assigned to each record.
- Calculating the average of the LOS values to obtain the LOS Index rating.

An example is shown in Table 3.7.

Table 3.7 Level of Service Index Rating Example

Road Sections	AM Peak Traffic Level of Service	Midday Peak Level of Service	PM Peak Traffic Level of Service	Level of Service Index	Roadway Classification
Main St. West to East					
First St. - Second St.	C	D	B	3.00	Principal Arterial
	⬆	⬆	⬆	⬆	
(Assigned Numeric Value)	3	4	2	9/3 = 3.00	
Main St. West to East					
Second St. to First St.	A	C	C	2.33	Principal Arterial
	⬆	⬆	⬆	⬆	
(Assigned Numeric Value)	1	3	3	7/3=2.33	

3.5 Safety

Traffic incidents account for about 25 percent of all congestion on U.S. roadway networks. Crashes are one type of traffic incident[6]. Crashes, especially those that result in a fatality or life-threatening injury or involve hazardous materials, can result in significant congestion and dramatically reduce the available capacity and reliability of the entire transportation system. Additionally, congestion can result in additional crashes. Whenever a crash occurs, traffic incident management systems are in place to help reduce the impacts of a crash by reducing the delay, clearing the incident, and reducing the potential for secondary crashes.

The SAMS crash data was used to identify trends in total crash frequency and those that resulted in a fatality or life-threatening injury. Section 2.7: Roadway Safety of *Technical Report #2: Existing Conditions Analysis* identified high crash frequency and high crash rate locations within the Jackson MPA. These locations were identified in Tables 2.5 through 2.9 as well as in Figure 2.12 and Figure 2.13 of that report. The MPA's safety needs, as well as ways to reduce the number of crashes, are summarized in Section 4.3: Roadway Safety of *Technical Report #4: Needs Assessment*.

[6] https://ops.fhwa.dot.gov/program_areas/reduce-non-cong.htm

4.0 Recurring Congestion Methodology and Analysis

4.1 Congestion Scoring

Once all performance metric data was gathered the information was used to develop congestion scores for each 2018 CMP network link. Tables 4.1 and 4.2 list the numeric values assigned to each study factor based on the results of the scoring described in Chapter 3.

For the purposes of the recurring congestion analysis, the safety scores were not analyzed since they are random events that create nonrecurring congestion.

Table 4.1 Level of Service Index Ranking

Value	Score
5.00 or Greater	4
4.00 to 4.99	3
3.00 to 3.99	2
2.33 to 2.99	1

Table 4.2 Travel Time Index

Value	Score
4.00 or Greater	4
3.00 to 3.99	3
2.00 to 2.99	2
1.50 to 1.99	1

The scores from the two metrics were added together for each roadway link direction to provide a final CMP Index Rating. The maximum possible CMP Index Rating score a two-way roadway link can receive is sixteen (16), and the maximum possible CMP Index Rating score a one-way roadway link can receive is eight (8). The CMP Index Rating score for one-way roadway links was doubled to adjust for the differences in maximum possible CMP Index Rating scores.

4.2 Congested Segments

Roadway segments with a CMP Index Rating of eight (8) or greater are considered to be congested. Figure 4.1 displays the existing recurring congested segments of the Jackson CMP network in 2018, based on their CMP Index Rating scores.

Public and Stakeholder Meeting and MPO Identification

Input from the public and stakeholders' meetings, as well the MPO, are also considered in the CMP. This input from the public, stakeholders, and MPO locates congested locations that were not identified in the analysis. The locations identified by the public are shown in Table 4.3 while the locations identified by the MPO are shown in Table 4.4.

Table 4.3 Congested Locations Identified by Public Meeting Input

Congested Location	Municipality
I-10 at US 49	Gulfport
US 49 at Creosote Rd	Gulfport
I-10 at MS 609	Biloxi
I-10 at Beatline Rd	Long Beach
Three Rivers Rd at Cora Dr	Gulfport
MS 57 at Old Spanish Trail	Ocean Springs
MS 605 at Cowan Rd	Gulfport
Three Rivers Road at Crossroads Pkwy	Gulfport
Three Rivers Pkwy at Seaway Rd	Gulfport
US 90 at MS 609	Ocean Springs
Dedeaux Rd at Three Rivers Rd	Gulfport
US 49 at Pass Rd	Gulfport
Courthouse Rd at Pass Rd	Gulfport
I-10 at Menge Ave	Pass Christian
Pass Rd at Popps Ferry Rd	Biloxi
28th St at Klondyke Rd	Long Beach
US 90 at MS 603	Waveland
US 90 at Gautier-Vancleave Rd	Gautier
I-10 at MS 605	Gulfport
I-10 at Cedar Lake Rd	Biloxi
US 90 at Chicot St	Pascagoula

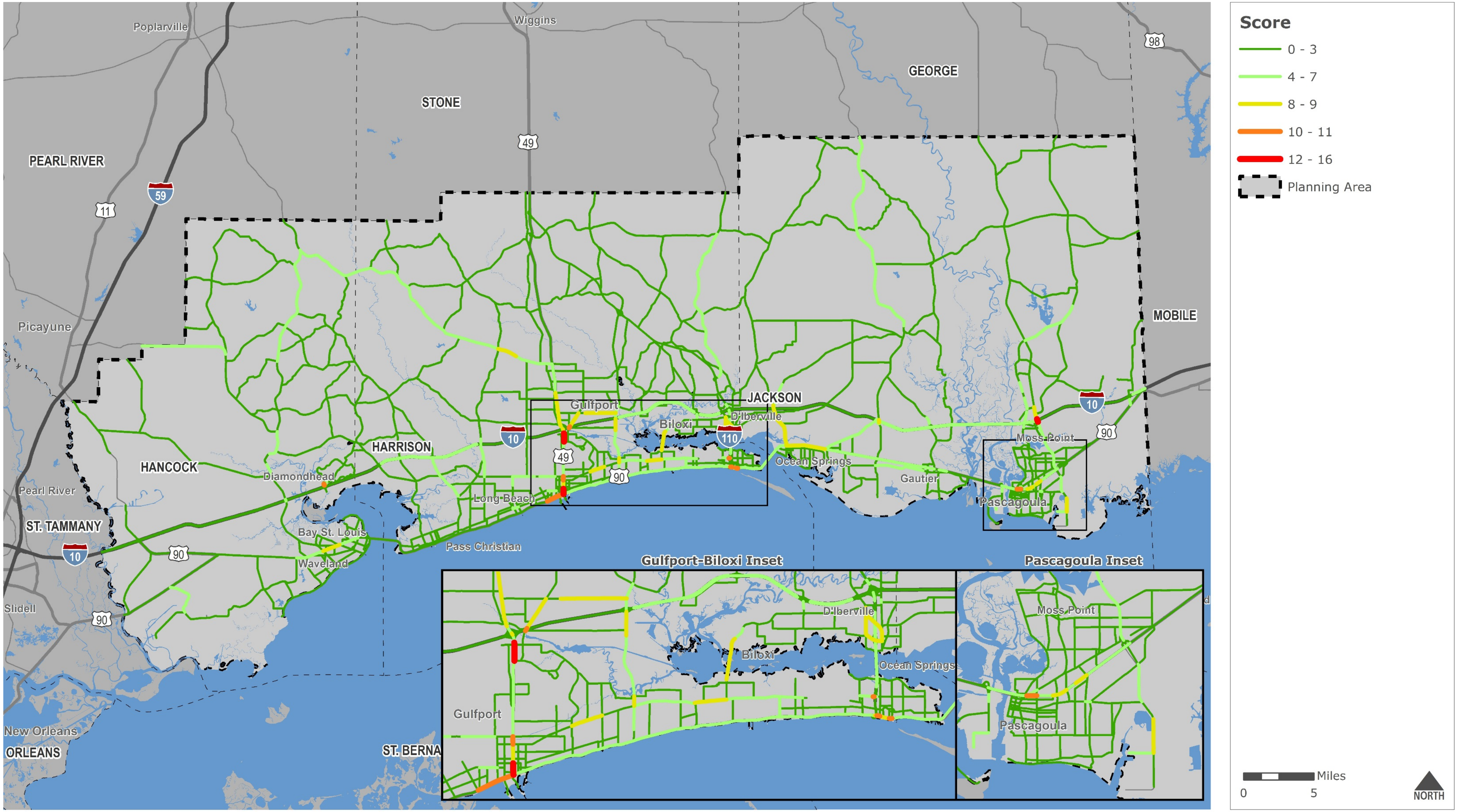
Table 4.4 Congested Locations Identified by the MPO

Roadway	Segment	Length (Miles)
Three Rivers Rd	Crossroads Pkwy to Dedeaux Rd	1.15
Dedeaux Rd	Wingate Dr to MS 605	2.16
Pass Rd	Hewes Ave to Courthouse Rd	1.05
Pass Rd	Eisenhower Dr to Popps Ferry Rd	1.05
D'Iberville Blvd	Popps Ferry Rd to Lamey Bridge Rd	0.95
Auto Mall Pkwy	D'Iberville Blvd to Brodie Rd	0.71
Rodriguez St	Brodie Rd to Central Ave	0.58
Central Ave	Lamey Bridge Rd to Rodriguez St	0.35
MS 609/Washington Ave	Seaman Rd to US 90	3.12

4.3 Segment Prioritization

The segments displayed in Figure 4.1 were sorted based on their CMP Index Rating. Table 4.5 shows the CMP Index Rating, as well as the TTI and LOS Ratings for each segment.

Figure 4.1 Recurring Congested Segments in 2018



Data Sources: NPMRDS, Travel Demand Model

Disclaimer: This map is for planning purposes only.

Table 4.5 Congestion Management Process Index Rating for Recurring Congestion Segments (2018)

Rank	Road Name	Segment	Length (miles)	Directional TTI	Directional TTI	Directional LOS	Directional LOS	CMP Index Rating
1	US 49	Airport Rd to I-10	0.59	4	2	4	3	13
2	US 49	US 90 to 17th St	0.38	3	3	3	3	12
3	MS 63	I-10 Eastbound Off-Ramp to I-10 Westbound Off-Ramp	0.20	3	2	4	3	12
4	US 90	Broad Ave to US 49	1.27	2	2	4	3	11
5	US 90	Telephone Rd to Market St	0.28	3	2	4	2	11
6	US 49	25th St to 28th St	0.26	2	2	3	3	10
7	Three Rivers Rd	Seaway Rd to Crossroads Pkwy	0.09	2	2	3	3	10
8	US 90	I-110 to Caillavet St	0.09	2	2	3	3	10
9	US 90	Lameuse St to Main St	0.09	2	2	3	3	10
10	Gex Dr	I-10 to Aloha Dr	0.09	2	2	3	3	10
11	Division St	Santini St to I-110	0.03	2	2	3	3	10
12	US 49	I-10 to O'Neal Dr	2.38	2	2	3	2	9
13	US 49	17th St to 25th St	0.62	2	2	2	3	9
14	MS 605	Pass Rd to Magnolia St	0.31	2	2	2	3	9
15	US 90	MS 609 to Ocean Springs Rd	2.78	2	2	2	3	9
16	MS 57	I-10 Eastbound Off-Ramp to I-10 Westbound Off-Ramp	0.18	2	2	3	2	9
17	MS 63	0.12 miles south of Saracennia Rd to Saracennia Rd	0.12	1	1	3	4	9
18	US 90	Caillavet St to Lameuse St	0.32	2	2	3	2	9
19	US 90	MS 43/MS 603 to Washington St	1.23	2	2	2	2	8
20	US 49	I-10 Eastbound Loop Ramps to I-10 Westbound Loop Ramps	0.06	1	2	2	3	8
21	MS 605	0.18 miles south of Seaway Rd to I-10	0.79	2	2	2	2	8
22	Popps Ferry Rd	Bonne Terra Blvd to Sunkist Country Club Rd	1.38	2	1	2	3	8
23	US 90	Hopkins Blvd to I-110	0.07	2	2	2	2	8
24	US 90	Victor St to Hospital Rd	0.42	2	2	2	2	8
25	US 90	0.38 miles west of Chicot St to Chicot St	0.38	2	2	2	2	8
26	MS 611	Wheeler Rd to Zollicoffer Rd	0.94	2	2	2	2	8
27	MS 63	I-10 to 0.12 miles south of Saracennia Rd	0.24	1	1	3	3	8
28	MS 63	0.13 miles north of Saracennia Rd to Old Saracennia Rd	0.39	1	1	3	3	8
29	MS 53	County Farm Rd to Pendora Ln	1.39	1	1	3	3	8

5.0 Nonrecurring Congestion Methodology and Analysis

The methodology[7] used to determine the roadway segments experiencing nonrecurring congestion was to:

- Group speed data into one-hour periods for a year and calculate the annual average speed and the annual standard deviation by hour for each segment.
- Group speed data into one-hour periods by hour and day and calculate the average speeds by hour.
- Tabulate the average speeds calculated in the previous steps, side by side, for all the speeds collected over the two years (2017 and 2018), for a specific time period (hour and day).
- Calculate the Standard Normal Deviate (SND) for each time period (hour and day) using the below formula.

$$(SND)_{ij} = \frac{((Speed)_{i\,j} - \ (Annual\ Average\ Speed)_i)}{(\ Annual\ Standard\ Deviation)_{\ i}}$$

Where:

SND = Standard Normal Deviate
i = Hour
j = Day

Negative SND values that are greater than a selected threshold would indicate congestion beyond average levels. This indicates a high likelihood of non-recurring congestion. For this CMP effort, a threshold value of -1.5 was selected based on the research's sensitivity analysis[7]. SND values which deviated by more than -1.5 (i.e., less than -1.5) were indicative of non-recurring congestion speeds. Additionally, the delays for time period (hour and day) where the SND deviated by more than -1.5 were calculated using the below formula.

$$Time\ Delay = \left(\frac{Segment\ Length}{Segment\ Speed_i}\right) - \left(\frac{Segment\ Length}{Segment\ Annual\ Average\ Speed_i}\right)$$

Where:

Segment length is in miles
Segment speeds are in MPH
Time Delay is in hours
i = Hour

[7] Andrew J. Sullivan, Virginia P. Sisiopiku, Bharat R. Kallem, "Measuring Non-Recurring Congestion in Small to Medium Sized Urban Areas" Prepared by the University Transportation Center for Alabama.

5.1 Non-Recurring Congestion Segments

With the methodology established, the following process was used to locate segments that experienced excessive non-recurring congestion in 2017 and/or 2018:

- Calculate the SND and the time delay (in hours) for each segment.
    - Segments experiencing a maximum delay of at least one (1) hour and at least 150 occurrences of SND values deviating by more than -1.5 in 2017 and/or 2018 were considered to experience excessive non-recurring congestion.
- Calculate the five-year crash trends using the 2014-2018 MDOT SAMS crash data for both total and fatality/life-threatening crash frequencies.
    - The average yearly crash frequency was used to prioritize the segments experiencing excessive non-recurring congestion.

Figure 5.1 displays the segments that experienced excessive non-recurring congestion in the years 2017 and/or 2018. The non-recurring congestion trends for each segment are shown in Table 5.1.

Limitations

To develop a reliable methodology that identifies non-recurring congestion, a consistent and reliable travel time database is necessary. Speed data and travel times for each time interval (5-minute, 10-minute, 15-minute, or 1-hour) throughout an entire year is essential. However, the RITIS database contains several time intervals where speed and travel time data is unavailable or missing, making it difficult to perform an accurate and reliable non-recurring congestion analysis.

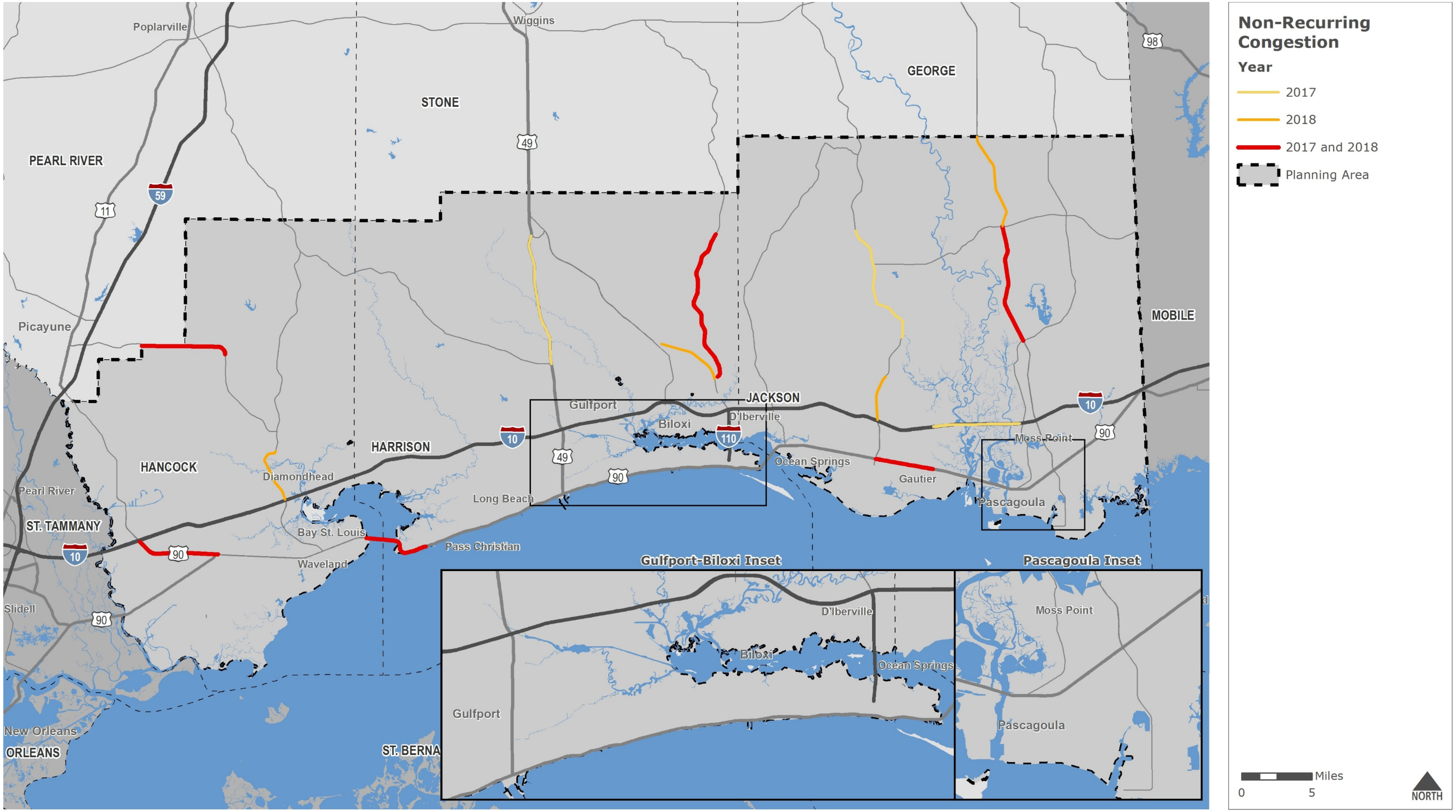
Additionally, the RITIS database travel time data is not available for each individual travel lane for multi-lane highways. However, with minor incidents there is a chance that the impacts from the incident would negatively impact only the travel lane experiencing the incident and not the other travel lanes. This indicates that the incident would not be reflected in the RITIS database even though an incident had occurred.

5.2 Segment Prioritization

The segments displayed in Figure 5.1 were ranked based on the five-year average crash frequency. Table 5.1 shows the following:

- Frequency of non-recurring congestion incidents
- The maximum delay for a non-recurring congestion incident
- The change in frequency of non-recurring congestion incidents and maximum delay for a non-recurring congestion incident between 2017 and 2018
- The 5-year trends for total crash frequency and fatal and life-threatening injury crash frequency for each segment.

Figure 5.1 Segments Experiencing Excessive Non-Recurring Congestion



Data Sources: NPMRDS

Disclaimer: This map is for planning purposes only.

Table 5.1 Non-Recurring Congestion Trends

Roadway	Segment	Length (miles)	Year(s) of Non-Recurring Congestion	2017 Non-Recurring Incidents	2017 Maximum Delay (Hours)	2018 Non-Recurring Incidents	2018 Maximum Delay (Hours)	5-Year Average Crash Frequency	5-Year Average Fatal/Life Threatening Crash Frequency	Change in Non-Recurring Incidents (2017 to 2018)	Change in Maximum Delay (Hours) (2017 to 2018)	5-Year Total Crash Trend	5-Year Fatal/Life Threatening Crash Trend
MS 57	Jim Ramsay Rd to Wire Rd	9.11	2017	171	2.84	145	2.82	73.6	0.8	-26	-0.02	Increasing	Stable
US 49	MS 53 to Bethel Rd	9.39	2017	151	1.71	146	1.41	55.4	1.2	-5	-0.30	Increasing	Decreasing
I-10 Westbound	MS 613 to Gautier-Vancleave Rd	6.17	2017	189	1.27	175	0.39	46.2	0.8	-14	-0.88	Increasing	Increasing
MS 43	I-10 to Kiln Delisle Rd	4.31	2018	148	0.99	156	1.34	32.0	0.8	8	0.35	Increasing	Increasing
US 90	MS 57 to Gautier-Vancleave Rd	4.11	2017 and 2018	160	1.26	160	1.26	29.6	0.2	0	0.01	Decreasing	Increasing
MS 63	MS 613 to MS 614	8.56	2017 and 2018	156	1.07	177	2.69	25.2	0.4	21	1.62	Increasing	Increasing
US 90	N 2nd St to Henderson Ave	4.86	2017 and 2018	267	1.26	289	1.72	14.2	0.6	22	0.46	Increasing	Increasing
MS 63	MS 614 to George County Line	6.93	2018	189	0.88	193	2.18	13.2	0.2	4	1.31	Increasing	Decreasing
MS 15	MS 67 to Bethel Rd	11.21	2017 and 2018	184	2.61	151	2.61	12.6	0.6	-33	0.00	Increasing	Increasing
MS 67	MS 15 to Shriners Blvd	4.77	2018	158	0.34	168	1.50	12.4	0.0	10	1.16	Increasing	Stable
MS 57	I-10 to Gautier-Vancleave Rd	3.27	2018	288	0.74	247	1.00	11.2	0.8	-41	0.27	Increasing	Decreasing
MS 43	Salem Rd to Old Kiln Rd	6.24	2017 and 2018	344	2.36	365	3.19	10.8	0.0	21	0.83	Increasing	Stable
MS 607	I-10 to US 90	5.87	2017 and 2018	446	1.31	389	1.31	8.0	0.4	-57	0.00	Decreasing	Decreasing
I-10 Eastbound	Gautier-Vancleave Rd to I-10	6.05	2017	159	1.39	184	0.60	6.6	0.0	25	-0.80	Increasing	Increasing

6.0 Congestion Reduction Strategies

6.1 Federal Guidelines for Congestion Reduction Strategies

Section 500.109 (a) of Subpart A (Management Systems), 23 CFR (Final Rule) states:

> "...A congestion management system or process is a systematic and regionally accepted approach for managing congestion that provides accurate, up-to-date information on transportation system operations and performance and assesses alternative strategies for congestion management that meet State and local needs."

Section 450.322 (c)(4) of Subpart C (Metropolitan Transportation Planning and Programming), 23 CFR (Final Rule) further states that a Congestion Management Process shall include:

> "Identification and evaluation of the anticipated performance and expected benefits of appropriate congestion management strategies that will contribute to the more effective use and improved safety of existing and future transportation systems based on the established performance measures. The following categories of strategies, or combinations of strategies, are some examples of what should be appropriately considered for each area:
>
> - Demand management measures, including growth management and congestion pricing;
> - Traffic operational improvements;
> - Public transportation improvements;
> - ITS technologies as related to the regional ITS architecture; and,
> - Where necessary, additional system capacity."

Section 450.322 (c)(5) of Subpart C (Metropolitan Transportation Planning and Programming), 23 CFR (Final Rule) also states that a CMP shall include: "Identification of an implementation schedule, implementation responsibilities, and possible funding sources for each strategy (or combination of strategies) proposed for implementation."

6.2 Identifying Congestion Reduction Strategies Using CMP Toolbox

There are constant changes in the way our society and economy operate. With increased in commercial, residential, and industrial development, there is also increased in transportation demand on existing transportation facilities. To address this increase in demand and ensuing congestion, appropriate strategies must be formulated to prevent deterioration in free flow traffic conditions. These strategies can include upgrading existing transportation facilities, creating additional facilities, and also exploring the use of alternative travel methods. The CMP proposes three (3) management strategies that provide a variety of measures that can be implemented to reduce traffic congestion. These strategies are travel demand management, supply management, and land use management.

Travel Demand Management (TDM)

The use of TDM alleviates congestion by employing methods that reduce the number of vehicles traveling major thoroughfares during peak traffic hours. These methods are summarized in Table 6.1.

Table 6.1 TDM Strategies

Strategy	Description
Staggered work hours	The organization has varying starting and ending working hours for employees.
Alternative work locations	These facilities can be closer to the organization's customers and clients and/or employees' home. This is one system where employees do not commute or travel to a central place of work.
Telecommuting	Work is performed wherever the employee chooses. This is another system where employees do not commute or travel to a central place of work.
Carpooling/Vanpooling	Carpooling and/or vanpooling prevents the need for others to have to drive to a location themselves by sharing trips.
Toll Roads	This is a type of road where a fee is assessed for passage. High-occupancy toll lanes and express toll lanes have variable fees that are adjusted in response to demand.

Supply Management

Supply management analyzes methods for reducing traffic congestion on major transportation facilities once it has been determined the facilities have reached or exceeded their designed capacity. Supply management strategies that can be used as part of the CMP's efforts are shown in Table 6.2.

Table 6.2 Supply Management Strategies

Strategy	Description
ITS	ITS allows users to be better informed about transportation conditions and make more informed decisions. It encompasses a wide range of technologies such as cameras and variable message boards.
Transit park and ride facilities	Park and ride facilities are parking lots where people leave their vehicles and transfer to a bus system or carpool for the remainder of the trip.
Traffic signal synchronization	Traffic signal synchronization systems seek to minimize congestion and delays by timing traffic signals to allow vehicles to traverse the most intersections in the shortest possible amount of time.
Bicycle and pedestrian	Bicycling or walking can remove vehicle trips from roadways. This can be encouraged if bicycle and pedestrian facilities are adequate.
Increase highway capacity	Increasing highway capacity (e.g. adding lanes or new roads) is not always possible due to physical and fiscal constraints. However, it remains an important approach to addressing congestion.

Land Use Management

The use of land use management reduces excessive traffic congestion by altering the way land is developed through the use of smart growth concepts. Smart growth analyzes future growth potential of an area and includes in its plan measures to abate/prevent excessive traffic demand on a thoroughfare. A summary of methods is shown in Table 6.3.

Table 6.3 Land Use Management Strategies

Strategy	Description
Planning and zoning	Inadequate zoning, such as allowing larger developments, can overwhelm available transportation facilities.
Mixed use development	Mixed use developments have increased population density and encourage walking and bicycling and/or access public transit. These developments also build up freight movement for goods and services.
Density development	High-density development increases the feasibility for transit, walking, and/or bicycling.
Transit	An improved transit system can increase its attractiveness and reduce the number of vehicle trips.

Table 6.4 presents potential strategies that can be employed to alleviate or reduce congestion on the roadways identified in Figure 4.1 and Figure 5.1 that experience the highest levels of traffic congestion in the MPA. The table also lists agencies responsible for proposed improvements, possible funding sources for project implementation, and a proposed project implementation schedule.

Table 6.4 Proposed Strategies for Alleviating Congestion

Roadway	Segment	Congestion Recurring or Non-Recurring	Proposed Congestion Alleviation Strategy	Organization/Local Govt. Responsible for Implementation and Possible Funding Source	Implementation Schedule (Construct by or before)
US 90	MS 43/MS 603 to Washington St	Recurring	Traffic operational improvements (signal retiming and/or access management)	MDOT	2025
US 49	Airport Rd to O'neal Rd	Recurring	Widen to six (6) lanes from School Rd to O'Neal Rd; and traffic operational improvements (signal retiming and/or access management) (entire segment). New roadway from Landon Rd to US 49 may also improve operations.	MDOT	2025
US 49	US 90 to 28th St	Recurring	Traffic operational improvements (signal retiming and/or access management)	MDOT	2025
US 90	Broad Ave to US 49	Recurring	Traffic operational improvements (signal retiming)	MDOT	2025
Gex Dr	I-10 to Aloha Dr	Recurring	Widen to four (4) lanes divided; and traffic operational improvements (access management and/or interchange modifications)	Diamondhead	2025
MS 53	County Farm Rd to Pendora Ln	Recurring	Widen to four (4) lanes divided; and traffic operational improvements (signal retiming)	MDOT	2035
Three Rivers Rd	Seaway Rd to Crossroads Pkwy	Recurring	Reconstruct as four (4) lane divided; and traffic operational improvements (signal retiming).	Gulfport	2045
MS 605	Pass Rd to Magnolia St	Recurring	Traffic operational improvements (access management and/or interchange modifications)	MDOT	2025
MS 605	0.18 miles south of Seaway Rd to I-10	Recurring	Traffic operational improvements (signal retiming); widening MS 605 north of I-10 and/or widening Eastbound On-Ramp and Westbound Off-Ramp at interchange may also improve operations.	MDOT	2045
Popps Ferry Rd	Bonne Terra Blvd to Sunkist Country Club Rd	Recurring	Traffic operational improvements (Drawbridge operations)	MDOT	2025
Division St	Santini St to I-110	Recurring	Widen to four (4) lanes divided; and traffic operational improvements (signal retiming)	Biloxi	2035
US 90	I-110 to Main St	Recurring	Traffic operational improvements (signal retiming)	MDOT	2025
US 90	MS 609 to Ocean Springs Rd	Recurring	Widen to six (6) lanes; and traffic operational improvements (signal retiming and/or access management).	MDOT	2025
MS 57	I-10 Eastbound Off-Ramp to I-10 Westbound Off-Ramp	Recurring	Traffic operational improvements (signal retiming); widening MS 57 north of I-10 may also improve operations.	MDOT	2035
MS 63	I-10 to Old Saracennia Rd	Recurring	Traffic operational improvements (signal retiming, access management, and/or interchange modification)	MDOT	2025
US 90	Telephone Rd to Market St	Recurring	Traffic operational improvements (signal retiming and/or access management)	MDOT	2025
US 90	Victor St to Hospital Rd	Recurring	Traffic operational improvements (signal retiming and/or access management)	MDOT	2025
US 90	0.38 miles west of Chicot St to Chicot St	Recurring	Traffic operational improvements (signal retiming)	MDOT	2025
MS 611	Wheeler Rd to Zollicoffer Rd	Recurring	Traffic operational improvements; and/or staggered work shifts at refineries	MDOT, Port, and/or Refineries	2025
MS 15	MS 67 to Bethel Rd	Non-Recurring	Safety improvements	MDOT	2025
MS 57	Jim Ramsay Rd to Wire Rd	Non-Recurring	Widen to four (4) lanes divided and realign; and safety improvements	MDOT	2035
US 49	MS 53 to Bethel Rd	Non-Recurring	Widen to six (6) lanes divided from MS 53 to O'Neal Rd; and safety improvements (entire segment).	MDOT	2025
I-10 (Westbound)	MS 613 to Gautier-Vancleave Rd	Non-Recurring	Safety improvements; and ITS improvements	MDOT	2025
MS 43	I-10 to Kiln Delisle Rd	Non-Recurring	Safety improvements	MDOT	2025
US 90	MS 57 to Gautier-Vancleave Rd	Non-Recurring	Widen to six (6) lanes; traffic operational improvements (signal retiming and/or access management); and safety improvements.	MDOT	2025
MS 63	MS 613 to MS 614	Non-Recurring	Safety improvements	MDOT	2025
US 90	N 2nd St to Henderson Ave	Non-Recurring	Safety improvements; safety improvements to parallel I-10 may also reduce congestion on this segment.	MDOT	2025
MS 63	MS 614 to George County Line	Non-Recurring	Safety improvements	MDOT	2025
MS 67	MS 15 to Shriners Blvd	Non-Recurring	Safety improvements	MDOT	2025
MS 57	I-10 to Gautier-Vancleave Rd	Non-Recurring	Widen to four (4) lanes divided and realign; and safety improvements	MDOT	2035

Roadway	Segment	Congestion Recurring or Non-Recurring	Proposed Congestion Alleviation Strategy	Organization/Local Govt. Responsible for Implementation and Possible Funding Source	Implementation Schedule (Construct by or before)
MS 43	Salem Rd to Old Kiln Rd	Non-Recurring	Safety improvements	MDOT	2025
MS 607	I-10 to US 90	Non-Recurring	Safety improvements; safety improvements to parallel I-10 may also reduce congestion on this segment.	MDOT	2025
I-10 (Eastbound)	Gautier-Vancleave Rd to MS 613	Non-Recurring	Safety improvements; and ITS improvements	MDOT	2025

7.0 Maintenance of the Congestion Management Process

7.1 Federal Guidelines for Maintaining the Congestion Management Process

Section 450.322 (d)(3) of Subpart C (Metropolitan Transportation Planning and Programming), 23 CFR (Final Rule) states that a Congestion Management Process shall include:

> "Establishment of a coordinated program for data collection and system performance monitoring to define the extent and duration of congestion, to contribute in determining the causes of congestion, and evaluate the efficiency and effectiveness of implemented actions. To the extent possible, this data collection program should be coordinated with existing data sources (including archived operational/ITS data) and coordinated with operations managers in the metropolitan area."

Section 450.322 (d)(6) of Subpart C (Metropolitan Transportation Planning and Programming), 23 CFR further states that the CMP shall include:

> "Implementation of a process for periodic assessment of the effectiveness of implemented strategies, in terms of the area's established performance measures. The results of this evaluation shall be provided to decision makers and the public to provide guidance on selection of effective strategies for future implementation."

7.2 System Performance and Maintenance

The overall goal of the CMP is to reduce traffic congestion within the MPA and improve free-flow traffic conditions through the implementation of proposed congestion reduction strategies. To measure the effectiveness the proposed strategies the 2015 CMP had on reducing traffic congestion in the MPA a comparative analysis was performed. This comparative analysis shows the proposed improvement for the 2015 CMP congested roadways, if that roadway is congested in the 2020 CMP, if there is an ongoing project, and the MTP's project implementation schedule. The results of the comparative analysis between the 2015 CMP and the 2020 CMP are shown in Table 7.1.

Table 7.1 2015 CMP and 2020 CMP Comparative Analysis

Road	Segment	2015 CMP Proposed Improvement	Segment in 2020 CMP	Status	Previous Implementation Schedule (2040 MTP)	Current Implementation Schedule (2045 MTP)
MS 605	I-10 to Dedeaux Rd	Add base capacity to roadway	No	N/A	Stage 2 (2021 - 2030)	Stage III (2036 - 2045)
Landon Rd	Old Hwy 49 to US 49	Add base capacity to roadway	No	E+C Project to widen Landon Rd to 4-lane divided between 34th Ave and US 49	Stage 1 (2016 - 2020) and Stage 2 (2021 - 2030)	Stage I (2021 - 2025)
Washington Ave	US 90 to Beach	Congestion is acceptable	No	N/A	N/A	N/A
US 90	Keller Ave to I-110	Transit system improvements; Corridor reconstruction - operations/channelization; Add base capacity to a parallel roadway, new roadway	Yes	N/A	Stage 2 (2021 - 2030)	N/A
US 49	Creosote Rd to Airport Rd	Add base capacity to a parallel roadway, New roadway; Intersection improvements	Yes	N/A	Stage 2 (2021 - 2030)	Stage I (2021 - 2025) for new roadway between Landon Rd and US 49
US 90	Holcomb Blvd to Ocean Springs Rd	Add base capacity to roadway	Yes	N/A	Stage 2 (2021 - 2030)	Stage I (2021 - 2025)
US 90	Rodenberg Ave to Treasure Bay	Transit system improvements; Add base capacity to a parallel roadway, New roadway	No	N/A	N/A	N/A
US 49	28th St to US 90	Add base capacity to a parallel roadway, New roadway; Intersection improvements	Yes	N/A	N/A	N/A
US 90	Azalea Dr to I-110	Transit system improvements; Corridor reconstruction - operations/channelization; Add base capacity to a parallel roadway, new roadway	No	N/A	Stage 2 (2021 - 2030)	N/A
US 90	MS 609 to Holcomb Blvd	Add base capacity to roadway	Yes	N/A	Stage 2 (2021 - 2030)	Stage I (2021 - 2025)
Pass Rd	Cowan Rd to Washington Ave	Intersection improvements; Corridor reconstruction - access management; Add base capacity to a parallel roadway, new roadway	No	N/A	Stage 2 (2021 - 2030)	N/A
Pass Rd	Debuys Rd to Stennis Dr	Intersection improvements; Corridor reconstruction - access management; Add base capacity to a parallel roadway; New roadway	No	N/A	Stage 3 (2031 - 2040)	N/A
US 90	Hospital Rd to Veterans Blvd	Corridor reconstruction - access management	No	N/A	Stage 2 (2021 - 2030)	N/A

8.0 Future Conditions

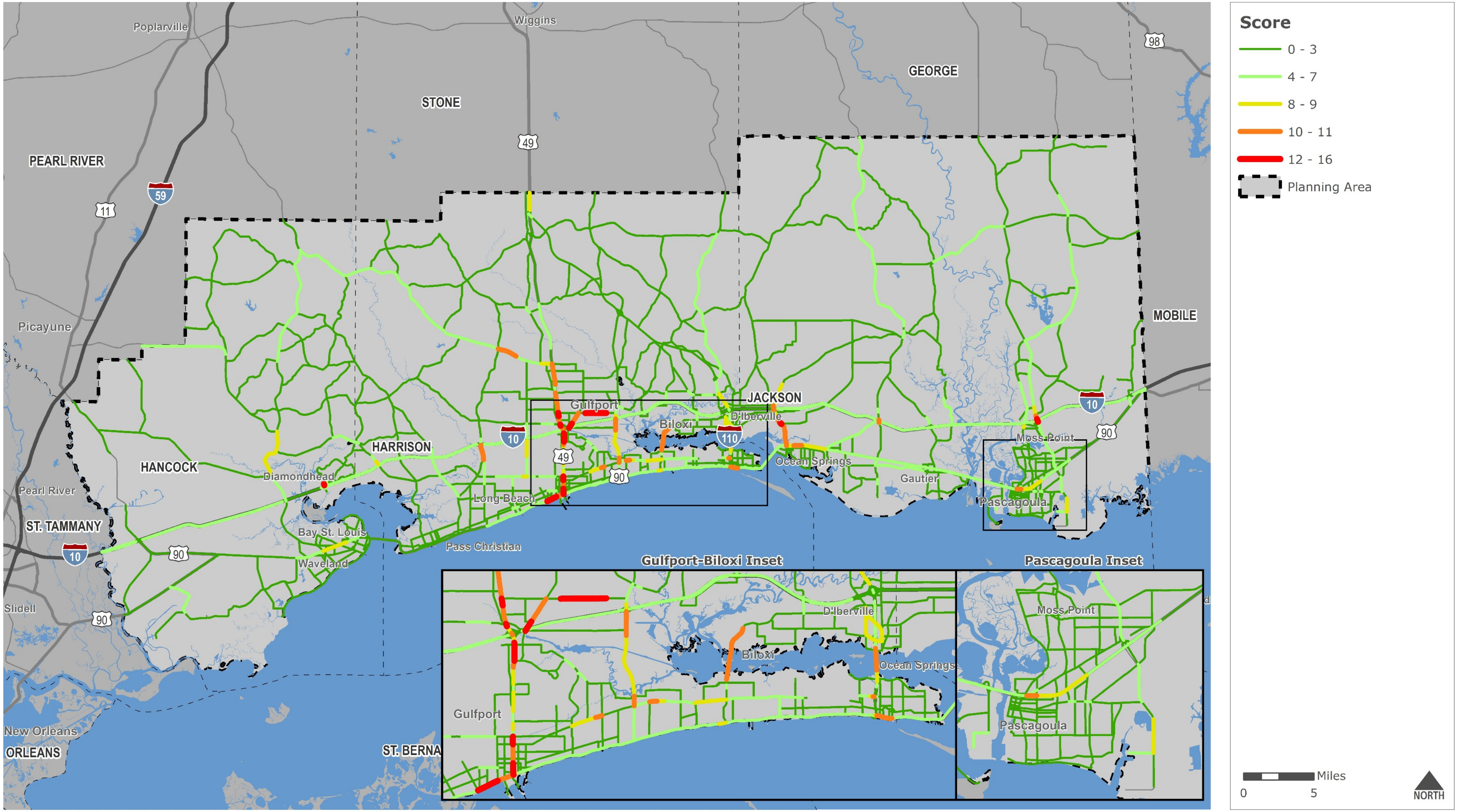
8.1 Future Congestion

According to the results from the 2045 Travel Demand Model, in the Gulf Coast MPA, the Vehicle Miles Traveled (VMT) will increase by nearly 31 percent between 2018 and 2045, and the Vehicle Hours Traveled (VHT) will increase by nearly 38 percent between 2018 and 2045. However, during this same time period, the Vehicle Hour Delay (VHD) will nearly double. The increase in VHD is expected to result in increasing congestion on the roadway network. During the public survey, congestion reduction on the roadway network was identified as the top priority for residents and workers. Section 4.0: Roadways and Bridges of *Technical Report #4: Needs Assessment* further summarized the congestion relief needs.

Using the same methodology for recurring congestion that was discussed in Chapter 4, scores were developed for each link in the 2045 CMP network. Figure 8.1 displays the expected recurring congested segments of the Jackson CMP network in 2045, ranked based on the results of the recurring congestion analysis process. Table 8.1 lists the segments that are expected to experience recurring congestion in 2045.

Non-recurring congestion analysis for the future was not conducted since the occurrence of random events such as crashes, road construction, or special events in the future cannot be determined. However, segments that currently experience non-recurring congestion due to crashes may experience longer delays in the future if no improvements are made. Chapter 5 identified the segments that experienced significant non-recurring congestion in 2017 and/or 2018.

Figure 8.1 Recurring Congested Segments in 2045



Data Sources: Travel Demand Model

Disclaimer: This map is for planning purposes only.

Table 8.1 Future Recurring Congested Segments (2045)

Rank	Road Name	Segment	Length (miles)	Directional TTI	Directional TTI	Directional LOS	Directional LOS	CMP Index Rating in 2045	CMP Index Rating in 2018	Change in CMP Index Rating (2018 to 2045)
1	US 49	Airport Rd to I-10	0.59	4	2	4	4	14	13	1
2	US 90	41st Ave to 33rd Ave	0.52	3	3	4	3	13	11	2
3	MS 63	I-10 Eastbound Off-Ramp to I-10 Westbound Off-Ramp	0.20	3	2	4	4	13	12	1
4	Gex Rd	I-10 to Aloha Dr	0.09	2	3	4	4	13	10	3
5	Three Rivers Rd	Seaway Rd to Crossroads Pkwy	0.09	2	3	4	4	13	10	3
6	US 49	US 90 to 17th St	0.38	3	3	3	3	12	12	0
7	US 49	25th St to 28th St	0.26	2	3	4	3	12	10	2
8	US 49	I-10 to Landon Rd	0.09	3	2	3	4	12	9	3
9	US 49	0.23 miles south of Dedeaux Rd to Dedeaux Rd	0.23	2	3	4	3	12	9	3
10	US 90	Broad Ave to 41st Ave	0.20	3	2	4	3	12	11	1
11	US 90	33rd Ave to US 49	0.55	2	2	4	3	11	11	0
12	US 49	I-10 Eastbound Loop Ramps to I-10 Westbound Loop Ramps	0.06	2	2	3	4	11	8	3
13	US 49	Community Rd to 0.07 miles north of Community Rd	0.07	2	3	3	3	11	9	2
14	US 49	Dedeaux Rd to 0.13 miles north of Orange Grove Rd	0.41	2	3	3	3	11	9	2
15	US 49	Parkwood Blvd to O'Neal Rd	0.42	2	3	3	3	11	9	2
16	US 49	0.21 miles south of Duckworth Rd to MS 53	1.47	2	2	3	4	11	6	5
17	Popps Ferry Rd	Sunkist Country Club Rd to N Country Club Ln	0.44	1	2	4	4	11	7	4
18	Division St	Santini St to I-110	0.03	2	2	4	3	11	10	1
19	US 90	Telephone Rd to Market St	0.28	3	2	4	2	11	11	0
20	County Farm Rd	Red Creek Rd to I-10	1.05	2	2	3	3	10	6	4
21	US 49	17th St to 25th St	0.62	2	2	3	3	10	9	1
22	US 49	Evans St to Airport Rd	0.21	2	1	4	3	10	7	3
23	US 49	Landon Rd to Community Rd	0.31	2	2	3	3	10	9	1
24	US 49	0.07 miles north of Community Rd to 0.23 miles south of Dedeaux Rd	0.22	2	2	3	3	10	9	1
25	US 49	0.13 miles north of Orange Grove Rd to Parkwood Blvd	0.62	2	2	3	3	10	9	1
26	MS 53	County Farm Rd to Pendora Ln	1.39	1	1	4	4	10	8	2
27	MS 605	0.18 miles south of Seaway Rd to I-10	0.79	2	2	3	3	10	8	2
28	MS 605	Pass Rd to Magnolia St	0.31	2	2	3	3	10	9	1
29	Pass Rd	Anniston Ave to Ford St	0.25	2	2	3	3	10	7	3
30	Popps Ferry Rd	Bonne Terra Blvd to Sunkist Country Club Rd	1.38	1	2	3	4	10	8	2
31	Three Rivers Rd	Crossroads Pkwy to Riverton Rd	0.26	1	2	3	4	10	6	4

Rank	Road Name	Segment	Length (miles)	Directional TTI	Directional TTI	Directional LOS	Directional LOS	CMP Index Rating in 2045	CMP Index Rating in 2018	Change in CMP Index Rating (2018 to 2045)
32	US 90	I-110 to Main St	0.51	2	2	3	3	10	9	1
33	I-110 (Southbound)	Rodriguez St to Bayview Ave	0.71	1	-	4	-	10	6	4
34	US 90	Vermont Ave to Holcomb Blvd	0.55	2	2	3	3	10	9	1
35	MS 63	I-10 to 0.12 miles south of Saracennia Rd	0.24	1	1	4	4	10	8	2
36	MS 57	I-10 Eastbound Off-Ramp to I-10 Westbound Off-Ramp	0.18	2	2	3	3	10	9	1
37	US 90	MS 43/MS 603 to 0.09 miles east of MS 43/MS 603	0.10	2	2	3	2	9	8	1
38	US 90	McLaurin St to Bouslog St	0.67	2	2	2	3	9	8	1
39	MS 43/MS 603	Texas Flat Rd to Comanche St	0.88	2	1	3	3	9	4	5
40	Canal Rd	0.84 miles south of I-10 to 0.17 miles south of I-10	0.67	1	1	3	4	9	2	7
41	28th St	73rd Ave to Canal Rd	0.26	2	1	3	3	9	6	3
42	US 49	I-10 Eastbound Ramps to I-10 Eastbound Loop Ramps	0.26	2	2	3	2	9	7	2
43	MS 53	Old Hwy 49 to US 49	0.77	2	2	3	2	9	7	2
44	Dedeaux Rd	Wingate Dr to Sweetgum Dr	0.57	1	1	4	3	9	4	5
45	MS 605	Magnolia St to 0.18 miles south of Seaway Rd	2.05	2	2	2	3	9	7	2
46	Pass Rd	Ford St to Lindh Rd	0.23	2	1	3	3	9	7	2
47	Division St	Iroquois St to Santini St	0.10	2	2	3	2	9	6	3
48	US 90	MS 609 to Vermont Ave	0.53	2	2	3	2	9	9	0
49	US 90	Holcomb Blvd to Ocean Springs Blvd	1.69	2	2	3	2	9	9	0
50	Seaman Rd	Tucker Rd to Arguellas Rd	1.35	1	1	4	3	9	7	2
51	MS 63	0.12 miles south of Saracennia Rd to Saracennia Rd	0.12	1	1	3	4	9	9	0
52	US 90	Lower Bay Rd to Idlewood Dr	0.40	1	2	2	3	8	6	2
53	US 90	0.09 miles east of MS 43/MS 603 to McLaurin St	0.09	2	2	2	2	8	8	0
54	US 90	Bouslog St to 0.29 miles west of Main St	0.90	2	2	2	2	8	7	1
55	MS 43/MS 603	Comanche St to MS 43	2.88	1	1	3	3	8	3	5
56	Kiln Delisle Rd	I-10 to Cuevas Rd	0.25	1	1	3	3	8	0	8
57	Canal Rd	Tillman Rd to 0.84 miles south of I-10	0.40	1	1	3	3	8	1	7
58	US 49	31st St to 33rd St	0.19	1	2	2	3	8	7	1
59	US 49	John Hill Blvd to 0.08 miles north of Martin Luther King Jr Blvd	0.63	1	2	2	3	8	7	1
60	US 49	Polk St to Russell Blvd	0.43	2	1	3	2	8	7	1
61	US 49	I-10 Westbound Loop Ramps to I-10 Westbound Ramps	0.28	2	1	3	2	8	7	1
62	US 49	MS 67 to Stone County Line	1.23	1	1	3	3	8	0	8
63	MS 67 (Southbound)	Old Hwy 67 to Promenade Pkwy	0.93	1	-	3	-	8	2	6

Rank	Road Name	Segment	Length (miles)	Directional TTI	Directional TTI	Directional LOS	Directional LOS	CMP Index Rating in 2045	CMP Index Rating in 2018	Change in CMP Index Rating (2018 to 2045)
64	MS 67 (Northbound)	I-10 to Promenade Pkwy	0.16	1	-	3	-	8	2	6
65	Dedeaux Rd	Lynn Ave to Jessica Cir	0.92	1	1	3	3	8	0	8
66	MS 605	I-10 Eastbound Off-Ramp to Helen Richards Dr	0.25	2	1	3	2	8	6	2
67	US 90	Pine Grove Ave to Oakmont Pl	0.22	1	2	2	3	8	6	2
68	US 90	Hopkins Blvd to I-110	0.07	2	2	2	2	8	8	0
69	I-110 (Northbound)	Eastbound Bayview Ave On-Ramp to Westbound Bayview Ave On-Ramp	0.38	1	-	3	-	8	4	4
70	US 90	Market St to Chicot St	1.57	2	2	2	2	8	7	1
71	MS 611	Wheeler Rd to Zollicoffer Rd	0.94	1	2	2	3	8	8	0
72	MS 613	0.09 miles north of Dutch Bayou Rd to Rosa Ln	0.09	2	1	3	2	8	6	2
73	MS 63	Saracennia Rd to Old Saracennia Rd	0.52	2	2	2	2	8	7	1
74	Seaman Rd	Arguellas Rd to 0.35 miles south of Cypress Ave	0.31	1	1	3	3	8	0	8

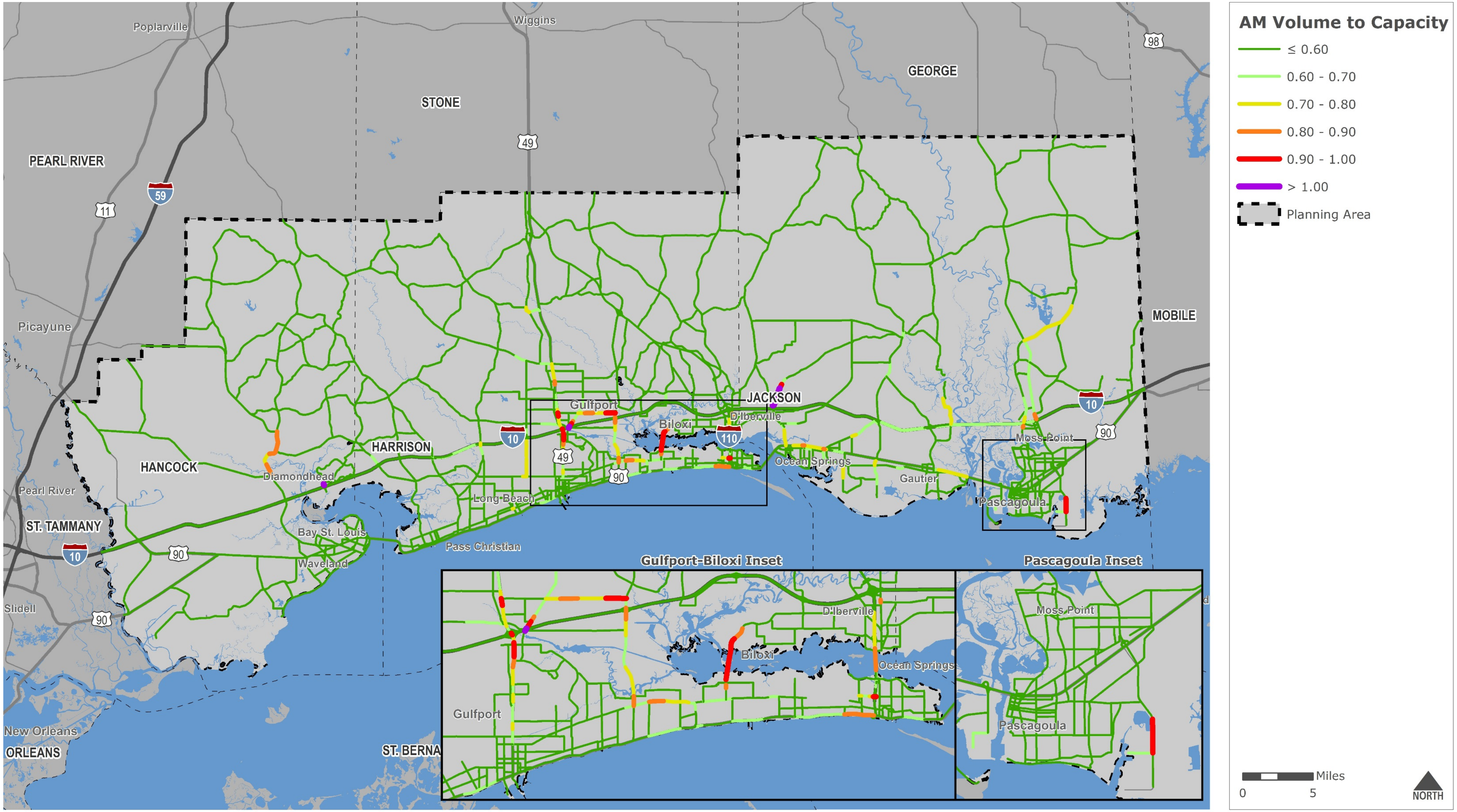
Appendices

Appendix A: Volume to Capacity Study

Appendix B: Travel Time Index Study

Appendix C: Level of Service Study

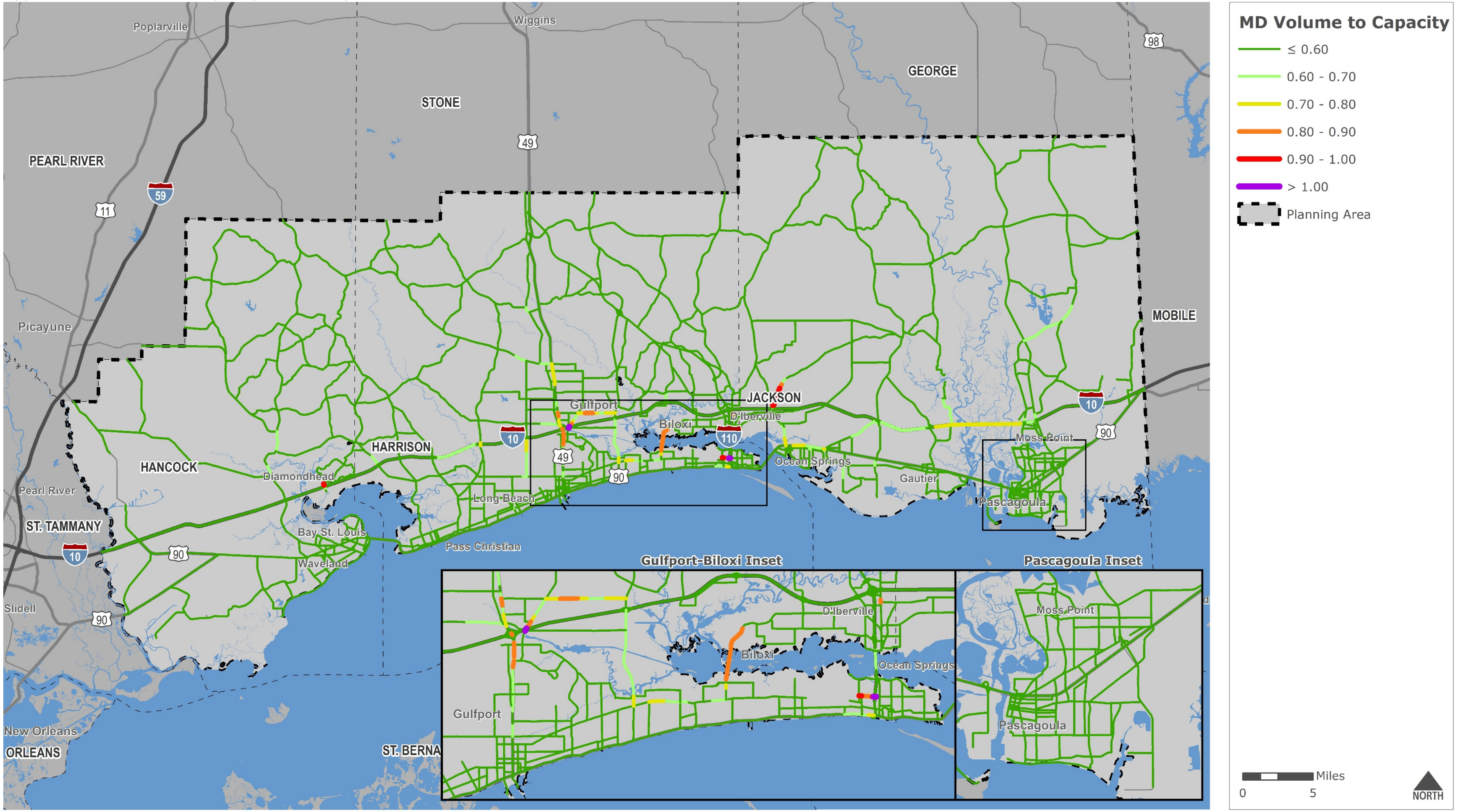
Appendix A.1 Volume to Capacity Ratio Study - 2018 AM Peak



Data Sources: Travel Demand Model

Disclaimer: This map is for planning purposes only.

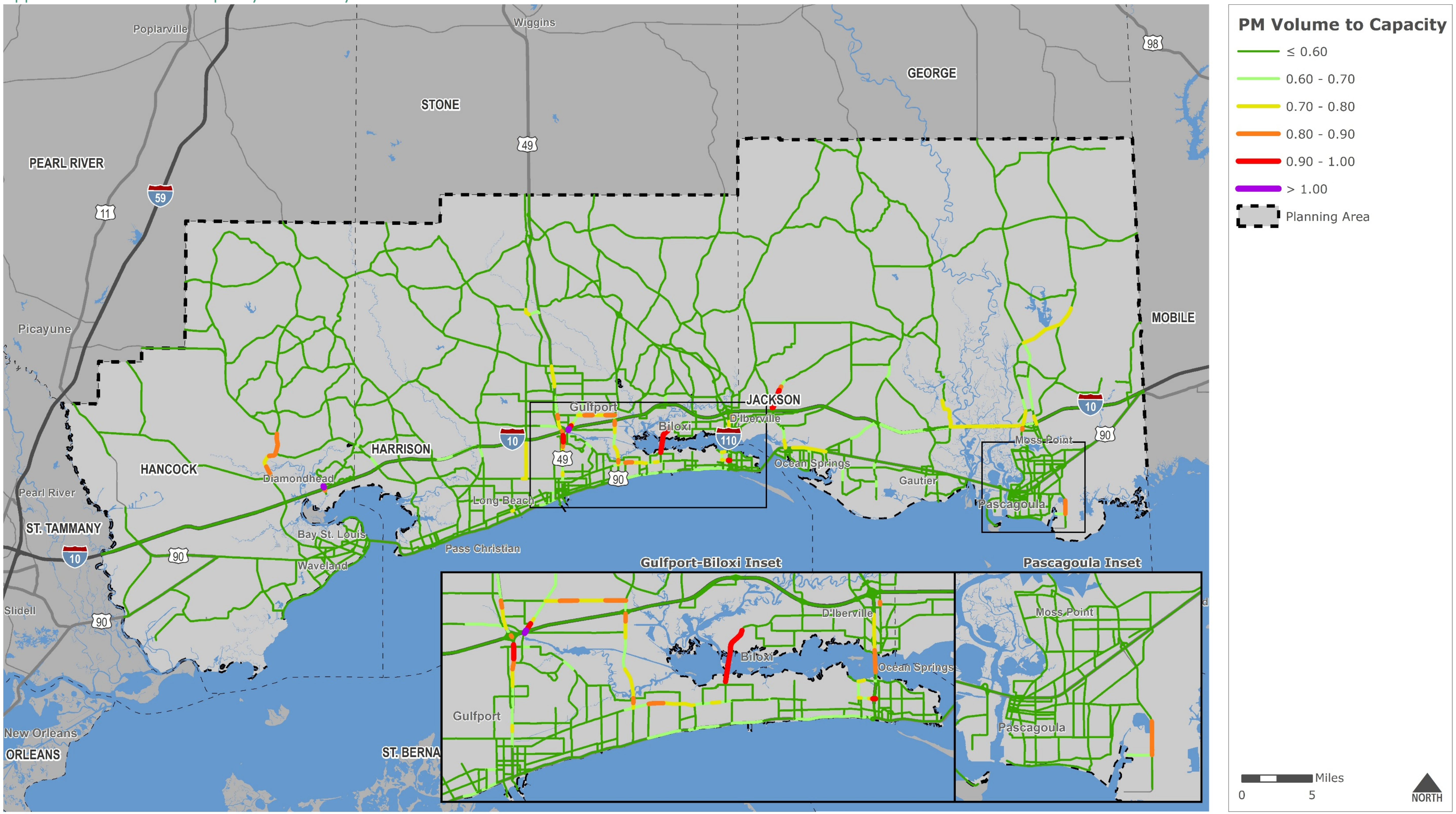
Appendix A.2 Volume to Capacity Ratio Study - 2018 MD Peak



Data Sources: Travel Demand Model

Disclaimer: This map is for planning purposes only.

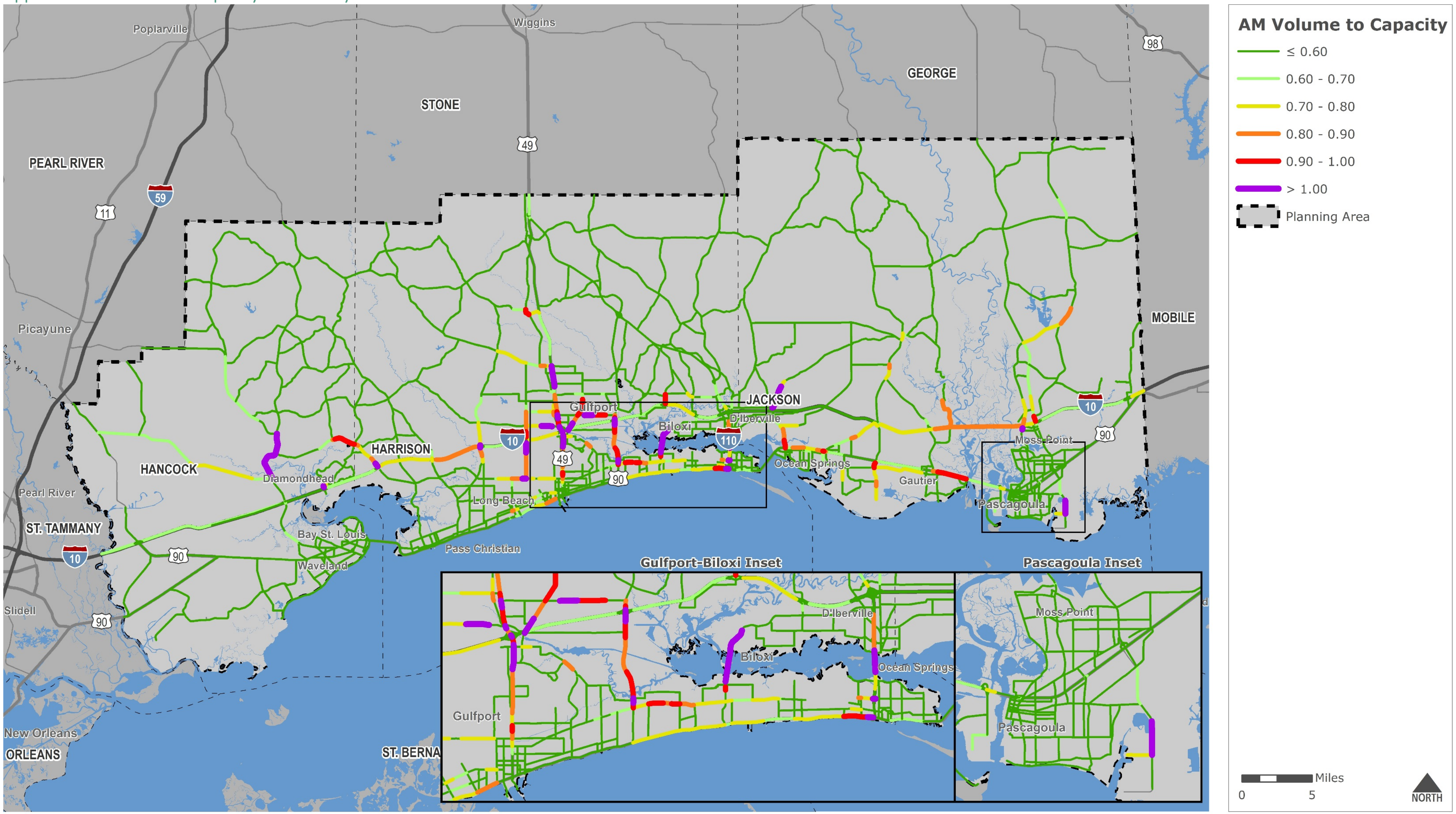
Appendix A.3 Volume to Capacity Ratio Study - 2018 PM Peak



Data Sources: Travel Demand Model

Disclaimer: This map is for planning purposes only.

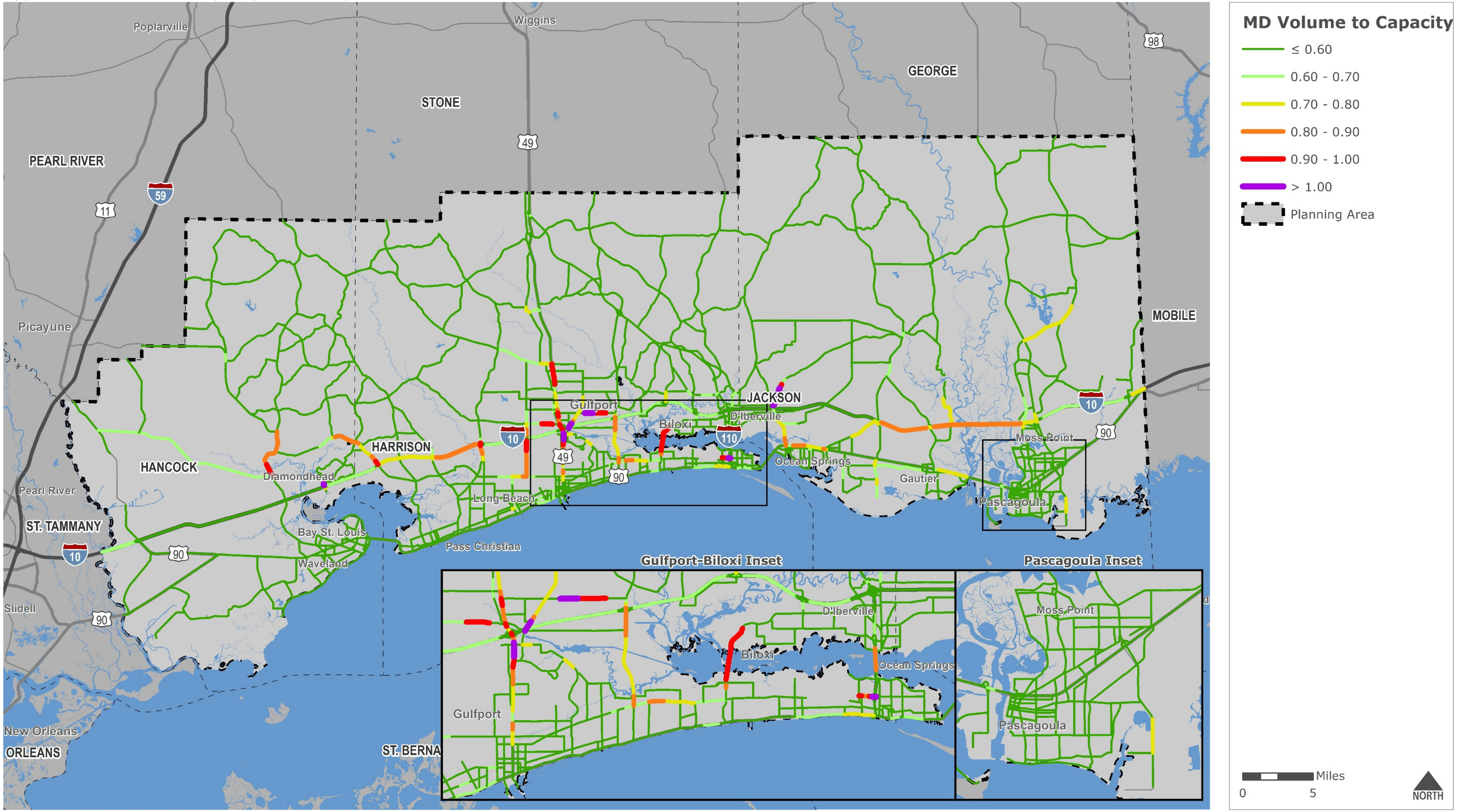
Appendix A.4 Volume to Capacity Ratio Study - 2045 AM Peak



Data Sources: Travel Demand Model

Disclaimer: This map is for planning purposes only.

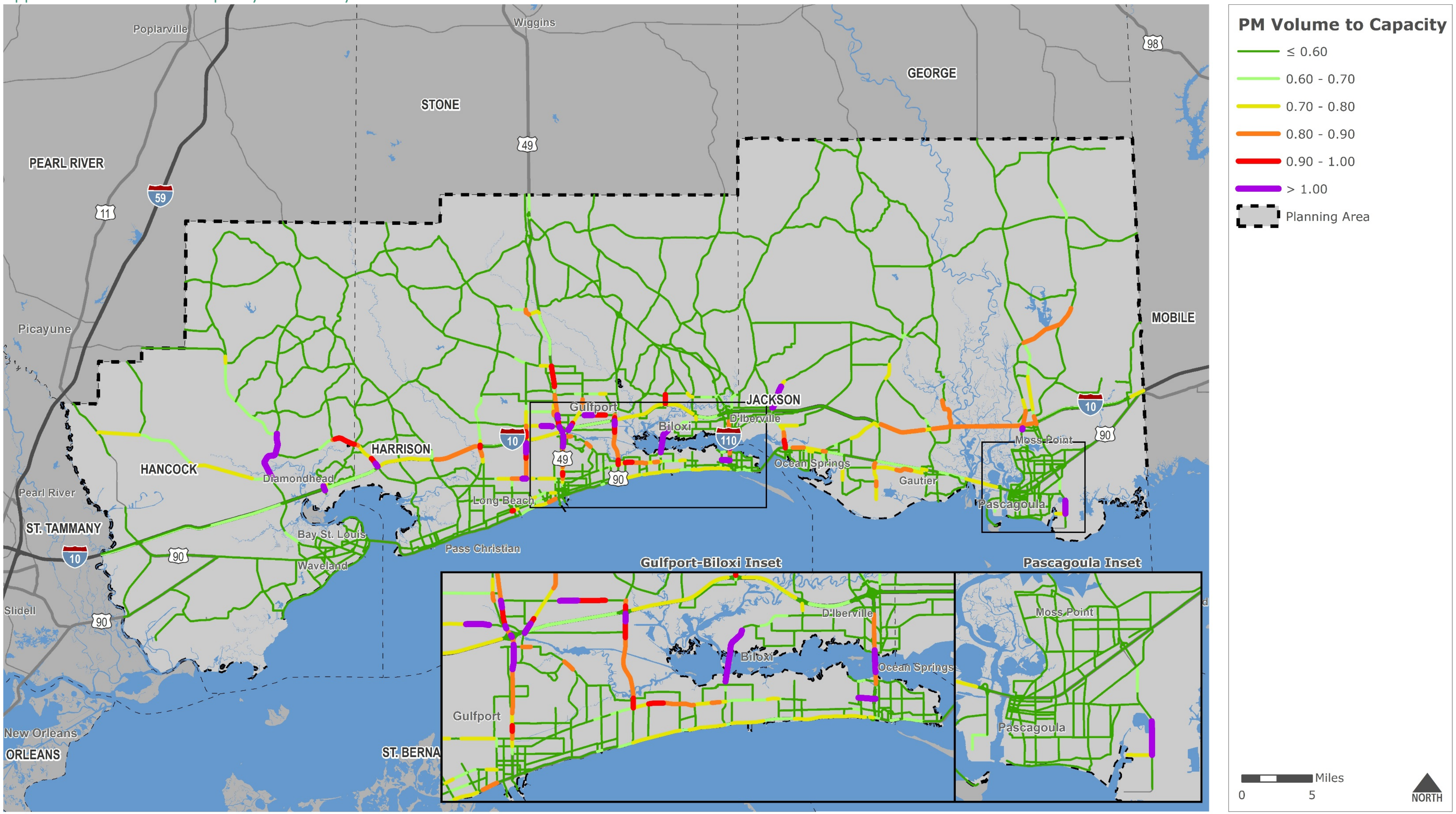
Appendix A.5 Volume to Capacity Ratio Study - 2045 MD Peak



Data Sources: Travel Demand Model

Disclaimer: This map is for planning purposes only.

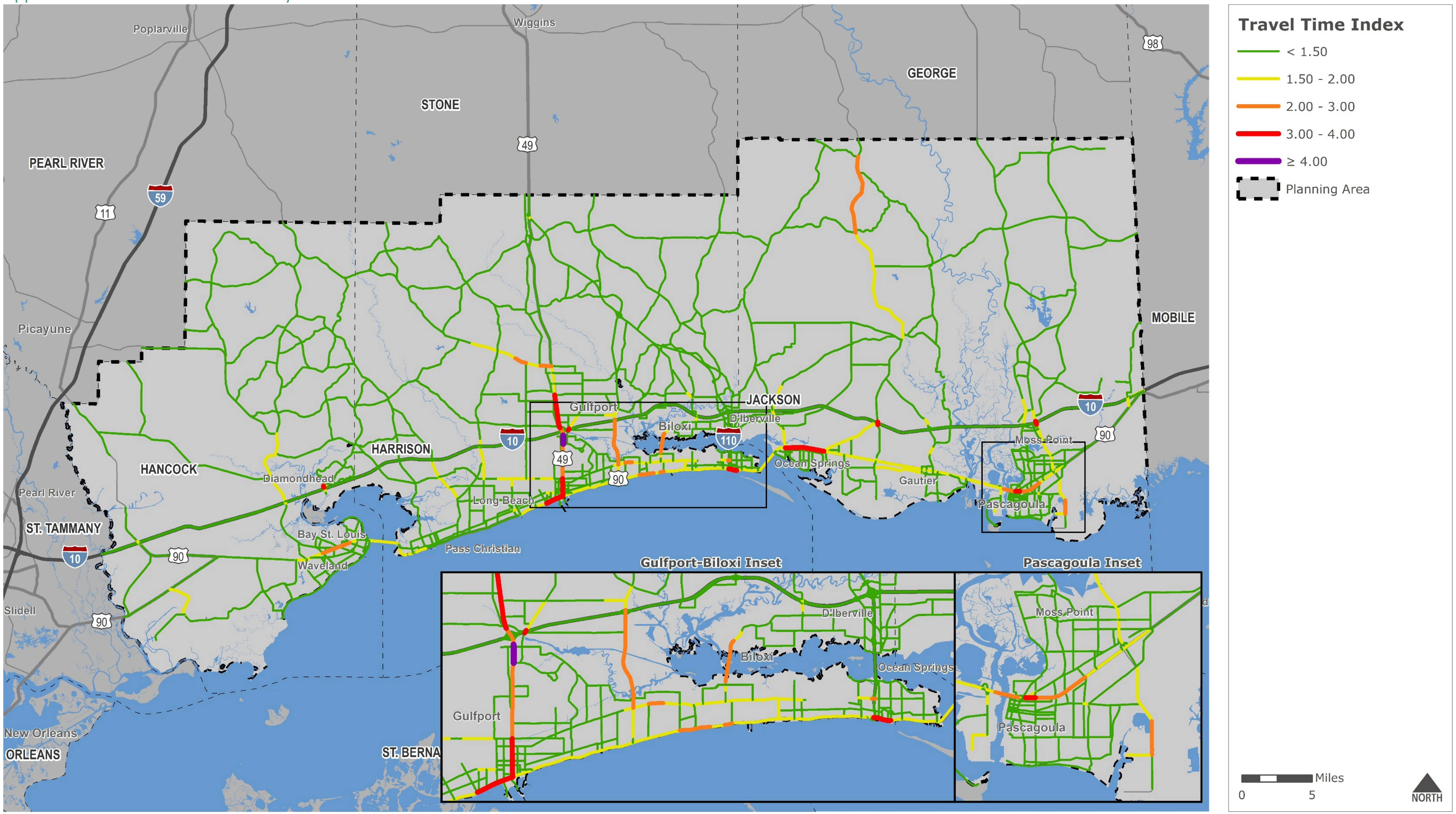
Appendix A.6 Volume to Capacity Ratio Study - 2045 PM Peak



Data Sources: Travel Demand Model

Disclaimer: This map is for planning purposes only.

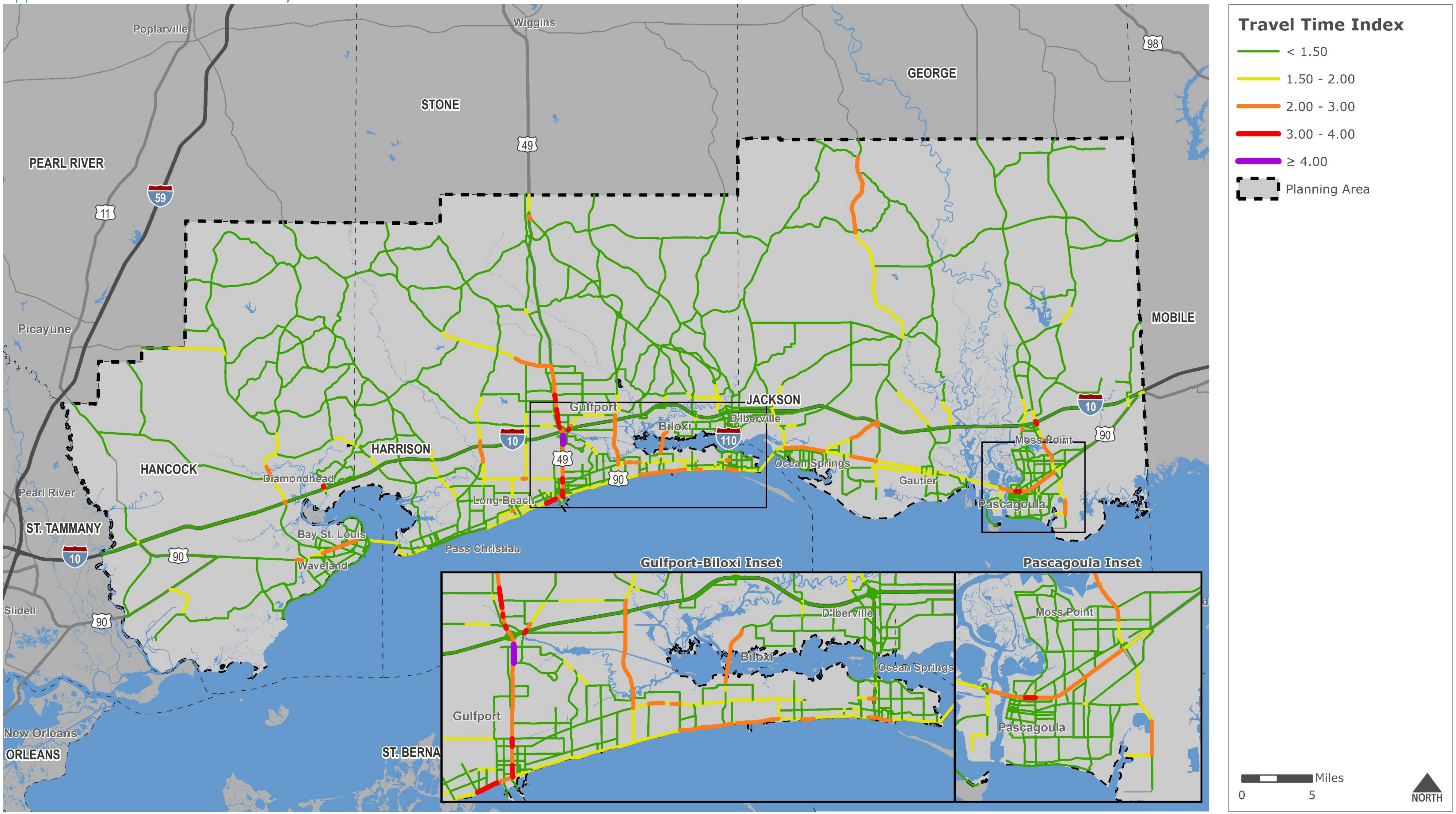
Appendix B.1 Travel Time Index Study - 2018



Data Sources: Travel Demand Model, NPMRDS

Disclaimer: This map is for planning purposes only.

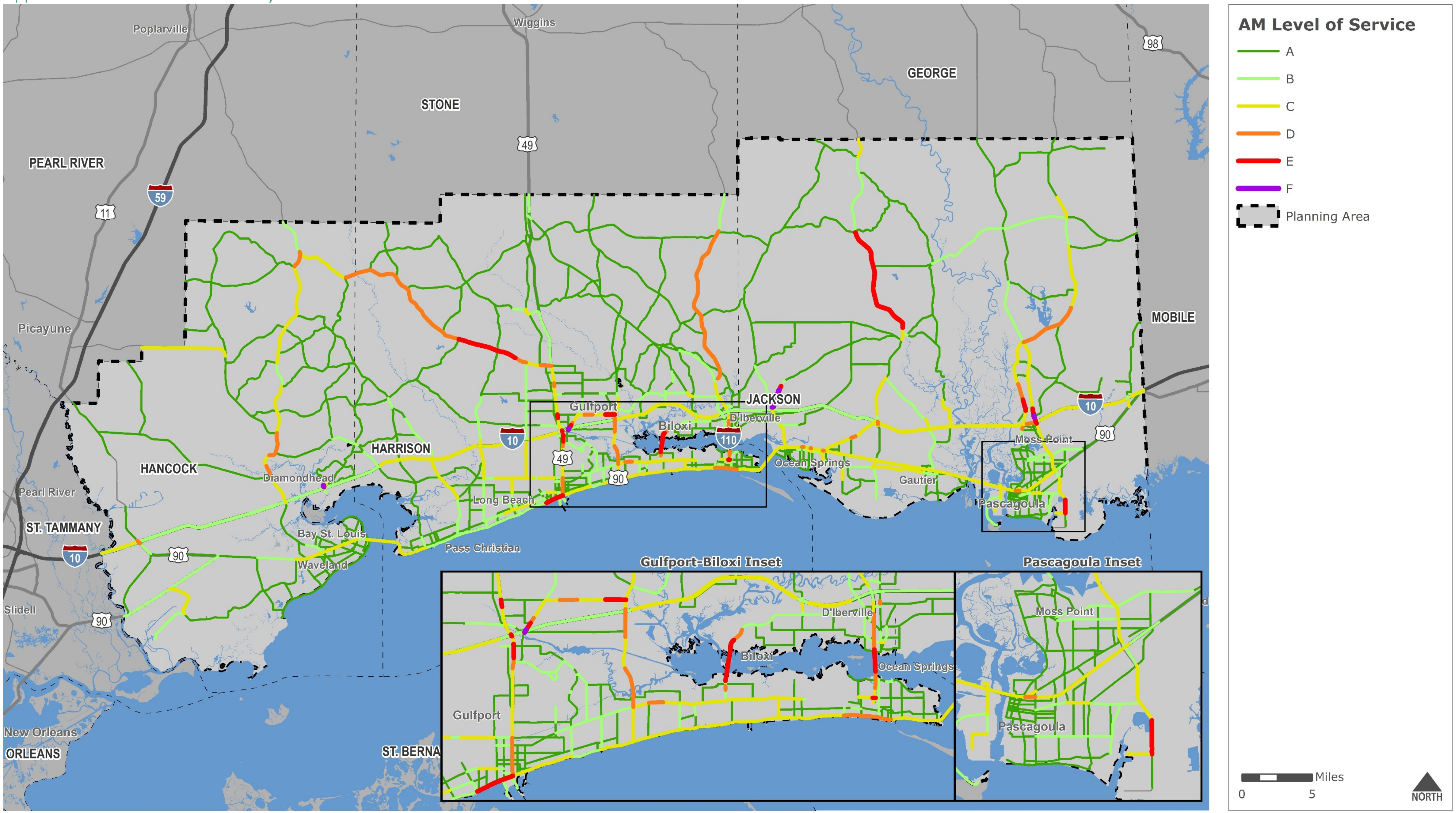
Appendix B.2 Travel Time Index Study - 2045



Data Sources: Travel Demand Model, NPMRDS

Disclaimer: This map is for planning purposes only.

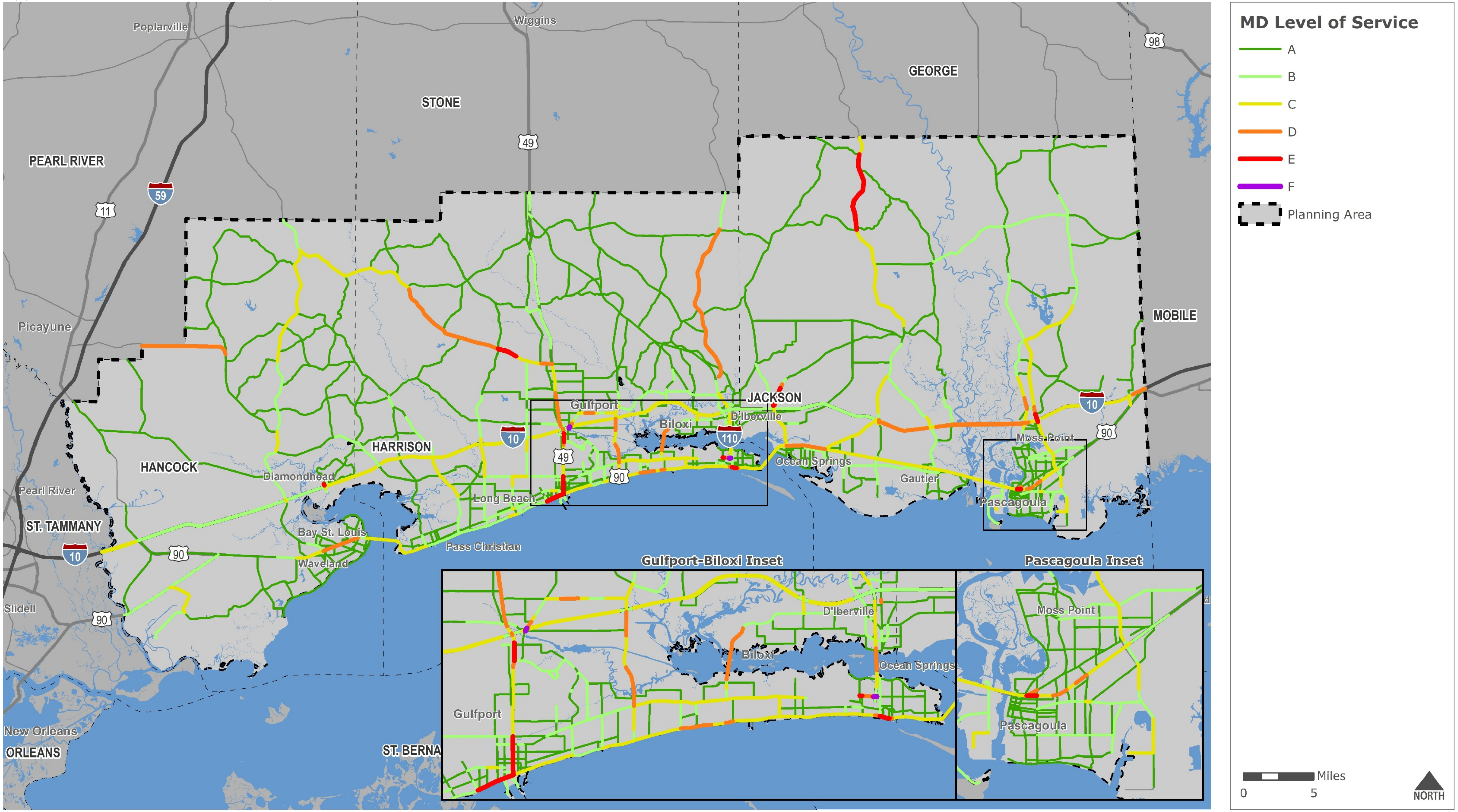
Appendix C.1 Level of Service Study - 2018 AM Peak



Data Sources: Travel Demand Model, NPMRDS

Disclaimer: This map is for planning purposes only.

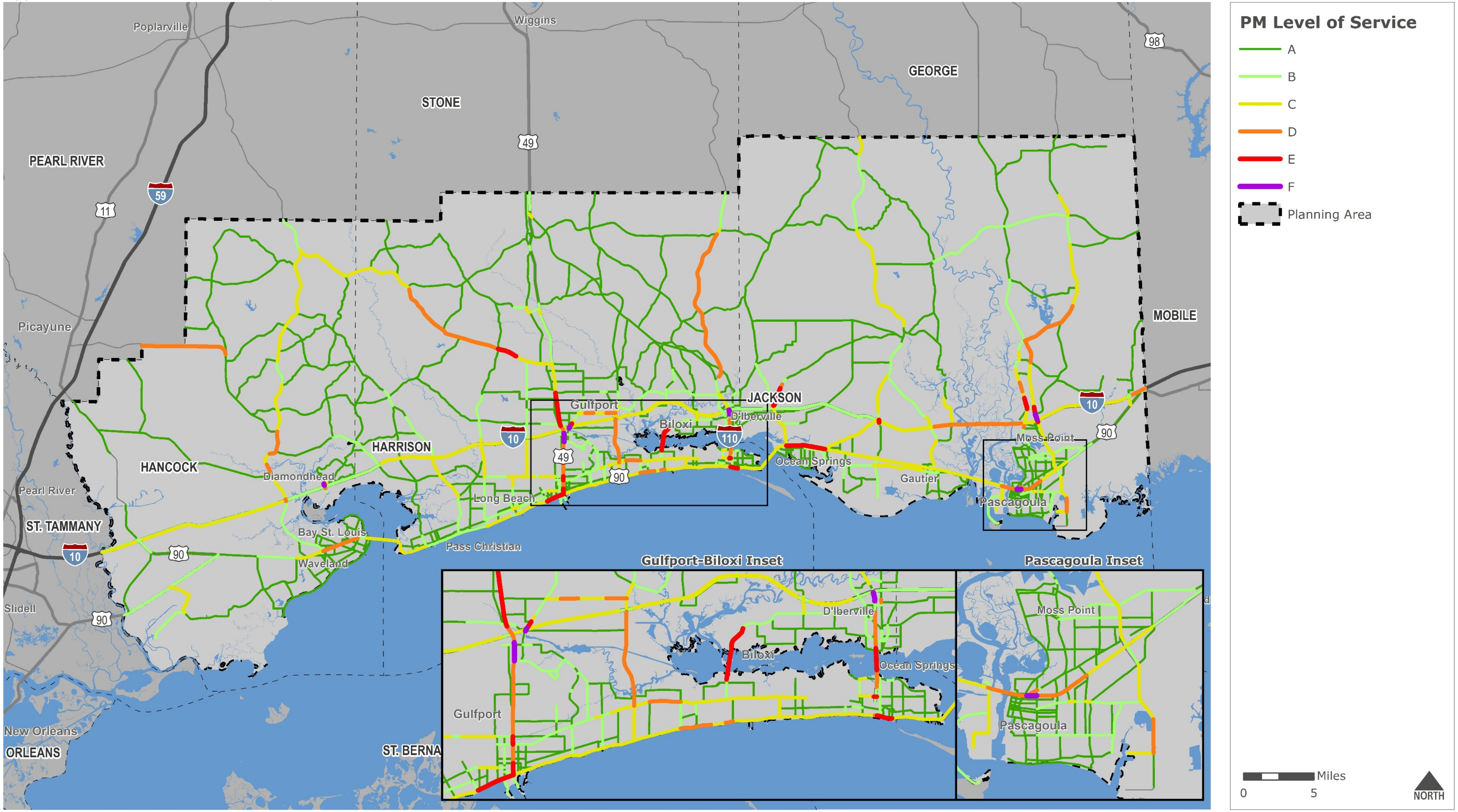
Appendix C.2 Level of Service Study - 2018 MD Peak



Data Sources: Travel Demand Model, NPMRDS

Disclaimer: This map is for planning purposes only.

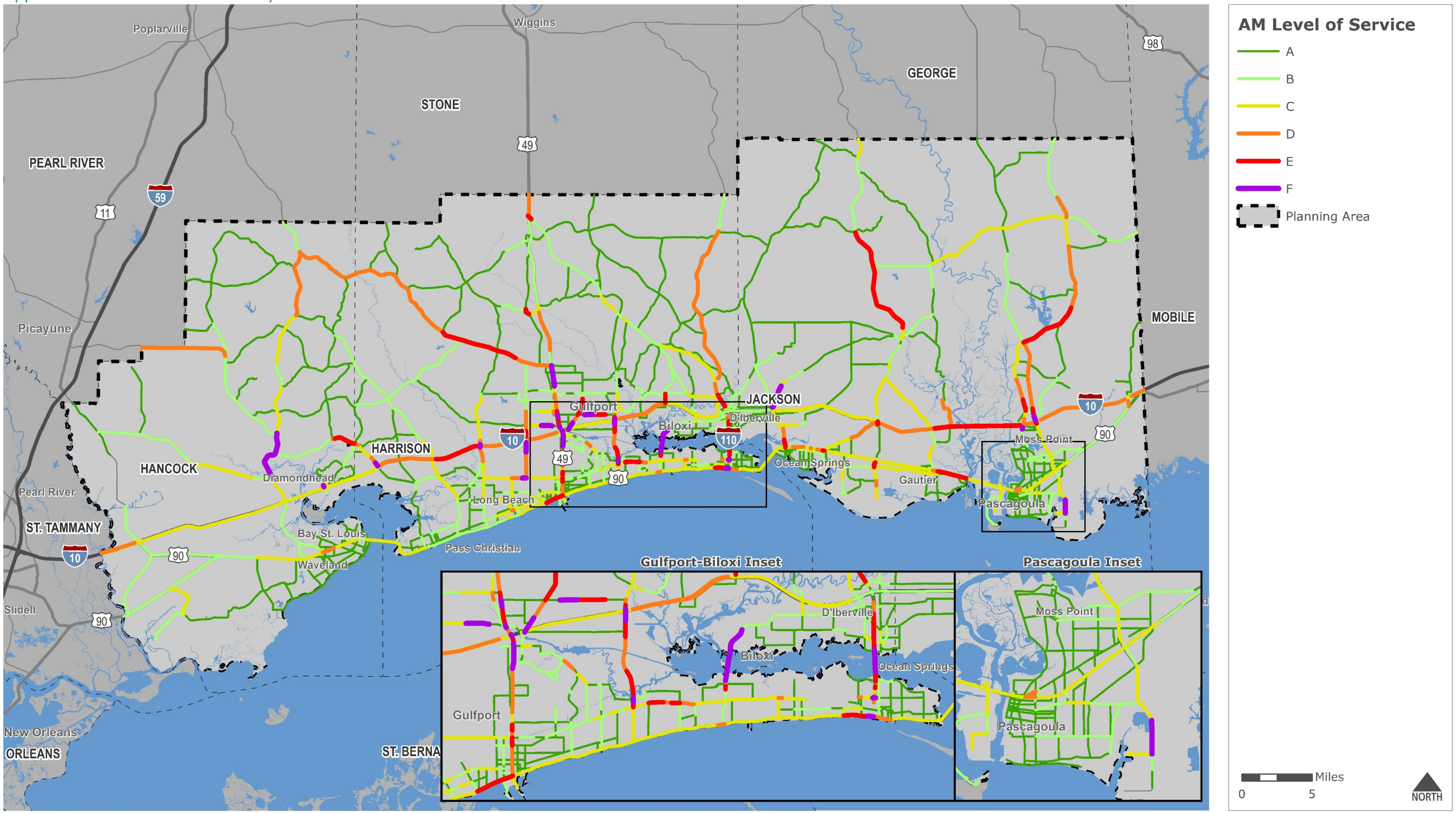
Appendix C.3 Level of Service Study - 2018 PM Peak



Data Sources: Travel Demand Model, NPMRDS

Disclaimer: This map is for planning purposes only.

Appendix C.4 Level of Service Study - 2045 AM Peak



Data Sources: Travel Demand Model, NPMRDS

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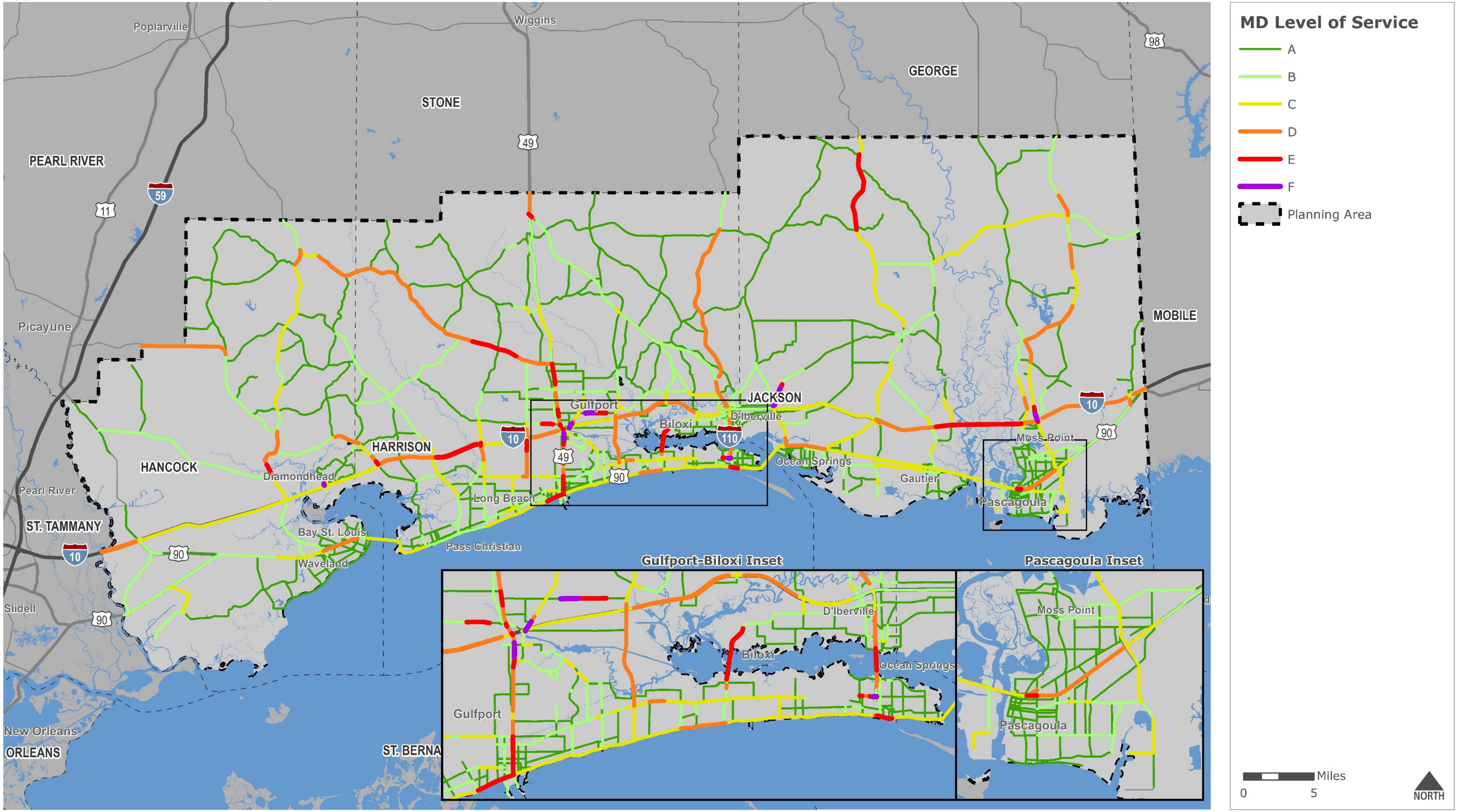
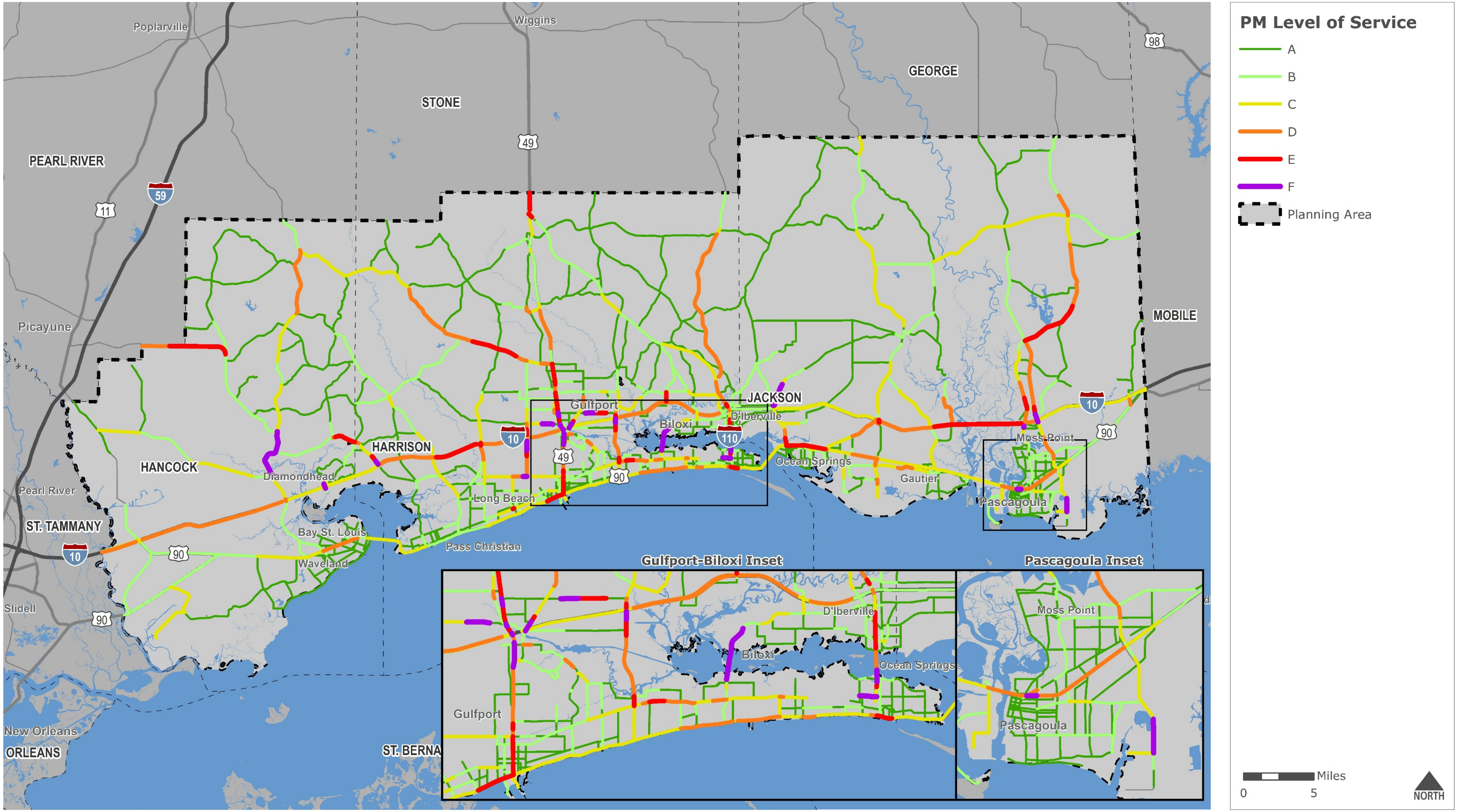
Appendix C.5 Level of Service Study - 2045 MD Peak



Data Sources: Travel Demand Model, NPMRDS

Disclaimer: This map is for planning purposes only.

Appendix C.6 Level of Service Study - 2045 PM Peak



Data Sources: Travel Demand Model, NPMRDS

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